CLT Envelope

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Sustainable Building Manitoba Envelope Design Competition 2026

Building Elevations

The building envelope makes use of strategic openings, subtle variations in material, and a playful roof line to create an energy-efficient structure which is also sensitive to the residential character of the neighourhood.

Window openings are employed strategically to create sensitive permeations which don't overuse glazing. The bedroom features a high, long window over where the bed would likely be placed, to let light in while preserving privacy, while next to it a full-length window provides a full experience of the outside from the bedroom. The, balcony edge , central core, and face of the units have all been standardized to end flush with each other in order to limit articulations on the facade which could create difficulties in maintianing control layer continuity and create the risk of thermal bridging. This also means the balcony is entirely set in to the building mass, allowing for complete sheltering by the roof and additional privacy.

Vertical wood siding was used alongside brick to allign with the Winnipeg low-rise residential design guidelines which recommend multiple materials on the street facing facade[1], and in this case the materials communicate a warmth and timelessness which is more in tune with a single-family residential neighbourhood.

The thinness of the wood siding maximizes available interior space by ensuring the cladding isn't any thicker than necessary. All of these facade materials are durable and will drain effectively with a rear vented cavity.

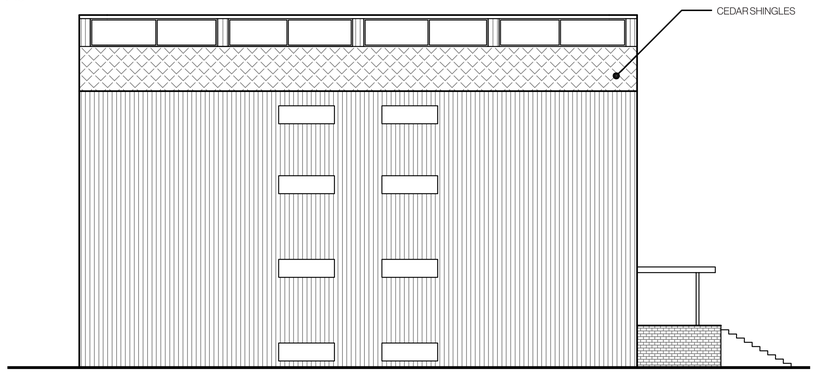
The clerestory roof makes use of the Winnipeg Zoning By-Law's stipulation that a building height restraint (in this case 35ft) extends to halfway up the height of a sloped roof rather than the top.[2] This allows for more vertical space and the creation of a high cathedral ceiling with a clerestory window that shines into each unit's living room and kitchen. The roof's gentle slope away from the lot edge ensures that even with this increased height, the building is not imposing to its surroundings.

The glazing on the facade was designed to meet at closely as possible the Winnipeg low-rise residential guidelines' minimum of 25% facade window area. No more glazing was used than is required by this guidelines, in order to ensure that excessive window area does not hamper the building's tier 3 energy target of R-30 effective performance.[3]

Wall - Window Area

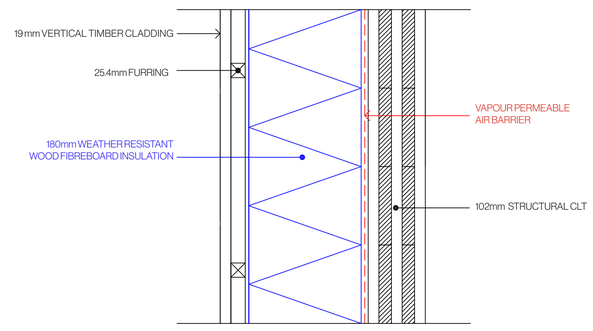
Front Facade | 221m2 Wall - 43m2 Window
Side Facade | 191m2 Wall - 27m2 Window

FRONT ELEVATION



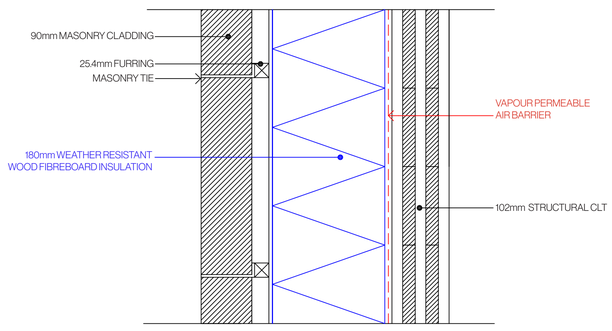
SIDE ELEVATION

Wall and Roof Assemblies



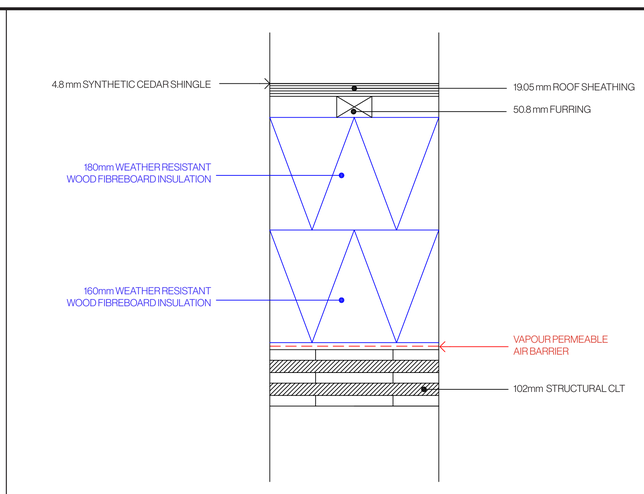
CLT Wall with Wood Cladding		
- 140mm STRUCTURAL CLT - 0.7mm ADHERO 3000 - 180mm GUTEX MULTITHERM - 25.4mm VERTICAL BATTENS - 25.4mm HORIZONTAL COUNTERBATTENS - 19mm VERTICAL TIMBER CLADDING	**U-Value** | 0.187 W/(m²K) **Condensate** | 0kg/m² **Drying Time** | -	**R-30.4**

Source: *Mass Timber Smart Enclosure System*, 475 High Performance Building Supply (2024), 31.



CLT Wall with Masonry Cladding		
- 140mm STRUCTURAL CLT - 0.7mm ADHERO 3000 - 180mm GUTEX MULTITHERM - 25.4mm VERTICAL BATTENS - 25.4mm HORIZONTAL COUNTERBATTENS - 90mm MASONRY CLADDING	**U-Value** | 0.187 W/(m²K) **Condensate** | 0kg/m² **Drying Time** | -	**R-30.4**

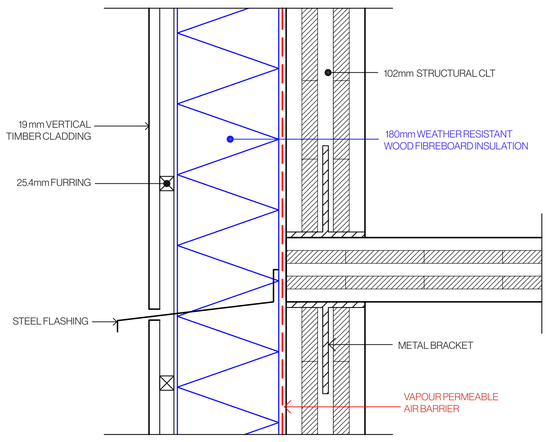
Source: *Mass Timber Smart Enclosure System*, 475 High Performance Building Supply (2024), 31.



CLT Roof		
- 102mm STRUCTURAL CLT - 0.7mm ADHERO 3000 - 160mm GUTEX MULTITHERM - 160mm GUTEX ULTRATHERM - 50.8mm 2x BATTENS - 4.8mm SYNTHETIC CEDAR SHINGLE	**U-Value** | 0.114 W/(m²K) **Condensate** | 0kg/m² **Drying Time** | -	**R-49.8**

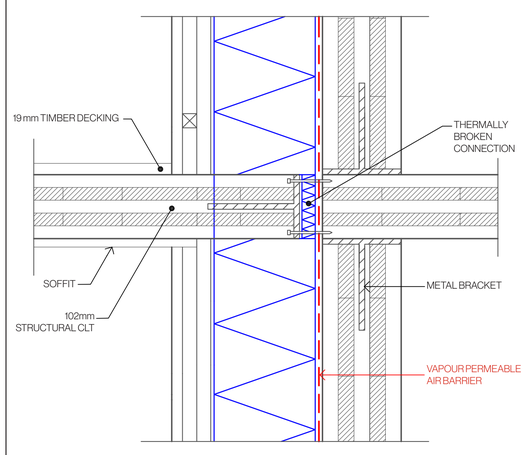
Source: *Mass Timber Smart Enclosure System*, 475 High Performance Building Supply (2024), 46.

Connection Details



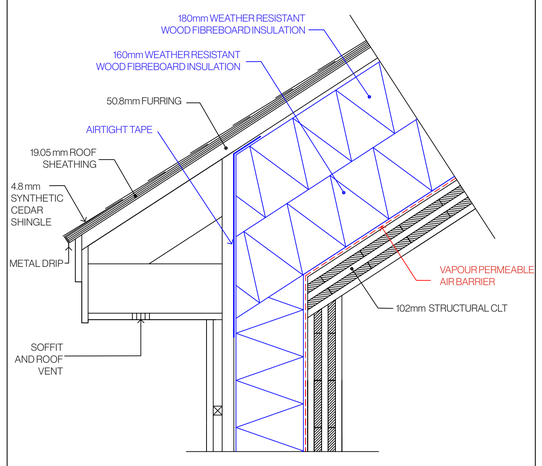
Wall at Floor

Source: Detail 8.7.2. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 665



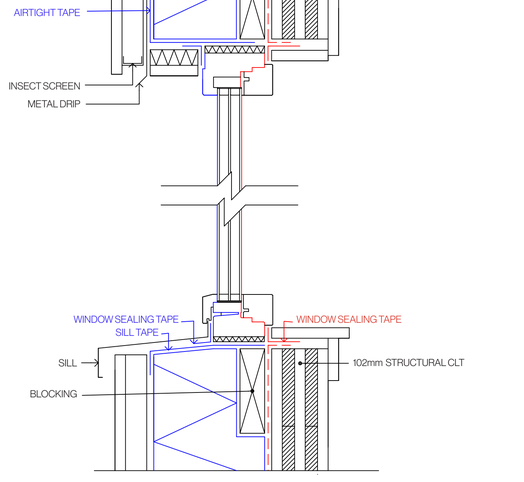
Wall at Balcony

Source: Detail 8.2.3. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 601



Wall at Roof

Source: *Mass Timber Smart Enclosure System*, 475 High Performance Building Supply (2024), 53.



Window Opening

Source: *Mass Timber Smart Enclosure System*, 475 High Performance Building Supply (2024), 41.

Materials and Finishes

CLT Wall with Wood Cladding

- 140 mm Structural CLT:
Local Distributer: Western Archrib Structural Wood Systems, Boissevain, Manitoba
The manufacturer does not provide a CLT Environmental Product Declaration but offers FSC Chain of Custody certified wood (FSC-C020013) to FSC-STD-40-004. Embodied carbon was considered based on the estimated transportation distance from the distributor to Winnipeg (approximately 3 hours 49 minutes)

- 0.7 mm ADHERO 3000:
Local Distributer: Not available locally, can be ordered online
Alternative is Henry **Blueskin VP100 Self Adhered Water-Resistive Air Barrier Membrane/ Vapour permeable** (Manufacturer in Fernley, Nevada; Sold at Home Depot, Winnipeg, MB)
ADHERO 3000 is not available in Manitoba, but the alternative, Henry Blueskin VP100 Self-Adhered Water-Resistive Air Barrier Membrane, can be sourced locally from Home Depot in Winnipeg. Embodied carbon was considered based on the estimated transportation distance from the supplier because EPD is not provided by the manufacturer

- 180 mm GUTEX MULTITHERM:
*GUTEX MULTITHERM rigid wood fibre insulation is not manufactured or distributed in Manitoba; the main manufacturer is in Germany
Alternative is ROCKWOOL COMFORTBOARD 80 (a rigid stone wool continuous insulation board used as a non-structural sheathing) and is available in Winnipeg's Home Depot. Although stone wool has higher embodied carbon during manufacturing stage,its availability locally makes a decent trade-off.
(Environmental Product Declaration for Wood Fibre Insulating Boards GUTEX, 2015; Environmental Product Declaration for Stone Wool Insulation ROCKWOOL, 2025)

- 25.4 mm Horizontal Counter Battens:
Local Distributer: Western Archrib Structural Wood Systems, Winnipeg, Manitoba
Vertical battens are fabricated from Douglas Fir, which can be purchased from the same local supplier as Structural CLT (Western Archrib Structural Wood Systems). Embodied carbon was considered based on the estimated transportation distance from the distributor to Winnipeg (approximately 3 hours 49 minutes)

- 19 mm Vertical Timber Cladding:
Product: **Cedar Valley Cedar Shingle Panels**
Local Distributor: Windsor Plywood, Winnipeg, Manitoba
Cedar Valley Cedar Shingle Panels are pre-assembled siding panels made from 100% kiln-dried Western Red Cedar (Thuja plicata). According to the 2025 Environmental Product Declaration for Western Red Cedar, cedar lumber is considered carbon-negative because the wood stores far more carbon during tree growth than is emitted during harvesting and milling. Although production generates some emissions, the finished lumber retains significant stored carbon, resulting in a net negative carbon balance. The cedar is manufactured in British Columbia, and sourcing it through a local distributor in Winnipeg helps reduce transportation-related emissions.

- 19 mm Vertical Timber Cladding:
Product: **Cedar Channel Siding**
Local Distributor: Windsor Plywood, Winnipeg, Manitoba
Cedar Channel Siding are pre-assembled siding panels. The channel siding can be installed vertically or horizontally. The siding is available locally in Winnipeg, reducing transportation-related emissions. Cedar naturally resists decay and insects, reducing potential maintenance costs in the future.

CLT Roof

- 102 mm Structural CLT:
Local Distributer: Western Archrib Structural Wood Systems, Boissevain, Manitoba
The manufacturer does not provide a CLT Environmental Product Declaration but offers FSC Chain of Custody certified wood (FSC-C020013) to FSC-STD-40-004. Embodied carbon was considered based on the estimated transportation distance from the distributor to Winnipeg (approximately 3 hours 49 minutes)

- 0.7 mm ADHERO 3000:
Local Distributer: Not available locally, can be ordered online
Alternative is Henry Blueskin VP100 Self Adhered Water-Resistive Air Barrier Membrane (Manufacturer in Fernley, Nevada; Sold at Home Depot, Winnipeg, MB)
ADHERO 3000 is not available in Manitoba, but the alternative, Henry Blueskin VP100 Self-Adhered Water-Resistive Air Barrier Membrane, can be sourced locally from Home Depot in Winnipeg. Embodied carbon was considered based on the estimated transportation distance from the supplier because EPD is not provided by the manufacturer

- 160 mm GUTEX MULTITHERM:
*GUTEX MULTITHERM rigid wood fibre insulation is not manufactured or distributed in Manitoba; the main manufacturer is in Germany
Alternative is ROCKWOOL COMFORTBOARD 80 (a rigid stone wool continuous insulation board used as a non-structural sheathing) and is available in Winnipeg's Home Depot. Although stone wool has higher embodied carbon during manufacturing stage,its availability locally makes a decent trade-off.
(Environmental Product Declaration for Wood Fibre Insulating Boards GUTEX, 2015; Environmental Product Declaration for Stone Wool Insulation ROCKWOOL, 2025)

- 160 mm GUTEX ULTRATHERM:
GUTEX ULTRATHERM Weather and rain-proof insulated sarking board is not manufactured or distributed in Manitoba; the main manufacturer is in Germany
Alternative is SSamatherm® ISO Rigid Closed Cell Polyisocyanurate Insulation Board (a rigid closed cell polyisocyanurate insulation board with fibre-reinforced felt facers)
Local Distributer: ROOFMART, A Canadian Exterior Building Supplier , Winnipeg, Manitoba
The manufacturer does not provide an EPD, however, based on the Product Data Sheet for Samatherm® ISO (November 2021), Samatherm® ISO is , produced in Quebec, Canada. Its low water absorption (<1.5%) and high dimensional stability (<2%) make it suitable for Canadian climates. Environmentally, it is manufactured without CFCs or HCFCs, has virtually no global warming potential, zero ozone depletion potential, and contains no hazardous materials (Product Data Sheet for Samatherm® ISO (November 2021).

- 50.8 mm 2xBattens:
Local Distributer: Western Archrib Structural Wood Systems / 50.8 mm battens are fabricated from Douglas Fir and are available from the same local supplier as Structural CLT and 25.4 mm Vertical Battens + 25.4 mm Horizontal Counter Battens from the wall assembly.

- 4.8 mm Synthetic Cedar Shingle:
Product: CEDAR IMPRESSIONS® SIDING (polymer-based siding product designed to replicate the natural look and texture of cedar shakes and shingles without the maintenance issues associated with real wood)
Local Distributer: Certain Teed, Winnipeg, MB
CertainTeed Cedar Impressions® is a durable polymer siding that mimics natural cedar. It is virtually maintenance-free and has a service life of around 50 years. The EPD (Environmental Product Declaration for Cedar Impressions® Siding, 2020) reports an embodied carbon of about 11.95 kg CO_2 eq per square meter, mostly from raw materials and manufacturing. Made in Kansas, but has a local distributer in Winnipeg, Manitoba can help reduce transport emissions.

Material Sources

140 mm Structural CLT
Western Archrib Structural Wood Systems. Cross Laminated Timber. Accessed at: https://www.westernarchrib.com/products/cross-laminated-timber

0.7 mm ADHERO 3000
Henry Company. LEED Declaration: Blueskin® SA Self-Adhering Membrane. 2025. Accessed at: https://www.henry.com/commercial/products/air-and-vapor-barriers/self-adhered-impermeable-avb/blueskin-sa/

180 mm GUTEX MULTITHERM
Environmental Product Declaration for Wood Fibre Insulating Boards GUTEX, 2015.
Environmental Product Declaration for Stone Wool Insulation ROCKWOOL, 2025.

25.4 mm Horizontal Counter Battens + 50.8 mm 2xBattens
Western Archrib Structural Wood Systems. Stock Beams. Accessed at https://wwwwesternarchrib.com/products/billets\

180 mm GUTEX ULTRATHERM
Environmental Product Declaration for Wood Fibre Insulating Boards GUTEX, 2015.
Environmental Product Declaration for Stone Wool Insulation ROCKWOOL, 2025.

4.8 mm Synthetic Cedar Shingle
Environmental Product Declaration for Cedar Impressions® Siding, 2020.

19. mm Vertical Cedar Timber Cladding
Windsor Plywood, Cedar Channel Siding, Accessed at https://www.windsorplywood.ca/products/cedar-channel-siding

Thermal Bridging Calculations

Clear Field Area Meth-

Select Area Calculation (Choose One)	Area	Units
Sum of Active Clear Field Areas (Default)	41.35	m²
User Defined Area	—	m²

Overall Opaque Wall Thermal Performance Values

Base Building		Proposed Building		% Below Baseline
Opaque USI - Value (W/m²K)	0.400	Opaque USI - Value (W/m²K)	0.195	-51.3%
Effective RSI - Value (m²K/W)	2.5	Effective RSI - Value (m²K/W)	5.1	—

Proposed Building Entries

Transmittance Type	Transmittance Description	Area, Length or Amount Takeoff	Units	Transmittance Value	Units	Totals: Source Reference	8.1: Heat Flow (W/K)	100%: % Total Heat Flow
Clear Field	CLT Wall	41.35	m²	0.170	W/m²K	8.1.17	7.0	87%
Linear Interface Detail	Balcony	8.90	m	0.115	W/mK	8.2.3	1.0	13%
Linear Interface Detail	Wall to Floor	14.40	m	0.092	W/mK	8.7.2	0.0	0%
Linear Interface Detail	Wall to Roof	13.10	m	0.045	W/mK	8.4.5	0.0	0%
Linear Interface Detail	Corner	7.50	m	0.092	W/mK	8.7.2	0.0	0%

Clear Field Area Method

Select Area Calculation (Choose One)	Area	Units
Sum of Active Clear Field Areas (Default)	14.3	m²
User Defined Area	—	m²

Overall Opaque Wall Thermal Performance Values

Base Building		Proposed Building		% Below Baseline
Opaque USI - Value (W/m²K)	0.400	Opaque USI - Value (W/m²K)	0.120	-70%
Effective RSI - Value (m²K/W)	2.5	Effective RSI - Value (m²K/W)	8.3	—

Proposed Building Entries

Transmittance Type	Transmittance Description	Area, Length or Amount Takeoff	Units	Transmittance Value	Units	Totals: Source Reference	8.1: Heat Flow (W/K)	100%: % Total Heat Flow
Clear Field	CLT Wall	14.3	m²	0.170	W/m²K	8.4.5	1.7	100%
Linear Interface Detail	Wall to Roof	13.10	m	0.045	W/mK	8.4.5	0.0	0%

Thermal Bridging Sources

CLT Wall - Clear Field
Detail 8.1.17. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 578
Detail 8.1.17, Thermal Data. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 1268

CLT Roof - Clear Field
Detail 8.4.5. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 645
Detail 8.4.5. Thermal Data. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 1335

Balcony - Linear Transmission
Detail 8.2.3. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 601
Detail 8.2.3, Thermal Data. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 1291

Wall to Floor - Linear Transmission
Detail 8.7.2. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 665
Detail 8.7.2, Thermal Data. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 135

Wall to Roof - Linear Transmission
Detail 8.4.5. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 645
Detail 8.4.5. Thermal Data. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 1335

Corner - Linear Transmission
Detail 8.7.2. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 665
Detail 8.7.2, Thermal Data. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 1354

Window/Door - Linear Transmission
Detail 8.3.9. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 626
Detail 8.3.9. Thermal Data. Building Envelope Thermal Bridging Guide, Version 1.6. Vancouver: BC Hydro Power Smart, 2021. pg. 131