



CKR PRE-CAST TECHNOLOGY (S) PTE LTD

Concrete Prefabrication Specialist



HOLLOWCORE SLABS

TECHNICAL INFORMATION

AUTOMATED PRECAST SOLUTIONS





Hollowcore Slabs are widely used in the construction of multi-storey buildings such as car park, industrial and commercial buildings.

The use of Hollowcore Slabs as a component in the building yield many benefits, especially in long spanning floor structure.

Hollowcore Slabs are prestressed concrete component manufactured to have a constant cross section. The production are carried out using high tensile strength prestressed strands which are embedded within the precast slab section.

The production of Hollowcore Slabs are achieved by using the extruder machine that cast in one phase along a long production bed without the need of formworks. Hollowcore Slabs are highly efficient and well-developed prefabricated structural elements, and are commonly used in Singapore construction industry since the early 80s due to the many advantages and diverse applications.

THE ADVANTAGES OF CKR HOLLOWCORE SLABS INCLUDES:

- Made in Singapore – Assurance of no disruption in supply
- QP / RE / RTO inspection - ease of random visit to plant for QA / QC check
- Long span up to 14 meters
- Shorter construction duration with quick erection
- No propping required, simple to install
- Reduction in wet works and labour on site
- Cleaner and safer site environment
- Mass production to meet site requirement
- Different sizes of opening can be made into Hollowcore Slab during manufacturing
- Service can be suspended from / fixed on soffit of erected Hollowcore Slab
- Hollowcore Slab off-form finished soffit requires minimum finishing as ceiling
- Fire rated to 2 to 4 hours
- Designed to Eurocodes
- Wide range of thickness to select for different load and span for many diverse floors planning by architects and engineers for their developments.

STANDARD DIMENSIONS

The Hollowcore Slabs manufactured at CKR CONTRACT SERVICES PTE LTD are available in standard width of 1200mm for 2 hours to 4 hours fire rating.

For 2-hour fire rated slabs, thickness ranges from 200mm, 265mm, 320mm, 360mm and 400mm; for 4-hour fire rated slabs, thickness ranges from 285mm, 340mm, 380mm, and 420mm.

In addition to the above thickness, CKR Hollowcore production facility can offer other thickness upon request to meet project requirement.

PRODUCTION CAPACITY

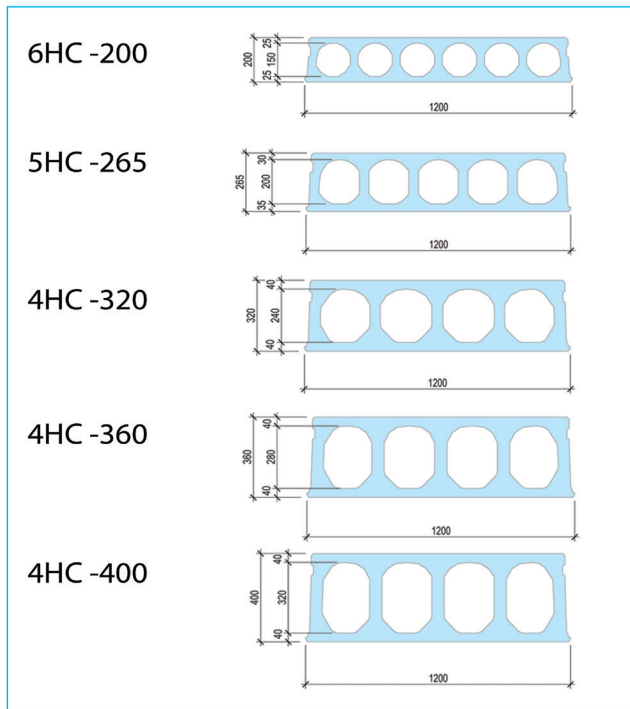
Our daily production capacity for Hollowcore Slabs is 1.2m x 90m x 5 beds = 500m² for a single production cycle. This can increase to 1000m² with the use of hot water curing for 2 cycles / day in the near future.

CUSTOMISATION

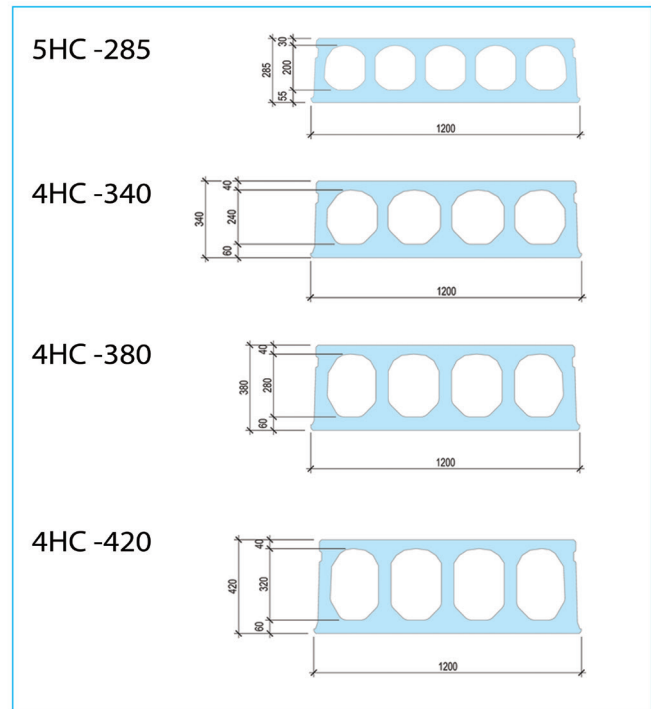
We are able to customise according to specifications upon request, and further information can be obtained from the marketing department.

STANDARD DIMENSIONS

DIMENSIONS OF STANDARD CKR HOLLOWCORE SLABS (2 HOUR FIRE RATED)



DIMENSIONS OF STANDARD CKR HOLLOWCORE SLABS (4 HOUR FIRE RATED)



SECTION PROPERTIES

Standard CKR Hollowcore Slab Section Properties - 2 hour fire rated

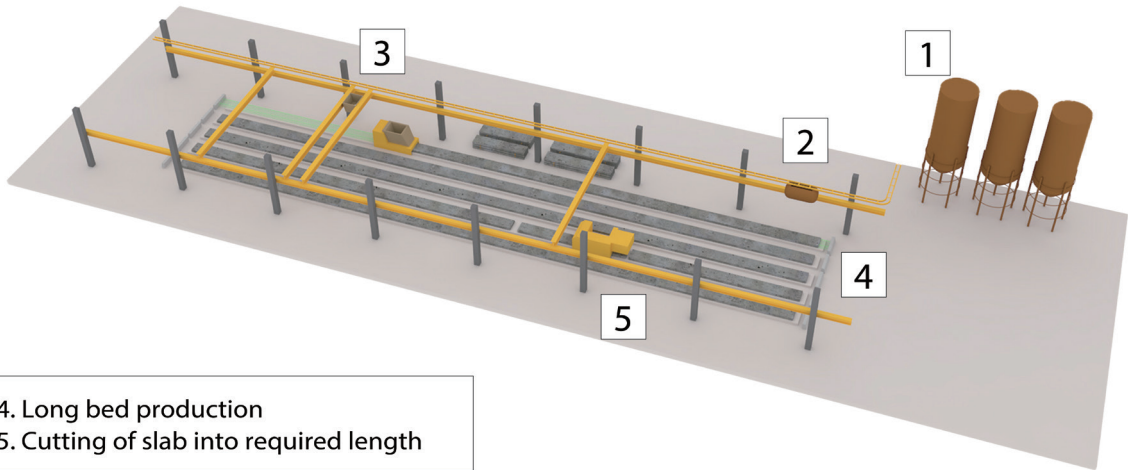
| Hollowcore Slab Type | Overall Depth (mm) | Self-weight (kPa) | | Cross section area (mm ²)x10 ³ | Centroid from soffit (mm) | Moment of Inertia about CG (mm ⁴)x10 ⁸ | Cover to lowest strand (mm) |
|----------------------|--------------------|-------------------|---------|---|---------------------------|---|-----------------------------|
| | | Unjointed | Jointed | | | | |
| 200HC6 | 200 | 2.43 | 2.57 | 121.4 | 99.3 | 6.18 | 40 |
| 265HC5 | 265 | 3.03 | 3.24 | 151.7 | 132.0 | 13.84 | 40 |
| 320HC4 | 320 | 3.75 | 4.00 | 188.8 | 158.9 | 28.21 | 40 |
| 360HC4 | 360 | 4.07 | 4.35 | 203.4 | 179.2 | 33.80 | 40 |
| 400HC4 | 400 | 4.31 | 4.64 | 215.6 | 199.0 | 44.45 | 40 |

Standard CKR Hollowcore Slab Section Properties - 4 hour fire rated

| Hollowcore Slab Type | Overall Depth (mm) | Self-weight (kPa) | | Cross section area (mm ²)x10 ³ | Centroid from soffit (mm) | Moment of Inertia about CG (mm ⁴)x10 ⁸ | Average Cover to centre of strands (mm) |
|----------------------|--------------------|-------------------|---------|---|---------------------------|---|---|
| | | Unjointed | Jointed | | | | |
| 285HC5 | 285 | 3.50 | 3.72 | 175.1 | 131.50 | 17.90 | 65 |
| 340HC4 | 340 | 4.24 | 4.50 | 212.1 | 159.90 | 30.70 | 65 |
| 380HC4 | 380 | 4.53 | 4.83 | 226.6 | 178.70 | 41.20 | 65 |
| 420HC4 | 420 | 4.78 | 5.13 | 239.1 | 197.20 | 53.60 | 65 |

HOLLOWCORE PRODUCTION LINES & PROCESS @ ICPH

- 1. Concrete Batching Plant
- 2. Concrete delivery via flying bucket
- 3. Concrete distribution in the extruder machine



- 4. Long bed production
- 5. Cutting of slab into required length



AUTOMATED PRODUCTION PROCESS

The production of Hollowcore Slabs is highly mechanised with multiple lines of simultaneous production. The process employs little labour but many machinery to increase efficiency in order to achieve high production output. There is a total of 5 Hollowcore Slab production beds at CKR ICPH facility, Level 1. Each line's production begins with cleaning and bed oiling, PC strands are then pulled by the bed cleaning machine. Once the PC strands are stressed to the design force, the extruder machine is set onto the bed to commence Hollowcore Slab production. A series of automation involving concrete delivery via a flying bucket, concrete distributor to feed the extruder machine, zero-slump dry concrete is extruded along the production beds to form the required Hollowcore Slab sections.

MACHINERY

Bed Cleaning Machine - The multi-task bed cleaning machine will remove unwanted leftover materials build up from previous production cycle. As part of oiling process, the nozzles on the machine spritze oil across the production bed. Thereafter, the PC strands are placed from start of the production line and pull to the end using the same multi-tasking machine.

Batching Plant – The in-house computerised batching plant mixes the concrete according to SS EN 206 standard.

Flying Bucket – The overhead flying bucket collects fresh concrete from the batching plant and transports the zero slump concrete to feed into the concrete distributor. The concrete distributor will then discharge the concrete into the extruder throughout the entire lengths of the beds during production.

Extruder – Upon receiving zero-slump concrete, the extruder machine compacts the dry concrete with high frequency vibration to form the Hollowcore Slab sections. Depending on project requirement and the type of elements to be produced, the extruder will cast in a single continuous operation along the 90 meter production bed.

Cutting Machine – Upon successful casting, curing and achieving concrete transfer strength of 35N/mm², a diamond-tipped saw machine with a laser light indicator is mounted onto the bed to cut slabs into pre-determined lengths with precision and accuracy in the final production process of CKR Hollowcore Slabs.

Overhead Crane – The cut slabs are lifted off the bed by an overhead crane and transferred to the storage area ready for site delivery.

MATERIALS

Hollowcore Slabs are precast prestressed slabs made from zero-slump concrete with C40/50 compressive strength. The PC strands used are 7-wire steel strand in accordance to ASTM 416 standard with an ultimate strength of 1860N/mm². Generally, two common sizes of the PC strands are 9.53mm and 12.7mm in diameters.

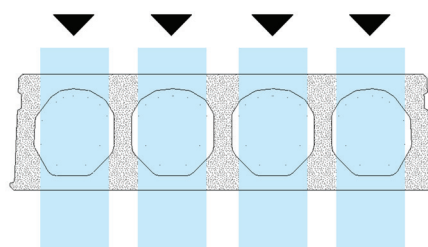
TOLERANCES

The production tolerances seen below are generally adopted for in-house quality acceptance.

| Production Tolerance of Hollowcore Slabs | |
|--|--|
| Length (L) | + 3mm |
| Thickness (h) | ± 3mm |
| Width (b) | I. Standard slabs: ± 3mm II. Narrow Slabs: ± 10mm |
| Position of Strands | ± 5mm mean value per slab ± 7mm |
| Position of Recess and Opening | I. Location: ± 15mm II. Size: +10mm, -0mm |
| Maximum Camber | ± 5mm |
| Maximum Slippage of Strands | 3mm |
| Flange Thickness | ± 1mm |

OPENINGS IN HOLLOWCORE SLABS

Openings in Hollowcore Slabs are usually made in the factory when the concrete is at green state during production. The openings are made within the void section at non-critical location on the Hollowcore Slabs. The reduced cross section has to be checked for design accuracy to withstand the specified design loads of the Hollowcore Slabs. The Hollowcore Slabs are able to accommodate openings of various sizes for M&E penetrations. Large openings are to be made in factory with appropriate strengthening if required. Medium and small size openings can be made at the site with the use of a diamond tipped coring tool.



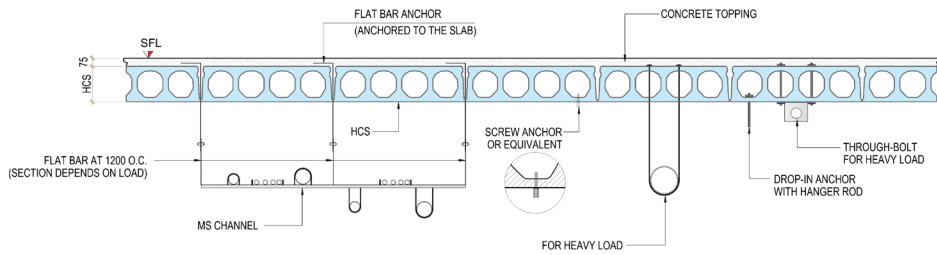
LOCATION OF THE OPENINGS

CONDUITS IN HOLLOWCORE SLABS

Small diameter service conduits can be laid on top of the Hollowcore Slab and concealed in the structural topping for the floors.

SUSPENSION

Hollowcore slabs are ideal for the mounting of ancillary provisions such as electrical trays, water sprinkler and HVAC systems.



CONCRETE TOPPING & INSTALLATION

Hollowcore Slabs can be designed with or without structural topping. However, a layer of concrete topping is generally required to achieve a levelled floor. In addition, water leakages can be prevented through the joints of the Hollowcore Slabs with the use of concrete topping properly reinforced with welded meshes.

The installation procedure of Hollowcore Slabs shall execute in accordance to the safety regulations and approved method of statement by CKR. In order to minimise handling damages, the slabs are hoist with a lifting beam that consists of an adjustable clamp and safety chains. These safety chains will support the Hollowcore Slabs should the clamp malfunction. Hollowcore Slab over 7 Ton in weight is recommended to use belt in lifting and handling.

STORAGE AND DELIVERY

After the slabs are cut in the relevant sizes and demoulded from the bed, it will be stacked in rows supported with timber battens in between at the storage. The Hollowcore Slabs should be stored on hard and levelled ground. Once the Hollowcore Slabs are scheduled for delivery, it will be loaded onto stationary trailer in compliance with safety measures. Once driver ensures the loaded slabs are properly secured, the slabs can then be transported to site. When the load reaches the site, the Hollowcore Slabs are used in direct installation or stored on hard levelled ground to avoid cracks.

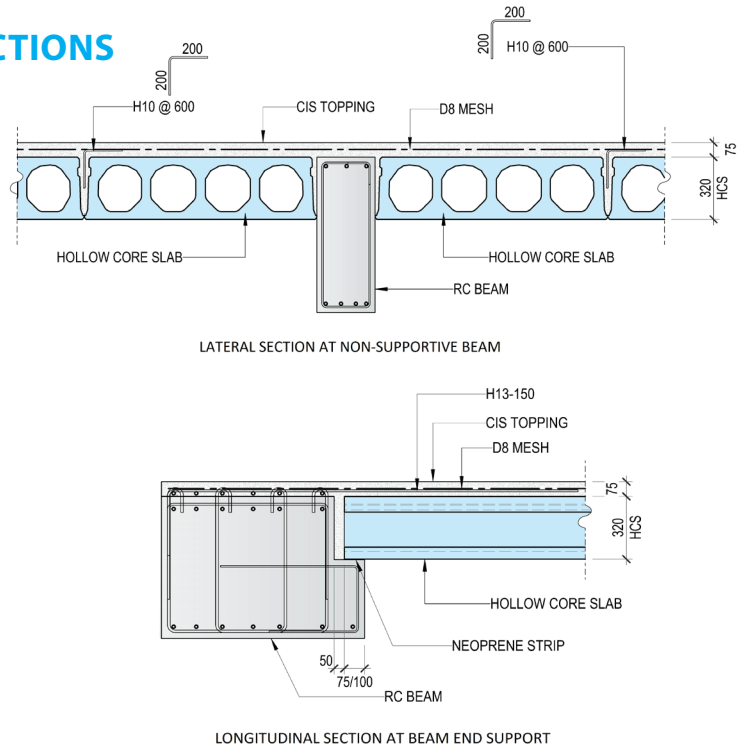
BEARING LENGTH

The simply supported Hollowcore Slabs will have nominal 75mm to 125mm bearing lengths depending on the slab thickness, by the design check for each project. The minimum bearing length for the Hollowcore Slabs can be found in the table below. 25mm wide by 4mm thick neoprene strips to use on bearing seating to prevent contacts between Hollowcore Slabs and the bearing seating area.

| Supporting Material | Construction Gap | Recommended Seating |
|-----------------------|------------------|---------------------|
| Cast in-situ concrete | 50mm | 100mm |
| Steel | - | 75mm |
| Precast | 50mm | 75mm |

CONNECTION AND TYPICAL SECTIONS

Upon installation, Hollowcore Slabs are connected together with C32/40 concrete with mesh and reinforcement bars as shown in the drawings. Joint surfaces are wetted before filling all joint grooves with concrete, which shall be compacted by 25mm immersion type vibrator. After compaction of concrete in joint areas, the underside of joint shall be brushed clean within one hour while the concrete is still green (initial set) to form a neat drip-free V-groove.



ACCREDITATION AND LICENCE

- ☑ HDB License – Normal Weight Concrete Components
- ☑ HDB License – Automated Precast Production System
- ☑ BCA IPA – Prefabricated Bathroom Units (PBU)
- ☑ PBU MAS – Prefabricated Bathroom Units (PBU)
- ☑ Batching Plant 1 & 2 – SS EN206
- ☑ SCI PAS – GS3 & GA (PC1A)
- ☑ ISO 9001, 45001, 14001 for ICPH Plant 1
- ☑ SGBC – Hollowcore Slab



CERTIFICATE OF CONFORMITY

Ready – Mixed Concrete Certification

This certificate is issued to

CKR Contract Services Pte Ltd
56 Sungei Kadut Drive, CKR Building, Singapore 729573

Batching Plant Address:
33 Kaki Bukit Road 6 Singapore 415908
(Kaki Bukit Plant 1)

For the product certification of

Ready – Mixed Concrete
(see Appendix for product / family details)

which has complied with the requirements of the scheme and based on the following:

SS EN 206: 2014; SS 544 Part 1 & 2: 2014; SAC CT 06: 2019

The validity of this certificate is subject to adherence to the agreed ongoing inspection programme, successful endorsement of certification following each inspection and compliance with ADMATERIA'S Regulations.

Signed for and on behalf of
Admaterials Technologies Pte Ltd

SS EN 206: 2014
SS 544 Part 1 & 2: 2014
SAC CT 06: 2019

PD 2019-01

The use of the SAC Accreditation Mark indicates accreditation in respect of those products covered by the accreditation certificate number PD 2019-01

Certificate Number:
ADM/0180

Date of Issue:
26/10/2020

Date of expiry:
25/10/2023

Authorised Signatory

Product conformity certificates are awarded on the basis of an assessment of conformity control system and process control covering contract review, product design, production methods, quality control system and handling of the product, all supported with evidence of the supporting quality management system.

Admaterials Technologies Pte Ltd is accredited by Singapore Accreditation Council (SAC) for certification in respect of Product Certification Systems (ISO/IEC 17065:2012 and SAC CT06:2019).

This Certificate is part of a 3rd report and should be used in conjunction with it. This Certificate remains the property of Admaterials Technologies (S) Pte Ltd and shall be returned upon request. The use of this Certificate is subject to the terms and conditions of the Ready-Mixed Concrete Scheme. The manufacturer is solely responsible for compliance of any product within the same designation as the product type listed. Persons relying on this Certificate should verify its validity by checking Admaterials Technologies Pte Ltd's website at apac.admat.com.sg

SINGAPORE GREEN BUILDING PRODUCT CERTIFICATE

AWARDED TO

CKR PRE-CAST TECHNOLOGY (S) PTE LTD
56 Sungei Kadut Drive
CKR Building,
Singapore
Singapore 729573

FOR THE PRODUCT

Structural Precast Concrete

PRODUCT BRAND

Hollowcore

PRODUCT MODEL

GS0

THE PRODUCT HAS BEEN ASSESSED ACCORDING TO THE ASSESSMENT CRITERIA OF SINGAPORE GREEN BUILDING PRODUCT CERTIFICATION SCHEME. IT HAS BEEN AWARDED THE RATING:

EXCELLENT

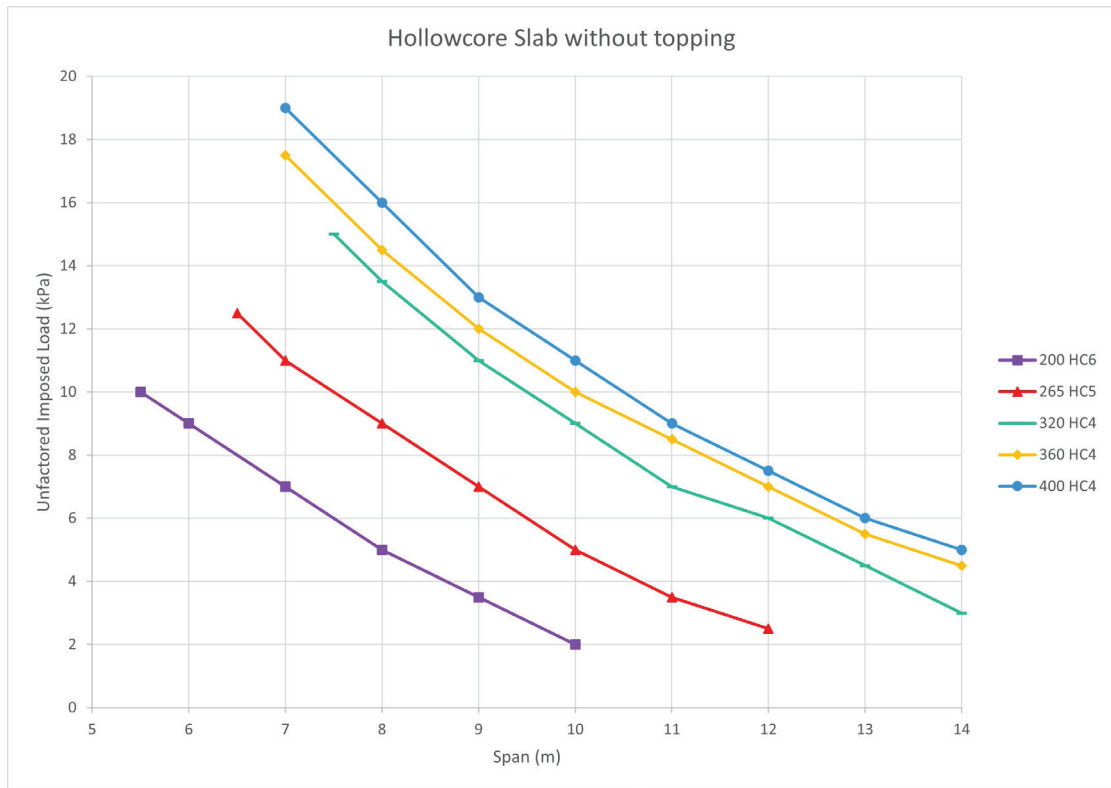
Director
SGBC Pte Ltd

| | | | |
|--------------------|-------------------------|--------------|-------------------------|
| Certificate Number | Original Issue Date | Revised Date | Valid Till |
| SGBP 3026 | 14 December 2020 | - | 13 December 2022 |

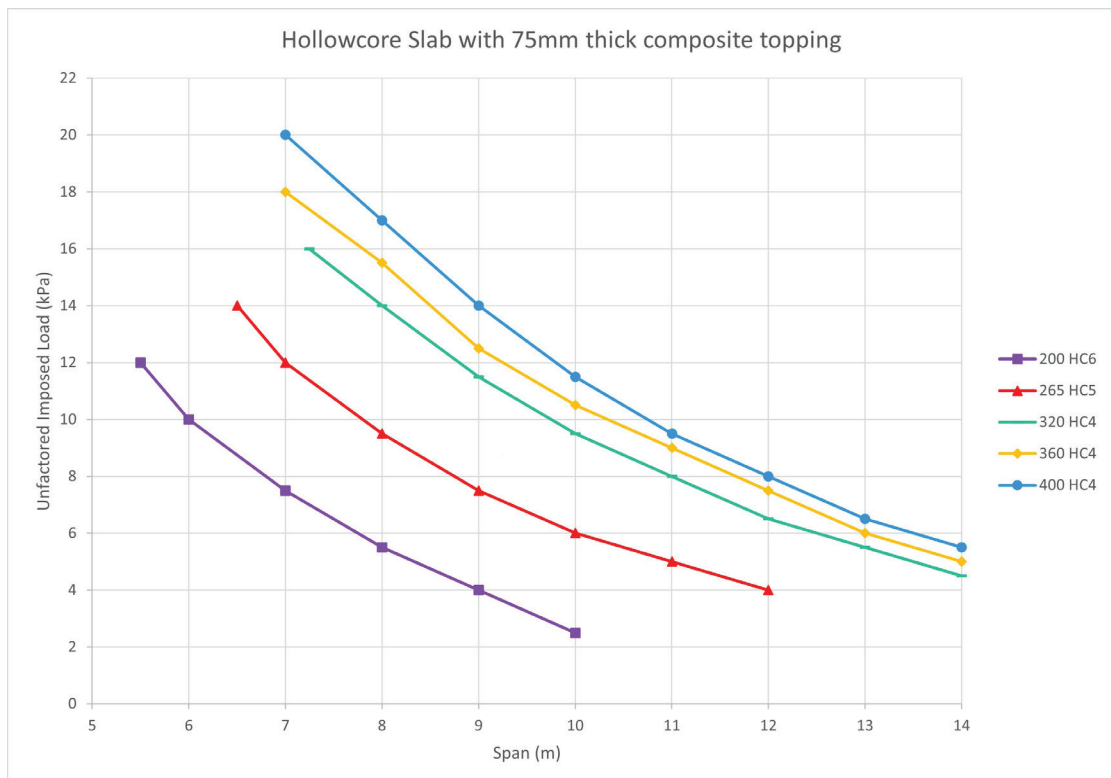
Good Very Good Excellent Leader
The use and release of this certificate is linked to the terms and conditions of the Singapore Green Building Product Certification Scheme. Revised certificates may also be issued at the discretion of the Council. The verification status may be verified at the Singapore Green Building Council website www.sgbc.org.sg.

INDICATIVE LOAD TABLE

(NON-COMPOSITE HOLLOWCORE SLABS – 2 HOURS)

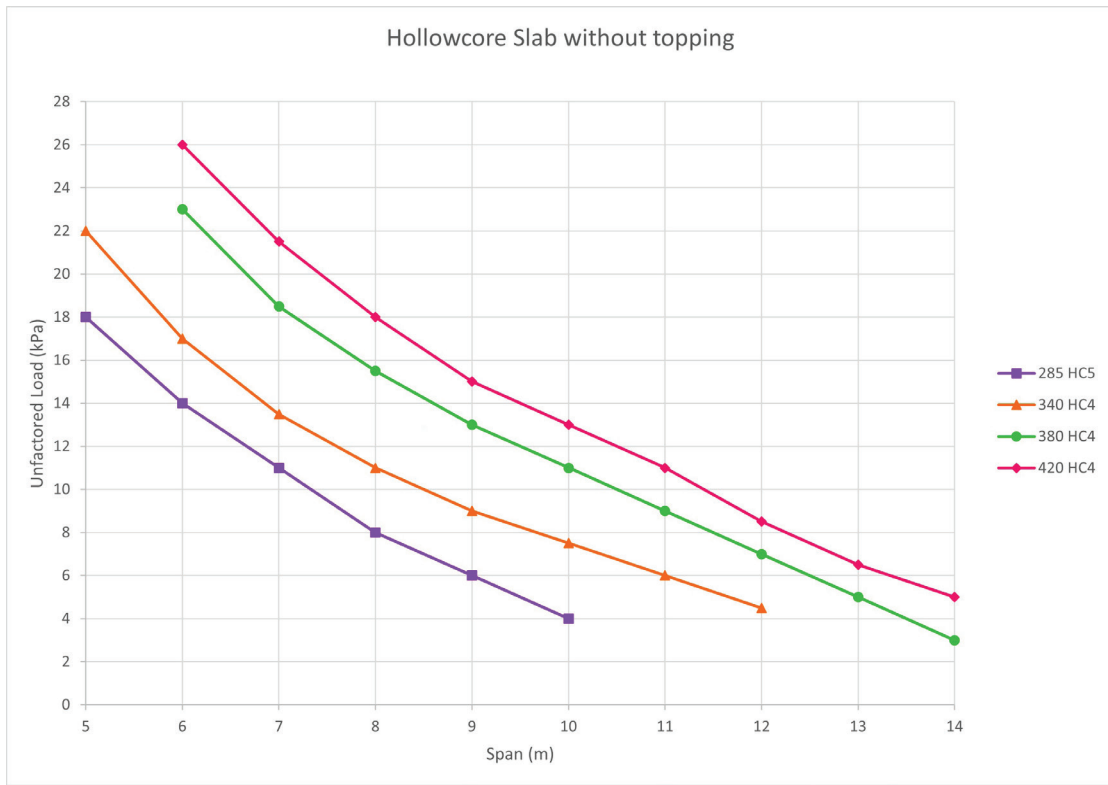


(COMPOSITE HOLLOWCORE SLABS – 2 HOURS)

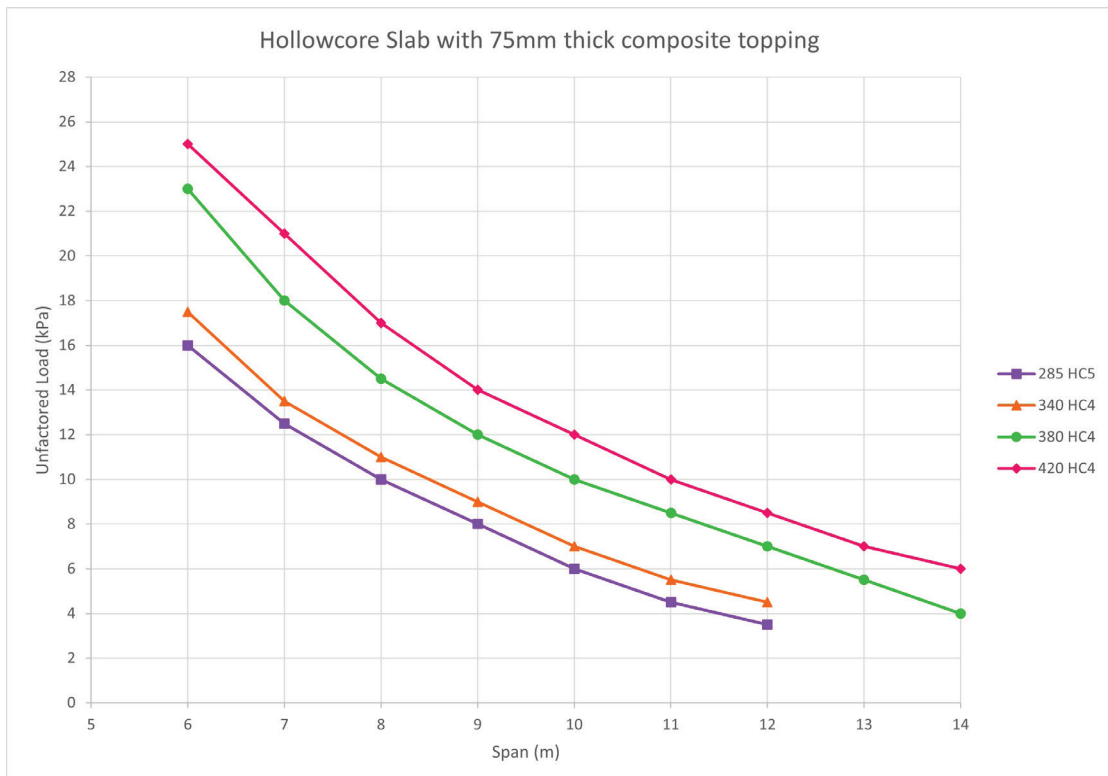


INDICATIVE LOAD TABLE

(NON-COMPOSITE HOLLOWCORE SLABS – 4 HOURS)



(COMPOSITE HOLLOWCORE SLABS – 4 HOURS)



PRECAST PRODUCTS SUPPLIED BY CKR:

- Hollowcore Slab (HCS)
- Large Panel Slab (LPS)
- Prestressed Planks
- 2D Precast Components: Non-Prestressed Plank, Column, Wall, Facades, Beam, Refuse Chute, Staircase Flight, Parapet, Planks, Roof Fascia, etc.
- Precast Bathroom Units (PBU): Concrete and Light Weight Concrete
- Household Shelter (HHS)
- Suction Tank / Hose reel Tank / Water Tank
- RC Piles
- Drains
- Prefabricated Prefinished Volumetric Construction (PPVC)
- Viaduct Segments and Crossheads

Contact Information

Precast Facilities

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33 Kaki Bukit Road 6
Singapore 415808

Factory 2
Punggol Pulau Timor
22 Seletar North Link

Email: info.precast@ckrgroup.com.sg

Headquarters

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