Plasti-Fab Design Manual

Wall Insulation Exterior Insulating Sheathing

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Plasti·Fab™ EPS PRODUCT SOLUTIONS **PlastiSpan™ Insulation**

Exterior Insulating Sheathing

New or Retrofit Construction

PlastiSpan insulation board can be used as an exterior insulating sheathing over wood or steel studs to increase the thermal resistance of a wall to any desired value without changing the framing system. When PlastiSpan insulation is placed over the entire exterior of the building, it provides a monolithic insulation to eliminate thermal shorts and reduce air infiltration while preserving the economy and familiarity of the framing system.

To obtain maximum energy efficiency, a layer of PlastiSpan insulation should be placed over the entire exterior of the building envelope. PlastiSpan insulating wall sheathing can be matched in thickness to exterior basement insulation to provide a continuous blanket of insulation without changes in surface level. Where the exterior finish of a wall must be supported by the building frame several systems are suggested using either a metal T-stud or nailers.

PlastiSpan insulating sheathing is not structural; as a result, if corner bracing is required for wind bracing or multi-story construction it must be added. Structural sheathing such as oriented strand board or plywood may also be used on the exterior of the studs to provide bracing. Gypsum board can also be used on the exterior with steel studs to provide a base for the exterior finish.

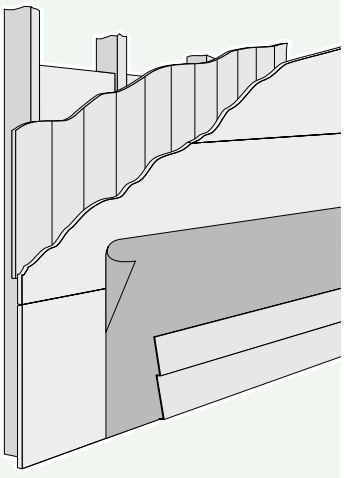
Existing buildings can be retrofitted with exterior sheathing to provide a base for a new exterior finish. With the existing finish left in place or removed, the exterior surface is completely covered with PlastiSpan insulation, and door and window frames built out to cover the extra insulation put in place. The bottom edge of the insulation must be supported by an insulation stop under the finish. A new exterior finish is applied over PlastiSpan insulation providing an efficient method for lowering fuel costs.

Residential construction under Part 9 of the National Building Code is generally of wood frame construction. Steel framing is more commonly used in Part 3 construction. Gypsum board inside and outside the frame can provide the fire rating required for a number of occupancies.

PlastiSpan insulation when used as exterior sheathing should be covered immediately after application. Should immediate covering not be possible or if the location is windy PlastiSpan HD insulation is recommended for use as exterior sheathing.

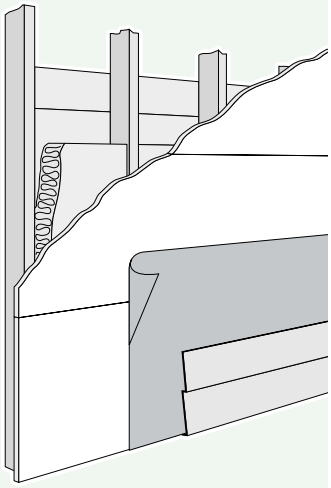
The advantages from an energy efficiency perspective of specifying a wall system using 38 x 89 mm (2" x 4") stud framing and PlastiSpan insulating sheathing versus a wall system using 38 x 138 mm (2" x 6") stud framing with insulation in stud cavities only can be seen by comparing the effective thermal resistance (R-Value) for each system. Effective R-Value calculations include the effect of thermal shorts due to framing which can leave up to 20% of the wall area uninsulated.

- Can be applied over existing wall construction.
- When added over existing construction, monolithic insulation layer increases effective thermal resistance of the wall.



Insulating Sheathing over Existing Construction

- Can be applied over wood or steel stud framing.
- Provides a monolithic insulation layer over exterior of building.
- When added over new construction, increases effective thermal resistance of the wall due to elimination of thermal shorts.



Insulating Sheathing over New Construction

Calculation for Wall System Effective Thermal Resistance

$$\text{Effective R-Value} = \frac{100\%}{\frac{\%\text{ Area with Framing}}{\text{R-Value through Framing}} + \frac{\%\text{ Area without Framing}}{\text{R-Value through Insulation}}}$$

PlastiSpan insulating sheathing provides a monolithic insulation layer over the exterior of the building eliminating thermal shorts and reducing air infiltration. As well, substitution of 2 x 4 in lieu of 2 x 6 studs retains the familiarity of wood framing, while adding the economy of 2 x 4 studs.

2 x 4 Stud Wall with R-12 Batt Insulation and R-8 PlastiSpan Insulating Sheathing

WALL COMPONENT DESCRIPTION	RSI-VALUE		R-VALUE	
	THROUGH FRAMING	THROUGH INSULATION	THROUGH FRAMING	THROUGH INSULATION
Outside Air Film (above grade)	0.03	0.03	0.17	0.17
Metal Siding	0.11	0.11	0.62	0.62
Sheathing Paper	0.01	0.01	0.06	0.06
R-8 PlastiSpan Insulation	1.41	1.41	8.00	8.00
R-12 Batt Insulation	—	2.11	—	12.00
Wood Stud @ 406 mm (16") o.c.	0.72	—	4.09	—
Gypsum Wall Board, 13 mm (1/2")	0.08	0.08	0.45	0.45
Inside Air Film	0.12	0.12	0.68	0.68
Sub-Totals	**2.48**	**3.87**	**14.07**	**21.98**
EFFECTIVE THERMAL RESISTANCE	**RSI 3.50**		**R 19.86**	

Thermal Resistance Calculation – PlastiSpan Insulation over 38 x 89 mm (2" x 4") Wood Stud Wall

2 x 6 Stud Wall with R-20 Batt Insulation Only

WALL COMPONENT DESCRIPTION	RSI-VALUE		R-VALUE	
	THROUGH FRAMING	THROUGH INSULATION	THROUGH FRAMING	THROUGH INSULATION
Outside Air Film (above grade)	0.03	0.03	0.17	0.17
Metal Siding	0.11	0.11	0.62	0.62
Sheathing Paper	0.01	0.01	0.06	0.06
R-20 Batt Insulation	—	3.52	—	20.00
Wood Stud @ 406 mm (16") o.c.	1.13	—	6.44	—
Gypsum Wall Board, 13 mm (1/2")	0.08	0.08	0.45	0.45
Inside Air Film	0.12	0.12	0.68	0.68
Sub-Totals	**1.48**	**3.87**	**8.42**	**21.98**
EFFECTIVE THERMAL RESISTANCE	**RSI 2.96**		**R 16.83**	

Thermal Resistance Calculation – 38 x 138 mm (2" x 6") Wood Stud Wall (Batt Insulation Only)

Selection, Specification and Application Instructions:

1. Scope:

1.1. National Building Code (NBC) Article 9.23.17.4. - Insulating Sheathing in Lieu of Sheathing Membrane.

1.2. NBC Sentence 9.23.17.5.(3). - Sheathing Membranes in Lieu of Sheathing.

2. Materials:

2.1. Insulation Materials:

2.1.1. PlastiSpan insulating sheathing board is an expanded polystyrene insulation meeting the requirements of CAN/ULC-S701, Type 1 or Type 2.

2.1.2. PlastiSpan insulation board (Type 1) is listed in the Canadian Construction Materials Centre (CCMC) Registry of Product Evaluations under CCMC evaluation listing 12424-L.

2.1.3. PlastiSpan HD insulation board (Type 2) is listed in the CCMC Registry of Product Evaluations under CCMC evaluation listing 12425-L.

2.1.4. NBC Sentence 9.23.16.3.(1) states that rigid insulation shall not be used for the attachment of siding materials. PlastiSpan insulating sheathing board can provide backing for exterior cladding.

2.1.5. NBC Article 9.23.17.4. states that where rigid exterior insulating sheathing, such as PlastiSpan M24 insulation board with shiplap edges, is installed, a separate sheathing membrane is not required since the joints are lapped and detailed to ensure drainage of water to the exterior.

2.1.6. The shiplap edges of PlastiSpan M24 insulation butted tightly together will provide a tight joint, so taping or caulking of joints will not be required.

2.1.7. Sentence 9.23.17.5.(3) states that PlastiSpan insulating sheathing board with joints not detailed as per 2.1.5 above can be used in lieu of one of the two layers of sheathing paper required per NBC Sentence 9.23.17.5.(1).

2.2. Other Materials:

2.2.1. Caulking adhesives used shall conform to CGSB Standard 71-GP-24M, Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.

2.2.2. Construction tape used shall be any commercially available construction tape such as 3M, Venture or equivalent.

2.2.3. Foam-in-place polyurethane shall be commercially available material compatible with polystyrene insulation.

2.2.4. Fasteners must have heads or washers at least 12.7 mm (1/2") in diameter,where the cladding is applied directly against the insulation, and at least 25.4 mm (1") diameter, where an air space between the insulation and the cladding exists.

Selection, Specification and Application Instructions:

3. Installation:

3.1. General:

3.1.1. Install PlastiSpan insulating sheathing board on the exterior of wood stud construction with all joints butted tightly together and vertical joints made at wood stud locations.

3.1.1.1. If 600 mm x 2440 mm (2 x 8 ft) boards, install board horizontally.

3.1.1.2. If 1220 mm x 2440 mm (4 x 8 ft) boards, install boards vertically.

3.1.2. Since PlastiSpan insulating sheathing board is not a structural sheathing, temporary wind bracing will be required until interior gypsum board is installed. NBC Sentence 9.23.10.2.(3) provides acceptable corner bracing methods. Typical methods used include:

3.1.2.1. diagonal 19 mm x 89 mm (1" x 4") let-in wood bracing,

3.1.2.2. flat or profiled steel strap bracing, or

3.1.2.3. OSB or plywood sheets at corners overlaid with PlastiSpan insulating sheathing.

3.1.3. Installation of batt insulation between wood studs and interior vapour barrier shall be completed following normal construction practices and in conformance with the applicable section of the Code.

3.1.4. When used as a backing for exterior cladding, PlastiSpan insulating sheathing board shall be fastened to framing as per section 2.1.4 above using fasteners as described in section 2.2.4. above as follows:

3.1.4.1. at a spacing of not more than 150 mm (6") centres along its vertical edges and

3.1.4.2. on a grid of not more than 300 mm. x 600 mm. (12" x 24") for the remainder of the sheet

3.1.5. Cladding materials shall be nailed through PlastiSpan insulating sheathing board into the framing members, furring members or to blocking between the framing members as stated in NBC Sentence 9.27.5.1.(1) using fasteners that are minimum of 25 mm (1") longer than the sheathing thickness used.

3.1.6. Fasteners for shakes and shingles shall penetrate into the framing not less than 19 mm (3/4"). Fasteners for other types of cladding shall penetrate into the framing not less than 25 mm (1").

3.1.7. Use a suitable material as per section 2.2.2 or 2.2.3 above to seal joints that have been cut or damaged. Typical locations where the joint may be cut include at corners or around windows and doors.

3.1.8. When PlastiSpan insulating sheathing as per sections 2.1.5 and 2.1.6 is installed, a separate sheathing membrane is not required to be used over PlastiSpan insulating sheathing board.

3.1.9. When PlastiSpan insulating sheathing as per section 2.1.7 is installed, install at least one layer of sheathing paper in conjunction with PlastiSpan insulating sheathing board.

PlastiSpan Insulation Properties

MATERIAL PROPERTIES	TEST METHOD	METRIC (SI) UNITS	CAN/ULC-S701		IMPERIAL UNITS	CAN/ULC-S701	
			TYPE 1	TYPE 2		TYPE 1	TYPE 2
Thermal Resistance [1] Minimum	ASTM C 518	$\frac{m^2 \cdot °C}{W}$	0.65	0.70	$\frac{ft^2 \cdot hr \cdot °F}{BTU}$	3.75	4.04
Compressive Resistance Minimum @ 10% Deformation	ASTM D 1621	kPa	70	110	psi	10	16
Flexural Strength Minimum	ASTM C 203 Procedure B	kPa	170	240	psi	25	35
Water Vapour Permanence [2] Maximum	ASTM E 96	$\frac{ng}{Pa \cdot s \cdot m^2}$	300	200	perms	5.2	3.5
Dimensional Stability Maximum	ASTM D 2126 7 days @ 70 ± 2° C	% linear change	1.5	1.5	% linear change	1.5	1.5
Water Absorption Maximum	ASTM D 2842	% by volume	6.0	4.0	% by volume	6.0	4.0
Limiting Oxygen Index [3] Minimum	ASTM D 2863	%	24	24	%	24	24

NOTES:
1. Thermal resistance measured at mean temperature of 24°C (75°F) for 25 mm (1 inch) thick material.
2. Values quoted are maximum for 25 mm (1 inch) thick material. Lower values will result for thicker materials.
3. PlastiSpan insulation board has a maximum Flame Spread Rating of 290 and a Smoke Developed Rating greater than 500 for minimum thickness of 25 mm classified in accordance with CAN/ULC–S102.2M.

WES – 0406

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