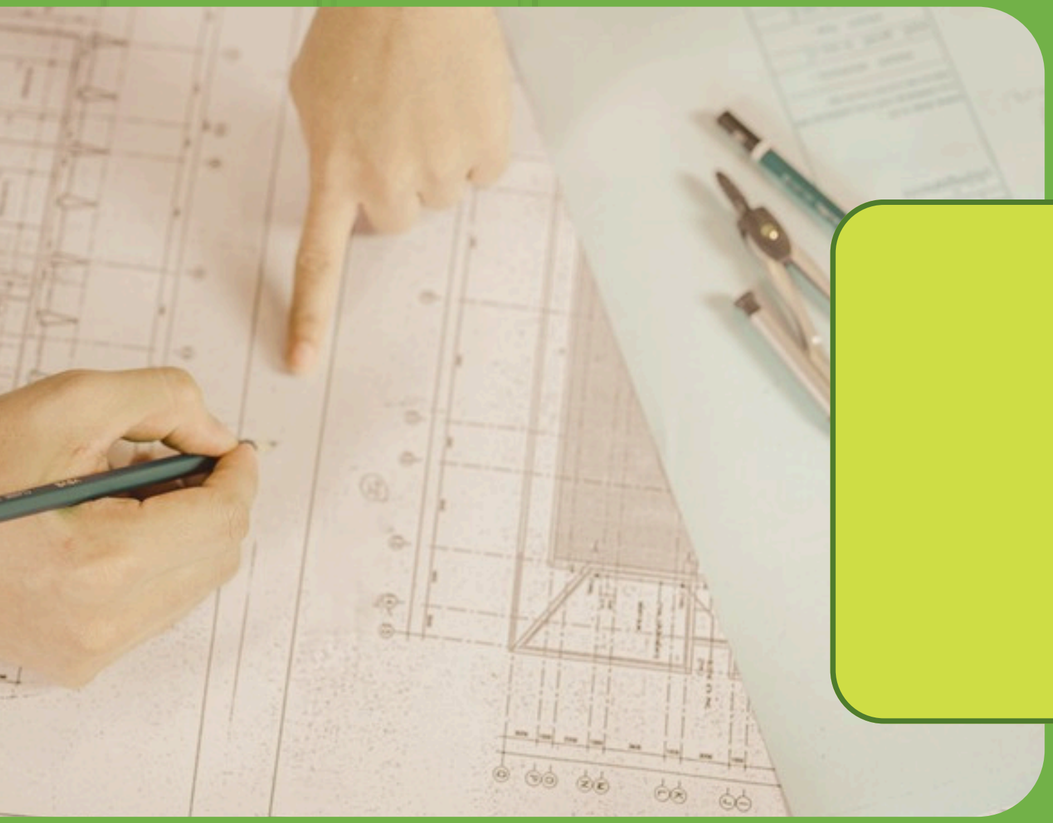
Building Envelope Design Competition



Competition Brief

Multi Unit Residential Building

2026

TABLE OF CONTENTS

INTRODUCTION

The Tier 3 Envelope Design Competition invites students and industry professionals to design an innovative building envelope assembly for a theoretical multi-unit residential building. The assembly must meet Tier 3 performance requirements while supporting strong overall building performance. As an educational platform, the competition encourages participants to think ahead and prepare for emerging industry expectations.

This challenge offers valuable hands-on experience with complex design issues, supports the development of creative solutions that might not arise in traditional design processes, and ultimately contributes to a more sustainable and energy-efficient built environment.

We invite you to design a notable building envelope that is both architecturally well-designed and fully compliant with the National Energy Code of Canada for Buildings (NECB) 2020.

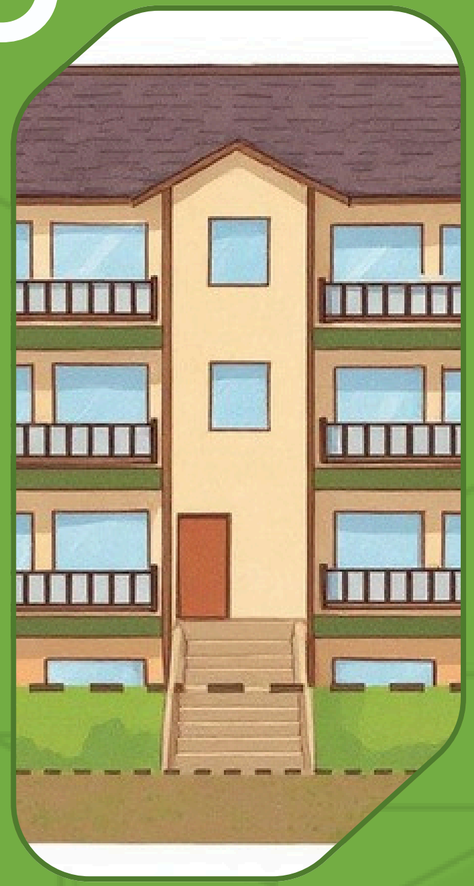
As our climate continues to change, it is essential that building envelopes are designed to withstand evolving environmental challenges.

This competition offers an opportunity to create a design that is not only energy efficient, but also durable and resilient for the future.

OBJECTIVES OF THE COMPETITION

The competition invites participants to design a prototype for the architectural envelope of a building façade that ensures overall efficient building performance while maintaining a striking aesthetic.

PROJECT BACKGROUND

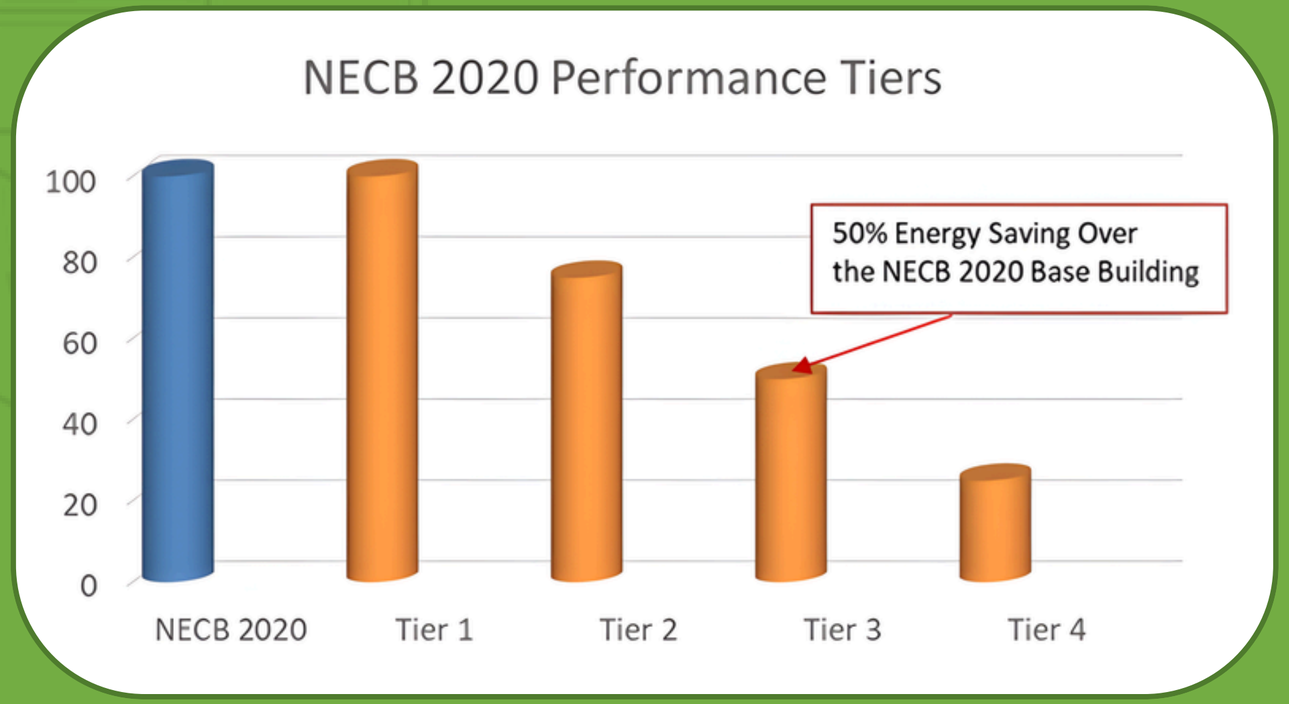


A fictional multi-unit residential building is planned for development in the City of Winnipeg to meet the growing needs of the community. The interior layout has already been finalized, but the design of the exterior building envelope has yet to be determined.

The four-storey, 16-unit building will be constructed on a vacant lot within an established residential neighbourhood in the City, adjacent to existing homes. Each two bedroom apartment will include a balcony.

NECB 2020 TIER3

The project has to meet the National Energy Building Code (NECB) 2020, Tier 3 PERFORMANCE compliance standards.



The NECB has a set of prescriptive building envelope values, however as this building is following the **performance** path, the competition has a calculated set of values that participants have to adhere to.

Tier 3 requires that a building is 50% more efficient overall than the corresponding base building.

There are two possible compliance paths that may be selected in order to demonstrate that their building design complies with the NECB.

National Energy Code of Canada for Buildings 2020 Document: NECB 2020

Prescriptive versus Performance description:

The **Prescriptive Path** involves following the prescriptive requirements of each section of the code. for each of the five building systems (envelope, HVAC, lighting, service water heating, and electrical systems).

The **Performance Path** uses the calculation methodologies provided in the NECB to trade off a limited number of mandatory requirements while still demonstrating that the overall energy efficiency of the system has not been compromised. Whole building simulation is used for this compliance path.

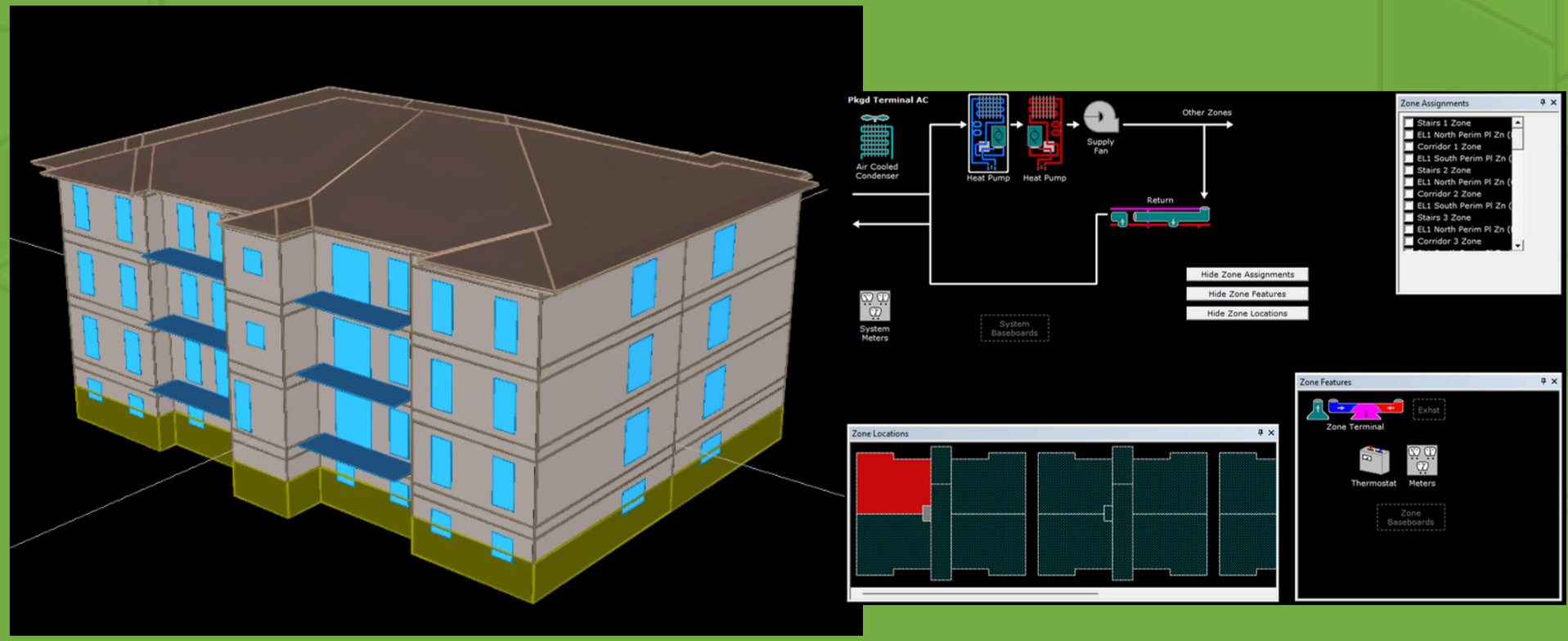
NECB 2020

Tier 3

Entrants will be required to meet Tier 3 PERFORMANCE compliance standards

PROJECT BACKGROUND

As this building is following the performance path, the competition has put together the new multi-unit residential building layout, along with HVAC and electrical design. Energy modelling has been used to calculate the minimum envelope thermal resistance (R and U) values that enable the addition to reach 50% energy savings over the NECB 2020.

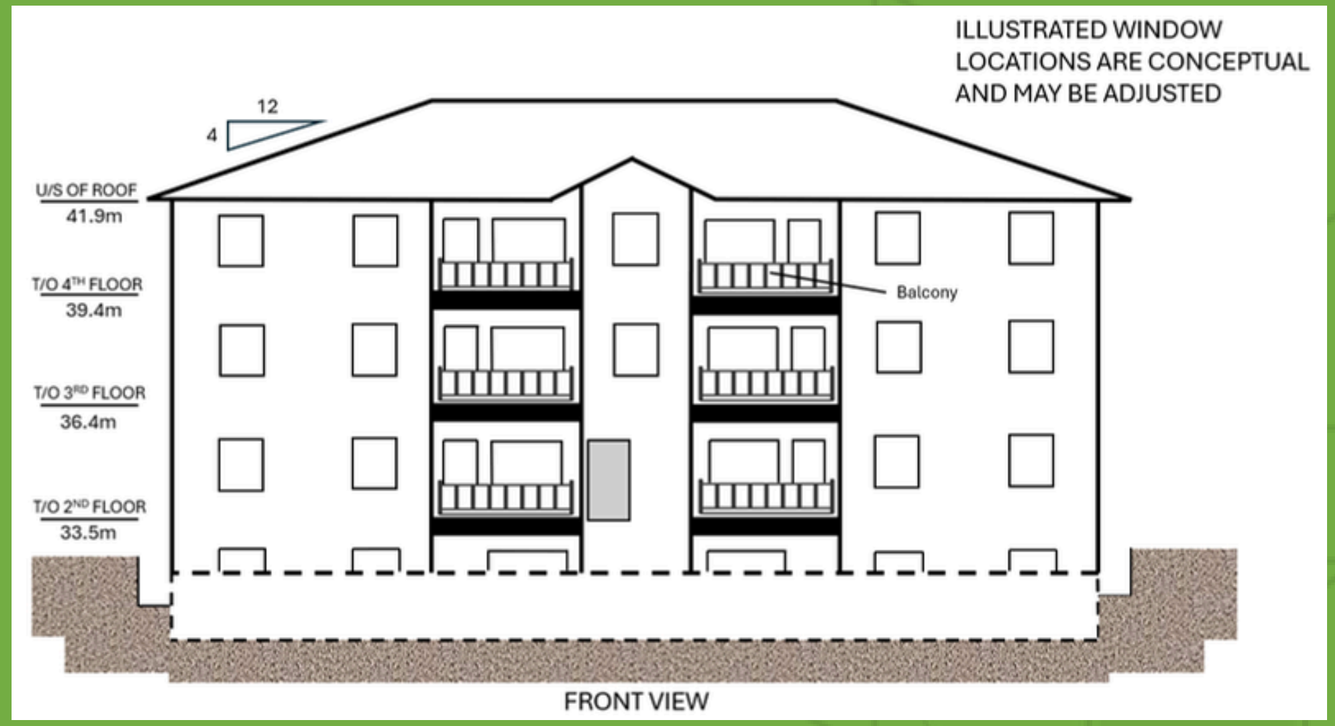


PROJECT BACKGROUND

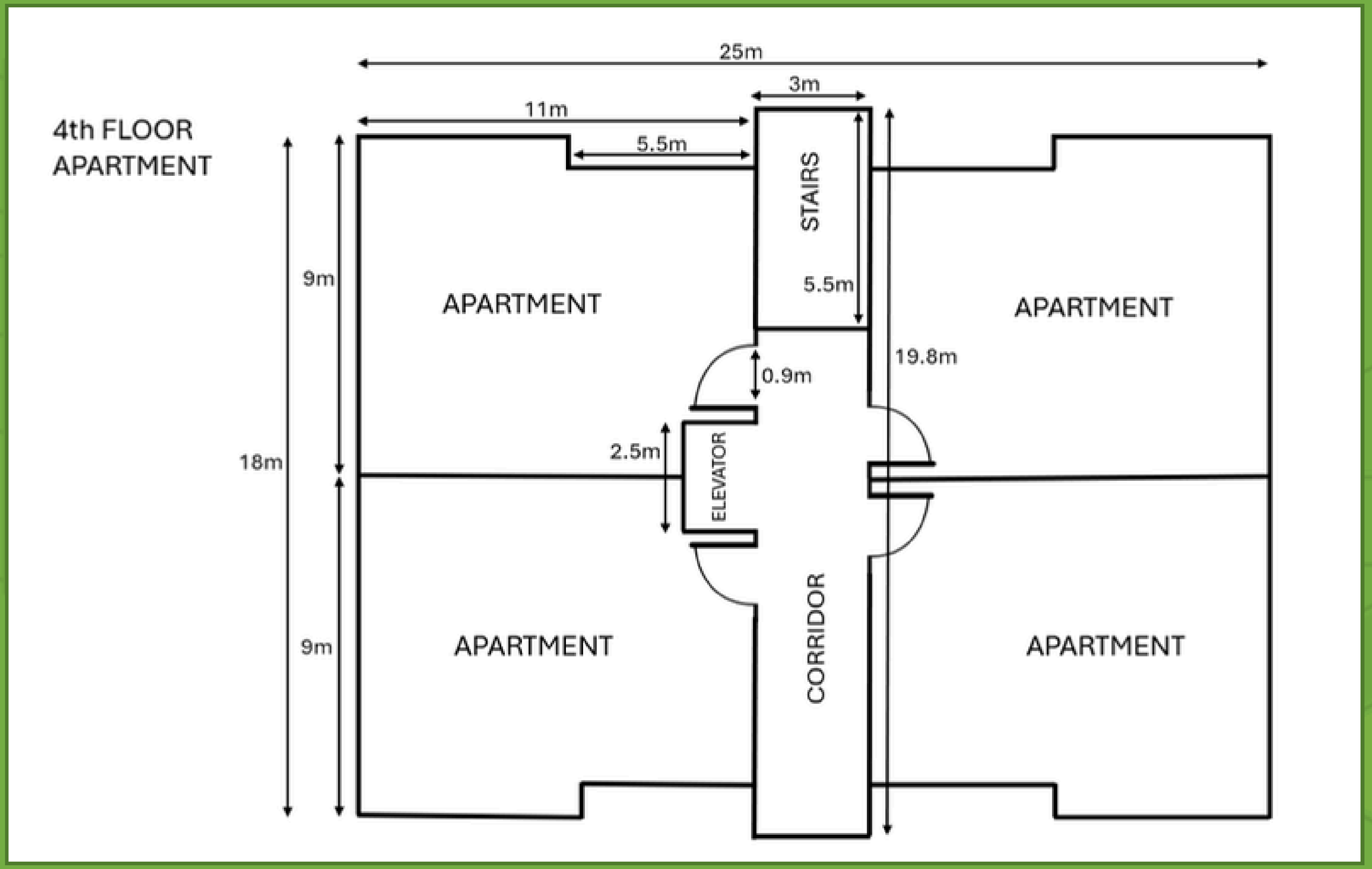
The design layout for the new MURB, including all mechanical and electrical systems, has been completed.

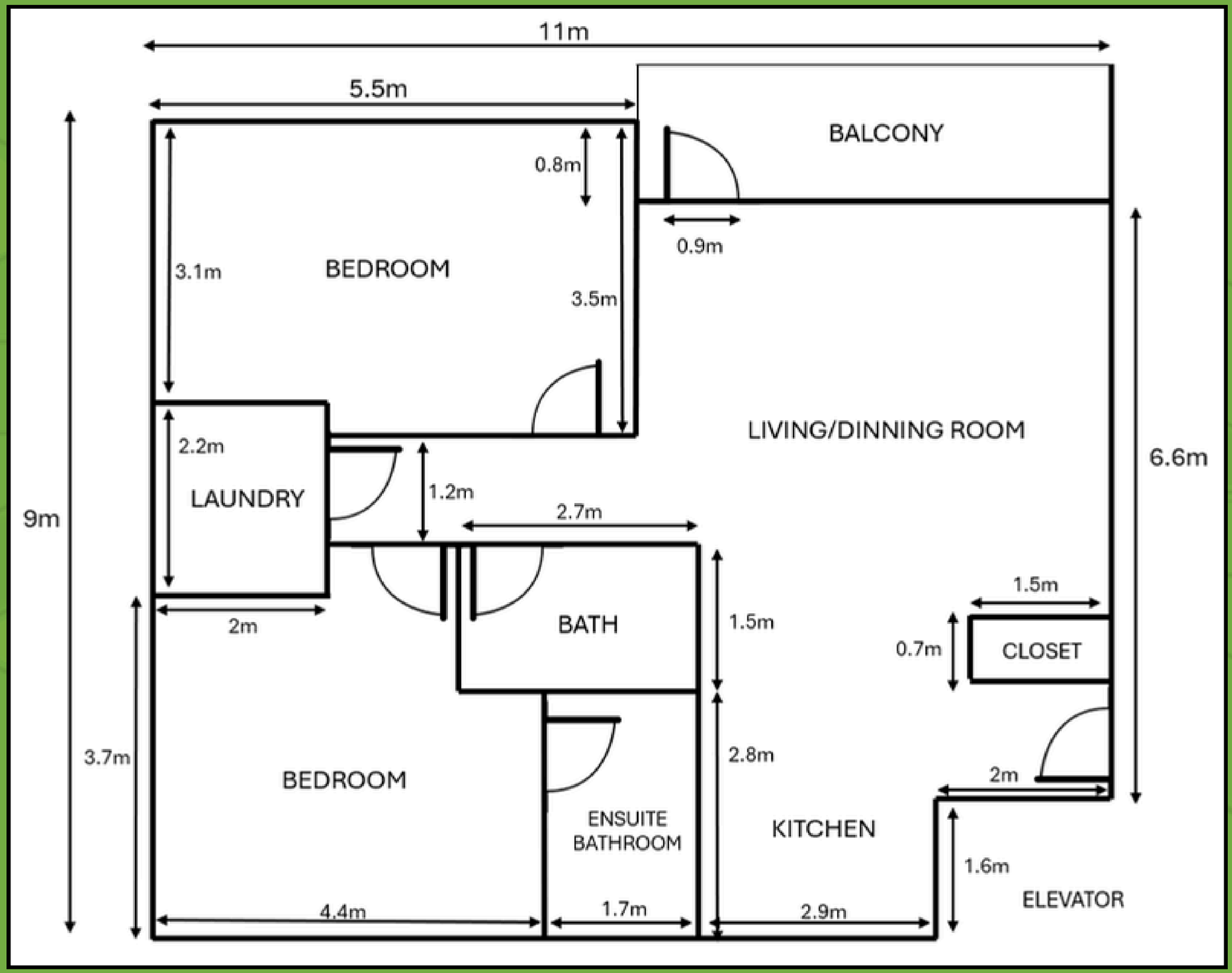
The four-storey, 16-unit building will be constructed on a vacant lot within an established residential neighbourhood, adjacent to existing homes. Each floor contains four apartments, for a total of 16 units. Every apartment includes a living room, kitchen, two bedrooms, and two bathrooms.

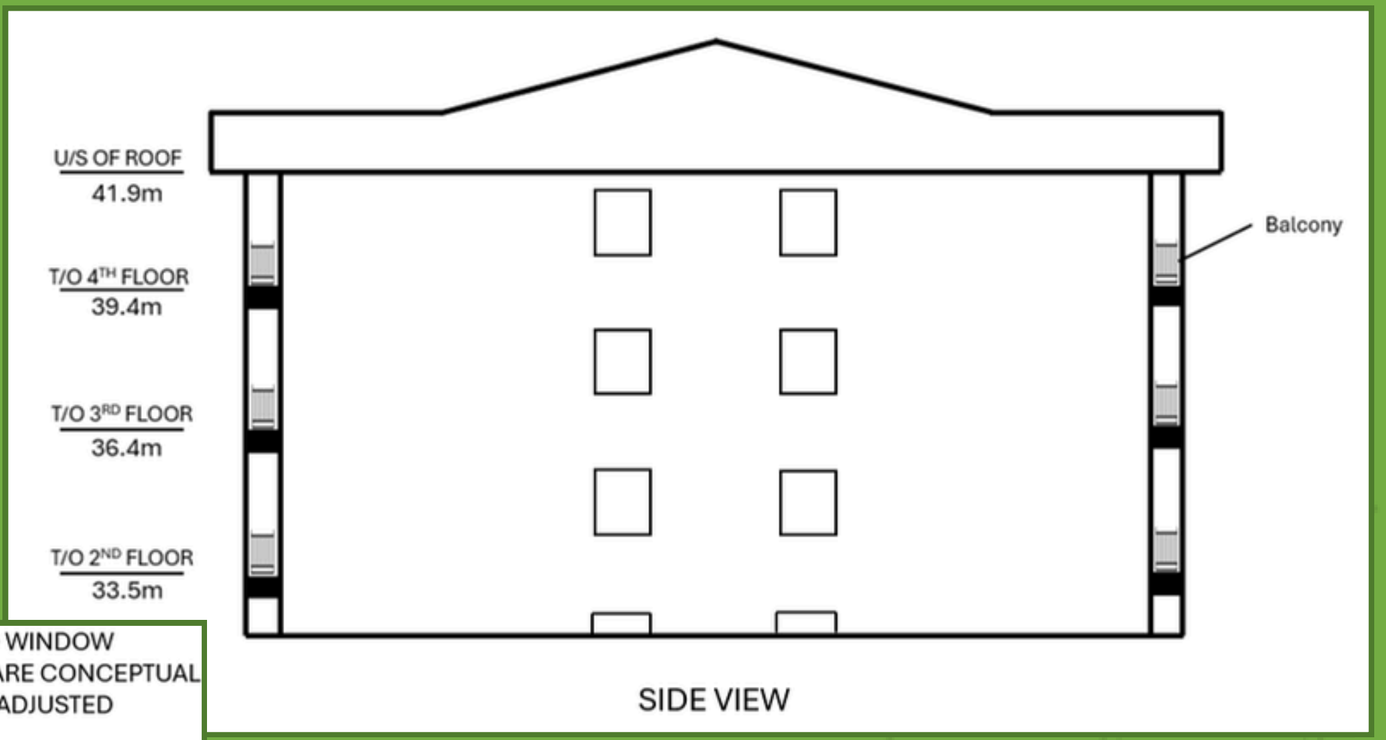
The lowest level features semi-basement units, where portions of the apartments sit below grade while others remain above ground. The apartments on the upper three floors each include a private balcony.



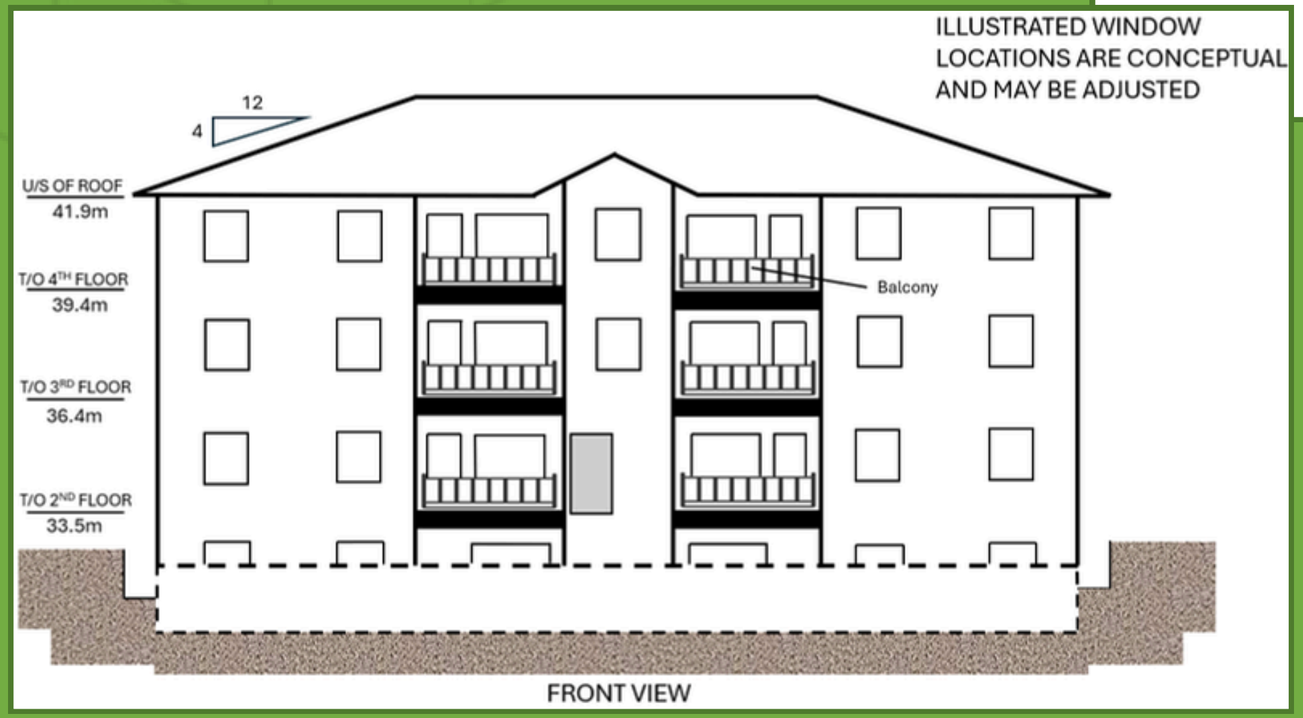
Entrants will be required to focus on the building envelope for the fourth-floor apartment, including the walls, roof, windows, and balcony.


4th FLOOR
APARTMENT
25m
3m
11m
5.5m
STAIRS
5.5m
9m
APARTMENT
APARTMENT
19.8m
0.9m
18m
2.5m
ELEVATOR
CORRIDOR
9m
APARTMENT
APARTMENT

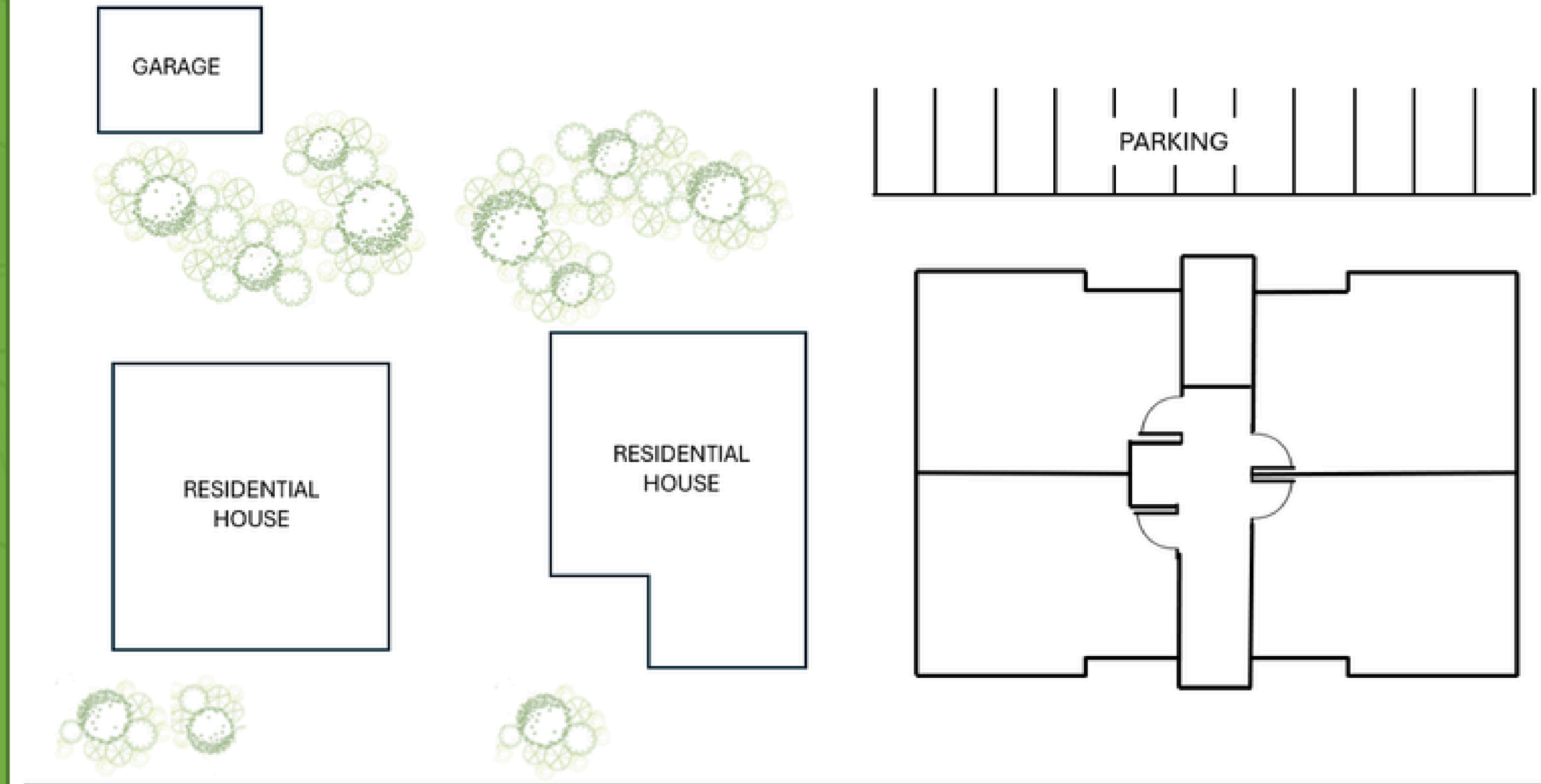

11m
5.5m
BALCONY
0.8m
0.9m
3.1m
BEDROOM
3.5m
LIVING/DINNING ROOM
6.6m
9m
2.2m
LAUNDRY
1.2m
2.7m
1.5m
2m
BATH
1.5m
0.7m
CLOSET
3.7m
2.8m
2m
BEDROOM
ENSUITE
BATHROOM
KITCHEN
1.6m
ELEVATOR
4.4m
1.7m
2.9m



SIDE VIEW



FRONT VIEW


GARAGE
PARKING
RESIDENTIAL HOUSE
RESIDENTIAL HOUSE
STREET

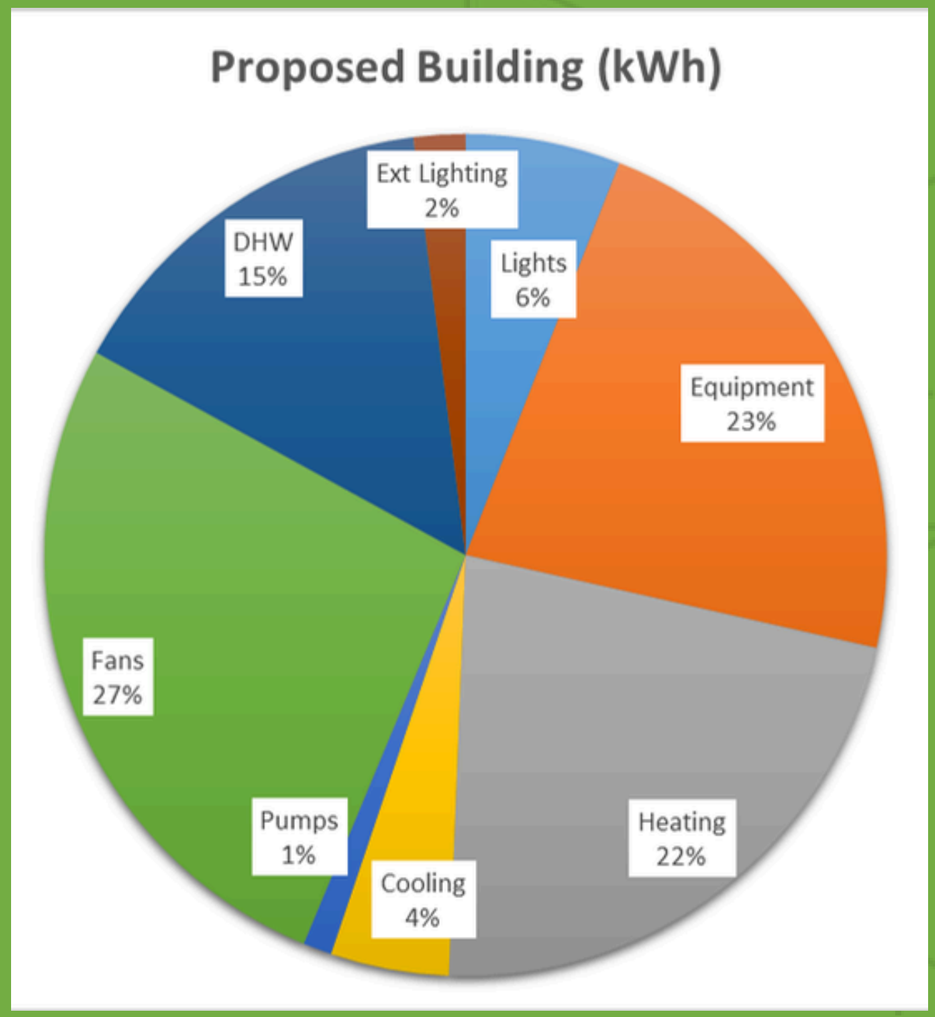
PROJECT BACKGROUND

The energy model was developed using key building parameters, but it is intended for **background information only** and is **NOT** required for the envelope analysis.

PARAMETER	INPUT
Area	1,742 m2 (18,749 ft2)
Conditioning Setpoints	Heating: 22°C, Cooling: 24°C
Schedule	Multi-Unit Residential Building: NECB Operating Schedule G
Lighting Power Density	Average: 5 W/m2 (0.45 W/ft2)
Heating	Heat Pump, COP 2.17 with Electric Supplemental Heating
Cooling	Heat Pump COP 4.40
Heat Recovery Efficiency	90%
Infiltration	0.069 (cfm)/ft2 @ 5 Pa

PROJECT BACKGROUND

	Proposed Electricity (kWh))	NECB 2020 Electricity (kWh)
Lights	15,374	17,296
Exterior Lights	5112	10,224
Plug Loads	58,293	58,293
Heating	57,032	220,939
Cooling	11,731	18,972
Pumps	2,842	2,584
Fans	68,926	110,986
DHW	38,880	78,818
	258,110	518,112
Energy Savings Against NECB 2020	50%	Tier 3
Area	815	m2
EUI	270	kWh/m2



MATERIALS

Participants are instructive to utilize products that are easily accessible and can be ordered for delivery within Manitoba. A materials list will not be provided. Additional points will be awarded for the incorporation of locally manufactured materials. Please be aware that material costs will not be a factor in the competition’s evaluation.

ENVELOPE REQUIREMENTS

Energy modelling has been used to calculate the minimum envelope thermal resistance (R and U) values that enable the addition to reach 50% energy savings over the NECB 2020.

The calculated minimum required envelope thermal resistance values are as follows:

ROOF	**Clear Field with Thermal Bridging and Linear Transmittance**	**R48**
Above Ground Vertical Façade: Wall/Windows	**Clear Field with Thermal Bridging and Linear Transmittance**	**R21**

The specified overall R-value for the wall and window system requires applicants to carefully balance the window-to-wall ratio. This balance must not only meet the required performance standards for the building envelope but also take into account the visual appeal and architectural aesthetics of the proposed design.

ENVELOPE REQUIREMENTS

Clear field transmittance is the heat flow from the wall, floor or roof assembly. This transmittance includes the effects of uniformly distributed thermal bridging components, like brick ties, structural framing like studs, and structural cladding attachments that would not be practical to account for on an individual basis. The clear field transmittance is a heat flow per area and is represented by a U-value denoted as the clear field (Uo).

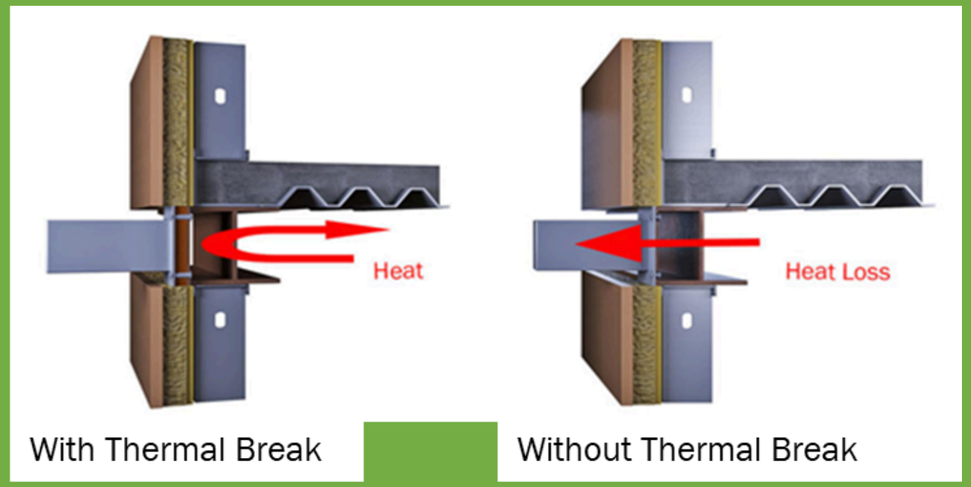
Linear transmittance is the additional heat flow caused by details that are linear. This includes slab edges, corners, parapets, and transitions between assemblies. The linear transmittance is a heat flow per length and is represented by psi (Ψ).

It is important to understand the thermal bridging effects of your proposed envelope design early in the design process.

THERMAL BRIDGING

The National Energy Code of Canada for Buildings (NECB) 2020 outlines specific methods for calculating thermal resistance (R-value) of building envelope assemblies:

1. Identify the Assembly Layers: Identify each layer in the building assembly, including exterior finishes, sheathing, insulation, air/vapor barriers, and interior finishes.
2. Determine the Thermal Resistance of Each Layer: Find the thermal resistance (R-value) of each material layer. This information is usually available from manufacturers or standard reference tables.
3. Adjust for Thermal Bridging: If the assembly includes components that create thermal bridges (e.g., studs, fasteners), the effective R-value must be adjusted.



THERMAL BRIDGING

In calculating the overall thermal transmittance of assemblies the effect of thermal bridging shall be considered for

1. closely spaced repetitive structural members, such as studs and joists, and ancillary members, such as lintels, sills and plates.
2. major structural elements that penetrate or intersect the building envelope. Examples of major structural elements that could penetrate the building envelope are walls, floors, roofs, balconies, joists, beams, girders, columns, and curbs.
3. the junctions between the following building envelope materials, components, and assemblies:
    - glazing assemblies,
    - spandrels,
    - Parapets,
    - roof-to-wall junctions,
    - corners, and
    - edges of walls or floors, and
    - secondary structural members

You need to calculate:

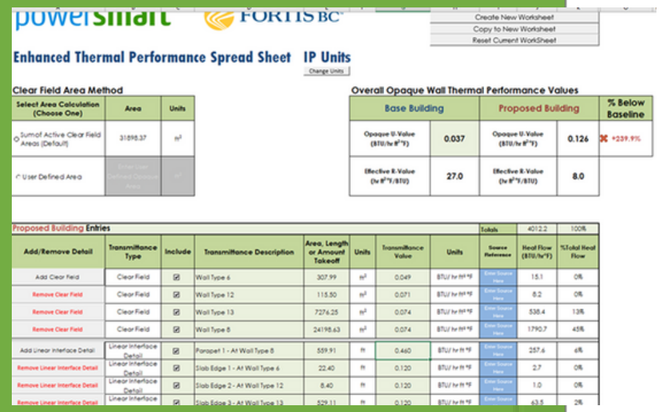
- **Clear field with Thermal Bridging**
- **Area or Length takeoffs**
- **Linear Interface Detail**

Source - NECB 2020: 3.1.1.7. Calculation of Overall Thermal Transmittance

THERMAL BRIDGING

Please use the Thermal Bridging guide and spreadsheet:

Please use the Thermal Bridging guide:
https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/builders-developers/building-envelope-thermal-bridging-guide-v1-6.pdf


powerSmart FORTIS BC

Enhanced Thermal Performance Spread Sheet IP Units

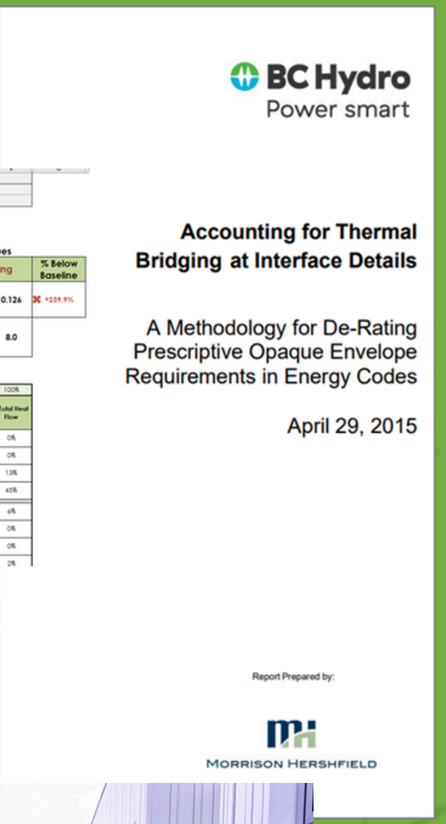
Clear Field Area Method

Overall Opaque Wall Thermal Performance Values

Base Building | Proposed Building | % Below Baseline

Enhanced Thermal Performance Spreadsheet:
https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/builders-developers/betbg-enhanced-spreadsheet.xlsm

Thermal Bridging Methodology:
https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/builders-developers/base-building-u-values-03102015.pdf



Guide to Mitigating Thermal Bridging at Roofs and Decks:
https://www.bchousing.org/sites/default/files/media/documents/Guide-to-Mitigating-Thermal-Bridging-at-Roofs-and-Decks.pdf

BETAC RESEARCH LABS & EQUIPMENT

Following the awards event, the winning designs will be constructed at BETAC, with the winners having the opportunity to participate in the build.

BETAC offers facilities for testing all building components, from concept to commercialization and validation. Innovations for new construction, retrofit projects, prefab, and modular homes can all be developed and evaluated within BETAC's facilities.

BUILDING EFFICIENCY
TECHNOLOGY ACCESS CENTRE



ELIGIBILITY

The competition offers two streams: professional and student. Both streams require technical skills but differ in their respective entry requirements.

People who have direct professional relationship with jury panel members or organizers may not participate in the competition.

- A team must consist of a minimum of 2 people. There is no upper limit.
- A team can consist of members from more than one organization or company.
- Each organization or company can submit up to two teams.
- There is no limit on the number of teams that can enter from a single educational institution.

SUBMISSION REQUIREMENTS

PROFESSIONAL STREAM

There are no registration fees. Submissions will be accepted until 11:59 pm (CST) on xxxxxxxxxx

Submission Requirements:

1.B**asic Information**
Provide the following details about your submission:

- A short description of the project.
- Key project members, including names, contact details, and links to professional profiles (if applicable).
- Other partners involved (if any).

2. Short Design Report
Describe the design concept, goals, and inspirations. Explain why your solution is feasible and how it is positioned to be realized.

3.Elevation Drawings or Sketches
Include exterior views of the building from all sides, indicating materials and finishes.

4.Construction Drawings
Provide typical construction drawings or sketches of the building envelope, including windows, doors, walls, roofs, balconies and any joints and junctions, included significant thermal bridges. The drawings must be clearly annotated, detailing dimensions, and materials. They do not need to be to scale, but should be thorough in detail. Please show continuity of the four principle boundary layers; water, air, vapour and thermal. The building envelope structure and materials must meet sound practice for moisture control, however, hygrothermal analysis using WUFI is not a requirement.

SUBMISSION REQUIREMENTS

PROFESSIONAL STREAM

6. Materials and Finishes
Provide a bill of materials used in the proposed design.
7. Contextual Rendering Sketches
Illustrate how the building fits within its environment.
8. **Thermal Bridging Calculations**
Include calculated thermal resistance values for walls, roof, windows, and doors. Also, specify the window Solar Heat Gain Coefficient (SHGC) and visible transmittance. Thermal resistance modelling software such as Therm is not a requirement.

Use the Thermal Bridging guide and spreadsheet available on the BC Hydro website: BC Hydro Whole Building Design Guide. Ensure that all values meet or exceed the required standards:

ROOF	**Clear Field with Thermal Bridging and Linear Transmittance**	**R48**
ABOVE GROUND VERTICAL FACADE WALL/WINDOWS	**Clear Field with Thermal Bridging and Linear Transmittance**	**R21**

9. Poster Boards
Provide 1–3 poster boards in either 36 × 48 inches (portrait) or 48 × 36 inches (landscape) showcasing your design. The poster boards will be displayed during the event evening and will be printed by the competition organizers.

SUBMISSION REQUIREMENTS

STUDENT STREAM

There are no registration fees. Submissions will be accepted until 11:59 pm (CST) on xxxxxx

Submission Requirements:

1. Basic Information
Provide the following details about your submission:

- A short description of the project.
- Key project members, including names and contact details.

2. Short Design Report
Describe the design concept, goals, and inspirations.
3. Elevation Drawings or Sketches
Include exterior views of the building from all sides, indicating materials.
4. Construction Drawings
Provide typical construction drawings or sketches of the building envelope, including windows, doors, walls, roofs, balconies and any joints and junctions, included significant thermal bridges. The drawings must be clearly annotated, detailing dimensions, and materials. They do not need to be to scale but should be thorough in detail. Please show continuity of the four principle boundary layers; water, air, vapour and thermal. The building envelope structure and materials must meet sound practice for moisture control, however, hygrothermal analysis using WUFI is not a requirement.

SUBMISSION REQUIREMENTS

STUDENT STREAM

5. Materials and Finishes
Provide a bill of materials used in the proposed design.
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Include calculated thermal resistance values for walls, roof, windows, and doors. Also, specify the window Solar Heat Gain Coefficient (SHGC) and visible transmittance. Thermal resistance modelling software such as Therm is not a requirement.

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Provide 1–3 poster boards in either 36 × 48 inches (portrait) or 48 × 36 inches (landscape) showcasing your design. The poster boards will be displayed during the event evening and will be printed by the competition organizers.

PROFFESSIONAL ADVISOR

If participants find any errors, discrepancies, or oversights in the Competition Brief, or if they are unsure about the meaning or intent of any requirements, they must promptly notify the professional Advisor by 11.59pm October 14, 2024.

If the enquiry leads to a correction or clarification of the Competition Brief, the response will be provided to all participants.

If the enquiry does not require any correction or clarification of the Competition Brief, the response will be provided only to the participant who made the enquiry.

This ensures that all participants have access to the same essential information.

The professional Advisor is Melanie Chatfield, P.Eng

Contact via Competition Webpage:

xxxxxxxxx

JURY

Bruce Pauls
MArch MAA RAIC
City of Winnipeg

Felise Bergmann
Dipl.Tech
Stantec

Grant Walkin
CPHC CPHD M.S.c. P.Eng
Litebox

Michael Reimer
P.Eng
Efficiency Manitoba

PRIZES

Prize money will be awarded to both the professional and student streams

1ST PRIZE WINNER
$5,000

2ND PRIZE WINNER
$2,500

3RD PRIZE WINNER
$1,000

EVALUATION CRITERIA

Effective Thermal Performance: Assessing the ability of the designs to provide efficient insulation and thermal regulation within the building.

Daylight and Views: Considering the incorporation of natural light and optimal views into the design to enhance the overall occupant experience.

Climate Resiliency: Ensuring that the designs exhibit resilience and adaptability to varying climatic conditions.

Future Proofing: Evaluating the designs with a focus on their ability to accommodate future technological advancements and evolving sustainability standards.

Aesthetics: Judging the visual appeal and architectural aesthetics of the proposed building envelopes.

Local Materials: Ensure the use of materials and manufacturers local to Manitoba as much as possible.

Constructability and Feasibility: Assessing how efficiently, safely, and realistically the design can be constructed using materials, labour, equipment, and construction methods available in Manitoba.

KEY DATES

FEBRUARY 9 2026

CLOSING DATE FOR REGISTRATION

FEBRUARY 23 2026

COMPETITION Q&A DEADLINE

MARCH 2 2026

CLOSING DATE FOR SUBMISSION

MARCH 25 2026

ANNOUNCEMENT OF WINNERS

In order to guarantee equal opportunities to all competition participants.
No new questions will be answered after this deadline.

AWARDS CEREMONY

The Building Envelope Design Competition Awards will take place on Wednesday March 25th at RRC Polytech's Notre Dame Campus.

Doors Open: 5:30pm
Presenting of Awards: 6:30pm

Networking throughout

Keep an eye open for more details coming soon.

THANK YOU

Melanie Chatfield, City of Winnipeg
Laura Tyler, Sustainable Building Manitoba
Ali Kaboorani, Building Efficiency Technology Access Centre, RRC Polytech
Rob Spewak, Efficiency Manitoba/Sustainable Building Manitoba
Jesse Watson, Connections Café, Construction Specifications Canada
Chris Buzunis, Province of Manitoba
Myles Boonstra, Shared Health
Stephen Gaunt, Efficiency Manitoba
Jeremy Rivers, Province of Manitoba
Joe Kasprick, Province of Manitoba

VISIT COMPETITION WEBSITE

This challenge was developed by with support from Natural Resources Canada

Natural Resources Canada
Ressources naturelles Canada