



Evaluation Report CCMC 13354-R Polycrete® Big Block 1600

MasterFormat:	03 11 19.01
Evaluation issued:	2011-10-20
Re-evaluated:	2018-01-29

1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Polycrete® Big Block 1600,” when used as a flat insulating concrete form wall system in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1.(1)(a) of Division A, using the following acceptable solutions from Division B:
 - Article 3.1.5.14., Combustible Insulation
 - Section 4.1., Structural Loads and Procedures
 - Article 4.3.3.1., Design Basis for Plain, Reinforced and Pre-stressed Concrete
 - Sentence 9.3.1.1.(4), General (Concrete)
 - Article 9.10.17.10., Protection of Foamed Plastics
 - Clause 9.15.1.1.(1)(c), General (Footings and Foundation)
 - Article 9.15.3.3., Application of Footing Width and Area Requirements
 - Clause 9.15.3.5.(1)(c), Adjustments to Footing Widths for Exterior Walls
 - Article 9.15.4.1., Permanent Form Material
 - Article 9.15.4.2., Foundation Wall Thickness and Required Lateral Support
 - Sentence 9.15.4.3.(5), Foundation Walls Considered to be Laterally Supported at the Top
 - Article 9.15.4.4., Foundation Walls Considered to be Laterally Supported at the Bottom
 - Article 9.15.4.5., Reinforcement for Flat Insulating Concrete Form Foundation Walls
 - Clause 9.20.1.1.(1)(b) General (Masonry and Insulating Concrete Form Walls Not In Contact with the Ground)
 - Article 9.20.15.1., Amount of Reinforcement (Reinforcement for Earthquake Resistance)
 - Subsection 9.20.17., Above-Ground Flat Insulating Concrete Form Walls
- Clause 1.2.1.1.(1)(b) of Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
 - Clause 4.1.1.3.(4)(c), Design Requirements

This opinion is based on CCMC's evaluation of the technical evidence in Section 4 provided by the Report Holder.

2. Description

The product is a foldable, modular, flat insulating concrete form wall system consisting of two expanded polystyrene (EPS) panels. Embedded within the EPS panels is steel wire mesh reinforcement connected with metal ties during the manufacturing process. The forms are dry-laid and stacked in a running (staggered) configuration. The stacked units form a rectangular space, which, after being filled with concrete, forms an insulated monolithic concrete wall of uniform thickness. The polystyrene panels have a preformed interlocking mechanism along their top and bottom edges to facilitate stacking and to prevent the leakage of freshly placed concrete.

Reinforcement may be placed where required to satisfy strength requirements for above- or below-grade loadbearing walls, beams, lintels, and shear walls. The units have external dimensions of 2440 mm in length and 305 mm, 460 mm and 610 mm in height. The polystyrene

panels are 64 mm thick resulting in an overall wall thickness of 270 mm, 320 mm, 370 mm, and 420 mm. The forms are available in straight, tapered top and brick ledge forms.

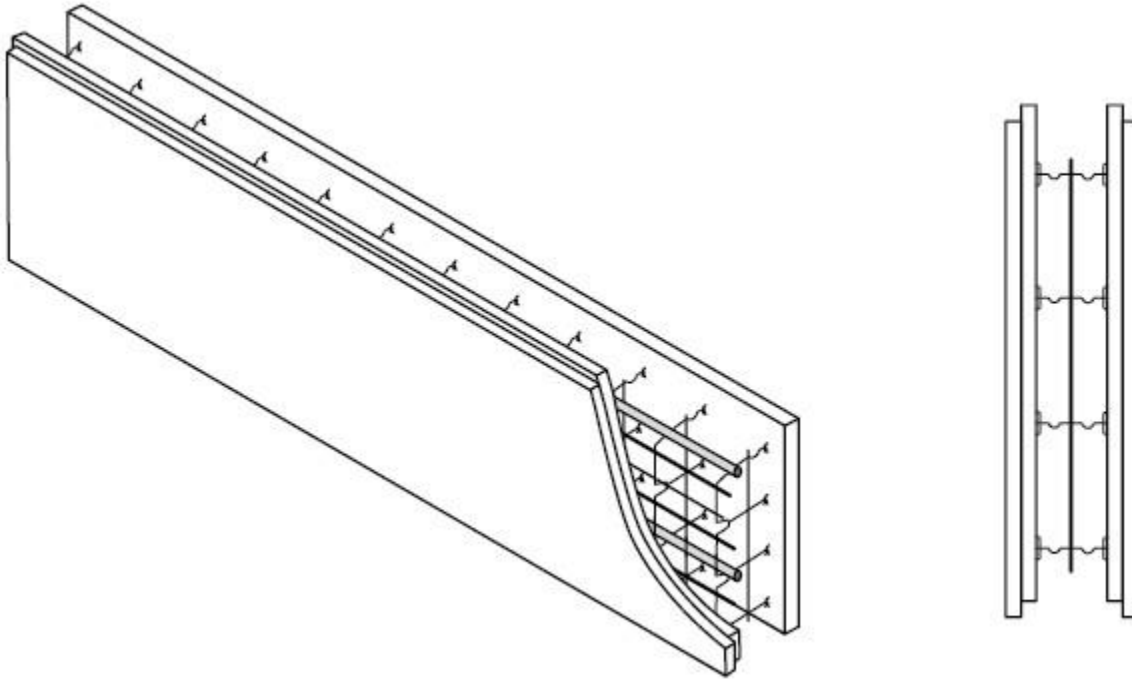


Figure 1. Isometric and front view of the product

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the "Polycrete® Big Block 1600" being used in accordance with the conditions and limitations set out below.

- Use of the product is permitted in the construction of houses and small buildings up to two storeys high that fall under the provisions of Part 9 of Division B of the NBC 2015, subject to all of the conditions listed below.
- Structural applications of the product must be in strict accordance with the design analysis as prepared for Smag Industries and included in Genivar Report, dated 25 October 2011, from which Tables 4.1.2.1.1 to 4.1.2.1.3 have been reproduced. When the product is used in structural applications outside the scope of the referenced design analysis, a professional engineer skilled in concrete design must certify the design analysis and the design drawings for such applications. The engineer must certify that the construction conforms to Part 4 and/or Part 9 of the NBC 2015.
- The attachment of exterior cladding and interior finishing materials has not been assessed by the present evaluation. The exterior cladding attachment must be in accordance with Section 9.27., Cladding, of Division B of the NBC 2015. The interior finishes attachment must be in accordance with Section 9.29., Interior Wall and Ceiling Finishes, of Division B of the NBC 2015.
- The concrete compressive strength shall not be less than 20 MPa after 28 days when used with this product
- The maximum aggregate size to be used in conjunction with the product must be no greater than 14 mm.
- For the wall heights indicated in Tables 4.1.2.1.1 and 4.1.2.1.2, the pouring of concrete must be made at a rate of 1.3 m per hour in consecutive lifts where each lift is limited to a maximum height of 1.3 m.
- The EPS insulation used in this system must comply with CAN/ULC-S701-11, "Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering," Type 2.
- The product's EPS insulation panels must be aged for at least three weeks from their date of manufacturing.
- The interior face of the product panels must be protected from the inside of the building in accordance with Article 9.10.17.10., Protection of Foamed Plastics, of Division B of the NBC 2015.
- For above-grade installations, the exterior face of the product must be protected with materials conforming to Article 9.20.6.4., Masonry Veneer, and Sections 9.27., Cladding, and/or 9.28., Stucco, of Division B of the NBC 2015.
- The concrete must be cured a minimum of seven days before backfilling. The top of the foundation wall must be supported by the first floor prior to backfilling.
- For below-grade installations, dampproofing material must be provided in accordance with Article 9.13.2.2., Dampproofing Materials, of Division B of the NBC 2015.
- Where hydrostatic pressure exists, waterproofing must be provided in accordance with Article 9.13.3.2., Waterproofing Materials, of Division B of the NBC 2015.

- For foundation-wall installations, the backfill must be placed in such a way as to avoid damaging the wall, the exterior insulation panel, and the waterproofing or dampproofing protection. The backfill material must be well-drained and a drainage system must be installed around the footing in accordance with NBC requirements.
- Installation of the product must be in compliance with the “Polycrete Installation Manual,” Version 1.0 Revision 1.10 dated 2011-1-27.
- The concrete wall must be constructed on a footing designed as per Article 9.15.3.4., Basic Footing Widths and Areas, of Division B of the NBC 2015.

4. Technical Evidence

The Report Holder has submitted technical documentation for CCMC’s evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

4.1 Material Requirements

4.1.1 Conformance of the EPS

Compliance of the expanded polystyrene thermal insulation with the requirements of CAN/ULC-S701-11 Type 2 is covered under the Intertek Testing Services NA LTD. certification program.

4.2 Design Requirements

4.2.1 Conformance of Structural Capacity (Steel Reinforcement Designs)

The design analysis presented by Genivar for walls using the product provides a level of performance equivalent to that required by applicable provisions in Part 4 and/or Part 9 of Division B of the NBC 2015. The design analysis is summarized in Tables 4.2.1.1 to 4.2.1.3. The tables provide steel reinforcement specifications for a number of different wall and lintel applications based on specific structural loads. The design assumptions are indicated below each table.

Table 4.2.1.1 Vertical and Horizontal Steel Reinforcement for Below-grade Walls⁽¹⁾

Height of Walls (m)	Backfill Height (m)	Vertical and Horizontal Steel Reinforcement for Below-grade Walls for All Seismic Zones					
		Maximum Vertical Steel Reinforcement Spacing			Maximum Horizontal Steel Reinforcement Spacing		
		150-mm Wall	200-mm Wall	250-mm Wall	150-mm Wall	200-mm Wall	250-mm Wall
2.44	1.22	10M at 425	10M at 325 or 15M at 500	10M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	1.53	10M at 400 or 15M at 425	10M at 325 or 15M at 500	10M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	1.83	10M at 250 or 15M at 425	10M at 325 or 15M at 500	10M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	2.14	10M at 200 or 15M at 425	10M at 325 or 15M at 500	10M at 450 FI and at 500 FE or 15M at 500 FI and 10M at 500 FE ⁽²⁾	15M at 600	20M at 600	10M at 600 each face
3.05	1.22	10M at 425	10M at 325 or 15M at 500	10M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	1.53	10M at 300 or 15M at 425	10M at 325 or 15M at 500	10M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	1.83	10M at 200 or 15M at 425	10M at 250 or 15M at 500	10M at 400 FI and at 500 FE or 15M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	2.14	10M at 150 or 15M at 325	10M at 325 or 15M at 500	10M at 350 FI and at 500 FE or 15M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	2.44	10M at 125 or 15M at 250	10M at 200 or 15M at 425	10M at 275 FI and at 500 FE or 15M at 500 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face
	2.75	10M at 100 or 15M at 200	10M at 175 or 15M at 350	10M at 225 FI and at 500 FE or 15M at 400 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face

Table 4.2.1.1 Vertical and Horizontal Steel Reinforcement for Below-grade Walls⁽¹⁾ (cont.)

Height of Walls (m)	Backfill Height (m)	Vertical and Horizontal Steel Reinforcement for Below-grade Walls for All Seismic Zones					
		Maximum Vertical Steel Reinforcement Spacing			Maximum Horizontal Steel Reinforcement Spacing		
		150-mm Wall	200-mm Wall	250-mm Wall	150-mm Wall	200-mm Wall	250-mm Wall
3.66	1.22	10M at 425	10M at 325 or 15M at 500	10M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	1.53	10M at 275 or 15M at 425	10M at 325 or 15M at 500	10M at 500 each face	15M at 600	20M at 600	10M at 600 each face
	1.83	10M at 175 or 15M at 375	10M at 300 or 15M at 500	10M at 400 FI and at 500 FE or 15M at 500 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face
	2.14	10M at 125 or 15M at 275	10M at 225 or 15M at 475	10M at 300 FI and at 500 FE or 15M at 500 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face
	2.44	10M at 100 or 15M at 200	10M at 175 or 15M at 350	10M at 250 FI and at 500 FE or 15M at 500 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face
	2.75	15M at 175	10M at 125 or 15M at 275	10M at 200 FI and at 500 FE or 15M at 400 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face
	3.05	(3)	10M at 100 or 15M at 200	10M at 150 FI and at 500 FE or 15M at 350 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face
	3.36	(3)	(3)	10M at 125 FI and at 500 FE or 15M at 275 FI and 10M at 500 FE	15M at 600	20M at 600	10M at 600 each face

Notes to table 4.2.1.1

- (1) Table 4.2.1.1 is based on the following assumptions:
1. For buildings conforming to Part 9 of Division B of the NBC 2015.
 2. Wall design shall be in accordance with the NBC 2015 (Part 9) and CSA A23.3-04, "Design of Concrete Structures."
 3. All materials and construction quality must be in accordance with the NBC 2015 and with modifications provided in the tables.
 4. Details concerning deflection, placement, spacing, and protection of reinforcement must conform to CSA A23.1, "Concrete Materials and Methods of Concrete Construction," CSA A23.2, "Test methods and standard practices for concrete" and CSA A23.3 standards.
 5. Reinforcing bars shall be hard grade deformed bars conforming to CSA G30.18, "Carbon Steel Bars for Concrete Reinforcement," Grade 400.
 6. Minimum compressive strength of concrete at 28 days is 20 MPa.
 7. For below-grade applications, the vertical reinforcement must be 60 mm from the interior face. When a double row of reinforcement is required, vertical reinforcement must be 60 mm from the respective face.
 8. Two 15M reinforcement bars must be placed around all openings and shall extend 600 mm beyond each side of the openings. For lintels, refer to Table 4.2.1.3.
 9. Stirrups with the same diameter and spacing of the horizontal reinforcement must be installed at all corners. Total length on each side: 40d
- (2) FE: Exterior face
FI: Interior face
- (3) Shaded zones indicate no configuration possible for reinforcement.
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Table 4.2.1.2 Vertical and Horizontal Steel Reinforcement for Above-grade Walls⁽¹⁾

Wall Height (m)	Maximum Vertical Spacing for Reinforcement			Maximum Horizontal Spacing for Reinforcement		
	150-mm Wall	200-mm Wall	250-mm Wall	150-mm Wall	200-mm Wall	250-mm Wall
Single storey concrete construction supporting wood truss roof						
2.44	10M at 400	15M at 400	10M at 400 each face	15M at 600	20M at 600	10M at 600 each face
3.05	10M at 300	15M at 400	10M at 400 each face	15M at 600	20M at 600	10M at 600 each face
3.66	10M at 200	15M at 400	10M at 400 each face	15M at 600	20M at 600	10M at 600 each face
Ground floor concrete construction supporting a second storey wood frame and a wood frame roof structure						
2.44	10M at 300	15M at 400	10M at 400 each face	15M at 600	20M at 600	10M at 600 each face
3.05	10M at 200	15M at 400	10M at 400 each face	15M at 600	20M at 600	10M at 600 each face
3.66	(2)	15M at 300	10M at 400 each face	(2)	20M at 600	10M at 600 each face
Ground floor concrete construction supporting a second storey concrete constructions and a wood frame roof structure						
2.44	10M at 200	15M at 400	10M at 400 each face	15M at 600	20M at 600	10M at 600 each face
3.05	(2)	15M at 300	10M at 400 each face	(2)	20M at 600	10M at 600 each face
3.66	(2)	15M at 200	10M at 400 each face	(2)	20M at 600	10M at 600 each face

Notes to Table 4.2.1.2:

- (1) Table 4.2.1.2 is based on the following assumptions:
- For buildings conforming to Part 9 of Division B of the NBC 2015.
 - The calculation of the walls is based on the NBC 2015 (Part 9) and CSA-A23.3.
 - All materials and workmanship shall conform to the requirements of the NBC 2015 and its Revisions and Errata that have been released as of the issue date of these tables.
 - Details concerning deflection, placement, spacing, and protection of reinforcement must conform to CSA A23.1, CSA A23.2, and CSA A23.3.
 - Reinforcing bars shall be hard grade deformed bars conforming to CSA G30.18, Grade 400.
 - Minimum compressive strength of concrete at 28 days is 20 MPa.
 - For above-grade applications, the vertical reinforcement must be placed in the centre third of the concrete wall. When the vertical reinforcement is placed on each face, it must be 60 mm from the exterior face.
 - Two 15M reinforcement bars must be placed around all openings and shall extend 600 mm beyond each side of the openings. For lintels, refer to Table 4.2.1.3.
 - Stirrups with the same diameter and spacing of the horizontal reinforcement must be installed at all corners. Total length on each side: 40d
 - For calculation purposes, maximum wind pressure of 3 kPa was considered (covers all of Canada).
- (2) Shaded zones indicate no configuration possible for reinforcement

Table 4.2.1.3(a) Minimum steel reinforcement of lintels for 150-mm Thick “Polycrete® Big Block 1600”⁽¹⁾

Width of openings (mm)	Uniformly distributed loads (kN/m)													
	2.0		5		10		15		20		25		30	
	Lower Steel Bar	Dist. from s/u ⁽²⁾	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u
1000	2-10M	0	2-10M	0	2-10M	0	2-10M	0	2-10M	0	2-10M	100	2-10M	167
1500	2-10M	0	2-10M	0	2-10M	0	2-10M	84	2-10M	250	2-15M	350	2-15M	417
2000	2-10M	0	2-10M	0	2-10M	0	2-15M	334	2-15M	500	2-15M	600	2-15M	667
2500	2-10M	0	2-10M	0	2-15M	250	2-15M	584	2-15M	750	2-15M	850	2-15M	917
3000	2-10M	0	2-10M	0	2-15M	500	2-15M	834	2-15M	1000	2-15M	1100	(3)	(3)
3500	2-10M	0	2-10M	0	2-15M	750	2-15M	1084	2-15M	1250	(3)	(3)	(3)	(3)
4000	2-10M	0	2-15M	0	2-15M	1000	2-15M	1334	(3)	(3)	(3)	(3)	(3)	(3)
4500	2-10M	0	2-15M	250	2-15M	1250	2-20M	1584	(3)	(3)	(3)	(3)	(3)	(3)
5000	2-10M	0	2-15M	500	2-20M	1500	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)

Table 4.2.1.3(b) Minimum steel reinforcement of lintels for 200-mm Thick “Polycrete® Big Block 1600”⁽¹⁾

Opening Width (mm)	Uniformly distributed loads (kN/m)													
	2.0		5		10		15		20		25		30	
	Lower Steel Bar	Dist. from s/u ⁽²⁾	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u
1000	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	34
1500	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	50	2-15M	190	2-15M	284
2000	2-15M	0	2-15M	0	2-15M	0	2-15M	67	2-15M	300	2-15M	440	2-15M	534
2500	2-15M	0	2-15M	0	2-15M	0	2-15M	317	2-15M	550	2-15M	690	2-15M	784
3000	2-15M	0	2-15M	0	2-15M	100	2-15M	567	2-15M	800	2-15M	940	2-20M	1034

Table 4.2.1.3(b) Minimum steel reinforcement of lintels for 200-mm Thick “Polycrete® Big Block 1600”⁽¹⁾ (cont.)

Opening Width (mm)	Uniformly distributed loads (kN/m)													
	2.0		5		10		15		20		25		30	
	Lower Steel Bar	Dist. from s/u^2	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u
3500	2-15M	0	2-15M	0	2-15M	350	2-15M	817	2-15M	1050	2-20M	1190	2-20M	1284
4000	2-15M	0	2-15M	0	2-15M	600	2-15M	1067	2-20M	1300	2-25M	1440	(3)	(3)
4500	2-15M	0	2-15M	0	2-15M	850	2-15M	1317	2-25M	1550	(3)	(3)	(3)	(3)
5000	2-15M	0	2-15M	0	2-20M	1100	2-25M	1567	(3)	(3)	(3)	(3)	(3)	(3)

Table 4.2.1.3(c) Minimum steel reinforcement of lintels for 250-mm Thick “Polycrete® Big Block 1600”⁽¹⁾

Opening Width (mm)	Uniformly distributed loads (kN/m)													
	2.0		5		10		15		20		25		30	
	Lower Steel Bar	Dist. from s/u^2	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u	Lower Steel Bar	Dist. from s/u
1000	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	0
1500	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	50	2-15M	167
2000	2-15M	0	2-15M	0	2-15M	0	2-15M	0	2-15M	125	2-15M	300	2-15M	417
2500	2-15M	0	2-15M	0	2-15M	0	2-15M	84	2-15M	375	2-15M	550	2-15M	667
3000	2-15M	0	2-15M	0	2-15M	0	2-15M	334	2-15M	625	2-15M	800	2-20M	917
3500	2-15M	0	2-15M	0	2-15M	0	2-15M	584	2-20M	875	2-20M	1050	2-20M	1167
4000	2-15M	0	2-15M	0	2-15M	250	2-15M	834	2-20M	1125	2-25M	1300	2-25M	1417
4500	2-15M	0	2-15M	0	2-15M	500	2-20M	1084	2-25M	1375	2-25M	1550	(3)	(3)
5000	2-15M	0	2-15M	0	2-20M	750	2-25M	1334	2-25M	1625	(3)	(3)	(3)	(3)

Notes to Tables 4.2.1.3(a) to (c):

- (1) Tables 4.2.1.3(a) to (c) are based on the following assumptions:
 1. All materials and installation procedures must be in accordance with the NBC 2015.
 2. Lintel calculations must conform to CSA A23-04.
 3. Minimum height for lintels is 300 mm.
 4. Stirrups shall be made of 10M steel bars and spaced not more than 170 mm o.c.
 5. Reinforcing bars shall be hard grade deformed bars conforming to CSA G30.18, Grade 400.
 6. Uniformly distributed loads include permanent loads and surcharges.
 7. Lintel reinforcing starts from the bottom of the lintel and extends 600 mm into the lintel support on each side of the openings.
 8. Lintels supporting concentrated loads such as beams or trusses must be calculated by a professional engineer.
 9. Minimum compressive strength of concrete is 20 MPa at 28 days. Concrete strength must be as recommended by the manufacturer.
 10. Details concerning deflexion, placing, spacing, and protection of reinforcement must conform to CSA A23.1, CSA A23.2, and CSA A23.3.
 - (2) s/u: stirrups
 - (3) Shaded zones indicate no configuration possible for reinforcement.
-

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Date modified:
2018-01-29