

CODEBORD AIR BARRIER SYSTEM - CABS

CCMC Evaluation Report 12935-R



Proud Member of:

**Canadian
Home Builders'
Association**



***Net Zero Energy
Housing Council***

“The illiterate of the future are not those who can’t read or write but those who cannot

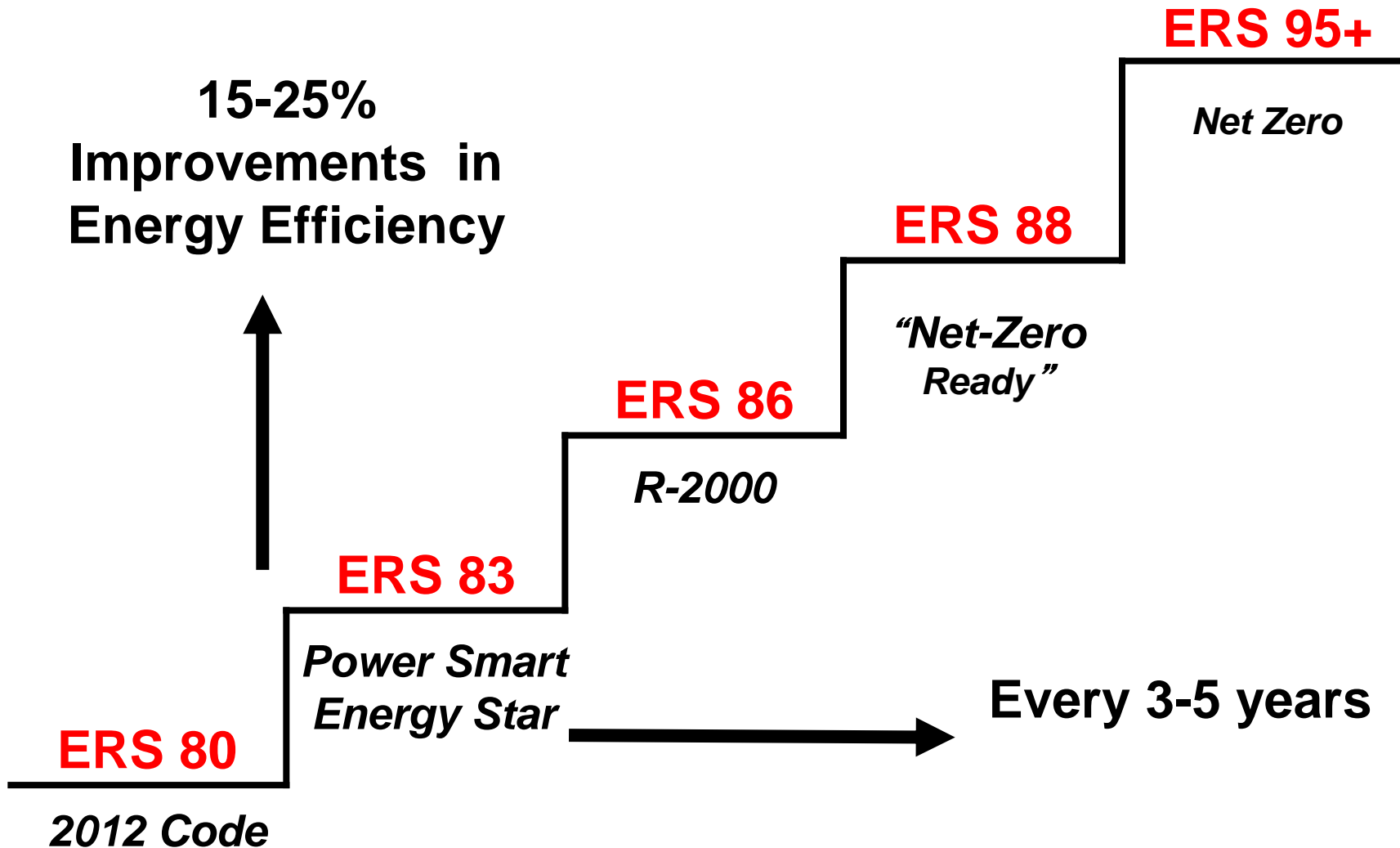
Learn

Unlearn

***and* Relearn.”**

Alvin Toffler, Future Shock

A Path of Continual Improvement



Path Towards Affordable Net Zero Housing

- Reduce energy required

- Super-insulated
- Airtight

(LOWEST COST TO THE BUILDER)

- Efficient HVAC

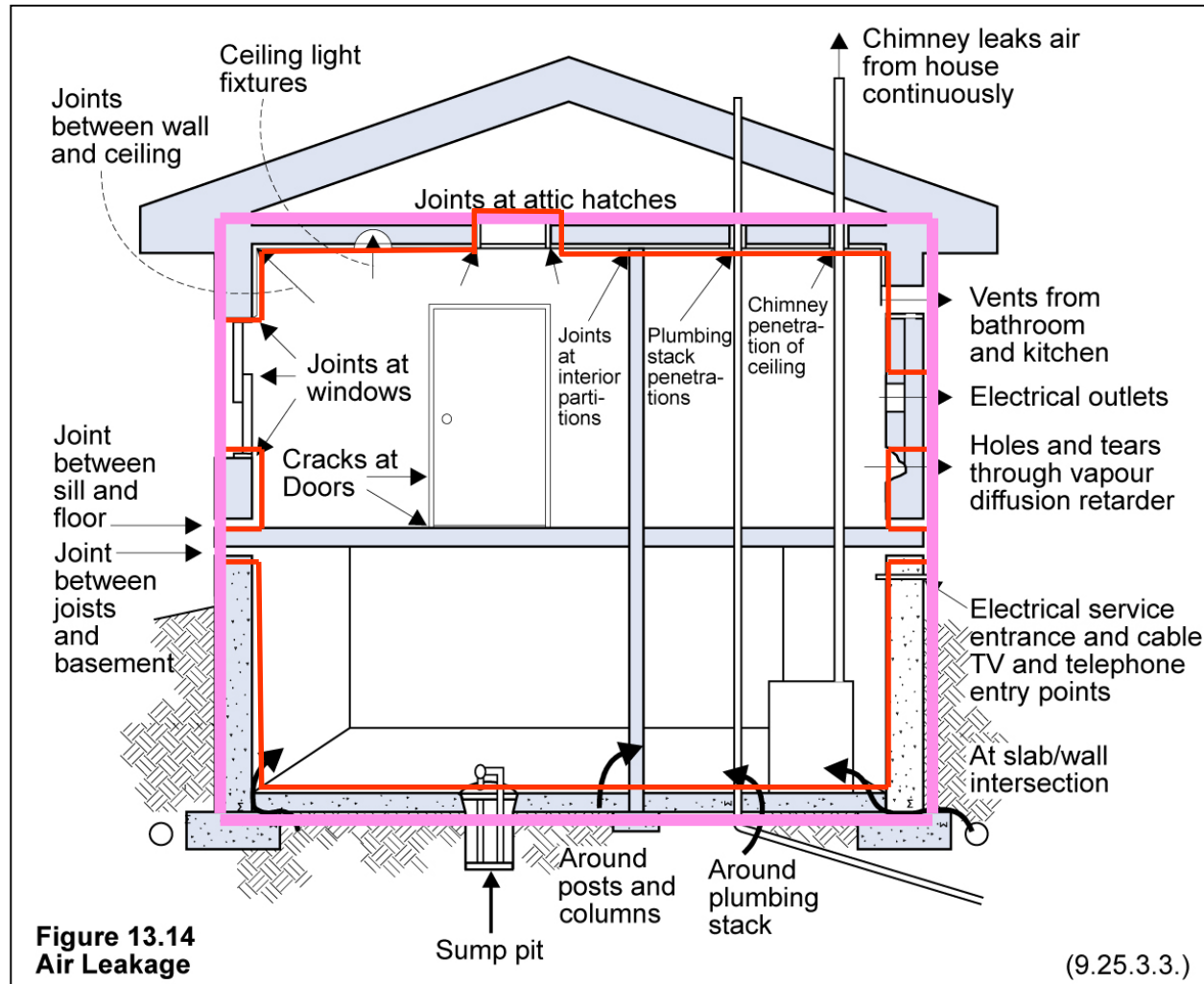
- Generate Energy On-site

(HIGHEST COST TO BUILDER)

- Solar Photovoltaics
- Wind
- Other



Typical Air Leakage Paths



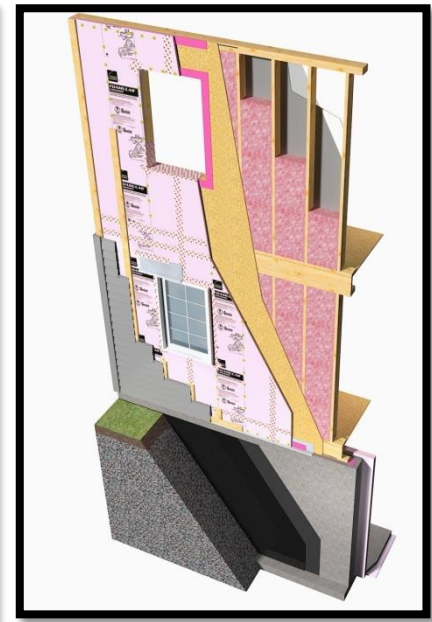
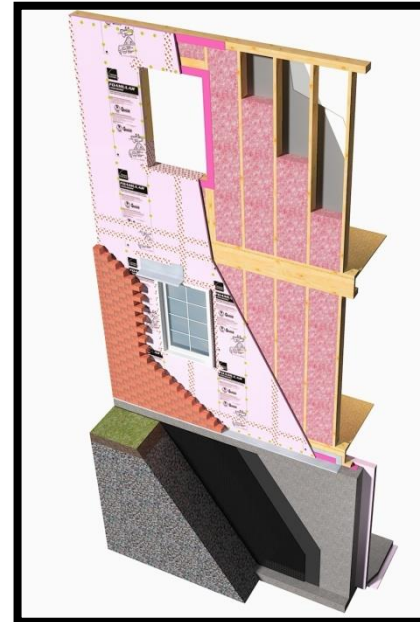
— 24 junctions

— 8 junctions

CodeBord Air Barrier System (CABS)



- **CABS IS A Multifunctional System**
 - Heat, Air, Moisture Flow
 - Weather Barrier
- **Manage Construction Risk**
- **Reduced Comfort Complaints**
- **Cost Effective System**



CCMC third party certification 12935-R

Codebord Air Barrier System



Ground Floor Rim Joist / Header



OC JointSealR Seam and Flashing Tape



CABS Gasket Compression / Windows



OC JointSealR Seam and Flashing Tape CCMC Approved - Evaluation Report Number





OC JointSealR Seam and Flashing Tape

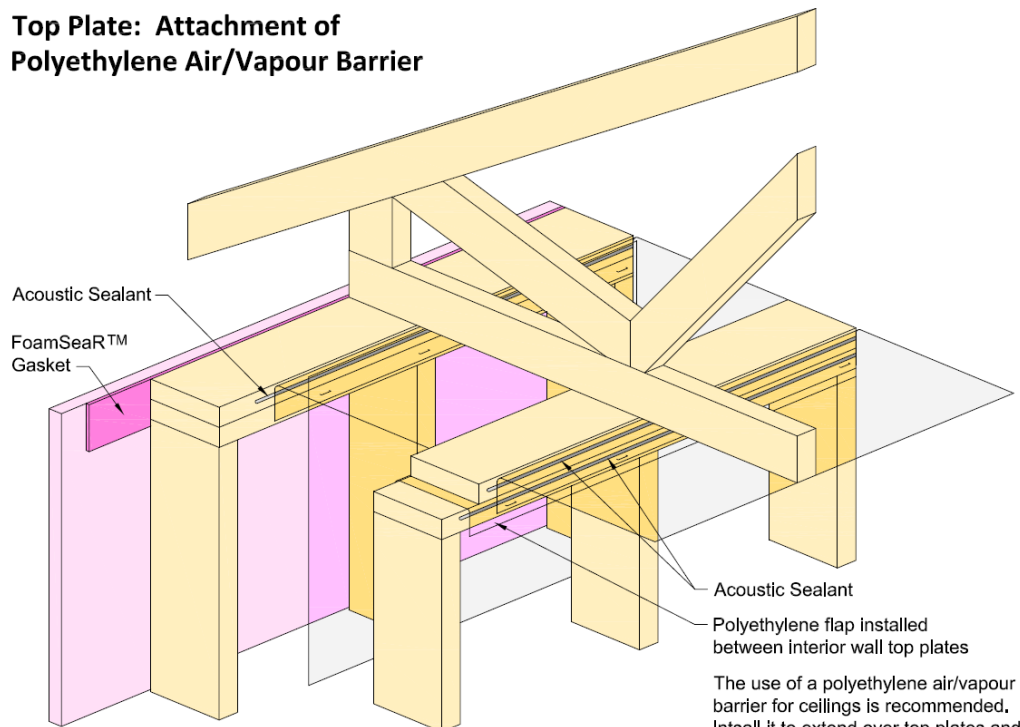
CCMC Approved - Evaluation Number



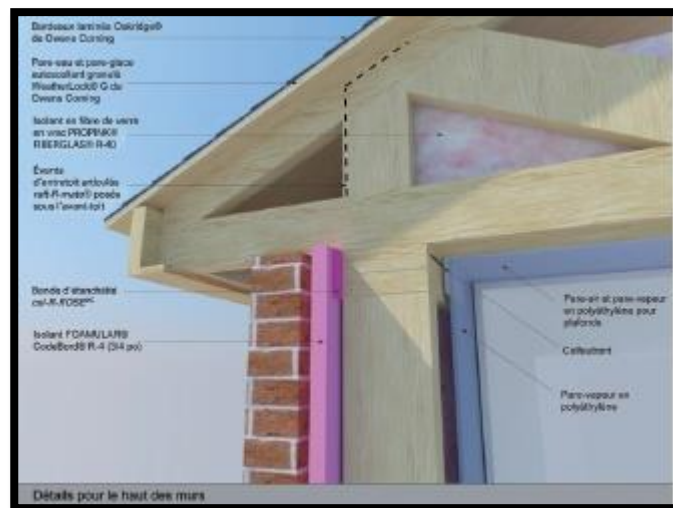
CEILING AIR BARRIER DETAIL



Top Plate: Attachment of Polyethylene Air/Vapour Barrier



The use of a polyethylene air/vapour barrier for ceilings is recommended. Install it to extend over top plates and apply acoustical caulking before stapling the polyethylene in place.



Top Plate Transition Detail

Cost Effective Alternative to Spray Foam (Floor for Room Above Garage)



DURABLE BELOW GRADE WALL SYSTEMS FOAMULAR® XPS INSULATION



CABS Eliminates Interior Air Barrier Issues

CABS: Going to the OUTSIDE for simplicity sake!!

- Gets rid of all the meticulous, time consuming POLY-AIR BARRIER Details i.e Behind bulkheads, back wrapping plugs and plates, foaming and calking every hole



Cost Savings Opportunity

- HVAC right sizing – 2015 New F280 Standard
- Room above garage
- Weather barrier not required
- Reduce prep time labour costs
- Eliminate header wrap 1st / 2nd floor
- Eliminate poly wrap details for air barrier continuity behind fireplaces, bump outs, and bathtubs
- Eliminate caulking for sealing of joints on poly for walls
- Use standard electrical boxes on exterior walls
- Reduce or remove spec items from contract (i.e. drywall, carpenters...etc.

- THANK YOU!
- QUESTIONS?

**Turn Building Science
into Building Genius™**



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Association



**Net Zero Energy
Housing Council**

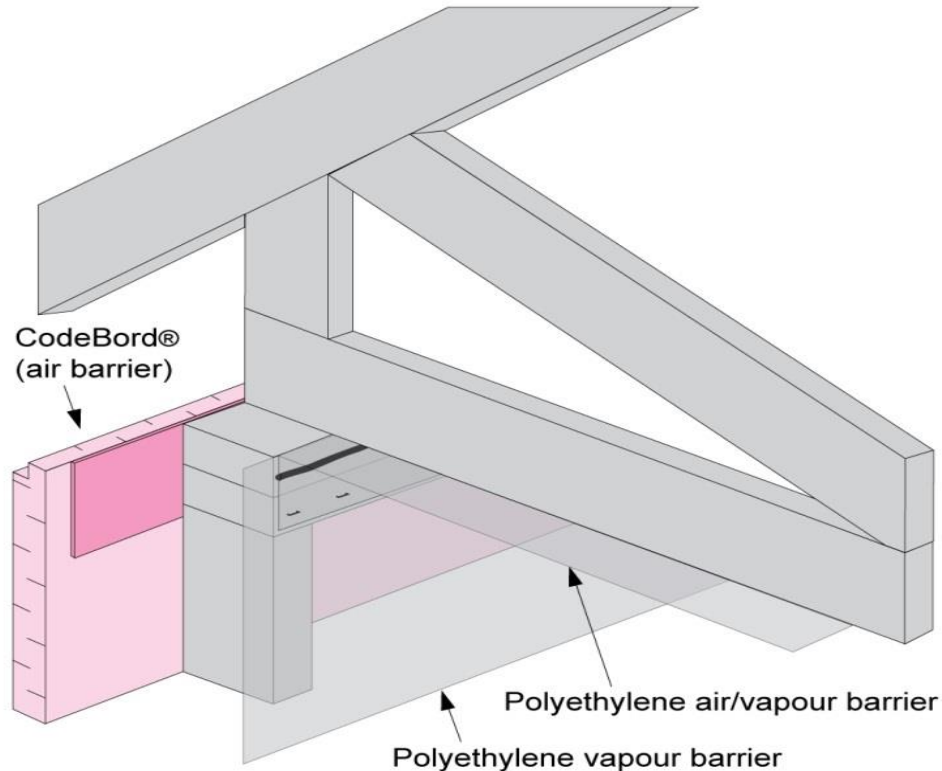
CABS Acrylic Seam & Flashing Tape



Ceiling Air Barrier



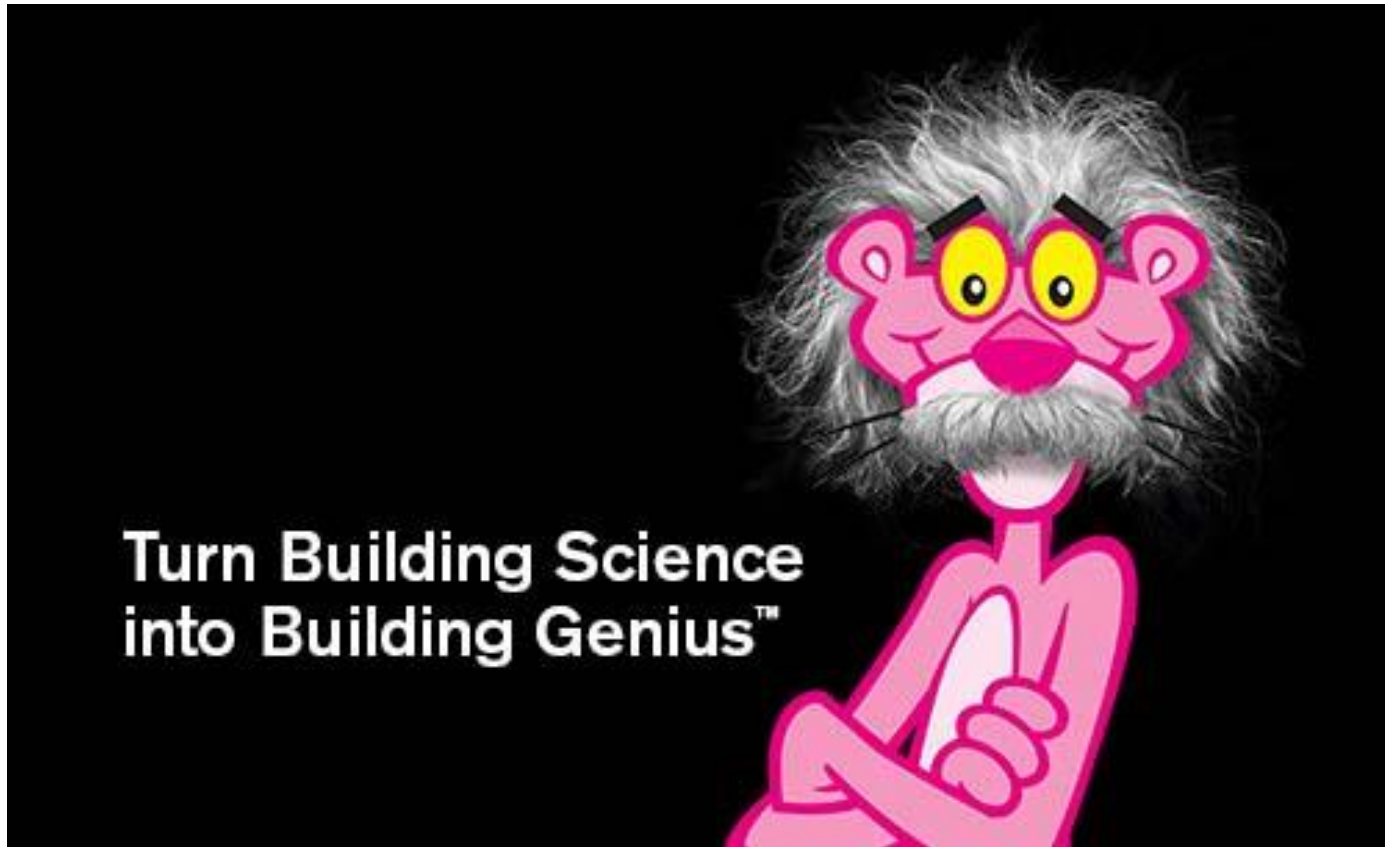
CABS Top Plate



The use of a polyethylene air/vapour barrier for ceilings is recommended. Install it to lap over the wall vapour retarder and extend down the top plates. Apply acoustical caulking before clamping the polyethylene in place. In all cases, the polyethylene must be clamped by the drywall against a supporting framing member.

Figure 4.5 Attachment of Polyethylene Air/Vapour Barrier

THANK YOU



Questions?

Warren Saunders- VP Sales & Marketing
Mattamy Homes Calgary



David Silburn- General Manager
SAIT Green Building Technologies



mattamyhomes.com



WHY WE'RE INVOLVED

NET ZERO REPRESENTS THE STATE-OF-THE-ART IN BUILDING PRACTICES & TECHNOLOGY

Mattamy Homes is the largest privately owned home builder in North America. It's essential for us to wield our experience and influence to help conserve resources for the families that live in our homes, and for the generations that will follow.

"Housing accounts for 17% of Canada's energy use, and 15% of greenhouse gas emissions. Helping lead our industry to build green on a mass scale is simply building responsibly. It's what we've always been doing: help each other to take care of where we live and those we love."

◦ Peter Gilgan, Founder, Mattamy Homes





PRACTICAL RESULTS IN NET ZERO CONSTRUCTION



PARTNERS

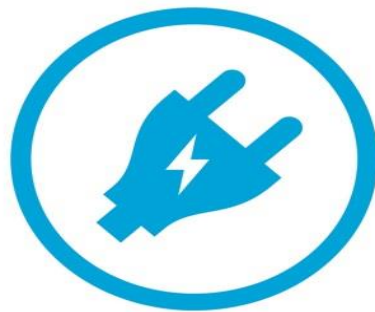
WE'RE ALL IN THIS TOGETHER. WE ARE PROUD TO STAND WITH
OUR PARTNERS IN THIS ESSENTIAL CAUSE



MATTAMY'S APPROACH

A NET ZERO ENERGY HOME IMPROVES ENERGY EFFICIENCY, HEALTH & HOME COMFORT

In this home, look for these symbols to indicate how Mattamy has applied these principles to enhance a homeowner's quality of living.



/ ENERGY EFFICIENCY /

Reduced consumption from appliances
& lighting & mechanical systems



/ ECO TECHNOLOGY /

Advanced materials & equipment from
insulation to solar panels to heat pumps



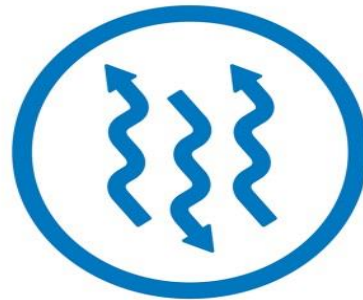
/ HEALTHY LIVING /

Non-polluting or non-emitting materials
inside the home

INSIDE THE HOME

ENHANCED BUILDING PRACTICES & A HIGH PERFORMANCE ENVELOPE

Achieving Net Zero begins with reducing a home's overall energy consumption by over 70%. This requires less overall energy to be produced in order to compensate. Mattamy's homes rely on three high performance upgrades to achieve significant reduction in energy use.



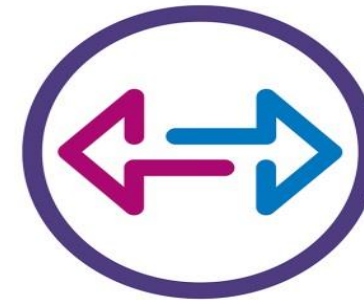
/ THERMAL COMFORT ENVELOPE /

From foundation to attic, Mattamy's airtight energy envelope doubles the effective insulation and retains the high standards of home comfort & durability.



/ HIGH PERFORMANCE WINDOWS /

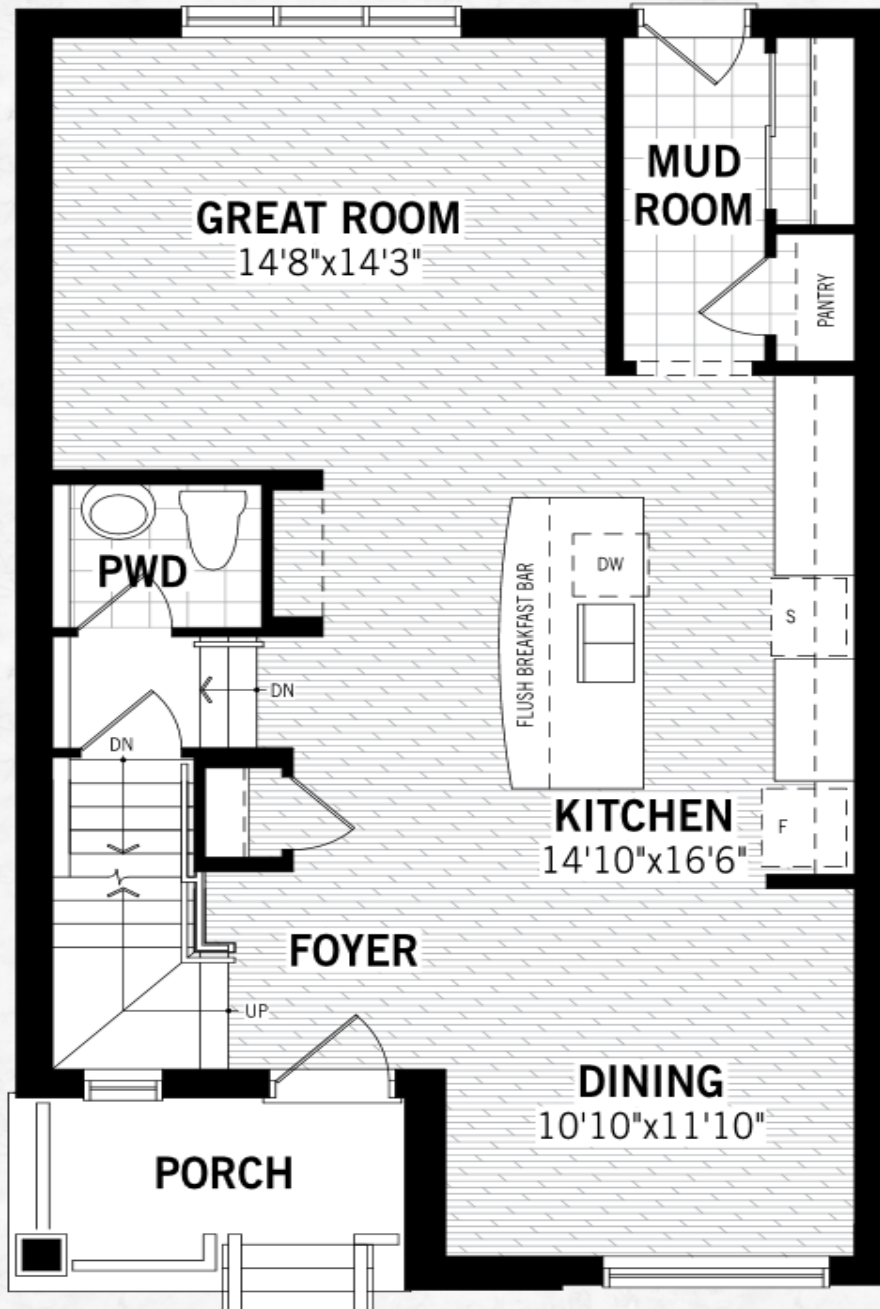
Mattamy's Triple-pane, Argon filled, Double Low E "Shield" windows insulate for consistent home comfort & energy efficiency.



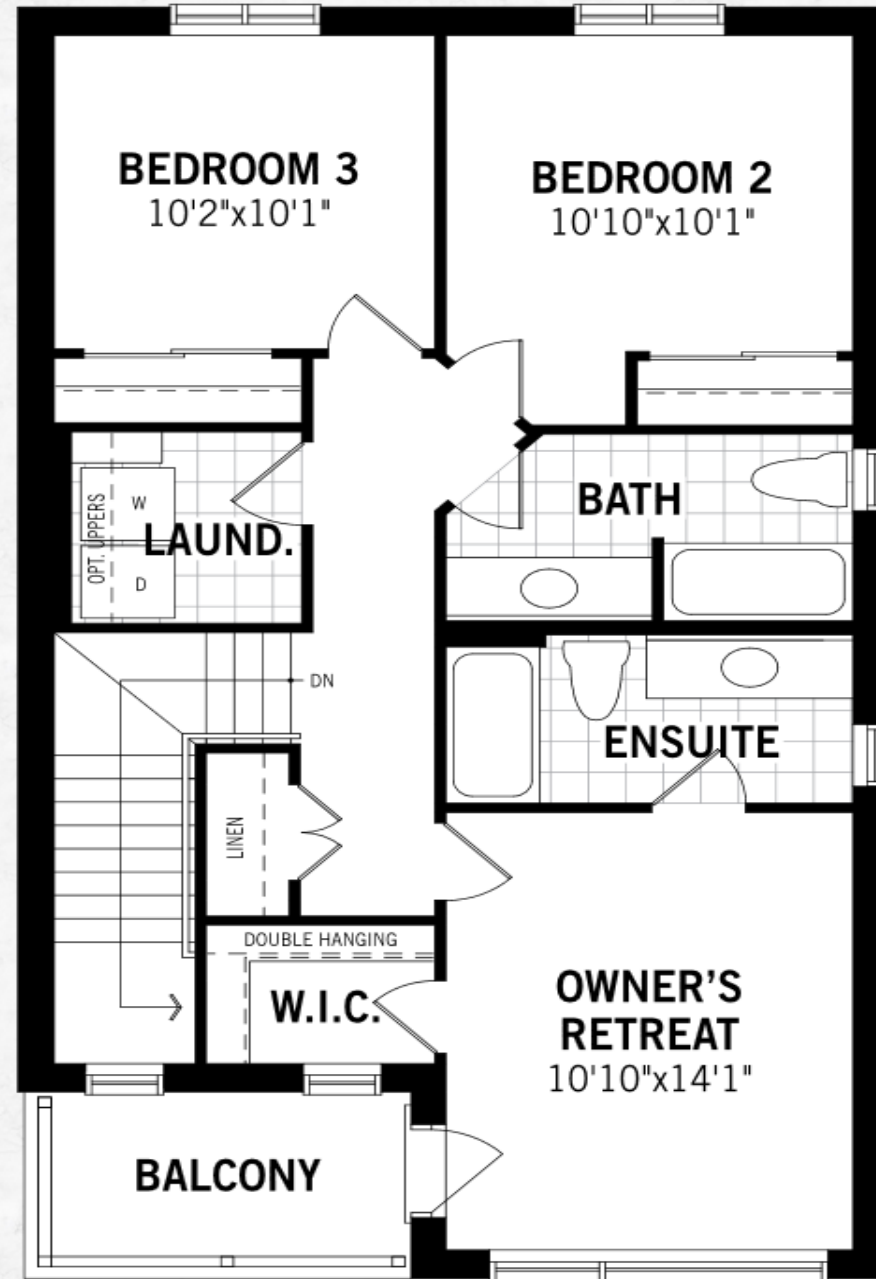
/ COLD CLIMATE HEAT PUMP /

Advanced mechanical systems require 50% less energy and ensure continuous fresh air during heating & cooling.

GROUND FLOOR



MAIN FLOOR





PRACTICAL RESULTS IN NET ZERO CONSTRUCTION

NET ZERO DESIGN AND CONSTRUCTION





PRACTICAL RESULTS IN NET ZERO CONSTRUCTION

ECO EII OWENS CORNING PROJECT TEAMS



HEATING DEGREE DAYS

GUELPH, ON: 4306 HDD +/- 18°C

OTTAWA, ON: 4520 HDD +/- 18°C

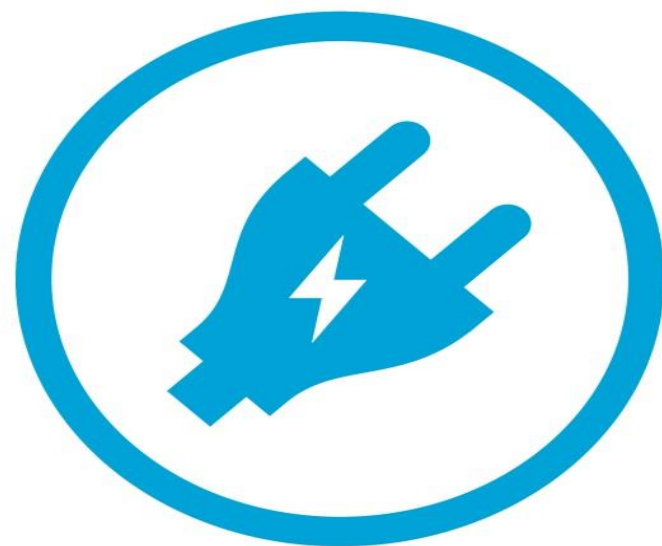
LAVAL, QC: 4651 HDD +/- 18°C

BEDFORD, NS: 4332 HDD +/- 18°C

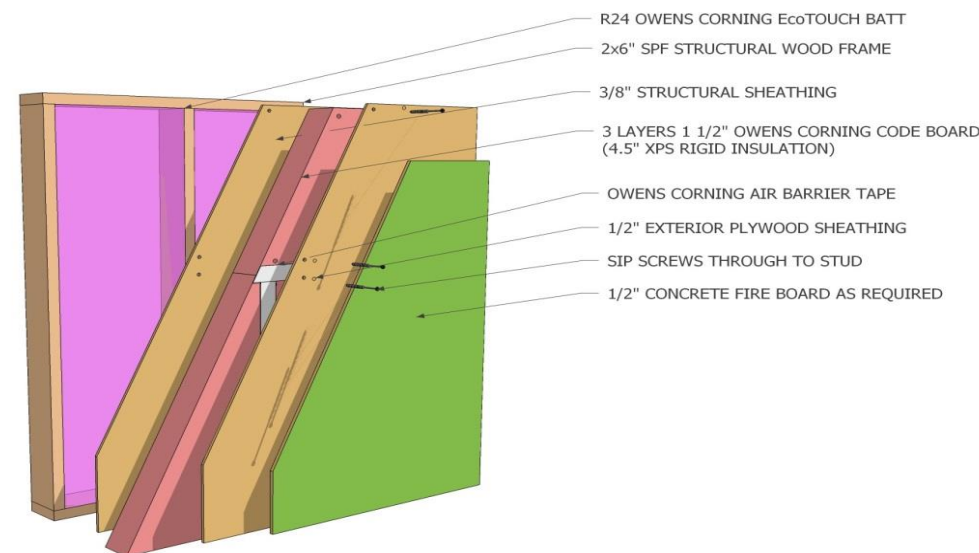
CALGARY, AB: 5109 HDD +/-18°C

STATISTICS WEATHER NETWORK
30 YR. SAMPLING PERIOD





ENERGY EFFICIENCY



FROM FOUNDATION TO ATTIC, MATTAMY'S AIRTIGHT ENERGY ENVELOPE DOUBLES THE EFFECTIVE INSULATION AND RETAINS THE HIGH STANDARDS OF HOME COMFORT & DURABILITY.

ATTIC INSULATION

R60 BLOWN CELLULOSE

WALL INSULATION

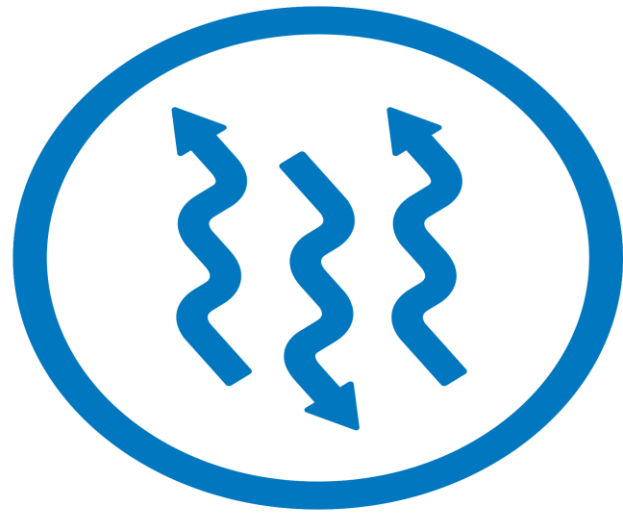
**R24 ECOTOUCH BATT INSIDE STUD CAVITY
R22.5 XPS (4.5") EXTERIOR CODE BOARD
R42 EFFECTIVE**

FOUNDATION WALL

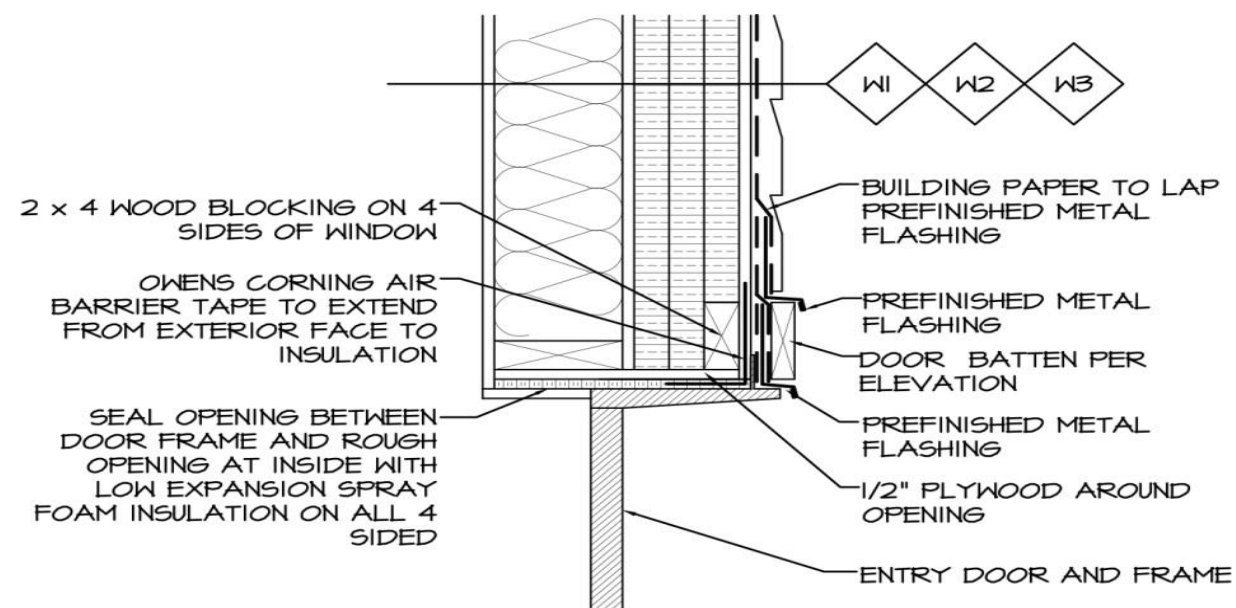
**R14 BATT INSIDE STUD CAVITY, R20 XPS (4")
R32 EFFECTIVE**

AIR TIGHTNESS

**ACH 0.2 @ 50 PASCAL- PREDRYWALL BLOWER DOOR
ACH 0.45- 0.7 @ 50 PASCALS- FINAL BLOWER DOOR (RANGE FOR 5)**



THERMAL COMFORT





PRACTICAL RESULTS IN NET ZERO CONSTRUCTION

MATTAMY NET ZERO: CONSERVATION FIRST



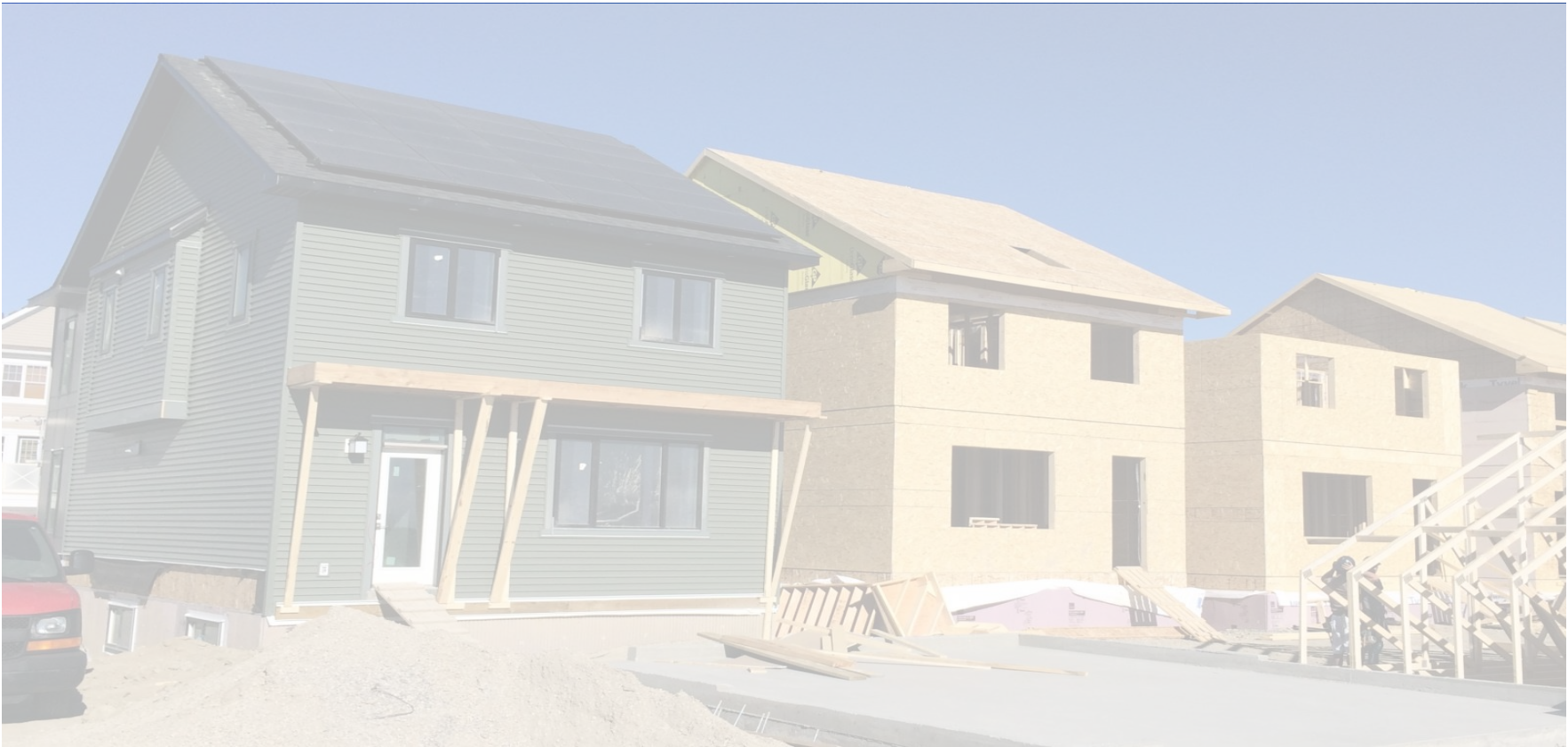
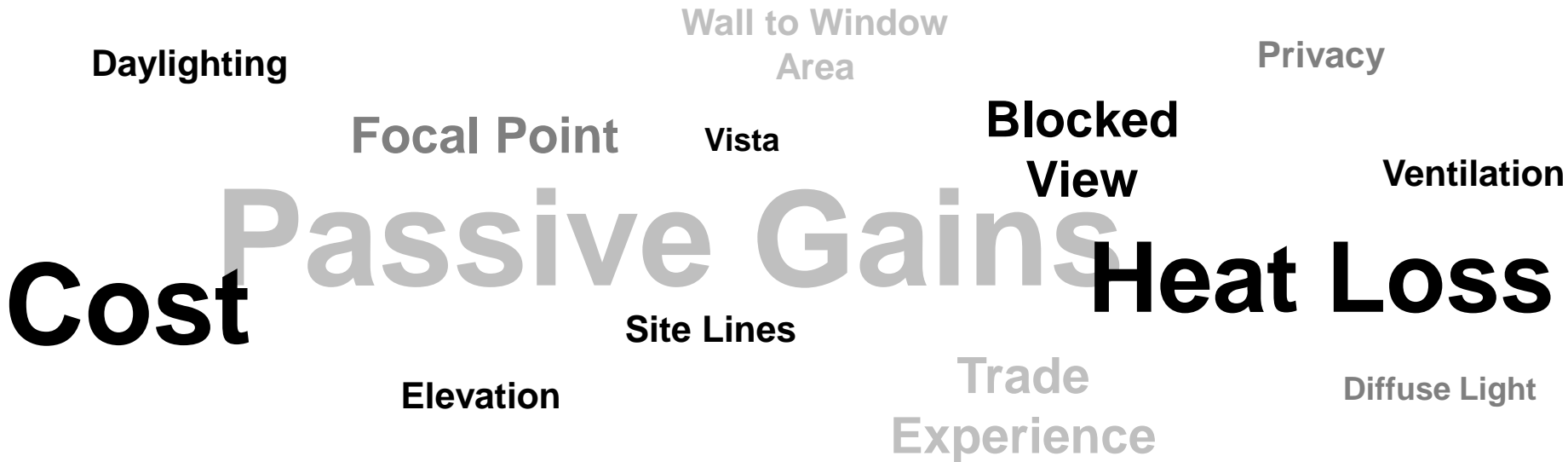


PRACTICAL RESULTS IN NET ZERO CONSTRUCTION
MATTAMY NET ZERO: ASSEMBLY DETAILING



**HIGH PERFORMANCE
WINDOWS**

WINDOW OPTIONS	JELD-WEN (kWh)	PLYGEM (kWh)
All windows 366 series	13787	13971
South 180, NEW 366 series	13490	13610
SEW 180, N 366 series	13435	13545
All 180 series	13413	13520
All i86 series		13741



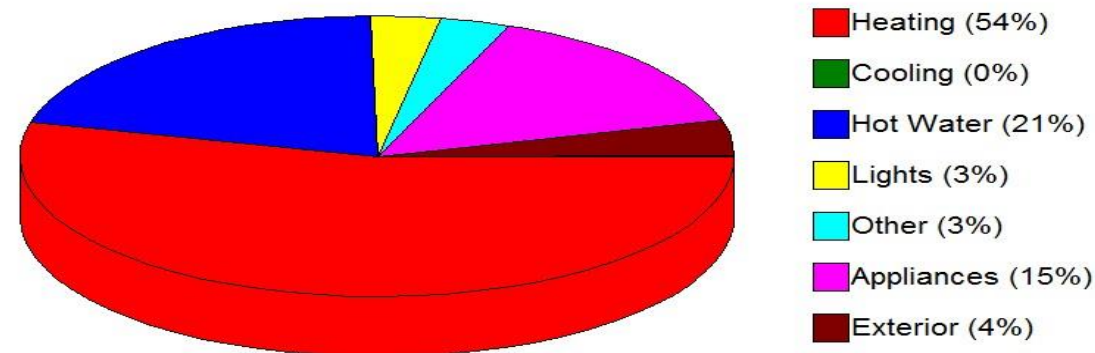


ECO TECHNOLOGY

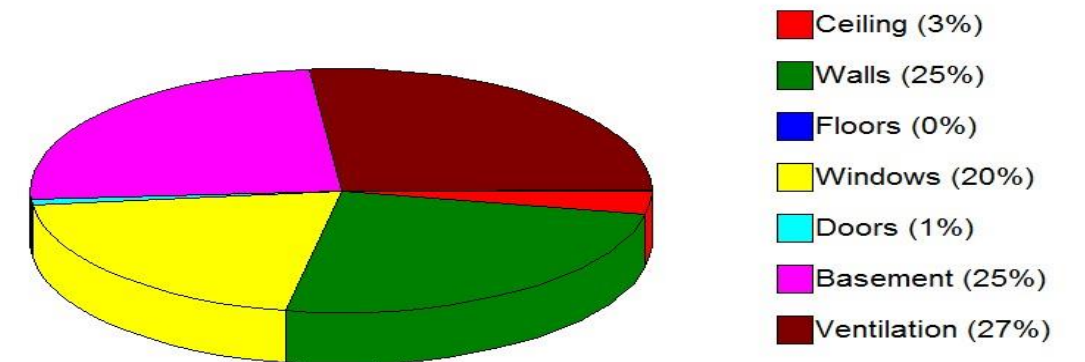
MATTAMY NET ZERO HOME BUILT TO 2016 CODE

SPACE HEATING:	18,664 KWH
DHW:	7,195 KWH
VENTILATION:	539 KWH
COOLING:	0 KWH
LIGHTS:	1,095 KWH
APPLIANCES/ EXTERNAL:	7,665 KWH
TOTAL:	35,158 KWH

COMPONENTS OF ANNUAL ENERGY CONSUMPTION



COMPONENTS OF ANNUAL HEAT LOSS



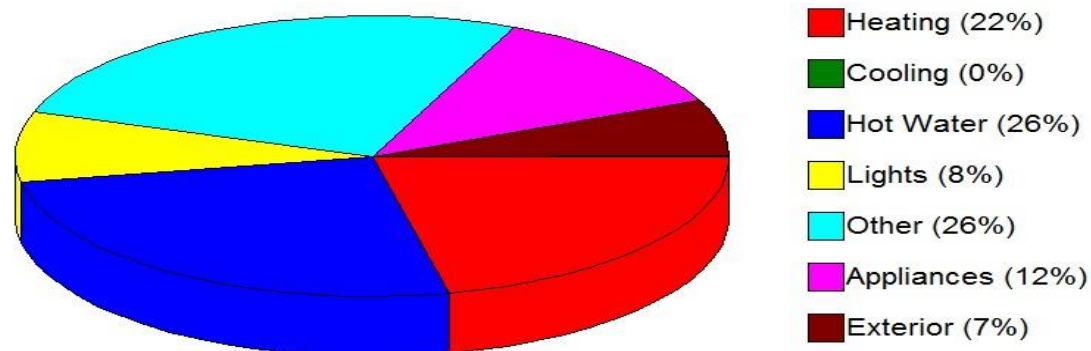


ECO TECHNOLOGY

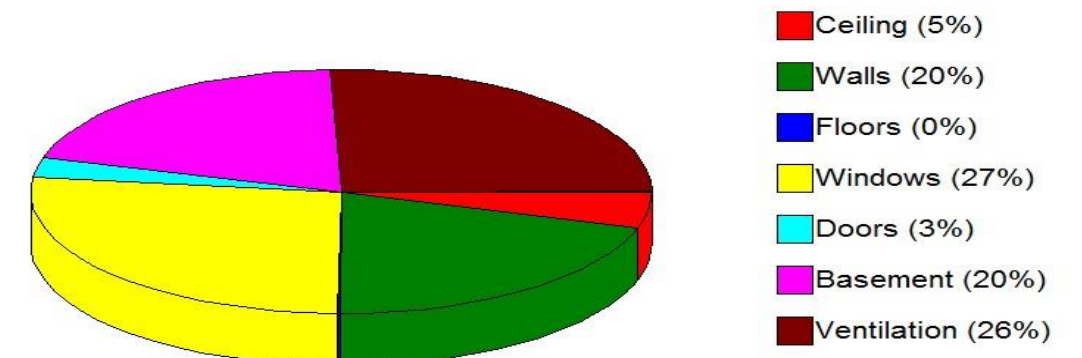
MATTAMY NET ZERO HOME AS BUILT

SPACE HEATING:	2,985 KWH
DHW:	2,252 KWH
VENTILATION:	2,038 KWH
COOLING:	0 KWH
LIGHTS:	365 KWH
APPLIANCES/ EXTERNAL:	5,658 KWH
TOTAL:	13,297 KWH
<i>63% MORE EFFICIENT THAN 2016 CODE COMPLIANT</i>	

COMPONENTS OF ANNUAL ENERGY CONSUMPTION



COMPONENTS OF ANNUAL HEAT LOSS





ECO TECHNOLOGY



DOMESTIC WATER

DOMESTIC WATER HEAT RECOVERY

AIR SOURCE HEAT PUMP

HRV

ENERGY MONITORING

SOLAR PHOTOVOLTAIC

RHEEM HB50RH

ECO INNOVATION TECH TD360B

MITSUBISHI ZUBA CENTRAL

VENMAR AVS 1.8HE

CIRCUIT METER + EYEDRO

HELIENE 260watt/ APS 500watt





PRACTICAL RESULTS IN NET ZERO CONSTRUCTION

MATTAMY NET ZERO: CONSERVATION FIRST





PRACTICAL RESULTS IN NET ZERO CONSTRUCTION

MATTAMY NET ZERO: CONSERVATION FIRST





PRACTICAL RESULTS IN NET ZERO CONSTRUCTION

MATTAMY NET ZERO: CONSERVATION FIRST







 **netzero**
BY REID'S HERITAGE HOMES

LiveNetZero.com



PARTICIPATION IN THE ecoEII NET ZERO PROJECT

- **Improve the lives of homeowners by providing a healthier, more comfortable, and affordable home**
- **Build better homes today for tomorrow**





DESIGN OPPORTUNITY

Climate Zone 6: 4270 HDD (ESNH ON Zone 1)

PV Potential: 4.7 GJ/kW

South, 8:12 Slope, module eff. 15.5%

Heating Design Temp: -19°C

Cooling Design Temp: 29°C



TECHNICAL OPPORTUNITY

Energy Data:

• Space Heating	8.4 GJ	23%
• Electrical Base Loads	22.5 GJ	61%
• Water Heating	4.4 GJ	12%
• Ventilation	1.0 GJ	3%
• Space Cooling	0.5 GJ	1%

Annual Energy Use 36.8 GJ

Annual Energy Generation 37.4 GJ

Net Annual Energy Use -0.6 GJ



The NZ Magic Number

37 GJ

1 ACH or less

DESIGN OPPORTUNITY



Push ridgeline forward and drop pitch to contain all needed panels
Reduce array to a maximum of 32 panels – 8.5 KW

OPPORTUNITY

Space Heating/Cooling:

- Loads **NOT** exceeding 20-25,000 BTU
- Dettson Alizé with Chinook gas backup with high wall supply = **RIGHT SIZED EQUIPMENT** and total comfort

WITH Zoning = Indoor temperature will **NOT** change drastically with outdoor fluctuations



Essential with
the tighter
envelope to
ensure fresh air
throughout





OPPORTUNITY

Necessary Components:

- TED energy monitoring to assist with occupant behaviour
- Solar Array Monitoring Data
- Energy Star appliances, LED lighting



ONLY possible with communications with trades and suppliers to ensure deliverability of this type of product going forward

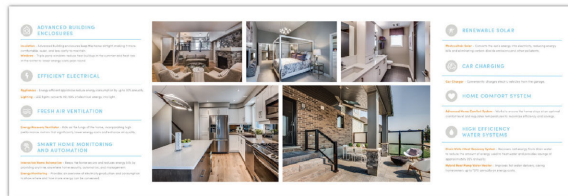
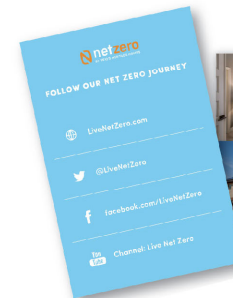
NATIONAL PARTNERS



SPONSORS



Critical - Effective marketing campaign to educate consumers and the industry





OPPORTUNITY

Consumer Engagement:

- Social media contest
- Education using dedicated **LiveNetZero.com** website, videos, guided tours



Air Changes Per Hour
Times per hour that a home's entire air escapes due to air leakage

Category	Value
Typical homes	3.0-4.0
Reid's Heritage Net Zero homes	1.0 or less

Net Zero Homes take **MUCH LESS ENERGY** to heat or cool!

netzero BY REID'S HERITAGE HOMES

Advanced Building Enclosures by Owens Corning

Greywater Recovery Unit

Typical Layout

Thin Clear Layers of Silver & Metal Oxide

netzero BY REID'S HERITAGE HOMES

Advanced Building Enclosures

Greywater Recovery Unit

Typical Layout

netzero BY REID'S HERITAGE HOMES

High Efficiency Water Solutions by Building Knowledge

POWER CONSUMPTION EQUIVALENT TO A NIGHTLIGHT

netzero BY REID'S HERITAGE HOMES

Ultra Efficient Electrical by Broan Nutone

RE-USES 80% OF ENERGY IN WASTE AIR

netzero BY REID'S HERITAGE HOMES

ERV - Energy Recovery Ventilator

Thin Clear Layers of Silver & Metal Oxide

netzero BY REID'S HERITAGE HOMES

Advanced Building Enclosures by JELD-WEN Windows and Doors

COEFFICIENT OF PERFORMANCE (COP)

Category	Value
Natural gas/propane Furnaces	0.92-0.97
Electric Baseboards	1.00
Mitsubishi Electric Heat Pump	3.50

netzero BY REID'S HERITAGE HOMES

Home Comfort Systems by Mitsubishi Electric

2015 MODELS ARE 20-30% MORE EFFICIENT THAN PREVIOUS MODELS

netzero BY REID'S HERITAGE HOMES

Ultra Efficient Electrical by Electrolux Major Appliances



WHY CONTINUE WITH NET ZERO ENERGY TYPE HOMES

- Increased comfort, better air quality, durability, quality, security from rate increases

BUILD AFFORDABLE NET ZERO HOMES IN A PRODUCTION SETTING



WHY CONTINUE WITH NET ZERO ENERGY TYPE HOMES

HOMES OFFERED TODAY	PER HOME Annual Energy	COMMUNITY SCALE	NET IMPACT
Current Ontario Building Code Home	110 GJ	100 Homes	11,000 GJ
Energy Star Home	101 GJ		10,100 GJ
NET ZERO READY Home	37 GJ		3,700 GJ
NET ZERO Home with Solar	37 /-37 GJ		0 GJ

REDUCTIONS IN PRICE TO GO NET ZERO ENERGY COMPLETE:

Started at \$90,000 → \$75,000 → \$65,000 → **now under \$60,000**

NET ZERO ENERGY READY ... **UNDER \$20,000**

MOVING FORWARD

- Relationships with Municipalities and utility providers to drive incentives to encourage energy efficient developments
- Launch our First Net Zero Energy Ready Community summer 2016
- Advance the multi-family product into Net Zero Ready



netzero

BY REID'S HERITAGE HOMES



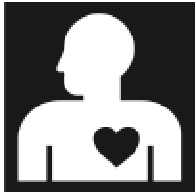


**ARCADIA COMMUNITY
KANATA, ONTARIO**

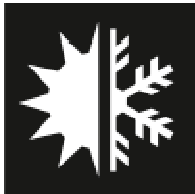
VALUE OF SUSTAINABILITY AT MINTO



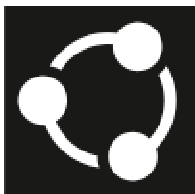
Cost Savings



Health



Comfort



Community

- Existing Properties – Retrofits
- Innovation and pilot projects
- Green Planning for all projects
- Design and construction reviews
- Marketing and sales support
- Branding, Cost savings and comfort
- Third Party certification
- Environmental reporting and benchmarking

LOCATION - ARCADIA

Block 27: 4 townhomes



Lot 8: Model Home:
Killarney D



HOUSE DESIGN - ENVELOPE

50% reduction in space heating and cooling from envelope upgrades



AIR TIGHTNESS IN TOWNHOMES



HOUSE DESIGN MECHANICAL

**65% reduction in remaining heating,
cooling, and hot water energy consumption**



**Cost of electricity remains a
barrier**

HOUSE DESIGN – PLUG LOAD

15% reduction in plug load



HOUSE DESIGN – RENEWABLE ENERGY

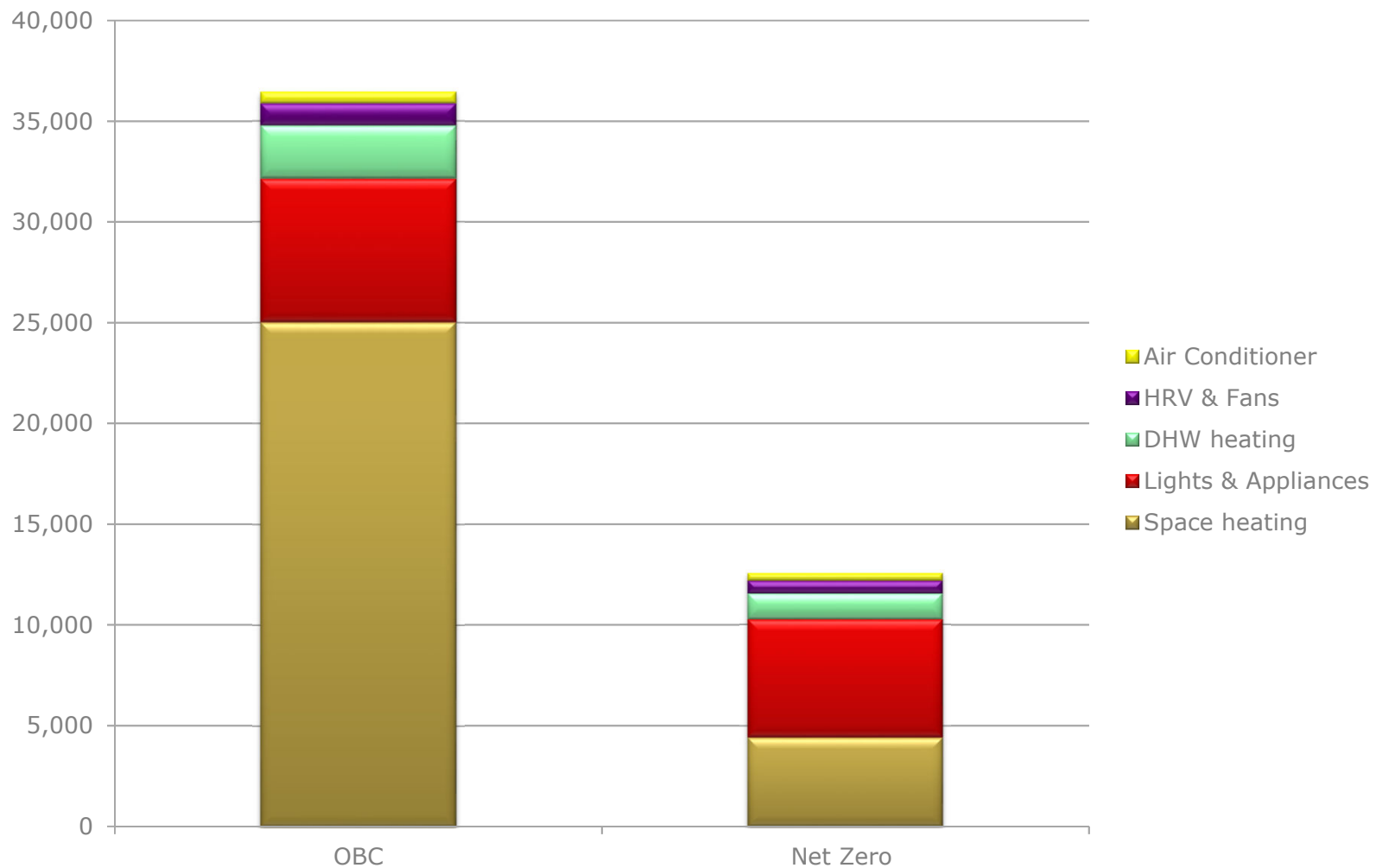
**8,500-1200 kwh produced onsite to offset
remaining energy load**



**Full gable roof provides good
solar exposure in all
orientations**

**Limited roof space on
Townhomes is a design
challenge**

PERFORMANCE – ENERGY PROFILE





MINTO'S NET ZERO ENERGY HOMES @ ARCADIA



Construction Voyer

Presentation by:

Jean-François Voyer

Webinar on June 9th, 2016

Project located in Laval, Québec



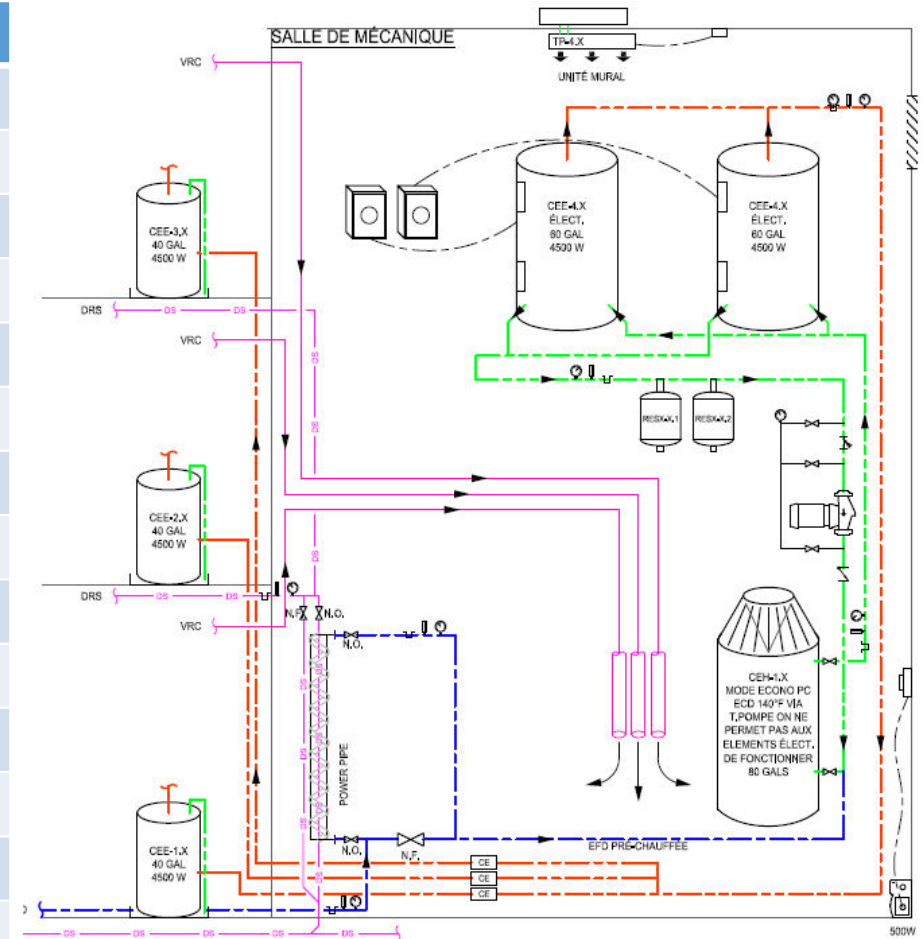
Objectives for Construction Voyer:

1. Learn new skills and techniques
2. Company statement about sustainable development
3. Acquire competitive advantage



Design and specifications

Component	Value
Ceiling	R-60 (blown fibreglass)
Ceiling Level 1	R-48 (batt)
2x6 walls	R-24 + R-15 (batt + 3 inch CodeBord)
Garage Walls	R-24
Floor Joist Headers	R-10 + 2x R-24 + R-10
Joist Headers-Garage	R-10 + R-24
Under Slab	R-15 (3 inch CodeBord)
Frost Walls	R-15 (3 inch CodeBord)
Windows	JeldWen180-triple
HRV	vanEE 90HV ECM
Heating	Mini-ducted heat pump + baseboards
Water heating	Hybrid heat pump water heater + storage
Air Tightness	1.00 ACH50 (target)
Solar PV	Canadian Solar 146 panels – 255W



Net Zero energy simulation

Annual consumption:

41 930 kWh

(all 6 units)

Annual PV production:

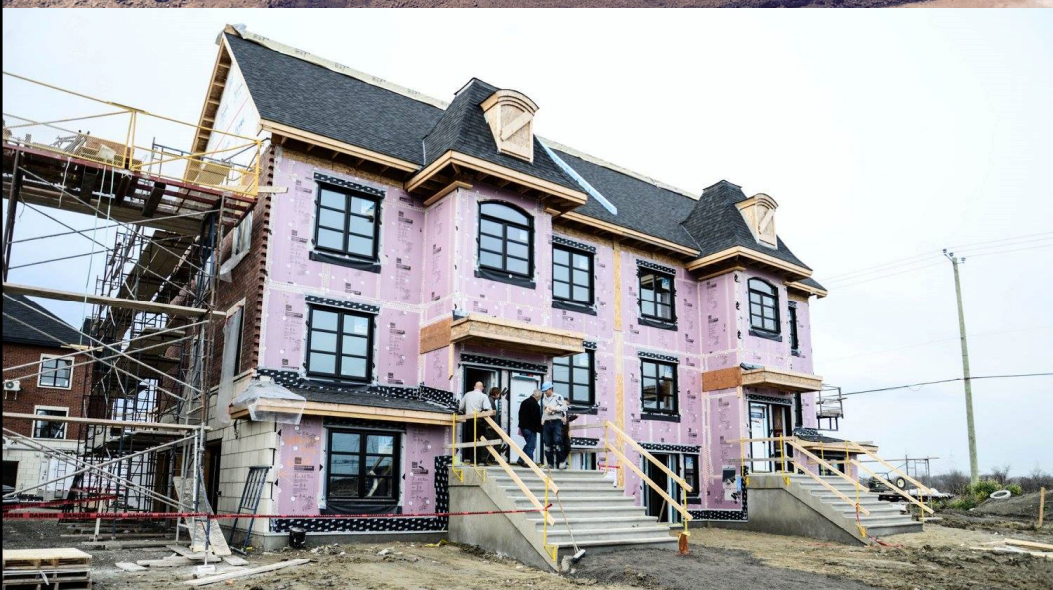
47 223 kWh

(more conservative)



Many challenges and lessons learned





Thank you!

Presented by:

Jean-François Voyer



NRCan ecoEI Owens Corning NZE Communities Initiative

NetZero Project Results

June 09, 2016



HAWK-EYE
Technical Services

Provident



INNOVATIONS FOR LIVING

What is it?

“A house that produces as much energy as it uses over the course of a year for heating/cooling, hot water, lights and major appliances.”

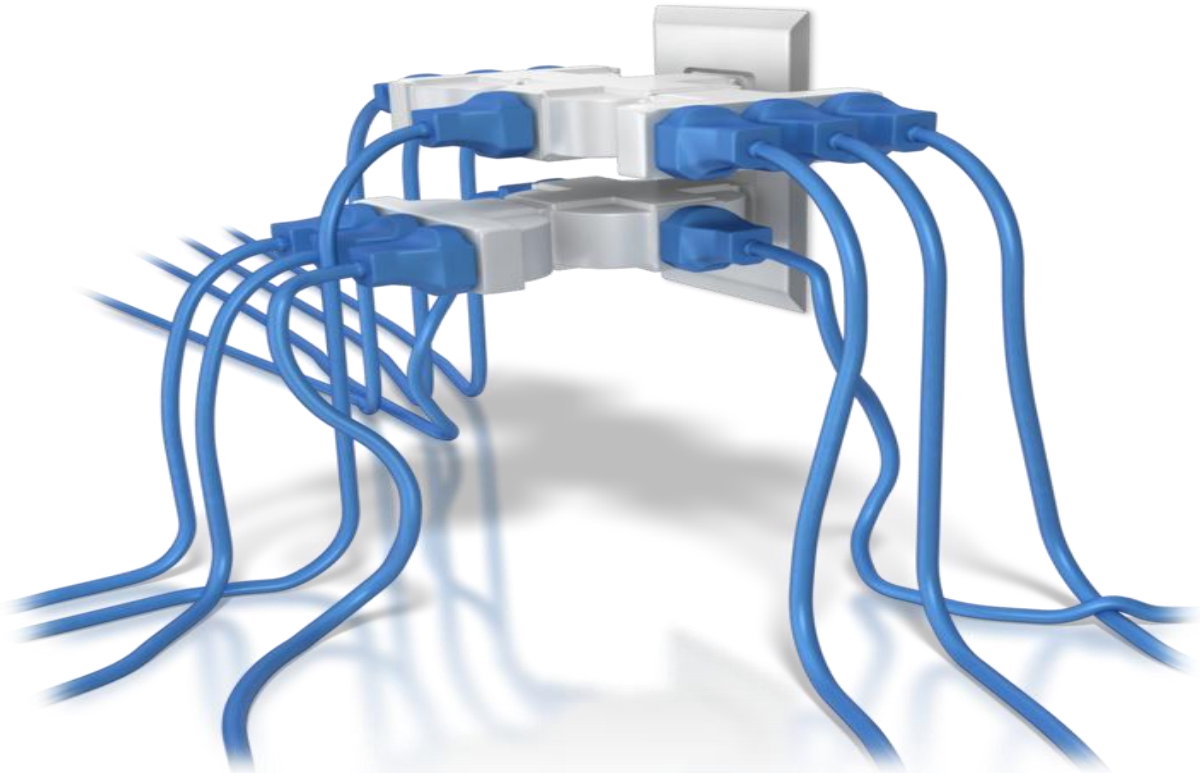


HAWK-EYE
Technical Services

Provident



INNOVATIONS FOR LIVING



HAWK-EYE
Technical Services

Provident



INNOVATIONS FOR LIVING



HAWK-EYE
Technical Services

Provident



INNOVATIONS FOR LIVING

covenants:

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cations to be
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art.

per W. J. X. J. Date July
WEST BEDFORD HOLDINGS LLC

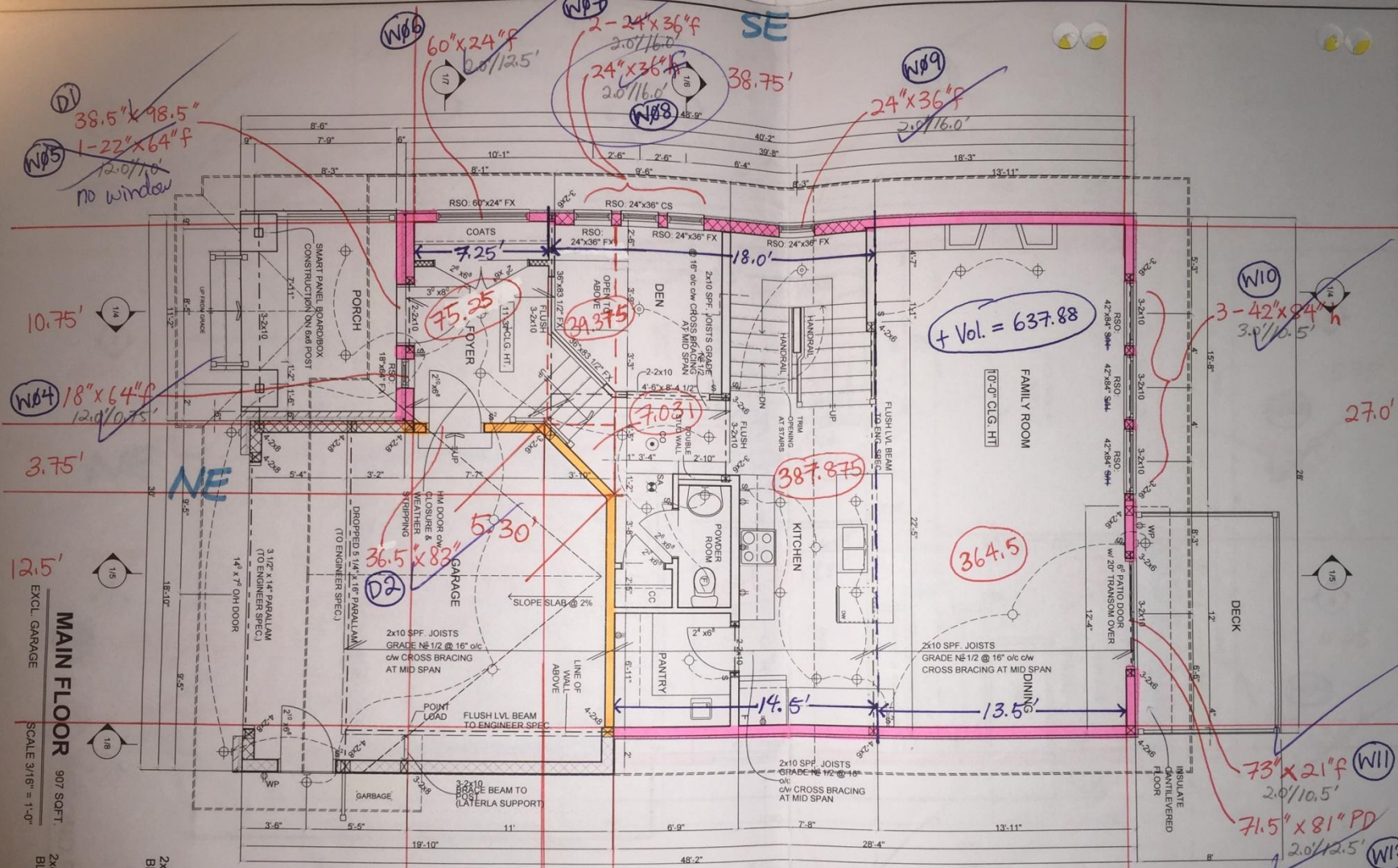


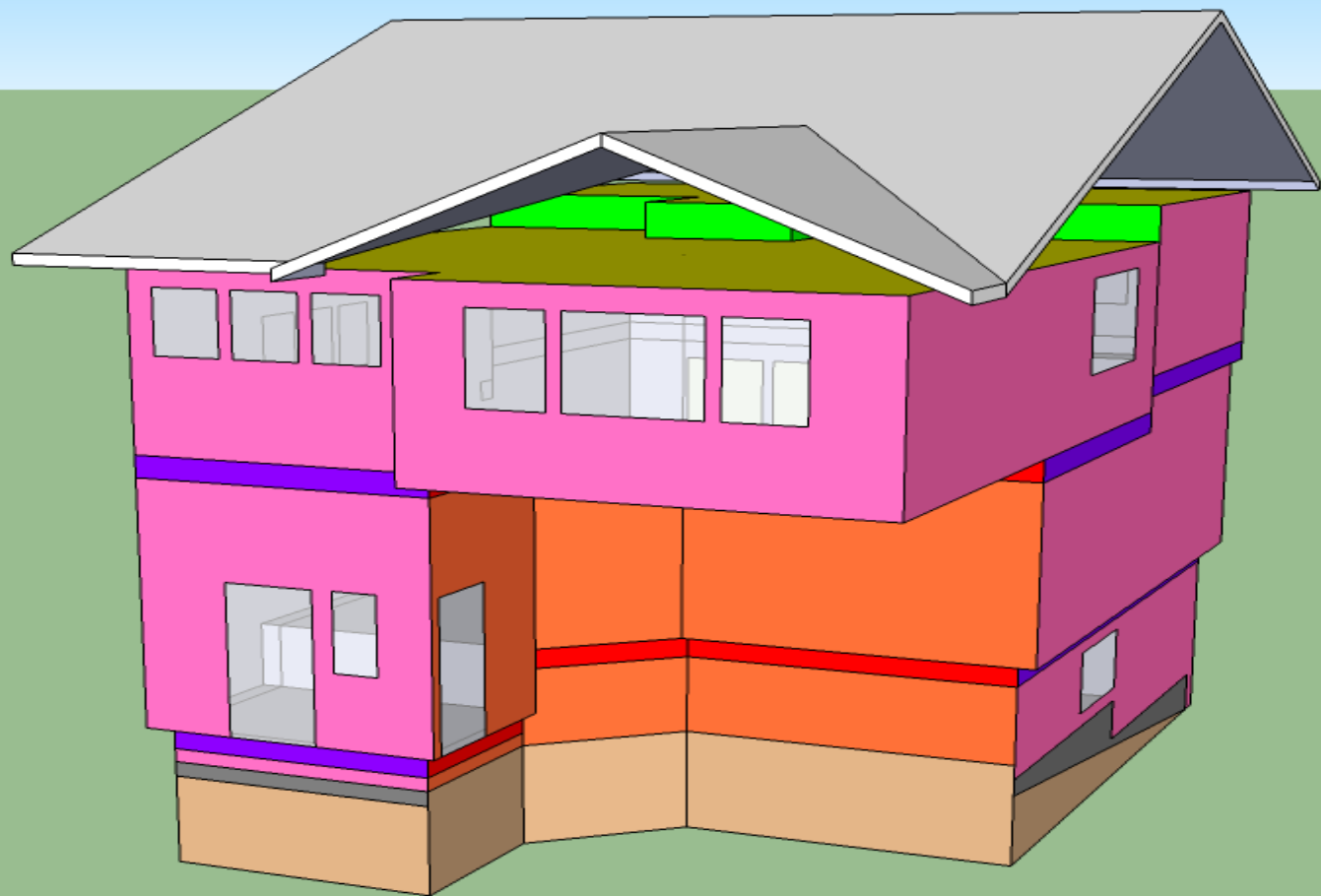
FRONT ELEVATION

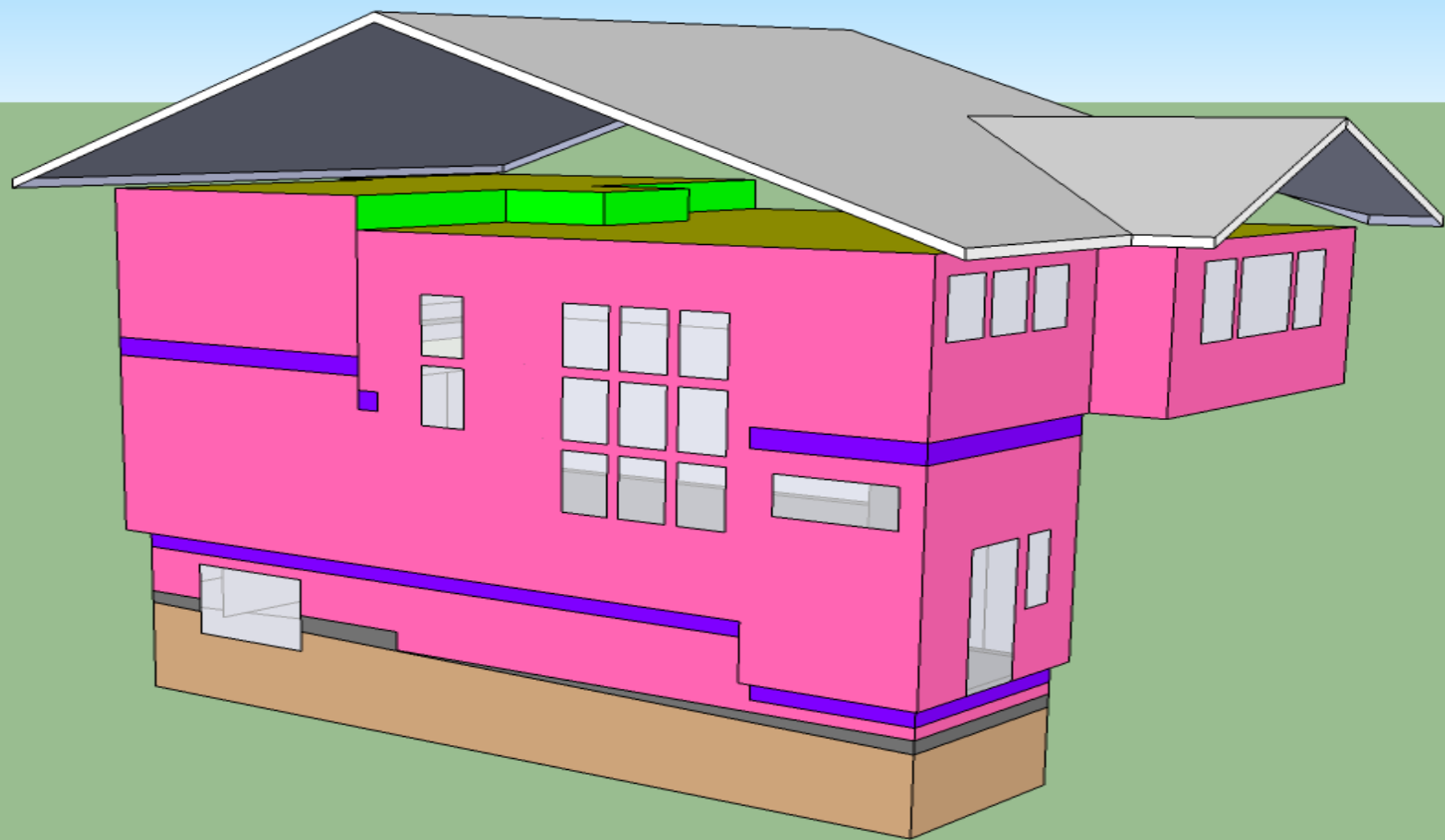
SCALE 3/16" = 1'-0"



OVATIONS FOR LIVING







Standard NetZero Ready Specifications

Roof	R65 blown cellulose
Main Walls	R24 + R10 XPS (2") CodeBord®
Basement Walls	R24 + R10 XPS (2") CodeBord®
Underslab	R10 XPS (2") CodeBord®
Windows	Triple Pane Windows
HRV	74% ERV
Space Heating	2 mini ductless heat pumps and a mini ducted heat pump, electric baseboard
Water Heating	Solar + Rheem 0.88 EF 50 Gallon Hybrid Heat Pump Water Heater
Airtightness	1.00 ACH @ 50Pa



HAWK-EYE
Technical Services

Provident



INNOVATIONS FOR LIVING



vident



INNOVATIONS FOR LIVING



INNOVATIONS FOR LIVING



INNOVATIONS FOR LIVING



INNOVATIONS FOR LIVING



Provident
A Tradition of Excellence

**Parks of West Bedford
Net Zero Energy Ready Community
Nova Scotia**



HAWK-EYE
Technical Services

Provident



INNOVATIONS FOR LIVING



HAWK-EYE
Technical Services

Provident



INNOVATIONS FOR LIVING





OWENS FOR LIVING



Lot AM28

Date Oct 30/15

ORD HOLDINGS LTD.

CONT.RIDGE VENT

In Accordance with rest

- All Metal Chimneys to be in) with Vinyl Siding;
- All Oil Storage/Propane T approved by Clayton and approved screening meth
- Exterior Colors must be a Clayton prior to Construct

TRIM

SMART SIDE

ASPHALT SHINGLES

SECOND FLOOR

6x6 POST
COVERED W/
BLACK EXTERIOR
MDF

MAIN FLOOR

STONE

BASEMENT

GRADE

STONE

RWL

CEDAR

TRIM

SMART SIDE

ASPHALT SHINGLES

GRADE

RWL

FRONT ELEVATION

SCALE 3/16"=1'-0"



OVATIONS FOR LIVING

19

Ceiling Hght. = 8.25' & 10.0' Hdr Hght. = 10' H
 Floor Area = 1310.81 ft² Rn. = 155.5 ft
 Volume = 12926.36 ft³
 10' Walls = 615.0 ft²
 (10' x 61.5')

MAIN FLOOR PLAN

SCALE 3/16" = 1'-0"

1213 SQ. FT
 8" Walls = 216.56 ft²
 (8.25' x 26.25')

8.25' Walls = 530.06 ft²
 (8.25' x 64.25')

6' Walls = 21.0 ft²
 (6' x 3.5')

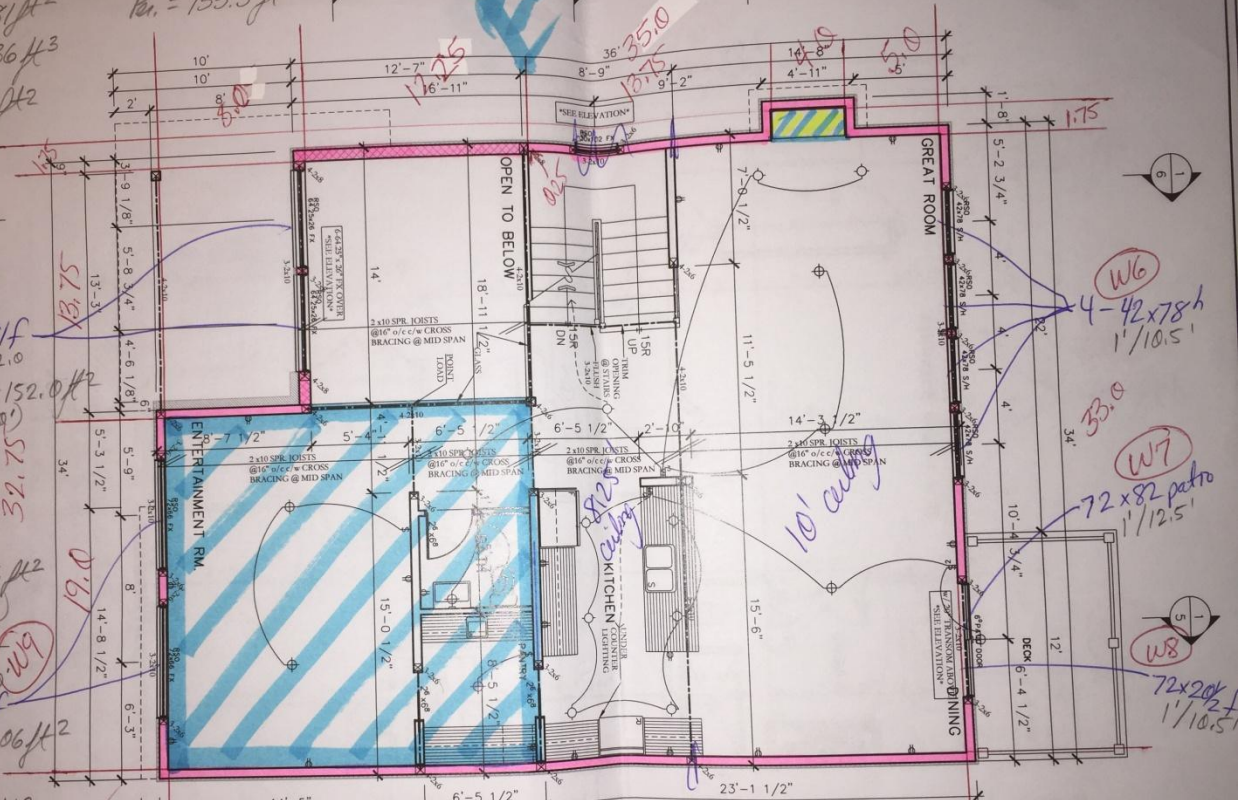
Ceiling @ 1 = 7 ft²
 1/2 @ 4.0
 Hdr = 0.75'

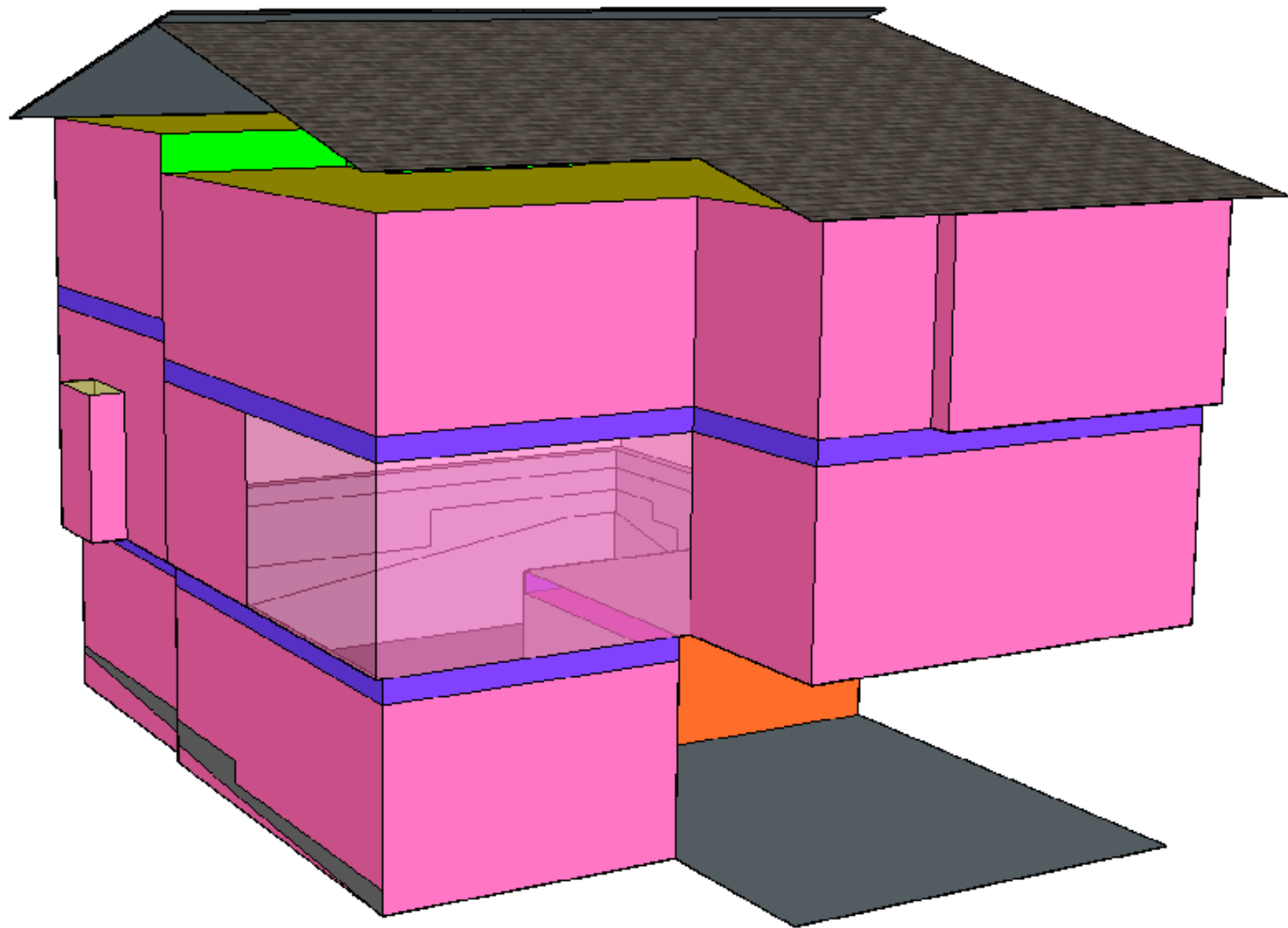
Exp Flr Ov Gr. = 390.88 ft²
 (19')

Exp Flr Ov Bnd. = 53.63 ft²
 (78.5')

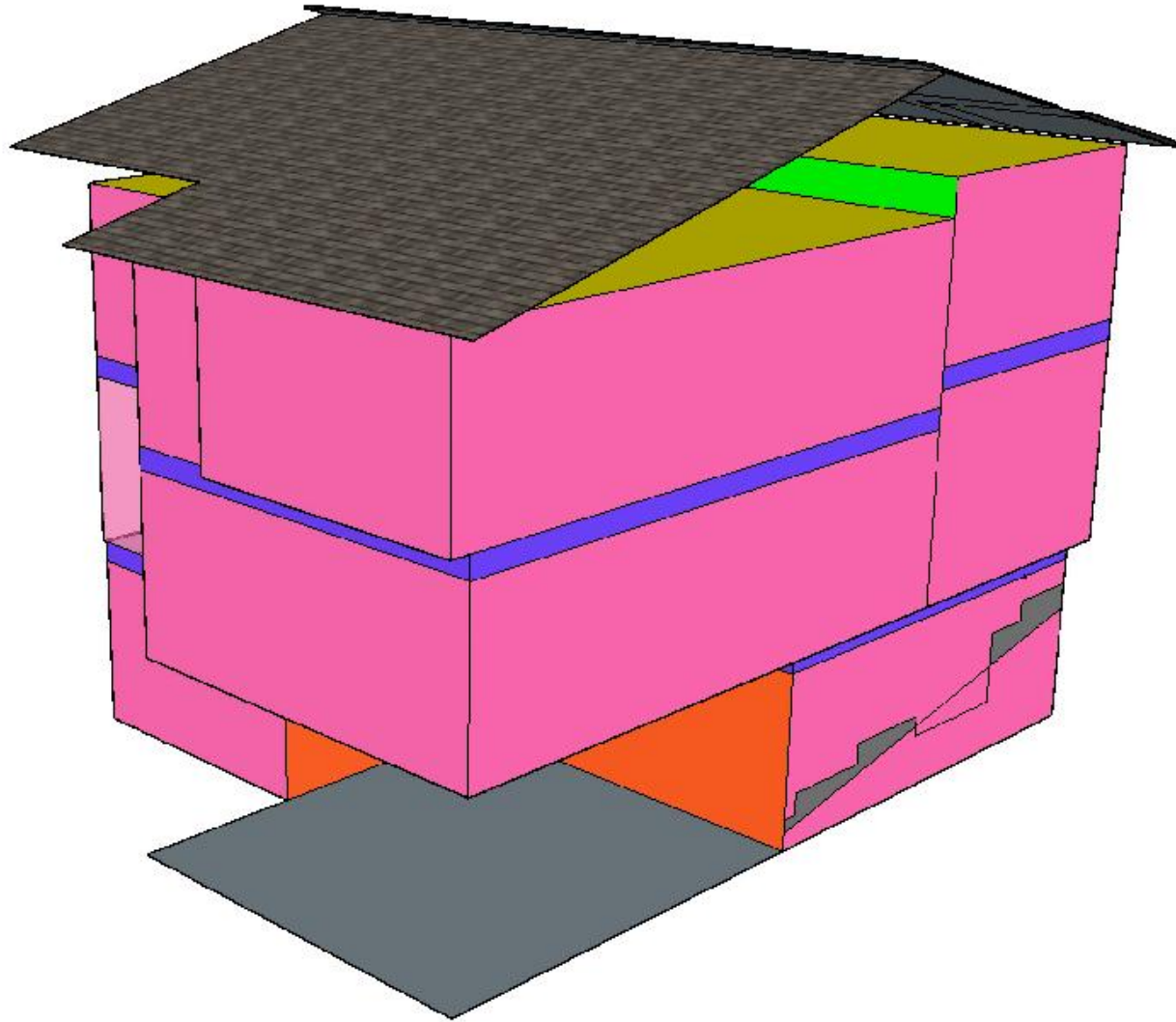
Exp Flr Ov Hng. = 7.0 ft²
 (4.0')

Surf Area = 1993.13 ft²

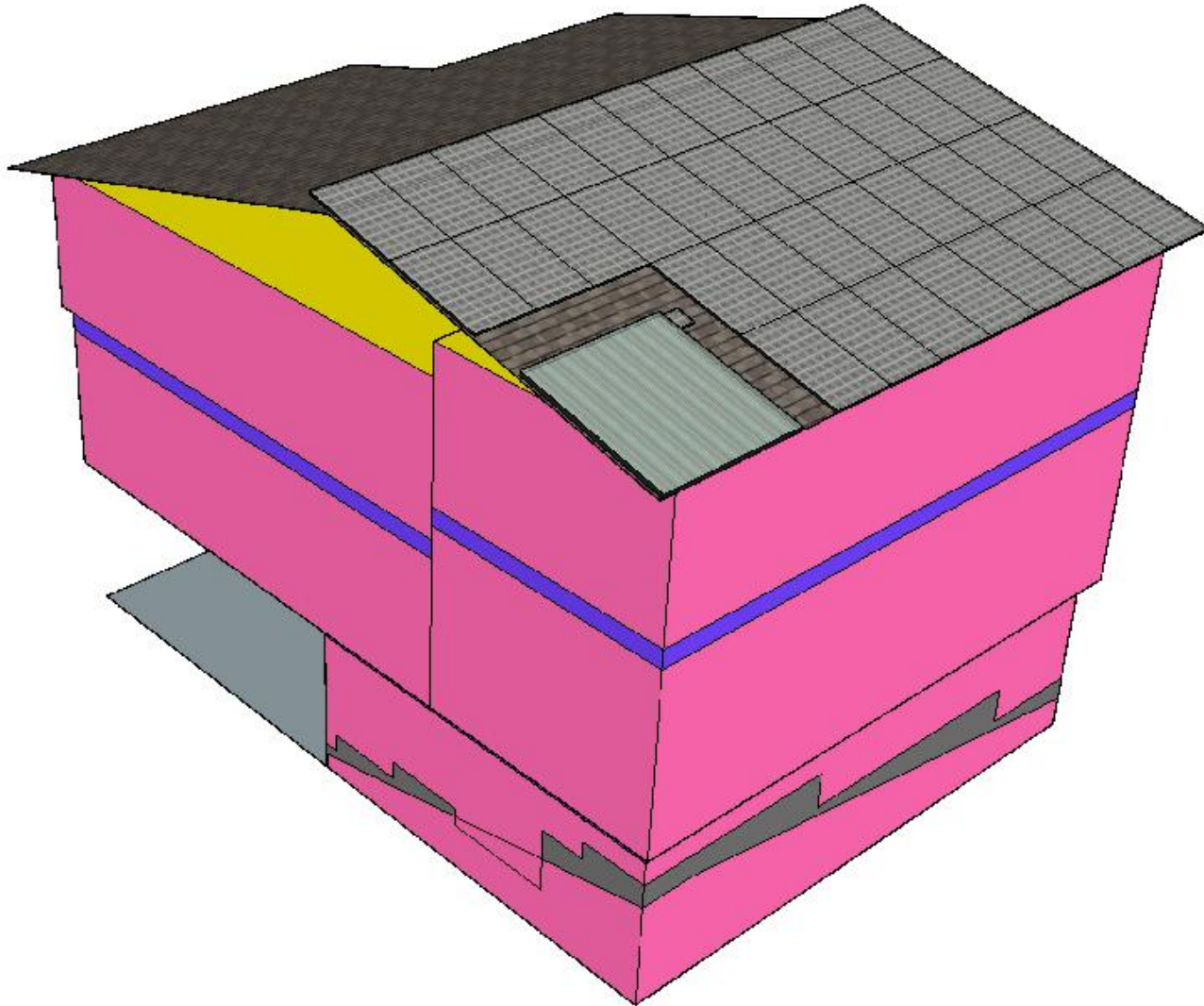




INNOVATIONS FOR LIVING



INNOVATIONS FOR LIVING



INNOVATIONS FOR LIVING







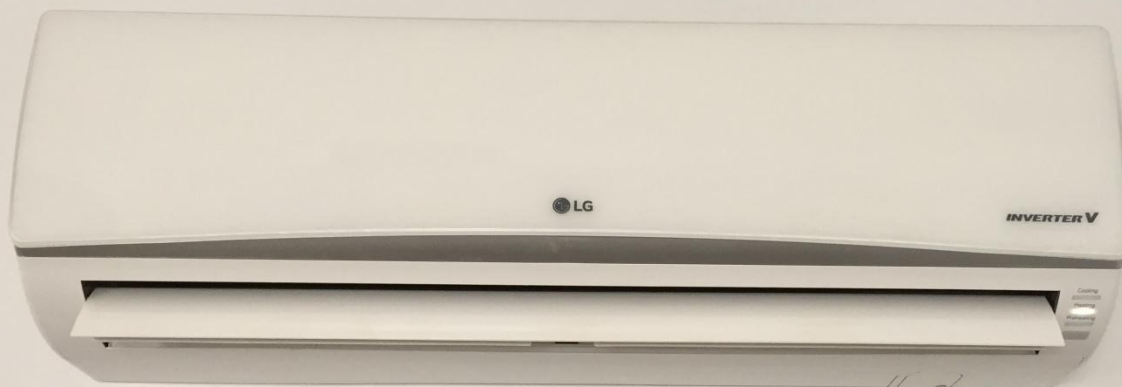
INNOVATIONS FOR LIVING



INNOVATIONS FOR LIVING



OVATIONS FOR LIVING

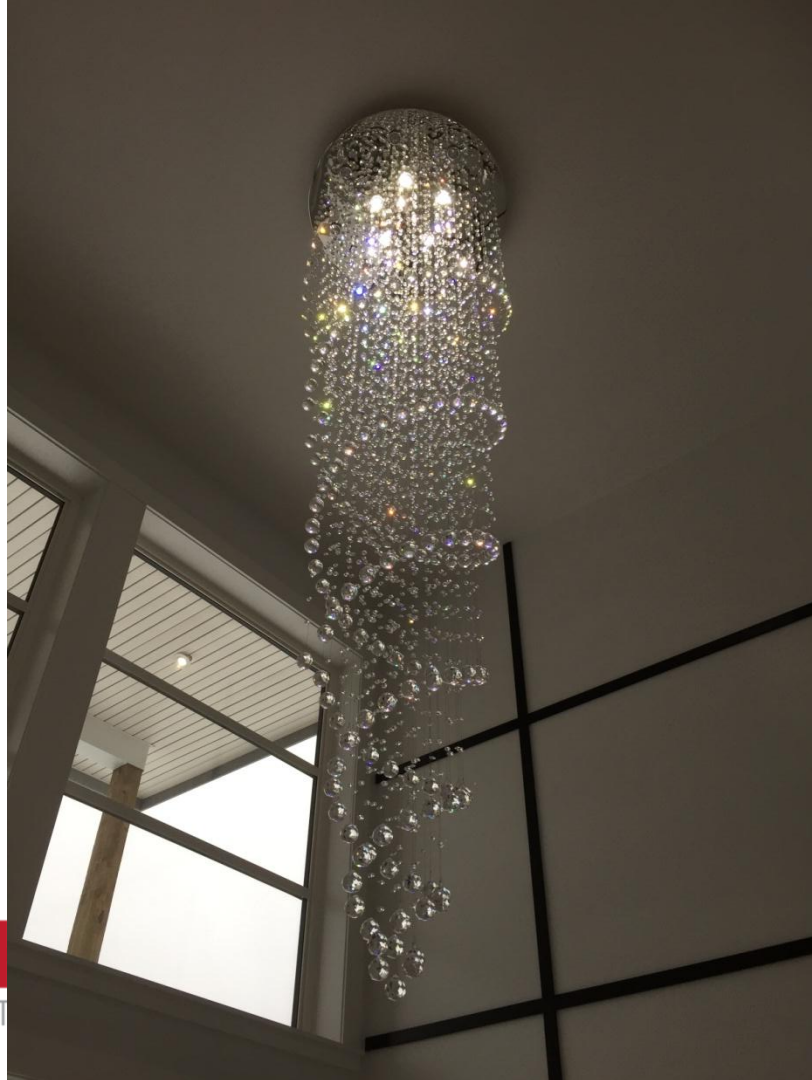


INNOVATIONS FOR LIVING





OVATIONS FOR LIVING



vident



INNOVATIONS FOR LIVING















“This project helped us find the right recipe for Net Zero Ready in a production suburban setting for our market. In the near future, we hope to provide Net Zero Ready as a standard in all our houses.”

**John Greenough, President
Provident Developments**



HAWK-EYE
Technical Services



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