DBL

Prestressed Rib & Block Slabs

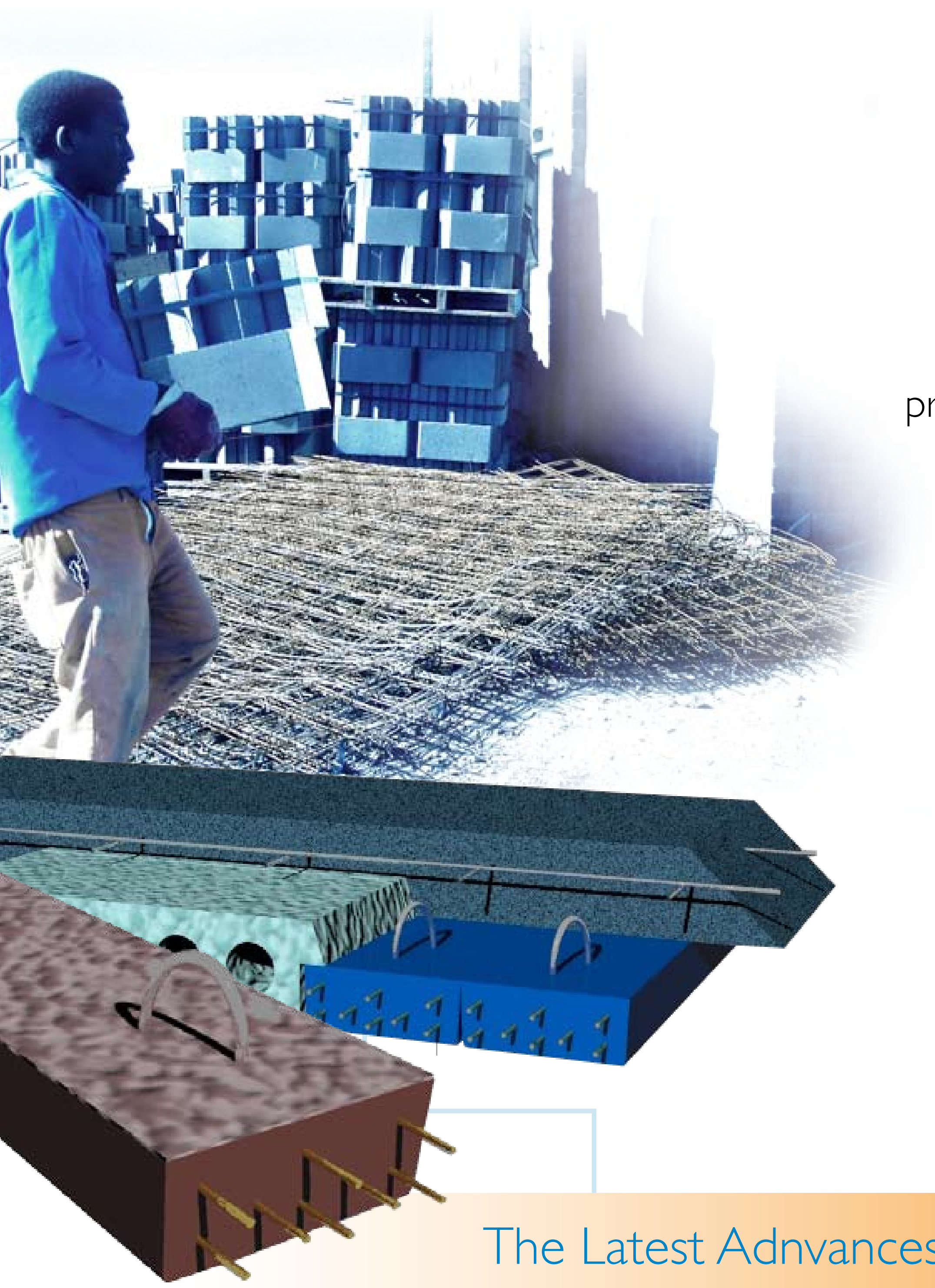
cost effective

modular system

less concrete

rapid lease-time

professional service



The Latest Adnvances in Concrete Slabs

Photos of Finished Works

About DBL Decking

What makes us unique

DBL Precast has been a leading supplier of lattice concrete ribs for many years. Engineers have preferred DBL to others due to their strict application of concrete codes of practice.

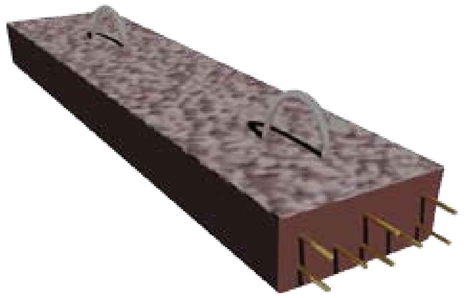
To provide the latest advances in concrete slabs by using prestressed concrete beams, DBL has joined forces with KBW Precast, from Gauteng. KBW is the largest manufacturer of prestressed ribs in South Africa, having produced in excess of 10 Million metres of ribs in the past 14 years

DBL Precast has commited itself to become the trusted source of materials for prestressed concrete rib and block slabs, and providing technical backup to all its customers.

DBL

Technical Specifications

Prestressed RIBS

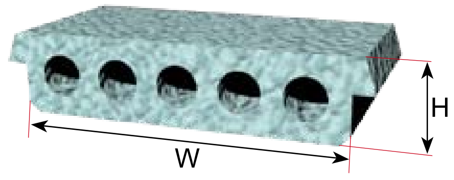


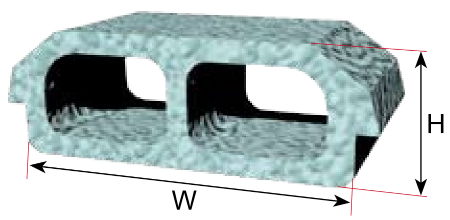
Nominal Size	150 X 60 mm
Mass	22 kg/m
Indented Prestressing Wire	BS 5896
Diameter	4mm GUTS 1770 Mpa
Concrete Strength at transfer	20 mPa
Concrete Strength at 28 days	40 mPa
Horiz Shear Connectors	SANS 10100-1

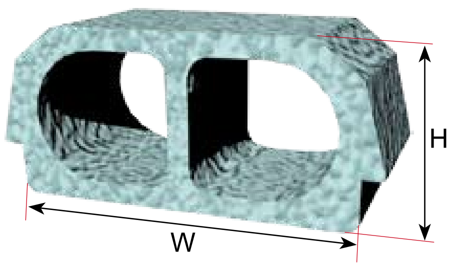
Length of Rib	Number of Wires
0.1m - 4.5m	5
4.6m - 5.9m	7
6.0m - 9.9 m	8
Special Order	10

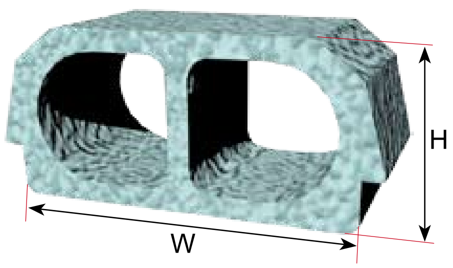
Concrete BLOCKS

Block Code	W x L x H (mm)	Mass (kg)	Slab Thickness (mm)
DBL 100	400x200x100	18	150
DBL 150	400x200x150	14	200
DBL 200	400x200x200	18	250
DBL 250	400x200x250	22	300









Quick Selection

HOW TO USE THE SLAB ESTIMATOR

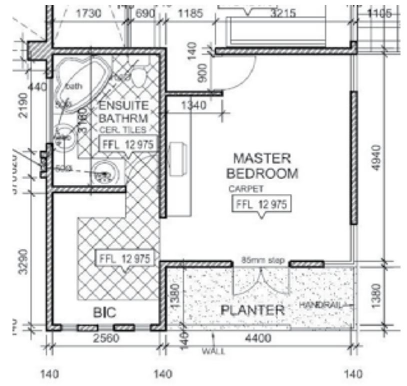
Assumed Add dead load 1,2 kN/m2

Determine Live Load from usage A

Calculate wall loads on slab B

Add A + B to find total additional load on slab

Find span of slab in metres (shortest is usually cheapest) and look up on graph which slab will be strong enough, each slab is shown in a different colour. Choose a slab that lies above the intersection of span and load. Thinner slab are cheaper



Ie Length of 140mm walls = 12m

Length of 90mm walls = 1,6 m

Height of walls = 2,8m

Weight of walls on slab = 120 kN

Area of slab = 44 m2

Approx Wall load at SLS = 3 kN / m2

Typical Slab Loading

Screeds + Plaster & Finishes 1,2 kN/m2

Residential Live Load 1,5 kN/m2 – A

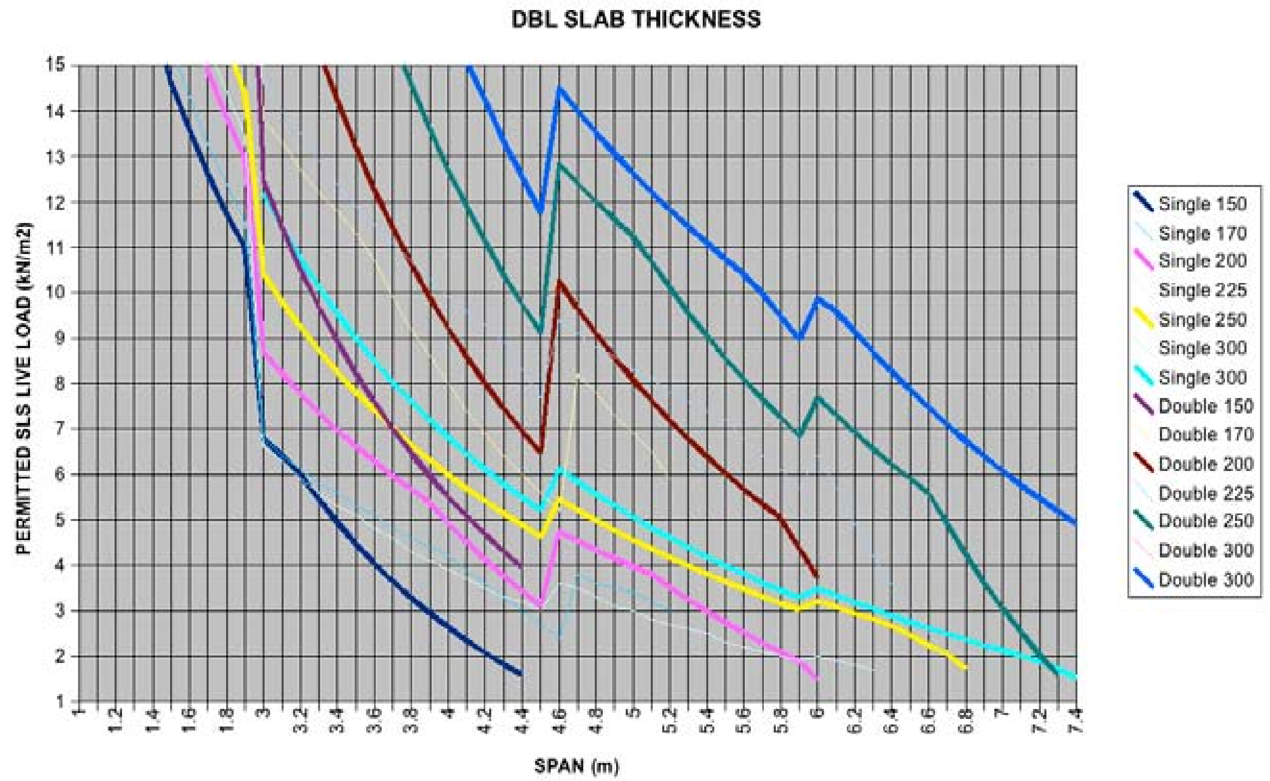
Office Live Load 2,5 to 5,0 kN/ -m2 – A

Wall loads on Slab – for approximate loads add length of walls on slab x height x wt per m2 – B

Ie 230mm Walls 5,4 kN/m2

115mm walls 2,7 kN/m2

140mm walls 3,3 kN/m2



150 mm SLAB DBL 100 Block

Single Rib - 560m c/c

Size	*400 x 200 x 100mm*
Rib Centres	*560 mm*
In-Situ Concrete	*0.075 m^3/m^2*
Self Weight Slab	*3.3 kN/m^2*
Precast Mass	*165 kg/m^2*
Mom of Inertia	*129 x 10E-6 m^4/m*

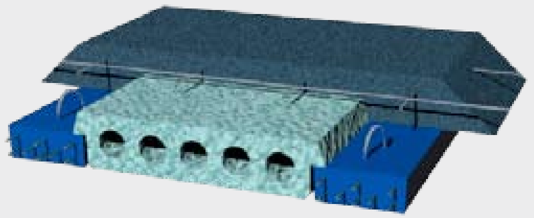


Table allows for 1.2 kN/m^2 additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity *kNm/m*	Ultimate Shear Capacity *kN/m*	Span (m) Maximum Additional SLS Load after slab has been cast (*kN/m^2*)										
			2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4
5 Wires	*19.2*	*21.4*	9.8	8.6	7.6	6.8	6.0	4.9	4.0	3.3	2.6	2.1	1.6
7 Wires													
8 Wires													

Double Rib - 710m c/c

Size	*400 x 200 x 100mm*
Rib Centres	*710 mm*
In-Situ Concrete	*0.078 m^3/m^2*
Self Weight Slab	*3.3 kN/m^2*
Precast Mass	*162 kg/m^2*
Mom of Inertia	*173 x 10E-6 m^4/m*

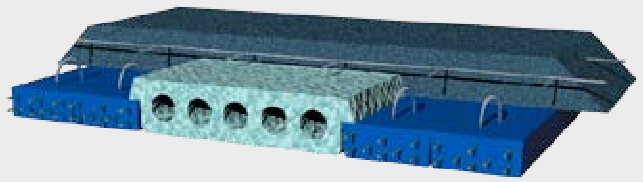


Table allows for 1.2 kN/m^2 additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity *kNm/m*	Ultimate Shear Capacity *kN/m*	Span (m) Maximum Additional SLS Load after slab has been cast (*kN/m^2*)										
			2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4
5 Wires	*28.5*	*37.8*	14.1	17.7	14.8	12.4	10.5	8.9	7.6	6.5	5.5	4.7	4.0
7 Wires													
8 Wires													

* FAILURE MODE OF SLAB AT INDICATED LOAD SHOWN BY COLOUR CODE

Vertical Shear Controls   Horizontal Shear Controls   Moment Controls   Deflection Controls

200 mm SLAB DBL 150 Block

Single Rib - 560m c/c

Size	*400 x 200 x 150mm*
Rib Centres	*560 mm*
In-Situ Concrete	*0.090 m^3/m^2*
Self Weight Slab	*3.8 kN/m^2*
Precast Mass	*165 kg/m^2*
Mom of Inertia	*301 x 10E-6m^4/m*

Table allows for 1.2 kN/m^2 additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity *kNm/m*	Ultimate Shear Capacity *kN/m*	Span (m) Maximum Additional SLS Load after slab has been cast (*kN/m^2*)															
			3.3	3.5	3.7	3.9	4.1	4.3	4.5	4.6	4.8	5.0	5.2	5.4	5.6	5.8	5.9	6.0
5 Wires	*27.7*	*24.8*	7.4	6.6	6.0	5.4	4.5	3.8	3.1									
7 Wires	*41.7*	*43.7*								4.7	4.3	4.0	3.5	3.0	2.5	2.1	1.9	
8 Wires																		

Double Rib - 710m c/c

Size	*400 x 200 x 150mm*
Rib Centres	*710 mm*
In-Situ Concrete	*0.096 m^3/m^2*
Self Weight Slab	*3.9 kN/m^2*
Precast Mass	*162 kg/m^2*
Mom of Inertia	*404 x 10E-6m^4/m*

Table allows for 1.2 kN/m^2 additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity *kNm/m*	Ultimate Shear Capacity *kN/m*	Span (m) Maximum Additional SLS Load after slab has been cast (*kN/m^2*)															
			3.3	3.5	3.7	3.9	4.1	4.3	4.5	4.6	4.8	5.0	5.2	5.4	5.6	5.8	5.9	6.0
5 Wires	*41.7*	*43.7*	15.3	13.2	11.4	9.9	8.6	7.5	6.5									
7 Wires	*59.6*	*48.9*								10.3	9.1	8.1	7.2	6.4	5.7	5.0	4.4	
8 Wires	*65.6*	*51.1*																3.7

* FAILURE MODE OF SLAB AT INDICATED LOAD SHOWN BY COLOUR CODE

Vertical Shear Controls   Horizontal Shear Controls   Moment Controls   Deflection Controls

250 mm SLAB DBL 200 Block

Single Rib - 560m c/c

Size	400 x 200 x 200 mm
Rib Centres	560 mm
In-Situ Concrete	0.108 m^3/m^2
Self Weight Slab	4.6 kN/m^2
Precast Mass	201 kg/m^2
Mom of Inertia	576 x 10E-6 m^4/m

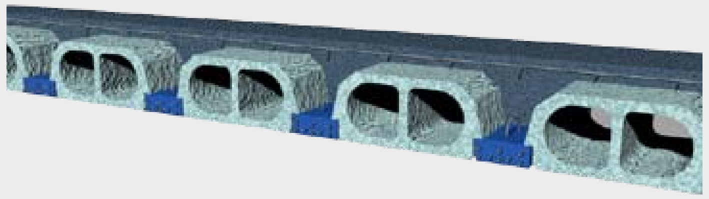


Table allows for 1.2 kN/m² additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity kNm/m	Ultimate Shear Capacity kN/m	Span (m) Maximum Additional SLS Load after slab has been cast (kN/m^2)															
			4.1	4.3	4.5	4.6	5.0	5.4	5.8	5.9	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.3
5 Wires	36.3	27.6	5.7	5.1	4.6													
7 Wires	51.4	30.9				5.5	4.6	3.8	3.2	3.0								
8 Wires	57.4	32.3									3.2	3.0	2.7	2.3	1.7			

Double Rib - 710m c/c

Size	400 x 200 x 200 mm
Rib Centres	710 mm
In-Situ Concrete	0.119 m^3/m^2
Self Weight Slab	4.7 kN/m^2
Precast Mass	190 kg/m^2
Mom of Inertia	767 x 10E-6 m^4/m

Table allows for 1.2 kN/m² additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity kNm/m	Ultimate Shear Capacity kN/m	Span (m) Maximum Additional SLS Load after slab has been cast (kN/m^2)															
			4.1	4.3	4.5	4.6	5.0	5.4	5.8	5.9	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.3
5 Wires	54.9	48.7	11.9	10.4	9.1													
7 Wires	78.6	54.4				12.8	11.2	9.0	7.2	6.9								
8 Wires	87.4	56.9									7.7	6.9	6.2	5.6	4.2	3.1	2.0	1.6

* FAILURE MODE OF SLAB AT INDICATED LOAD SHOWN BY COLOUR CODE

Vertical Shear Controls　Horizontal Shear Controls　Moment Controls　Deflection Controls

300 mm SLAB DBL 250 Block

Single Rib - 560m c/c

Size	400 x 200 x 250 mm
Rib Centres	560 mm
In-Situ Concrete	0.129 m^3/m^2
Self Weight Slab	5.4 kN/m^2
Precast Mass	237 kg/m^2
Mom of Inertia	977 x 10E-6 m^4/m

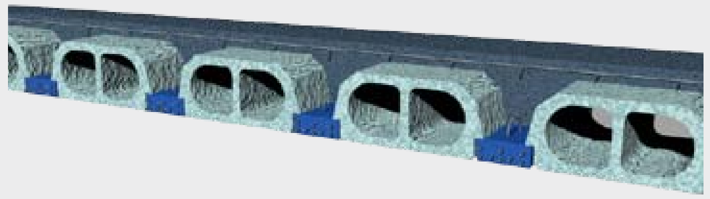


Table allows for 1.2 kN/m² additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity kNm/m	Ultimate Shear Capacity kN/m	Span (m) Maximum Additional SLS Load after slab has been cast (kN/m^2)															
			4.1	4.3	4.5	4.6	5.0	5.4	5.8	5.9	6.0	6.3	6.6	6.9	7.2	7.4	7.8	8.0
5 Wires	44.8	30.1	6.5	5.8	5.2													
7 Wires	63.4	33.6				6.1	5.1	4.2	3.6	3.3								
8 Wires	71.2	35.1									3.5	3.0	2.6	2.2	1.9	1.5		

Double Rib - 710m c/c

Size	400 x 200 x 250 mm
Rib Centres	710 mm
In-Situ Concrete	0.142 m^3/m^2
Self Weight Slab	5.5 kN/m^2
Precast Mass	218 kg/m^2
Mom of Inertia	1288 x 10E-6 m^4/m

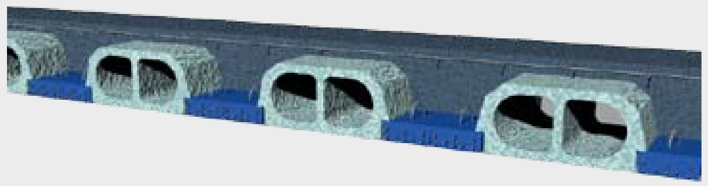


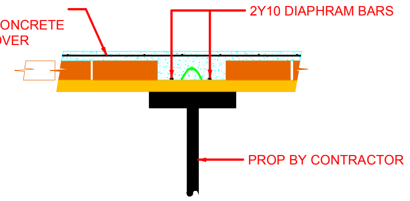
Table allows for 1.2 kN/m² additional dead load (40 mm screed + 10 mm plaster)

Number of Wires	Ultimate Moment Capacity kNm/m	Ultimate Shear Capacity kN/m	Span (m) Maximum Additional SLS Load after slab has been cast (kN/m^2)															
			4.1	4.3	4.5	4.6	5.0	5.4	5.8	5.9	6.0	6.3	6.6	6.9	7.2	7.4	7.8	8.0
5 Wires	68.1	53.0	15.1	13.4	11.8													
7 Wires	97.7	59.3				14.5	12.6	11.1	9.5	9.0								
8 Wires	109.2	62.0									9.9	8.7	7.5	6.4	5.5	4.6	3.0	2.0

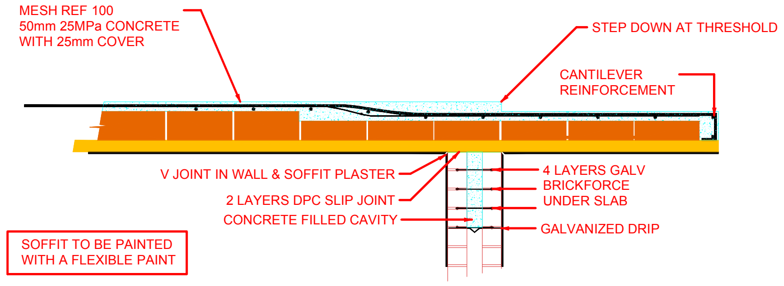
* FAILURE MODE OF SLAB AT INDICATED LOAD SHOWN BY COLOUR CODE

Vertical Shear Controls　Horizontal Shear Controls　Moment Controls　Deflection Controls

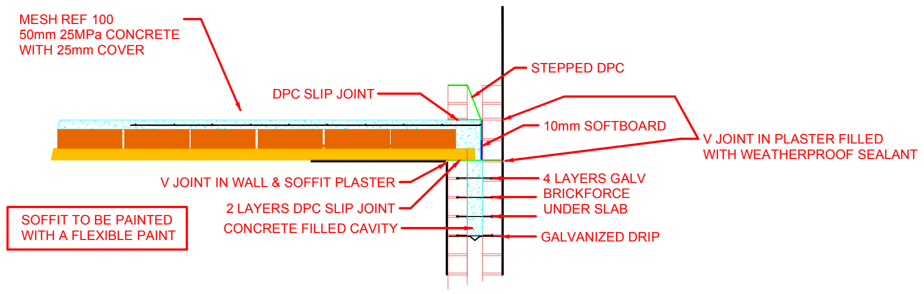
Standard Details



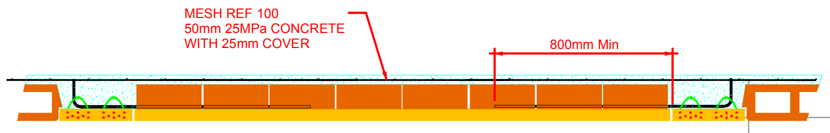
TYPICAL DIAPHRAM SECTION



CANTILEVER SECTION

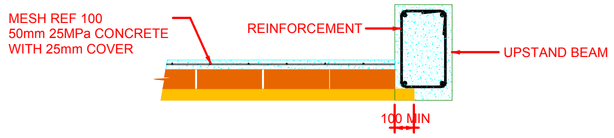


WALL BEARING SECTION

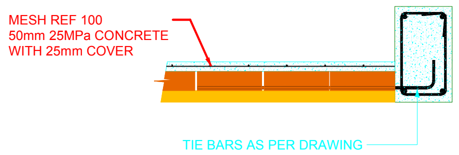


CROSS RIB CONNECTION

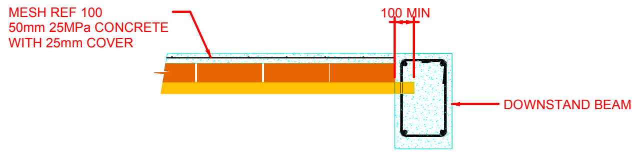
Standard Details



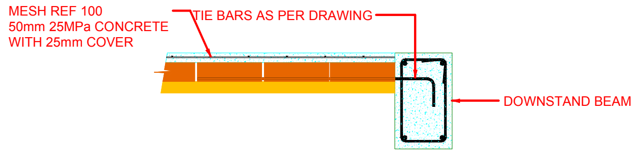
UPSTAND BEAM SECTION TYPE 1
RIB BEARING INTO BEAM



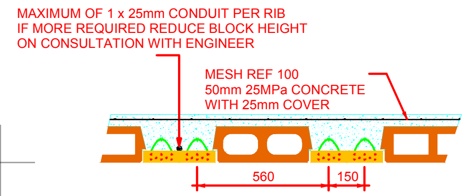
UPSTAND BEAM SECTION TYPE 2



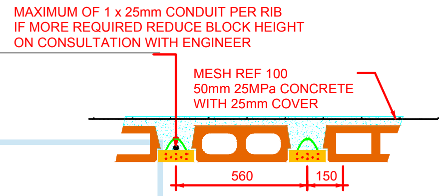
DOWNSTAND BEAM SECTION TYPE 1
RIB BEARING INTO BEAM



DOWNSTAND BEAM SECTION TYPE 2



TYPICAL DOUBLE RIB SECTION



TYPICAL SINGLE RIB SECTION

Design Assumptions & Constraints

Deflection Requirements : fcu (in-situ) = 25 MPa - E Short Term = 26 GPa

Short term deflections to be less than span/250 or less than 15mm using short term Young's modulus for concrete

Ultimate Moment of resistance
The program uses the rectangular stress block for concrete as defined in SABS 0100. The program calculates the initial strain in the prestressing wires after losses, then assumes a neutral axis 0,1mm below the top of the in-situ concrete and calculates the additional strain in each prestressing wire. From the stress strain curve for prestressing wire as given in SABS 0100. It determines from the total strain in the wire, the actual stress in each wire. Typically, it is found that each wire is fully stressed to Ultimate values.
The total tension force can then be calculated and compared to the compression force in 0,1mm of concrete. Initially, the tensile forces far exceed the compression. The program then drops the neutral axis 0,1mm and recalculates the Tension and Compression forces. This continues until the neutral axis is low enough for compression in the concrete to balance the tension in the prestressing wires.

Having determined the level of the neutral axis, taking moments of the tension force about the centroid of the compression block, yields the Ultimate Moment capacity of the section.

Important Note
The only mechanism that can transfer the prestress forces in the prestressed Ribs into the composite slab is through creep of the prestressed Rib.
As the age of the prestressed Rib is indeterminate at the time of adding in-situ concrete to form the composite slab, it is not possible to determine the amount of stress transfer.
Accordingly, the known beneficial effects of prestressed Ribs are not incorporated into the Ultimate Strength Analysis.

Ultimate Vertical Shear Capacity
SABS 0100 refers to a formula 100As/bd to determine the enhanced shear capacity of a section with a particular area of reinforcement As. Codes of practice are drawn up to assist Engineers to design simple structures. In this instance the derivation of the equations used in the code require closer evaluation. The enhanced shear resistance arises from the dowel effect of the reinforcement crossing the shear failure plane. In effect, the crack is bolted together by the reinforcement. Derivation of this formula involves the "bolting" or dowel force provided by the reinforcement, the code however does not state this. It, incorrectly, refers to an area of reinforcement required. This formula was initially presented in CP110 where in the depths it can be found that the strength of the reinforcement implied is 425 MPa. The DBL prestressed Ribs use reinforcement with characteristic strength of 1770 MPa. The corresponding area referred to in SABS 0100, if the area of prestressing wires is Aps is therefore

As (effective) 1770/425* Aps

Shear Capacity is calculated assuming that the entire section is composed of in-situ concrete. The higher strength of the prestressed concrete Rib (40 MPa min) is ignored, for a conservative shear strength. Shear strength of only the web of the T beam is considered.

Ultimate Horizontal Shear Capacity
The maximum horizontal shearing force that can occur in the prestressed rib is the maximum tension force in the wires. This force is resisted by the horizontal shear resistance at the interface between the Precast rib and the in-situ concrete. Where the program calculates that horizontal shear governs the load carrying capacity of the slab, the tensile force in the wires is reduced and the resulting moment capacity is reduced accordingly.

Short Term Deflections
Short Term deflections are checked using the short term Young's modulus. Checks are made to ensure that deflections are less than span/250 or 15mm which ever is the lesser.

Long Term Deflections
It is assumed that as creep in the highly stressed prestressed rib will result in a net upwards movement of the slab that long term deflections are ignored

Sample Calculation

missing!

Rib & Block Installation Procedure

INFORMATION
Make sure that you have the latest complete engineers drawing and steel bending schedules. Ensure that you fully understand the entire layout and that it is in keeping with the design brief and as-built structure on site. Changes and alterations can still be made at relatively low costs at this stage.

MATERIALS
Dependant on site constraints make sure all material is on site or that it is delivered in the sequence in which you intend to install the deck. For safe economical installation calculate and deliver to site all required props, bearers and support equipment. Do not use any bent or damaged equipment and please note that scaffold boards are not to be used as bearers.

LOAD BEARING WALLS
These are the walls that carry the ribs at either end. Load bearing walls in most instances have two skins of brickwork and are always built up from foundation. Walls built up from the surface bed slab are not load bearing! Check that the top of all load bearing brickwork is level and even, if not this must be rectified with a mortar leveling bed as uneven bearing will result in an uneven soffit that will require costly dubbing out before finishing.

SLIP JOINTS, CAVITY CLOSURES AND BONDBREAKERS
This must be installed strictly according to the engineer's detail. If this is not done correctly or omitted it will result in the slab and the walls cracking.

PACKING SEQUENCE
Plan your packing sequence and start at critical areas such as voids, span direction changes and openings for stairs that have fixed positions and can be set out according to the architects plan. Always check that you have set out square, else the last row of ribs and blocks will not fit correctly. If there are no critical areas mark out the rib positions on the walls and check that they will all fit and that there will be no gaps. Note that a rib may be placed fully onto brickwork or next to the brickwork, giving you the wall thickness as a packing tolerance.

INSTALLATION
Lift the first rib into place onto the load bearing walls according to your set out points; make sure the rib rests equally on both support walls. The ribs may not rest less than 50mm on the walls. In the event that the ribs are short contact the engineer who will asses the situation and probably request additional sheer bars. Check that the tag on the rib matches the rib specified in the engineers rib schedule and plan before proceeding. Now place the next rib 400mm from the first rib and place a block between the ribs at either end only. Do not pack any further blocks between the ribs at this stage. Repeat this sequence until the whole bay is complete. Check that additional double or multiple ribs if shown have been placed in the correct position and that the entire area is covered. Should you have a gap you may move each rib up to but not exceeding 410mm apart to close the gap.

PROPPING
Temporary support is now placed in position. It is advisable to hire this material from a reputable supplier who is able to give you the specifications on the props and bearers i.e. How far the bearer can span and what the working load of the props are. Place the bearer's perpendicular to the ribs 1500mm away from the wall and support with the props across the entire span of the deck. Repeat at 1500mm intervals until the whole bay is supported. It is very important not to exceed 1500mm spaces between bearers. Jack all the props up to the point where the ribs are level, this is easy to check with a building line pulled tight along the top edge of the rib.

PACKING BLOCKS
First check the block type specified for the bay and then start packing the blocks between the ribs row by row. It is very important that the first and last block of each row does not rest more that 30mm on the support walls. In most instances there are transverse stiffeners across the slab at between 1500mm and 1800mm centers. A row of 100mm high blocks is usually specified with 2 x Y12 bars over. Put the low blocks in while packing as they are difficult to replace afterwards.

SERVICES
Select your light point positions and replace those blocks with either a light fitting or down lighter block as required. It is very important that the electrician runs the conduits over the blocks and never over the length of the ribs. Conduit should never run over the block perpendicular to the prestressed ribs. This can be achieved by running the conduit in the stiffener ribs. Conduits must be spaced apart to allow concrete to pour freely around them. Where there are a large number of conduits together above an electrical distribution board, install low blocks to allow for more space. Where plumbing waste pipes are installed in the slab, the same rules apply except that a lower block must be used in all instances to allow the pipes to run with a fall and not project above the finished concrete slab.

Photos related to Installation

ADDITIONAL REINFORCING AND MESH
The additional reinforcing steel may be placed once the blocks are complete, but generally has to be re-fixed once the plumber and electrician are complete. Make sure everything is correct as per the engineers drawing; you should never have any steel left over. Once satisfied that all the above is complete the mesh is laid over the blocks with a minimum 200mm overlap between sheets. The entire deck area must be covered with mesh.

STOPENDS AND STEPDOWN SHUTTERS
In most instances the outer skin of brickwork is built up to form a stop end shutter, with a sheet of DPC attached to the inner face to create a bond breaker. Always consult the engineers and architects drawing to confirm this detail as it is very important and varies from consultant to consultant. Timber stop end are generally used around stair, voids and cantilever balconies. It is important that there are no gaps or openings in the shutters as this will result in concrete grout loss with resultant honeycombing that is expensive to repair. Insure that step-down shutters for balconies and weather steps are in the correct position, as chopping concrete back later is not advised and may only be done with engineers consent.

LEVELING AND CHECKING PROPS
The deck must be leveled up with a slight pre-camber, so that the centre of the deck is slightly higher than at bearing. This can be done with a dumpy or laser level, failing that a builder's line pulled taught can also be used. Check each prop and insure that it is well founded on a soil plate should you not be propping off a concrete. Do not prop off un-compacted soil. Tighten each prop to the point that it just starts to lift the deck and make sure it is plumb.

ENGINEERS INSPECTION
The engineer must inspect and pass the slab before concrete is cast. The engineer must be notified at least 24 hours before an inspection is required. The installation must be complete for the engineer to pass the slab. It is important to book your concrete for the day after the inspection to give you enough time to do any remedial work that the engineer my require.

CONCRETE ORDERING AND PREPERATION
Only 25mpa ready-mix concrete is to be used, preferably with a pump. Site batching will only be allowed with specific written consent of the engineer. Calculate your concrete and place your order in advance as pumps are not always available, always order the concrete with test cubes. You should always order the concrete with a final i.e. The last truck is not dispatched until you have checked and confirmed the exact amount of concrete required to complete the deck. Book a poker vibrator and drive unit from the local hire shop as they are not always available. Make up a dipstick to check the depth of the concrete over the blocks, normally a piece of rebar with a ferule.

PLACING CONCRETE
Before the concrete arrives clean the entire deck and wet the deck with a hose pipe and make sure there is no loose material lying on top of the ribs. Plan your pour so that you do not disturb areas that you have already cast. The concrete must be placed evenly; piling up concrete in one area must be avoided at all costs as the excessive extra weight may cause the props to fail. As the concrete is placed it must be well vibrated. Use the dipstick to check that the concrete is 50mm thick over the void blocks. While casting hook and pull the mesh up in the concrete so that it rests in the middle of the 50mm thick layer of concrete over the blocks. During casting continually check the propping to ensure that nothing has moved or sagged, as problems can only be rectified within half an hour of placing the concrete over the affected area.

CURING OF CONCRETE
It is very important to keep the slab wet after casting to avoid shrinkage curing cracking especially on hot or windy days. It is advisable to form a small dam with a layer of sand around the perimeter of the slab and keep it flooded for a couple of days after casting to achieve optimal strength in the shortest time.

STRIPPING
Although the concrete has an ultimate strength of 25 mpa, the props may be removed once the concrete has reached 17.5 mpa. Check with your concrete supplier after 7 days as they will perform the first cube crush test at this point. It is important to confirm with the engineer before removing the props.
Please note that if you intend stacking bricks or piling sand on the deck, these areas must remain propped until clear.

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