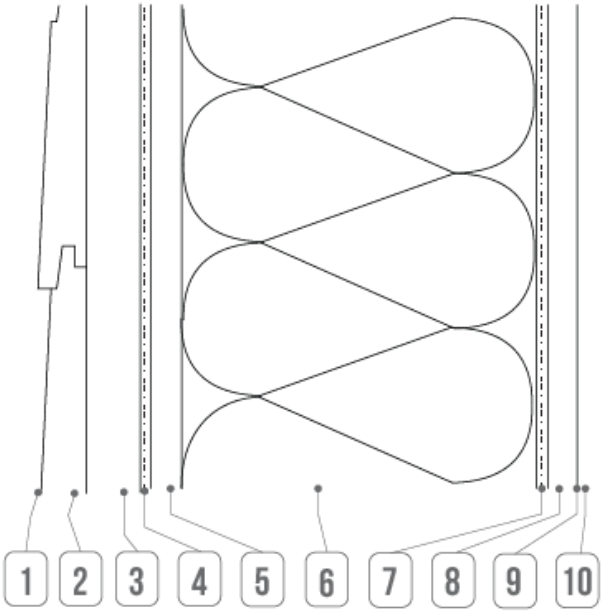


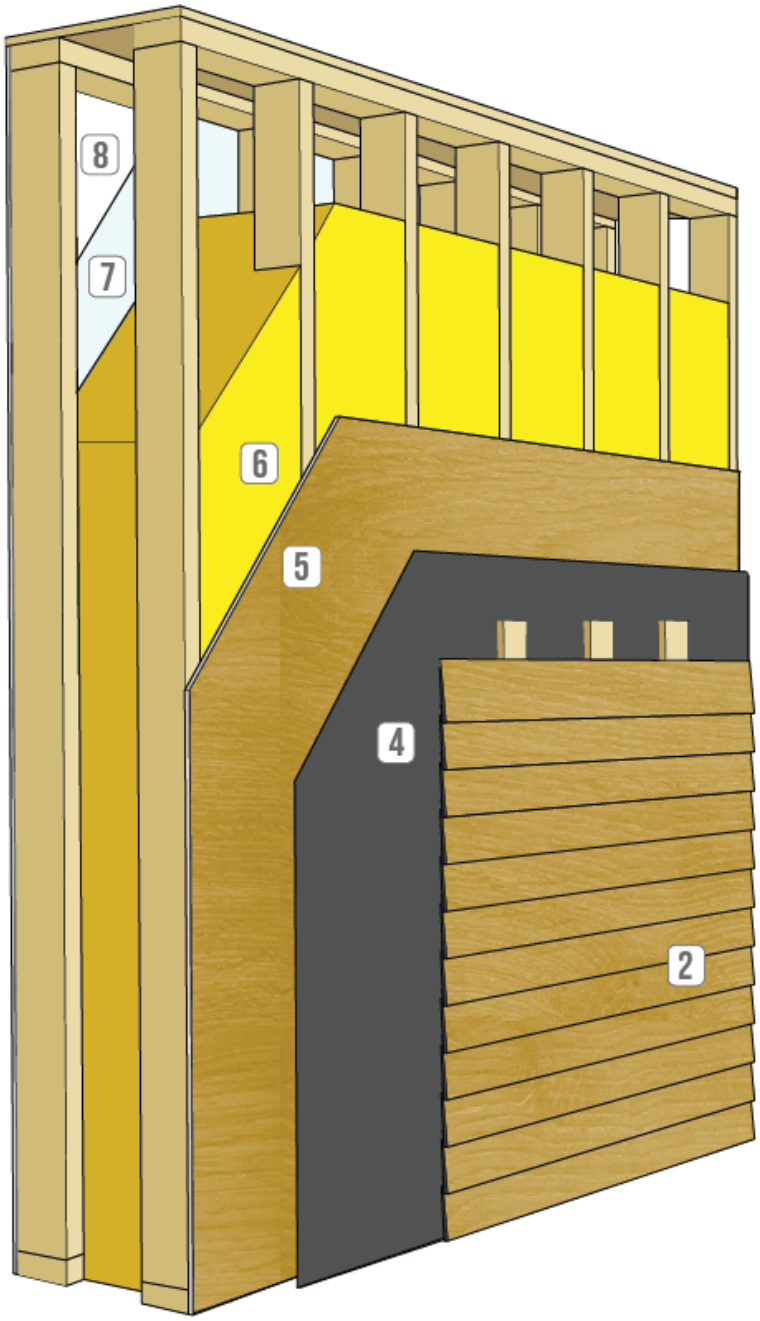


| WALL ASSEMBLY COMPONENTS[1] | | RSI | R |
|---|---|---|---|
| 1 | exterior air film | 0.03 | 0.17 |
| 2 | wood siding (bevelled)[2] | 0.00 | 0.00 |
| 3 | more than 3/4" (20mm +) air space[3] | 0.00 | 0.00 |
| 4 | asphalt impregnated paper[4] | 0.00 | 0.00 |
| 5 | 7/16" (11.1mm) OSB sheathing | 0.11 | 0.62 |
| 6 | 2x4 double stud framing filled with R36 batt @ 16" o.c. | 5.07 | 28.79 |
| 7 | smart vapour retarder[5] | 0.00 | 0.00 |
| 8 | 1/2" (12.7mm) gypsum board | 0.08 | 0.45 |
| 9 | finish: 1 coat latex primer and latex paint | 0.00 | 0.00 |
| 10 | interior air film | 0.12 | 0.68 |
| Effective RSI / R Value of Entire Assembly | | **5.41** | **30.71** |
| Centre of Cavity RSI / R Value | | 6.64 | 37.69 |
| Installed Insulation RSI / R Value(nominal) | | 6.30 | 35.77 |
| Effective RSI / R Value of Assembly with Advanced Framing (advanced framing as defined by NBC9.36.2.4.(1)) | | 5.57 | 31.62 |

Note: [1]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. [2]The siding is exterior of the vented air space, therefore excluded from calculation. [3]The vented airspace created by furring for rain screen is not a closed air space therefore excluded as an air cavity. [4]Sheathing membrane material must comply with CAN/CGSB-51.32, "Sheathing Membrane Breather Type." [5]Smart vapour retarder properties are based on CertainTeed's MemBrain™ Continuous Air Barrier and Smart Vapour Retarder 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·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 | | | | | |

**30.7** $R_{eff}$

## Summary

This is a durable wall overall in all the climate zones listed, due mainly to the rain screen properties of the painted bevelled wood siding installed over vertical furring as required in some jurisdictions (best practice). The bevelled wood siding is water shedding on all painted surfaces, thus minimizing solar-driven moisture issues, while maintaining reasonable 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 for drying towards the inside. Due to the increased thickness of these walls, there is reduced drying potential when compared to more traditional, thinner walls. The reduced drying potential is due mainly to the decreased wall temperatures and increased amount of material that moisture must travel through to dry. As a result, extra care must be taken with all construction details.

**Notes:**

- Any field cut edges must be painted and primed as per manufacturer guidelines to avoid moisture absorption
- Best practice is to install bevelled wood 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

- 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%)
- 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.
- If wood siding is installed over a standard 16" on center stud built wall and furring strips can be lined up with the studs, then a minimum strapping thickness of 10mm (3/8 inch) is permissible.If the strapping is NOT applied directly over studs, then 25mm (full 1 inch thick) strapping MUST be used. See manufacturers installation guidelines in all cases.
- To effectively limit potential for interstitial condensation a rigorous air barrier design and application is important in this wall design.
- The effective R value of this wall will increase as the "gap" between framing members is increased from 2.5" to 5.5" and beyond. This said, some thermal bridging still occurs through top and bottom plates.
- Water resistant barrier (WRB) design and application (flashing, etc) is critical to the performance and durability of this wall system.
- Proper control of vapor diffusion and the location of a vapor control layer within the assembly is important and dependent upon the climate conditions.
- Consideration of window and door jamb depth is needed. For example, placing the window glazing further "out" from the interior plane of the finished interior drywall, may increase interior convective cooling of the glass and increased condensation potential.

## 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 lapped board/bevelled wood 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.
- Any liquid water leaking past the siding will be intercepted by the asphalt impregnated 30 minute paper. 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 lapped board/beveled wood siding must be installed over 3/4" or thicker vertical furring to provide ventilation behind the cladding.
- Built-in construction moisture must be managed to reasonable levels.
- The lapped board/bevelled wood siding is non-absorptive and rain shedding.

## 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, as well as anywhere in between). Proper detailing at any connection or penetrations (window openings, electrical boxes, plumbing penetrations etc.), will also help reduce heating and air conditioning costs.
- Protected air barriers (e.g. polyethylene, OSB Sheathing etc...) located within the wall assembly are often good additional air barrier approaches for these thicker wall types.
- As a general note, the wall is able to dry to the outside, but the increased thickness caused by the double stud wall means that it does not dry as effectively as the more traditional, thinner walls.
- This assembly has good drying potential towards the outside due to the ventilation behind the siding in the furring space allowing for convective drying. However, due to the increased thickness of the double stud wall, it will not dry as effectively as the thinner walls.

## 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.

- Should moisture get into the assembly, it has reasonable drying potential towards the outside:
    - Insulation is 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
    - Siding is ventilated, allowing convective drying to the outside

## Drying Potential 

- Built-in moisture must be managed to reasonable levels.
- Should moisture get into the assembly through penetrations, it has good drying potential to the outside. Air movement behind the lapped board siding supported over vertical furring is important. While the assembly is still able to dry, it will not dry as easily as the thinner, more traditional walls.

## 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
- Prior to installation, furring strips shall be installed. It is very important to ensure adequate air circulation and drainage between the siding and sheathing so that walls can dry in all seasons and conditions. It is critical to follow manufacturer installation requirements and local prevailing building codes regarding drainage details and/or rain screen requirements.
- Wood siding cannot be applied DIRECTLY over/in contact with concrete forms (ICF) or continuous exterior insulated foam sheathings . See wood siding manufacturers installation requirements for fastening instructions when applying to ICF or insulated foam sheathing assemblies.
- Consideration to depth of window and door jambs is needed.

## Affordability: Cost Implications

- Wall thickness adjustment could require minor increase of foundation wall thickness (e.g. 8" to 10" foundation width) and increase costs
- Double stud wall enclosures can be designed to optimize spacing of structural wall studs AND spacing of non-structural wall studs (typically the interior facing assembly).

## Esthetics: Architectural Design

- Exterior wood sheathing provides a nailing substrate for cladding materials including various siding applications (vertical or horizontal)
- 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)

**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@cwc.ca