Building Envelope

DESIGN COMPETITION

FBLOK architecture

March 02 2026

TABLE OF CONTENTS

Basic Information

Design Rationale/Analysis

Project Drawings

Renderings

Envelope Performance

project team

Our Envelope Design submission builds upon the typical truss roof systems commonly used in Winnipeg and introduces targeted refinements where feasible to enhance overall energy performance. Rather than reinventing conventional construction methods, this approach strategically adjusts standard details to improve thermal continuity, airtightness, and durability.

The goal is to demonstrate that incremental yet thoughtful modifications to familiar industry practices can meaningfully elevate building performance. By working within established construction norms, this design aims to provide a practical and replicable model that can be adopted industry-wide, helping redefine baseline expectations while encouraging continued innovation and refinement of typical envelope details.

EDUCATION
Master of Architecture,
University of Manitoba

Bachelor of Architecture,
Ramaiah Institue of
Technology

Kaamil Allah Baksh, MArch, RAIC, MAA Intern

Experience & Expertise

Kaamil's design process prioritizes understanding users and their routines to create functional and accessible environments that enhance community well-being. Passionate about sustainability and environmental stewardship, Kaamil advocates for preliminary modeling studies in his work. His expertise in optimizing building form, orientation, glazing, and daylighting contributes to reduced energy consumption and improved building operations and maintenance.

EDUCATION
Master of Architecture,
University of Manitoba

Bachelor of
Environmental Design,
University of Manitoba

Bryce Rezansoff, MArch MAA Intern

Experience & Expertise

Bryce is a self-driven designer known for blending creativity with technical skill, he excels in creating functional, visually compelling spaces while promoting collaboration and efficiency through the Integrated Design Process. With a focus on sustainable design and material innovation, Bryce stays at the forefront of building technologies and cost management. His proactive approach and commitment to continuous learning enable him to deliver tailored design solutions that meet both functional and aesthetic goals.

BASIC INFORMATION

project description

Typical multi-storey construction in Winnipeg commonly consists of pre-engineered roof trusses with blown-in attic insulation, combined with cavity-insulated stud walls and, where required, rigid exterior insulation. While this approach is widely accepted and cost-effective, it often results in discontinuities in thermal and air/vapour control layers, particularly at transitions such as the roof-to-wall junction.

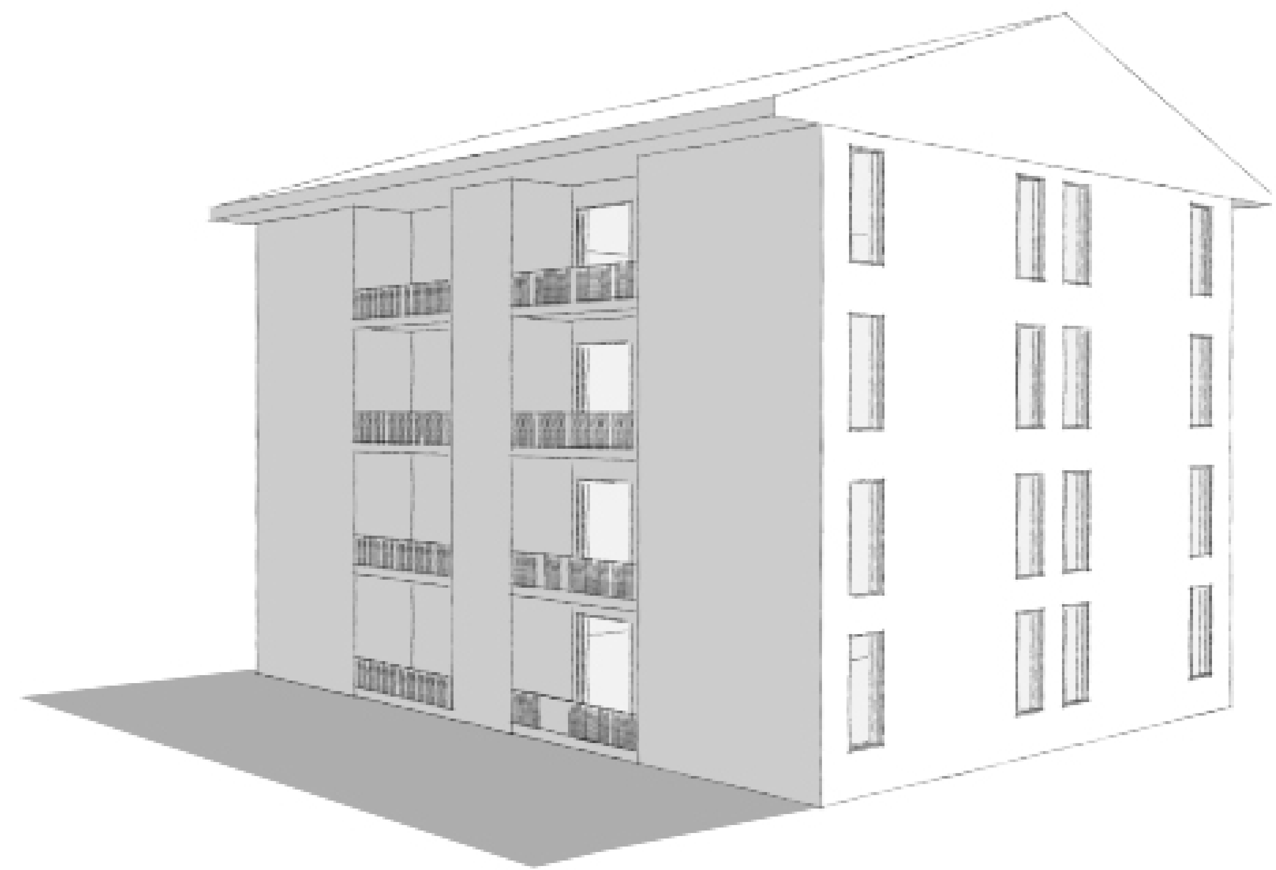
Our design builds upon this conventional framework but redefines the boundary layers to ensure maximum thermal performance and continuous air/vapour control.

The primary strategy is the introduction of a fully outboard insulation system for both walls and roof. By placing the majority of insulation exterior to the structural sheathing, the thermal layer becomes continuous and uninterrupted, effectively wrapping the entire building envelope. This approach shifts the dew point outward—beyond the exterior sheathing,allowing for a simplified control strategy using a single layer of self-adhered air/vapour barrier. By reducing the risk of interstitial condensation, this system both improves durability and simplifies membrane installation, while also reducing overall material complexity and cost. This also frees up all interior framing for any electrical or plumbing roughins and avoid any vapour barrier penetration which would be the case in a typical wall assembly.

The continuity of exterior insulation from wall to roof eliminates the typical cold bridge at the roof-to-wall junction commonly seen in attic-insulated truss assemblies. This detail significantly improves thermal continuity and reduces localized heat loss, contributing to improved energy performance and occupant comfort.

Passive solar design principles were also integrated to optimize seasonal performance. South-facing glazing is introduced in one bedroom to maximize winter solar gains, while west-facing glazing serves the second bedroom. To mitigate overheating from high-angle summer sun, extended window flashing profiles have been incorporated to act as passive shading devices. These elements are intentionally expressed as brightly coloured architectural features, ensuring that performance-driven detailing also contributes to the building's visual identity.

The exterior cladding system utilizes a Canadian-manufactured aluminum product selected for long-



boundary layers

Air and Vapour boundary layers:

Air and vapour control are combined into a single, high-performance peel-and-stick membrane applied directly to the exterior face of the structural sheathing. This approach ensures continuous air and vapour control above grade while simplifying the control layer strategy. The membrane is fully integrated at all window and door openings and carefully lapped at corners, transitions, and other high-risk junctions to maintain long-term continuity. In addition to serving as the primary air and vapour control layer, the membrane also functions as a secondary water-resistive barrier, managing incidental moisture that may penetrate the outer cladding assembly

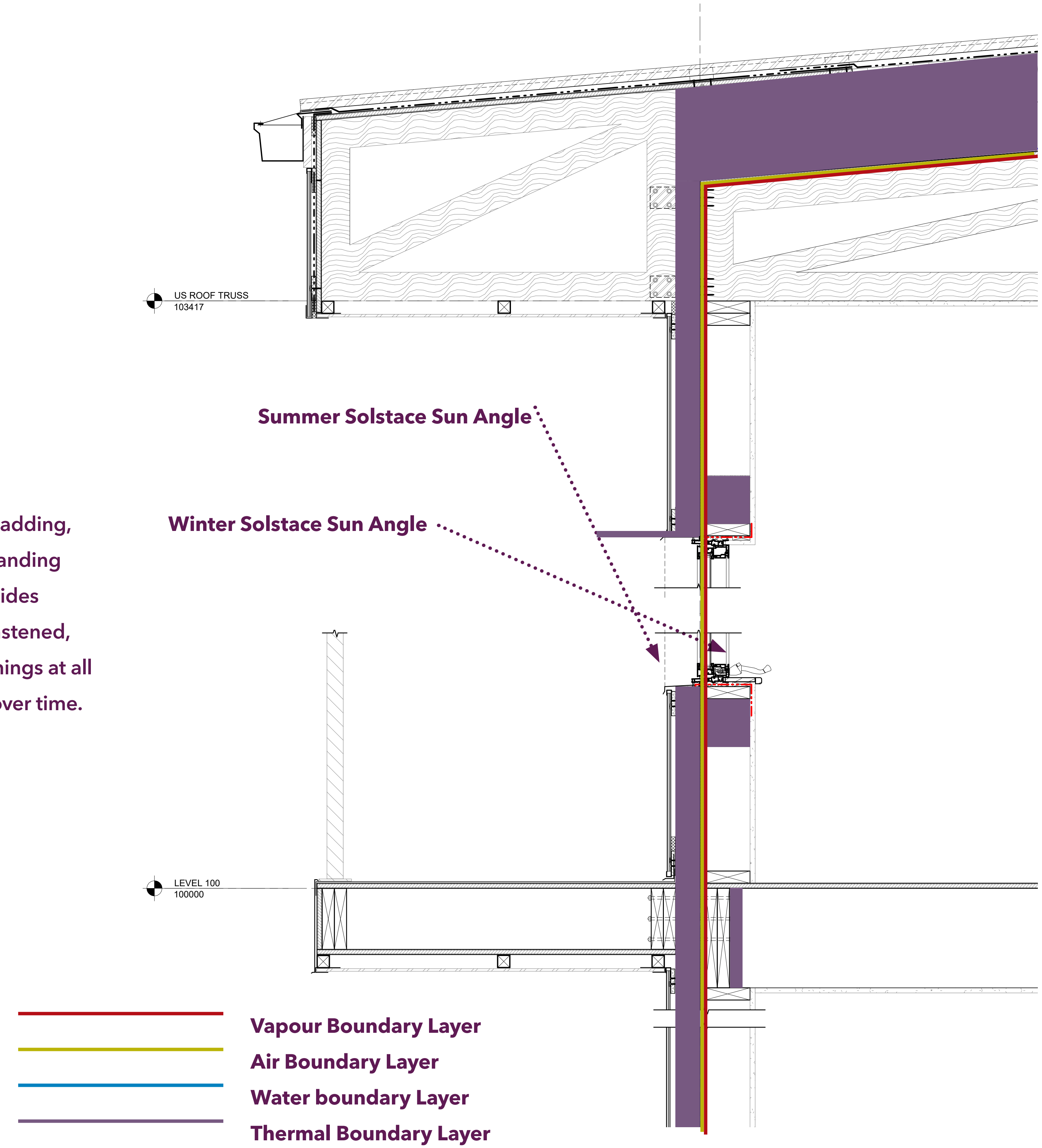
Water boundary layer:

The primary water control strategy is established through a layered system consisting of roofing/cladding, membranes, and properly detailed metal flashings at all transitions. The roof assembly utilizes a standing seam metal roof system, supported by a vapour-permeable peel-and-stick underlayment that provides secondary protection beneath the metal panels. The wall assembly is finished with mechanically fastened, tongue-and-groove aluminum siding, detailed as a drained and ventilated rainscreen system. Flashings at all penetrations, openings, and material transitions ensure controlled water shedding and durability over time.

Thermal boundary layer

The primary water control strategy is established through a layered system consisting of roofing/cladding, membranes, and properly detailed metal flashings at all transitions. The roof assembly utilizes a standing seam metal roof system, supported by a vapour-permeable peel-and-stick underlayment that provides secondary protection beneath the metal panels.

The wall assembly incorporates two layers of 38 mm Sdi Quik-Therm insulation installed outboard of the sheathing. The staggered installation improves thermal continuity while achieving the required effective R-value. The insulation panels incorporate built-in drainage channels, enabling the wall to function as an effective rainscreen system. Any incidental moisture that penetrates the cladding layer can drain and dry efficiently, improving long-term durability.



boundary layers

Window placement

Windows are strategically positioned deeper within the assembly to enhance solar control and shading performance. Extended header and flashing projections are incorporated to limit high-angle summer sun penetration while allowing beneficial winter solar gain. To mitigate potential thermal bridging and cold surface conditions at the window perimeter, 150 mm of spray foam insulation is proposed around the rough opening. This reinforces the continuity of the thermal layer and reduces the risk of condensation at the frame interface.

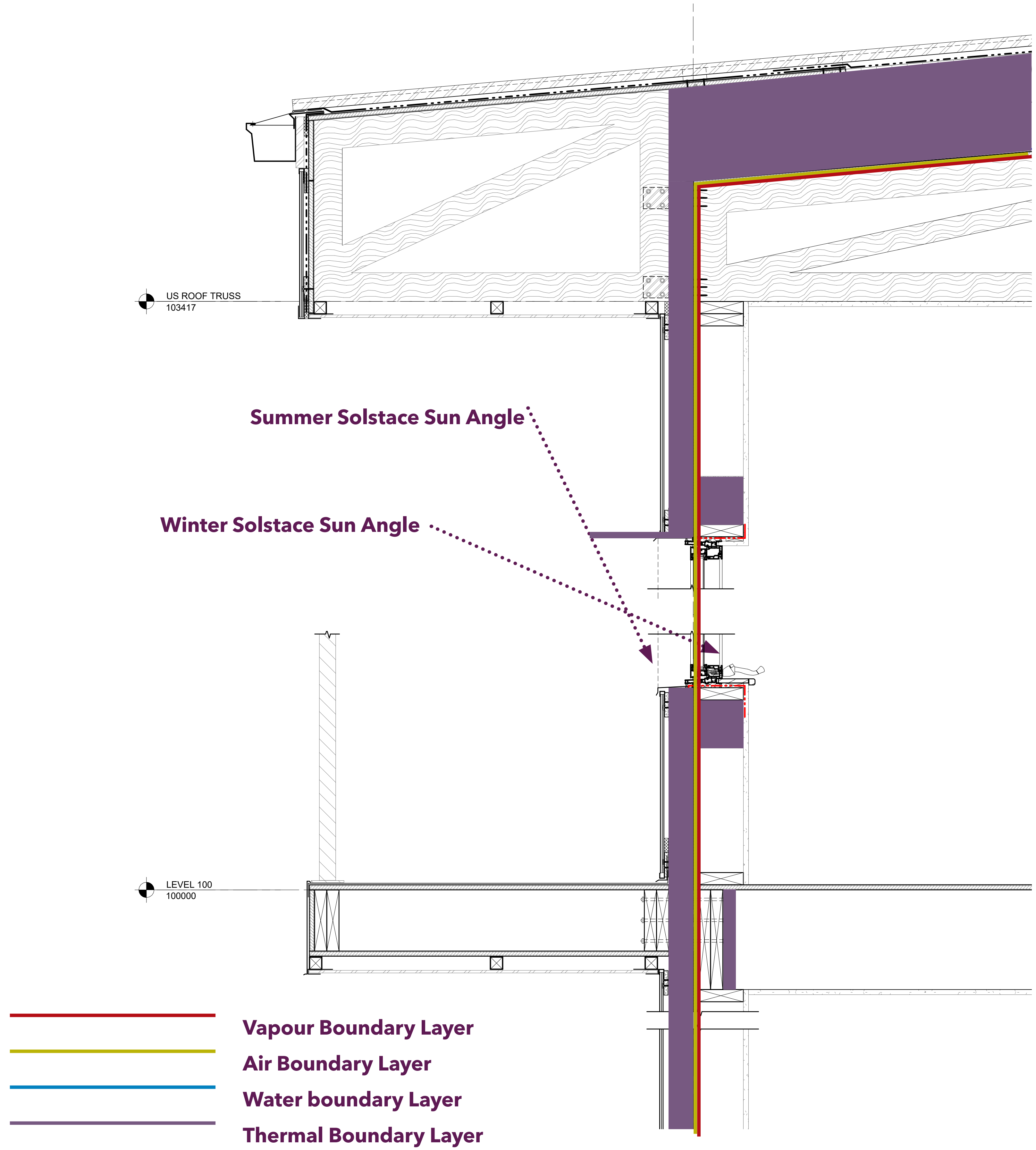
Roof system

Rather than extending the top chord of the truss to form roof overhangs—as is typical in conventional Winnipeg construction—the modified design proposes a bolt-on overhang system that is structurally independent from the primary roof truss assembly. By separating the overhang structure from the main truss system, the exterior insulation layer can run fully continuous over the roof plane without interruption. This eliminates the thermal discontinuity typically introduced when truss members project through the thermal boundary. The bolt-on overhang assembly is secured to the primary roof structure using engineered steel hangers. This approach maintains structural integrity while preserving the continuity of the thermal layer, improving overall energy performance and reducing thermal bridging at the eaves.

Thermal break insulation

At the balcony interface—where the exterior balcony structure connects to the interior floor system—structural thermal bridging is mitigated through the use of Armatherm FRR Structural Thermal Break material.

This high-performance material provides a balance of low thermal conductivity and high compressive strength, allowing it to transfer structural loads while significantly reducing heat flow through the connection. By incorporating a structural thermal break at this critical junction, the design minimizes heat loss, reduces the risk of condensation at interior floor edges, and enhances occupant comfort.



assembly analysis

All thermal performance analysis has been completed using the Isometric Planes method and manufacturer data as available. Embodied carbon emissions are from manufacturer data where possible, generic material database where needed.

Roof Assembly Analysis

Component	Product Standard of Acceptance	Effective Thermal Performance (RSI)	Notes for Installation	Comments
Exterior Air Film	N/A	0.03	N/A - Included for thermal analysis only	
Pre-Finished Standing Seam Metal Panels	Longboard	0	Panels formed on site to remove need for horizontal joints	
Peel and Stick Vapour Permeable Air Barrier	Blueskin VP160 or 3M 3015VP	0	Ensure positive lap between all joints	
152mm Rigid Insulation c/w built-in Wood Strapping	Quiktherm Air-Dry Connect	4.44	Installed w/ strapping perpendicular to roof seams	Thermal performance per manufacturer testing (Matrix system)
152mm Rigid Insulation c/w built-in Wood Strapping	Quiktherm Air-Dry Connect	4.44	Installed w/ strapping parrallel to roof seams	Thermal performance per manufacturer testing (Matrix system)
Peel and Stick Air/Vapour Barrier	Blueskin SA or 3M 3015NP	0	Ensure positive lap between all joints	
Interior Air Film	N/A	0.11	N/A - Included for thermal analysis only	
19mm Pressure treated exterior plywod sheathing	N/A	0.139		
13mm Drywall	N/A	0.08		
Summary		9.20 (R52.28)		

DESIGN RATIONALE/ANALYSIS

Wall Assembly Analysis

Component	Product Standard of Acceptance	Effective Thermal Performance (RSI)	Notes for Installation	Comments
Exterior Air Film	N/A	0.03	N/A - Included for thermal analysis only	
Vertical Aluminum cladding	Longboard	0		
UV Resistant Black Vapour Permeable Air Barrier	Delta Fassade S	0	Mechanically fastened, ensure positive lap between all joints	
51mm Rigid Insulation c/w built-in Wood Strapping	Quiktherm SDI	2.28	Installed w/ strapping vertically oriented	Thermal performance per manufacturer testing SDI system
51mm Rigid Insulation c/w built-in Wood Strapping	Quiktherm SDI	2.28	Installed w/ strapping horizontally oriented	Thermal performance per manufacturer testing SDI system
Peel and Stick Air/Vapour Barrier	Blueskin SA or 3M 3015NP	0	Ensure positive lap between all joints	
19mm Pressure treated exterior plywod sheathing		0.139	Continuous between stud wall and beams for lateral strength	
38x152 Wood Studs @ 610 OC				
13mm Gypsum Board		0.08		
Interior Air Film	N/A	0.12	N/A - Included for thermal analysis only	
Summary		**4.899 (R27.81)**		

DESIGN RATIONALE/ANALYSIS

Glazing Analysis

Hybrid casement window are used for the windows that provide high thermal performace and a black exterior look.
Exterior window Product: DF8500 Hybrid casement - Jeldwen
Exterior Door Product: WW Sliding patio door - Jeldwen

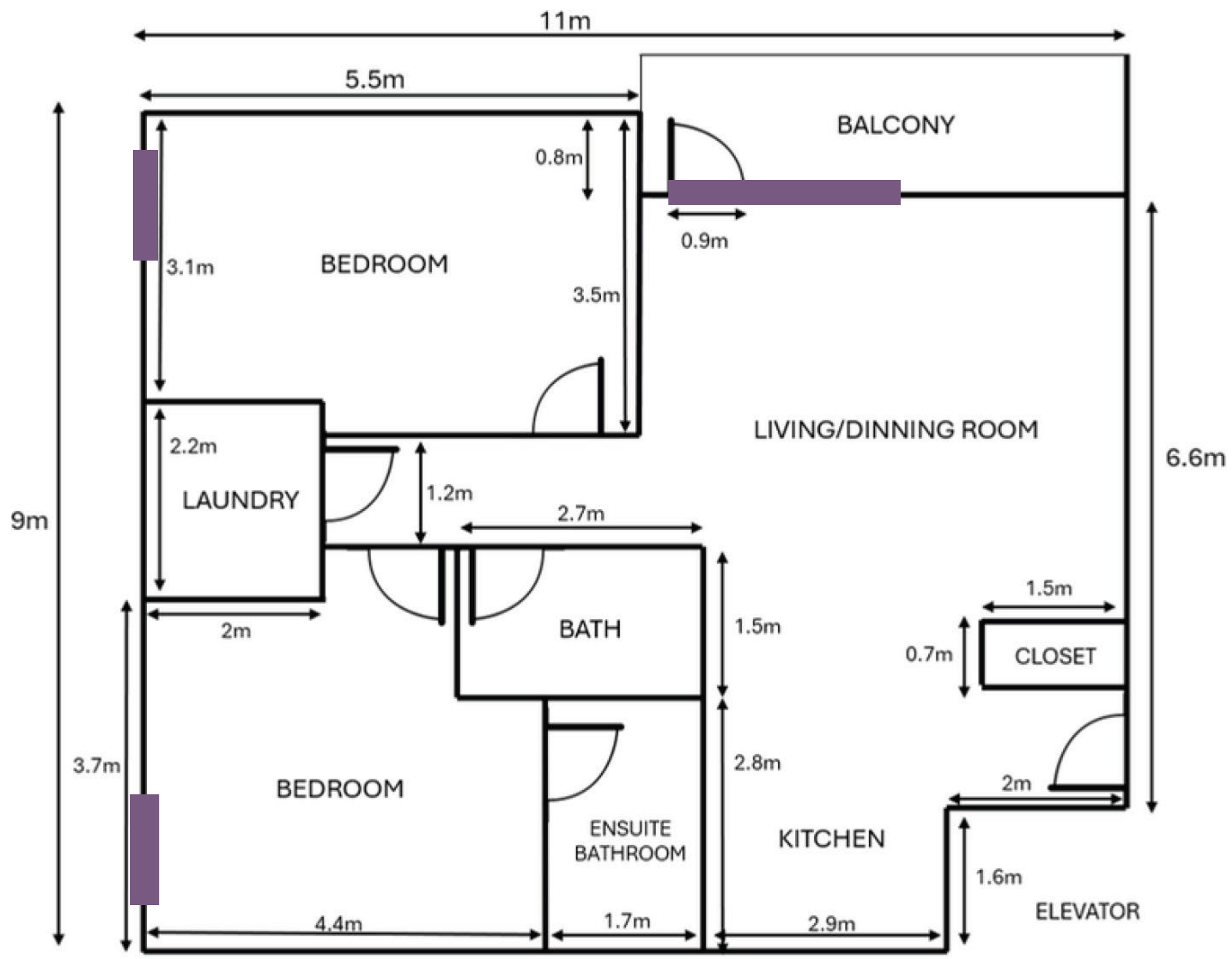
Triple Pane Glazed Units are utilized for all exterior windows and doors with low-E coatings on surfaces 2 and 5.
Glass Pane Product: Clear Tempered
Low-E Product: Solarban 60 or similar
Cavity: 95% Argon Fill

Centre of Glazing Performance
U-Value: 0.90
Visible Light Transmittance (VLT): 57%
Solar Heat Gain Coefficient (SHGC): 0.33

Window to Wall Ratio (For one apartment only)

The proposed vertical envelope area include 82 sq.m. opaque wall area (83%), 14 sq.m. window an door area (17%). Allowed % is 28.8% as per NECB.

floor plan and View

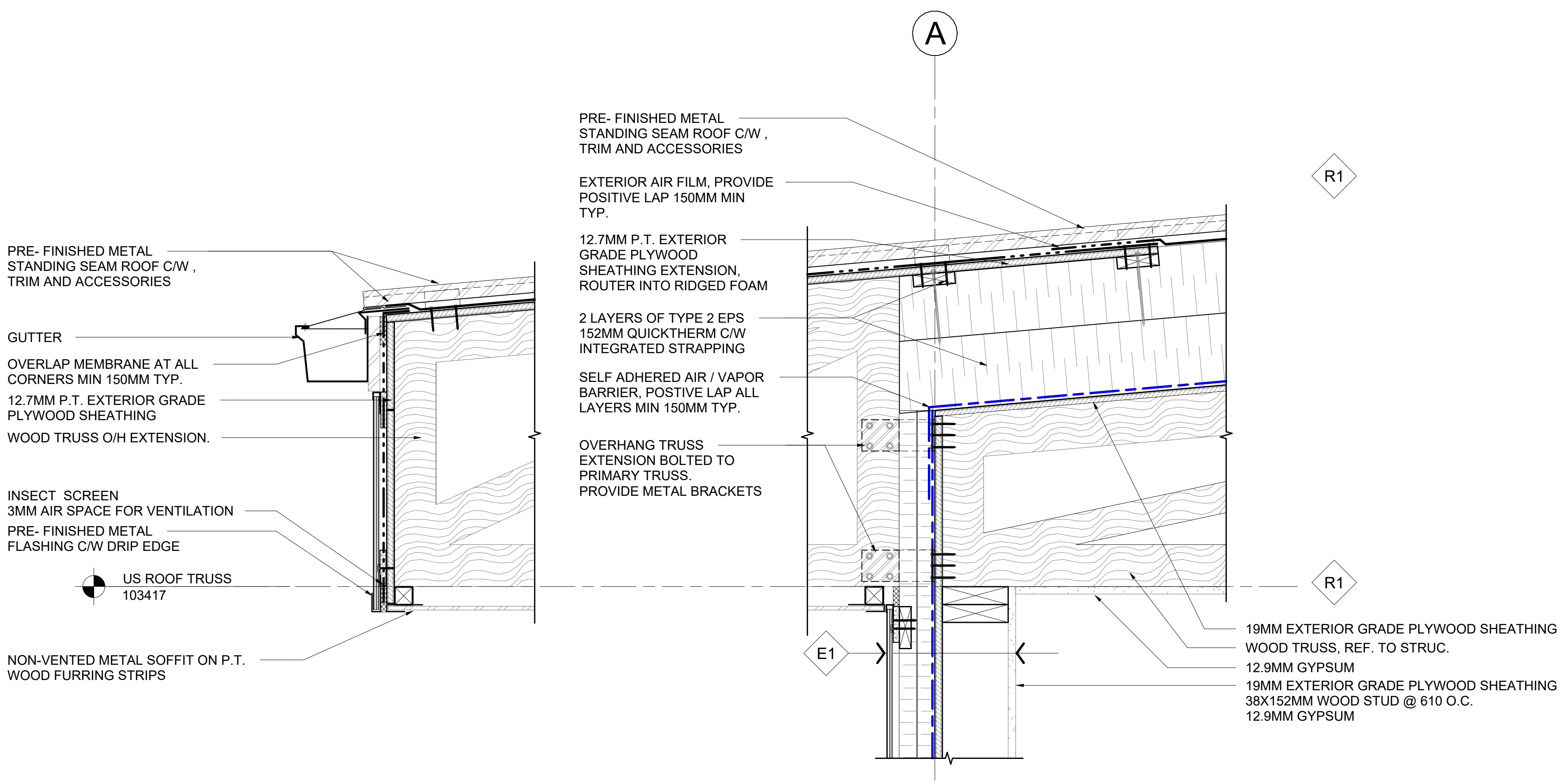


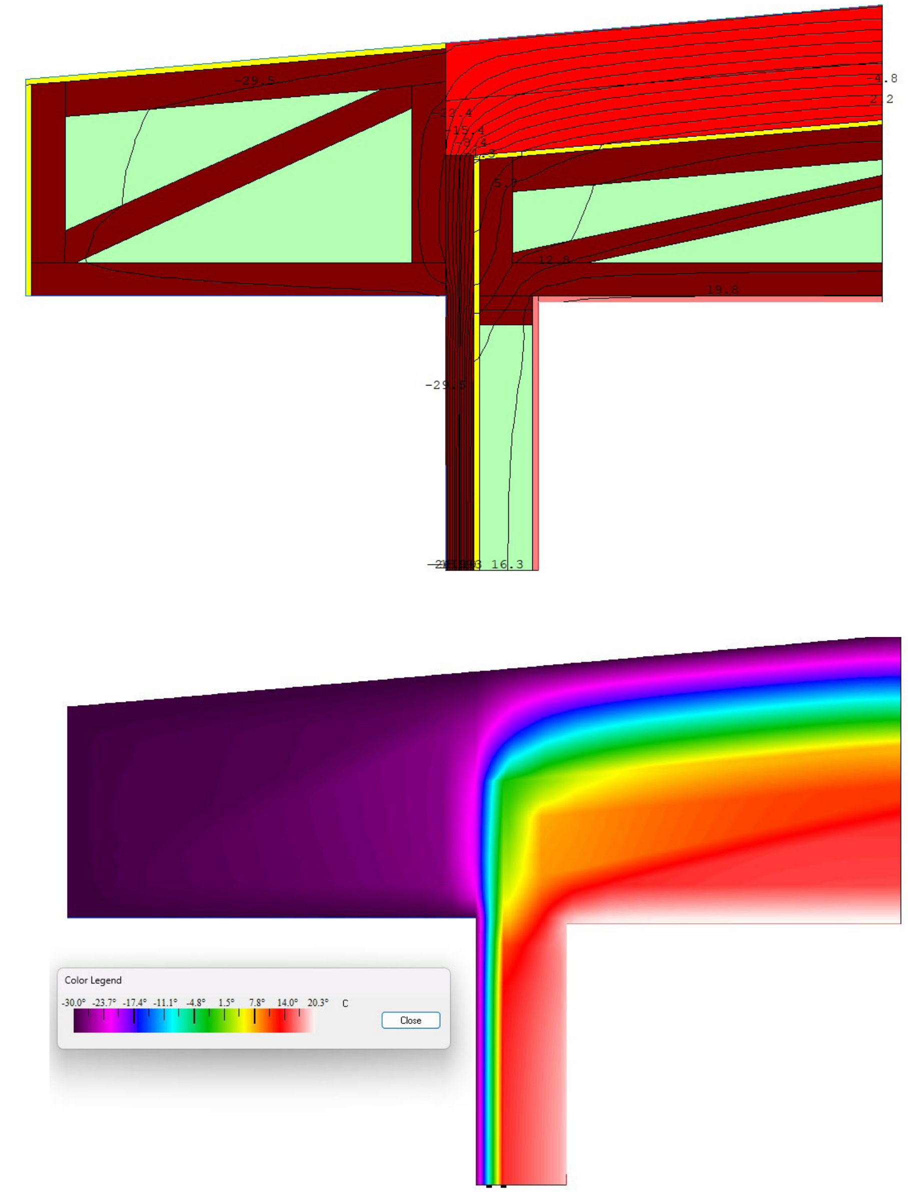
Bedroom window
900mm x 1800mm

Sliding patio door
2400mm x 2100mm

North

construction details





WALL TO ROOF DETAIL

Ψ= L2D-L1D

= (U overall with thermal bridging x overall length) - (U clear value x overall length)

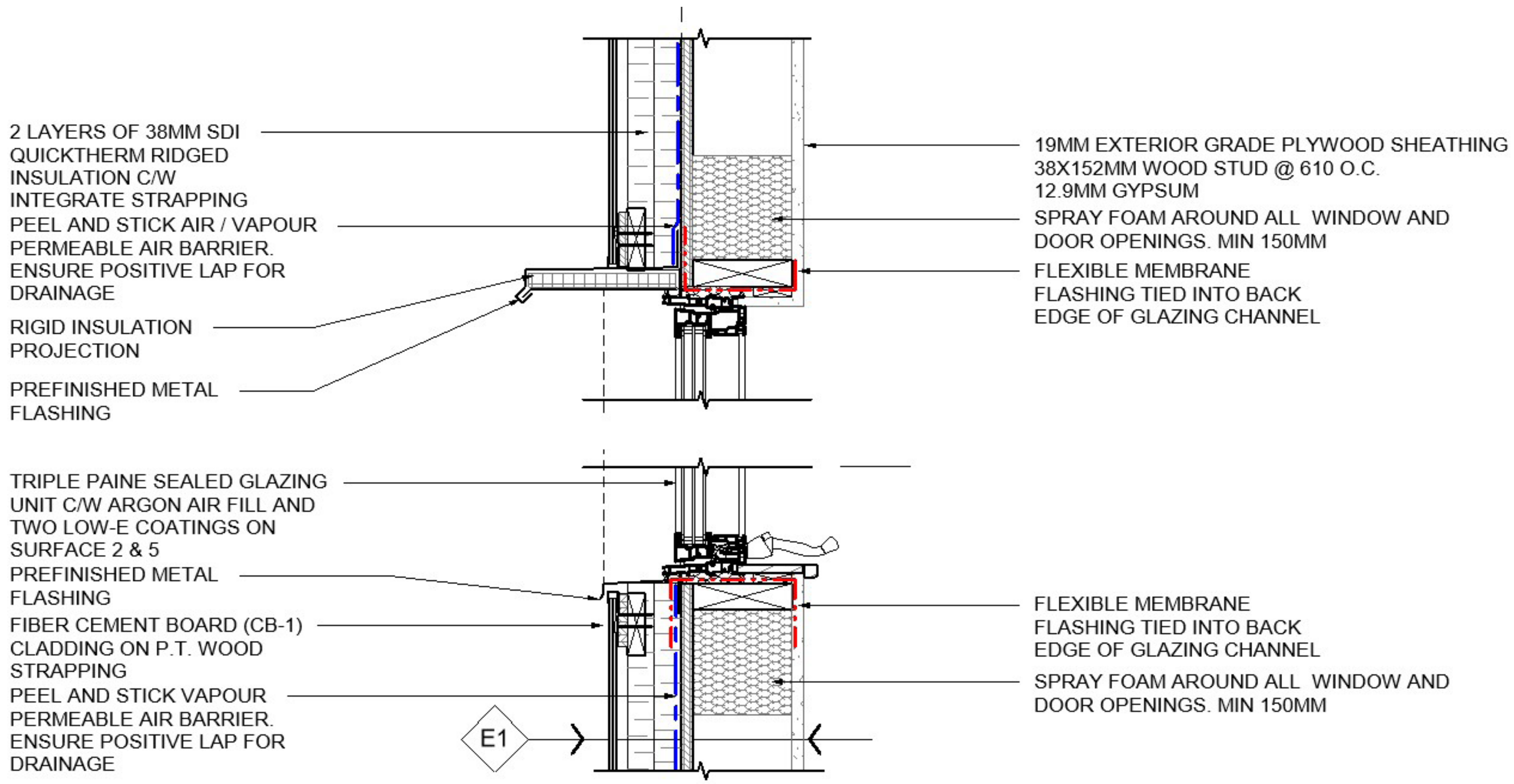
=0.215x1.63m - (0.236x0.71m) + (0.11x0.91m)

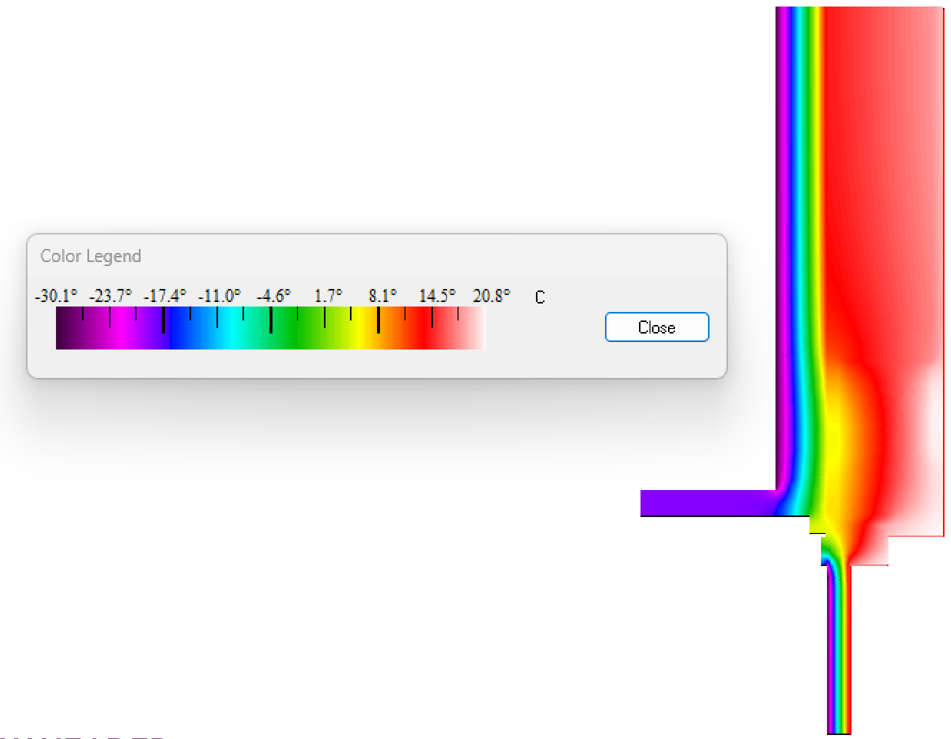
=0.35 - 0.167+0.101

=0.082w/mk

length take off = 12.02m

PROJECT DRAWINGS





WINDOW HEADER

Ψ= L2D-L1D

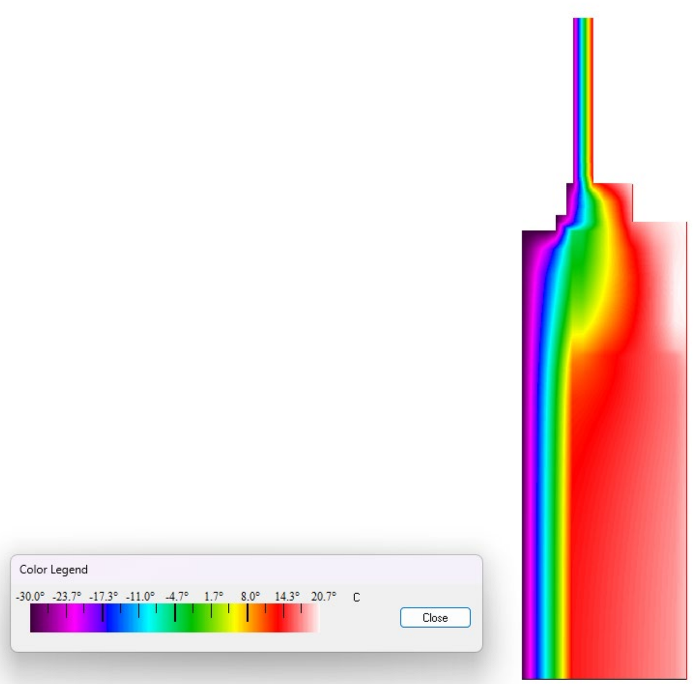
= (U overall with thermal bridging x overall length) - (U clear value x overall length)

=0.406x1.2 - 0.236x0.9 + 0.69x0.3

=0.487 - 0.4194

=0.0676w/mk

length take off = 4.1m



WINDOW SILL

Ψ= L2D-L1D

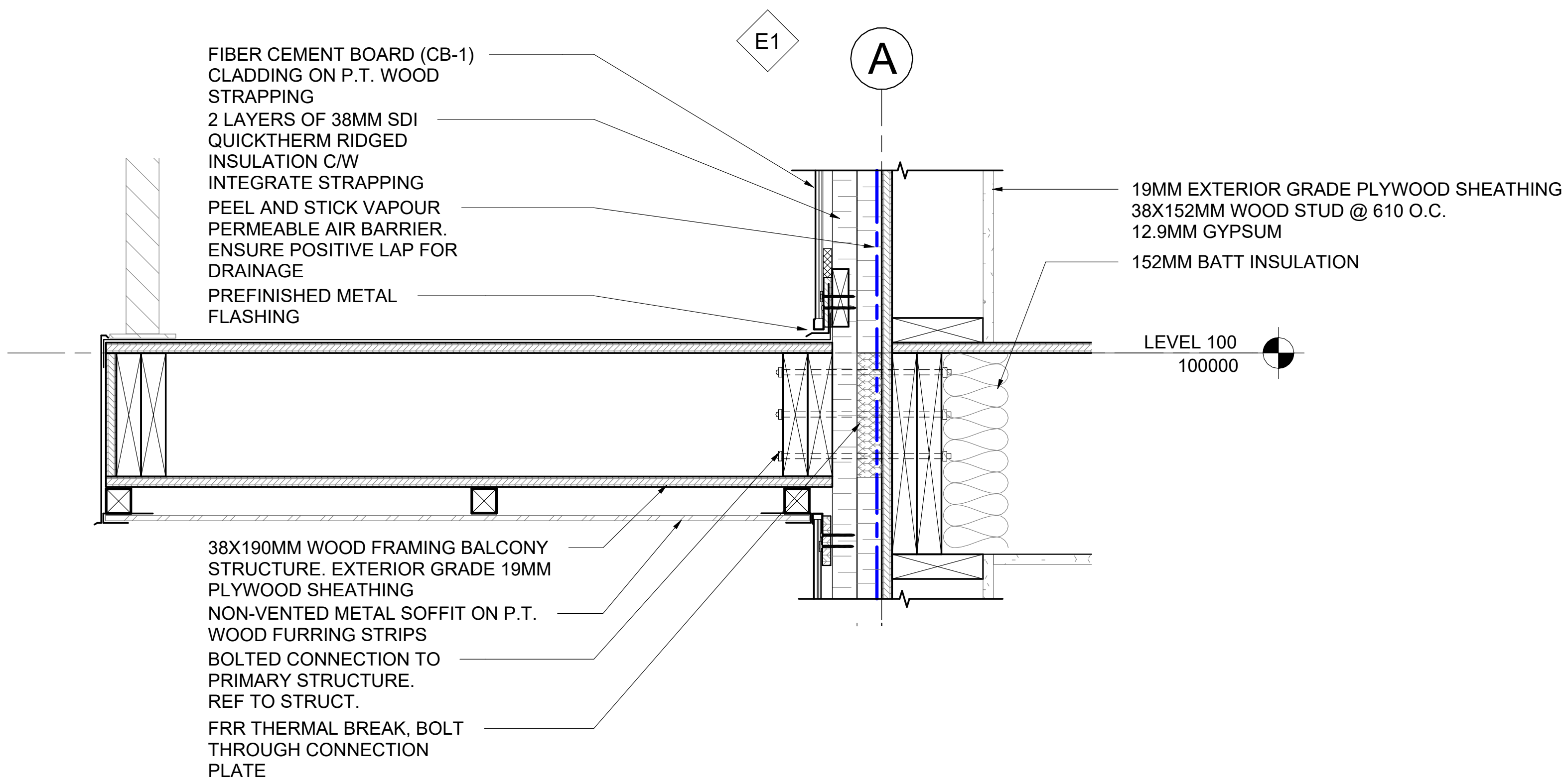
= (U overall with thermal bridging x overall length) - (U clear value x overall length)

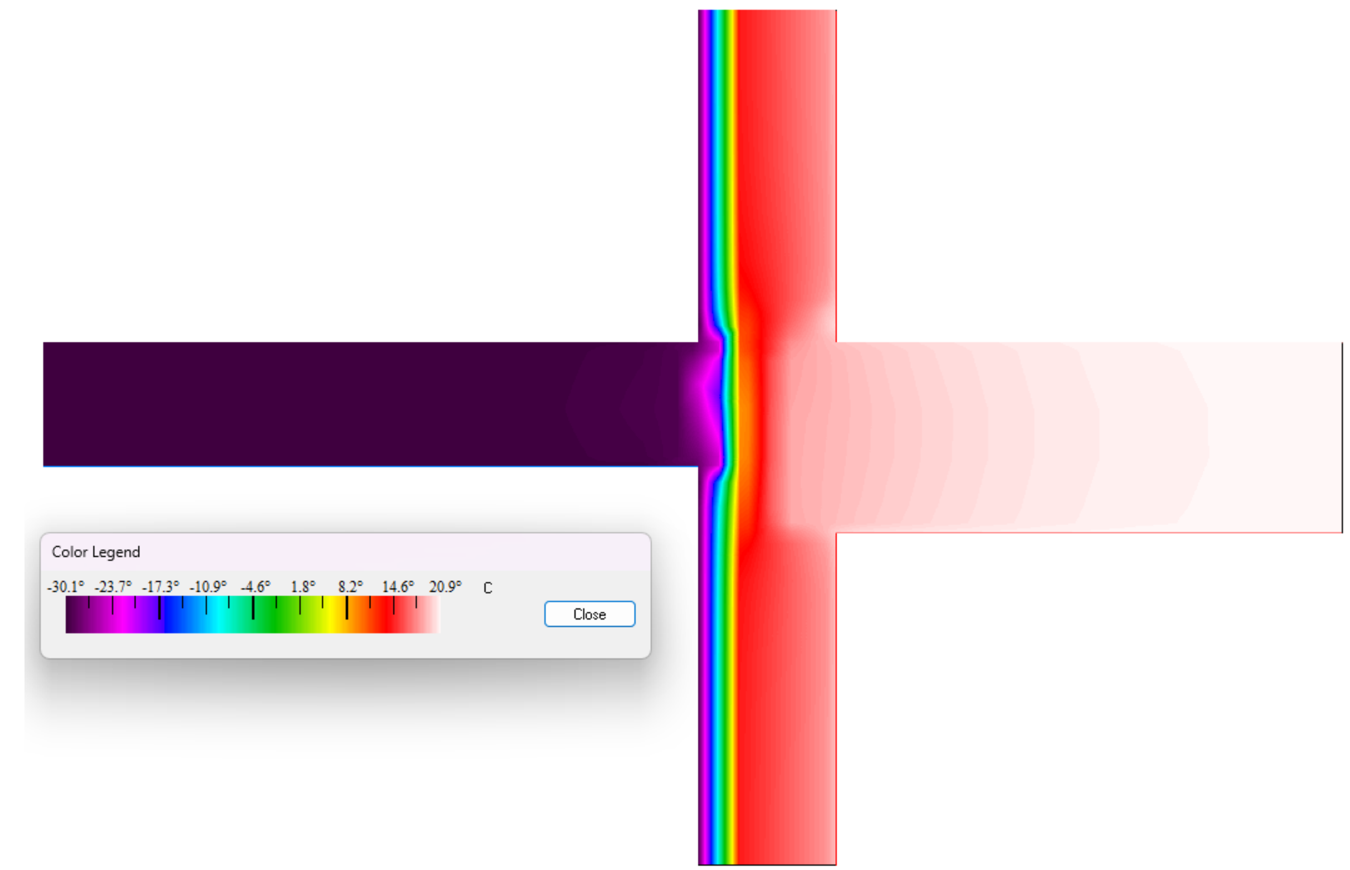
=0.41x1.1 - 0.236x0.8 + 0.69x0.3

=0.45 - 0.188+0.207

=0.055 w/mk

length take off = 13m





BALCONY

Ψ= L2D-L1D

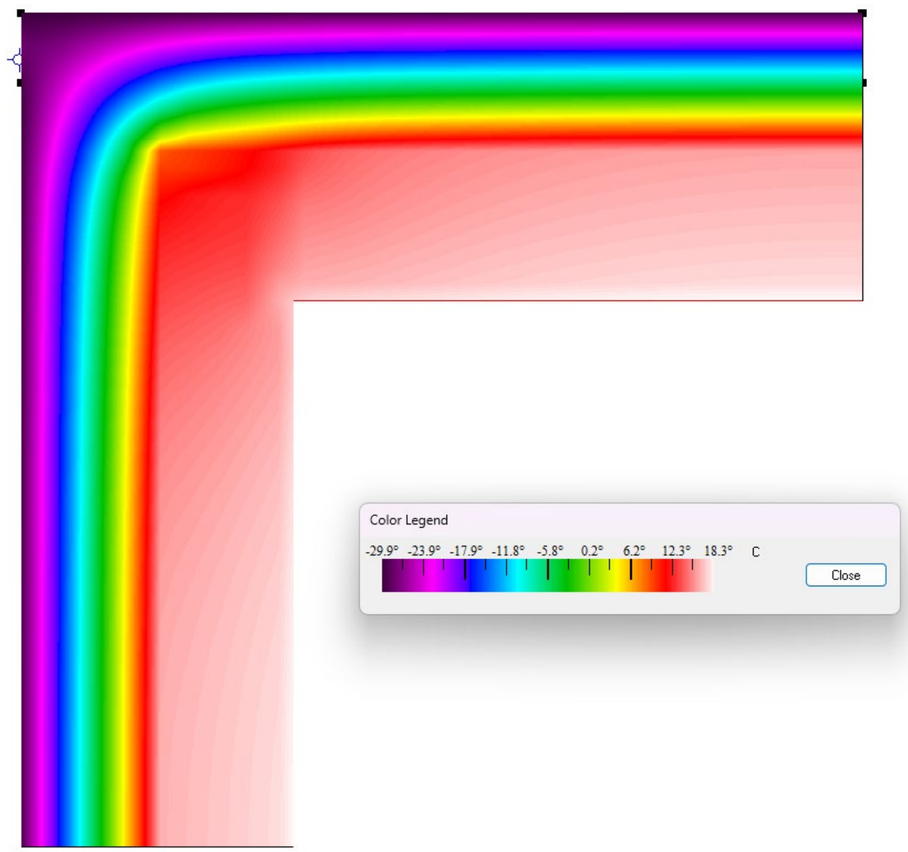
= (U overall with thermal bridging x overall length) - (U clear value x overall length)

=0.39x1.2 - 0.36x1.2

=0.468 - 0.2832

=0.1848 w/mk

length take off = 5.5m



WALL CORNER

Ψ= L2D-L1D

= (U overall with thermal bridging x overall length) - (U clear value x overall length)

=0.5329*0.61 - 0.236*0.61

=0.32-0.14

=0.0448 w/mk

length take off = 4m

thermal performance calculations

BChydro
powersmart
FORTIS BC

Enhanced Thermal Performance Spread Sheet SI Units

Change Units

Scenario Description

Enter Scenario Name
Create New Worksheet
Copy to New Worksheet
Reset Current WorkSheet

Clear Field Area Method

Select Area Calculation (Choose One)	Area	Units
◉ Sumof Active Clear Field Areas (Default)	132.00	m^2
○ User Defined Area	Enter User Defined Opaque Area	m^2

Overall Opaque Wall Thermal Performance Values

Base Building		Proposed Building		% Below Baseline
Opaque USI-Value (W/m^2K)	0.118	Opaque USI-Value (W/m^2K)	0.117	✔ -0.5%
Effective RSI-Value (m^2K/W)	8.5	Effective RSI-Value (m^2K/W)	8.5	

Proposed Building Entries

Add/Remove Detail	Transmittance Type	Include	Transmittance Description	Area, Length or Amount Takeoff	Units	Transmittance Value	Units	Source Reference	Heat Flow (W/K)	%Total Heat Flow
								Totals	15.5	100%
Add Clear Field	Clear Field	☑	roof	132.00	m^2	0.110	W/m^2K	Enter Source Here	14.5	94%
Add Linear Interface Detail	Linear Interface Detail	☑	Wall to roof	12.00	m	0.082	W/mK	Enter Source Here	1.0	6%
Add Point Interface Detail	Point Interface Detail	☑	Enter Description Here	Enter Amount Here	#	Enter Chi-Value Here	W/K	Enter Source Here	-	-

Roof Effective Thermal Performance

The analysis reveals that the designed roof assembly and detailing performs 0.5% better than the minimum value of R48 stated in the competition brief. The roof assembly thermal resistance is calculated at R52 after thermal bridges have been considered.

ENVELOPE PERFORMANCE

Clear Field Area Method

Select Area Calculation (Choose One)	Area	Units
◉ Sum of Active Clear Field Areas (Default)	97.00	m^2
○ User Defined Area	Enter User Defined Opaque Area	m^2

Overall Opaque Wall Thermal Performance Values

Base Building		Proposed Building		% Below Baseline
Opaque USI-Value (W/m^2K)	0.270	Opaque USI-Value (W/m^2K)	0.237	✔ -12.3%
Effective RSI-Value (m^2K/W)	3.7	Effective RSI-Value (m^2K/W)	4.2	

Proposed Building Entries

Add/Remove Detail	Transmittance Type	Include	Transmittance Description	Area, Length or Amount Takeoff	Units	Transmittance Value	Units	Source Reference	Heat Flow (W/K)	%Total Heat Flow
								Totals	23.0	100%
Add Clear Field	Clear Field	☑	wall	97.00	m^2	0.204	W/m^2K	Enter Source Here	19.8	86%
Add Linear Interface Detail	Linear Interface Detail	☑	Wall to roof	12.00	m	0.082	W/mK	Enter Source Here	1.0	4%
Remove Linear Interface Detail	Linear Interface Detail	☑	Wall corner	4.00	m	0.045	W/mK	Enter Source Here	0.2	1%
Remove Linear Interface Detail	Linear Interface Detail	☑	wall to header	4.10	m	0.068	W/mK	Enter Source Here	0.3	1%
Remove Linear Interface Detail	Linear Interface Detail	☑	wall to sill/jamb	13.00	m	0.055	W/mK	Enter Source Here	0.7	3%
Remove Linear Interface Detail	Linear Interface Detail	☑	wall to balcony	5.50	m	0.185	W/mK	Enter Source Here	1.0	4%
Add Point Interface Detail	Point Interface Detail	☑	Enter Description Here	Enter Amount Here	#	Enter Chi-Value Here	W/K	Enter Source Here	-	-

Wall Effective Thermal Performance

The analysis reveals that the designed wall assembly and detailing performs 12% better than the minimum value of R21 stated in the competition brief. The wall assembly thermal resistance is calculated at R27 after thermal bridges have been considered.

Note that the calculation is onyl for one apartment of the fourht floor.