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Applied Research
and Innovation Services

**Green Building
Technologies**

SOUTHERN ALBERTA INSTITUTE OF TECHNOLOGY

GREEN BUILDING TECHNOLOGIES

High Performance Wall Assembly Project
Summary Report

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FOR: Alberta Ecotrust Foundation | June 27, 2025

Executive Summary

Purpose

Promote energy efficient building envelope and wall constructions to the residential building sector in Alberta.

Process

6 different assemblies were researched and selected to be showcased. This would consist of the development of construction detail drawings, a physical mockup, and cost comparison analysis for each selected assembly. The assemblies selected to showcase were:

- Tier 1 2x6 Assembly
- Exterior Mineral Wool Tier 3 Assembly
- Double Stud Wall Net Zero Assembly
- Exterior Foam Net Zero Assembly
- Fire Resistant Retrofit Assembly
- Larsen Truss Retrofit Assembly

Physical mockups of the chosen assemblies' walls were constructed by GBTAC. The purpose of these mockups is for AEF to bring across the province to different educational events to showcase, and use for an educational tool. The advantages of each assembly and difficulties were noted during construction of the mockups.

Key Findings/Results

Of the new build construction mockups, the most affordable assembly to build, as per GBTAC's findings, was the Tier 1 2x6 Assembly, while the costliest being the Exterior Foam Net Zero Assembly. In terms of cost for all 6 assemblies, the order from most affordable to least affordable, as per the materials selected for the mockups, was:

1. Larsen Truss Retrofit Assembly (Pricing for retrofit components only)
2. Tier 1 2x6 Assembly
3. Fire Resistant Retrofit Assembly (Pricing for retrofit components only)
4. Double Stud Wall Net Zero Assembly
5. Exterior Mineral Wool Tier 3 Assembly
6. Exterior Foam Net Zero Assembly

GBTAC staff found that the order of difficulty to construct, from least to most difficult were as follows:

1. Tier 1 2x6 Assembly
2. Double Stud Wall Net Zero Assembly
3. Exterior Mineral Wool Tier 3 Assembly
4. Larsen Truss Retrofit Assembly
5. Fire Resistant Retrofit Assembly
6. Exterior Foam Net Zero Assembly

GBTAC found that one of the largest factors on the cost of an assembly was the selection of the WRB, VB, and sealant tapes. The more high performance designated membranes did come at a substantial cost increase over more readily available materials and membranes.

Future Research/Additional Exploration

The largest item that should be considered for future research is to complete a cost analysis on the assemblies using the same materials throughout. Comparing the assemblies when high performance materials were selected for some, but not the other can have an impact on the accuracy of a cost comparison.

Scope/Deliverables

The following report was written by staff at the Green Building Technology Access Center (GBTAC), which is part of the Southern Alberta Institute of Technology's (SAIT) Applied Research and Innovation Services (ARIS) hub. This report is intended to summarize the process and methods used by GBTAC to assist in the design, construction and evaluation of different high-performance wall assemblies for the Alberta Ecotrust Foundation (AEF).

The intention of this project is to promote cost-effective and energy-efficient building envelopes and wall construction in Alberta, specific to the Alberta's climate zones. The deliverables of this project aim to provide valuable data, training materials, and knowledge exchange opportunities to everyone involved in the designing and constructing of high-performance walls in the industry.

The Scope and Deliverables of the project were as follows:

Research and Development

Research and design the below listed 6 assemblies focusing on affordability and constructability.

- List of walls to be researched and developed:
    - 1 Business as Usual (BAU) assembly
    - 1 Tier 3 assembly
    - 2 Net Zero assemblies
    - 1 High-performance retrofit assembly
    - 1 Net Zero retrofit assembly

Deliverable: Wall description (including a section describing how the design is affordable and constructible) materials, and drawing details (rough drawings are acceptable for this deliverable).

Stakeholder Engagement

SAIT's GBTAC will provide details from the Research and Development stage and ENBIX will engage with industry associations (BILD AB, ER, Calgary) to gather insights and address challenges.

Deliverable: Representation from SAIT at each of the three one-hour meetings and one summary meeting with ENBIX

Construction Planning

Begin construction of the six wall assemblies after receiving approval from ENBIX.

Deliverable: SAIT's GBTAC to construct the 6 wall assemblies, document the process via video, detailing the constructability and step-by-step process and will share the challenges encountered along the way in a report.

- A minimum of 10 images/figures per assembly.
- The following construction details for each assembly
  - Wall Section Overview & Materials List
  - Wall Section Detail
  - Base of Wall at Foundation
  - Cladding transition at floor junction
  - Wall & Roof Interface
  - Window sill
  - Window Jamb
  - Window Head
  - Wall Penetration at Duct - Section
  - Wall Penetration at Receptacle – Section

Performance Evaluation

ENBIX to conduct energy modeling, SAIT to do a cost analysis on a per sq ft basis based on a model home to be provided by AEF, to evaluate the performance of each wall assembly. This should be broken out per material in each wall including any fenestration. This will be reviewed by engagement with industry for cost comparison.

Deliverable: Cost per square foot of each wall broken out per material and total cost per wall.

Knowledge Sharing

Participation in BUILDEX Calgary on October 23-24, 2024.

Deliverable: Representation from SAIT at BUILDEX Calgary to assist in running a workshop titled "Building Beyond Code: Exploring High-Performance Wall Assemblies" with the ENBIX team. A presentation will be prepared by ENBIX for the workshop.

Continuous Improvement

Incorporate lessons learned from the project into future iterations.

Constraints/Limitations

Within the scope of the project, there were certain constraints and limitations that had an effect on the final outcome. Some of these include but are not limited to:

- Cost analysis pricing calculations were based off of material pricing gathered by GBTAC in 2023. Pricing is for comparative purposes between the selected assemblies only and not to be used for budgeting.
- Cost analysis pricing was for material only and did not consider labour costs due to the variability of labour costs.
- Cost analysis was completed as per the materials utilized for the physical mock-ups. This can misrepresent a true comparison between the assemblies. High-quality materials, or more affordable materials could potentially be installed on each the selected assemblies. Some of the materials selected for certain assemblies and not for the other can alter the costs significantly.
- Due to the variability of cost and abundant selection, cost analysis pricing did not include windows, attic insulation, or foundation construction costs.
- The cost analysis outlined in the body of this report was completed as if the model home was to be built from scratch. The retrofit assemblies in the cost comparison does not include wall, roof, or floor framing material, as they would be considered to existing.
- The affordability analysis as outlined in ***Appendix D: Cost per sq/ft of Wall Affordability Analysis*** was calculated on a cost per sq/ft of wall assembly material only. The retrofit assemblies did not include wall framing material as they would be considered to be existing.
- Cost and affordability analyses do not include a monetary value. They are comparisons as a percentage based on GBTAC staff material cost estimates.
- Wall mock-ups were constructed in a shop environment. This does not represent the actual build process that would be performed on construction sites in most cases.
- Assembly design and construction is based on GBTAC staff's industry experience. There are numerous methods for constructing various assemblies, and the techniques used for this project may not be the most optimal for every situation.
- Specific materials and manufacturers are only mentioned in regards to the materials utilized for the physical mock-ups. SAIT, ARIS and GBTAC are not sponsored by or endorse any of the manufacturers named.
- Material selection did not consider any specific climate resiliency strategies.
- The materials listed in this report reflect what was used for construction of the mock-ups only. Specific materials and manufacturers were not listed in the drafting and detailing documents.
- Physical mock up stud spacing is not on a set 16" or 24" O.C. spacing. The studs were placed centered in the wall length which varied per mock up.
- Thermal modelling to be done on a 24" O.C. stud spacing.
- Effective thermal performance calculations were calculated on a clear wall. Partitions, windows, doors, fasteners, etc. were not considered.
- Effective thermal performance calculations were not completed for the foundation or roof assemblies.
- Effective thermal performance calculations were calculated based off of the GBTAC developed drawings, not on the physical mock-up construction.

Process

Assembly Selection and Construction

GBTAC used internal staff's industry knowledge, along with input from the AEF Foundation, residential construction professionals, and the NRCAN LEEP NZE Wall Assembly Guides to determine which assemblies to showcase. The 2020 NBC, NBC – 2023 Alberta Edition, and the 2020 NECB were also referenced for the design of all of the assemblies chosen. GBTAC, with the approval from staff at the AEF Foundation developed drawings and construction details. The six assemblies selected were:

- **Tier 1 2x6 Assembly**
- **Exterior Mineral Wool Tier 3 Assembly**
- **Double Stud Wall Net Zero Assembly**
- **Exterior Foam Net Zero Assembly**
- **Fire Resistant Retrofit Assembly**
- **Larsen Truss Retrofit Assembly**

There were several factors that had an influence on the selection of the six assemblies to construct, including but not limited to:

- Constructability
  - How difficult is the assembly to construct?
  - Will it be able to be replicated again and again to the same standard and quality?
  - Does the assembly require specialized trades or workers to complete?
- Material Availability
  - Is the material in the assembly readily available?
  - Can the material be purchased at a local hardware or building supply store?
  - Does the assembly require custom materials to construct?
- Building Science Fundamentals
  - Does the assembly follow basic building science fundamentals, ensuring as durable and energy efficient of an assembly as possible?
- Cost
  - Is the assembly unnecessarily costly?
  - Will the assembly influence the amount of energy used, thereby, influencing the monthly cost of ownership of the building?

GBTAC constructed a physical mock-up for each of the chosen assemblies. These mock-ups were constructed to show an example of an exterior corner of a home. Included is a wall to floor transition, a detailed window opening with a small corner unit window installation, and examples of sealing a duct penetration and electrical penetration through the air control layer on a select few.

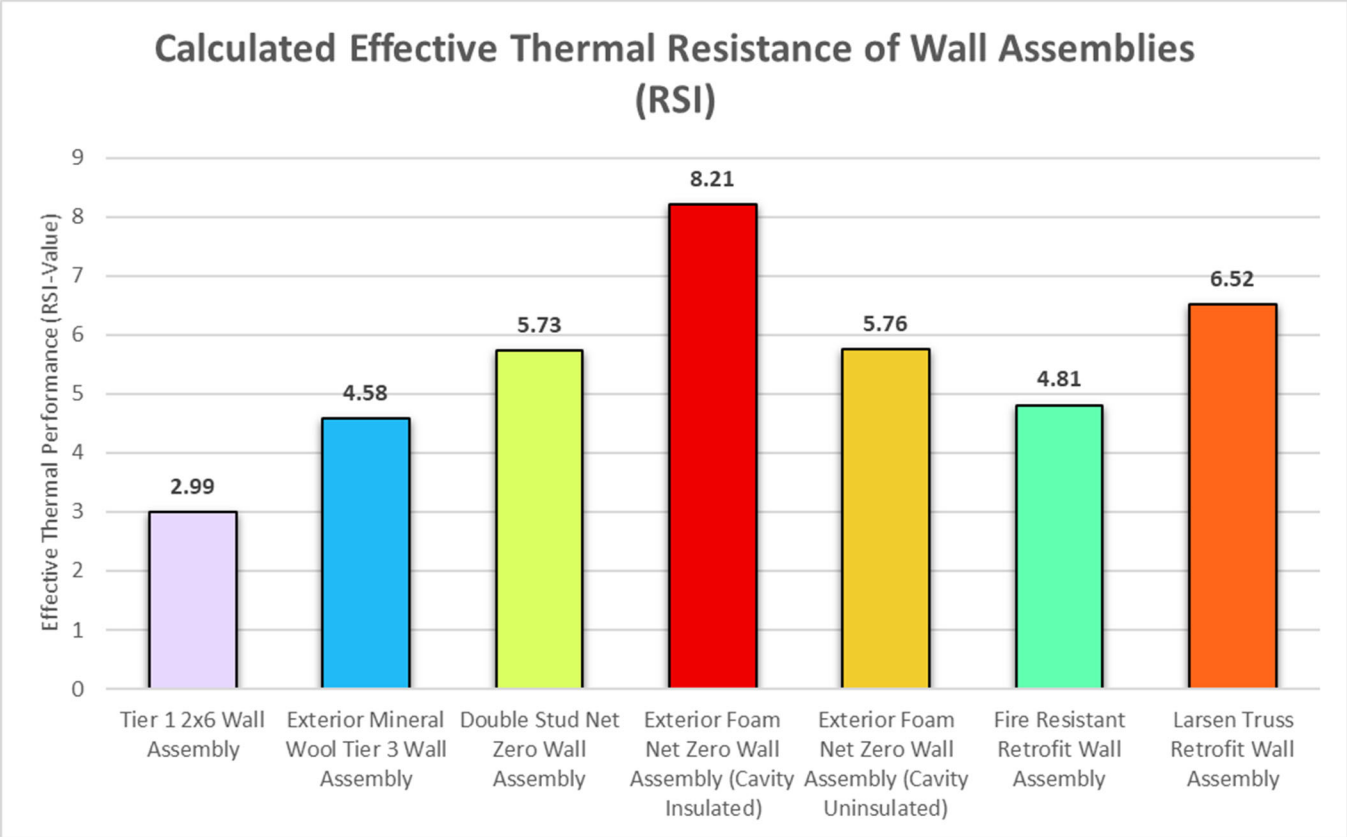
Effective Thermal Resistance

Calculations to determine the wall assembly effective thermal resistance for each wall assembly were completed by GBTAC. All the information to calculate effective thermal resistance were taken from the following sources:

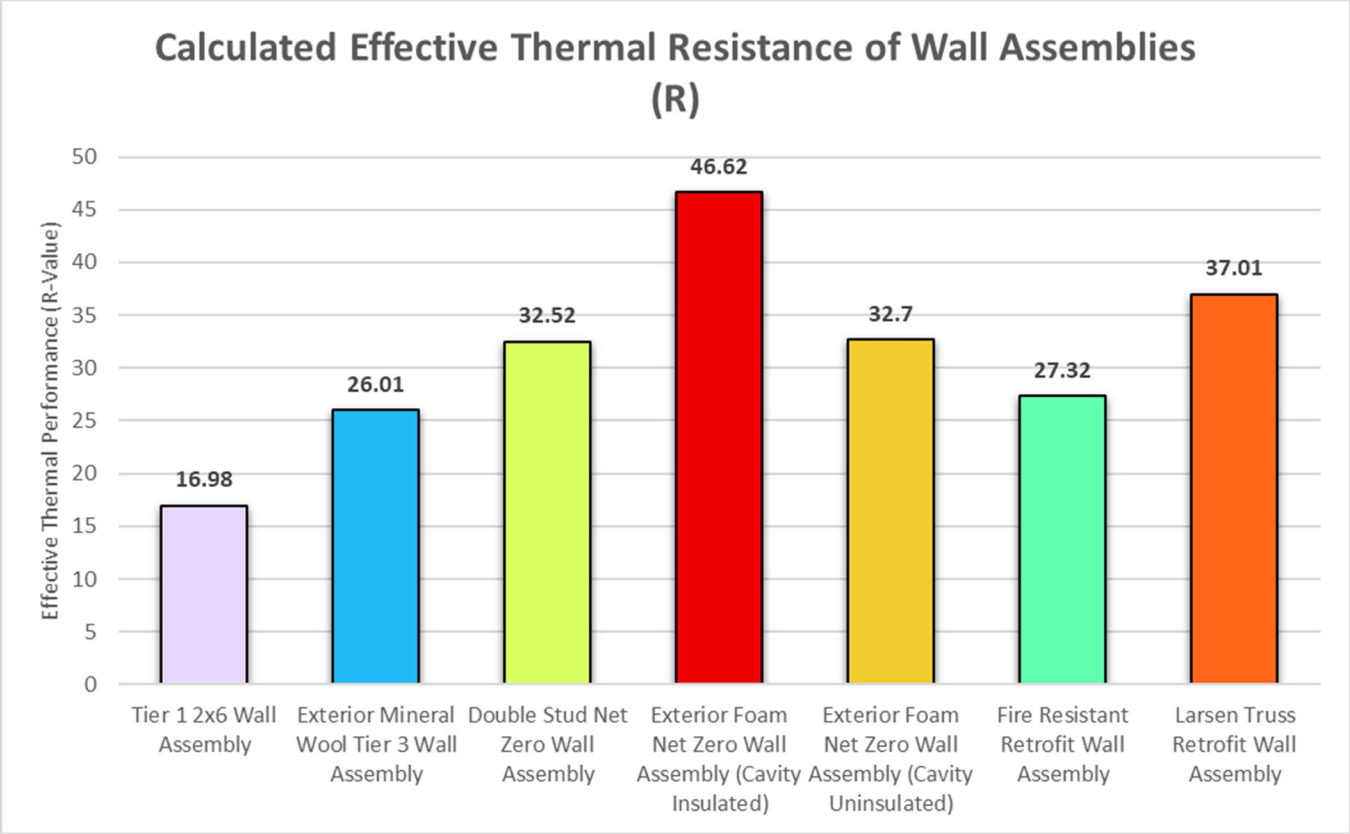
- **2020 NBC – A-9.36.2.4.(1)** Calculating the Effective Thermal Resistance of Building Envelope Assemblies
- **2020 NBC – Table A-9.36.2.4.(1)-A** Framing and Cavity Percentages for Typical Wood-frame Assemblies
- **2020 NBC – Table A-9.36.2.4.(1)-D** Thermal Resistance Values of Common Building Materials

The below graphs show the results of the effective thermal resistance calculations of each wall assembly both in RSI-value and R-value. The calculation information can be found in ***Appendix B: Wall Assembly Effective Thermal Resistance Calculations.***

Graph 1: Calculated Effective Thermal Resistance of Wall Assemblies (RSI)



Graph 2: Calculated Effective Thermal Resistance of Wall Assemblies (R)



Cost & Constructability Analysis

An approximate cost analysis was completed for each assembly. For these cost comparisons, only materials were considered as labour pricing can vary drastically from one builder or trade, to another. GBTAC utilized a database of material prices that were gathered by staff in 2023. Material take-offs for the estimate were calculated using plans from a previously constructed home that had been donated for use by GBTAC and AEF (see ***Appendix C: Cost Analysis Model Home***). New construction assemblies considered the cost to supply and construct the entire wall assembly, as well as an engineered floor and roof truss system.

Retrofit assemblies only considered the material to the exterior of the structural sheathing and did not include material to build walls, floors, or roofs as these were intended to be existing and unchanged.

Some items that were not included in the cost analysis for varying reasons were, but not limited to:

- Cladding
- Interior finishes (gypsum board, trim, etc.)
- Windows and doors
- Foundation and basements
- Decks, porches, or roofs covering them

GBTAC utilized the results from this initial cost analysis to complete an additional affordability analysis (see ***Appendix D: Wall Assembly Affordability and Constructability Analysis***).

Stakeholder Engagement

All of the assemblies that were selected were initially roughly drafted and submitted to AEF for approval. AEF shared these drafts with industry experts, mainly those associated with BILD Alberta, BILD Calgary Region, and BILD Edmonton Region. The majority of the feedback provided from these drafts pertained to the affordability of the higher performance assemblies. This feedback ultimately did not result in any changes to the proposed assembly selection or plans.

GBTAC presented two built mock ups at two events with AEF. The two mock ups were;

- Exterior Mineral Wool Tier 3 Assembly
- Double Stud Net Zero Assembly

These were showcased at the BUILDEX Alberta event in Calgary, Alberta in October 2024, and the Building for Sustainability Symposium in Canmore, Alberta in October 2024. Presenting the mock ups at these two events resulted in valuable conversation with the attendees about other methods of construction and materials that are available. The feedback from these presentations did not result in changes being made to the existing mock ups or the future built mock ups.

Outcome

Selected Assemblies

Tier 1 2x6 Assembly

See ***Appendix A: Tier 1 2x6 Assembly Construction Details*** for plans and construction details.

Description and Overview

This assembly is one of the most common methods of constructing residential buildings in Canada at the time of this report. AEF requested that a "Business as Usual" assembly be developed to display a code requirement level of construction. GBTAC staff, with assistance from AEF, developed the design for this assembly utilizing feedback from the residential building and construction professionals. The wall assembly, from exterior to interior, contains:

- Exterior Cladding
- WRB, vapour open
- Structural sheathing
- 2x6 stud wall @ 24" O.C. with fibreglass batt cavity insulation
- Airtight 6 mil polyethylene sheet vapour barrier
- ½" gypsum board
- Interior finish

With the variability of roof and foundation options, it was decided to go with a flat bottom chord truss system with raised heels to accommodate the required attic insulation for the roof. The foundation was drawn as an 8" concrete foundation, with damp proofing and a capillary break to the exterior. To the interior there is a 1" air space, a 2x4 stud wall at 24" O.C. filled with R-12 fibreglass batt insulation, and then an airtight 6 mil poly vapour barrier.

The window that was used for the physical mock-up was a standard window used in construction in Alberta at the time of writing. It is a triple pane window, with a vinyl frame and jamb extension. Installation is to the structural sheathing layer fastened with nails through an attached nailing flange. The sill of the window R.O. utilizes a piece of bevel siding spanning the length to create a sloped sill, guiding any moisture that may accumulate there to the exterior of the opening, and down the WRB. Sloped shims were then placed at the spots of the window that need structural support, as determined by the window manufacturer.

Materials

Materials used for mock-up wall construction are as follows:

- **WRB**
  - DuPont - Tyvek HomeWrap – mechanically fastened
  - Sill Pan Flashing – Henry Bakor BlueSkin WB & Bakor Aquatec Emulsion Primer
- **Structural Wall**
  - 3/8" OSB structural sheathing
  - 2x6 SPF lumber
- **Cavity Insulation**
  - Owens Corning R-22 Pink Next Gen Fiberglass Insulation

- **Airtight Vapour Barrier**
  - Membrane - Everbilt CGSB Approved 6 mil Vapour Barrier
  - Tape – Tuck Tape - UV-Resistant Sheathing Tape Roll for PE Vapour Barrier
  - Sealant – LePage PL Acousti-Seal Sound Absorbing Vapor Barrier Adhesive
- **Assembly Effective Thermal Performance**
  - RSI-2.99 or R-16.98

Construction

Construction of this assembly mockup was very straightforward and easy to complete. This being a very common assembly, most home builders and trades people will have constructed or worked with this assembly before.

The air control layer for this assembly is the 6-mil poly VB. Maintaining a continuous air control layer was achieved with this membrane along with the following materials:

- Compressed acoustical sealant at joints and openings of the VB and under the wall bottom plates.
- Airtight electrical boxes with gasket seals at the face.
- Expanding spray foam insulation and tape around mechanical penetrations.
- Foam backer rod and caulking at the windows.

Assembly Advantages

- Easy to build and common across Canada.
- Materials were easily accessible at most hardware or building supply stores.
- Materials selected were more affordable compared to other high-performance materials in the other assemblies.
- Construction did not require specialized professionals outside the norm to design or build.
- The VB being the air control layer on the interior of the assembly means that installers have a flat floor and an interior environment for the installation of this layer.

Assembly Disadvantages

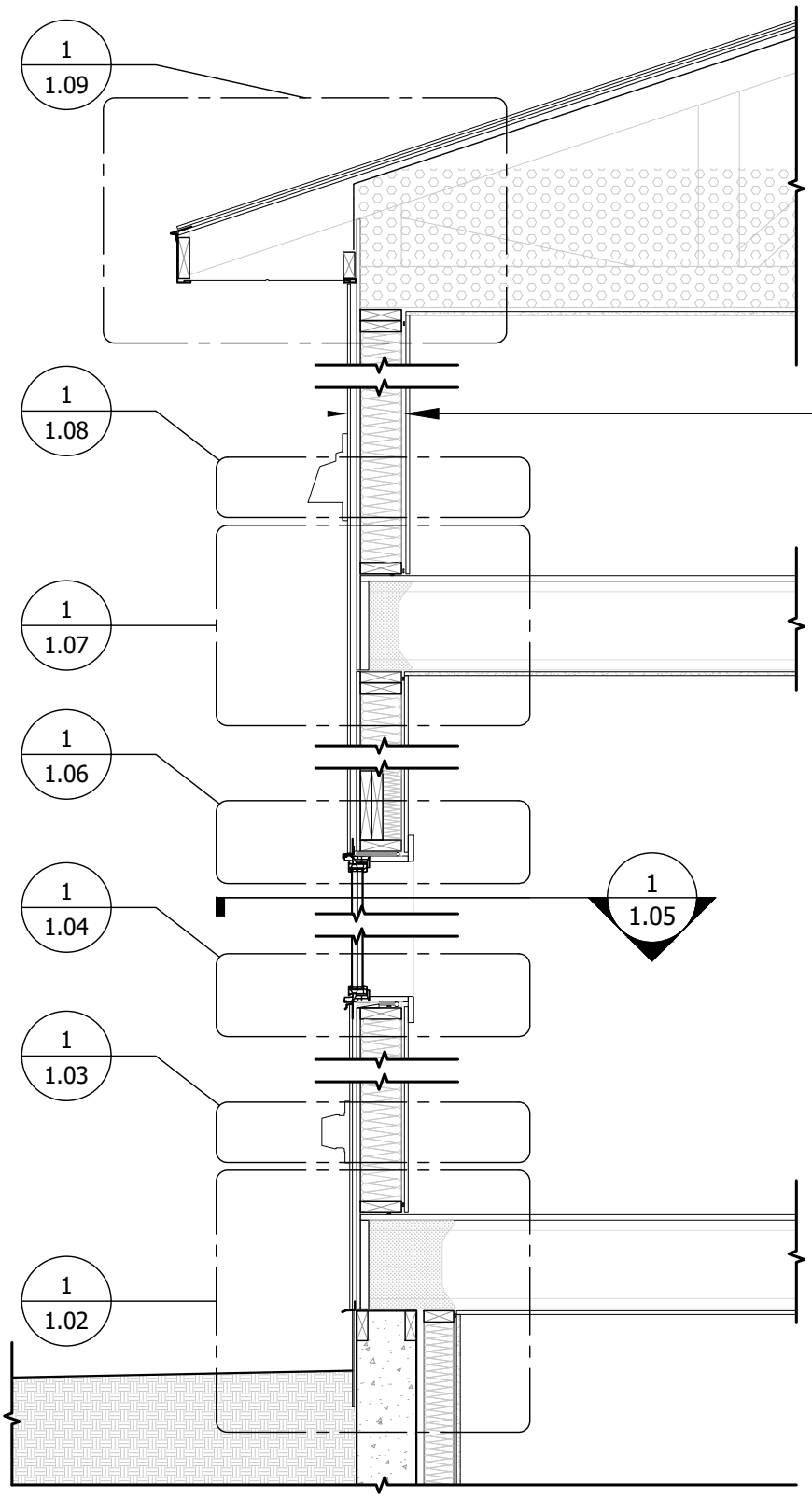
- Airtightness detailing was challenging as the air control layer is on the interior of the wall resulting in breaks in the continuity at floor, partition, electrical boxes, and mechanical junctions that needed to be detailed.
- Acoustical sealant as the air seal can be very messy and if not installed with care, can get on and damage certain finishes.
- If acoustical sealant is not properly installed and compressed then the effectiveness of it can be greatly reduced.
- Once the walls are lifted, it was not possible to see if the air control layer is continuous under the wall plate to the floor sheathing, unless a membrane is installed under the plate extending to the interior.
- There is a considerable amount of structural wood thermal bridges in this construction method. This causes heat loss, resulting in higher energy use.

Cost Analysis

This assembly being considered a “Business as Usual” assembly, set the baseline price that was used to compare the other assemblies to. Of the new construction assemblies selected for this project, GBTAC calculations found that this assembly came out to be the most affordable to build.

Appendix A:

Tier 1 2x6 Assembly Construction Details



TIER 1 2x6 ASSEMBLY

EFFECTIVE RSI = 2.99; R-VALUE = 16.98

- EXTERIOR CLADDING
- WATER RESISTANT BARRIER, SHEET APPLIED MEMBRANE, VAPOUR OPEN
- ⅜" EXTERIOR SHEATHING
- 2X6 STUD WALL WITH FIBERGLASS BATT CAVITY INSULATION
- AIRTIGHT 6 MIL VAPOUR BARRIER
- ½" GYPSUM BOARD
- INTERIOR FINISH

1 ENVELOPE SECTION

1/2" = 1'-0"

SAIT

1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title

TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
Drawn by	PY	Checked by	BH, NM	Date	2025-04-30	Scale	1/2" = 1'- 0"
Project Address	N/A						
Issued For	ALBERTA ECOTRUST FOUNDATION						

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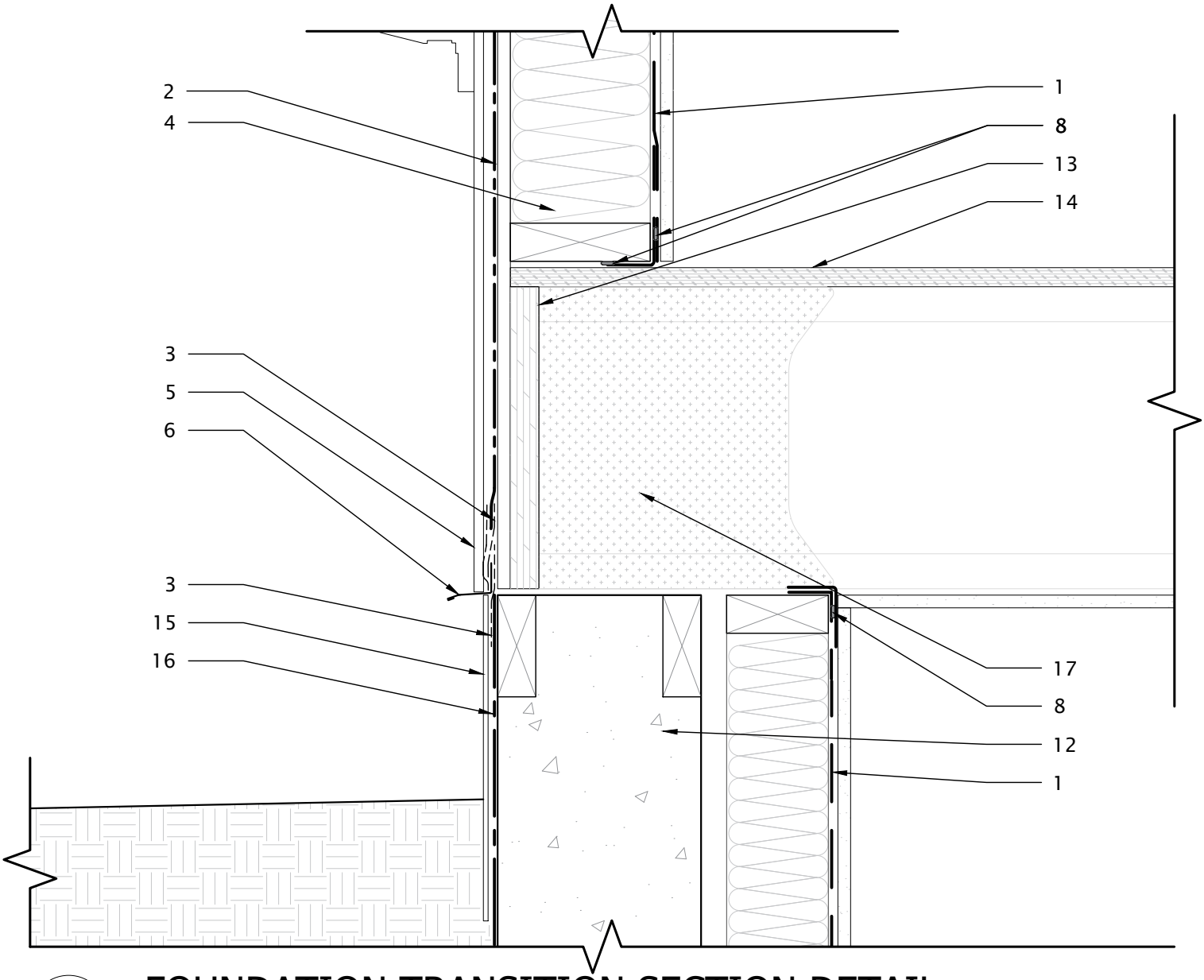

1 FOUNDATION TRANSITION SECTION DETAIL

2" = 1'-0"

1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 CAST-IN-PLACE CONCRETE
13 RIM BOARD
14 SUBFLOOR
15 PARGING
16 DAMPPROOFING
17 SPRAY FOAM INSULATION

SAIT
1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

Project Number: 2024-009
Project Name: HIGH PERFORMANCE WALL ASSEMBLY
Drawn by: PY
Checked by: BH, NM
Date: 2025-04-30
Scale: 2" = 1'- 0"
Project Address: N/A
Issued For: ALBERTA ECOTRUST FOUNDATION

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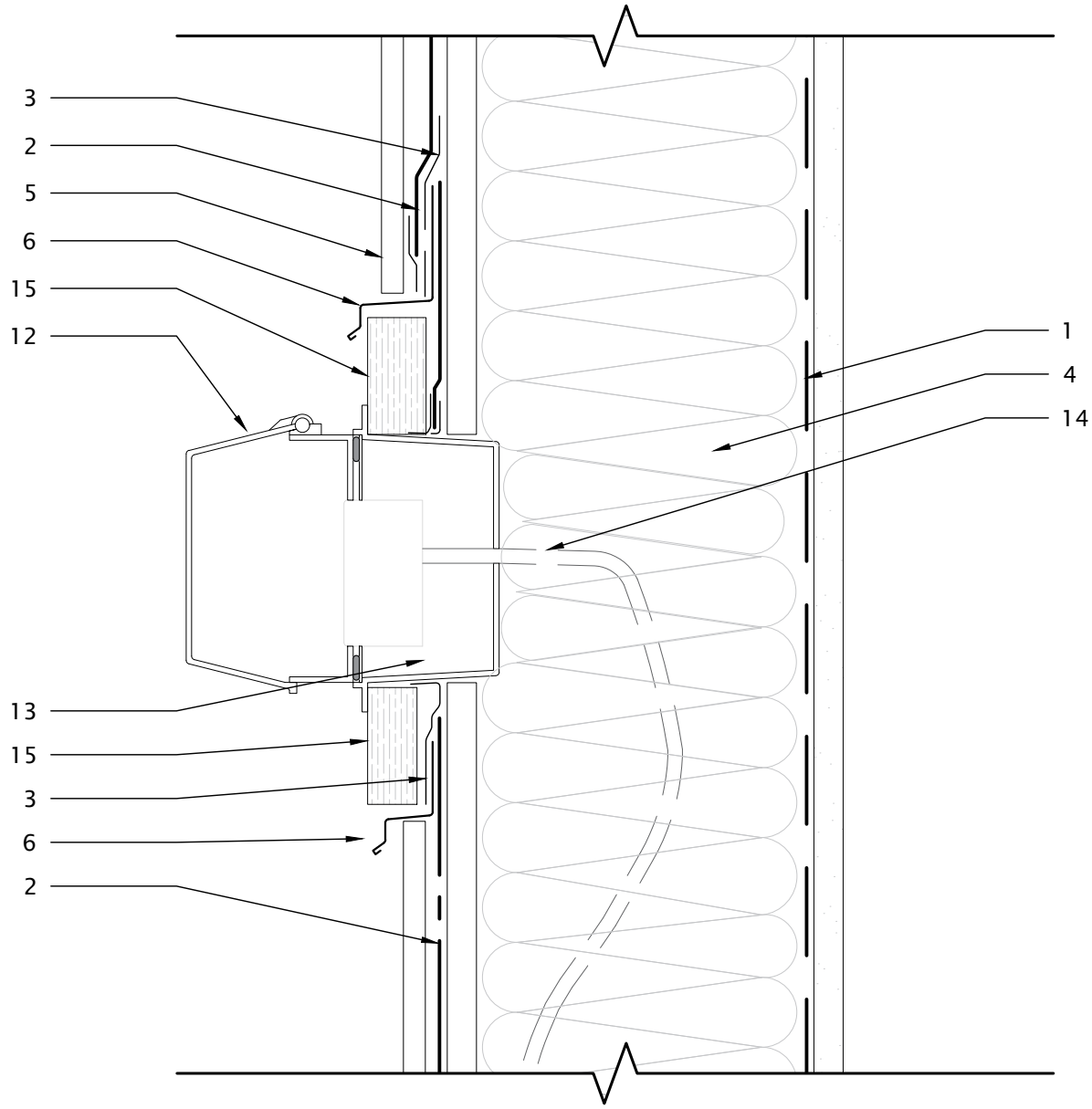

1 RECEPTACLE SECTION DETAIL

4" = 1'-0"

1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 RECEPTACLE COVER
13 RECEPTACLE CAGE
14 ELECTRICAL WIRE
15 BATTEN OSB CAP

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Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
Drawn by	PY	Checked by	BH, NM	Date	2025-04-30	Scale	4" = 1'- 0"
Project Address	N/A						
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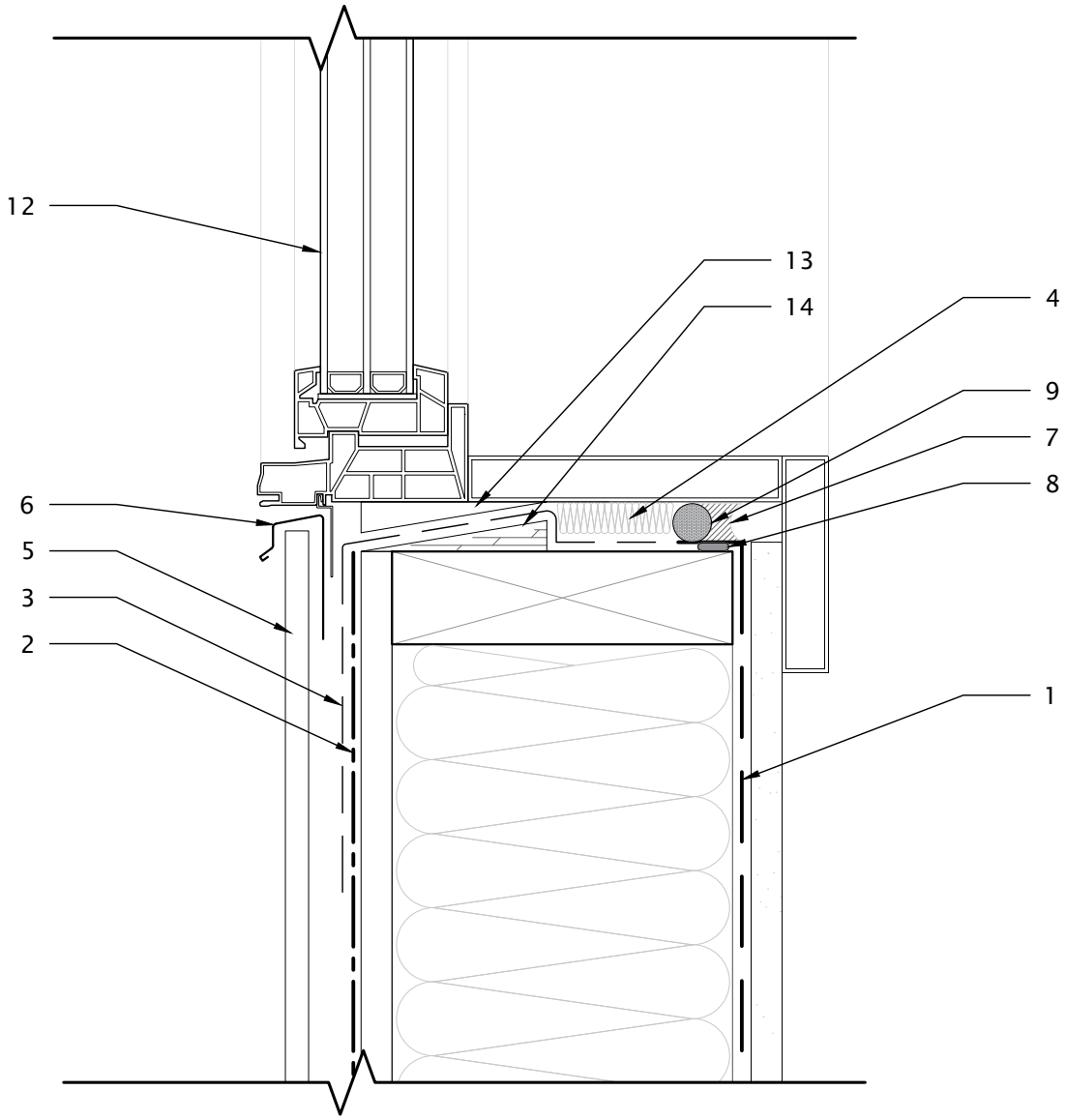

1 WINDOW SILL SECTION DETAIL

4" = 1'-0"

1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 GLAZING UNIT
13 WINDOW SUPPORT SHIM
14 BEVELED SIDING SLOPED DAM

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1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

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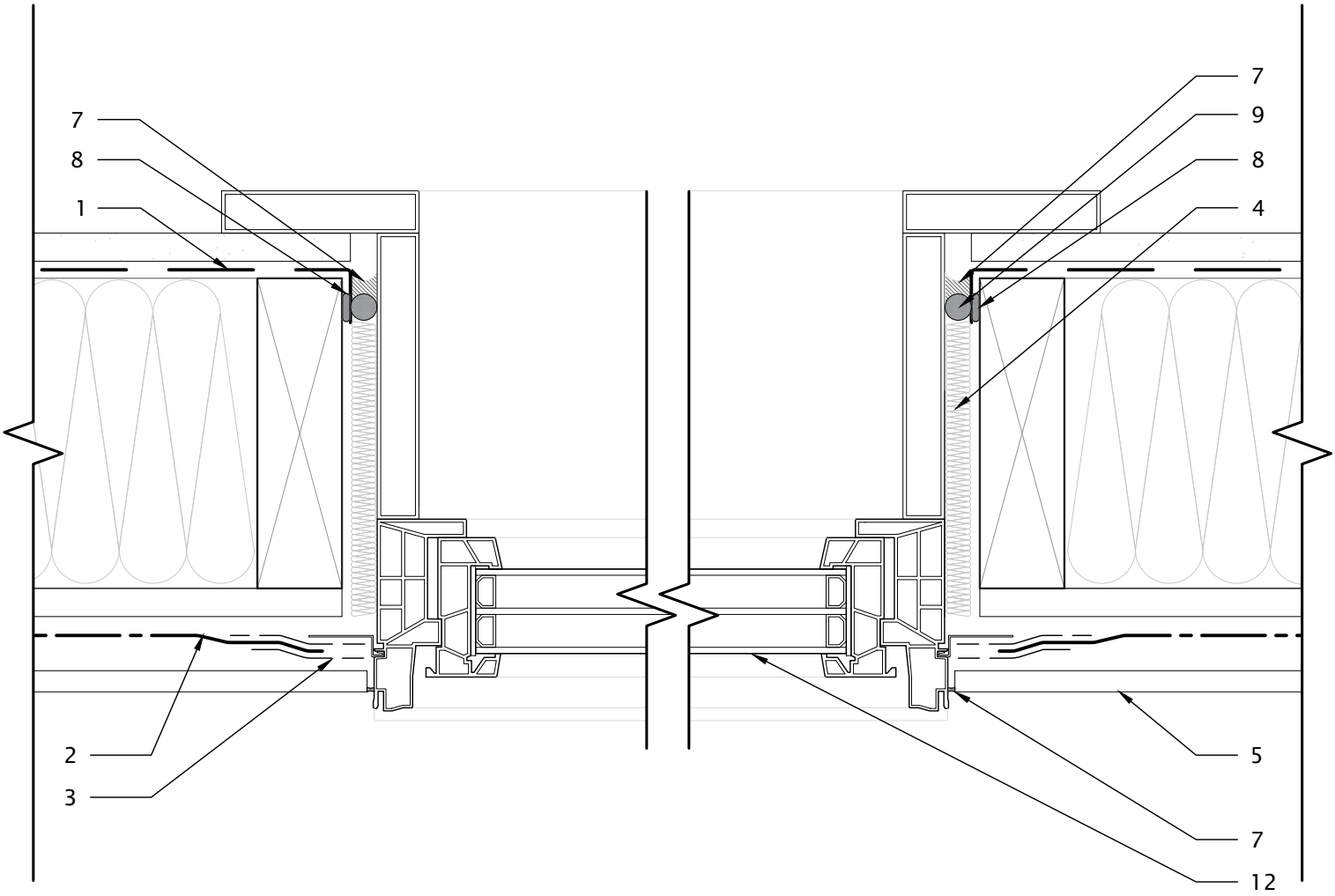

1 WINDOW JAMB PLAN DETAIL

4" = 1'-0"

1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 GLAZING UNIT

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Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
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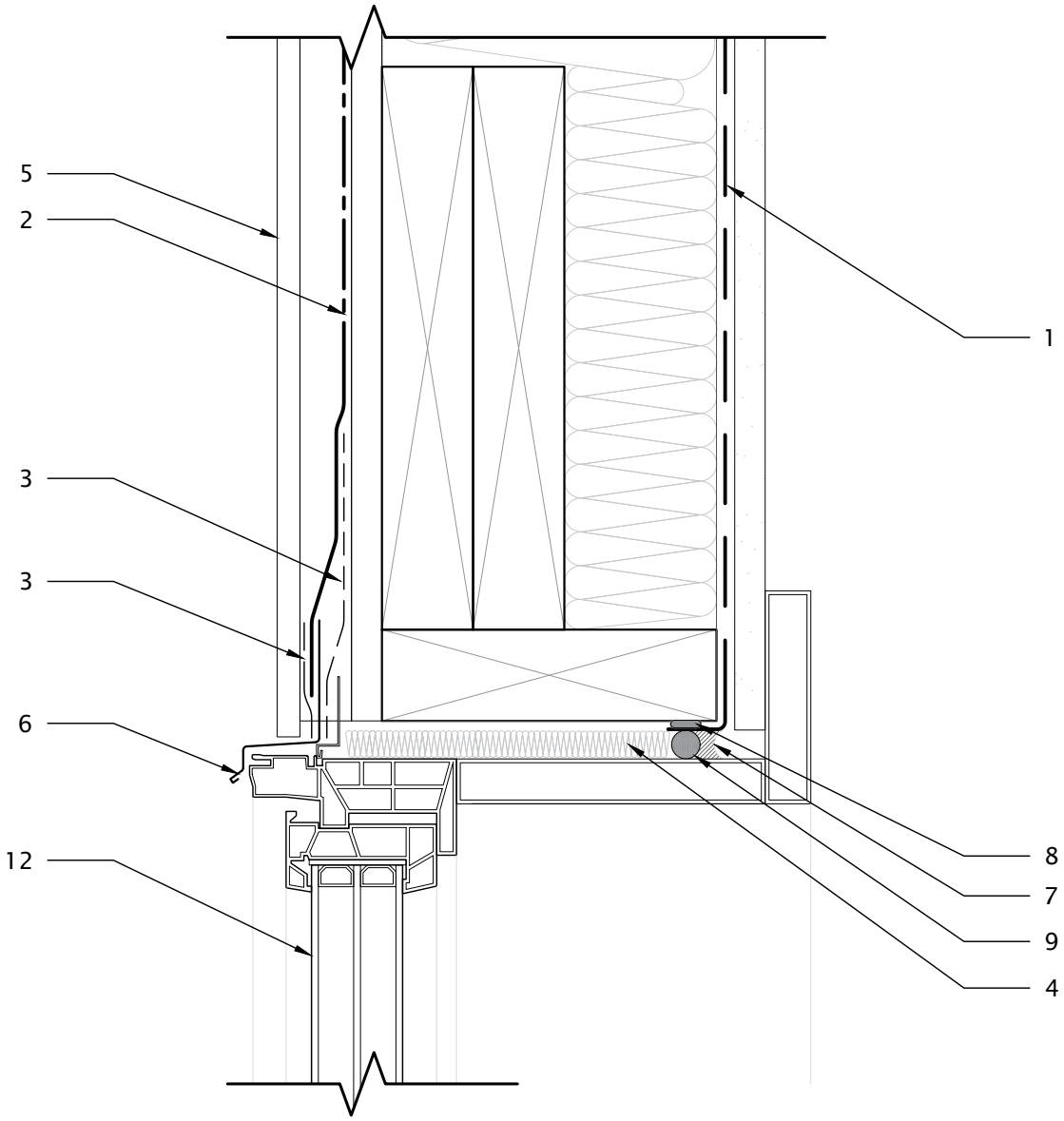

1 WINDOW HEAD SECTION DETAIL

4" = 1'-0"

1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 GLAZING UNIT

SAIT
1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

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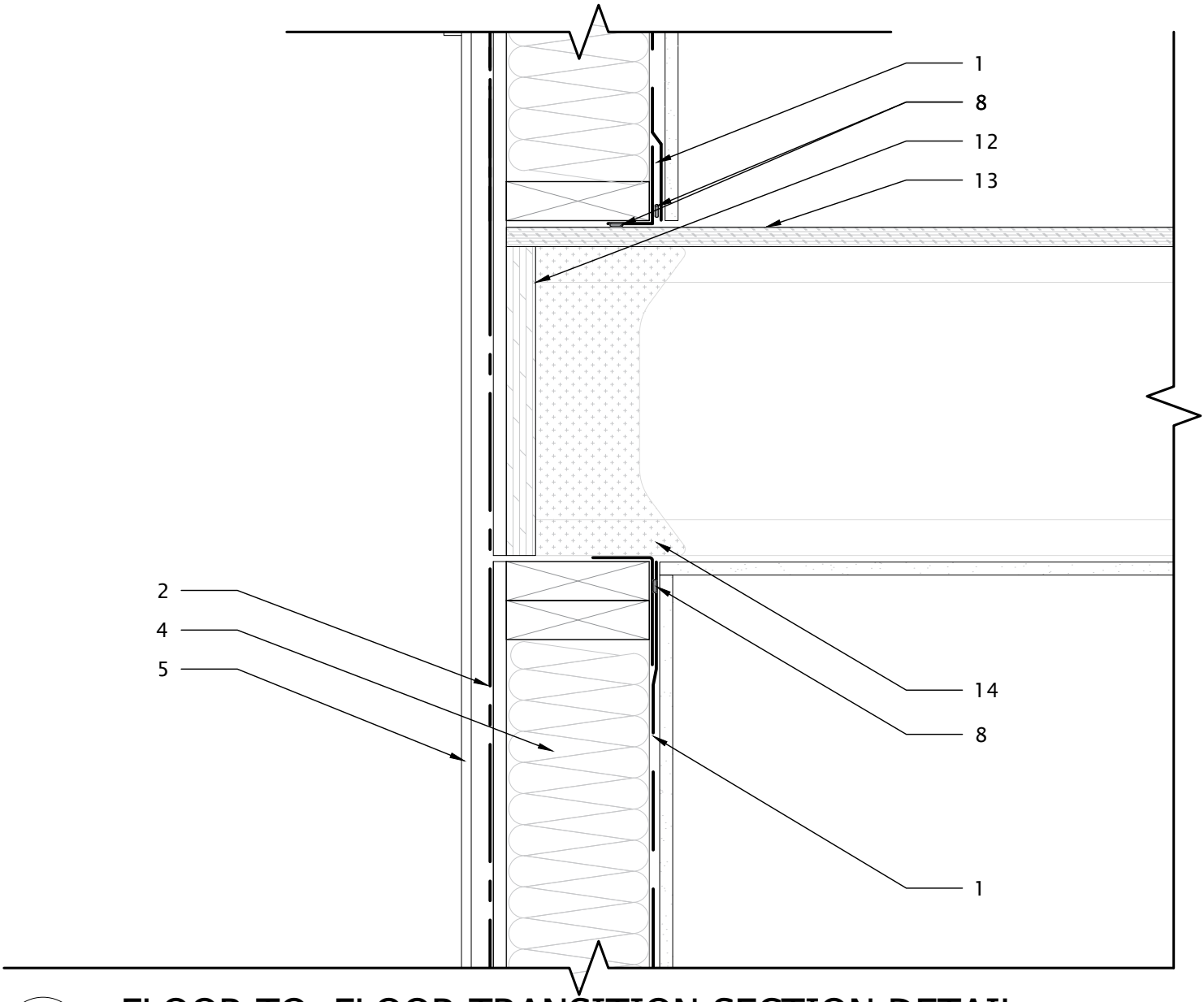

1 FLOOR TO FLOOR TRANSITION SECTION DETAIL

2" = 1'-0"

1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 RIM BOARD
13 SUBFLOOR
14 SPRAY FOAM INSULATION

SAIT
1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
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Project Address	N/A						
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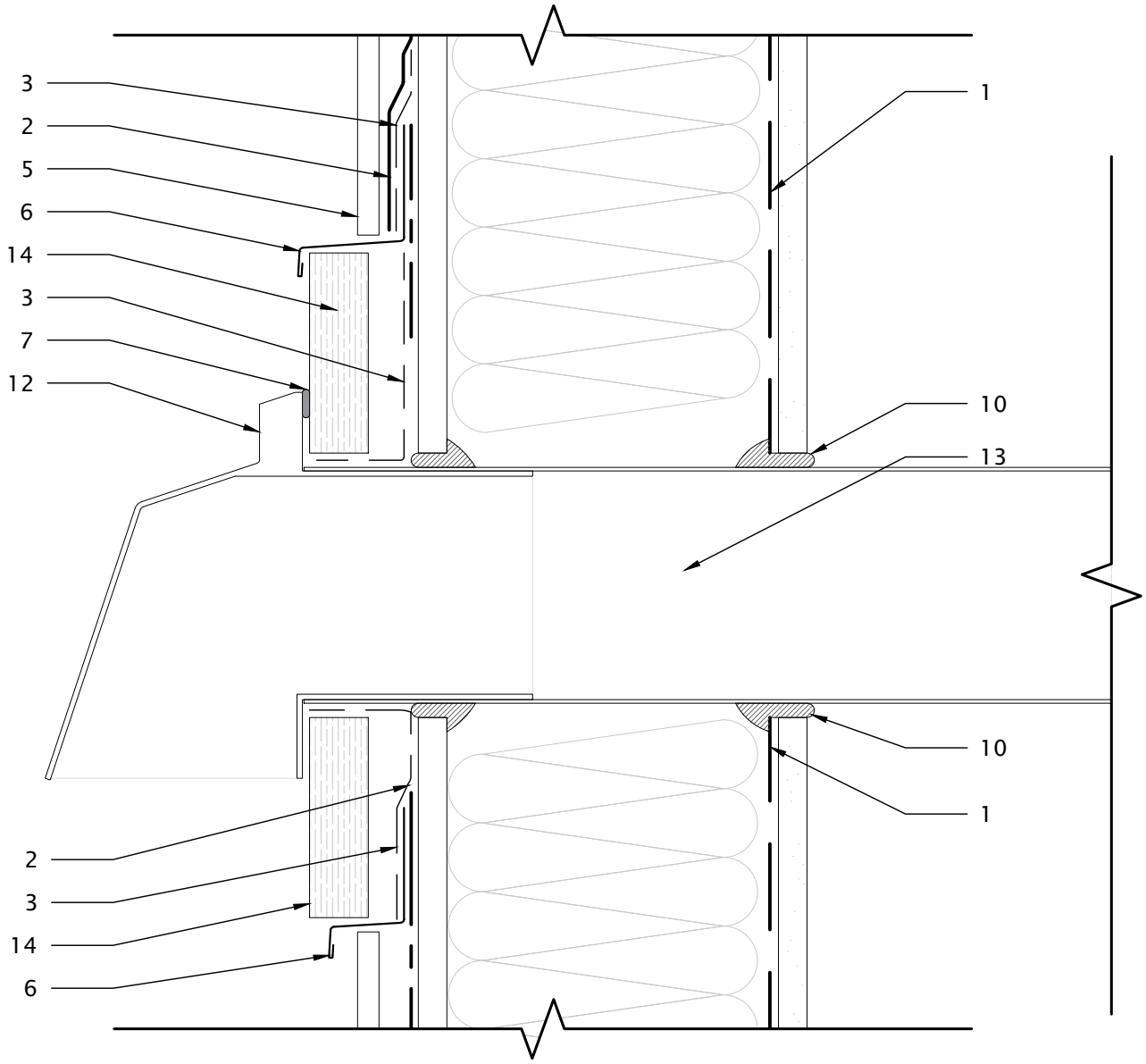


1 DUCT OPENING SECTION DETAIL

4" = 1'-0"

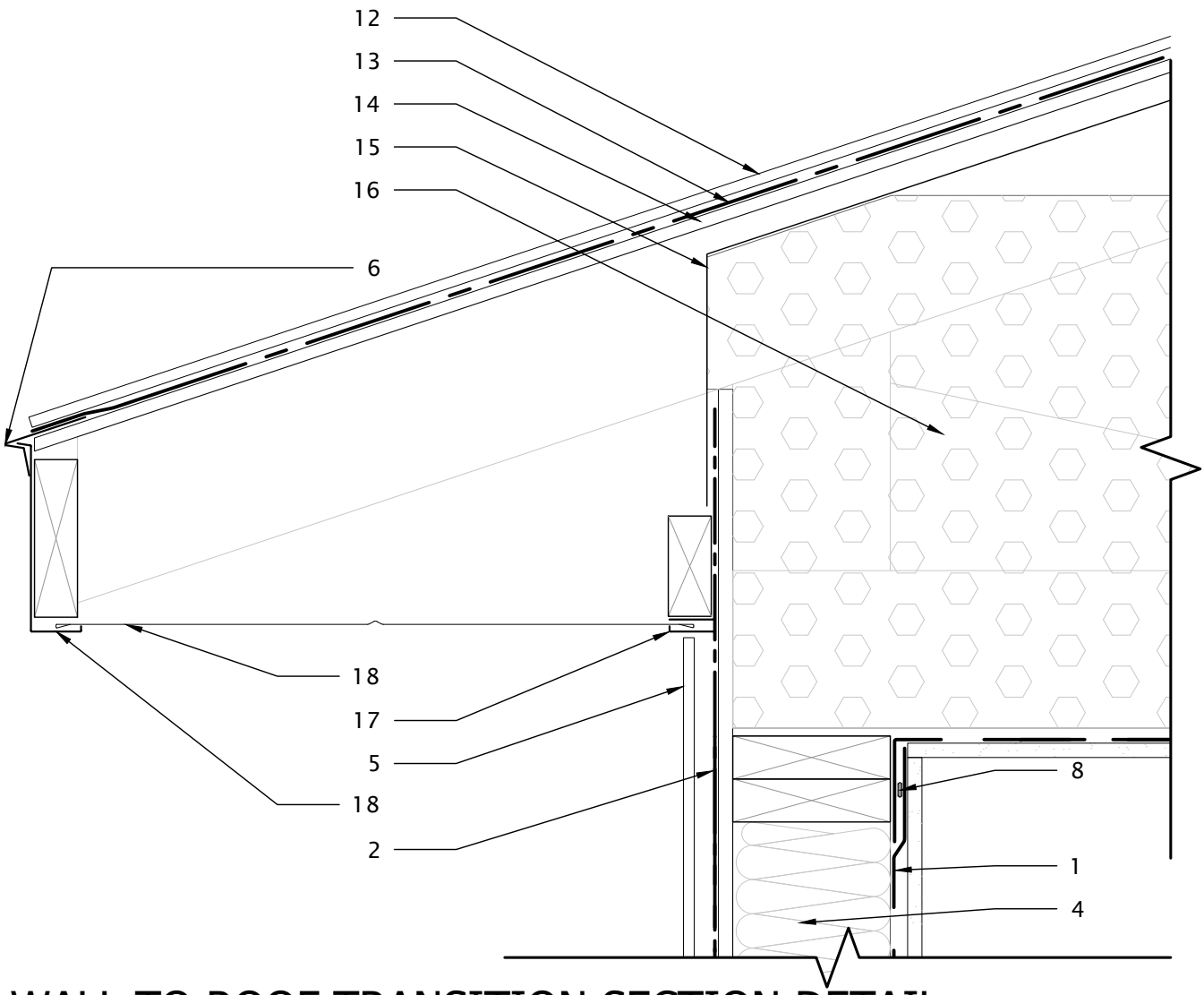
1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 DUCT HOOD
13 DUCT
14 BATTEN

SAIT
1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
Drawn by	PY	Checked by	BH, NM	Date	2025-04-30	Scale	4" = 1'- 0"
Project Address	N/A						
Issued For	ALBERTA ECOTRUST FOUNDATION						

1.08



1 WALL TO ROOF TRANSITION SECTION DETAIL

2" = 1'-0"

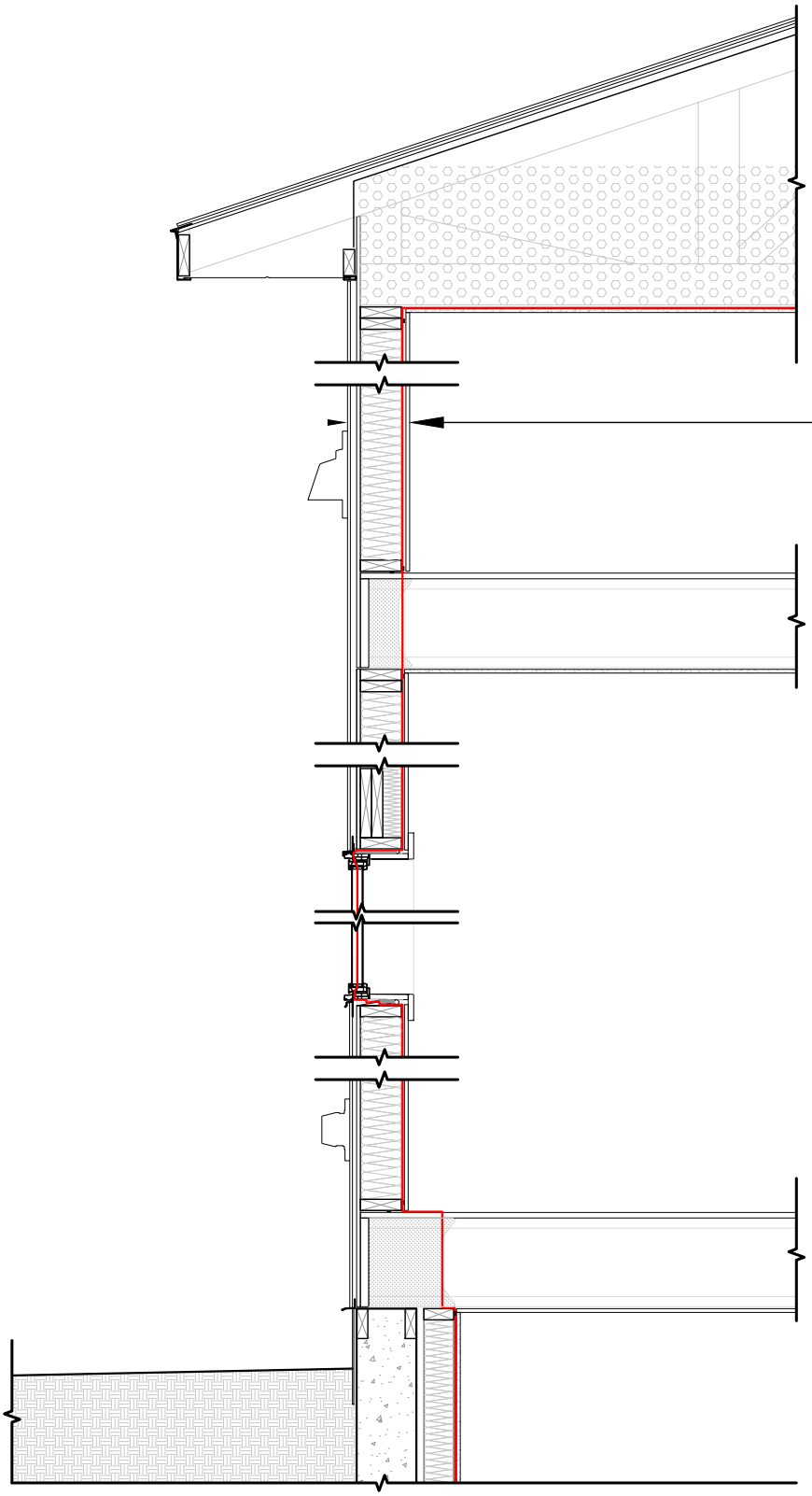
1 AIRTIGHT VAPOUR BARRIER
2 WATER RESISTANT BARRIER
3 SELF ADHERED MEMBRANE
4 FIBREGLASS BATT INSULATION
5 CLADDING
6 FLASHING
7 SEALANT
8 NON-HARDENING SEALANT
9 COMPRESSED FOAM ROD
10 EXPANDING POLYURETHANE SPRAY FOAM
11 RAINSCREEN STRAPPING
12 ROOFING SHINGLE
13 ROOFING UNDERLAYMENT MEMBRANE
14 ROOFING SHEATHING
15 INSULATION STOP
16 BLOWN INSULATION
17 J-CHANNEL
18 SOFFIT
19 FASCIA

SAIT
1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
Drawn by	PY	Checked by	BH, NM	Date	2025-04-30	Scale	2" = 1'- 0"
Project Address	N/A						
Issued For	ALBERTA ECOTRUST FOUNDATION						

1.09



TIER 1 2x6 ASSEMBLY

EFFECTIVE RSI = 2.99; R-VALUE = 16.98

- EXTERIOR CLADDING
- WATER RESISTANT BARRIER, SHEET APPLIED MEMBRANE, VAPOUR OPEN
- ⅜" EXTERIOR SHEATHING
- 2X6 STUD WALL WITH FIBERGLASS BATT CAVITY INSULATION
- AIRTIGHT 6 MIL VAPOUR BARRIER
- ½" GYPSUM BOARD
- INTERIOR FINISH

AIR BARRIER

1 AIR BARRIER CONTINUITY

1/2" = 1'-0"

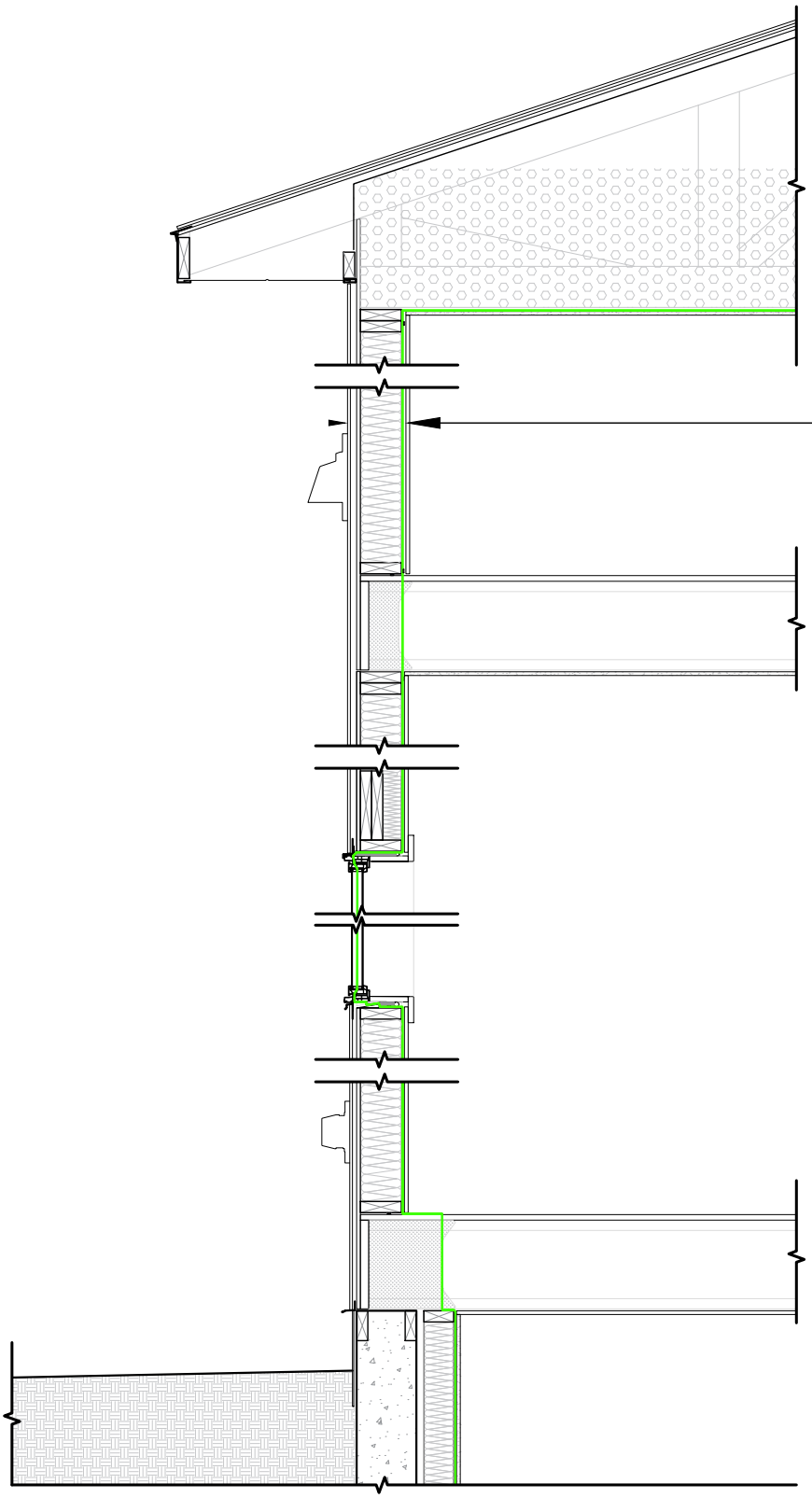
SAIT

1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
Drawn by	PY	Checked by	BH, NM	Date	2025-04-30	Scale	1/2" = 1'- 0"
Project Address	N/A						
Issued For	ALBERTA ECOTRUST FOUNDATION						

1.10



TIER 1 2x6 ASSEMBLY

EFFECTIVE RSI = 2.99; R-VALUE = 16.98

- EXTERIOR CLADDING
- WATER RESISTANT BARRIER, SHEET APPLIED MEMBRANE, VAPOUR OPEN
- ⅜" EXTERIOR SHEATHING
- 2X6 STUD WALL WITH FIBERGLASS BATT CAVITY INSULATION
- AIRTIGHT 6 MIL VAPOUR BARRIER
- ½" GYPSUM BOARD
- INTERIOR FINISH

VAPOUR BARRIER

1 VAPOUR BARRIER CONTINUITY

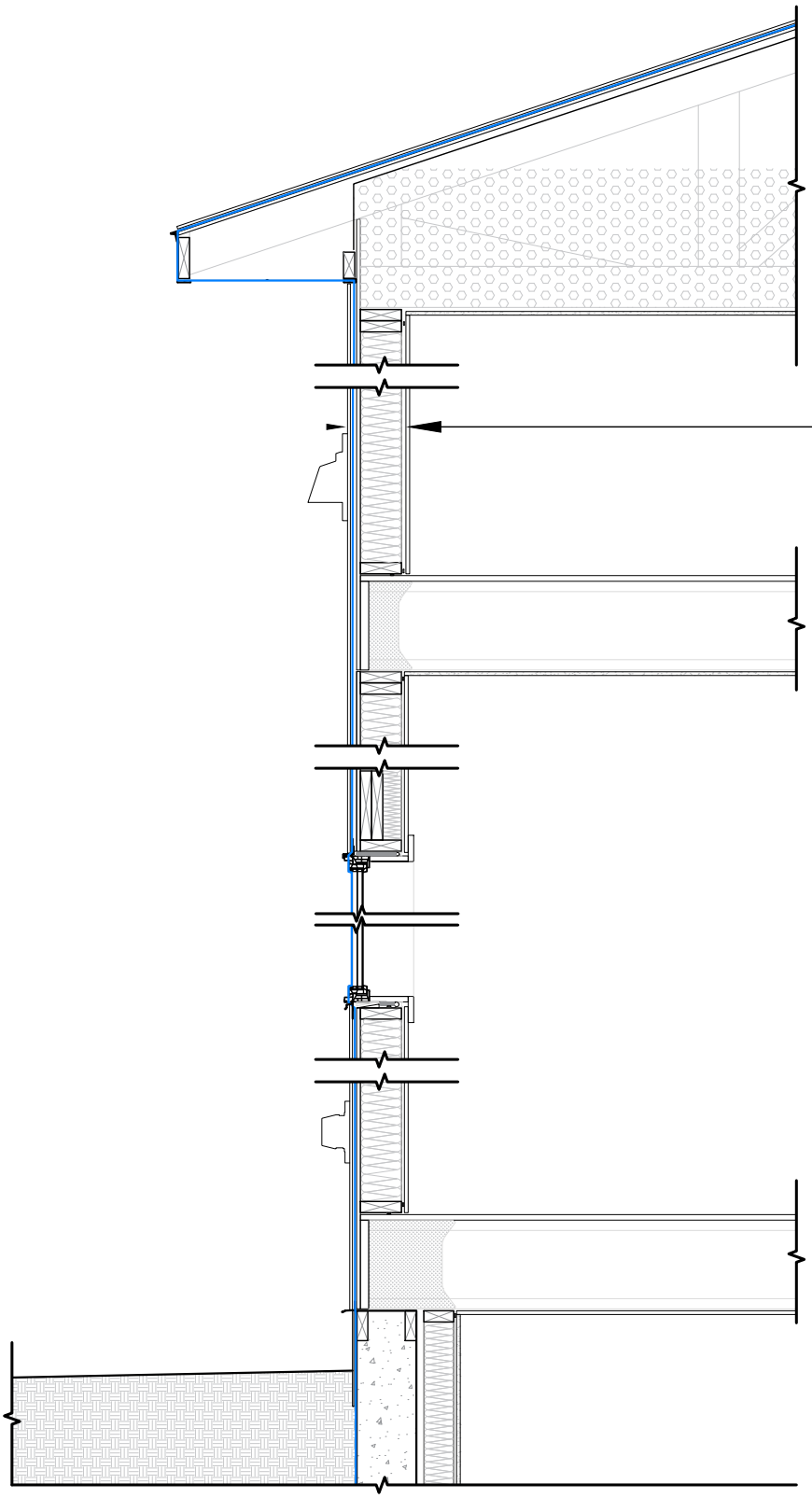
1/2" = 1'-0"

SAIT
1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
Drawn by	PY	Checked by	BH, NM	Date	2025-04-30	Scale	1/2" = 1'- 0"
Project Address	N/A						
Issued For	ALBERTA ECOTRUST FOUNDATION						

1.11



TIER 1 2x6 ASSEMBLY

EFFECTIVE RSI = 2.99; R-VALUE = 16.98

- EXTERIOR CLADDING
- WATER RESISTANT BARRIER, SHEET APPLIED MEMBRANE, VAPOUR OPEN
- ⅜" EXTERIOR SHEATHING
- 2X6 STUD WALL WITH FIBERGLASS BATT CAVITY INSULATION
- AIRTIGHT 6 MIL VAPOUR BARRIER
- ½" GYPSUM BOARD
- INTERIOR FINISH

LEGEND

WATER BARRIER

1 WATER BARRIER CONTINUITY

1/2" = 1'-0"

SAIT

1301-16 AVENUE NW CALGARY AB, T2M 0L4

Drawing Title: TIER 1 2x6

Project Number	2024-009	Project Name	HIGH PERFORMANCE WALL ASSEMBLY				
Drawn by	PY	Checked by	BH, NM	Date	2025-04-30	Scale	1/2" = 1'- 0"
Project Address	N/A						
Issued For	ALBERTA ECOTRUST FOUNDATION						

1.12

Appendix B:

Wall Assembly Effective Thermal Resistance Calculations

Project Name: **High-Performance Wall Assembly Project**

Project Address:

Assembly Name: **Tier 1 2x6 Wall Assembly**

Materials in Assembly					RSI, $(m^2*K)/W$	R-Value
Outside Air Film					0.03	0.17
Building Paper					0.00	0.00
OSB Sheathing (9.5mm)					0.0930	0.53
Stud @ 610 (140mm x 0.0085 RSI/mm)	RSI_F =	1.19	% area of framing =	20	$RSI_{Parallel}$=	
Batt Insulation (R22)	RSI_C =	3.87	% area of cavity =	80	2.67	15.15
(Vapour Barrier					0.00	0.00
Gypsum (12.7mm)		0.8			0.08	0.45
Interior Air Film		57.6			0.12	0.68
			Calculated RSI_{EFF}=		**2.99**	**16.98**
			9.36 Prescriptive RSI Required =		3.08	17.49
			W/HRV		2.97	16.86

Parallel Path Flow Calculations

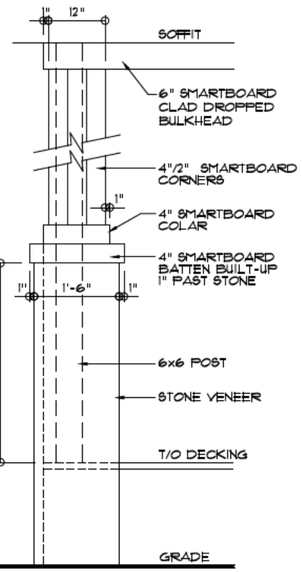
140mm stud with Batt Insulation (R22)

$$RSI_{Parallel} = \frac{100}{\frac{20}{1.19} + \frac{80}{3.87}} = 2.67 \text{ (m2*K)/W}$$

Appendix C:

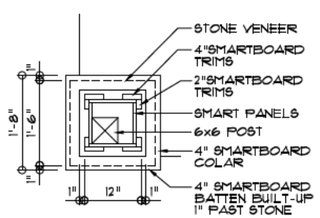
Cost Analysis Model Home

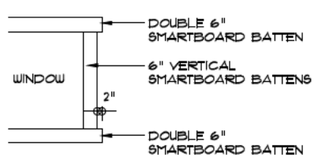
[redacted]



COLUMN DETAIL

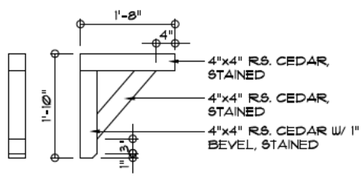
SCALE: 3/8" = 1'-Ø"





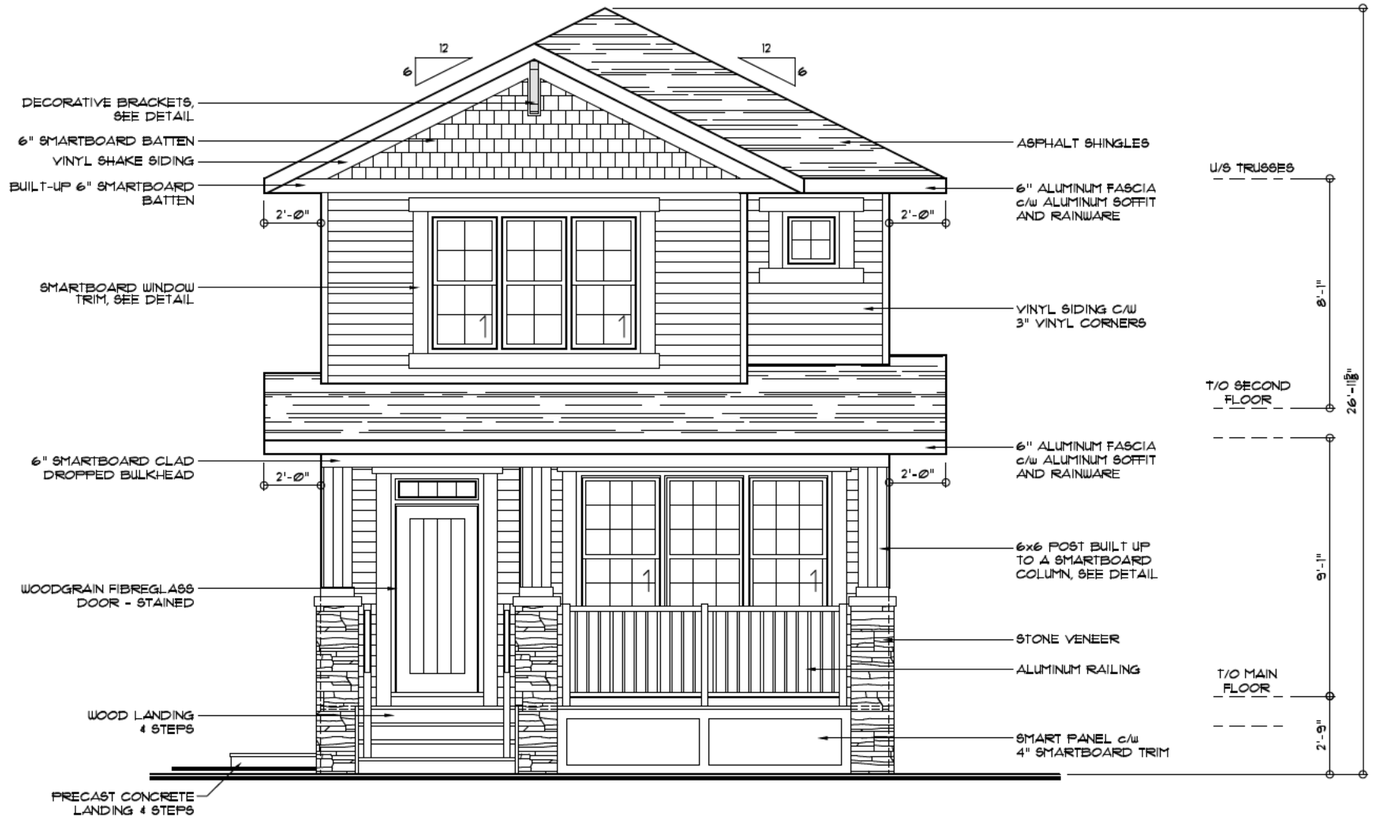
WINDOW TRIM DETAIL

SCALE: 3/16" = 1'-Ø"



BRACKET DETAIL

SCALE: 3/8" = 1'-Ø"



FRONT ELEVATION

SCALE: 3/16" = 1'-Ø"

[redacted]

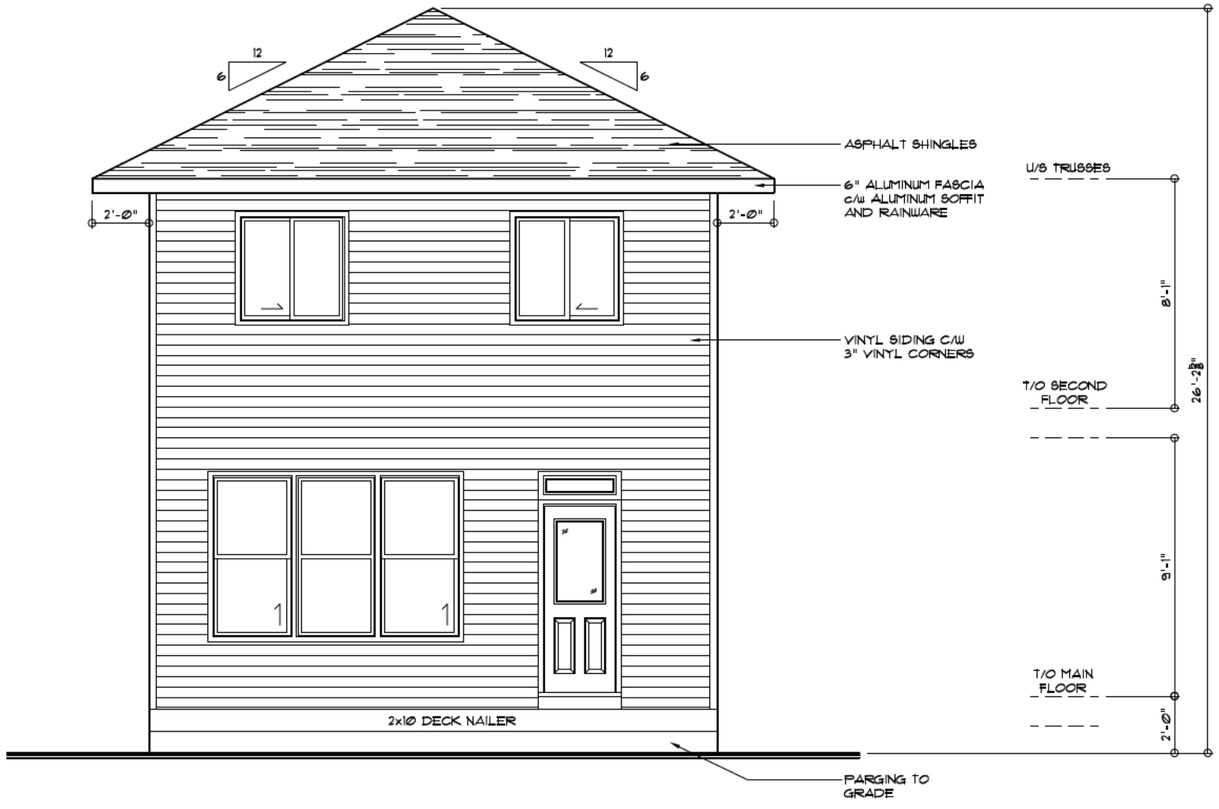
ADDRESS: [redacted]

TOTAL AREA:	1440	sq.ft.
MAIN FLOOR:	700	sq.ft.
UPPER FLOOR:	740	sq.ft.
GARAGE:	N/A	sq.ft.
BSMNT DEV:	N/A	sq.ft.
DECK:	N/A	sq.ft.

REVISIONS:

MODEL: 2 STOREY

ELEVATION: CRAFTSMAN



[redacted]

ADDRESS: [redacted]

TOTAL AREA:	1440	sq.ft.
MAIN FLOOR:	700	sq.ft.
UPPER FLOOR:	740	sq.ft.
GARAGE:	N/A	sq.ft.
BSMNT DEV:	N/A	sq.ft.
DECK:	N/A	sq.ft.

REVISIONS:

MODEL: 2 STOREY

ELEVATION: CRAFTSMAN

UNPROTECTED OPENINGS

LIMITING DISTANCE:	3.08 m
ALLOWABLE OPENINGS:	9.00 %
EXPOSED BUILDING FACE:	743.33 sq.ft.
UNPROTECTED OPENINGS:	46.84 sq.ft.
ACTUAL OPENINGS:	6.30%

[redacted]

ADDRESS: [redacted]

TOTAL AREA:	1440	sq.ft.
MAIN FLOOR:	700	sq.ft.
UPPER FLOOR:	740	sq.ft.
GARAGE:	N/A	sq.ft.
BSMNT DEV:	N/A	sq.ft.
DECK:	N/A	sq.ft.

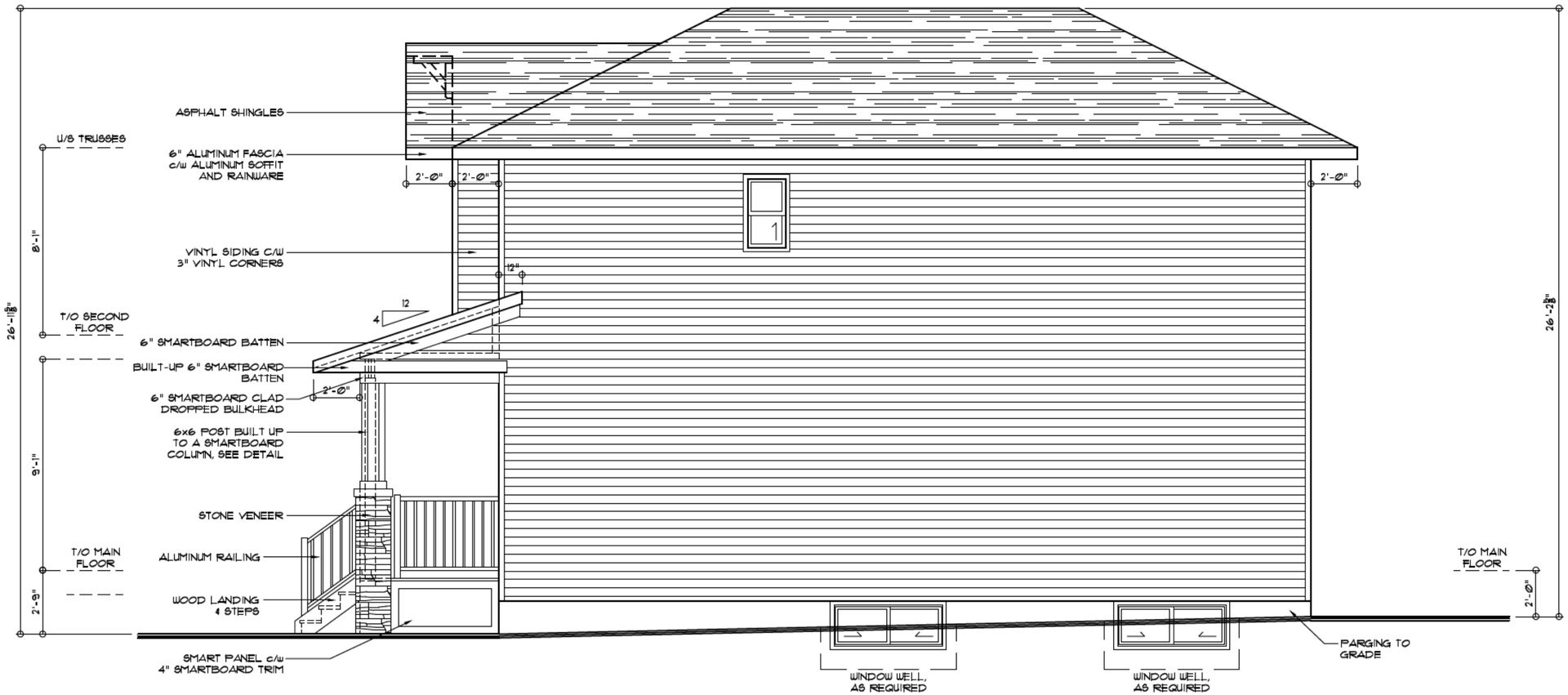
REVISIONS:

MODEL: 2 STOREY

ELEVATION: CRAFTSMAN

UNPROTECTED OPENINGS

LIMITING DISTANCE:	1.22 m
ALLOWABLE OPENINGS:	7.00 %
EXPOSED BUILDING FACE:	739.05 sq.ft.
UNPROTECTED OPENINGS:	27.50 sq.ft.
ACTUAL OPENINGS:	3.72%



RIGHT ELEVATION

SCALE: 3/16" = 1'-0"

[redacted]

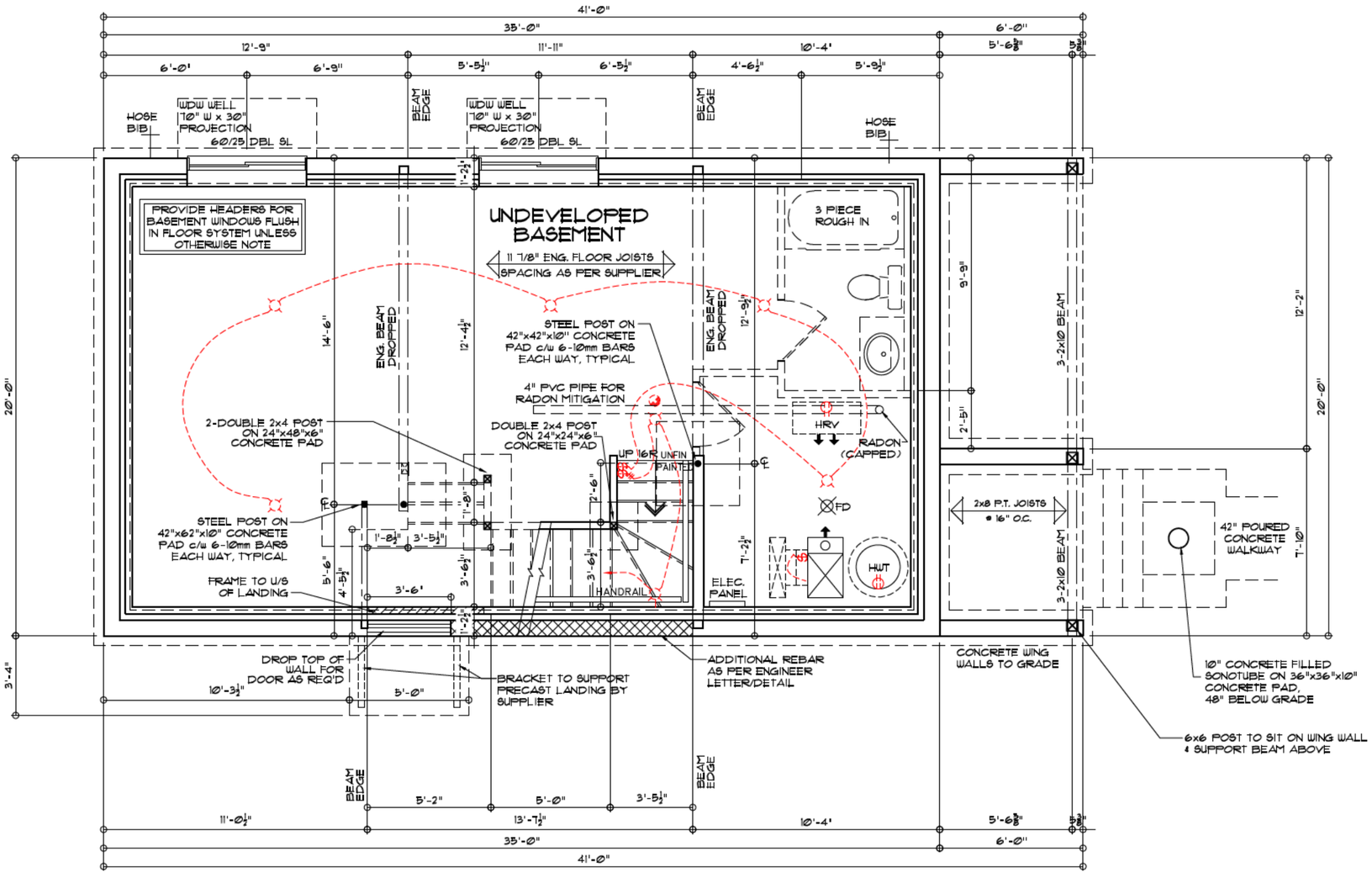
ADDRESS: [redacted]

TOTAL AREA:	1440	sq.ft.
MAIN FLOOR:	700	sq.ft.
UPPER FLOOR:	740	sq.ft.
GARAGE:	N/A	sq.ft.
BSMNT DEV:	N/A	sq.ft.
DECK:	N/A	sq.ft.

REVISIONS:

MODEL: 2 STOREY

ELEVATION: CRAFTSMAN



FOUNDATION PLAN

SCALE: 3/16" = 1'-0"

STANDARD WALL SCONCE HEIGHT AT LANDING OR RISERS: 6'-8"

[redacted]

ADDRESS: [redacted]

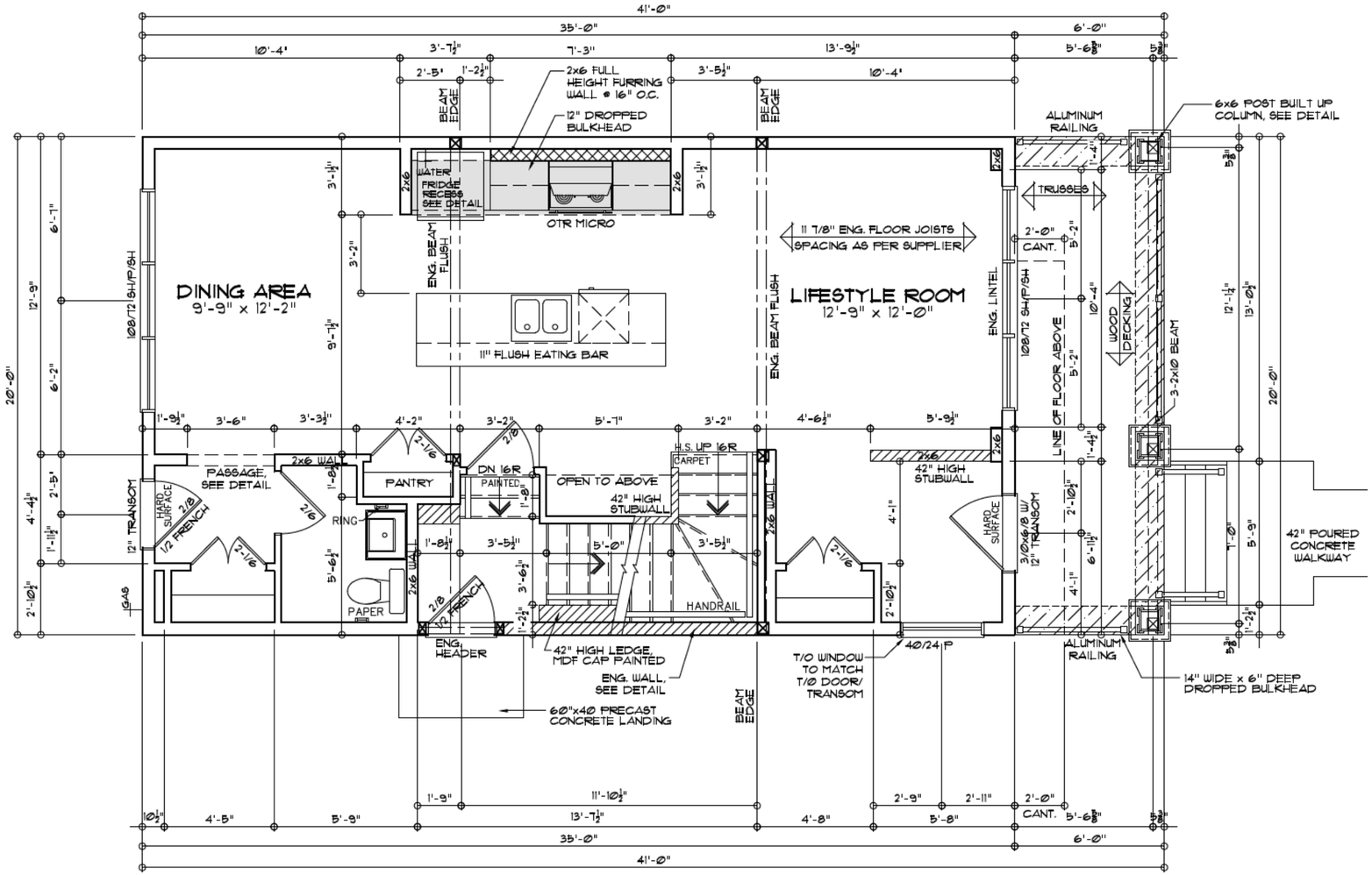
TOTAL AREA:	1440	sq.ft.
MAIN FLOOR:	700	sq.ft.
UPPER FLOOR:	740	sq.ft.
GARAGE:	N/A	sq.ft.
BSMNT DEV:	N/A	sq.ft.
DECK:	N/A	sq.ft.

REVISIONS:

MODEL: 2 STOREY

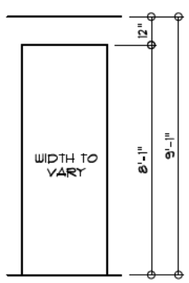
ELEVATION: CRAFTSMAN

NOTE:
MAIN FLOOR WINDOWS
TO BE 7'-11" HIGH UNLESS
OTHERWISE NOTED



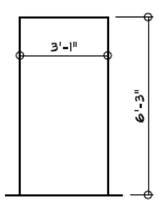
MAIN FLOOR PLAN

SCALE: 3/16" = 1'-0"



PASSAGE DETAIL MAIN

SCALE: 3/16" = 1'-0"



NOTE:
DIMENSIONS ARE
TO FINISHED MATERIAL

FRIDGE RECESS DETAIL

SCALE: 3/16" = 1'-0"

[redacted]

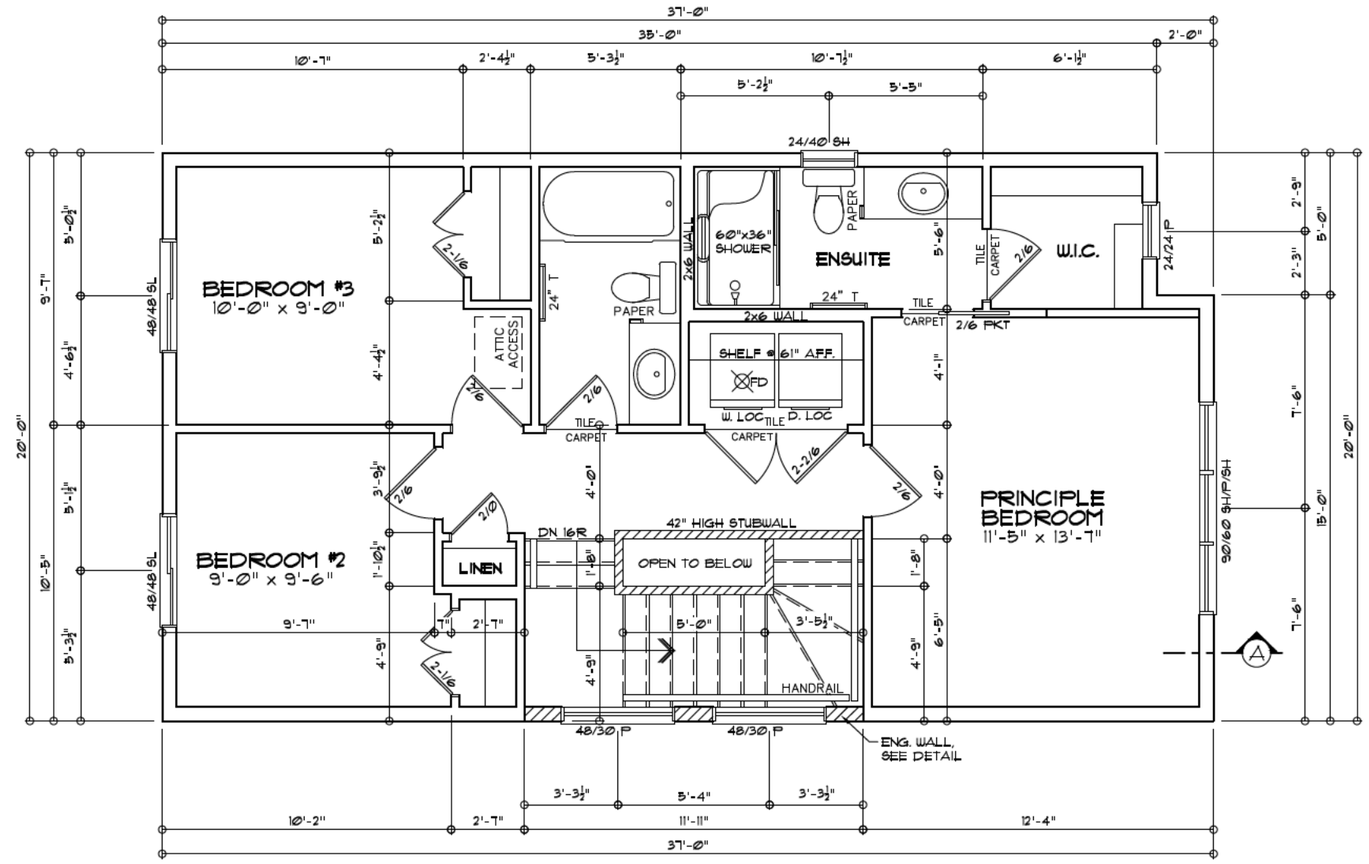
ADDRESS: [redacted]

TOTAL AREA:	1440	sq.ft.
MAIN FLOOR:	700	sq.ft.
UPPER FLOOR:	740	sq.ft.
GARAGE:	N/A	sq.ft.
BSMNT DEV:	N/A	sq.ft.
DECK:	N/A	sq.ft.

REVISIONS:

MODEL: 2 STOREY
ELEVATION:
CRAFTSMAN

NOTE:
UPPER FLOOR WINDOWS
TO BE 6'-11" HIGH



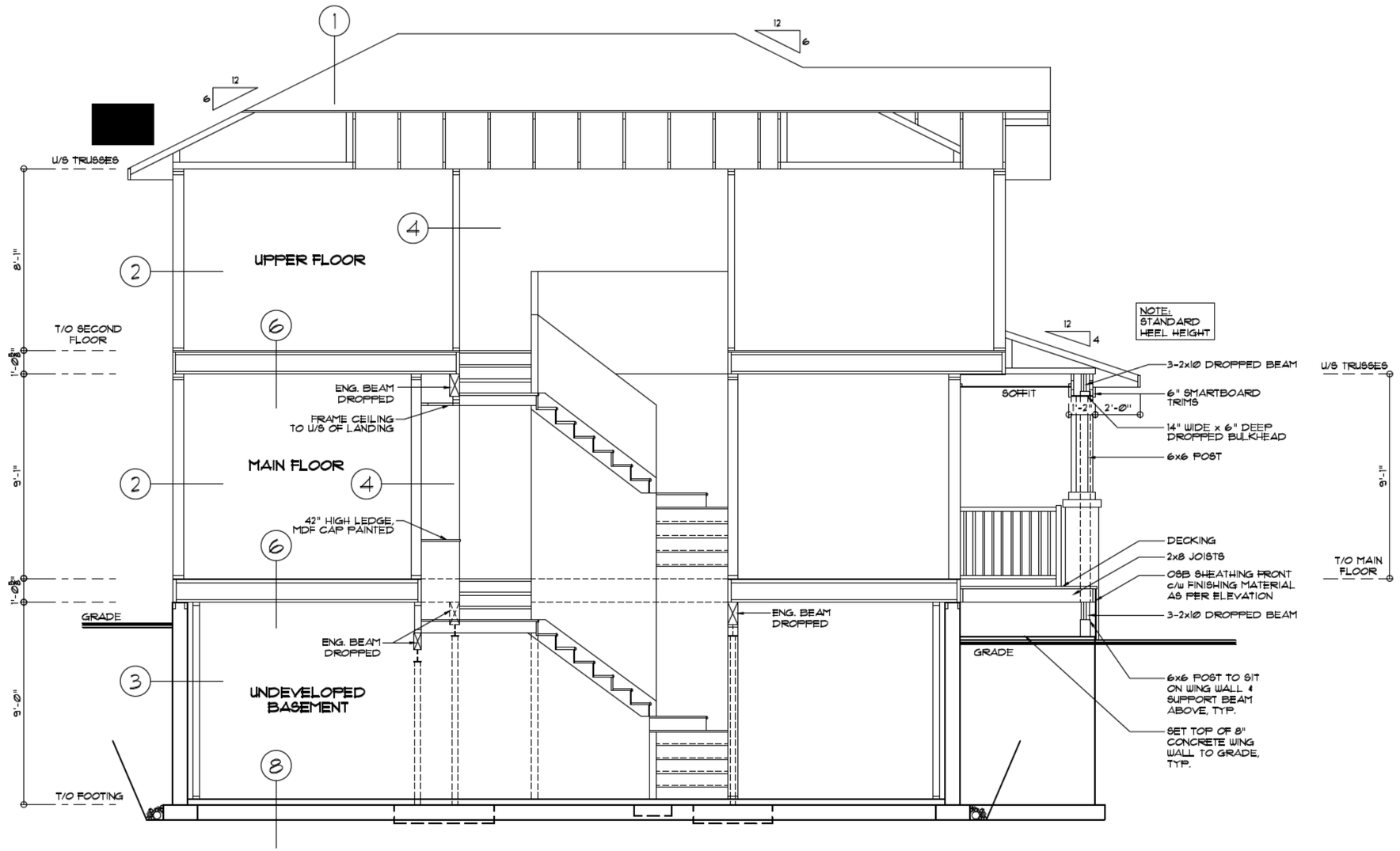
UPPER FLOOR PLAN

SCALE: 3/16" = 1'-0"

[redacted]	ADDRESS: [redacted]		
	TOTAL AREA: 1440 sq.ft. MAIN FLOOR: 700 sq.ft. UPPER FLOOR: 740 sq.ft. GARAGE: N/A sq.ft. BSMNT DEV: N/A sq.ft. DECK: N/A sq.ft.	REVISIONS:	MODEL: 2 STOREY ELEVATION: CRAFTSMAN PAGE 7 OF 10

NOTE:
MAIN FLOOR WINDOWS TO BE 7'-11" HIGH UNLESS OTHERWISE NOTED

UPPER FLOOR WINDOWS TO BE 6'-11" HIGH UNLESS OTHERWISE NOTED



CROSS SECTION A

SCALE: 3/16" = 1'-0"

GENERAL NOTES

-ALL CONSTRUCTION TO CONFORM TO CURRENT A.B.C., FIRE CODES AND 9.36 PERFORMANCE ENERGY MODEL DETAILS
-SPECIFICATIONS, CHANGE REQUESTS SHALL OVERRIDE PLANS
-FINAL GRADING AND SITE CONDITIONS MAY VARY EXTERIOR APPEARANCE
-SECTION NOTES ARE GENERAL AND MAY VARY OR NOT APPLY TO ALL PLANS
-ALUMINUM FASCIA AND EAVESTROUGH AS NOTED
-ALUMINUM VENTED SOFFIT ON FRONT AND REAR ELEVATIONS ONLY.
-NON-VENTED ALUMINUM SOFFIT ON SIDE ELEVATIONS
-TRUSS MANUFACTURER TO VERIFY ALL ROOF SLOPES AND TRUSS DESIGN PRIOR TO FABRICATION

LINTEL NOTES:
-ALL EXTERIOR LINTELS TO BE 2-2x10 SPF UNLESS NOTED
-ALL LINTELS OVER 6'-0" MUST HAVE A DOUBLE CRIPPLE
-INSULATE & DRYWALL WALLS WITHIN 4'0" OF FURNACE & HWT
-INSULATE & DRYWALL WALLS ADJACENT TO STAIRS AND LANDING
-INSULATE AND DRYWALL WALLS AT BASEMENT LAUNDRY WHEN APPLICABLE
-ANY DISCREPANCIES TO BE REPORTED TO THE DESIGNER PRIOR TO CONSTRUCTION

[redacted]

ADDRESS: [redacted]

TOTAL AREA:	1440 sq.ft.
MAIN FLOOR:	700 sq.ft.
UPPER FLOOR:	740 sq.ft.
GARAGE:	N/A sq.ft.
BSMNT DEV:	N/A sq.ft.
DECK:	N/A sq.ft.

REVISIONS:

MODEL: 2 STOREY
ELEVATION: CRAFTSMAN

Appendix D:

Wall Assembly Affordability and Constructability Analysis

Cost per sq/ft of Wall Affordability Analysis

Assembly	Cost/sqft of Wall	Notes
Tier 1 2x6	**Baseline Cost**	Assembly built with materials commonly used in current residential construction. These include; • Tyvek WRB. • 6 mil poly vapour barrier.
Exterior Mineral Wool Tier 3	**153%** higher than baseline	Incorporates high-performance building materials at an additional cost. These include; • Siga Majvest WRB (Roughly twice as much per sq/ft coverage of Tyvek). • Siga Majrex vapour barrier (roughly 9x as much per sq/ft coverage of 6 mil poly). • Siga WRB and VB tapes for air sealing. Other Additional Costs: • Exterior mineral wool insulation. • Rainscreen material.
Double Stud Net Zero	**64%** higher than baseline	Incorporates a combination of more commonly used construction materials and high-performance building materials at an additional cost. These include; • Typar WRB (similar in price to Tyvek). • Siga Majrex vapour barrier (roughly 9x as much per sq/ft coverage of 6 mil poly). • Siga VB tapes for air sealing. Other Additional Costs: • Framing of 2 walls. • Additional insulation to fill wall cavity.
Exterior Foam Net Zero	**465%** higher than baseline	Incorpotates high-performance building materials at an additional cost. These include; • Soprema Sopraseal Stick WRB (Roughly 11x as much per sq/ft coverage of Tyvek). •Soprema sill flashing. Other Additional Costs: • Exterior XPS insulation. • Rainscreen material. • Fasteners for screwing through a large amount of insulation.
Fire Resistant Retrofit	**206%** higher than baseline	Incorporates high-performance building materials at an additional cost. These include; • ProClima Mento WRB (Roughly 3x as much per sq/ft coverage of Tyvek. • ProClima tapes for air sealing. Other Additional Costs: • Exterior mineral wool insulation. • Rainscreen material. • Thermal Clips.
Larsen Truss Retrofit	**165%** higher than baseline	Incorporates common building materials similar to the baseline home; • Typar WRB (similar cost as Tyvek). Additional Costs: • Framing material for the Larsen Truss. • Rainscreen material. • WRB tape for air sealing. • Insulation for Larsen Truss cavity. • Soprema liquid applied membrane for window bucks and air sealing.

• No monetary value has been noted as there are many variables that could impact the comparability of these costs.
• This chart is a direct comparison of the cost of the material to construct ***ONLY*** *the wall assembly of the model home.*
• This chart only compares the materials selected for each physical mock-up. It cannot be considered a 1 to 1 comparison as different materials selected have different costs, possibly resulting in inflated prices for certain assemblies.

Constructability Analysis

Assembly	Material Availability	Difficulties/Issues	Constructability Rating (1-5)
Tier 1 2x6	• All material used was available at common hardware/construction material supply stores. • Material was all readily available as this is a commonly built assembly across Alberta.	• Accoustical sealant can be messy and inconsistent.	**1** **Baseline** •Easiest to construct.
Exterior Mineral Wool Tier 3	• Framing and cavity insulation materials were readily available at common hardware/material supply stores. • SIGA WRB, VB and tapes was not readily available and needed to be ordered in. This required a small lead time. • Exterior mineral wool insulation was not readily available and needed to be ordered. This required a significant lead time. • Rainscreen framing material and fasteners were readily available at common stores. • Custom made flashing was required. GBTAC made these on site with the use of a Break. If GBTAC did not have this tool, this material would need to be custom ordered.	• WRB was the air control layer, so ensuring continuous membrane behind flashings and penetrations increased the difficulty of installing the WRB. • Ensuring the screws that hold on the rainscreen strapping properly embed in a structural member of the wall. • Ensuring proper flashing installation and detailing around the window. • Custom exterior window trim detail was required. • Order of operations for the framer. WRB membrane was required to transfer into the interior at the roof so as to transfer the air control layer to the underside of the roof ceiling.	**2.5** • Relatively simple to construct. • Exterior insulation is the major change from the baseline that makes it more difficult
Double Stud Net Zero	• All materials used in this assembly were readily available at common hardware/material supply stores aside from the VB. • VB and tapes was not readily available and needed to be ordered in. This required a small lead time.	• Double walls could be heavy and difficult to move around. • Custom window jambs are required to be made to cover the large window rough opening to the interior of the window. • Order of operation for the framer. VB needs to be wrapped under the plates of the walls before the walls are installed. • Proper installation of the 3 layers of insulation in the cavity to ensure there is no settlement.	**2** • Simple Construction . • Not to dissimilar to the baseline with adding a second wall and extra insulation increasing the difficulty.
Exterior Foam Net Zero	• Framing material readily available at common hardware/material supply stores. • WRB was not readily available and needed to be ordered in. This required a small lead time. • XPS and fasteners were readily available at some material supply stores, but had the possibility to need to be ordered in with a small lead time. • Custom flashing needed to be made. This was made onsite with a break, otherwise this would have been needed to be ordered from a supplier.	• WRB was the air control layer, so ensuring continuous membrane behind flashings and penetrations increased the difficulty of installing the WRB. • Ensuring the screws that hold on the rainscreen strapping properly embed in a structural member of the wall. • Ensuring proper flashing installation and detailing around the window. • Custom exterior window trim detail was required. • Installing through flashing in the correct spot at the wall proved difficult. • Peel and stick membrane required at least 2 workers to install as it was difficult to remove the backing without adhering the membrane to itself.	**5** • Most difficult to construct. • Long screws and the amount of exterior insulation made this assembly difficult to construct.
Fire Resistant Retrofit	• ProClima WRB and tapes wer not readily available and needed to be ordered in. This required a small lead time. • Exterior mineral wool insulation was not readily available and needed to be ordered. This required a significant lead time. • Rainscreen framing material and fasteners were readily available at common stores. • Custom made flashing was required. GBTAC made these on site with the use of a Break. If GBTAC did not have this tool, this material would need to be custom ordered. • Soprema thermal clips had to be ordered in with minimal lead time.	• Attaching the rainscreen strapping to the metal thermal clips proved quite difficult at times.	**3** • Somewhat difficult to construct. • If good screws are used that screw into the metal thermal clips well, the construction would be slightly easier.
Larsen Truss Retrofit	• All framing material and the WRB material was readily available at common hardware/material supply stores. • Dense pack cellulose needed to be installed by a professional installer. Lead time for booking the installer was required. • Liquid applied membrane for window bucks was required to be ordered in with a small lead time.	• Installing the liquid applied membrane could not be done at a lower temperature.	**2.5** • Relatively simple to construct. • Amount of labour and correct installation of the Larsen Truss raises the difficulty.

• Constructability values are based on the previous experience of the GTAC Staff and conversations with industry

Appendix E:

Physical Mock-Up Photos

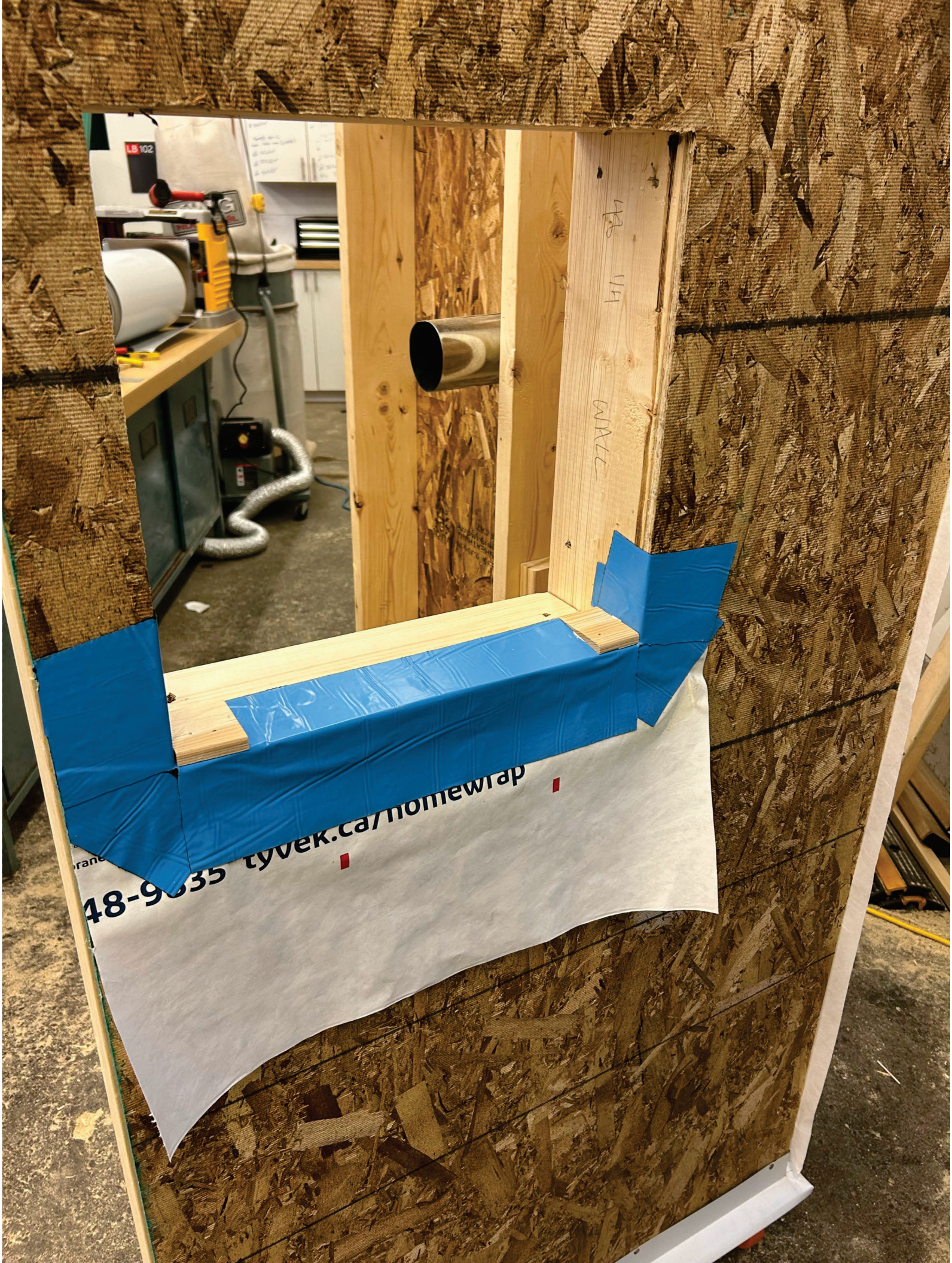
Tier 1 2x6 Assembly


48-9835 tyvek.ca/homewrap


ATTENTION
STATION


tyvek.ca/homewrap
Henry
Hi-Tac
DANGER


tyvek.ca/homewrap
Henry
Hi-Tac
DANGER


tyvek.ca/homewrap


Bluesky


k.ca/homewrap


tyvek.ca/homewrap
USA


TM
EXTRA-DUTY


tyvek.ca/no