HOLLOW-CORE SLAB SYSTEMS

Information Manual - First Edition 2008

Quality, strength, speed.

CONCRETE MANUFACTURERS ASSOCIATION

Quality cast in concrete

DISCLAIMER

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HOLLOW-CORE SLAB SYSTEMS INFORMATION MANUAL

FIRST EDITION 2008

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1 INTRODUCTION

Hollow-core was originally conceived and developed as South Africa's alternative to insitu cast concrete floor panels for multi-storey buildings some 25 years ago. In today's world of innovation and fast-tracking, the hollow-core floor slab is a viable and in many instances, preferable alternative to more conventional building methods.

Besides the obvious advantages of simpler, faster construction, not to mention a more durable end product, the secret of applying the material successfully is in the pre-planning. Get one of the CMA member companies involved at the concept stage and their advice and design input comes at no charge.

Set out in this manual are several examples demonstrating the versatility and multi-purpose functionality of the prestressed and reinforced hollow-core slabs. Applications covered include security walls, reservoir roofing, retaining walls and warehouse walling, multi-storey floor applications to residential, commercial and industrial buildings, as well as suspended ground floor slabs in clay areas.

Also discussed are important sub-contracting aspects which apply when slabs are deployed in their more traditional guise as flooring.

INTRODUCTION TO HOLLOW-CORE MEMBERS

1.1 Echo Floors (Reinforced hollow-core slabs)

Available in Gauteng and surrounding areas

Echo Floors provide a complete service: design, manufacture, installation and grouting of reinforced precast hollow-core concrete floor slabs.

"Echo Floors" slabs are suitable for short span applications (up to 7.0m between support structures), like individual houses, flats, townhouses, clusters and light industrial applications. The slabs are traditionally used as suspended floors for buildings up to 4 floors, roof slabs and suspended ground floor slabs.

Echo Floors is an ISO 9001 accredited company.

1.2 Echo Prestress (Prestressed slipformed hollow-core slabs)

Available in Gauteng and surrounding areas and KZN (Durban and surrounding areas)

Echo Prestress provide a complete service: design, manufacture, installation and grouting of prestressed hollow-core concrete floor slabs.

"Echo Prestress" slabs are suitable for long span applications (up to 11m between support structures) like townhouses, clusters, industrial and commercial projects, schools, clinics and suspended ground floors in areas of clay heave and shrinkage. These slabs are traditionally used as suspended floors for buildings up to 4 floors, but can be applied to high rise buildings by introducing a composite design. Composite refers to structures where prestressed slabs and insitu concrete or steel work together to form an integral structural component (refer to composite details).

Alternatively Echo Prestress can be used as security walls for prisons, airports, airforce bases or any property with high security requirements. The panels can also be used to construct a building — this application is installed between structural columns (steel or concrete). Echo Prestress panels are ideal as retaining walls and can be used as a foundation system for affordable housing.

Echo Prestress is an ISO 9001 accredited company and carries the SABS mark — SANS 1879:2001.

1.3 Echo Prestress Durban (Prestressed slipformed hollow-core slabs)

(Refer to Echo Prestress Gauteng)

1.4 Fastfloor (Prestressed slipformed hollow-core slabs)

Available in Botswana (Gabarone and surrounding areas)

Fastfloor is part of the Echo Group of companies and offers the same product and service as Echo Prestress except Fastfloor is not ISO 9001 accredited nor does the product have the SABS mark.

1.5 Shukuma Flooring Systems (Prestressed slipformed hollow-core slabs)

Available in Port Elizabeth and surrounding areas

Shukuma provide a prestressed slipformed hollow-core slab.

Suitable applications: residence, industrial, commercial buildings, schools, clinics, townhouses, multi-storey carparks and suspended ground floor slabs in heaving clay areas.

Shukuma provide various slab depths ranging up to 250mm deep slabs, spanning up to 11m between support structures.

Shukuma's service includes the design, manufacture, installation, lining and levelling and grouting between the longitudinal joints.

1.6 Stabilan (Prestressed slipformed hollow-core slabs)

Available in O.F.S., Northern Cape and Lesotho

Stabilan provide a complete service: design, manufacture, installation and grouting of prestressed hollow-core concrete floor slabs.

"Stabilan" slabs are suitable for long span applications like townhouses, clusters, industrial and commercial projects, schools, clinics and suspended ground slabs in areas of clay heave and shrinkage. These slabs are traditionally used as suspended floors for buildings up to 4 floors, but can be applied to high rise buildings by introducing a composite design. Composite refers to structures where prestressed slabs and insitu concrete or steel work together to form an integral structural component (refer to composite details).

1.7 Topfloor (Slipformed and extruded hollow-core slabs)

Available in the Western Cape (Cape Town and surrounding areas)

Topfloor provide a complete service: design, manufacture, installation and grouting of prestressed hollow-core concrete floor slabs.

"Topfloor" slabs are suitable for long span applications like houses, townhouses, clusters, industrial and commercial projects, schools, clinics and suspended ground floors in areas of clay heave and shrinkage. These slabs are traditionally used as suspended floors for buildings up to 4 floors.

2 DESIGN OVERVIEW

2.1 Hollow-Core Used As Flooring

Hollow-core concrete slabs offer several advantages over insitu floor casting, including speed of installation, lower building costs and consistent quality levels — attributes not often found in one convenient package.

Slabs are available in standard widths of 900mm and 1 200mm, in thicknesses of 120mm, 150mm, 160mm, 200mm and 250mm. Slabs are available in spans of up to 11m. Non-standard widths are also available and lengths are manufactured to suit individual requirements. Refer to individual manufacturers specifications concerning product specific criteria.

Due to the weight saving — up to a third or more — the use of high strength concrete, coupled with pre-stressing means that hollow-core slabs can achieve considerably larger spans than insitu reinforced concrete slabs of similar depths.

The slabs can be used in the construction of virtually any type of building in which suspended floors or roofs are required. These include flats, hospitals, office blocks, hostels, factories, hotels, townhouses, schools, shopping malls, multi-storey car parks, culverts and reservoir roofs.

2.2 Structural Details

	PRESTRESSED HOLLOW-CORE	REINFORCED HOLLOW-CORE
Slab depths available	*120mm* *150mm* *160mm (Stabilan only)* *200mm* *250mm*	*150mm only*
Slab widths available	*1200mm*	*900mm*
Non-standard widths	*100mm increments*	*100mm increments*
Minimum concrete strength at detensioning	*35MPa for 120mm, 150mm, 160mm and 200mm deep slabs.* *45MPa for 250mm deep slabs*	*Minimum 35MPa when stripping from the casting pallets.*
Minimum concrete strength at 28 days	*50MPa*	*50MPa*
Suggested maximum span to depth ratio	*L/50*	*L/30*
Prestressing wire type	*5.0mm dia triple indented – low relaxation wire.*	*Reinforcing type 450MPa*
Prestressing strand type	*9.53mm dia stabilised strand* *12.5mm stabilised strand*	
Suggested slab bearings	*On brickwork - 100mm* *On steel - 75mm* *On concrete - 75mm*	*On brickwork – 100mm* *On steel – 60mm* *On concrete – 60mm*
Fire rating	*1 hour standard* *Higher ratings are possible*	*1 hour standard*
Cantilevers	*Suggested cantilevers with the various slab depths:* *120mm – 720mm* *150/160mm – 900mm* *200mm – 1200mm* *250mm – 1500mm* *Cantilever top reinforcing steel is cast into the top of the opened hollow-core and the ends are cast solid.*	*Steel is required in a structural topping on all cantilever panels.* *For an Echo slab, twice the length of the cantilever must be on the building.* *For a steel beam or channel, three times the cantilever length must be on the building.* *Cantilevers up to 2m long can be done with Echo slabs with a structural topping and reinforcement.*
Self weight of slabs (kN/m²)	*Echo & Shukuma / Fastfloor / Stabilan / Topfloor* *120: 2.4 / 2.16 / 2.46 / -* *150: 2.75 / 2.51 / - / 2.02* *160: - / - / 2.76 / -* *200: 3.29 / 3.02 / 3.27 / -* *250: 3.86 / 3.53 / 4.08 / -*	*Self weight of a 900mm wide reinforced slab* *Slab only: 2.30kN/m²* *Slab & joint: 2.42kN/m²* *Slab, joint & 30mm levelling screed: 3.14kN/m²* *Slab, joint & structural topping:* *30mm – 3.14kN/m²* *40mm – 3.38kN/m²* *50mm – 3.62kN/m²* *60mm – 3.86kN/m²* *70mm – 4.10kN/m²* *80mm – 4.34kN/m²*
Number of hollow-cores (1200mm wide)	*Echo & Shukuma / Fastfloor / Stabilan / Topfloor* *11 / 9 / 9 / 8*	*Number of hollow-cores 900mm wide 8*

2.3 Basic Design Parameters

2.3.1 Design Details
Basic design parameters of a reinforced hollow-core slab

Echo Floors

All slabs 4.5m and over should be propped in the centre during the casting of the joints (one prop per panel).

All slabs over 5.0m require a structural concrete topping in addition to grout in the joints.

Props should be left in position for a minimum of 10 days after the casting of joints and topping.

External walls at first floor level can be built while props are in position. Internal walls which are supported by the slab (i.e. no wall underneath) should only be constructed after props have been removed.

Openings up to 1.5 metres wide in load-bearing walls can be covered by 2 lintels plus five courses (with brick force in between the courses). This is suitable for the support of slabs up to 7.8m long. Openings wider than 1.5 metres should be referred to the engineer for the detailing of additional structural steel support.

Bearing for 200mm deep steel beam or channel or angle — 220mm minimum on brickwork on either side of opening. Bearing for 250mm plus deep steel beams — minimum 330mm on brickwork on either side of opening.

Cantilevers: Reinforcing steel is required in a structural topping on all cantilever panels.

For an Echo slab, twice the length of the cantilever must be on the building.

For a steel beam or channel, three times the cantilever length must be on the building. Cantilevers up to 2 metres long can be done with Echo slabs with a structural topping and reinforcement.

Where Echo slabs are used as roof slabs, balconies, external walkways or flat roofs, we recommend a minimum Ref 100 mesh in the screed/topping over the slabs.

Where the Echo slab soffit is to be plastered we recommend a minimum Ref 100 mesh in the screed/topping over the slabs together with a fiberglass bandage over the V-joint on the soffit.

It is recommended that either a textured paint or tyroleen finish is used on the soffit of the slabs.

2.3.2 Design Details
Basic design parameters of a prestressed hollow-core slab (slipformed)

Echo Prestress (Gauteng and KZN)

No propping is required.

Only a 40mm levelling screed is required over the slab.

Prestresed slabs may be specified with cantilevers by incorporating reinforcing into the hollow-cores which are grouted in the factory during the casting process.

Where prestressed slabs are used as roof slabs or balconies a minimum Ref 100 mesh is required in the insulating screed over the panels, as well as a slip joint on the walls. On indoor areas where tiles are specified a minimum Ref 100 mesh is required in the screed.

Expansion joints are required in tiled areas. Specifications are available from the manufacturer.

All unfinished areas also require Ref 100 mesh.

Self weights of various slab depths are 30% lighter than an insitu slab of similar depths. Prestressed slabs achieve longer spans than insitu of a similar depth. This is attributed to high strength concrete and prestressed wire and strand used.

Spans of up to 11.0m are possible with a 250mm deep slab.

The upward camber under self weight excluding screed is L/300. The downward deflection under total load is L/350.

e.g. 5.0m panel under self weight would have an upward camber of 17mm and a downward deflection of 15mm under the total load.

Service holes of up to 90mm may be made in the panels on site. Any service holes larger than 90mm should be referred to the design engineer. It is easy to make holes up to 90mm diameter by hand in the hollow-core of the slab as the concrete thickness is a maximum of 30mm. The holes can be made in the slab after they have been erected into position.

Larger cut outs can be formed in the factory — these holes require more specific strengthening but can be catered for at the design stage.

Skylights and stair openings are formed by specifically fabricated steel hangers which are supplied and erected by the manufacturer, alternatively a steel, brick or concrete beam can be used as support around the opening.

The tops of the hollow-cores can be opened to take steel when the walls are used in composite action with steel or concrete beams.

Skew ends can be cut in the factory with a diamond tipped saw blade specifically manufactured to accurately cut any angle.

A CD with a full design package is available to all consulting engineers. A professional engineer's certificate is issued for the slab only. Structural designs are in accordance with SANS 1879:2001.

2.3.3 Design Details Basic design parameters of a prestressed hollow-core slab (slipformed)

Fastfloor™

No propping is required.

Only a 40mm leveling screed is required over the slab.

Prestresed slabs may be specified with cantilevers by incorporating reinforcing into the hollow-cores which are grouted in the factory during the casting process.

Where prestressed slabs are used as roof slabs or balconies a minimum Ref 100 mesh is required in the insulating screed over the panels, as well as a slip joint on the walls. On indoor areas where tiles are specified a minimum Ref 100 mesh is required in the screed.

Expansion joints are required in tiled areas. Specifications are available from the manufacturer.

All unfinished areas also require Ref 100 mesh.

Self weights of various slab depths are 30% lighter than an insitu slab of similar depths. Prestressed slabs achieve longer spans than insitu of a similar depth. This is attributed to high strength concrete and prestressed wire and strand used.

Spans of up to 11.0m are possible with a 250mm deep slab.

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Larger cut outs can be formed in the factory — these holes require more specific strengthening but can be catered for at the design stage.

Skylights and stair openings are formed by specifically fabricated steel hangers which are supplied and erected by the manufacturer, alternatively a steel, brick or concrete beam can be used as support around the opening.

The tops of the hollow-cores can be opened to take steel when the walls are used in composite action with steel or concrete beams.

Skew ends can be cut in the factory with a diamond tipped saw blade specifically manufactured to accurately cut any angle.

A CD with a full design package is available to all consulting engineers. A professional engineer's certificate is issued for the slab only. Structural designs are in accordance with SANS 0100.

2.3.4 Design Details Basic design parameters of a prestressed hollow-core slab

Shukuma

• No propping is necessary.

• The slabs require a 40-50mm levelling screed only.

• Cantilevers can be formed by incorporating steel reinforcements into the hollow-cores. These are grouted into the open cores during the casting process in the factory.

• The Shukuma hollow-core panel is 30% lighter that the equivalent depth insitu slab.

Shukuma slabs used as balconies or roofs:

• A Ref 100 mesh is required in an insulating screed with a slip joint on the support walls.

• All tiled areas require a minimum Ref 100 mesh in the screed with expansion joints specified by the manufacturer. The same mesh is required in all unfinished areas.

2.3.5 Design Details
Basic design parameters of a prestressed hollow-core slab (slipformed)

Stabilan

Support widths are as follows:

Slabs not longer than 5 000mm
- *70mm (suggest design)*
- *40mm (safe minimum)*

Slabs longer than 5 000mm
- *100mm (suggest design)*
- *L/100 (safe minimum)*

In cases where smaller support widths are used, additional shear reinforcement may be cast into grooves opened into the slabs, but this situation should rather be avoided.

For design loads (LL+IMP.DL) above 10KPa the design as well as the support widths should be checked with Stabilan.

Load capacities of the support should be checked separately, taking into account the type of material from which the support is constructed.

The deflection of slabs, taking into account the effect of the prestressing, are limited to the following:

Upward camber under self weight excluding screed
- *L/300 or 15mm*

Downward deflection under total load
- *L/350 or 20mm*

For additional strength a composite design of Stabilan hollow-core units and insitu concrete structural topping can be used.

A 55MPa concrete mix with very low creep and shrinkage coefficient is used which will result in low camber and deflections.

Minimum concrete strength after 3 days: 28MPa.
Minimum concrete strength after 28 days: 55MPa.

Grout mixture – 25MPa concrete (6.7-9mm) aggregates.

A cantilever of up to 1 500mm can be achieved but additional top reinforcing is required.

On the soffit of the floor/roof the joints between the units must preferably be finished off as V-joints. The Stabilan hollow-core panel soffit must not be plastered.

Service holes of up to 150mm may be cut on site by the Stabilan installation team. Larger holes can be accommodated if provided sizes are available during the design process and then the manufacturing process.

A finishing screed of no less than 50mm is recommended.

Hangers for suspended ceilings may be fixed through the joints between the Stabilan units.

Stabilan units can be cut to any shape and size — preferably during the manufacturing process.

2.3.6 Design Details
Basic design parameters of an extruded prestressed hollow-core slab

Topfloor

Topfloor is a division of allied Concrete and Plaster Supplies Limited, leaders in precast concrete since 1904.

Topfloor supply and erect prestressed decks the day after brickwork is ready.

Full engineering advice and drawings are provided by the Topfloor in-house team, as well as the appropriate documentation for councils and NHBRC.

Design, advice, drawings for council, all approved by the Topfloor in-house team.

Topfloor is ideally used for houses, flats, shops, offices, schools and sports stadia.

Benefits of Topfloor decks include:

Lightweight:	*Less load on support structure*
No Propping:	*Saves time and money*
No concrete topping:	*Light finishing screed only*
No skimming needed:	*Excellent soffit needs only textured paint finish, but can be skimmed if required.*
Module width:	*1 200mm (filler widths available)*
Weight:	*202kg/m^2*
Height:	*150mm*

2.4 Recommended design imposed loads for common classes of building

Building Type	Intensity of distributed load	
	kN/m^2	kgf/m^2
Banking halls	*4.0*	*408*
Colleges		
Assembly area without fixed seating	*5.0*	*510*
Classrooms, lectures theatres	*3.0*	*204*
Dining rooms, kitchens	*3.0*	*306*
Dormitories	*1.5*	*153*
Gymnasia	*5.0*	*510*
Libraries	*5.0*	*510*
Stairs, Corridors	*3.0*	*306*
Light workshops	*3.0*	*306*
Factories, workshops *and* ***similar buildings***	*5.0* *7.5 or* *10.0*	*510* *765* *1020*
Flats and houses	*1.5*	*153*
Garages		
Car parking only for passenger vehicles and light vans not exceeding 2500kg (2 ½ tons) gross weight.	*2.0*	*204*
Repair workshops for all types of vehicles and parking for unloaded vehicles exceeding 2500kg (2 ½ tons) gross weight	*5.0*	*510*
Offices		
Filing and storage spaces	*5.0*	*510*
Office for general use	*2.5*	*255*
Lightweight partitions	*1.0*	*102*
Corridors / Lobbies	*3.0*	*306*
Shop floors *for the sale and display of merchandise*	*4.0*	*408*

2.5 Load Span Tables

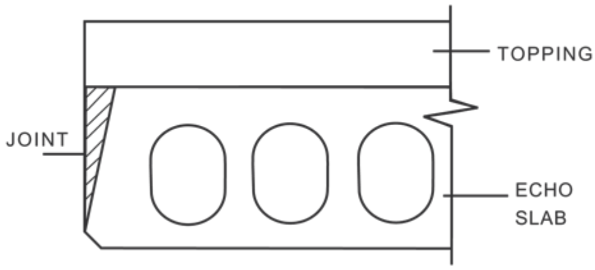
2.5.1 Echo Floors Load Span Tables

Load span tables – Maximum panel lengths					
Live Load	*SLAB TYPE*				
Kn/m²	*C*	*D*	*E*	*H*	*H3/X/Z*
NO TOPPING					
1,50	*3,20*	*3,60*	*4,10*	*4,60*	*6,10*
2,50	*3,20*	*3,60*	*4,10*	*4,60*	*5,40*
5,00	*3,00*	*3,40*	*3,80*	*-*	*-*
30mm TOPPING					
1,50	*3,30*	*3,70*	*4,10*	*4,60*	*6,80*
2,50	*3,30*	*3,70*	*4,10*	*4,60*	*6,00*
5,00	*3,30*	*3,70*	*4,10*	*4,60*	*5,10*
40mm TOPPING					
1,50	*3,40*	*3,80*	*4,20*	*4,60*	*7,10*
2,50	*3,40*	*3,80*	*4,20*	*4,60*	*6,30*
5,00	*3,40*	*3,80*	*4,20*	*4,60*	*5,30*
50mm TOPPING					
1,50	*3,40*	*3,80*	*4,20*	*4,60*	*7,40*
2,50	*3,40*	*3,80*	*4,20*	*4,60*	*6,50*
5,00	*3,40*	*3,80*	*4,20*	*4,60*	*5,50*
60mm TOPPING					
1,50	*3,40*	*3,80*	*4,20*	*4,60*	*7,69*
2,50	*3,40*	*3,80*	*4,20*	*4,60*	*6,70*
5,00	*3,40*	*3,80*	*4,20*	*4,60*	*5,70*
70mm TOPPING					
1,50	*3,40*	*3,80*	*4,20*	*4,60*	*7,40*
2,50	*3,40*	*3,80*	*4,20*	*4,60*	*7,20*
5,00	*3,40*	*3,80*	*4,20*	*4,60*	*6,80*
80mm TOPPING					
1,50	*3,40*	*3,80*	*4,20*	*4,60*	*7,40*
2,50	*3,40*	*3,80*	*4,20*	*4,60*	*7,20*
5,00	*3,40*	*3,80*	*4,20*	*4,60*	*6,80*

NOTE: *The dead weight plus the joint filling, as well as standard finishes up to 1Kn/m2 are included in the above tables.*

Reinforcing content – of various slab types			
Slabs are cast in lengths from 1 000 to 8 200mm in 100mm increments. Slabs are cast with standard steel reinforcing top and bottom dependant on the length of the slab.			
Slab type	*Slab Length (mm)*	*Top Steel Qty./Dia.*	*Bottom Steel Qty./Dia.*
C	*1 000 – 3 400*	*3 x ø8mm*	*5 x ø8mm*
D	*3 500 – 3 800*	*3 x ø8mm*	*6 x ø8mm*
E	*3 900 – 4 200*	*3 x ø8mm*	*8 x ø8mm*
H	*4 300 –4 600*	*3 x ø8mm*	*6 x ø12mm*
H3	*4 700 – 5 700*	*3 x ø8mm*	*9 x ø12mm*
X	*5 800 – 7 700*	*3 x ø8mm*	*9 x ø12mm*
Z	*7 800 – 8 200*	*7 x ø8mm*	*9 x ø12mm*

NOTE: *Echo slabs have a fixed depth of 150mm. The overall depth is increased by the thickness of the structural topping required.*



Moment of resistance – kN metre/metre/900mm unit							
Total Slab Depth (mm)	*150*	*180*	*190*	*200*	*210*	*220*	*230*
Structural Topping (mm)	*0*	*30*	*40*	*50*	*60*	*70*	*80*
Slab Type							
C	*14,260*	*14,263*	*19,679*	*21,031*	*22,381*	*23,730*	*25,086*
D	*18,285*	*18,326*	*24,967*	*26,642*	*28,318*	*29,991*	*31,683*
E	*22,720*	*23,286*	*30,840*	*32,900*	*34,952*	*37,007*	*39,060*
H	*38,270*	*41,276*	*51,590*	*55,060*	*58,517*	*61,966*	*65,418*
H3/X/Z	*54,479*	*68,203*	*73,596*	*78,913*	*83,985*	*89,056*	*94,148*
Total Weight							
kN/m²	*2,42*	*3,14*	*3,38*	*3,62*	*3,86*	*4,10*	*4,34*

NOTE: *Although slabs to a maximum length of 8 200mm can be supplied, please note that the maximum clear span should not exceed 7 000mm for deflection purposes.*

2.5.2 Echo Prestress and Shukuma Load Span Tables

Prestressed concrete design details – 120mm deep slabs

Sectional information			
Cross section area	*108,507 10e3mm²*	*Conc. 28 day strength*	*50N/mm²*
Moment of inertia	*161,752 10e6mm⁴*	*Conc. Strength at transfer*	*35N/mm²*
Section modulus top	*2,679 10e6mm³*	*Mod. of elasticity or conc.*	*34kN/mm²*
Section modulus bottom	*2,713 10e6mm³*	*Stressing of strand/wire*	*70%*
Total breadth of webs	*468mm*	*Check: stresses at transfer*	*O.K.*
Centroidal axis from bottom	*32,5mm*	*Cover to steel*	*30,0mm*

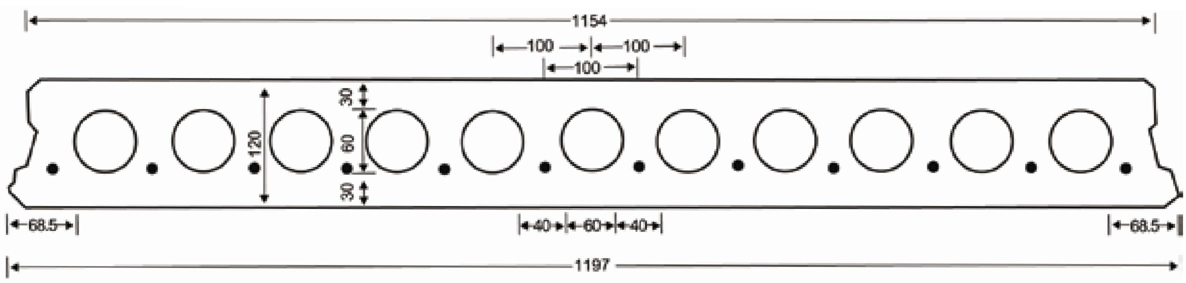
Structural information				
Moment & Shear Capacities	*Wiring Patterns*			
	A	*B*	*C*	*D*
Service moment	*16,59kN/m*	*20,22kN/m*	*23,46kN/m*	*25,79kN/m*
Ultimate moment	*19,99kN/m*	*29,24kN/m*	*37,83kN/m*	*43,41kN/m*
Ultimate shear resist	*90,82kN*	*98,19kN*	*101,95kN*	*104,08kN*

Standard wiring patterns	
A = 8 x 5mm wires	*C = 9 x 5mm + 3 x 9,53mm strand*
B = 12 x 5mm wires	*D = 7 x 5mm + 5 x 9,53mm strand*

Load capacity table				
Live Load kN/m²	*A Span*	*B Span*	*C Span*	*D Span*
0,75	*4,5*	*5,5*	*6,0*	*6,3*
1,5	*4,2*	*5,1*	*5,5*	*5,8*
2,5	*3,8*	*4,6*	*5,0*	*5,3*
4,0	*3,4*	*4,1*	*4,5*	*4,7*
5,0	*3,2*	*3,9*	*4,2*	*4,4*
7,5	*2,8*	*3,4*	*3,7*	*3,9*
10,0	*2,5*	*3,0*	*3,4*	*3,5*

NOTE: *Design loads include self weight, grouting between joints and finishes up to 1,5kN/m².*

Cross Sectional Dimensions



Self Weight = 2.40kN/m²

Prestressed concrete design details – 150mm deep slabs

Sectional information			
Cross section area	*124,674 10e3mm²*	*Conc. 28 day strength*	*50N/mm²*
Moment of inertia	*301,385 10e6mm⁴*	*Conc. Strength at transfer*	*35N/mm²*
Section modulus top	*4,002 10e6mm³*	*Mod. of elasticity or conc.*	*34kN/mm²*
Section modulus bottom	*4,034 10e6mm³*	*Stressing of strand/wire*	*70%*
Total breadth of webs	*468mm*	*Check: stresses at transfer*	*O.K.*
Centroidal axis from bottom	*32,5mm*	*Cover to steel*	*30,0mm*

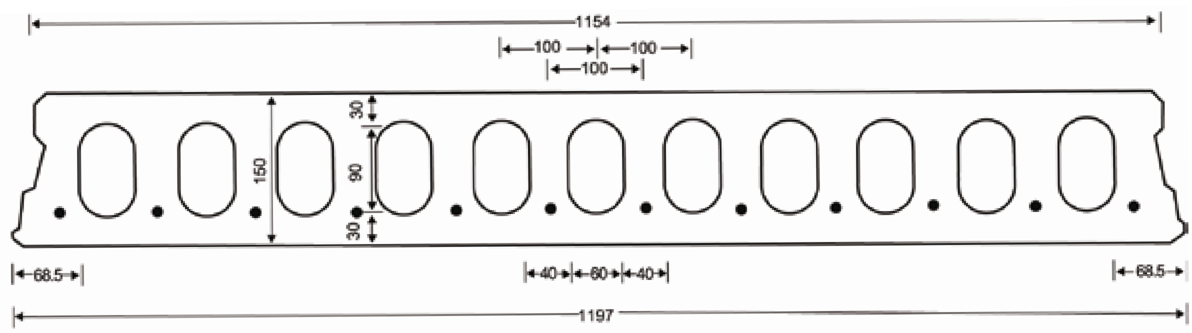
Structural information						
Moment & Shear Capacities	*Wiring Patterns*					
	A	*B*	*C*	*D*	*E*	*F*
Service moment	*24,21kN/m*	*29,39kN/m*	*34,14kN/m*	*37,52kN/m*	*42,22kN/m*	*47,80kN/m*
Ultimate moment	*27,04kN/m*	*40,04kN/m*	*52,71kN/m*	*61,80kN/m*	*73,77kN/m*	*87,65kN/m*
Ultimate shear resist	*109,13kN*	*117,50kN*	*122,17kN*	*124,79kN*	*129,10kN*	*129,43kN*

Standard wiring patterns	
A = 8 x 5mm wires	*D = 7 x 5mm + 5 x 9,53mm strand*
B = 12 x 5mm wires	*E = 4 x 5mm + 8 x 9,53mm strand*
C = 9 x 5mm wires + 3 x 9,53mm strand	*F = 12 x 9,53mm strand*

Load capacity table						
Live Load kN/m²	*A Span*	*B Span*	*C Span*	*D Span*	*E Span*	*F Span*
0,75	*5,1*	*6,3*	*7,0*	*7,3*	*7,8*	*8,3*
1,5	*4,7*	*5,8*	*6,4*	*6,7*	*7,1*	*7,6*
2,5	*4,3*	*5,3*	*5,9*	*6,2*	*6,6*	*7,0*
4,0	*3,9*	*4,7*	*5,3*	*5,6*	*5,9*	*6,3*
5,0	*3,6*	*4,4*	*5,0*	*5,3*	*5,6*	*5,9*
7,5	*3,2*	*3,9*	*4,4*	*4,6*	*4,9*	*5,2*
10,0	*2,9*	*3,5*	*4,0*	*4,2*	*4,5*	*4,7*

NOTE: *Design loads include self weight, grouting between joints and finishes up to 1,5kN/m².*

Cross Sectional Dimensions



Self Weight = 2.75kN/m²

Prestressed concrete design details – 200mm deep slabs

Sectional information			
Cross section area	*148,970 10e3mm²*	*Conc. 28 day strength*	*50N/mm²*
Moment of inertia	*661,627 10e6mm⁴*	*Conc. Strength at transfer*	*35N/mm²*
Section modulus top	*6,579 10e6mm³*	*Mod. of elasticity or conc.*	*34kN/mm²*
Section modulus bottom	*6,654 10e6mm³*	*Stressing of strand/wire*	*70%*
Total breadth of webs	*468mm*	*Check: stresses at transfer*	*O.K.*
Centroidal axis from bottom	*32,5mm*	*Cover to steel*	*30,0mm*

Structural information							
Moment & Shear Capacities	*Wiring Patterns*						
	A	*B*	*C*	*D*	*E*	*F*	*K*
Service moment	*38,23kN/m*	*46,02kN/m*	*53,314kN/m*	*58,50kN/m*	*65,72kN/m*	*74,33kN/m*	*99,88kN/m*
Ultimate moment	*38,54kN/m*	*57,81kN/m*	*77,10kN/m*	*90,89kN/m*	*111,02kN/m*	*136,03kN/m*	*169,61kN/m*
Ultimate shear resist	*143,04kN*	*153,20kN*	*159,88kN*	*163,61kN*	*169,34kN*	*170,50kN*	*198,85kN*

Standard wiring patterns

A = 8 x 5mm wires

B = 12 x 5mm wires

C = 9 x 5mm wires + 3 x 9,53mm strand

D = 7 x 5mm wires + 5 x 9,53mm strand

E = 4 x 5mm + 8 x 9,53mm strand

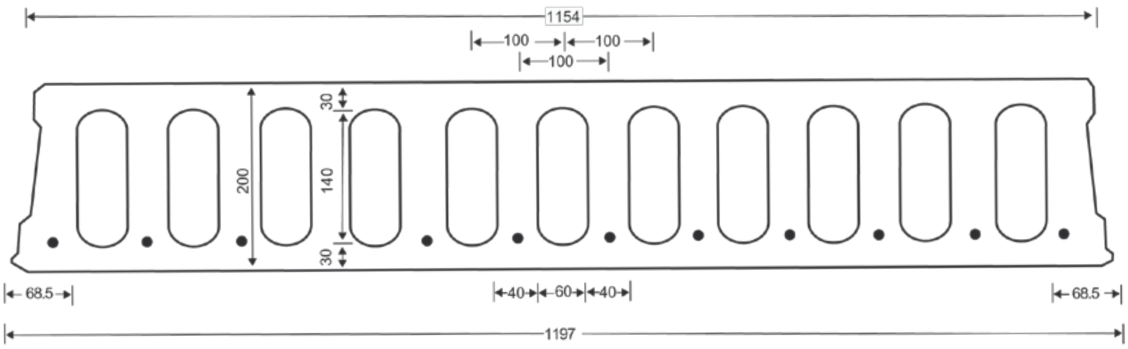
F = 12 x 9,53mm strand

K = 4 x 5mm wires – top + 8 x 9,53mm strand + 4 x 12.5mm strand bottom

Load capacity table							
Live Load kN/m²	*A Span*	*B Span*	*C Span*	*D Span*	*E Span*	*F Span*	*K Span*
0,75	*5,8*	*7,2*	*8,2*	*8,7*	*9,2*	*9,8*	*11,5*
1,5	*5,4*	*6,6*	*7,7*	*8,0*	*8,5*	*9,1*	*10,7*
2,5	*5,0*	*6,1*	*7,0*	*7,4*	*7,9*	*8,4*	*9,8*
4,0	*4,5*	*5,5*	*6,3*	*6,8*	*7,2*	*7,6*	*8,8*
5,0	*4,2*	*5,2*	*6,0*	*6,4*	*6,8*	*7,2*	*8,3*
7,5	*3,7*	*4,6*	*5,3*	*5,7*	*6,0*	*6,4*	*7,3*
10,0	*3,4*	*4,1*	*4,8*	*5,2*	*5,5*	*5,8*	*6,6*

NOTE: *Design loads include self weight, grouting between joints and finishes up to 1,5kN/m².*

Cross Sectional Dimensions



Self Weight = 3.29kN/m²

Prestressed concrete design details – 250mm deep slabs

Sectional information			
Cross section area	*174,855 10e3mm²*	*Conc. 28 day strength*	*50N/mm²*
Moment of inertia	*1205,857 10e6mm⁴*	*Conc. Strength at transfer*	*35N/mm²*
Section modulus top	*9,651 10e6mm³*	*Mod. of elasticity or conc.*	*34kN/mm²*
Section modulus bottom	*9,642 10e6mm³*	*Stressing of strand/wire*	*70%*
Total breadth of webs	*468mm*	*Check: stresses at transfer*	*O.K.*
Centroidal axis from bottom	*34,5mm*	*Cover to steel*	*30,0mm*

Structural information			
Moment & Shear Capacities	*Wiring Patterns*		
	G	*H + 2*	*J + 4*
Service moment	*108,20kN/m*	*133,59kN/m*	*152,89kN/m*
Ultimate moment	*167,99kN/m*	*230,13kN/m*	*273,66kN/m*
Ultimate shear resist	*214,72kN*	*235,20kN*	*251,11kN*

Standard wiring patterns

G = 10 x 9,53mm strand

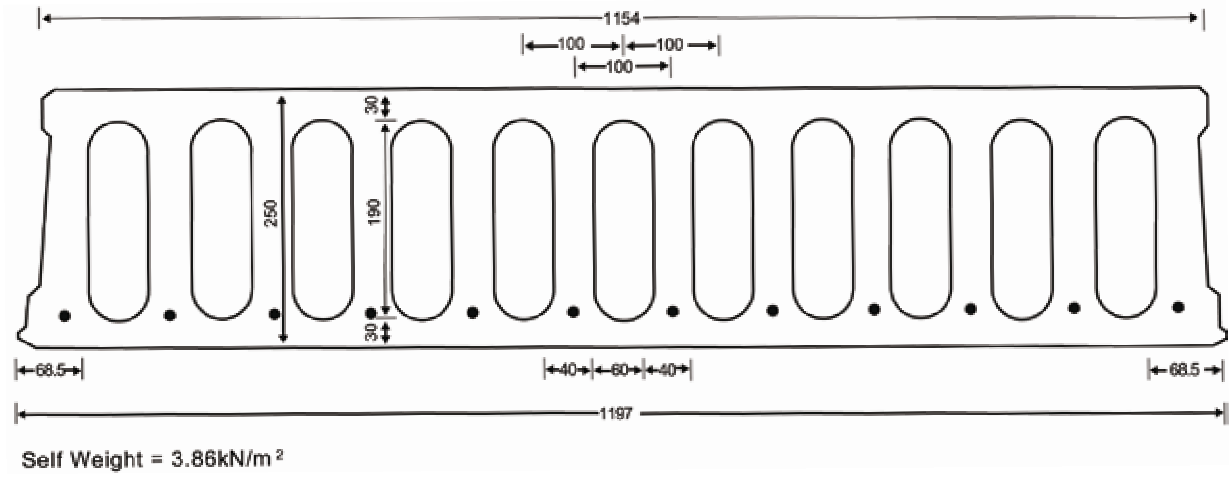
H + 2 = 9 x 9,53mm strand + 3 x 12,5mm strand + 2 x 5mm wire - top

J + 4 = 4 x 9,53mm strand + 8 x 12,5mm strand + 4 x 5mm wire - top

Load capacity table			
Live Load kN/m²	*G Span*	*H + 2 Span*	*J + 4 Span*
0,75	*11,4*	*12,6*	*13,3*
1,5	*10,5*	*11,8*	*12,5*
2,5	*9,8*	*10,9*	*11,6*
4,0	*8,9*	*9,9*	*10,6*
5,0	*8,4*	*9,4*	*10,1*
7,5	*7,5*	*8,3*	*8,9*
10,0	*6,9*	*7,7*	*8,2*

NOTE: *Design loads include self weight, grouting between joints and finishes up to 1,5kN/m².*

Cross Sectional Dimensions



2.5.3 Fastfloor Load Span Tables

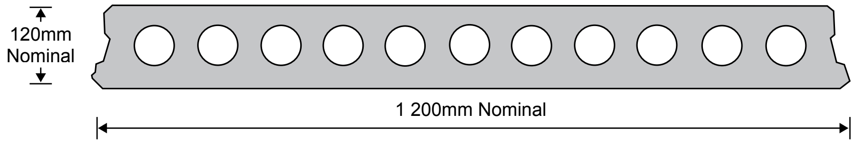
Slab types and loadings

In addition to the superimposed load shown, these tables include an allowance for the self weight of the unit and 1,5 kN/m² for levelling screeds and finishes.

These tables show minimum and maximum wiring patterns for each slab depth. There are many other standard wiring patterns available.

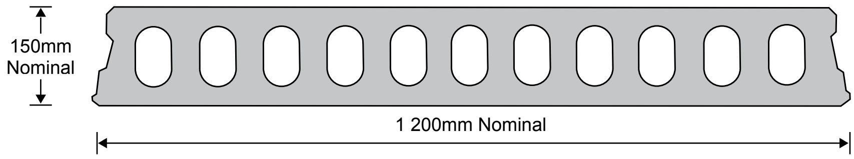
The capacity of Fastfloor slabs can be enhanced by the addition of a structural concrete topping. Consult the Fastfloor design office.

120mm Fast Floor



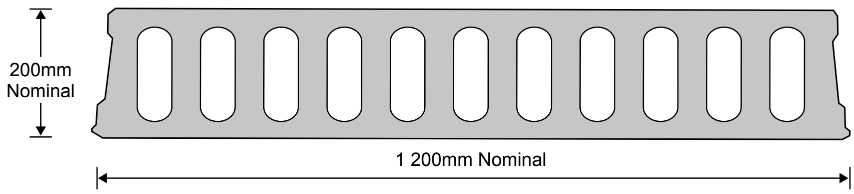
Depth	Width	Self wt	Reinforcement	Superimposed loading in kN/m² with limiting clear span in metres						
mm	mm	kg/m²		1,5	2,0	3,0	5,0	7,5	10,0	kN/m²
120	1 200	216	Min	3,8	3,6	3,2	2,7	2,4	2,1	metres
			Max	6,0	5,9	5,8	5,1	4,5	4,1	metres

150mm Fast Floor



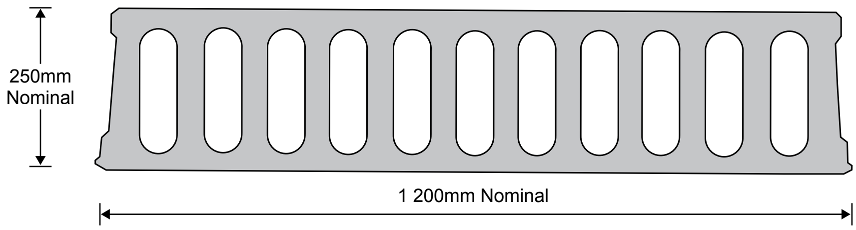
Depth	Width	Self wt	Reinforcement	Superimposed loading in kN/m² with limiting clear span in metres						
mm	mm	kg/m²		1,5	2,0	3,0	5,0	7,5	10,0	kN/m²
120	1 200	216	Min	4,6	4,4	4,0	3,4	3,0	2,7	metres
			Max	7,5	7,4	7,0	6,3	5,6	5,1	metres

200mm Fast Floor



Depth	Width	Self wt	Reinforcement	Superimposed loading in kN/m² with limiting clear span in metres						
mm	mm	kg/m²		1,5	2,0	3,0	5,0	7,5	10,0	kN/m²
120	1 200	216	Min	6,0	5,7	5,2	4,5	4,0	3,6	metres
			Max	9,9	9,5	8,9	7,9	7,1	6,4	metres

250mm Fast Floor



Depth	Width	Self wt	Reinforcement	Superimposed loading in kN/m² with limiting clear span in metres						
mm	mm	kg/m²		1,5	2,0	3,0	5,0	7,5	10,0	kN/m²
120	1 200	216	Min	6,9	6,6	6,1	5,4	4,8	4,3	metres
			Max	11,3	10,9	10,3	9,2	8,3	7,6	metres

2.5.4 Stabilan Load Span Tables

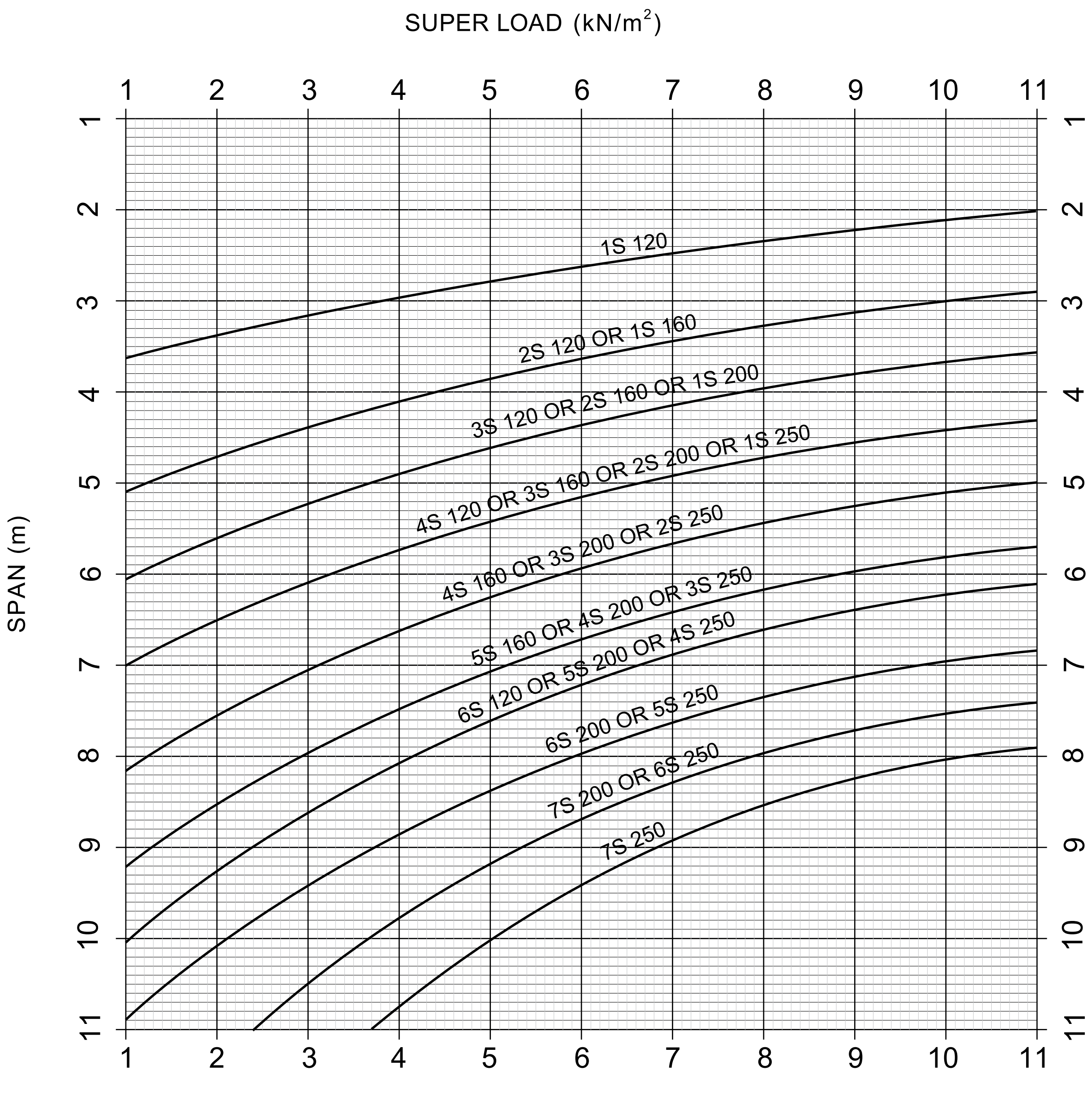
Self weight of slab + 50mm screed

120mm slab = 3,57kN/m²
160mm slab = 3,87kN/m²
200mm slab = 4,41kN/m²
250mm slab = 5,15kN/m²

Loads must be calculated according to sabs 0160 — table 2

Live load + imposed dead load = super load

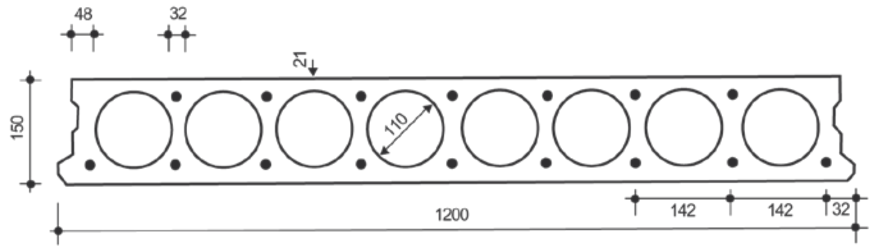
Designs on request for:
- *Loads more than 10kN/m²*
- *Composite sections*



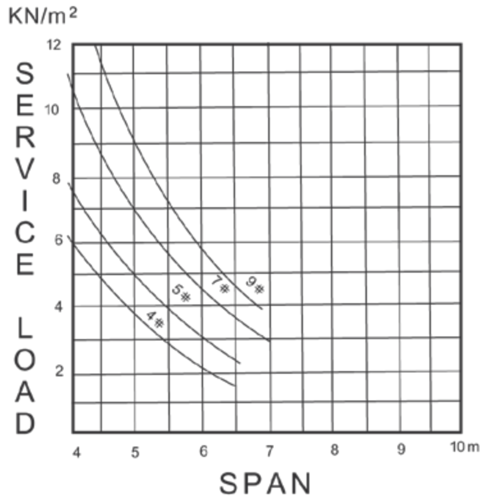
2.5.5 Topfloor Load Span Tables

Specifications

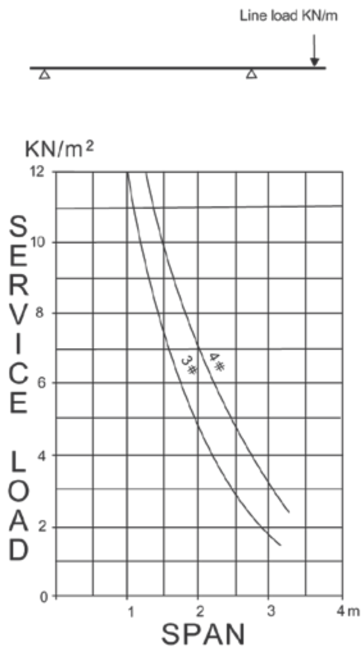
- *Module width: 1200mm*
- *Filler widths available*
- *Height: 150mm*
- *Weight = 202 kg/m²*
- *Max number of top cables: 7*
- *Max number of bottom cables: 9*



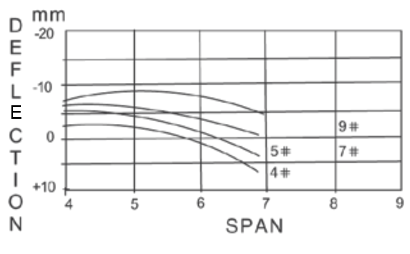
Span ranges for a uniformly distributed load

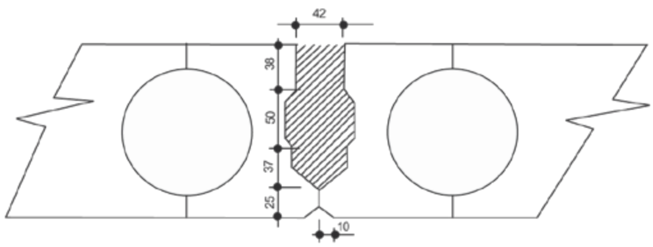


Span ranges for a line load on cantilever



 # = Numbers of cables





2.6 Prestressed Hollow-Core Composite Construction

Introduction

The term "composite" refers to structures where prestressed slabs and insitu concrete work together to form an integral structural component. The prestressed slab can be made composite with supporting beams to increase the overall structural depth of the supporting beams.

Various schemes may be proposed using prestressed hollow-core slabs in conjunction with the following:

- *Reinforced precast beams supplied by manufacturer, refer to picture 1.*
- *Cast insitu reinforced, prestressed or post tensioned beams, refer to picture 2.*
- *Structural steel framework with shear connectors welded to the beam to provide composite action, refer to pictures 3 & 4.*
- *Mixed-use load bearing masonry perimeter walls with internal insitu columns and precast beams in composite action with prestressed slabs. This is the most economical solution. See pictures 5 and 6.*

Design Synopsis

As in any composite structure, the design principal is to bond separate elements together to form one element which by virtue of shear interaction is considerably stiffer than the two elements acting individually.

In the case of prestressed hollow-core concrete panels and concrete support beams this shear interaction is provided by steel stirrups projecting above the surface of the beam and transverse shear steel, which facilitates the transfer of the forces between the slab and the beam.

Structural steel beams are provided with shear connectors on the top flange in the form of channels or welded studs to provide the shear interaction.

The support framework is generally designed to support the loads imposed by the prestressed hollow-core floor panels and in nominal construction loading with or without the use of props, depending on the budget. Provision is made for continuity steel in the slab across the support beams to accommodate the increased mass imposed by finishes, partitions and upper-imposed loading.

Column design theory

Full moment transfer in the region of the support columns is achieved by introducing non-shrink grout between the beam and column elements. Continuity steel is provided over the column support in the insitu concrete over the beams. Shear transfer between beams and columns is achieved by allowing a minimum bearing of 100mm of the beams on the column heads. The ends of the beams are rebated to allow for continuity of the column steel.

(Picture 1) *Precast beams cast with recesses to allow reinforcing steel from the column below to pass through the beam for tee next lift of columns. (sizes of the recesses vary according to the size of the column*

(Picture 2) *Slabs on cast insitu beams. The shear interaction is provided by reinforcing steel stirrup protecting above the surface of the beams, and transverse shear steel which helps to transfer forces into the slab.*

SLAB END DETAILS
The panels are cast with open cores, the number and lengths of which are determined by the design parameters. The open cores are blocked off with concrete. The open core technique enables full composite acions with the support beam to be developed. Reinforcing steel is placed in the bottom for shear transfer and top steel is provided for anti-crakcing and continuity.

(Picture 3) *Slabs on steel beams with conventional shear studs, structural steel beams are provided with shear connectors on the top flange in the form of welded studs to provide the shear interaction. The minimum width of the beams is 171mm.*

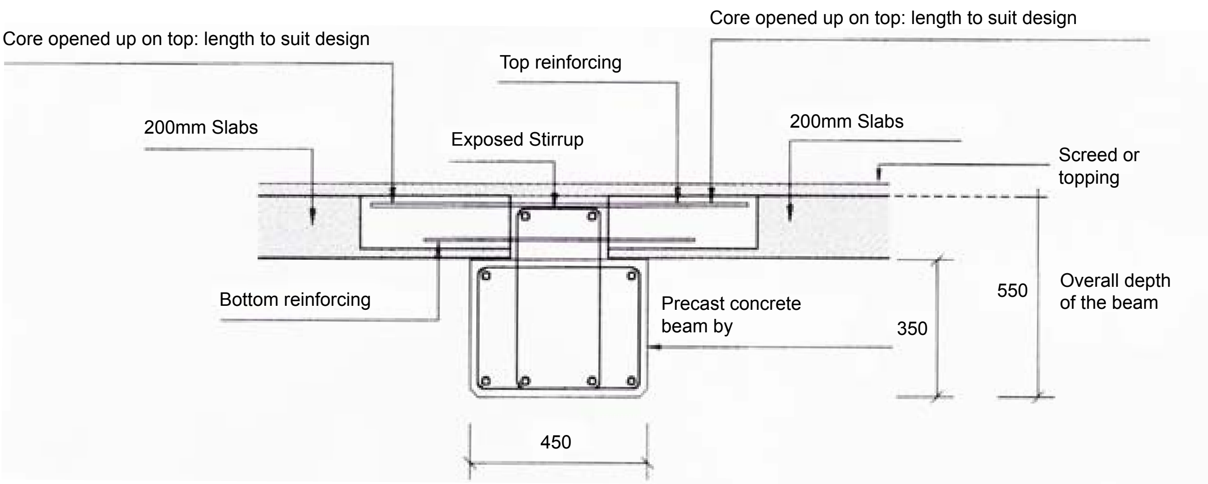
(Picture 4) *On steel beams with channel sections as shear connectors the design allows for additional concrete around the shear connectors. To increase the width of the top flange of the steel beams. 75x75mm angles are welded to the top flange of the beam. The same design principles apply to the shear transfer and continuity/anti-crack steel as for the conventional shear stud design.*

Service holes are pre-made in precast beams to allow services to pass from one side of the beam to the other.

(Picture 5) *The most economical solution - load bearing brickwork with internal insitu columns with precast beams and Prestress slabs*

(Picture 6) *Precast beams and Echo prestressed slabs in composite action*

Precast beam design in compsite action with prestressed slabs



The design of these 'spine beams' have to be optimized to minimise the depth below the soffit of the slabs. This can best be achieved by the design of the beam as a T-beam in its final stage. To achieve this it is necessary to combine the precast floor slab with the precast beams.

3 INSTALLATION

When using a hollow-core product, the installation is included in the price and is done by an in-house team. The installation is done by means of a mobile or tower crane, depending on the site conditions. The panels are lifted off the delivery trucks and placed onto their supports. Up to 500m2 can be erected in a day with one team which enables the contractor to proceed with the balance of the structure without being delayed by props and wet concrete. No storage space is required.

Site requirements

Clear, level and sound access up to and around the building on which the slabs are to be erected.

In order to obtain a flush ceiling on brickwork, the load bearing walls must be level. Avoid internal walls being higher. If brickwork is not level, a mortar bed will be required on top of the brickwork.

As the panels are designed and manufactured specifically for our project, site dimensions need to be accurate to avoid delays.

Sand and cement for grouting between the prestressed panels are to be supplied by the customer. The actual grouting is done by the supplier.

Window and door openings in load bearing walls up to 2.0m wide can be covered by lintels side by side with five courses brickwork with brick force in every course for slab spans up to 7.0m. Openings wider than 2 meters must be referred to the engineer for detailing of additional structural steel supports.

Should a panel be required inside a building, a minimum entrance of 4.5m high by 3.0m wide is needed, provided there is sufficient turning space for trucks.

4 GROUTING

Specification for grouting hollow-core concrete slabs

This in a labour only service, also included in the supplier's price — all materials are sourced from site.

The manufacturer will only grout along the longitudinal length of the panel — not the ends — this is filled in when the screeding is done.

The grouting of the panels along the longitudinal length of the panels should have 3:1 river sand : cement giving a 25MPa strength at 28 days.

Generally the 150mm and the 200mm deep slabs require 1m^3 of river sand, and 10 pockets of cement will cover 100m^2 of slabs and 1 ½ m^3 of river sand and 15 pockets of cement for the 250mm deep slab.

The joints must be hosed wet before placing the grout.

No movement / traffic on the slab until the grout has hardened – no loading of bricks or wheelbarrow loads on the slabs.

If props are used they must remain in position for 3 days after grouting.

If river sand is not available in some areas, fine crusher sand is used with 5:1 plaster sand mix.

5 SCREEDING / CONCRETE TOPPING

The Cement and Concrete Institute (011 315 0300) have produced a standard specification for sand/ cement screeds and concrete toppings for all types of floors. The detailed specification is available from the C&CI.

Once erected and grouted the floor becomes a monolithic slab. A 40 - 50mm minimum finishing screed plus up to 15mm additional average screed to counter any camber is required. Cambers of up to 40 mm can be expected depending on the spans and loading (the finishing screed is done as a finishing trade and not before the walls are built on top of the slab).

5.1 Application of Screed

On contracts where hollow-core slabs are used indoors and no structural topping is specified a simple 40-50mm leveling screed is necessary.

All loose materials is to be removed from the tops of the slabs. The slabs should be thoroughly wetted and screed applied immediately. The levelling screed should comprise of 1:4 mix by volume of cement to clean river sand. Water should be added to the mixture to an extent that the mixture is relatively dry but remains easy to float finish. The screed should be laid to an approximate thickness of 40-50mm. **Note that in some areas additional screed may be necessary to level out the camber in the units.** *After laying the screed it should be steel floated and then wetted for 48 hours to prevent shrinkage cracks.*

In certain areas namely balconies, roofs, walkways, tiled areas, car parks and in areas where the screed is to be left unfinished the specification changes slightly.

On balconies, roofs, walkways i.e. all areas where Echo Prestress slabs are exposed to the elements a Ref 100 mesh must be placed in the levelling screed to counteract the transverse forces created by large temperature difference. After removing the loose material from the top of the slab and the above procedure followed for the laying of the screed. Under no circumstances must any form of cover blocks be placed between the slab and the mesh.*

Where tiles are used on the slab a Ref 100 mesh must be placed in the levelling screed as for balconies, roofs and walkways. Where the tiled area is to exceed 30m² expansion joints should be allowed in the tiles every 5-6 metres and particularly where the section alters shape such as at doorways. It is recommended that a flexible tile adhesive is used.

*On car parks a Ref 193 mesh** must be placed in a structural topping of not less than 50mm thickness to help spread the load from one panel to the next. The screed can be left rough to suit the client's requirements.*

In areas with exposed screed / topping a Ref 100 mesh is required to control shrinkage / drying stresses.

Placing of mesh where the screed / topping thickness is 50mm or less the mesh should be laid flat on top of the slab and the screed / topping placed on top. Where the screed / topping depth exceeds 50mm the mesh should be placed 20mm from the top surface of the screed / topping.

Providing the above procedure is followed the screed will adhere extremely well to the prepared surface of the slab. Past experience has shown that it is impossible to remove the levelling screed from the top surface of the slab after a few days.

** A Ref 100 mesh is a 4.0mm wire in a square pattern at 200mm centres*

*** A Ref 193 mesh is a 5.6mm wire in a square pattern at 200mm centres*

5.2 Mix Design for a concrete topping

Concrete topping – 0.3m³

30MPa hand compacted concrete mix 1:3:3

- *1 wheelbarrow of cement (2 bags)*
- *3 wheelbarrows of stone (minimum 6.7mm – maximum 13.2mm)*
- *3 wheelbarrows of clean sand*
- *55 – 57 litres of water – by others*

5.3 Structural topping notes

The surface of the slab is to be swept clean, free from dust and any other foreign matter. The slab is then to be thoroughly wetted without any ponding.

The structural topping must have a 28 day comprehensive strength of not less than 25MPa. The aggregate used must not be larger than 12mm.

The structural topping must be cured by wetting for at least 4 days prior to opening to any traffic.

The structural topping should be vibrated into open cores and joints to ensure monolithic action with the precast elements. This is vital for composite action.

Concrete topping incorporating mesh

6 FINISHES TO HOLLOW-CORE PANELS

6.1 Tiling

Fixing of ceramic tiles onto precast hollow-core floor slab systems, or onto any concrete suspended floor slab, requires special attention if cracking is to be avoided. Flexible adhesive is the answer, nevertheless, several basic rules must be followed to ensure success.

These include:

All new concrete work or screeds must cure fully before any tiling proceeds. Surfaces must be clean and free of all traces of curing agents, laitance, loose particles and sand, or any other surface contaminants.

Power-floated or steel-trowelled surfaces must either be scarified or keyed with slurry consisting of a cement and a "Keycoat" type product. Specifications are obtainable from various adhesive manufacturers. The adhesive must be applied while the slurry is still "tacky"

The adhesive itself should always remain flexible to counter the possibility of cracking, whereas the rigid *adhesives – as most are – will transfer any minor racking through to the tile. To obtain this type of flexible adhesive, manufacturers have developed liquid bonding additives which replace water when mixed with the cement-based power adhesives. Alternatively, high-polymer cement based adhesives are suitable for use where extra flexibility, high strength, or water resistance is required. These adhesives require no additives; they are simply mixed with water and will maintain the necessary flexibility to avoid cracks.*

Adhesives should at least be 5mm thick and spread in m2 batches. This prevents the adhesive drying. Only DRY tiles – not soaked – must be bedded into the wet adhesive, by twisting slightly and tapping home with a mallet.

Grouting must not be carried out until a sufficient strong bond has developed between the bedding mix and the tiles to prevent disturbance of the tiles during the grouting operation. Grouting should therefore not commence until one to three days after tiles have been laid. Joints exceeding 8mm require a different grout mix — consult with the manufacturer on specifications.

To further ensure tiles on suspended floors do not crack, movement joints must be left across door openings and at interfaces of concrete; and brickwork, and directly above any structural ground floor walls.

Movement joints must be located around any fixtures protruding through the tiled surface, such as columns or stairs.

Joints should be at least 5mm wide and extend through the tile and adhesive layers to the surface. The bulk of the joint depth can be fitted with an inexpensive compressible material such as polyethylene foam strips. Seal the joint using a suitable resilient sealant according to the manufacturer's instructions. It is important that the joint sealant is only bonded to the sides of the movement joint.

These tiling procedures have been proven successful when effectively implemented. Ensure that the specification is given to the tiling contractor and indicate to the contractor where joints are required to enable the planning of the tile layouts.

Specification for the tiling of Hollow-core slabs

Ref 100 mesh must be placed in the screed / topping.

A flexible tile sealant (e.g. Tilefix) should be used. A gap must be left between the tiles for grouting.

Expansion joints should be provided between the tiles at all places where the cross section changes, e.g. at doorways or entrances to passages.

Where the tiled area is to exceed 30m² expansion joints should be allowed in the tiles every 5-6 metres.

6.2 Down-Lights

The fitting of down-lights into hollow-core slabs is fast becoming the preferred lighting solution thanks to the increasing use of precast hollow-core concrete floor slabs and improved lighting technology. The latter having led to smaller lights and enhanced performance.

Other factors influencing the swing to down-lighting include the recent changes in municipal requirements both for large concrete boxes and for single transformer units.

Compared to fitting light boxes and conduits using the more traditional insitu floor casting method, installing down-lighting in precast hollow-core slabs offer several advantages.

Light points are far simpler and easier to place than in insitu floor construction which requires much larger transformer boxes to be positioned between steel reinforcement, and the boxes are also difficult to position accurately.

Costs are lower. Wiring and single light transformers can be installed the day after installation. The traditional method involves fitting larger light boxes, which are more expensive than coring costs, and placing conduits before concrete is poured. Furthermore wiring can only begin once shuttering and scaffolding have been removed some two or three weeks later.

Down-light coring is simple and accurate and far more economical than the installation of light boxes. Larger holes can be factory formed subject to a maximum diameter of 560mm and any edge chipping can be easily repaired with Rhinolite or a similar material. Modern lighting equipment is a lot more compact allowing for ancillary equipment to be stored in slab cores.

A 12-volt single light transformer requires a minimum core of 70mm. This allows for short cylindrical transformers to be easily removed and replaced during maintenance.

6.3 Plastering

At the design stage a consulting Engineer should allow adequate expansion joints in the building – too many is better than too few.

It is important that the job is erected carefully.

All cut joints must be on top of walls as the lack of castelations in a grouted joint can cause cracking.

The joint between the slab and the top of the wall must be effectively "dry packed" with the material forced into the joint before brickwork continues on top of the slab and obviously before ground floor walls are plastered. This part is essential and is easily forgotten.

Joints must be well cleaned and wetted before grouting.

Joints must be grouted with a good quality river sand cement mix.

A Ref 100 mesh must be placed in the leveling screed or topping.

Plasterkey should be applied in the V joints and plastered flush, preferably with a flexible filler.

When the filler in the V joints is dry, ± 2 days later plasterkey should be applied to the whole soffit and a skim coat of plaster / rhinolite applied for a smooth finish.

If the above specification is followed there is no reason why, under normal circumstances, cracks will form in the plaster.

As an extra precaution a fibreglass bandage can be painted over the V joint area before skimming the ceiling.

6.4 Painting 'V' exposed

A small amount of rhinolite should be "thumbed" into the top of the joint between the panels and then finished off with a piece of plastic conduit to round the top of the joint.

Alternatively, painters mate sealant (by Soudal) should be "gunned" into the top of the joint and rounded off with a plastic conduit dipped in soapy water.

A bonding liquid (plasterkey or similar) or a good quality undercoat should be applied to the soffits prior to painting. While we recommend the use of a textured paint the possible use of two coats of PVA is up to the customer.

7 ALTERNATIVE APPLICATIONS

7.1 Warehouse Walls

The use of prestressed slabs as retaining walls was successfully applied to a fast tracking exercise when two huge potato sheds were built for a food producer.

Adapted from a system originally used in Holland, 1 100m^2 of wall slabs were erected in a record time of only 11 working days; the wall contractors being on site for a total of two weeks.

Using prestressed concrete floors as walls is unusual in South Africa. It is a method more commonly found in the US and Europe.

The two buildings are steel-framed and supported on piled foundations, precast, prestressed hollow-core panels were slotted into the webs of 6m steel columns. As the potatoes were to be stored to the full height of the walls, very high horizontal forces had to be allowed for at the design stage.

Each building consists of two storage sheds of 40m x 20m with built in galleries for ventilation and temperature control. Both structures were insulated with polyurethane foam.

Once the piles were in place the total construction time was only two months.

The alternative would have been to cast concrete on site and that would have taken twice as long. Standard panel profiles were used, allowing for normal delivery, minimal adaptation of existing lifting gear, and very short lead times. As a result of the speed and success of this operation, it is expected that this system will be more widely used.

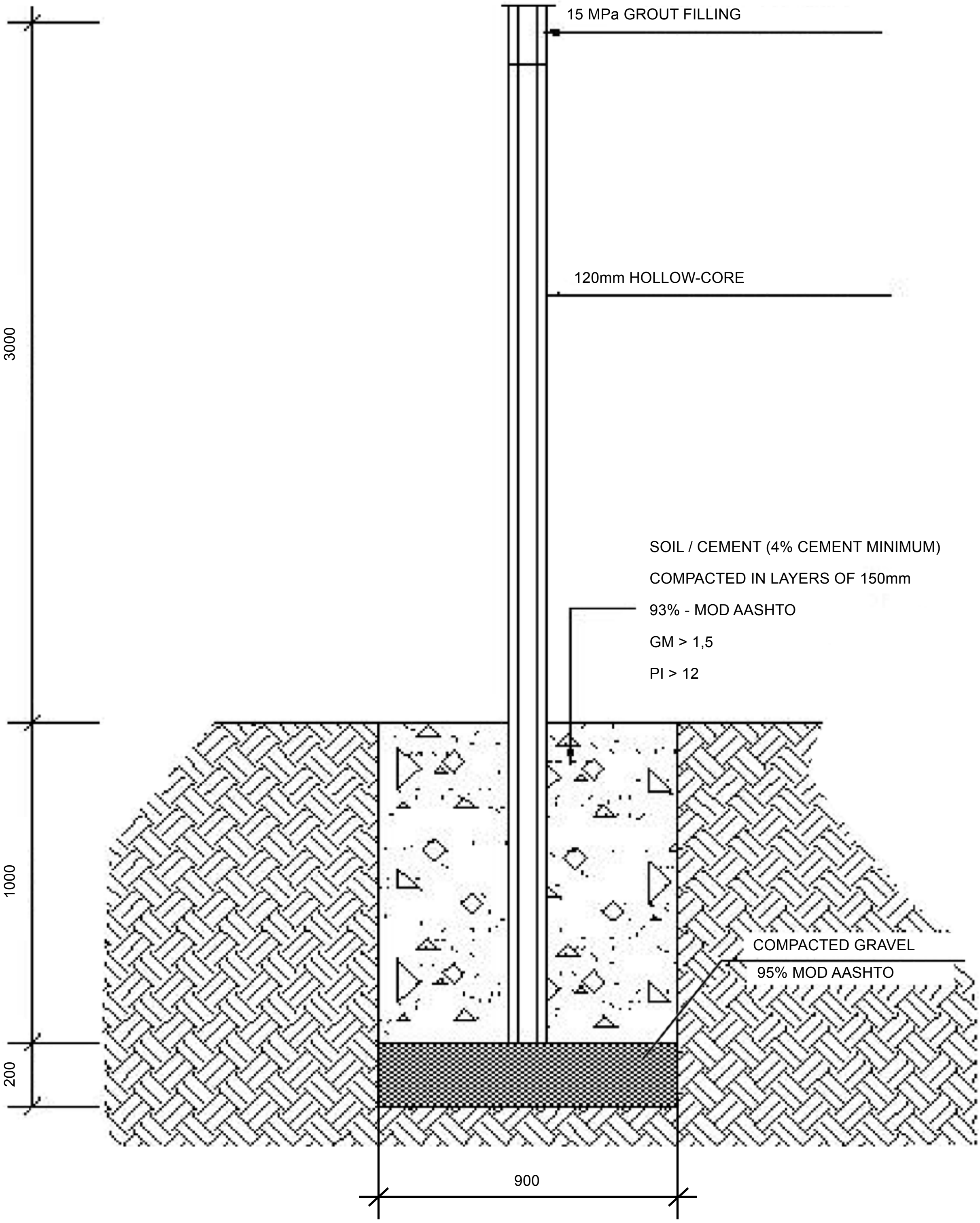
7.2 Security Walls

Three outstanding examples, all of them in Bloemfontein, serve to illustrate this application. Two walls were constructed to safeguard military equipment, one at an SA Airforce base, the other at an SA Defence Force equipment depot. A third wall was built for the Post Office in the industrial area of Hamilton.

Security wall areas between 2500m² and 10 000m², were constructed with slabs measuring 4m x 1.2m. Each wall topped 3m, with the additional one meter section sunk into a foundation of soilcrete, a mixture of compacted gravel and cement.

Speed of erection and strength are two of the major advantages to take into consideration for this type of walling.

7.2a Security Wall Typical Section



7.3 Retaining Walls

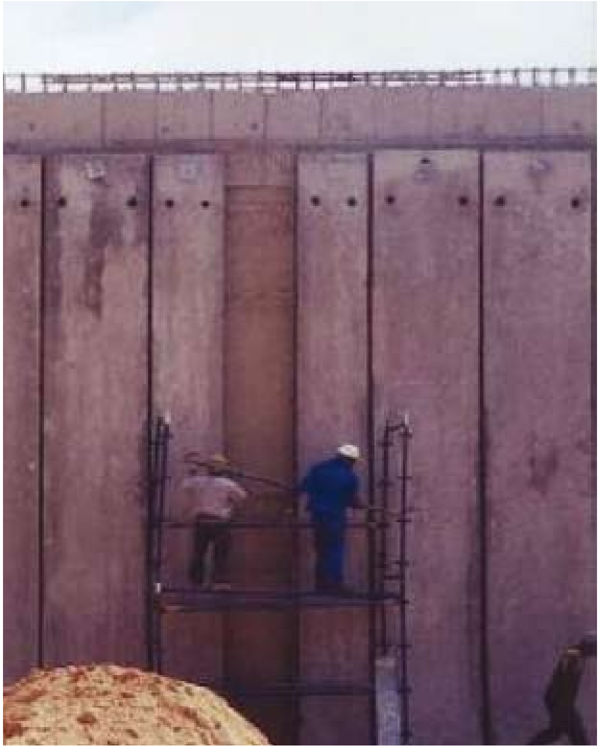
All applications are specifically designed to ensure the most economic solution. The major advantage is time saving.

Another major advantage is the fact that building work can continue prior to the erection of a retaining wall which usually takes place during the installation of floor panels. Others include the possibility of window openings with no requirement for formwork or propping.

Two prominent projects which demonstrate the effectiveness of the system include the mixed office/ retail/residential development at Melrose Arch in Johannesburg and a new Johannesburg Hyundai dealership in the suburb of Bryanston.

When used as retaining walls, the panels are generally two storeys high (6-7m) and 250mm deep. Unlike floor slabs, which are cast with prestressed steel cables at the bottom to form a positive camber, wall panels must be straight as possible and are therefore cast with cables at both the top and bottom of the slab, and then evenly stressed.

Wall panels are delivered on site with ready-made holes to facilitate lifting into position.They can be



simply hoisted off a truck and placed onto a concrete foundation with an insitu kicker beam.It is then bolted to an overhead ring beam.

7.4 Foundation System for Affordable Housing

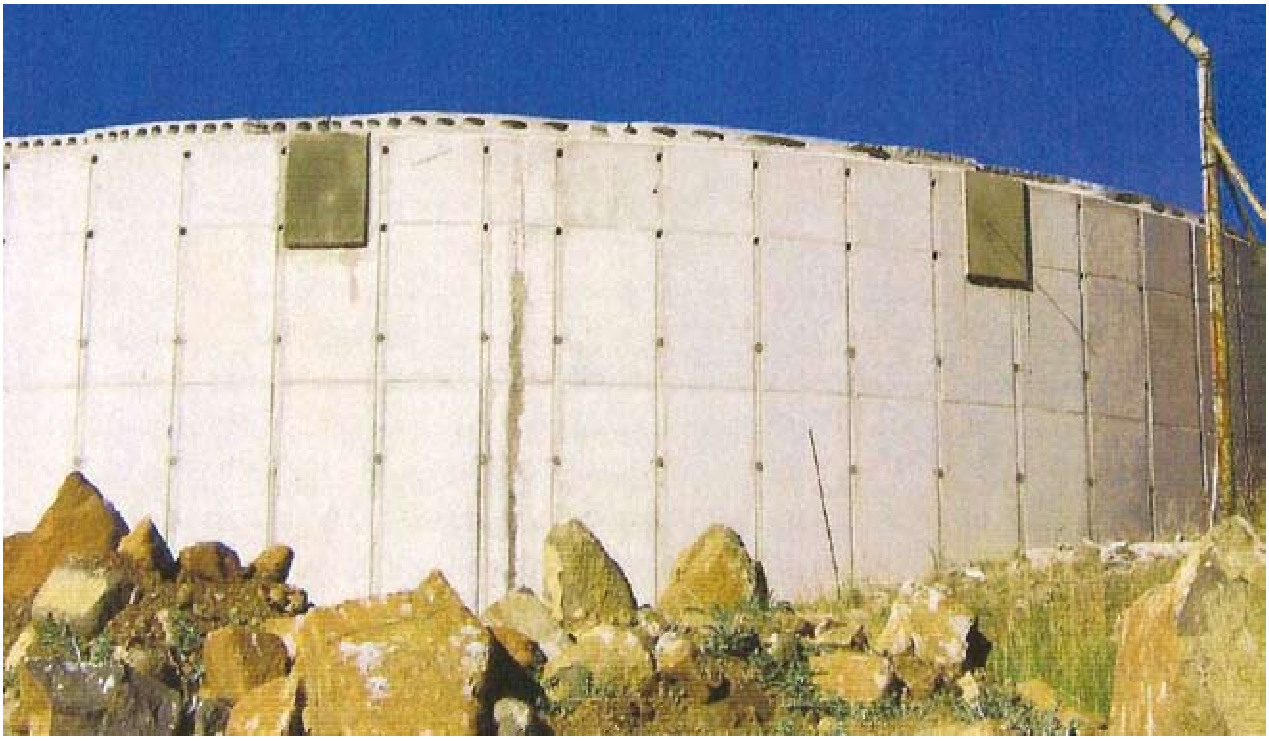
A split hollow-core slab used on edge as a ground beam

The trench is backfilled and compacted

Hollow-core slabs are placed onto the ground beams and then grouted

Construction of the brickwork continues the day after grouting has been done

7.5 Reservoir Walls and Roofs



Hollow-core concrete panels form the outer reservoir walls.

Hollow-core slabs on roof after screeding to obtain falls.

Manhole openings formed in the hollow-core slabs either in the factory or on sirte, the manufacturer will advise.

8 HOW TO SPECIFY THE HOLLOW-CORE PRODUCT

Example of typical wording for a bill of quantity

ITEM	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
24	*Prestressed hollow-core slabs erected onto brickwork 3.0m above ground level including grouting of longitudinal joints. All in accordance with manufacturers specifications.*				
	Manufacturers contact details.				
	Excluding the following: *Grouting ends of panels, support beams over openings in load-bearing walls and all materials required for the grouting. The screeding and mesh is measured elsewhere in the Bill.*				
24.1	*150mm deep – 1 200mm wide prestressed hollow-core slab not exceeding 5.0m to be designed for a S.I.L. of 5.0kN/m²*	*M²*	*1650*		
24.2	*200mm deep – 1 200mm wide prestressed hollow-core slab not exceeding 7.6m to be designed for a S.I.L. of 4.0kN/m²*	*M²*	*964*		

Example of typical wording for a bill of quantity when drawings are included in the bill of quantity

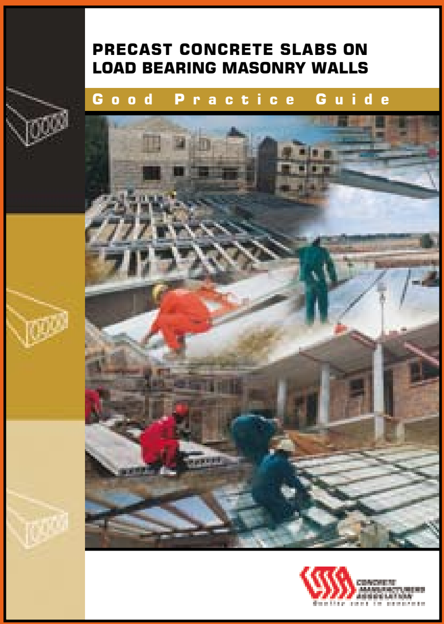
ITEM	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
6.0	*Prestressed hollow-core slabs erected onto brickwork 3.0m above ground level including grouting of longitudinal joints. All in accordance with manufacturers specifications.*				
	Manufacturers contact details.				
	Excluding the following: *Grouting ends of panels, support beams over openings in load-bearing walls and all materials required for the grouting. The screeding and mesh is measured elsewhere in the Bill.*				
6.1	*Prestressed hollow-core slabs 6.0m long* *Manufacturers product code – 1 200mm wide* *Block A 640m²* *Block B 140m²* *Block C 200m²* *Block D 520m²*	*M²*	*1500*		
6.2	*Beams to be supplied and erected by manufacturer* *254 x 146 x 31 I Beam 45m long* *200 x 75 x 25.3 RSC 45m long* *150 x 90 x 10 RSA 6,4m long*	*M*	*96,4*		

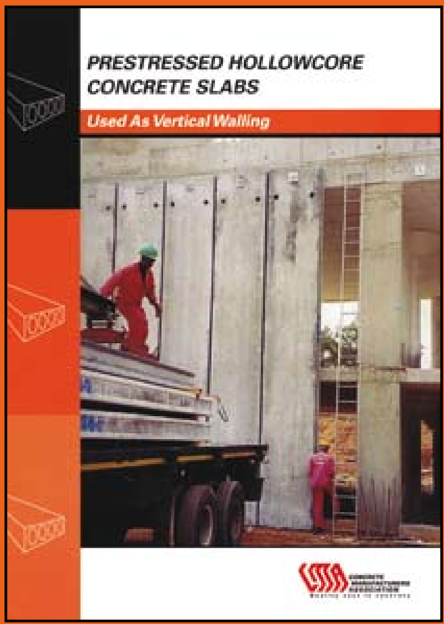
NOTES

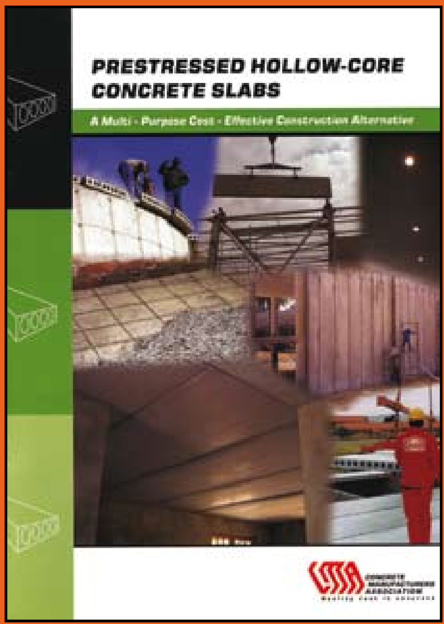
NOTES

HOLLOW-CORE PRODUCER MEMBERS (AUGUST 2008)

Echo Floors	011 957 2033 / 087 940 2054
Echo Prestress	087 940 2060
Echo Prestress Durban	031 569 6950
Fastfloor Botswana	087 940 2060
Shukuma Flooring Systems	041 372 1933
Stabilan	051 434 2218
Topfloor	021 552 3147







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