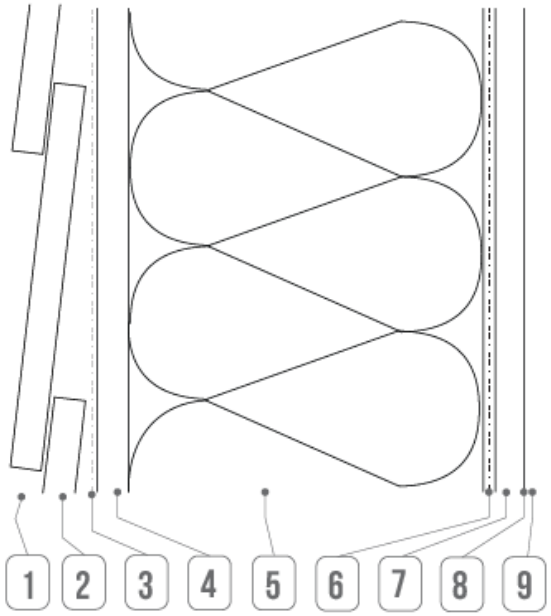

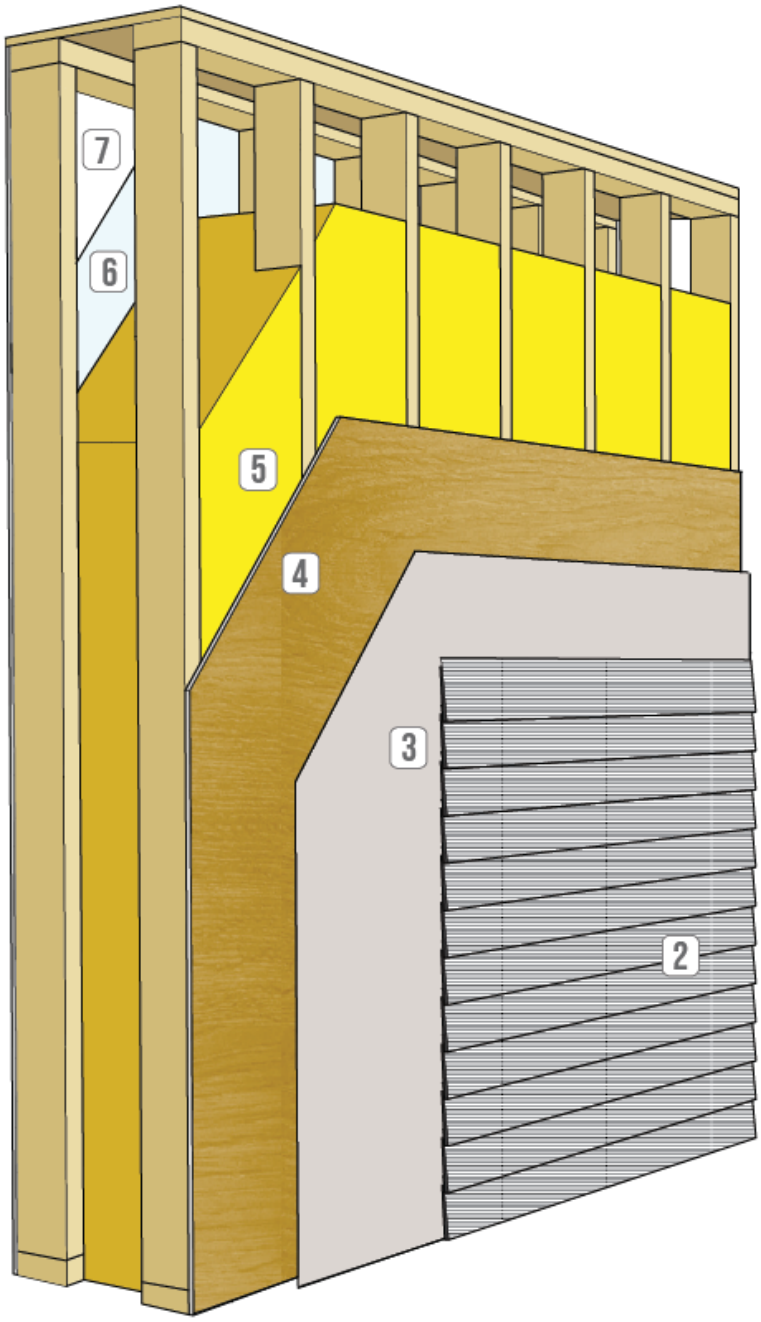

WALL ASSEMBLY COMPONENTS[1]		RSI	R
1	exterior air film	0.03	0.17
2	single-faced cellulose fibre reinforced cement 5/16" (8mm)[2]	0.03	0.15
3	spun bonded polyolefin (house wrap)	0.00	0.00
4	7/16" (11.1mm) OSB sheathing	0.11	0.62
5	2x4 double stud framing filled with R38 blown fibre glass @ 16" o.c.	5.09	28.90
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		**5.46**	**30.97**
Centre of Cavity RSI / R Value		7.23	41.02
Installed Insulation RSI / R Value(nominal)		6.86	38.95
Effective RSI / R Value of Assembly with Advanced Framing (advanced framing as defined by NBC9.36.2.4.(1))		5.68	32.22

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 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 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					

31.0 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 30 minute paper, or installed over vertical furring as required in some jurisdictions (best practice). The lapped board 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 rest of the wall assembly is also reasonably vapour permeable towards the outside, outboard of the variable permeance vapour retarder, maintaining reasonable drying characteristics towards the outside. 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:

- Lapped board may be 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

- 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.
- 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.
- 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.
- 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.
- Should moisture get into the assembly through penetrations, it has reasonable drying potential to the outside. Ventilation must be provided behind the lapped board siding supported over vertical furring.

Air Leakage Transported Moisture from Inside

- 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.
- 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.

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
- 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.
- 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)
- 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.