Plasti-Fab EPS PRODUCT SOLUTIONS

PlastiSpan™ Insulation

Ice Rink Slab Insulation

Plasti-Fab PlastiSpan insulation board is installed under the floor slabs of artificial ice rinks to minimize the effect of soil frost heaving beneath the ice surface. In addition, it shortens the time required to make or remove an ice surface and may also permit a reduction in the capacity of the refrigeration equipment. These benefits are important as they reduce the energy costs for the operation of the ice rink.

PlastiSpan insulation board meeting CAN/ULC-S701, Type 1 is adequate for this service. If a higher compressive strength material is required as a result of additional compressive loads on the insulation, PlastiSpan HD insulation board meeting CAN/ULC-S701, Type 2 or PlastiSpan insulation board meeting CAN/ULC-S701, Type 3 may be used.

The use of PlastiSpan insulation under ice rink surfaces will be discussed under the general headings of:

a) seasonal operations

b) continuous operations (more than seven months per year)

These two methods of operation create much different operating conditions. Seasonal operation of ice rinks allows the subsoil condition to reach a normal frost-free equilibrium each year during the period that the ice rink surface is not in place. Continuous operation of ice rinks results in deeper penetration of freezing into soil, which could result in frost heave and major structural problems unless methods are adopted to minimize penetration of freezing.

For either type of ice rink operation, the ice surface freezing coils can be covered with clean washed sand or embedded in a concrete slab. The sand alternative provides the most economical construction where the building is to be used solely as an ice rink. The reinforced concrete slab alternative allows for multipurpose use of the building in the off-season.

PlastiSpan insulation can be placed directly over a drained granular fill for economical construction or over a concrete slab where the building design requires it.

Frost Heaving

Frost heaving can occur in fine-grained soils such as silty clay or gravel, when a high water table is encountered. The formation of frost lenses within the soil can cause heaving of several inches. Where an artificial ice rink must be constructed over this type of soil, several alternates are possible dependent upon whether the ice rink is to be operated on a seasonal or continuous basis.

Seasonal Operation

This type of operation allows the warm off-season temperatures to warm up the soil to a state of frost-free equilibrium before the next season starts. This will prevent frost build-up in the soil during the operating season and eliminates the need for soil heating devices, which are required in continuous operations. The alternatives possible to prevent frost heaving are:

1. Remove susceptible soil to a depth below the anticipated frost penetration and replace with non-susceptible soil.
2. Lower the water table by drainage to a depth below the capillary rise of water and the anticipated frost penetration.
3. Operate rink so refrigerant temperature is as high as possible.
4. Remove upper layers of frost-susceptible soil, replace with granular fill or other non-frost-susceptible soil and provide insulation under the refrigerant coil to slow the heat loss from the soil. This will raise the maximum depth of penetration above the frost-susceptible soil.

Of the above alternatives, the last is generally the most effective and economical. Thickness requirements are shown in the following table:

Recommended Insulation Thickness

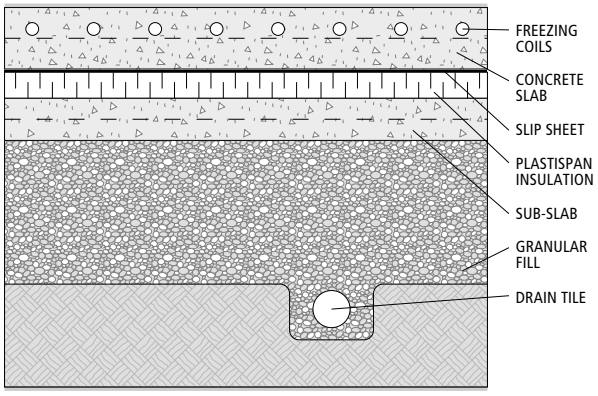
SI VALUES	MONTHS IN SERVICE			
BRINE TEMPERATURE & SERVICE	6	7	8	9
–9° C to –8° C (Skating & Curling)	38 mm	63 mm	75 mm	100 mm
–10° C (Hockey)	75 mm	100 mm	Design as continuous operation	

IMPERIAL VALUES	MONTHS IN SERVICE			
BRINE TEMPERATURE & SERVICE	6	7	8	9
16° F to 17° F (Skating & Curling)	1.5''	2.5''	3''	4''
12° F (Hockey)	3''	4''	Design as continuous operation	

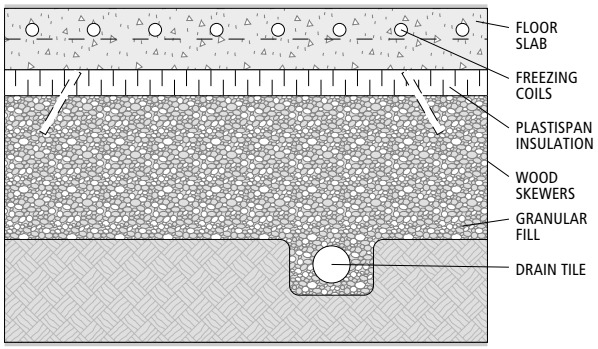
These tables based on dew point of air over ice rink of 7° C (45° F) and ice thickness of 25 mm (1''). Higher dew point or thicker ice will require lower brine temperature.

The tables assume that building is at a normal average temperature or 16° C (60° F) where ice rink is out of service and in the thaw phase. The thaw can be accelerated by heating the building in the spring and fall or by circulating warm brine through the freezing coils. These procedures may allow some extension to the service season of the rink.

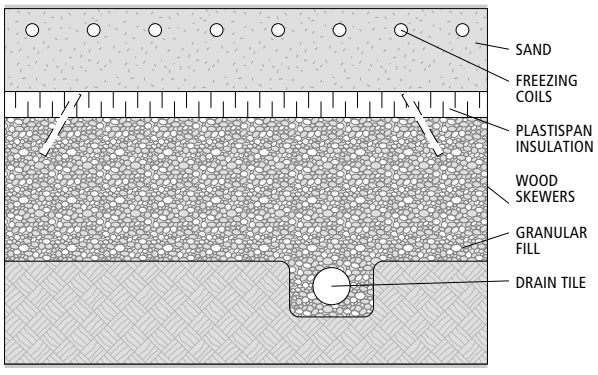
Seasonal Operation



Multipurpose Slab with Sub Slab

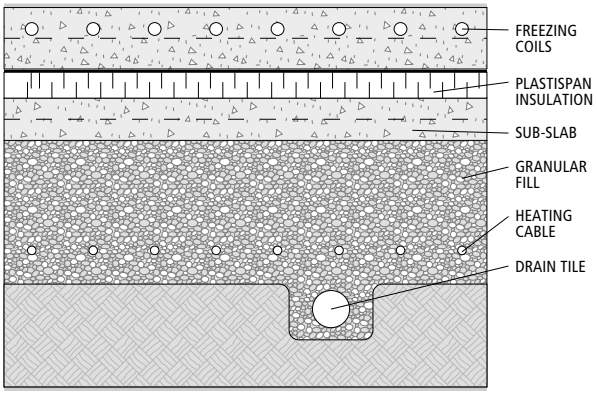


Multipurpose Slab

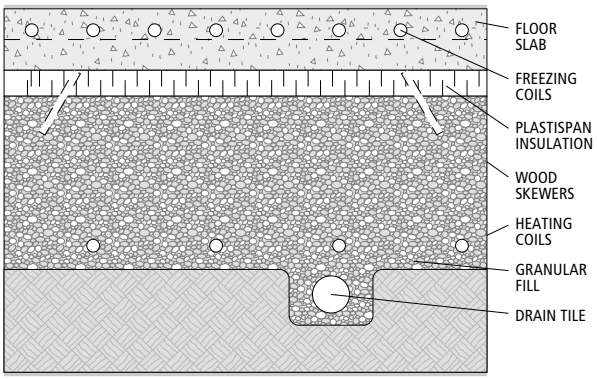


Rink Use Only

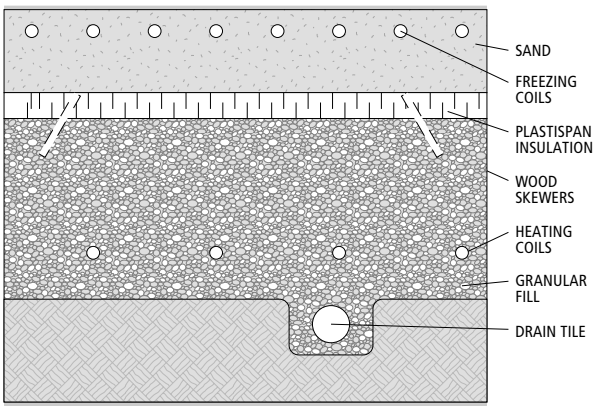
Continuous Operation



Multipurpose Slab with Sub Slab



Multipurpose Slab



Rink Use Only

Continuous Operation

When an ice rink is operated continuously, frost can penetrate into the soil below to depths that make the removal of frost-susceptible soil impracticable. A layer of PlastiSpan insulation beneath a refrigerated slab is an alternative but the thickness required may be significant. An economical alternative may be to provide a reasonable thickness of PlastiSpan insulation and a heat source under the insulation to offset the small remaining heat loss. Locate the heat source near the bottom of the granular fill, which will not be susceptible to frost heaving. Electric heating cable or warm brine coils are the usual methods.

Recommended PlastiSpan insulation thicknesses is:

High Cost Energy Areas	– 100 mm (4")
Other Areas	– 75 mm (3")

When electric cable heating is used in the sub-slab, savings in power costs will justify a PlastiSpan insulation thickness of 75 mm (3") on the basis of payoff over 3 to 5 years.

Jacketed electric cable delivering 16 to 22 W/m^2 (1-1/2 to 2 wafts per square foot) is installed on approximately 750 mm (30") centres near the bottom of the granular fill.

Warm brine coils of steel or plastic pipe 300 to 600 mm o/c. (12" to 24") are located approximately 150 mm (6") under PlastiSpan insulation.

An accurate design on a particular construction may be prepared by determining the heat balance between the refrigerated slab and the heat system. Consult a Plasti-Fab sales representative for more details.

Drainage

The use of PlastiSpan insulation does not eliminate the need for proper drainage. The water table should be kept as low as is practicable by site drainage over the entire rink area. When a concrete sub-slab is used below the insulation, provision should be made for drainage for the surface of the sub-slab. If a slip-sheet is used above the insulation board, provide for drainage for the surface of the slip-sheet as well as at the surface of the floor.

Surfacing

Do not use asphalt pavement as a surfacing material. It is a poor conductor of heat and hinders ice making.

Where the surface will be used for ice only, a clean washed sand fill around the freezing coils is sufficient. When the building is to be used for other purposes, embed the freezing coils in concrete and finish the surface as a floor.

Other Considerations

Where PlastiSpan insulation is used under a rink, it should always extend a minimum of 900 mm (3 ft) beyond the edge of the ice. Alternatively, the refrigerated slab should be separated from the adjacent soil by a vertical slab of insulation extending from the top of the slab a minimum of 900 mm (3 ft) into the ground.

One layer of PlastiSpan insulation is preferred to two layers, since it is desirable to have any moisture in the system drain away through the insulation joints.

Thermocouples installed in the soil under the slab at the bottom of the granular fill will provide invaluable information of the operation of the rink and the performance of the insulation. Thermocouple readings can be the basis for the economical operation of the electric heating cable.

Application

Choose application instructions from the PlastiSpan brochure "Building Insulation Foundation Applications - Selection, Application and Specification".

The following instructions apply specifically to artificial ice rinks.

Insulation on Granular Fill

Place a minimum of 300 mm (12") well-graded granular fill under PlastiSpan insulation.

If heating cable or warm brine coils are to be installed (for continuously

operating rink), install them near the bottom of granular fill. Compact and level fill over entire rink area to a tolerance of 6 mm (1/4"). A grader can be used with grade stakes. Smaller equipment and a system of screeds are also satisfactory.

Lay PlastiSpan insulation boards in position and hold them in place with 6 mm x 200 mm (1/4" x 8') hardwood skewers driven at an angle of 30°, where necessary.

Insulation on Concrete Sub-Slab

Place a minimum of 300 mm (12") well-graded granular fill under PlastiSpan insulation.

If heating cable or warm brine coils are to be installed, install them near the bottom of the granular fill. Alternatively heating systems may be installed in the concrete sub-slab.

Pour concrete sub-slab over granular fill, level to within 6 mm (1/4") and float finish.

When concrete is fully cured, prime sub-slab with asphalt primer and allow curing. Mop slab with hot asphalt and lace insulation in asphalt while it is still fluid, butting joints in moderate contact. If required, a waterproofing system may be placed over the sub-slab before the insulation is laid.

Application (continued)

Finish

If a concrete slab is to be poured over the refrigeration coils, the use of a slip-sheet over the insulation is optional. Do not use a slip-sheet when a sand surface is to be installed. Place wire pipe chairs with plates on the feet on the insulation to hold the refrigeration coils.

Where welding is to be done after insulation is in place protect the insulation from welding sparks and drips with an asbestos pad.

Pour concrete over insulation to embed pipe and reinforcing, using screeds or other means to ensure a level slab on which to lay ice within a tolerance of +0 mm, -6 mm (+0", -1/4").

OR

Place 150 mm to 250 mm (6" to 10") of well graded, clean, washed sand over insulation covering refrigeration coils. Level and compact to a smooth surface.

Specification

Choose specification from Specification Section of the PlastiSpan brochure "Building Insulation Foundation Applications - Selection, Application and Specifications" with the following additions:

Asphalt Primer

Asphalt primer conforming to CGSB 37-GP-9M.

Asphalt

Asphalt conforming to CSA A 123.7, Type 2.

Skewers

6 mm (1/4") diameter by 200 mm (8") long hardwood skewers.

INSTALLATION (See Note 1)

On Compacted Granular Fill

Lay PlastiSpan insulation boards in position and hold them in place with 6 mm (1/4") diameter by 200 mm (8") long hardwood skewers driven at an angle of 30°, where necessary.

On Concrete Sub-Slab

Prime sub-slab with asphalt primer and allow drying. Mop slab with hot asphalt and place insulation in asphalt while it is still fluid, butting joints in moderate contact.

Specification Notes

1. Only the installation of the insulation is included in this specification. For operations preceding and following see pages 2 and 3 of this brochure.

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ECP-Certified Insulation