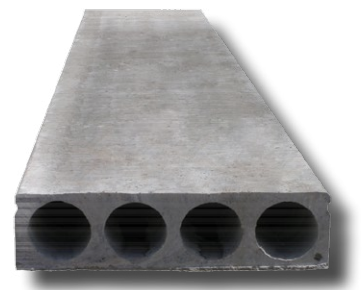




HOLLOWCORE CONCRETE SOLUTIONS



Concrete Hollowcore Solutions

Precast Hollowcore concrete enjoys wide use in various residential, commercial and municipal applications that require a floor or roof system using standard components, which are manufactured in a controlled environment.

The significant benefits of superior fire resistance, sound control, durability and low maintenance, owners and designers alike recognize rapid construction and attractive exterior.

- Hollowcore slabs conform to the current edition of CSA and CPCI related standards.
- Estimated values of cambers and deflections can be supplied upon request
- **For superimposed loads greater than 10 kPa and fire resistance ratings greater than 2 hours, special design requirements and different materials may be required**

Fire Resistance Ratings

- Precast prestressed concrete elements can be provided with any degree of fire resistance that may be required by building codes, insurance companies and other authorities.
- The fire resistance of building assemblies is determined from

standard fire tests as defined by ULC Standard current CAN/ULC-S101 "Standard Methods of Fire Endurance Tests of Building Construction and Materials".

Topping Options (Type S Concrete)	203mm Hollowcore		305mm Hollowcore	
	Equivalent thickness (mm)	Fire Endurance (hours)	Equivalent thickness (mm)	Fire Endurance (hours)
No Topping	113	1.50	150	2.75
15 mm Cementations Topping	128	2.00	165	3.50
50 mm Composite Topping	163	3.00	200	4.00

Table 1 - Fire Endurance Ratings

Sound Insulation Ratings

- Mandatory sounds insulation requirements between adjoining dwellings are generally specified in building codes and equivalent regulations.
- For example: City of Vancouver Building By-Law 6164, requires a Sound Transmission Class (STC) of 50 for all residential suites. It has

been shown by extensive research that the STC rating of various components is related to the surface density of the materials*.

- Class (IIC) is derived from ASTM Standard Method E492, "Laboratory Measurements of Impact Sound Transmission Through Floor Ceiling Assemblies Using the Tapping Machine."

Assembly Normal Density Concrete	203mm Hollowcore			305mm Hollowcore		
	Mass (kg/m ²)	STC	IIC	Mass (kg/m ²)	STC	IIC
Slab Only	310	50	28	380	52	31
Hollowcore Plus Carpet & Pad	314	50	70	384	52	73

Table 2 - Sound Insulation Ratings

For more information see CPCI Metric Design Manual, 4-th Edition, Chapter 6-21

Precast Hollowcore Cross Section

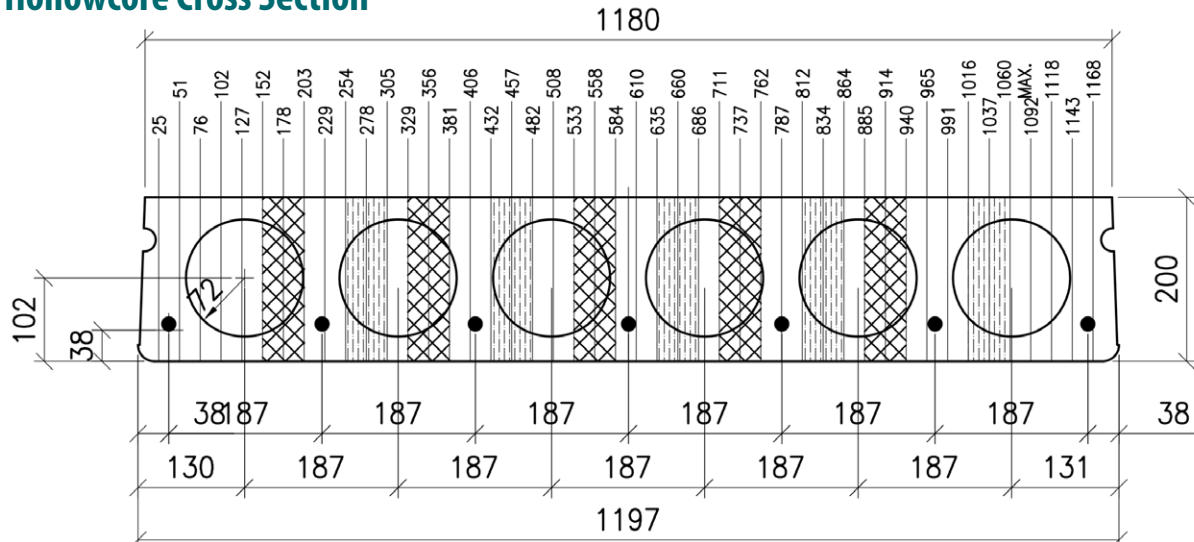


Figure 1 - 203 Deep x 1200 Wide Hollowcore Panel

Slab Section and Material Properties (203 x 1220)

Net Area	138,685 mm ²	Strength of Concrete	40 MPa
Moment of Inertia	683.03 x 10 ⁶ mm ⁴	Strength at Release	28 MPa
Centroid From Slab Bottom	100 mm	Unit Weight of Concrete	2400 kg/m ³
Section Modulus, Top	6830 x 10 ³ mm ³	Ultimate Steel Strength	1860 MPa
Section Modulus, Bottom	6830 x 10 ³ mm ³	Strand Jacking Stress	1302 MPa
Web Width	314 mm	Strand Type	Low Relaxation
V/S Ratio	52.2 mm	Grout Joint Requirements	241 m ² /m ³
Self Weight (May Vary)	3.0 kN/m ²		

Table 3 - The above properties vary, please contact Expocrete for other sections, material's properties and structural



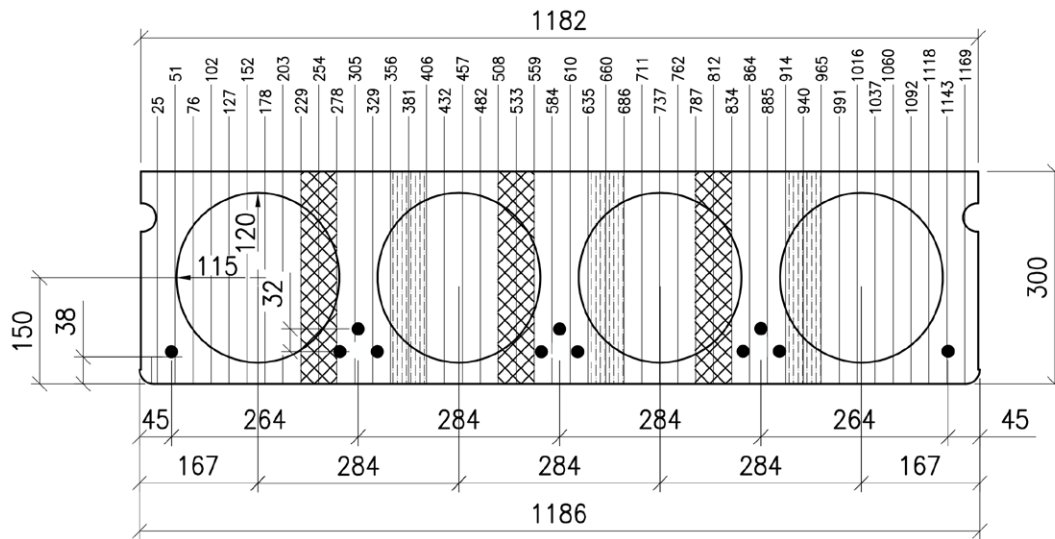


Figure 2 - 305 Deep x 1200 Wide Hollowcore Panel

Slab Section and Material Properties (305 x 1220)

Net Area	165,511 mm ²	Strength of Concrete	40 MPa
Moment of Inertia	2,049.8 x 10 ⁶ mm ⁴	Strength at Release	28 MPa
Centroid From Slab Bottom	150 mm	Unit Weight of Concrete	2400 kg/m ³
Section Modulus, Top	13,665 x 10 ³ mm ³	Ultimate Steel Strength	1860 MPa
Section Modulus, Bottom	13,665 x 10 ³ mm ³	Strand Jacking Stress	1302 MPa
Web Width	200 mm	Strand Type	Low Relaxation
V/s Ratio	59.7 mm	Grout Joint Requirements	134 m ² /m ³
Self Weight (May Vary)	3.9 kN/m ²		

Table 4 - The above properties vary, please call Expocrete for other sections, material's properties and structural capacities.

LEED Points Information

The hollowcore slab produced by Expocrete and associated materials can be applied for LEED rating credits. The following information can be used as a guideline for potential LEED credits. Each project will require job-specific calculation.

Aggregate in concrete mix	Used within 100 miles of quarry location
Korolath Bearing Pads (placed at plank bearing ends)	10% - 60% Post Consumer Recycled Content
Precast-Prestress Hollowcore slabs	Reduce heat required in construction site specially in winter time.
Prestress Low relaxation strand reinforcing contains	1-10% of recycled content
Precast product shipping	Usually within 800 km radius of our plant location

Note: All components of our concrete mix are manufactured within 300 miles of our plant. Information on all suppliers, locations, and letters of recycled content are available upon request. Expocrete will not accept any liability or responsibility on grants in LEED Points.

Hollowcore 1200 x 203

- Loads shown below for uniformly distributed, superimposed not factored
- Openings, point or line loads, snow drifts, etc should be considered in design and are not included in the table below
- CPCI and National Building Code latest revision governs
- Data below does not include any allowance for
- **The information below is for guideline purposes** - accurate design must be carried out to determine panels capacity
- Panel resistance to shear, flexural torsion must be calculated before using the data below

Table Of Superimposed Service Load (kN/m²) and Cambers (mm) - No Topping

Strand Pattern	e _e ⁽¹⁾ e _c	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10	
3-13mm Ø	57	13.4	10.5	8.3	6.6	5.3	4.3	3.4	2.8	2.8				
		0	0	0	0	0	0	0	0	0	-10			
		0	0	0	0	0	0	0	0	0	-10			
4-13mm Ø	57		*	11.4 9.2	7.5	6.2	5.1	4.2	3.5	2.8	2.3			
			*	10 10	10	10	10	0	0	0	0	-10		
			*	10 10	10	0	0	0	-10	-10	-20			
5-13mm Ø	57				11.4	9.4	7.7	6.4	5.3	4.4	3.7	3.0	2.5	
					10	10	10	10	10	10	10	10	0	0
					10	10	10	10	10	10	0	0	-10	-20
6-13mm Ø	57				13.3	10.9	9.1	7.6	6.4	5.4	4.5	3.8	3.2	
					10	10	10	10	10	10	10	10	10	10
					10	20	20	20	20	10	10	10	0	-10

Table 5 - Source: CPCI Design Manual 4th Edition.

Table Of Superimposed Service Load (kN/m²) And Cambers (mm) - 50mm Nominal Density Fully Bonded

Strand Pattern	e _e ⁽¹⁾ e _c	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10	
3-13mm Ø	57		13.1	10.3	8.1	6.5	5.0	3.7	2.6					
			0	0	0	0	0	0	0	0				
			0	0	0	0	0	0	-10	-20				
4-13mm Ø	57		*	11.4 9.2	7.5	6.2	5.1	4.2	3.5	2.8	2.3			
			*	10 10	10	10	10	0	0	0	0	-10		
			*	10 10	10	0	0	0	-10	-10	-20			
5-13mm Ø	57				11.4	9.4	7.7	6.4	5.3	4.4	3.7	3.0	2.5	
					10	10	10	10	10	10	10	10	0	0
					10	10	10	10	10	10	0	0	-10	-20
6-13mm Ø	57				13.3	10.9	9.1	7.6	6.4	5.4	4.5	3.8	3.2	
					10	10	10	10	10	10	10	10	10	10
					10	20	20	20	20	10	10	10	0	-10

Table 6 - Source: CPCI Design Manual 4th Edition.

Hollowcore 1200 x 305

- Loads shown below for uniformly distributed, superimposed not factored
- Openings, point or line loads, snow drifts, etc should be considered in design and are not included in the table below
- CPCI and National Building Code latest revision governs
- Data below does not include any allowance for
- **The information below is for guideline purposes** - accurate design must be carried out to determine panels capacity
- Panel resistance to shear, flexural torsion must be calculated before using the data below

Table Of Superimposed Service Load (kN/m²) and Cambers (mm)

Strand Pattern	e _e ⁽¹⁾ e _c	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5			
5-13mm Ø	108		12.1	10.3	8.7	7.4	6.4	5.4	4.6	3.9	3.3	2.8	2.4									
			10	10	10	10	10	10	10	0	0	0	-10	-10								
			10	10	10	10	10	0	0	0	-10	-10	-20	-20								
6-13mm Ø	108		*	12.5	10.7	9.2	8.0	6.9	5.9	4.4	3.8	3.2	2.7	2.2								
			*	10	10	10	10	10	10	0	0	0	-10	-10								
			*	10	10	10	10	10	10	10	0	0	-10	-20	-20	-30						
7-13mm Ø	108				12.6	10.9	9.4	8.2	7.1	6.1	5.3	4.6	4.0	3.4	2.9	2.4						
					20	20	20	20	20	10	10	10	10	10	0	0	-10					
					20	20	20	20	10	10	10	10	0	0	-10	-10	-20					
8-13mm Ø	108					12.3	10.7	9.3	8.1	7.1	6.2	5.4	4.7	4.1	3.6	3.1	2.6					
						20	20	20	20	20	20	20	10	10	10	0	0					
						20	20	20	20	20	20	20	10	10	0	-10	-20	-30				
9-13mm Ø	108						11.4	10.0	8.8	7.7	6.8	6.0	5.3	4.6	4.0	3.5	3.0	2.6				
							20	20	20	20	20	20	20	20	10	10	0	0				
							30	30	30	20	20	20	10	10	0	-10	-20	-30				

* CPCI 4th Edition

Table Of Superimposed Service Load (kN/m²) and Cambers (mm) - 50 mm Nominal Density Fully Bonded Topping

Strand Pattern	e _e ⁽¹⁾ e _c	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5		
5-13mm Ø	108			11.4	9.6	8.1	6.9	5.7	4.6	3.7	2.9	2.2									
				10	10	10	10	10	0	0	0	-10									
				10	10	0	0	0	-10	-10	-20	-20									
6-13mm Ø	108				12.1	10.2	9.6	7.2	6.0	4.9	4.0	3.2	2.5								
					10	10	10	10	10	10	0	0	0								
					10	10	10	10	0	0	-10	-10	-20								
7-13mm Ø	108					12.0	10.2	8.7	7.3	6.2	5.2	4.3	3.5	2.8	2.2						
						20	20	20	10	10	10	10	10	0	0						
						20	10	10	10	10	0	0	-10	-20	-30						
8-13mm Ø	108						11.8	10.1	8.6	7.4	6.3	5.3	4.5	3.7	3.0	2.4					
							20	20	20	20	20	20	10	10	10	0					
							20	20	20	20	10	10	0	-10	-20	-30					
9-13mm Ø	108						11.8	10.3	8.9	7.8	6.8	5.9	5.1	4.3	3.6	3.0	2.5				
							20	20	20	20	20	20	20	20	10	10	0				
							20	20	20	20	20	10	10	0	-10	-20	-30				

Key 12.5 - Superimposed (service) load, kN/m²

10 - Estimated camber at erection, mm

10 - Estimated long-time camber, mm

* CPCI 4th Edition

Connections Details

All connection illustrations below are used for concept design only.

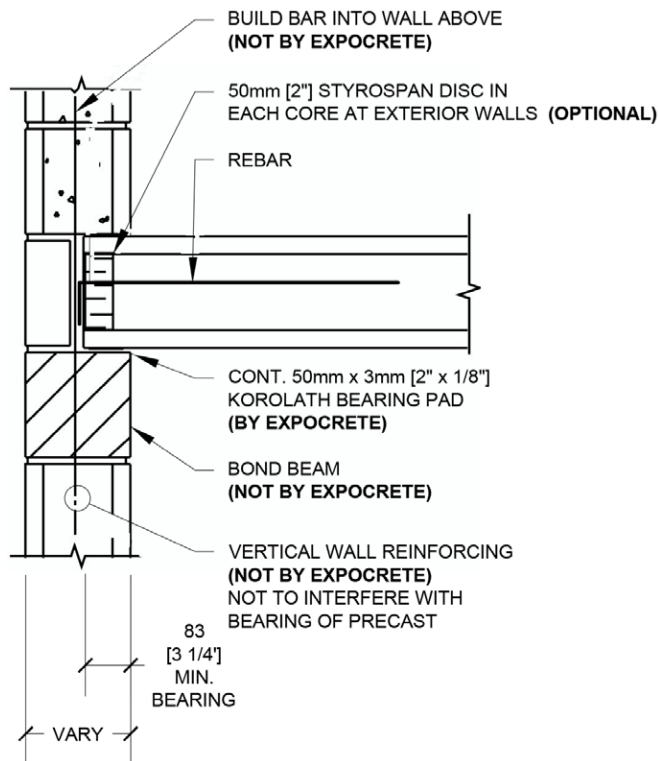


Figure 3 - End Bearing On Block - Half Bearing - Tie Up (Scale - N.T.S.)

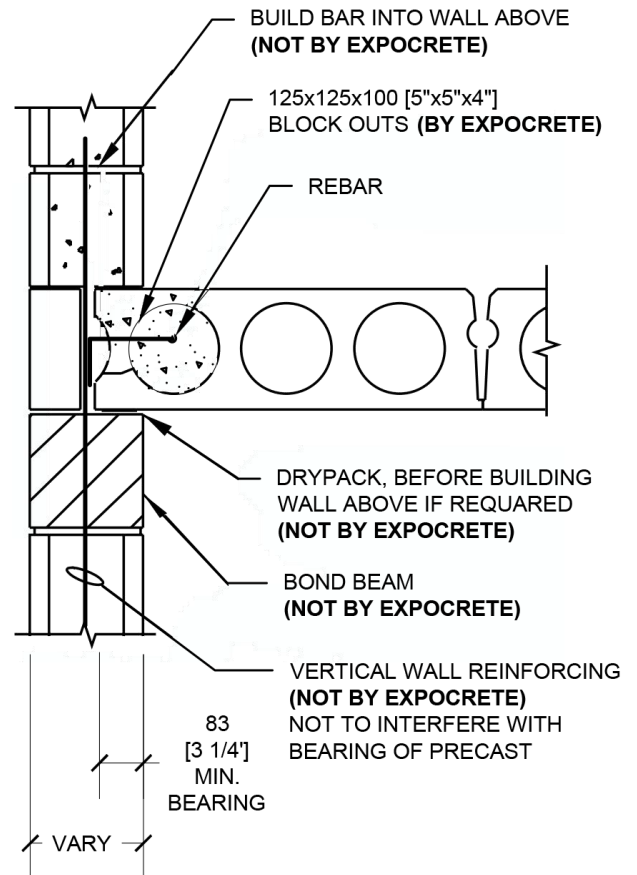


Figure 5 - Side Bearing On Block - Half Bearing - Tie Up (Scale - N.T.S.)

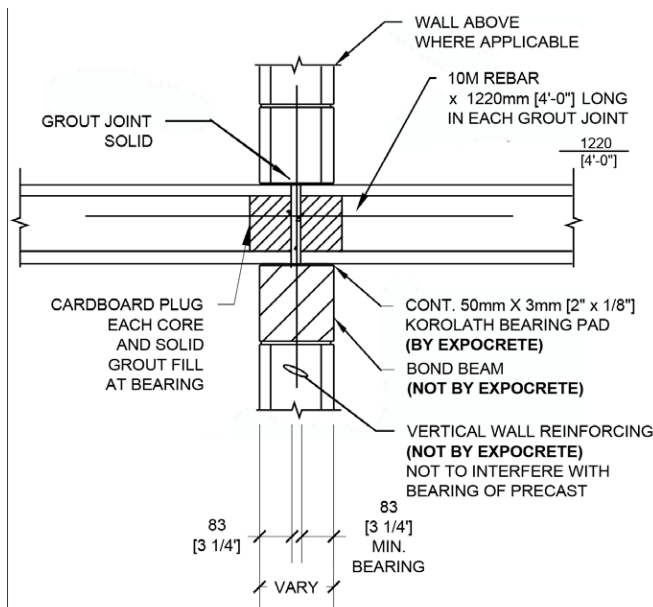


Figure 4 - End Bearing On Block - Abutting - Tie Across (Scale - N.T.S.)

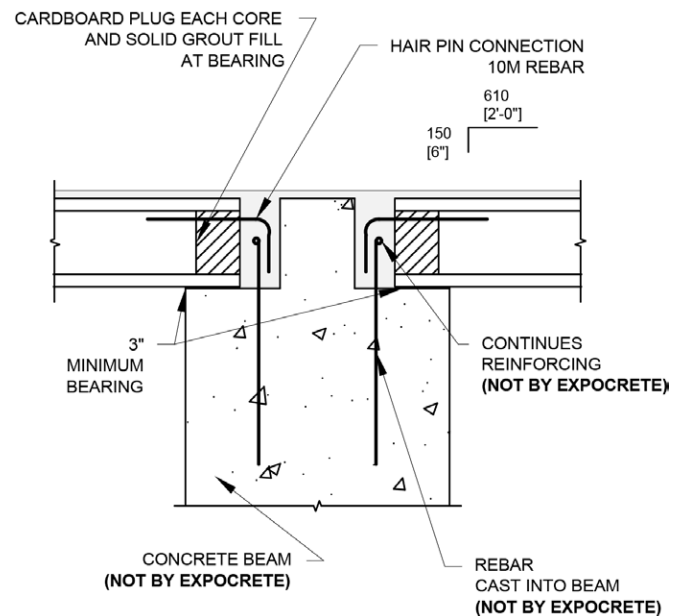


Figure 6 - Precast Slab Bearing On Concrete Beam

Connection Details

All connection illustrations below are used for concept design only.

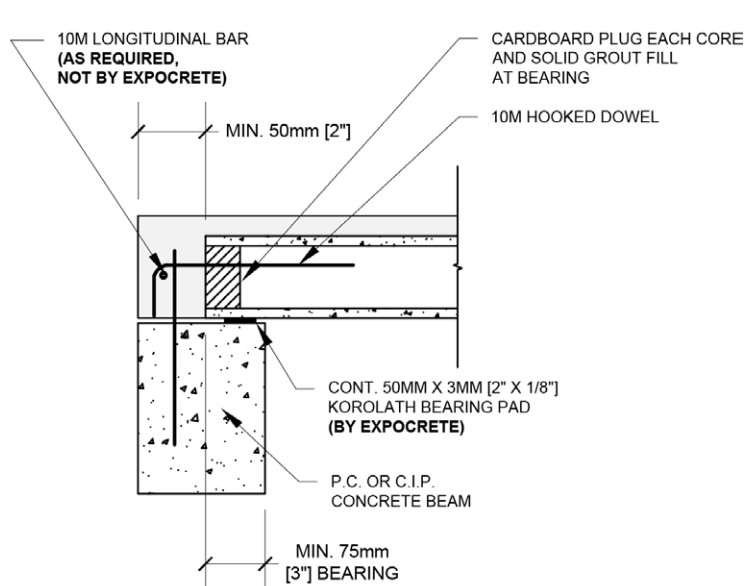


Figure 7 - End Bearing On P.C. OR C.I.P. Concrete Beam (Scale - N.T.S.)

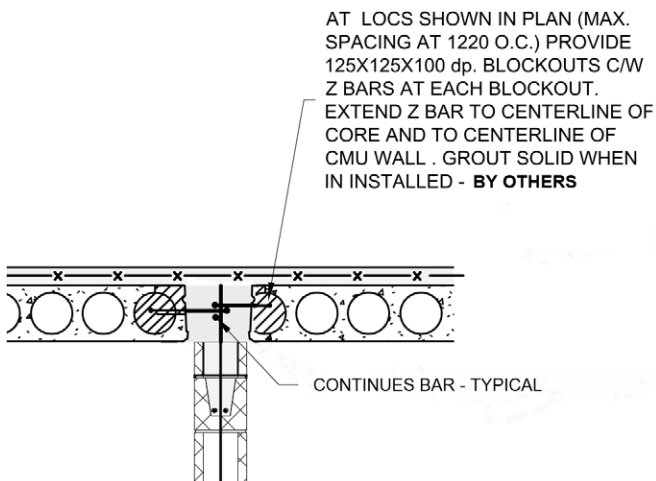


Figure 8 - Interior Hollowcore Parallel to CMU (Scale - N.T.S.)

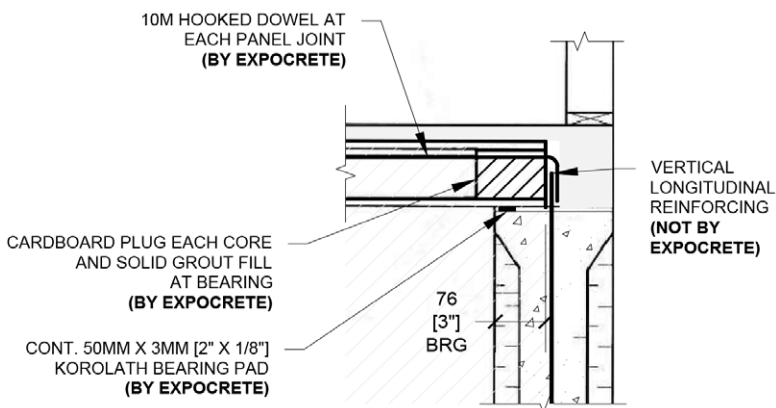


Figure 9 - Masonry / ICF Foundation (Scale - N.T.S.)

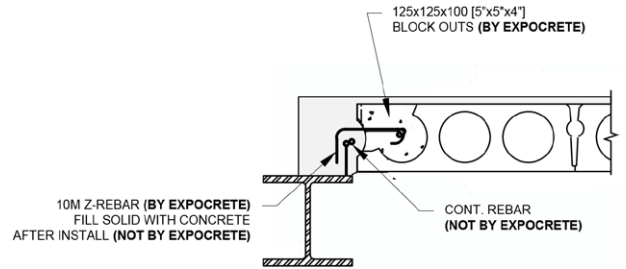
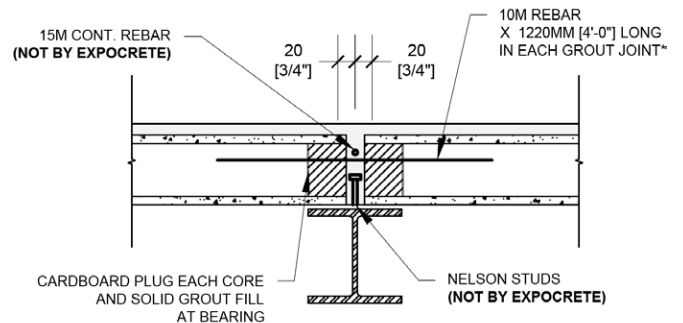


Figure 10 - Side Bearing On Beam - Half Bearing (Scale - N.T.S.)



* WHERE JOINTS NOT UNTENURED PROVIDE 10M HOOKED DOWELS

Figure 11 - End Bearing On Beam (Scale - N.T.S.)

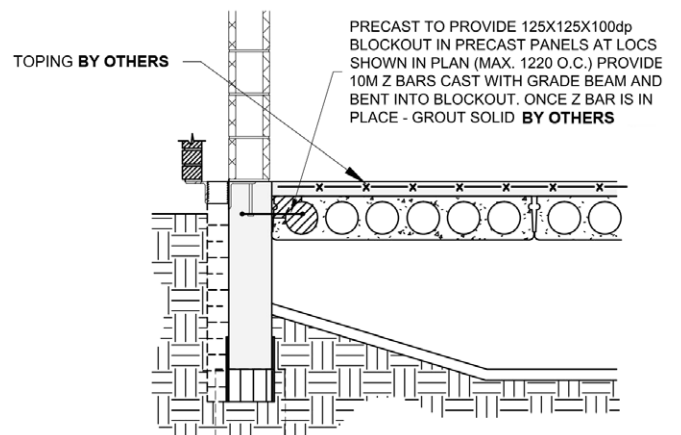


Figure 12 - Grade Beam - Parallel to Hollowcore (Scale - N.T.S.)

**** All connections shown are to be used for concept design only.**

Hollowcore Installation Guidelines

Please follow the following procedures for Hollowcore installation process:

Organization

Be sure to inform Expocrete of the sequence of installation prior to Hollowcore production in order to ensure that slabs are produced and stockpiled in the appropriate order.

Before Requesting Site Delivery

- Clarify that the site dimensions and details are in accordance with Expocrete drawing. Always read Expocrete drawing in conjunction with Architectural and Structural drawings.
- Ensure that bearing surfaces are smooth, flat and level and that they are within $\pm 6\text{mm}$ in 6m.
- Be sure that all the other materials that are required for the installation process of the Hollowcore are available.
- Obtain a record approval of the stability of the supporting structure from engineer.

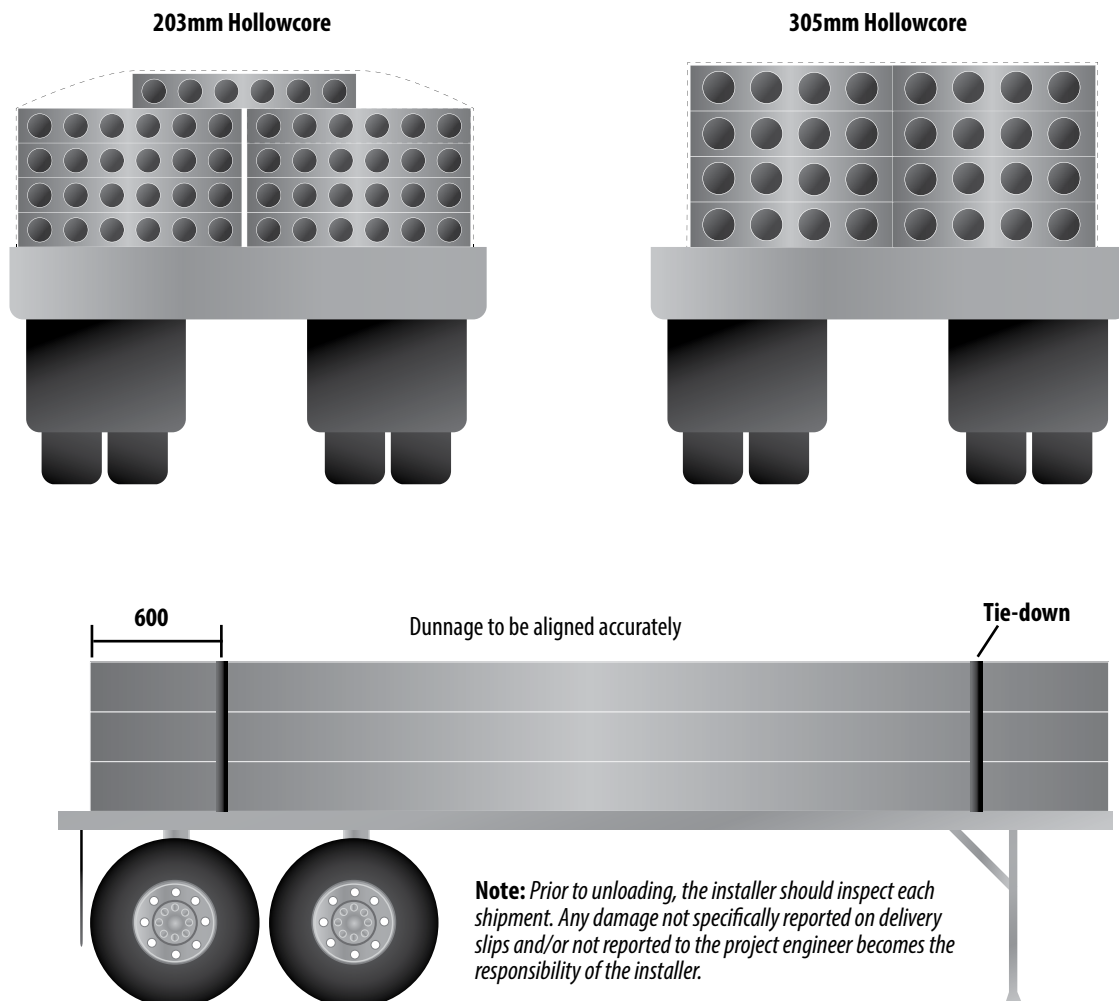
Delivery Notice

- Always provide seven (7) working days delivery notice to the shipper.

Transportation

- The diagram below illustrates the maximum loading pattern on high-bed trailers
- Load may also be governed by legal trailer capacity and slab geometry
- Offloading sequence may differ slightly from the shipping list due to the slab geometry
- Irregular slabs are placed on top of the load
- Prior to unloading, the installer should inspect each shipment
- Any damage not specifically reported on delivery slips and/or not reported to the project engineer becomes the responsibility of the installer
- Stockpiling at the site may be necessary - use full width 4"x4" dunnage placed on stable level ground. Separate the slab with full width 2"x4" dunnage. Maximum stockpile for 203 mm Hollowcore.

Diagram 1 - Load Illustrations



is 6 slabs, and for 305 mm for 4 slabs

- Keep the dunnage accurately aligned from slab to slab

Installation

- Hollowcore slabs are to be located and installed in accordance with Expocrete drawings
- Minimum end bearing is 75mm unless specified otherwise on drawings
- Keep slab joint widths uniform

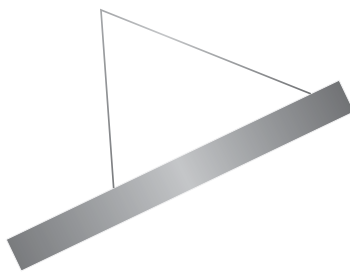
Hoisting

- Use lifting devices (clamps, belts, chokers, forks) of adequate capacity with minimum safety factor 5:1
- Clamps should be used only with spreader bar. The slab shall be lifted with lines vertical. If this cannot be accomplished, then belts or chokers should be used instead of clamps.
- On slabs less than 4 feet wide, use belts or chokers; do not use clamps

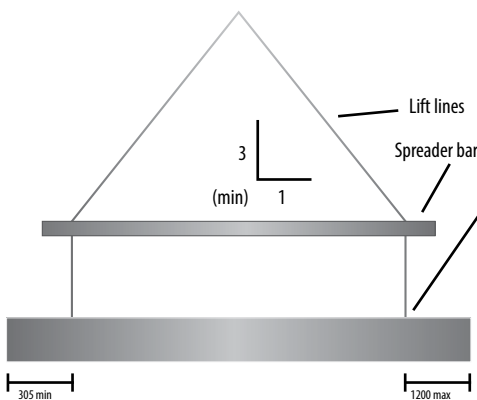
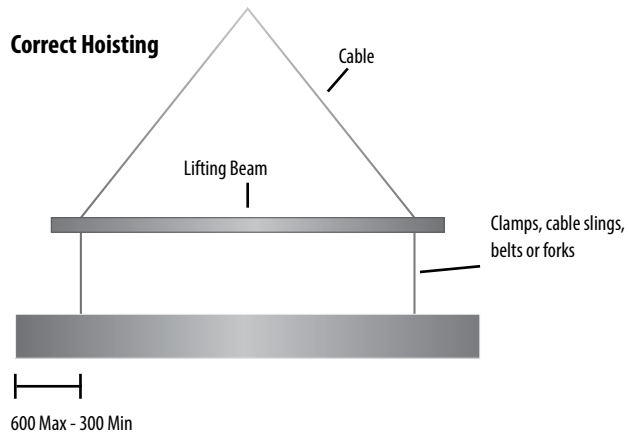
- Balance load to avoid slipping and to eliminate twist on clamps or belts
- When using clamps, ensure that the clamp edges fit properly against sound concrete grooves insides of slab, after crane has taken load but before hoisting.
- Blocking for stockpile, same location as lifting
- Refer to shop tickets for slab weight
- Hoist only one slab at a time
- Always use safety slings when hoisting with clamps or forks
- Never use Hollowcore as a platform for hoisting people or materials
- Never hoist slabs by hooking into cores
- Never turn slabs on edge or upside-down
- Hand Trap - ever put hands in cores or between slabs. Handle only from top surface or with lifting gear.
- For special conditions or concerns of safety, contact Expocrete before hoisting

Diagram 2 - Proper Installation

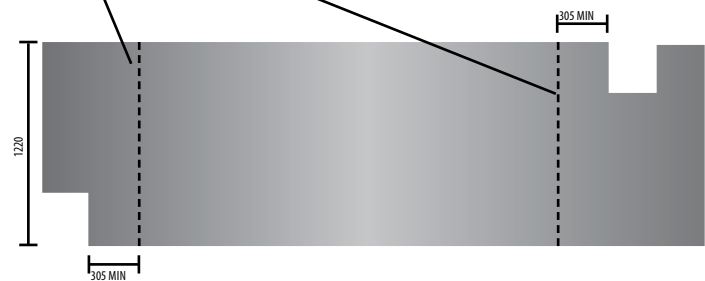
Incorrect Hoisting



Correct Hoisting



Use Belt, choker or clamp



Grouting

- Remove all debris from joints
- Grouting Materials - unless specified otherwise, they consist of sand/cement mix. Minimum 28 days strength is 25MPa with an air content of 3% to 6%.
- Camber may occur in Hollowcore slab and will vary with slabs age, span, reinforcing and loading conditions
- Different camber can be minimized by shoring slabs prior to grouting by others
- Cold weather grouting procedures to be in accordance with CSA A23.1. Until the grout has reached adequate strength, full load capacity may not be assumed.

Field Cut Openings

- Round holes in the location and the maximum sizes are showing in the diagrams below may be cut in the field.
- Approval must be obtained from Expocrete if:
 1. More than 3 holes are to be placed across the slab in one location through core space .
 2. The holes are larger than showing in the diagrams
 3. The holes are within 1/5 of the slab length measured from the bearing point
 4. Webs must be cut to accommodate openings.
- Core-drilling is recommended for all the holes.

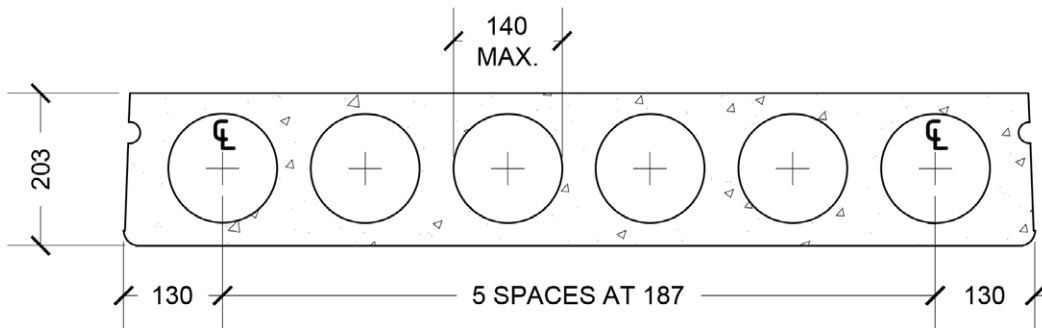


Figure 13 - 203mm Hollowcore

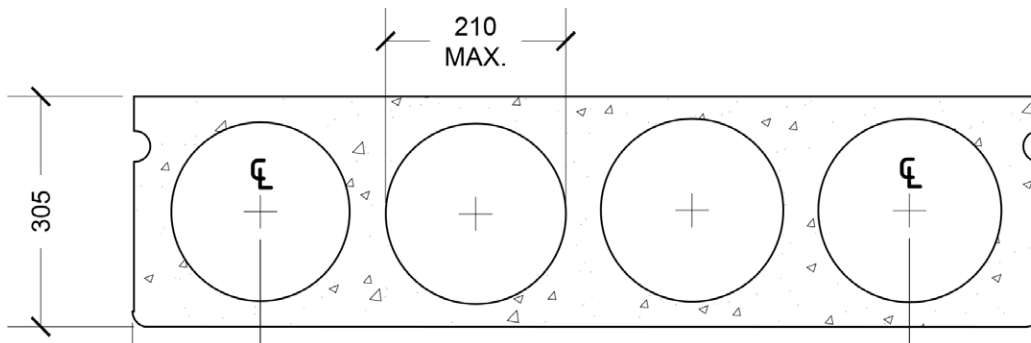


Figure 14 - 305mm Hollowcore

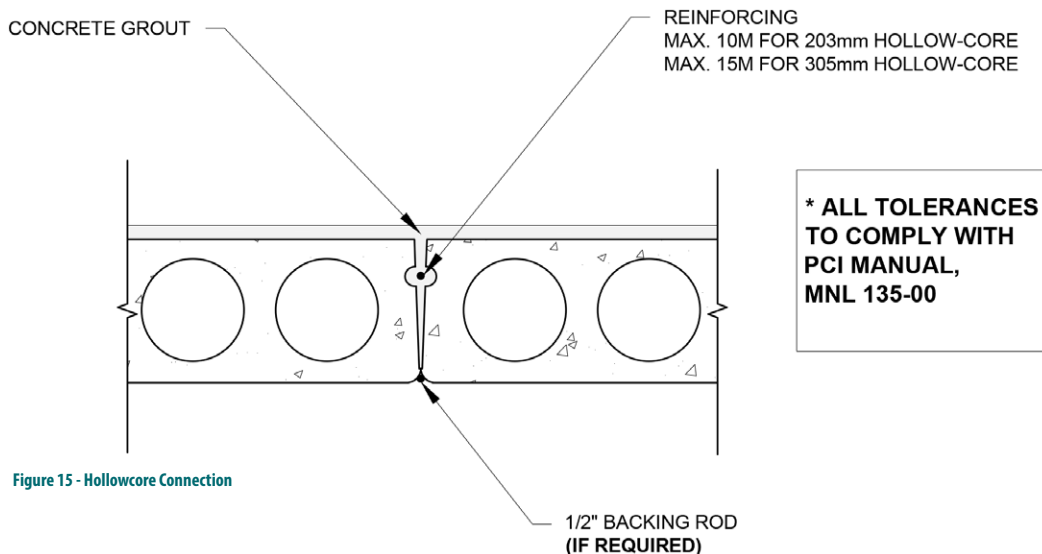


Figure 15 - Hollowcore Connection

*** ALL TOLERANCES TO COMPLY WITH PCI MANUAL, MNL 135-00**



- Sales/Manufacturing
- Sales

Expocrete Concrete Products Ltd.

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Richmond, BC

Edmonton, AB

Acheson, AB

Balzac, AB

Saskatoon, SK

Winnipeg, MB

Together we create, inspire and deliver innovative sustainable concrete solutions to bring our Customers vision to reality.



expocrete.com