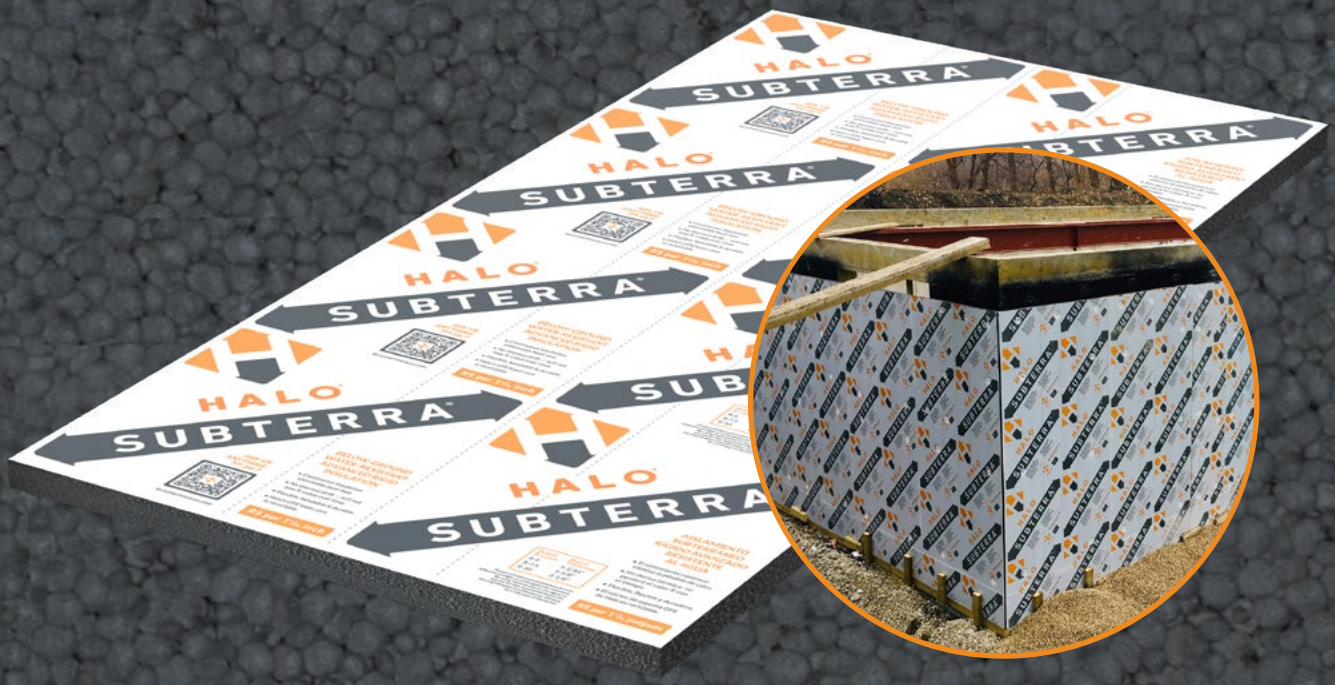
HALO®

ADVANCED GRAPHITE INSULATION SYSTEM

SUBTERRA & SUBTERRA PLUS

PRODUCT SUBSTITUTION REQUEST



BuildwithHalo.com

DOCUMENT PAGE

Date:

ATTENTION:
Company:
Project Title:
Project No.:

Subject: Request for Alternate Product(s) Approval

We respectfully submit for your review and approval of the following Pecora products, corresponding to those listed in **Division** **and Section**
of the above-mentioned project. Listed below are the products currently noted in the specification.

The Corresponding Logix Brands products that are being submitted for approval can be found below. Information contained will highlight major benefits for using Logix Brands Halo

Product comparison: Below grade rigid foam insulation

STANDARD			
Thermal Resistance Warranty			
ASTM C578 *(Standard specification for rigid, cellular polystyrene thermal insulation)*			
CAN/ULC-S701 *(Standard for thermal insulation polystyrene boards)*			
CCMC Evaluation Number			
QAI Listing			

ASTM D2842 *(Water absorption)*			
ASTM E96 *(Water vapour permeance)*			
ASTM D1621 *(Compressive strength)*			
ASTM D203 *(Flexural strength)*			
ASTM D2126 *(Dimensional stability)*			
ASTM E84 *(Flame Spread)* C**AN/ULC-S102.2** *(Surface burning)*			
ASTM E84 *(Flame Spread)* **CAN/ULC-S102.2** *(Surface burning)*			
CAN/ULC-S114 *(Non-combustibility)*			
Recycled Content			
GreenGuard Certification			
UL Environmental Product Declaration			
Health Product Declaration			
Declare Label			

Owens Corning data obtained from
Product data sheet Foamular NGX 250: 43522-FOAMULAR-250-XPS-Insulation-Product-Data-Sheet.pdf
Product data sheet Foamualr NGX C-300: 501120-Foamular-NGX-C300-Data-Sheet-EN.pdf

Halo Subterra & Subterra Plus data obtained from
Product data sheet Subterra: Subterra-MPDS-060823.pdf
Product data sheet Subterra Plus: Subterra-Plus-MPDS-060223.pdf
Neopor literature: Downloads | BASF Neopor

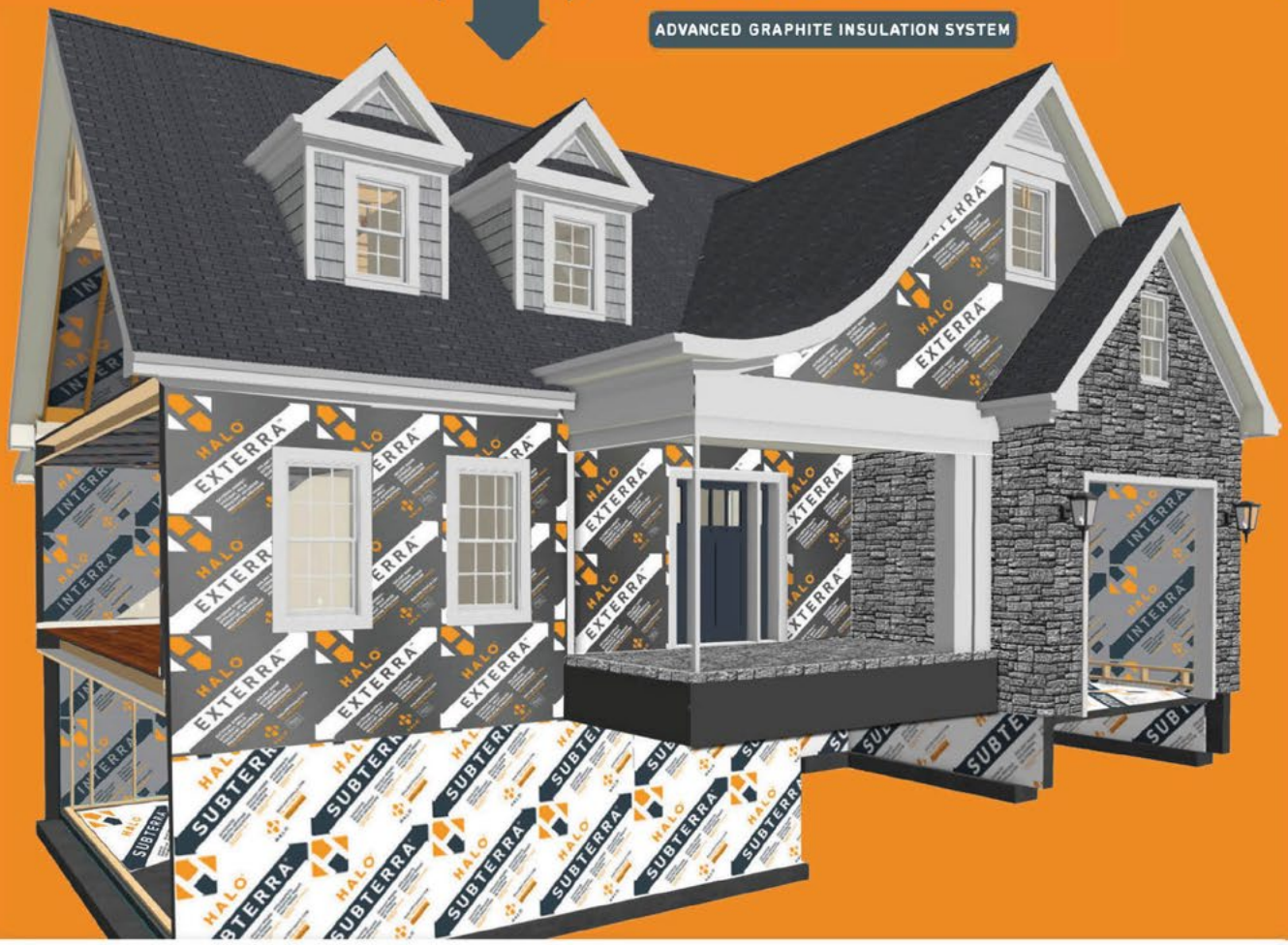
Thank you for taking the time to evaluate and consider Halo Subterra and Subterra Plus and their applications for the above noted project. Over the life span of the project, Halo products will yield significant cost savings, have a positive impact on the environment, and provide the performance and the quality that you expect. I trust the information provided will encourage acceptance of our product in this project and future inclusion in your firm's Master Specification.

Yours sincerely,

HALO®

ADVANCED GRAPHITE INSULATION SYSTEM

Powered by High R-Value GPS Technology



Make the Switch to Today's Most Advanced Graphite Insulation System!

Halo® offers a breakthrough graphite insulation system that is perfectly designed for three customized applications

EXTERRA®
ADVANCED BREATHABLE EXTERIOR INSULATING SHEATHING

SUBTERRA®
ADVANCED BELOW-GROUND RIGID INSULATION

INTERRA®
ADVANCED REFLECTIVE INTERIOR RIGID INSULATION

MADE OF Graphite Polystyrene

BUILDWITHHALO.COM

HALO® EXTERRA®

DESIGNED FOR
EXTERIOR APPLICATIONS

- Halo® GPS (graphite polystyrene) delivers a long-term R-4.7 per inch.
- Continuous GPS insulation creates a thermal break
- Perforated laminate allows vapor to escape the wall assembly
- It's breathable — walls stay dry and healthy
- Built-in water-resistive barrier*
- Water is kept to the exterior

* When seams, fasteners and edges are taped and/or sealed (see the Halo® Installation Guide).

HALO® SUBTERRA®

DESIGNED FOR
BELOW-GROUND APPLICATIONS

- Halo® GPS (graphite polystyrene) delivers a long-term R-4.7 per inch.
- Available with a thick polypropylene laminate or an extra-tough cross-woven laminate (Subterra® Plus)
- Per the NRC's Radon Diffusion test, Subterra Plus is a radon barrier with 7 times higher radon resistance than 6 mil polyethylene membranes.
- Continuous GPS insulation creates a thermal break
- Protects waterproofing
- Exterior laminate helps drain water away from the foundation wall
- It's job site tough — withstands severe foot and equipment traffic without breaking
- Built-in water-resistive barrier*

* When seams, fasteners and edges are taped and/or sealed (see the Halo® Installation Guide).

HALO® INTERRA®

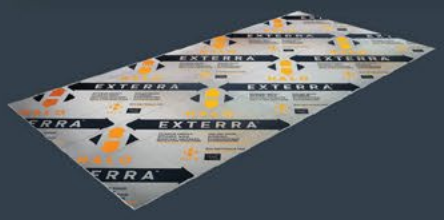
DESIGNED FOR
INTERIOR APPLICATIONS

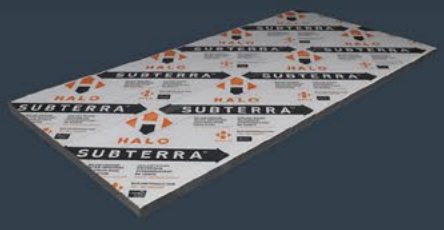
- Halo® GPS (graphite polystyrene) delivers a long-term R-4.7 per inch.
- Continuous GPS insulation creates a thermal break
- Built-in vapor barrier*
- Reflective laminate reflects heat back into the home or building**
- Interra® FR is now regionally available and is specially formulated to not require a thermal or ignition barrier (in the USA only) when installed on any interior wall surface.***

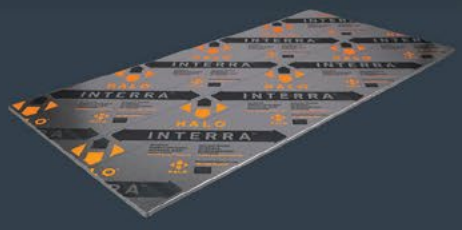
* When seams, fasteners and edges are taped and/or sealed (see the Halo® Installation Guide). **When an appropriate air space is provided. ***Provided Type XI Halo® Interra® FR is installed at a maximum thickness of 2.28". Based on testing to NFPA 286 in accordance with IBC 2015, Section 2603.9 and IRC 2015, Section 316.6. (Not available in all regions)

ZERO THERMAL DRIFT. ZERO COMPROMISE.

- Graphite Polystyrene (GPS) provides R-4.7 per inch.
- GPS provides a permanent long-term R-value and won't deteriorate over time like XPS and ISO.
- GPS delivers greater R-values at lower outside temperatures.
- Minimizes the energy loss from thermal bridging.
- Light yet durable — perfect for today's demanding jobsites.
- Superior indoor air quality due to Halo®'s clean steam-fused GPS core.
- GPS is 100% recyclable and ozone layer-friendly — no CFCs or HCFCs.







HALO® EXTERRA®

HALO® SUBTERRA®

HALO® INTERRA®

BUILDWITHHALO.COM

HALO®

ADVANCED GRAPHITE INSULATION SYSTEM

An innovation in insulation. Right to the very core.

Graphite Polystyrene (GPS) is the new standard in thermal insulation, thanks to millions of graphite infrared absorbers and heat reflectors that reduce thermal conductivity.

SPECIFICATIONS

Halo® Product	Board Size[4,5]	Standard R-values[2]	Board Thicknesses[1,4]	Compressive Resistance[3] psi(KPa)
EXTERRA®	4' x 8', 9', 10' 1230mm x 2460mm, 2770mm, 3075 mm	R-3 R-5 R-7.5 R-10	5/8" (16MM) 1 1/16" (27MM) 1 5/8" (41MM) 2 1/8" (54MM)	10 (70)
SUBTERRA® (with polypropylene laminate)	4' x 8' 1230mm x 2460mm	R-5 R-7.5 R-10	1 1/16" (27MM) 1 5/8" (41MM) 2 1/8" (54MM)	16 (110) / 20 (140) / 25 (172) / 30 (210) / 40 (276)
SUBTERRA® PLUS[6] (with cross-woven laminate)	4' x 8' 1230mm x 2460mm	R-5 R-7.5 R-10	1 1/16" (27MM) 1 5/8" (41MM) 2 1/8" (54MM)	16 (110) / 20 (140) / 25 (172) / 30 (210) / 40 (276)
INTERRA®	4' x 8', 9', 10' 1230mm x 2460mm, 2770mm, 3075 mm	R-3 R-5 R-7.5 R-10	5/8" (16MM) 1 1/16" (27MM) 1 5/8" (41MM) 2 1/8" (54MM)	10 (70)
INTERRA® FR[6]	4' x 8', 9', 10' 1230mm x 2460mm, 2770mm, 3075 mm	R-3 R-5 R-7.5 R-10	5/8" (16MM) 1 1/16" (27MM) 1 5/8" (41MM) 2 1/8" (54MM)	5 (35)

1 Custom thicknesses and compressive strengths are available upon request. Please contact your local Halo® dealer or representative. 2 Typically, XPS and ISO insulation products are not guaranteed to maintain their published R-values over time. Halo® meets or exceeds most XPS-guaranteed R-values (check the guaranteed R-value with your XPS supplier). 3 Listed compression values are minimum requirements conforming to ASTM C578 and CAN/ULC S701. Halo® products meet or exceed the requirements of ASTM C578, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation", and CAN/ULC S701, "Expanded Polystyrene Insulation Board and Pipe Covering". 4 The dimensional tolerances for the length, width and thickness of a 4' W x 8' L x 5" (max thickness) Halo board is +/- 1/4", +/- 1/4", +/- 1/16", respectively. 5 9' and 10' lengths available on a custom order basis 6 This product is Regionally Available (see product website for availability)

HALO PACKAGING

Standard Bundle Size: 4' wide x 8' long x 1' deep	
Board Thickness	No. of Boards/Bundle
5/8"	20
1-1/16"	12
1 5/8"	8
2-1/8"	6

Installation Instructions: Please refer to the Halo® Installation Guide at **BuildWithHalo.com** or from your local Halo® dealer or representative.

ZERO THERMAL DRIFT

DEMYSTIFYING R-VALUE (@ 1" THICKNESS FOAM)

HALO PROVIDES HIGHER GUARANTEED R-VALUE THAN XPS	HALO (GPS)	Extruded Polystyrene (XPS)
Stated R-value	4.7[1]	5.0
Expected Long Term R-value	4.7	4.7
Guaranteed R-value	4.7	4.5

All R-values tested at 24 deg C/75 deg F. Note: foam insulation products tested at lower temperatures generate higher R-values.

[1] R-4.7/inch can be otherwise expressed as R-5 Per 1 1/16" (nominal inch)

FOR MORE INFORMATION

Visit BuildWithHalo.com. • Call the Halo® hotline at 855.350.HALO (4256). • Call your local Halo® manufacturer below.

AMC Foam Technologies Inc.
35 Headingley Rd.
Headingley, MB
R4H 0A8
877.789.7622

Beaver Plastics Ltd.
11581-272 St.
Acheson, AB
T7X 6E9

#215-44393 Simpson Rd.
Chilliwack BC
V2R 5M3
888.453.5961

Progressive Foam Technologies Inc.
6753 Chestnut Ridge Rd.
Beach City, OH
44608
800.860.3626

Perma R Products Inc.
2604 Sunset Dr.
Grenada, MS
38901

106 Perma R Rd.
Johnson City, TN
37604
800.647.6130

Form Systems Inc.
330 Cain Drive
Haysville, KS
67060
888.838.5038

A PRODUCT BY LOGIX® BRANDS

LOGIXBRANDS.COM

CCMC# 14004-L
REV.022723

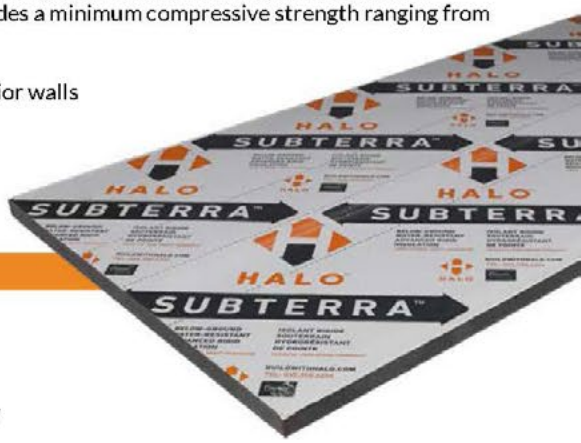
Graphite Polystyrene (GPS) Rigid Foam Insulation

Halo® Subterra® is designed to insulate below-grade walls and under slab in residential, commercial, and industrial buildings. The product is manufactured from denser rigid Neopor® Plus breads (graphite polystyrene - GPS), which provides a minimum compressive strength ranging from 16 to 40 PSI (110 to 275 kPa).

Halo® Subterra® is coated with polypropylene laminates on both sides of the insulation. The laminates are white on one side, and white or clear on the other side. The denser Neopor® Plus and polypropylene laminate makes Subterra® strong and durable against heaving loading and wet environments, such as backfill and construction traffic. In addition, Halo® Subterra® acts as a vapor barrier, while providing continuous insulation.

BASIC USE

- Below-grade exterior walls
- Under-slab



Product Features

Stable long term thermal resistance (LTTR) R5 nominal

Environmentally responsible

Flexible

Durable

Vapor barrier

Environmental & Sustainability

- Produced without the use of chlorofluorocarbon (CFCs), hydrochlorofluorocarbon (HCFCs) or formaldehyde. As a result, Halo® Exterra® will not produce harmful emissions to the environment.
- BASF Neopor® 5300 Plus is recognized as a product that produces low chemical emissions by the Greenguard Environment Institute. Neopor® 5300 Plus is Greenguard Indoor Air Quality Certified® and Greenguard Children & Schools SM Certified product.
- Neopor® 5300 is compliant with the Living Building Challenge Red List materials as well it has achieved a Health Product Declaration further indicating its safety to maintain a healthy environment for occupants.

NSF Environmental Product Declaration · Greenguard Gold Certified · hpdc Health Product Declaration · Living Building Challenge Living Building Red List Compliant · LEED v4

Physical Properties

			Subterra® 16[c] Type II (Type 2)	Subterra® 20[c] Type XIII (Type 3)	Subterra® 25[c] Type IX (Type 3)	Subterra® 30[c] Type IX (Type 3)	Subterra® 40[c] Type XIV (Type 3)
		COMPLIANCE	ASTM C578[b] (CAN/ULC S701[b])				
THERMAL RESISTANCE[a]	75°F (24°C)	ASTM C518 CAN/ULC S701	R-5 (0.88 RSI)				
	40°F (4.4°C)		R-5.2 (RSI 0.92)	R-5.3 (RSI 0.93)			
PHYSICAL	Compressive Resistance at 10% def., Min.	ASTM D1621	16 psi (110 kPa)	20 psi (140 kPa)	25 psi (172 kPa)	30 psi (210 kPa)	40 psi (276 kPa)
	Flexural Resistance Min.	ASTM C203	35 psi (240 kPa)	45 psi (300 kPa)	50 psi (300 kPa)	50 psi (300 kPa)	60 psi (300 kPa)
	Dimensional Stability Max.	ASTM D2126	2%				
MOISTURE	Water Vapor Permeance Max.	ASTM E96	0.08 perms (4.4 ng/Pa-s-m²)[d]				
	Water Absorption Max.	ASTM C272	1.1%				
FIRE	Flame Spread Index, Max.	ASTM E84 CAN/ULC S102.2	<=25(<230)				
	Smoke Developed Index, Max.		<=450 (>500)				
	Thickness		4" (102mm)				
	Density, Max.		2.2 pcf (35 kg/m³)				
	Oxygen Index, Min.	ASTM D2863	24%				

a. At 1" nominal thickness (actual thickness = 1.06" (26.92mm)
b. Unless noted otherwise, properties are based on 1" (25.4mm) thickness without laminate. Data provided by BASF
c. Contact your local manufacturer to confirm availability.
d. Based on independent testing conducted by QAI with laminate and 1" thick GPS

Technical Information

- Halo® products should be protected from reflective or direct UV exposure. Always keep stored Halo® products tarped or covered to protect from weather, and when possible store indoors. Do not use a clear plastic covering film.
- Until Halo® Subterra® is covered the following recommendations will help ensure installed products maintain manufactured dimensions.
- Remove or cover the surface that is casting a reflection on installed Halo® products, or shield the affected Halo® products.
- Cover Halo® Subterra® if left exposed for more than 30 days. Faded printing on Halo® laminates is normal and will not degrade the products properties.
- Ensure all butt joints are tightly fitted and apply sheathing tape or liquid sealant as soon as possible.
- Immediately tape seal or temporarily cover all joints of inside corners until tape sealant is applied.
- Prior to use of adhesives, sealants or other similar products with GPS insulation please verify the compatibility with adhesive manufacturers.
- Halo® Subterra® products are made of combustible materials and may need to be protected from high heat sources. In addition, a thermal barrier may be required when used on the interior of a building. Refer to the local building code for appropriate protection and thermal barrier requirements.

Sizes

Halo® Subterra® sheathing are available in 4' x 8' (1220mm x 2440mm) sheets, 5/8" (16mm), 1" (25.4mm), 1.5" (38.1mm), andd 2" (50.8mm) thick. Custom sizes are available. Contact your local Halo representative for more information.

Packaging

Halo® packaging and bundle sizes vary. Please contact your local Halo® manufacturer or dealer to confirm your local packaging specifications and available bundle sizes.

Manufacturers

- AMC Foam Technologies Inc.
  35 Headingley St.
  Headingley Manitoba, R4H 0A8
  877-789-7622
- Form Systems, Inc.
  330 Cain Drive
  Haysville, Kansas 67060
  1-888.838.5038
- Perma R Products Inc.
  2604 Sunset Dr.
  Grenada, MS, 38901
  800-647-6130
- Perma R Products Inc.
  106 Perma R Rd.
  Johnson City, TN, 37604
  800-647-6130
- Progressive Foam Technologies
  1 Southern Gateway Dr.
  Gnadenhutten, OH, 44629
  800-860-3626

Applicable Standards

ASTM C578	Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
ASTM C518	Standard Test Method for Steady-state Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
ASTM D1621	Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
ASTM D2842	Standard Test Method for Water Absorption of Rigid Cellular Plastics.
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials.
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials.
ASTM C203	Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
ASTM D2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index).
CAN/ULC-S701	Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
CAN/ULC S102.2	Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.
ASTM C272	Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions

Limited Warranty

Subject to the terms and conditions contained in the Limited Warranty, the Manufacturer (as defined herein) warrants that if the representative thermal insulation value of the Neopor® bead in the Halo® insulation product Halo® Interra®, Halo® Exterra®, or Halo® Subterra® (the "Product" or "Products") varies from the published thermal resistance, the Manufacturer will, when a claim under the attached Limited Warranty is made within fifteen (15) years from the date of manufacture, refund the original purchase price to the first owner of a structure in which the Product has been installed (the "Owner"). For the purposes of the Limited Warranty, the original purchase price of the Product shall be exclusive of taxes and all other costs, including builder mark ups, labor costs and costs to remove the original Product and replace it with new Product.

For more information refer to the Halo Zero Thermal Drift Guarantee.

Disclaimer of Liability

References to "Logix Brands" or the "Company" mean the manufacturer selling the Products to Owner (the "Manufacturer") unless otherwise expressly noted. NO EXPRESS WARRANTIES ARE GIVEN EXCEPT FOR THE ATTACHED LIMITED WARRANTY. ALL OTHER WARRANTIES, EXPRESS, STATUTORTY AND IMPLIED, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED. The Owner assumes all risks as to the use of the material. As the Manufacturer has no control over installation design and workmanship, accessory materials or application conditions, the Manufacturer does not warranty the performance or results of any installation containing the Products. The Products must be handled and installed according to the instructions outlined in the applicable Product installation guide and used only for the particular purposes recommended in the Halo Product literature available on BuildWithHalo.com.

Technical Support

For North American technical inquires please contact Francis Roma (froma@logixbrands.com) or Tyler Simpson (tsimpson@logixbrands.com).

Code Evaluation Approvals

- CCMC 14004-L
- QAI Listing B1031-2
- QAI B1055-2

SECTION 07 21 13
BOARD INSULATION

HALO SUBTERRA

*[**NOTE TO USERS:** This document has been prepared for the Halo Subterra sheathing products and has been prepared in accordance with the Construction Specifications Institute (CSI) Section Format 2004. The main intention of this document is to aid the Contractor/Installing Contractor in developing CSI specifications of Halo Subterra for use in combination with specific project specification manuals, which follow CSI formatting, as part of the overall project scope of work.*

This document is a template and where appropriate, may require modifications to suit specific projects.

Italicized text enclosed in parenthesis, [ ], are intended for the user of this document to aid in determining where modifications may be required.]

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
[This section may be modified to suit specific project details]
1. Rigid board perimeter insulation
2. Rigid board under-slab insulation

B. Related Sections:
[This section may be modified to suit specific project details]
1. 072600 – Weather Barriers: insulation provided as vapor barrier
2. 072700 – Air Barriers: insulation provided as an air barrier and air sealant materials

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

1.2 REFERENCES

[This section may be modified to suit specific project details]

A. American Society for Testing and Materials (ASTM)
1. ASTM C177 – Standard Test Method for Steady-state Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
2. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
3. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics..
4. ASTM D2842 – Standard Test Method for Water Absorption of Rigid Cellular Plastics.
5. ASTM De84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
7. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.

8. ASTM C203 – Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
9. ASTM C303 – Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation
10. ASTM D2863 – Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
11. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

B. AC 71 Acceptance Criteria For Foam Plastic Sheathing Panels Used As Water-Resistive Barriers
12.

C. Underwriters Laboratories of Canada
1. CAN/ULC-S701 – Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
2. CAN/ULC S102.2 - Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies

1.3 SUBMITTALS

[Do not request submittals if drawings sufficiently describe the products of this section or if proprietary specifying techniques are used. The review of submittals increases the possibility of unintended variations to drawings, thereby increasing the Specifier's liability. The following submittals are intended for review and acceptability]

A. Submit manufacturer's product literature and installation instructions under provisions of Section 013300.
B. Product Data: Submit product data for each type of insulation and accessories proposed for the work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Section 016600: Product Storage and Handling Requirements
B. Store materials off ground and protect against sunlight, wind, moisture and accidental ignition.
C. Deliver, store and handle materials in accordance with manufacturer's instructions.
D. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
E. Remove damaged or deteriorated products from site.

1.5 PROJECT/SITE CONDITIONS

A. Section 016100: Common Product Requirements.
B. Do not install insulation adhesives and sealants when temperature or weather conditions are detrimental to successful installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. AMC Foam Technologies, 35 Headingley St, Headingley, MB, Canada, R4H 0A8, 204-633-8800
B. Perma R Products Inc., 2604 Sunset Drive, Grenada, MS, 38901, 1-800-647-6130
C. Form Systems, Inc. 330 Cain Drive, Haysville, Kansas 67060, 1-888.838.5038
D. Progressive Foam Technologies Inc., 6753 Chestnut Ridge Rd., Beach City, OH, 44608, 1-800-860-3626

2.2 EXISTING PRODUCTS

[This section may be modified to suit specific project details]

A. [Exterior foundation perimeter, and below-slab insulation]

1. Subterra 16
   a. Standard: ASTM C578, Type II EPS, CAN ULC/S701, Type 2 EPS
   b. Thermal Resistance: Minimum R per nominal inch of 5.0 (actual thickness = 1.1") when tested in accordance with ASTM C518 at 75 degrees F. mean temperature.
   c. Compressive Strength at 1" thickness: Minimum 16 psi *[110 kPa under CAN/ULC S701]* when tested to ASTM D1621
   d. Flexural Strength at 1" thickness: 70 psi (483 kPa) per ASTM C203.
   e. Water Absorption: Maximum 1.1% *[1.1% under CAN/ULC S701]*
   f. Water Vapor Permeance at 1" thickness: <1.0 perms *[<57 ng/Pa-s-m^2]*
   g. *Standing Water Test per AC 71*
2. Subterra 20
   a. Standard: CAN ULC/S701, Type 3 EPS
   b. Thermal Resistance: Minimum R per nominal inch of 5.0 (actual thickness = 1.1") when tested in accordance with ASTM C518 at 75 degrees F. mean temperature.
   c. Compressive Strength at 1" thickness: Minimum 20 psi *[140 kPa under CAN/ULC S701]* when tested to ASTM D1621
   d. Flexural Strength at 1" thickness: 70 psi (483 kPa) per ASTM C203.
   e. Water Absorption: Maximum 1.1% *[1.1% under CAN/ULC S701]*
   f. Water Vapor Permeance at 1" thickness: <1.0 perms *[<57 ng/Pa-s-m^2]*
   g. *Standing Water Test per AC 71*
3. Subterra 25
   a. Standard: ASTM C578, Type IX EPS
   b. Thermal Resistance: Minimum R per nominal inch of 5.0 (actual thickness = 1.1") when tested in accordance with ASTM C518 at 75 degrees F. mean temperature.
   c. Compressive Strength at 1" thickness: Minimum 25 psi when tested to ASTM D1621
   d. Flexural Strength at 1" thickness: 70 psi (483 kPa) per ASTM C203.
   e. Water Absorption: Maximum 1.1% *[1.1% under CAN/ULC S701]*
   f. Water Vapor Permeance at 1" thickness: <1.0 perms *[<57 ng/Pa-s-m^2]*
   g. *Standing Water Test per AC 71*
4. Subterra 30
   a. Standard: ASTM C578, Type IX EPS, CAN ULC/S701, Type 3 EPS

b. Thermal Resistance: Minimum R per nominal inch of 5.0 (actual thickness = 1.06") when tested in accordance with ASTM C518 at 75 degrees F. mean temperature.
c. Compressive Strength: Minimum 30 psi *[210 kPa under CAN/ULC S701]* when tested to ASTM D1621
d. Flexural Strength at 1" thickness: 70 psi (483 kPa) per ASTM C203.
e. Water Absorption: Maximum 1.1%
f. Water Vapor Permeance at 1" thickness: <1.0 perms *[<57 ng/Pa-s-m^2]*
g. *Standing Water Test per AC 71*

2.3 MATERIALS

[This section may be modified to suit specific project details]

A. Block molded expanded polystyrene (EPS) made of BASF Neopor Plus beads
B. White polypropylene laminate on one side, white or clear polypropylene laminate on the other side.

2.4 MANUFACTURED UNITS

A. Board size: 4 ft x 8 ft
B. Board thickness: *[This section may be modified to suit specific project details] [Subterra 16 and Subterra 30]:* 1.0 in *[25 mm]*, 1.5 in *[38 mm]*, 2.0 in *[51 mm] [or as required]*

2.5 ACCESSORIES

A. Adhesives:
[This section may be modified to suit specific project details]
1. Type recommended by insulation manufacturer for application.
2. Gun grade, mastic type, compatible with insulation and substrate.
3. Tape: Blue Tuck Tape, 3M air and vapor barrier flashing membrane, Blueskin permeable flashing tape.
4. Insulation fasteners: Impaling clip of *[unfinished, galvanized steel, plastic or nylon]* with washer retainer *[and clips]* to be *[adhered][mechanically fastened]* to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
5. Protective boards: *[Cementitious][Wood fiberboard][cladding per job specific]*

3.0 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials are dry and ready to receive insulation *[and adhesive]*.
B. Verify substrate surface is flat, free of *[honeycomb,] [fins,] [irregularities,] [materials or substances that may impede adhesive bond]*.

3.2 RIGID BOARD PERIMETER INSULATION BELOW-GRADE

[This section may be modified to suit specific project details]

A. *[Subterra 16 or Subterra 30 for exterior insulation]*
B. *[Coordinate with Section 31 20 00 for installation of Subterra 16 or Subterra 30]*
C. Follow Halo recommended installation instructions.
D. Minimum vertical height: as detailed.

3.3 BELOW-SLAB INSULATION

[This section may be modified to suit specific project details]

A. Use Subterra 16 or Subterra 30.
B. Ensure that granular sub base is properly leveled to ensure uniform contact with insulation boards.
C. Follow Halo recommended installation instructions.

3.4 WORKMANSHIP

[This section may be modified to suit specific project details]

A. Install insulation to maintain continuity of thermal protection to building elements and spaces.
B. Keep insulation minimum *[75 mm][3 inches]* from heat emitting devices such as recessed light fixtures, and minimum *[50 mm] [2 inches]* from *[sidewalls of CAN4-S604 type A chimneys] [and] [CAN/CGA-B149.1 and CAN/CGA-B149.2 [type B] [and] [L] vents]*.
C. Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
D. Offset both vertical and horizontal joints in multiple layer applications.

END OF SECTION

SAFETY DATA SHEET

Safety Data Sheet – Graphite Polystyrene (GPS) in Halo® Advanced Graphite Insulation System

SECTION 1 - IDENTIFICATION

Product identifier:	Halo® Subterra, Halo® Subterra Plus, Halo® Subterra Protection Board Halo® Exterra, Halo® Interra, Halo® Interra FR, Chrome GPS™ FR
Other means of identification:	graphite polystyrene (GPS – EPS with graphite particles), rigid cellular foam insulation
Recommended use:	Exterior and interior continuous insulation for building envelopes, including foundation walls, above- and below-slab-on-grade.
Company:	Logix Insulated Concrete Forms Ltd. PO Box 162 Port Hope, Ontario L1A 3W3 1-866-944-0153
Emergency telephone number:	Francis Roma 1-866-944-0153

SECTION 2 – HAZARDOUS IDENTIFICATION

GHS classification:	None
Label elements:	None
Signal word:	None
Hazard statements:	None
Precautionary statements:	Keep away from heat/sparks/open flames/hot surfaces. - No smoking Avoid breathing dust/fume/gas/mist/vapours/spray. Wash thoroughly after handling Wear respiratory protection.
Other hazards:	May accumulate combustible dust particles when sanding or sawing in restricted or confined spaces. Residual off-gassing of blowing agent may occur in low toxicity levels under normal use conditions.

SECTION 3 – COMPOSTION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Content
Benzene Ethenyl-Homopolymer (Common Name: Polystyrene)	9003-53-6	> 90%
Pentane	109-66-0	>=3.0% - <7.0%
Isopentane	78-78-4	>=0.3% - <3.0%

SECTION 4 – FIRST AID MEASUREMENTS	
Inhalation:	When hot-knifing vapors may cause irritation to nose and throat. Dizziness may occur in poorly ventilated areas when hot-knifing. Remove affected individual into fresh air and keep the person calm. If difficulties occur, seek medical attention.
Skin contact:	This material is not considered to be a skin irritant. In cases where irritation may occur to extra sensitive skin, wash with soap and water for several minutes. Get medical attention if skin irritation develops or persists.
Eye contact:	Flush eyes with water for several minutes. Get medical attention if eye irritation persists or particulates are difficult to remove from the eye.
Ingestion:	This material is not considered to be hazardous when ingested but may cause blockage of air passage if large pieces are ingested. Get medical attention and apply proper first aid for persons with air passage blocked.
Physical state:	Solid
Odour & appearance:	Slight hydrocarbon odour, Gray in color

SECTION 5 – FIRE-FIGHTING MEASURES	
Suitable extinguishing media:	Use water spray, dry chemical, foam or carbon dioxide to extinguish flames.
Special protective equipment and precautions for fire-fighters:	Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.
Flash Point:	175 – 185 °C (347 – 365 °F), ASTM D3278
Autoignition:	285 °C (571 °F), DIN 51794
Lower explosion limit:	1.4 % (V) (air)
Upper explosion limit:	8.3 % (V) (air)
Flammability:	Not highly (UN Test N.1 (ready combustible solids))
Self-ignition temperature:	Not self-igniting
Further information:	Fire gives off black smoke consisting of carbon monoxide (< 10ppm), carbon dioxide (500ppm), oxides of nitrogen (4ppm), including trace of amounts of pentane, aldehydes and keytones. Fire hazards increase with presence of ignition sources or high concentrations of dust from work sites.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Personal precautions:	Sources of ignition should be kept well clear. Maintain proper ventilation in areas prone to static discharge (high dust environment) or products prone to combustion.
Environmental precautions:	Do not allow to enter drains or waterways.
Methods and materials for containment and cleaning up:	Loose material can be vacuumed or swept and placed in disposal containers. This material can be disposed of in accordance with local, state/provincial and federal regulations. This material is not considered a hazardous waste.

SECTION 7 – HANDLING AND STORAGE

Precautions for safe handling:	Take special precautions in handling and unloading product onto the construction site. When loading or unloading from trucks use either proper lifting equipment or use a minimum of 2 persons when manually loading or unloading pallets from trucks.
Conditions for safe storage (including incompatible materials):	Storage locations should be in an area that will minimize damage or soiling to products. Products can be exposed to UV or freezing rain or snow for prolonged periods. However, protection is recommended in cases where stored or installed products are exposed for more than 2 weeks. Keep products away from heat, sparks, flames or other ignition sources. Care should be taken to protect exposed foam surfaces from reflected sunlight and prolonged solar exposure until wall cladding or finish material is applied. Shade exposed foam areas, or remove sources of reflective surfaces, where heat buildup onto exposed foam might occur.

SECTION 8 – EXPOSURE CONTROL/PERSONAL PROTECTION

Eye protection:	Approved safety goggles when applying fasteners, sanding or sawing.
Skin protection:	Approved gloves and/or sleeves should be worn if sensitive to material composition of products.
Respiratory protection:	Approved dust mask when sanding, sawing or when working in high dust/particulates environment. In areas of high dust, vapor or mist content exceeding safe exposure limits use NIOSH or MSHA approved air purifiers or air supplied respirators.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Rigid cellular foam blocks and shapes. Gray in color.
Odour:	Faint odour.
Odour threshold:	N/A
pH:	N/A
Melting point/freezing point:	Softens at approximately 70 ºC (160 ºF)

Initial boiling point/boiling range:	N/A
Evaporation rate:	N/A
Flammability (solid, gas):	> 24% oxygen index (ASTM D2863)
Vapour pressure:	N/A
Vapour density:	N/A
Solubility:	Insoluble in water. Soluble with materials containing primarily of hydrocarbons, aldehydes, esters and amines.
Partition coefficient – n-octanol/water:	N/A
Viscosity:	N/A

SECTION 10 – STABILITY AND REACTIVITY

Reactivity:	Products react to high temperatures and strong oxidizers.
Chemical stability:	Stable under normal use conditions.
Possibility of hazardous reactions:	None.
Conditions to avoid:	Avoid all sources of ignition, such as heat, sparks, open flame. Unstable when exposed to high temperatures. Recommended maximum use temperature of 60°C (166°F).
Incompatible materials:	Not compatible with materials containing primarily of hydrocarbons, aldehydes, esters and amines.
Hazardous decomposition products:	High heat or combustion produces black smoke consisting of carbon monoxide (< 10ppm), carbon dioxide (500ppm), oxides of nitrogen (4ppm), including trace of amounts of pentane, aldehydes and keytones.

SECTION 11 – TOXICOLOGICAL INFORMATION

Primary route of entry:	Eyes, skin and inhalation.
Effects of Acute Exposure:	
Eyes:	When hot-knifing material, vapors may cause irritation to eyes.
Skin:	This material is not considered to be a skin irritant. Products may contain small particulates of dust accumulated naturally from surrounding environment, which may cause skin irritation with possible mild discomfort on extra sensitive skin.
Inhalation:	When hot-knifing vapors may be cause irritation to nose and throat. Dizziness may occur in poorly ventilated areas when hot-knifing.
Effects of chronic exposure:	Exposure to vapors may aggravate existing respiratory conditions, such as asthma, bronchitis and inflammatory or fibrotic respiratory disease.

SECTION 12 – ECOLOGICAL INFORMATION

Non-biodegradable.

SECTION 13 – DISPOSAL CONSIDERATIONS

Loose material can be vacuumed or swept and placed in disposal containers.

This material can be disposed of in accordance with local, state/provincial and federal regulations. This material is not considered a hazardous waste.

SECTION 14 – TRANSPORT INFORMATION

N/A

SECTION 15 – REGULATORY INFORMATION

All ingredients listed with TSCA and DSL (Toxic Substances Control Act and Domestic Substances List, respectively)

EPCRA 311-312 (Emergency Planning and Emergency Right-to-Know Act): Not hazardous

Classified as non-hazardous with WHMIS.

SECTION 16 – OTHER INFORMATION

SDS updates: October 30, 2018 (first release)

TO THE BEST OF OUR KNOWLEDGE THE INFORMATION CONTAINED HEREIN IS BELIEVED TO BE ACCURATE. HOWEVER, NEITHER THE ABOVE NAMED MANUFACTURER OR SUPPLIER NOR ANY OF ITS SUBSIDIARIES ASSUMES ANY LIABILITY WHATSOEVER FOR THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN. FINAL DETERMINATION OF SUITABILITY OF ANY MATERIAL IS THE SOLE RESPONSIBILITY OF THE USER. ALL MATERIALS MAY PRESENT UNKNOWN HAZARDS AND SHOULD BE USED WITH CAUTION. ALTHOUGH CERTAIN HAZARDS ARE DESCRIBED HEREIN, WE CANNOT GUARANTEE THAT THESE ARE THE ONLY HAZARDS THAT EXIST.

Halo® Subterra® & Subterra® Plus

HALO®

ADVANCED GRAPHITE INSULATION SYSTEM

INSTALLATION GUIDE

For more information, or to contact a Halo representative, visit our website at www.BuildWithHalo.com and click “Contact Us”.

This manual will be updated regularly. Current updates will be available at www.BuildWithHalo.com.

1.0 - PRECAUTIONS FOR HANDLING, STORAGE & INSTALLATION

Precautionary measures taken in packaging, storage, transportation and installation of Halo products can help minimize the potential for damage to the products.

1.1 - JOBSITE STORAGE AND HANDLING

Halo products should be protected from reflective sunlight or prolonged solar exposure.

Always keep stored Halo products tarped or covered to protect from weather. Do not use a clear plastic covering film. If possible, store indoors.

1.2 - INSTALLATION

Until the building is enclosed with the wall, subfloor or roof sheathing, the following recommendations will help ensure installed Subterra products are protected from thermal expansion, and minimize damage due to reflective sunlight or prolonged solar exposure.

- Remove or cover any surface that is casting a reflection on installed Halo products, or shield the affected Halo products. (Reflections can also come through the building enclosure through openings or non-opaque areas, such as windows).
- Cover Subterra products if left exposed for more than 30 days. Faded printing on Halo laminates is normal and will not degrade the Halo properties.
- Ensure all butt joints are tightly fitted. See “5.6 - SEALING JOINTS AND FASTENER PENETRATIONS” on page 12.
- Immediately tape seal or temporarily cover all joints of inside corners until tape sealant is applied. Edges of Subterra products installed on subgrades and adjacent to Exterra or Interra should also be immediately covered until proper sealant method is applied along the perimeter between Subterra and Exterra or Intrerra.

For more information contact your local Halo representative or e-mail info@buildwithhalo.com.

2.0 – USEFUL TOOLS & MATERIALS

Recommended for sealing joints, penetrations, perimeter edges and flashing details.

- Halo Sheathing Tape
- Perma R Products Sheathing Tape
- Vapor barrier blue Tuck Tape,
- 3M peel and stick membrane,
- Expandable foam and
- Blueskin flashing tape (may require a primer for some surfaces)

Recommended for fastening or gluing

- Weather resistive construction glue, such as PL 300

Additional tools:

- Hammer and cordless drill
- Hole saw
- Utility knife and straight edge

3.0 – PRODUCT DESCRIPTION

FEATURES

Subterra products are rigid foam sheathing insulation faced with either a polypropylene laminate (referred to as Subterra) or a tougher woven polypropylene fabric (referred to as Subterra Plus).

The insulation is made of GPS - expanded polystyrene containing graphite, which provides up to 18% more R-value than conventional EPS (expanded polystyrene).

Subterra and Subterra Plus are both suited for residential and commercial projects. However, Subterra Plus is more resistant to heavy repetitive loading and construction traffic conditions.

Subterra and Subterra Plus is available in compressive strengths 16, 20, 25, 30, and 40 psi (110, 140, 172, 210, 276 kPa). Higher compressive strengths in excess of 40 psi (276 kPa) is also available upon request[1].

1. Check with your local Halo representative for available Subterra/Subterra Plus compressive strengths.

BENEFITS

When installed under slabs Subterra and Subterra Plus products offer the following functional benefits.

- Protects void forms under structural slabs
- Continuous insulation reducing heat loss through the slab.
- Flexible, resilient and durable against heavy loading and construction traffic conditions - will not warp.
- Provides a safe, non-slip, surface.
- Quick and simple installation - saves time and labour.
- Light in weight and easily cut to fit any space.

In addition to the benefits listed above, Subterra Plus offers additional benefits.

- Prevents the ingress of radon - 7 times more radon resistant than 6 mil polyethylene membranes.[1]
- Replaces 6 mil polyethylene membranes as the air and vapor barrier.[3]
- Provides a water resistant barrier - resistant to over 2 feet of standing water.[2]

When installed as exterior insulation for foundation walls Subterra Products offer the following functional benefits.

- Protects waterproofing applied to foundation walls, and helps drain water away from the wall.
- Reduces damage to foundation walls that can be caused by freeze-thaw cycles over time.
- Provides continuous insulation.

AVAILABLE SIZES

Available in 4ft x 8ft sheets, 1/2", 3/4", 5/8", 1", 1.5" and 2" thickness. Custom sizes are available. Contact your local Halo representative for availability.

1. National Research Council of Canada's (NRC) Radon Diffusion Test, which shows Subterra Protection Board is more than 7 times Radon resistant than 6 mil polyethylene membranes.
2. In accordance with AATCC 127, Water Resistance: Hydrostatic Pressure Test, and AC71, Foam Plastic Sheathing Panels Used as Weather-resistive Barriers.
3. Independently evaluation of Subterra to the National Building Code of Canada by QAI (Quality Auditing Institute).

4.0 – APPLICATIONS

Subterra and Subterra Plus are used in residential, multi-residential, commercial, and industrial buildings completely insulating the building envelope below-grade.

Typical applications include:

- Exterior insulation against foundation walls
- Insulation under concrete slab-on-grades

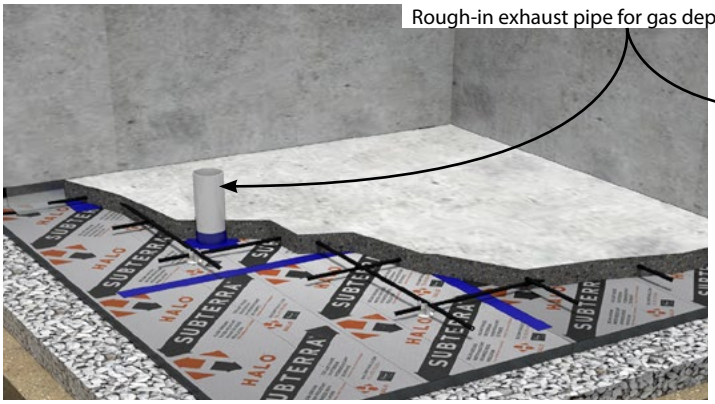
The following illustrations are typical for the installation of Subterra and Subterra Plus.

Installation may vary depending on project specific requirements. Before starting, make sure all installation complies with local building code requirements.

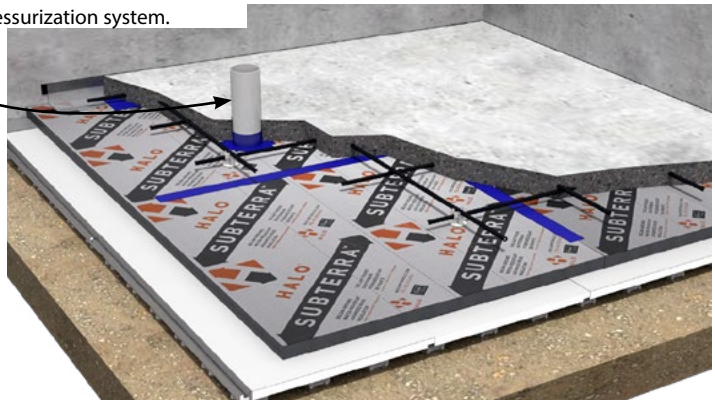
4.1 - UNDER SLABS

Subterra Plus is specifically required to prevent the ingress of gas to the interior, or when used as void form protection under structural concrete slabs. Refer to the Subterra Protection Board Installation Guide for more information.

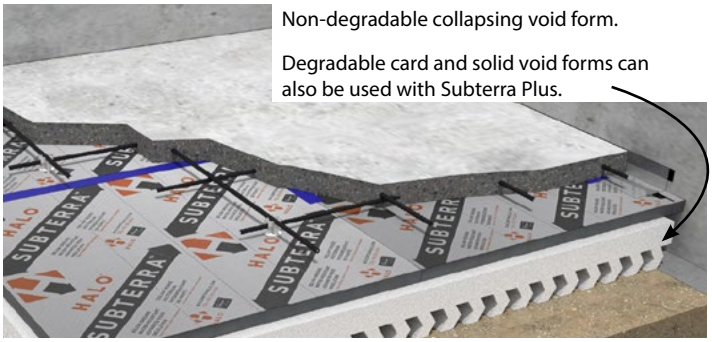
Subterra or Subterra Plus can be used if the only requirement is to provide the vapor barrier.



Subterra Plus over granular substrate as part of the subfloor gas depressurization system.



Subterra Plus over proprietary subfloor gas depressurization system.

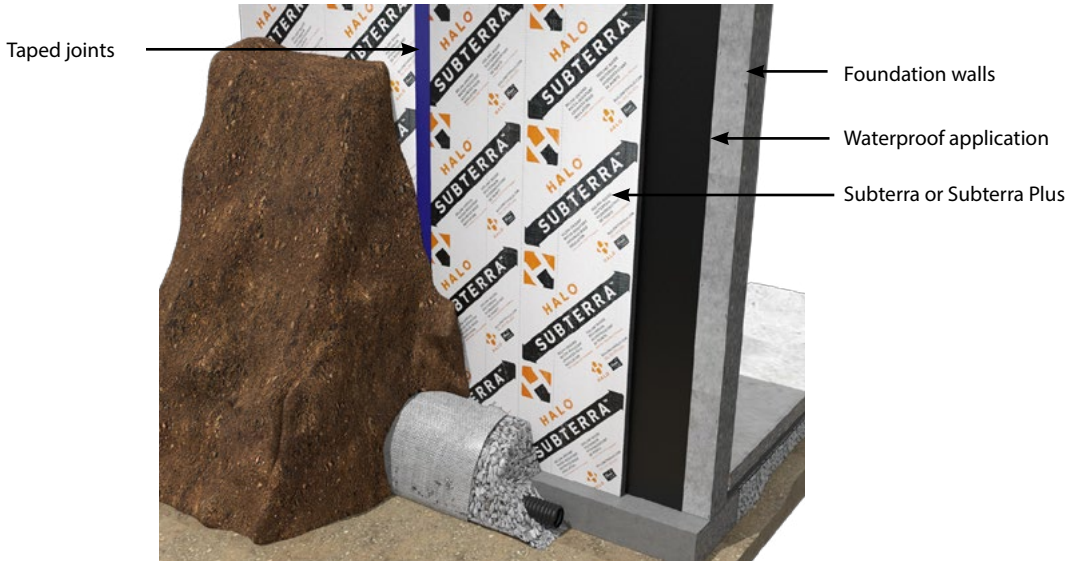


Subterra Plus as void form protection.

Subterra or Subterra Plus installed as a vapor barrier.

4.2 - FOUNDATION WALLS

Place Subterra or Subterra Plus directly against the concrete or masonry foundation wall with the longest edge vertically, and the bottom edge resting on top of the footing.



5.0 – INSTALLATION

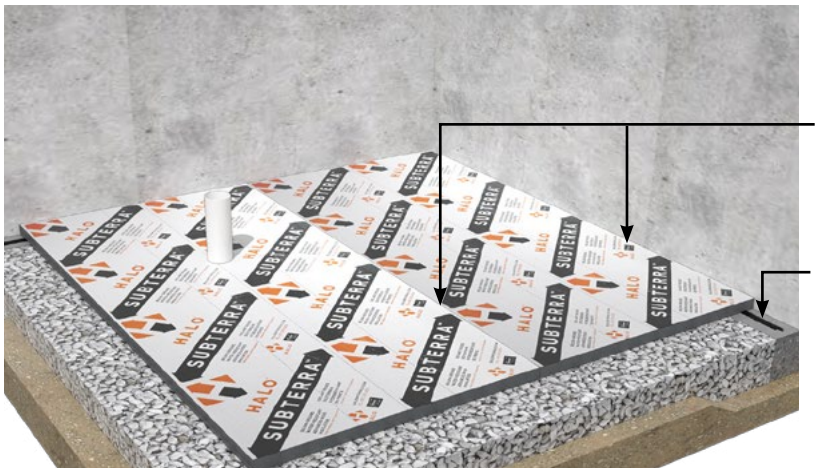
The following instructions are typical for the installation of Subterra and Subterra Plus for under-slab and foundation wall applications. For installation as void form protection or as a radon barrier refer to the Subterra Protection Board Installation Guide.

Installation may vary depending on project specific requirements. Before starting, make sure all installation complies with local building code requirements.

5.1 - UNDER-SLABS

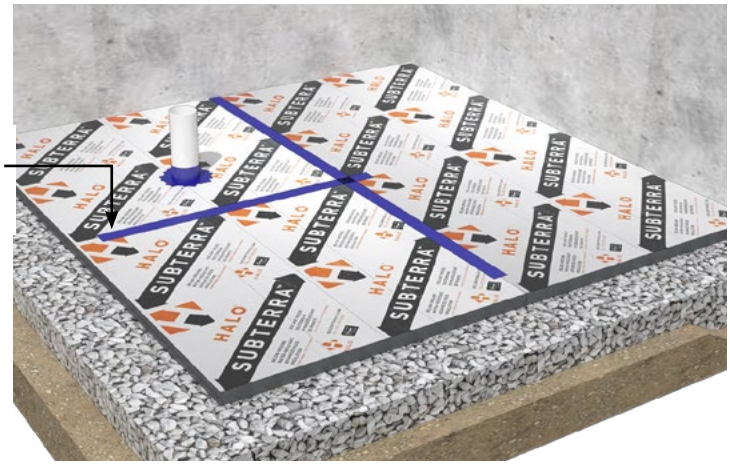
STEP 1 - Level and Compact The Base Material:
Level and compact the earth or granular material under the slab. Inspect the surface to ensure there are no protrusions that could prevent Subterra from being placed level and flush to the base material.

STEP 2 - Install Subterra or Subterra Plus:
With the white laminate side facing up install Subterra or Subterra Plus over the base material covering the entire area of the concrete pour. The orientation of Subterra can be placed in any direction.

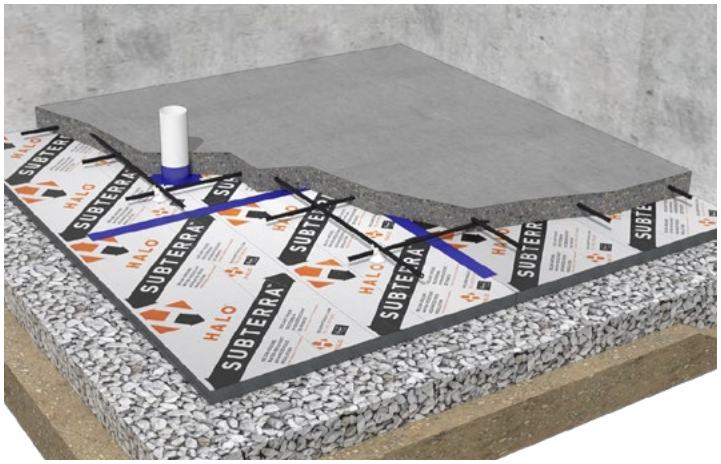


STEP 3 - Tape Seal All Joints and Penetrations:
For sealing penetrations see "6.0 – FASTENING EXTERRA" on page 18.

Use vapor barrier sheathing tape to seal all joints. Gaps between joints larger than 1/4" should be foam filled and tape sealed.



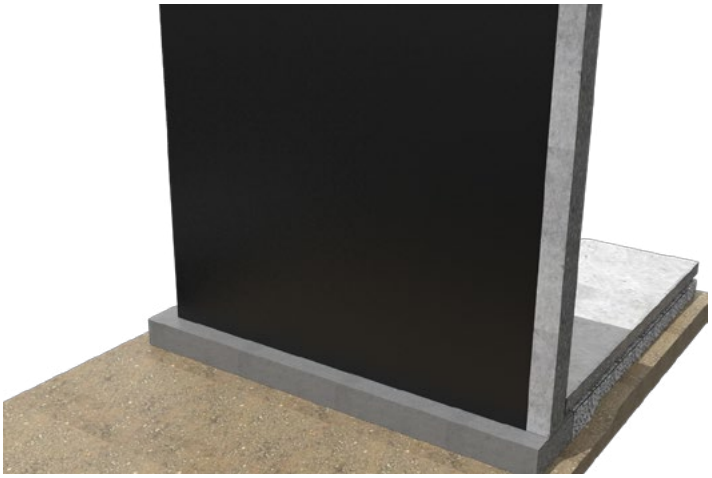
STEP 4 - Pour The Slab:
Prior to concrete placement, inspect the condition of the Subterra boards and all sealed joints and penetrations. See "7.0 - INSPECTION & REPAIRS" on page 20.



5.2 - FOUNDATION WALLS

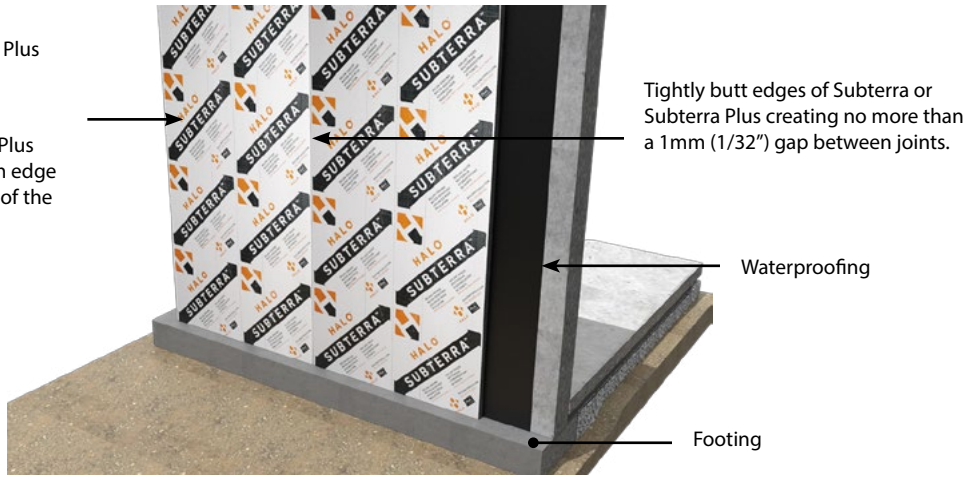
STEP 1 - Prepare the foundation wall:
Prior to placing Subterra or Subterra Plus the foundation wall should be treated with waterproofing.

- Remove any protrusions that can damage or prevent Subterra from laying flat against the foundation wall.
- For existing foundation walls remove the backfill away from the foundation wall and remove any loose dirt and debris from the wall.



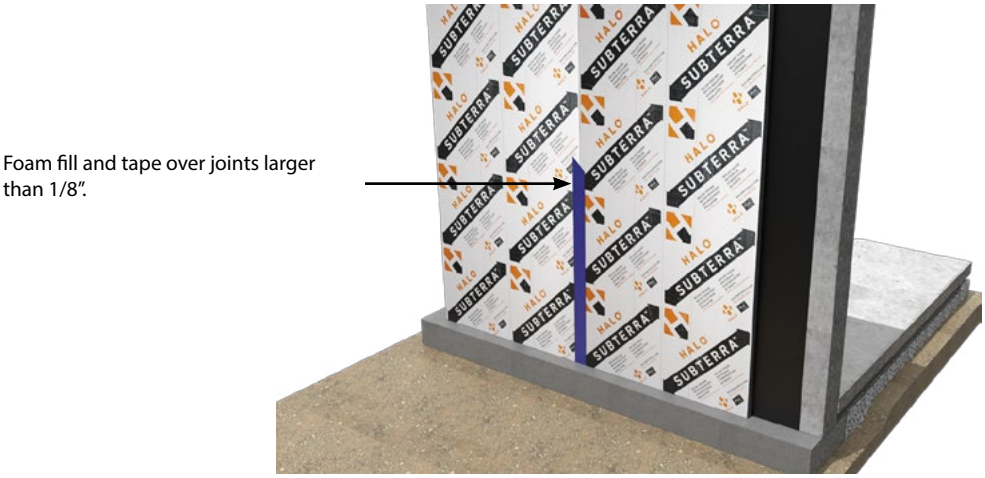
STEP 2 - Install Subterra or Subterra Plus:
For new construction allow the waterproofing to set, if required, before applying Subterra.

- Use weather resistant construction glue compatible with EPS, such as PL 300, to secure Subterra or Subterra Plus to the wall. If the wall is too rough or uneven concrete screws with washers can be used along with adhesives to help secure Subterra or Subterra Plus. Subterra should be installed with the white laminate side facing the exterior.



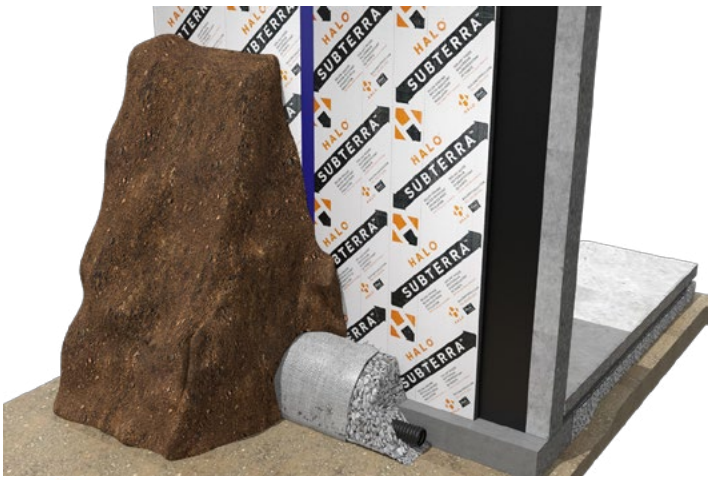
STEP 3 - Sealing Joints:
Seal and tape all joints between Subterra or Subterra Plus boards.

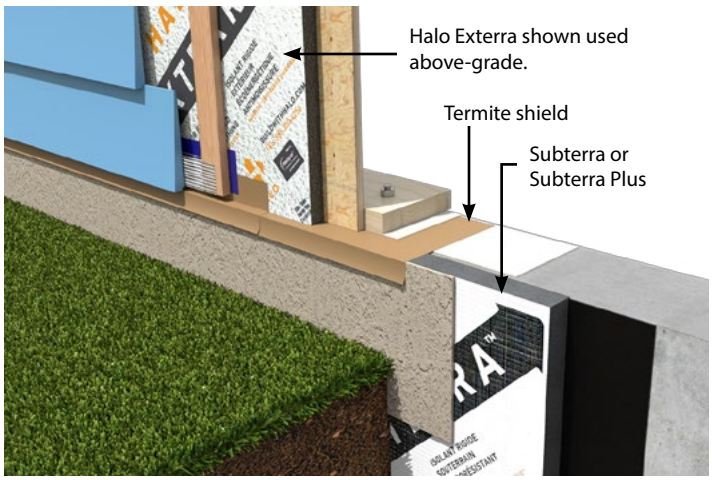
- Seal all joints with sheathing or flashing tape. In cold weather applications, a primer may be required to ensure proper adhesion of the tape or flashing to Subterra or Subterra Plus. Water based primers are suitable for temperatures up to -4°C (25°F). For colder temperatures solvent based primers are recommended.
- Seal around window and vent openings with sheathing or flashing tape. Sealing around openings will eliminate potential moisture entering within the wall assembly.



STEP 4 - Backfilling:
Carefully place the backfill against the foundation wall to required grade.

- Seal the top of Subterra with a compatible sealant to prevent moisture from getting behind the Subterra sheathing.
- Protect Subterra that is exposed above-grade with compatible parging materials such as Stuccoflex or Styroflex.
- Provide a termite shield detail to protect the insulation and wall assemblies in areas of high termite infestation.

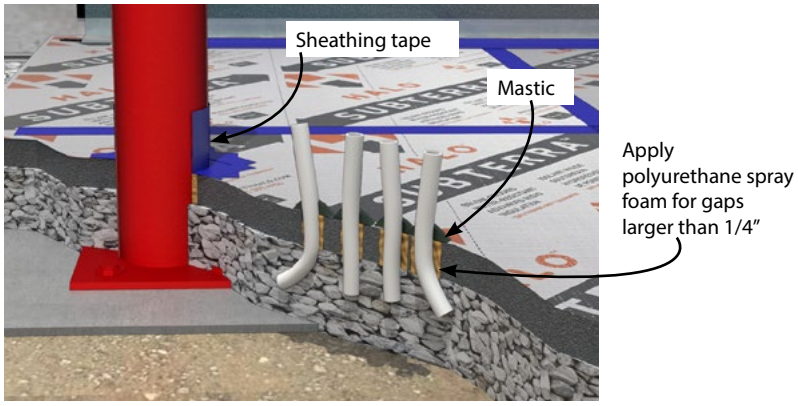




6.0 – PENETRATIONS

Penetrations through Subterra or Subterra Plus, such as utilities or columns can be simply sealed with sheathing tape or a mastic sealant to maintain the continuity of the air and moisture barrier.

Gaps larger than 1/4" between Subterra or Subterra Plus and the penetration should be foamed filled before tape sealing to maintain continuous insulation.



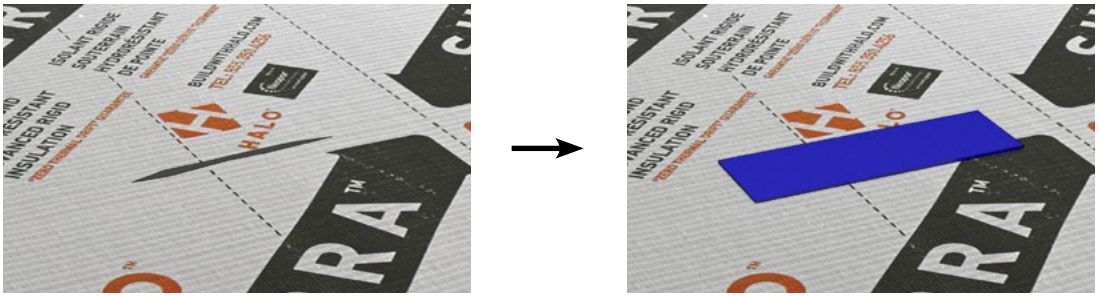
7.0 - INSPECTION & REPAIRS

Subterra and Subterra Plus are designed to be extremely durable and resilient against heavy construction traffic. However, inspecting the condition of installed Subterra boards prior to the concrete pour will ensure proper installation is maintained.

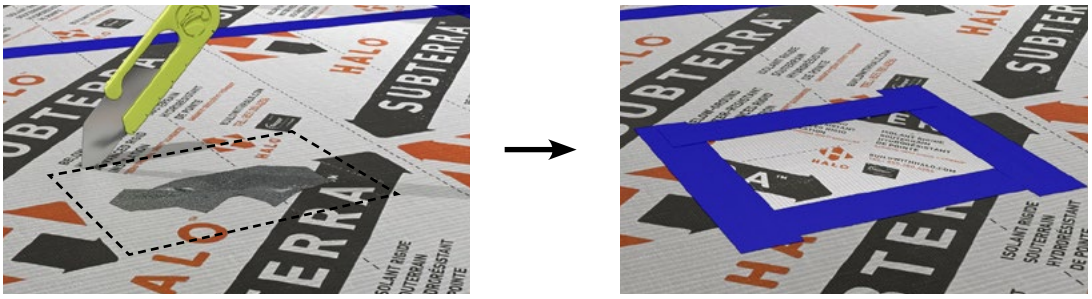
Inspect installed Subterra boards sufficiently in advance of concrete placement to ensure

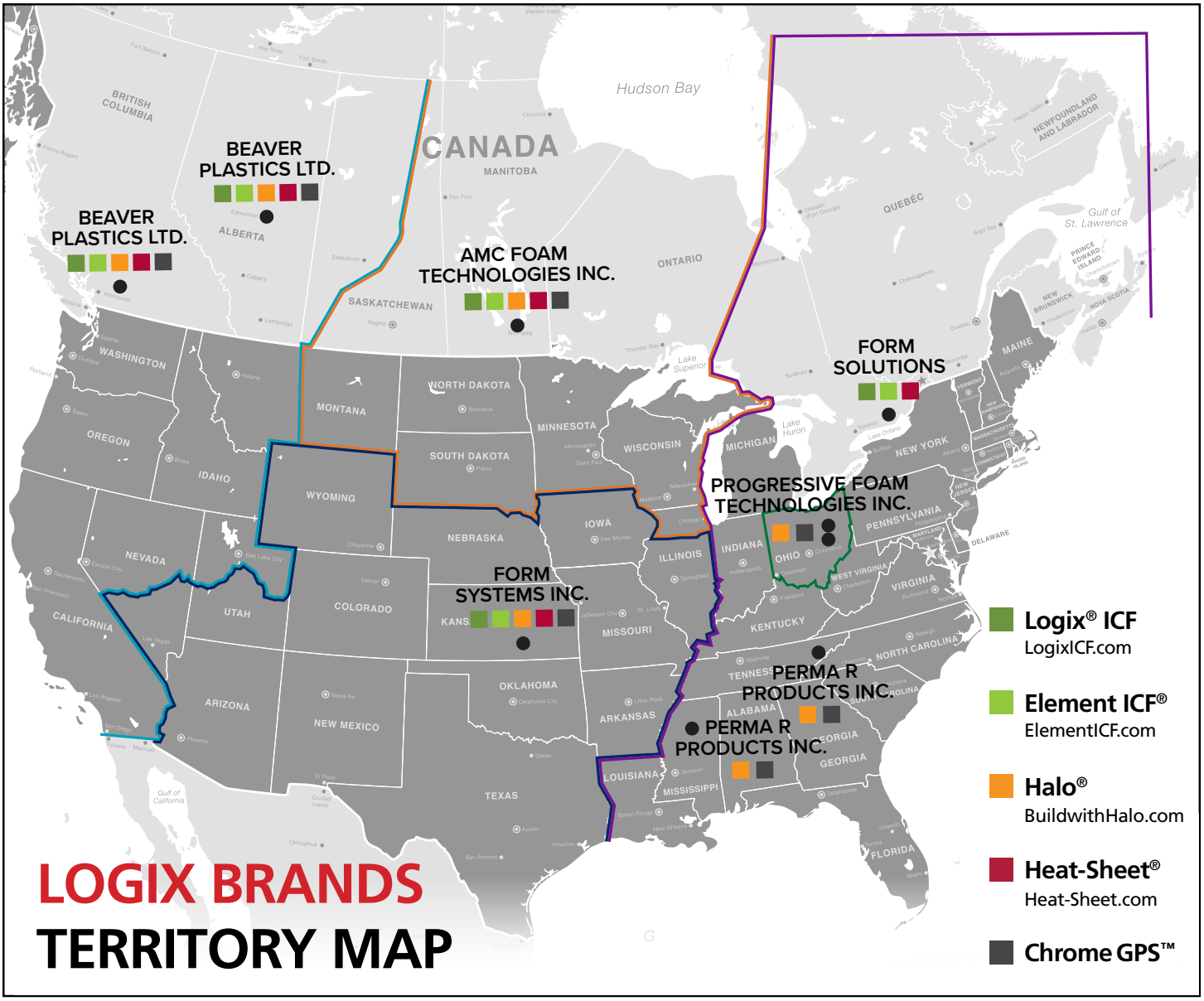
- taped seams are not broken
- joints, penetrations and perimeter are properly sealed
- damaged areas are marked and properly repaired.

In most cases repairing damaged Subterra boards simply requires tape sealing over the damaged area.



If the foam and laminate are damaged then removing the damaged section and replacing with a new section will be required.





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6753 Chestnut Ridge Rd. Beach City, OH

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2604 Sunset Dr. Grenada, MS 38901

106 Perma R Rd.
Johnson City, TN 37604

888.838.5038
330 Cain Drive Haysville, KS 67060-2004

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