

Panasonic

Homes & Living

PRODUCT

COMPARATIVE VALUES

Insulation R-Values

TYPE OF INSULATION	R-VALUE
Fiberglass Batt	3.14
Fiberglass Blown (attic)	2.2
Fiberglass Blown (wall)	3.2
Rock Wool Batt	3.14
Rock Wool Blown (attic)	3.1
Rock Wool Blown (wall)	3.03
Cellulose Blown (attic)	3.13
Cellulose Blown (wall)	3.7
Vermiculite	2.13
Air-entrained Concrete	3.9
Urea terpolymer foam	4.48
Rigid Fiberglass (> 4lb/ft ³)	4
Expanded Polystyrene (beadboard)	4
Extruded Polystyrene	5
Polyurethane (foamed-in-place)	6.25
Polyisocyanurate (foil-faced)	7.2



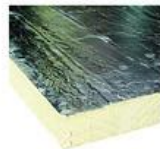
3.14
Fiberglass Batt



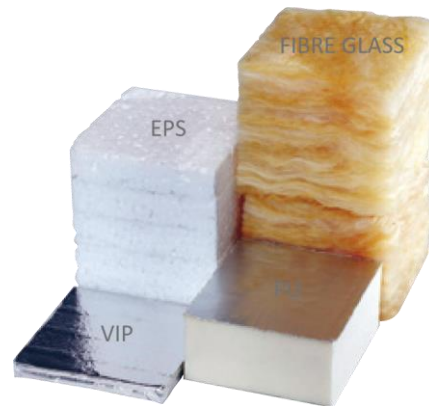
3.13
Cellulose Blown (attic)



6.25
Polyurethane
(foamed-in-place)



7.2
Polyisocyanurate
(foil-faced)



insulation
thickness
required
to achieve
0.16 w/m²k



glass wool
210mm



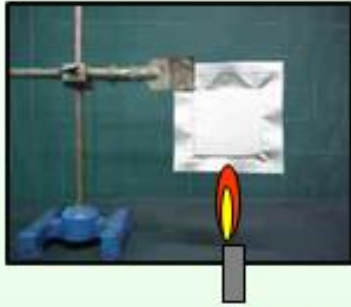
PIR
130mm



VIP
25mm

FLAMMABILITY

Tested by UL Method



10 sec of flame contacted time



The core materials of all the VIPs found in the survey carried out in this study are made of non combustible materials (silica fume, rigid fiberglass board and aerogel). Where a combustible material such as EPS or XPS is used to clad the VIP the normal precautions required by building code regulations for those materials must be followed. This involves covering the EPS or XPS with a non combustible material such as concrete, stucco or drywall.

Ontario Building Officials Association(OBOA), 2010 AMTS Technical Committee Meeting, 06 October 2010

NRC-CNRC

*Institute for
Research in
Construction*

Green in Blue Mountains

High-Performance Vacuum Insulation Panel in Building Envelope Construction

Dr. Phalguni Mukhopadhyaya
Senior Research Officer

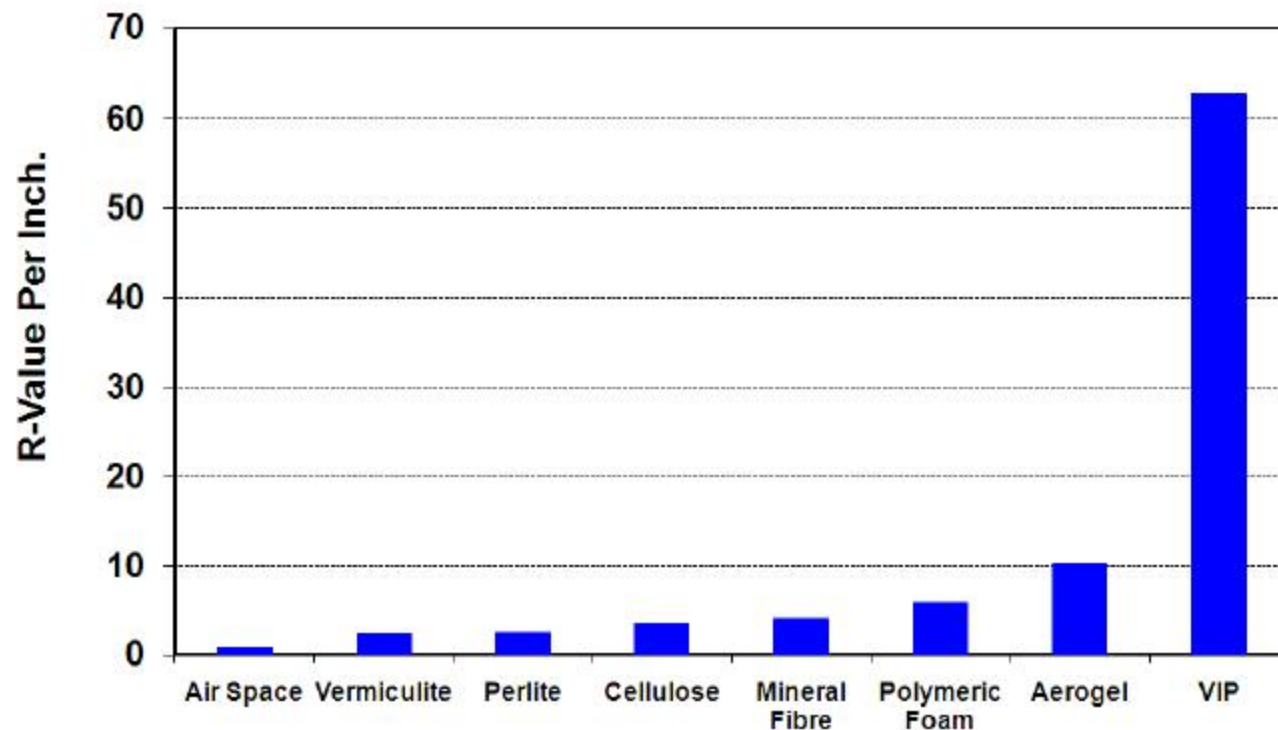


National Research
Council Canada

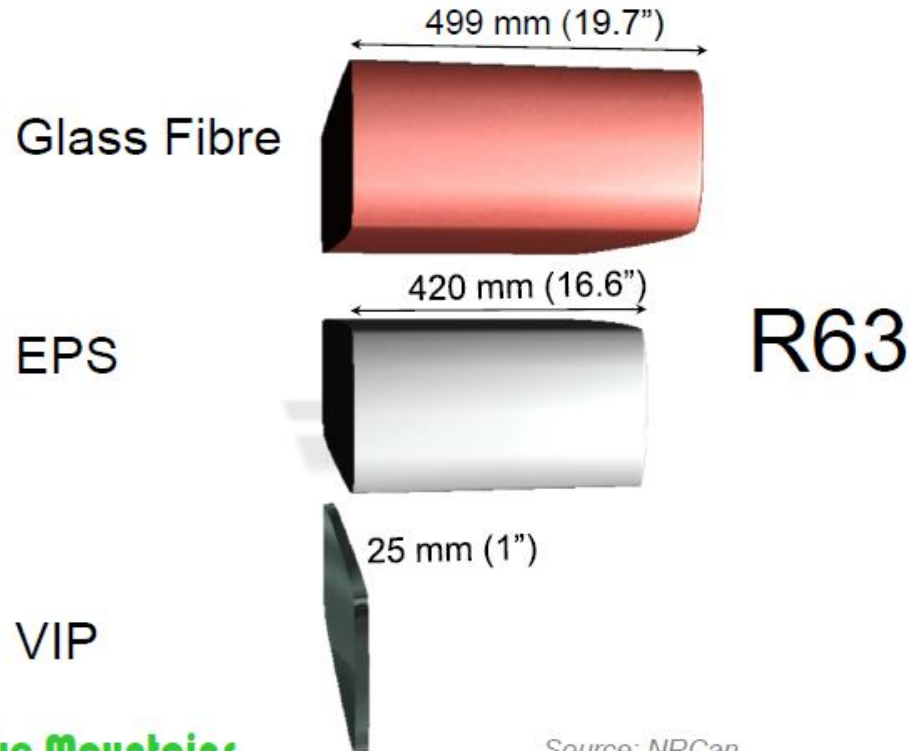
Conseil national
de recherches Canada

Canada 

Thermal Performance Improvement Continues

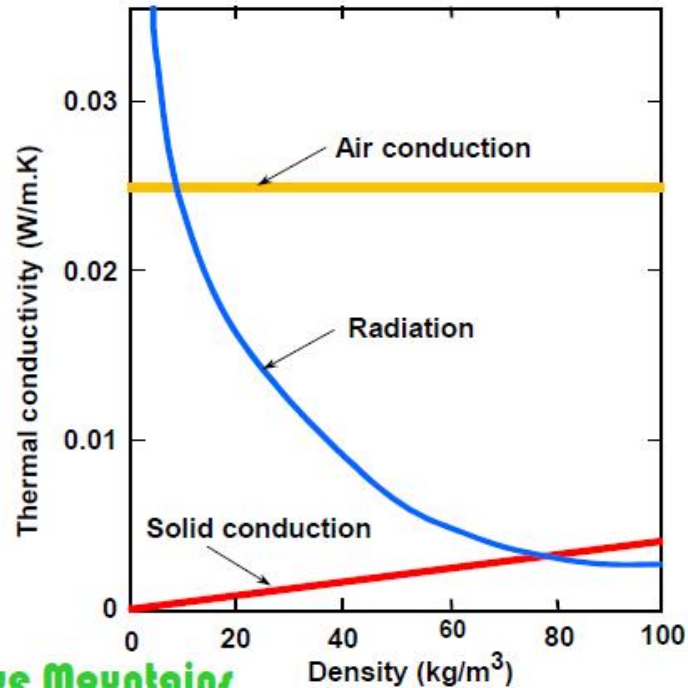


Vacuum Insulation Panel (VIP)

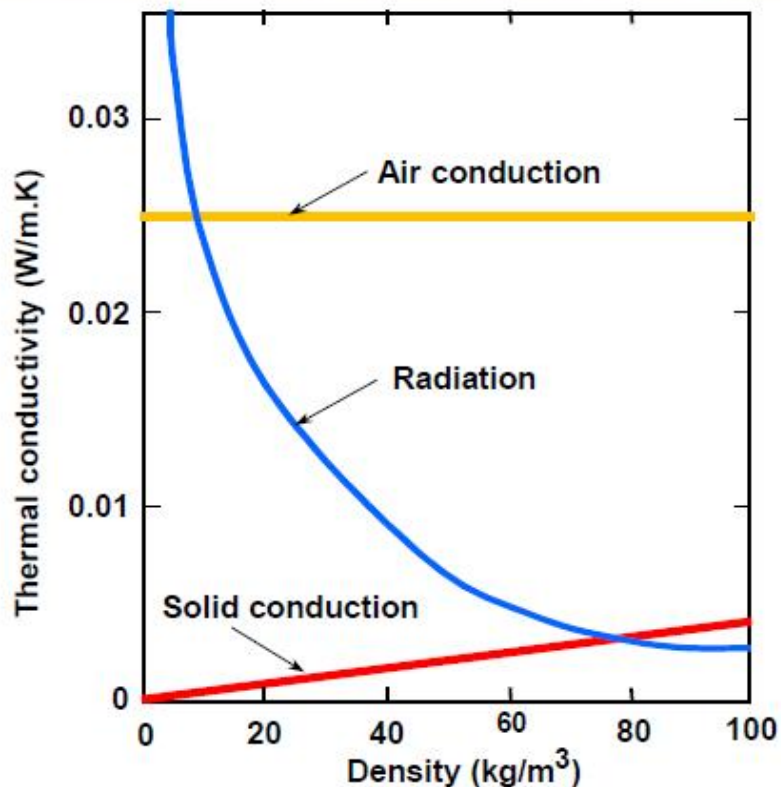


High Performance Thermal Insulation

- VIP: Air conductivity component \approx zero



Insulation – Components for Heat Transfer



Thermal conductivity (W m ⁻¹ K ⁻¹)	R-value per inch
0.040	3.6
0.035	4.1
0.030	4.8
0.025	5.8
0.020	7.2
0.015	9.6
0.010	14.4
0.005	28.9

High Performance Thermal Insulation

- Closed-cell foam insulation
 - Blowing agent conductivity $<$ Air conductivity
- Aerogel
 - Air conductivity (nanopore) $<$ Air conductivity (macropore)
- Vacuum insulation
 - Air conductivity \cong Zero

Vacuum Insulation Panel (VIP)

1. **Core Material** – imparts mechanical strength and thermal insulating capacity
2. **Gas Barrier / Facer Foil** – provides air and vapour tight enclosure for core material
3. **Getter / Desiccant** – adsorbs residual or permeating atmospheric gases or water vapour in the VIP enclosure

Vacuum Insulation Panel (VIP)

- Inherent advantages
 - Higher thermal resistance*
 - Reduced thickness of the component
 - Recyclable

* *Any damage in the vacuum system (even a small pinhole) will severely destroy the thermal insulating capacity of VIPs*








Condensation

- VIP is an absolute vapour barrier
- Avoid damp construction materials
- Consequences of vacuum failure

INSTALLS

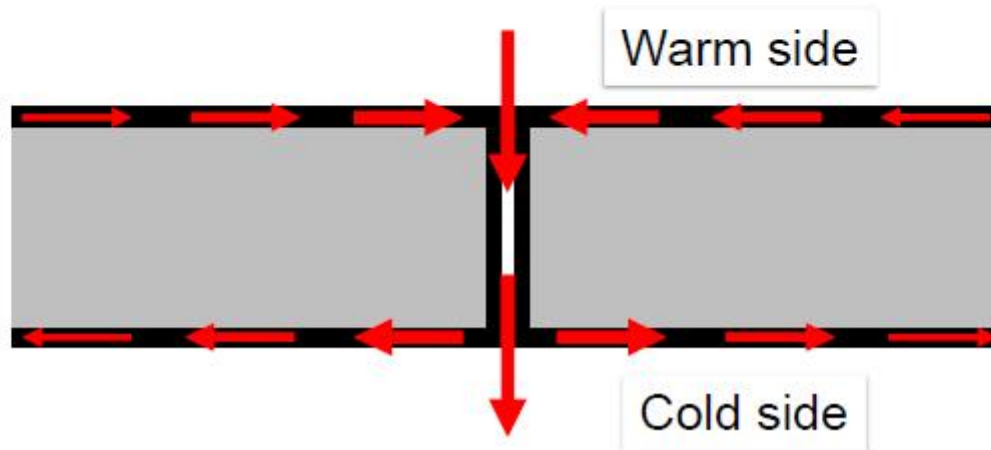
ADHESIVE TESTS

Test result of adhesion for VIP

	No.1	No.2	No.3	No.4	No.5	No.6	No.7
Supplier, Product	Geocel, 2300 Construction Adhesive	PPG, Liquid Nail Heavy Duty Construction Adhesive	PPG,Liquid Nail Projects Construction Adhesive	Loctite, Pro Line Premium Construction Adhesive	GE, Iron Grip	Gorilla Glue Construction Adhesive	Sika, Sika Pro Select
							
Adherability with laminate film for VIP	△ (Peel)	× (Easy peel)	× (Easy peel)	○ (Fix tightly)	○ (Fix tightly)	△ (Peel)	△ (Peel)
Flexibility	○ (Soft)	× (Hard)	× (Hard)	× (Hard)	○ (Soft)	○ (Soft)	○ (Soft)
Chemical attack (Outlooking) (60degC x 11days)	○ (None)	○ (None)	○ (None)	○ (None)	○ (None)	○ (None)	○ (None)

Thermal Bridge

- Use large panels
- Overlap panels
- Fill gaps at edges with insulating materials



Various Applications



Various Applications



Floor



Wall



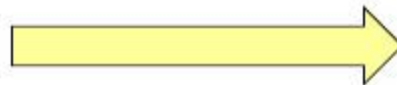
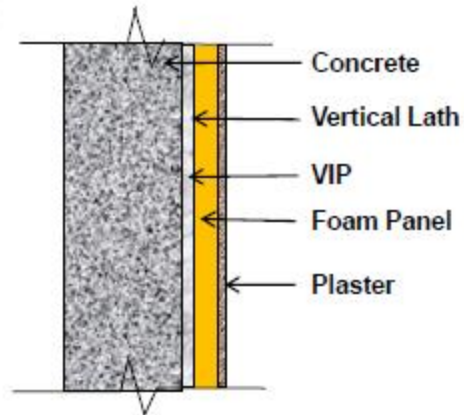
Ceiling



Wall

Apartment and Office Block (Europe)

Façade Renovation



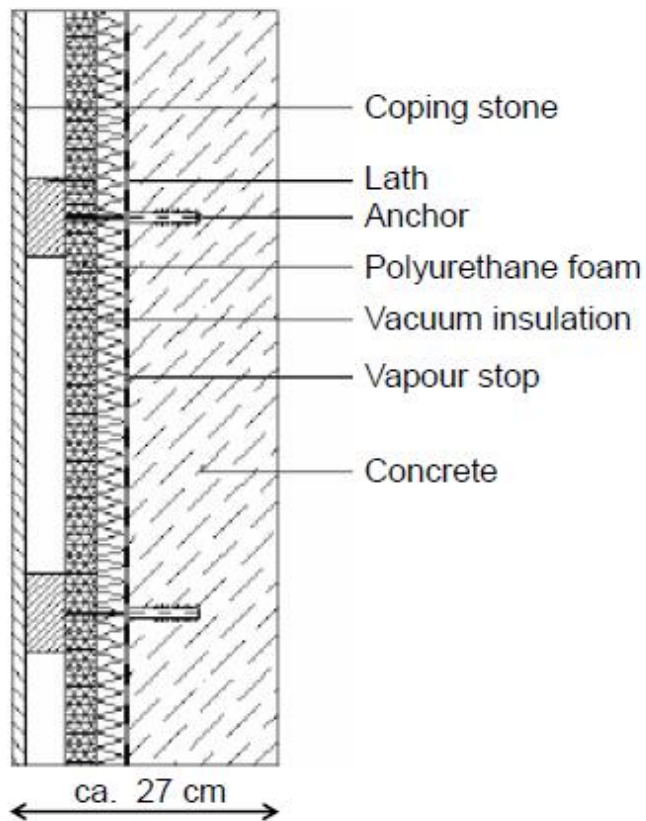
After

Office Building (Europe)

Insulated Prefabricated Concrete Elements



Prefabricated Wall Elements



Semi-detached House (Europe)

Façade Renovation



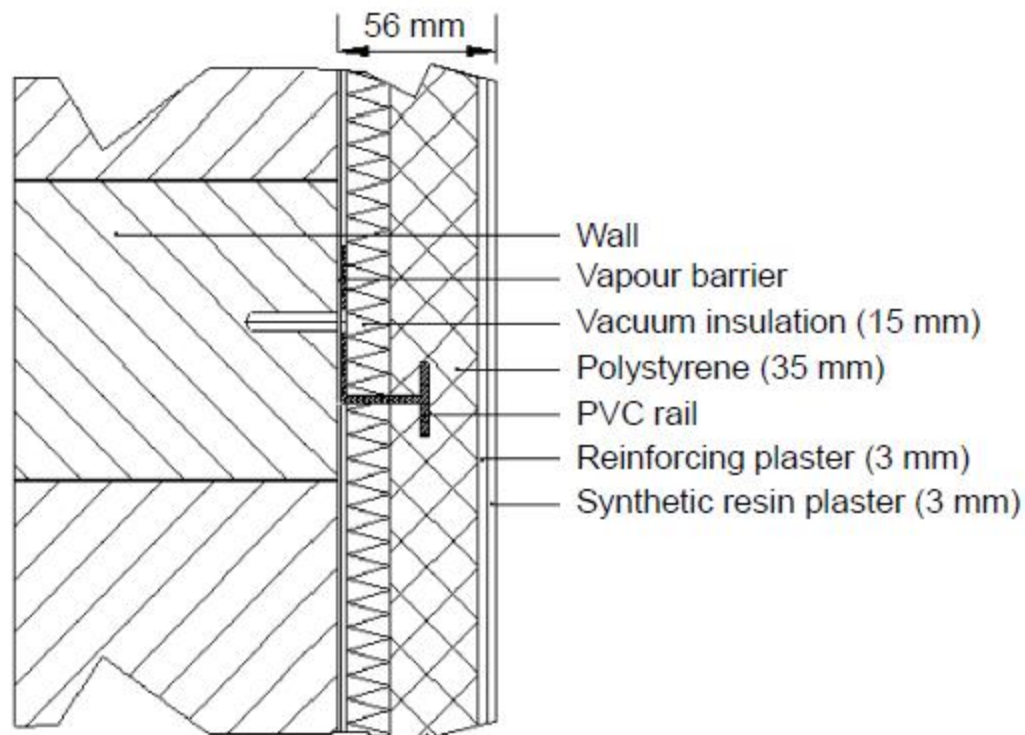
Before



After

Semi-detached House

Cross-section of Insulated Wall



Semi-detached House



Installation

Performance Assessment



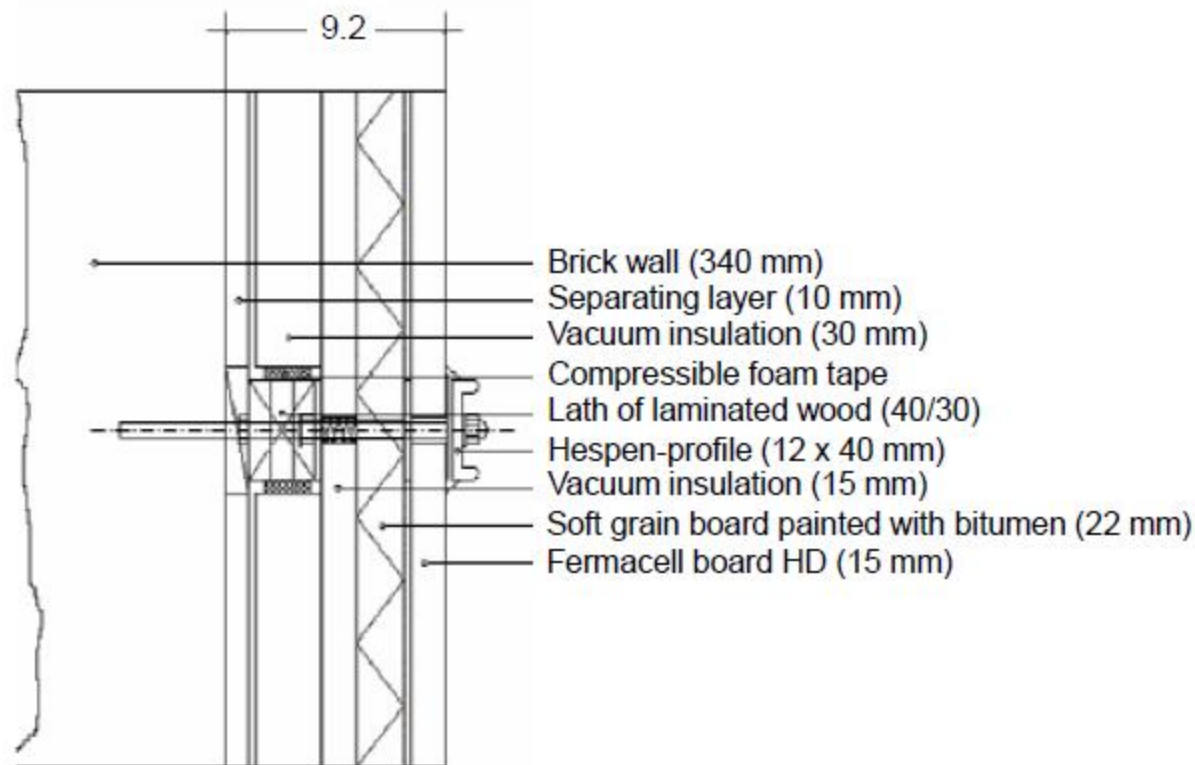
Terraced House (Europe)

Building Envelope Renovation



Terraced House

Cross-section of Insulated Wall

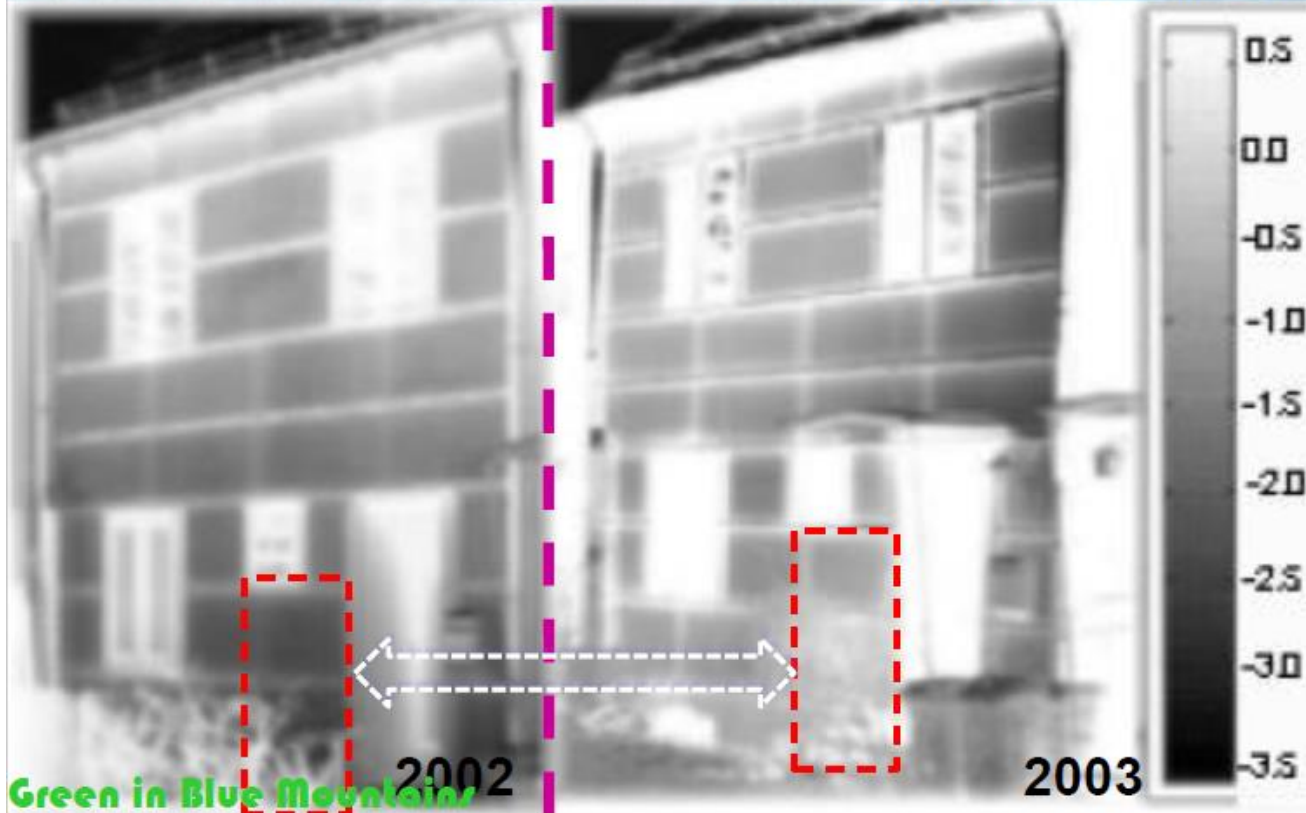


Performance Assessment

MRC-CMRC

Green in Blue Mountains

Source: IEA/ECBCS Annex 39

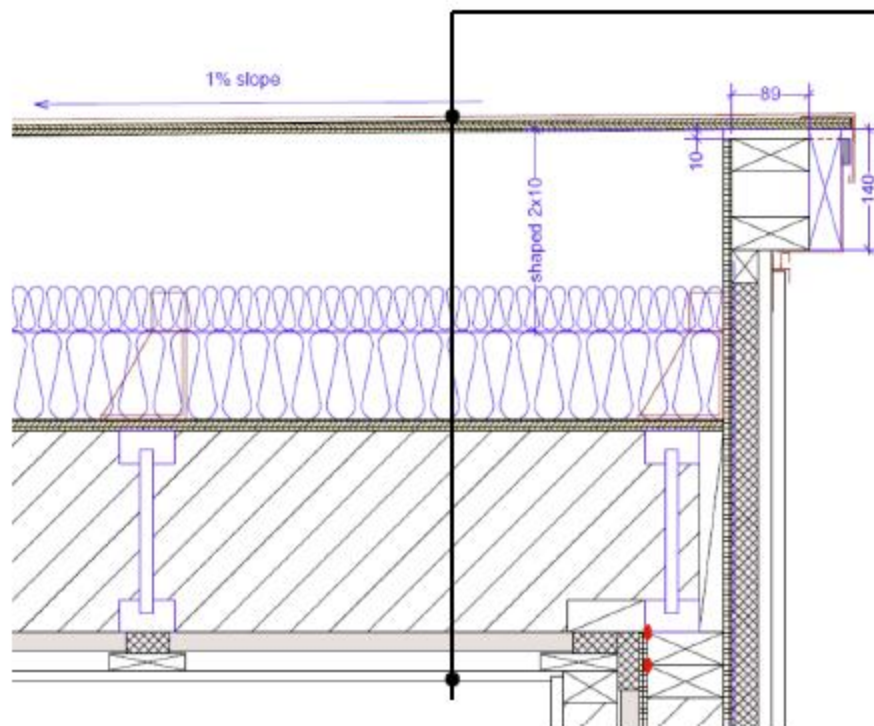


Net Zero Energy Super E House (Japan)



Source: Chris Mattock MRAIC, Habitat Design Plus Consulting Ltd.

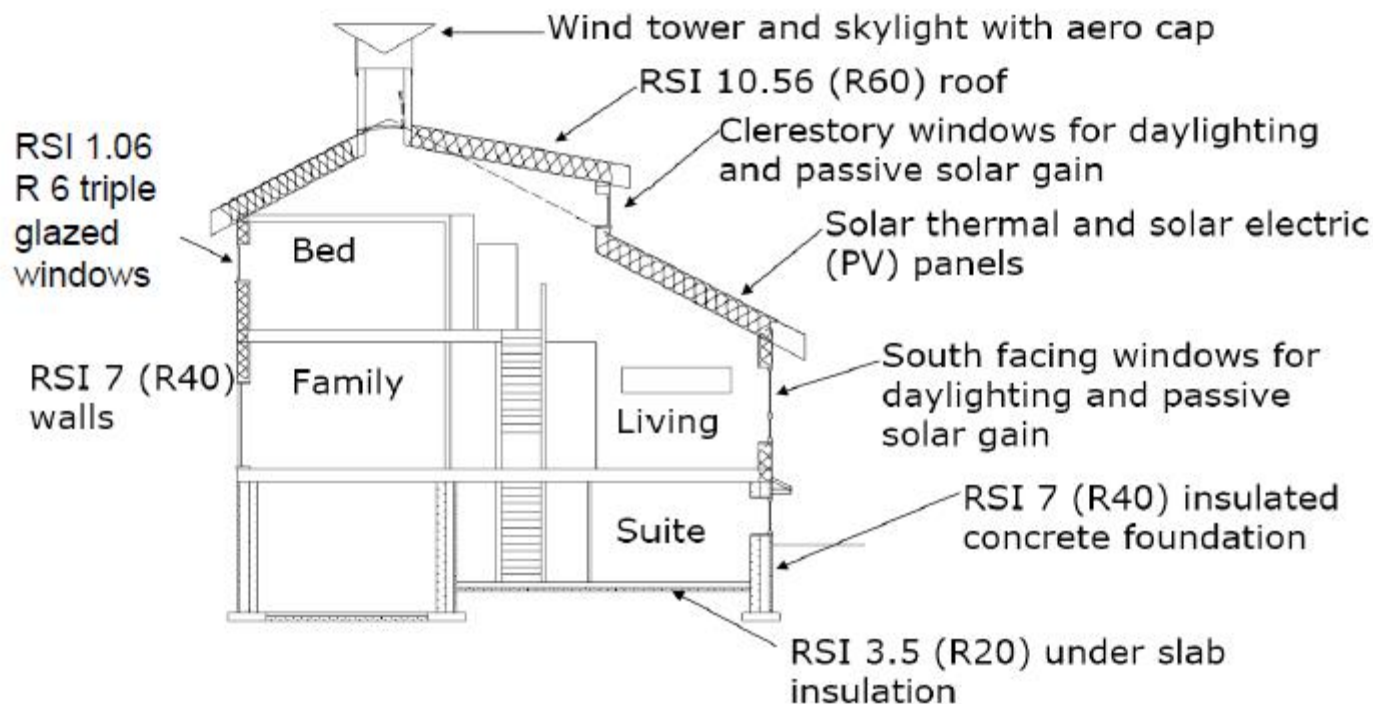
Flat Roof Assembly



TYPICAL FLAT ROOF

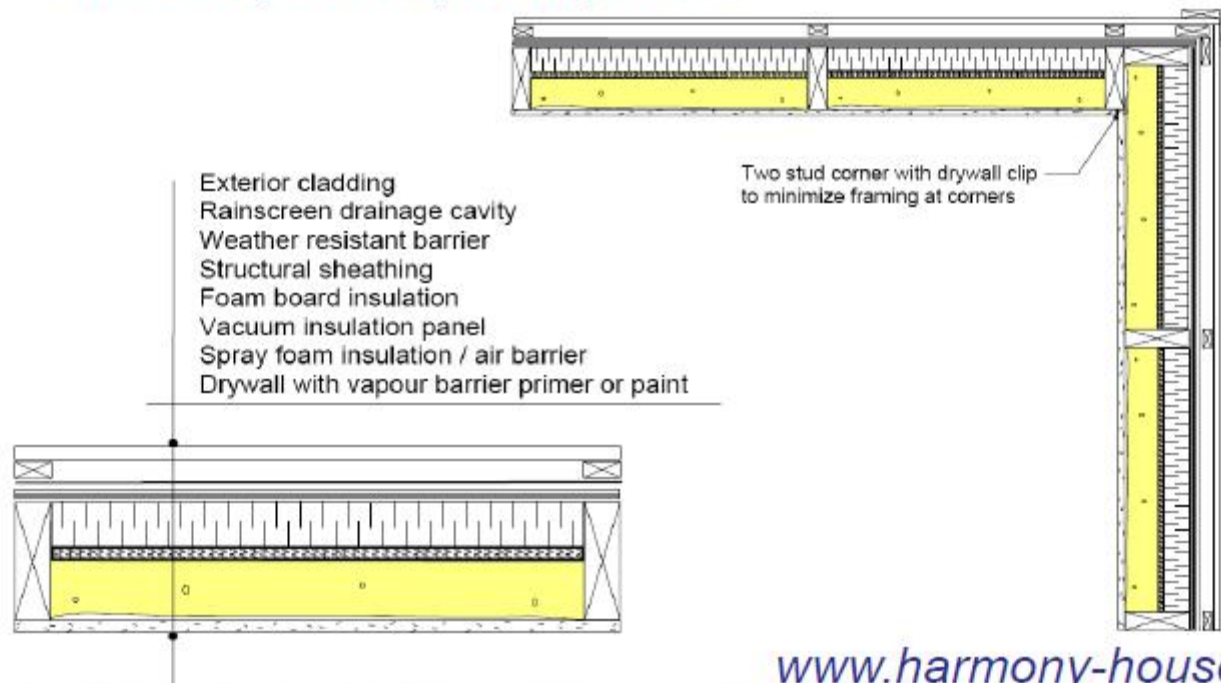
Metal roof
 Roofing paper
 12.5 mm plywood sheathing
 shaped 38x184 @ 610mm o.c.
 Fiberglass bracket
 150 mm Rock wool (R22)
 Roofing paper
 12.5 mm plywood sheathing
 241 mml-joist @610mm o.c.
 241 mm Icynene A.B. (R34.2)
 21 mm VIP (R43)
 19x89 strapping @610mm o.c.
 12.5mm drywall ceiling
 Paint finish

Harmony House Equilibrium Project (Canada)



Wall Assembly

RSI 11.9 (R 67.6) Nominal
RSI 6.6 (R 37.7) Composite



www.harmony-house.ca

Source: Chris Mattock MRAIC, Habitat Design Plus Consulting Ltd.

RESOURCES

**Final Report: Review and Evaluation of Vacuum Panel Insulation
for use in Net Zero or Near Net Zero Energy
Low-Rise Residential Construction**

[Right Click for study](#)- Open
Hyperlink

RCI Interface Featured Article: Vacuum Insulation Panels (VIPs): Five Years of Field Performance

January 6, 2017 By RCI Publications

The Use of VIPs as a Next-Generation Insulation Material in Roofing Systems

by Sudhakar Molleti, PEng; Dominique Lefebvre; Appupillai Baskaran, PEng;
and Pascal Beaulieu

<http://rci-online.org/rci-interface-featured-article-vacuum-insulation-panels-vips-five-years-field-performance/>

Vacuum Insulation Panels (VIPs):

AN HISTORIC OPPORTUNITY FOR THE
BUILDING CONSTRUCTION INDUSTRY

By Phalguni Mukhopadhyaya, Sudhakar Molleti, and David van Reenen

<http://rci-online.org/wp-content/uploads/2014-08-mukhopadhyaya-molleti-vanreenen.pdf>