Plasti-Fab EPS PRODUCT SOLUTIONS
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Product Information Bulletin

DuroFoam® Insulation for Basement Applications

DuroFoam insulation board is a moulded expanded polystyrene (EPS) insulation that meets or exceeds CAN/ULC-S701, ***Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering***. The addition of laminated films to the top and bottom surfaces of DuroFoam insulation board provides a more durable product that is less susceptible to handling damage.

The reflective facer on DuroFoam insulation contains a thin layer of foil embedded within the film. The reflective facer does not increase the nominal R-value of DuroFoam insulation (for additional information see Plasti-Fab PIB 253 - ***Facts About Thermal Resistance of Reflective Insulation***). The green face of DuroFoam insulation should be left exposed to make use of the markings on this face provided for easy cutting of insulation and spacing of interior framing as required.

Material Property[1]	Test Method	Units	Type 1
Thermal Resistance *Minimum RSI per 25 mm (R per inch)*	ASTM C518	m^2•°C/W (Ft^2•hr•°F/BTU)	0.65 (3.75)
Compressive Resistance *Minimum @ 10% Deformation*	ASTM D1621	kPa (psi)	70 (10)
Flexural Strength *Minimum*	ASTM C203	kPa (psi)	170 (25)
Water Vapour Permeance[2] *Maximum*	ASTM E96	ng/Pa•s•m^2 (perm)	30 (0.5)
Water Absorption[3] *Maximum*	ASTM D2842	% By volume	6.0
Dimensional Stability *Maximum, 7 Days @ 70 ± 2°C (158 ± 4°F)*	ASTM D2126	% Linear Change	1.5
Limiting Oxygen Index *Minimum*	ASTM D2863	%	24

1. DuroFoam insulation properties are third party certified to CAN/ULC-S701, type 1 under a quality listing program administered by Intertek Testing Services. DuroFoam insulation is listed by the Canadian Construction Materials Centre (CCMC) under evaluation listing 12424-L.
2. The ***maximum*** vapour permeance value for type 1 EPS insulation is 300 ng/Pa•s•m^2 for a 25-mm (5.2 perms for a 1-inch) thickness. The vapour permeance value provided above for DuroFoam insulation is significantly lower as a result of the laminated films. Where water vapour permeance is a design issue, contact Plasti-Fab technical services for additional information.
3. Water absorption % by volume is determined using ASTM D2842 which involves complete submersion under a head of water for 96 hours. The value provided in the table above is the ***maximum*** for CAN/ULC-S701, type 1 EPS insulation without facers.

NBC 2010 – Energy Efficiency Requirements

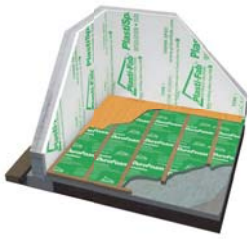
NBC 2010, Section 9.36 provides energy efficiency requirements for buildings 3 storeys or less in building height, having a building area not exceeding 600 m^2 and used for major occupancies classified as residential occupancies. Energy efficiency requirements in NBC 2010, Subsection 9.36.2. are based upon minimum ***effective thermal resistance (RSI_{eff}/R_{eff})*** of building assemblies which includes the effect of thermal bridging due to repetitive structural members such as wood framing members in wall or roof assemblies calculated using the formula below.

$$RSI_{eff}\ (R_{eff}) = \frac{\%\ \text{with Framing}}{RSI_F\ (R_F)} + \frac{100\%\ \text{Area Cavity}}{RSI_C\ (R_C)} + \text{RSI(R) Continuous Material Layers}$$

DuroFoam Insulation Installed Above or Below a Basement Floor Slab

Heat loss through an un-insulated basement slab can be a significant source of energy loss in a heated basement. Installing DuroFoam insulation reduces heat loss and ensures more uniform more floor surface temperature.

DuroFoam insulation installed above the basement slab as part of a retrofit is a cost-effective method of improving existing energy efficiency. When installed as a continuous layer below the basement slab as part of new construction it provides a uniform insulation layer. The table below provides examples of basement slab construction using DuroFoam insulation.

Typical Detail	System Description and Components			
 Figure 1 - Above Slab Application	**DuroFoam insulation installed between wood strapping**	**R_{eff} Calculation**		
		RSI_F	**RSI_C**	**Continuous Materials**
	Horizontal Air Film (above floor)	----	----	0.16
	15.8 mm (5/8") OSB sub-floor	----	----	0.15
	76 mm (3") DuroFoam Insulation	----	1.98	----
	Wood strapping @ 610 mm (24")	0.54		----
	Polyethylene moisture barrier	----	----	----
	102 mm (4") Concrete Slab	----	----	0.04
	Sub-Totals	**0.54**	**1.98**	**0.35**
	% Area	9%	91%	100%
	RSI_{eff} (R_{eff})	**RSI-1.95 (R-11.1)**		
 Figure 2 - Below Slab Application	**DuroFoam insulation installed as a continuous insulation layer**	**RSI_{eff}**		
	Horizontal Air Film (above floor)	0.16		
	102 mm (4") Concrete Slab	0.04		
	76 mm (3") DuroFoam Insulation	1.98		
	Polyethylene moisture barrier	----		
	RSI_{eff} (R_{eff})	**RSI-2.18 (R-14.4)**		

NOTE: If the protective film over the thin foil layer in the reflective face of DuroFoam insulation is pierced during concrete placing, the high alkaline content in concrete may react with the foil. For this reason, the reflective film should be faced toward the ground when a concrete slab will be cast over DuroFoam insulation. The reaction with the thin foil layer does not damage the concrete, but may damage the reflective film on DuroFoam insulation in the area where the reaction occurs.

DuroFoam Insulation Installed on Interior or Exterior of Basement Wall

DuroFoam insulation is an excellent option for full-height basement wall insulation. A Canada Mortgage and Housing Corporation (CMHC)/Canadian Home Builders Association (CHBA) report concluded that use of insulation partway down the interior of a basement wall actually increases heat loss to the adjacent soil because the upper zone insulation is appreciably short-circuited by the heat loss from below.

The table below illustrates two wall installation methods that use continuous DuroFoam insulation to provide a uniform insulation layer over the entire basement wall.

Typical Detail	System Description and Components			
 Figure 3 - Interior Basement Wall	**DuroFoam Insulation over interior of basement wall with 2 x interior framed wall**	**RSI_F**	**RSI_C**	**Continuous Materials**
	203 mm (8") Basement wall	----	----	0.08
	102 mm (4") DuroFoam Insulation	----	----	2.64
	Wood Stud @ 600 mm (24")	0.48	----	----
	13 mm (1/2") Gypsum wall board	----	----	0.08
	Inside Air Film	----	----	0.12
	Total	**0.48**	**NA**	**2.92**
	% Area of Each Component	**9%**	**NA**	**100%**
	RSI_{eff} (R_{eff})	**RSI-2.96 (R16.8)**		
 Figure 4 – Outside Basement Wall	**DuroFoam insulation over exterior of basement wall with a 2 x interior framed wall**	**RSI_F**	**RSI_C**	**Continuous Materials**
	102 mm (4") DuroFoam Insulation	----	----	2.64
	203 mm (8") Basement wall	----	----	0.08
	Interior polyethylene moisture barrier	----	----	----
	Wood Stud @ 600 mm (24")	0.48	----	----
	13 mm (1/2") Gypsum wall board	----	----	0.08
	Inside Air Film	----	----	0.12
	Total	**0.48**	**NA**	**2.92**
	% Area of Each Component	**9%**	**NA**	**100%**
	RSI_{eff} (R_{eff})	**RSI-2.96 (R16.8)**		

When DuroFoam insulation is applied directly to the interior face of the basement wall, the temperature of the inner surface of the insulation will be close to the interior room temperature. NBC 2010 states that if the foamed plastic insulation has a vapour permeance below 60 ng/Pa•s•m^2, it can fulfill the function of a vapour barrier to control condensation within the assembly due to vapour diffusion.

DuroFoam insulation applied as a continuous layer over the interior face of the basement wall can also provide the moisture protection for wood framing materials and interior finish materials as required by NBC 2005 and 2010, Sentence 9.13.2.6.(1).

DuroFoam insulation applied to the exterior of basement walls reduces temperature fluctuations through the wall – reducing thermal stresses in the basement wall – as well as reducing the likelihood of internal condensation forming on the interior of concrete wall. In this case, the moisture protection required by Code for wood members placed in contact with the interior surface of basement walls and interior finish materials must be provided using a separate moisture barrier.

DuroFoam Insulation - Frequently Asked Questions

Should DuroFoam insulation be installed with the reflective face facing inwards or outwards in wall or floor assemblies?

The reflective facer on DuroFoam insulation contains a thin layer of foil embedded within the film. The reflective facer does not increase nominal R-value of DuroFoam insulation. See Plasti-Fab Product Information Bulletin No. 253 for additional information on reflective insulation.

How does DuroFoam insulation compare to other insulation types?

DuroFoam insulation provides excellent durability and a very competitive cost per R-value when compared to other insulation materials.

How is DuroFoam insulation attached to the wall structure?

DuroFoam insulation may be attached to a concrete wall using an adhesive compatible with EPS insulation. Foam compatible adhesives such as PL300 may be used with DuroFoam Insulation.

Are there dampproofing materials that can be applied over DuroFoam insulation in exterior below grade applications?

When an asphalt emulsion is used as the dampproofing, it is applied to the foundation wall and allowed to cure before installation of DuroFoam insulation. Another solution would be to use a rigid air-gap membrane, to protect the insulation layer and provide positive drainage to the drainage tile at the base of the basement wall.

When DuroFoam insulation is applied to the exterior of a concrete basement wall how does this affect interior wall construction?

If DuroFoam insulation is applied to the exterior of the basement wall, an interior wood frame wall with finish is constructed on the inside of the basement wall. As required by building code, a moisture barrier (most often a polyethylene sheet material) must be placed over the concrete surface so that wood framing is not in direct contact with the concrete wall.

Are there installation instructions for DuroFoam insulation used in various applications available on line?

Typical installation instructions and how-to videos can be downloaded from the Plasti-Fab website at www.plastifab.com.