



WALL ASSEMBLY COMPONENTS ¹		RSI	R
1	exterior air film	0.03	0.17
2	single-faced cellulose fibre reinforced cement 5/16" (8mm) ²	0.03	0.15
3	spun bonded polyolefin (house wrap)	0.00	0.00
4	1/2" (12.7mm) Plywood sheathing	0.11	0.62
5	2x8 framing filled with R28 batt @ 24" o.c.	3.40	19.31
6	smart vapour retarder ⁴	0.00	0.00
7	1/2" (12.7mm) gypsum board	0.08	0.45
8	finish: 1 coat latex primer and latex paint	0.00	0.00
9	interior air film	0.12	0.68
Effective RSI / R Value of Entire Assembly		3.77	21.38
Centre of Cavity RSI / R Value		5.30	30.07
Installed Insulation RSI / R Value(nominal)		4.93	28.00
Effective RSI / R Value of Assembly with Advanced Framing (advanced framing as defined by NBC9.36.2.4.(1))		3.99	22.62

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. ²The building code does not require furring behind fibre-cement, however please refer to the specific fibre-cement manufacturer instructions for drainage space requirements.

LEGEND High Pass Pass Conditional Pass Conditional Fail Fail

SIMULATED DURABILITY ANALYSIS

Note: See WUFI Assumptions. Non-wood based exterior sheathing material that has a water vapour permeance less than 80 ng/(Pa·s·m²) must comply to NBC 9.25.5.2.

LOCATION: Vancouver Edmonton Toronto Montreal St. John's

DURABILITY RATING
BASED ON SIMULATIONS
AND FIELD EXPERIENCE



21.4

R_{eff}

Summary

This is a durable wall overall in all the climate zones listed, due mainly to the rain screen properties of the lapped board siding, whether installed directly over a water resistive barrier such as asphalt impregnated paper 30 minute paper, or installed over vertical furring as required in some jurisdictions (best practice). However, the thicker 2x8 assembly has a slightly reduced drying ability compared to a 2x6 assembly and a colder cladding temperature. The lapped board siding is water shedding on all painted surfaces, thus minimizing solar-driven moisture issues, while maintaining excellent drying potential towards the outside due to the ventilation behind the siding for convective drying should any moisture find its way into the wall. The variable permeance vapour retarder also allows drying towards the inside.

Notes:

- Lapped board is susceptible to freeze-thaw deterioration, so it is important to maintain minimum clearances as per manufacturer guidelines from the ground or wall/roof intersections to avoid excessive water absorption, and contact with standing water should always be avoided
- Due to the caustic nature of the product, corrosion resistant fasteners must be used as per manufacturer guidelines
- Butt joints where two adjacent lapped board siding boards meet must be installed with a piece of flashing behind the joint as per manufacturer guidelines, with the bottom lapped over the top of the siding board beneath to direct any water back out onto the surface
- Any field cut edges must be caulked, painted or primed as per manufacturer guidelines to avoid moisture absorption
- Best practice is to install lapped board siding with the fastener heads driven snug against the siding (not flush), as the fastener head can then act as a spacer providing a small air gap where the two boards overlap shingle style, as this provides ventilation for convective drying and allows the assembly to better act as a rain screen

Energy & Thermal Performance

- This wall is subject to some thermal bridging due to exposure of framing elements to outside temperature conditions.
- The framing factor for this wall at 24" o.c. is 20% (i.e. 20% of the wall is wood only and 80% is insulated)
- 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%)
- The effective R value calculations and the durability analysis were completed for cement board assuming a minimum 10mm cavity space between the cladding and the substrate. It should be noted that some fiber cement board products can be installed over solid-foam insulation board up to 1-in. thick without the 10mm cavity or furring strips for additional fastening. Local prevailing building codes and manufacturers installation instructions should be deferred to in every case.

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.
- 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.
- The fibre cement siding is non-absorptive on all painted/treated surfaces.
- The fibre cement siding is rain shedding, and therefore acts as a rain screen when installed properly in accordance to manufacturer instructions. All field cut edges must be caulked, painted or primed. Flashing must be installed behind each siding butt joint.

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.
- This wall assembly has good drying potential towards the outside due to the ventilation behind the siding in the furring space allowing for convective drying.

Water Vapour Diffusion from Outside

- Solar driven moisture is not a significant issue with vinyl, fibre cement, metal, Maibec type coated wood siding (with all surfaces coated) or other similar non-absorptive and rain-shedding sidings, provided they are detailed properly, they have a ventilated (openings at the top and bottom of the assembly) air gap minimum 3/8" behind them, and that they are installed in accordance to manufacturer guidelines.
- The non-absorptive lapped board siding does not have significant solar driven moisture issues when installed properly in accordance to manufacturer instructions. All field cut edges must be caulked, painted or primed. Flashing must be installed behind each siding butt joint.

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.

Drying Potential

- Should the moisture get into the assembly through penetrations, it has good drying potential to the outside. Air movement behind the lapped board siding over vertical furring is important.
- 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
- 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
- Length of fastener may need minor adjustment to ensure proper penetration depth into framing member. When applying fiber cement board siding to furring strips,

which is applied on foam sheathing or other non-nailable substrates (e.g. gypsum sheathing) with a combined thickness up to 4 inches thick, the foam sheathing and other non-nailable substrates do not have adequate nail holding capacity. In this scenario the nail holding substrate for the cladding is the furring strips. Fastener depth and type must be specified by the designer in accordance with the manufacturers instructions.

Affordability: Cost Implications

- Alternative bracing methods can be substituted for the wood sheathing panel (e.g. T-slot inlet bracing) - however, details for wall bracing, tall walls, and more than 3-storey construction may require additional engineering
- 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)

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)
- Fiber cement as do all building materials, expands and contracts with changes in relative humidity and temperature. Most manufacturers recommend designing for this type of movement on buildings with long runs of continuous siding.
- Fiber cement board is available in both plank (single long traditional siding lengths) and panel (up to 4x8 sheet/panel) configurations. This allows for a wide range of exterior finishes and architectural features.

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 effectiveR@cw.ca