



National Research
Council Canada

Conseil national
de recherches Canada

Institute for
Research in
Construction

Institut de
recherche en
construction

CCMC 12621-R

CCMC

EVALUATION
REPORT

DIVISION 03371

Issued 1994-08-03

Re-Evaluation 2002-03-25

Re-evaluation due 2003-08-03

ICS 3-D® Building Panel

ICS 3-D Panel Works, Inc.
2610 Sidney Lanier Drive
Brunswick, Georgia
U.S.A. 31525

Tel.: (912) 264-3772

Fax: (912) 264-3774

Plants: ICS 3-D Panel Works, Inc.
2610 Sidney Lanier Drive
Brunswick, Georgia
U.S.A.

Insteel Panelmex, S.A. De C.V.
Carretera a San Felipe 733
Delegación Cerro Prieto
C.P. 21900 Mexicali, B.C.
Mexico

This report contains no endorsement, warranty, or guarantee, expressed or implied, on the part of NRC. NRC accepts no responsibility for the performance of any product or system described herein if manufactured and/or used outside the purpose of this evaluation report.

1. Purpose of Evaluation

The proponent sought confirmation from the Canadian Construction Materials Centre (CCMC) that the “ICS 3-D® Building Panel” can be used in the construction of interior or exterior, loadbearing or non-loadbearing walls of small buildings (Part 9) in compliance with the intent of the National Building Code of Canada (NBC).

2. Opinion

Tests results and assessments provided by the proponent show that the “ICS 3-D® Building Panel” complies with CCMC's Technical Guide for Exterior and Interior Loadbearing and Non-Loadbearing Walls, Masterformat number 03361, dated 1992-08-10. If used in accordance with the limitations and conditions stated in this report, “ICS 3-D® Building Panel” provides a level of performance equivalent to that required in:

- NBC 1995, Article 4.3.3.1.

The materials comply with:

- CSA Standard A23.3-94, “Design of Concrete Structures;”
- CSA Standard G30.3-M1983 (R1998), “Cold-Drawn Steel Wire for Concrete Reinforcement;”

- CSA Standard G30.5-M1983 (R1998), “Welded Steel Wire Fabric for Concrete Reinforcement;” and
- CAN/ULC-S701-01, “Thermal Insulation, Polystyrene, Boards and Pipe Covering”.

Canada Mortgage and Housing Corporation permits the use of this product in construction financed or insured under the National Housing Act.

3. Description

The “ICS 3-D® Building Panel” is a prefabricated panel consisting of a three-dimensional steel welded wire space frame integrated with a polystyrene insulation core. The core of the expanded polystyrene is placed between two parallel sheets of welded 50.8 mm x 50.8 mm x 11 gauge wire mesh grid and is held firmly in place by diagonal spacer 9 gauge strut wires that pierce the insulating core and are welded to the sheets.

These strut wires are individually welded to the wire mesh grids at a frequency of approximately 97 wires/m². The reinforcement/insulation module is placed in position at the building site and a thickness of 38 mm to 51 mm of pneumatically applied concrete with a minimum strength of 20 MPa is applied to both sides. The panel receives its strength and rigidity by the diagonal cross wires welded to the two parallel sheets of welded wire mesh on each side. This produces a truss effect which is rigid and provides adequate shear transfer for composite behaviour. Panels are 1220 mm wide and can be produced in lengths from 2.43 m to 7.62 m.

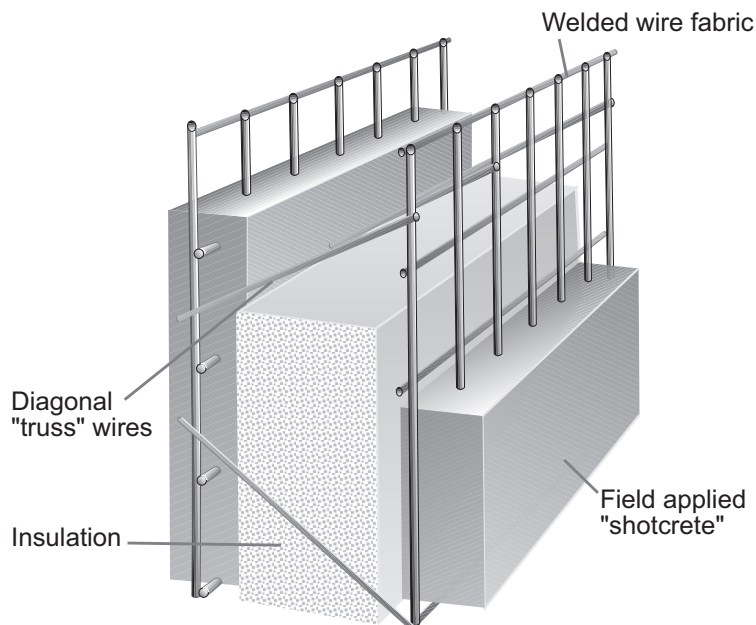


Figure 1. “ICS 3-D® Building Panel”

4. Usage and Limitations

This product may be used in the construction of interior/exterior, loadbearing/non-loadbearing walls and foundation walls subject to the following conditions:

- “ICS 3-D® Building Panel” may only be used in the construction of foundation walls supporting 3 storeys or less, unless designed by a professional engineer.
- “ICS 3-D® Building Panel” may only be used in buildings no more than 3 storeys high, in the construction of above-grade walls unless the loadbearing walls are designed by a professional engineer.
- Steel reinforcement must be provided as per “Design Notes & Tables” provided by G.L. Heeringa Ltd., dated February 18, 2001.
- Concrete must be applied by either the “shotcrete dry” or “shotcrete wet” process in accordance with ACI 506 R-85, “Guide to Shotcrete,” by the American Concrete Institute.

- The concrete compressive strength shall not be less than 20 MPa.
- The steel reinforcement shall have a minimum allowable stress (f_y) of 415 MPa.
- Tables in this report shall only be used when all loading conditions and spans comply with Part 9 of the NBC 1995.
- “ICS 3-D® Building Panel” was only evaluated for its intended use in combustible construction.
- Assembly and installation shall be done in accordance with the manufacturer’s manual titled “Instruction for Installing 3-D Panel System.”

5. Performance

Testing and assessments were conducted at laboratories recognized by the Canadian Construction Materials Centre. The test results of the “ICS 3-D® Building Panels” are summarized as follows.

Table 1. Test Wall Characteristics for the ICS 3-D® Building Panel

Wall Panel Height	2.44 m
Wall Panel Thickness	178 mm
Reinforcing Steel	Mesh: 11 gauge/Staywire: 9 gauge
Concrete Thickness (each side)	38 mm
Insulation Thickness (Type 1 EPS)	100 mm
Average Concrete Strength	20 Mpa

Table 2. Test Results for the ICS 3-D® Building Panel

Thermal Resistance	3.15 m ² ·K/W
Sound Transmission Class	34 STC
Compression Load ⁽¹⁾ at failure	715 kN/lin. m
Transverse Load ⁽¹⁾ (Clear span 2743 mm)	13 kPa
Residual ⁽²⁾ Average Mid-Span Deflection	10.80 mm
Transverse Load at failure	15.05 kPa

⁽¹⁾ The data presented in this report is not to be used for design purposes.

⁽²⁾ Residual deflection is the permanent deflection once the live load is removed.

Tables 3 to 9 apply to housing and small building construction where the design live load does not exceed 1.9 kPa for floor areas, live load due to snow does not exceed 1.7 kPa, and wind load does not exceed 1.0 kPa. In the following tables, “0” means no reinforcement is required, “1” means reinforcement of 10m @ 600mm o.c. is required, and “NP” means reinforcement is not permitted.

Table 3. Reinforcement Required for 2.44 m High Basement Wall (Surcharge < 3.6 kPa (assuming normal grade loading))

Height of Backfill, m	One Storey	Two Storey	Three Storey
1.22	0	0	0
1.52	0	0	0
1.83	0	0	1
2.13	1	1	1
2.44	1	1	1

Table 4. Reinforcement Required for 2.44 m High Basement Wall (Surcharge=14.4 kPa)

Height of Backfill, m	One Storey	Two Storeys	Three Storeys
1.22	0	0	0
1.52	1	1	1
1.83	1	1	1
2.13	1	1	1
2.44	1	1	1

Table 5. Reinforcement Required for Combined Axial and Wind Loaded Walls (Including 1.22 m 3-D Foundation Wall) (Hollow Core Slab Spanning 8 m with Pre-stressed Roof Slab)

Unsupported Height of Wall, m	One Storey	Two Storeys	Three Storeys
2.44	0	1	1
3.0	0	1	1
3.7	0	1	1
4.3	0	1	NP
4.9	1	1	NP
5.5	1	NP	NP
6.1	1	NP	NP

Table 6. Reinforcement Required for Combined Axial and Wind Loaded Walls (Slab-on-Grade or Other Foundation) (Hollow Core Slab Spanning 8 m with Pre-stressed Roof Slab)

Unsupported Height of Wall, m	One Storey	Two Storeys	Three Storeys
2.44	0	0	1
3.0	0	1	1
3.7	0	1	1
4.3	0	1	NP
4.9	1	1	NP
5.5	1	NP	NP
6.1	1	NP	NP

Table 7. Reinforcement Required for Combined Axial and Wind Loaded Walls (Including 1.22 m 3-D Foundation Wall) (Wood Joist Spanning 4 m with Wood Roof Trusses)

Unsupported Height of Wall, m	One Storey	Two Storeys	Three Storeys
2.44	0	0	0
3.0	0	0	0
3.7	0	0	1
4.3	0	1	NP
4.9	0	1	NP
5.5	1	NP	NP
6.1	1	NP	NP

Table 8. Reinforcement Required for Combined Axial and Wind Loaded Walls (Slab on Grade or Other Foundation) (Wood Joist Spanning 4 m with Wood Roof Trusses)

Unsupported Height of Wall, m	One Storey	Two Storeys	Three Storeys
2.44	0*	0	0
3.0	0	0	0
3.7	0	0	1*
4.3	0	1	NP*
4.9	0	1	NP
5.5	1	NP	NP
6.1	1	NP	NP

For more information contact:

Luc F. Cécire, P.Eng.
(613) 993-0776

Note: Readers are asked to refer to limitations imposed by OC on the interpretation and use of this report. These limitations are included in the introduction to CCMC's Registry of Product Evaluations, of which this report is part.

Readers are advised to confirm that this report has not been withdrawn or superseded by a later issue by referring to www.nrc.ca/ccmc, or by contacting the Canadian Construction Materials Centre, Institute for Research in Construction, National Research Council of Canada, Montreal Road, Ottawa, K1A 0R6; Telephone (613) 993-6189, Fax (613) 952-0268.

*Issued by the Institute for Research in Construction
under the authority of the National Research Council*

John Berndt, P.Eng.
Manager, CCMC

Table 9. Load Tables for Standard 178 mm ICS 3-D Panel Bearing Wall Panels

Assumptions: Live Load = Dead Load (Unfactored)
 50% fixity at base of wall
 Centroid of loading falls within middle third of wall

Unsupported Height (m)	Lateral Wind Pressure (kPa)										
	0	0.31	0.42	0.52	0.63	0.73	0.84	0.94	1.04	1.15	1.25
One Storey	0	0.31	0.42	0.52	0.63	0.73	0.84	0.94	1.04	1.15	1.25
	Allowable Superimposed Vertical Load on Top of Wall (kN/m)										
4.88	22.76638										
4.57	102.4487	60.71034	41.73836	26.56077	9.48599						
4.27	174.5422	149.8786	132.8039	115.7291	100.5515	83.47671	70.19633	55.01874	41.73836	28.45797	15.17758
3.96	240.9441	231.4582	216.2806	199.2058	184.0282	170.7478	155.5702	142.2899	129.0095	115.7291	102.4487
3.66	301.6545	301.6545	292.1685	278.8881	263.7105	250.4301	237.1498	223.8694	212.4862	199.2058	187.8226
3.35	356.6732	356.6732	356.6732	349.0844	337.7012	326.3181	314.9349	301.6545	292.1685	280.7853	269.4021
3.05	407.8976	407.8976	407.8976	407.8976	404.1032	394.6172	383.234	373.748	364.262	354.776	345.29
2.74	451.5331	451.5331	451.5331	451.5331	451.5331	451.5331	445.8415	438.2527	430.6639	423.0752	415.4864
2.44	491.3743	491.3743	491.3743	491.3743	491.3743	491.3743	491.3743	491.3743	489.4771	483.7855	478.0939
2.13	527.421	527.421	527.421	527.421	527.421	527.421	527.421	527.421	527.421	527.421	527.421

Note: Wind loadings above the solid lines require solid concrete through top and bottom blocks to resist laminar shear.