RDH Building Science Inc.
4333 Still Creek Drive #400
Burnaby, BC V5C 6S6

Making Buildings Better™

DATE February 2, 2023

TO ***ProFrame Manufacturing Inc.***

R-26921.000
Pro-Frame Wall System
R-value Calculation

REGARDING ***Clear-field Effective R-value of a 2x8" Pro-Frame Wall System***

As requested by Pro-Frame Wall Systems (Pro-Frame), RDH Building Science Inc. (RDH) calculated the effective thermal performance of several interior insulated 2x8" Pro-Frame wall assemblies. The effective thermal resistance calculations were performed using the isothermal-planes and parallel-path flow methods in general accordance with Part 9 of the Vancouver Building Bylaw (VBBL) and the BC Building Code (BCBC). Framing factors and thermal conductivities were obtained from the BCBC, Table A-9.36.2.14.(1)-A and -D respectively.

Figure 1 is a 3D representation of the assessed Pro-Frame Wall assembly including interior and exterior sheathing layers. A non-insulative rainscreen exterior cladding was indirectly included in the effective R-value calculation using a sheltered exterior air film resistance in accordance with CSA Z5010.

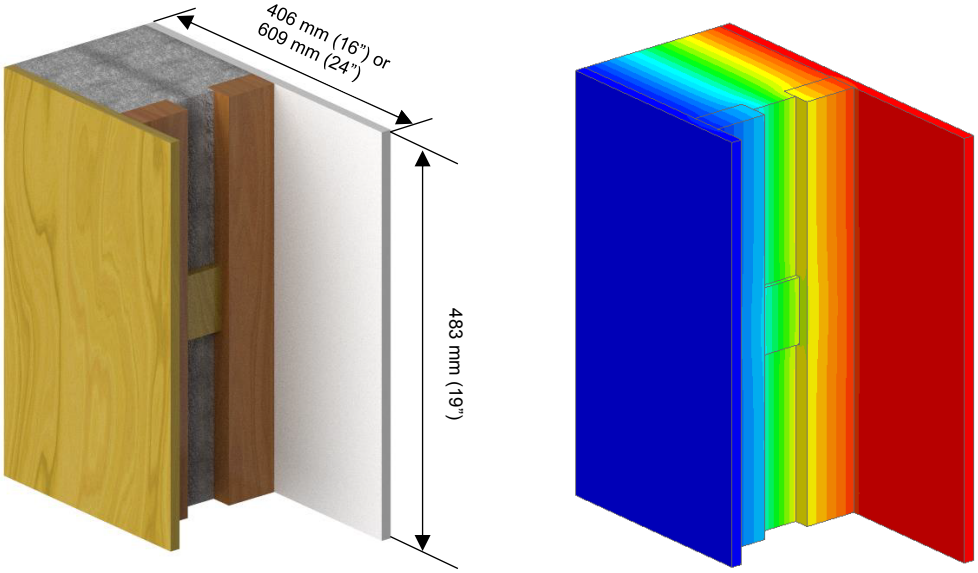


Figure 1: 3D representation of the 2x8 interior insulated Pro-Frame Wall assembly

Due to the unique geometry of the Pro-Frame Wall assembly relative to traditional framing members, RDH validated the results of the calculations by simulating a 406 mm by 482 mm clear field section of the 2x8 Pro-Frame assembly. The results of the 3D thermal simulation matched the calculation approach within 1%.

2x8 Pro-Frame Thermal Performance

Table 1 describes the effective thermal performance of several interior insulated Pro-Frame wall assemblies. Table 1 also includes a comparable 2x8 wood framed wall.

TABLE 1 SUMMARY OF 2X8 PRO-FRAME THERMAL PERFORMANCE

Wall Description	Nominal R-Value	16" O.C. Effective R-Value (RSI-Value)	% Effective Insulation	24" O.C. Effective R-Value (RSI-Value)	% Effective Insulation
Pro-Frame 2x8 Wall, Fiberglass Batt	R-28	R-24.8 (4.37)	80%	R-25.4 (4.48)	82%
Pro-Frame 2x8 Wall, Blown-In Cellulose	R-26	R-23.7 (4.17)	81%	R-24.2 (4.26)	83%
Pro-Frame 2x8 Wall, Open Cell Spray Foam	R-27	R-24.3 (4.28)	81%	R-24.9 (4.38)	83%
Pro-Frame 2x8 Wall, Closed Cell Spray Foam	R-37	R-30.7 (5.41)	75%	R-31.7 (5.57)	78%
Standard 2x8 Wood Wall, Fiberglass Batt	*R-28*	*R-21.2 (3.73)*	*67%*	*R-22 (3.88)*	*70%*

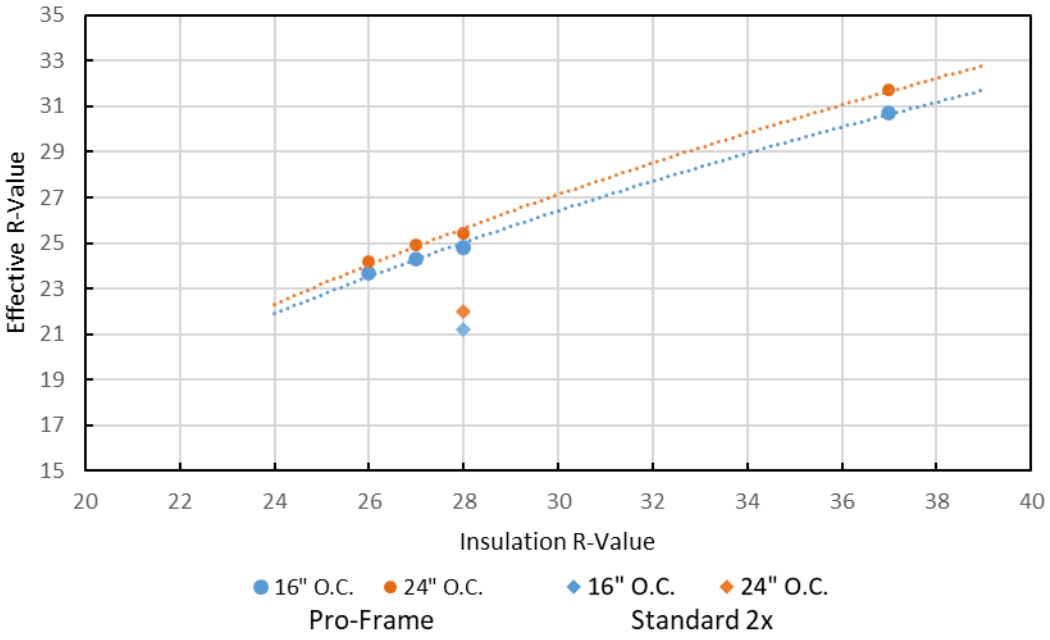


Figure 2: Effective R-value vs. Nominal Insulation R-value installed in the framed cavity for the Pro-Frame Wall system. A standard 2x8 wall assembly is shown for comparison.

The following tables provide an example of the isothermal-planes and parallel-path flow calculations.

TABLE 2 EXAMPLE CALCULATION
General Wall Description: Pro-Frame 2x8 Wall @ 16" O.C. with Blown-In Cellulose

Continuous Layers Description	Thickness [mm]	RSI/mm	RSI [m²·K/W]	R-Value [ft²·hr·°F/Btu]
Exterior Air Film	0.00	N/A	0.12	0.68
Plywood - Generic Softwood	12.70	0.009	0.11	0.62
Pro-Frame 2x8 Wall @ 16" O.C. with Blown-In Cellulose	184.15	0.020	3.74	21.23
Gypsum Wall Board	12.70	0.0061	0.08	0.44
Interior Air Film	0.00	N/A	0.12	0.68
Effective R-value			**4.17**	**23.7**

Pro-Frame Parallel Paths Description	Thickness [mm]	RSI/mm	RSI [m²·K/W]	R-Value [ft²·hr·°F/Btu]
R1 - Spacer	82.55	0.017	1.58	8.98
R2 - Insulation	57.15	0.034	2.51	14.24
R-Value for Pro-Frame			2.30	13.04

Framing and Insulation Parallel Paths Description	Thickness [mm]	RSI/mm	RSI [m²·K/W]	R-Value [ft²·hr·°F/Btu]
Pro-Frame Framing (23%)	184.15	0.012	2.30	13.04
Insulation (77%)	184.15	0.025	4.60	26.14
R-Value for Pro-Frame and Insulation			3.74	21.23

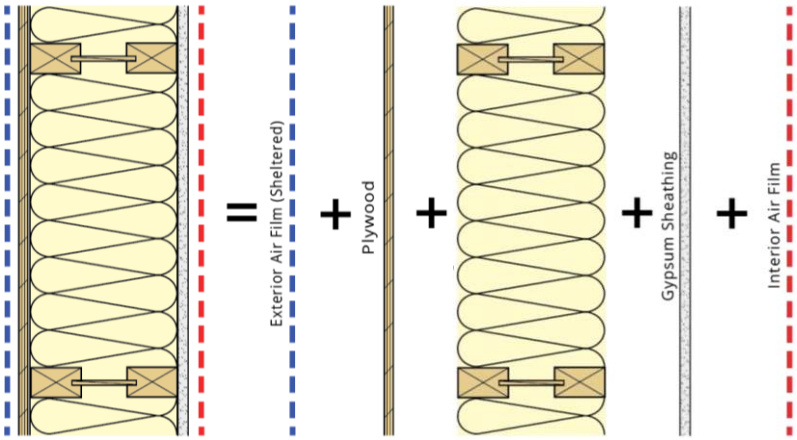
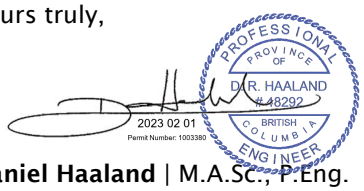


Figure 3: Illustration of the isothermal-planes and parallel-path flow calculation including sheltered exterior air film resistance per CSA Z5010.

We trust that this letter meets with your needs at this time. Please feel free to contact the authors of this letter with any questions regarding the calculation methodology or results.

Yours truly,



Daniel Haaland | M.A.Sc., P.Eng.
Associate, Building Science Engineer
dhaaland@rdh.com
T 778-370-6862
RDH Building Science Inc.

Baihan Guo | B.A.Sc
Building Science Engineer (EIT)