



WALL ASSEMBLY COMPONENTS <sup>1</sup>		RSI	R
1	exterior air film	0.03	0.17
2	vinyl siding (no air space)	0.11	0.62
3	spun bonded polyolefin (house wrap)	0.00	0.00
4	3/8" (9.5 mm) OSB sheathing	0.09	0.53
5	2x6 framing filled with R22 batt @ 16" o.c.	2.55	14.48
6	polyethylene	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
<b>Effective RSI / R Value of Entire Assembly</b>		<b>2.98</b>	<b>16.93</b>
Centre of Cavity RSI / R Value		4.30	24.45
Installed Insulation RSI / R Value(nominal)		3.87	22.00
Effective RSI / R Value of Assembly with Advanced Framing (advanced framing as defined by NBC9.36.2.4.(1))		3.14	17.84

Note: <sup>1</sup>Values 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.

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 60 ng/(Pa·s·m<sup>2</sup>) must comply to NBC 9.25.5.2.

LOCATION: Vancouver Edmonton Toronto Montreal St. John's

DURABILITY RATING BASED ON SIMULATIONS AND FIELD EXPERIENCE



**16.9**

R<sub>eff</sub>

## Summary

This is a very durable wall overall in all the climate zones listed, due mainly to the rain screen properties of the vinyl siding. The vinyl siding is non-absorptive to moisture, thus avoiding solar-driven moisture issues, while maintaining excellent drying potential towards the outside due to the ventilation of the siding (should any moisture find its way into the wall). The rest of the wall assembly is also relatively vapour permeable outboard of the polyethylene vapour retarder, maintaining excellent drying characteristics towards the outside.

## 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 16" o.c. is 23% (i.e. 23% of the wall is wood only and 77% 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%)
- 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

## Exterior Moisture/Wetting

- Any liquid water leaking past the vinyl siding will be intercepted by the weather barrier. It must have lapped joints and be lapped over flashing (located at the bottom of the wall assembly) to act as a secondary drainage plane and drain any liquid water to the outside.
- The vinyl siding is non-absorptive and rain shedding.
- Any moisture which may leak into the wall through penetrations can dry to the outside due to the "air-leakiness" of the vinyl siding, and the excellent drying characteristics of the whole assembly
- 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.
- 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.
- Should moisture get into the assembly, it has excellent drying potential towards the outside due to the ventilation of the vinyl siding.
- 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.

## 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.
- Should moisture get into the assembly, it has very good drying potential towards the outside:
  - Fibreglass batt is very vapour permeable
  - Wood sheathing is relatively vapour permeable when on the cold side of a wall, where relative humidity is typically higher
  - Weather barrier is vapour permeable
  - Vinyl siding is ventilated, allowing convective drying to the outside

## 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

## 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. 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)

## Additional Sources of Information

[Designing Energy Efficient Building Enclosures, FPInnovations](#)

[High R Value Enclosure Assemblies, Building Science Corporation](#)

[Guide to Attaching Exterior Wall Coverings through Foam Sheathing to Wood or Steel Wall Framing, FSC](#)

[Illustrated Guide: R22+ Effective Walls in Wood-Frame Construction](#)

[Advanced Framing Construction Guide](#)

[Wood Moisture Content and the Importance of Drying in Wood Building Systems.](#)

**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 [wtd@cw.ca](mailto:wtd@cw.ca)

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