SANDFORD FLEMING FORUM

Structural Resilience - How Building Systems Improve Operational Resilience

BOMA Toronto

RiskLogik

ENTUITIVE

Risk Nexus
Advisory | Expertise | Results

Southern Harbour
FUTURE READY

crci

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

SUSTAINABLE.TO
ARCHITECTURE + BUILDING

Community Sustainability + Resilience = Economic Opportunity

"An Ounce of Prevention is Worth a Pound of Cure"

Paul Dowsett | Principal Architect

CRCI Sandford Fleming Forum

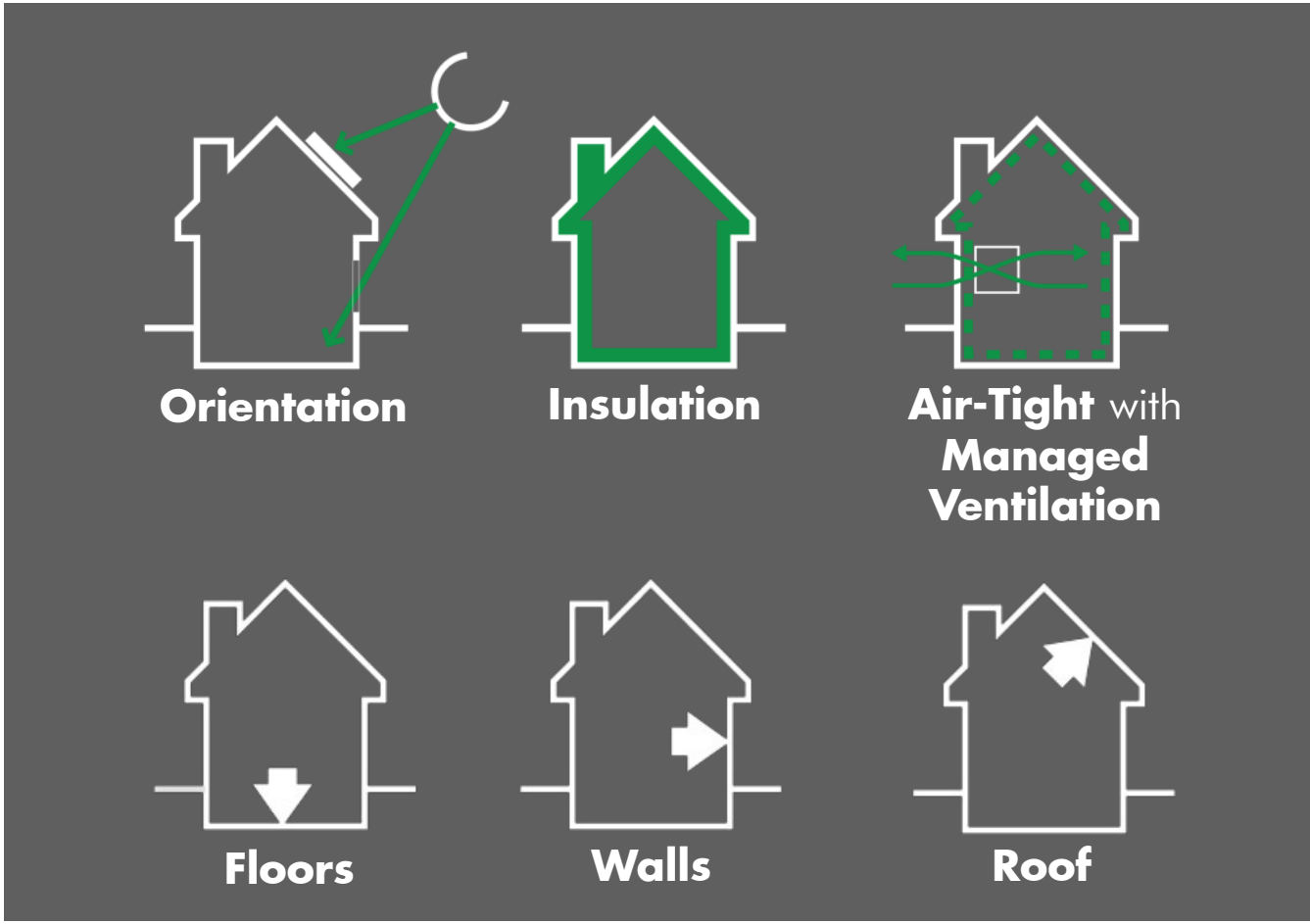
October 13, 2016


PLUMO

PASSIVE HOUSE PRINCIPLES

Three issues.

Three locations.



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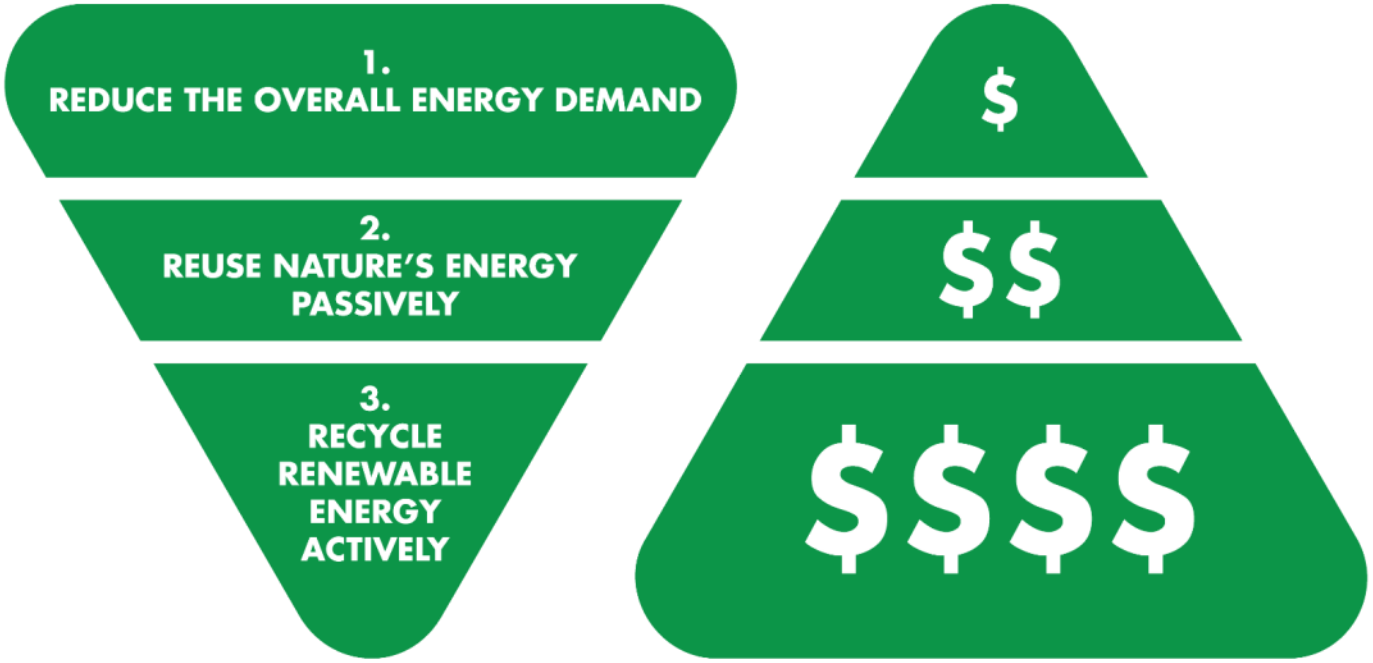
SUSTAINABLE.TO Ethos



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STAYING AHEAD OF
THE ENERGY CURVE

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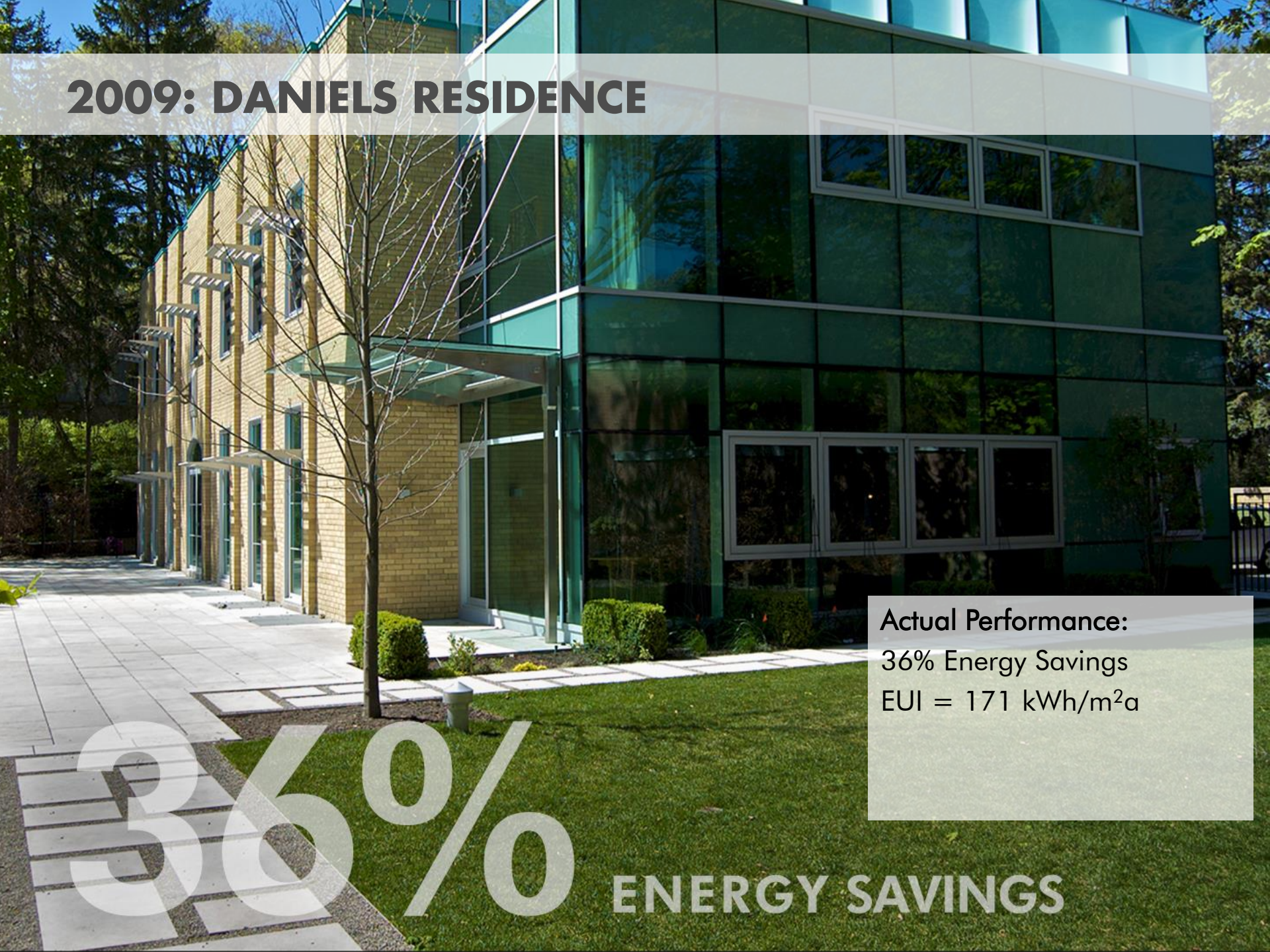
2009: DANIELS RESIDENCE

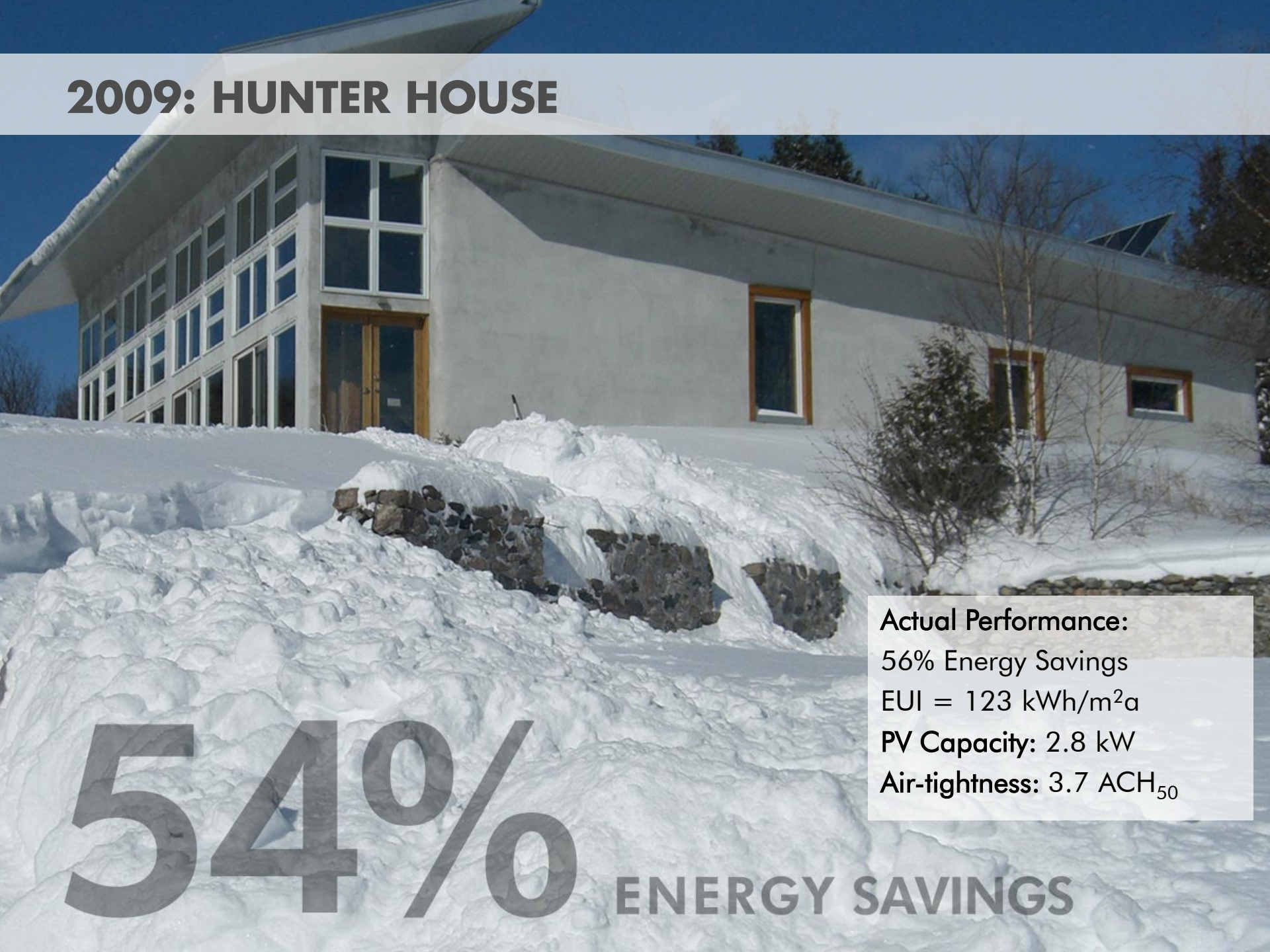


Actual Performance:

36% Energy Savings

EUI = 171 kWh/m^{2}a

2009: HUNTER HOUSE



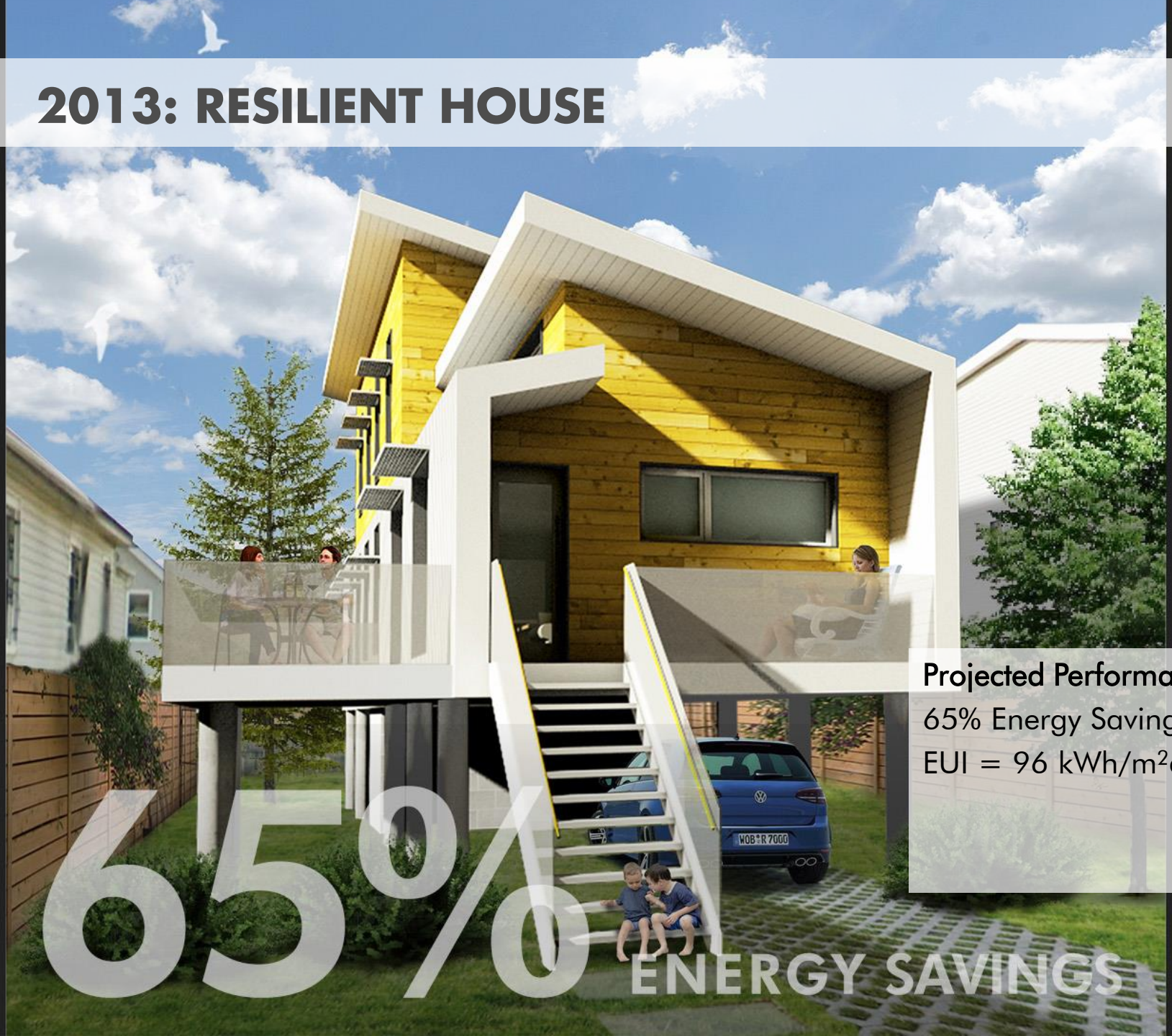
Actual Performance:
56% Energy Savings
EUI = 123 kWh/m²a
PV Capacity: 2.8 kW
Air-tightness: 3.7 ACH_{50}

54% ENERGY SAVINGS

2013: QUEEN VICTORIA

Actual Performance:
37% Energy Savings
EUI = 176 kWh/m²a
PV Capacity: 5 kW
Air-tightness: 5.5 ACH_{50}

2013: RESILIENT HOUSE



Projected Performance:

65% Energy Savings

EUI = 96 kWh/m^{2}a

2013: LANEWAY HOUSE

Actual Performance:
50% Energy Savings
EUI = 139 kWh/m²a

Air-tightness: 2.5 ACH_{50}

50% ENERGY SAVINGS

2016: RISEBROUGH RESIDENCE

Projected Performance:
80% Energy Savings
EUI = 56 kWh/m^{2}a
Heating Load = 15.6 W/m^2
Air-tightness: 1.7 ACH_{50}

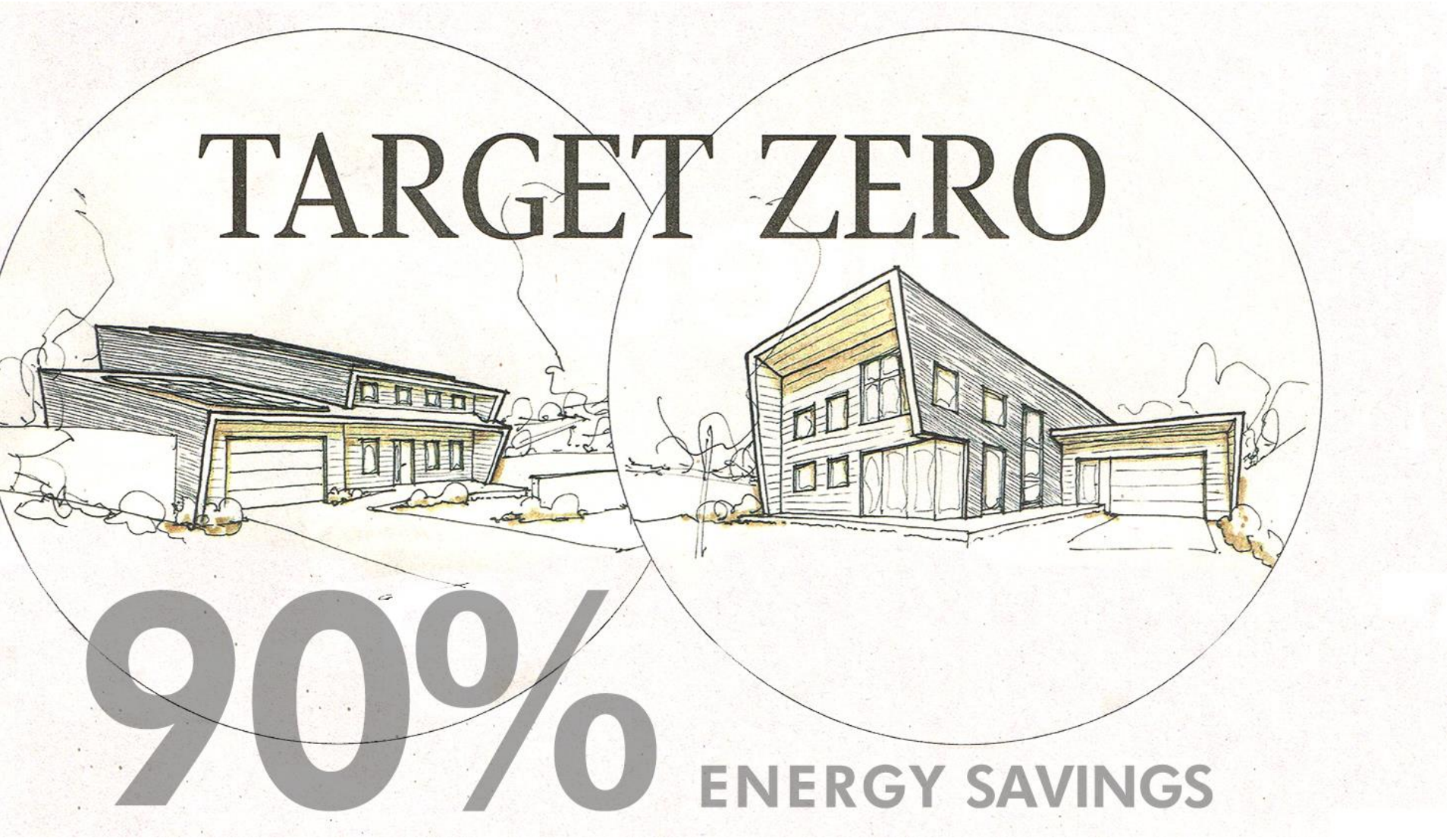
2016: CARLAW

Projected Performance:
83% Energy Savings
EUI = 50 kWh/m²a

Air-tightness: 1.5 ACH_{50}

83% ENERGY SAVINGS

2018: CHURCHILL AVENUE



THE TORONTO METHOD

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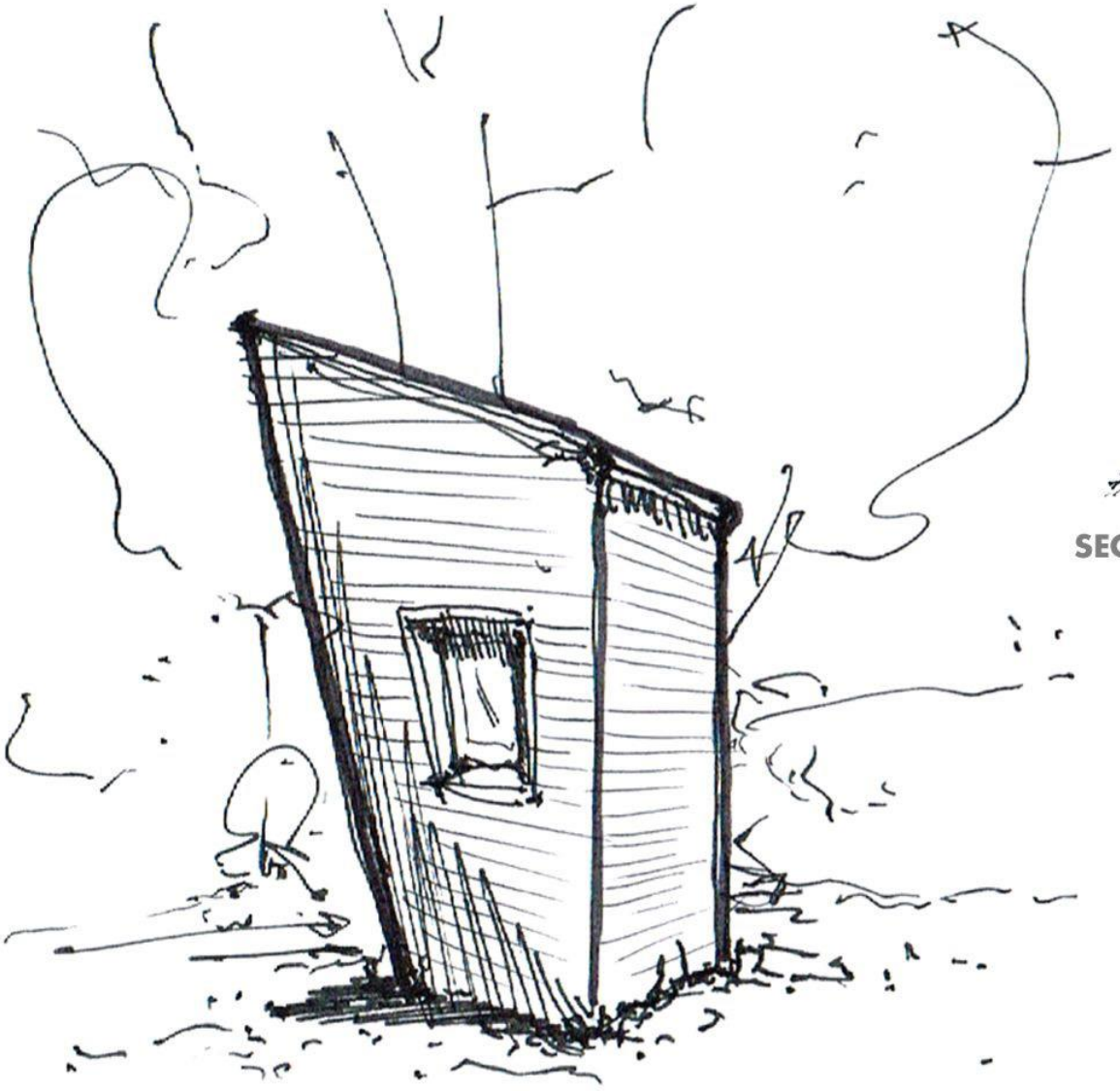
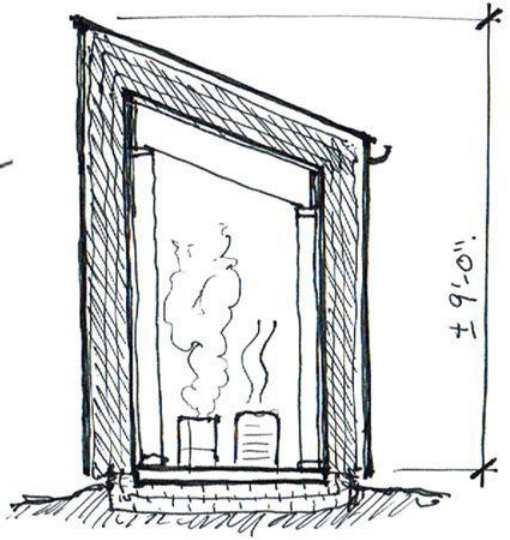
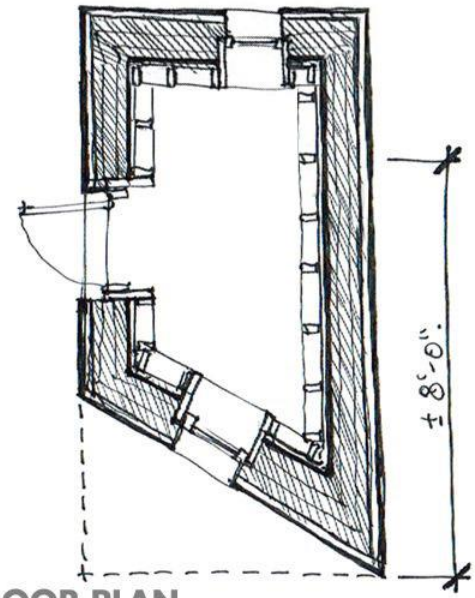


PERSPECTIVE



SECTION



FLOOR PLAN

WHY ROCK WOOL?

- Health
- Hygrothermal performance
- Recycled content
- Durability
- Fire
- Acoustics

We want walls that can DRY to both sides

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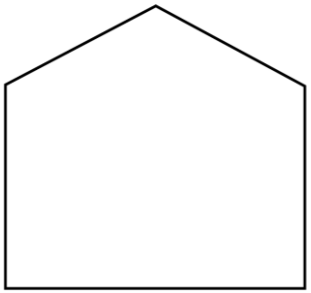
PROJECT GOALS



PROTECTED INTERNAL
STRUCTURE

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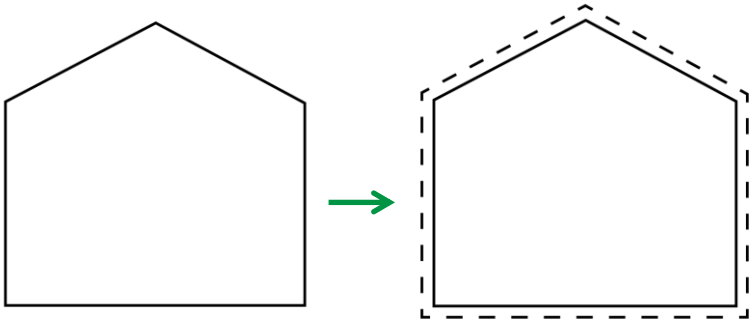
PROJECT GOALS



PROTECTED INTERNAL STRUCTURE

ONE CONTINUOUS MEMBRANE

[air, weather, vapour]

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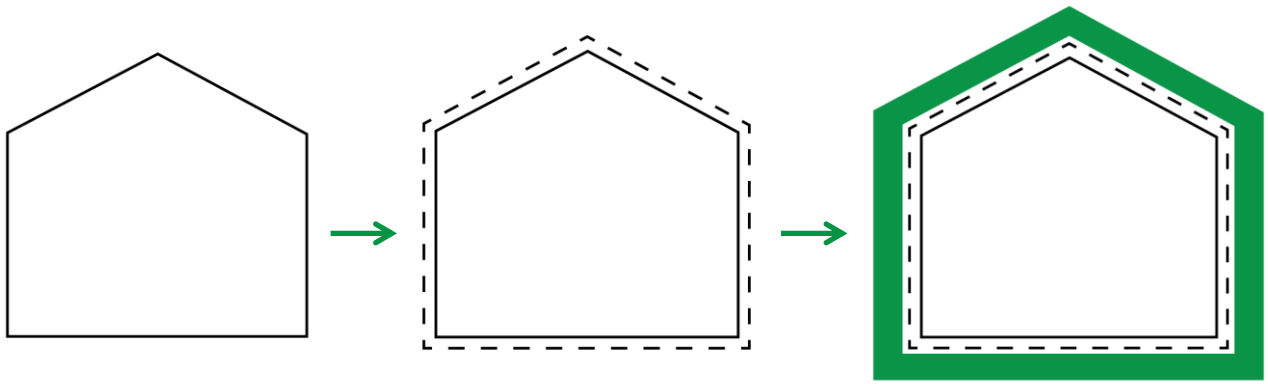
PROJECT GOALS



PROTECTED INTERNAL STRUCTURE

ONE CONTINUOUS MEMBRANE

[air, weather, vapour]

CONTINUOUS THERMAL **BLANKET**

[thermal bridge free]

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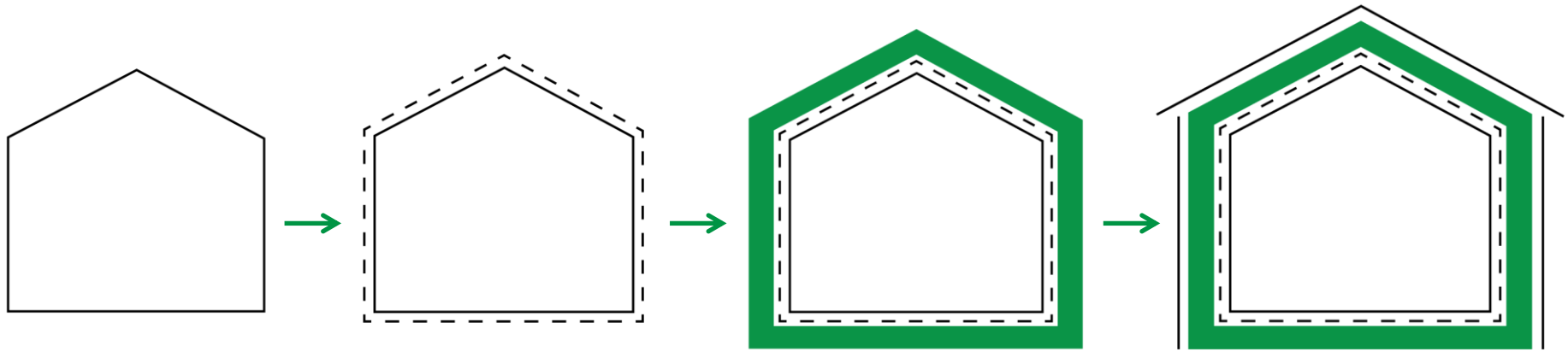
PROJECT GOALS



PROTECTED INTERNAL STRUCTURE

ONE CONTINUOUS MEMBRANE

[air, weather, vapour]

CONTINUOUS THERMAL **BLANKET**

[thermal bridge free]

LIGHTWEIGHT **RAINSCREEN** CLADDING

[vented]

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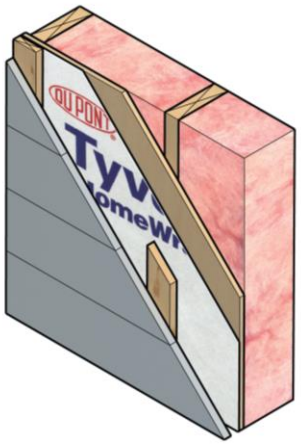
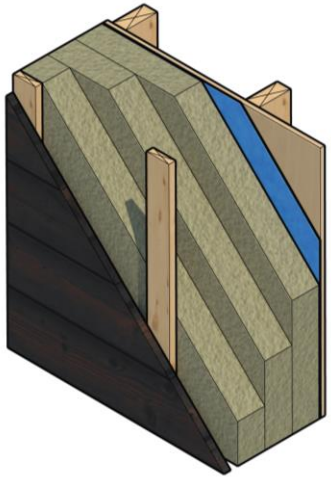
CODE-MINIMUM vs. METHOD.TO



Code-Minimum Wall

Nominal R-value: R-24
Effective R-value: R-18.7



Toronto Method Wall

Nominal R-value: R-24
Effective R-value: R-24

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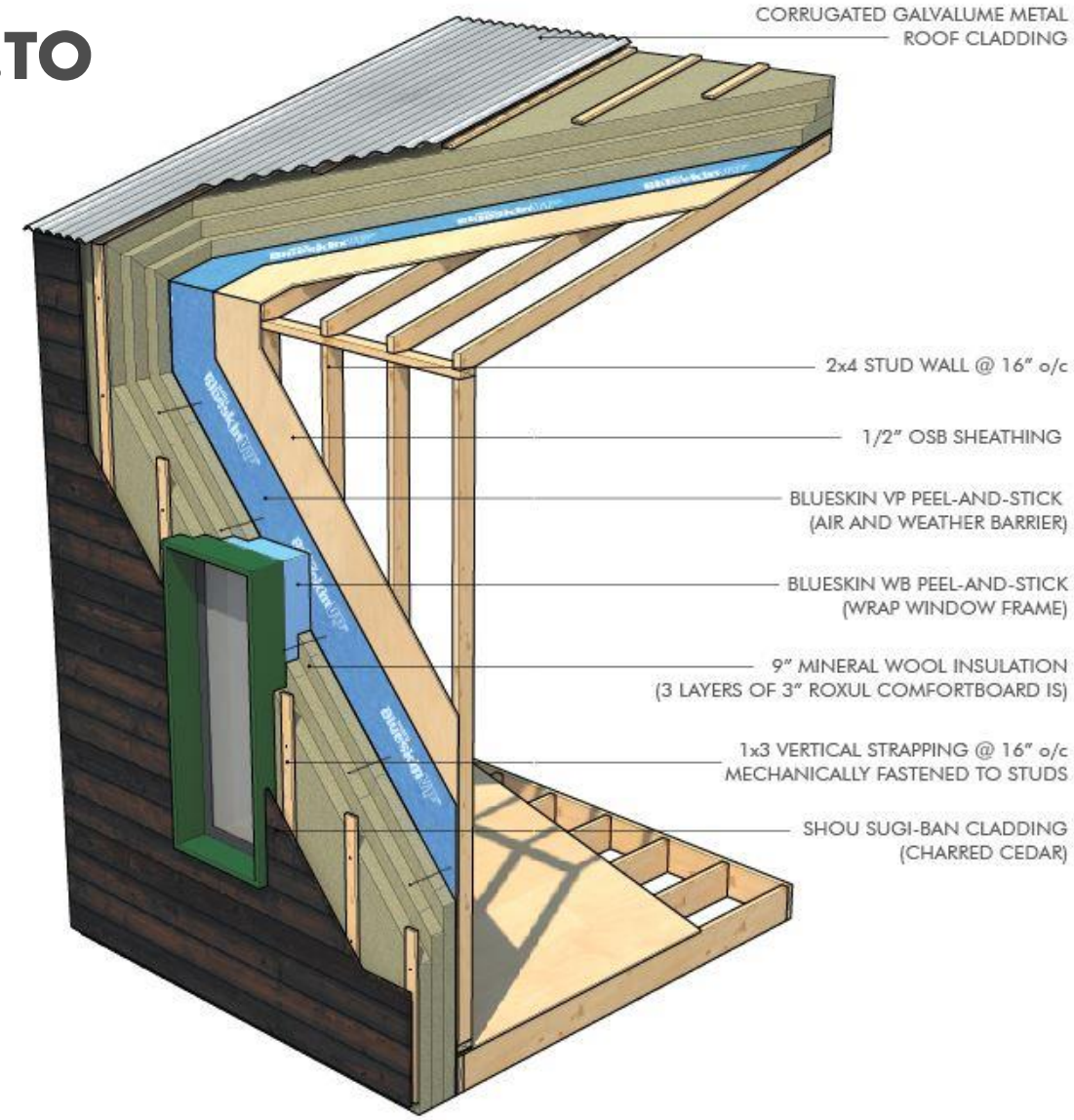
METHOD.TO



Wood Frame Construction

SIGA tape on sheathing – continuous air barrier, OSB vapour control

Weather and air sealing at window buck extension

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Photos courtesy of SUSTAINABLE.TO

Blueskin air, weather and vapour control

Long 12" TruFast SIP screws fastened through furring and insulation to stud wall

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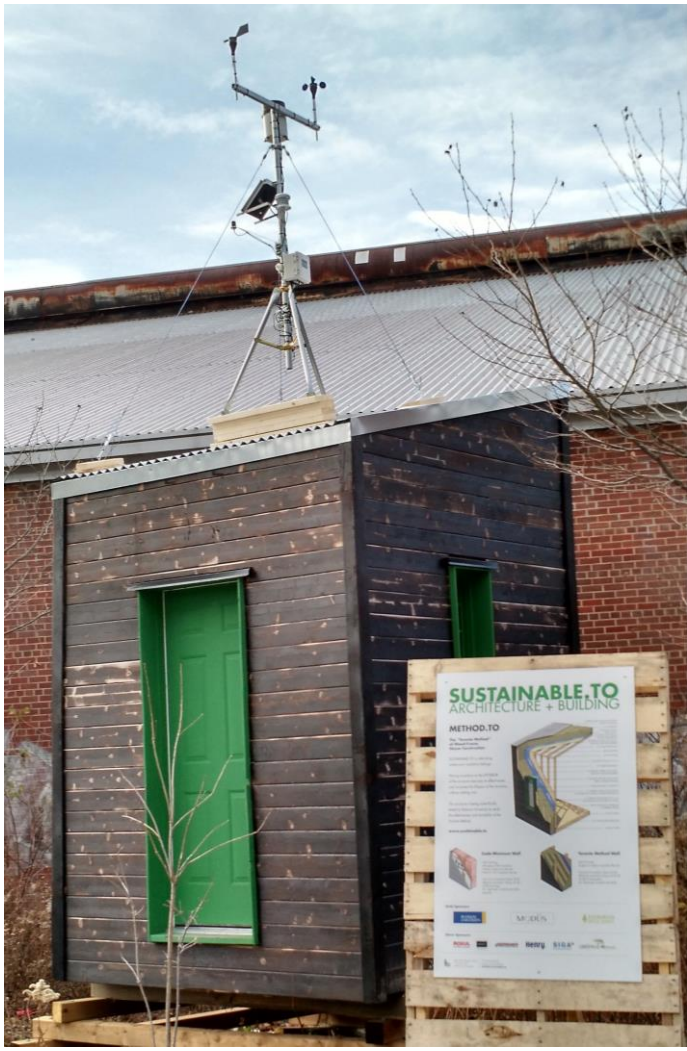
Photos courtesy of SUSTAINABLE.TO

Layering insulation, 3″ lapped seams

Wood Furring for Siding



Ready to Test!

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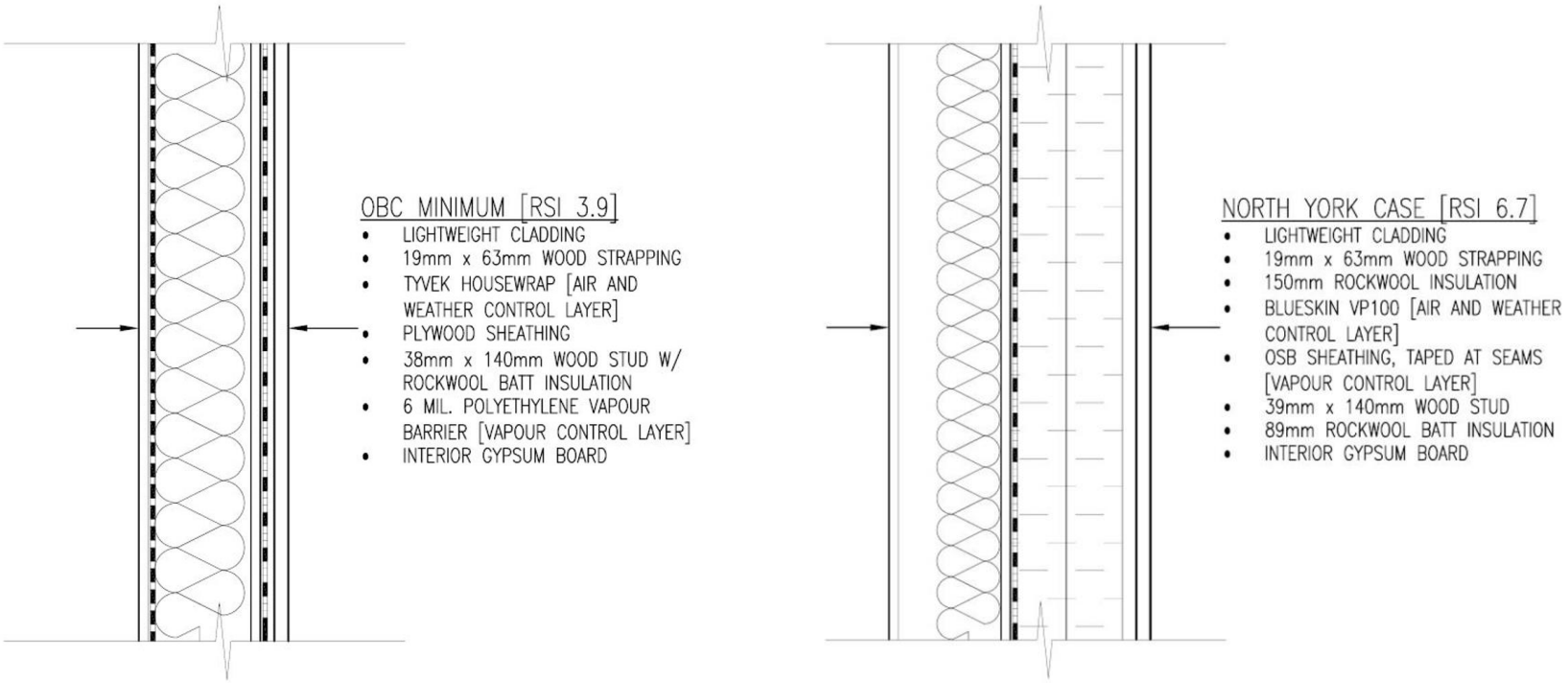
Photos courtesy of SUSTAINABLE.TO

CASE STUDY: RISEBROUGH RESIDENCE

- Variation on METHOD.TO
- No Polyethylene Vapour Barrier – Approved by City!
- Single, semi-permeable air/weather/vapour control membrane



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CASE STUDY: RISEBROUGH RESIDENCE

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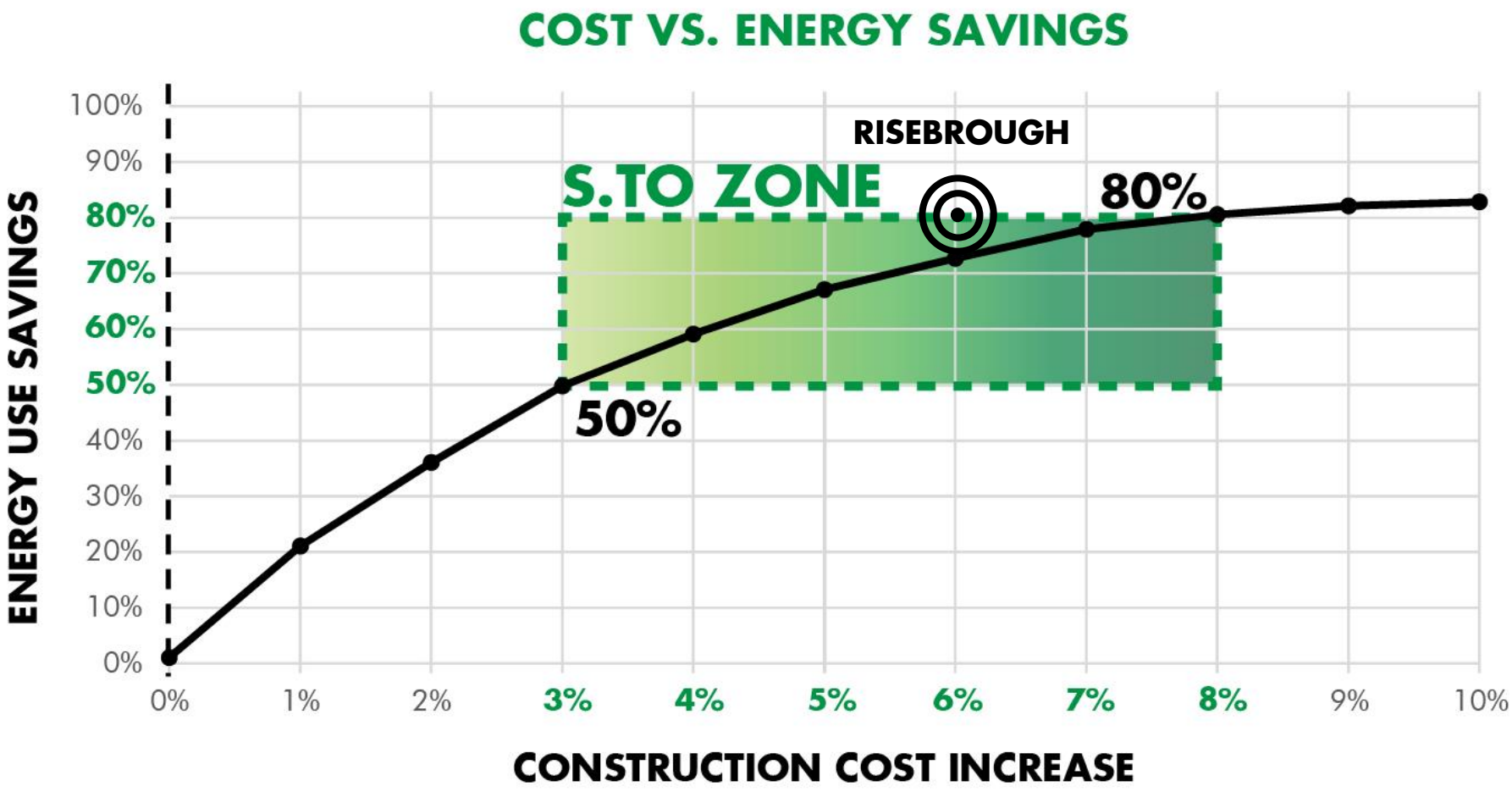
CASE STUDY: RISEBROUGH RESIDENCE

Projected Performance:
80% Energy Savings
$EUI_{h/c}$ = 23.2 kWh/m^{2}a
Heating Load = 15.6 W/m^2

Pre-drywall Air-tightness:
1.7 ACH_{50}

COST



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RESILIENT NEIGHBOURHOODS

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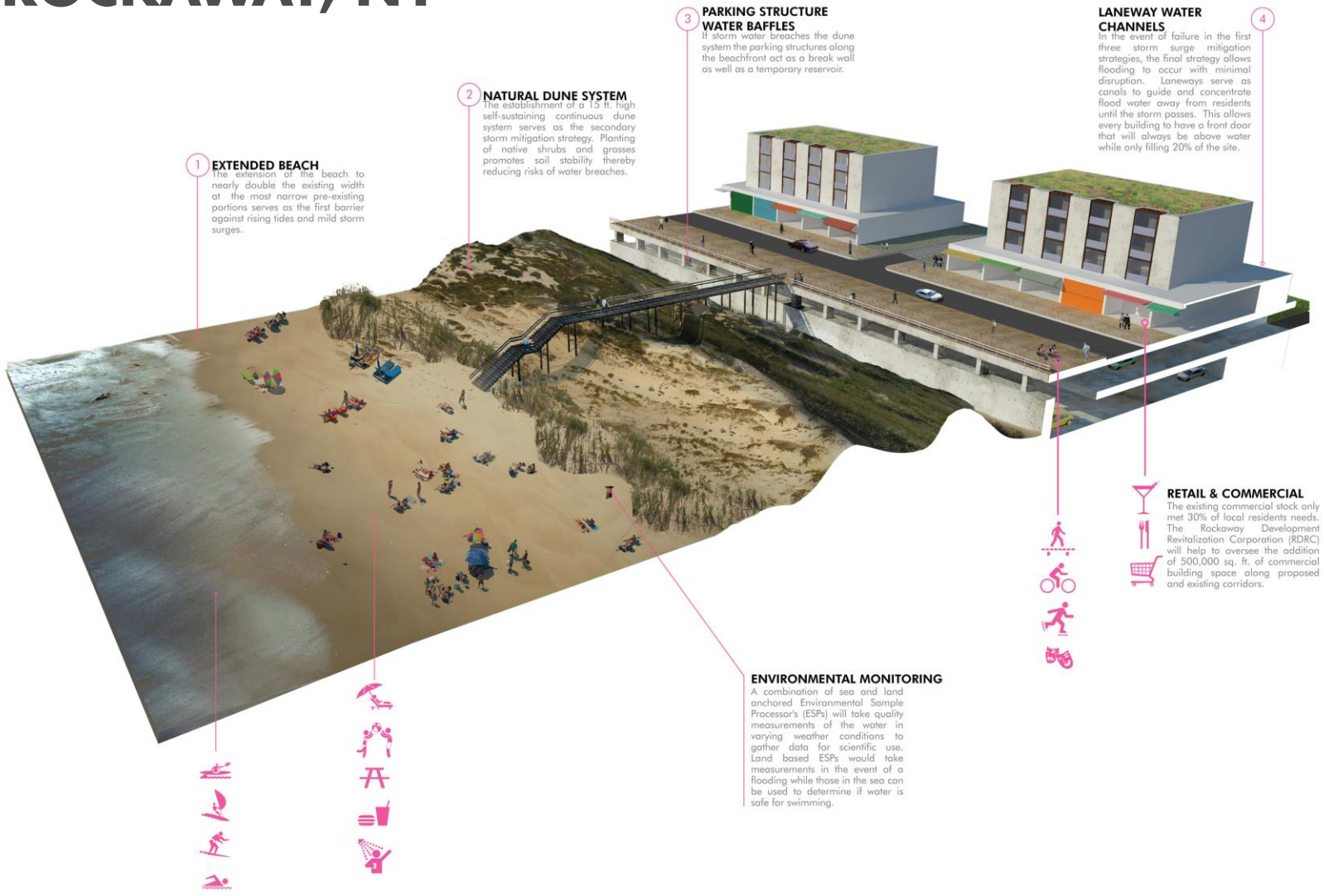
FAR ROCKAWAY, NY



FAR ROCKAWAY, NY

GREEN ROOF & SOLAR PANELS
Reducing energy demand by building well insulated, passive buildings is first priority. The remaining (relatively small) energy demand may then be accommodated by on-site renewables. This is environmentally beneficial and provides energy-independence when weather events impact the grid.

ARVERN PARK
Beach 35th & 36th St.

COMMUNITY GARDENS
Local residents and The Food Retail Expansion to Support Health program (FRESH) is provided with 1.5 acres of land for urban agriculture to promote healthy eating and support a community that currently is undersupplied by grocery stores and supermarkets.

RETAIL & COMMERCIAL
In the aftermath of Hurricane Sandy 90% of all shops were forced to close temporarily which lead to the phenomenon of retail leakage. All new retail is located along raised streets eliminating the risk of flood damage. All retail streets front on boardwalks adjacent to the beach or Arvern Park.

PUBLIC TRANSIT
New bus routes, the restoration of Old Rockaway Railroad Line and daily express ferry services will add redundancy to the existing public transportation network, decrease commute times and decrease congestion on the existing A-line subway.

ELEVATED GRADE
Grade up to in-filled streets allows 80% of the site to remain unaltered, while allowing all buildings street-front access to their ground floors.

EDGEMERE AVE.

RENEWABLE ENERGY
Onsite power generation in the form of micro turbines and photo-voltaic panels on buildings and streetlight fixtures will provide the community with renewable energy and add redundancy to the existing energy grid.

FLEXIBLE RETAIL & PARKING
Moveable pavilions placed throughout the underside of the subway trestle activate the street level and provide flexible retail opportunities for small vendors and farmers markets. Parking under and beside the trestle serves businesses along Rockaway Beach Blvd. and park-and-go for subway commuters.

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FAR ROCKAWAY, NY

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FAR ROCKAWAY, NY

PASSIVE HOUSE

Buildings with minimal energy demand (well insulated, naturally ventilated, passively heated) benefit the environment and remain liveable even when weather events effect the power grid.

4 LANEWAY CHANNELS

In the event of failure in the first three storm surge mitigation strategies the final strategy allows flooding to occur with minimal disruption. Laneways serve as canals to guide and concentrate flood waters away from residents until the storm passes. This allows every building to have a front door that will always be above water while only filling 20% of the site.

TRIPLEX STREETS

MIXED-USE STREETS

All streets accommodate motor vehicle, bicycle, and pedestrian traffic to varying degrees. Quiet residential streets on the interior of the site prioritize bicycle and pedestrian traffic, since residents park in rear laneways.

INFRASTRUCTURE

Utilities have been buried to accommodate community requests and ensure resiliency and stability with power and communications infrastructure.

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THANK YOU!

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