TECH SOLUTIONS 613.0
STYROFOAM™ BRAND HIGHLOAD INSULATION FOR AIRFIELD EMBANKMENTS

INTRODUCTION

Airport runways run the risk of damage in regions where underlying soils are susceptible to seasonal frost heave and spring breakup. Soil and embankment insulation is an ideal means to protect runway construction from the ravages of frost effects. STYROFOAM™ Brand HIGHLOAD Extruded Polystyrene Insulation under airfield embankments can safeguard runways against frost heave or spring thaw weakening.

STYROFOAM™ BRAND HIGHLOAD INSULATION

STYROFOAM™ Brand HIGHLOAD Insulation products are extruded polystyrene foam insulation boards with high compressive strength developed specifically for in-ground applications and freezer floors. STYROFOAM™ Brand HIGHLOAD Insulation features:

- exceptional moisture resistance
- high R-value* retention
- long-term compressive creep and fatigue resistance
- high vertical compressive strength: 40 psi, 60 psi or 100 psi (275 kPa, 415 kPa or 690 kPa)

Like all STYROFOAM™ Brand Extruded Polystyrene Insulation products, STYROFOAM™ Brand HIGHLOAD Insulation is durable, versatile and reusable – making it a preferred choice for a variety of high-load applications. Designed for use in low-temperature applications where moderately heavy loads are expected, STYROFOAM™ Brand HIGHLOAD Insulation is recommended for insulating airfield embankments.

INSULATED AIRFIELD EMBANKMENT, KAPUSKASING, ONTARIO, AIRPORT – 1974

Background

To moderate the effects of airport runway frost heave and spring breakup, the Department of Transport in Ottawa, Ontario, insulated a portion of the Kapuskasing Airport with STYROFOAM™ Brand HIGHLOAD 40 Insulation.** Runway 10-28 at the Kapuskasing Airport suffered extreme frost heaving problems and had a very high water table. The presence of the water table level near the pavement surface was believed to be due to the inability of the granular base layer to drain. A drainage system was built in an attempt to prevent water entering the subgrade, but did not prove effective at preventing frost heave. In fact, every year for the 10 years prior to the implementation of this project, Runway 10-28 had to be closed due to unsafe surface conditions. Some winters, frost heave elevated the runway pavement from 5" to 8" (125 mm to 200 mm), causing rough, hazardous conditions for arriving and departing aircraft.

Project Details

In 1974, the Department of Transport in Ottawa insulated a 232' x 162' (71 m x 49 m) section of Runway 10-28 with STYROFOAM™ Brand HIGHLOAD 40 Insulation.

A 2" (50 mm) thickness of STYROFOAM™ Brand HIGHLOAD 40 Insulation was placed in the central section, which measured 200' x 150' (61 m x 46 m), with 16' (5 m) long transition zones consisting of 1" (25 mm) thick insulation at each end to ensure a gradual transition from uninsulated runway to fully insulated runway. A 1" (25 mm) layer of insulation extended 6' (1.8 m) beyond the edges on both sides of the runway (Figure 1). The subgrade soils at the test site were found to be mainly sandy, clayey silt material that was classified as a CL soil, according to the Unified Soil Classification System.

The insulation was placed on top of roughly 8" (200 mm) sand and then covered with 12" (300 mm) of gravel base and 2" (50 mm) of asphaltic concrete. Site instrumentation consisted of:

- thermistors to measure soil temperatures above and below the insulation
- 3 “Swedish” frost-depth indicators to determine frost-depth penetration

*R means resistance to heat flow. The higher the R-value or RSI, the greater the insulating power. RSI (R-value Système Internationale) is the metric equivalent of R-value.
**STYROFOAM™ Brand HIGHLOAD 40 Insulation was called STYROFOAM™ Brand HI-35 at the time of this test.

STYROFOAM™ Brand HIGHLOAD Insulation for Airfield Embankments

- elevation nails to monitor surface elevation and potential heaving movement during the study
- 4" (100 mm) perforated stand-pipe to measure the level of the groundwater table

The Kapuskasing Airport test site was monitored for two full winter periods from 1974 to 1976. Measured air freezing indices for these two winter periods were 3,134 and 3,841 degree-days °F (1,741 and 2,134 degree-days °C), respectively. The mean air freezing index for the site is 3,440 degree-days °F (1,911 degree-days °C) and mean annual air temperature is 33.4°F (0.8°C). The area is approximately 740' (225 m) above sea level and expected frost penetration below the pavement is generally 8' – 10' (2.4 m – 3.0 m).

Findings

The Kapuskasing Airport Insulated Airfield Embankment study found that:

- STYROFOAM™ Brand HIGHLOAD 40 Insulation reduced the amount of frost heave by one-half to one-third of that measured in the control section in the same area.
- 2" (50 mm) of STYROFOAM™ Brand HIGHLOAD 40 Insulation was effective in reducing frost penetration into the runway subgrade.

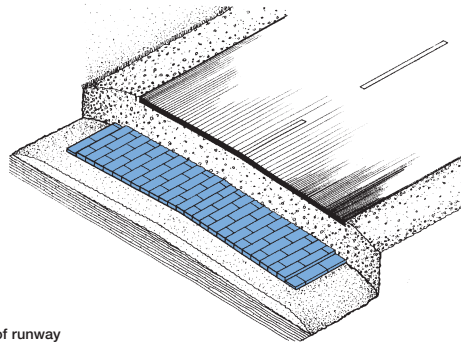
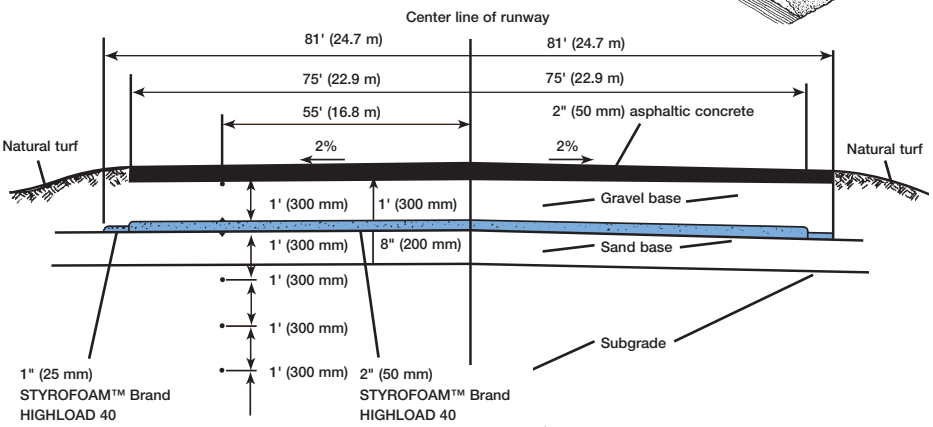


Figure 1



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Republished November 2008

Form No. 178-00760-1108P&M