The Toronto Method of Construction
Re-thinking How We Insulate Our Homes

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PASSIVE HOUSE PRINCIPLES

Three issues.

Orientation
Insulation
Air-Tight with Managed Ventilation

Floors
Walls
Roof

Three locations.
SUSTAINABLE.TO Ethos

1. REDUCE THE OVERALL ENERGY DEMAND

2. REUSE NATURE’S ENERGY PASSIVELY

3. RECYCLE RENEWABLE ENERGY ACTIVELY

IMPACT ON ENERGY

ASSOCIATED COST

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RESEARCH

PERSIST Wall System

Pressure
Equalized
Rain
Screen
Insulated
Structure
Technique
PROJECT GOALS

PROTECTED INTERNAL STRUCTURE

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PROJECT GOALS

PROTECTED INTERNAL STRUCTURE

ONE CONTINUOUS MEMBRANE

[air, weather, vapour]
PROJECT GOALS

PROTECTED INTERNAL STRUCTURE

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[air, weather, vapour]

CONTINUOUS THERMAL BLANKET

[thermal bridge free]
PROJECT GOALS

PROTECTED INTERNAL STRUCTURE

ONE CONTINUOUS MEMBRANE
[air, weather, vapour]

CONTINUOUS THERMAL BLANKET
[thermal bridge free]

LIGHTWEIGHT RAINSCREEN CLADDING
[vented]
Method.TO vs. Code-Minimum Wall

**Code-Minimum Wall**

- 2x6 Framing
- Fibreglass Pink insulation
- Interior vapour/air barrier
- Exterior “air”/weather barrier

- Nominal Insulation Value: R-24
- Effective Insulation Value: R-18.7 (20% framing)
- Air Tightness: 2.5ACH @ 50Pa (typical)

**Toronto Method Wall**

- 2x4 Framing
- Single air/vapour/weather Barrier

- Nominal Insulation Value: R-24
- Effective Insulation Value: R-23.99 (0.001% fasteners)
- Air Tightness: 0.6ACH @ 50Pa

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HYPOTHESES

1. Long screws through furring strips and 9” ROXUL Comfortboard IS into stud wall structure will support light-weight cladding.

2. Effective R-value of wall assembly will be nearly nominal R-value

3. The sheathing temperature will remain below the Dew Point Temperature
METHOD.TO

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2x4 STUD WALL @ 16" c/c
2x4 STUD WALL @ 16\" o/c
1/2\" OSB SHEATHING
BLUESKIN VP PEEL-AND-STICK (AIR AND WEATHER BARRIER)
BLUESKIN WB PEEL-AND-STICK (WRAP WINDOW FRAME)
9\" MINERAL WOOL INSULATION (3 LAYERS OF 3\" ROXUL COMFORTBOARD IS)
2x4 STUD WALL @ 16” o/c

1/2” OSB SHEATHING

BLUESKIN VP PEEL-AND-STICK (AIR AND WEATHER BARRIER)

BLUESKIN WB PEEL-AND-STICK (WRAP WINDOW FRAME)

9” MINERAL WOOL INSULATION (3 LAYERS OF 3’ ROXUL COMFORTBOARD IS)

1x3 VERTICAL STRAPPING @ 16” o/c MECHANICALLY FASTENED TO STUDS
SIGA tape on sheathing – continuous air barrier, OSB vapour control

Consulting with local contractors

Weather and air sealing at window buck extension

Photos courtesy of SUSTAINABLE.TO
Blueskin air, weather and vapour control

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

Photos courtesy of SUSTAINABLE.TO
Layering insulation, 3” min. lapped seams

Warm window frame

Blocking at base, strap as you go

Photos courtesy of SUSTAINABLE.TO
COST vs. ENERGY

Construction Budget Increase

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THERMAL IMAGING

Cold fasteners on interior
- insulate to reduce condensation risk
- 2 winters, no issues

Air leakage at corner of roof
- no Siga installed, only Blueskin
IN SITU TESTING

Located at Evergreen Brickworks for testing

Roof-mounted weather station

Testing In-Situ Hygrothermal Performance

Photo courtesy of Mark Flynn, MASc candidate, Ryerson University
IN SITU TESTING

54 sensors installed to test:

- heat flux
- RH
- temperature

Photos courtesy of Mark Flynn, MASc candidate, Ryerson University
Sensor Placement

54 sensors installed to test:

- Heat flux
- RH
- Temperature
- Moisture content

[Schematic diagram showing sensor placement across different layers and locations (Exterior and Interior).]
HYPOTHESES

1. Long screws through furring strips and 9” ROXUL Comfortboard IS into stud wall structure will support light-weight cladding.

2. **Effective R-value** of wall assembly will be nearly nominal R-value

3. The sheathing temperature will remain below the **Dew Point Temperature**
RESULTS

CONDENSATION RISK

North and South

Summer (top) vs. Winter (bottom)
RESULTS

MOISTURE CONTENT

North Wall

Summer (top) vs. Winter (bottom)
RESULTS

MOISTURE CONTENT

South Wall

Summer (top) vs. Winter (bottom)
RESULTS

THERMAL RESISTANCE (RSI)

North Wall

Late Spring vs. Winter
CASE STUDY: RISEBROUGH RESIDENCE

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

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80% ENERGY SAVINGS

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

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

• Continue in-situ testing through Winter 2016/2017

• Laboratory testing using climate simulator

• WUFI calibration and hygrothermal analysis

• Develop recognized assembly for walls without vapour retarders

• Refine construction method with contractor collaboration
THANK YOU!

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