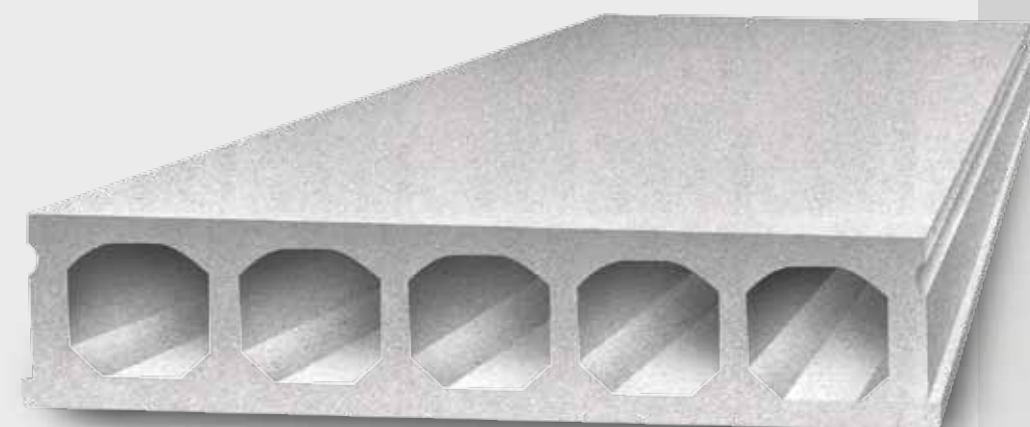


# نظام البلاطات المفرغة Hollowcore Slab System



ALRASHID - ABETONG



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ALRASHID - ABETONG



الراشد - أيه بيتونج



## INTRODUCTION

## مقدمة

**AlRashid Abetong Co.** was established in 1977 as a Saudi – Swedish Company and has grown rapidly to become the largest and most successful precast concrete company in the Kingdom of Saudi Arabia.

The company has the full range of the Precast Concrete Products like: Hollowcore Slabs (HCS), Double Tee Slabs (DTS), Form Slabs (FS), Solid Slabs (SS), Coloumns, Beams, External and Internal Wall Panels and all types of precast concrete structures in addition to the unique Swede Beam System (SBS).

**AlRashid Abetong Co.** has Five large factories located in the Industrial City in Riyadh and one factory located in Jizan. We serve our customers through our main office in Riyadh and our two branch offices situated in Jeddah and AlKhobar.

**AlRashid Abetong Co.** is well Known for its superior quality of precast concrete products, reliable professional services and commitment to fulfilling the expectations of clients.

تأسست **شركة الراشد أيه بيتونج** في عام ١٩٧٧ كشراكة سعودية – سويدية وتوسعت أعمالها بسرعة لتصبح إحدى أكبر وأنجح شركات الخرسانة المسبقة الصنع في المملكة.

الشركة تقوم بإنتاج جميع العناصر الخرسانية المسبقة الصنع مثل:

البلاطات المفرغة، ونظام البلاطات المزدوجة، وبلاطات آرا فورم سلاب، والأعمدة، والكمرات، والجدران الخارجية والداخلية، وجميع العناصر الانشائية بالإضافة إلى النظام الفريد الخاص بالشركة (نظام الكمرات السويدية)

**شركة الراشد أيه بيتونج** لديها خمسة مصانع كبيرة في المدينة الصناعية في الرياض بالإضافة إلى مصنع ضخم يقع في مدينة جيزان. ونقوم بخدمة العملاء من خلال مكتبنا الرئيسي في الرياض وفروع الشركة في جدة والخبر.

**شركة الراشد أيه بيتونج** معروفة بتفوقها الكبير في جودة المنتجات الخرسانية المسبقة الصنع بالإضافة إلى الحرص الشديد على كسب ثقة العملاء وتحقيق توقعاتهم.



# HOLLOW CORE SLAB (HCS) SYSTEM



HCS slab are cast with G50/C42 concrete and 1/2" or 3/8" strands, ASTM A416 as standard.

The top surface of the HCS slab is normally prepared for a levelling screed ( Structural or non-structural) as bedding for floor finishing.

The bottom surface of the HCS slab can be used as a finished ceiling as installed by applying painting system.

Holes and openings can be arranged in accordance with instructions later in this folder. A Hollow Core Slab (HCS) is a precast prestressed

concrete member with continuous voids provided to reduce weight and therefore cost. HCS is primarily used for floor or roof deck systems.

Dry cast or extrusion system is used as manufacturing method for HCS slab. The cores are formed by augers with the concrete being compacted around the cores. Hollow Core slab are cast in a continuous length of about 100m. after hardening , the slabs are cut into accurate length according to design requirements. This is made by a special cutting machine using a diamond sawing blade.

# ADVANTAGES HOLLOW CORE SLAB (HCS) SYSTEM

HCS slab are most widely known for providing economical and efficient floor and roof systems.

Structurally, HCS slabs provide the efficiency of prestressed members concerning load capacity , span range and deflection control . In addition, by connecting the slab with joint reinforcement, the floor can be arranged as a diaphragm, distributing lateral forces for stability purpose.

Excellent fire resistance is another attribute of the HCS slabs. This is achieved by using sufficient slab thickness and concrete cover for strands.

Used as floor-ceiling assemblies, HCS slabs have the excellent acoustic, but can also be used as panels for boundary walls, etc. characteristics associated with concrete.

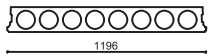

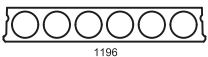

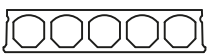







The fast and convenient installation of HCS slabs minimizes the execution period at the site and enables early start of finishing and other works to follow.





# RANGE OF SPAN

The table below shows the normal range of span for each size of HC slabs. The shorter span can carry heavy loads while the longer is applicable for lighter loads (like roof loads etc.)

HCS 150																	
HCS 200																	
HCS 250																	
HCS 300																	
HCS 320																	
HCS 380																	
RANGE OF SPAN (m)			4	6	8	10	12	14	16	18							

Later in this folder there is more comprehensive design information about load capacities, camber weight, etc. If there is a need for even more detailed or sophisticated analysis, Al Rashid-Abetong design department will always be at your service.

## DESIGN

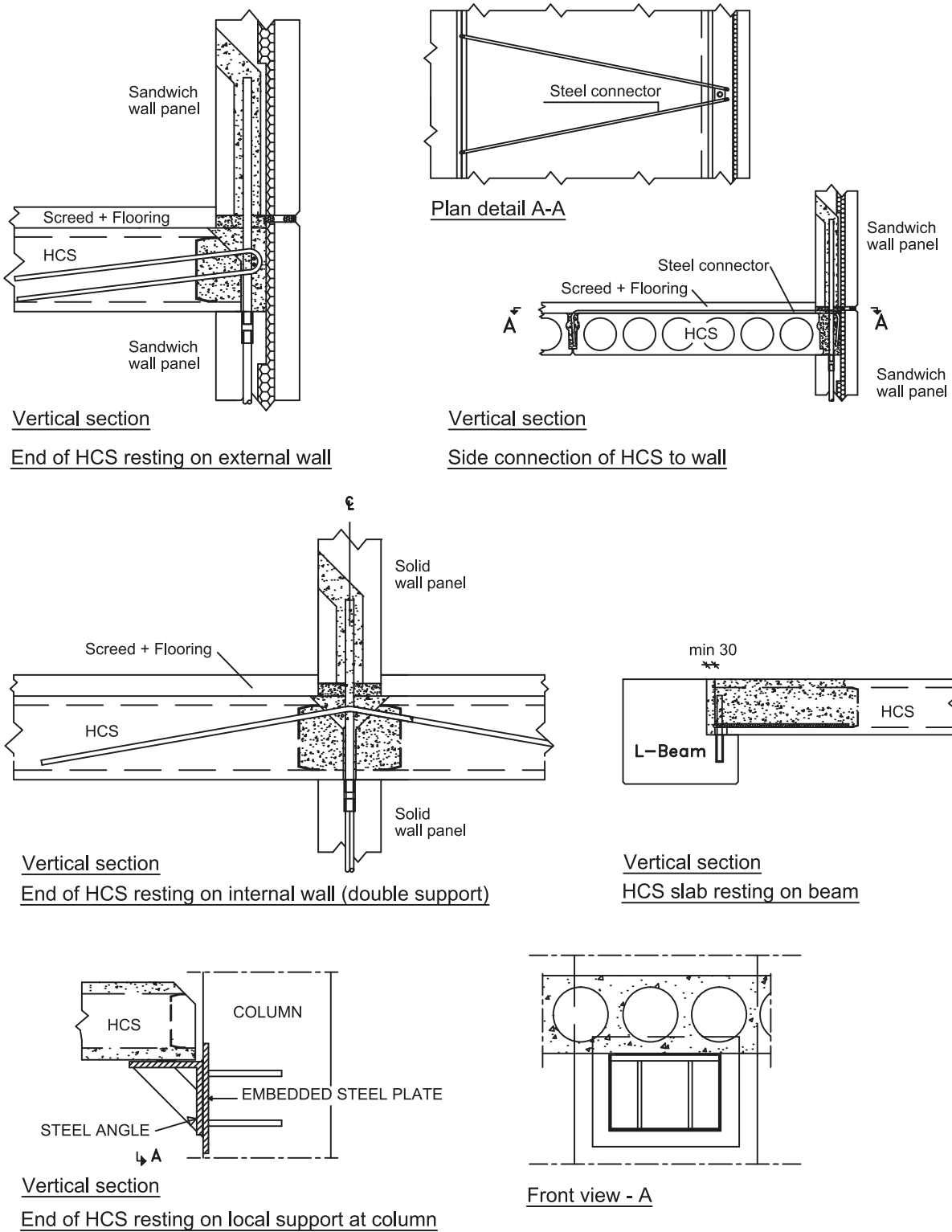
A floor consisting of hollow core slabs can be designed to provide a rigid and homogenous part of the structure (diaphragm). This (diaphragm) can be used as part of the stabilizing system and is achived by arranging the joint reinforcement to tie the slab together. Normally there is no need for structural screed for stability purpose. This design is done by the party who is responsible for the general stability of the building.

Each single element is designed to carry loads according to specifications. This is normally done by AlRashid-Abetong design department. if there is a need for structural screed to act together with the slab for vertical load bering this will be advised by AlRashid-Abetong designer.

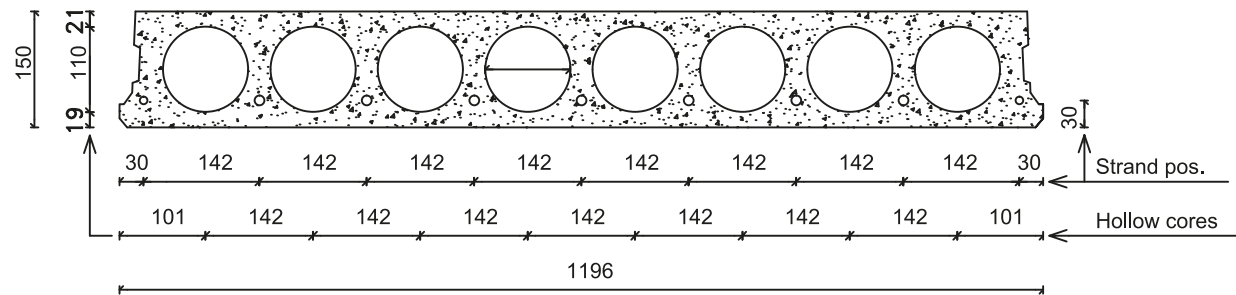
Topping for levelling purpose is needed to level the slab considering camber and other irregularities.

# CONNECTION DETAILS

Some examples of connection details of HCS slabs are shown below. These details can be modified (simple or more sophisticated) depending on the conditions for each project.



# HCS 150



### TYPICAL SECTION OF HCS 150 SLAB (all measures in mm)

## TECHNICAL INFORMATION

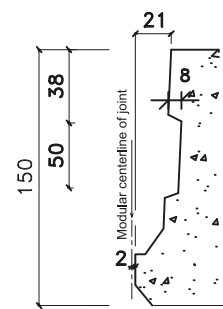
### DIMENSIONS OF HCS 150 SLAB

- WIDTH 1196 mm  
-HEIGHT 150 mm  
-LENGTH ACCORDING TO LOAD CURVES  
(SEE NEXT PAGE)

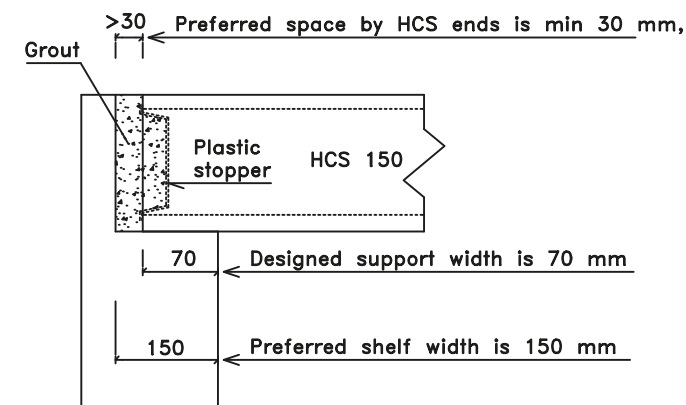
SELF WEIGHT 2.00 kN/m<sup>2</sup>  
SELF WEIGHT (JOINTED) 2.10 kN/m<sup>2</sup>

FIRE RATING - 60 MIN WITHIN LOAD/SPAN  
SHOWN ON NEXT PAGE

LOAD BEARING CAPACITIES AND EXPECTED  
CAMBER ARE SHOWN ON NEXT PAGES



**SIDE EDGE OF  
HCS 150 SLAB**



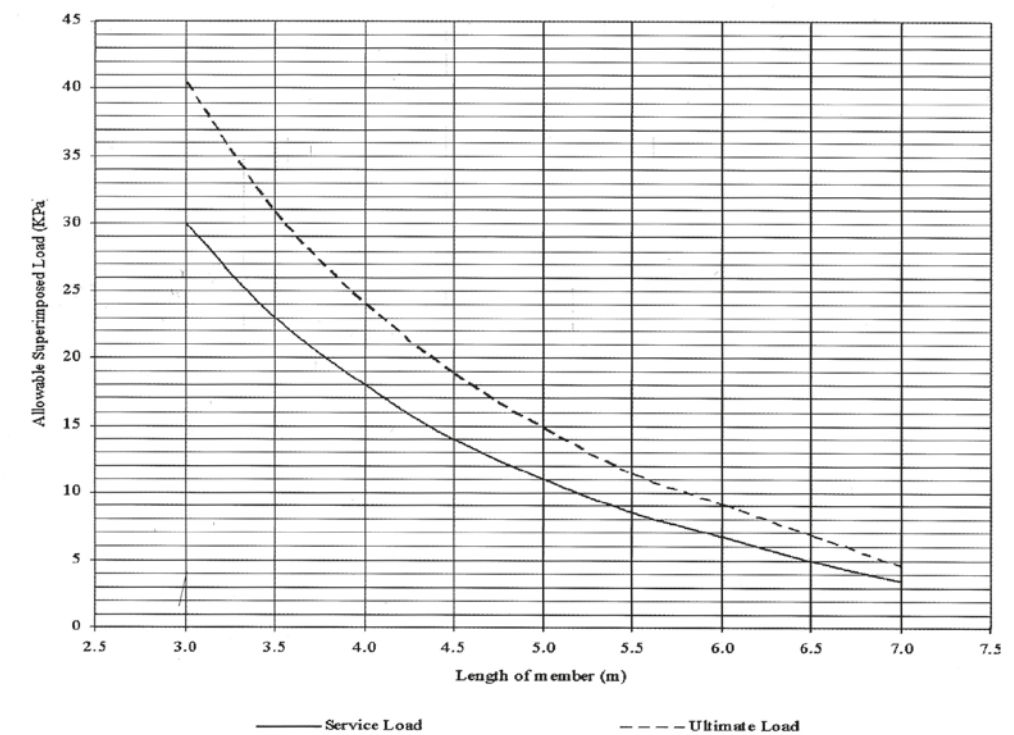
## SUPPORT ARRANGEMENT FOR HCS 150

# HCS 150

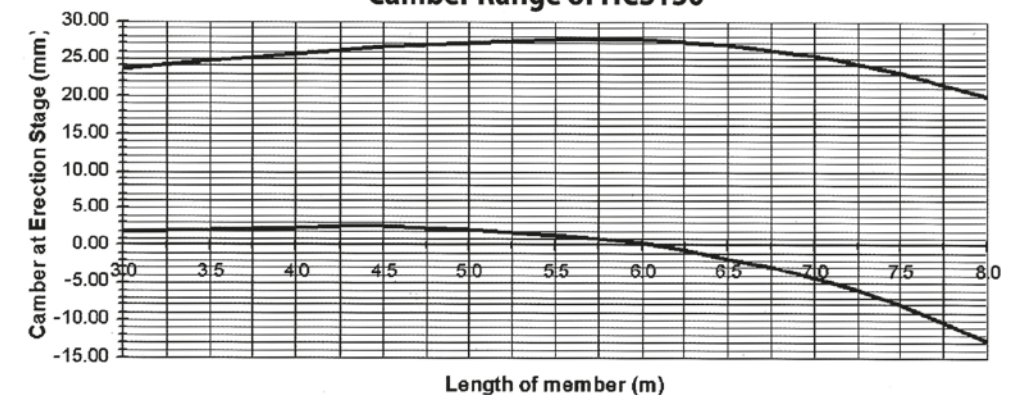
Load curves are given for service load (unfactored) and ultimate load (factored) and for the most favourable (technically, commercially, etc.) reinforcement alternative. Self weight is already included in capacities. For very high loads at short span there might be a need for extra shear control.

Camber is shown for erection stage (pre-stressing and self-weight are considered).  
The two curves are showing estimated range of camber for highest and lowest reinforcement alternative including tolerance.

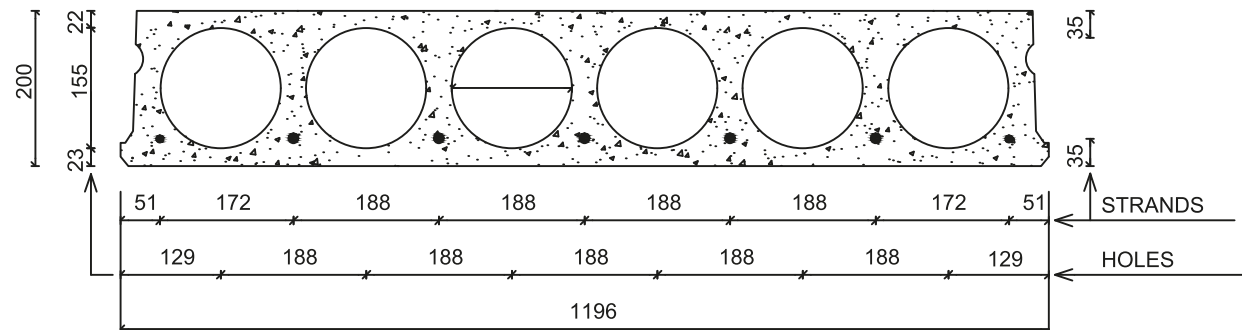
### LOAD BEARING CAPACITY TABLE OF HCS 150



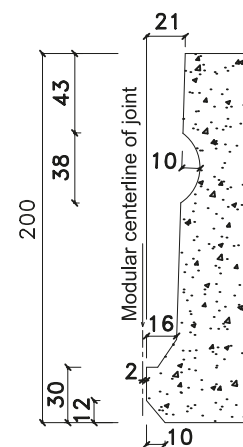
### Camber Range of HCS150



# HCS 200



**TYPICAL SECTION OF HCS 200 SLAB (all measures in mm)**



**SIDE EDGE OF  
HCS 200 SLAB**

## TECHNICAL INFORMATION

### DIMENSIONS OF HCS 200 SLAB

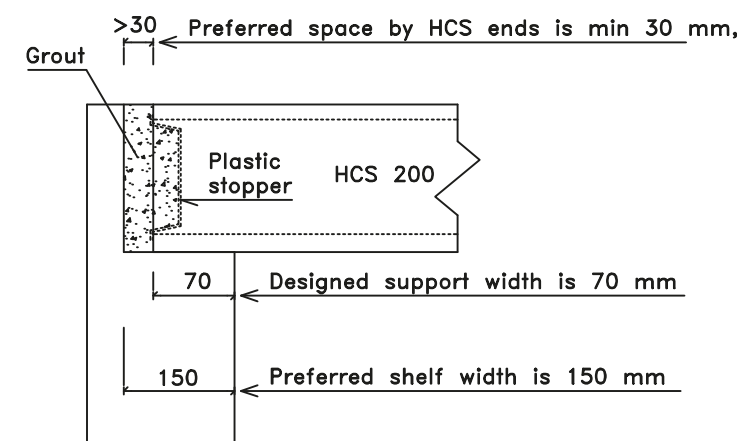
- WIDTH 1196 mm  
-HEIGHT 200 mm  
-LENGTH ACCORDING TO LOAD CURVES  
(SEE NEXT PAGE)

SELF WEIGHT 2.45 kN/m<sup>2</sup>

SELF WEIGHT (JOINTED) 2.60 kN/m<sup>2</sup>

FIRE RATING - 60 MIN WITHIN LOAD/SPAN  
SHOWN ON NEXT PAGE

LOAD BEARING CAPACITIES AND EXPECTED  
CAMBER ARE SHOWN ON NEXT PAGES



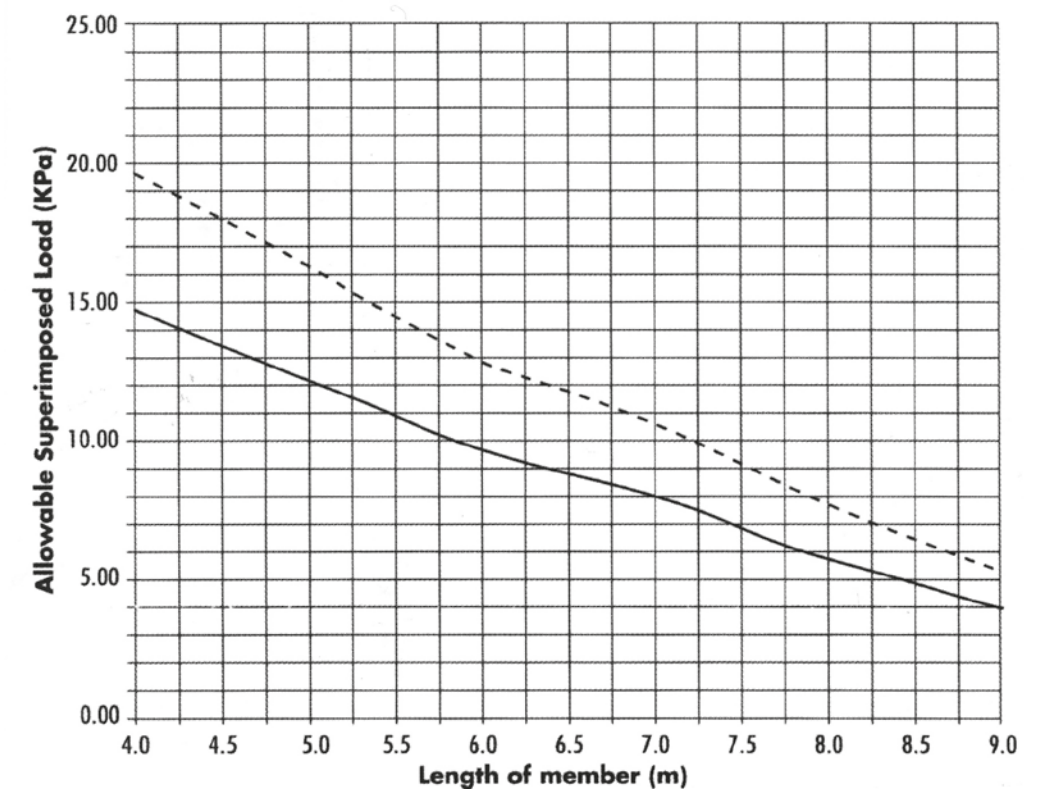
## SUPPORT ARRANGEMENT FOR HCS 200

# HCS 200

Load curves are given for service load (unfactored) and ultimate load (factored) and for the most favourable (technically, commercially, etc.) reinforcement alternative. Self weight is already included in capacities. For very high loads at short span there might be a need for extra shear control.

Camber is shown for erection stage (pre-stressing and self-weight are considered).  
The two curves are showing estimated range of camber for highest and lowest reinforcement alternative including tolerance.

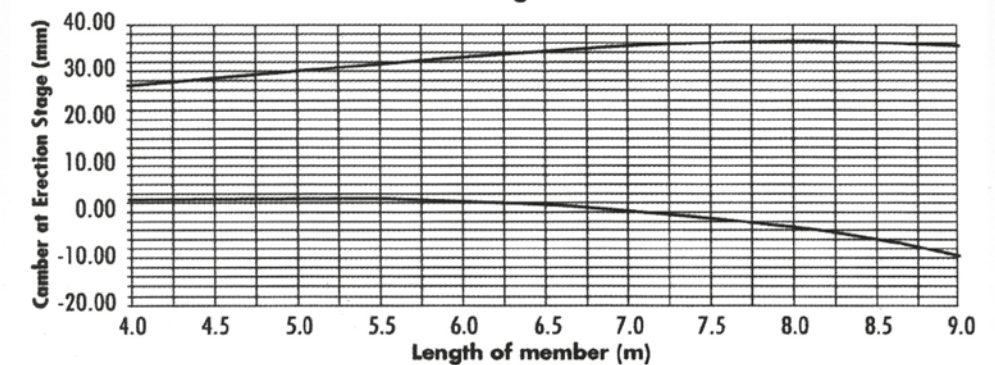
### LOAD BEARING CAPACITY TABLE OF HCS 200



---- Service Load

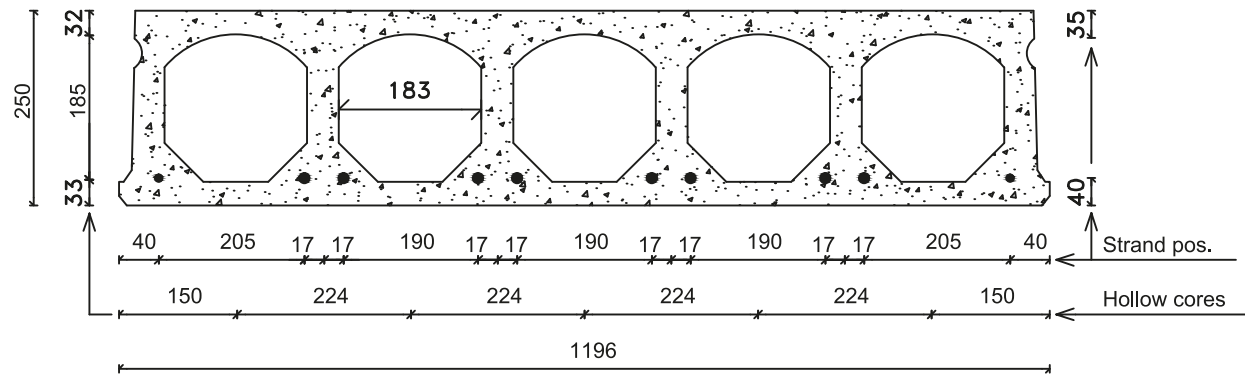
— Ultimate Load

### Camber Range of HCS 200

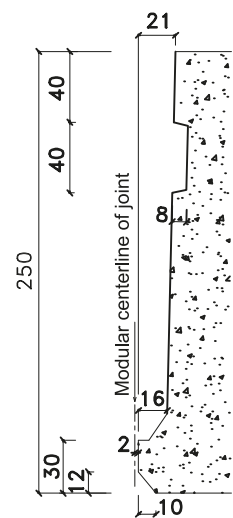




# HCS 250



### TYPICAL SECTION OF HCS 250 SLAB (all measures in mm)



**SIDE EDGE OF**  
**HCS 250 SLAB**

## TECHNICAL INFORMATION

### DIMENSIONS OF HCS 250 SLAB

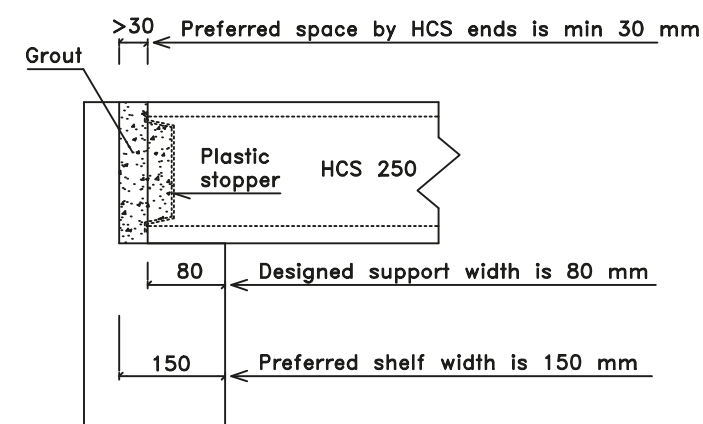
- WIDTH 1196 mm  
-HEIGHT 250 mm  
-LENGTH ACCORDING TO LOAD CURVES  
(SEE NEXT PAGE)

SELF WEIGHT  $2.84 \text{ kN/m}^2$

SELF WEIGHT (JOINTED) 3.04 kN/m<sup>2</sup>

FIRE RATING - 60 MIN WITHIN LOAD/SPAN  
SHOWN ON NEXT PAGE

LOAD BEARING CAPACITIES AND EXPECTED  
CAMBER ARE SHOWN ON NEXT PAGE



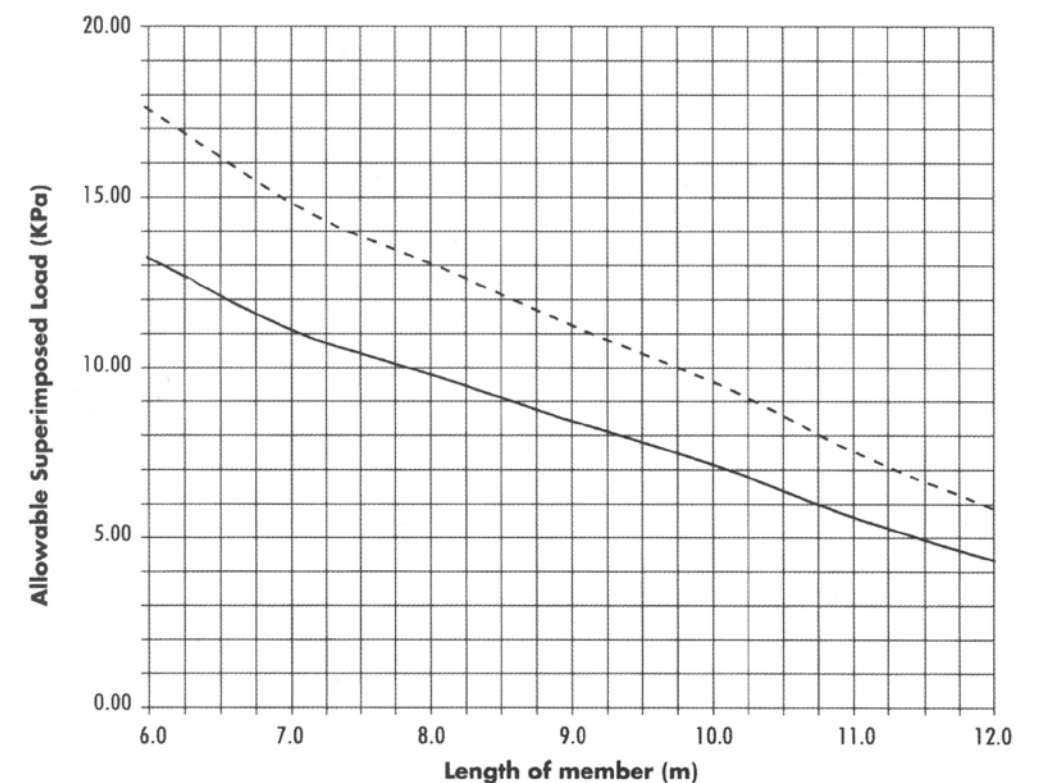
## SUPPORT ARRANGEMENT FOR HCS 250

# HCS 250

Load curves are given for service load (unfactored) and ultimate load (factored) and for the most favourable (technically, commercially, etc.) reinforcement alternative. Self weight is already included in capacities.

Camber is shown for erection stage (pre-stressing and self-weight are considered).  
The two curves are showing estimated range of camber for highest and lowest reinforcement alternative including tolerance.

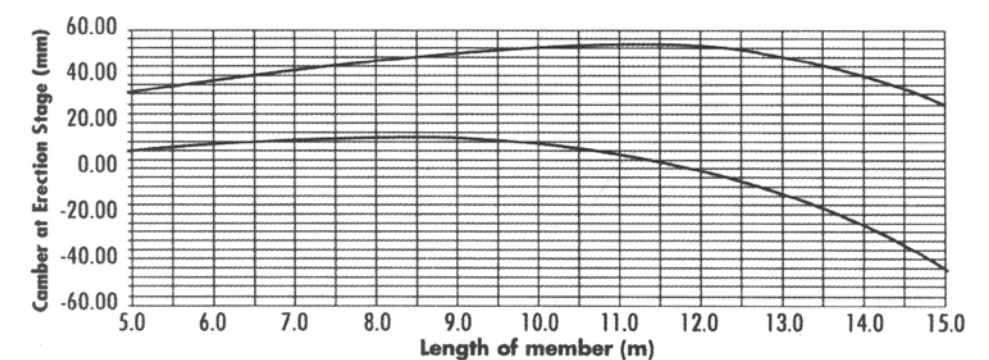
### LOAD BEARING CAPACITY TABLE OF HCS 250



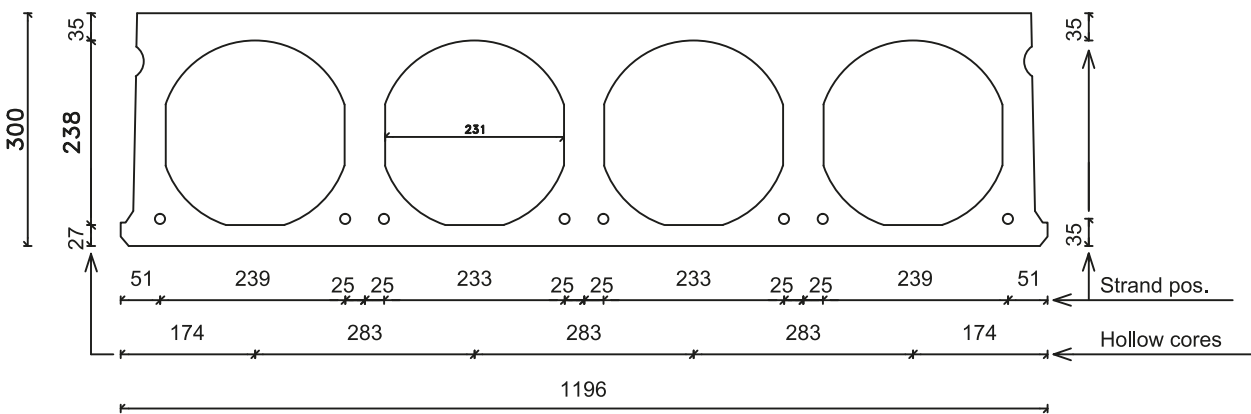
---- Service Load

— Ultimate Load

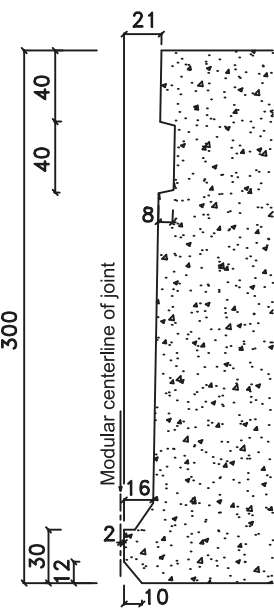
### Camber Range of HCS 250



# HCS 300



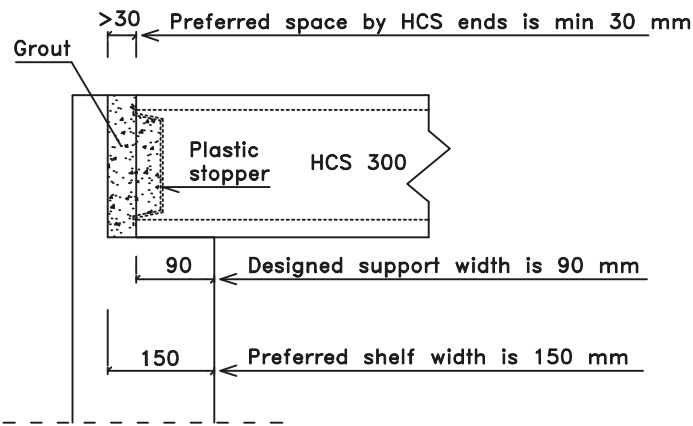
TYPICAL SECTION OF HCS 300 SLAB (all measures in mm)



SIDE EDGE OF HCS 300 SLAB

## TECHNICAL INFORMATION

- DIMENSIONS OF HCS 300 SLAB**
- WIDTH 1196 mm
  - HEIGHT 300 mm
  - LENGTH ACCORDING TO LOAD CURVES (SEE NEXT PAGE)
- SELF WEIGHT 3.33 kN/m<sup>2</sup>  
SELF WEIGHT (JOINTED) 3.55 kN/m<sup>2</sup>
- FIRE RATING - 60 MIN WITHIN LOAD/SPAN SHOWN ON NEXT PAGE
- LOAD BEARING CAPACITIES AND EXPECTED CAMBER ARE SHOWN ON NEXT PAGE

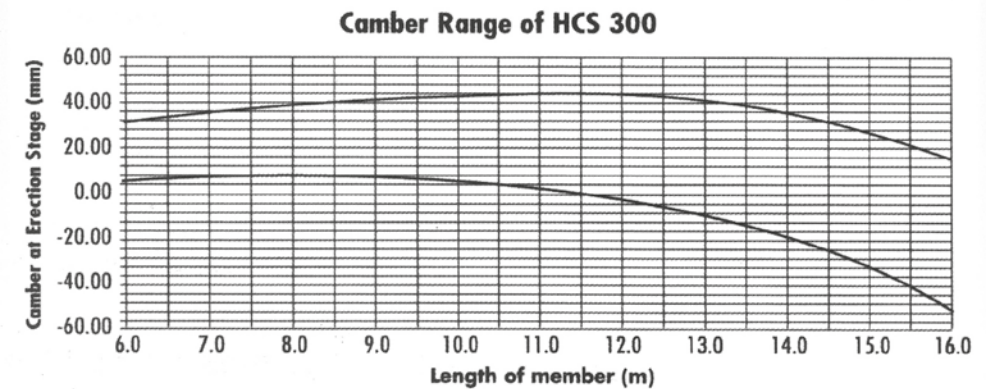
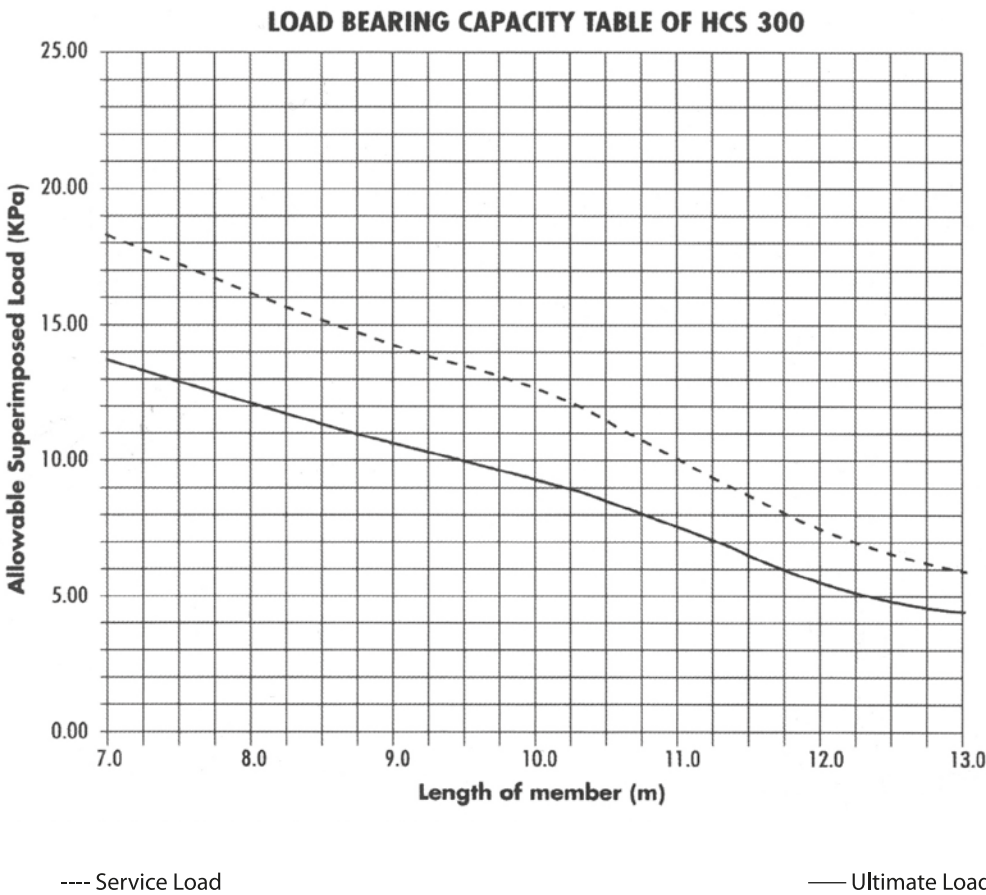


SUPPORT ARRANGEMENT FOR HCS 300

# HCS 300

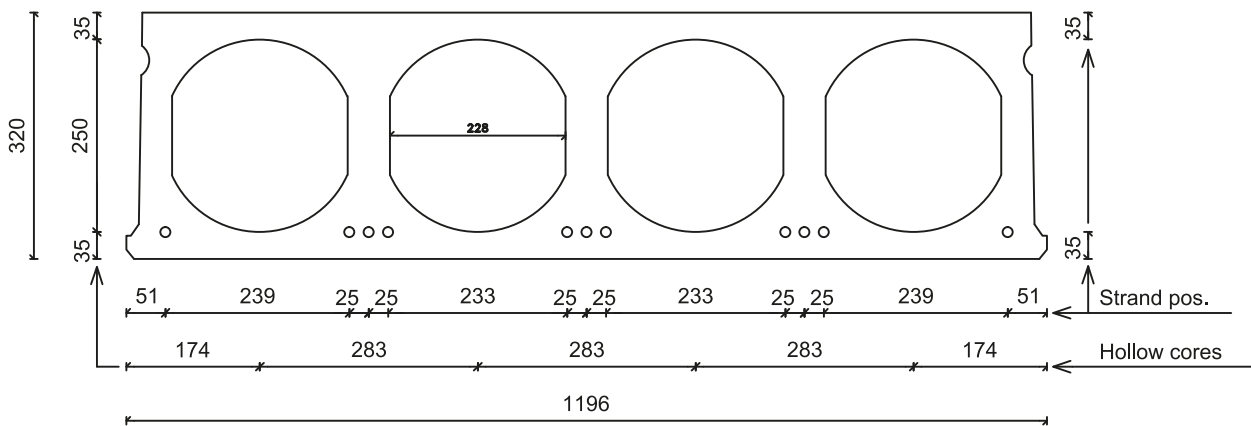
Load curves are given for service load (unfactored) and ultimate load (factored) and for the most favourable (technically, commercially, etc.) reinforcement alternative. Self weight is already included in capacities.

Camber is shown for erection stage (pre-stressing and self-weight are considered). The two curves are showing estimated range of camber for highest and lowest reinforcement alternative including tolerance.

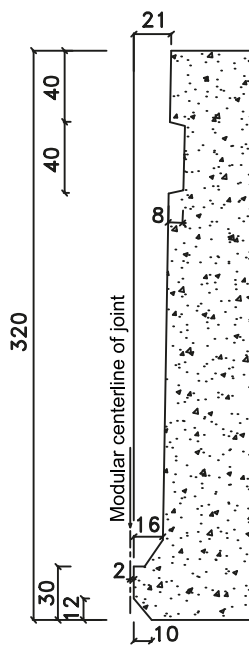




# HCS 320



TYPICAL SECTION OF HCS 320 SLAB (all measures in mm)



SIDE EDGE OF HCS 320 SLAB

## TECHNICAL INFORMATION

### DIMENSIONS OF HCS 320 SLAB

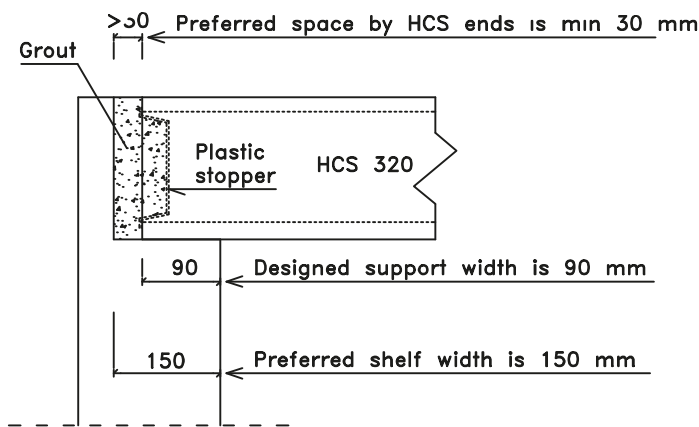
- WIDTH 1196 mm
- HEIGHT 320 mm
- LENGTH ACCORDING TO LOAD CURVES (SEE NEXT PAGE)

SELF WEIGHT 3.56 kN/m<sup>2</sup>

SELF WEIGHT (JOINTED) 3.80 kN/m<sup>2</sup>

FIRE RATING - 60 MIN WITHIN LOAD/SPAN SHOWN ON NEXT PAGE

LOAD BEARING CAPACITIES AND EXPECTED CAMBER ARE SHOWN ON NEXT PAGE



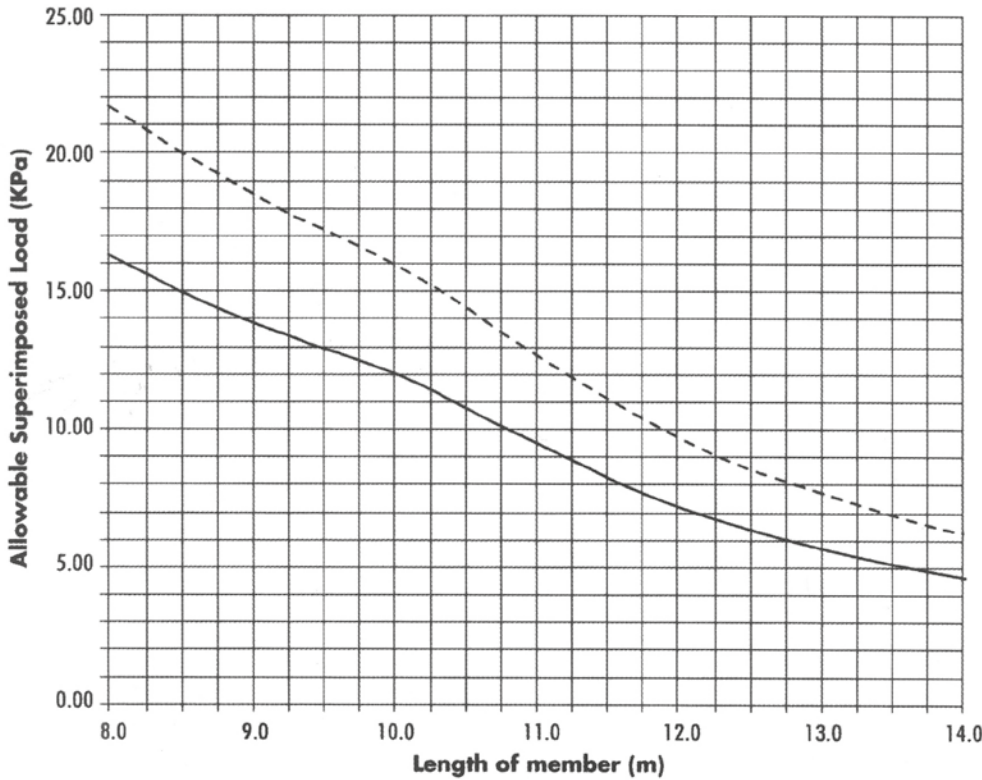
SUPPORT ARRANGEMENT FOR HCS 320

# HCS 320

Load curves are given for service load (unfactored) and ultimate load (factored) and for the most favourable (technically, commercially, etc.) reinforcement alternative. Self weight is already included in capacities.

Camber is shown for erection stage (pre-stressing and self-weight are considered). The two curves are showing estimated range of camber for highest and lowest reinforcement alternative including tolerance.

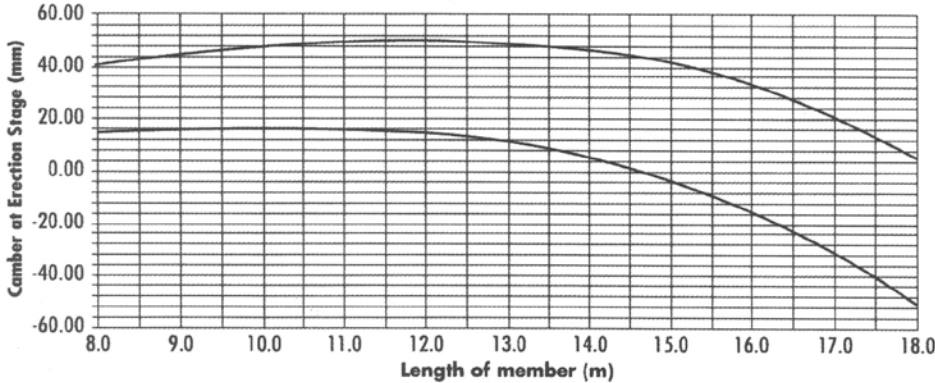
LOAD BEARING CAPACITY TABLE OF HCS 320



---- Service Load

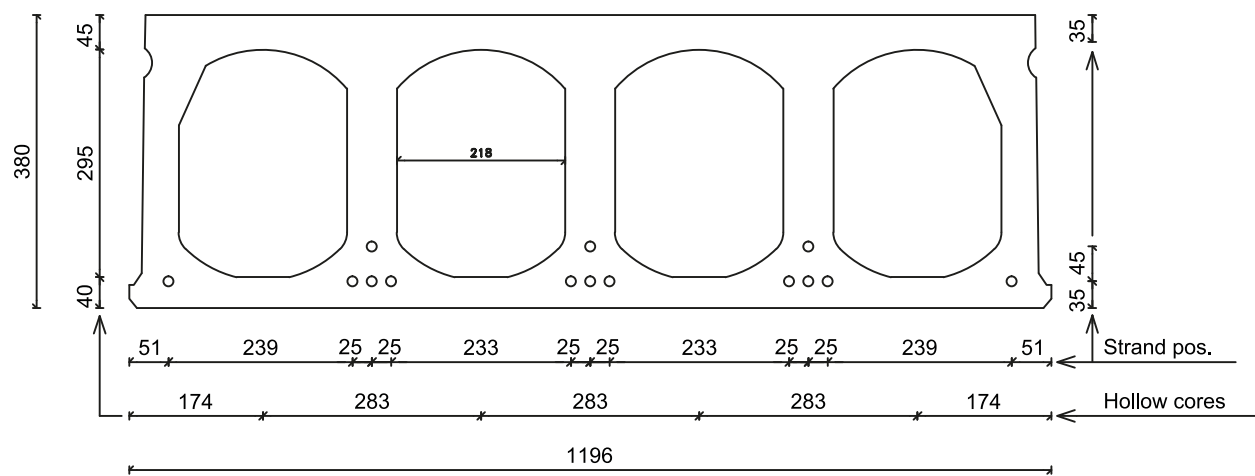
— Ultimate Load

Camber Range of HCS 320



# HCS 380

# HCS 380



TYPICAL SECTION OF HCS 380 SLAB (all measures in mm)

## TECHNICAL INFORMATION

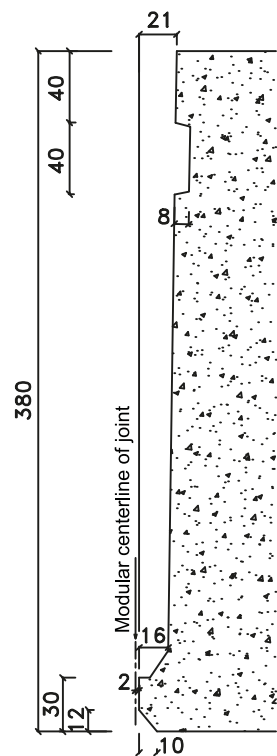
DIMENSIONS OF HCS 380 SLAB

- WIDTH 1196 mm
- HEIGHT 380 mm
- LENGTH ACCORDING TO LOAD CURVES (SEE NEXT PAGE)

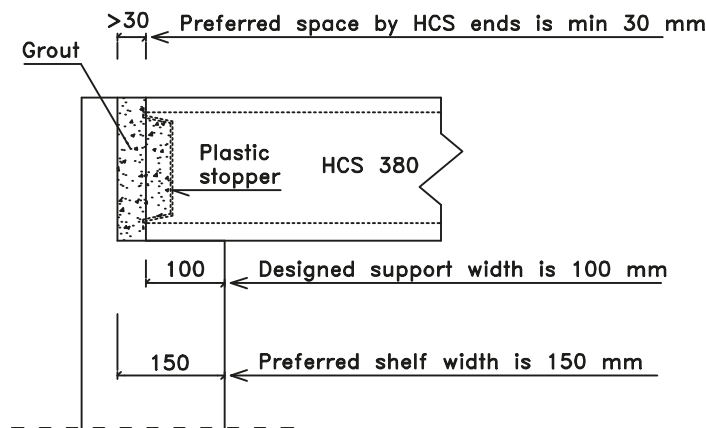
SELF WEIGHT 4.20 kN/m<sup>2</sup>  
SELF WEIGHT (JOINTED) 4.55 kN/m<sup>2</sup>

FIRE RATING - 60 MIN WITHIN LOAD/SPAN  
SHOWN ON NEXT PAGE

LOAD BEARING CAPACITIES AND EXPECTED  
CAMBER ARE SHOWN ON NEXT PAGE



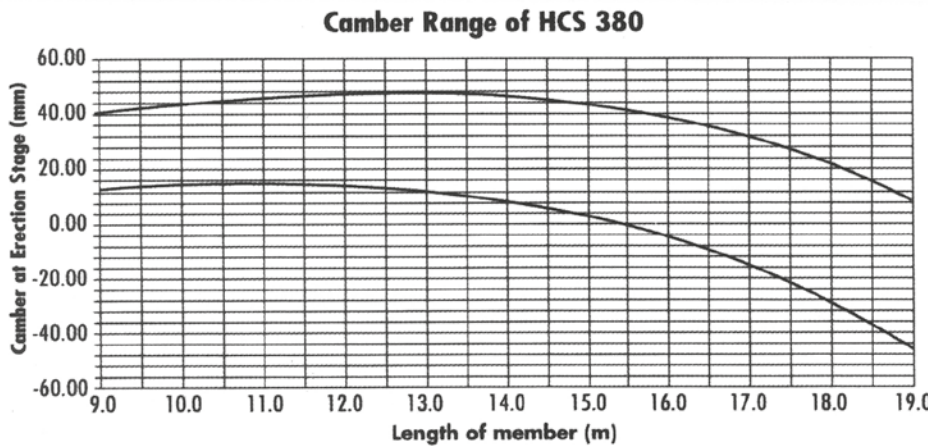
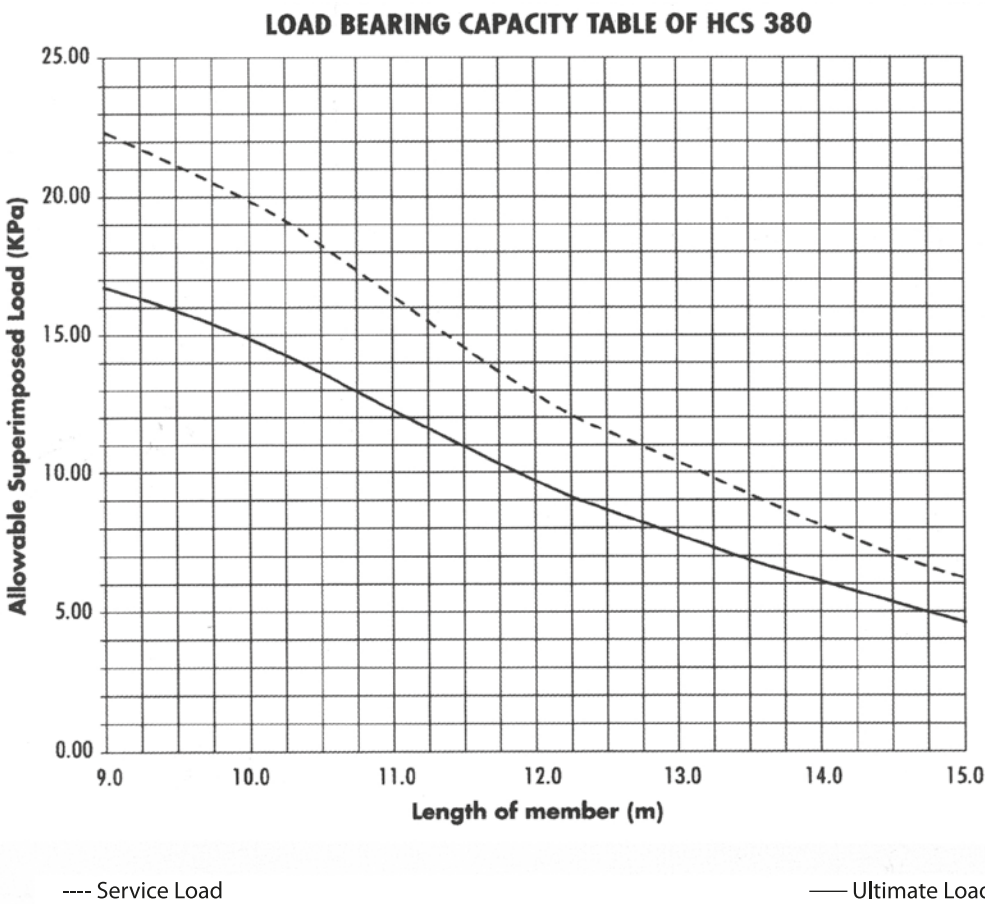
SIDE EDGE OF  
HCS 380 SLAB



SUPPORT ARRANGEMENT FOR HCS 380

Load curves are given for service load (unfactored) and ultimate load (factored) and for the most favourable (technically, commercially, etc.) reinforcement alternative. Self weight is already included in capacities. For very high load at Short span there might be a need for extra shear control.

Camber is shown for erection stage (pre-stressing and self-weight are considered). The two curves are showing estimated range of camber for highest and lowest reinforcement alternative including tolerance.

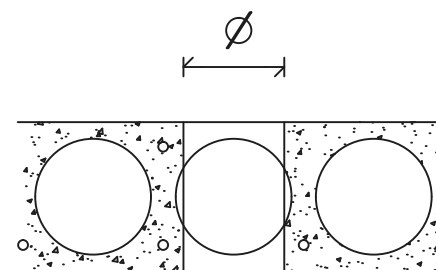


# OPENINGS AND HOLES

Openings and holes can be made in slabs but has to be coordinated with location and size of cores and strands.

Smaller vertical holes could preferably be cut on site after casting/erection. Locations of holes should match with cores and maximum sizes are as follows:

HOLLOW CORE DEPTH	MAXIMUM HOLE SIZE
HCS 150	Ø 85
HCS 200	Ø 130
HCS250	Ø 150
HCS 300	Ø 185
HCS 320	Ø 185
HCS 380	Ø 185

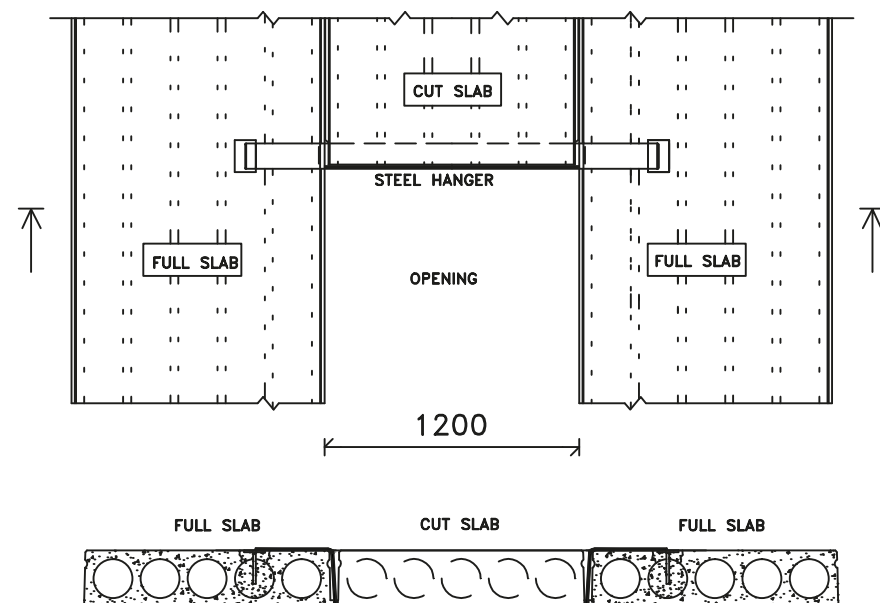


Bigger opening s and cut-outs than above can also be done but has to be arranged during fabrication and need to be coordinated with ARA during design stage.

The standard width of the slabs in 1200mm (including joints). This has to be taken into consideration during design of the building in order to minimize the number of cut slabs.

It is possible to cut one full slab and rest it on adjacent slabs using a steel hanger (see detail below). This will provide an opening 1200mm wide and with flexible length.

The partitioning of a floor into slabs is made by AlRashid-Abetong design department considering required openings and standards for cutting of narrow slabs. It is therefore essential that the openings for air conditioning, electro mechanical provisions, etc are coordinated with AlRashid-Abetong in a very early stage of design.



# ERECTION, SITE CONDITIONS

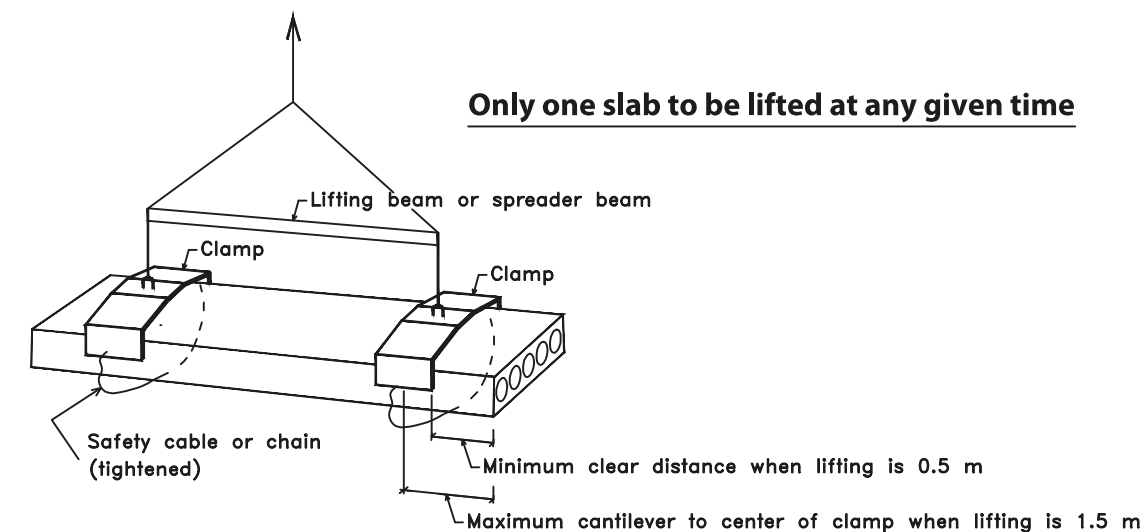
Hollow core slab are designed for quick and easy installation. However, make sure that the building site and roads provide free access for the mobile crane and the delivery truck to the place of erection. Also ensure that erection can be completed without interruption.

## LIFTING

Lifting can be done by lifting clamps or by hooks cast into the slabs in the factory.

When lifting with clamps. Lifting beam or spreader beam must be used to ensure only vertical lifting in clamps (see figure below).

Lifting clamps shall be placed close to the ends of the slab according to fig below.



## INSTALLATION

Hollow core slabs are installed either on beams or on walls. The supporting beam or wall should be straight, smooth and even in order to install the slab directly concrete without rubber strip or other support material.

The support width should be minimum as per requirement given for each different size of slab (see specifications in this folder). It needs also to be considered that the fabrication tolerance for length of slab is +/-0.5inch (+/-13mm).

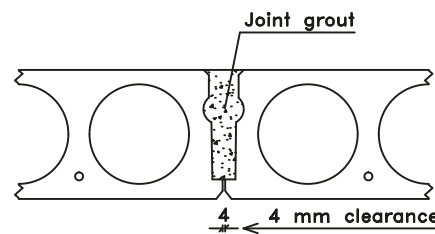
If the support length is less than given in this folder AlRashid-Abetong design department should be contacted for advice.



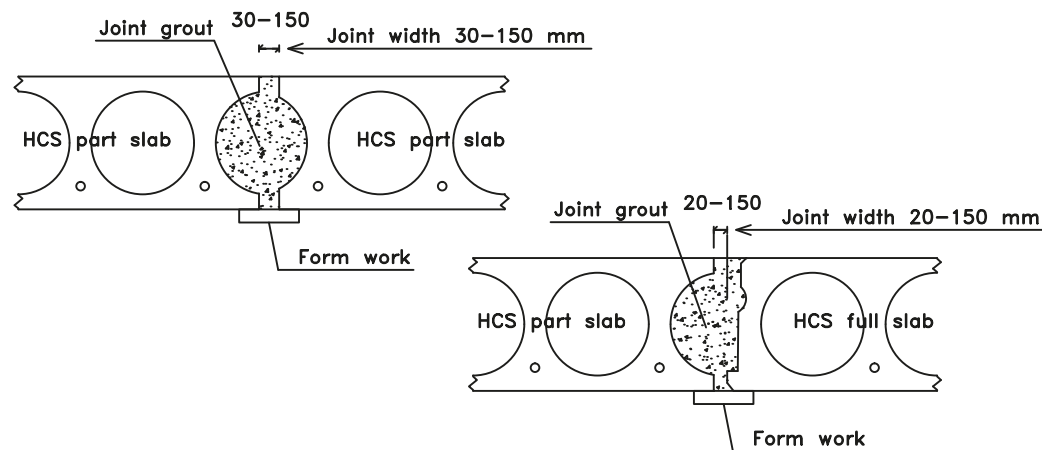
# JOINTS AND SCREED

## JOINTS

The standard hollow core slab element is fabricated for a module width of 1200mm. The actual width of the element is 1196 mm leaving a clearance of 4mm in all joints (see fig below). For correct installation, the 1200mm module must be marked on the supporting beam or wall before installation. This is made to ensure a controlled and uniform joint width between all elements.



Joints between two cuts slabs should be minimum 30 mm in order to cast the joint properly. A joint between one full slab and cut slab should be minimum 20mm (see figure below).



## GROUTING OF JOINTS

After installing the hollow core slabs all joints must be filled with concrete grout and reinforcement as per structural design requirements. It is recommended to do the grouting immediately after installing one floor (before installing next floor).

For grouting of joints, use a concrete of minimum G20 (cube strength 20MPa). Aggregate should have maximum stone size of 10mm.

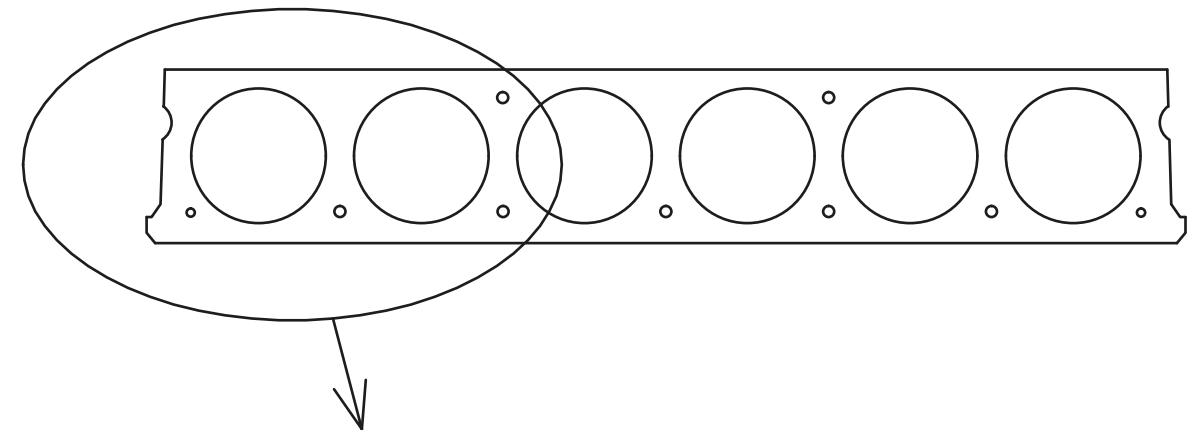
When grouting cut slabs there is a need for form work as shown above.

## TOPPING (SCREED)

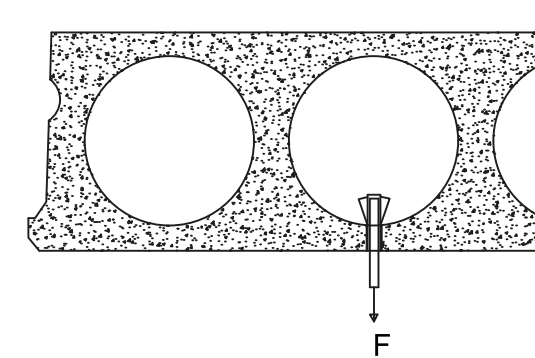
Topping (screed) could be for levelling purpose only or for structural purpose as well. The topping is added after casting the joints in a separate operation.

# BOLTED CONNECTION IN HCS

Bolted connections in the HCS slabs can be made with different type so anchors intended for this purpose. There are several suppliers of these fasteners. For information regarding loads and applications see the supplier's instructions.



The bolt should be placed in the core to avoid clashing with strands (see sketch below).





# COMPLETED PROJECTS



Princess Noura University - Riyadh



Crystal Resorts - Jeddah



Ministry of Higher Education - Riyadh

# SOME OF THE COMPLETED PROJECTS



Lexus Show Room - Riyadh



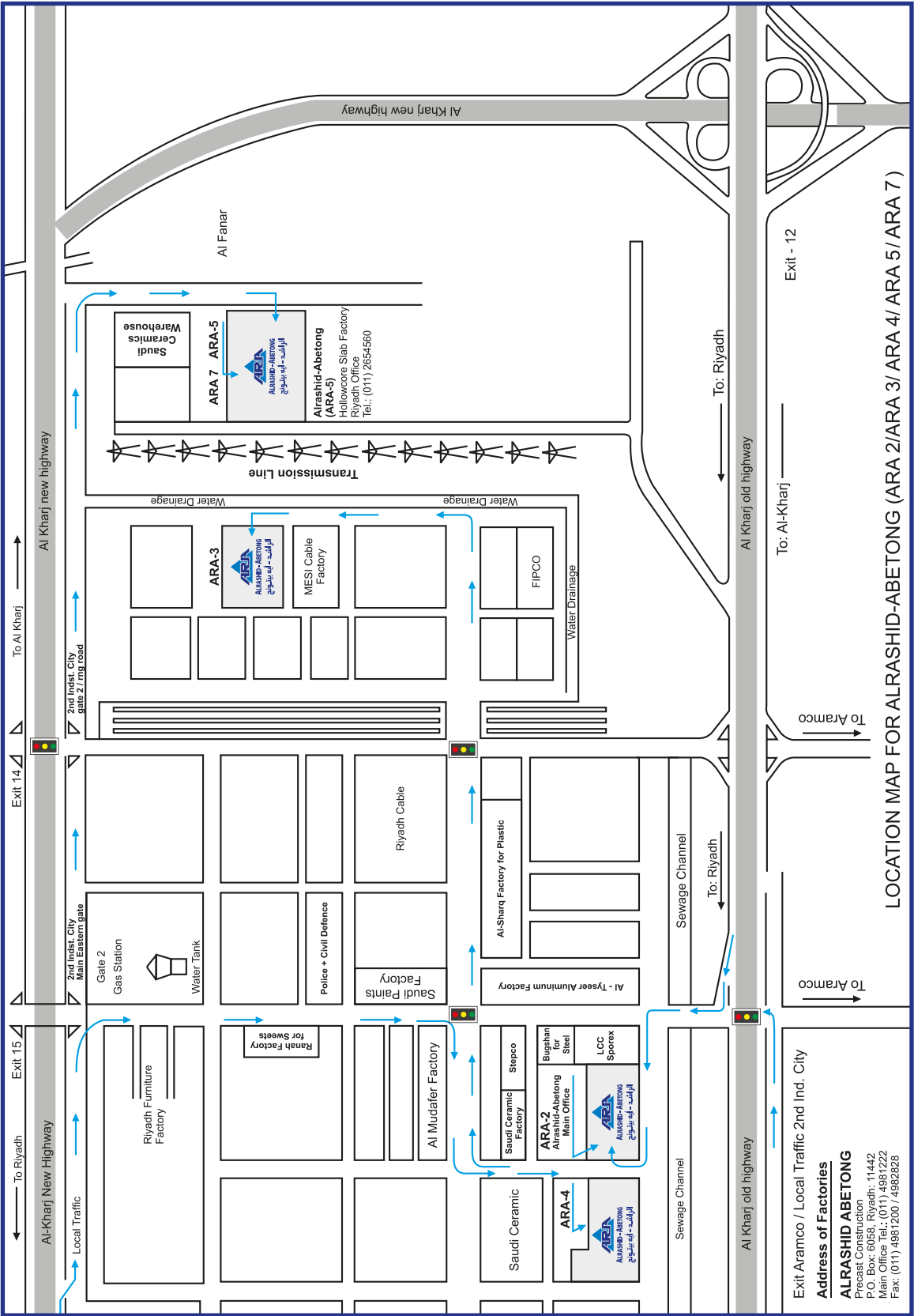
Al Rashid Towers - Al Khobar



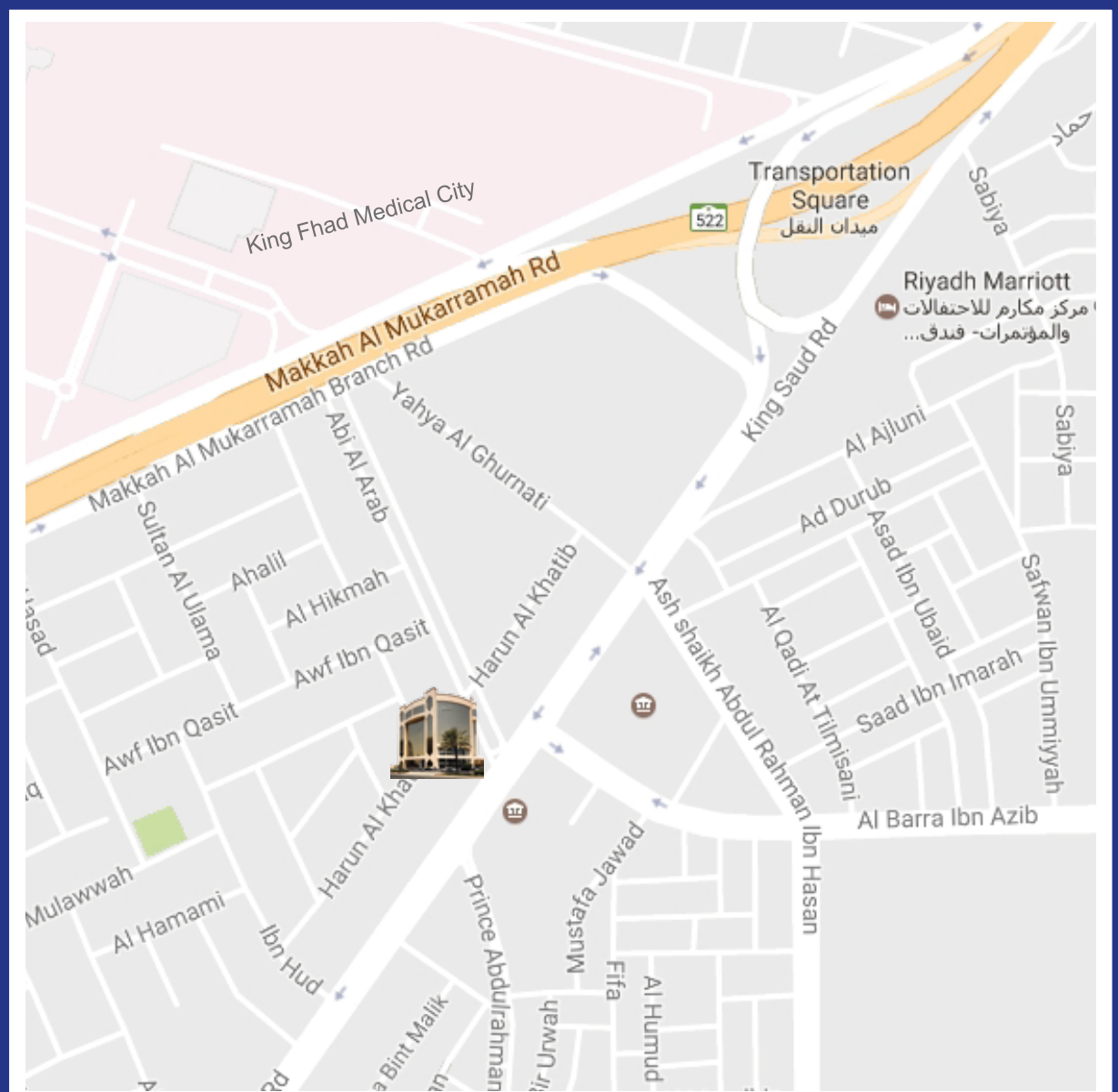
Alaglan Show Room - Riyadh



# FACTORY LOCATION MAP



# HEAD OFFICE LOCATION MAP



<https://www.google.com.sa/maps/@24.6823664,46.7074149,18z>

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