



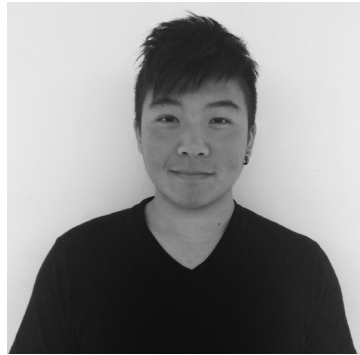
PROVENANCE LANE

U. S. DEPARTMENT OF ENERGY

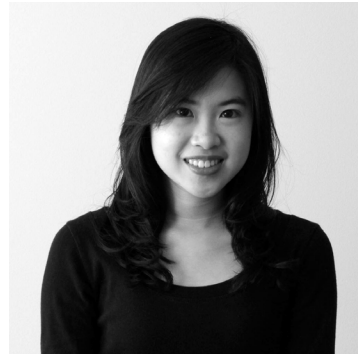
Architecture



Sivan Glazberg



Jeffrey Kwong



Tiffany Cheung



Jacqueline Foott



Cameron Laidlaw



Mark De Souza



Nikolay Tikhovsky



Caeleigh Kinch

Project Management

Building Science

Faculty Advisor:

Prof. Umberto Berardi

Faculty Consultants:

Prof. Jennifer McArthur, Prof. Vera Straka, Prof. Paul Poh, Prof. Mark Gorgolewski, Prof. Zaiyi Liao

Industry Partners

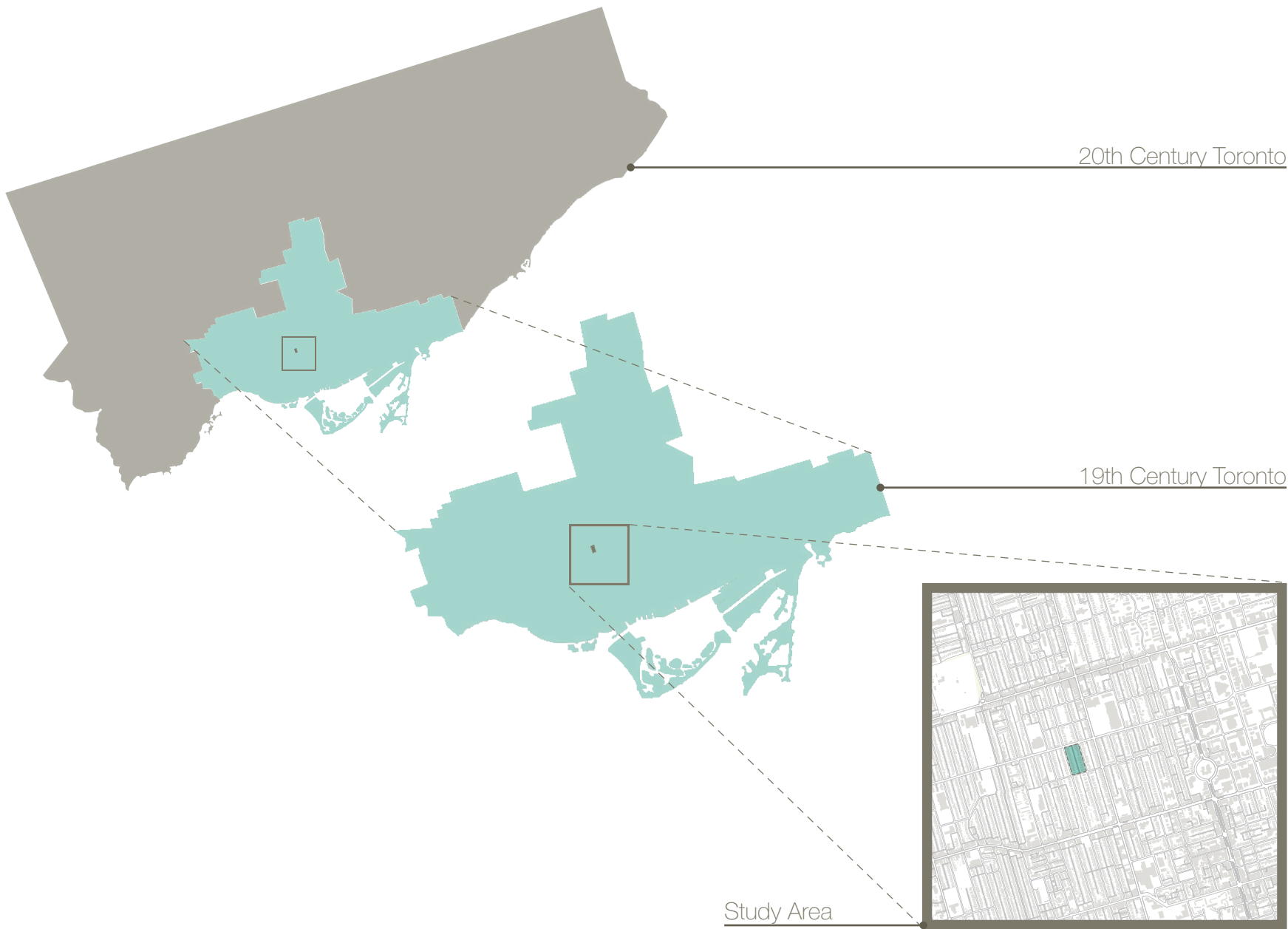
Astra Burka Design, Baird Sampson Neuert Architects, Süperkul, PHC Advisors, Pro Electric, Michael + Clark Construction.



1995



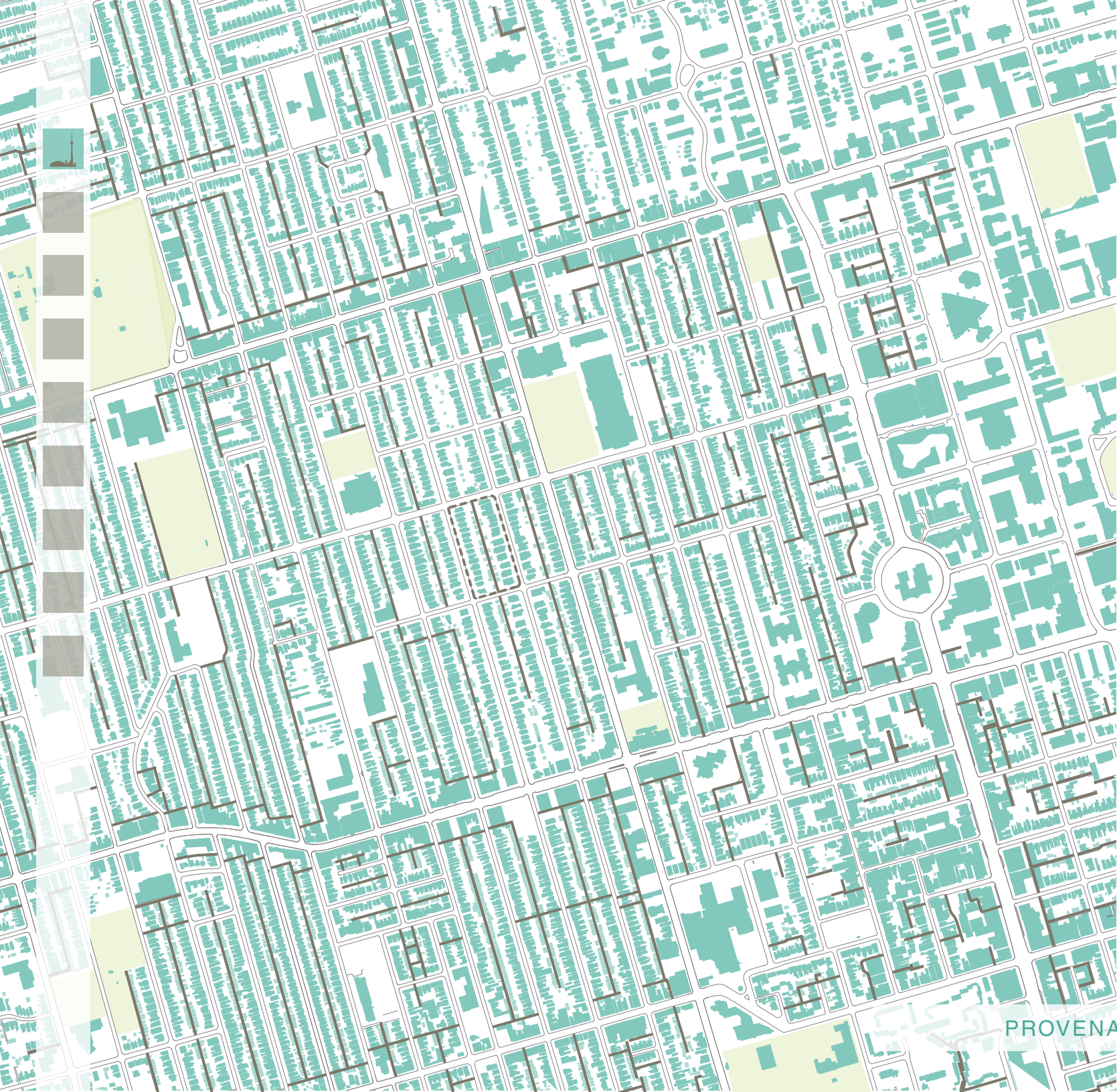
2012



20th Century Toronto

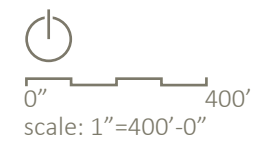
19th Century Toronto

Study Area



LEGEND

— Laneway





NO PARKING
ANY TIME

Hand-drawn graffiti on a white garage door, featuring a stylized face with large eyes and a wide smile.



DESIGN GOALS



Develop a Prototype



Resource Efficiency



Affordability



Passive Design Strategies



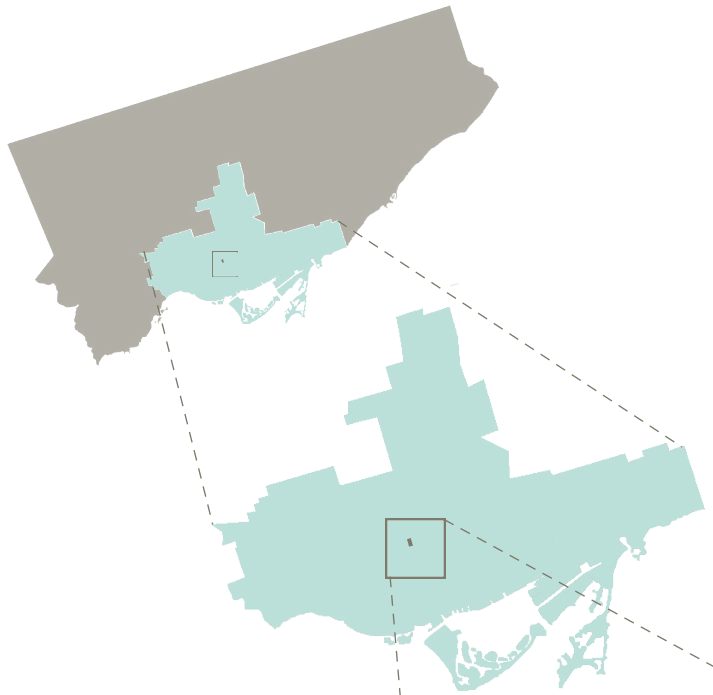
Flexible Design



Alternative Garden Spaces



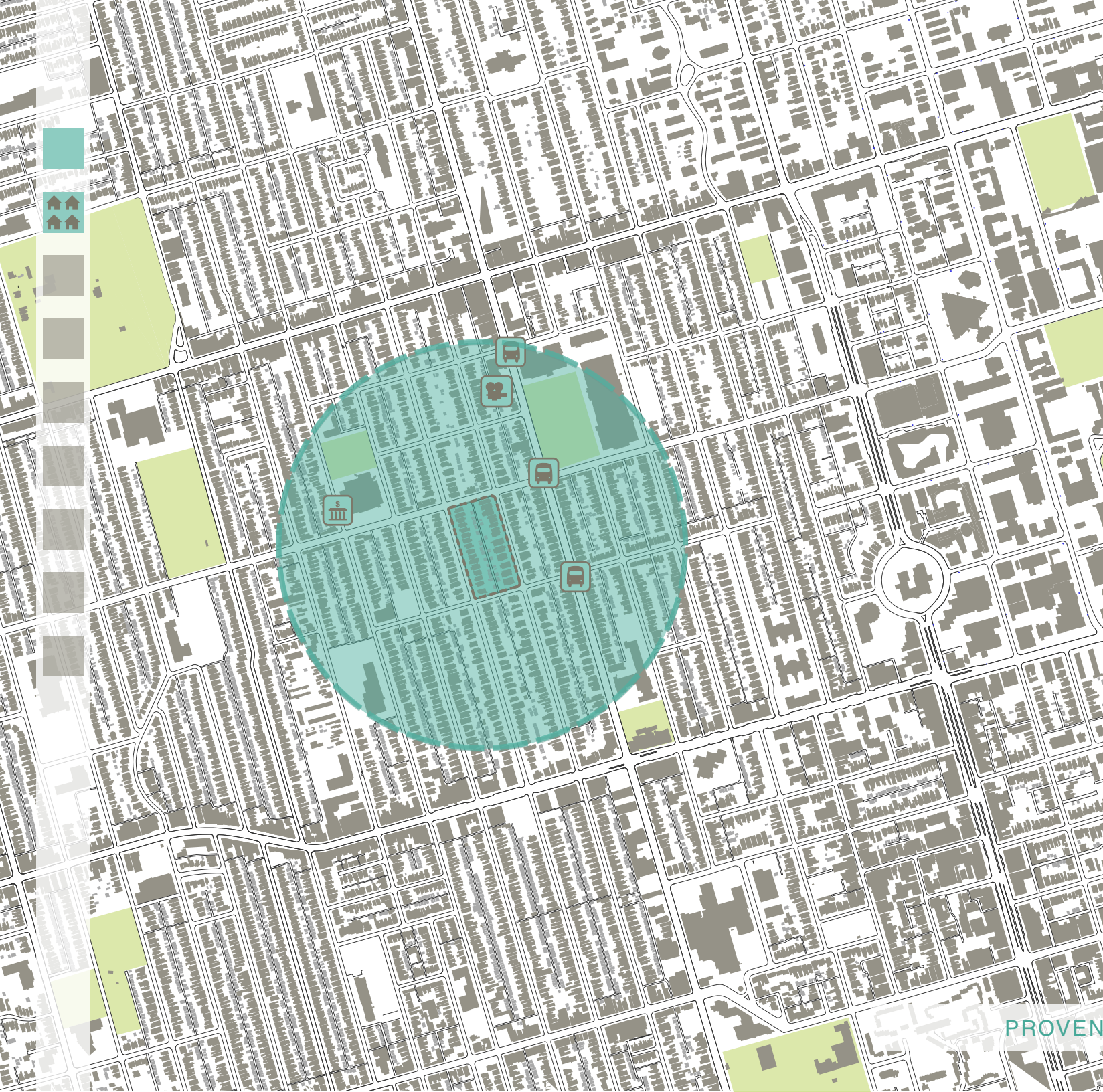
Privacy



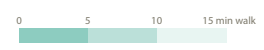
Study Area














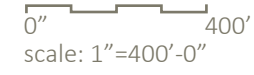
Site



LEGEND

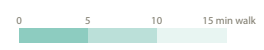













-  Bank
-  Park
-  Public Transit
-  Bike Share
-  Autoshare
-  School
-  Cinema
-  Groceries
-  Library
-  Pharmacy
-  Hospital

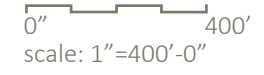


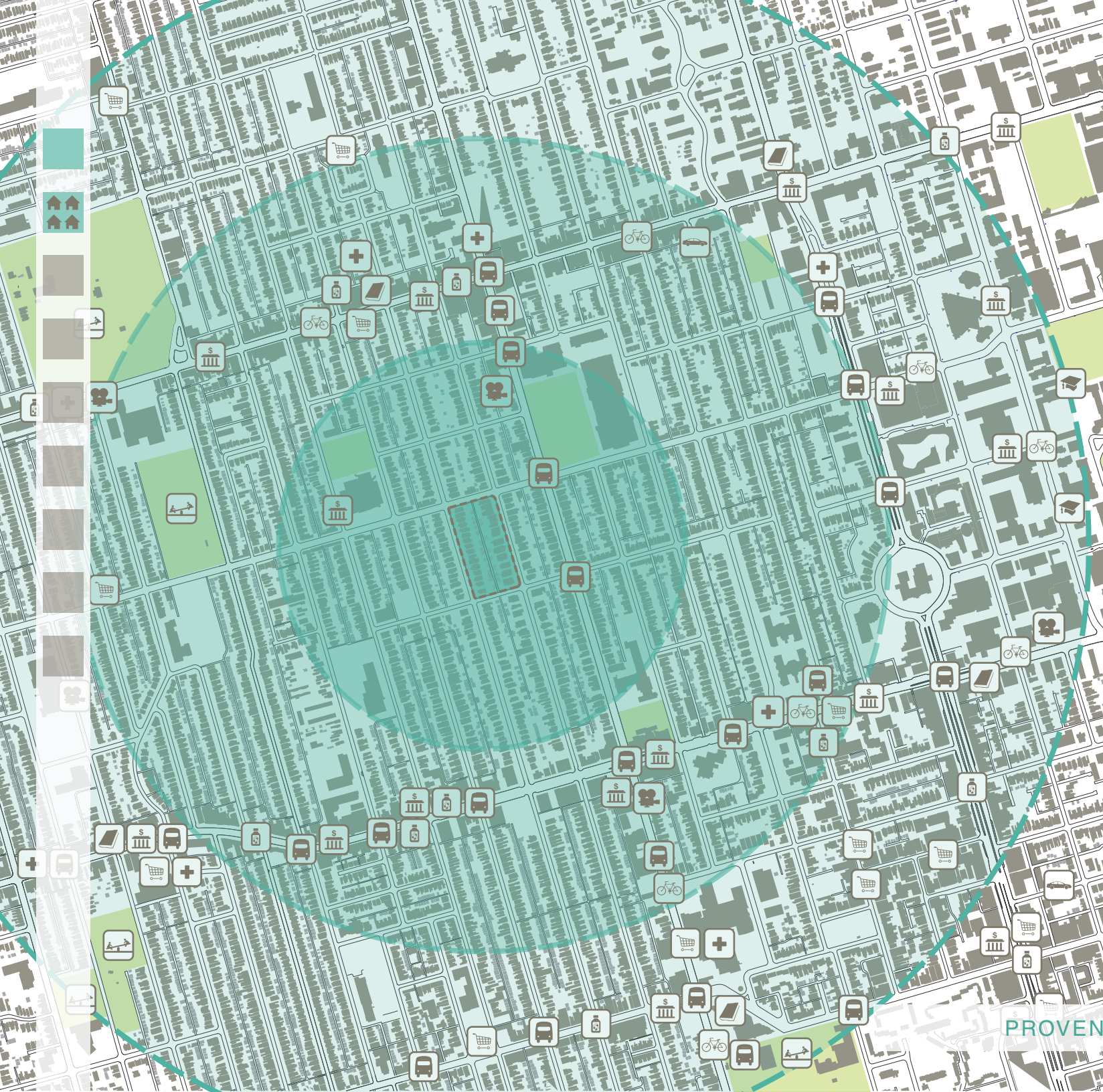


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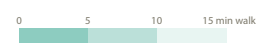













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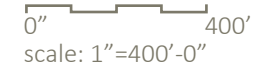


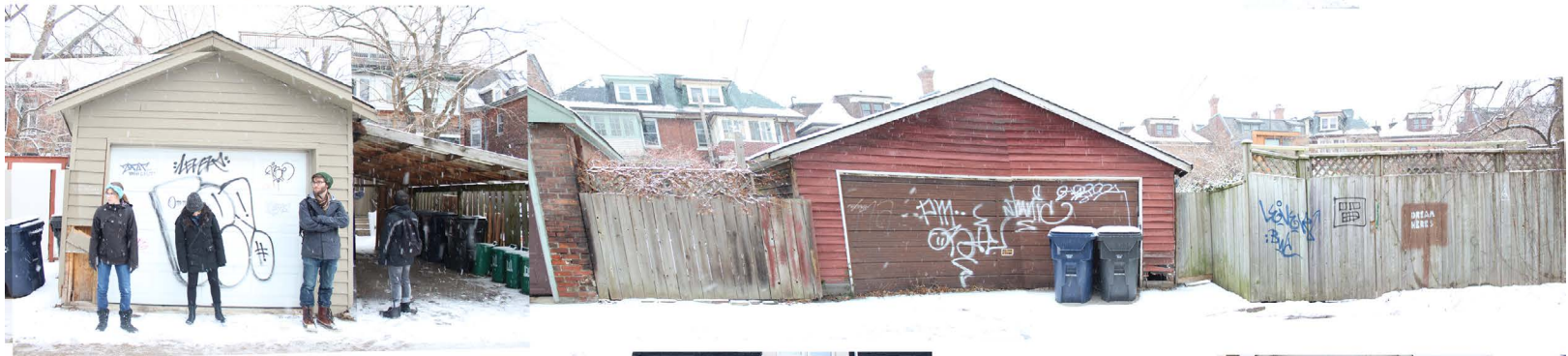


LEGEND



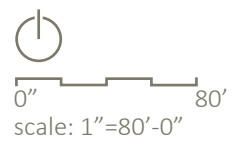
-  Bank
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-  Hospital

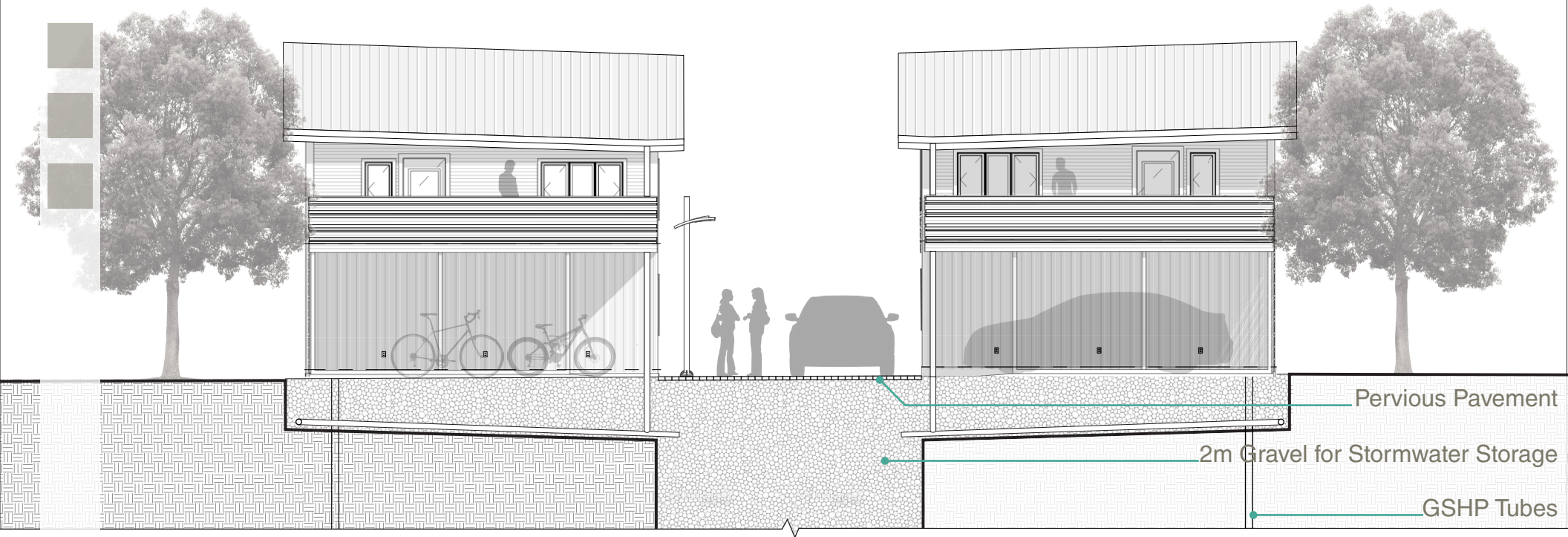






- LEGEND**
- Three Bedroom House
 - Two Bedroom House
 - One Bedroom House
 - Carport
 - Parking in Front
 - Edible Garden
 - Garbage

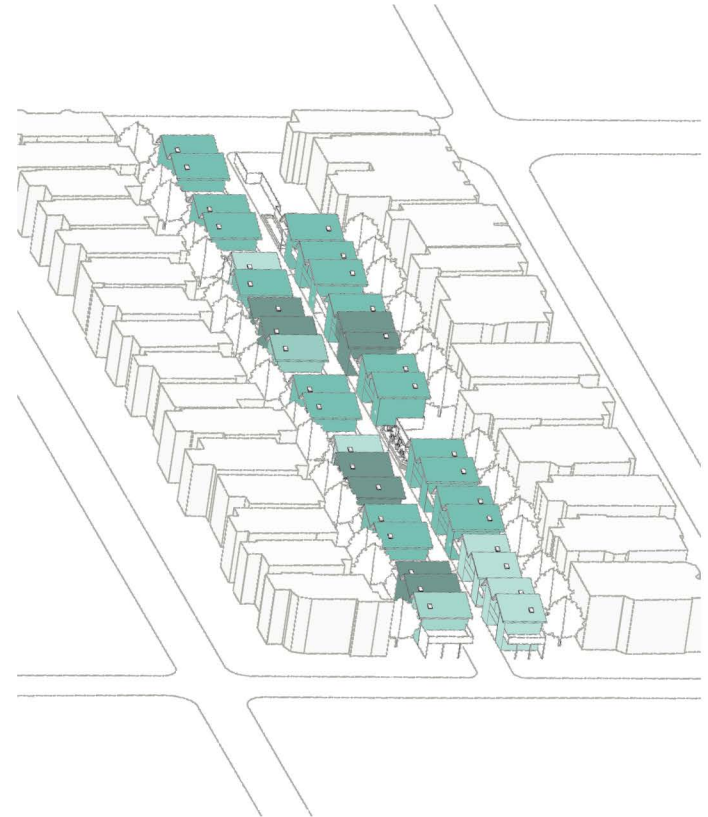


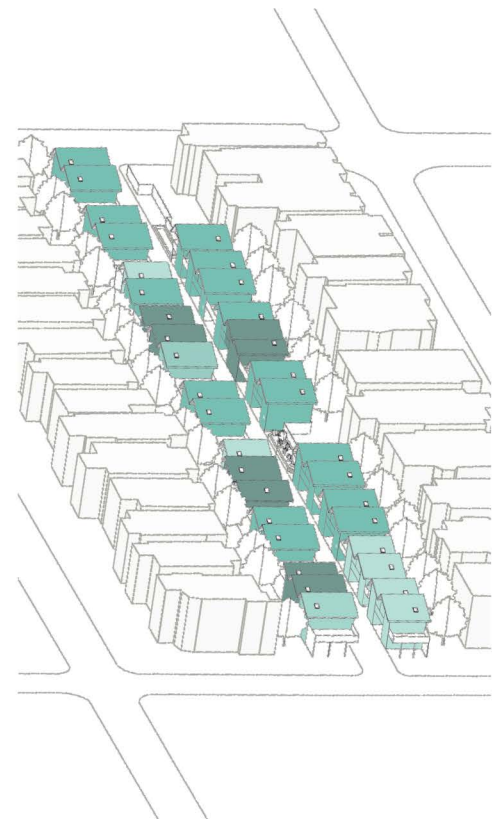
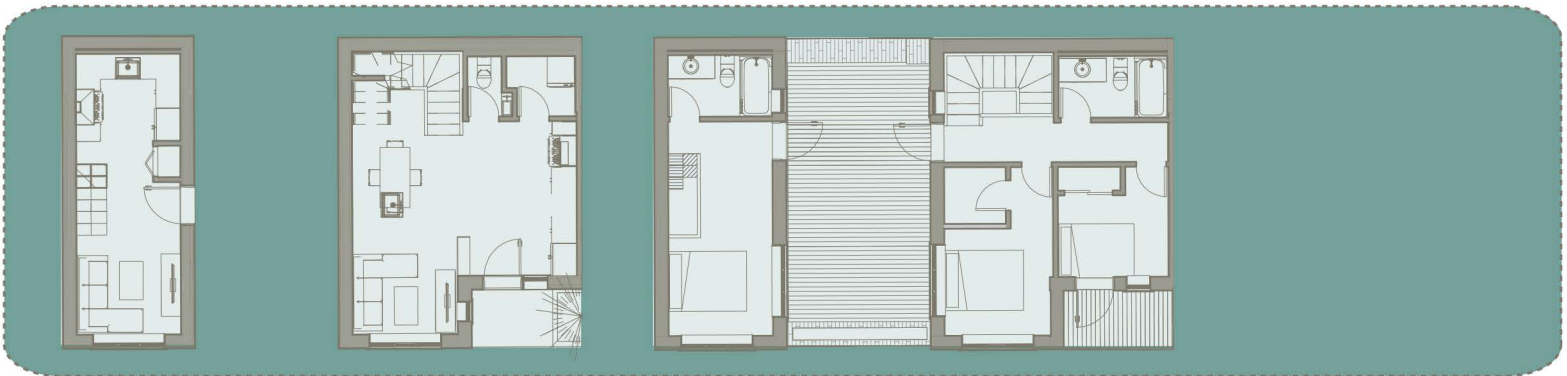
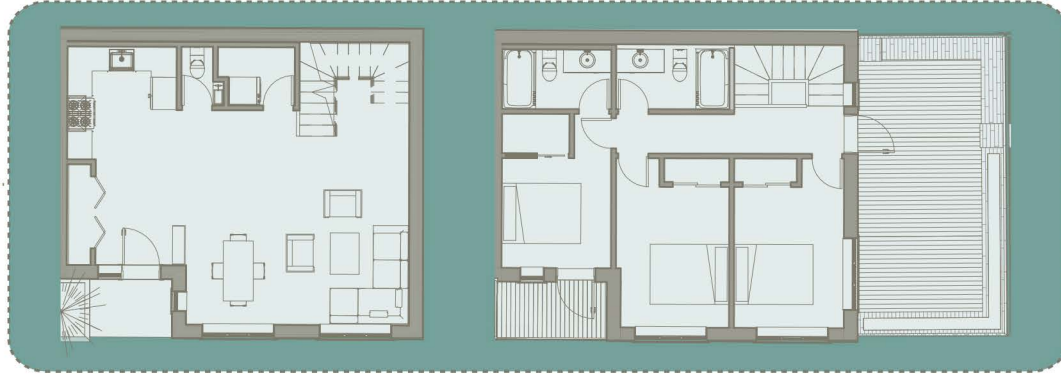


Pervious Pavement

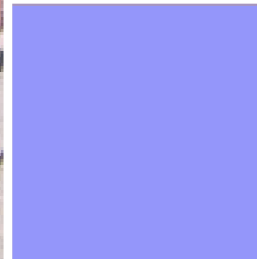
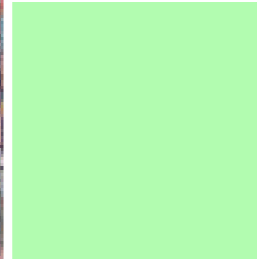
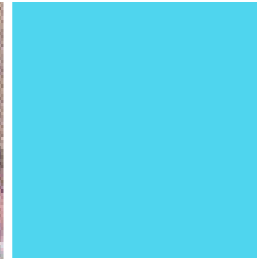
2m Gravel for Stormwater Storage

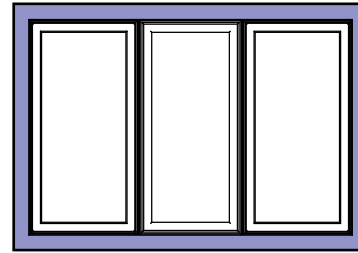
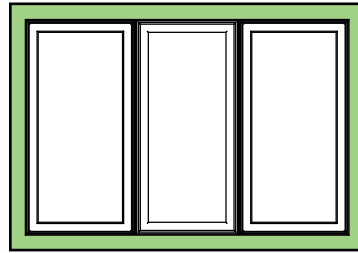
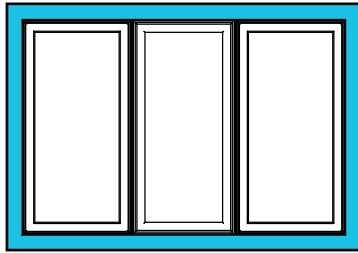
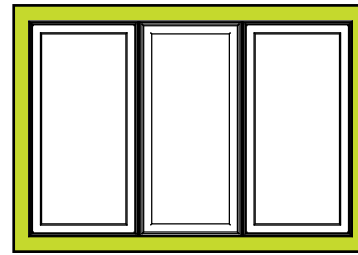
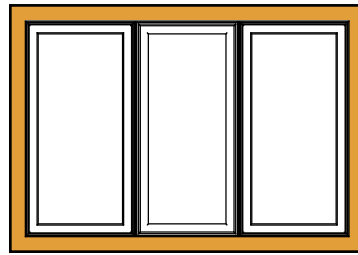
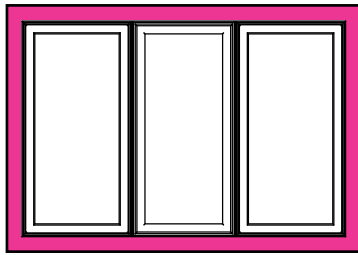
GSHP Tubes





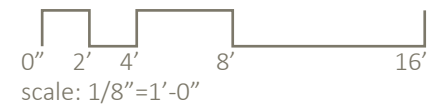


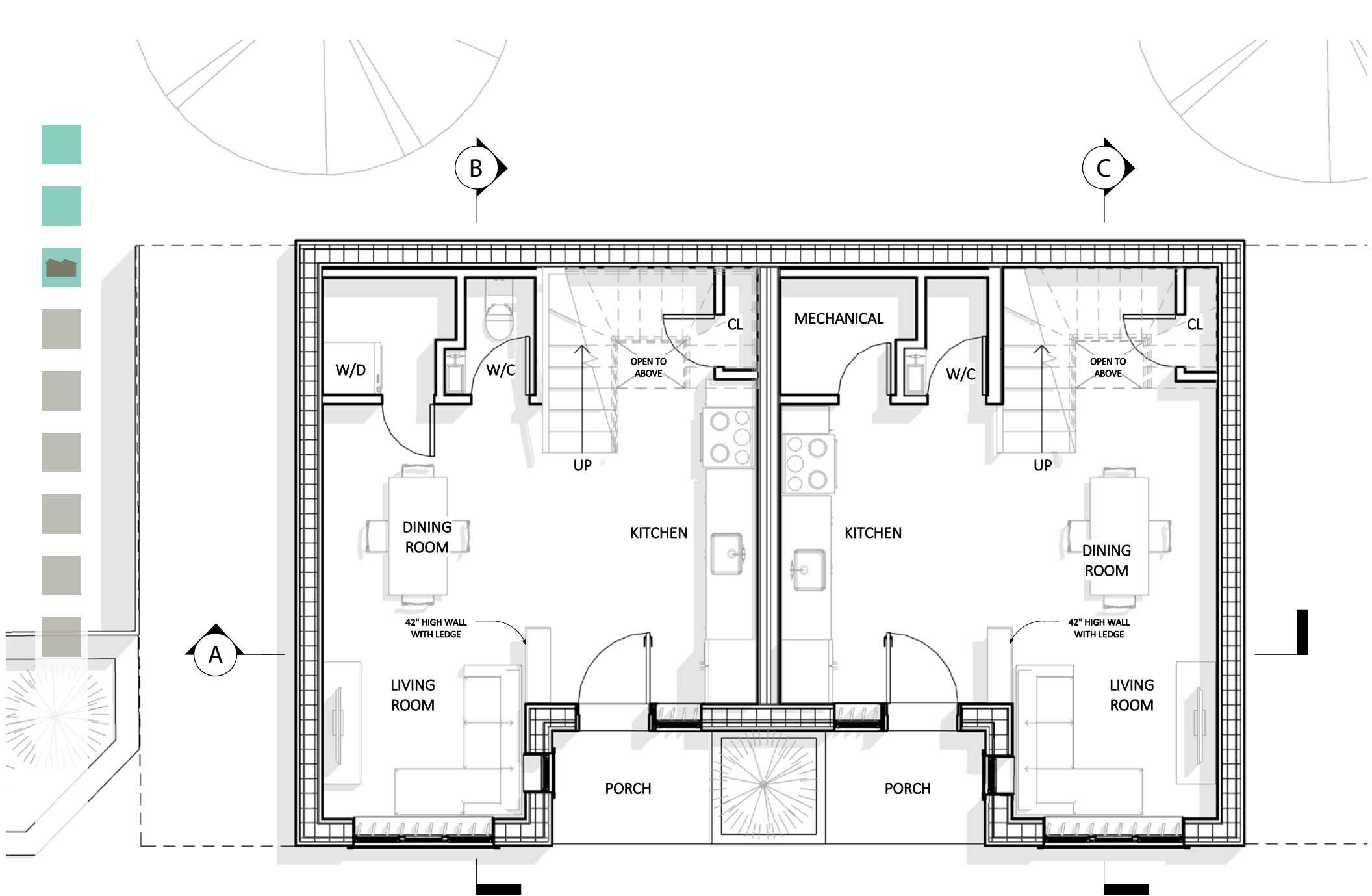




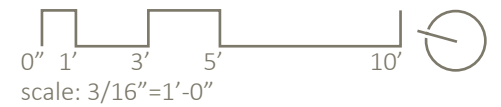


West Elevations

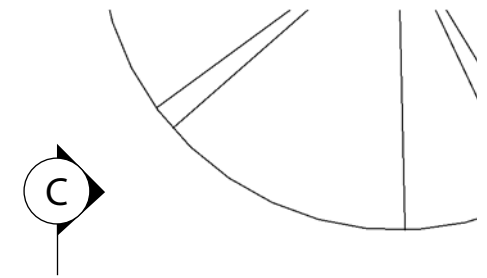
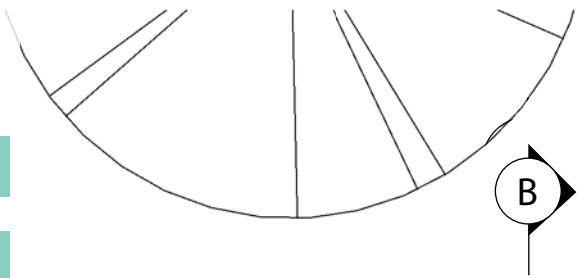




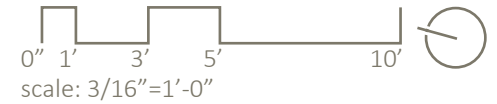
Ground Floor Plan







Second Floor Plan



Section B

Section C

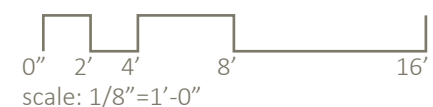


T.O.Roof
24'-0"

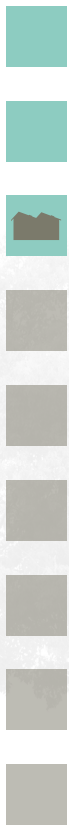
Level 2
9'-4"

Level 1
0'-0"

Grade
-0'-10"

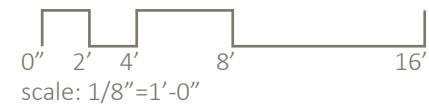


North & South Elevation



North Elevation

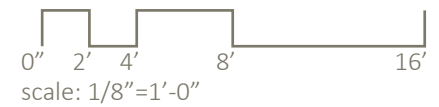
South Elevation







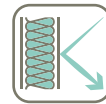
East Elevation



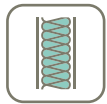
ENVELOPE DURABILITY GOALS



Airtightness



Thermal Bridge Elimination



High Thermal Insulation



Durability



Bulk Water Shedding

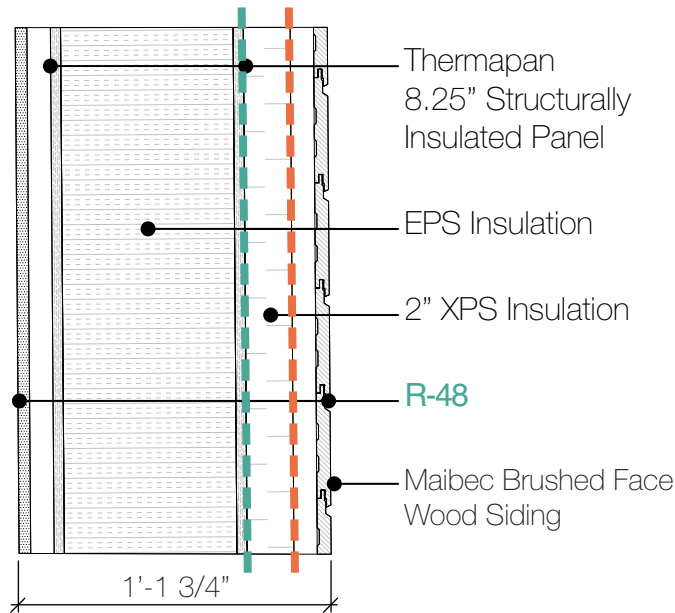


Constructability



Drying Potential

ENVELOPE DURABILITY ANALYSIS



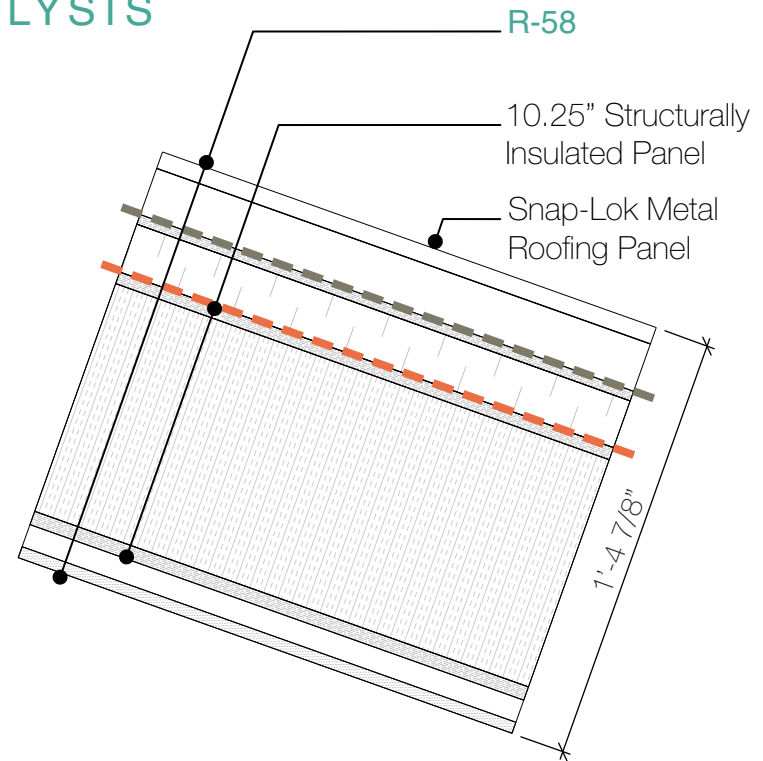
1. Wall Assembly (Exterior to Interior)

- Maibec Wood Cladding
- 1" Air Space (1"x 3" Furring strips)
- 2" XPS Insulation
- Joints taped with Mastic Tape (Air barrier)
- Vapor Retarder
- 8.25" Structurally Insulated Panel (SIP)
- SIP Joints sealed with Mastik tape
- 1" Furring Strip
- 1/2" Gypsum
- Low-VOC Paint

--- Air Barrier

--- Vapor Retarder

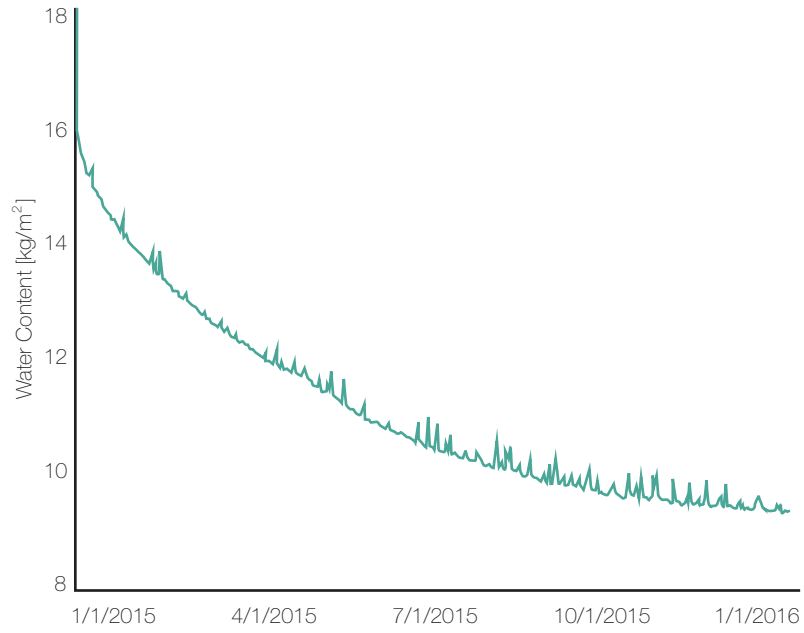
--- Waterproofing Membrane



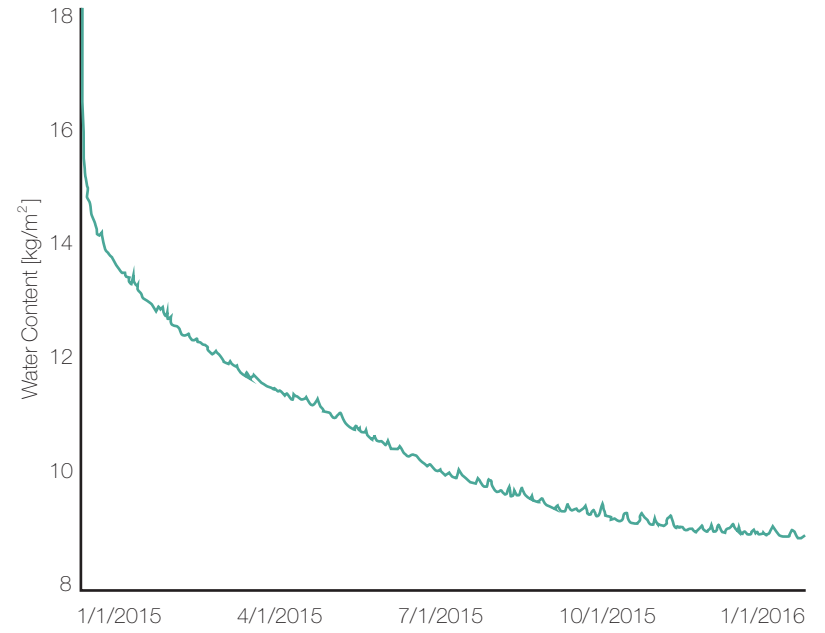
2. Roof Assembly (Exterior to Interior)

- 3/4" Snap-Lok Metal Roofing Panel (26 Gauge)
- 2" Vented Cavity (2"x 4" wood furring)
- Self Adhered Water Proofing Membrane Blue Skin VP100
- 1/2" OSB
- 2" XPS Insulation
- Continuous Tyvek Air Barrier
- SIP Joints sealed with Mastik tape
- 10.25" Structurally Insulated Panel (SIP)
- 1" Furring Strip
- 1/2" Gypsum
- Low-VOC Paint

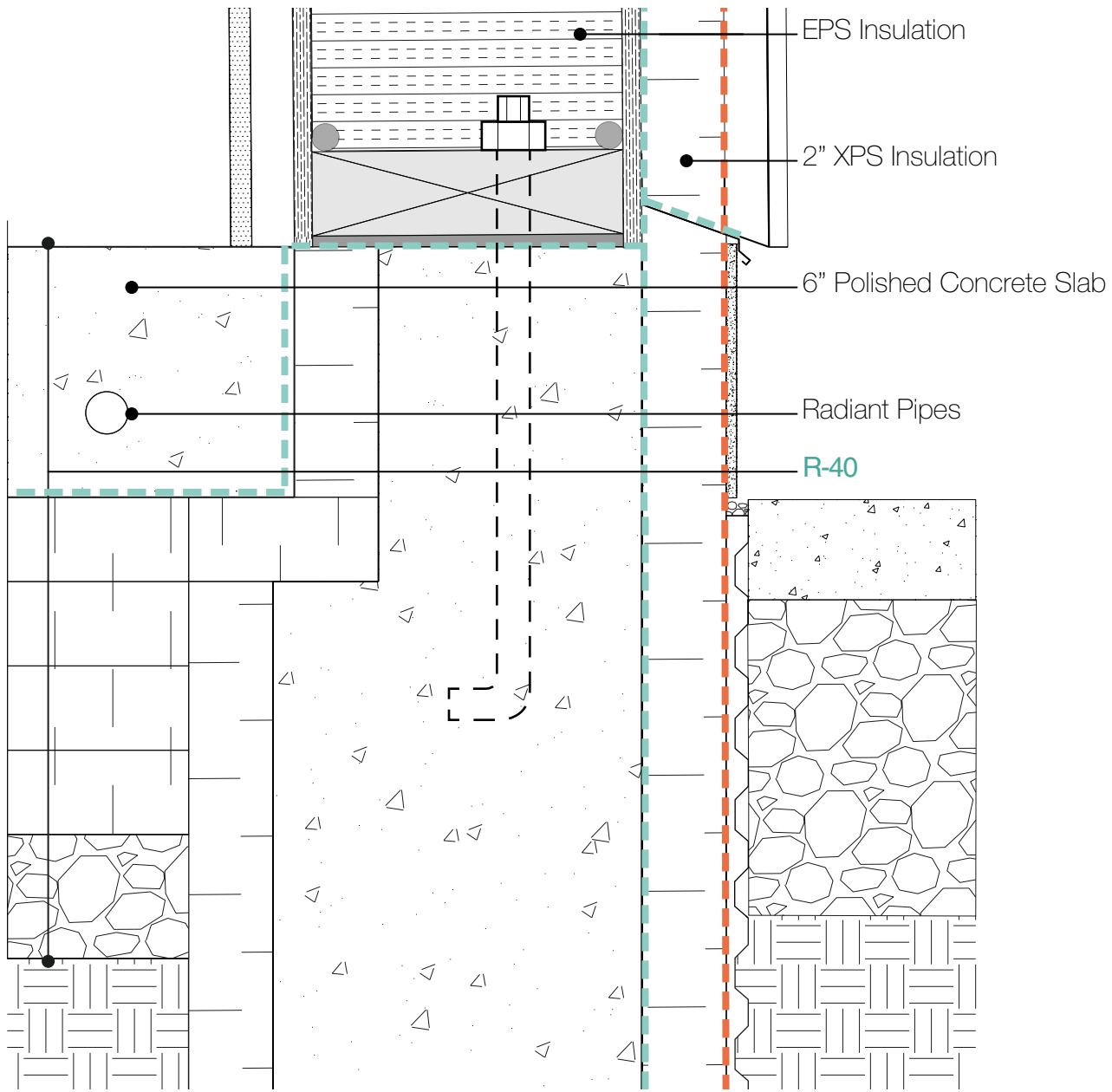
Hygrothermal Analysis - Wall and Roof Assemblies



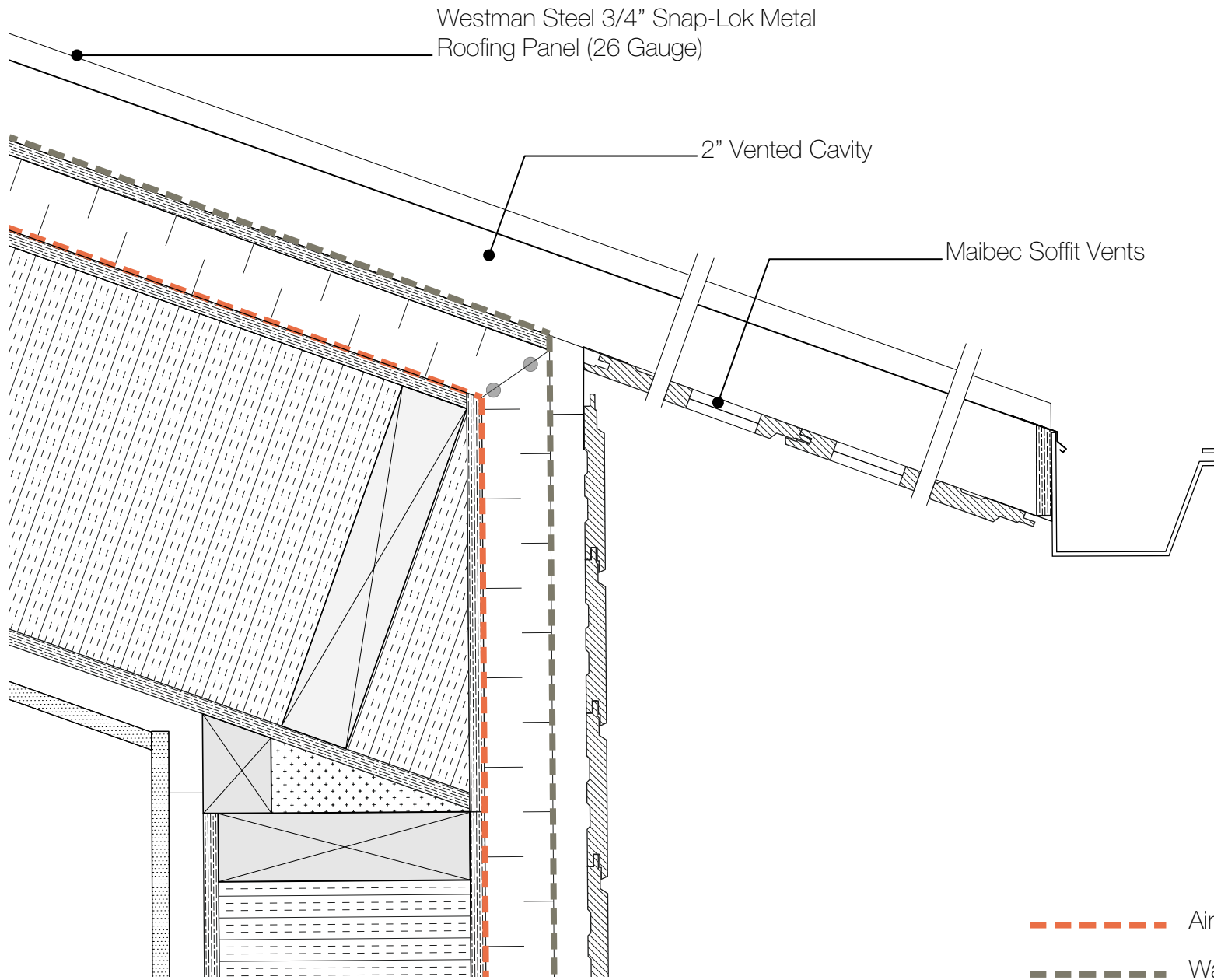
Total Water Content in Wall

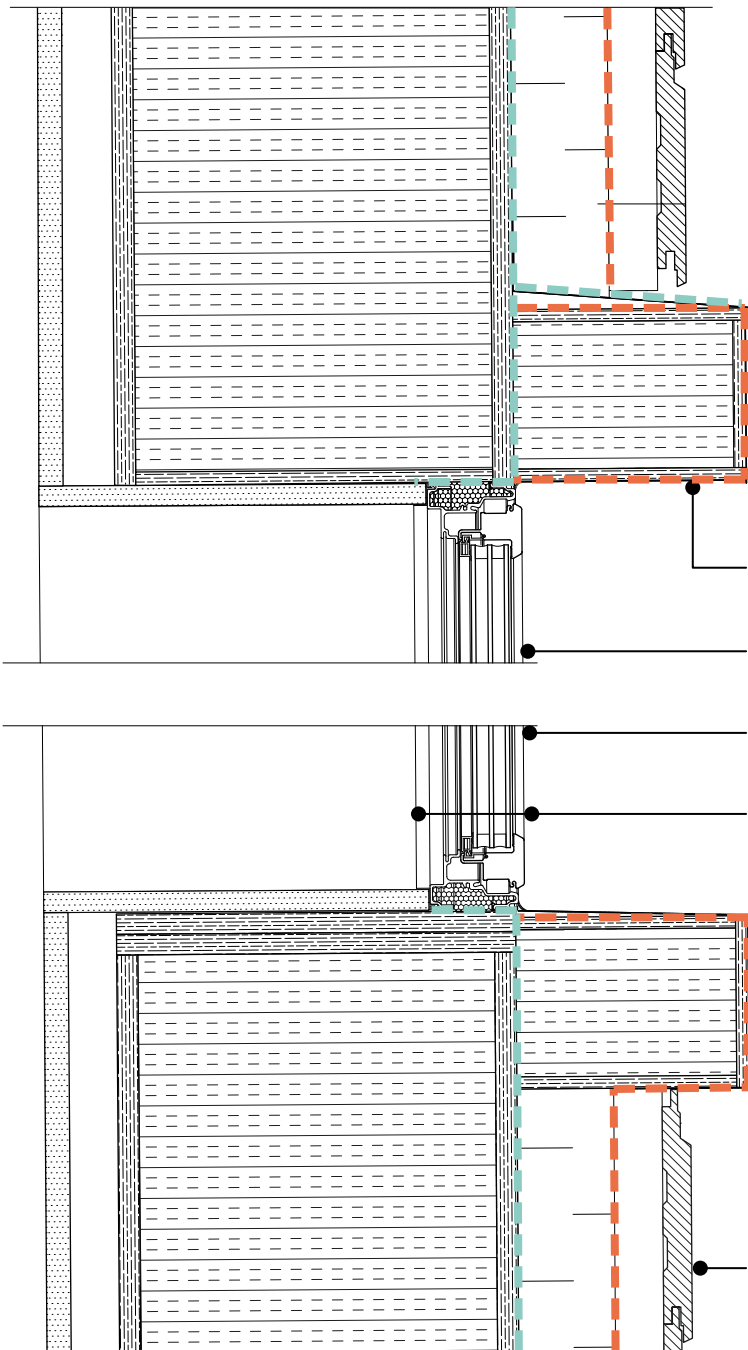


Total Water Content in Roof



- Air Barrier
- Vapor Retarder





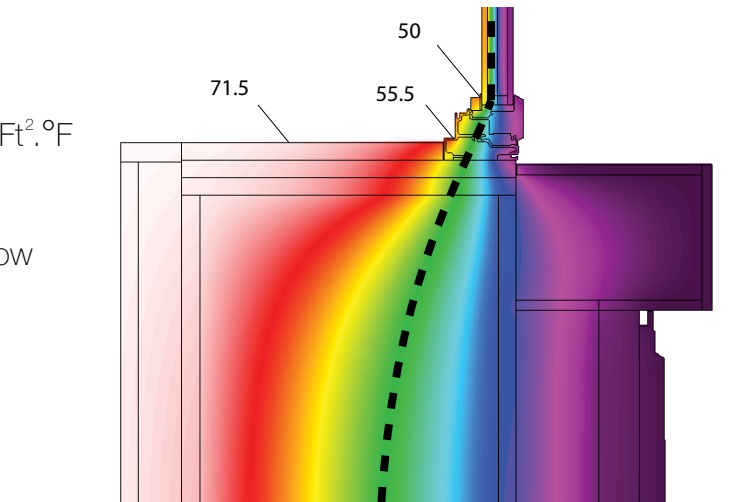
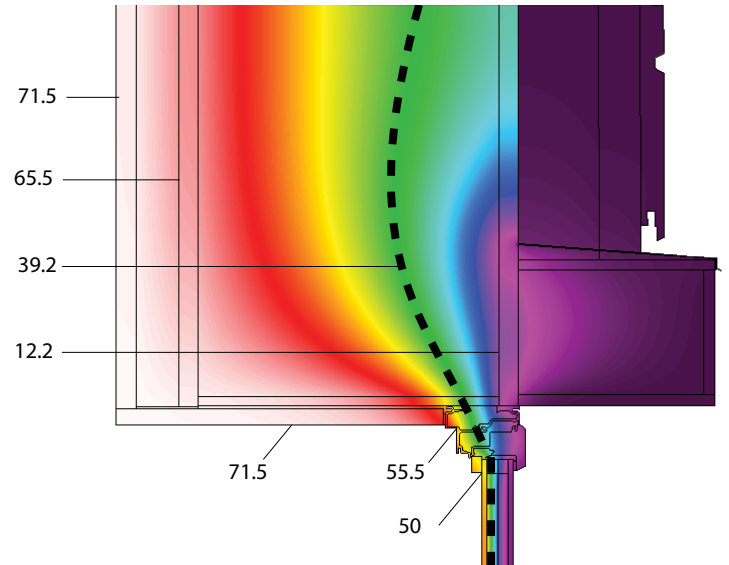
Blue Powder Coated Steel Window Frame

SHGC 0.37

U-Value 0.17 BTU/hr.Ft².°F

Inline Fibreglass Triple Pane Casement Window

Maibec Brushed Face Wood Siding

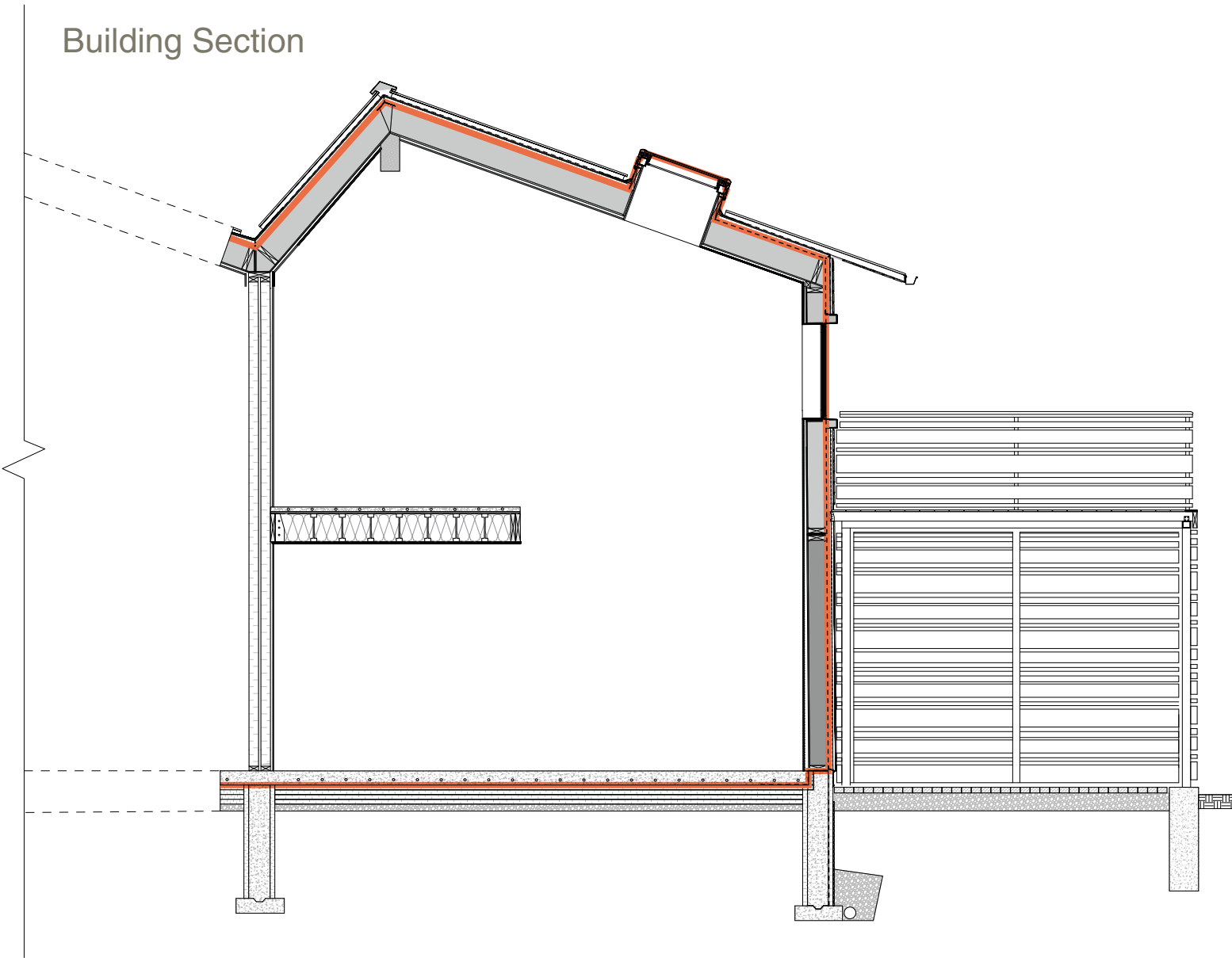


--- Air Barrier

--- Vapor Retarder

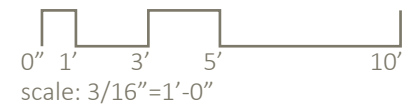


Building Section



— Air Barrier

Building Section A



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

INDOOR AIR QUALITY GOALS



Minimize Noise



High Incoming Air Quality

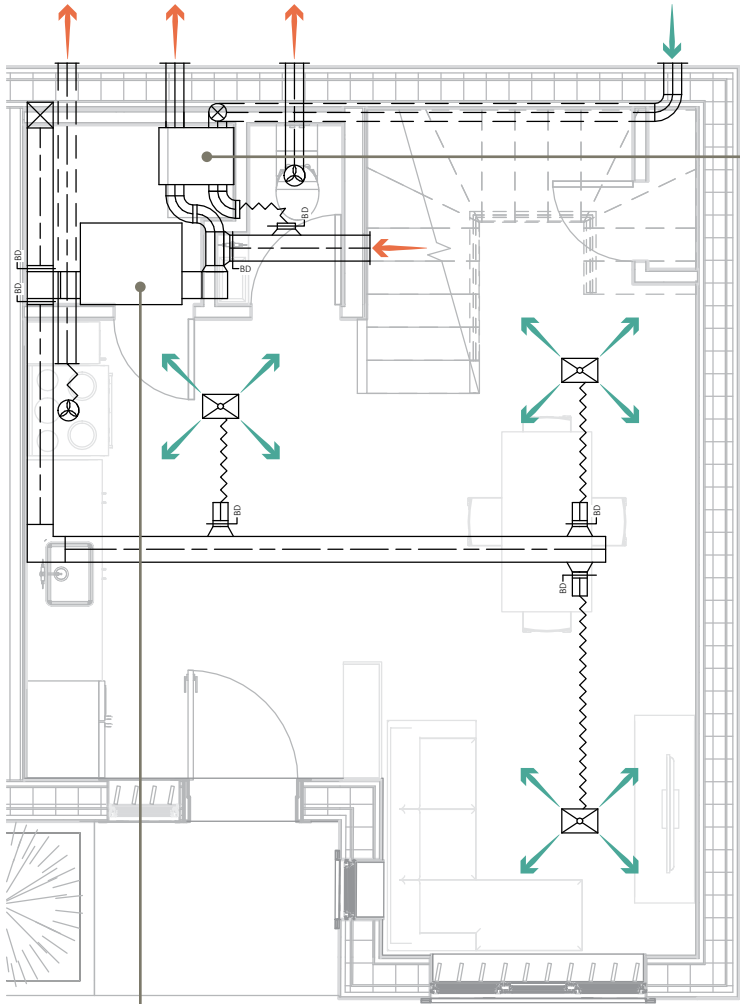


Low VOC Materials Wherever Possible



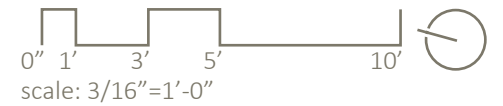
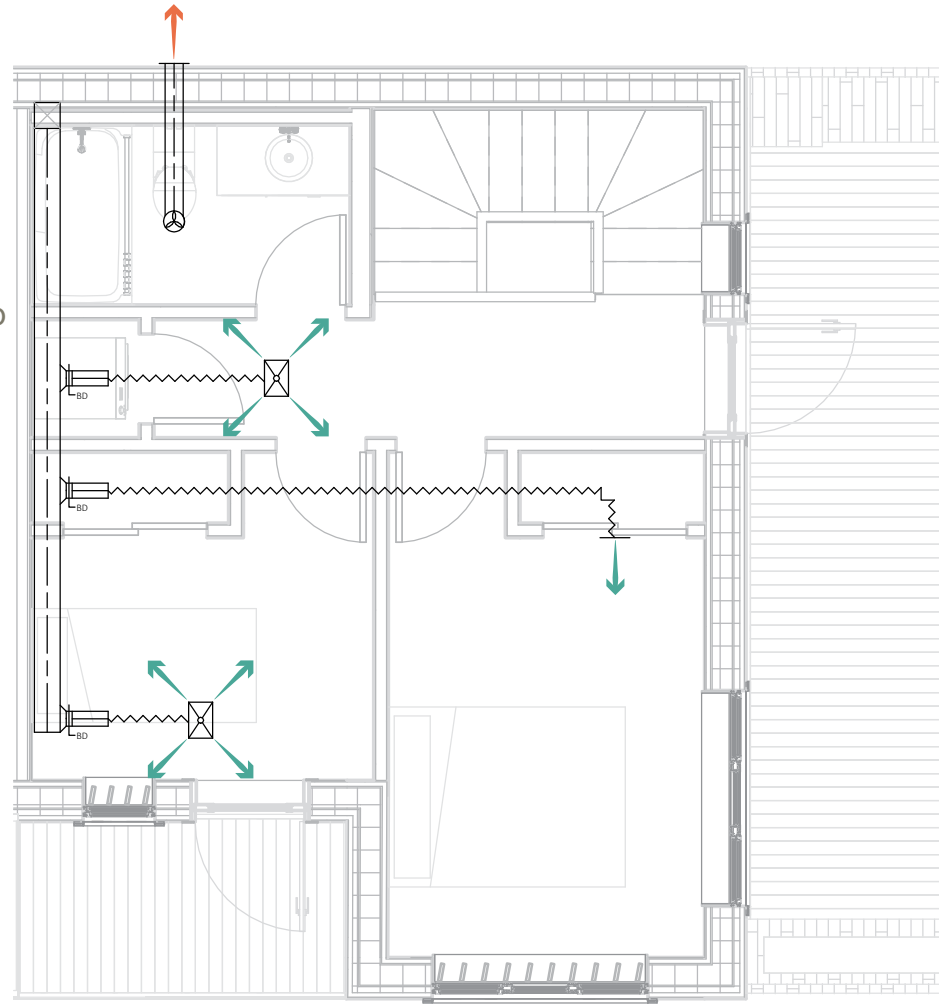
Humidity Control

HVAC Plans



Ultimate Air
RecoupAerator
200DX ERV
30-200 cfm
MERV 12 filter to
1.8 Microns

UniTrane 06 Horizontal Concealed Fan-Coil
Output of 4.1 kW Cooling



SPACE CONDITIONING DESIGN GOALS



Avoid the Use of Fossil Fuels



Exploit the Heat of the Earth

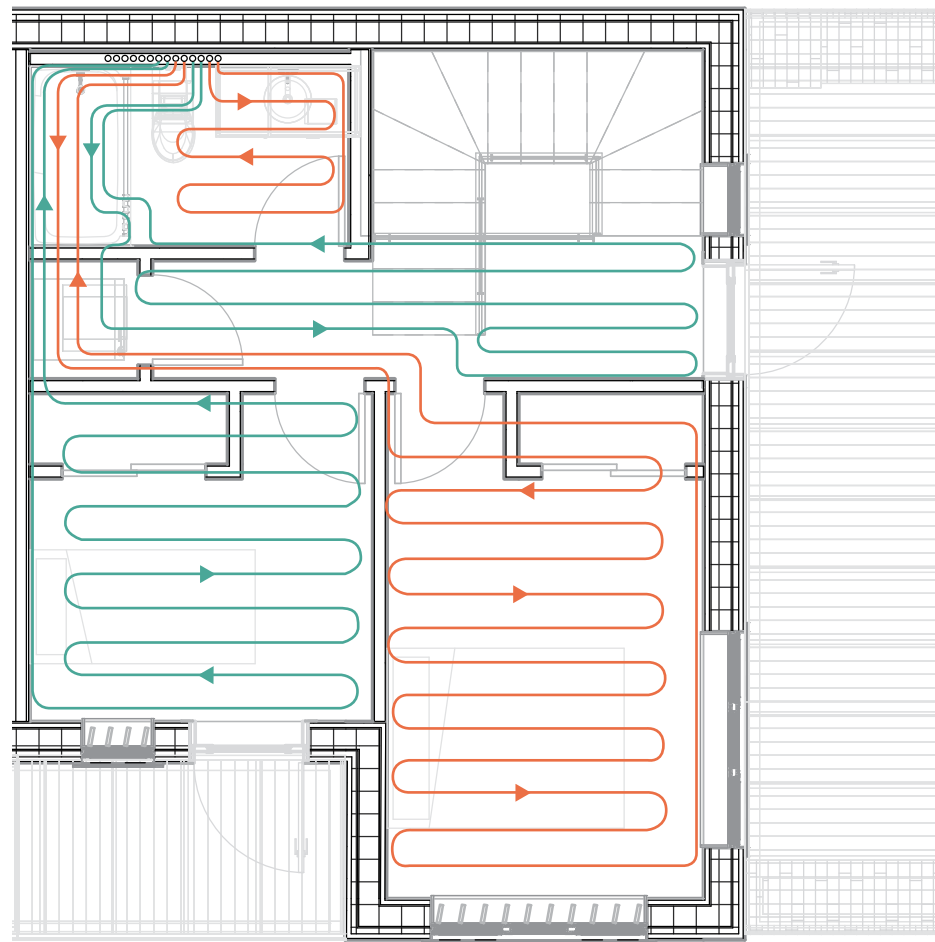
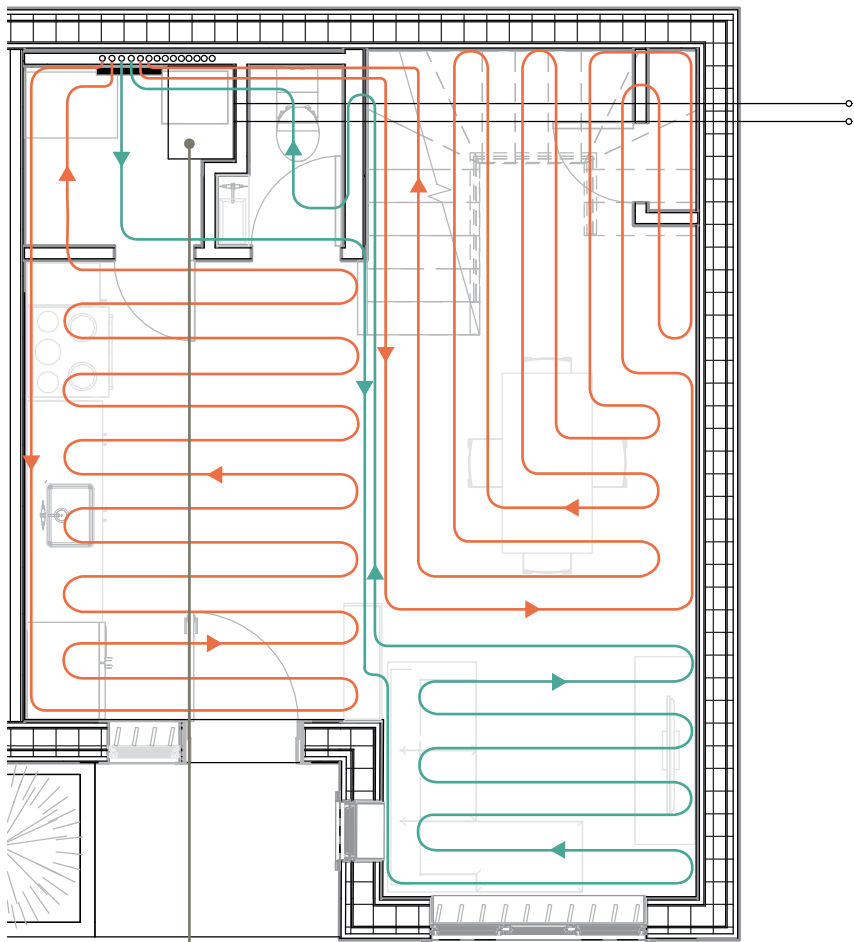


Efficient Distribution

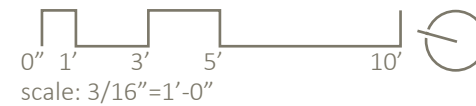


Minimize Heat Loss from Exhaust

Radiant Floor Plans



Trane T1GW 018 Ground Source Heat Pump
Output of 5 kW



UTILITIES GOALS

Hot Water Goals



Minimize Standing Water Losses



Avoid the Use of Fossil Fuels



Use a Core System

Electrical/Lighting Goals



Ambient Lighting Both Indoors and Outdoors

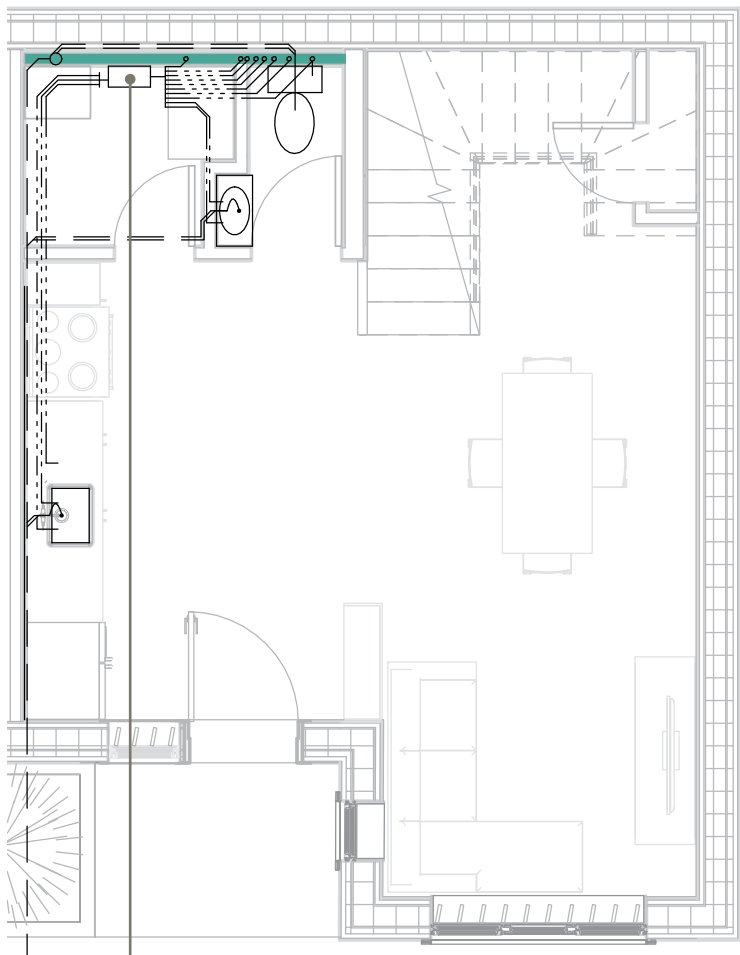


Task Lighting Where Needed

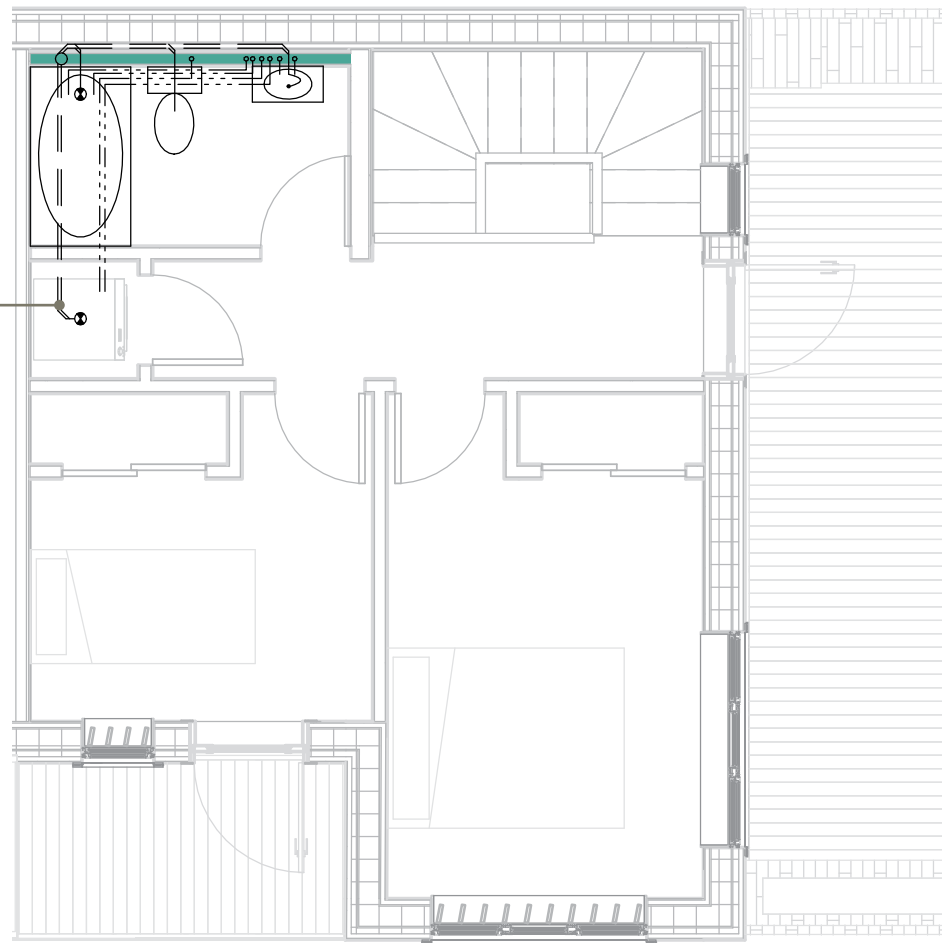


Master Switch at entryway

Plumbing Plans



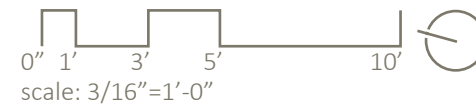
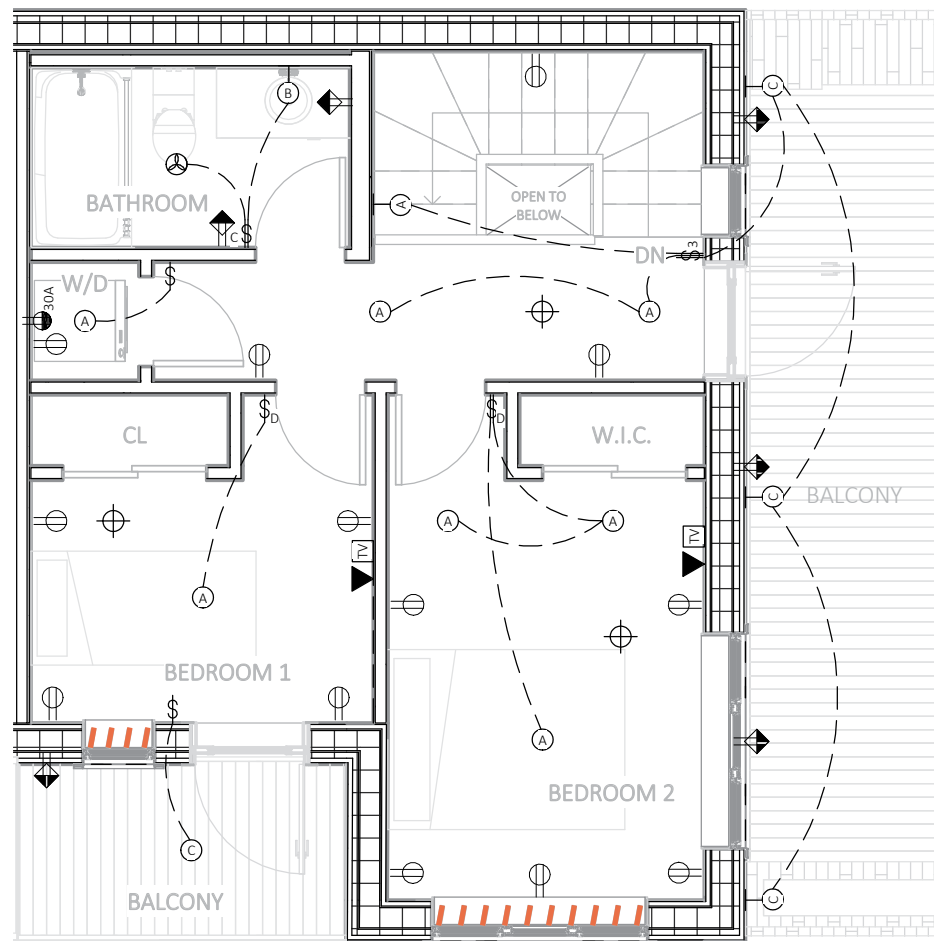
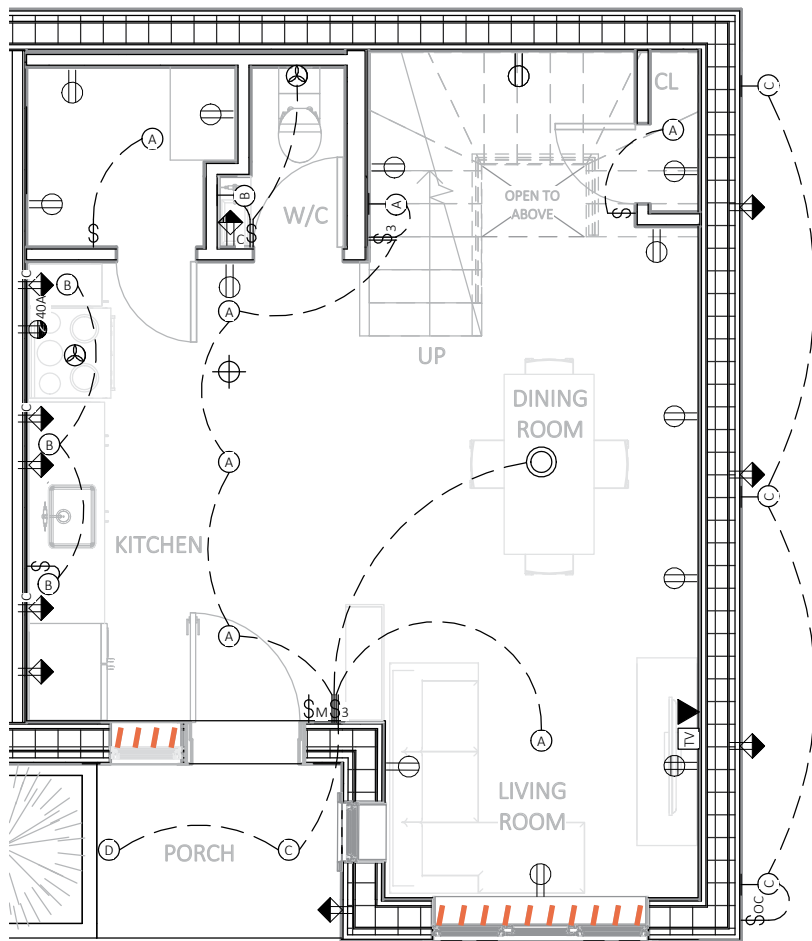
Longest Run
0.19 Gallons



GE Geospring Hybrid Heat Pump/Electric Water Heater
50 Gallon Capacity



Electrical/Lighting Plans



ENERGY GOALS



Window Placement and Shading Devices



Operable Skylight for Natural Ventilation

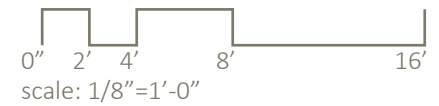
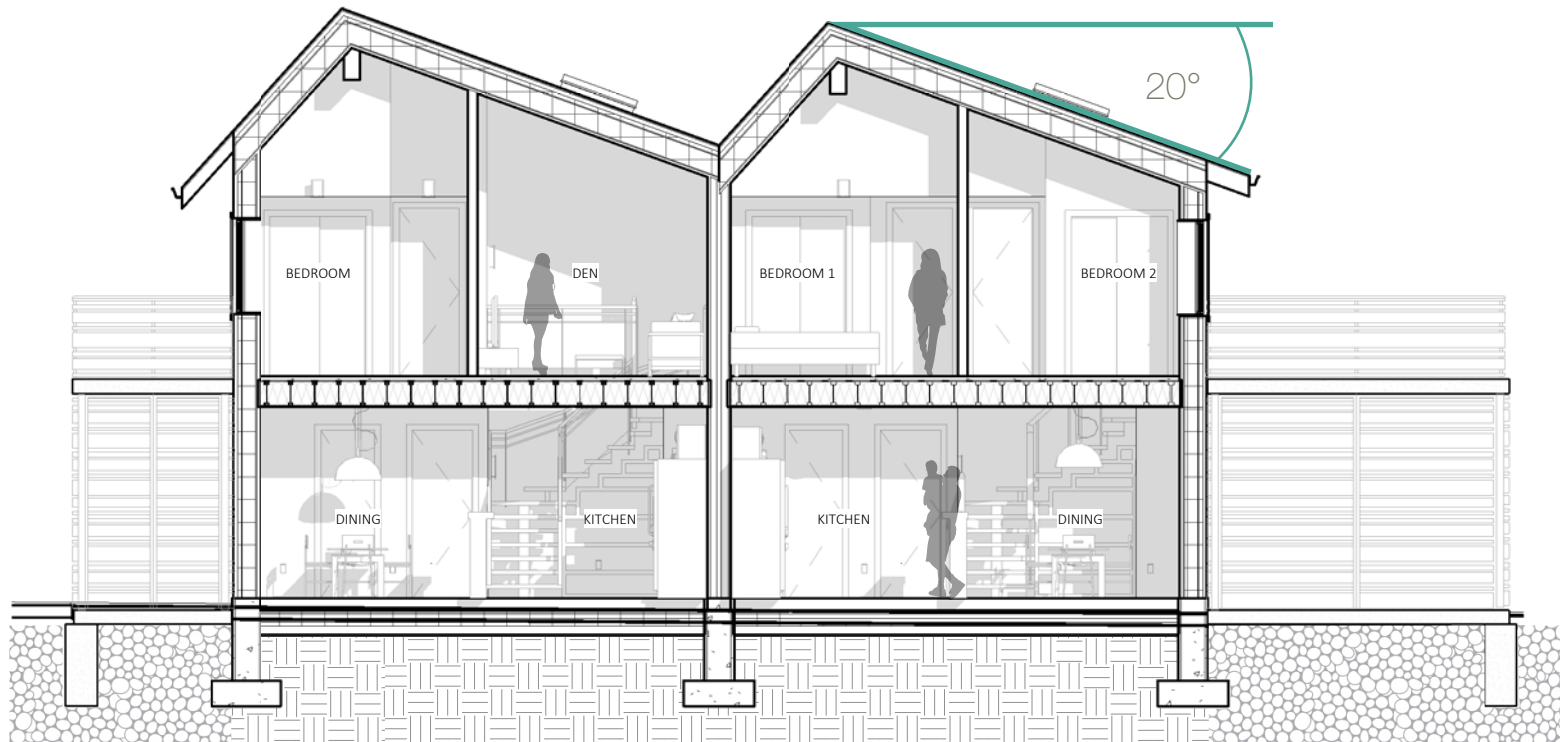


Nighttime Cooling Strategy in Summer



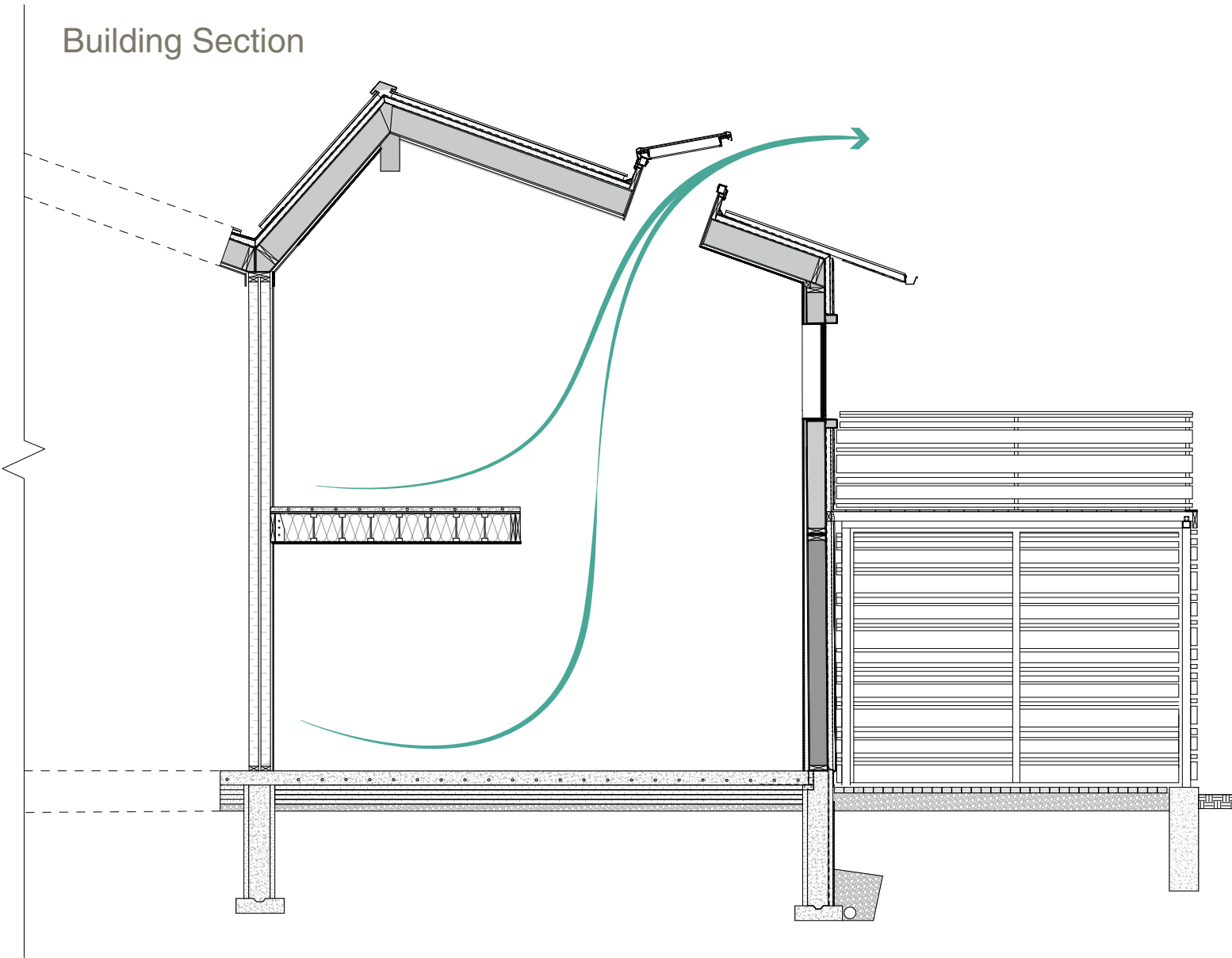
South Sloping Roof for PV

Section A

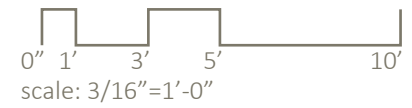




Building Section



Building Section A

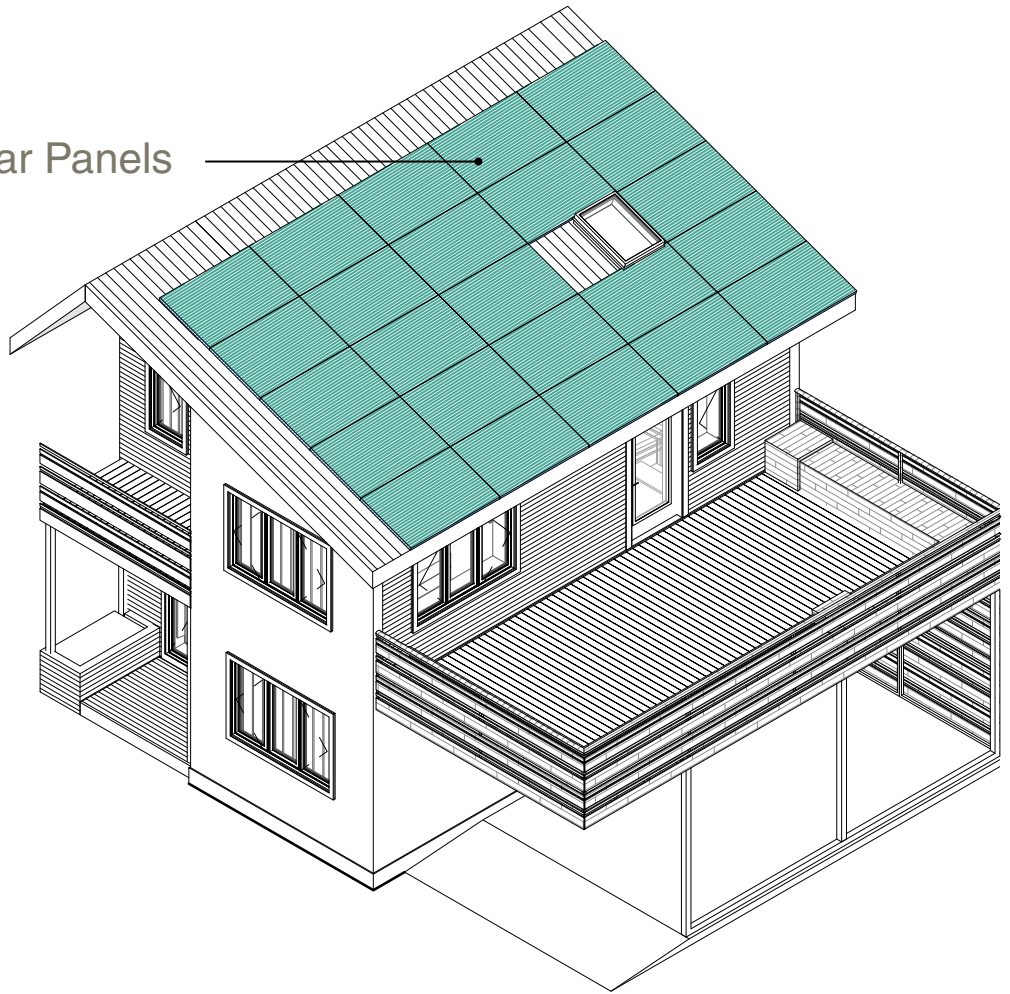




9,421 kWh/yr Energy Harvested via Solar Panels

6,700 kWh/yr Provenance Lane Household Energy Consumption

29,700 kWh/yr Ontario Average Household Energy Consumption





2,667 kWh/yr Heating Load

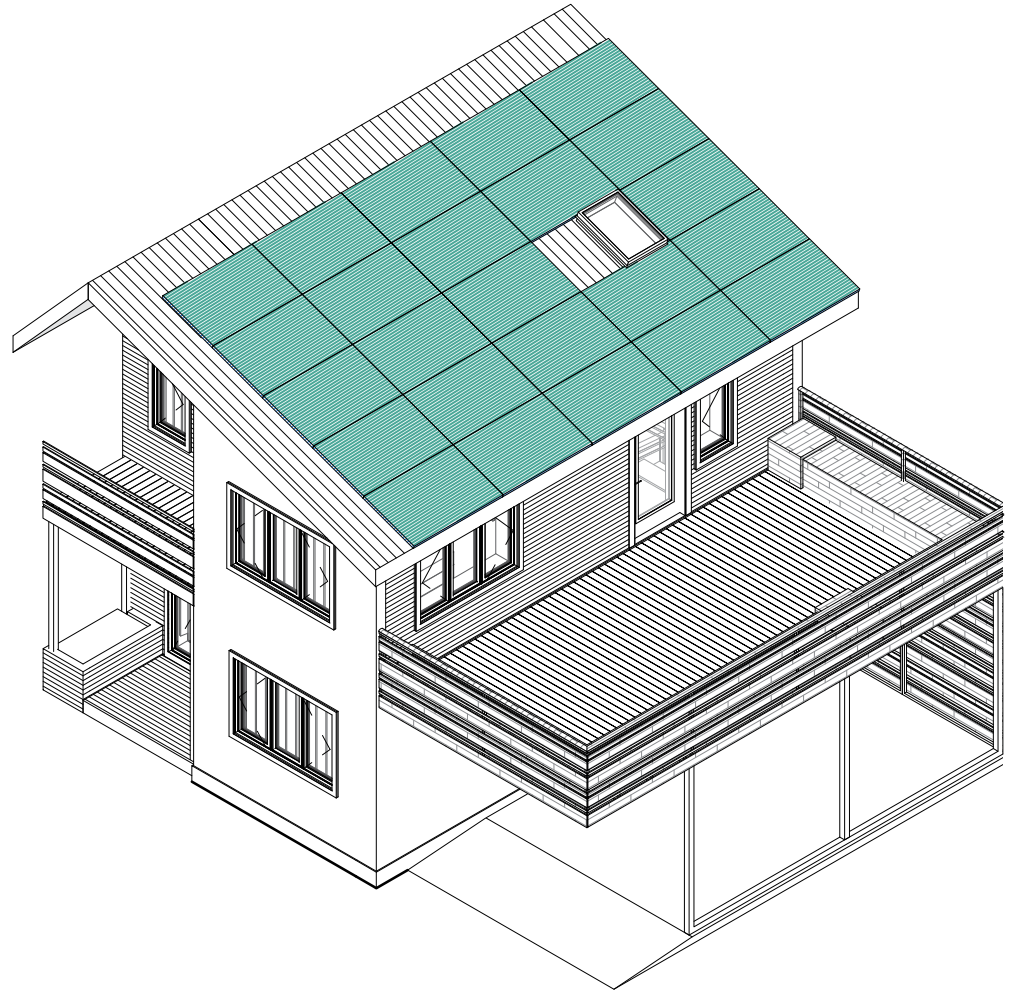
528 kWh/yr Cooling Load

2 kW Peak Heating Load

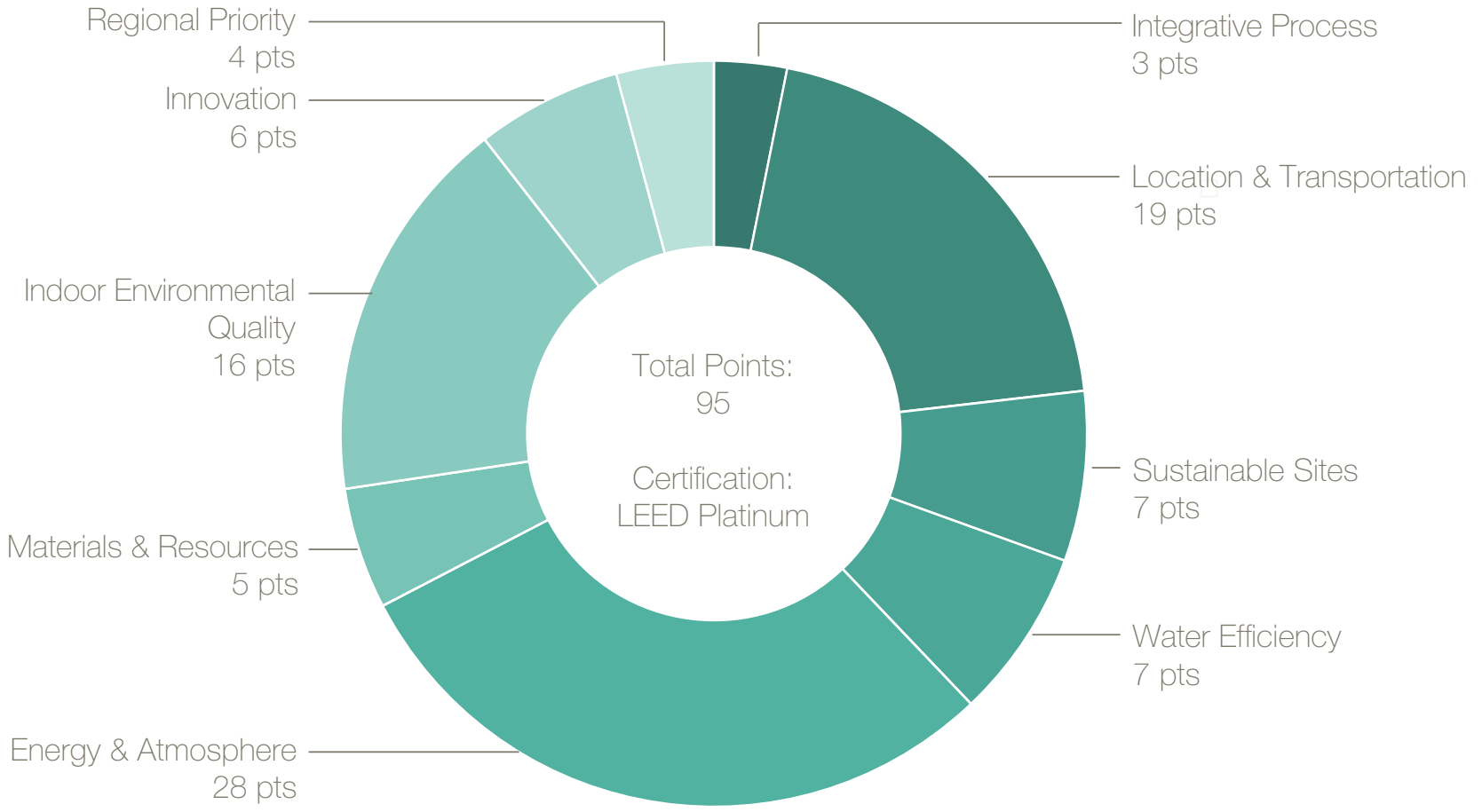
2.2 kW Peak Cooling Load

43 HERS Score

-20 HERS Score [w/Solar Panels]



LEED for Homes v.4





Toronto Housing Market



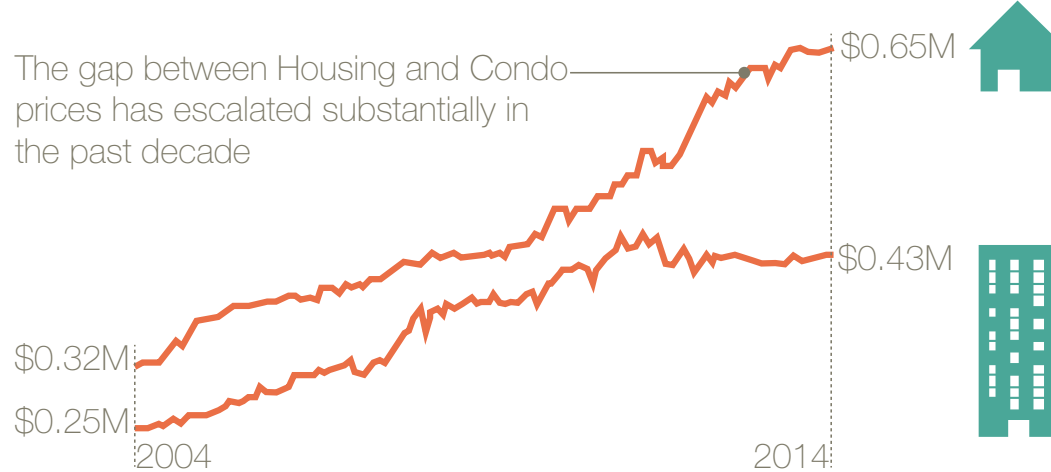
Toronto's housing market is the second most expensive in Canada



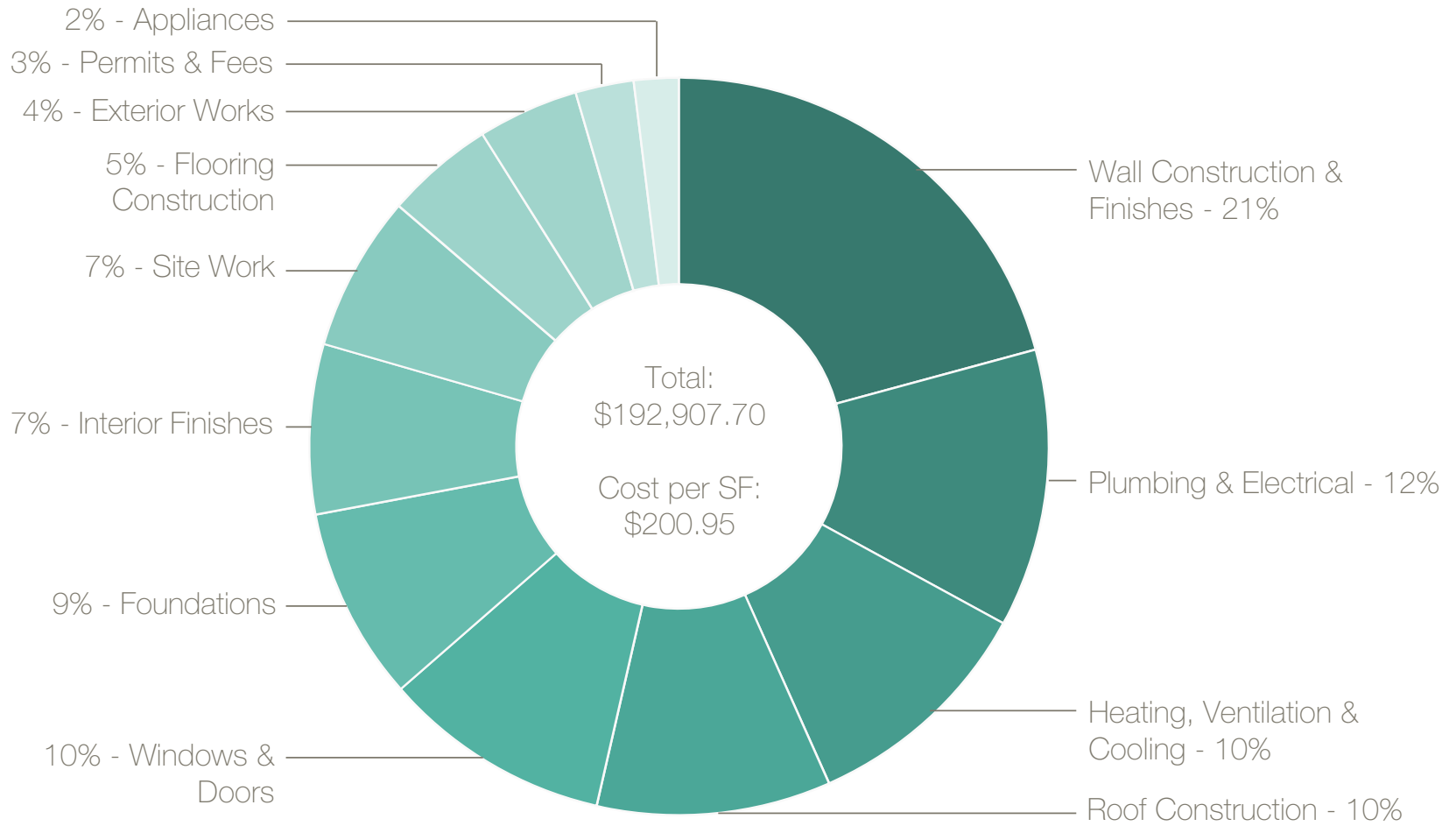
\$657,961

The average price to build a house in Toronto

The gap between Housing and Condo prices has escalated substantially in the past decade



Construction Cost Breakdown



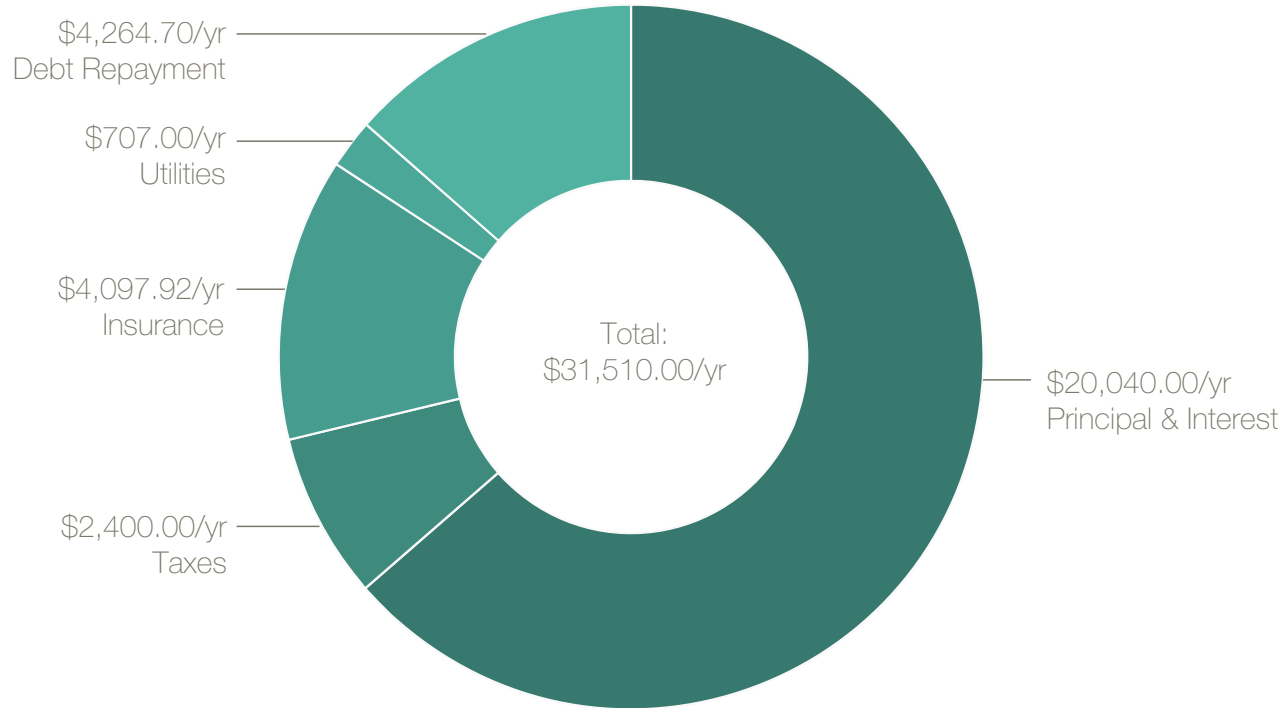
Affordability Analysis

Median Family Income (Toronto) \$85,294.00

Provenance Lane Affordability \$31,510.00/year

Average Household Affordability (38%) \$32,411.72/year

Net Annual Cashflow \$902.10



Financial Conclusions





PROVENANCE LANE

U. S. DEPARTMENT OF ENERGY

