Welcome to todays CHBA Net Zero Webinar!

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The CHBA Net Zero Team

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Housekeeping

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Today's Webinar

October 6 from 10:30-11:30 PT / 1:30-2:30 ET

Turning basements into valuable, comfortable, healthy, and safe 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.

*Follow-up seminar **The Science of Building Better Basements** (hosted by BuildABILITY) is on November 4 from 1-5 ET. Attendance is limited to the first 30 participants. MORE SEATS WILL BE AVAILABLE ON OCT 21 & 28.*

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

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BUILDING **VALUE WITH LIVABLE, HEALTHY & SAFE BASEMENTS**

UNLOCKING THE POTENTIAL OF AN ADDED LIVING SPACE

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

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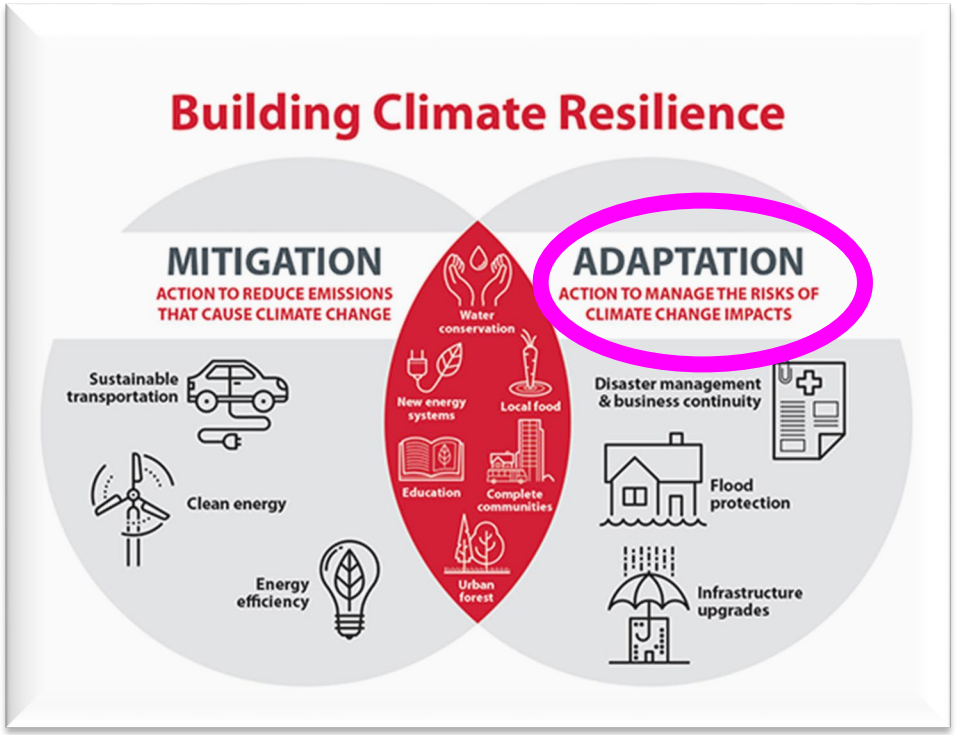
TURNING BASEMENTS INTO VALUABLE, COMFORTABLE, HEALTHY, AND SAFE LIVING AREAS

Agenda

- *Exterior basement enclosure and drainage systems*
- *Split insulation interior basement enclosure systems*
- *Innovative radon abatement system*

THE NEED TO BUILD BETTER



THE ULTIMATE LOWER LIVING AREA EXPERIENCE

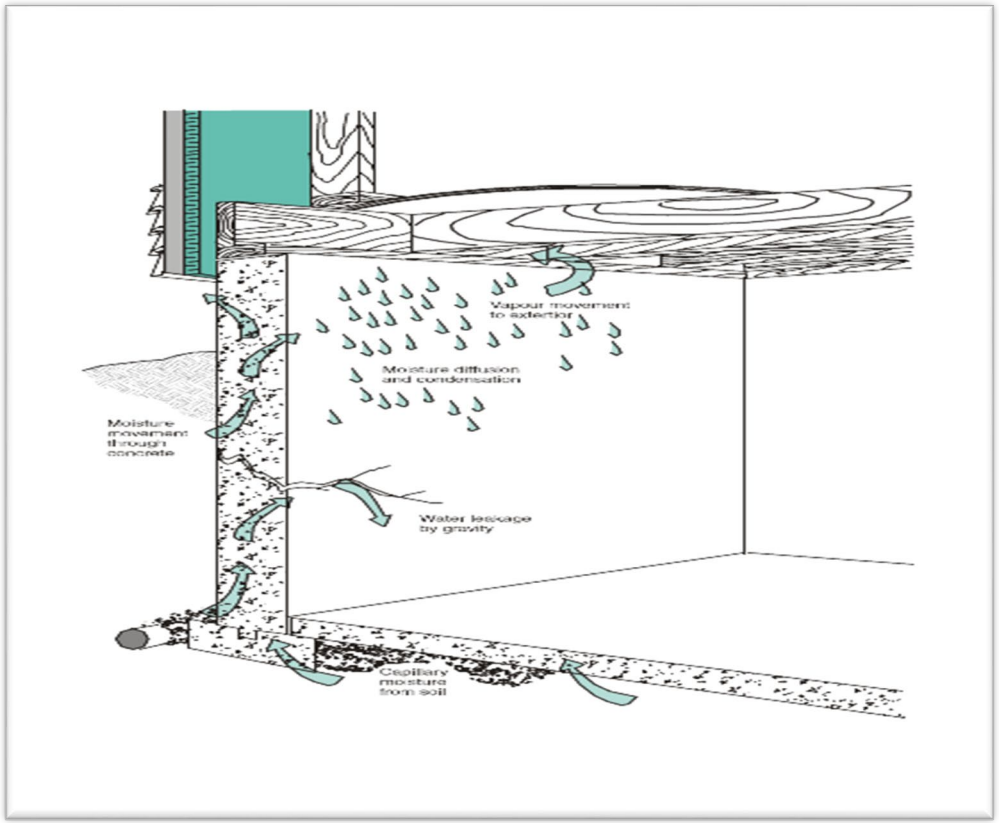
Storage area → *Comfortable and Safe Additional Living Spaces*

THE ULTIMATE LOWER LIVING AREA

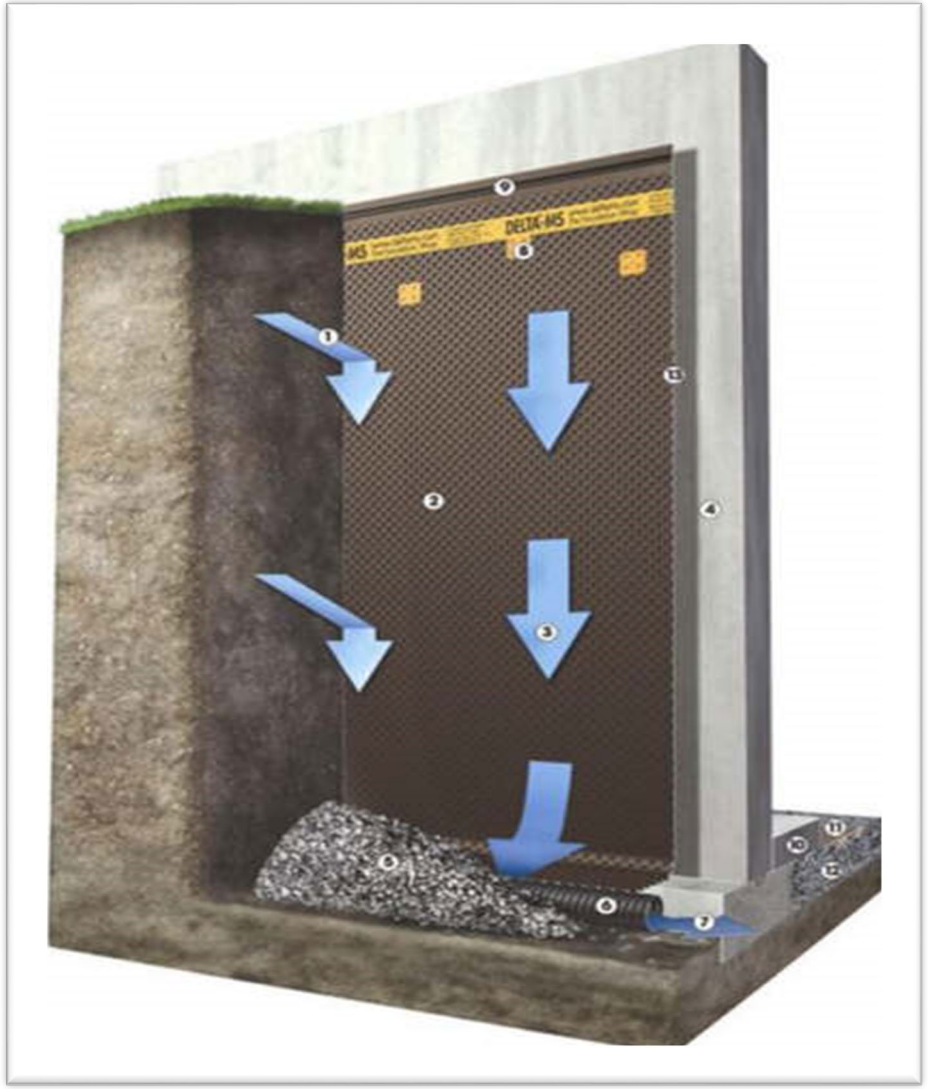
CRITICAL CONTROL LAYERS

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

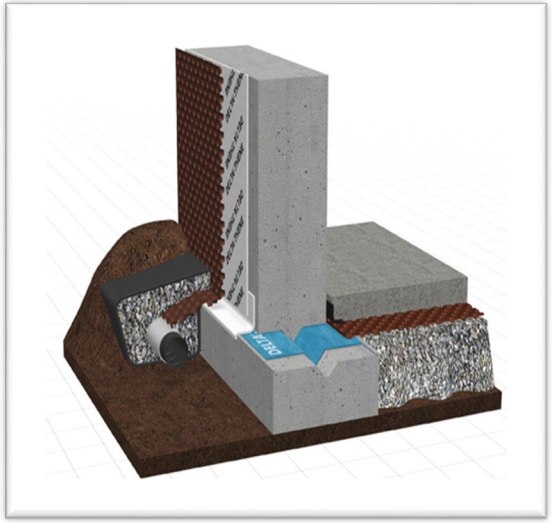


DAMPROOFING & WATERPROOFING



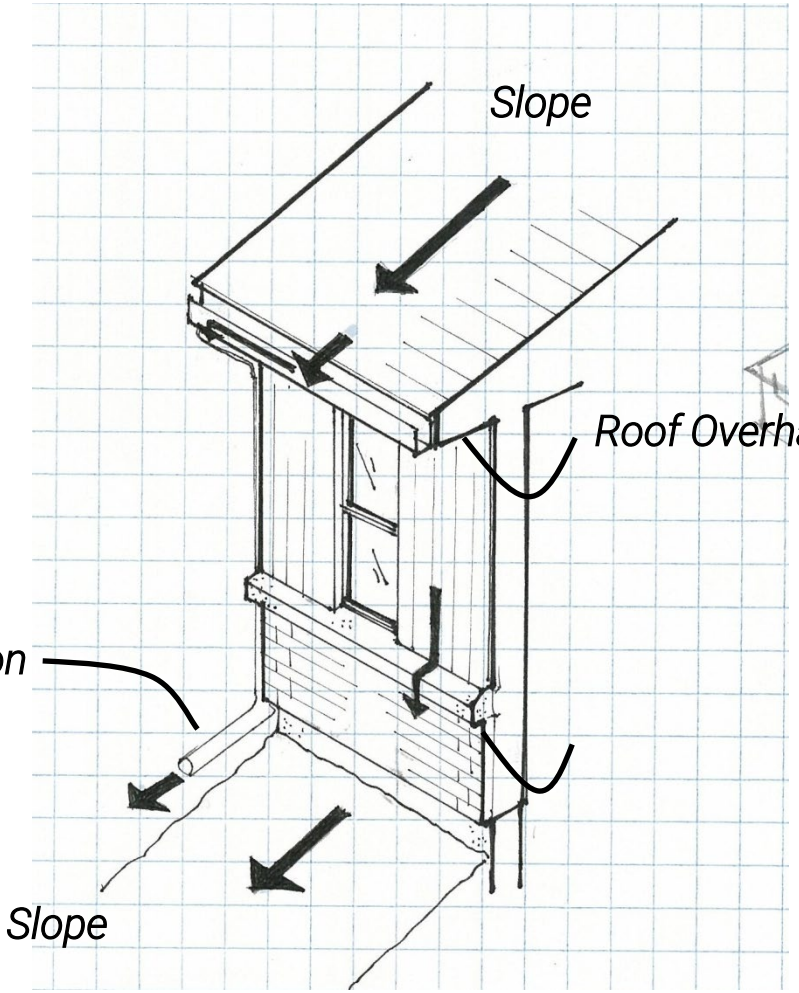
Waterproofing

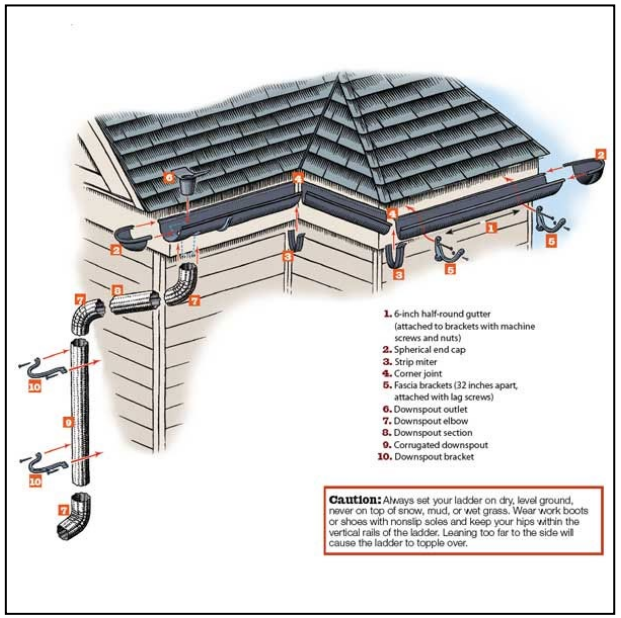
Damproofing



Capillary break

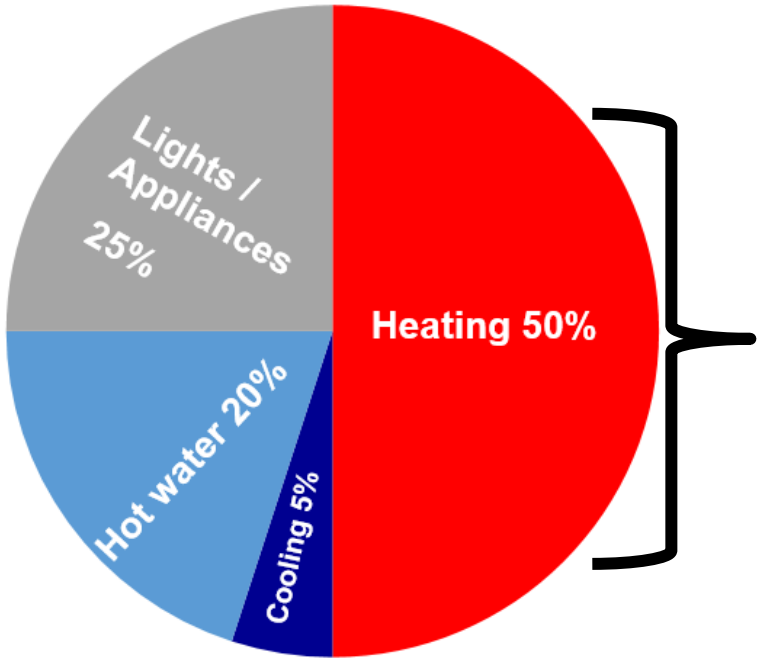
WATER MANAGEMENT

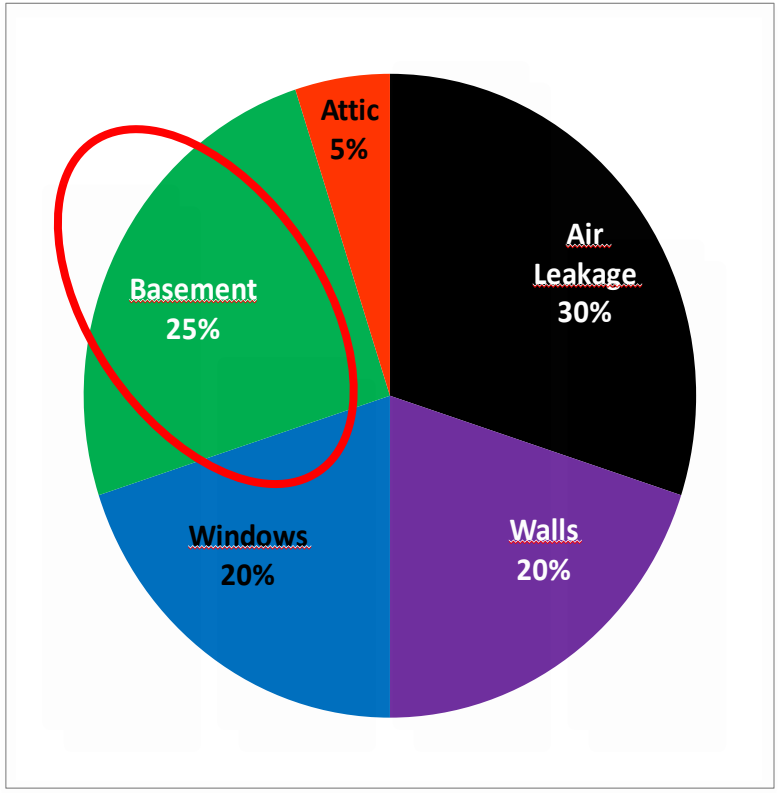




BETTER BASEMENTS

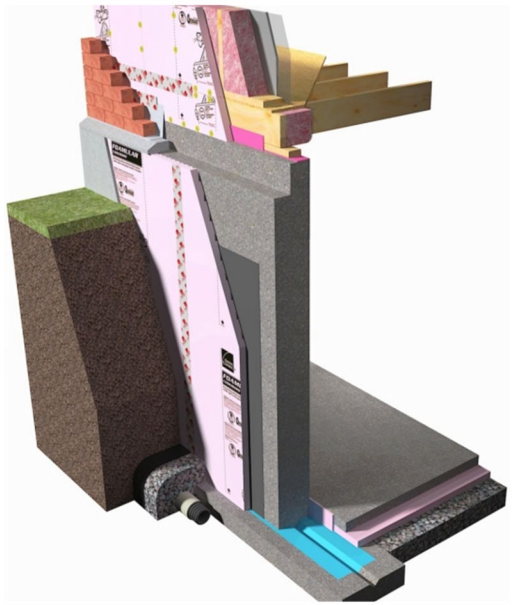
« GOOD INVESTMENT FOR NET ZERO READY PERFORMANCE (R-20+) »





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

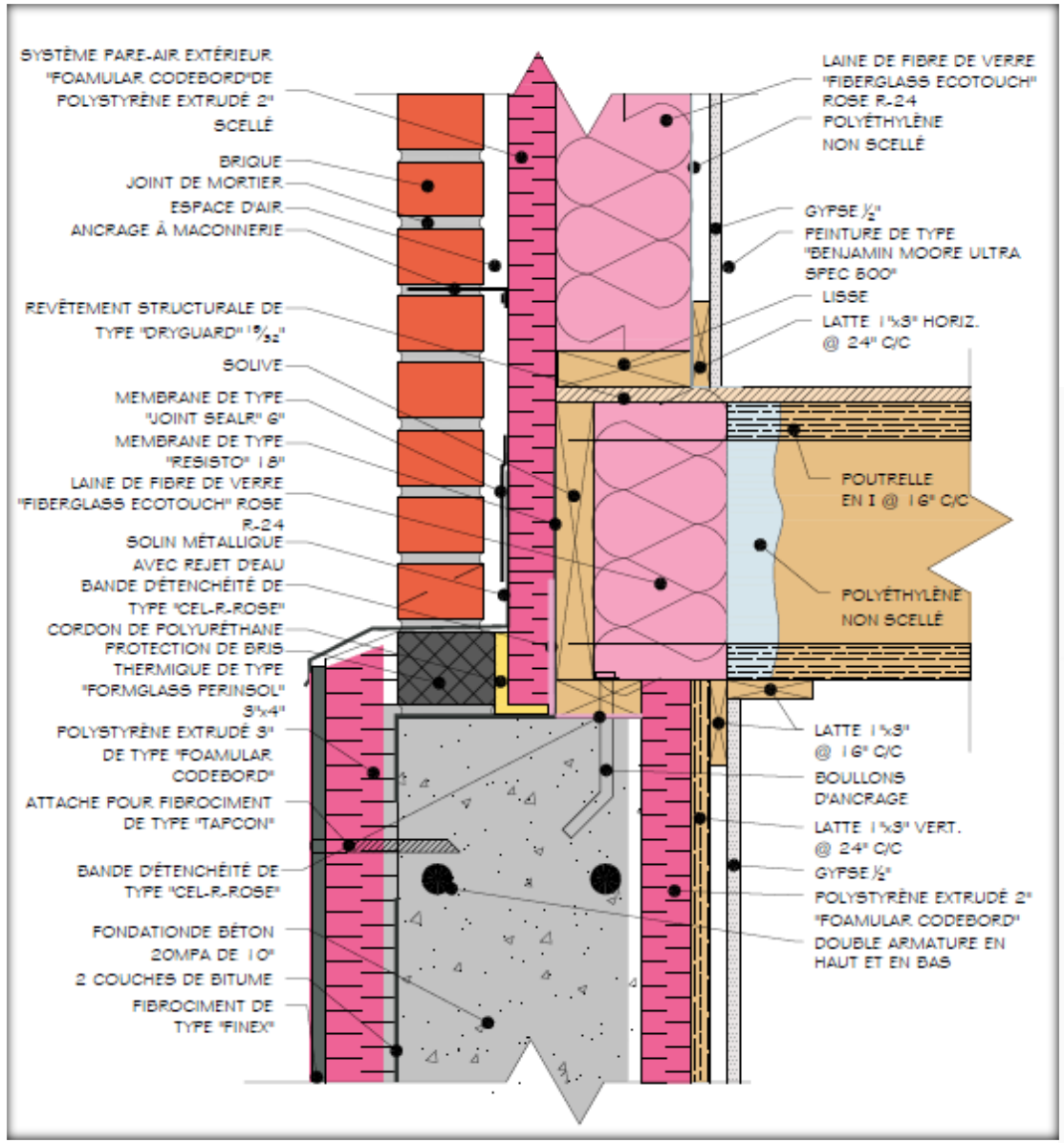
Table 4.3: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Exterior Insulated Below-Grade Wall and Floor Detail in Montreal (Winter Design Temperature: -23°C and Interior Temperature: 20°C)

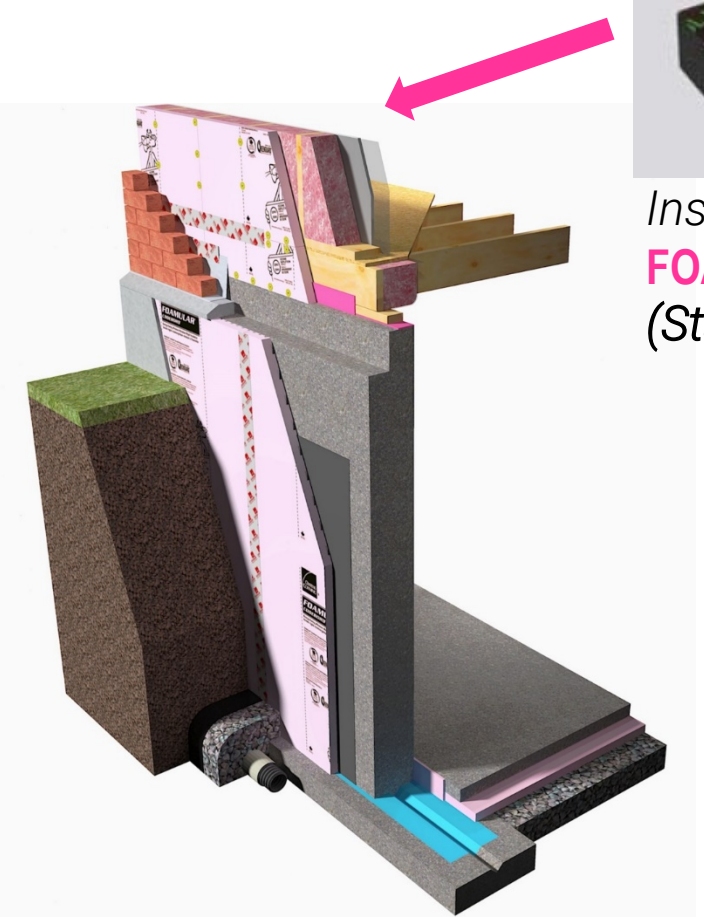
Wall Insulation R-value ft²h°F/Btu	Floor Insulation R-value ft²h°F/Btu	Critical Location			
		T_{i1} Gypsum at Floor at studs		T_{i2} Interior face of concrete between studs	
		Surface Temp °C	Max. RH	Surface Temp °C	Max. RH
R-15 (3" XPS)	None	13.1	64.5%	14.9	72.6%
	R-5	12.9	63.5%	14.9	72.6%
	R-7.5	12.7	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%

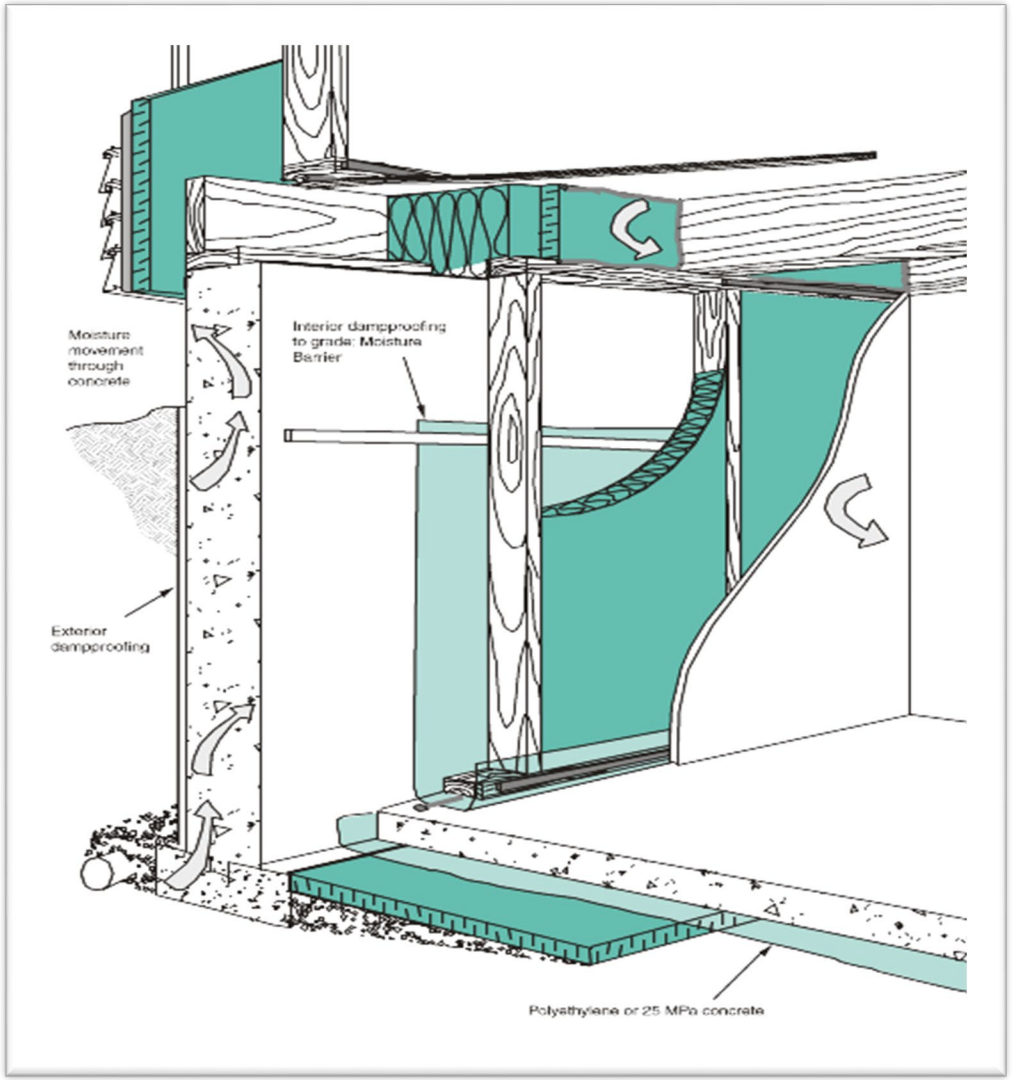
REDUCED THERMAL BRIDGE AT TOP OF FOUNDATION WALL





Insulated ledge block
FOAMGLAS® PERINSUL S
(Standard)

TYPICAL BASEMENT INSULATION



1

2

3

4

Source: CHBA manual

CONDENSATION RISK (Winter)

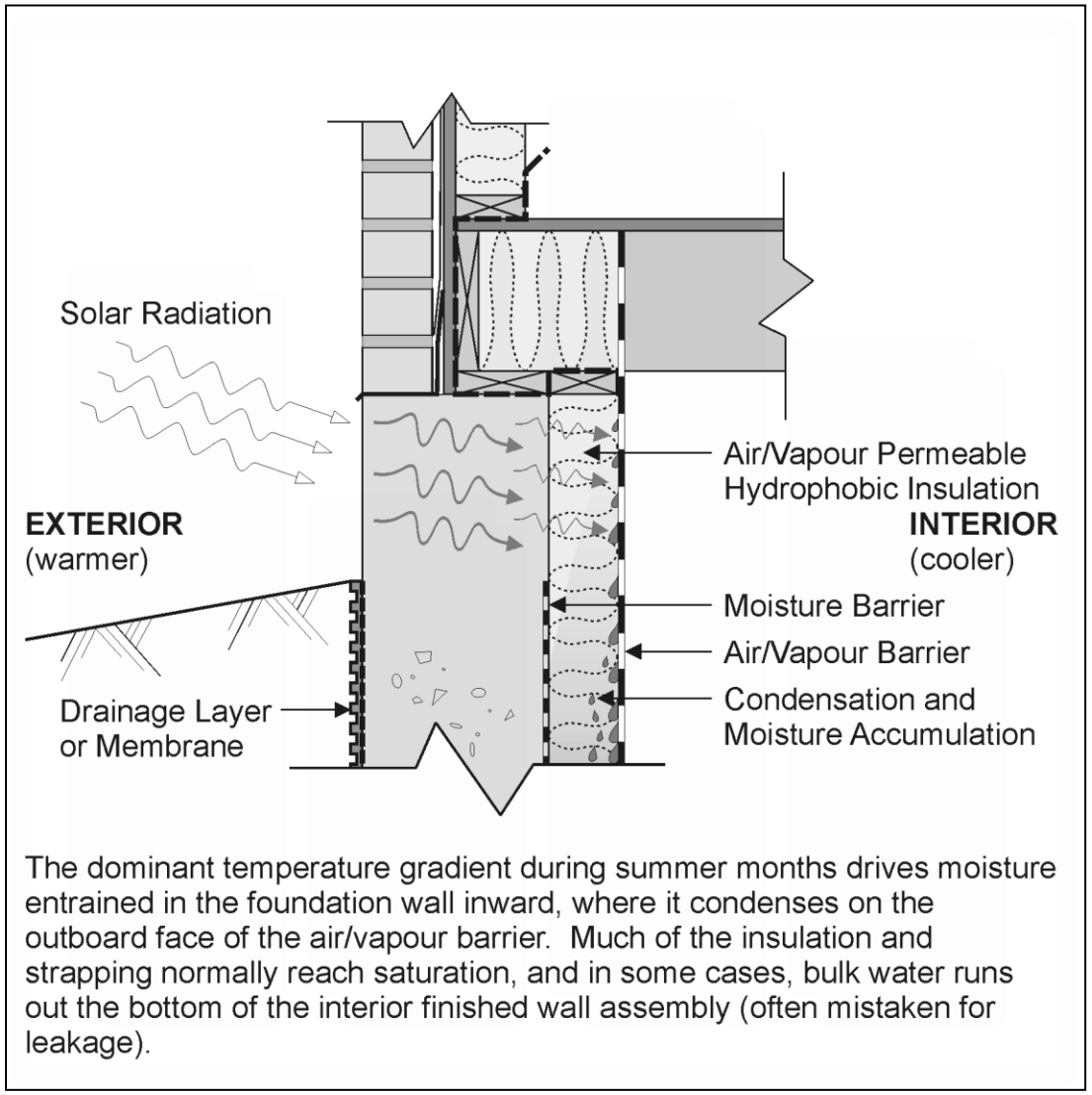
Table 4.1: Surface Temperatures and Maximum Relative Humidity (RH) at Critical Locations of an Interior Insulated Below-Grade Wall and Uninsulated Floor Detail at Winter Design Temperatures and 20°C Interior Temperature

Wall Insulation	Floor Insulation R-value ft²h°F/Btu	Climate		Critical Locations					
		Location	Exterior Design Temp °C	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)	
				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!

Source: Morrison Hershfield

CONDENSATION RISK (Spring)

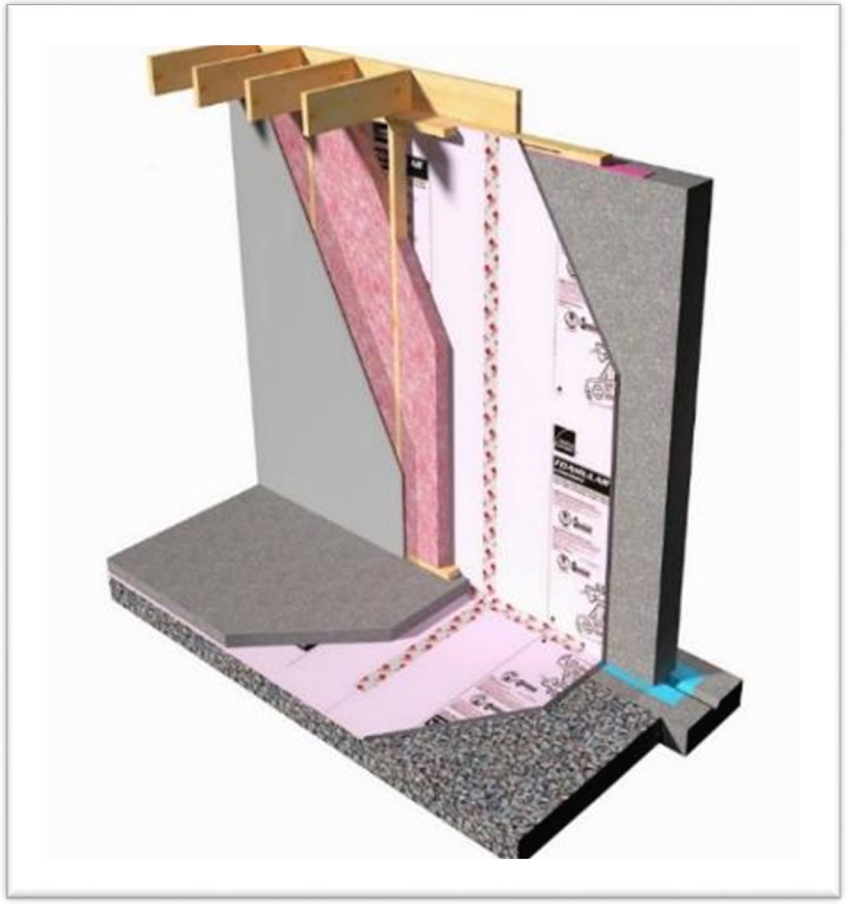


The dominant temperature gradient during summer months drives moisture entrained in the foundation wall inward, where it condenses on the outboard face of the air/vapour barrier. Much of the insulation and strapping normally reach saturation, and in some cases, bulk water runs out the bottom of the interior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

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

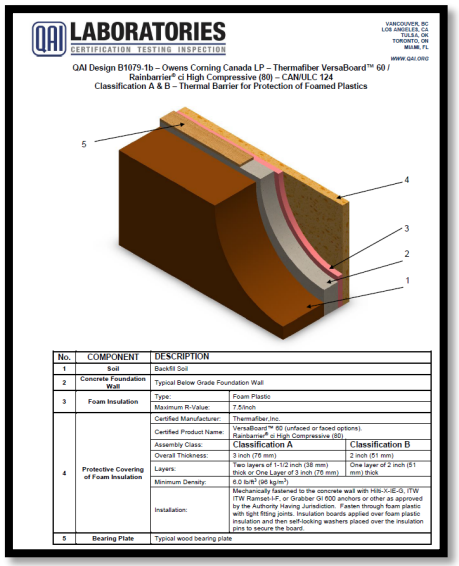
HIGH PERFORMANCE HYBRID SYSTEM

« 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!


QAI LABORATORIES
CERTIFICATION TESTING INSPECTION

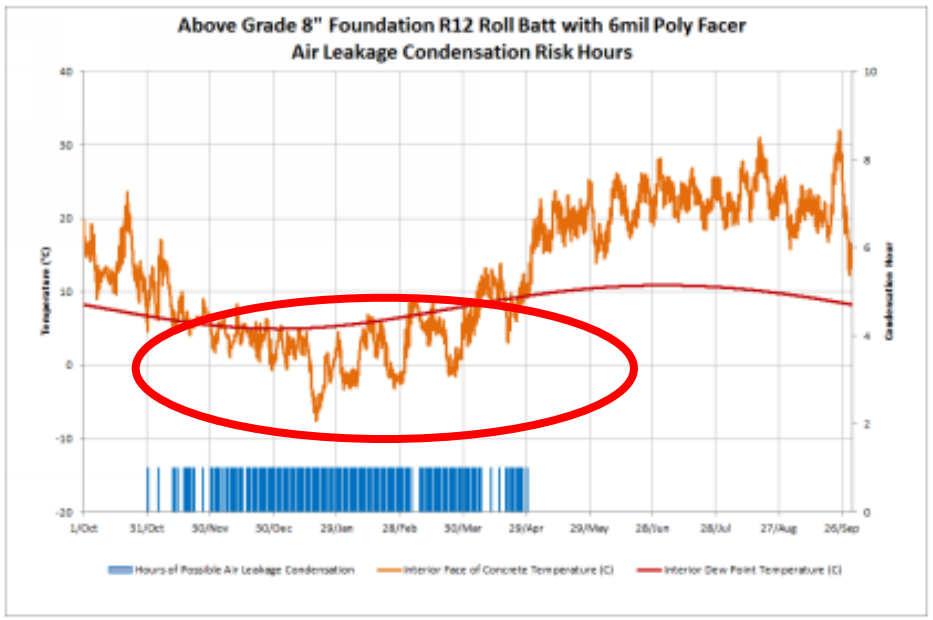
QAI Design B1079.1b – Owens Corning Canada LP – Thermafiber VersaBoard™ 60 / Rainbarrier® ci High Compressive (80) – CAN/ULC 124
Classification A & B – Thermal Barrier for Protection of Foamed Plastics

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:	ThermaBer,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/ft³ (96 kg/m³)
		Installation:	Mechanically fastened to the concrete wall with HIN-Y-IE-0, 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	

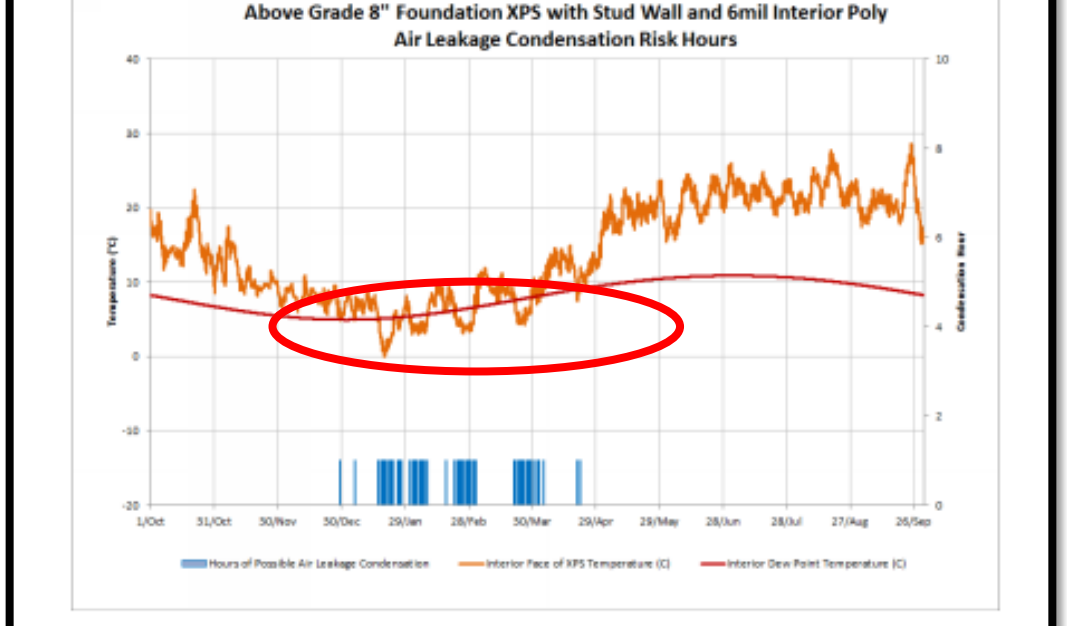
FOAMULAR® NGX™ CodeBord® *plus*
THERMAFIBER® RAINBARRIER® CI HC 80
QAI Certifications & Listings

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



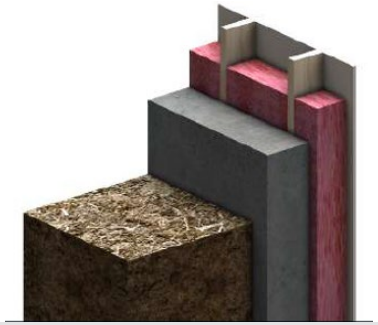
Finished Basement – 1" XPS, Stud Wall with Fiberglass, Poly Vapour Barrier
Above Grade – Concrete Exposed to Climate
Winter – Condensation is limited on the face of the XPS



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

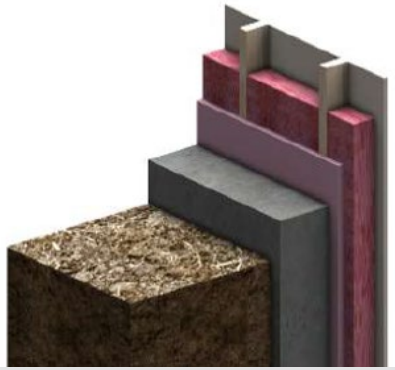
Wall Insulation	Floor Insulation R-value ft²h°F/Btu	Climate		Critical Locations					
				T_{i1} Gypsum at Floor between studs		T_{i2} Interior face of concrete between studs		T_{i3} Concrete Floor at Wall between studs (under sill plate)	
		Location	Exterior Design Temp °C	Surface Temp °C	Max. RH	Surface 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

Condensing plane is 16 Deg C warmer!

Reduced risk of condensation in winter and spring

Source: Morrison Hershfield

Energy Savings

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)

38% less heat loss

Appropriate insulation ratios by region

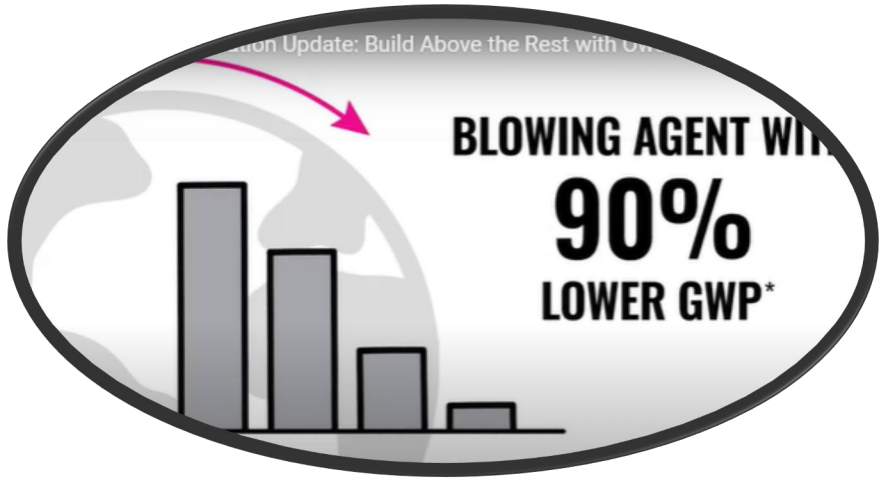
Table 1.4: Evaluated Insulation Levels of Interior Hybrid Insulated (Continuous Interior Insulation) Wall Assemblies

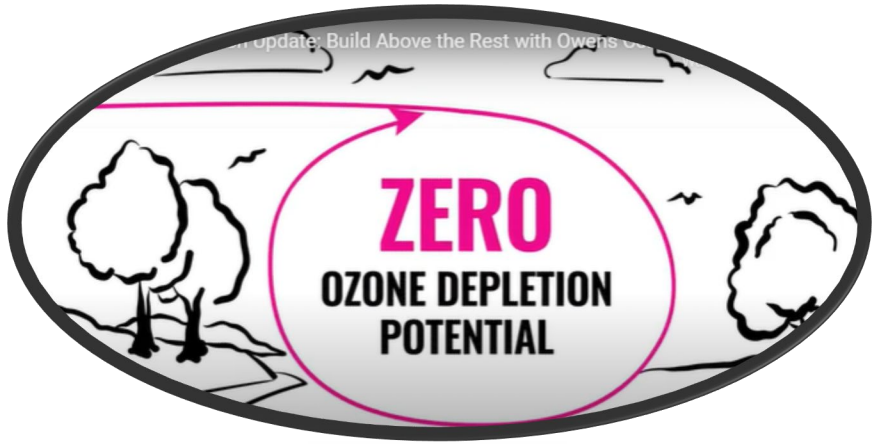
Location	Interior Conditions	Fiberglass Batt Insulation R-value in Stud Cavity ft²h°F/BTU	Interior XPS Insulation R-value ft²h°F/BTU
Vancouver, BC (Climate Zone 4)	20°C, 40% RH	R-12 (2x4 studs)	R-5 (1", 25 mm)
Montreal, PQ (Climate Zone 6)	20°C, 30% RH	R-14 (2x4 studs)	R-10 (2", 50 mm)
		R-20 (2x6 studs)	R-12.5 (2.5", 64 mm)
Winnipeg, MB (Climate Zone 7A)	20°C, 30% RH	R-14 (2x4 studs)	R-12.5 (2.5", 64 mm)
		R-20 (2x6 studs)	R-20 (4", 102 mm)

For the condensation risk analysis, critical surface temperatures were identified at three locations exposed to interior conditions for all scenarios. The surface temperatures at these locations were found for the following interior and exterior design conditions:

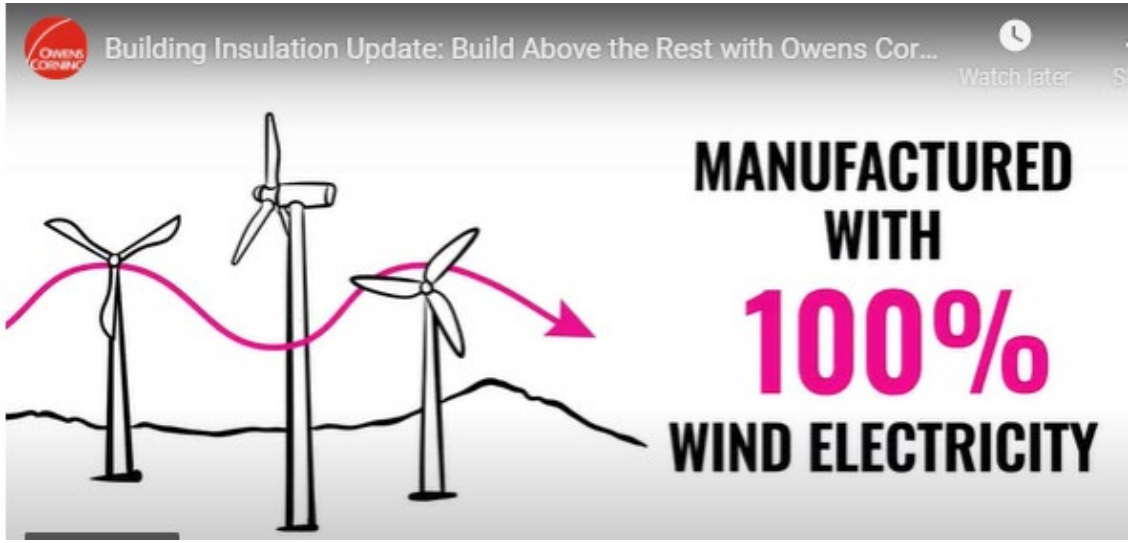
- Interior Design Temperature: 20°C
- Vancouver, BC Winter Design Temperature[4]: -7°C
- Montreal, PQ Winter Design Temperature[4]: -23°C
- Winnipeg, MB Winter Design Temperature[4]: -33°C

46% less heat loss compared to 2x6 with R-20 batts and no insulation under slab=1.31, (2.26)





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 OCS 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

PRODUCT ENVIRONMENTAL FOOTPRINT SUMMARY

FOAMULAR®

XPS INSULATION

FOAMULAR® 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	21.9	3.36 x 10^{-5}	0.177	0.0138	0.00729	9.42
Total A1-A5, B, C1-C4	57.8	3.36 x 10^{-5}	0.206	0.0149	0.00751	9.81

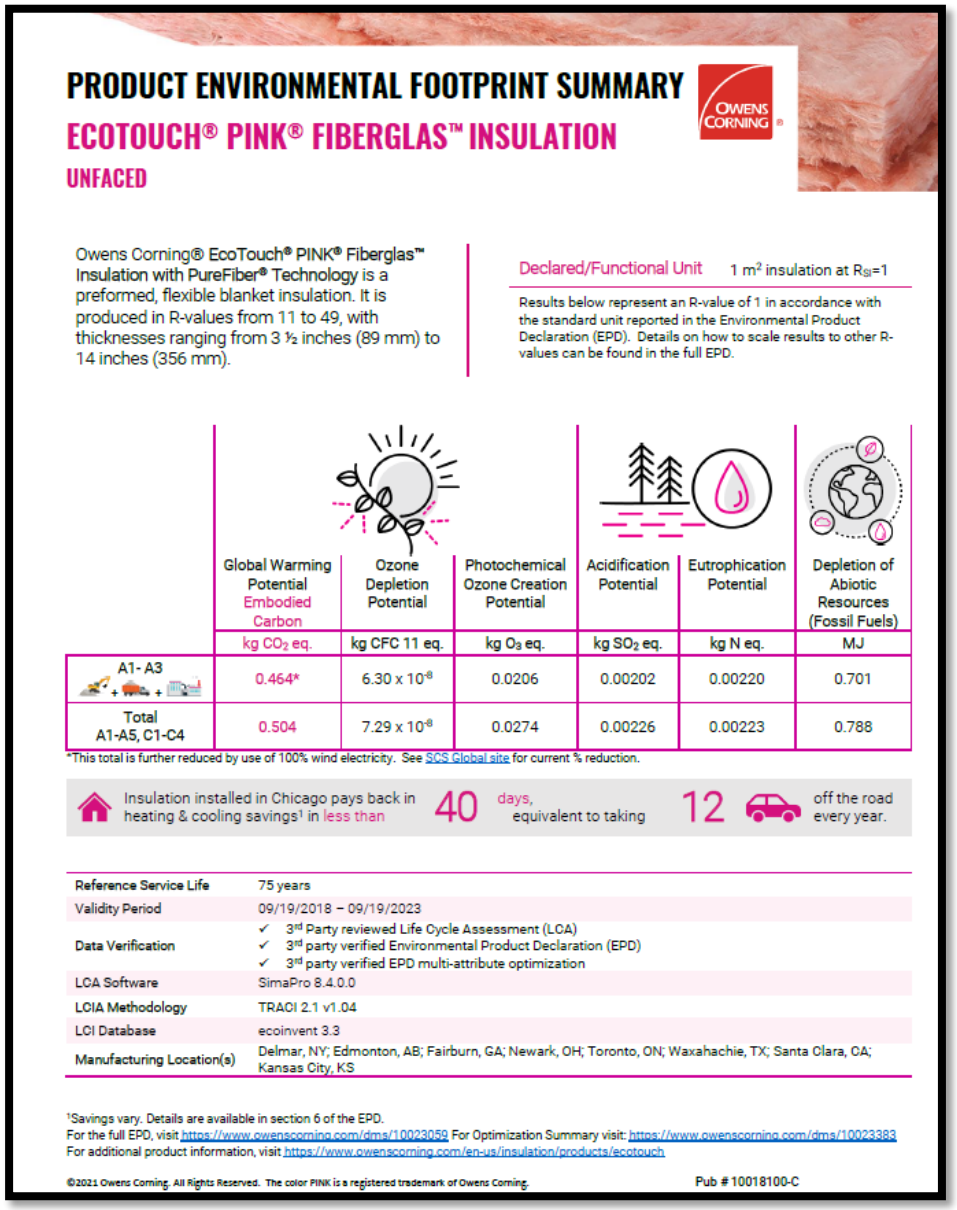
Insulation installed in Chicago pays back in heating & cooling savings[1] in less than **8** months, equivalent to taking **44** off the road every year.

Reference Service Life	75 years
Validity Period	01/1/2019 – 01/1/2024
Data Verification	✓ 3rd Party reviewed Life Cycle Assessment (LCA) ✓ 3rd party verified Environmental Product Declaration (EPD)
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[2]; Rockford, IL; Monterrey, Mexico

[2]Pursuant to Section 69 of the Ozone-depleting Substances and Halocarbon Alternatives Regulations of the Canadian Environmental Protection Act, 1999, product would only be manufactured at this location after January 1, 2021 if granted a permit to manufacture.

[1]Savings vary. Details are available in section 6 of the EPD.
For the full EPD, visit https://www.owenscorning.com/dms/10018927
For additional product information, visit https://www.owenscorning.com/en-us/insulation/commercial/foamular-xps

- *Formaldehyde free*
- *Non-Combustible*
- *Min 73% Recycled content*
- *GreenGuard Gold Certified*



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

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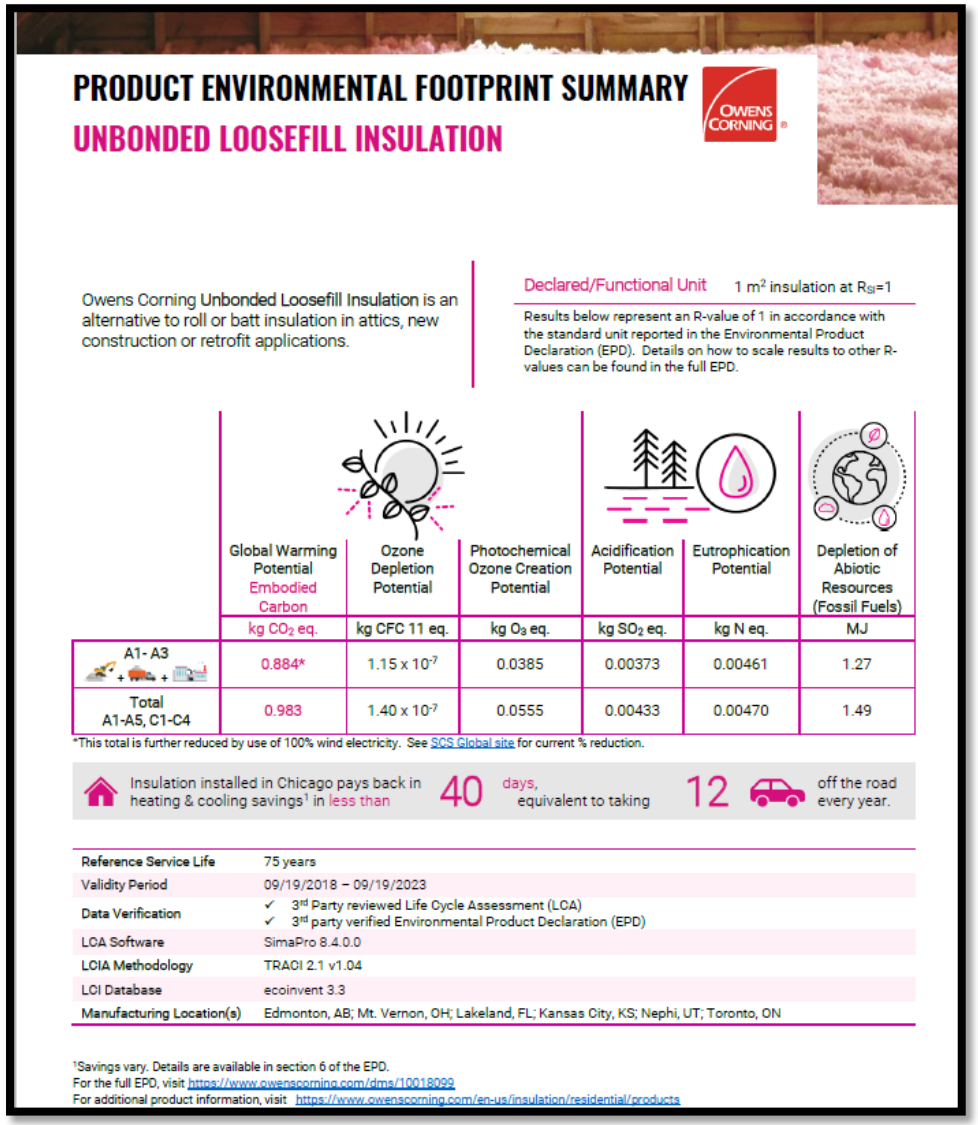
Next Gen Fiberglas= 0.46 kg CO_2 eq with wind power reduction of 24%
Cellulose = 0.47 kg CO_2 eq
NRCAN calculator..\Embodied carbon content round table\NRCan MCE Calculator V4.1 2021-04-29_results.xlsm



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 42% = 0.51 kg CO_2 eq

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)

Basement Insulation System Performance
<u>With Insulation</u> Under the Concrete Slab <u>Vs No Insulation</u>

17% to 32% less heat loss

20% to 36% less heat loss

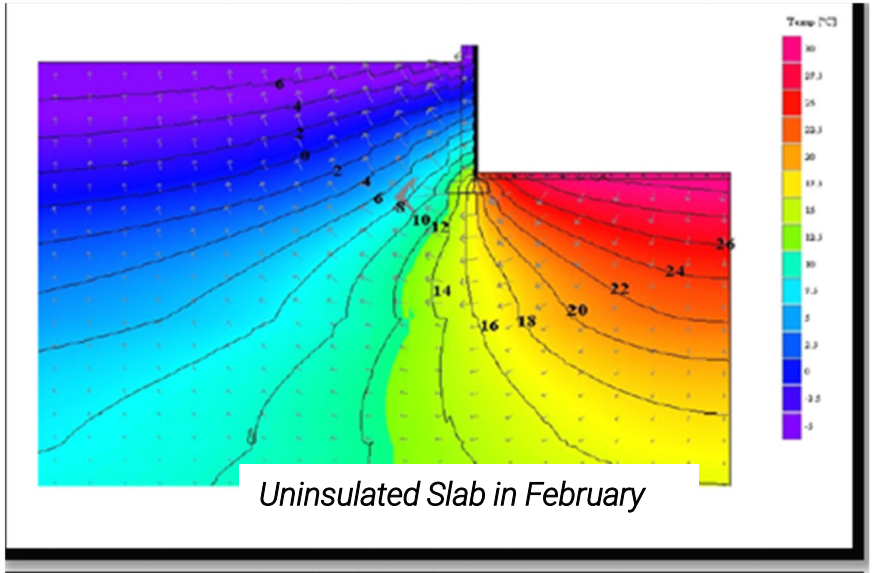
20% to 38% less heat loss

20% to 37% less heat loss

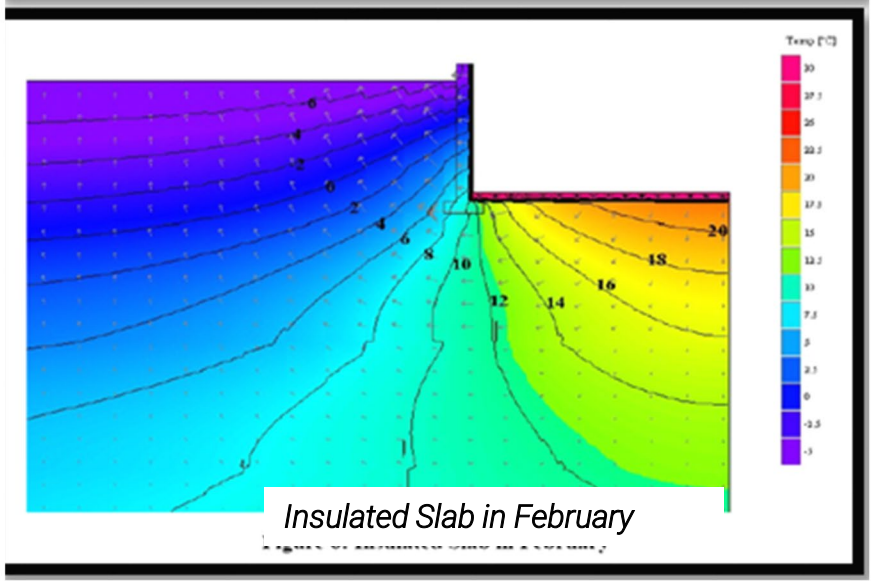
22% Up to 40% less heat loss

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%

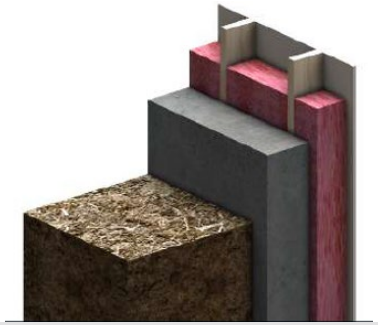
- ***R5*** *= 4,500 KWh energy savings annually*
  $350 savings annually; electricity at $0.08/KWh

- ***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, 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			48.5%
	R-5	14.8	72.0%	-6.1		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%

4.1 Deg C warmer

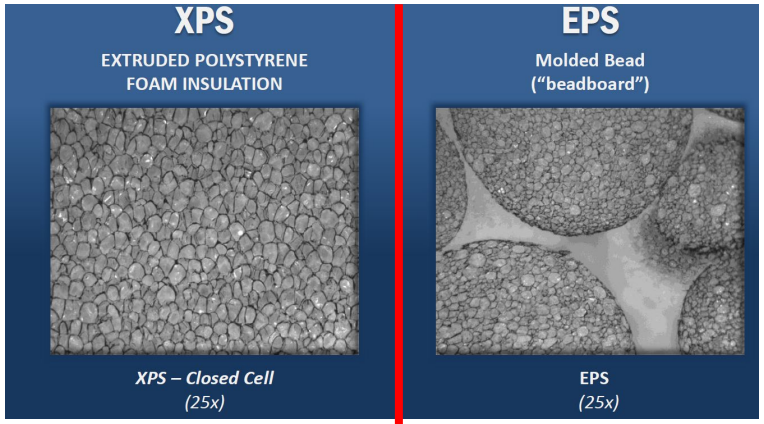
R-5 Under Slab

Slab is 11 Deg C warmer than uninsulated slab with 2x6 & R-20 batts

- 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

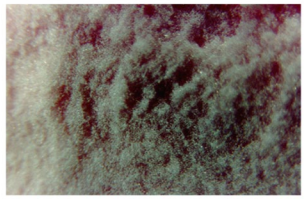
Source: Morrison Hershfield

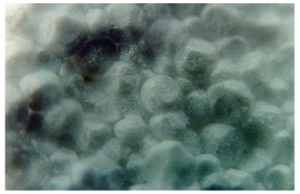
THE TYPE OF INSULATION MATTERS!

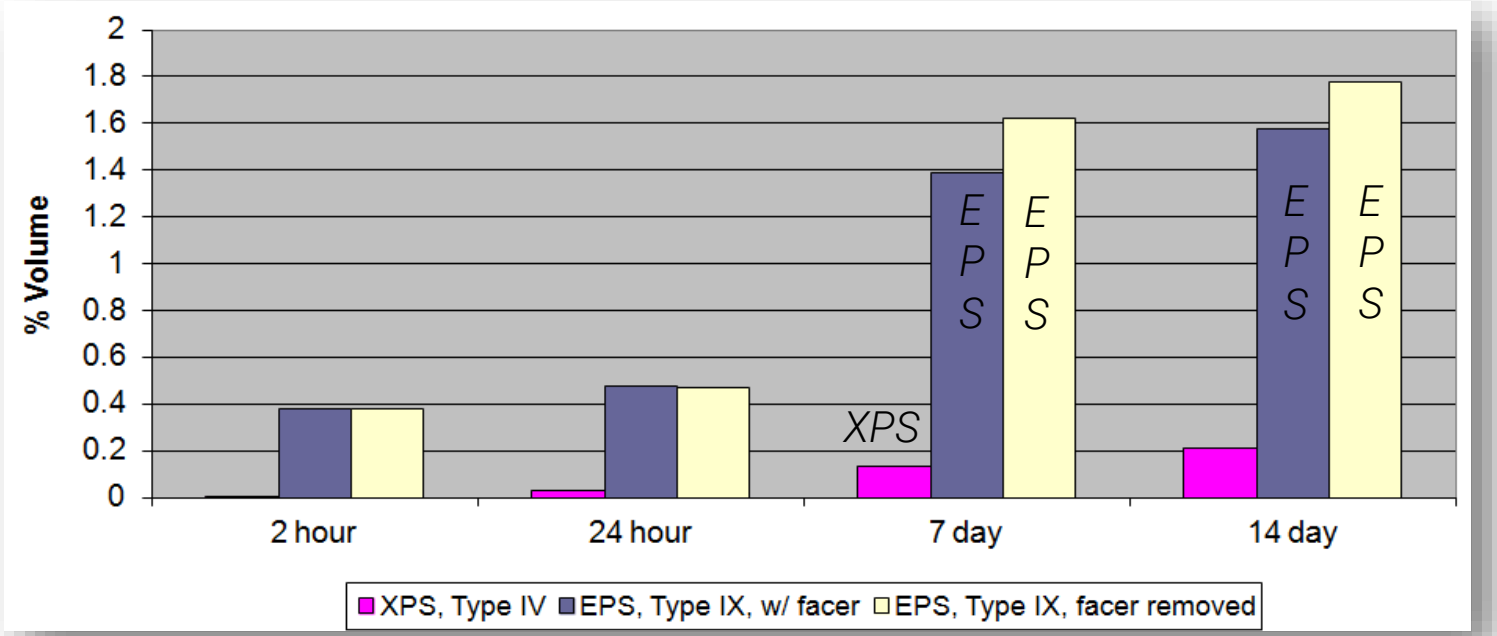


Closed Cell XPS
(Max 0.7% water absorption)

Open Cell EPS
(2-4% water absorption)







- *XPS Insulation keeps the slab warm and dry*
- *No polyethylene required (max. 60 ng/Pa.s.m^2)*

DAMPROOFING & VAPOR CONTROL

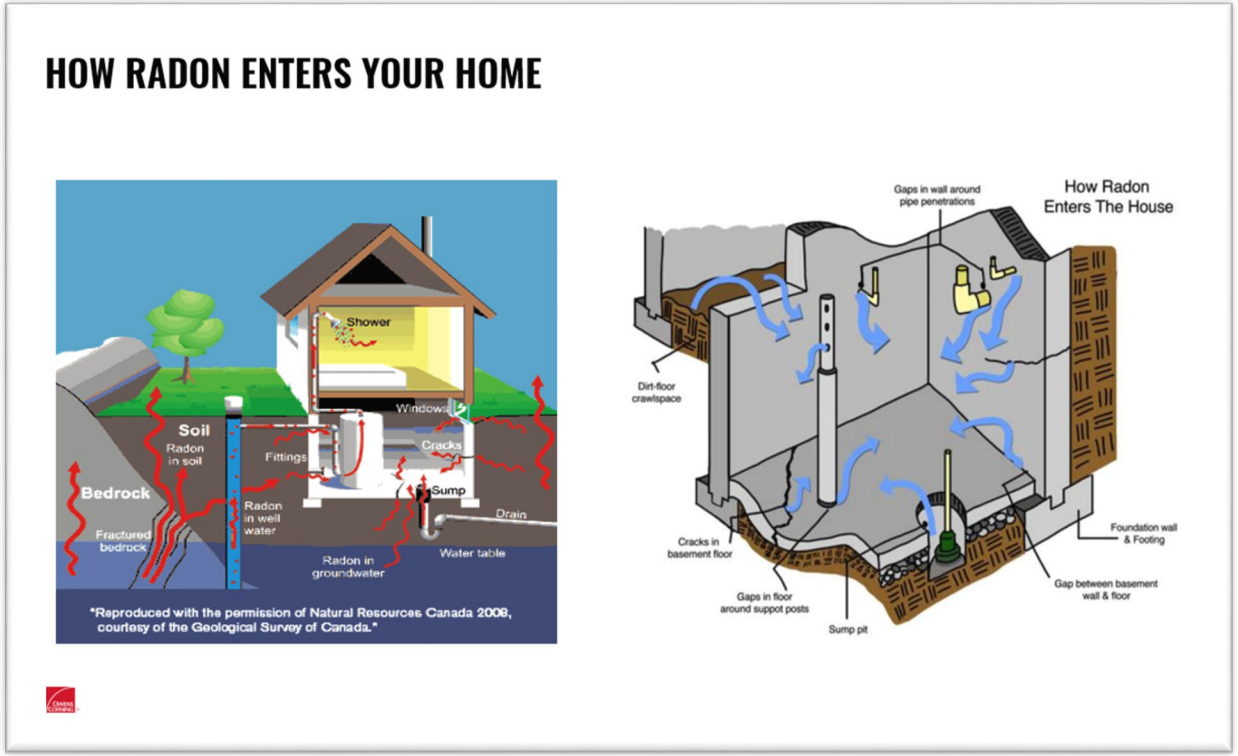
OBC
9.13.2.6
Damproofing of Floors-on-Ground

- *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-m2 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
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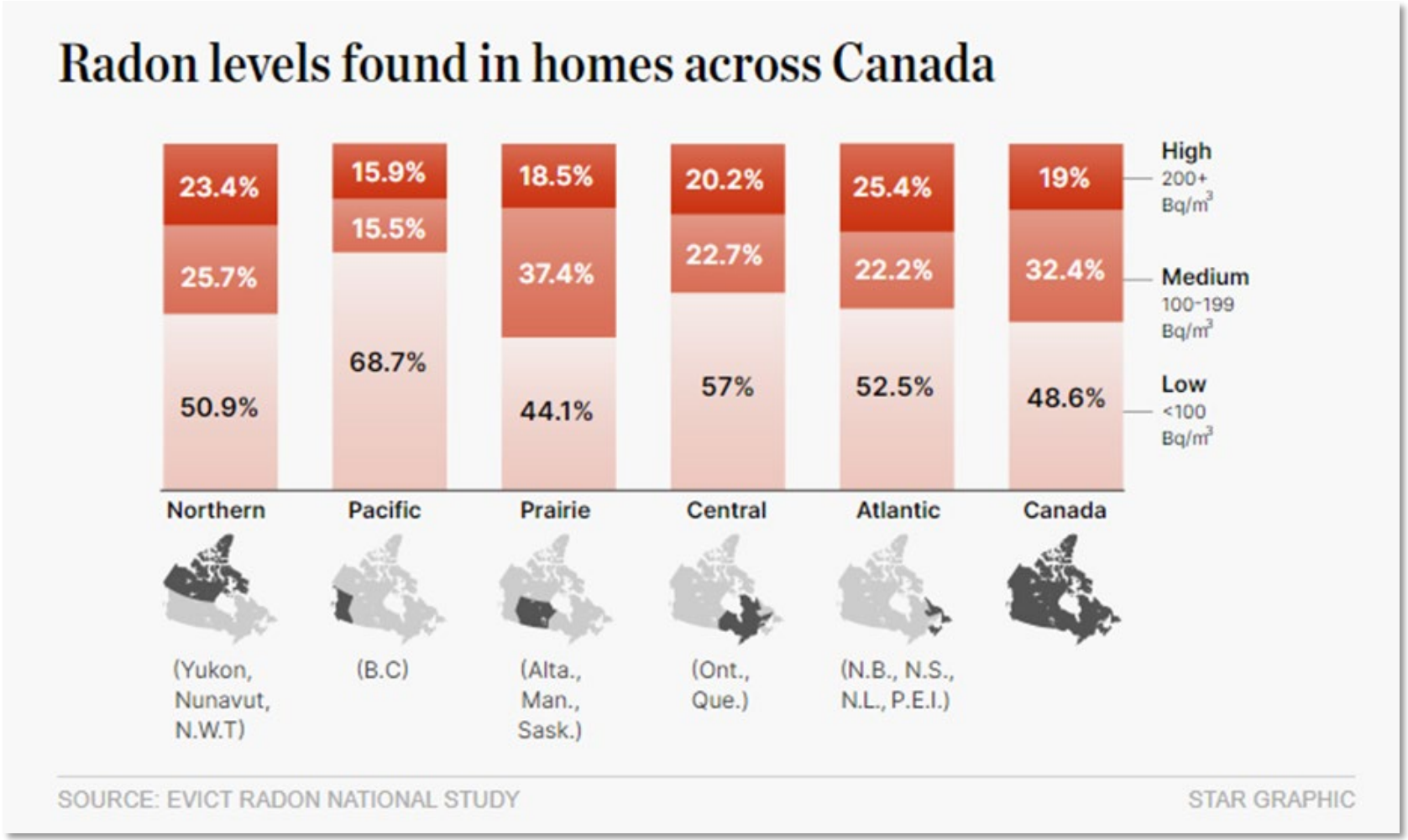
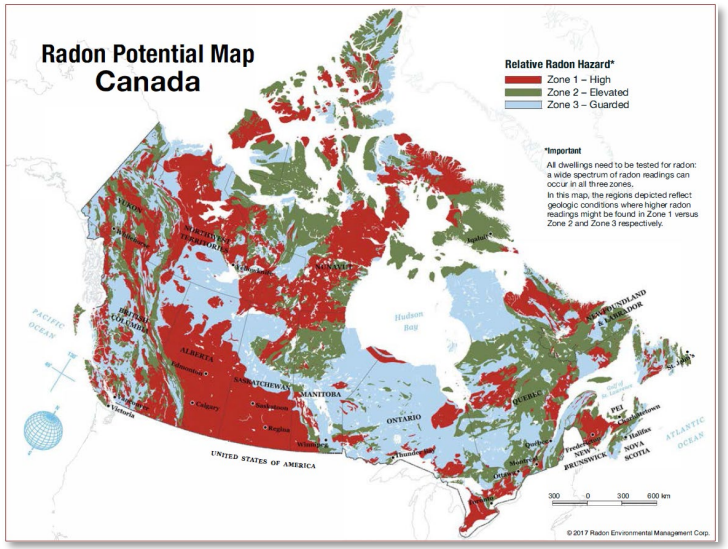
RADON STATISTICS





- *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)

SOIL GAS BARRIERS NBCC 2015

9.13.4.2. Protection from Soil Gas Ingress

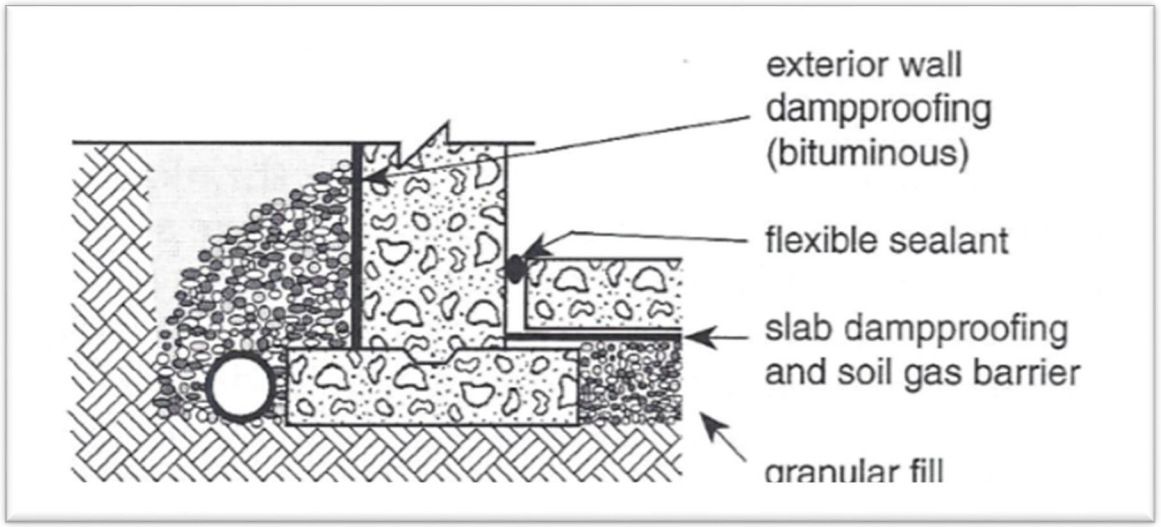
1) All wall, roof and floor assemblies separating *conditioned space* from the ground shall be protected by an *air barrier system* conforming to Subsection 9.25.3.

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.

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

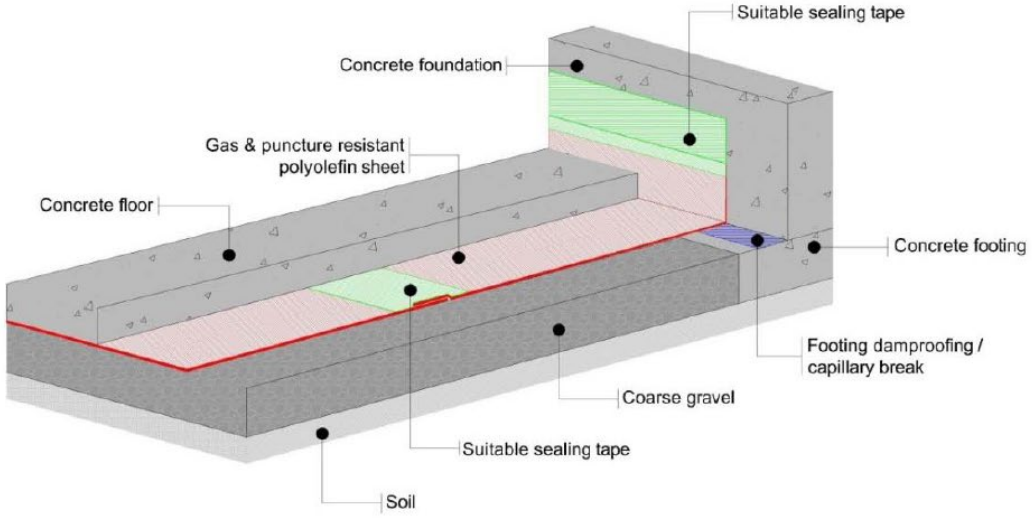
Reference: NBCC 2015

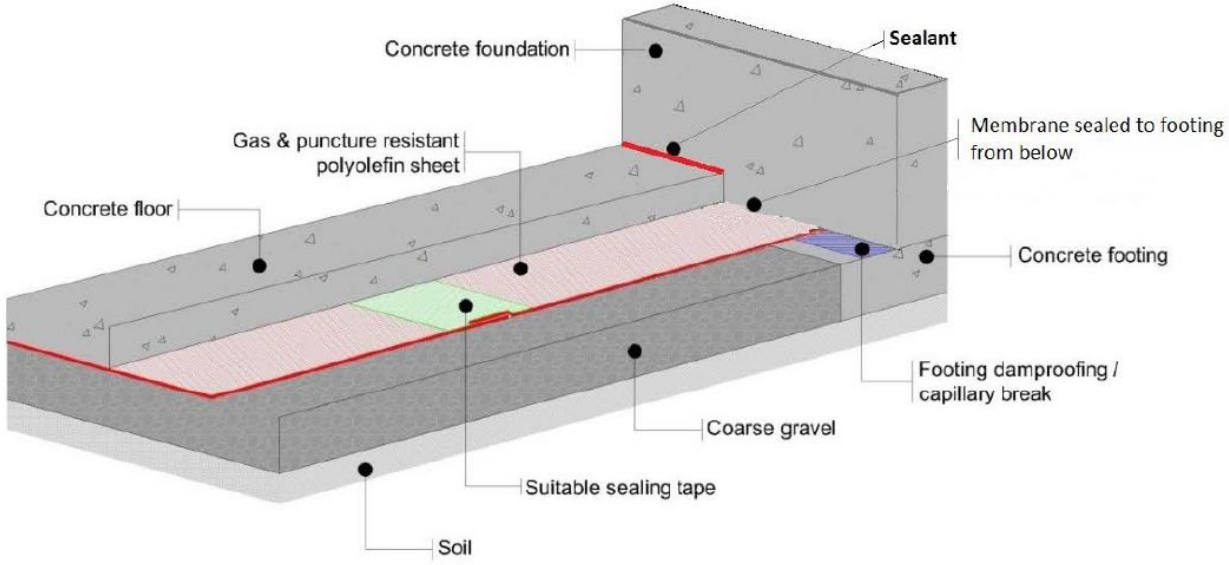
SOIL GAS BARRIERS CAN/CGSB-149-11-2019

7.1.4.5 Soil gas barriers under concrete slabs

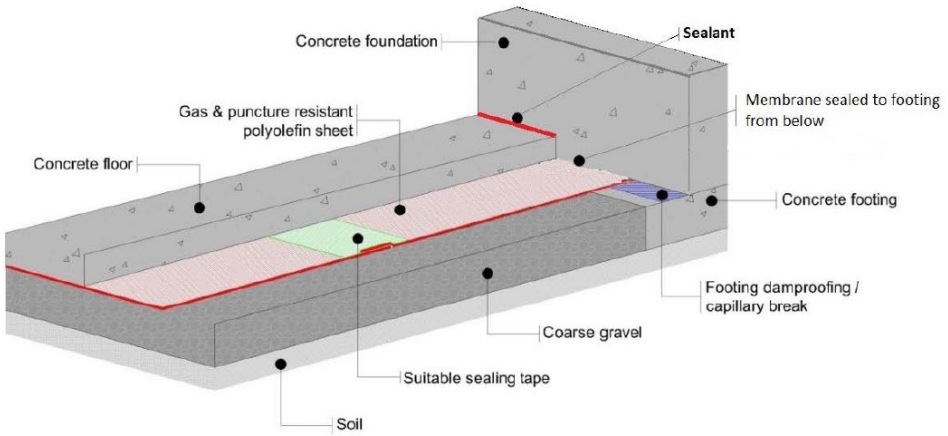
7.1.4.5.1 The soil gas barrier material used under a concrete slab shall be 0.25 mm (10 mil) thick polyethylene or equivalent polyolefin, and be gas and puncture resistant.

CAN/CGSB-149.11-2019





RADON GAS BARRIERS

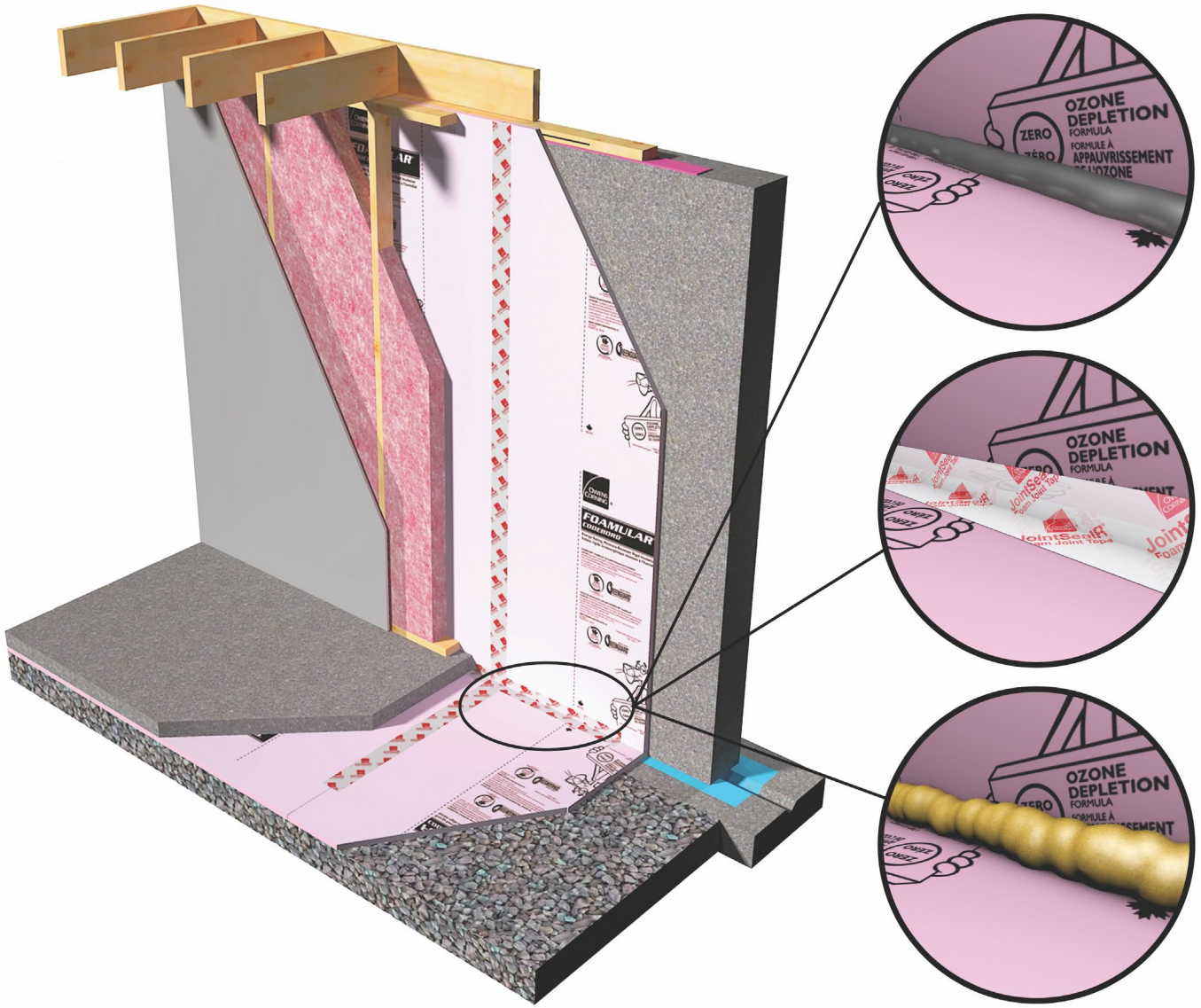


Polyethylene must be continuous, sealed along perimeter and at penetrations and puncture resistant

FOAMULAR®

RADONBARRIER™

RADON ABATEMENT SYSTEM



FOAMULAR® NGX™ CODEBORD®

Flexible caulking

Joint SealR Tape

Propink Comfort Seal Foam Sealant

FOAMULAR® RADONBARRIER™

RADON ABATEMENT SYSTEM

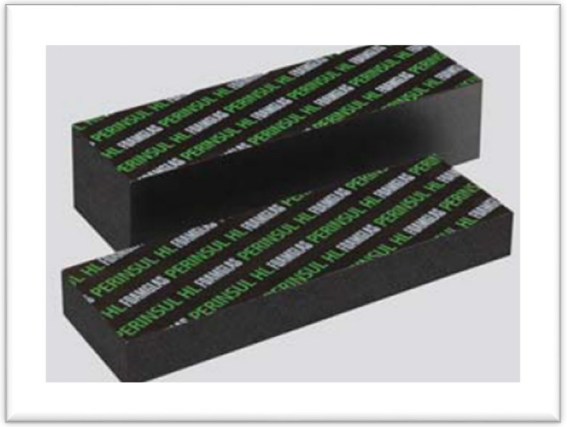
- ✓ *The only CCMC approved XPS solution*
- ✓ *Better tested performance vs 6 mil poly*
- ✓ *Quicker to install vs EPS and Polyethylene*
- ✓ *Less expensive than SPF*
- ✓ *Can be installed year round*

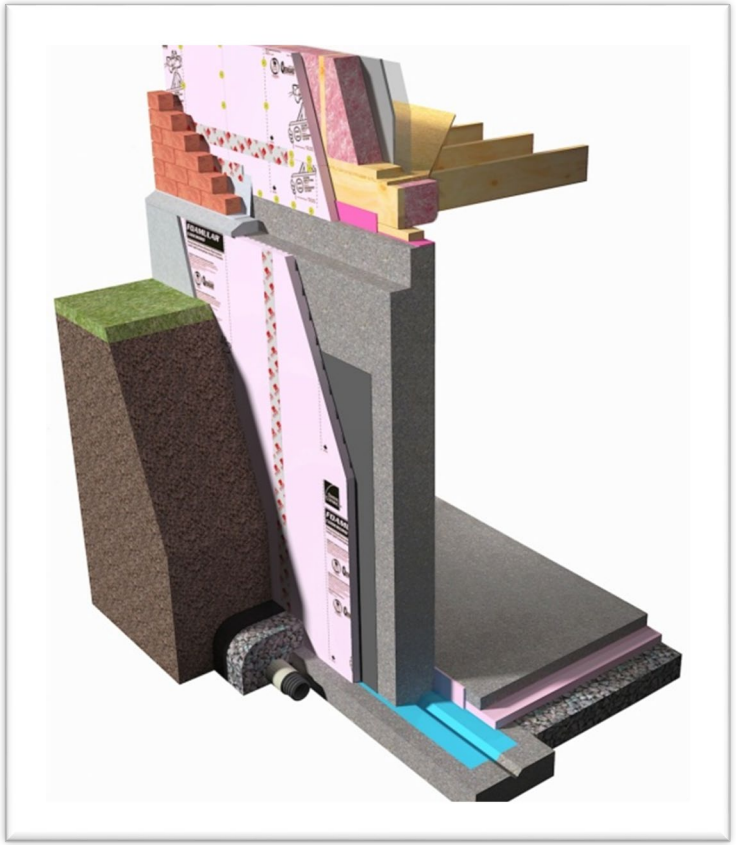
ONE PRODUCT 5 ATTRIBUTES

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

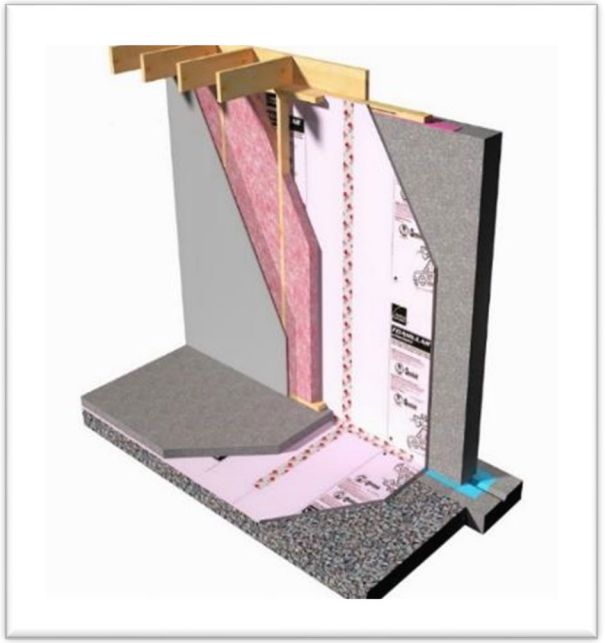
No Polyethylene required!

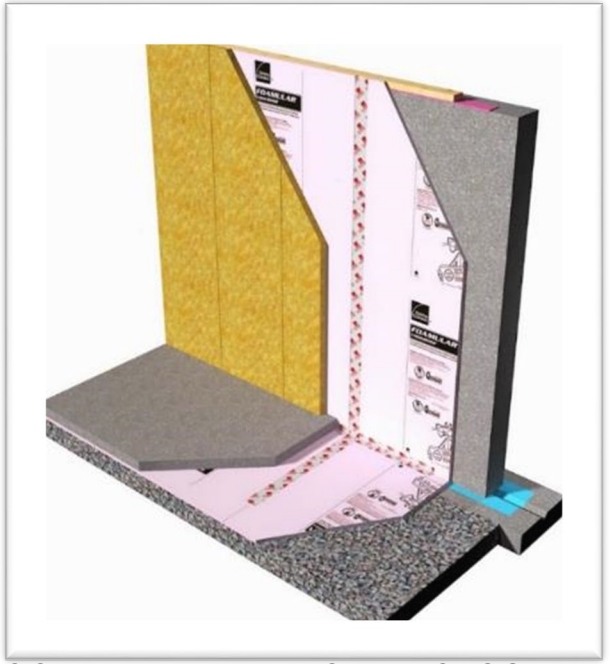
- *Healthier Living Space*
- *Greater Comfort*
- *Safer*
- *Better Air Indoor Quality*
- *3rd Party CCMC Certified*
- *No Poly Required*
- *Skilled Trades not required*
- *Best Long-Term Solution*
- *Moisture Resistant*
- *Guaranteed R-Value*
- *Higher Compressive Strength*





COMPLETE EXTERIOR ENCLOSURE SOLUTIONS





COMPLETE INTERIOR ENCLOSURE SOLUTIONS

- *Simple,*
- *Cost Effective &*
- *Durable Solutions*

To Turn Basements into Comfortable, Healthy and Safe Added Living Spaces

RADON BARRIER SYSTEM

Owens Corning Comfort Shield

"Complete Enclosure Systems"

OWENS CORNING TECHNICAL SALES TEAM

BUILDING SCIENCE EXPERTS

Luis Faria (Western Canada)
Technical Sales Manager Western Canada

Salvatore Ciarlo (Eastern Canada)
Technical Sales/Services & Codes & Standards Director Canada

BUILDING INDUSTRY SEMINAR

The Science of Building Better Basements

More and more homebuyers expect their basements to provide the same level of comfort, liveability, and moisture control as above grade spaces. Homebuyers won't accept the damp, cold, wet, mouldy basements of the past. For smart builders, this seminar presents an opportunity to perfect their craft and to deliver the high performing living space that their home buyers demand. This seminar will identify key areas to enhance basement performance, introduce best practices to understand materials, components, and systems and how they work together and ultimately to provide a better basement. The seminar will also highlight the importance of radon control which is the key to healthy and safe lower living areas where people will be spending more time as they work from home and turn their basements into valuable additional living spaces .

In this workshop, you will:

- Understand the science of how basements work
- Discuss the poor practices that impair basement performance
- Describe basement construction best practices that improve basement performance
- Describe alternative approaches through case studies

Seminar Content:

- High performance basements
- Soil characteristics: bearing capacity, backfilling pressure, porosity, high water table, pore water, frost penetration
- Heat loss control: Types of insulation and their locations
- Moisture control: moisture in soils, moisture in materials, water vapour presence
- Air leakage control: envelop durability energy efficiency, ventilation system effectiveness
- Radon control in basements and the need for proper radon barriers
- Basement details that work!

About the Instructor:

Michael is a professional engineer who has consulted on projects and publications across North America relating to housing, energy efficiency and sustainability. His studies have supported the development of the Energy Star for New Homes program in Ontario, the EnerGuide Rating System, and the new R-2000 Program. Michael has facilitated hundreds of training sessions for audiences across Canada. He also taught sustainable housing in the Architecture Program at Ryerson University for 12 years and also taught building science and building technology and ecology for 15 years at the Daniels Faculty of Architecture at the University of Toronto.

MICHAEL LIO, M.Eng, P.Eng
President, buildABILITY Corporation

Webinar
Nov 4th 2021
1 pm to 5 pm Eastern time

link: https://buildability.ca/event-registration/?id=6036

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Canadian Home Builders' Association