Evaluation Report CCMC 12938-R
IntegraSpec®

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "IntegraSpec®", 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 2010:

- Clause 1.2.1.1.(1)(a), Division A, using the following acceptable solutions from Division B:
  - Article 4.1.1.3. Design Requirements (structural loads and procedures)
  - Article 4.3.3.1. Design Basis for Plain, Reinforced and Pre-stressed Concrete
  - Subsection 9.3.1. Concrete
  - Subsection 9.4.1. Structural Design Requirements and Application Limitations
  - Subsection 9.4.4. Foundation Conditions
  - Article 9.10.17.10. Protection of Foamed Plastics
  - Article 9.15.3.3. Application of Footing Width and Area Requirements
  - Article 9.15.3.5. Adjustments to Footing Widths for Exterior Walls
  - Clause 9.20.1.1.(1)(b) General (masonry and insulating concrete form walls not in contact with the ground)
  - Sentence 9.20.1.1.(2) General (masonry and insulating concrete form walls not in contact with the ground)
  - Subsection 9.20.17. Above-Ground Flat Insulating Concrete Form Walls

- Clause 1.2.1.1.(1)(b), 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:
  - Subsection 9.15.4. Foundation Walls
  - Article 9.20.1.2. Earthquake Reinforcement

This opinion is based on CCMC's evaluation of the technical evidence in Section 4.1 provided by the Report Holder.

2. Description

The product's construction system consists of two expanded polystyrene (EPS) panels with equally spaced plastic inserts molded into the panels. Interlocking plastic webs are inserted and locked in-place during on-site assembly. The forms are dry-laid and stacked in a running (staggered) configuration. The laid-up units form a rectangular space, which after being filled with concrete, forms an insulated, monolithic concrete wall of uniform thickness. The EPS panels incorporate dovetail grooves for permanent bonding with the concrete wall.

Reinforcement complying with the NBC 2010 must be placed in accordance with the engineering tables prepared for Phil-Insul Corporation to satisfy strength requirements for above- or below-grade loadbearing walls used in the construction of single residential units.

The EPS units have external dimensions of 1219 mm (length) and 311 mm (height) with an overall wall thickness of 279 mm, which includes a 152-mm-thick concrete wall and 2 – 63.5 mm EPS panels. The minimum thickness of concrete for walls not in contact with the ground and foundation walls shall not be less than 140 mm.

The EPS face panels have a preformed interlocking mechanism along their top and bottom edges to facilitate stacking and to prevent the leakage of freshly placed concrete.

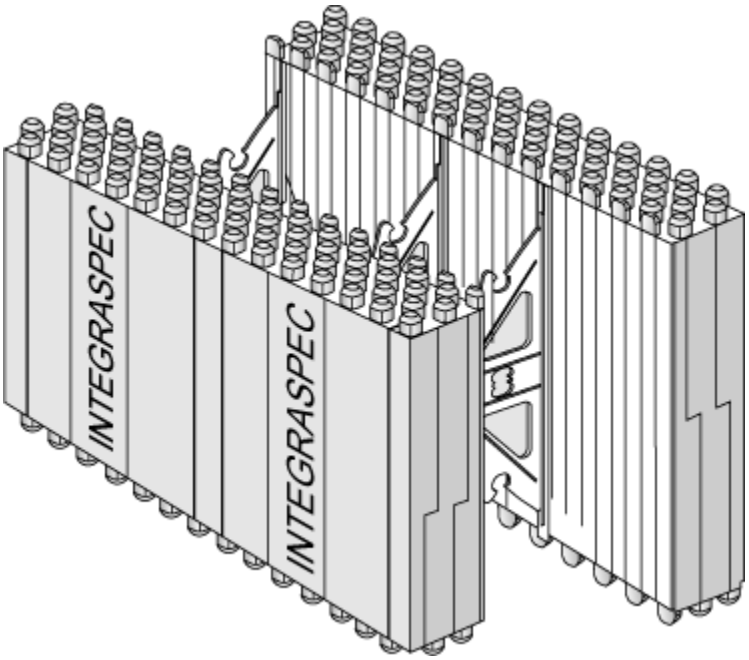

Figure 1. Standard unit

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the "IntegraSpec®" 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 2010 and 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 IntegraSpec® Insulating Concrete Forms and included in Novatech Engineering Consultants Ltd. Report 1100197 dated 2011-02-22, from which Tables 4.2.1.1 to 4.2.1.6 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 Division B of the NBC 2010.
- The attachment of exterior cladding and interior finishing materials has not been assessed by the present evaluation. The exterior cladding attachment must be as per Part 5 of Division B of the NBC 2010 as stated in Sentence 9.27.1.1.(5), General (cladding), of Division B of the NBC 2010. The interior finishes attachment must be in accordance with Section 9.29., Interior Wall and Ceiling Finishes, of Division B of the NBC 2010.
- Concrete used with this system must comply with Subsection 9.3.1., Concrete, of Division B of the NBC 2010.
- The concrete compressive strength must 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 4.2.1.1 to 4.2.1.4, 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-S701-05, "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 2010.
- 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 2010.
- 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., Material Standards (dampproofing), of Division B of the NBC 2010.
- Where hydrostatic pressure exists, waterproofing must be provided in accordance with Article 9.13.3.2., Material Standards (waterproofing), of Division B of the NBC 2010.

- 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 IntegraSpec® Installation Manual, updated November 2003 and produced by Phil-Insul Corporation.
- 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 2010.
- Openings in walls must conform to Articles 9.20.17.3., Openings in Non-Loadbearing Flat Insulating Concrete Form Walls, and 9.20.17.4., Openings in Loadbearing Flat Insulating Concrete Form Walls, of Division B of the NBC 2010.
- Anchoring of the roof must comply with Article 9.20.17.6., Anchoring of Roof Framing to the Top of Flat Insulating Concrete Form Walls, of Division B of the NBC 2010.

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 EPS

The EPS thermal insulation that complies with CAN/ULC-S701, Type 2 is covered under Intertek Testing Services NA LTD certification program.

4.2 Design Requirements

The design analysis presented by Novatech Engineering Consultants Ltd. 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 2010. The design analysis is summarized in Tables 4.2.1.1 to 4.2.1.6. The tables provide steel reinforcement specifications for a number of different wall and lintel applications based on specific structural loads.

4.2.1 Conformance of Structural Capacity (Steel Reinforcement Designs)

Table 4.2.1.1 Foundation walls with reinforcement – not supporting brick veneer siding

Horizontal Reinforcement - 10M @ 325 mm - All Locations - All Wall Heights (152-mm-thick concrete)							
Maximum Vertical Reinforcement Spacing (mm)							
Height of Wall (m)	Height of Backfill (m)	Toronto	Ottawa	Montreal	Halifax	Calgary	Vancouver
2.44	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
2.44	1.53	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
2.44	1.83	10M@400	10M@300	10M@300	10M@400	10M@400	10M@250
2.44	2.14	10M@300	10M@250	10M@250	10M@300	10M@300	10M@200
3.05	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
3.05	1.53	10M@400	10M@400	10M@400	10M@400	10M@400	10M@300
3.05	1.83	10M@400	10M@250	10M@250	10M@400	10M@400	10M@200
3.05	2.14	10M@250	10M@200	10M@200	10M@250	10M@250	15M@300
3.05	2.44	10M@200	15M@300	15M@300	10M@200	10M@200	15M@200
3.05	2.75	15M@300	15M@200	15M@200	15M@300	15M@300	15M@150
3.66	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
3.66	1.53	10M@400	10M@400	10M@400	10M@400	10M@400	10M@300
3.66	1.83	10M@300	10M@250	10M@250	10M@300	10M@300	10M@200
3.66	2.14	10M@250	15M@300	15M@300	10M@250	10M@250	15M@250
3.66	2.44	15M@300	15M@250	15M@200	15M@300	15M@300	15M@150
3.66	2.75	15M@250	15M@150	15M@150	15M@250	15M@250	15M@100
3.66	3.05	15M@200	15M@150	15M@100	15M@200	15M@200	15M@100
3.66	3.36	15M@150	15M@100	15M@100	15M@150	15M@150	N/A[1]

Notes to Table 4.2.1.1:

1 N/A means this combination of height and backfill exceeds the maximum capacity of the wall.

Table 4.2.1.2 Foundation walls with reinforcement and a horizontal peak ground acceleration (PGA) value that has a 2% probability of being exceeded in 50 years – not supporting brick veneer siding

Horizontal Reinforcement - 10M @ 325 mm - All Locations - All Wall Heights (152-mm-thick concrete)							
Maximum Vertical Reinforcement Spacing (mm)							
Height of Wall (m)	**Height of Backfill (m)**	**PGA = 0.036**	**PGA = 0.15**	**PGA = 0.25**	**PGA = 0.40**	**PGA = 0.50**	**PGA = 0.60**
2.44	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
2.44	1.53	10M@400	10M@400	10M@400	10M@400	10M@400	10M@300
2.44	1.83	10M@400	10M@400	10M@400	10M@300	10M@250	10M@200
2.44	2.14	10M@300	10M@300	10M@300	10M@200	10M@200	15M@300
3.05	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
3.05	1.53	10M@400	10M@400	10M@400	10M@300	10M@300	10M@250
3.05	1.83	10M@400	10M@250	10M@300	10M@250	10M@200	15M@300
3.05	2.14	10M@250	10M@200	10M@200	15M@300	15M@300	15M@250
3.05	2.44	10M@200	10M@200	15M@300	15M@250	15M@200	15M@150
3.05	2.75	15M@300	15M@200	15M@200	15M@200	15M@150	15M@150
3.66	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
3.66	1.53	10M@400	10M@400	10M@400	10M@300	10M@300	10M@250
3.66	1.83	10M@300	10M@300	10M@300	10M@200	15M@300	15M@300
3.66	2.14	10M@250	10M@250	10M@200	15M@300	15M@250	15M@200
3.66	2.44	15M@300	15M@300	15M@250	15M@200	15M@150	15M@150
3.66	2.75	15M@250	15M@250	15M@200	15M@150	15M@100	15M@100
3.66	3.05	15M@200	15M@200	15M@150	15M@100	15M@100	N/A
3.66	3.36	15M@150	15M@150	15M@100	15M@95	N/A[1]	N/A

Notes to Table 4.2.1.2:

1 N/A means this combination of height and backfill exceeds the maximum capacity of the wall.

Table 4.2.1.3 Foundation walls with reinforcement and a horizontal peak ground acceleration (PGA) value that has a 2% probability of being exceeded in 50 years – supporting brick veneer siding

Horizontal Reinforcement - 10M @ 325 mm - All Locations - All Wall Heights (152-mm-thick concrete)							
Maximum Vertical Reinforcement Spacing (mm)							
Height of Wall (m)	Height of Backfill (m)	PGA = 0.036	PGA = 0.15	PGA = 0.25	PGA = 0.40	PGA = 0.50	PGA = 0.60
2.44	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@300
2.44	1.53	10M@400	10M@400	10M@400	10M@300	10M@250	10M@250
2.44	1.83	10M@300	10M@300	10M@300	10M@200	10M@200	15M@300
2.44	2.14	10M@250	10M@250	10M@200	15M@300	15M@300	15M@300
3.05	1.22	10M@400	10M@400	10M@400	10M@400	10M@300	10M@300
3.05	1.53	10M@300	10M@300	10M@300	10M@250	10M@250	10M@200
3.05	1.83	10M@250	10M@250	10M@250	10M@200	15M@300	15M@300
3.05	2.14	10M@200	10M@200	15M@300	15M@300	15M@250	15M@200
3.05	2.44	15M@300	15M@300	15M@300	15M@200	15M@200	15M@150
3.05	2.75	15M@250	15M@250	15M@200	15M@150	15M@150	15M@100
3.66	1.22	10M@400	10M@400	10M@400	10M@400	10M@300	10M@300
3.66	1.53	10M@300	10M@300	10M@300	10M@250	10M@200	10M@200
3.66	1.83	10M@250	10M@250	10M@200	15M@300	15M@300	15M@250
3.66	2.14	15M@300	15M@300	15M@300	15M@250	15M@250	15M@150
3.66	2.44	15M@250	15M@250	15M@250	15M@150	15M@150	15M@100
3.66	2.75	15M@200	15M@200	15M@150	15M@100	15M@100	15M@95
3.66	3.05	15M@150	15M@150	15M@150	15M@100	N/A[1]	N/A
3.66	3.36	15M@100	15M@100	15M@100	N/A	N/A	N/A

Notes to Table 4.2.1.3:

1 N/A means this combination of height and backfill exceeds the maximum capacity of the wall.

Table 4.2.1.4 Foundation walls with brick veneer and reinforcement – city locations

Horizontal Reinforcement - 10M @ 325 mm - All Locations - All Wall Heights (152-mm-thick concrete)							
Maximum Vertical Reinforcement Spacing (mm)							
Height of Wall (m)	Height of Backfill (m)	Toronto	Ottawa	Montreal	Halifax	Calgary	Vancouver
2.44	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
2.44	1.53	10M@400	10M@300	10M@300	10M@400	10M@400	10M@300
2.44	1.83	10M@300	10M@250	10M@250	10M@300	10M@300	10M@200
2.44	2.14	10M@250	10M@200	10M@200	10M@250	10M@250	15M@300
3.05	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@400
3.05	1.53	10M@300	10M@300	10M@300	10M@300	10M@300	10M@250
3.05	1.83	10M@250	10M@200	10M@200	10M@250	10M@250	15M@300
3.05	2.14	10M@200	15M@300	15M@300	10M@200	10M@200	15M@250
3.05	2.44	15M@300	15M@250	15M@250	15M@300	15M@300	15M@200
3.05	2.75	15M@250	15M@200	15M@200	15M@250	15M@250	15M@150
3.66	1.22	10M@400	10M@400	10M@400	10M@400	10M@400	10M@300
3.66	1.53	10M@300	10M@300	10M@250	10M@300	10M@300	10M@250
3.66	1.83	10M@250	10M@200	10M@200	10M@250	10M@250	15M@300
3.66	2.14	15M@300	15M@250	15M@250	15M@300	15M@300	15M@200
3.66	2.44	15M@250	15M@200	15M@200	15M@250	15M@250	15M@150
3.66	2.75	15M@200	15M@150	15M@150	15M@200	15M@200	15M@100
3.66	3.05	15M@150	15M@100	15M@100	15M@150	15M@150	15M@100
3.66	3.36	15M@100	15M@100	15M@100	15M@100	15M@100	N/A[1]

Notes to Table 4.2.1.4:

1 N/A means this combination of height and backfill exceeds the maximum capacity of the wall.

Table 4.2.1.5 Lintel reinforcement – openings in full-height ICF walls[1]

Factored Load - 24.7 kN/m - Lintel Reinforcement					
Span (m)	**Moment (kNm)**	**Shear (MPa)**	**Depth (mm)**	**Tension**	**Shear Reinforcement**
0.9	2.50	5.19	300	1-15M	No stirrups
1.2	4.45	8.90	300	1-15M	No stirrups
1.8	10.01	16.32	300	1-15M	No stirrups
2.1	13.63	20.02	300	1-15M	10M@150
2.4	17.80	23.73	300	2-15M	10M@150
2.7	22.53	27.44	300	2-15M	10M@150
3.0	27.81	31.15	300	2-15M	10M@150
3.3	33.65	34.86	300	2-20M	10M@150
3.6	40.05	38.56	300	2-20M	10M@150
3.9	47.00	42.27	450	2-15M	10M@250
4.2	54.51	45.98	450	2-20M	10M@250
4.5	62.57	49.69	450	2-20M	10M@250
4.8	71.19	53.40	450	2-20M	10M@250

Notes to Table 4.2.1.5:

1 Includes arching effects in uninterrupted walls, or a max. 2.5 m height of ICF wall between openings.

Table 4.2.1.6 Lintel reinforcement – openings in basement ICF walls supporting full-height wood-framed walls

Factored Load - 45.3 kN/m - Lintel Reinforcement					
Span (m)	**Moment (kNm)**	**Shear (MPa)**	**Depth (mm)**	**Tension**	**Shear Reinforcement**
0.9	4.59	9.52	300	1-15M	No stirrups
1.2	8.16	16.31	300	1-15M	No stirrups
1.8	18.35	29.91	300	2-15M	10M@150
2.1	24.98	36.71	300	2-15M	10M@150
2.4	32.63	43.50	300	2-20M	10M@150
2.7	41.29	50.30	450	2-15M	10M@250
3.0	50.98	57.10	450	2-20M	10M@250
3.3	61.69	63.89	450	2-20M	10M@250
3.6	73.41	70.69	600	2-20M	10M@250
3.9	86.16	77.49	600	2-20M	10M@250

Table 4.2.1.6 Lintel reinforcement – openings in basement ICF walls supporting full-height wood-framed walls (cont.)

Factored Load - 45.3 kN/m - Lintel Reinforcement					
Span (m)	Moment (kNm)	Shear (MPa)	Depth (mm)	Tension	Shear Reinforcement
4.2	99.92	84.29	600	2-20M	10M@250
4.5	114.70	91.08	N/A[1]	N/A	N/A
4.8	130.51	97.88	N/A	N/A	N/A

Notes to Table 4.2.1.6:

1 N/A means not applicable.

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