

TECHNICAL BULLETIN

STYROFOAM® INSULATION AND THE AIR SPACE



Subject: Styrofoam™ Insulation and the Air Space 25-01

For many years, DuPont has strongly recommended that an air space or drainage layer be incorporated between the surface of Styrofoam™ brand insulation and anything that may hold moisture for extended periods of time or trap moisture at the surface of the foam. This air space requirement was initiated due to a concern that water vapor driving through an assembly, from the interior of the building (or underside of the foam) to the exterior, would encounter the cold, impervious topping material above the insulation and condense. This moisture would be trapped between the foam and the topping if no air space was available to allow the water to exit – essentially creating a “diffusion closed” condition. This condition raises issues with respect to excess water absorption in Styrofoam™ over time.

Hydrotech has advocated the use of Hydrodrain® AL or 300 to provide the air space when required. Other drainage composites like the “dimpled core” type (i.e., Hydrodrain 400) are not appropriate as they are formed with a flat, unvented bottom.

Diffusion Open vs. Diffusion Closed

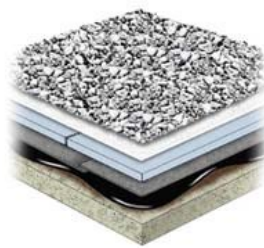
When Styrofoam™ is installed horizontally and covered with materials which provide small or no pore spaces, a diffusion closed condition is formed. In these instances, an air space may be required.

Materials commonly used in Hydrotech assemblies, which may cover the Styrofoam™ and form open or closed conditions are:

Diffusion Open (No Air Space Required)	Diffusion Closed (Air Space Required)
<ul style="list-style-type: none"> Typical Stone Ballast 	<ul style="list-style-type: none"> Concrete Pavers Set Directly on the Foam and Covering >10% of Surface
<ul style="list-style-type: none"> Compacted Stone Base or Sand 	<ul style="list-style-type: none"> Concrete Topping Slab
<ul style="list-style-type: none"> Pedestal-Installed, Open Joint Pavers 	<ul style="list-style-type: none"> Flat-Bottomed, Unvented Drainage Mats
<ul style="list-style-type: none"> Hydrodrain AL, 300, 302 	<ul style="list-style-type: none"> Soil
<ul style="list-style-type: none"> Gardenrain 	<ul style="list-style-type: none"> Expanded Polystyrene (EPS) Fill
	<ul style="list-style-type: none"> Moisture Mat or Equivalent



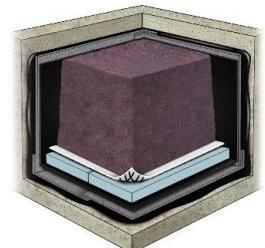
Sand Setting Bed



Stone Ballast



Concrete Topping



Soil



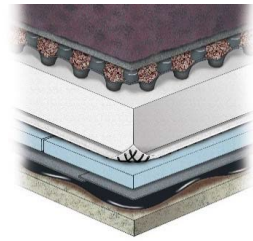
Stone Ballast



Gardenrain or Hydorrain



Moisture Mat



EPS Fill

Exception to the Rule

In warmer climates, the primary direction of vapor flow is from the exterior of the building to the interior. Therefore, the same concern over excess water absorption in Styrofoam™ does not exist. DuPont has identified that in climates with less than 3,000 Heating Degree Days annually, the air space is not required. In these instances, diffusion closed conditions can exist without concern for the performance of the foam.

A Heating Degree Day (HDD) is defined as, each degree below 65 degrees F reached by the average daily outside temperature. HDD is a form of degree day commonly used to estimate the required energy for heating in the winter months.

The map below provides the approximate 3,000 HDD line. Therefore, any project that is located south of this line would not require an air space between the foam and any topping material. Any project located north of the line would require the air space in diffusion closed conditions in order to be considered for a thermal warranty.



Reproduced from NOAA Climatology of the United States No. 85, June 2002. Climate divisions shown represent regions within a state that are as climatically homogeneous as possible. Divisional boundaries generally coincide with county boundaries except in the western U.S., where they are based largely on drainage basins.

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