



## HOLLOW CORE SLAB

### PRECAST PRESTRESSED CONCRETE FLOOR & ROOF SYSTEM



❖ QUALITY

❖ STRENGTH

❖ SPEED

❖ COST SAVING





## INTRODUCTION

Concrete Technology LLC (in short CONCRETEEC) is one of the UAE's leading manufacturers of precast and pre-stressed concrete products since 1997.

CONCRETEEC has developed a reputation for excellence in the provision of cost efficient structural precast system. As industry leaders, Concrete Technology has served and assisted an array of prestigious clients in achieving quality outcomes which are both economical and reliable and as part of our total solution, we offer a full package, including design, manufacturing, testing, supply and installation services.

By adopting the best practices in the industry, we provide our clients with a wide range of high quality precast prestressed products and solutions side by side with the best customer service and technical support.

Hollowcore slab is one of the products which Concrete Technology is specialized in its design, production and installation. Hollowcore slabs are used for a variety of applications in low and high-rise commercial, residential and industrial buildings. Hollowcore slabs are primarily used as floor or roof/deck systems, wall panels, sound barriers, spandrel members and bridge deck units.



## DESIGN

A Hollow Core Slab is a precast prestressed concrete member with continuous voids provided to reduce weight, Cost and for electrical & mechanical run, hence provide provide an efficient structural system.

Hollow core slab is a simply supported slab and can be designed in accordance with international standard, namely, ACI, BSI, etc.

Concrete Technology shall prepare and submit shop drawings for approval of the general arrangement of the slabs, adequacy and dimensions, prior to manufacture. Shop drawings detailing each unit, cast-in inserts and its strand configuration shall be submitted to the Client for approval. The design of the structure to support the Hollow core slabs shall be the responsibility of the project structural engineer of the Client unless designed by Concrete Technology.



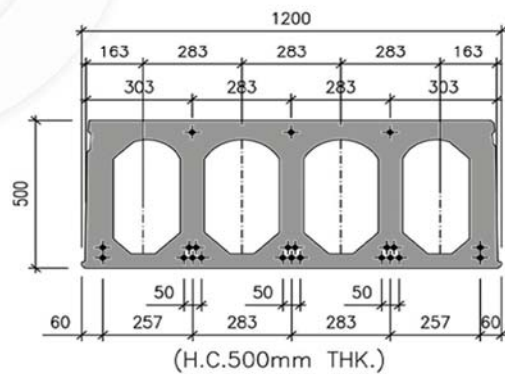
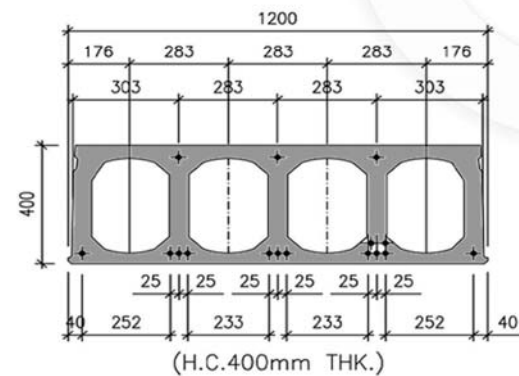
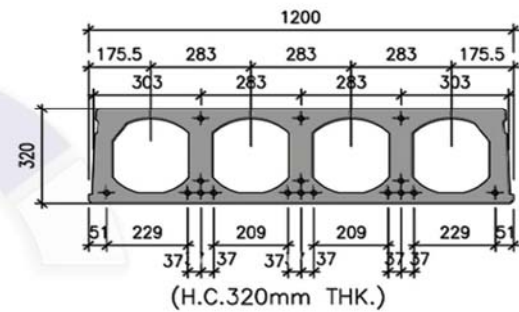
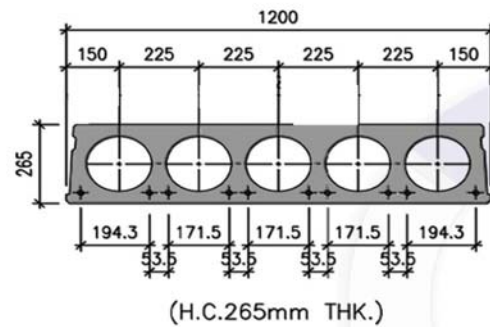
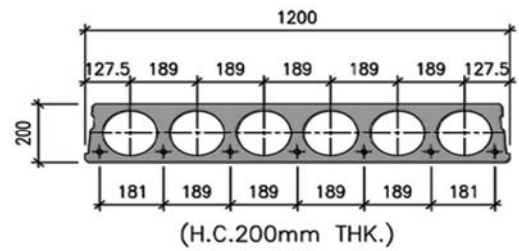
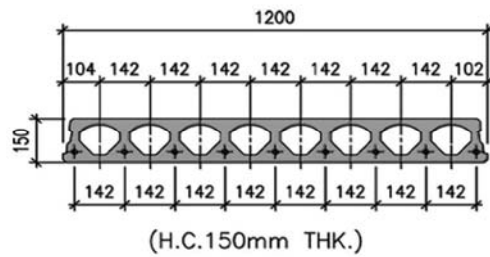
## ADVANTAGES

1. Hollowcore slab provide economical and efficient floor and roof system for various reasons;
  - i. Hollowcore slabs weigh up to 50% less than the conventional cast-in-situ slab of the same size, resulting in considerable savings in construction costs.
  - ii. Concrete industrial production lines are providing just in-time manufacturing resulting in less-on-site congestion and reduced financing costs.
  - iii. Hollowcore slabs help achieving a shorter and faster construction durations in all weather conditions resulting in more construction cost savings.
2. Hollowcore slab provides the efficiency of a prestressed member for load capacity, span range and deflection control.
3. Top surface of Hollow core slab can be prepared for installation of floor covering on concrete topping of up to 2 inches.
4. The underside (bottom) surface of the Hollowcore slab is smooth, which can be directly painted and hence used as finished ceiling.
5. Hollowcore slab can be used as diaphragms to transfer internal loads.
6. Hollowcore slab reduces sound transmission and vibrations.
7. Hollowcore slab provides excellent fire resistance and depending on the strand cover, it can endure up to (4) hours.
8. The voids of the Hollowcore slab can be used as runs for electrical and / or mechanical services.



## PRODUCTS RANGE

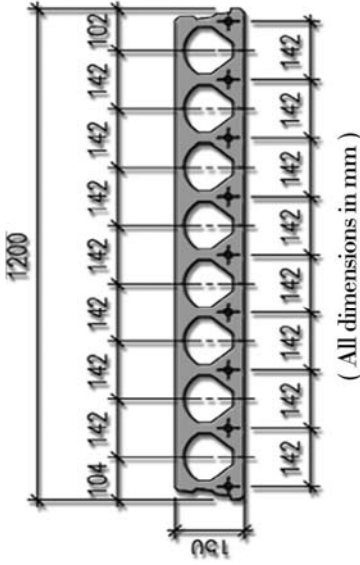
CONCRETEC provides Hollow core slabs of different thicknesses as illustrated below:



## LOAD-SPAN CHARTS AND TABLES

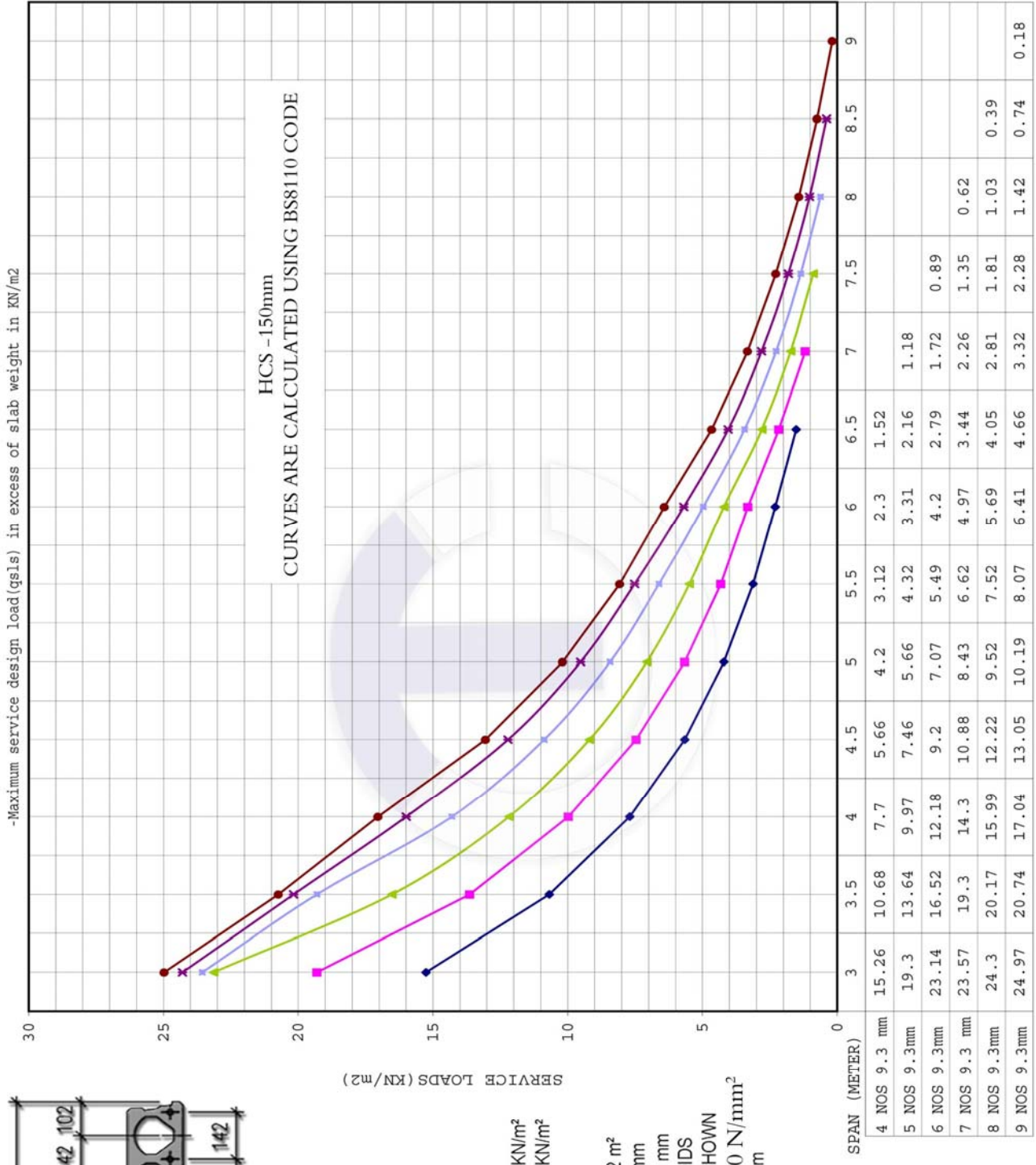
- The attached Load-Span Charts and Tables are provided for a guidance for slab design range and load capacity for various thicknesses of slabs with various combination of PC Strands in accordance with BS 8110.

# HCI150 Load-Span Chart



### SLAB PROPERTIES:

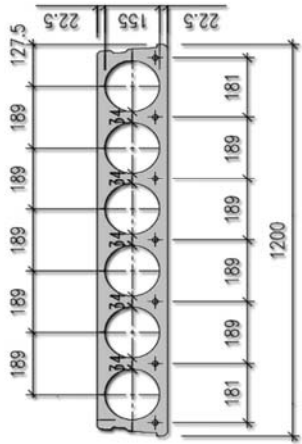
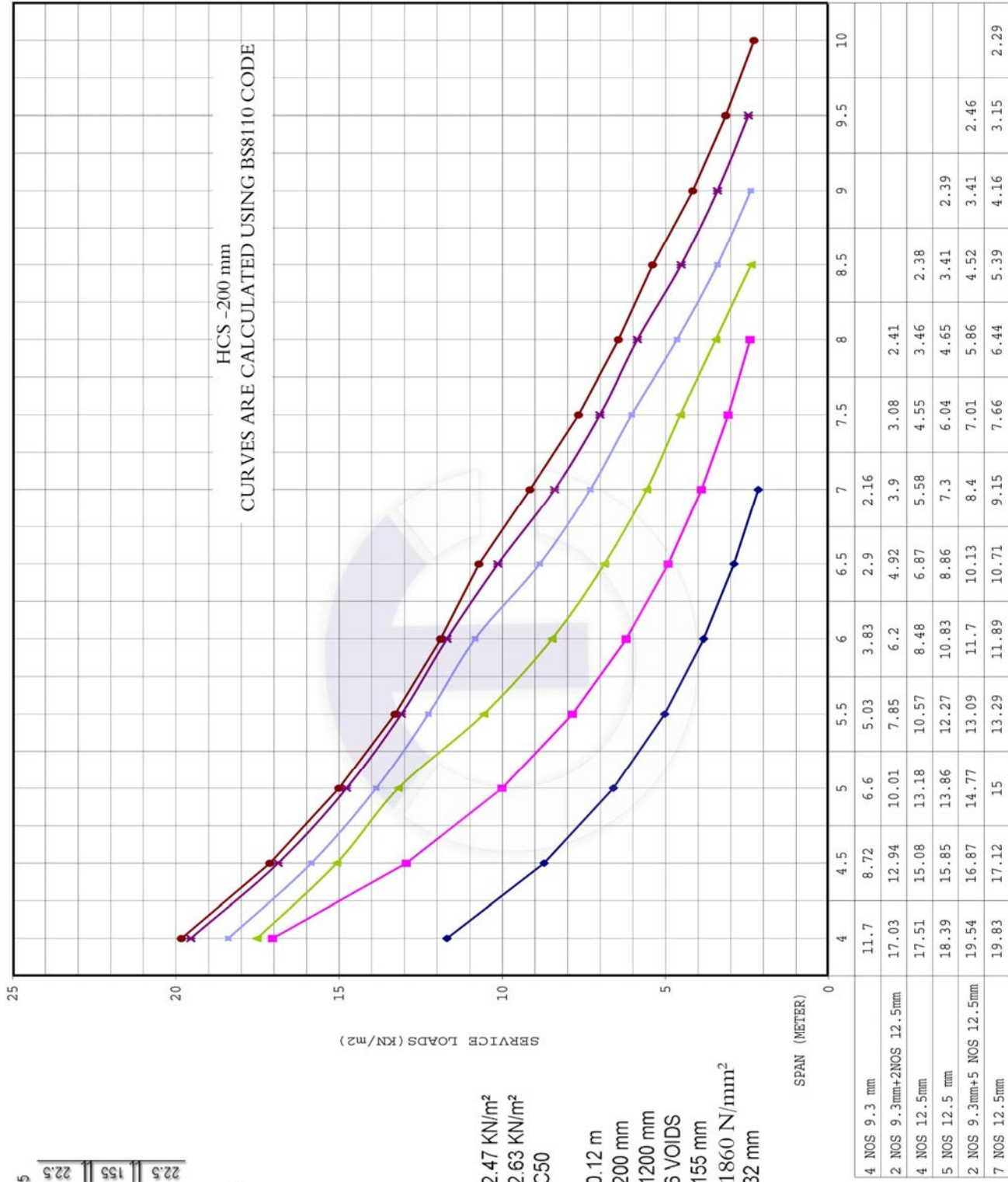
- Precast slab weight 2.04 KN/m<sup>2</sup>
- Jointed slab weight 2.16 KN/m<sup>2</sup>
- Concrete grade C50
- Dimension 0.102 m<sup>2</sup>
- Area of Section 150 mm
- Depth of slab 1200 mm
- Nominal width of slab 8 VOIDS
- No. of voids AS SHOWN
- Diameter of one void 1860 N/mm<sup>2</sup>
- Steel ultimate tensile strength 35 mm
- Reinforcement cover



Legend: 4 NOS 9.3 mm (blue diamond), 5 NOS 9.3mm (magenta square), 6 NOS 9.3mm (green triangle), 7 NOS 9.3 mm (light blue square), 8 NOS 9.3mm (dark red circle), 9 NOS 9.3mm (dark red circle)

# HC200 Load-Span Chart

-Maximum service design load (qs1s) in excess of slab weight in KN/m<sup>2</sup>



## SLAB PROPERTIES:

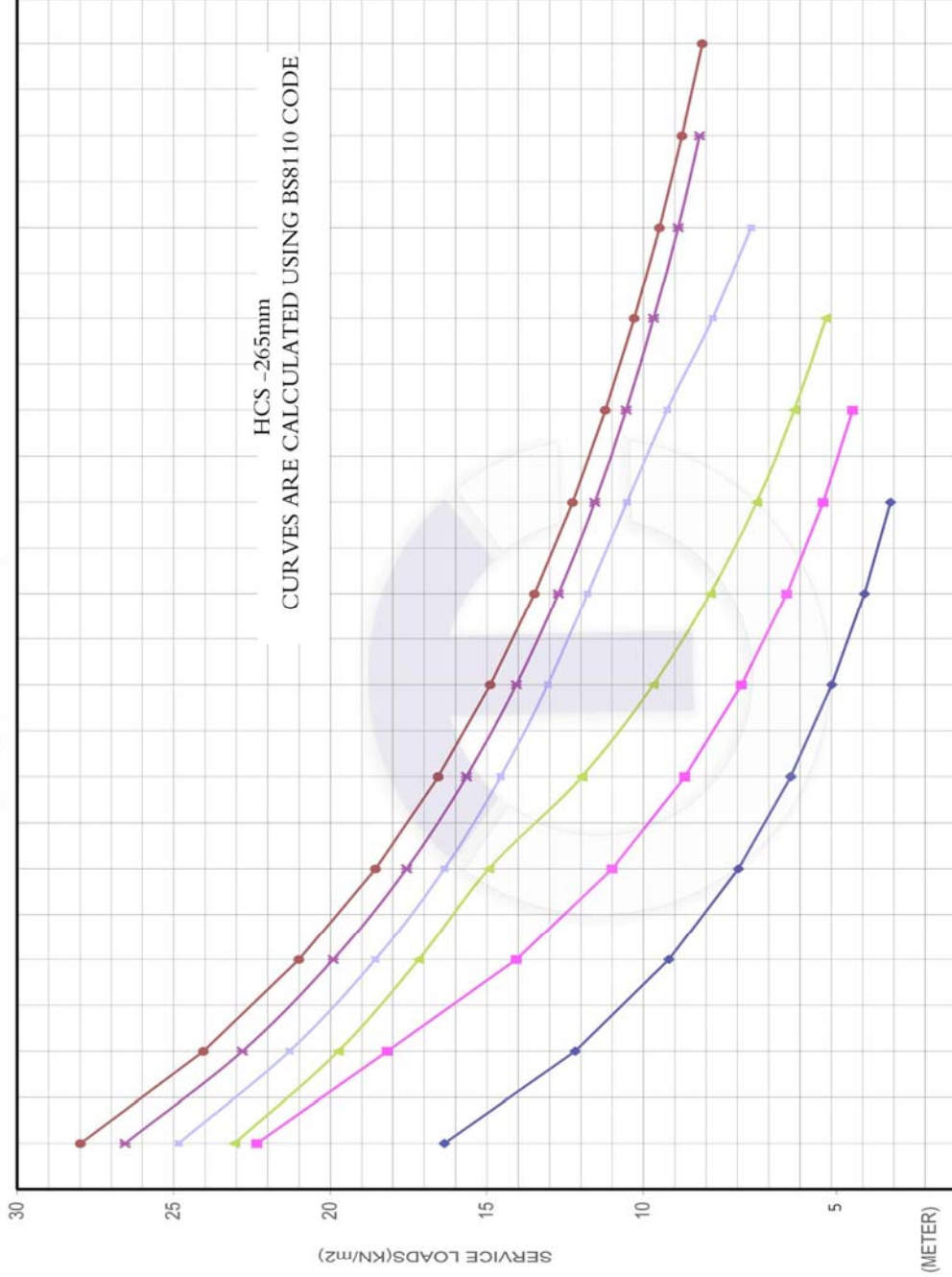
- Precast slab weight 2.47 KN/m<sup>2</sup>
- Jointed slab weight 2.63 KN/m<sup>2</sup>
- Concrete grade C50
- Dimension 0.12 m
- Area of Section 200 mm
- Depth of slab 1200 mm
- Nominal width of slab 6 VOIDS
- No. of voids 155 mm
- Diameter of one void 1860 N/mm<sup>2</sup>
- Steel ultimate tensile strength 32 mm
- Reinforcement cover



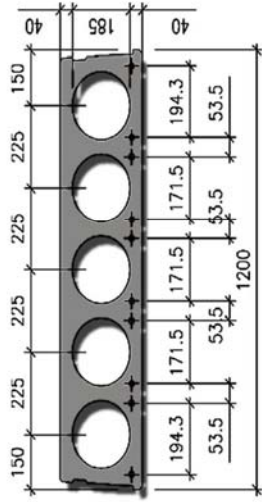


# HC265 Load-Span Chart

-Maximum service design load(qsls) in excess of slab weight in KN/m<sup>2</sup>



HCS -265mm  
CURVES ARE CALCULATED USING BS8110 CODE



( All dimensions in mm )

### SLAB PROPERTIES:

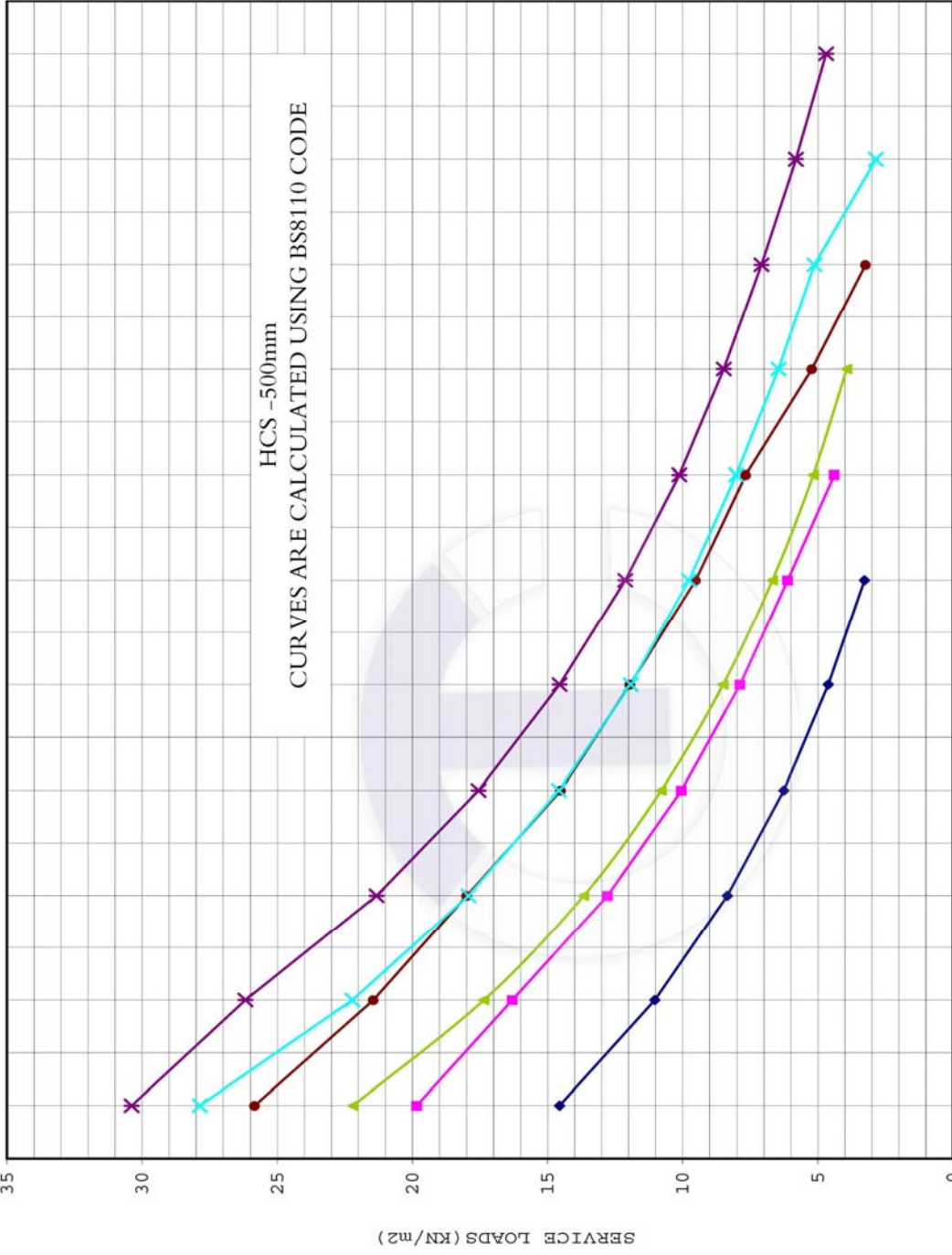
- Precast slab weight 3.61 KN/m<sup>2</sup>
- Jointed slab weight 3.82 KN/m<sup>2</sup>
- Concrete grade C50
- Dimension 0.176 m
- Area of Section 265 mm
- Depth of slab 1200 mm
- Nominal width of slab 5 VOIDS
- No. of voids 185 mm
- Diameter of one void 1860 N/mm<sup>2</sup>
- Steel ultimate tensile strength 35 mm
- Reinforcement cover

SPAN (METER)	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
4 NOS 9.3 mm	16.36	12.18	9.19	6.97	5.29	3.98	2.94	2.1					
2 NOS 9.3mm+2NOS 12.5mm	22.34	18.18	14.05	10.99	8.67	6.86	5.42	4.26	3.31				
4 NOS 12.5mm	23.06	19.75	17.17	14.93	11.96	9.68	7.86	6.38	5.18	4.16			
5 NOS 12.5 mm	24.84	21.31	18.56	16.36	14.56	13.05	11.78	10.53	9.24	7.78	6.55		
2 NOS 9.3mm+5 NOS 12.5mm	26.55	22.81	19.9	17.56	15.65	14.06	12.71	11.55	10.55	9.67	8.89	8.21	
7 NOS 12.5mm	27.97	24.05	21	18.55	16.55	14.89	13.47	12.26	11.21	10.29	9.48	8.76	8.12

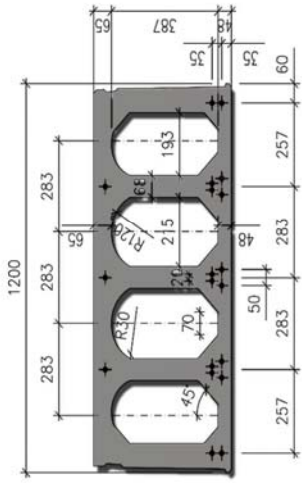
- 4 NOS 9.3 mm
- 2 NOS 9.3mm+2NOS 12.5mm
- 4 NOS 12.5mm
- 5 NOS 12.5 mm
- 2 NOS 9.3mm+5 NOS 12.5mm
- 7 NOS 12.5mm

# HC500 Load-Span Curves

-Maximum service design load(qsis) in excess of slab weight in KN/m<sup>2</sup>



HCS -500mm  
CURVES ARE CALCULATED USING BS8110 CODE



( All dimensions in mm )

### SLAB PROPERTIES:

- Precast slab weight 6.00 KN/m<sup>2</sup>
- Jointed slab weight 6.40 KN/m<sup>2</sup>
- Concrete grade C50
- Dimension 0.304 m<sup>2</sup>
- Area of Section 500 mm
- Depth of slab 1200 mm
- Nominal width of slab 4 VOIDS
- No. of voids 1860 N/mm<sup>2</sup>
- Steel ultimate tensile strength 35 mm
- Reinforcement cover

SPAN (METER)	10	11	12	13	14	15	16	17	18	19	20
6 NOS 12.5 mm	14.55	11.03	8.35	6.26	4.61	3.28					
8 NOS 12.5mm	19.84	16.31	12.78	10.04	7.87	6.12	4.39				
10 NOS 12.5mm	22.2	17.35	13.66	10.79	8.51	6.68	5.17	3.93			
11 NOS 12.5mm	25.84	21.44	17.99	14.51	11.95	9.52	7.66	5.22	3.23		
13 NOS. 12.5 mm	27.86	22.22	17.92	14.58	11.92	9.77	8.02	6.45	5.13	2.85	
17 NOS. 12.5 mm	30.38	26.18	21.33	17.55	14.55	12.12	10.13	8.48	7.09	5.81	4.7

◆ 6 NOS 12.5 mm   
 ◆ 8 NOS 12.5mm   
 ◆ 10 NOS 12.5mm   
 ◆ 11 NOS 12.5mm   
 ◆ 13 NOS. 12.5 mm   
 ◆ 17 NOS. 12.5 mm



## MANUFACTURING

Hollow core slabs are manufactured in a closed environment using the highest levels of technology that ensure a high quality product. Using world renowned PCE production lines and extruders and employing a team of highly qualified staff, CONCRETEC is considered among the most reputed providers of Hollow core slabs in the region.



Hollow core slabs are pre-stressed elements production a long bed by using extruders and mechanically compacted. The Hollow core slabs are produced in standard width of 1200 mm; service openings widths can be accommodated. The top surface shall be finished as cast by the machine or intentionally - roughened to achieve the specified bond characteristics of the topping to other finish applied after erection of the slabs.

## MATERIALS

Hollowcore slab is same as any other structural precast member and is a composite member of concrete and reinforcing steel.

1. Concrete is made up of the following ingredients:
  - ▶ Ordinary Portland Cement (OPC) complying with BS EN 197-1 or ASTM C 150.
  - ▶ Aggregates complying with BS 882 or ASTM C 33.
  - ▶ Mixing Water complying with BS EN 1008 or ASTM C 1602.
  - ▶ Concrete Admixtures complying with BS EN 934-2 or ASTM C 494.
 Cement Supplementary Materials (CSM) such as silicafume or GGBS can be used in the production of concrete for the manufacture of Hollowcore slab if required
  
2. Prestressing Strands for reinforcement shall comply with BS 5986 or ASTM A 416 / A416M.

## TOLERANCES

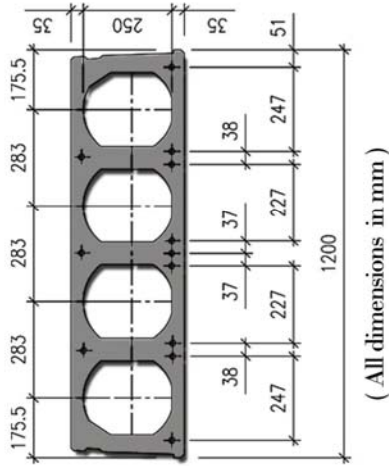
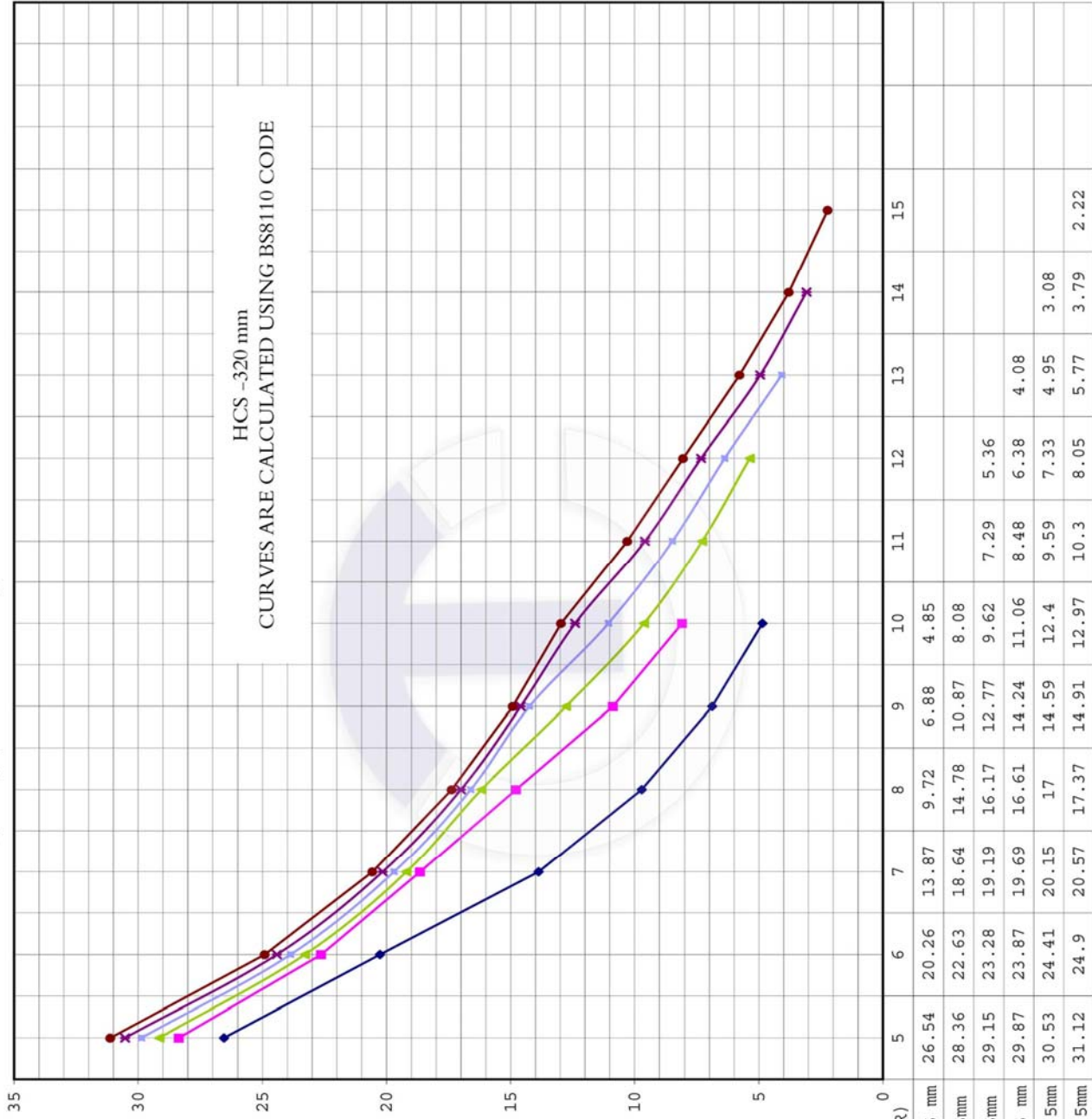
CONCRETEC Hollowcore slabs are supplied in of the highest level of quality and within the tolerance limits set forth in Fig. 1.8.1 of PCI MNL-126.

The table below shows some dimensional tolerances for produced precast Hollowcore slab;

Length	+/- 12.7 mm (+/- ½ in)
Width	+/- 6.35 mm (+/- ¼ in)
Depth	+/- 6.35 mm (+/- ¼ in)
Blockout location	+/- 50.8 mm (+/- 2 in)
Sweep	+/- 9.5 mm (+/- ⅜ in)
Variation from specified plan and squareness or skew	+/- 13 mm (+/- ½ in)
Center of Gravity (CG) of strand group	+/- 6 mm (+/- ¼ in)
Location of strand perpendicular to plane of panel	+/- 13 mm (+/- ½ in)
Location of strand parallel to plane of panel	+/- 19 mm (+/- ¾ in)
Location smoothness	+/- 6mm in 3m(+/- ¼ in in10 ft)

# HC320 Load-Span Chart

-Maximum service design load( $q_{sls}$ ) in excess of slab weight in KN/m<sup>2</sup>



### SLAB PROPERTIES:

- Precast slab weight 3.65 KN/m<sup>2</sup>
- Jointed slab weight 3.87 KN/m<sup>2</sup>
- Concrete grade C50
- Dimension 0.183 m<sup>2</sup>
- Area of Section 320 mm
- Depth of slab 1200 mm
- Nominal width of slab 4 VOIDS
- Steel ultimate tensile strength 1860 N/mm<sup>2</sup>
- Reinforcement cover 35 mm

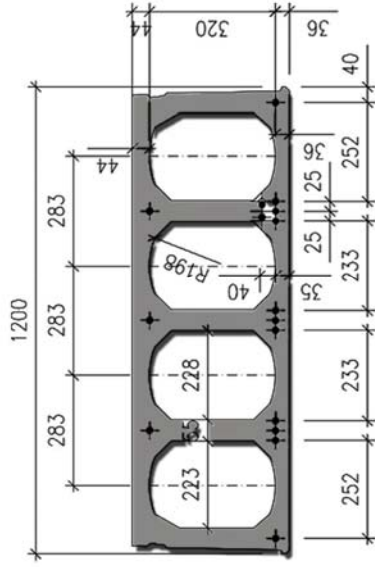
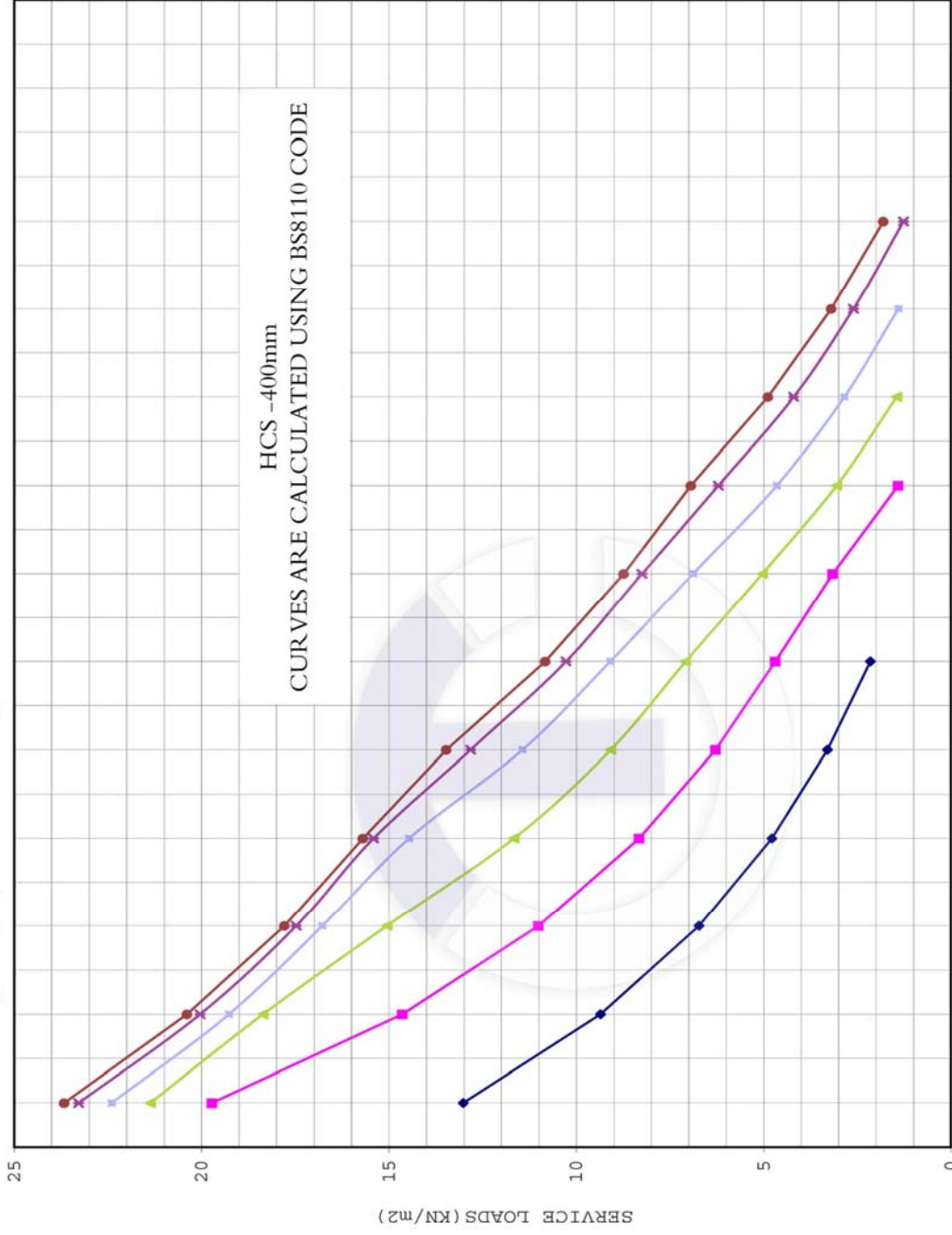
SPAN (METER)	5	6	7	8	9	10	11	12	13	14	15
5 NOS 12.5 mm	26.54	20.26	13.87	9.72	6.88	4.85					
7 NOS 12.5mm	28.36	22.63	18.64	14.78	10.87	8.08					
8 NOS 12.5mm	29.15	23.28	19.19	16.17	12.77	9.62	7.29	5.36			
9 NOS 12.5 mm	29.87	23.87	19.69	16.61	14.24	11.06	8.48	6.38	4.08		
10 NOS 12.5mm	30.53	24.41	20.15	17	14.59	12.4	9.59	7.33	4.95	3.08	
11 NOS 12.5mm	31.12	24.9	20.57	17.37	14.91	12.97	10.3	8.05	5.77	3.79	2.22





# HC400 Load-Span Chart

-Maximum service design load(qsls) in excess of slab weight in KN/m<sup>2</sup>



( All dimensions in mm )

## SLAB PROPERTIES:

- Precast slab weight 4.15 KN/m<sup>2</sup>
- Jointed slab weight 4.34 KN/m<sup>2</sup>
- Concrete grade C50
- Dimension 0.2074 m<sup>2</sup>
- Area of Section 400 mm
- Depth of slab 1200 mm
- Nominal width of slab 4 VOIDS
- No. of voids 1860 N/mm<sup>2</sup>
- Steel ultimate tensile strength 35 mm
- Reinforcement cover

SPAN (METER)	5 NOS 12.5 mm	7 NOS 12.5 mm	9 NOS 12.5 mm	11 NOS 12.5 mm	13 NOS 12.5 mm	14 NOS 12.5 mm
8	13.02	14.64	18.36	20.04	20.39	23.67
9	9.35	11.01	15.05	16.78	17.79	20.39
10	6.72	8.32	11.66	14.46	15.69	17.79
11	4.78	6.28	9.08	11.44	12.82	15.69
12	3.3	4.69	7.08	9.09	10.27	13.47
13	2.15	3.16	5.03	6.88	8.25	10.83
14		1.41	3.05	4.65	6.21	8.73
15			1.45	2.85	4.2	6.94
16				1.4	2.6	4.88
17					1.27	3.19
18						1.8
19						



## HANDLING, LIFTING & DELIVERY

Hollowcore slab units shall be lifted and supported during manufacturing, stockpiling, transporting and erection operations only at the lifting or supporting points, or both, as specified by the company.

The on-site lifting and erection operations shall be in accordance with the method statement for erection of Hollowcore slabs which is based on PCI MNL 126 and/or as per project requirements.



Full width Hollowcore slabs shall be hoisted by using specially designed lifting equipment (rigging clamp with spreader beam) to ensure vertical lifting of slab.

Hollowcore Slabs shall be stored off ground by placing them on plywood runner, etc. The slabs should be stored in such a way that identification marks are discernible. The stacked Hollowcore slabs shall be separated by patterns across full width of each slab. The upper slab of the stacked tier should not be used as storage area for shorter members or heavy equipment.



Hollow core slab are handled in the flat horizontal position. Slabs are not turned on edge or end unless approved by design engineer. While lifting narrow slabs (width less than 1200 mm) and slabs with cut-outs near the end, sling belts of adequate capacity properly tightened around the slabs, are used for lifting process.

Hollow core slabs are transported from the factory to the site on flat bed trailers. Slabs are secured to the trailer, using latching chains (and belts if required). Loading is governed by trailer capacity and slab geometry



## INSTALLATION

Bearing surfaces for the support of the Hollow core slabs shall be true and level. Temporary shoring and bracing shall also be provided as necessary to ensure the stability of the structure during erection. Installation and handling processes of the slabs shall be in accordance with CONCRETEC procedures and based on PCI MNL 126.



## ERECTION TOLERANCES

The erection tolerances for Hollowcore slabs shall be within limits set forth in Fig. 1.8.2 of PCI MNL-126.

The table below shows some dimensional tolerances for erection of Hollowcore slabs.

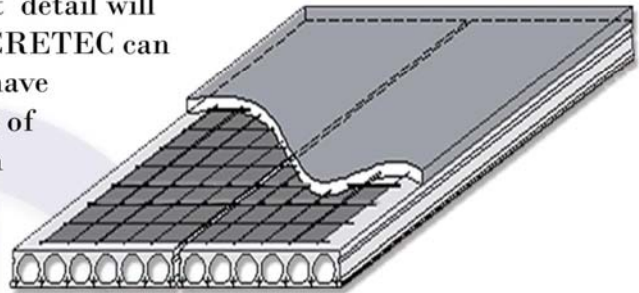
▶ Plan location from building grid datum	+/- 25 mm (+/- 1 in)
▶ Plan location from centerline of steel	+/- 25 mm (+/- 1 in)
▶ Top elevation from nominal top elevation at member ends	
* Covered with topping	+/- 19 mm (+/- ¾ in)
* Untopped floor	+/- 6 mm (+/- ¼ in)
* Untopped Roof	+/- 19 mm (+/- ¾ in)
▶ Maximum jog in alignment of matching edges (Both topped and untopped construction)	+/- 25 (+/- 1 in)
▶ Joint Width	
* 0 to 12 m (0 to 40 ft) member length	+/- 13 mm (+/- ½ in)
* 12.5 to 18m (41 to 60 ft) member length	+/- 19 mm (+/- ¾ in)
* 18.5m (61 ft) plus member length	+/- 25 mm (+/- 1 in)
▶ Bearing length	+/- 19 mm (+/- ¾ in)

## ATTACHMENTS

Attachments to the Hollow core slab shall be in accordance with the approved details, and shall not impair or reduce the strength of the slabs. There are several methods of fixing hanging loads to the hollow core slabs; for example, special socket drilled into the voids at the bottom of the slab or anchors placed into the longitudinal joint of the top of the slab which can be used for fixing hanging loads to the slabs. Penetrations and chases to the Hollow core slabs shall be in accordance with details agreed by structural engineer.

## STRUCTURAL TOPPING

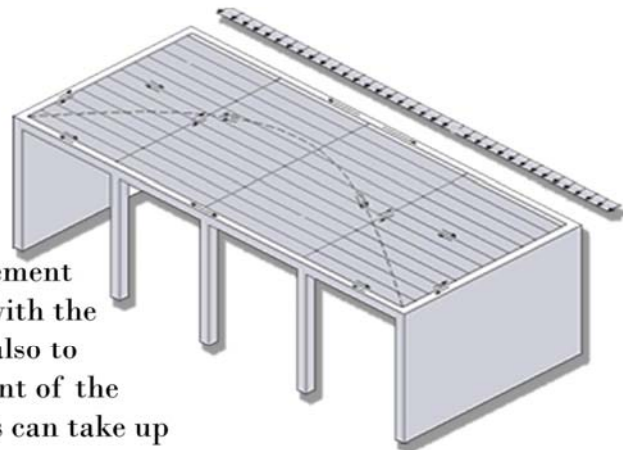
Hollow core slabs can be used with or without structural topping; however if structural topping will not be used, special reinforcement detail will be needed to achieve diaphragm action. CONCRETEC can design both systems. Topping concrete shall have minimum characteristic strength @28 days of 40MPa or as required by the structural design and it shall be reinforced with wire mesh as shown on the design drawings.



If topping concrete is used to grout the keyways, the maximum aggregate size shall be 10mm. Maximum thickness of topping should be 50mm. The client shall provide a well-compacted in-situ structural concrete topping to the Hollow core slabs as detailed in the drawings. Reinforcement shall be in accordance with structural details. The slab surface shall be clean and free of loose material and surface-moist (saturated surface-dry) immediately prior to placing the topping. Finishing and curing of the topping should ensure that plastic shrinkage cracks are controlled to acceptable levels. The hollow core slab and the topping will act as a composite slab and consequently the moment capacity of the hollow core slabs can be enhanced.

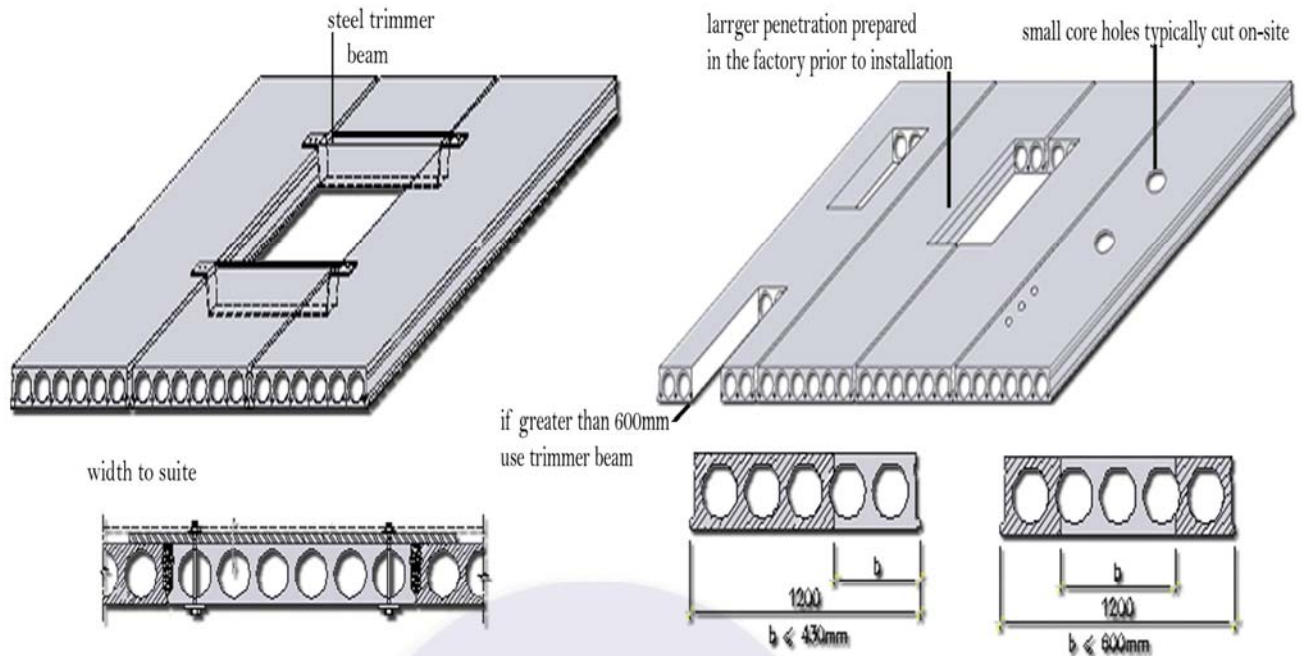
## DIAPHRAGM ACTION

The diaphragm action of hollow core slab is achieved through a good joint design to transfer horizontal forces to the main structural system. The peripheral reinforcement plays a determinate role not only to cope with the tensile forces of the diaphragm action but also to prevent the relative horizontal displacement of the hollow core units so that longitudinal joints can take up shear forces.





## HOLLOW CORE TYPICAL PENETRATION DETAILS



The Hollow Core flooring system allows for significant flexibility in terms of penetrations and block-outs. Penetrations for plumbing, electrical and mechanical services can be catered for along with larger voids such as stair openings and light wells. There are a number of different ways that these can be achieved. Examples of these are shown on the above drawing and can be described as follows:

1. **Core Holes;** Core holes are the most common type of penetration and are easily achieved by simply drilling the required hole on site to suit the building requirements. Provided the core holes are not greater than 120mm diameter (for 200 and 265 mm thick slabs) and 165mm diameter (for 320, 400, and 500 mm thick slabs) they can be easily catered for by simply drilling through core. In broad terms up to 65% of the slab section has the allowance to be cored through without any significant structural effects. Where the penetration is greater than that nominated above or if the hole cuts through the web and strand, CONCRETEC Structural designer should be contacted to review the slab.

2. **Cut-Outs;** Larger penetrations, such as those required for mechanical services can be easily catered for as shown on the above drawing. These larger cut-outs are nominated during the design process to allow the design to take into account the local strand and web reduction. These cut-outs are generally pre-cut in the factory prior to installation. If future demands or site modifications require these larger penetrations to be introduced, they can be catered for in most cases with minor onsite slab modification.

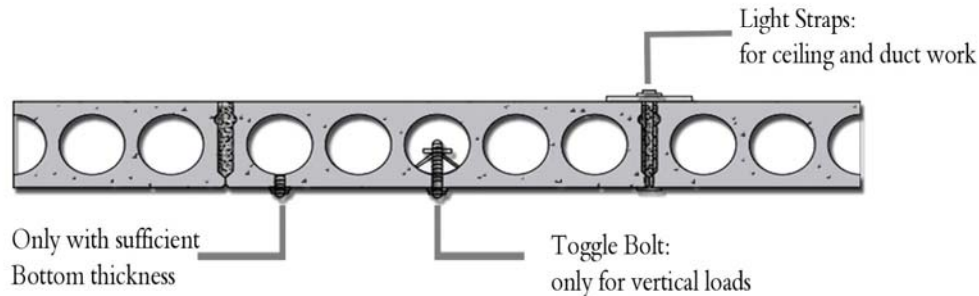
3. **Trimmer Beams;** Large openings to allow for stair voids, light wells or larger mechanical services can be catered for by the use of trimmer beams. Where these large penetrations are required full width headers or trimmer beams are used to transfer the load to the adjacent planks. These planks are designed to support the additional load without the need for supporting columns.

The slab manufacturer should be consulted during the preliminary stages of the project so that advice can be provided on the most cost effective and practical design to accommodate the required penetrations

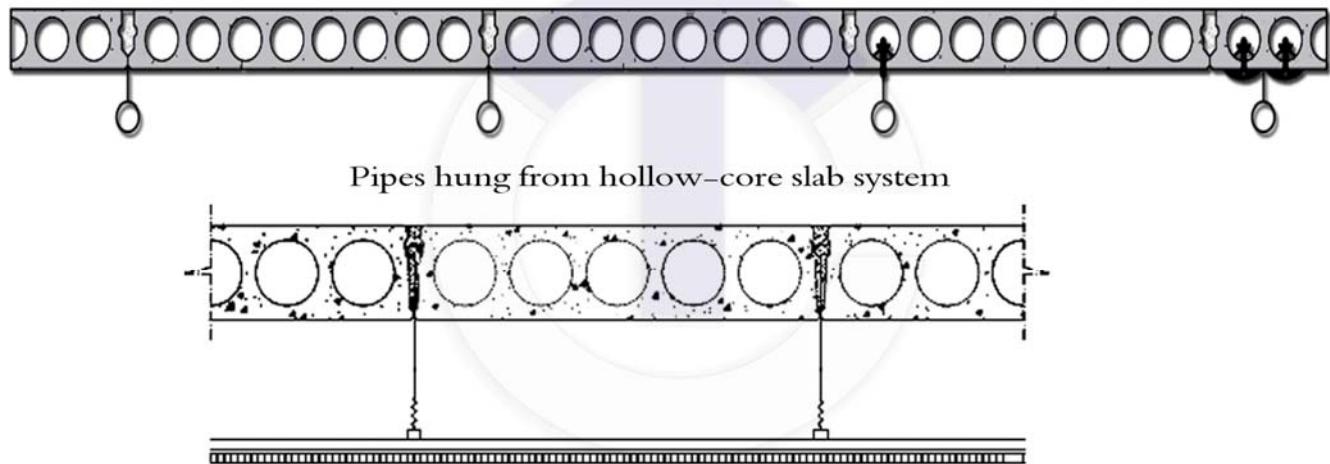
## DUCT WORK

The voids in the Hollow core slab can be utilized for distribution ducts for HVAC (Heating, Ventilation, and Air Conditioning) and/or Exhaust Systems.

Connections can be made through several means (as illustrated in the drawing below). Field installed devices generally offer the most economical way and ensure placement in the exact locations where the connection devices will be required.



Suspended ceiling below hollow-core slab



Pipes hung from hollow-core slab system

Suspended ceiling below hollow-core slab

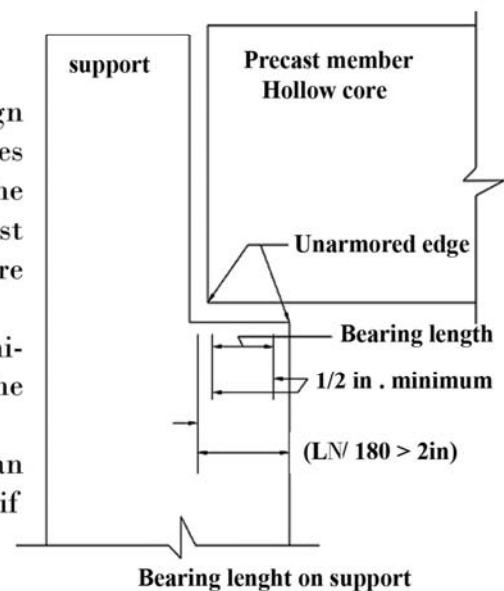
## BEARING LENGTH

(a) Each member and its supporting system shall have design dimensions selected so that, after considering tolerances the distance from the edge of the support to the end of the precast member in the direction of the span is at least  $LN/180^*$ , but not less than 2 in For Solid or Hollow core slabs .....

(b) Bearing pads at unarmored edges shall be set back a minimum of 1/2 in from the face of the support, or at least the chamfer dimension at chamfered edges.

(c) the above mentioned values are based on the American standard. Other international standards can be used if required

\* LN: Clear Hollow core Span





## ALLOWANCE FOR CAMBER

Hollow core floor slabs are cambered because of the upward bending induced by prestressing. This camber should be allowed for in detailing the slabs and the joints at abutting walls, door openings and the like. A cast-in-situ topping screed unifies the slabs into a monolithic floor, takes out differential levels between units and provides a level working surface. The minimum thickness of topping occurs at the highest point of the slab.

## FIR RESISTANCE

Hollow core slabs meet the very highest standards for non-flammability and fire resistance. For fire rating of prestressed concrete elements, reference is made to BS 8110-1:1997 section 4.12 or any International code requirements.

## NOISE REDUCTION AND THERMAL RESISTANCE

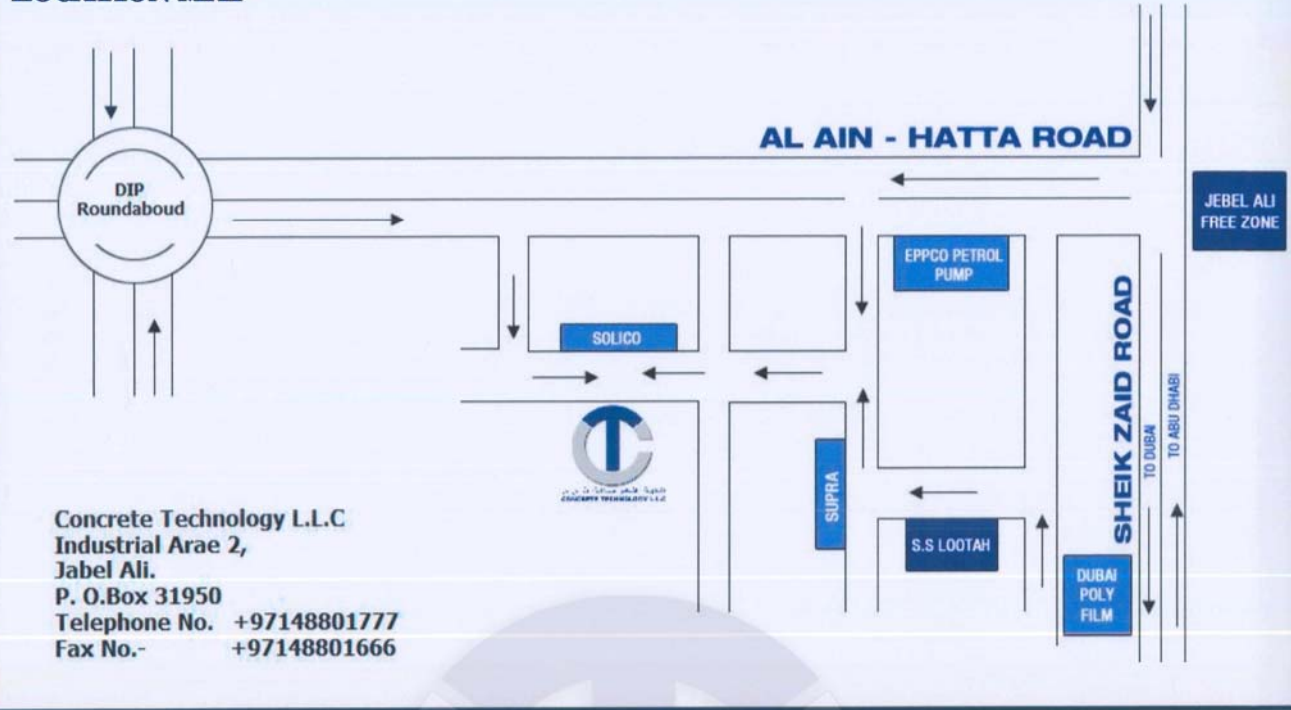
Noise reduction and thermal resistance properties for HOLLOW CORE SLABS are according to the table below: For detail noise reduction factor, reference is made to BS8233, 1987.

Slab Type	R - Value (m K/W)	U-Value (W/m K)	Noise Reduction (dB)
HCS 150	0.12	8.33	50
HCS 200	0.15	6.67	53
HCS 265	0.19	5.26	56
HCS 320	0.20	5.00	58
HCS 400	0.22	4.55	60
HCS 500	0.26	3.85	63
HCS 150+60	0.16	6.25	53
HCS 200+60	0.19	5.26	56
HCS 265+60	0.23	4.35	59
HCS 320+60	0.24	4.16	61
HCS 400+60	0.26	3.85	63
HCS 500+60	0.30	3.33	65

## INSPECTION AND ACCEPTANCE

CONCRETEC quality control engineer / inspector shall verify the conformance of the product to the project specifications before delivery to the site.

## LOCATION MAP



## LOCATION MAP

