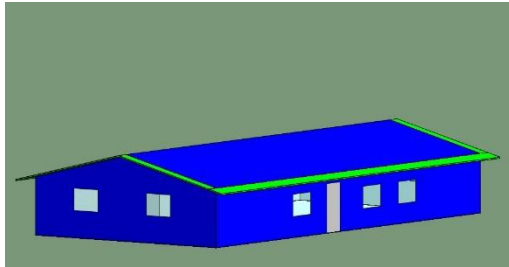


9.36.5. Energy Performance Compliance & Energy Cost Report

Key Project Information



VE Model of Proposed House

Project Description	Little Red River Affordable Housing Prototype
Address	TBD
House Faces	TBD
Location	High Level, AB
Location Heating Degree Days (HDD)	6700 (Ft. Vermillion Weather)
Climate Zone	7B
ASHRAE 140 Compliant Software	IES Virtual Environment 2016

Key Data for Energy Model Calculations

Building Envelope

	Reference House	Proposed House
Total Floor Area of Conditioned Space	334.5 m ²	334.5 m ²
Airtightness Value	2.5 ACH @ 50 Pa	1.0 ACH @ 50 Pa - See Notes
Flat Ceilings Below Attics	n/a	n/a
Vaulted Ceilings with Vented Attics	n/a	n/a
Cathedral Ceilings & Flat Roofs	5.02 (m ² ·K)/W	5.55 (m ² ·K)/W
Above Ground Exterior Walls - Type 1	3.85 (m ² ·K)/W	3.34 (m ² ·K)/W
Above Ground Exterior Walls - Type 2	n/a	n/a
Conditioned / Unconditioned Partition - Type 1	n/a	n/a
Conditioned / Unconditioned Partition - Type 2	n/a	n/a
Rim Joists / Floor Headers - Type 1	n/a	n/a
Rim Joists / Floor Headers - Type 2	n/a	n/a
Cantilevered Floors - Type 1	n/a	n/a
Cantilevered Floors - Type 2	n/a	n/a
Fenestration	1.4 W/(m ² ·K)	1.40 W/(m ² ·K) - See Notes
Doors	1.4 W/(m ² ·K)	1.40 W/(m ² ·K) - See Notes
Skylights	n/a	n/a
Fenestration & Doors to Wall Ratio (FDWR)	17.0%	10.3%
Foundation Walls	3.46 (m ² ·K)/W	3.20 (m ² ·K)/W
Unheated Floors Below Frost Line	n/a	n/a
Unheated Floors Above Frost Line	n/a	n/a
Heated Floors	n/a	n/a
Slabs on Grade with Integral Footing	n/a	n/a

Heating, Ventilation, & Air Conditioning

	Reference House	Proposed House
Basis of Ventilation (all systems, as applicable)	2019 ABC 9.32.3.3.	2019 ABC 9.32.3.3.
Heating System Type 1	Furnace - Gas	Fan Coil - Air-to-Water HP
Heating System Type 1 Efficiency	0.92 AFUE	2.78 COP
Heating System Type 1 Fan Energy (max.)	2.3 W/L/s	1.65 W/L/s



Heating, Ventilation, & Air Conditioning Cont'd

Reference House

Proposed House

Heating System Type 2	n/a	n/a
Heating System Type 2 Efficiency	n/a	n/a
Heating System Type 2 Fan Energy (max.)	n/a	n/a
Ventilation System Type 1	Forced Air + Principle Exhaust	Forced Air + Principle Exhaust
Ventilation System Type 1 Principle Exhaust Rate	45 L/s	45 L/s
Ventilation System Type 1 Heat Recovery Efficiency	n/a	n/a
Ventilation System Type 2	n/a	n/a
Ventilation System Type 2 Principle Exhaust Rate	n/a	n/a
Ventilation System Type 2 Heat Recovery Efficiency	n/a	n/a
Air Conditioning System Type 1	Furnace - Gas	Fan Coil - Air-to-Water HP
Air Conditioning System Type 1 Efficiency	11.5 EER	3.5 COP
Air Conditioning System Type 2	n/a	n/a
Air Conditioning System Type 2 Efficiency	n/a	n/a

Service Water Heating

Reference House

Proposed House

Service Water Heating System Type	Gas-Fired Tank	Heat Pump (Heating System #1)
Service Water Heating System Efficiency	0.8 Et & SL ≤ 204 W	2.5 COP
Drain Water Heat Recovery Efficiency	n/a	n/a

Energy Model Calculation Results

Energy Consumption by End Use

Reference House (GJ)

Proposed House (GJ)

Space Heating Energy	88.1	34.1
Space Cooling Energy	0.1	0.0
Ventilation Air Heating Energy	15.1	6.7
HVAC Distribution Energy	12.6	2.8
Service Water Heating Energy	<u>28.7</u>	<u>6.4</u>
TOTAL	144.5 GJ	50.0 GJ

Estimated Energy Rate & Resultant Annual Energy Costs of Proposed House

Estimated Effective Electricity Rate	\$0.16/kWh
Estimated Annual Space Conditioning, Ventilation, and Hot Water Heating Energy Cost	\$2,500

9.36.5. Compliance Summary

Based on calculations performed in accordance with Subsection 9.36.5. of Division B of the 2019 Alberta Building Code (ABC), the calculated annual energy consumption (50 GJ) of the Proposed house design is less than the Reference House Energy Target (144.5 GJ); therefore, the proposed design is COMPLIANT with Subsection 9.36.5. of the ABC.



Project Notes and Assumptions

- Unless noted otherwise below, all building components addressed by 9.36. of the 2019 Alberta Building Code (ABC) shall be installed in accordance with all measures outlined in subsections 9.36.2. thru 9.36.4.
- The building's air barrier system shall be constructed in accordance with Subsection 9.25.3. and Articles 9.36.2.9. and 9.36.2.10 of the ABC.
- Builder shall verify that U-values of windows and doors supplied do not exceed Proposed U-values identified above.
- See following page(s) for calculations of effective thermal resistances of building envelope components.



Thermal Resistance Calculations for Envelope Components with Framing Members

BUILDING ENVELOPE COMPONENT

Flat Roof

Framing: 2"x10" Structural splines @ 48" O.C.

Insulation: 9¼" Rigid expanded polystyrene (EPS)

Notes: Framing and insulation percentages are 9% and 91% respectively, as per NBC Table A-9.36.2.4.(1)A

Assembly (outside to inside)

	<u>RSI</u>
Exterior air film	0.03
Asphalt shingles	0.00
½" Magnesium oxide sheathing	0.09
9¼" Structural spline / EPS insulation (235 mm)	5.15
½" Magnesium oxide sheathing	0.09
½" (12.7 mm) Drywall interior finish	0.08
Interior air film (ceiling)	<u>0.11</u>
Total	5.55

Above Ground Exterior Walls

Framing: 2"x6" structural splines @ 48" O.C.

Insulation: 5½" Rigid expanded polystyrene (EPS)

Notes: Framing and insulation percentages are 14% and 86% respectively, as per NBC Table A-9.36.2.4.(1)A

Assembly (outside to inside)

	<u>RSI</u>
Exterior air film	0.03
Vinyl siding	0.11
½" Magnesium oxide sheathing	0.09
5½" Structural spline / EPS insulation (139.7 mm)	2.82
½" Magnesium oxide sheathing	0.09
½" (12.7 mm) Drywall interior finish	0.08
Interior air film (wall)	<u>0.12</u>
Total	3.34

Foundation Walls (Crawl Space)

Framing: 2"x6" structural splines @ 48" O.C.

Insulation: 5½" Rigid expanded polystyrene (EPS)

Notes: Framing and insulation percentages are 14% and 86% respectively, as per NBC Table A-9.36.2.4.(1)A

Assembly (outside to inside)

	<u>RSI</u>
½" Magnesium oxide sheathing	0.09
5½" Structural spline / EPS insulation (139.7 mm)	2.82
½" Magnesium oxide sheathing	0.09
½" (12.7 mm) Drywall interior finish	0.08
Interior air film (wall)	<u>0.12</u>
Total	3.20

Project Model Info Summary

Project Number	TBD	
Client Name	TitanWall Affordable Housing	
Project Name & Address	High Level, Alberta	
Building Type	Detached	
Building Configuration	# Stories: One	Foundation: Crawl Space
Infiltration Shielding (CSA-F280)	Site: Open flat terrain, grass	Walls: Light local shielding
Modeler Info	Name: Mikhael	Date: 3-Aug-20

Key Parameters

Building orientation confirmed?	<input checked="" type="checkbox"/>
Windows and Doors Take-off complete?	<input checked="" type="checkbox"/>

	Floor Area	Volume	Ext. Wall Area
Crawl Space - ENTIRE	0.0 ft ²	9000.0 ft ³	900.0 ft ²
<i>Average</i> elevation of grade relative to Main finished floor (non walk-out segments of perimeter only)			0.00 ft
Estimated effective average elevation of grade relative to Main finished floor (accounts for openings)			TBD ft

	Floor Area	Volume	Ext. Wall Area
Common Space	0.0 ft ²	0.0 ft ³	0.0 ft ²
Bsmt - ABOVE GRADE ONLY			0.0 ft ²
Main Floor	1800.0 ft ²	17700.0 ft ³	1550.0 ft ²
Second Floor	0.0 ft ²	0.0 ft ³	0.0 ft ²
Third Floor	0.0 ft ²	0.0 ft ³	0.0 ft ²
Totals	Living Space Only -> 1800.0 ft ²	26700.0 ft ³	1550.0 ft ²
Does Note 1 apply?			No
Gross exterior SHELL area ⁽²⁾			2640.9 ft ²

Proposed Model

Total vertical fenestration and door area	160.0 ft ²
Fenestration and door to wall ratio (FDWR) of Proposed House	10.3 %

Reference Model

Window & Door Area Percentages Assigned to Reference model in Virtual Environment

	Windows	Doors
Exposed Basement	n/a	n/a
Upper Levels	12.75%	4.25%

Total exterior openings inputted to Reference model, including doors (as calculated by IES VE)	263.5 ft ²
Resultant Reference Model fenestration and doors to wall ratio (FDWR)	17.0 %
Reference model fenestration and doors is either 17%, 22%, or equal to Proposed?	<input checked="" type="checkbox"/>
Model complete?	<input checked="" type="checkbox"/>
Model Reviewer & Analyst Info	Name: Mikhael Date: 2 June, 2021

Notes:

- (1) For buildings containing more than 2 dwelling units, and where the fenestration exceeds 40% of the gross wall area enclosing the space, the gross wall area enclosing the space shall be used as the gross exterior wall area.
- (2) Includes exterior walls, exterior walls of attached garages, exposed and buried foundation walls, all exterior fenestration and doors, exposed and ground contacted floors, ceilings (horizontal area) of attic roofs, cathedral ceilings, walls separating conditioned space from unconditioned space, but not the exterior walls of the unconditioned spaces themselves. Feasibility of fenestration is irrelevant.