

EffectiveR.ca

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WAL	L ASSEMBLY COMPONENTS ¹	RSI	R
1	exterior air film	0.03	0.17
2	3/8" (10mm) lamina ²	0.01	0.05
3	2" (50.8 mm) unfaced expanded polystyrene type 2	1.42	8.08
4	more than 3/4" (20mm +) drainage space ³	0.18	1.02
5	liquid applied membrane - water resistive barrier ⁴	0.00	0.00
6	asphalt impregnated paper ⁴	0.00	0.00
7	7/16" (11.1mm) OSB sheathing	0.11	0.62
8	2x6 framing w/ 2 lb. closed cell spray foam @ 16" o.c.	2.89	16.41
9	smart vapour retarder⁵	0.00	0.00
10	1/2" (12.7mm) gypsum board	0.08	0.45
11	finish: 1 coat latex primer and latex paint	0.00	0.00
12	interior air film	0.12	0.68
Effective RSI / R Value of Entire Assembly		4.84	27.48
Centre of Cavity RSI / R Value		6.99	39.69
Installed Insulation RSI / R Value(nominal)		6.46	28.62
Effective RSI / R Value of Assembly with Advanced Framing (advanced framing as defined by NBC9.36.2.4.(1))		5.07	28.79



Note: ¹Values are for generic insulation products. Where a specific insulation product is used in the assembly, the thermal resistance value, or long term thermal resistance value, where applicable, of that product is permitted to be used as reported by the Canadian Construction Materials Centre (CCMC) in the evaluation of such a product. ³The drainage space incorporates an air space and is created in two ways: 1) the thickness of the vertical adhesive ribbons used to secure the insulation board to the WRB and wood sheathing or 2) a geometrically defined insulation board that has grooves cut out to provide a vertical channel for drainage. The method in which the drainage cavity is created is generally part of the proprietary nature of EIFS but must conform the the requirements of Code. ⁴Simulated with



Summary

The Exterior Insulation Finish System (EIFS) incorporates an insulative sheathing that reduces the risk of interstitial condensation by raising the temperature of the wall assembly inboard of it, and reduces the potential for inward solar driven moisture issues. However, the relatively low permeability of the combined wood sheathing and EIFS results in a reduced drying potential of the assembly, so extra care must still be taken to minimize the chance of rain water leaking into the assembly by proper detailing and use of flashings and sealants. Only EIFS with an air gap manufactured as part of the insulation board or created by the adhesive (drained EIFS) should be used. This gap provides proper drainage to the exterior at all penetrations with the help of proper flashing details at the bottom of the wall. While air gap sizes vary considerably between different EIFS systems, and a gap of only 1 mm has been shown to be sufficient to provide drainage, larger gap sizes may improve the rate of drying. The use of a ventilated cavity (vent holes at both the top and bottom of the air gap) has also been shown to improve drying over a vented cavity (vent/drainage holes only at the bottom), and should be considered for wetter climates. However, some research has also shown that higher ventilation rate may also negatively impact the thermal resistance of the EIFS.

This EIFS assembly uses a smart vapour retarder as the vapour barrier in lieu of polyethylene. This increases the drying potential towards the inside. With proper detailing the water resistive barrier (WRB) would be the air barrier in this assembly. In summary, please refer to manufacturer installation instructions and requirements.

Energy & Thermal Performance

- Advanced framing as defined by NBC 9.36.2.4. (1) (e.g. insulated headers, 2 stud corners, ladder blocking, and in-line framing) can potentially reduce the framing factor by 10% to 20%)
- Maximum nominal R-value of cavity insulation is typically limited to R19,20,22,24 (fiberglass batt) to R30 with medium density spray-applied insulation
- EIFS are available with a variety of insulation thicknesses from 1" to 3" or more.
- Most EIFS use a type 1 or 2 EPS insulation board. The insulation board properties provide an ideal attachment base for the lamina coatings.
- EIFS provides a continuous layer of insulation across the exterior wall thereby significantly minimizing thermal bridges and enhancing the overall effective R-value of the entire assembly.
- Due to the limited permanence of some proprietary applied weather barriers (located within the assembly as a drainage plane), keeping the wall dry through detailed flashing and rigorous air barrier applications is important.
- The exact RSI value for proprietary EIFS will vary between manufacturers. It would be advisable to obtain the EIFS manufacturers' proprietary testing data to ensure appropriate RSI values are recognized.

Exterior Moisture/Wetting

- Care must be taken at all penetrations and transitions (windows, etc.) by use of proper detailing as well as sealants and/or flashing to ensure water does not leak into the assembly.
- The air gap between the insulative sheathing and the water resistive barrier is designed to drain any water which reaches the gap to the outside. However, the drying potential of the wall from behind the WRB towards the outside is significantly reduced by the wood sheathing, WRB composite and the EIFS.
- Unlike polyethylene, a variable permeance "smart" vapour retarder will help the assembly dry to the inside and help reduce risk of moisture accumulation.

• Built-in construction moisture must be managed to reasonable levels.

Air Leakage Transported Moisture from Inside

- Air leakage into the assembly must be managed by means of a continuous air barrier (preferably both interior and exterior). Proper detailing at any connection or penetrations (window openings, electrical boxes, plumbing penetrations etc.), will also help reduce heating and air conditioning costs.
- The spray foam filling the stud cavity in this assembly effectively manages the leakage of warm, moist interior air.
- In order to be used as an effective air barrier, the 2lb spray foam product must be approved by CCMC as part of an air barrier system. Please refer to the product's technical specifications and manufacturer's instructions.
- Additional air leakage control from the inside will be provided by the polyethylene, vapour retarder paint or smart vapour retarder layer recommended for vapour diffusion control, as well as the gypsum board

Water Vapour Diffusion from Inside 🜌

- Vapour diffusion from the inside must be controlled by the installation of a vapour retarding membrane (such as polyethylene, a vapour retarder paint or variable permeance "smart" vapour retarder if the code allows) on the inside behind the gypsum board or painted onto the gypsum board according to code.
- For some climates where the drying potential in the winter is not ideal, the thickness of the insulative sheathing must be increased to raise the dew point temperature in the stud cavity, reducing the potential for condensation but depends on the assembly and inwards drying potential.

Drying Potential

- The air gap between the insulative sheathing and the water resistive barrier is designed to drain any water which reaches the gap to the outside. However, the drying potential of the wall from behind the WRB towards the outside is significantly reduced by the wood sheathing, WRB composite and the EIFS.
- Built-in moisture must be managed to reasonable levels.

Ease of Construction

- This wall is easily constructed through traditional stick frame methods on-site
- Exterior wood sheathing provides both structural resistance to "racking" and a nailing substrate for cladding materials
- Insulation, weather barrier and air barrier details and materials are readily available and understood within the Canadian industry
- Constructing walls with exterior insulation is rapidly becoming common practice in some Canadian Zones
- Handling, application and process integration of rigid insulation by Suppliers and Framers can initially affect cycle time - however, production cycle times quickly return to normal after the first few built units
- Materials such as studs, wood sheathing panels and/or insulation sheet goods are readily available in pre-cut lengths for 8' and 9' wall heights
- Spray-applied insulation products must be applied within given ideal temperature ranges as per manufacturer instructions
- Foam plastics (board stock) or other spray applied insulation products will likely require fire protection prior to occupancy as per the NBC/Provincial Building Codes

- EIFS are tested and approved as an entire system. It is critical that EIFS be applied using the referenced manufacturers' materials and application methods.
- EIFS will require water management and weather resistant barrier detailing and application. This includes preparing all intended openings with integrated flashing and drainage details.
- Length of EIFS fastener will vary with thickness of EIFS EPS insulation.
- EIFS can be an effective exterior air barrier. Most EIFS manufacturers provide specific details and cut-sheets detailing how to ensure continuity of the air barrier through openings and penetrations of the envelope.
- It is highly recommend that EIFS applications be applied as a "system" as per CCMC specifications and approvals. Mixing elements of various EIFS systems from various manufacturers is extremely risky.
- The fastener spacing, size, and embedment into the backup wall attaching the insulation and cladding depends on the cladding weight, the stud spacing of the backup wall, the sheathing type and thickness, and the exterior insulation type and thickness.

Affordability: Cost Implications

- Reduction in wood use framing stud members is possible (19.2" OR 24" o.c.) with no additional engineering required.
- Alternative bracing methods can be substituted for the wood sheathing panel (e.g. Tslot inlet bracing) - however, details for wall bracing, tall walls, and more than 3storey construction may require additional engineering
- Wall thickness adjustment could require minor increase of foundation wall thickness (e.g. 8" to 10" foundation width) and increase costs
- Wall thickness adjustment could require minor jamb extensions or additional trim details on openings in the enclosure (i.e. for windows and doors)
- Advanced framing as defined by NBC 9.36.2.4. (1) (e.g. insulated headers, 2 stud corners, ladder blocking, and in-line framing) can potentially reduce overall lumber costs by upwards of 10 to 20% (i.e. for softwood and panel products)
- Some spray-applied insulation products may require changes to electrical wire gauge requirements within enclosures
- Cost of EIFS material and related labour vary widely from region to region

Esthetics: Architectural Design

- This wall assembly design can be used up to 3 storey construction under most prevailing building codes
- Exterior wood sheathing provides a nailing substrate for cladding materials including various siding applications (vertical or horizontal)
- Exterior wall dimension width may have minor effect on interior dimensions (i.e. stair widths on exterior walls and overall interior useable square footage)
- Wall thickness adjustment may not require minor increase of foundation wall thickness (e.g. 8" to 10" foundation width) in some applications. EIFS is non-structural cladding adhered directly to the structural wall.
- Manufacturer proprietary EIFS material coatings and integrated drainage spaces will vary in thickness and design. Therefore, it would be prudent for designers to reference the exact EIFS specifications and testing data.
- EIFS provide an array of exterior finishes that resembles stucco. EIFS and stucco are not the same. The primary difference is that in EIFS, the thermal insulating boards support the base coat with integral glass fibre reinforcing mesh. This differs from conventional stucco, where the reinforcement is the supporting element of the rendering.

DISCLAIMER: The Canadian Wood Council's Wall Thermal Design Calculator has been developed for information purposes only. Although all possible efforts have been made to ensure that the information on this tool is accurate, the CWC cannot under any circumstances guarantee the completeness, accuracy or exactness of the information. Reference should always be made to the appropriate Building Code and/or Standard. This tool should not be relied upon as a substitute for legal or design advice, and the user is responsible for how the tool is used or applied.

Although all possible efforts have been made to ensure that the information on this tool is accurate, we cannot under any circumstances guarantee the completeness, accuracy or exactness of the information. Suggestions regarding this tool are welcome. If you feel that areas are missing, unclear or incorrect, please forward your suggestions to <u>effectiveR@cwc.ca</u>

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