Modern
CONCRETE
All Products

الشركة الحديثة للمنتجات
الخرسانية والاسمنتية

HOLLOW CORE SLABS

TECHNICAL GUIDE

Index

About US

MODERN CONCRETE is a pioneer company in Egypt specialized in manufacturing all kinds of concrete products using the newest production lines and Equipments in association with the best concrete industry specialized companies in the world including the provision of all services from conceptualization and design to manufacture, transport, installation and after sales service.

• Our products cover full range of concrete industry such as:
  - Precast and Pre-stressed concrete elements & buildings.
  - Block, interlock, all types of paving tiles and curbstone.
  - Ready mix concrete.

• Our high experience team is one of our features to reach a high level of quality in all our products to satisfy our clients.

MODERN CONCRETE was established in 2009 with the aim of leading the way in Egypt towards highly industrialized construction practices.

MODERN CONCRETE factory is located in El-Sadat city; Industrial zone plot (M) & Office in Cairo on total area (175,000) m2 + Latest extension more than (63,000 m2), this factory truly was born a giant, because we hired a professional staff of engineers and technicians for each department, looking after the business in all stages: Architecture & Structure Design, proposals and technical quotation, Coordination with stakeholders for approvals, Detailed Shop Drawings, Production, Quality control, Curing, Transportation and Installation on Site.

MODERN CONCRETE has the capability to deal with the all types of projects: Industrial Buildings, Housing, Office buildings, Schools, Hospitals, malls, Car Parking, Commercial buildings, International Stadiums, all types of precast and Pre-stressed Concrete girders or barriers for Bridges and all sorts of miscellaneous precast products using our different variety of precast concrete building systems products: -

1. Precast & pre-stressed concrete flooring & roofing systems (hollow core slabs, single & double tee slabs).
2. Full wall frame system (load bearing walls, solid slabs & hollow core slabs).
3. Full structure frames (Plinth foundation, Columns, Beams, Gutters, Rafters & Solid Slabs).
4. Solid and insulated wall cladding panels with a wide range of different shapes & finishes..
5. Standard and non-standard boundary fence walls.
6. Miscellaneous precast concrete products (staircases, culverts, manholes, tunnels, planters, street furniture, concrete posts and supports for planting grapes & fruits ..... etc.)
7. Landscape & construction products: Cement Blocks (Solid, Hollow & Insulated) Interlock paving tiles, paving Stone & Curbstone.
8. Ready Mix concrete.
9. Design & fabrication of all types of metal, wooden & rubber molds and Forms.
10. Future New Production line of GFRC (Glass Fiber Reinforcement Concrete).
11. Future New Production Lines for Aluminum Facade & Windows.

Our Vision

We are looking ahead to the future to keep our lead in the concrete industry in Egypt through improving our strategies, quality and our range of products to let everyone get the benefits of precast concrete and other cement products in all construction and landscape fields.

Our Mission:

To make it easier to build your dreams through our knowledge and experience.
We take the challenge to spread the new technologies in the concrete industry to help our clients to get a full advantage of concrete products in their projects.

Stock Yard for Precast Concrete factory

Hollow Core slabs factory

Ready mix concrete

Block & interlock factory

Guide specification

This guide specification is intended to be used in the preparation of the specification for a particular project.

Scope

This guide specification covers the Design process, manufacture, erection of hollow core floor planks produced by Modern Concrete.

Design

Hollow core shall be designed in accordance with ACI-318-14, PCI-7th edition and PCI-MNL-123, except where industry practice provides a proven alternative method.

MCC shall prepare and submit Detailed design, General arrangement and Shop drawings for approval. General arrangement shall show the location of all planks with all major openings detailed. Shop drawings detailing each unit, cast-in inserts and its strand configuration shall be submitted to the building contractor for approval.

Materials

- Cement shall comply with ASTM C150-Type I.
- Aggregates shall comply with ASTM C33.
- Chemical admixtures shall comply with ASTM C494/C494M.
- Prestressing strands uncoated 7-wires, low - relaxation strand complying with ASTM A416 (including supplement) - Grade 270K (1860 Mpa) and Grade 250K (1720 Mpa).
- Strands standard sizes are 9.3mm & 12.7mm as per ASTM416/416M and 9.5mm & 12.5mm as per BS 5896.
- Concrete shall have minimum characteristic 28-day cylinder strength of 40 Mpa, at release of strands shall be a minimum of 30 Mpa or as required by the structural Calculations.
- Bearing strip is a Polychloroprene (Neoprene) based rubber compound complying with BS EN 1337-3
- Topping concrete shall have minimum characteristic 28-day cylinder strength of 20 MPa or as shown on the drawings. If topping concrete is used to grout the keyways, the maximum aggregate size shall be 10 mm.

Raw materials starge

Double Automated concrete mixer

Cable Strands

Concrete samples testing

INTRODUCTION TO HOLLOW CORE SLABS

Hollow core slabs are precast pre-stressed concrete elements used for floor slabs and wall panels. The success of this product is the combination of high efficiency of design, automated production technology, resulting in remarkable low price, in addition to its ready-to-paint smooth soffit as well as its high quality and durability. The automated manufacturing process uses a combination of dry mix concrete and shear compaction, which considerably reduces the consumption of water and concrete if compared to conventional process. Hollow core is manufactured using long line extruders which form continuous cores running through the slabs. The primary purpose of these cores is to decrease by Up to 50% the weight of the slabs, which leads to significant savings in the rest of the members of the building construction (Beams, columns and Foundations).
They are also used as pre-existing conduits to place electrical cables and pipes, thus reducing even further the overall construction time. Hollow core slabs type of structures such as villas, buildings, commercial and industrial structures, hotels, schools, shopping malls. Also they are used vertically, as wall panel partitions, in industrial structures or in boundary walls.

hollow core slabs system
EMESSA factory - Bani-Swief

Hollow core slabs swift erection
Cairo Airport - Cairo

Hollow core slab gives wide spans
Fourtex textile factory - Sadat City

ADVANTAGES OF HOLLOW CORE SLABS

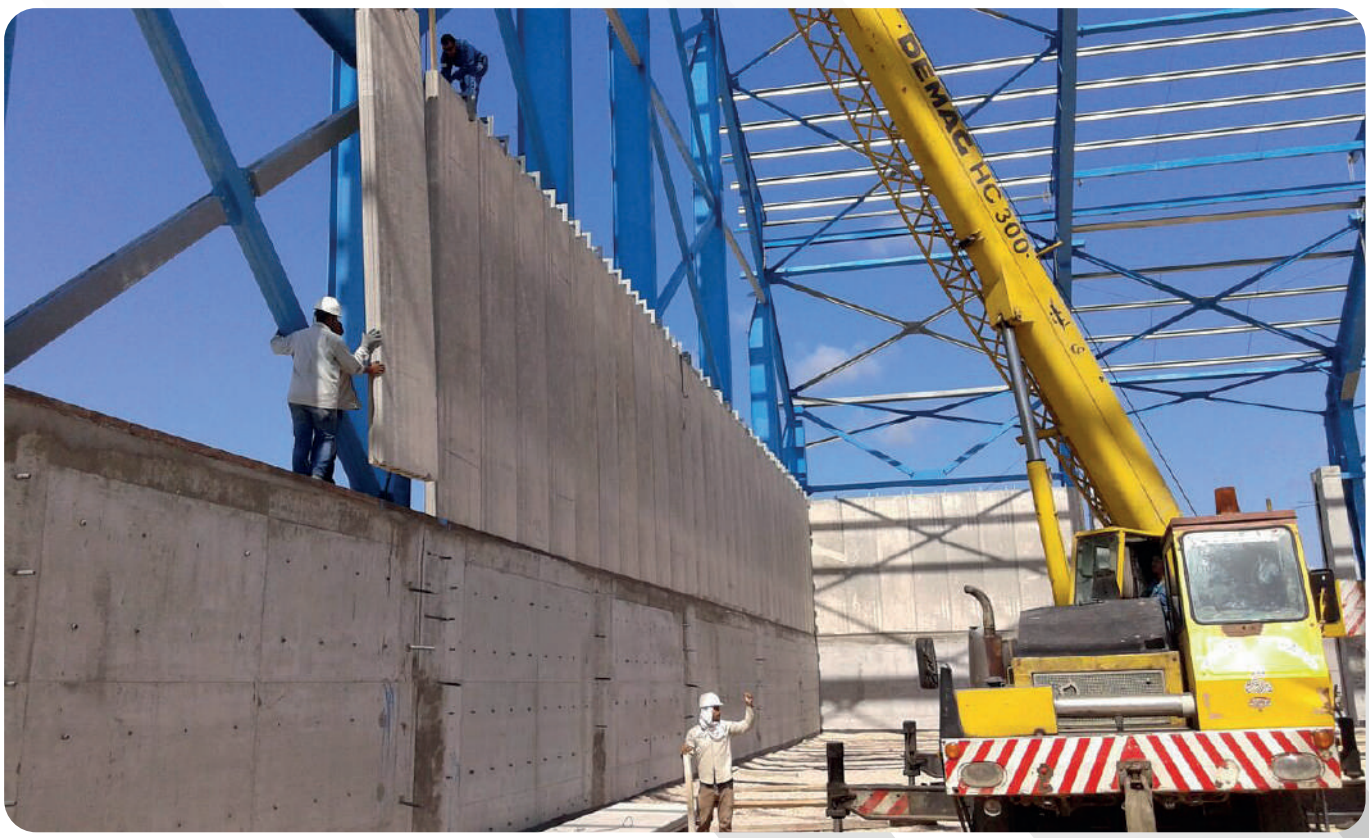
- Remarkably lower price compared to other slab systems.
- Automated production under strict Quality and Safety Control.
- Huge production capacity up to 2000 m2 per day
- No need for propping and scaffolding.
- High strength, lightweight, durable structure.
- Covering long spans in high loaded floors
- Superior fire resistance.
- Thermal resistance.
- Sound Insulation.
- Longitudinal Cores that can be used as Pipe conduits.
- Speed and ease of construction.

Hollow core slabs used in sports hall
Olympic Staduim - Olympic Village

Hollow core slabs are available in a range of seven depths:
120, 160, 200, 265, 320, 400 and 500mm slabs (Screed thickness is not included)

Hollow core slabs different sections

Hollow core walls are available in a range of four depths:
120, 160, 200, and 320mm.



Hollow core can be used for vertical walls

Factory produced by automatic extrusion:
Hollow core slabs are manufactured in the factory on 180 long beds using automatic extruders, combining high output, low manpower and superior quality products.

Automatic extruder machine

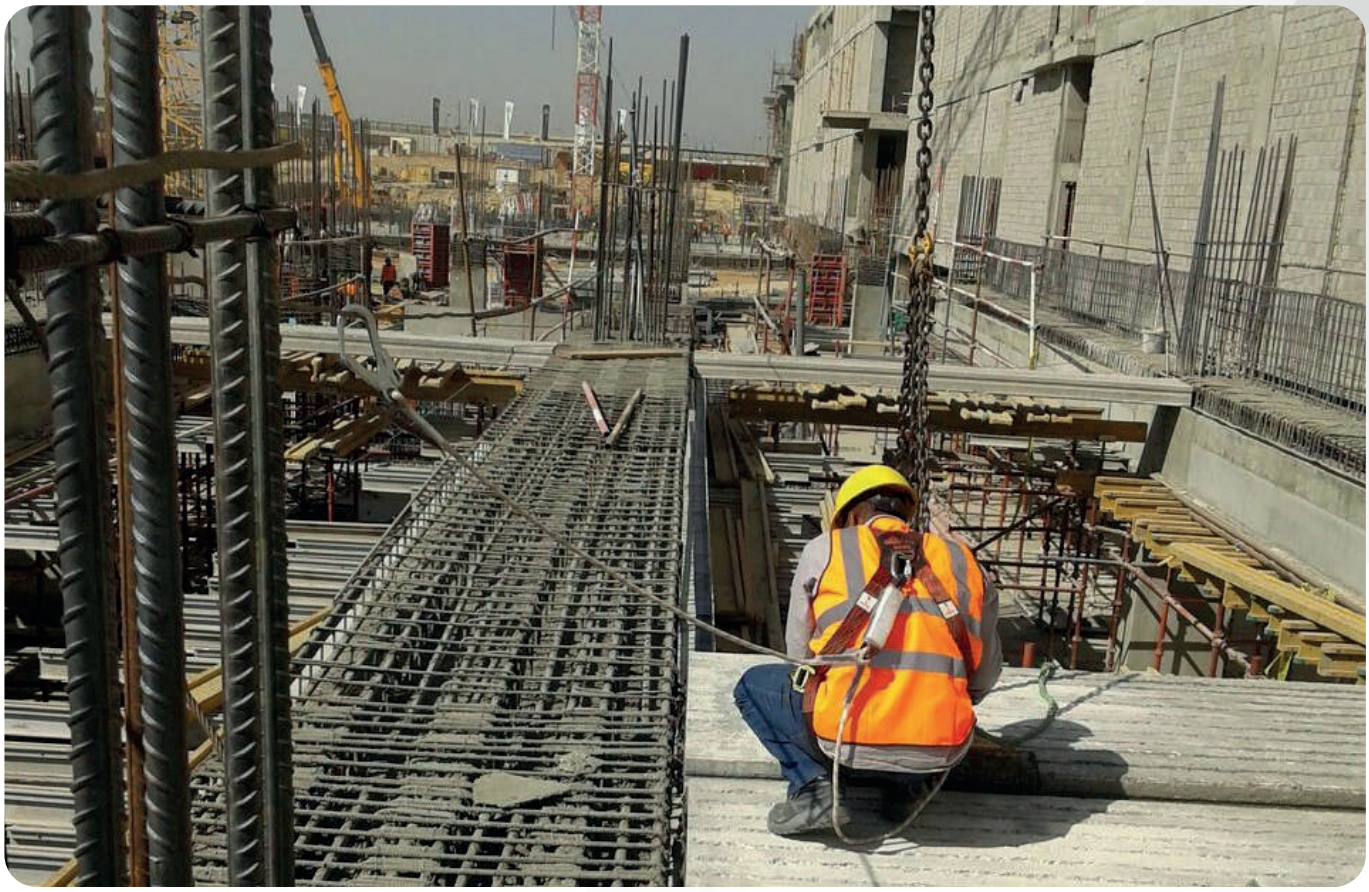
Automatic concrete feeding by flying bucket & hooper

Rapid construction:
Hollow core slabs are cut to fit the requirements before leaving the factory, thus allowing simple fast erection on site.

Automatic saw machine

lifting Hollow core piece after cutting process

Immediate work deck:
Hollow core slabs provide an immediate solid work deck for other trades.



Immediate deck just after erection
Almaza City Center - Heliopolis

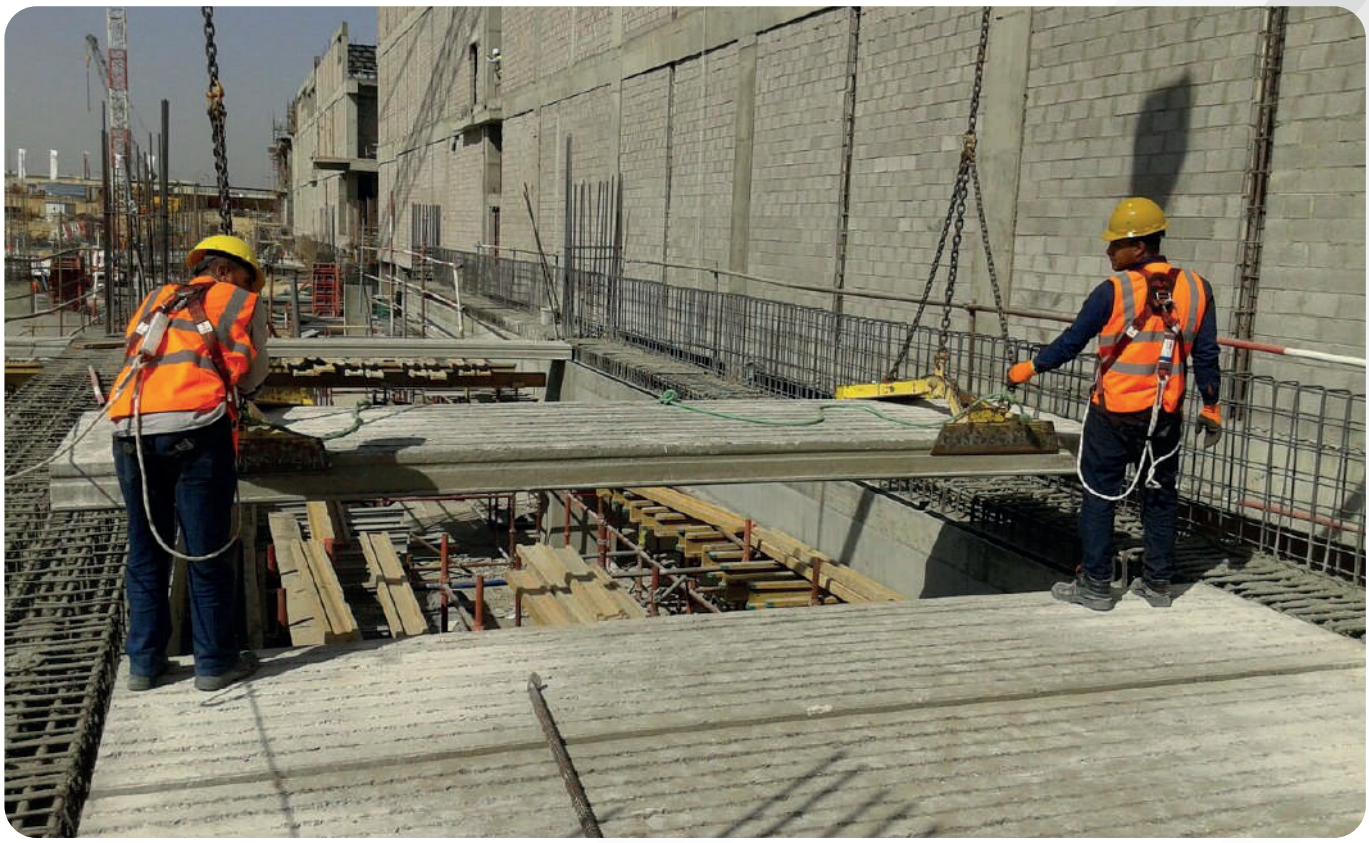
Immediate deck just after erection
Noor EL-ELM international school - Sadat City

No formwork or Propping:
Expensive formwork and temporary props are eliminated, giving free uncluttered space with vastly improved access within the work site.

Covering long spans without any formwork
ALWADI Poultry ward - AlWADI ALGADED

Covering Multiple stories without any formwork
TOSHIBA ALARABY factory - Quesna city

Reduced on-site labor:
Only a small erection crew is required to install as much as 2000 square meters per day.



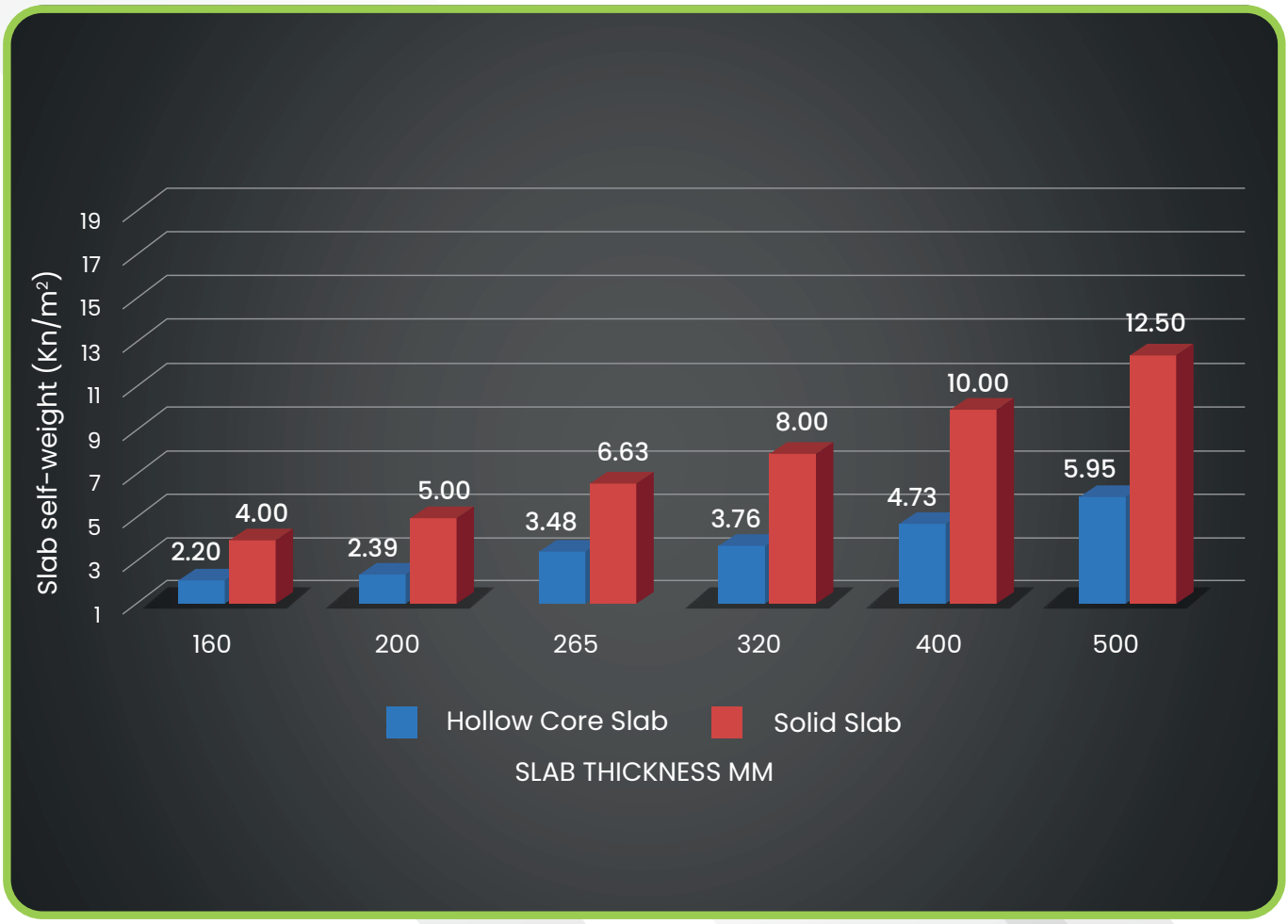
Minimum erection crew needed for hollow core slab
Almaza City Center - Heliopolis

Minimum erection crew needed for hollow core slab
Linetex factory - 10th of ramadan

Efficient light weight section:

The Hollow core and pre-stressing impart a lightness and strength to the slabs which reduce the dead load on the floor. The depth of floor and the strand pattern can be varied at minimum cost to suit the span and load requirements.

Thickness to Weight for both hollow core and solid slabs



Durability:

Concrete quality meets the durability requirements of the strictest standards.

High load capacity:
Hollow core slabs can handle the heavy loads required in most factories, warehouse and storage buildings without increasing floor depths or adding multitudes of beams and columns.

Large span with high loads floor to be covered by hollow core slabs
ALsham factory - Obour City

Fire resistance:
Fire resistance periods up to 120 minutes (2 hours) can be provided to meet building code requirements. Strand cover may be varied to suit particular exposure classifications.

Thermal resistance:

Thermal insulation values are normally only significant at roof levels, where an insulation layer has to be placed on top of the slab to achieve good thermal resistance. The U-value (W/m2k) for hollow core slabs are as listed below:

Hollow core slab section	U-value (W/m^2K)
HCS-120	9.55
HCS-160	8.0
HCS-200	6.67
HCS-265	5.26
HCS-320	5.0
HCS-400	4.55
HCS-500	3.85

Sound Insulation:

Hollow core slabs used as structural floor units offer excellent sound insulation properties associated with concrete and the longitudinal voids give further dampening effect. This will contribute to less sound transmission between floors. The airborne sound reduction index **Rw** for hollow core slabs according to Bs 8233, 1987 is as follows:

Hollow core slab section	Rw (dB)
HCS-120	47
HCS-160	50
HCS-200	53
HCS-265	56
HCS-320	58
HCS-400	60
HCS-500	63

Prefinished ceilings:

Exposed Hollow core soffits can be painted directly or spray coated to provide attractive ceilings. Alternatively ceiling tiles can be applied directly or suspended ceiling simply installed.

Hollow core slabs finish surface as per mold casting
Fourtex Textile factory - Sadat City

Hollow core slabs finish surface as per mold casting
Fourtex Textile factory - Sadat City

Hollow core slabs with paint finish
EMESSA factory - Bani-Swief

Hollow core slabs with paint finish & Skylight
Line textile factory - 10th of ramadan

Complete Package:

Hollow core slabs can be manufactured, delivered and installed on site by the manufacturer as a complete package.

Hollow core slabs full package by Modern concrete
Farag Textile factory - 10th of ramadan

Service cores:

Longitudinal core holes in floor slabs can be used as service ducts for concealed services such as plumbing, electrical and telephone cable. Breakouts can be drilled as required.

Cores in slabs used for extending pipes
ORMAN school - 6 OCTOBER CITY

Design Process

The design of a hollow core floor is usually undertaken in two stages:

Preliminary Design:
The general layout, the overall dimensions of the planks and the typical details are selected to suit the building requirements.

Final Design:
The details of the planks such as strand patterns, connections, embedded items are decided and the shop drawings produced.

It is normal for MCC to participate in the design process with the client project management team as well as providing advice on costing. The responsibilities are generally divided as follows:

The Client project management team is usually provides the following:

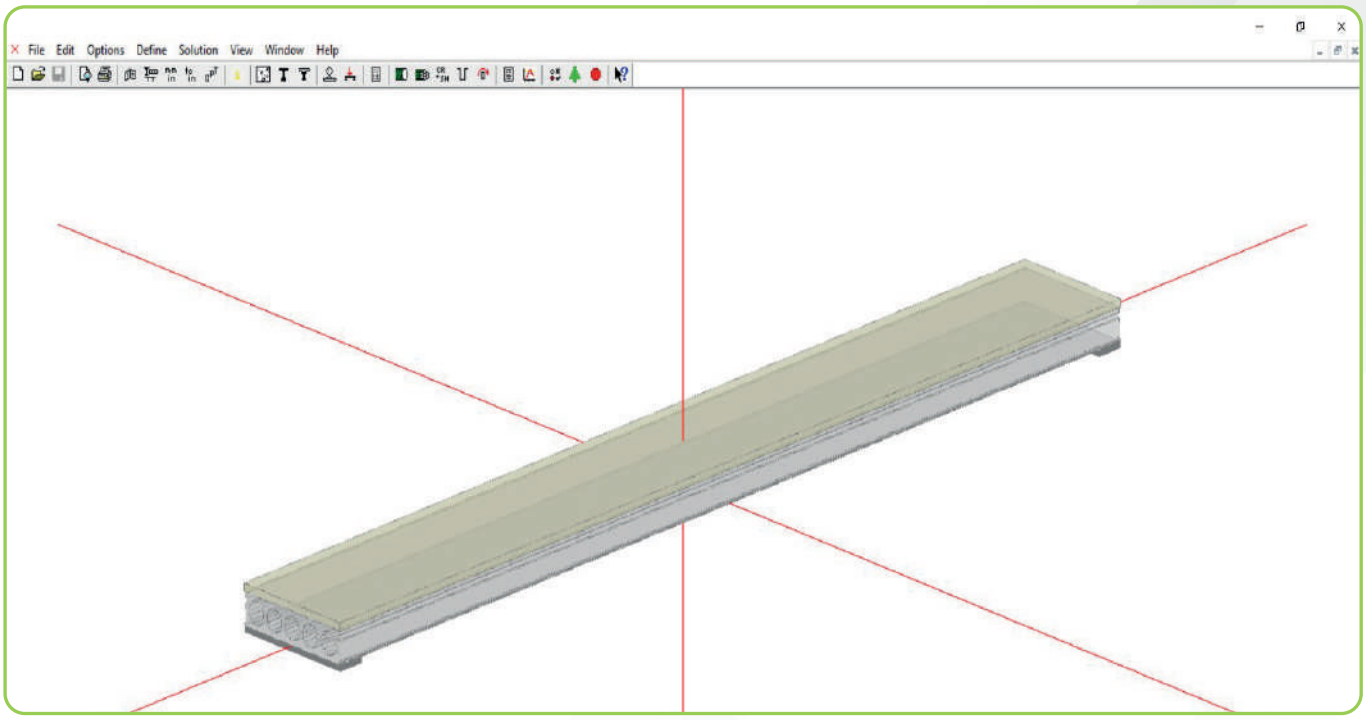
- The design drawings showing the floor plan layout, building dimensions, general structure and support methods.
- The project specification.
- The vertical and horizontal loadings on the floor.
- The required fire resistance levels.
- The noise insulation requirements.
- The vibration characteristics if required.
- Any deflection restrictions.
- Forces arising from structural frame actions.
- Checking and acceptance of the design calculations when MCC carries these out.
- Overall responsibility for the structural design of all elements in the project including the integration of the hollow core planks into the structure.

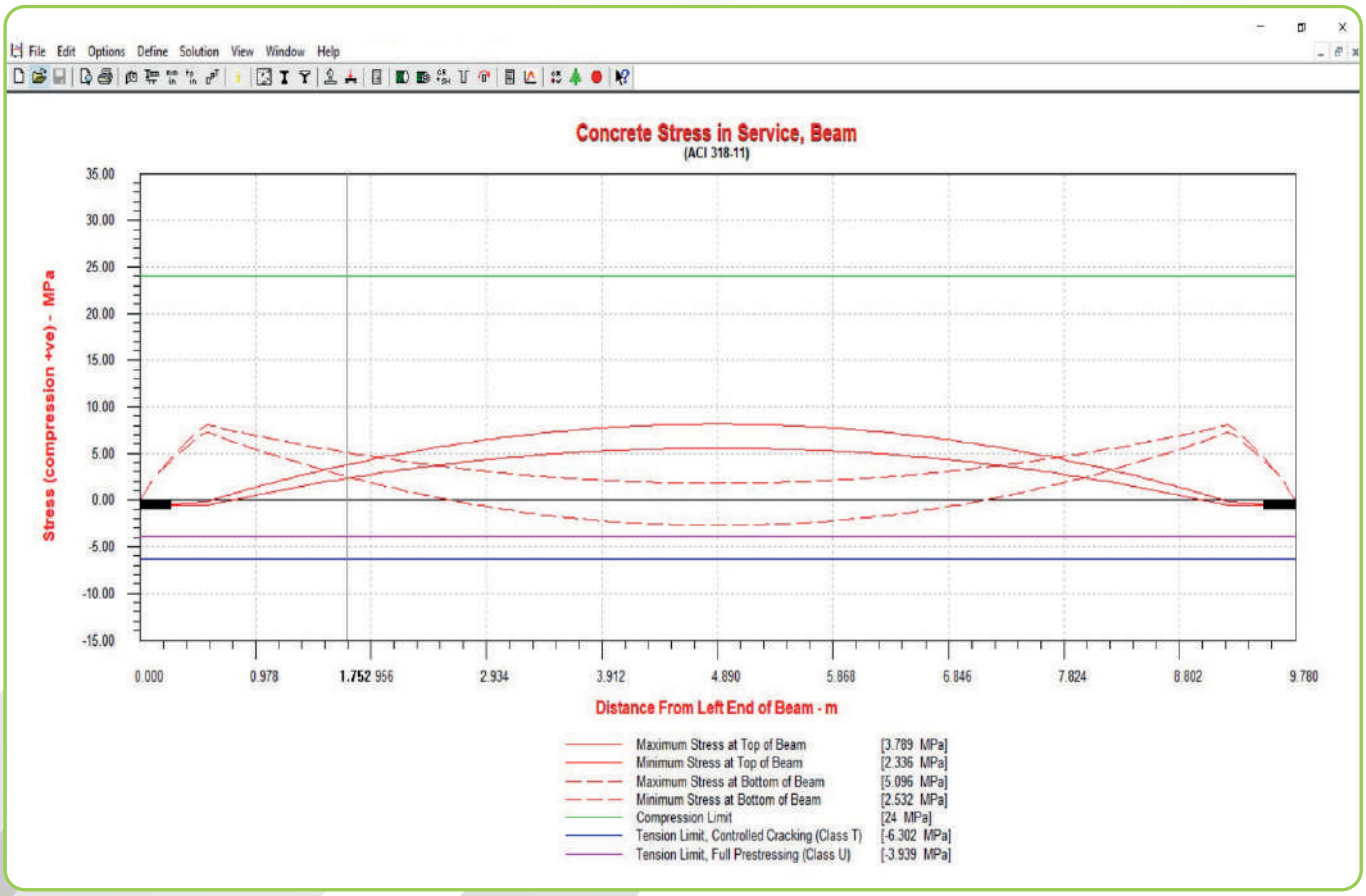
MCC usually provides the following:

- Detailed specification for the manufacture of the planks using proprietary equipment.
- The detailed design of the hollow core planks as agreed.
- General arrangement drawings (G.A.D), locating each plank type in the structure, Support and joint details.
- Shop drawings showing plank details including dimensions and the location of lifting and fixing inserts (If any).
- The erection procedure.

The structural design of the planks may be provided by either party, depending on the contractual arrangements:

- If carried out by Client party Engineer, MCC supplies design properties unique to its product, such as section properties, normal concrete strengths, and strand patterns.
- If carried out by MCC, all design documentation is provided to the Client Engineer who checks that the design meets the project requirements in all respects





Design Aid Software

Production process

1. Bed Preparation: Our hollow core slabs are casted in 180m and 150m steel beds using automated extruder machine and Steel beds are cleaned and oiled to allow easy stripping of product after casting. Low relaxation strands are then laid and fixed at dead end, stressing machine.

Bed cleaning machine

Strands cable lay-down

2. Stressing the Strands: Strands are stressed one time with the stressing machine, under strict Quality Control.

Cable strands stressing machine

Cable strands stressing machine

3. Casting and Automatic Extrusion: High early and ultimate strength, zero slump concrete is batched and transported to extruder machine using automatic flying bucket system which compacts it, then extrudes the Hollow core section continuously along a 180m bed.

Automatic flying bucket system

Extruder machine

4. Curing: Hollow core slabs are covered with sheets after casting, the concrete is cured by heating the casting beds through embedded water pipes connected to automatic boiler. water temperature gradually increased to accelerate concrete setting time and obtain the required initial strength.

Covered bed for curing

Boiler station

5. Cutting and storage: Once reached required initial strength slabs cut with required sizes as per issued shop drawings using diamond blade saw machine, then moved to stocking yard accroding to quality procedures.

Releasing and cutting process

Hollow Core section after cutting

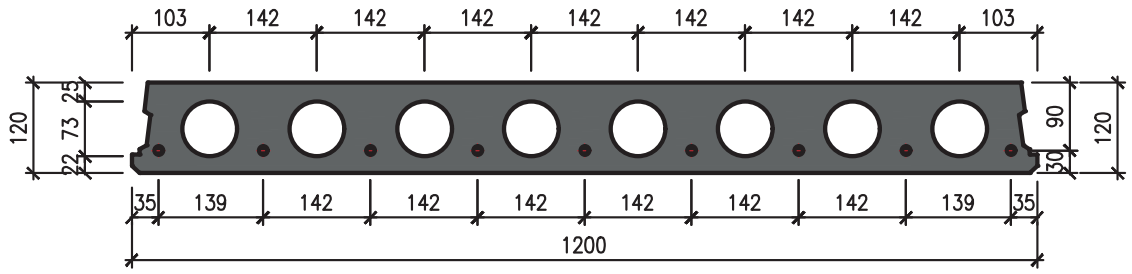
6. Delivery: Delivery to site is done by flat trailers, with Hollow core slabs stacked horizontally, supported by timber planks and well secured to avoid transport damage.

Flat bed truck used for slabs transportation

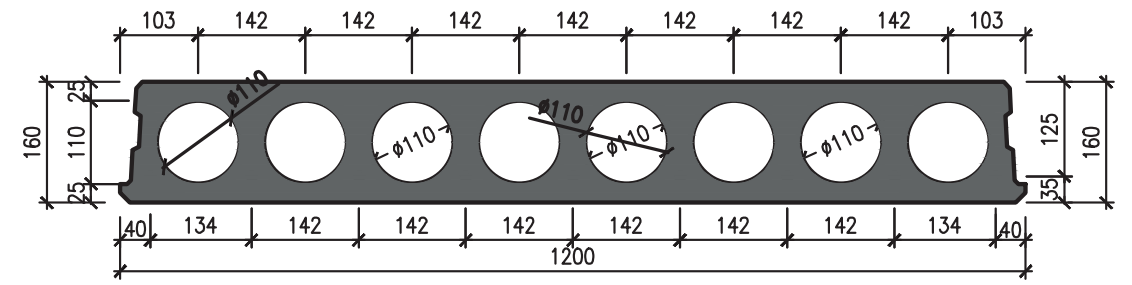
Flat bed truck used for slabs transportation

HOLLOW CORE STANDARD SECTIONS

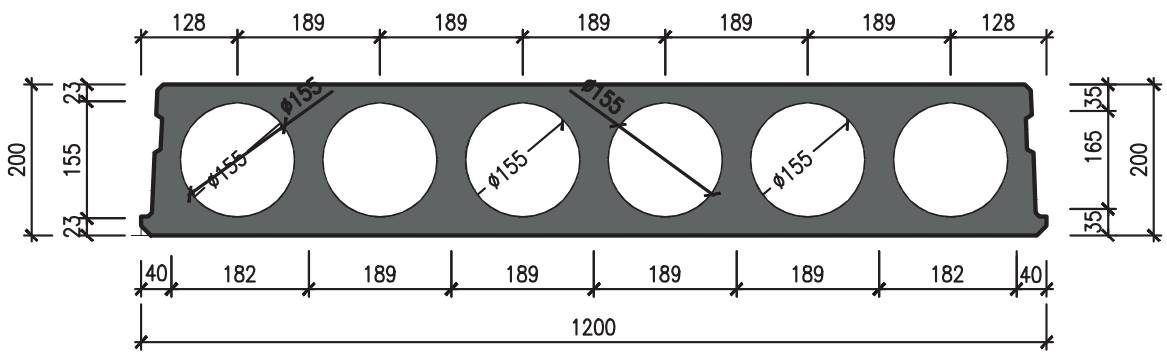
Hollow core slabs standard sections



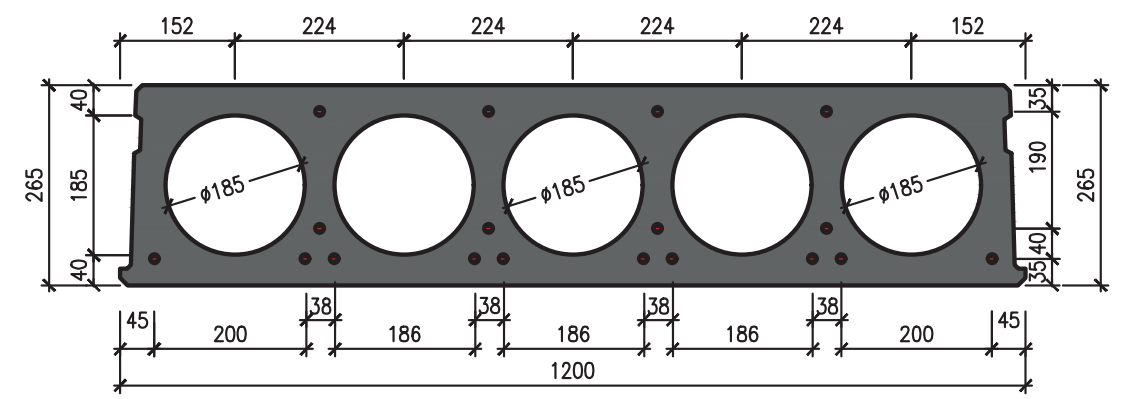
HC120



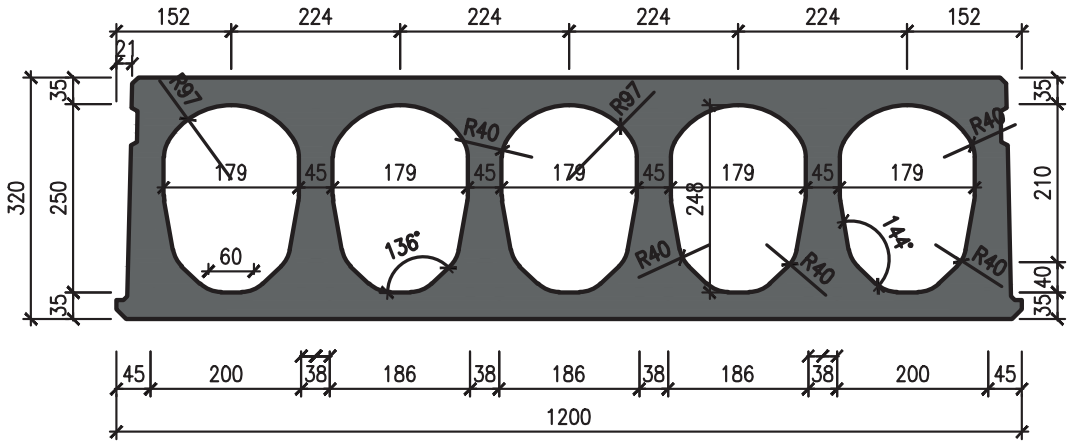
HC160



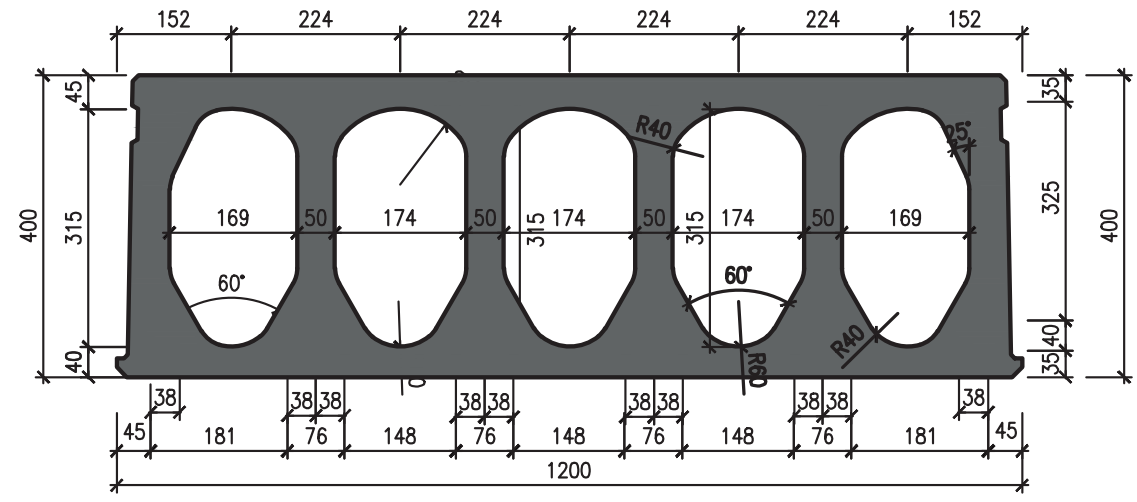
HC200



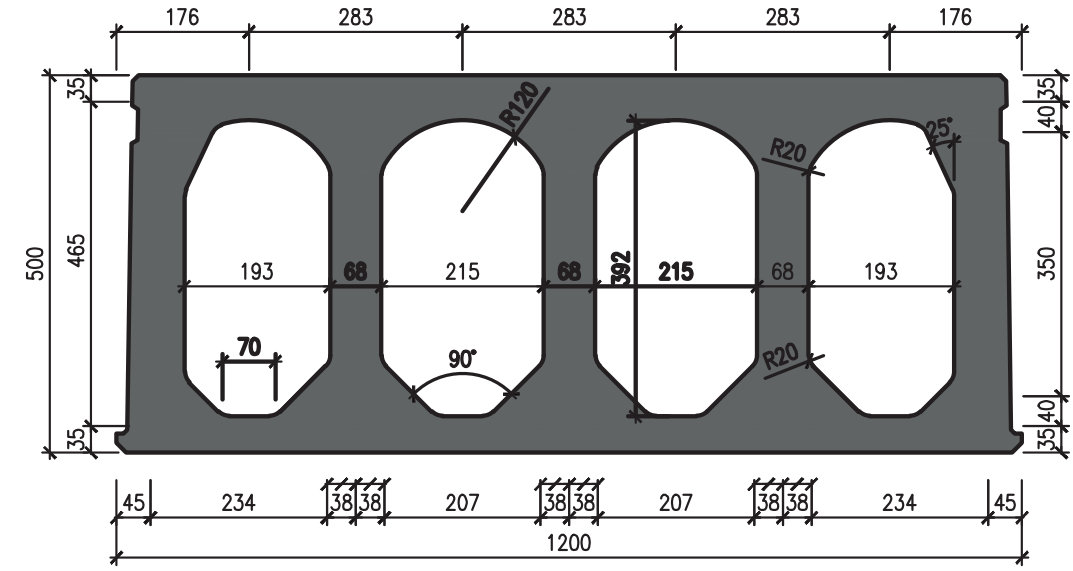
HC265



HC320



HC400

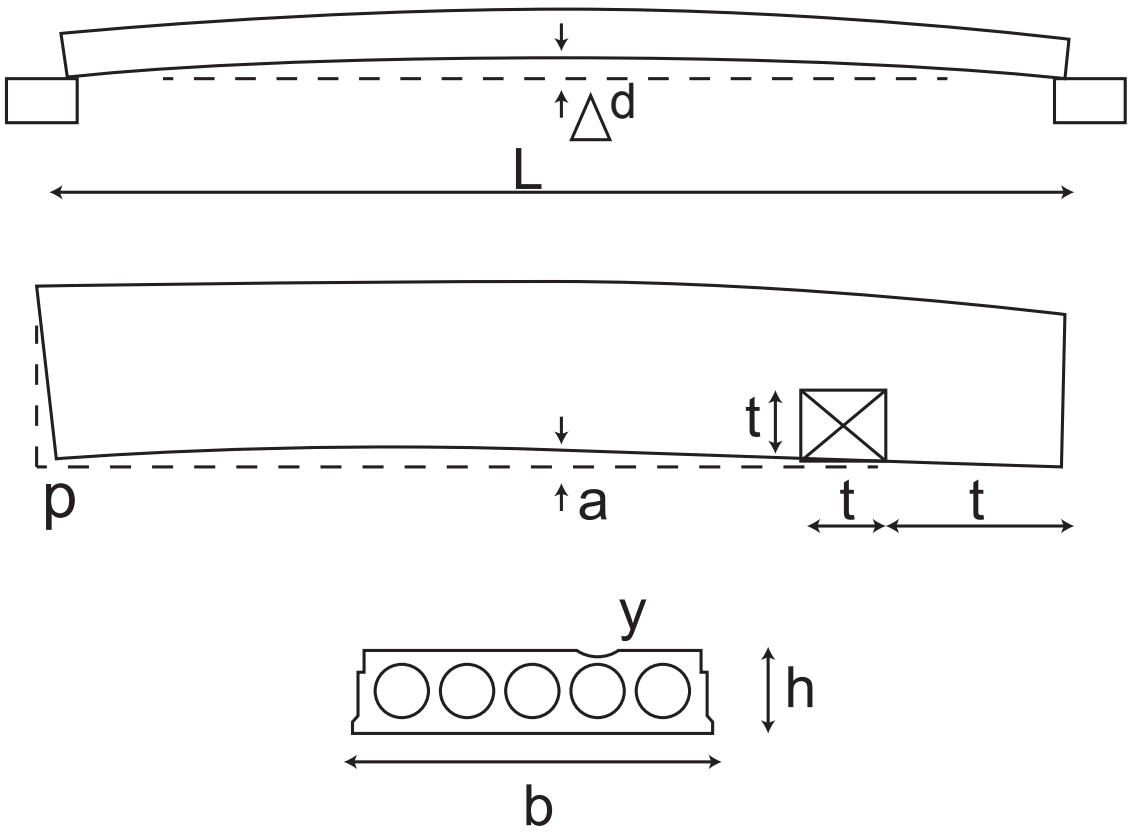


HC500

Production Tolerances

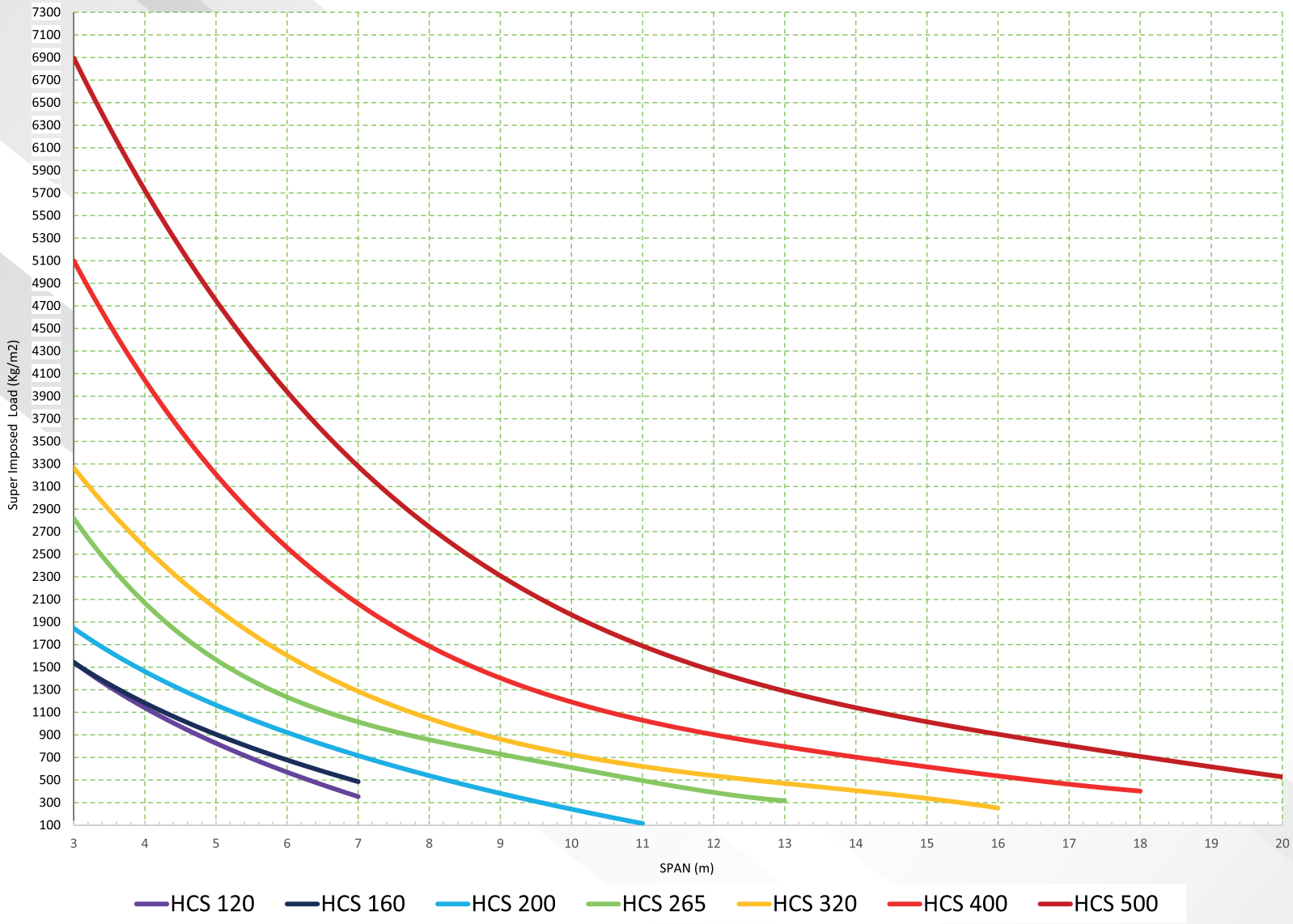
1. Length (L):	± 15 mm or L/1000[1)]
2. Thickness (h):	± 5 mm or h/40[1)]
3. Width (b) : whole slab narrow slab:	+ 0-6 mm ± 15 mm
4. Orthogonality end face (p):	± 10 mm
5. Camber before erection (Δ^d)[2)]:	± 6 mm or L/1000[1)]
6. Warping (a):	± 10 mm or L/1000
7. Flatness (y):	10 mm under a lath of 500 mm
8. Holes and recesses (t) cut in fresh concrete: cut in hardened concrete:	 ± 50 mm ± 20 mm

[1)] Whichever is the larger
[2)] Deviated from the calculated precamber



Combined loading curves for available hollow core slab sections

Modern CONCRETE All Products



**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

Modern CONCRETE All Products

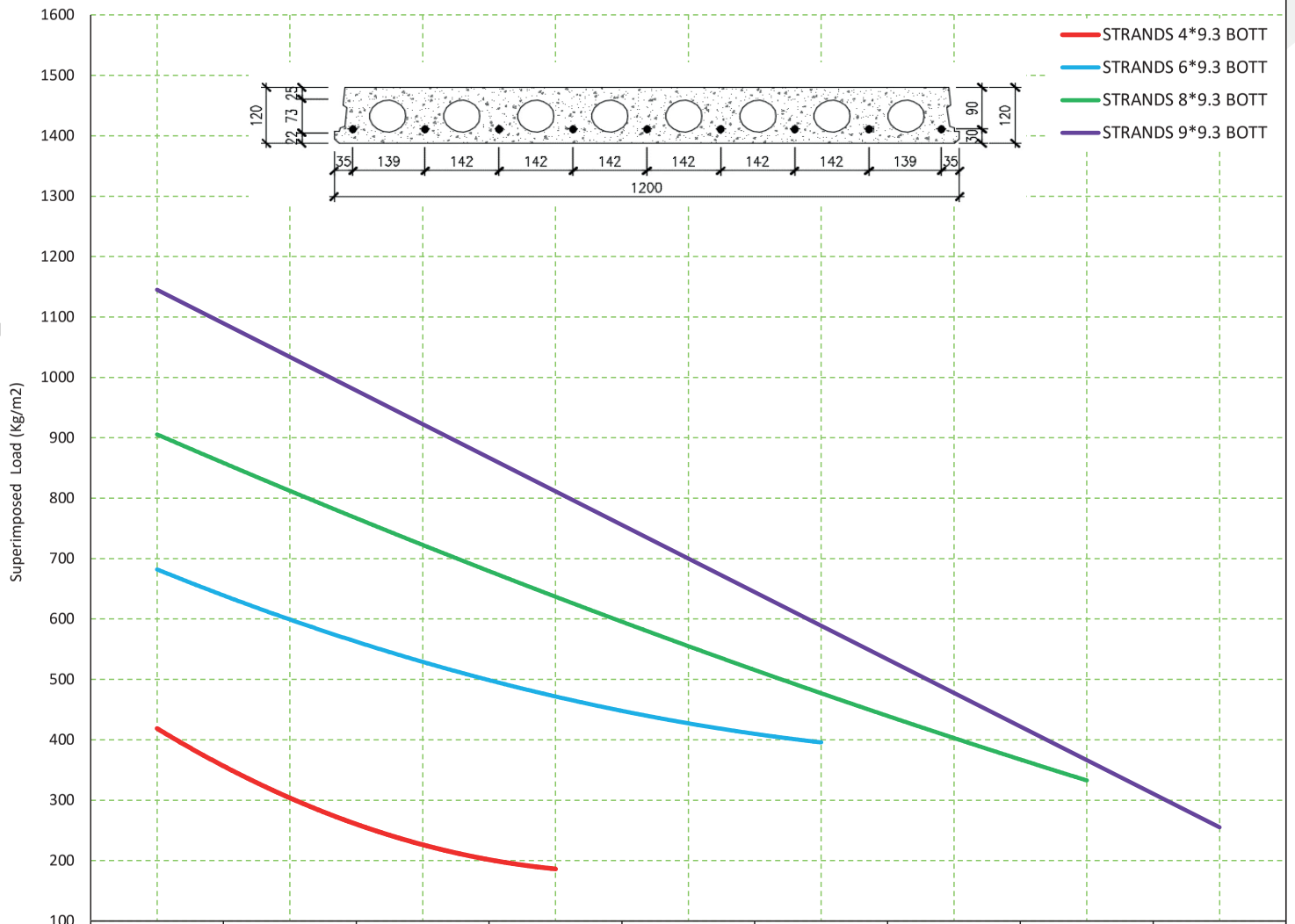
HOLLOW CORE SLAB 120mm

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W OF HCS + Joint Filling = 222 Kg/m^2
X-Sec Area = 1067 Cm^2
Inertia = 15856 Cm^4
Bw = 58.3 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2
FRR = 60 Min



SPAN(m)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Strands 4*9.3 Bott ϕMn=2806 Kg.m	415	315	215	190					
Strands 6*9.3 Bott ϕMn=4038 Kg.m	690	590	515	490	430	390			
Strands 8*9.3 Bott ϕMn=5189 Kg.m	965	740	690	640	590	515	390	315	
Strands 9*9.3 Bott ϕMn=5727 Kg.m	1100	1000	950	900	740	565	440	340	265

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

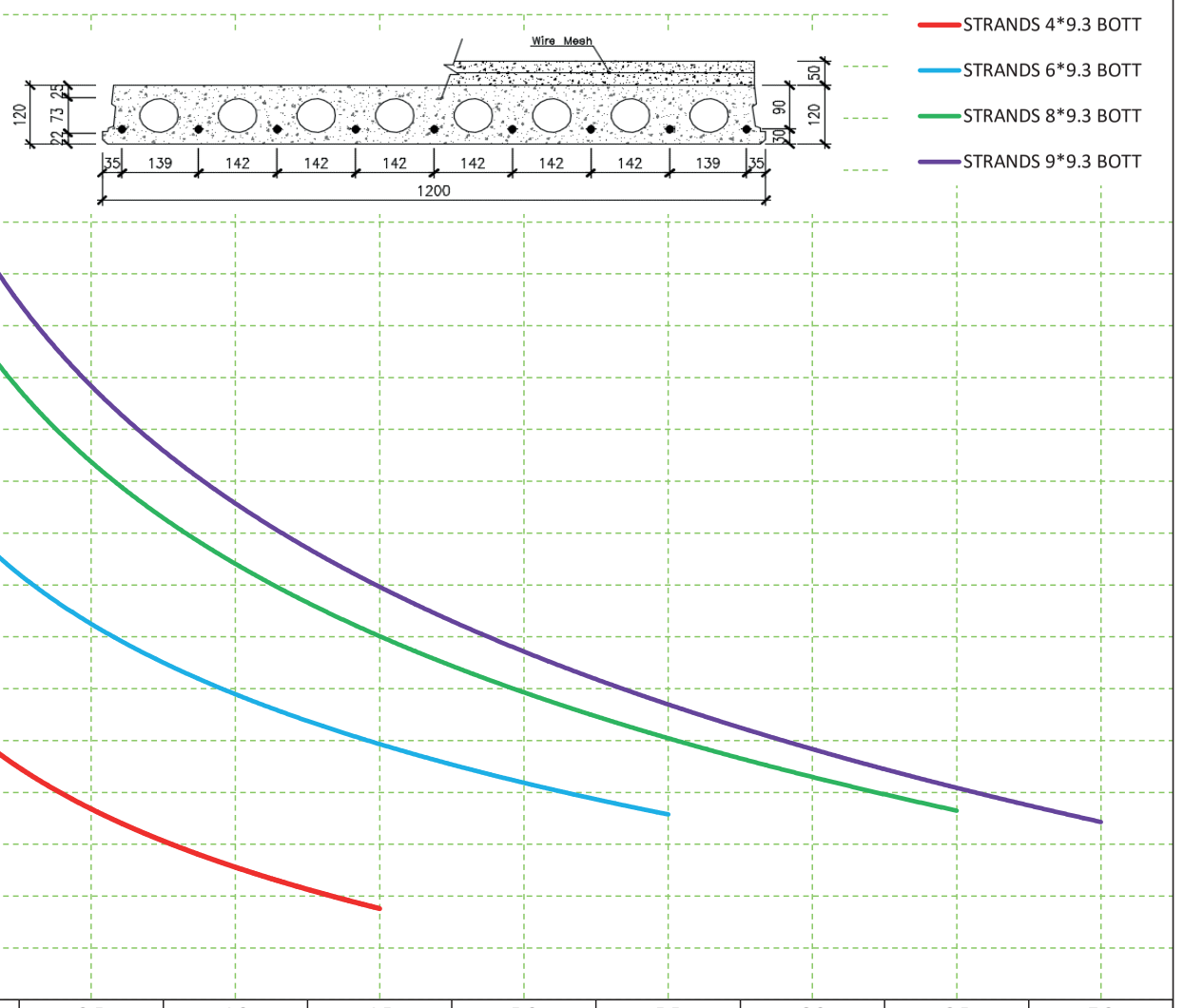
HOLLOW CORE SLAB 120mm+50mm TOPPING

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W OF HCS + Joint Filling + 50MM TOPPING= 347 Kg/m^2
X-Sec Area = 1637 Cm^2
Inertia = 39731.8 Cm^4
Bw = 58.3 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2



SPAN (m)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Strands 4*9.3 Bott ϕMn=4312 Kg.m	665	465	340	290					
Strands 6*9.3 Bott ϕMn=6172 Kg.m	1090	815	615	590	540	490			
Strands 8*9.3 Bott ϕMn=7868 Kg.m	1465	1115	890	840	790	715	490	340	
Strands 9*9.3 Bott ϕMn=8656 Kg.m	1640	1265	990	940	890	840	615	415	290

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING+50MM TOPPING

Modern CONCRETE All Products

HOLLOW CORE SLAB 160mm

NOTES

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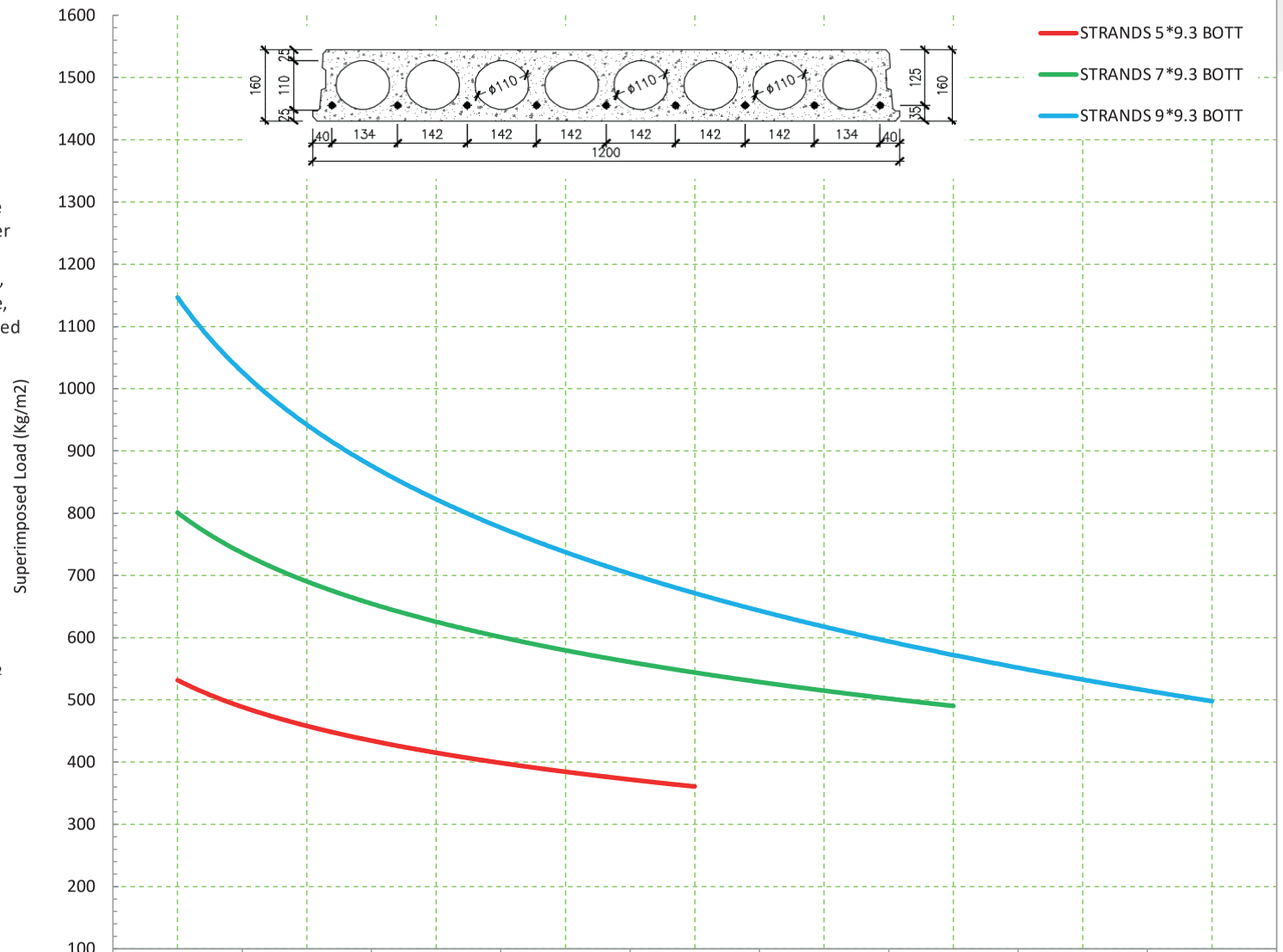
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.



SEC-PROP

S.W OF HCS + Joint Filling = 235 Kg/m^2
X-Sec Area = 1100 Cm^2
Inertia = 34429.7 Cm^4
Bw = 30.7 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2

SPAN (m)	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
Strands 5*9.3 Bott ϕMn=5134 Kg.m	510	485	435	385	335				
Strands 7*9.3 Bott ϕMn=7006 Kg.m	760	710	660	610	560	535	410		
Strands 9*9.3 Bott ϕMn=8769 Kg.m	1010	960	910	860	810	660	535	435	360

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

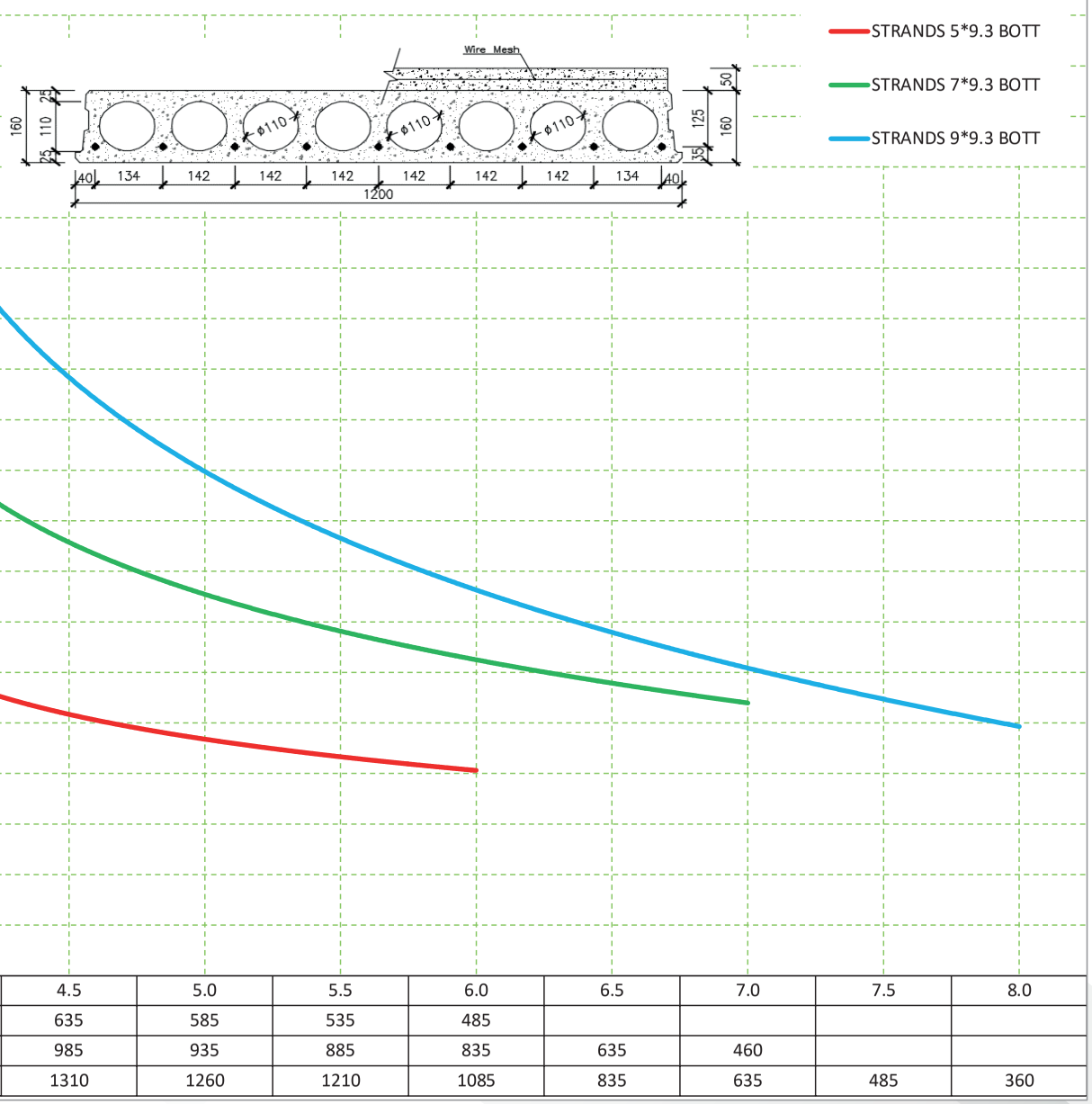
HOLLOW CORE SLAB 160mm+50mm TOPPING

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W OF HCS+ Joint Filling +50MM
TOPPING = 360 Kg/m^2
X-Sec Area = 1672Cm^2
Inertia = 71485.7 Cm^4
Bw = 30.7 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2



SPAN (m)	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
Strands 5*9.3 Bott ϕMn=7033 Kg.m	685	635	585	535	485				
Strands 7*9.3 Bott ϕMn=9503 Kg.m	1035	985	935	885	835	635	460		
Strands 9*9.3 Bott ϕMn=11750 Kg.m	1360	1310	1260	1210	1085	835	635	485	360

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

Modern CONCRETE All Products

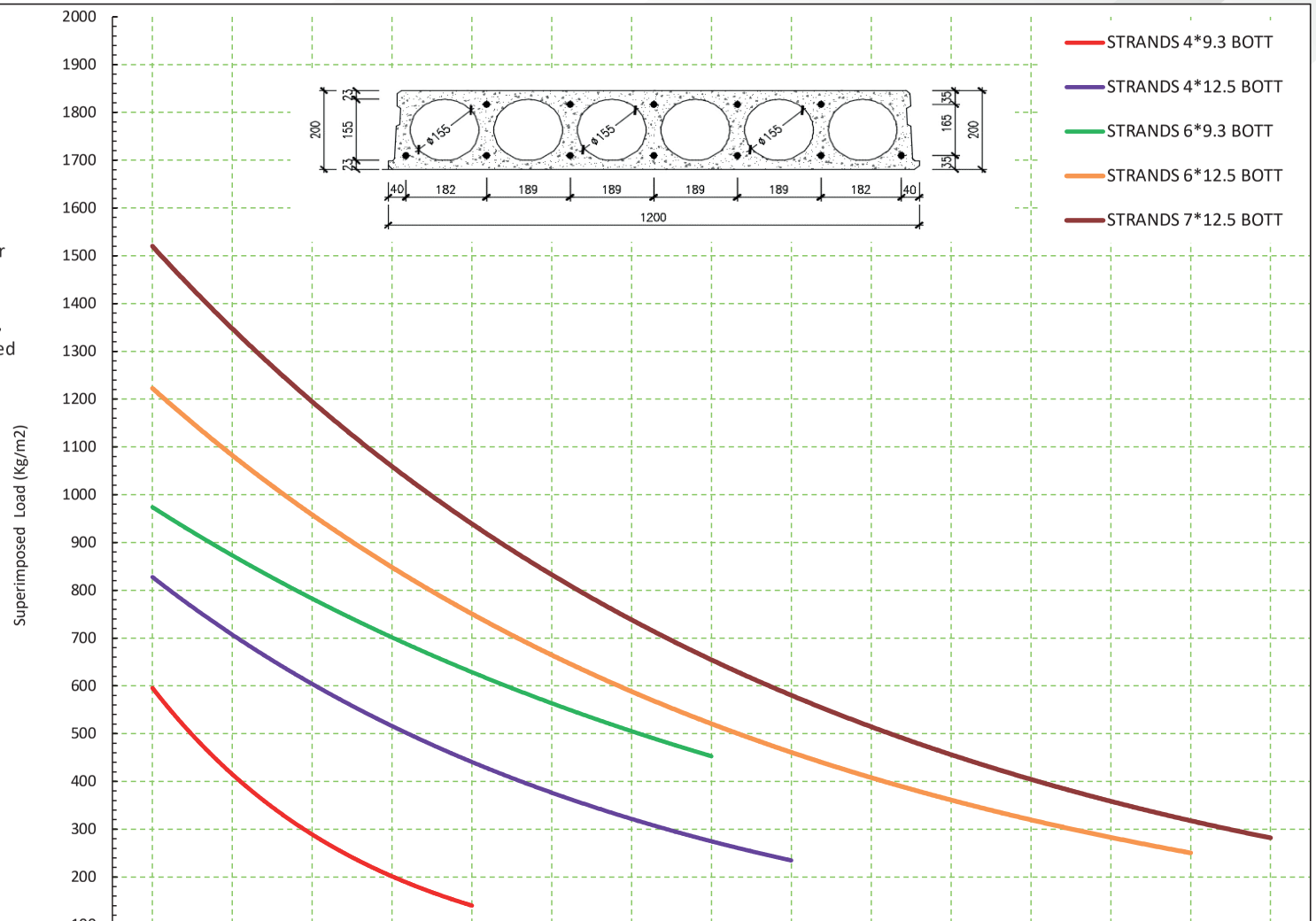
HOLLOW CORE SLAB 200mm

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling = 256 Kg/m^2
X-Sec Area = 1196 Cm^2
Inertia = 61673 Cm^4
Bw = 26.6 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2



SPAN (m)	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11
Strands 4*9.3 Bott ϕMn=5548 Kg.m	557	432	307	207	132										
Strands 4*12.5 Bott ϕMn=8951 Kg.m	882	707	582	482	432	382	332	282	232						
Strands 6*9.3 Bott ϕMn=8177 Kg.m	907	857	807	757	657	582	482	432							
Strands 6*12.5 Bott ϕMn=12780 Kg.m	1357	1107	932	782	682	632	582	532	482	432	382	332	282	232	
Strands 7*12.5 Bott ϕMn=14550 Kg.m	1582	1307	1082	932	882	832	782	732	632	582	532	432	357	282	232

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

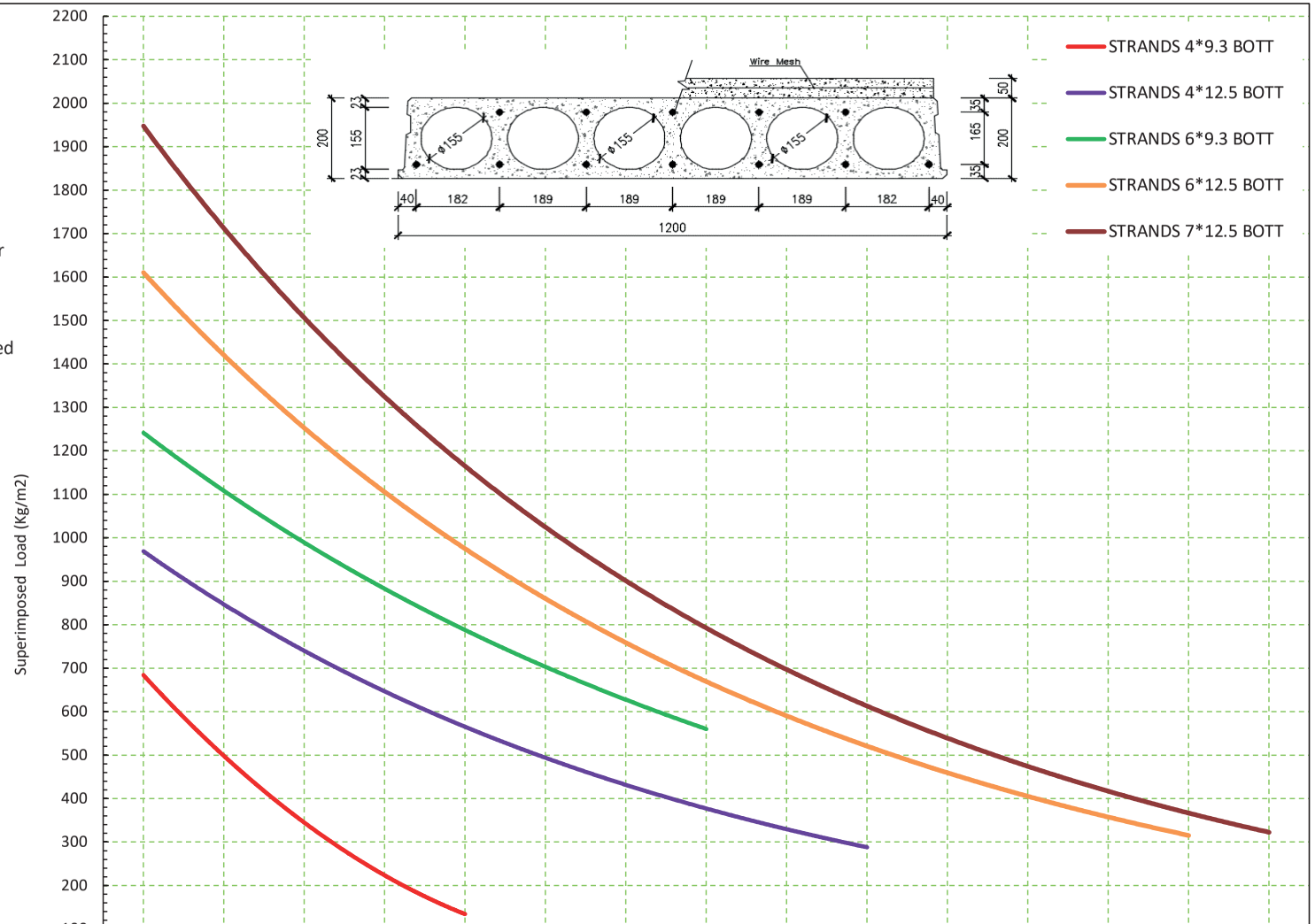
HOLLOW CORE SLAB 200mm+50mm TOPPING

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling + 50MM TOPPIING = 381 Kg/m^2
X-Sec Area = 1766 Cm^2
Inertia = 114900 Cm^4
Bw = 26.6 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2



SPAN (m)	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0
Strands 4*9.3 Bott ϕMn=7115 Kg.m	682	507	332	232	132										
Strands 4*12.5 Bott ϕMn=11400 Kg.m	1082	882	707	582	532	482	432	382	332	307					
Strands 6*9.3 Bott ϕMn=10390 Kg.m	1132	1082	1032	907	857	782	632	482							
Strands 6*12.5 Bott ϕMn=16070 Kg.m	1682	1382	1132	957	907	857	807	757	707	632	507	407	307	257	
Strands 7*12.5 Bott ϕMn=18200 Kg.m	1957	1607	1332	1132	1082	1032	982	932	857	732	632	507	407	332	232

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

Modern CONCRETE All Products

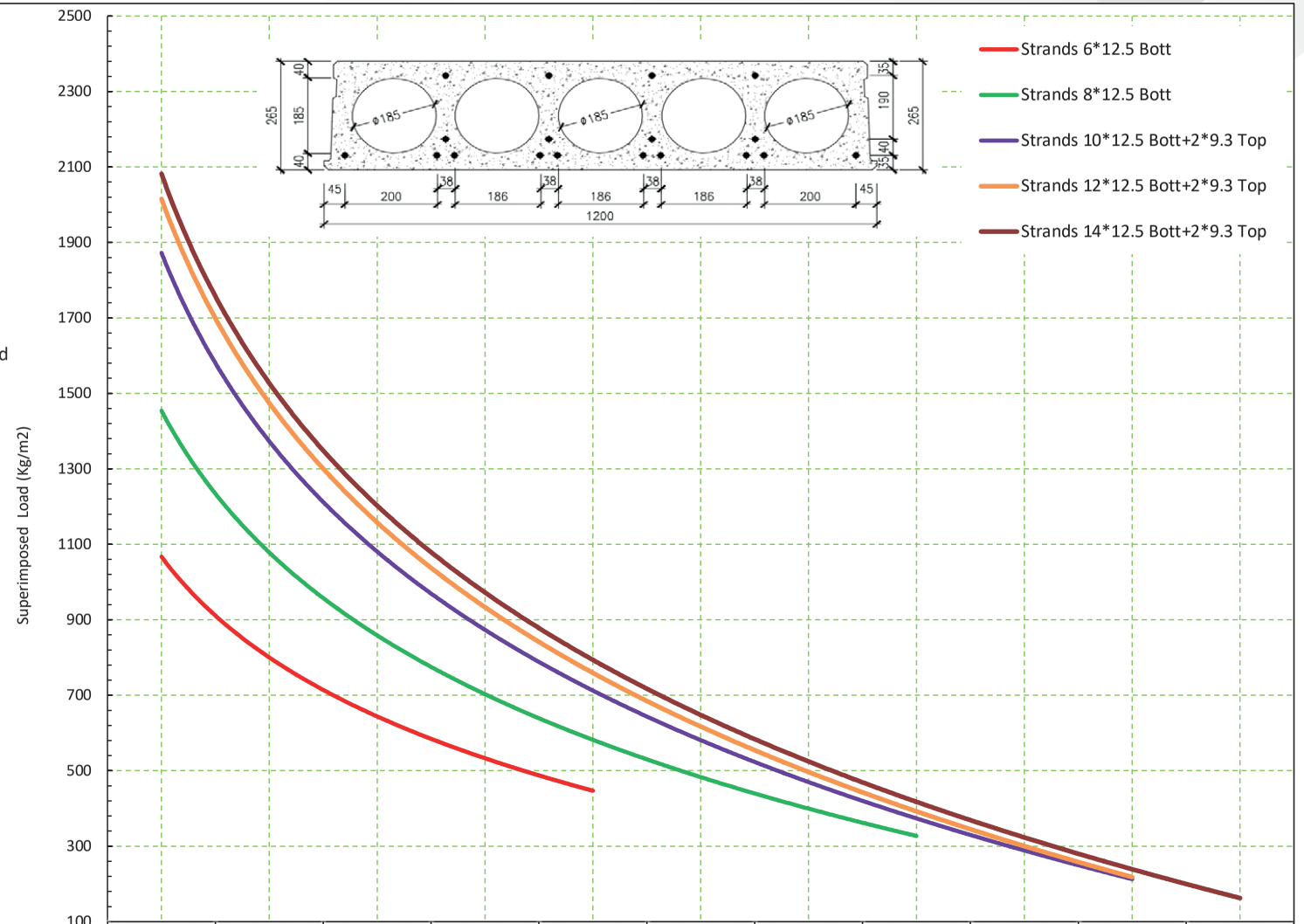
HOLLOW CORE SLAB 265mm

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling = 371 Kg/m^2
X-Sec Area = 1741 Cm^2
Inertia = 153500 Cm^4
Bw = 27.5 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2



SPAN (m)	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
Strands 6*12.5 Bott ϕMn=18480 Kg.m	1112	770	556	542	513						
Strands 8*12.5 Bott ϕMn=23740 Kg.m	1496	1040	770	741	627	499	399	314			
Strands 10*12.5 Bott+2*9.3 Top ϕMn=28630 Kg.m	1838	1297	1240	926	698	556	442	356	271	214	
Strands 12*12.5 Bott+2*9.3 Top ϕMn=32320 Kg.m	1981	1496	1183	983	755	584	470	385	299	228	
Strands 14*12.5 Bott+2*9.3 TOP ϕMn=35610 Kg.m	2052	1539	1226	998	812	641	499	413	314	242	157

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

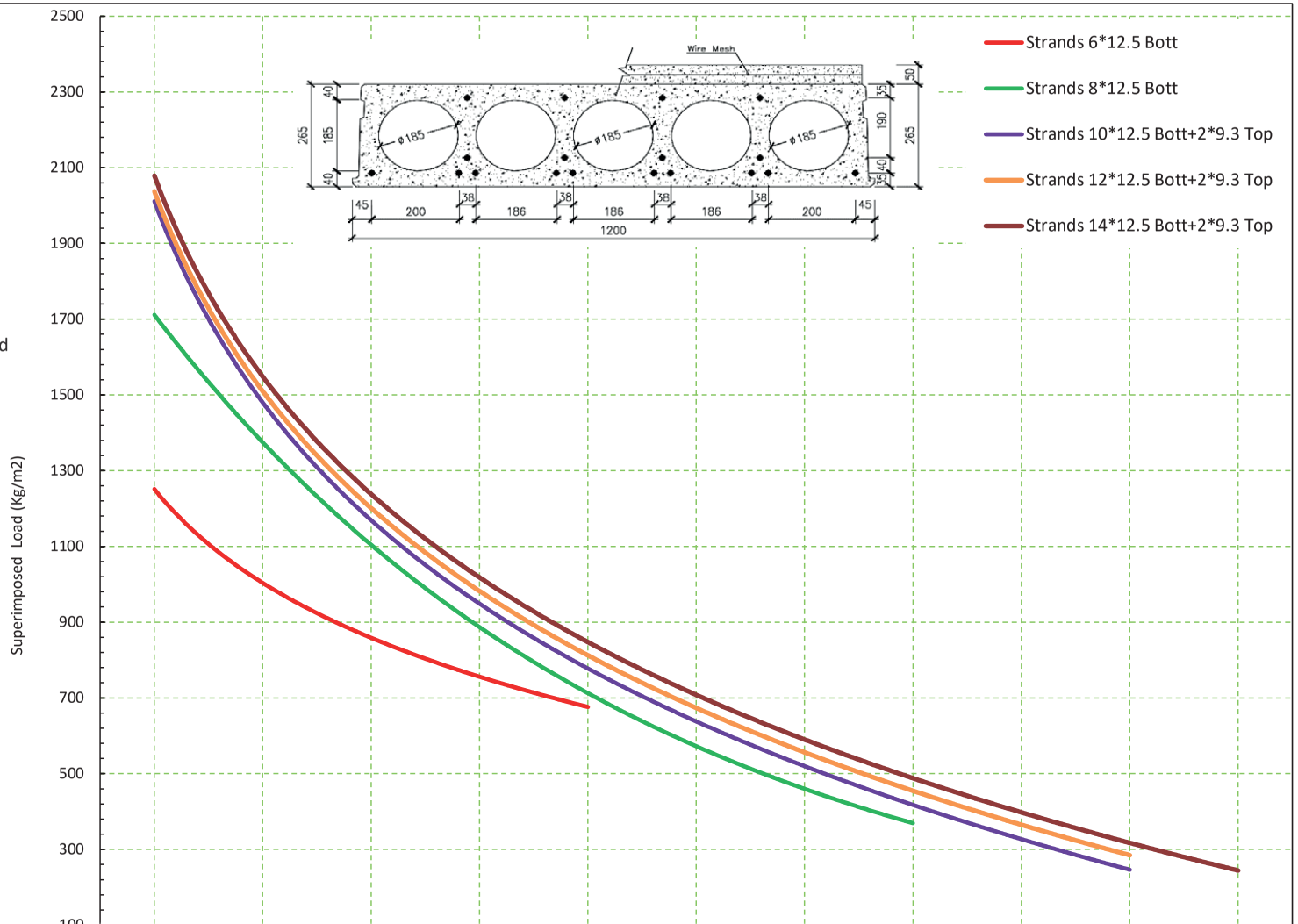
HOLLOW CORE SLAB 265mm+50mm TOPPING

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling+ 50MM TOPPIING = 496 Kg/m^2
X-Sec Area = 2311 Cm^2
Inertia = 244200 Cm^4
Bw = 27.5 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2
FRR = 60 Min



SPAN (m)	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
Strands 6*12.5 Bott ϕMn=21810 Kg.m	1311	884	855	827	670						
Strands 8*12.5 Bott ϕMn=27770 Kg.m	1739	1197	1140	926	770	613	470	328			
Strands 10*12.5 Bott+2*9.3 Top ϕMn=33610 Kg.m	1995	1482	1169	955	798	670	527	413	314	214	
Strands 12*12.5 Bott+2*9.3 Top ϕMn=37870 Kg.m	2024	1511	1211	983	827	698	556	442	356	271	
Strands 14*12.5 Bott+2*9.3 TOP ϕMn=42010 Kg.m	2066	1553	1240	1012	855	727	613	485	399	314	214

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

Modern CONCRETE All Products

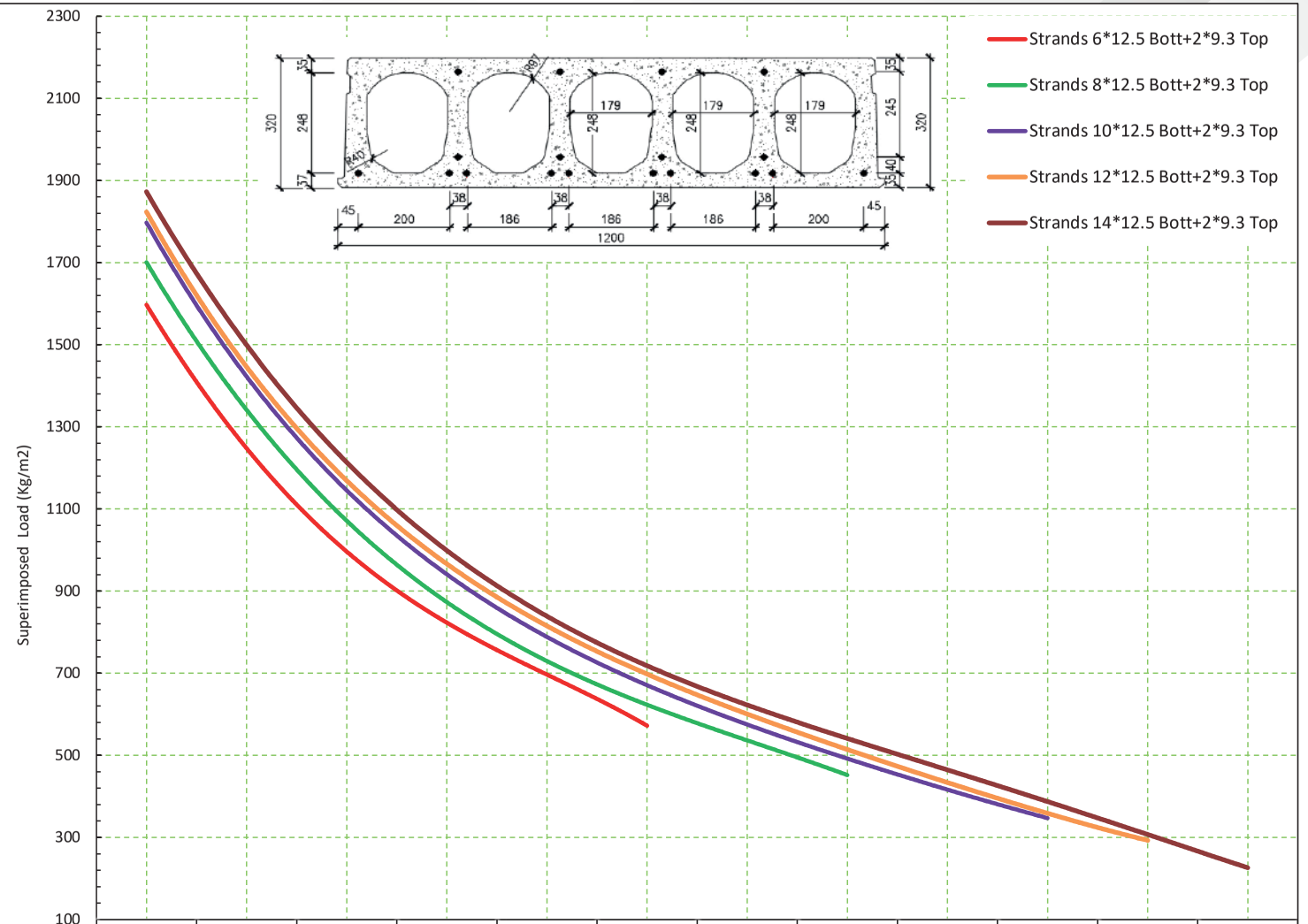
HOLLOW CORE SLAB 320mm

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling = 403 Kg/m^2
X-Sec Area = 1879 Cm^2
Inertia = 242900 Cm^4
Bw = 26.8 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2



SPAN (m)	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
Strands 6*12.5 Bott+2*9.3 Top ϕMn=25270 Kg.m	1597	1247	997	822	697	572						
Strands 8*12.5 Bott+2*9.3 Top ϕMn=32910 Kg.m	1697	1347	1072	872	722	622	547	447				
Strands 10*12.5 Bott+2*9.3 Top ϕMn=40140 Kg.m	1797	1422	1147	947	772	672	597	472	422	347		
Strands 12*12.5 Bott+2*9.3 Top ϕMn=45280 Kg.m	1822	1447	1172	972	797	697	622	497	447	347	297	
Strands 14*12.5 Bott+2*9.3 TOP ϕMn=48580 Kg.m	1872	1497	1222	997	822	722	647	522	472	372	322	222

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

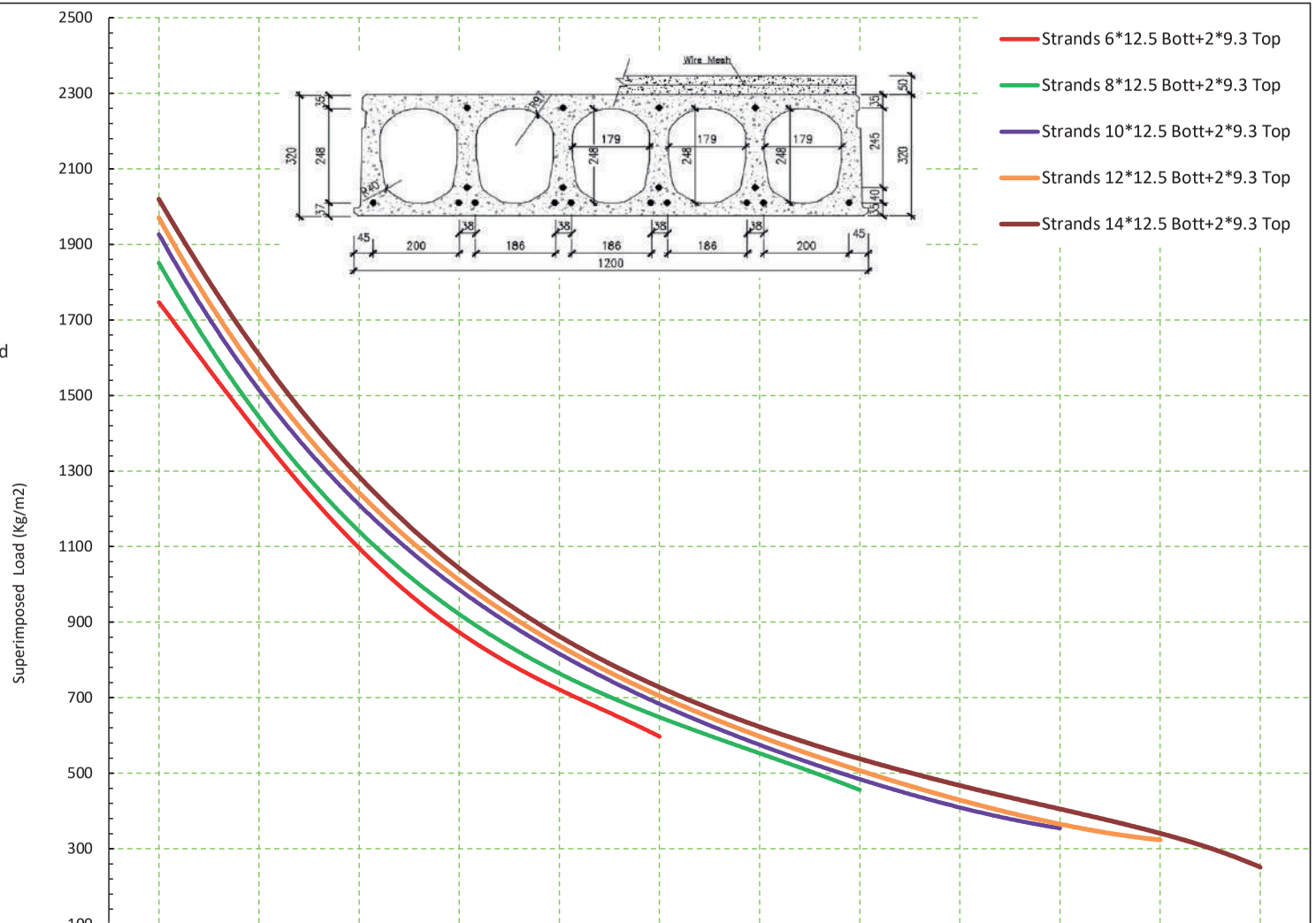
HOLLOW CORE SLAB 320mm+50mm TOPPING

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling+50mm Topping = 528 Kg/m^2
X-Sec Area = 2450 Cm^2
Inertia = 372300 Cm^4
Bw = 26.8 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2
FRR = 60 Min



SPAN (m)	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
Strands 6*12.5 Bott+2*9.3 Top ϕMn=28930 Kg.m	1747	1397	1097	872	722	597						
Strands 8*12.5 Bott+2*9.3 Top ϕMn=37290 Kg.m	1847	1447	1147	922	747	647	572	447				
Strands 10*12.5 Bott+2*9.3 Top ϕMn=45310 Kg.m	1922	1522	1222	972	797	697	597	472	400	360		
Strands 12*12.5 Bott+2*9.3 Top ϕMn=51670 Kg.m	1972	1547	1247	1022	822	697	622	497	422	372	322	
Strands 14*12.5 Bott+2*9.3 TOP ϕMn=57570 Kg.m	2022	1597	1297	1047	847	722	647	522	475	397	347	250

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

Modern CONCRETE All Products

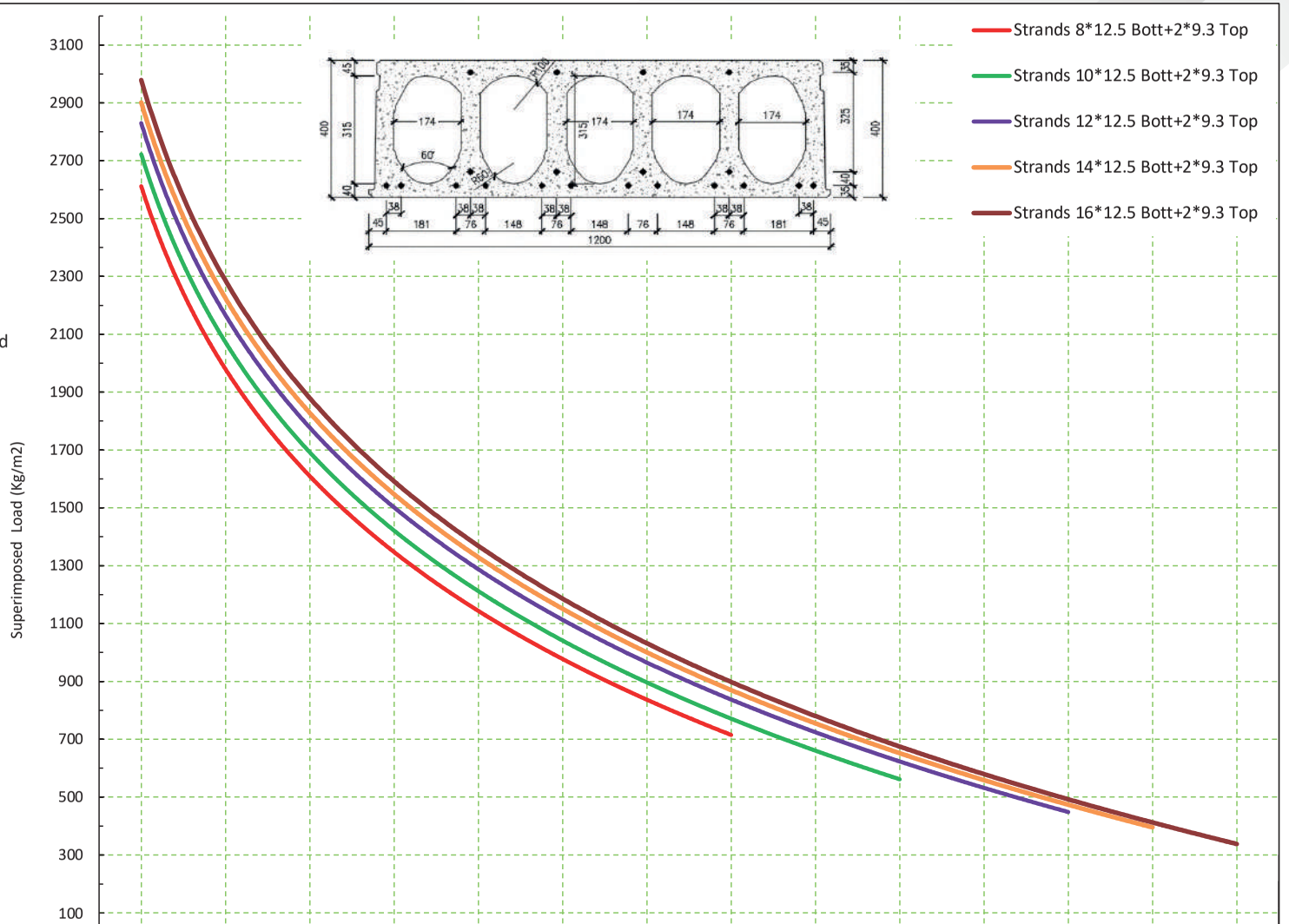
HOLLOW CORE SLAB 400mm

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling = 507 Kg/m^2
X-Sec Area = 2366 Cm^2
Inertia = 472500 Cm^4
Bw = 31.4 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2
FRR = 60 Min



SPAN (m)	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0
Strands 8*12.5 Bott+2*9.3 Top ϕMn=42910 Kg.m	2565	2040	1615	1365	1140	965	840	690						
Strands 10*12.5 Bott+2*9.3 Top ϕMn=52750 Kg.m	2715	2090	1715	1390	1215	1015	915	740	665	590				
Strands 12*12.5 Bott+2*9.3 Top ϕMn=62110 Kg.m	2840	2190	1790	1465	1290	1065	965	790	715	640	590	465		
Strands 14*12.5 Bott+2*9.3 TOP ϕMn=69420 Kg.m	2915	2240	1840	1515	1340	1115	990	815	740	665	615	465	430	
Strands 16*12.5 Bott+2*9.3 TOP ϕMn=75230 Kg.m	2990	2315	1890	1565	1365	1140	1015	840	765	690	640	490	450	340

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

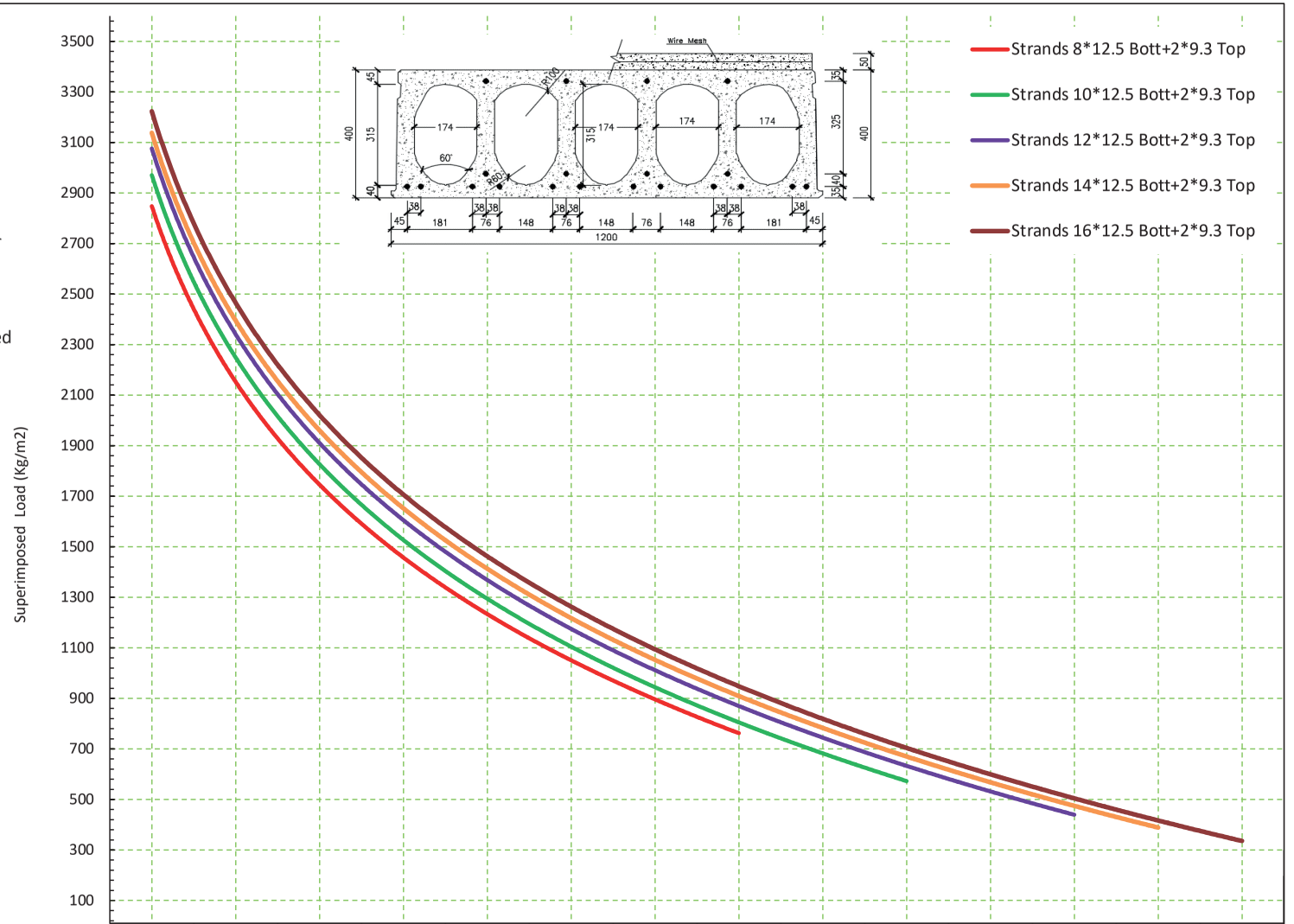
HOLLOW CORE SLAB 400mm+50mm TOPPING

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling+50mm
Topping = 632 Kg/m^2
X-Sec Area = 2936 Cm^2
Inertia = 674000 Cm^4
Bw = 31.4 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2



	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0
Strands 8*12.5 Bott+2*9.3 Top ϕMn=47300Kg.m	2815	2190	1765	1465	1215	1065	865	765						
Strands 10*12.5 Bott+2*9.3 Top ϕMn=57860 Kg.m	2940	2290	1840	1540	1265	1115	915	815	665	590				
Strands 12*12.5 Bott+2*9.3 Top ϕMn=68070 Kg.m	3065	2390	1940	1590	1315	1165	965	865	715	640	565	490		
Strands 14*12.5 Bott+2*9.3 TOP ϕMn=76660 Kg.m	3140	2440	1990	1640	1365	1215	990	890	715	640	590	540	465	
Strands 16*12.5 Bott+2*9.3 TOP ϕMn=84180 Kg.m	3240	2515	2040	1690	1415	1240	1040	915	740	665	615	565	515	365

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

Modern CONCRETE All Products

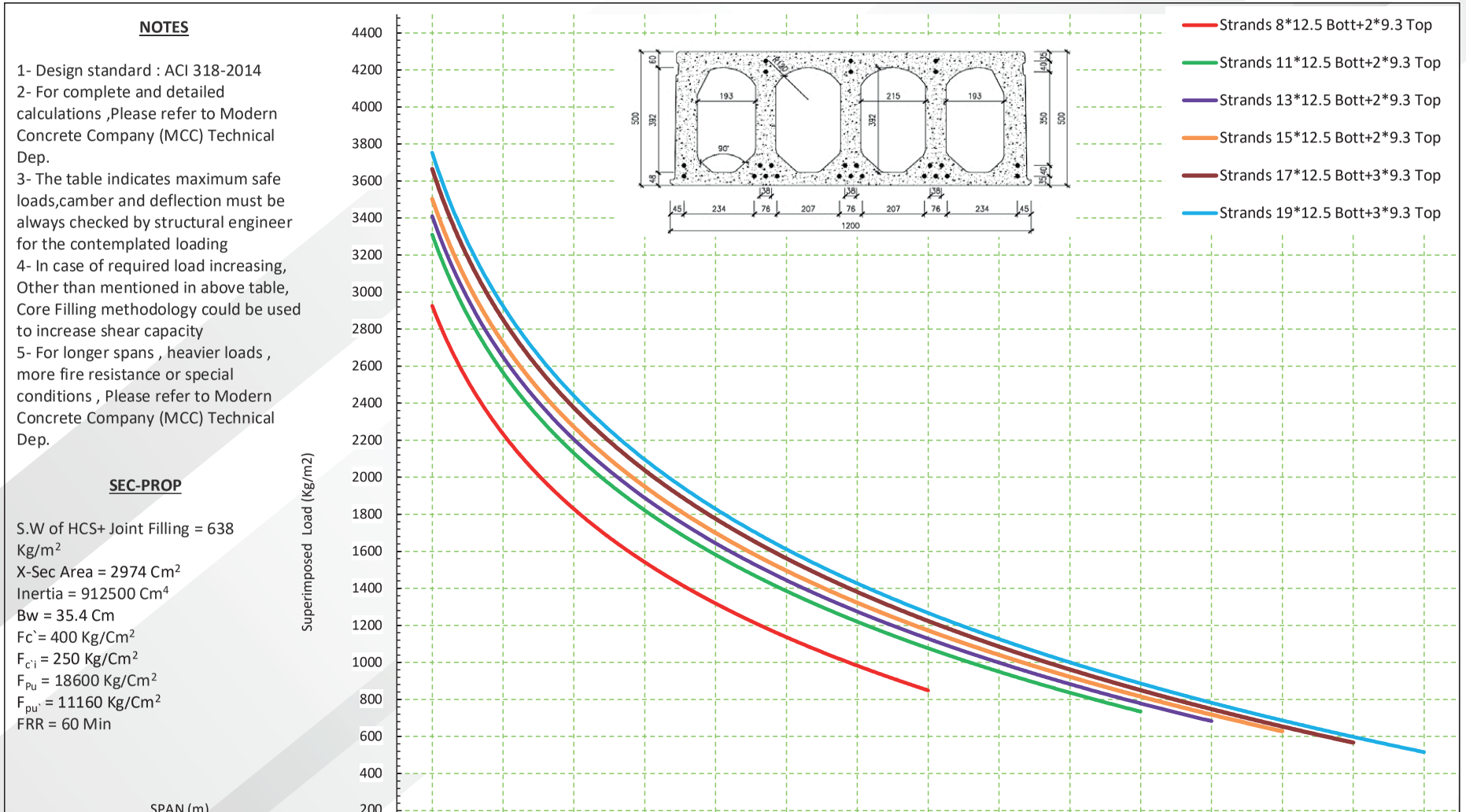
HOLLOW CORE SLAB 500mm

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling = 638 Kg/m^2
X-Sec Area = 2974 Cm^2
Inertia = 912500 Cm^4
Bw = 35.4 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2
FRR = 60 Min



	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
Strands 8*12.5 Bott+2*9.3 Top ϕMn=55360 Kg.m	2905	2455	2030	705	1455	1280	1080	905							
Strands 11*12.5 Bott+2*9.3 Top ϕMn=74720 Kg.m	3205	2630	2205	1855	1580	1405	1210	1080	980	805	655				
Strands 13*12.5 Bott+2*9.3 Top ϕMn=85940 Kg.m	3305	2730	2280	1930	1630	1455	1230	1105	1030	855	780	655			
Strands 15*12.5 Bott+2*9.3 Top ϕMn=96720 Kg.m	3405	2805	2355	1980	1680	1505	1280	1155	1055	880	805	730	630		
Strands 17*12.5 Bott+3*9.3 Top ϕMn=106600 Kg.m	3555	2930	2455	2080	1755	1580	1330	1230	1130	930	800	730	700	530	
Strands 19*12.5 Bott+3*9.3 Top ϕMn=115600 Kg.m	3630	3030	2530	2130	1805	1630	1380	1255	1155	955	830	750	730	630	500

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

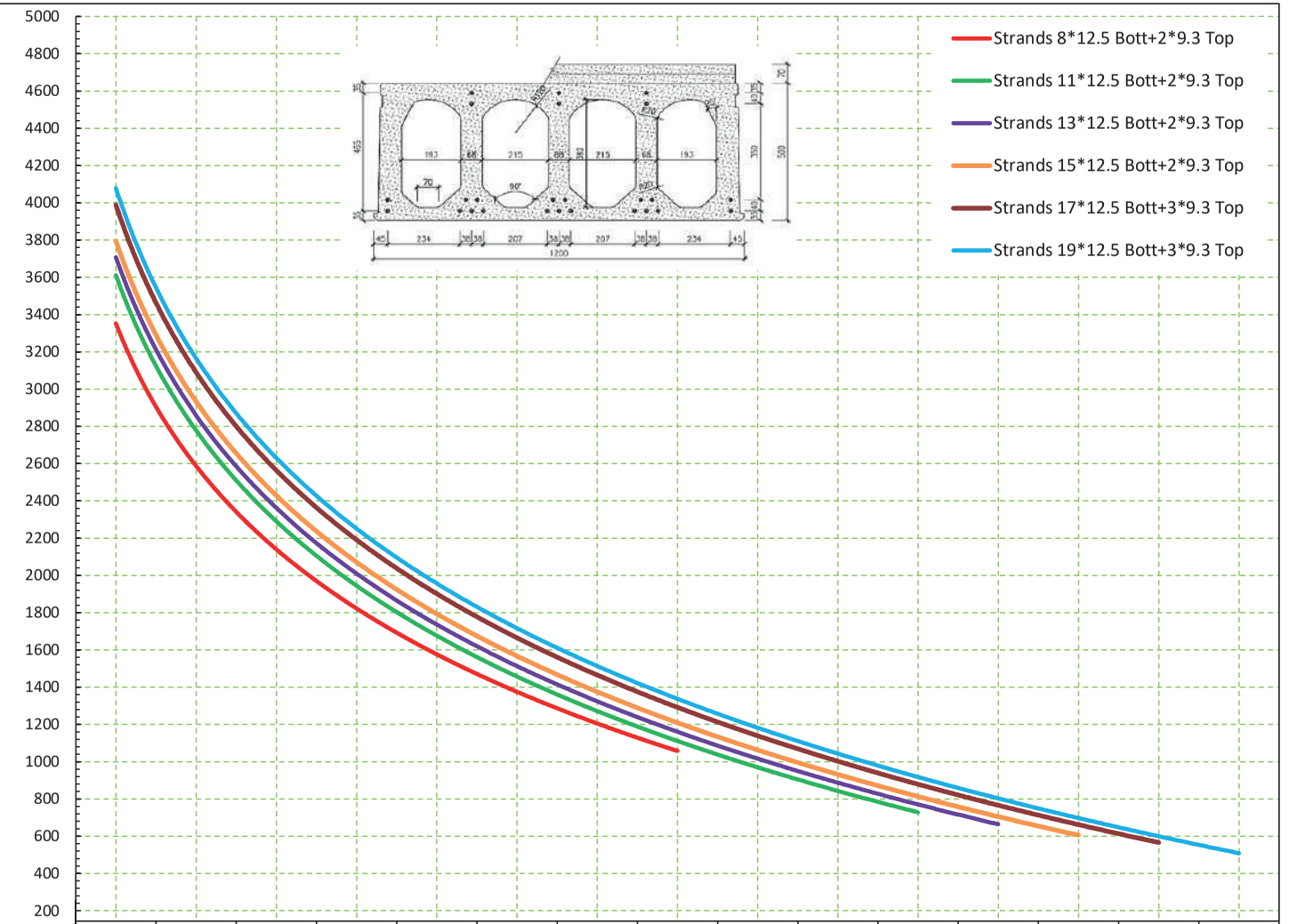
HOLLOW CORE SLAB 500mm+70mm TOPPING

NOTES

1- Design standard : ACI 318-2014
2- For complete and detailed calculations ,Please refer to Modern Concrete Company (MCC) Technical Dep.
3- The table indicates maximum safe loads,camber and deflection must be always checked by structural engineer for the contemplated loading
4- In case of required load increasing, Other than mentioned in above table, Core Filling methodology could be used to increase shear capacity
5- For longer spans , heavier loads , more fire resistance or special conditions , Please refer to Modern Concrete Company (MCC) Technical Dep.

SEC-PROP

S.W of HCS+ Joint Filling+70mm
Topping = 813Kg/m^2
X-Sec Area = 3774Cm^2
Inertia = 1332600 Cm^4
Bw = 35.4 Cm
Fc`= 400 Kg/Cm^2
$F_{c`i}$ = 250 Kg/Cm^2
F_{Pu} = 18600 Kg/Cm^2
$F_{pu`}$ = 11160 Kg/Cm^2
FRR = 60 Min

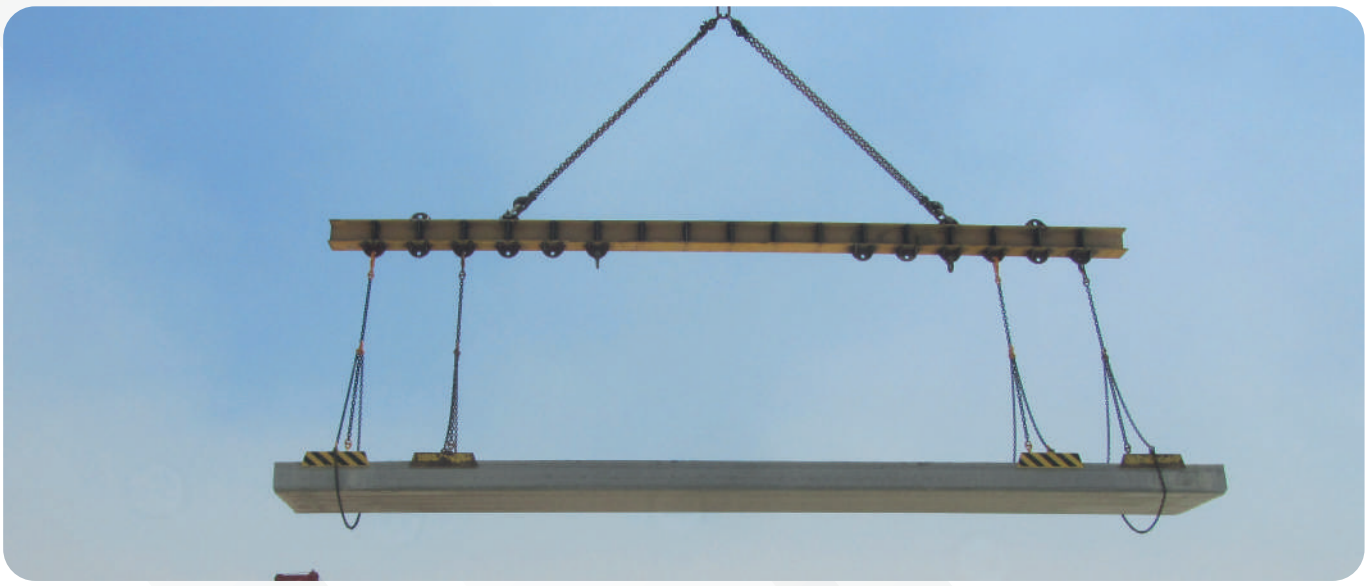


	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	
Strands 8*12.5 Bott+2*9.3 Top ϕMn=62180 Kg.m	3230	2680	2230	1880	1580	1355	1205	955							
Strands 11*12.5 Bott+2*9.3 Top ϕMn=83030 Kg.m	3480	2855	2380	2005	1705	1430	1280	1080	980	855	630				
Strands 13*12.5 Bott+2*9.3 Top ϕMn=95270 Kg.m	3580	2930	2455	2080	1755	1480	1330	1130	1005	905	755	605			
Strands 15*12.5 Bott+2*9.3 Top ϕMn=107100 Kg.m	3655	3030	2530	2130	1805	1530	1380	1155	1055	955	780	705	580		
Strands 17*12.5 Bott+3*9.3 Top ϕMn=118600 Kg.m	3855	3180	2680	2255	1905	1630	1455	1230	1105	1030	830	755	705	555	
Strands 19*12.5 Bott+3*9.3 Top ϕMn=128700 Kg.m	3955	3255	2730	2330	1980	1655	1505	1255	1155	1055	855	780	730	655	505

**SUPERIMPOSED LOAD = LIVE LOAD+ALL ADDITIONAL DEAD LOAD EXCLUDING WEIGHT OF HOLLOW CORE SLABS+JOINT FILLING

Erection process

The erection of the hollow core floor slabs should be done according to the instructions of the design engineer. MCC will supply written statements of the principles of site erection, methods of making structural joints and materials specification on request.
Hollow core slabs are designed for quick and easy installation. However, free access for the mobile crane and delivery truck to the place of erection at site must be provided. Completion of erection without interruption is crucial. Hollow core slabs are easy to install using lifting booms and clamps, Erection belts available from MCC.



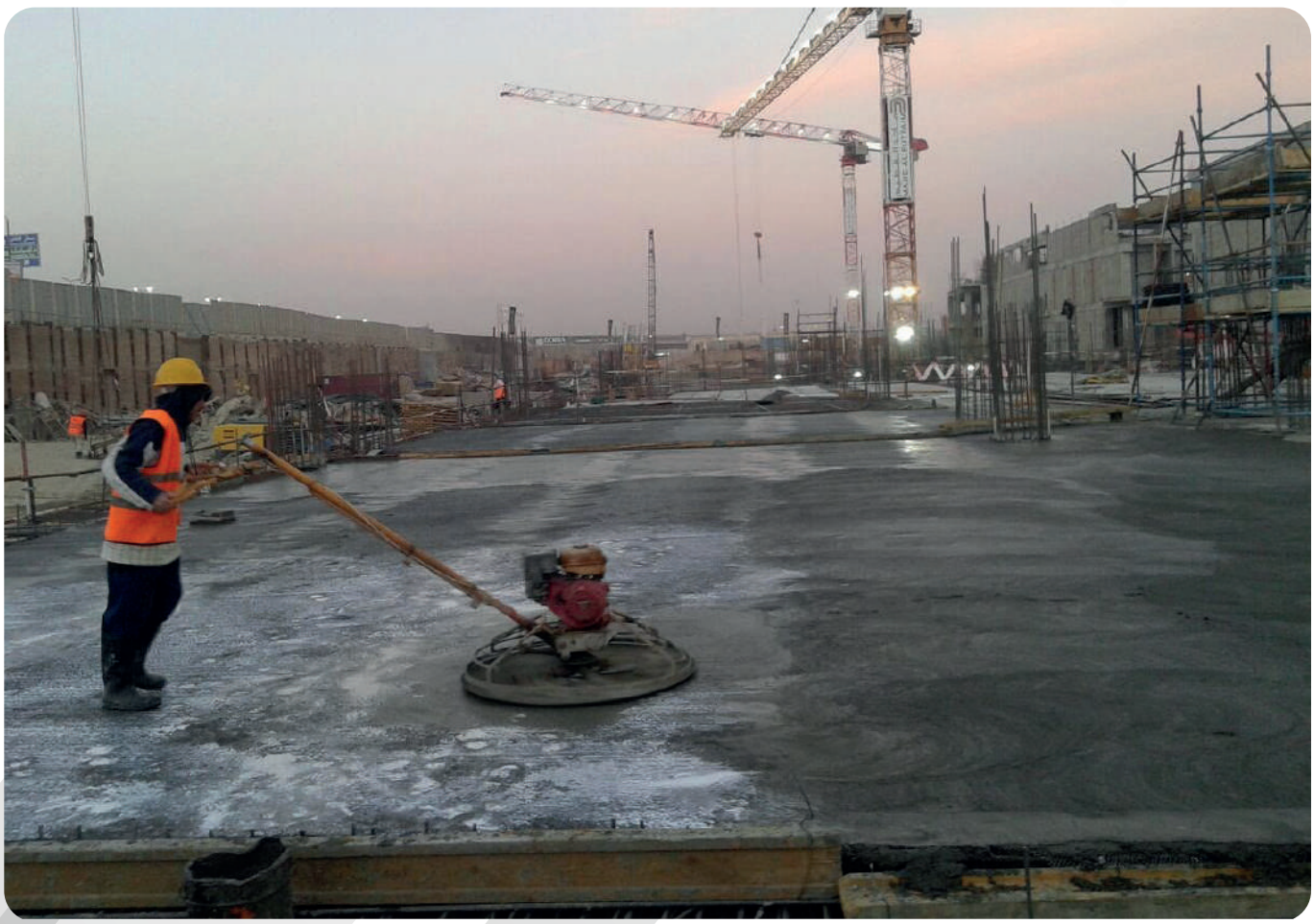
Hollow core slabs lifting using special spreader beam and clamps

Hollow core slabs erection at required place
BEDCO Textile factory - 10th of Ramadan

Top surface finishing

1- Screed:

The longitudinal joints between the floor units should be filled using concrete grade C25 to C35, containing a **10mm maximum size aggregate.** The floor units should be moistened prior to placement of in-situ concrete. The joints should be filled carefully since they fulfill a structural function both in the transversal load distribution and the horizontal floor diaphragm action. When a structural screed is to be used, it is advisable to fill the longitudinal joints immediately prior to the casting of the screed. The workability should be ensured by using concrete with a slump between 120 - 180 mm. The wet concrete should be spread evenly over the floor area as quickly as possible. Mechanical vibrating beams are used to compact the concrete. The screed must be power floated or rough tampered in the usual manner depending on the type of floor finish. The topping screed should contain a shrinkage reinforcement mesh and extraordinary care should be taken to ensure the curing is ensured properly



Casting of screed layer above Hollow core slabs
Almazah City center - Heliopolis

2- Insulation:

1. After finishing the hollow core slabs erection, directly start to fill the longitudinal & transverse joints between slabs with minimum 250 Kg/ cm2 concrete compressive strength.
2. After concrete hardens , start to paint the longitudinal & transverse joints with primary layer , stick membrane slices on the joints slices are usually 250mm wide for longitudinal joints and 500mm for transverse joint & 3mm thickness and overlap not less than 150mm.
3. all membrane slices must be fully torched (using Flame torch).
4. Entire roof must be cleaned and painted with primary layer.
5. Membrane mineral gray sheets (4.5 kg/m2) shall be applied with 100 , 150mm overlap between each two sheets.

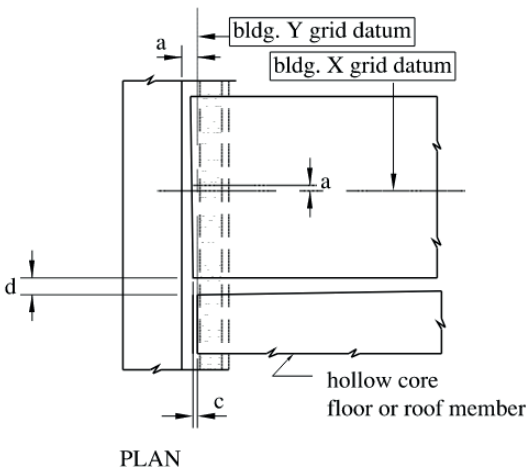
Preparing the joints for concrete filling
Fourtex New weaving hall - Sadat City

Applying the insulation sheets
Baskolita factory - 6 October City

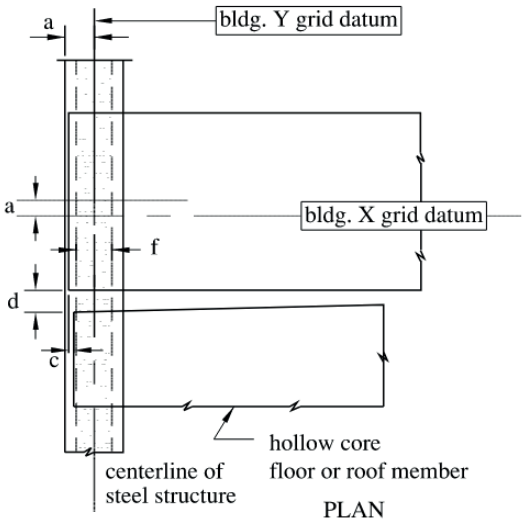
Erection Tolerances

a	=	Plan location from building grid datum	± 1 in
a_1	=	Plan location from centerline of steel*	± 1 in
b	=	Top elevation from nominal top elevation at member ends	
		Covered with topping	± 3/4 in
		Untopped floor	± 1/4 in
		Untopped roof	± 3/4 in
c	=	Maximum jog in alignment of matching edges (both topped and untopped construction)	1 in
d	=	Joint width	
		0 to 40 ft member length	± 1/2 in
		41 to 60 ft member length	± 3/4 in
		61 ft plus	± 1 in
e	=	Differential top elevation as erected	
		Covered with topping	3/4 in
		Untopped floor	1/4 in
		Untopped roof**	3/4 in
f	=	Bearing length*** (span direction)	± 3/4 in
g	=	Differential bottom elevation of exposed hollow-core slabs****	1/4 in

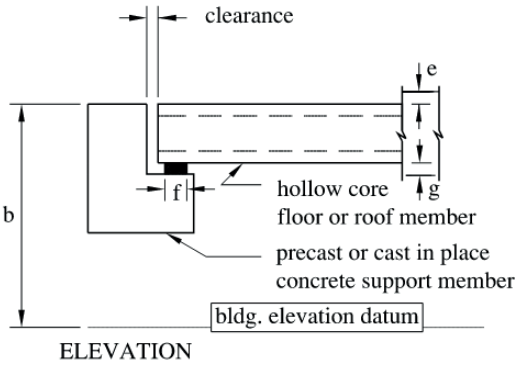
* For precast concrete erected on a steel frame building, this tolerance takes precedence over tolerance on dimension "a".
** It may be necessary to feather the edges to ± 1/4 in to properly apply some roof membranes.
*** This is a setting tolerance and should not be confused with structural performance requirements set by the architect/engineer.
**** Untopped installation will require a larger tolerance here.



PLAN

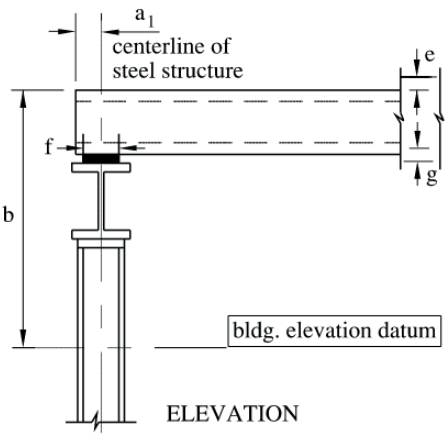


PLAN



ELEVATION

Precast element to precast or
cast-in-place concrete or masonry

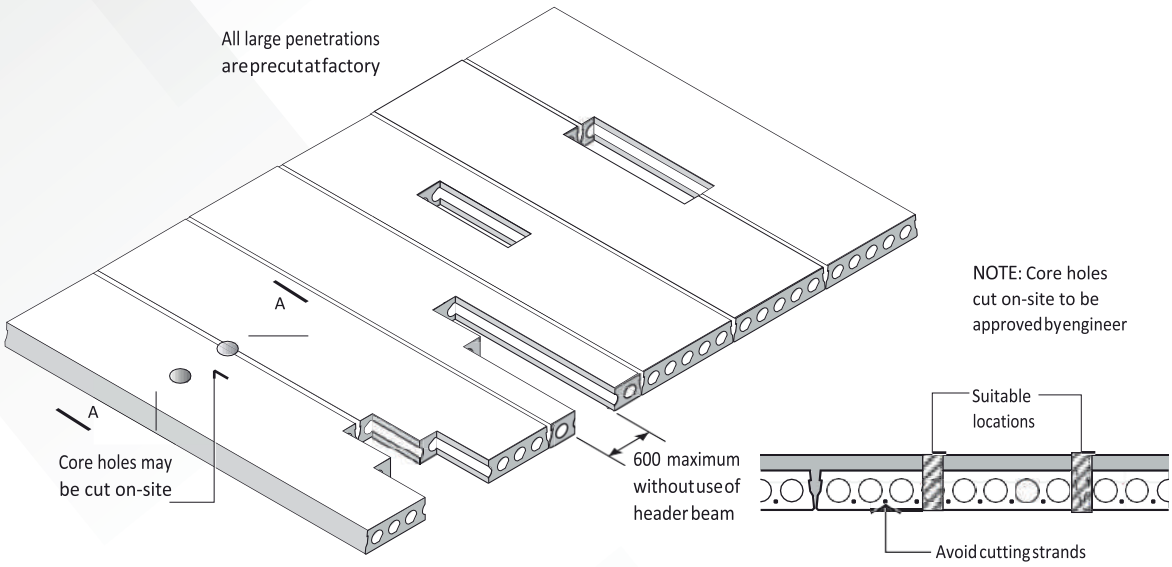


ELEVATION

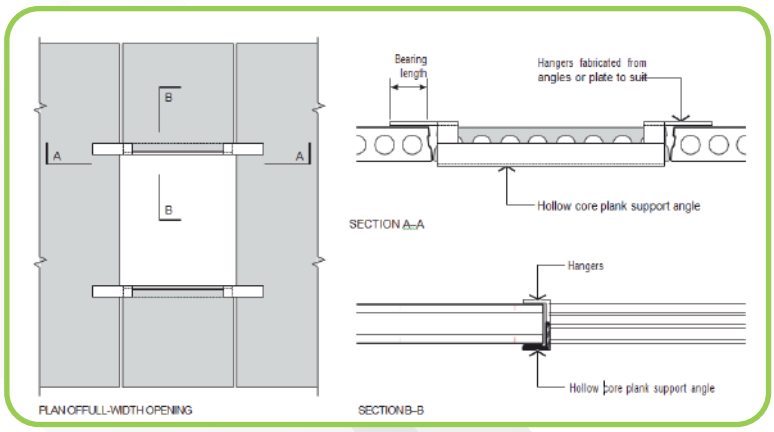
Precast element to structural steel

Openings in Hollow core Slabs

Different sizes of openings can be made into hollow core slabs:



Large opening where one or more slabs are totally cut: The load from the slab(s) with no support will be transferred to the adjacent slabs mainly through the shear keys and through a 'hidden" steel beam (STEEL HANGER)



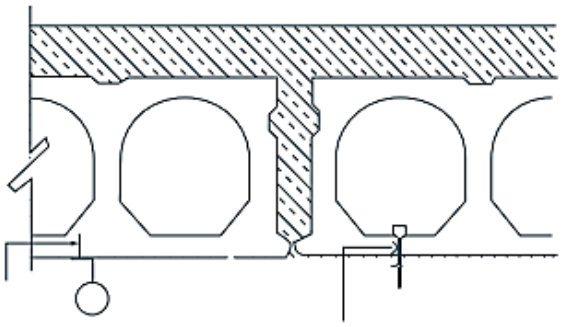
Medium size openings in hollow core slabs are usually made at the factory. The reduced cross section has to be designed to withstand the design loads.

Small openings and recesses can be made at site by diamond tipped coring. Holes may be circular or rectangular. When making holes, great care must be taken not to damage the slab. It is particularly important that the pre-stressing stands are not cut without the permission of MCC Technical department.

Suspension in Hollow core slabs

Light Weight Suspensions:
Lightweight suspensions can be fixed by drilling the fixing to the lower surface of the slab at a hollow core.

Usage
- Electrical conduits and ceiling
- Light duty services e.g. signage,etc.

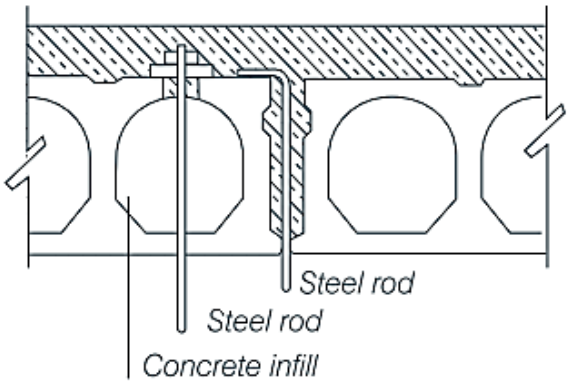


Rawplug Nylon Masonry Anchors or equivalent.

HILTI hollow deck anchor HTW TWIN or equivalent.

Heavy Suspensions:
It is advisable to fix any heavy suspensions to slab interfaces or with a through slab suspension bolt.

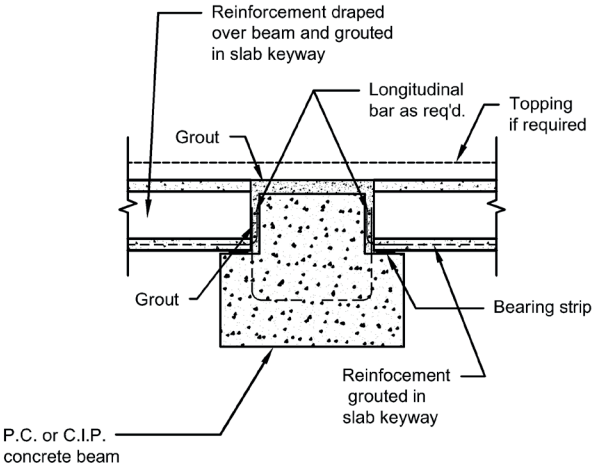
Usage
- Heavy /large equipments (subject to loading by respective nominated sub-contractor for approval).
- Motors (e.g.for smoke-spilled,etc.)

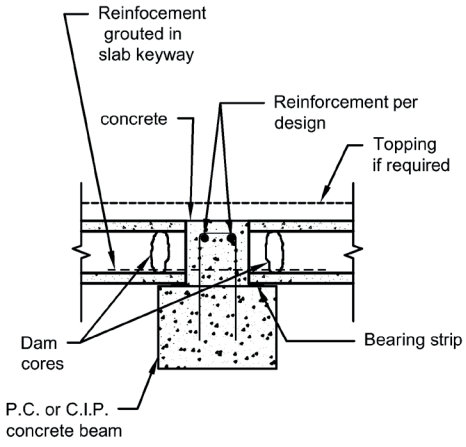


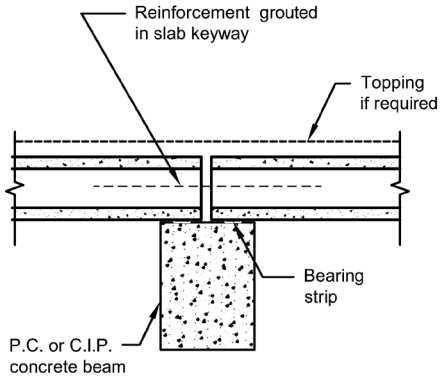
Heavy duty hangers are fixed through the slab and supported from the top of the slab

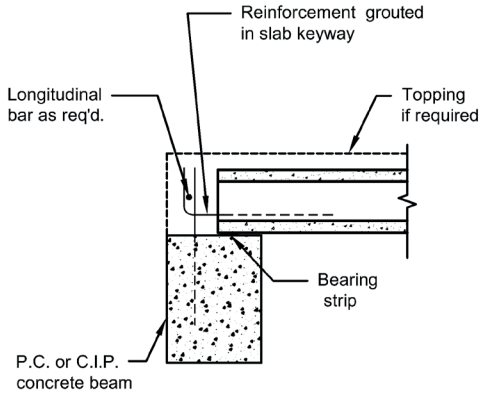
Typical Connection details

1- Concrete beams with hollow core

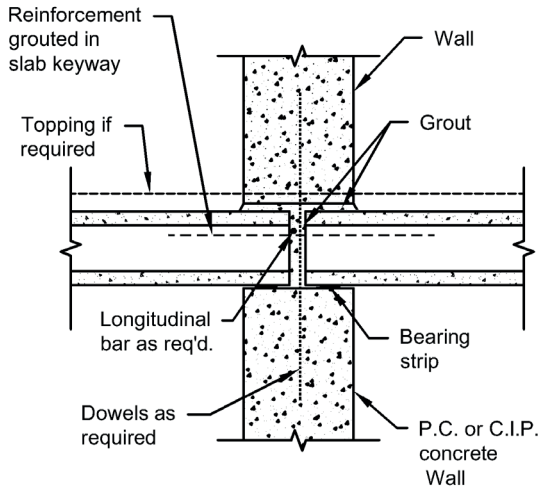


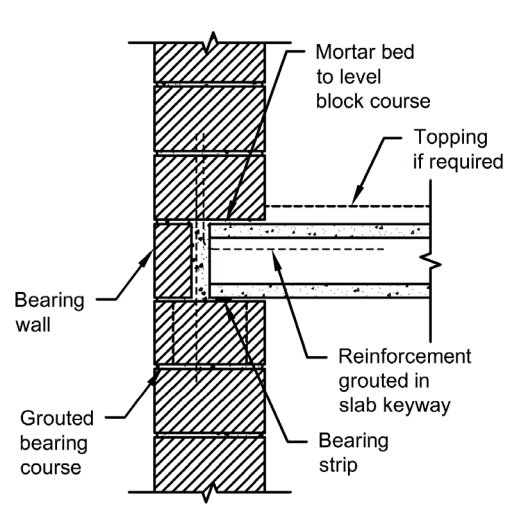


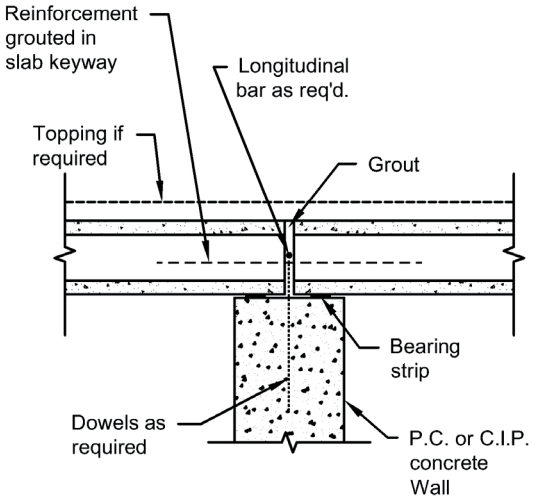


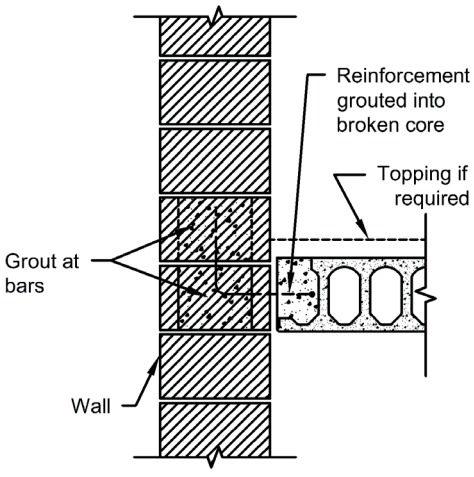


2- Bearing walls with hollow core

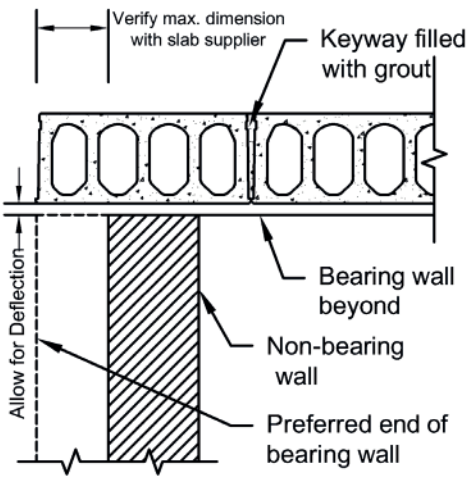


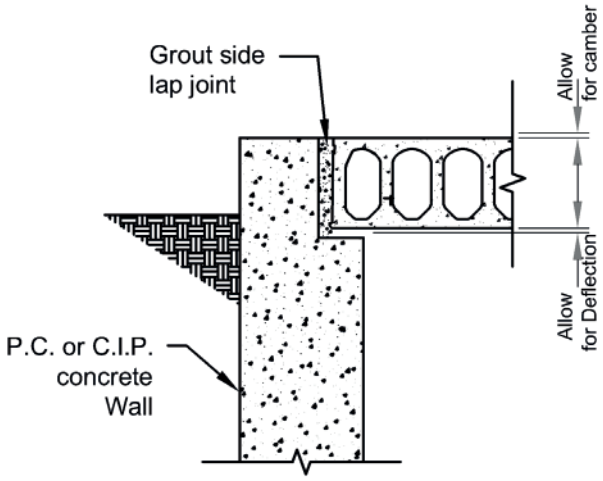




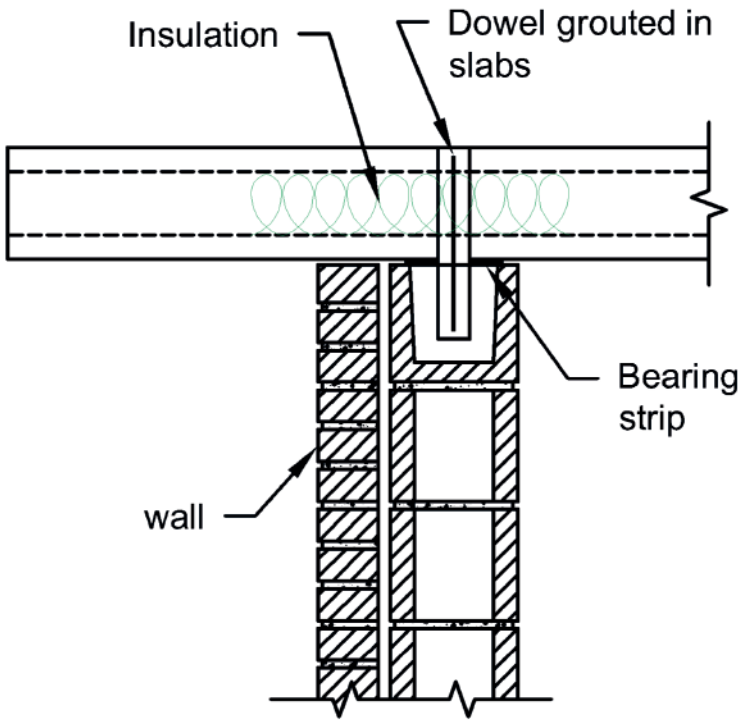


3- Non-bearing wall below hollow core

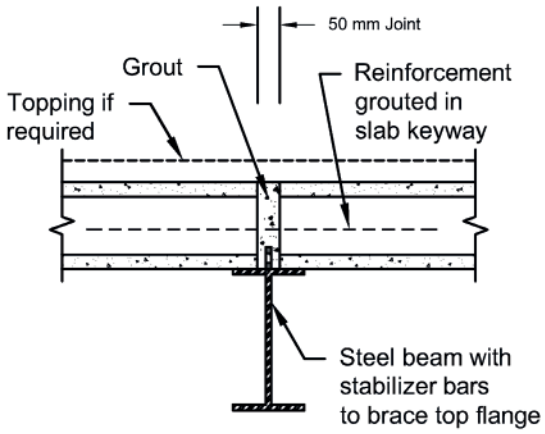


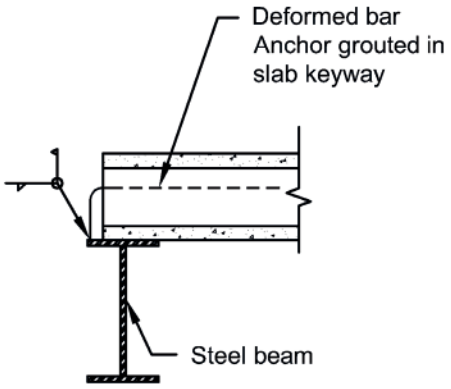


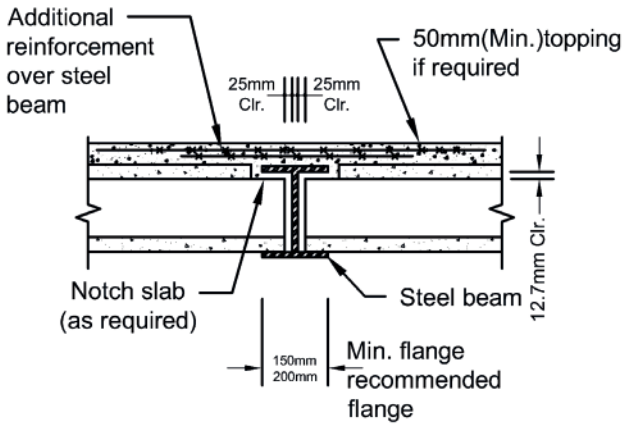
4- Typical cantilever detail



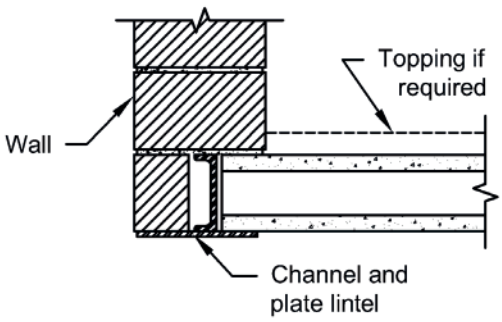
5- Steel Beams with hollow core

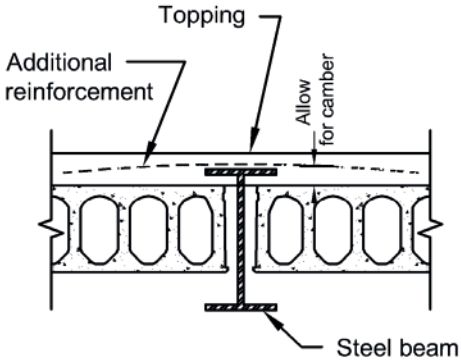


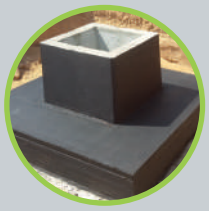




Note:
Difficult erection if this detail occurs at both ends of slab







FOUNDATIONS

COLUMNS

BEAMS

WALLS

DOUBLE T SLABS

HOLLOW CORE SLABS

PRE-STRESSED GIRDERS

SOLID SLABS

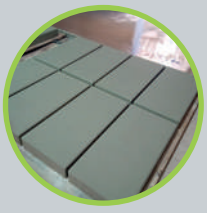
STAIRS

FENCES

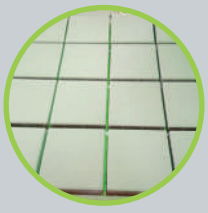
RAFTER

PARKING

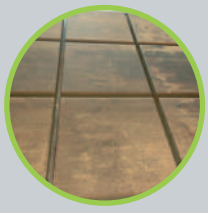
Tiles: 60x60x8cm



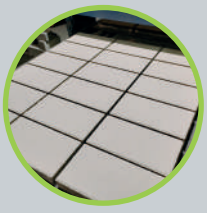
Tiles: 60X30x8cm



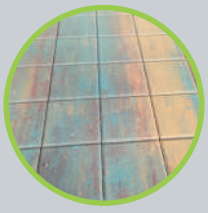
Tiles: 30X30x8cm



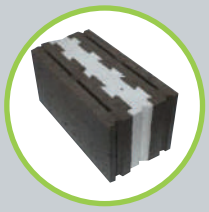
Tiles: 40X40x6cm



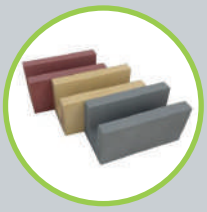
Tiles: 40X20x6cm



Tiles: 20X20x6cm



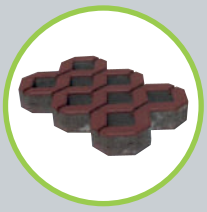
INSULATED THERMO BLOCK



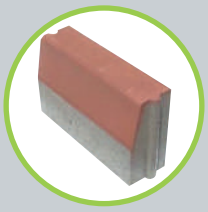
LINTEL BLOCK

HOLLOW BLOCK

SOLID BLOCK



GRASS BLOCK



KERBSTONE

VINEYARD POLES

READY MIX CONCRETE

ISO 9001:2015

ISO14001:2015

ISO 45001:2018

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