Welcome to today's CHBA Net Zero Webinar!

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The ultimate in comfort and efficiency

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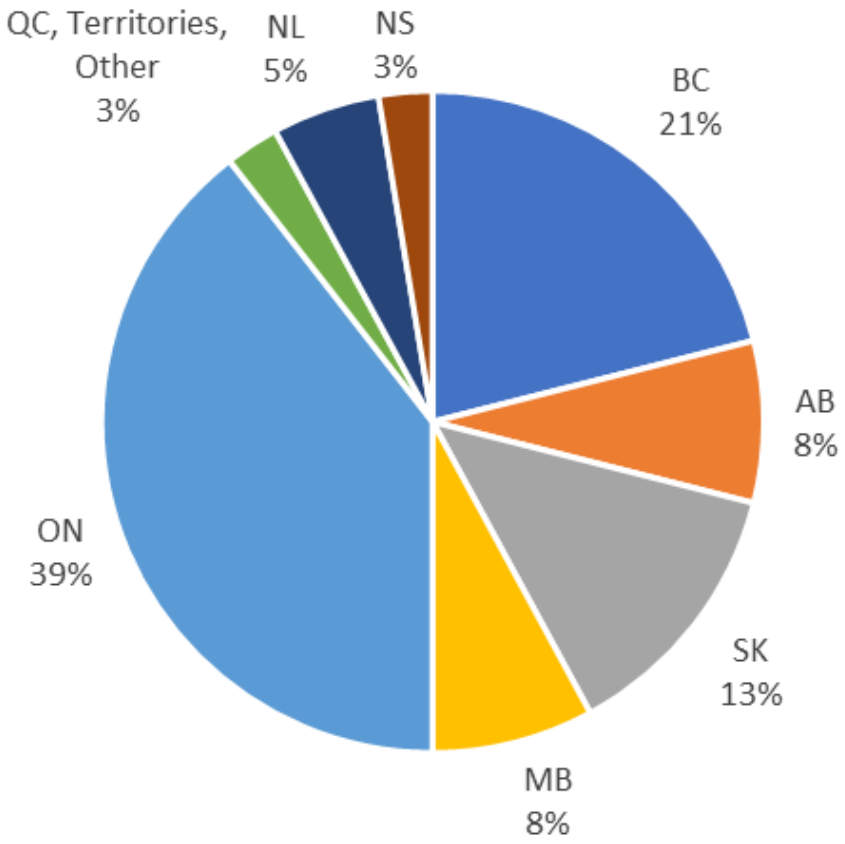
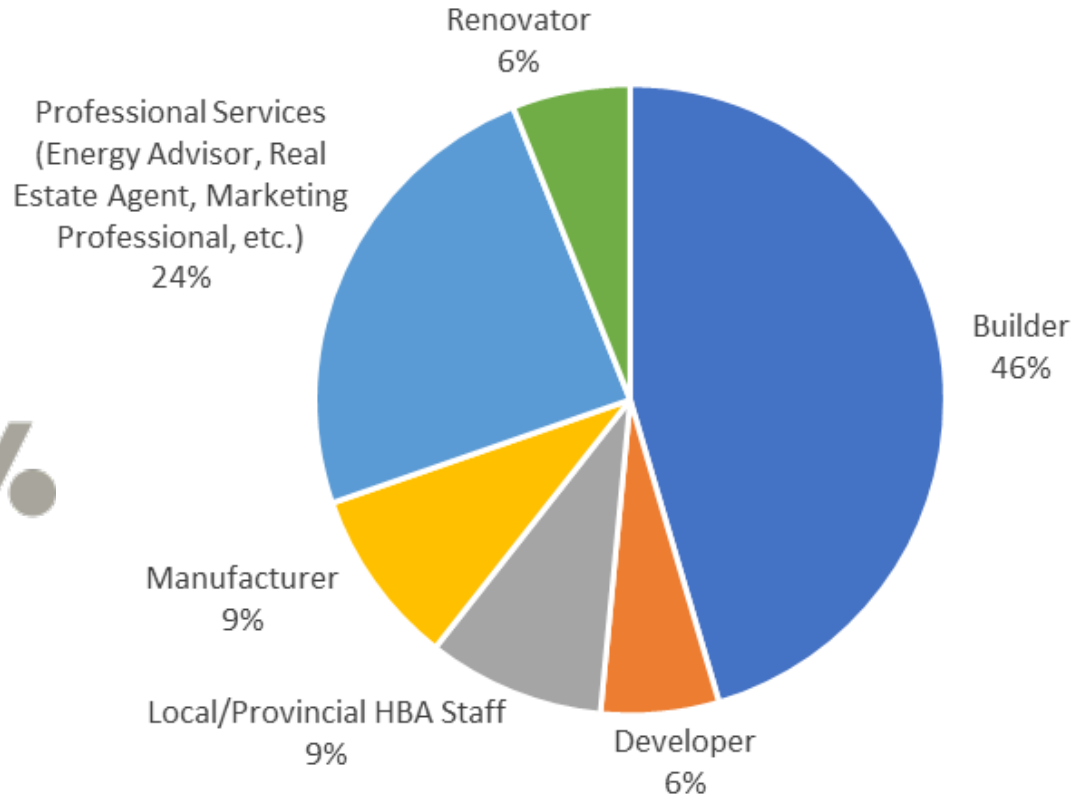
POLLS





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The ultimate in comfort and efficiency

Today's Webinar

February 10, 2022, from 10:30-11:30 PT / 1:30-2:30 ET

Insulation and radon gas control solutions for comfortable, durable and healthier basement living areas

Presented by Salvatore D. Ciarlo, P Eng. Technical Services and Building Enclosures Director, Owens Corning Canada

With more people working from home and having kids attending remote school from home, having a home office or other livable space in the basement has become a bigger priority for many households. Join us for this webinar to learn how you can unlock the potential of an added living space that is healthier, safe, comfortable, durable, and also minimizes radon ingress.

Join us to learn about Owens Corning's innovative next generation Fiberglas and Foam insulations made with 100% wind powered electricity and our Foamular Radon abatement system.

Members can access the recording & slide deck at chba.ca/NZwebinars

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BASEMENT INSULATION & RADON GAS CONTROL STRATEGIES

UNLOCKING THE POTENTIAL OF AN ADDED LIVING SPACE

- *HEALTHIER*
- *SAFER*
- *COMFORTABLE*
- *DURABLE*
- *ADDED LIVING SPACE*

QUEBEC & ATLANTIC CANADA

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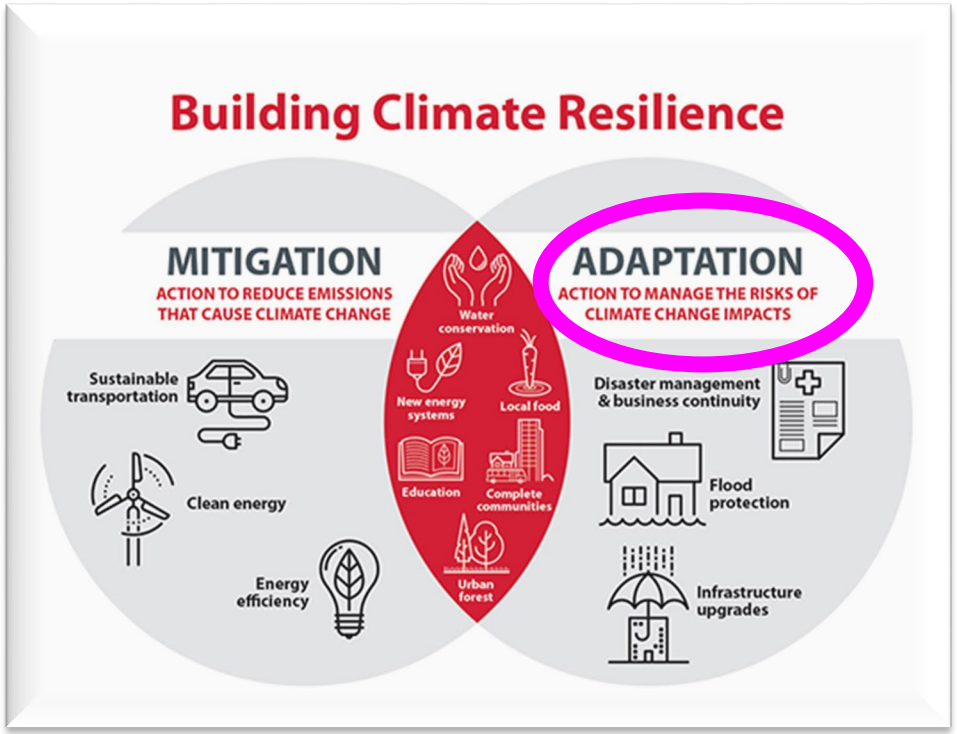
BASEMENT INSULATION & RADON GAS CONTROL STRATEGIES

Agenda

- *Water management*
- *Basement insulation options for walls and slab*
- *Innovative radon abatement system*

THE NEED TO BUILD BETTER



THE ULTIMATE LOWER LIVING AREA EXPERIENCE

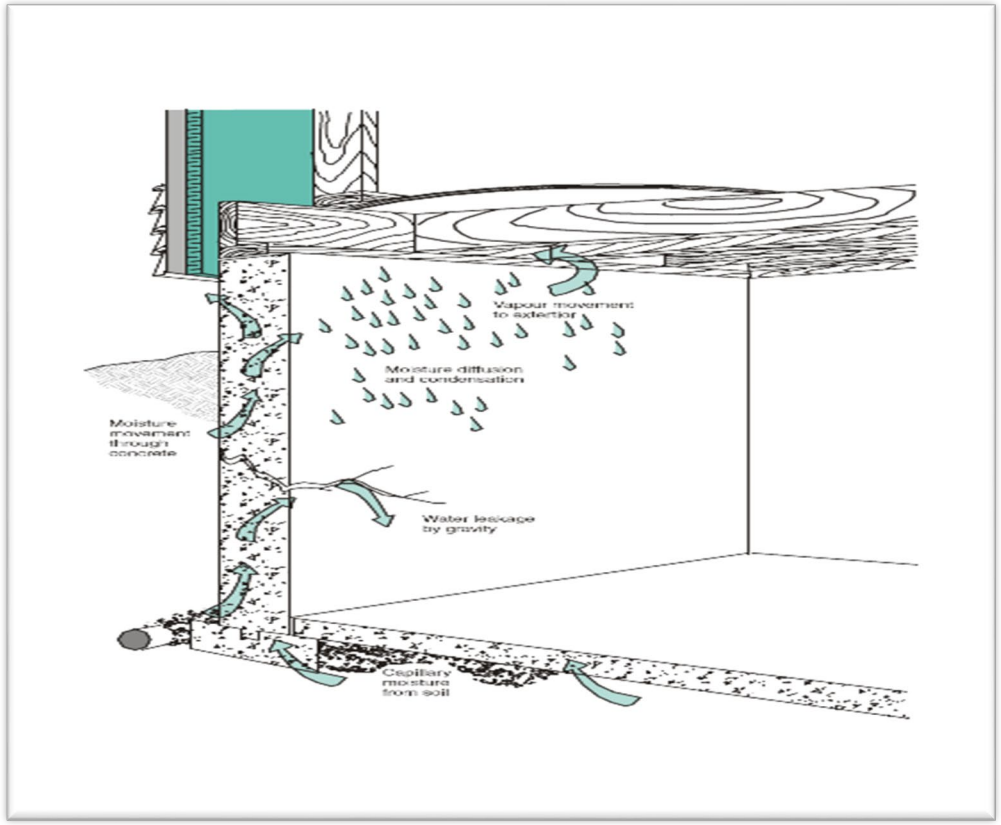
Storage area → *Comfortable and Safe Additional Living Spaces*

THE ULTIMATE LOWER LIVING AREA

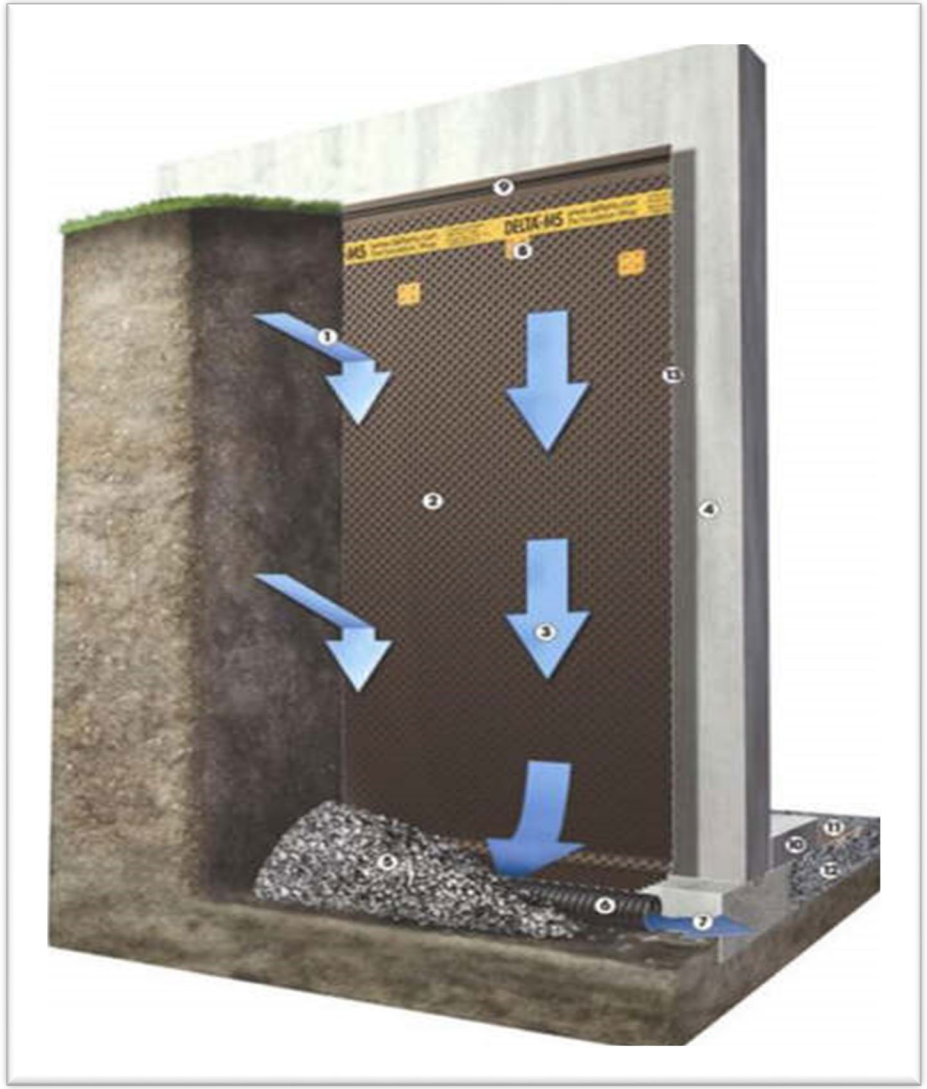
CRITICAL CONTROL LAYERS

Moisture:	*Better air quality; no dampness, no mold, no smells*
Thermal:	*Comfortable space year-round and cost savings*
Air/Vapor:	*Durability (no condensation)*
Soil gas:	*Health & Safety*

WATER MANAGEMENT

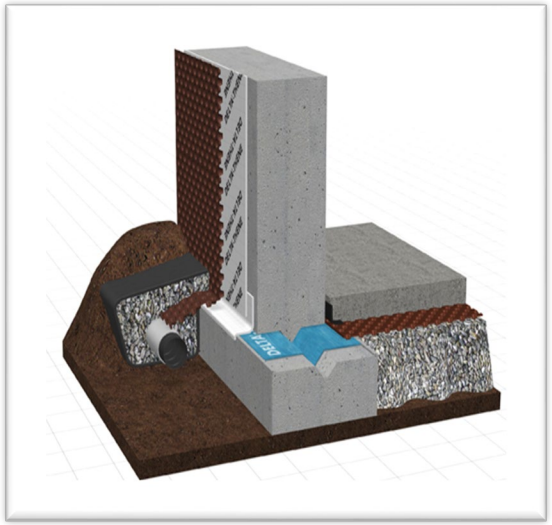


DAMPROOFING & WATERPROOFING



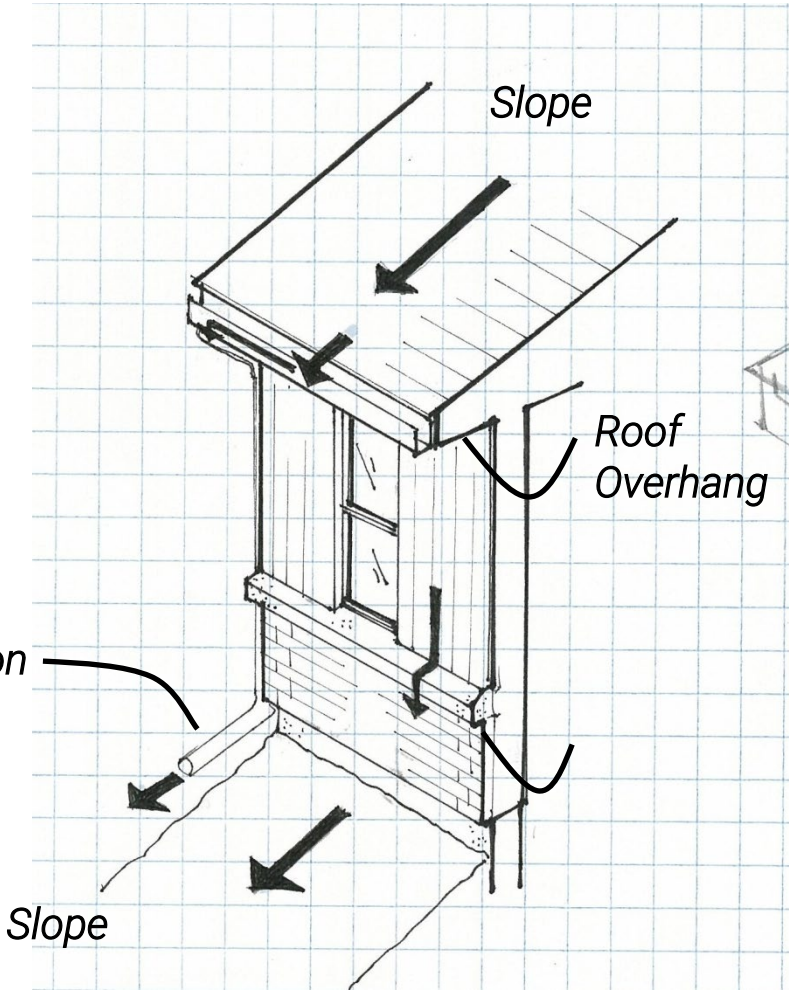
Waterproofing

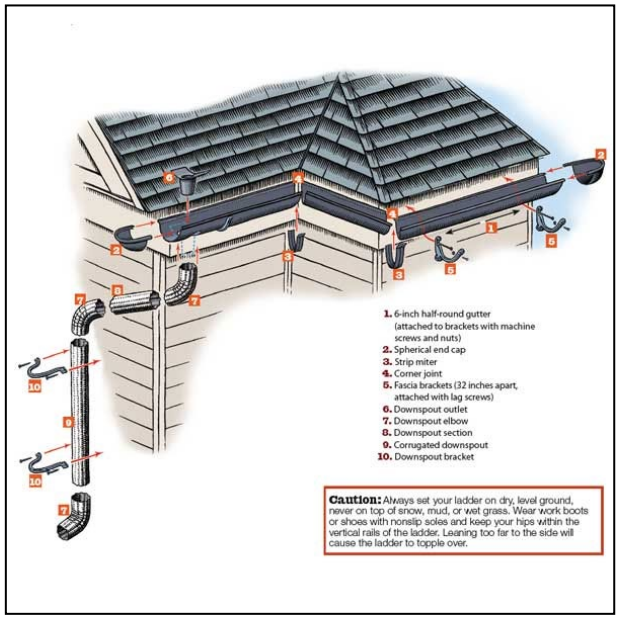
Damproofing



Capillary break

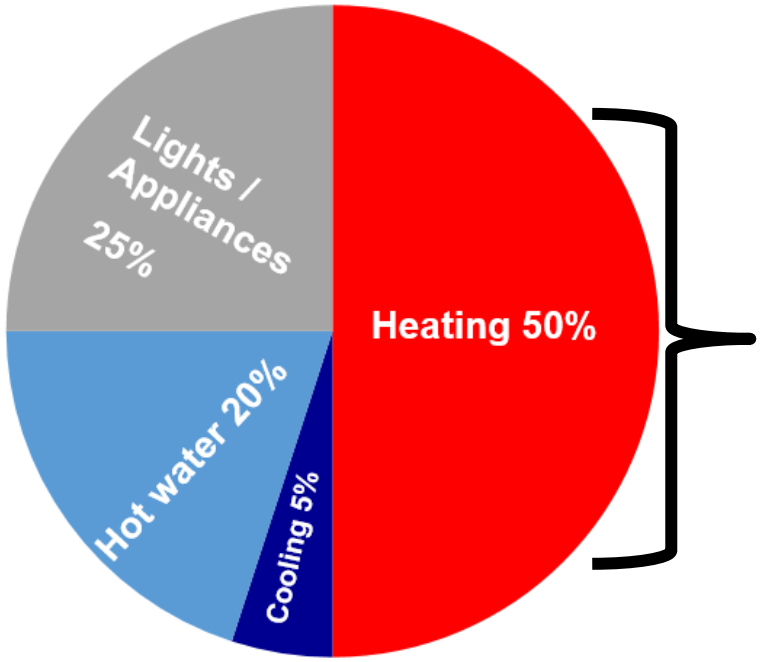
WATER MANAGEMENT

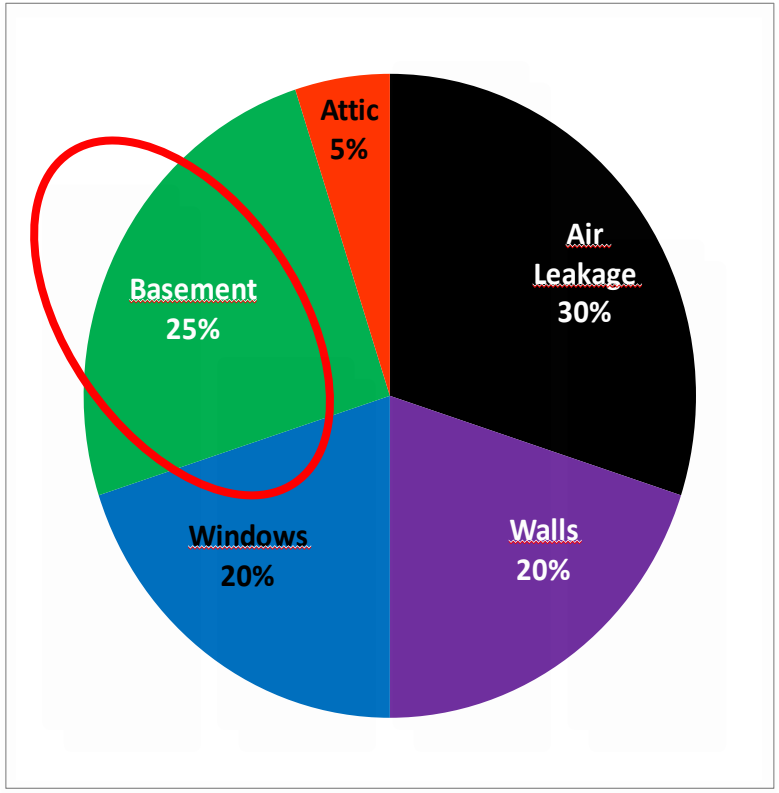




BETTER BASEMENTS

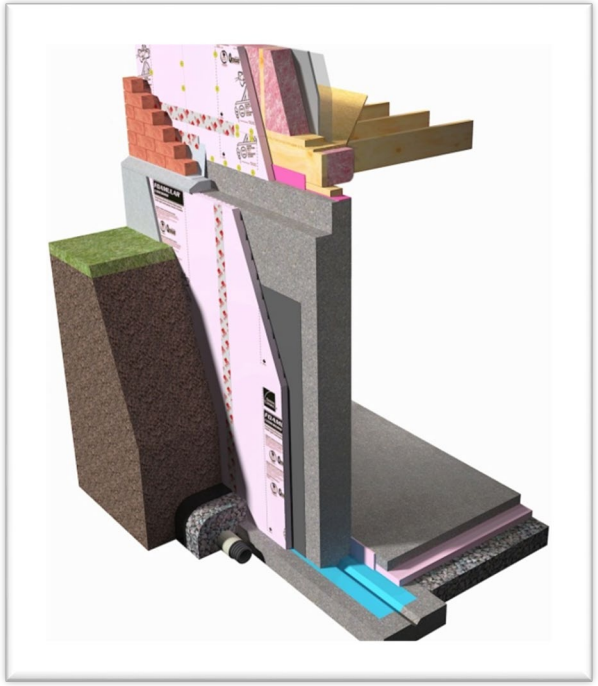
« GOOD INVESTMENT FOR NET ZERO READY PERFORMANCE (R-30+) »





ENERGY USE PROFILE TYPICAL CODE BUILT HOME

EXTERIOR INSULATION WITH DRAINAGE CHANNELS



FOAMULAR® C-200 Cel-Drain® *with drainage channels, CCMC 13387R:*

- *Thermal Protection*
- *Durability (Concrete wall not subjected to temperature fluctuations)*
- *Reduced risk of frost heaving with susceptive soils*
- *Moisture Protection (even if concrete cracks, water will not get in! no call backs)*
- *Moisture can dry to interior, low condensation risk*

Above grade insulation finishing options: Cement Board or THERMO-SHIELD FOUNDATION COATING (Gemite)

LOW CONDENSATION RISK

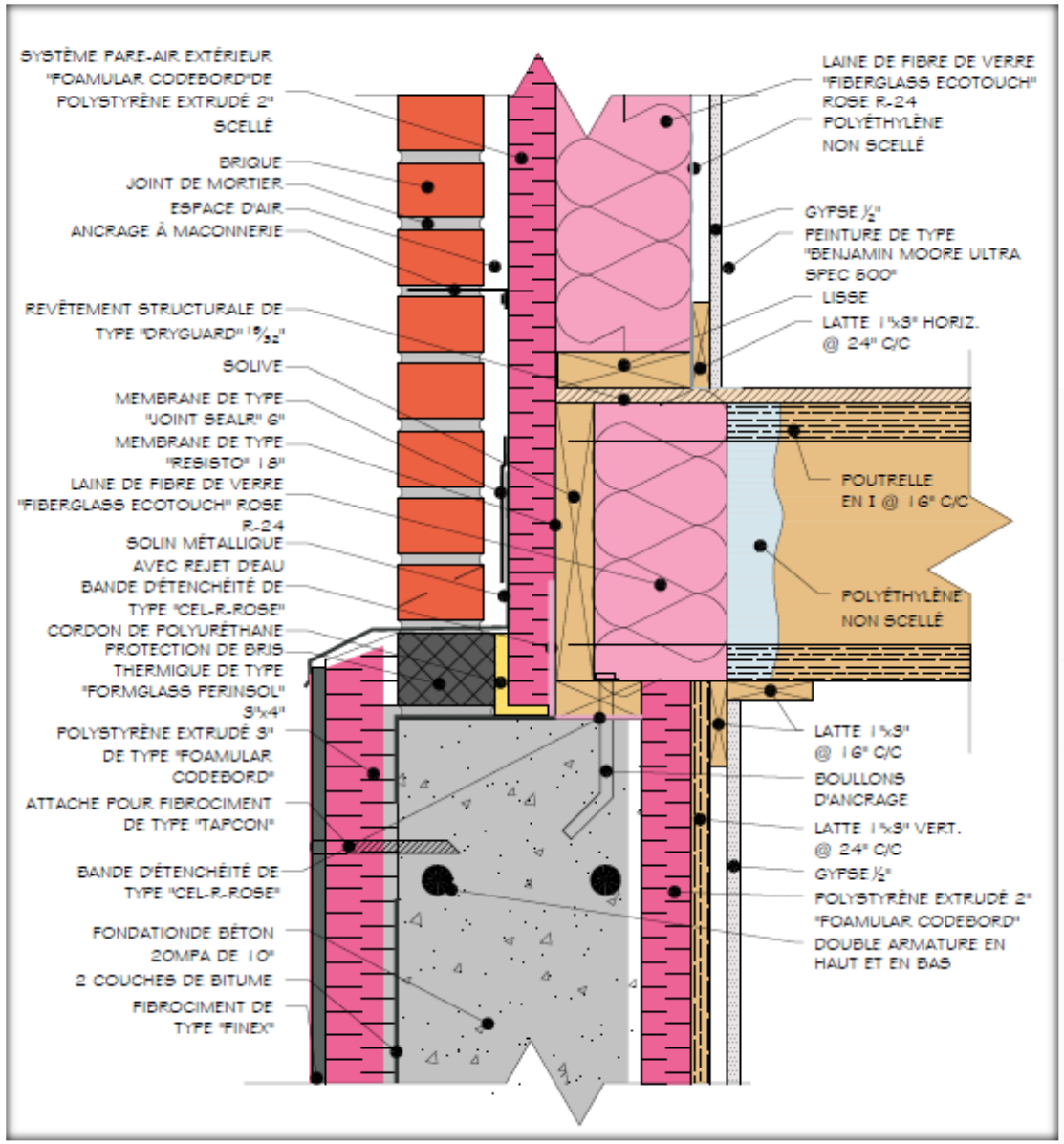
Table 4.3: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Exterior Insulated Below-Grade Wall and Floor Detail in Montreal (Winter Design Temperature: -23°C and Interior Temperature: 20°C)

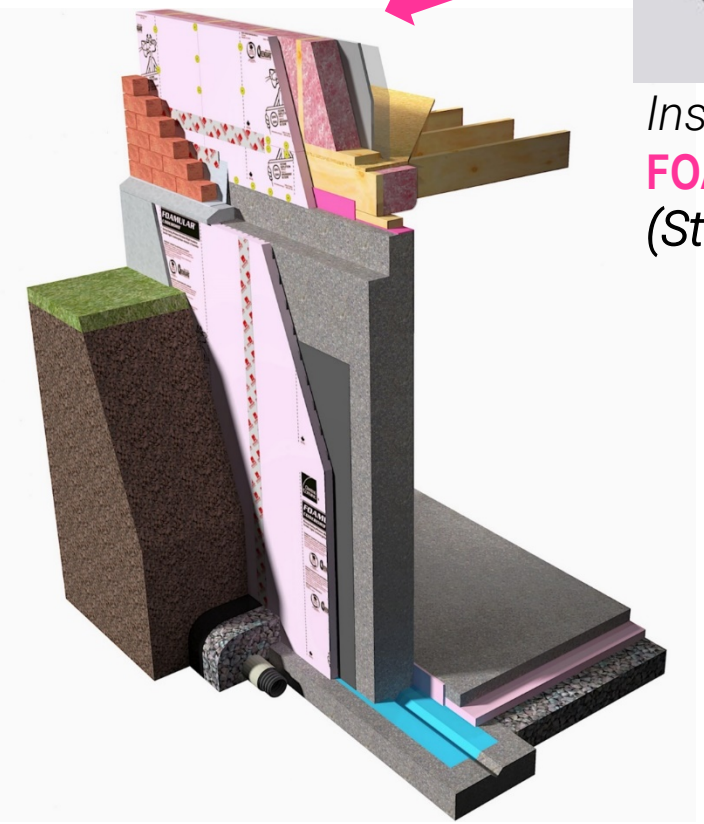
Wall Insulation R-value ft²h°F/Btu	Floor Insulation R-value ft²h°F/Btu	Critical Location			
		T_{i1} Gypsum at Floor at studs		T_{i2} Interior face of concrete between studs	
		Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-15 (3" XPS)	None	13.1	64.5%	14.9	72.6%
	R-5	12.9	63.5%	14.9	72.6%
	R-7.5	12.7	62.8%	14.9	72.6%
	R-10	12.6	62.5%	14.9	72.6%
	R-15	12.5	62.0%	14.9	72.6%
R-20 (4" XPS)	None	13.3	65.1%	16.0	77.9%
	R-5	13.0	63.9%	16.0	77.9%
	R-7.5	12.9	63.5%	16.0	77.9%
	R-10	12.8	63.2%	16.0	77.9%
	R-15	12.8	63.0%	16.0	77.8%

Table 4.2: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Exterior Insulated Below-Grade Wall and Floor Detail in Vancouver (Winter Design Temperature: -7°C and Interior Temperature: 20°C)

Wall Insulation R-value ft²h°F/Btu	Floor Insulation R-value ft²h°F/Btu	Critical Location			
		T_{i1} Gypsum at Floor at studs		T_{i2} Interior face of concrete between studs	
		Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-10 (2" XPS)	None	15.6	75.7%	15.6	75.9%
	R-5	15.4	74.7%	15.6	75.8%
	R-7.5	15.3	74.4%	15.6	75.8%
	R-10	15.3	74.1%	15.6	75.8%
	R-15	15.2	74.0%	15.6	75.8%

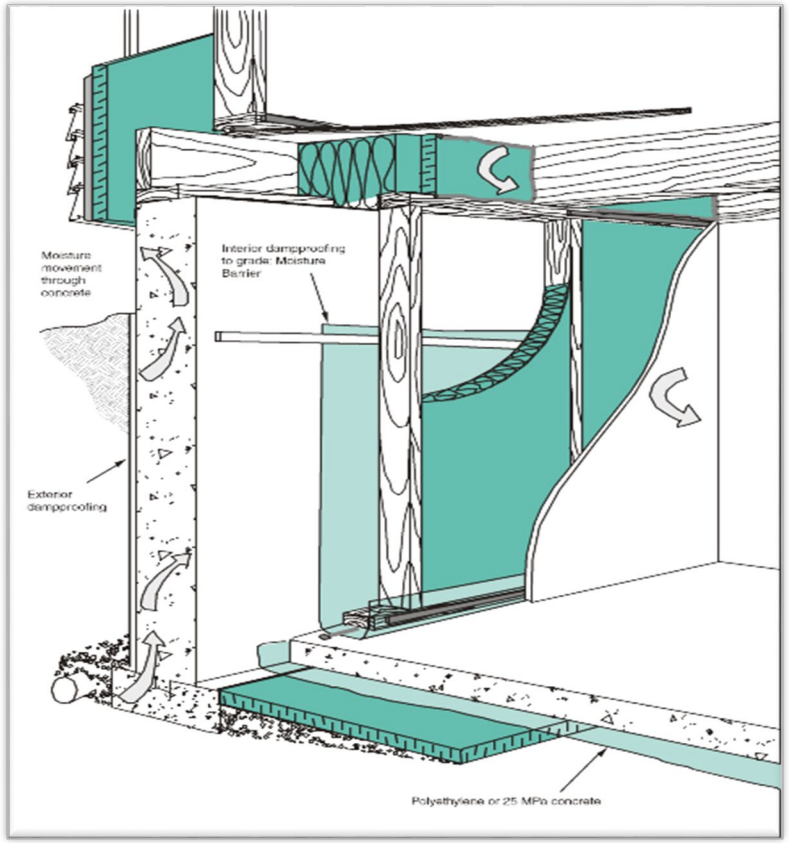
REDUCED THERMAL BRIDGE AT TOP OF FOUNDATION WALL





Insulated ledge block
FOAMGLAS® PERINSUL S
(Standard)

TYPICAL BASEMENT INSULATION



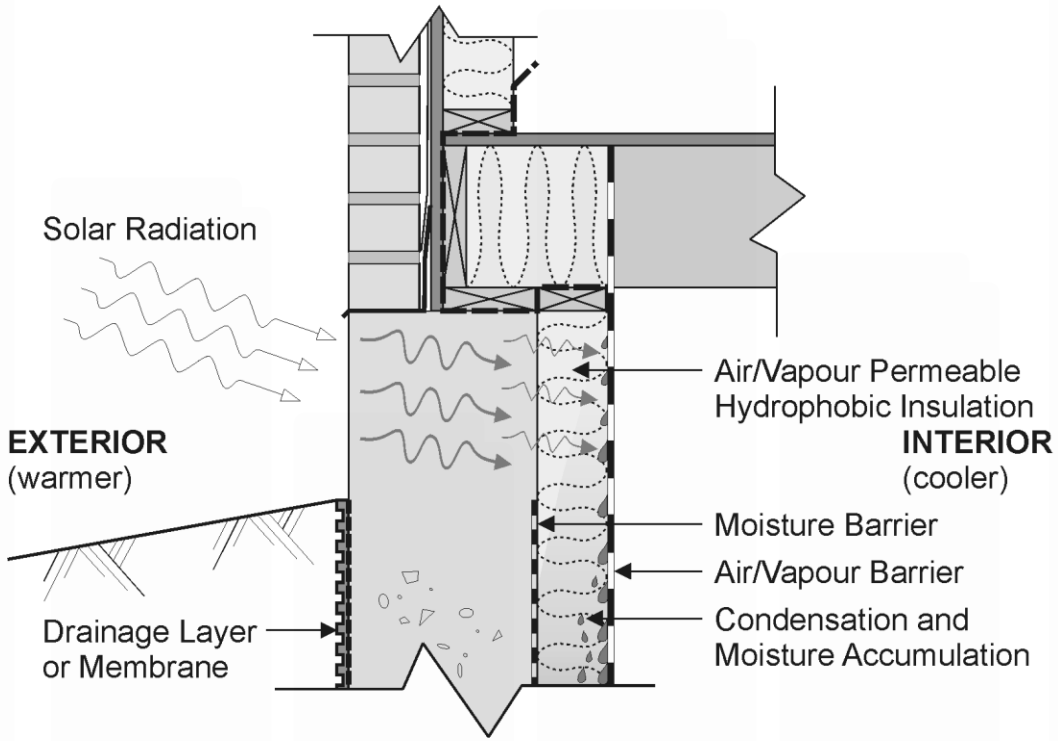
Source: CHBA manual

Table 4.1: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Interior Insulated Below-Grade Wall and Uninsulated Floor Detail at Winter Design Temperatures and 20°C Interior Temperature

Wall Insulation	Floor Insulation R-value ft²h°F/Btu	Climate		Critical Locations					
				T_{i1} Gypsum at Floor between studs		T_{i2} Interior face of concrete between studs		T_{i3} Concrete Floor at Wall between studs (under sill plate)	
		Location	Exterior Design Temp °C	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-20 Fiberglass Batt	None	Vancouver	-7	13.5	66.1%	-5.9	15.9%	9.0	49.0%
		Montreal	-23	9.6	51.1%	-21.2	3.9%	2.4	31.1%
		Winnipeg	-33	7.2	43.4%	-30.8	1.5%	-1.7	22.8%

Continuous air/vapor barrier is critical!

CONDENSATION RISK (Spring)



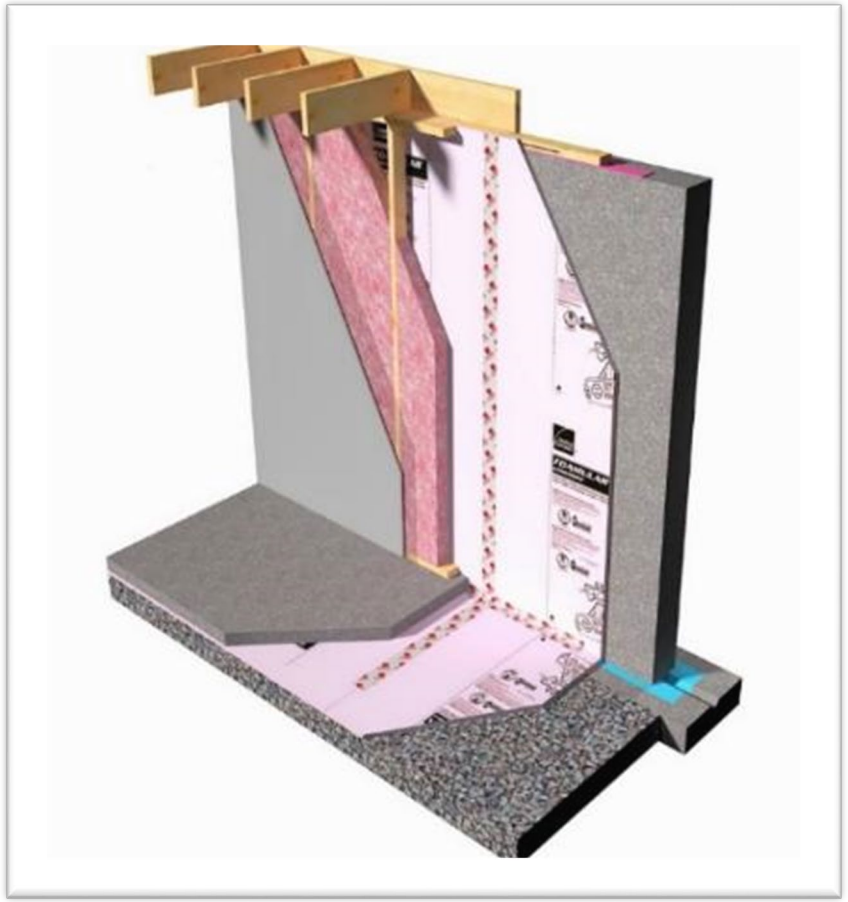
The dominant temperature gradient during summer months drives moisture entrained in the foundation wall inward, where it condenses on the outboard face of the air/vapour barrier. Much of the insulation and strapping normally reach saturation, and in some cases, bulk water runs out the bottom of the interior finished wall assembly (often mistaken for leakage).

Source: Performance Guidelines for Basement Envelope Systems and Materials, CNRC

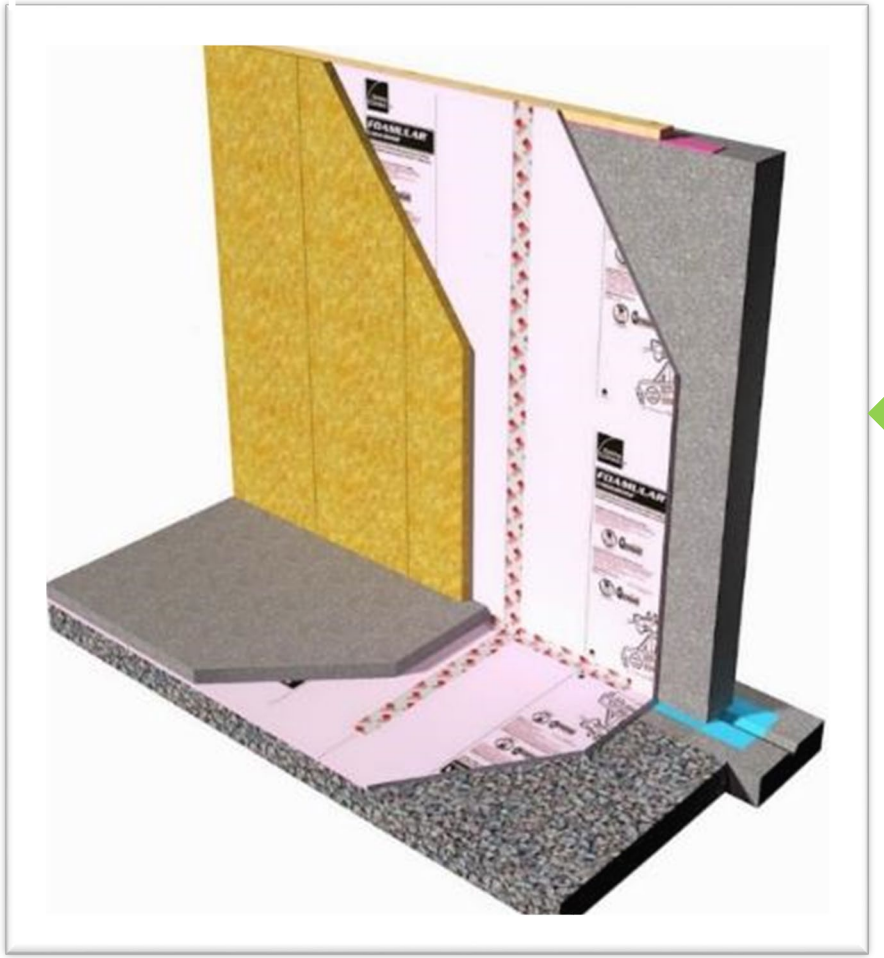
Smart vapour retarder

HIGH PERFORMANCE HYBRID SYSTEM

« COST EFFECTIVE SOLUTION FOR NET ZERO READY PERFORMANCE (R-30+) »



FOAMULAR® NGX™ CodeBord ® *plus*
ECOTOUCH® PINK® FIBERGLAS® *Batt Insulation*

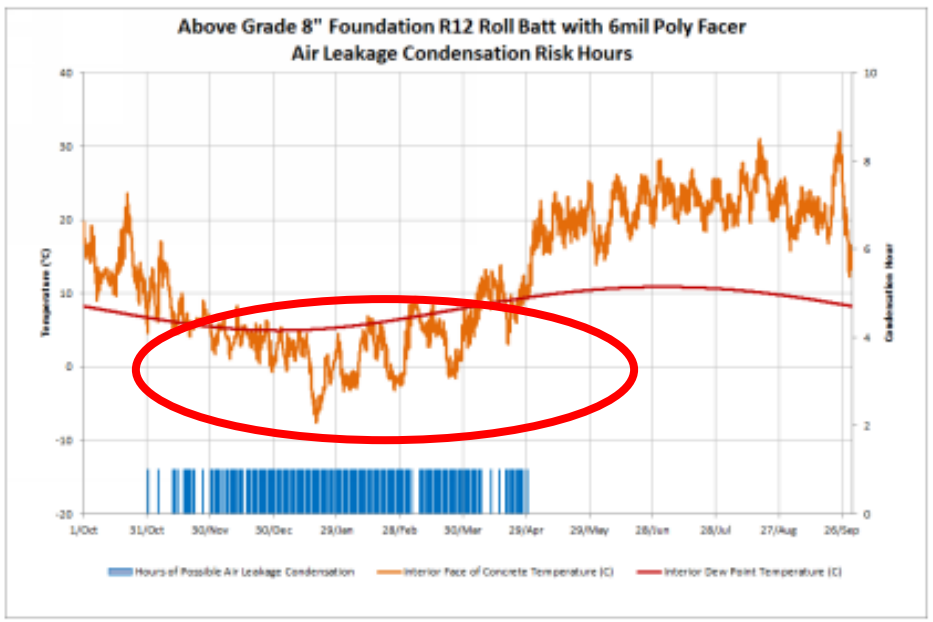


Does not require gypsum board finish!

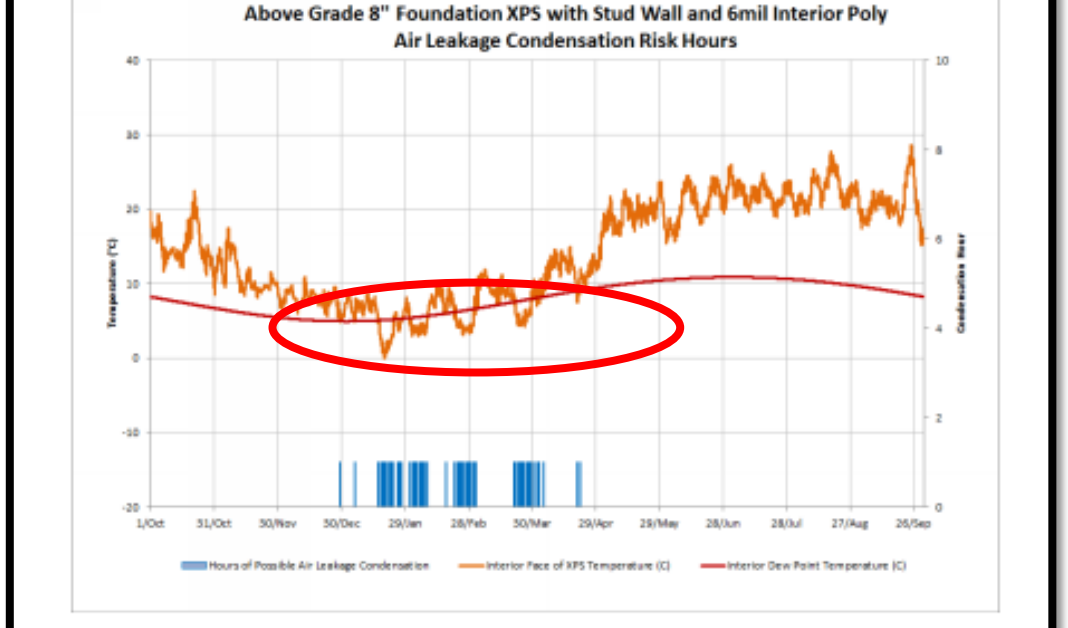
FOAMULAR® NGX™ CodeBord ® *plus*
THERMAFIBER® RAINBARRIER® CI HC 80
QAI Certifications & Listings

LOW PERMEANCE FOAMULAR® NGX™ CODEBORD®
REDUCES THE RISK OF CONDENSATION YEAR-ROUND!

Unfinished Basement – R12 Roll Batt with Poly Facer
Above Grade – Concrete Exposed to Climate
Winter – Air leaks past poly and condenses on the concrete



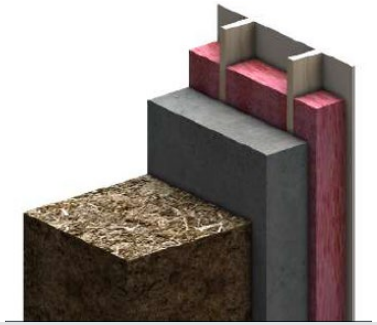
Finished Basement – 1" XPS, Stud Wall with Fiberglass, Poly Vapour Barrier
Above Grade – Concrete Exposed to Climate
Winter – Condensation is limited on the face of the XPS



RDH Building Science Labs

Table 4.1: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Interior Insulated Below-Grade Wall and Uninsulated Floor Detail at Winter Design Temperatures and 20°C Interior Temperature

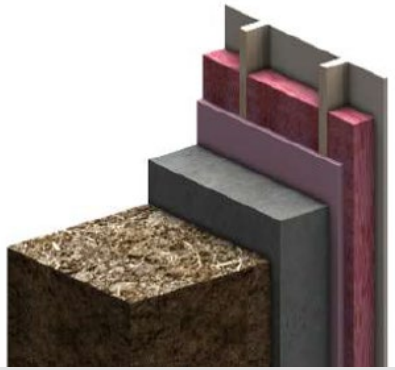
Wall Insulation	Floor Insulation R-value ft²h°F/Btu	Climate		Critical Locations					
				T_{i1} Gypsum at Floor between studs		T_{i2} Interior face of concrete between studs		T_{i3} Concrete Floor at Wall between studs (under sill plate)	
		Location	Exterior Design Temp °C	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-20 Fiberglass Batt	None	Vancouver	-7	13.5	66.1%	-5.9	15.9%	9.0	49.0%
		Montreal	-23	9.6	51.1%	-21.2	3.9%	2.4	31.1%
		Winnipeg	-33	7.2	43.4%	-30.8	1.5%	-1.7	22.8%



- 1/2" (13 mm) gypsum drywall
- 6 mil poly vapour control
- wood studs (2x4, 2x6) at 16" (406 mm) o.c. with fiberglass batt insulation (R-12, R-14, R-20)±
- 8" (203 mm) concrete wall

Table 4.6: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Interior Hybrid Insulated (Continuous Interior Insulation) Below-Grade Wall and Floor Detail in Montreal (Winter Design Temperature: -23°C and Interior Temperature: 20°C)

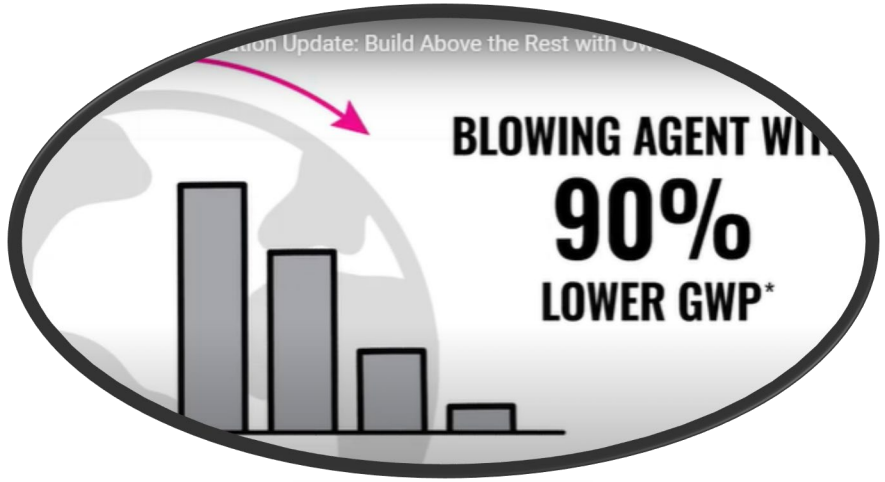
Wall Insulation R-value ft²h°F/Btu	Floor Insulation R-value ft²h°F/Btu	Critical Location					
		T_{i1} Gypsum at Floor between studs		T_{i2} Interior face of XPS between studs		T_{i3} Concrete Floor at Wall XSP between studs	
		Surface Temp °C	Max. RH	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-14 Batt + R-10 (2" XPS)	None	12.1	60.4%	-4.9	17.3%	10.0	52.5%
	R-5	15.0	72.7%	-4.9	17.3%	13.2	64.7%
	R-7.5	15.3	74.5%	-4.9	17.3%	13.6	66.5%
	R-10	15.6	75.8%	-4.9	17.3%	13.8	67.6%
	R-15	15.9	77.2%	-4.9	17.3%	14.1	68.9%
R-20 Batt + R-12.5 (2.5" XPS)	None	11.8	59.3%	-6.1	15.7%	8.8	48.5%
	R-5	14.8	72.0%	-6.1	15.7%	12.4	61.4%
	R-7.5	15.3	74.2%	-6.1	15.7%	12.9	63.5%
	R-10	15.6	75.6%	-6.1	15.6%	13.2	64.8%
	R-15	15.9	77.5%	-6.1	15.6%	13.6	66.5%

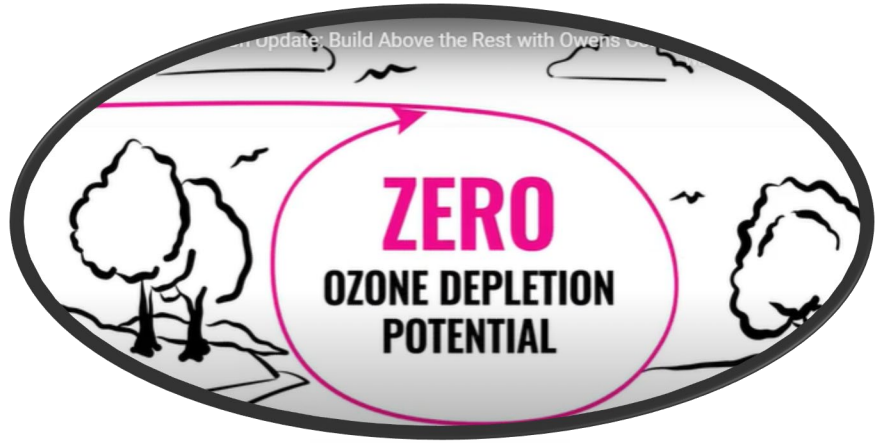


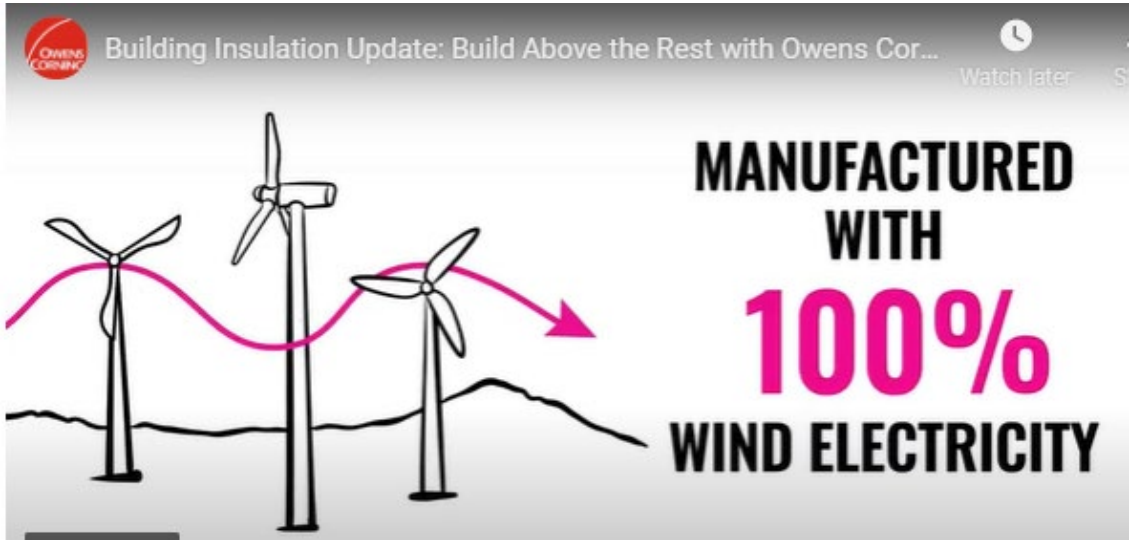
- 1/2" (13 mm) gypsum drywall
- 6 mil poly vapour control
- wood studs (2x4 or 2x6) at 16" (406 mm) o.c. with fiberglass batt insulation (R-12, R-14, R-20) ±
- XPS insulation (varies) ±
- 8" (203 mm) concrete below grade wall

Reduced risk of condensation in winter and spring

Source: Morrison Hershfield







WITH EVERY 10 BOARDS INSTALLED

PRODUCT ENVIRONMENTAL FOOTPRINT SUMMARY

FOAMULAR® NGX™

XPS INSULATION

FOAMULAR® NGX™ XPS Insulation is a comprehensive line of rigid foam products that are easy to use, resist water absorption, deliver high compressive strength and maintain a high R-value throughout the life of the building.

Declared/Functional Unit 1 m^2 insulation at R_{SI}=1

Results below represent an R-value of 1 in accordance with the standard unit reported in the Environmental Product Declaration (EPD). Details on how to scale results to other R-values can be found in the full EPD.

	Global Warming Potential Embodied Carbon	Ozone Depletion Potential	Photochemical Ozone Creation Potential	Acidification Potential	Eutrophication Potential	Depletion of Abiotic Resources (Fossil Fuels)
	kg CO_2 eq.	kg CFC 11 eq.	kg O_3 eq.	kg SO_2 eq.	kg N eq.	MJ
A1- A3	6.92*	2.08 x 10^{-5}	0.188	0.0157	0.00779	9.56
Total A1-A5, B, C1-C4	9.77	2.08 x 10^{-5}	0.217	0.0168	0.00800	9.95

*This total is further reduced by use of 100% wind electricity. See SCS Global site for current % reduction.

Insulation installed in Chicago pays back in heating & cooling savings[1] in less than **8** months, equivalent to taking **44** off the road every year.

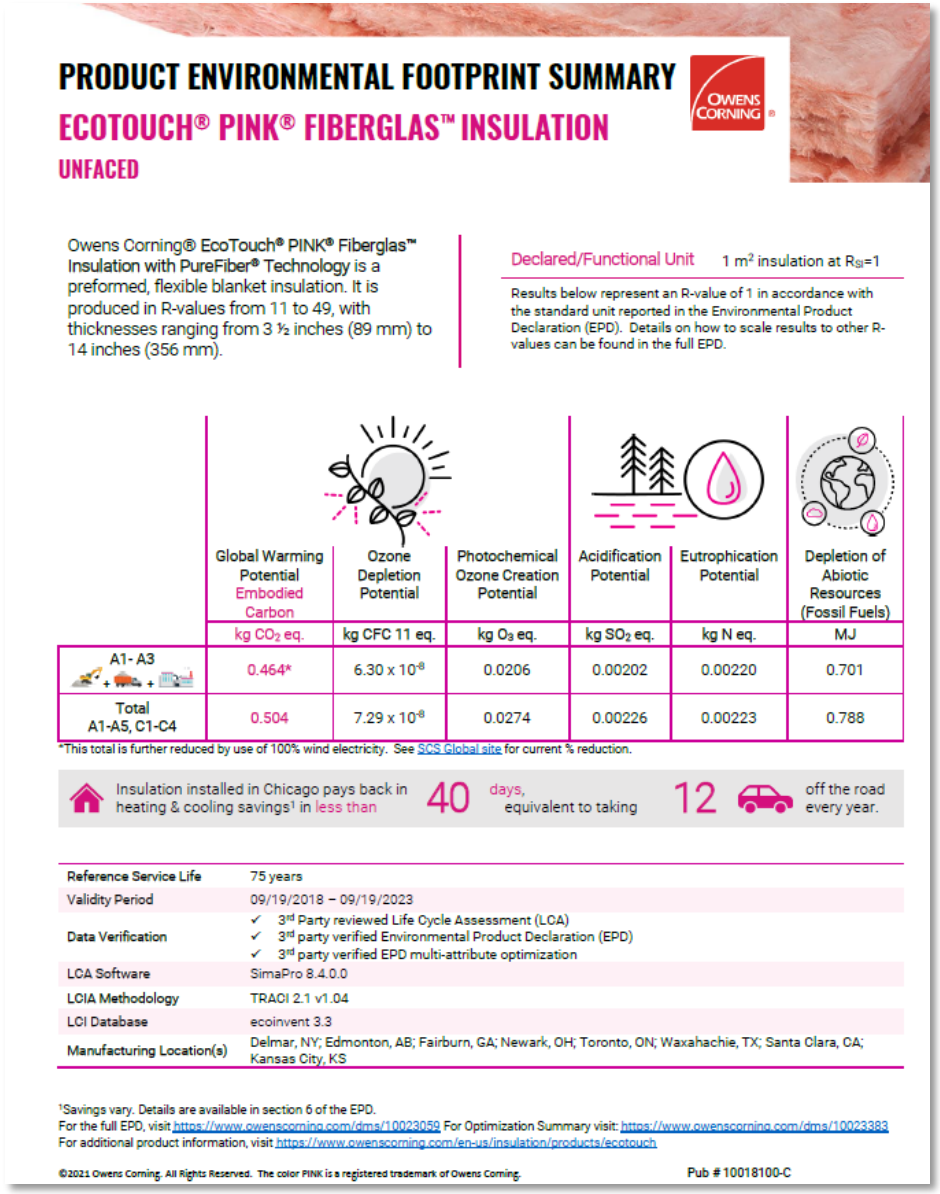
Reference Service Life	75 years
Validity Period	01/1/2021 – 01/1/2026
Data Verification	✓ 3rd Party reviewed Life Cycle Assessment (LCA) ✓ 3rd party verified Environmental Product Declaration (EPD) ✓ 3rd party verified EPD multi-attribute optimization
LCA Software	SimaPro 9.0.035
LCIA Methodology	TRACI 2.1 v1.04
LCI Database	ecoinvent 3.5
Manufacturing Location(s)	Tallmadge, OH; Gresham, OR; Valleyfield, QC

[1]Savings vary. Details are available in section 6 of the EPD.
For the full EPD, visit https://www.owenscorning.com/dms/10024576 For Optimization Summary visit: https://www.owenscorning.com/dms/10024646
For additional product information, visit https://www.owenscorning.com/en-us/insulation/commercial/foamular-ngx

Additional reduction of 4% by use of 100% wind electricity= 6.64 kg CO_2eq

NEXT GEN FIBERGLAS

- *Non-combustible as tested to CAN/ULC-S-114*
- *Settlement resistance friction fit batts*
- *Fungal & Corrosion resistant*
- *73% recycled content*
- *Formaldehyde Free*
- *GreenGuard Gold certification*
- *Made with 100% Wind Powered Electricity*
- *Saves 12X energy used to make it in just one year*
- *Environmental Product Declaration*



PRODUCT ENVIRONMENTAL FOOTPRINT SUMMARY

ECOTOUCH® PINK® FIBERGLAS™ INSULATION

UNFACED

Owens Corning® EcoTouch® PINK® Fiberglas™ Insulation with PureFiber® Technology is a preformed, flexible blanket insulation. It is produced in R-values from 11 to 49, with thicknesses ranging from 3 ½ inches (89 mm) to 14 inches (356 mm).

Declared/Functional Unit 1 m^2 insulation at R_{SI}=1

Results below represent an R-value of 1 in accordance with the standard unit reported in the Environmental Product Declaration (EPD). Details on how to scale results to other R-values can be found in the full EPD.

	Global Warming Potential Embodied Carbon	Ozone Depletion Potential	Photochemical Ozone Creation Potential	Acidification Potential	Eutrophication Potential	Depletion of Abiotic Resources (Fossil Fuels)
	kg CO_2 eq.	kg CFC 11 eq.	kg O_3 eq.	kg SO_2 eq.	kg N eq.	MJ
A1- A3	0.464*	6.30 x 10^{-8}	0.0206	0.00202	0.00220	0.701
Total A1-A5, C1-C4	0.504	7.29 x 10^{-8}	0.0274	0.00226	0.00223	0.788

*This total is further reduced by use of 100% wind electricity. See SCS Global site for current % reduction.

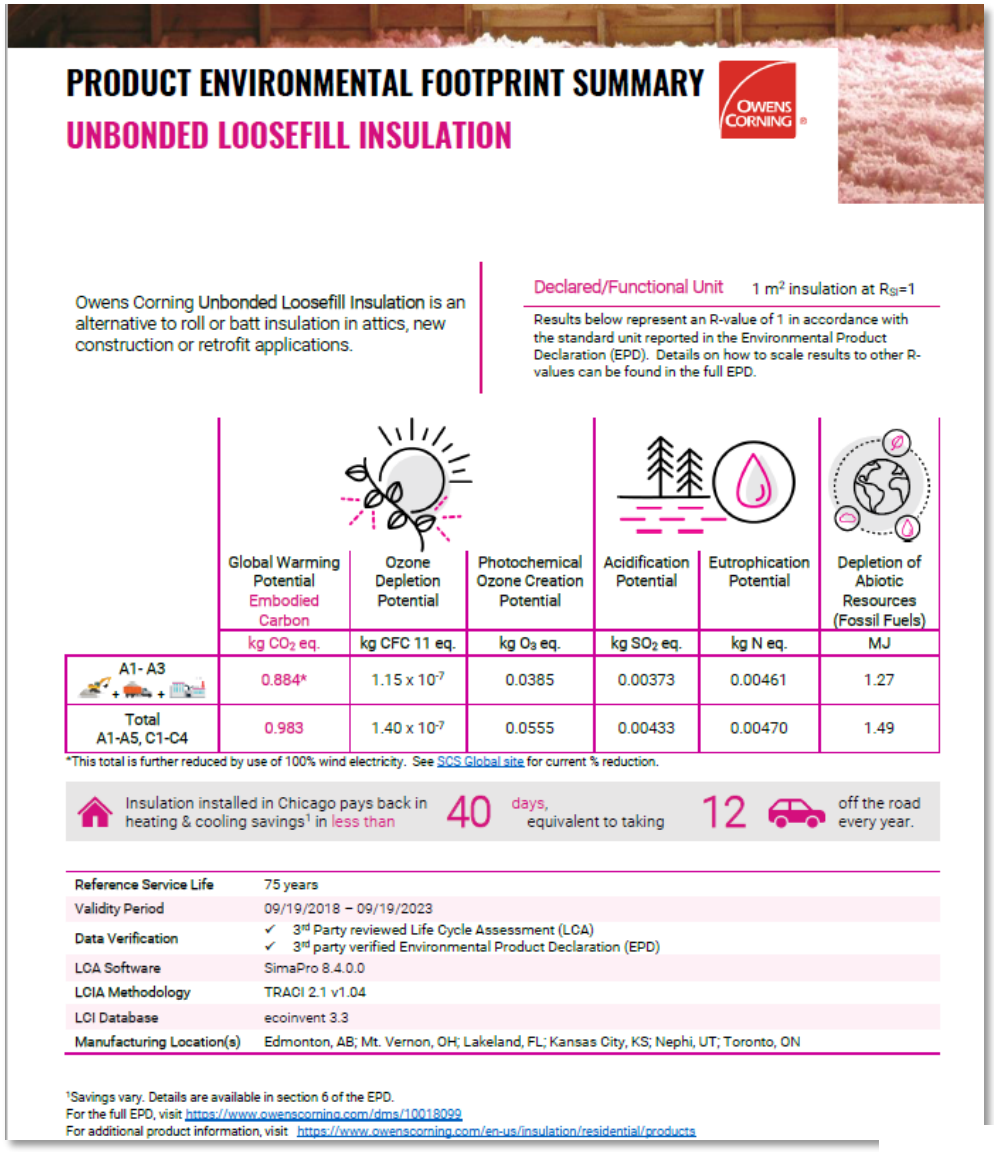
Insulation installed in Chicago pays back in heating & cooling savings[1] in less than 40 days, equivalent to taking 12 off the road every year.

Reference Service Life	75 years
Validity Period	09/19/2018 – 09/19/2023
Data Verification	✓ 3rd Party reviewed Life Cycle Assessment (LCA) ✓ 3rd party verified Environmental Product Declaration (EPD) ✓ 3rd party verified EPD multi-attribute optimization
LCA Software	SimaPro 8.4.0.0
LCIA Methodology	TRACI 2.1 v1.04
LCI Database	ecoinvent 3.3
Manufacturing Location(s)	Delmar, NY; Edmonton, AB; Fairburn, GA; Newark, OH; Toronto, ON; Waxahachie, TX; Santa Clara, CA; Kansas City, KS

[1]Savings vary. Details are available in section 6 of the EPD.
For the full EPD, visit https://www.owenscorning.com/dms/10023059 For Optimization Summary visit: https://www.owenscorning.com/dms/10023383
For additional product information, visit https://www.owenscorning.com/en-us/insulation/products/ecotouch

Pub # 10018100-C

Next Gen Fiberglas= 0.37 kg CO_2eq with wind power reduction of 20%
Cellulose = 0.47 kg CO_2 eq
NRCAN calculator..\Embodied carbon content round table\NRCan MCE Calculator V4.1 2021-04-29_results.xlsm



PRODUCT ENVIRONMENTAL FOOTPRINT SUMMARY

UNBONDED LOOSEFILL INSULATION

Owens Corning Unbonded Loosefill Insulation is an alternative to roll or batt insulation in attics, new construction or retrofit applications.

Declared/Functional Unit 1 m^2 insulation at R_{SI}=1

Results below represent an R-value of 1 in accordance with the standard unit reported in the Environmental Product Declaration (EPD). Details on how to scale results to other R-values can be found in the full EPD.

	Global Warming Potential Embodied Carbon	Ozone Depletion Potential	Photochemical Ozone Creation Potential	Acidification Potential	Eutrophication Potential	Depletion of Abiotic Resources (Fossil Fuels)
	kg CO_2 eq.	kg CFC 11 eq.	kg O_3 eq.	kg SO_2 eq.	kg N eq.	MJ
A1- A3	0.884*	1.15 x 10^{-7}	0.0385	0.00373	0.00461	1.27
Total A1-A5, C1-C4	0.983	1.40 x 10^{-7}	0.0555	0.00433	0.00470	1.49

*This total is further reduced by use of 100% wind electricity. See SCS Global site for current % reduction.

Insulation installed in Chicago pays back in heating & cooling savings[1] in less than 40 days, equivalent to taking 12 off the road every year.

Reference Service Life	75 years
Validity Period	09/19/2018 – 09/19/2023
Data Verification	✓ 3rd Party reviewed Life Cycle Assessment (LCA) ✓ 3rd party verified Environmental Product Declaration (EPD)
LCA Software	SimaPro 8.4.0.0
LCIA Methodology	TRACI 2.1 v1.04
LCI Database	ecoinvent 3.3
Manufacturing Location(s)	Edmonton, AB; Mt. Vernon, OH; Lakeland, FL; Kansas City, KS; Nephi, UT; Toronto, ON

[1]Savings vary. Details are available in section 6 of the EPD.
For the full EPD, visit https://www.owenscorning.com/dms/10018099
For additional product information, visit https://www.owenscorning.com/en-us/insulation/residential/products

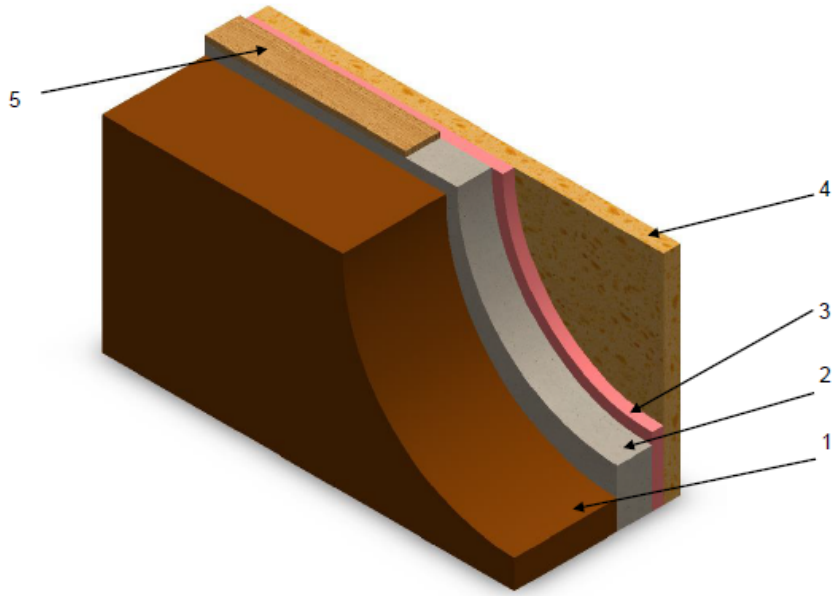
With wind power reduction of 38% = 0.55 kg CO_2eq

QAI LABORATORIES
CERTIFICATION TESTING INSPECTION

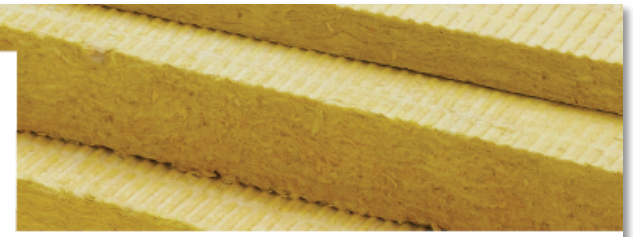
VANCOUVER, BC
LOS ANGELES, CA
TULSA, OK
TORONTO, ON
MIAMI, FL

WWW.QAI.ORG

QAI Design B1079-1b – Owens Corning Canada LP – Thermafiber VersaBoard™ 60 / Rainbarrier® ci High Compressive (80) – CAN/ULC 124
Classification A & B – Thermal Barrier for Protection of Foamed Plastics



No.	COMPONENT	DESCRIPTION		
1	Soil	Backfill Soil		
2	Concrete Foundation Wall	Typical Below Grade Foundation Wall		
3	Foam Insulation	Type:	Foam Plastic	
		Maximum R-Value:	7.5/inch	
4	Protective Covering of Foam Insulation	Certified Manufacturer:	Thermafiber,Inc.	
		Certified Product Name:	VersaBoard™ 60 (unfaced or faced options). Rainbarrier® ci High Compressive (80)	
		Assembly Class:	Classification A	Classification B
		Overall Thickness:	3 inch (76 mm)	2 inch (51 mm)
		Layers:	Two layers of 1-1/2 inch (38 mm) thick or One Layer of 3 inch (76 mm)	One layer of 2 inch (51 mm) thick
		Minimum Density:	6.0 lb/ft^3 (96 kg/m^3)	
		Installation:	Mechanically fastened to the concrete wall with Hilti-X-IE-G, ITW ITW Ramset-I-F, or Grabber GI 600 anchors or other as approved by the Authority Having Jurisdiction. Fasten through foam plastic with tight fitting joints. Insulation boards applied over foam plastic insulation and then self-locking washers placed over the insulation pins to secure the board.	
5	Bearing Plate	Typical wood bearing plate		



OWENS CORNING®

THERMAFIBER® RAINBARRIER® CI HIGH COMPRESSIVE (80)

MINERAL WOOL INSULATION

Description

Thermafiber® RainBarrier® ci High Compressive (80) continuous insulation boards are designed to support cladding attachment with minimal penetrations. The use of ThermaCrimp™ technology allows for excellent compressive strength while providing thermal efficiency, non-combustibility, water repellency, and flexibility when working with uneven substrates. RainBarrier® ci High Compressive (80) can be used behind light weight cladding – including combustible and open-joint assemblies.

Features

- High compressive strength to support cladding attachment system with minimal penetration through continuous insulation
- Vapor permeable
- Tolerant of substrate irregularities
- Non-combustible and non-deteriorating
- Fire resistant to temperatures above 1,093°C (2,000°F)
- Enhances acoustical performance
- Minimum 70% recycled content[2]
- Contributes to credits in several green building programs such as LEED® and Green Globes®

Standards, Code Compliance

- CCMC Evaluation Listing No. 14060-L
- CAN/ULC-S702, Standard for Mineral Fibre Thermal Insulation for Buildings, Type I
- ASTM C612, Mineral Fiber Block and Board Thermal Insulation, Type IA, IB, II, III, IVA, IVB

Physical Properties

PROPERTY	TEST METHOD	VALUE
Compressive Strength	ASTM C165	22.7 kPa (475 lbs/ft^2) @ 10% deformation
Surface Burning Characteristics	CAN/ULC-S102	Flame Spread 0, Smoke Developed 5
	ASTM E84	Flame Spread 0, Smoke Developed 0
Non-Combustibility	CAN/ULC-S114	Non-Combustible
	ASTM E136	Non-Combustible as defined per NFPA 220
Smoulder Resistance	CAN/ULC-S129	Mean Mass Loss ≤ 0.02%
Linear Shrinkage	ASTM C356	<2% @ 650 °C (1200 °F)
Water Vapour Permeance	ASTM E96	1,373 ng/Pa•s•m^2 (24 Perms)
Water Vapour Sorption	ASTM C1104	<1%
Fungi Resistance	ASTM C1338	Pass
Corrosion of Steel, Aluminum, and Copper	ASTM C665	Pass
Stress Corrosion – Austenitic Steel	ASTM C795	Pass
Odor	ASTM C1304	Pass

Technical Data

TESTED TO ASTM C518		TESTED TO CAN/ULC-S102 UNFACED	
RSI /25.4 mm @ 24 °C m^2•K/W	R-value/inch @ 75°F hr•ft^2•°F/Btu	Flame Spread	Smoke Developed
0.74	4.2	0	5

Acoustical Performance

ASTM C423	THICKNESS	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	NRC
	51 mm (2")	0.22	0.90	1.05	1.06	1.02	1.04	1.00

SUB SLAB INSULATION

FOAMULAR® CODEBORD® NGX™

BENEFITS

Thermal:

- *Comfortable space year-round, no more cold feet, can accommodate multiple finishes above concrete slab*

Moisture:

- *Better indoor air quality; no dampness, no mold, no smells*

Air/Vapor:

- *Durability (no condensation)*

Insulation) Below-Grade Wall and Floor Details

Applicable Climate Zones	Insulation R-value ft²h°F/Btu			Clear Wall U-value Btu/h ft²°F (W/m²K)	Clear Wall Effective R-value Ft²h°F/Btu (m²K/W)	Below-Grade Foundation Perimeter Heat Loss, L_f Btu/h ft°F (W/mK)
	Wall: Stud Cavity	Wall: Continuous	Floor			
4 (Vancouver)	R-12	R-5	None	0.056 (0.32)	18.0 (3.16)	1.31 (2.27)
			R-5			1.09 (1.89)
			R-7.5			1.03 (1.78)
			R-10			0.98 (1.69)
			R-15			0.90 (1.56)
6 (Montreal)	R-14	R-10	None	0.041 (0.23)	24.5 (4.32)	1.21 (2.10)
			R-5			0.98 (1.70)
			R-7.5			0.91 (1.58)
			R-10			0.86 (1.49)
			R-15			0.78 (1.36)
	R-20	R-12.5	None	0.031 (0.17)	32.5 (5.72)	1.14 (1.97)
			R-5			0.91 (1.57)
			R-7.5			0.84 (1.45)
			R-10			0.79 (1.36)
			R-15			0.71 (1.22)
7A (Winnipeg)	R-14	R-12.5	None	0.037 (0.21)	27.0 (4.76)	1.19 (2.05)
			R-5			0.95 (1.65)
			R-7.5			0.88 (1.53)
			R-10			0.83 (1.44)
			R-15			0.75 (1.30)
	R-20	R-20	None	0.025 (0.14)	40.0 (7.04)	1.09 (1.88)
			R-5			0.86 (1.49)
			R-7.5			0.79 (1.37)
			R-10			0.74 (1.28)
			R-15			0.66 (1.13)

Insulation under slab vs none

17% to 32% less heat loss

20% to 36% less heat loss

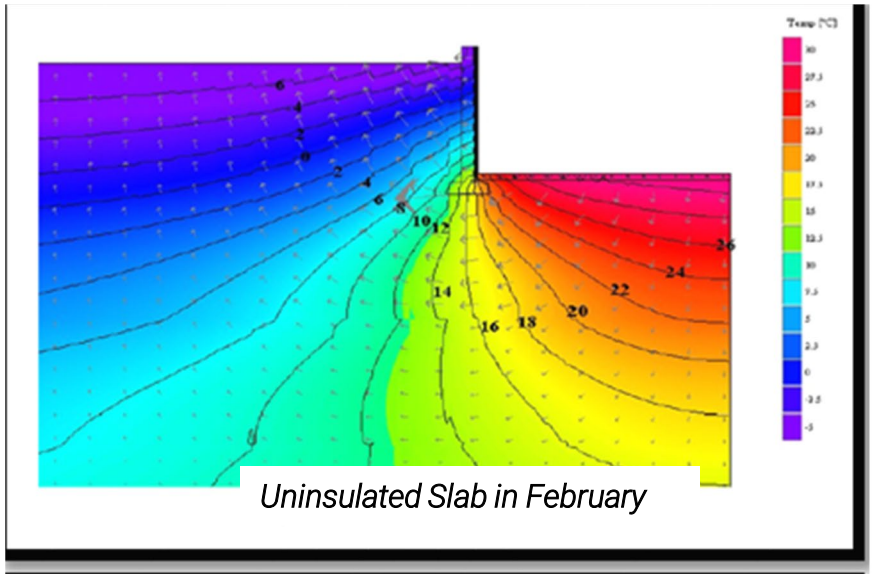
20% to 38% less heat loss

20% to 37% less heat loss

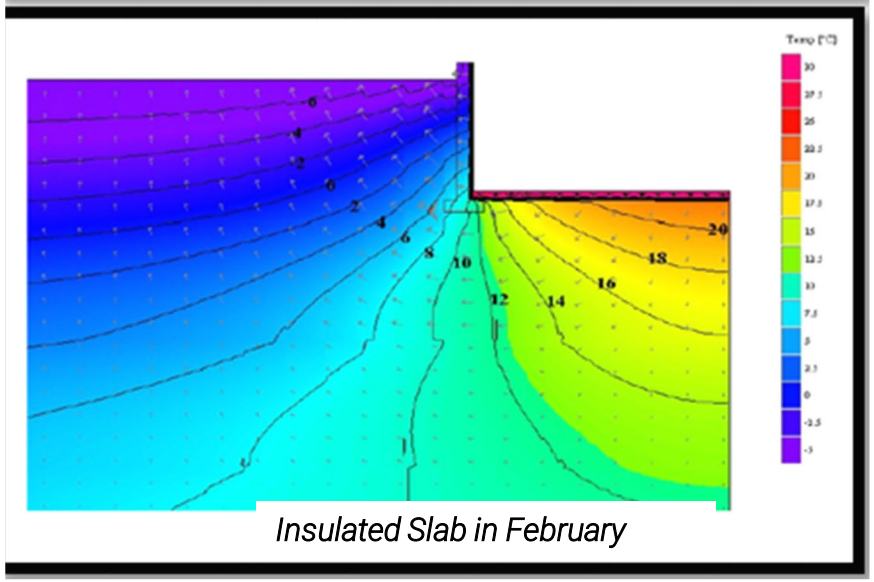
22% Up to 40% less heat loss

Source: Morrison Hershfield

ENERGY SAVINGS + OCCUPANT COMFORT



Uninsulated Slab in February



Insulated Slab in February

Climate Zone 7A

Description	airtightness in ACH@50	Heating demand KWh/m2a	GJ/a	TFA m2	% Better than Benchmark
Code compliant 2x6 wall (BENCHMARK)	2.5	107.6	112.33	290m²	0%
Code compliant 2x6 wall with R-2 Sub slab insulation	2.5	74.3	77.57	290m²	31%
Code compliant 2x6 wall with R-4 Sub slab insulation	2.5	67.8	70.78	290m²	37%
Code compliant 2x6 wall with R-8 Sub slab insulation	2.5	62.8	65.56	290m²	41%
Code compliant 2x6 wall with R-12 Sub slab insulation	2.5	60.9	63.58	290m²	43%
Code compliant 2x6 wall with R-16 Sub slab insulation	2.5	59.8	62.43	290m²	44%
Code compliant 2x6 wall with R-20 Sub slab insulation	2.5	59.2	61.80	290m²	45%

- *R5 = 4,500 KWh energy savings annually*
  $350 savings annually; electricity at $0.08/KWh

- *R10 = 5,000 KWh energy savings annually*
  $400 a,savings annually; electricity at $0.08/KWh

Energy savings plus optimum comfort, no more cold feet!!

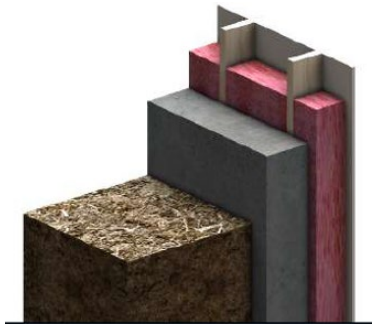


Table 4.1: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Interior Insulated Below-Grade Wall and Uninsulated Floor Detail at Winter Design Temperatures and 20°C Interior Temperature

Wall Insulation	Floor Insulation R-value ft²h°F/Btu	Climate		Critical Locations					
				T_{i1} Gypsum at Floor between studs		T_{i2} Interior face of concrete between studs		T_{i3} Concrete Floor at Wall between studs (under sill plate)	
		Location	Exterior Design Temp °C	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-20 Fiberglass Batt	None	Vancouver	-7	13.5	66.1%	-5.9	15.9%	9.0	49.0%
		Montreal	-23	9.6	51.1%	-21.2	3.9%	2.4	31.1%
		Winnipeg	-33	7.2	43.4%	-30.8	1.5%	-1.7	22.8%

- 1/2" (13 mm) gypsum drywall
- 6 mil poly vapour control
- wood studs (2x4 or 2x6) at 16" (406 mm) o.c. with fiberglass batt insulation (R-12, R-14, R-20) ±
- XPS insulation (varies) ±
- 8" (203 mm) concrete below grade wall

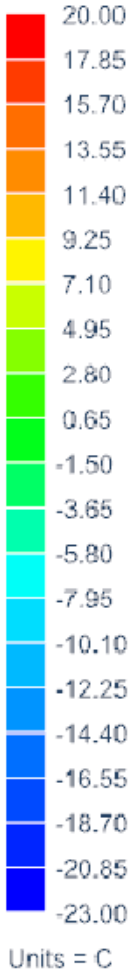
Table 4.6: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Interior Hybrid Insulated (Continuous Interior Insulation) Below-Grade Wall and Floor Detail in Montreal (Winter Design Temperature: -23°C and Interior Temperature: 20°C)

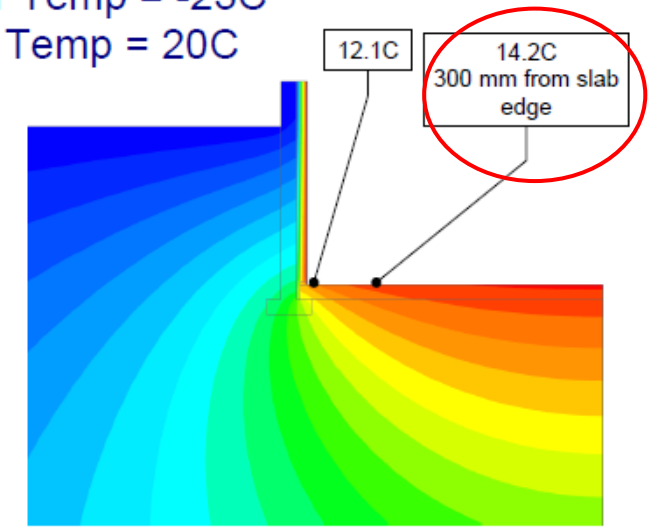
Wall Insulation R-value ft²h°F/Btu	Floor Insulation R-value ft²h°F/Btu	Critical Location					
		T_{i1} Gypsum at Floor between studs		T_{i2} Interior face of XPS between studs		T_{i3} Concrete Floor at Wall XSP between studs	
		Surface Temp °C	Max. RH	Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-14 Batt + R-10 (2" XPS)	None	12.1	60.4%	-4.9	17.3%	10.0	52.5%
	R-5	15.0	72.7%	-4.9	17.3%	13.2	64.7%
	R-7.5	15.3	74.5%	-4.9	17.3%	13.6	66.5%
	R-10	15.6	75.8%	-4.9	17.3%	13.8	67.6%
	R-15	15.9	77.2%	-4.9	17.3%	14.1	68.9%
R-20 Batt + R-12.5 (2.5" XPS)	None	11.8	59.3%	-6.1	15.7%	8.8	48.5%
	R-5	14.8	72.0%	-6.1	15.7%	12.4	61.4%
	R-7.5	15.3	74.2%	-6.1	15.7%	12.9	63.5%
	R-10	15.6	75.6%	-6.1	15.6%	13.2	64.8%
	R-15	15.9	77.5%	-6.1	15.6%	13.6	66.5%

Source: Morrison Hershfield

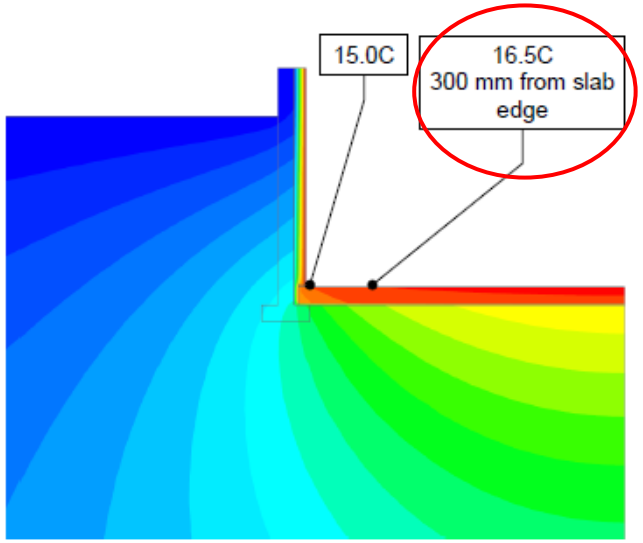
Interior (Hybrid) Insulated Below Grade Walls - Montreal

R-14 + R-10 wall insulation
Exterior Temp = -23C
Interior Temp = 20C

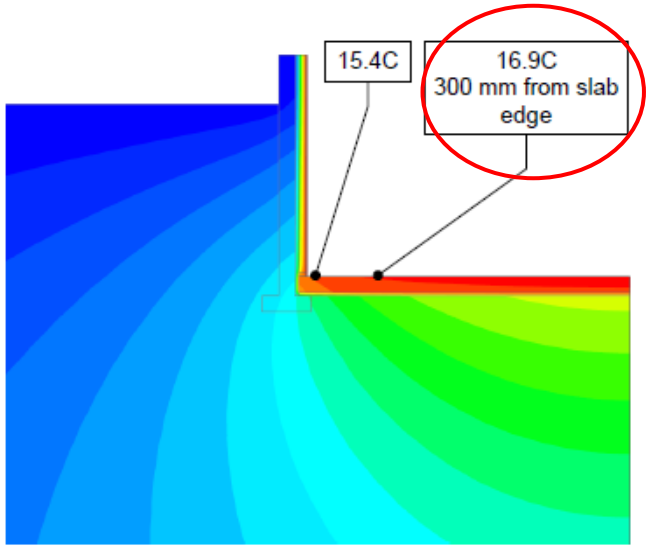




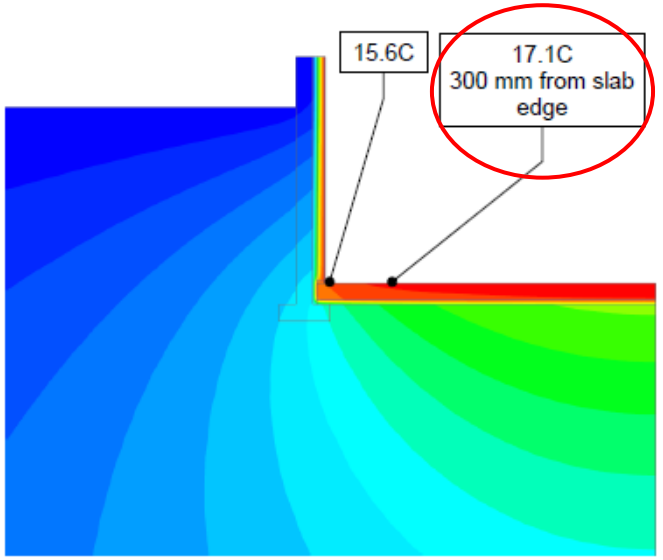
No Slab Insulation



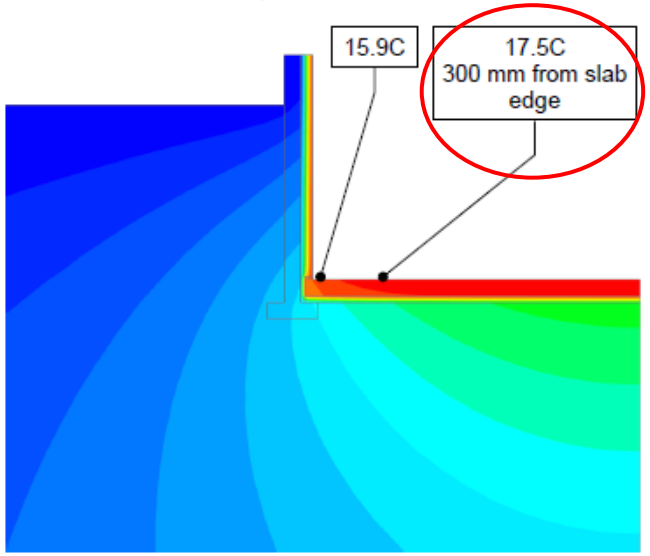
1in Slab Insulation



1.5in Slab Insulation

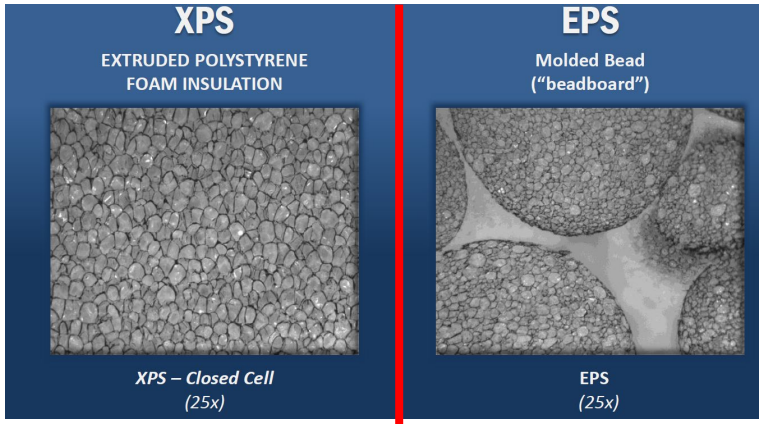


2in Slab Insulation



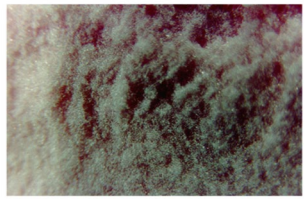
3in Slab Insulation

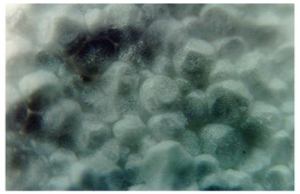
THE TYPE OF INSULATION MATTERS!

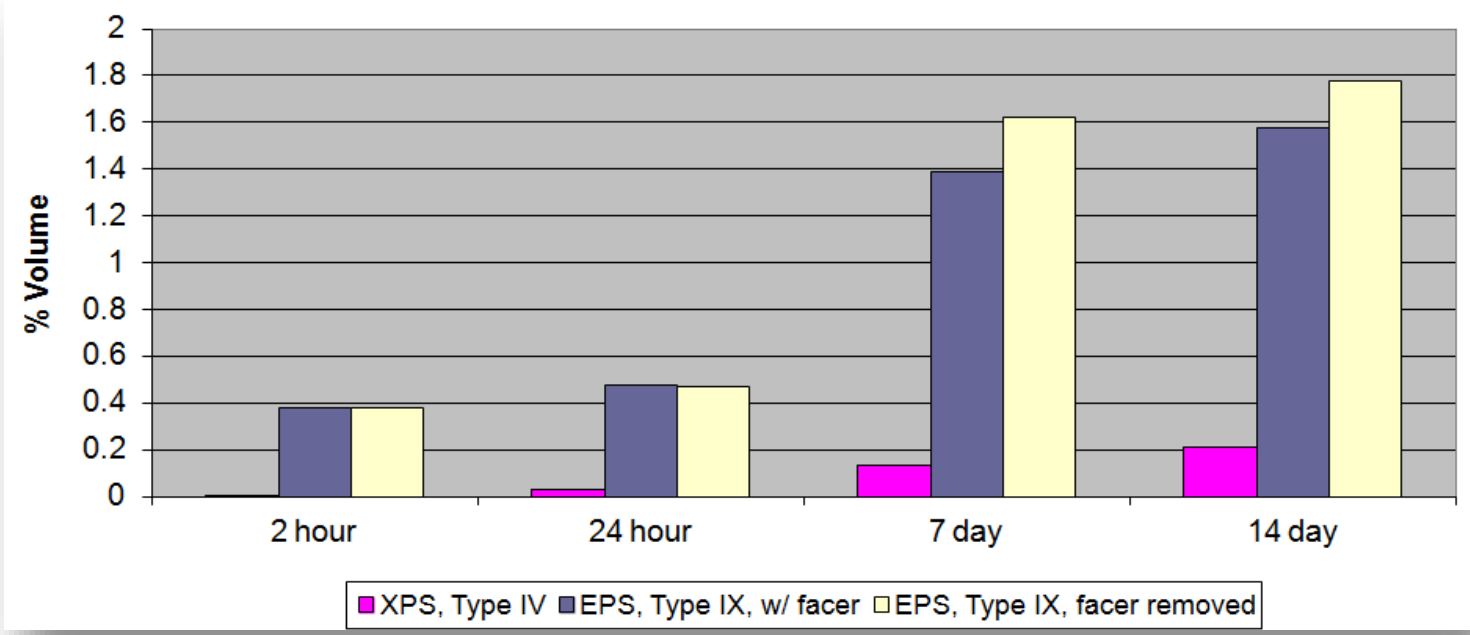


Closed Cell XPS
(Max 0.7% water absorption)

Open Cell EPS
(2-4% water absorption)



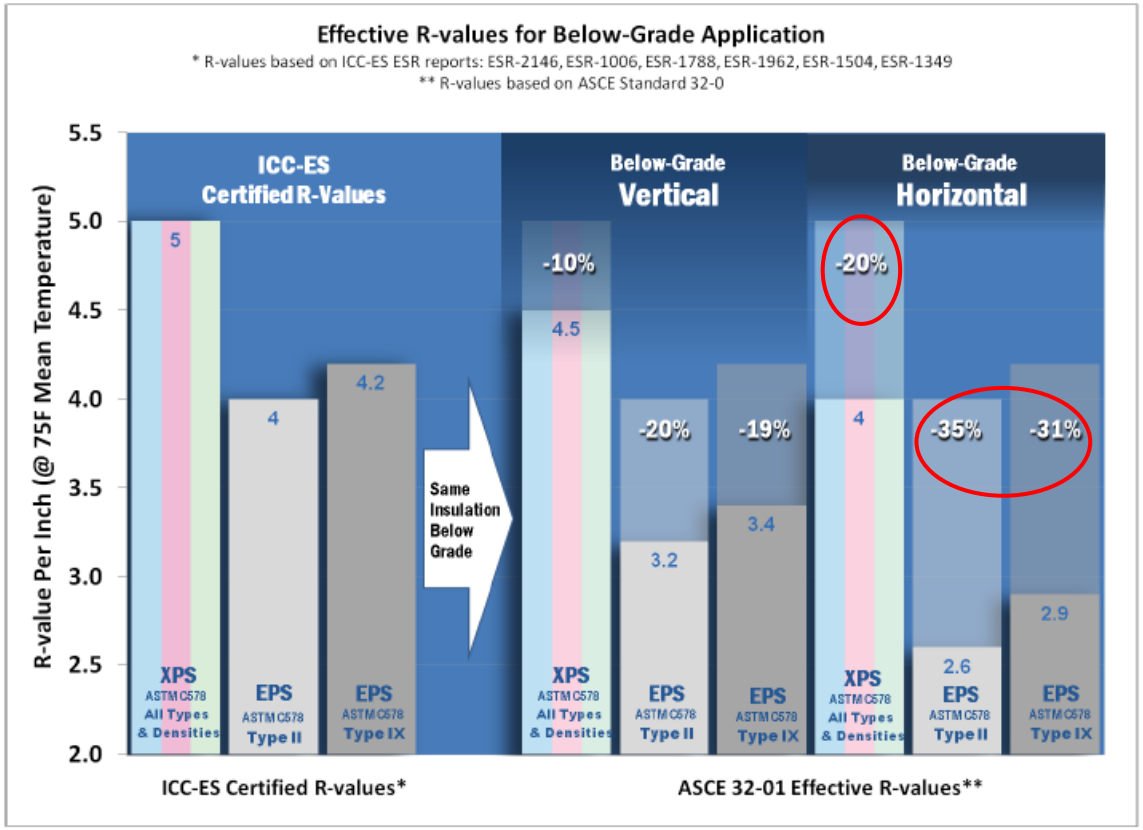


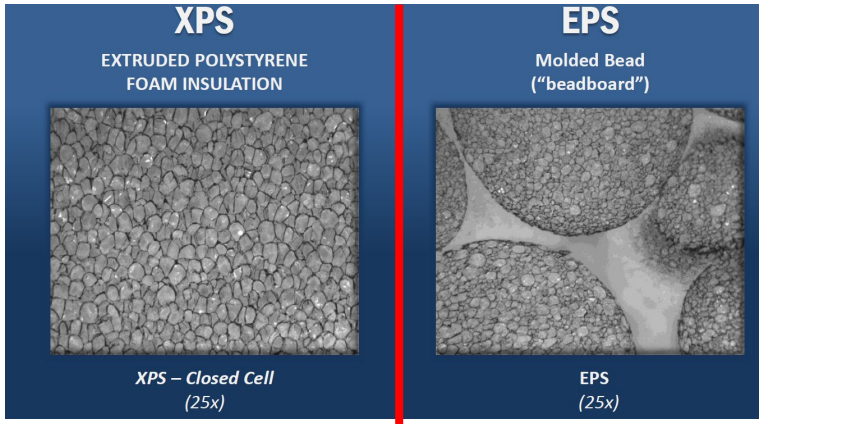


- *XPS Insulation keeps the slab warm and dry*
- *No polyethylene required*

THE TYPE OF INSULATION MATTERS!

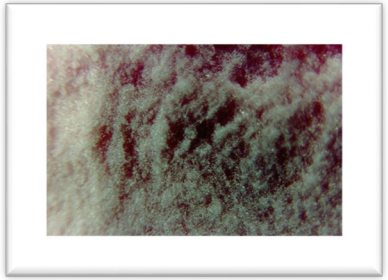
	Vertical orientation Below-grade	Horizontal orientation Below-grade
EPS	80%	69%
XPS	90%	80-81%

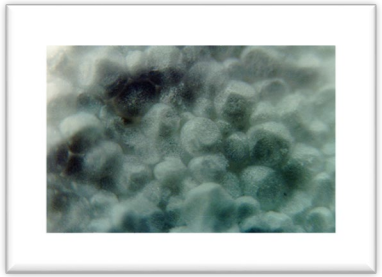




Closed Cell XPS
(Max 0.7% water absorption)

Open Cell EPS
(2-4% water absorption)

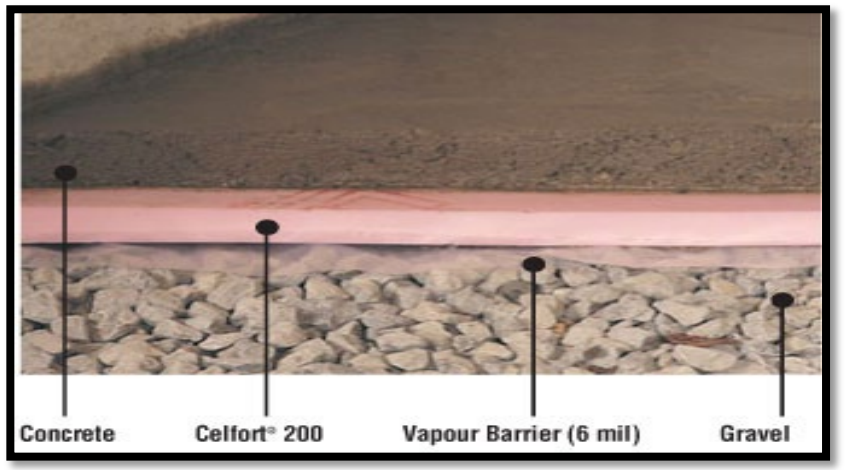




ASCE Standard 32-01 Effective In-service R-values based on Field Performance Studies of Below-grade Insulation

The American Society of Civil Engineers (ASCE) has established Effective R-values for rigid polystyrene foam insulations used in below-grade applications. (J. Crandell, Below-Ground Performance of Rigid Polystyrene Foam Insulation: review of Effective Thermal resistivity Values Used in ASCE Standard 32-01 - Design and Construction of Frost Protected Shallow Foundations", J. Cold. Reg. Engrg. June 2010)

DAMPROOFING & VAPOR CONTROL



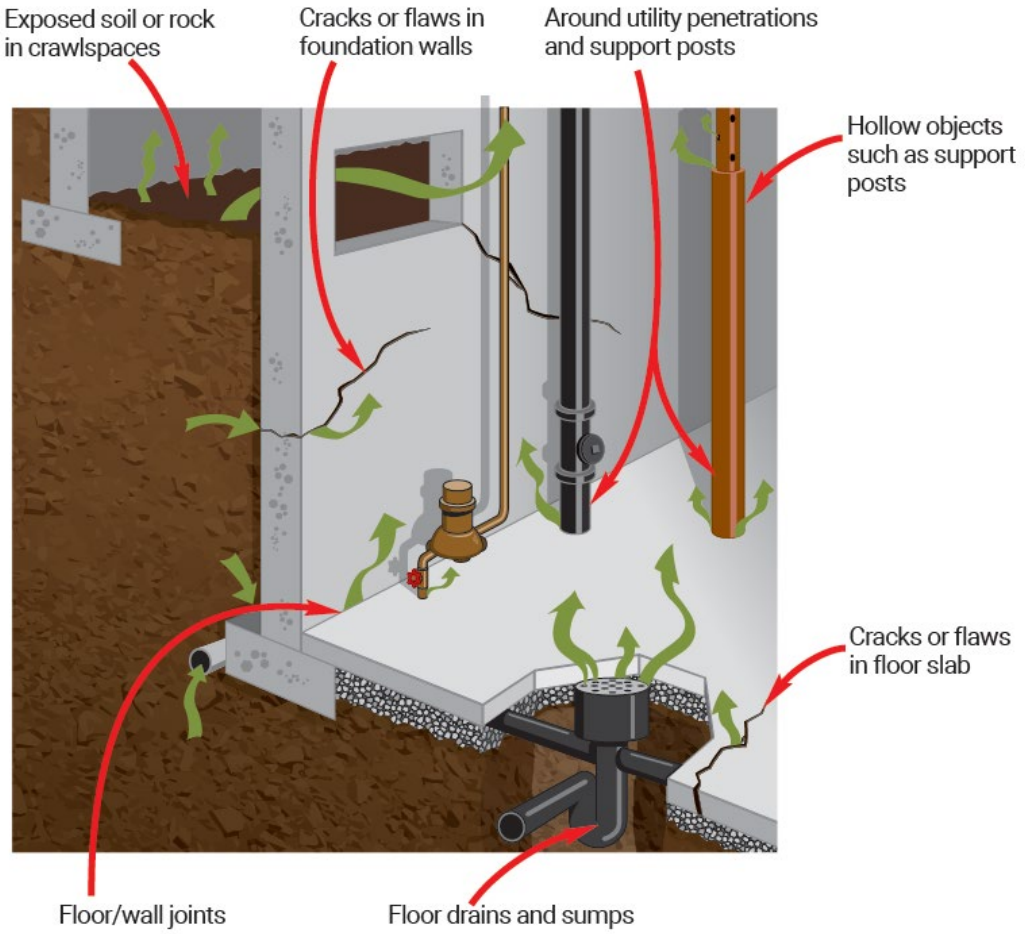
OBC
9.13.2.6
Damproofing of Floors-on-Ground

Rigid extruded polystyrene can be used as damproofing above or below the slab, provided
- *sealed or ship lap joints,*
- *sufficient compressive strength to support the floor assembly and*
- *a water vapor permeance complying with Clause 9.13.2.2.(2)(b), (43 ng/Pa-s-m^2 wet cup)*

RADON FACTS

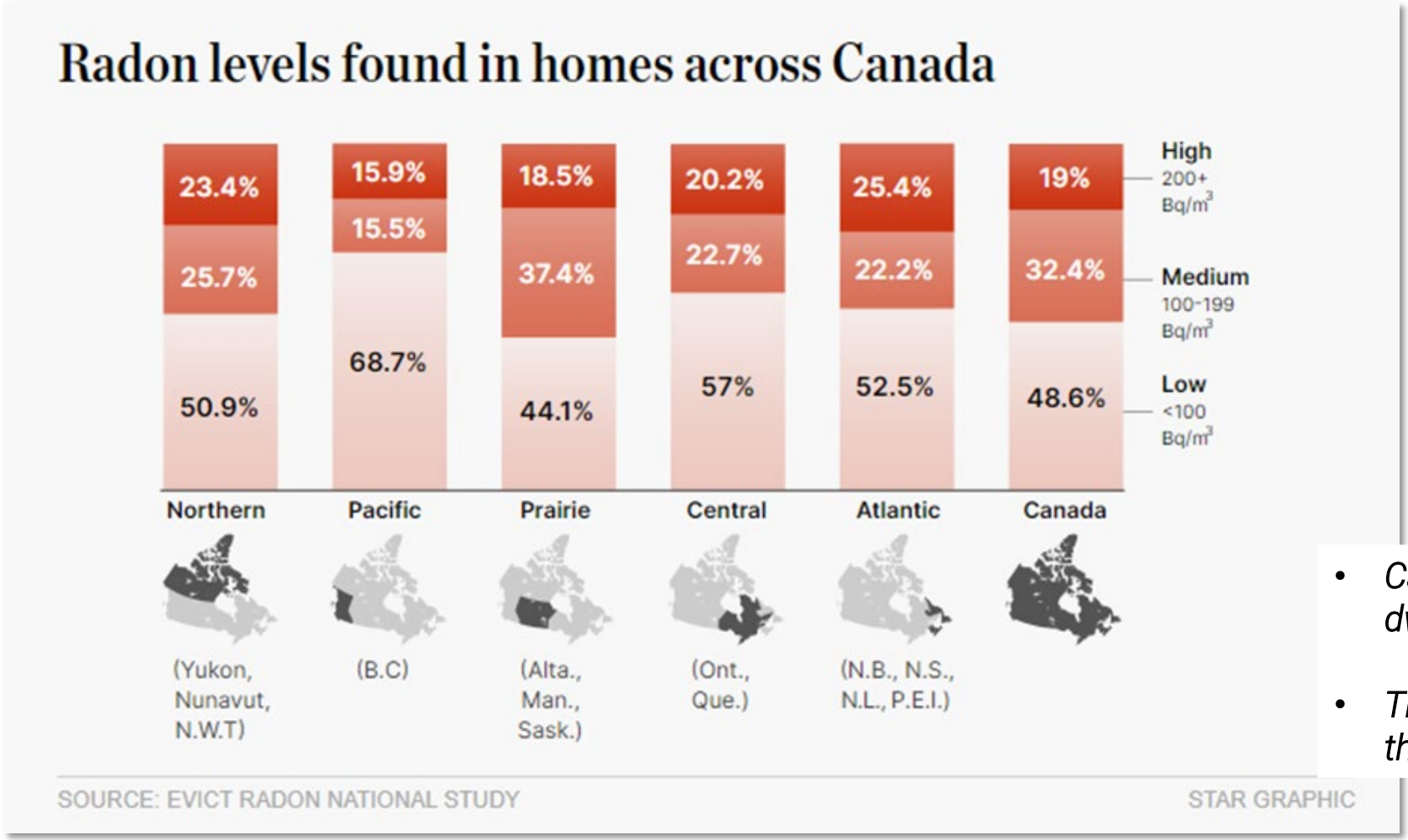
Radon is a colorless, odorless, and flavorless radioactive gas that is the second leading cause of lung cancer overall (after smoking) and the leading cause of lung cancer in non-smokers.

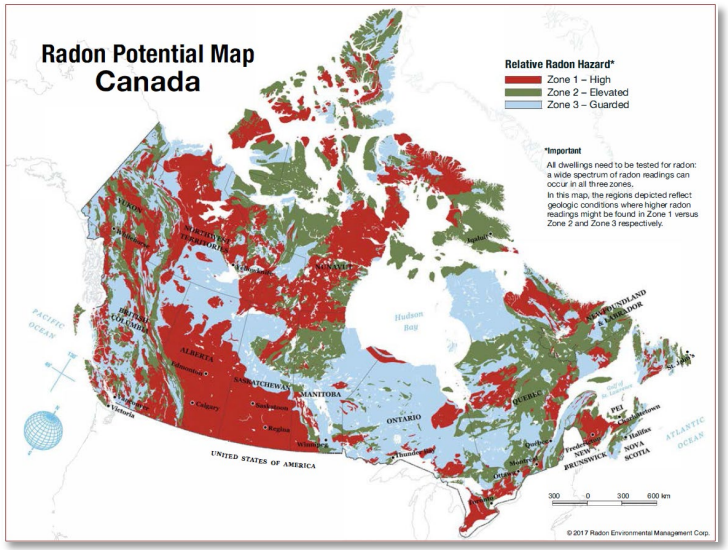
- *Radon is the leading environmental cause of cancer*
- *Radon kills 3,000 Canadians and 21,000 Americans per year*
- *1 in 15 homes in the U.S. and Canada has high radon levels*



https://www.thoughtco.com/interesting-radon-element-facts-603364
https://www.cbc.ca/news/world/high-radon-levels-found-in-health-canada-tests-across-country-1.2662610
Haynes, William M., ed. (2011). CRC Handbook of Chemistry and Physics (92nd ed.). Boca Raton, FL: CRC Press. p. 4.122. ISBN 1439855110
Kusky, Timothy M. (2003). Geological Hazards: A Sourcebook. Greenwood Press. pp. 236–239. ISBN 9781573564694.

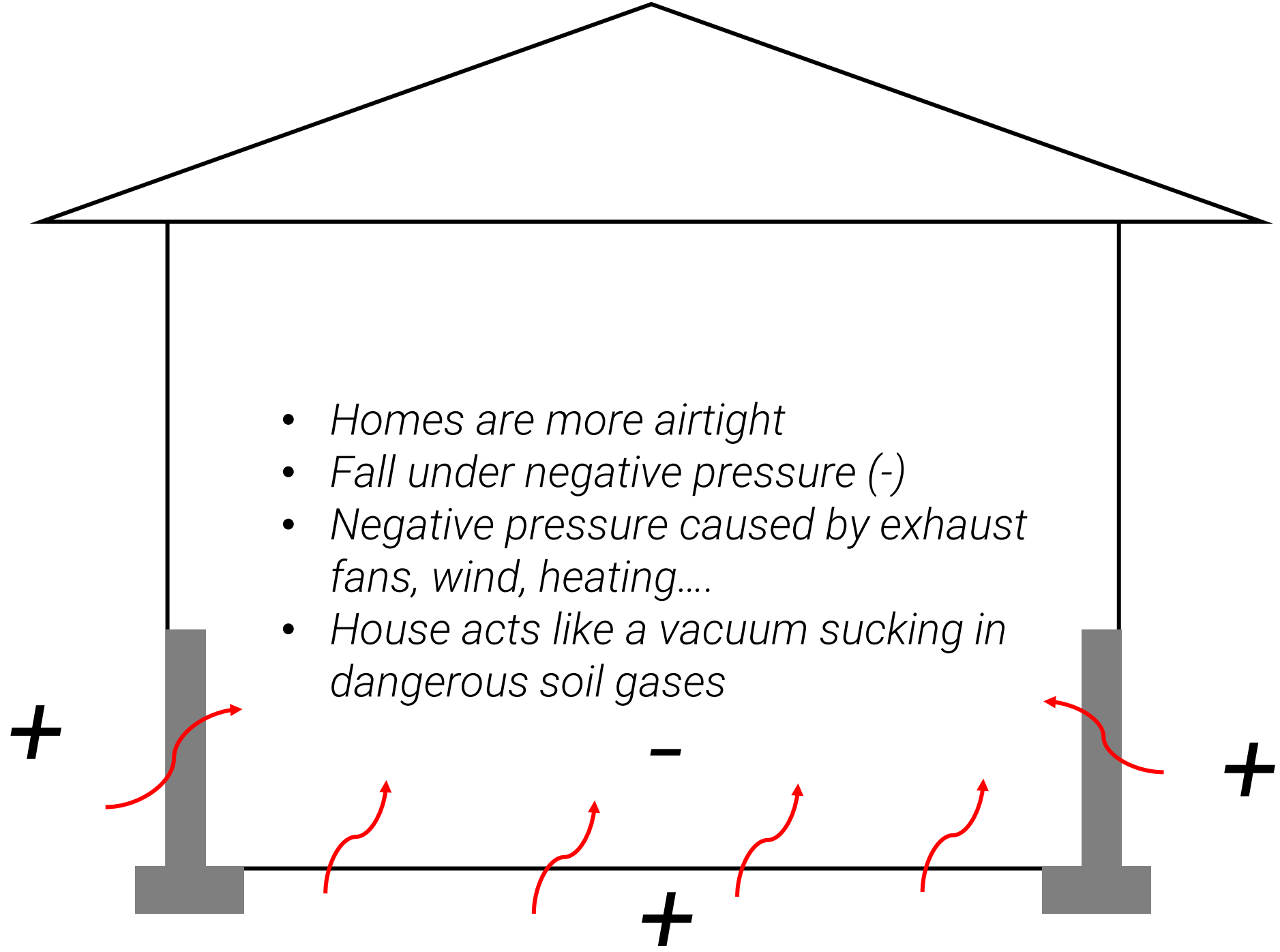
RADON STATISTICS





- *Canadian guideline for radon in indoor air for dwellings is 200 Bq/m³)*
- *The World Health Organisation recommends that countries adopt 100 Bq/m³*

Front page article in Toronto Star (May 1, 2021)


• Homes are more airtight
• Fall under negative pressure (-)
• Negative pressure caused by exhaust fans, wind, heating….
• House acts like a vacuum sucking in dangerous soil gases
+
–
+
+

PROTECTION FROM SOIL GAS INGRESS, NBCC 2015

9.13.4.2. Protection from Soil Gas Ingress

1) All wall, roof and floor assemblies separating *conditioned space* from the ground shall be protected by an *air barrier system* conforming to Subsection 9.25.3.

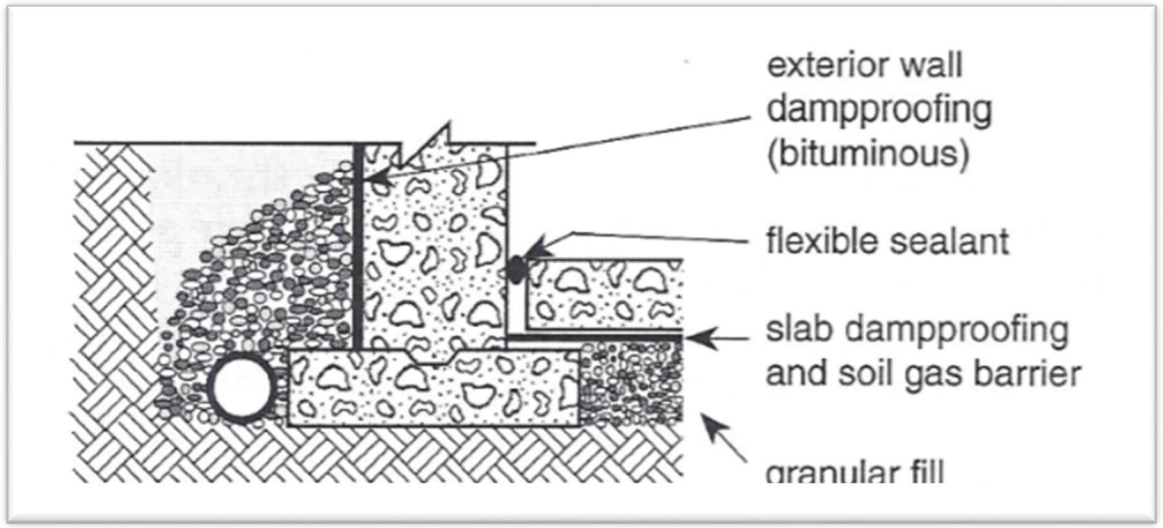
9.25.3.2. Air Barrier System Properties

(See Note A-9.25.5.1.(1).)

1) *Air barrier systems* shall possess the characteristics necessary to provide an effective barrier to air infiltration and exfiltration under differential air pressure due to stack effect, mechanical systems or wind.

Polyethylene is acceptable soil gas barrier prescribed in Code

2) Where polyethylene sheet is used to provide airtightness in the *air barrier system*, it shall conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."



NBC 9.25.3.4 & 9.25.3.6

Reference: NBCC 2015

PROTECTION FROM SOIL GAS INGRESS, NBCC 2015

9.13.4.2.2

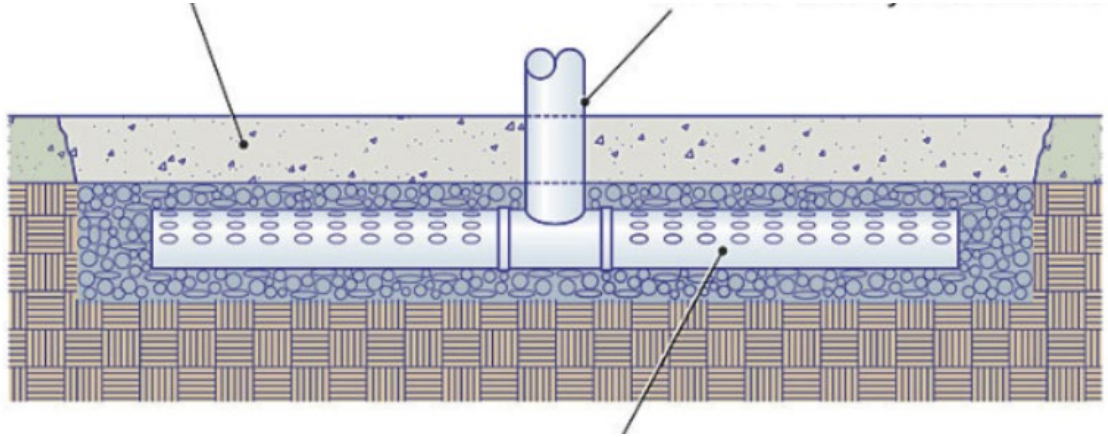
2) Unless the space between the ai barrier system and the ground is designed to be accessible for future installation of a subfloor depressurization system, dwelling units and buildings containing residential occupancies shall be provided with the rough-in for a radon extraction system conforming to Article 9.13.4.3

2B - #57 stone is the best

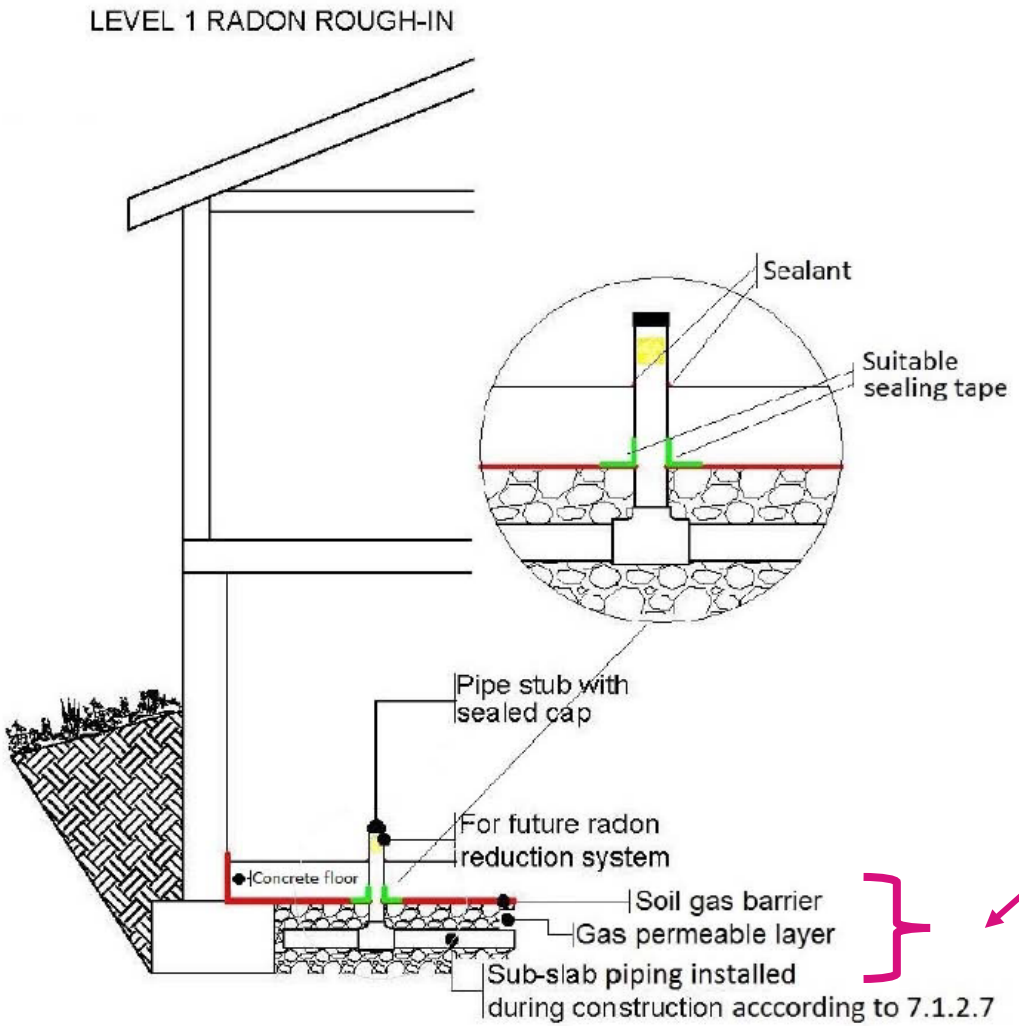
Slotted Corrugated

Ridgid perforated

Optional
Geotextile Fabric



CAN/CGSB-149.11-2019



- *Soil gas barrier +*
- *Rough in for a radon extraction system*

Figure 7.1a — Level 1 — Rough-in for active soil depressurization

CAN/CGSB-149.11-2019

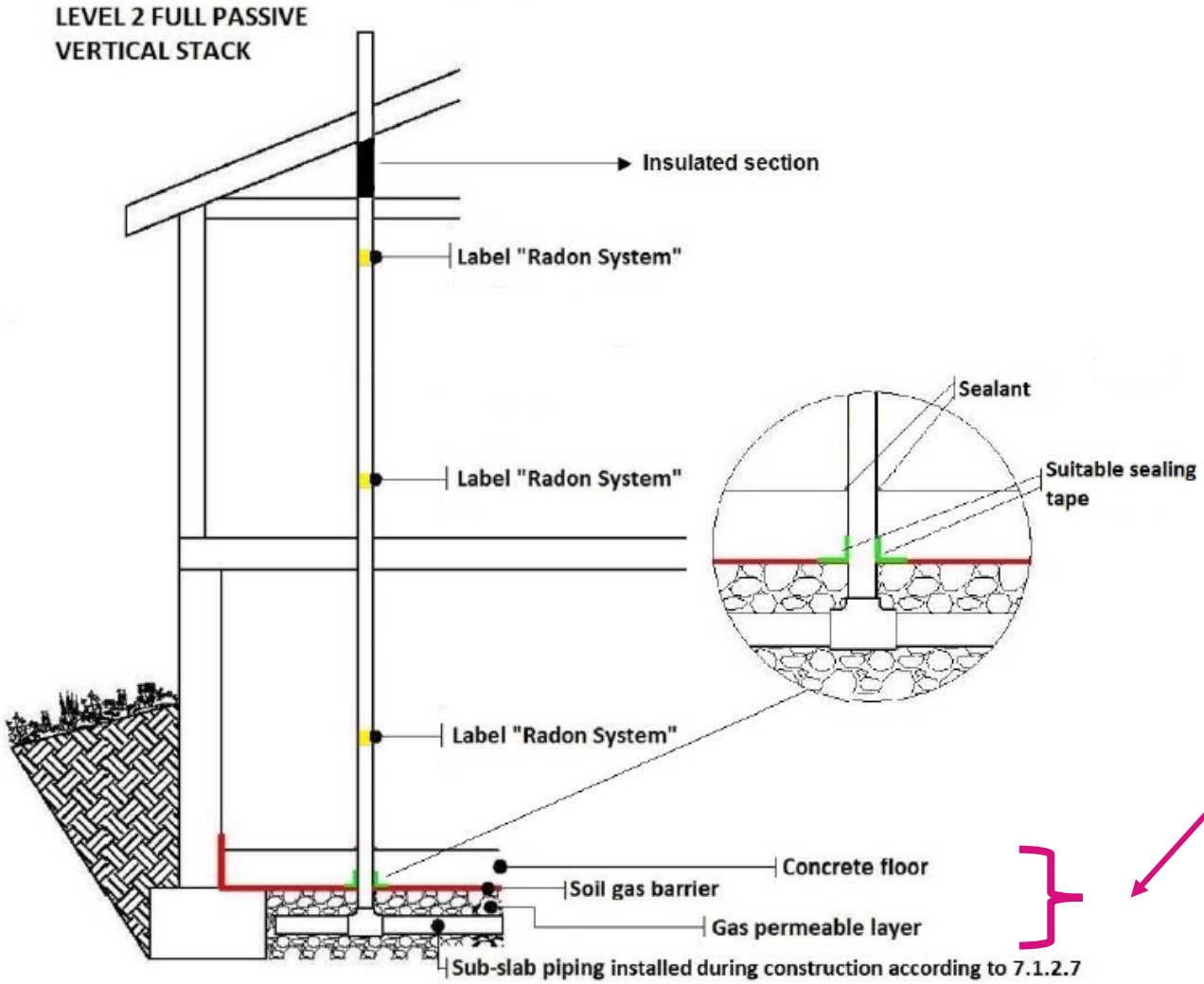


Figure 7.2b — Level 2 — Full passive vertical radon stack

- *Soil gas barrier +*
- *Rough in for a radon extraction system +*
- *Vertical stack*

CAN/CGSB-149.11-2019

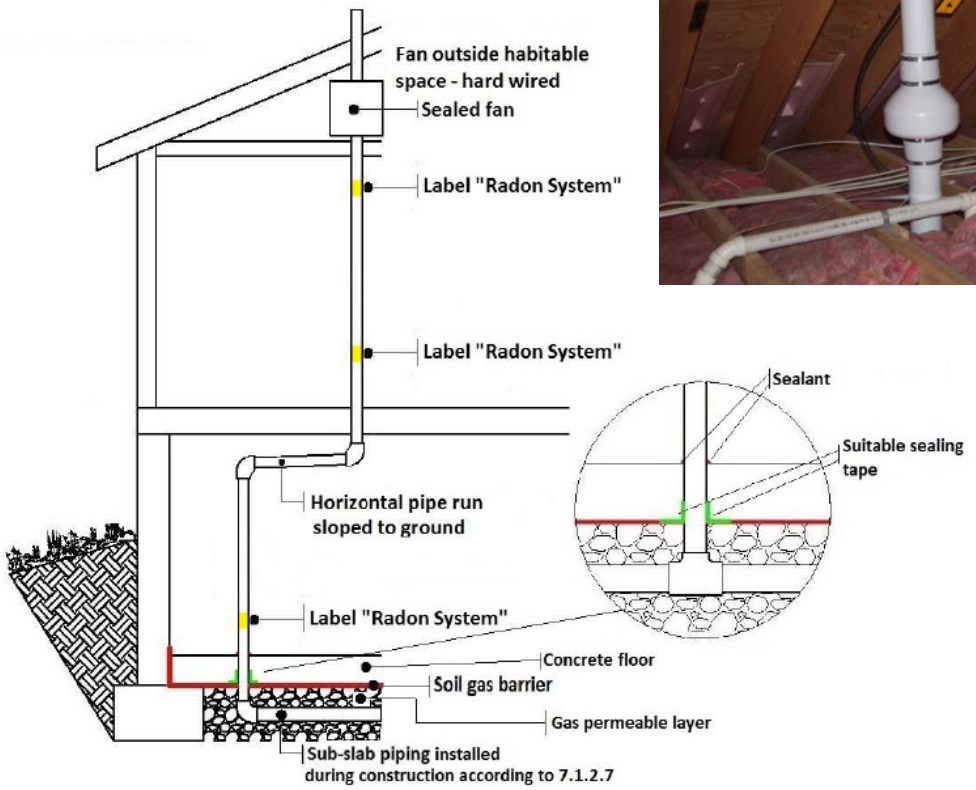


Figure 7.3.4a — Level 3 — Full active soil depressurization system-rooftop discharge

- *Soil gas barrier +*
- *Rough in for a radon extraction system +*
- *Vertical stack +*
- *Mechanical extraction fan*

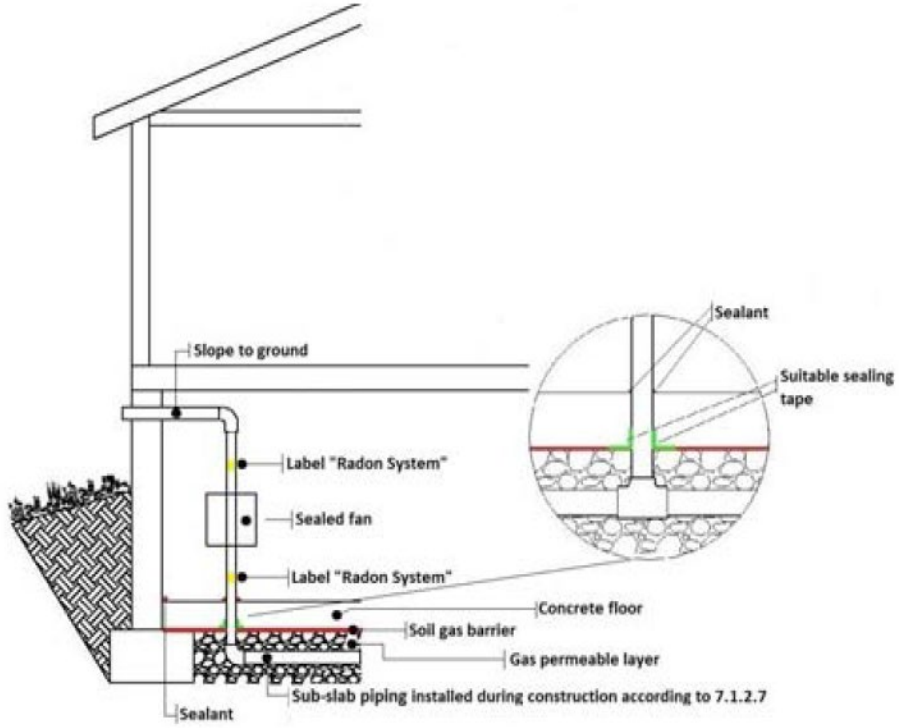
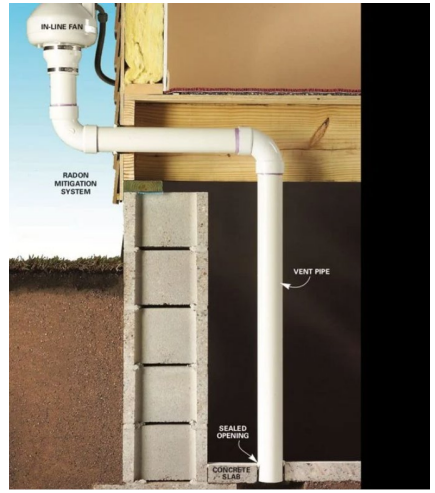


Figure 7.3.4c- Level 3 — Full active soil depressurization (ASD) system — Side-wall discharge near ground level with indoor fan

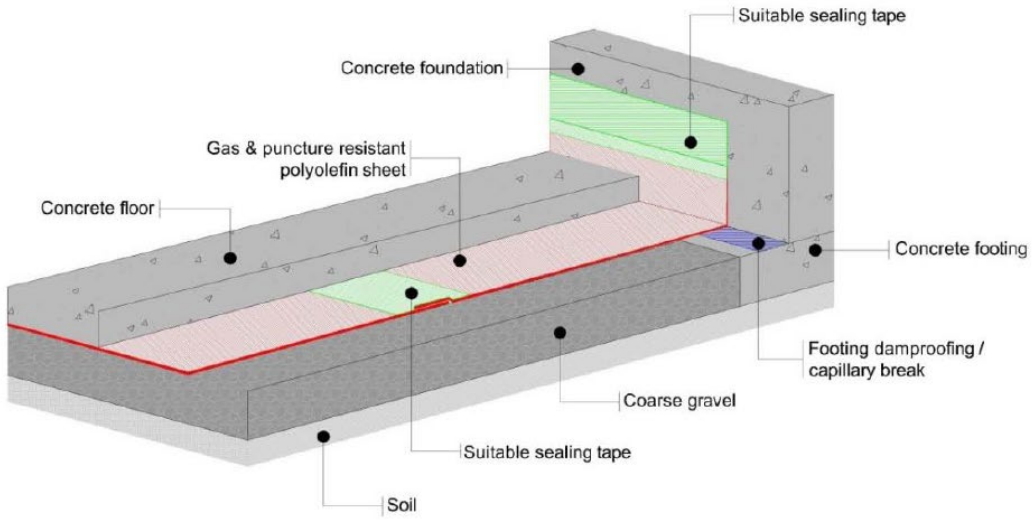


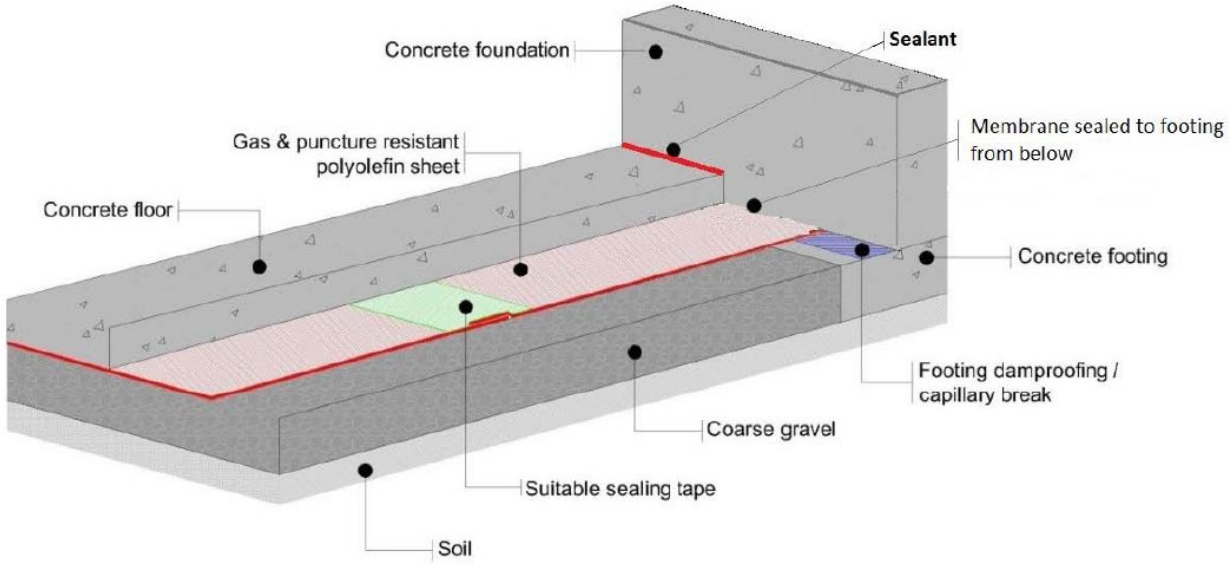
SOIL GAS BARRIERS CAN/CGSB-149-11-2019

7.1.4.5 Soil gas barriers under concrete slabs

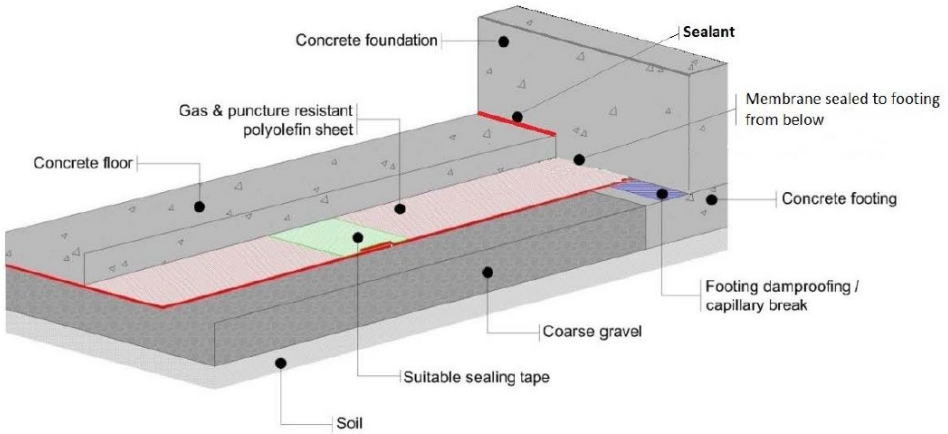
7.1.4.5.1 The soil gas barrier material used under a concrete slab shall be 0.25 mm (10 mil) thick polyethylene or equivalent polyolefin, and be gas and puncture resistant.

CAN/CGSB-149.11-2019





RADON GAS BARRIERS

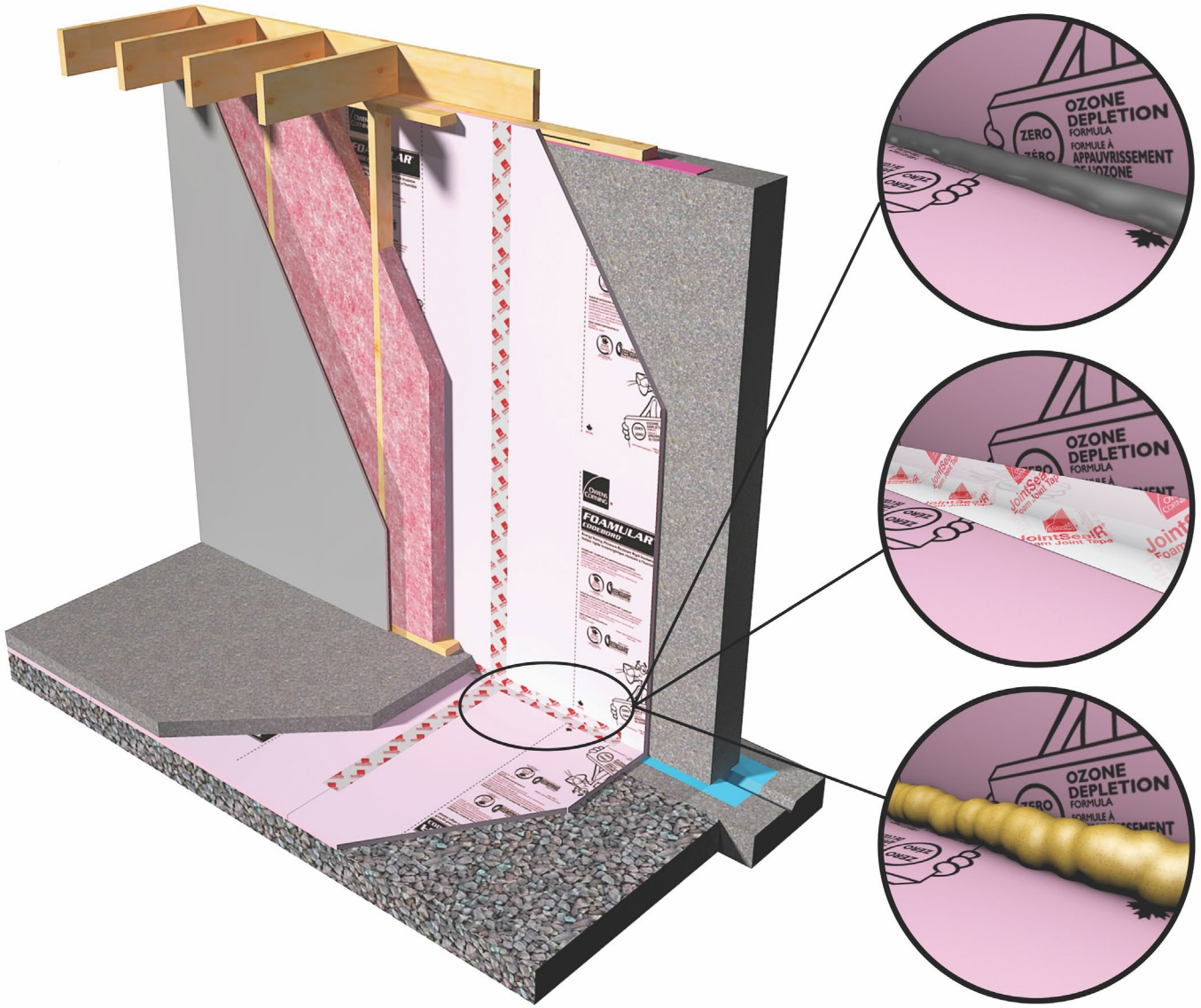


Polyethylene must be continuous, sealed along perimeter and at penetrations and puncture resistant

FOAMULAR®

RADONBARRIER™

RADON ABATEMENT SYSTEM



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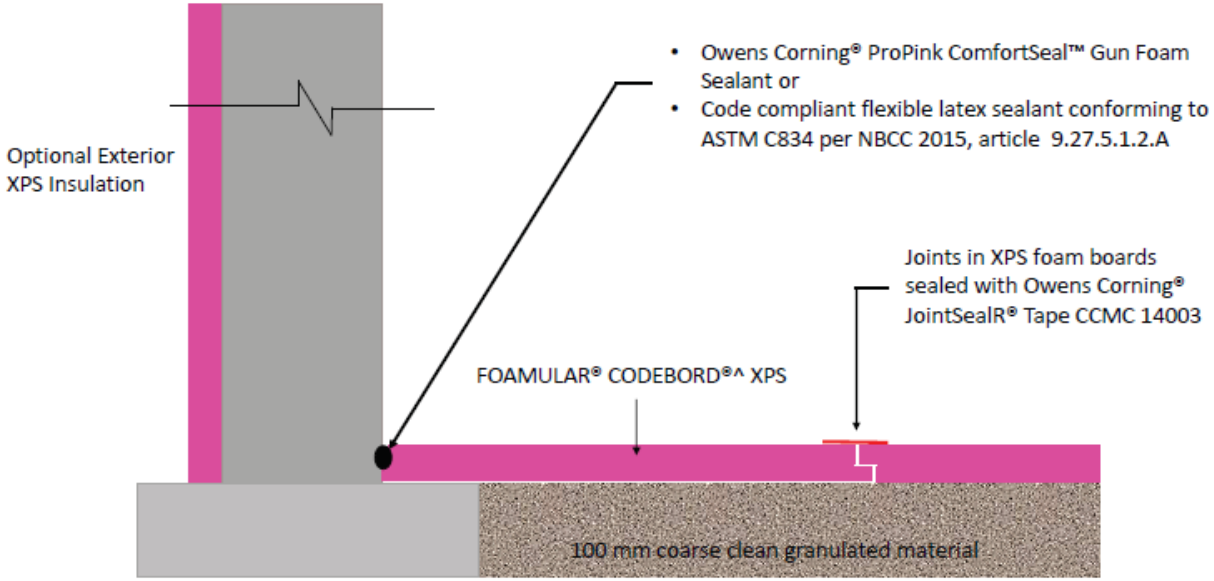
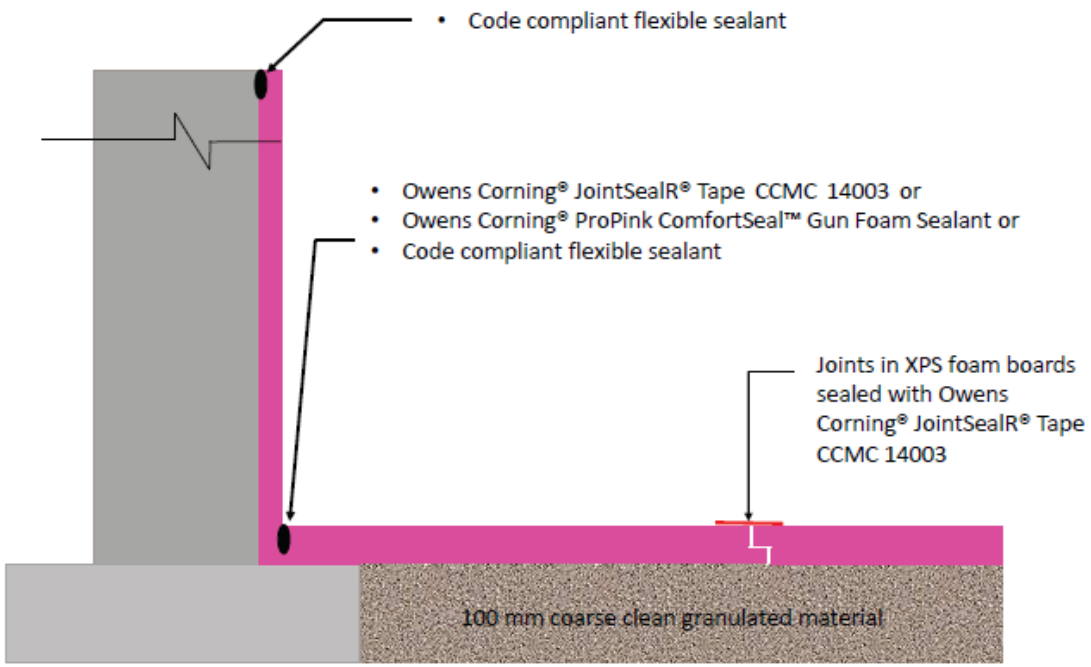
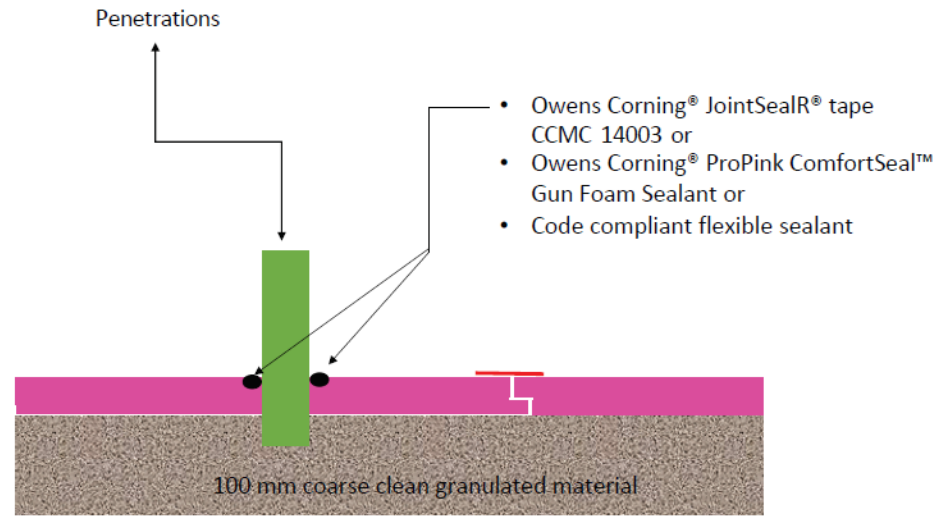
JointSealR™ Joint Seal Tape

ProPink ComfortSeal™ Gun Foam Sealant





Sealing around penetrations



FOAMULAR® RADONBARRIER™

RADON ABATEMENT SYSTEM

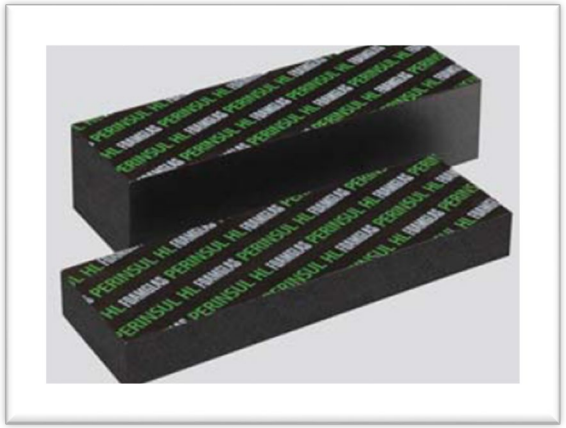
- ✓ *The only CCMC approved XPS solution*
- ✓ *Better tested performance vs 6 mil poly*
- ✓ *Less expensive than SPF*
- ✓ *Can be installed year round*

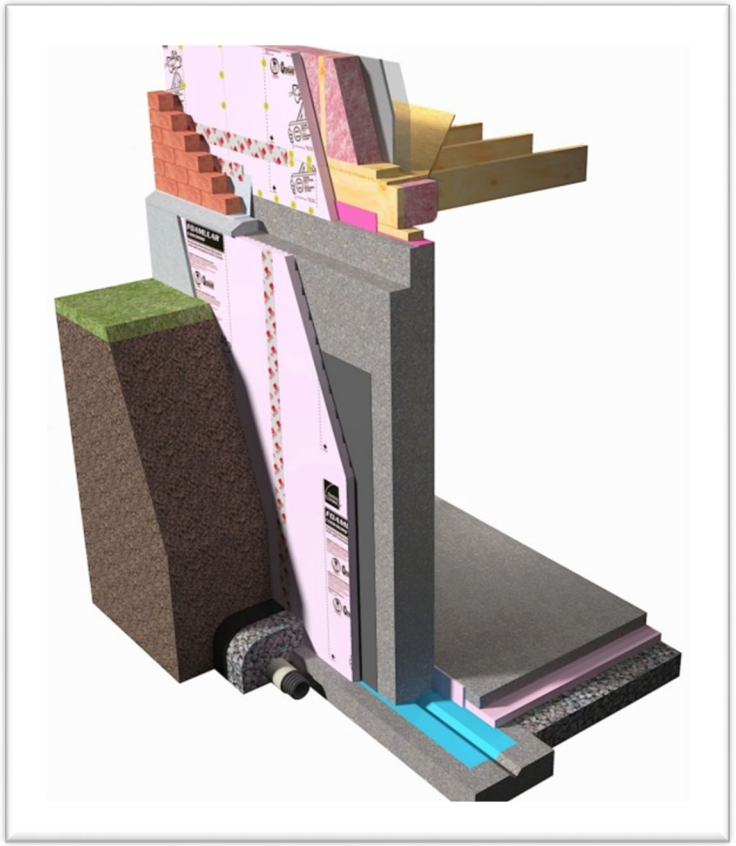
ONE PRODUCT 5 ATTRIBUTES

- ❖ *Air Barrier*
- ❖ *Moisture Barrier*
- ❖ *Vapour Barrier*
- ❖ *Thermal Barrier*
- ❖ *Radon Barrier*

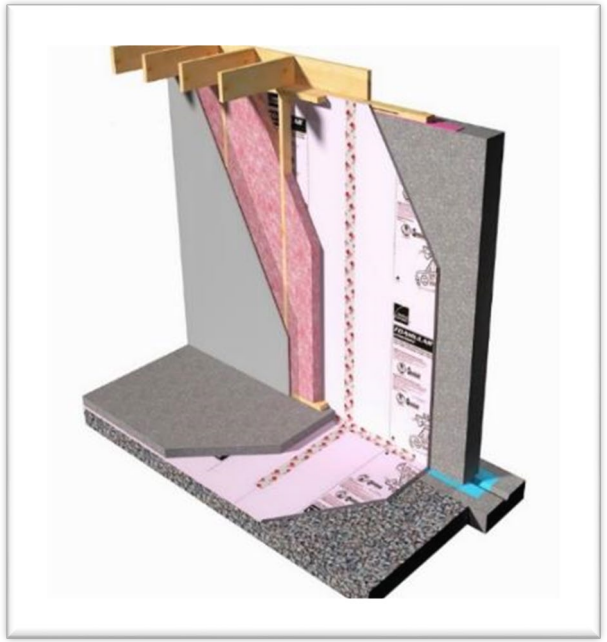
No Polyethylene required

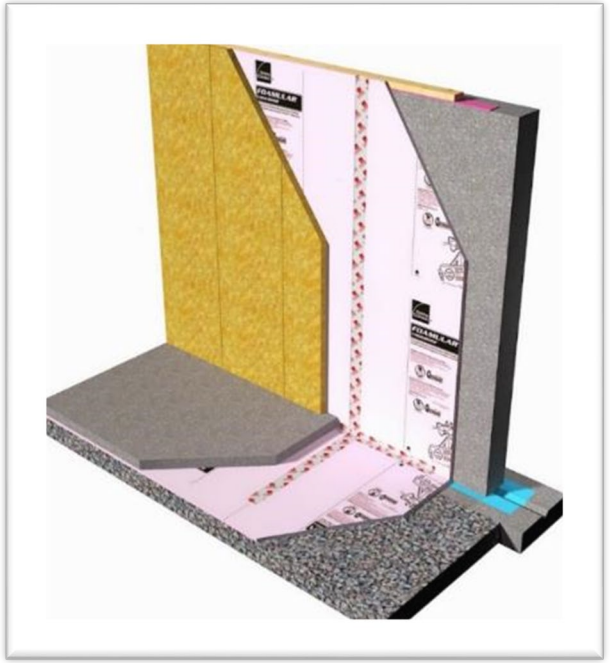
- *Healthier Living Space*
- *Greater Comfort*
- *Safer*
- *Better Air Indoor Quality*
- *3rd Party CCMC Certified*
- *No Poly Required*
- *Skilled Trades not required*
- *Best Long-Term Solution*
- *Moisture Resistant*
- *Guaranteed R-Value*
- *Higher Compressive Strength*





COMPLETE EXTERIOR ENCLOSURE SOLUTIONS





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Simple, Cost Effective & Durable Solutions to Turn Basements into Comfortable, Healthy and Safe Added Living Spaces

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OUR MISSION
To build a sustainable future through material innovation

OUR PURPOSE
Our people and products make the world a better place

OUR VALUES
Global in scope, human in scale

Caring
Curious
Collaborative
Committed

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