

TECH SOLUTIONS 612.0 STYROFOAM™ BRAND HIGHLOAD INSULATION FOR PERMAFROST SOILS



PROTECTION ABOVE AND BELOW THE SURFACE

Construction in the Arctic can change the ground surface thermal regime and thaw permafrost soil. This can lead to subsidence and damage of structures built in or on permafrost soils. STYROFOAM™ Brand HIGHLOAD 40, 60 and 100 Extruded Polystyrene Insulation products can prevent the thawing of permafrost so that structural integrity is retained. STYROFOAM™ Brand HIGHLOAD Insulation is a proven economical, long-term solution to ground frost problems.

STYROFOAM™ Brand HIGHLOAD Insulation keeps subgrade soil frozen during the summer to prevent thaw weakening. Soil insulation protects in-ground construction from the ravages of frost heaving and spring breakup. This is done by controlling the transfer of heat from the surface to the permafrost table. When the permafrost melts, it saturates the soil to create thaw weakening conditions that can compromise structures built on these areas. STYROFOAM™ Brand HIGHLOAD Insulation helps prevent the thawing of permafrost during the summer to maintain the load-bearing ability of the subgrade.

Examples of insulated construction in permafrost soils are provided in Table 1. A list of references provides additional information.

TABLE 1: TYPICAL INSULATED CONSTRUCTIONS

Date	Facility	Location	Owner	Comments
1969	Highway ^{1,7}	Chitina, Alaska	Alaska Department of Highways	56 m insulated with 10 mm and 100 mm STYROFOAM™ Brand HIGHLOAD 40*
1969	Airport Runway ⁴	Kotzebue, Alaska	Alaska Division of Aviation	648 m runway insulated with 100 mm STYROFOAM™ Brand HIGHLOAD 40
1969	Building ³	Inuvik, Northwest Territories	Imperial Oil	Two layers of 50 mm STYROFOAM™ Brand Insulation under floor slab with cold air ducts
1972	Building	Inuvik, Northwest Territories	Okanagan Helicopters Ltd.	STYROFOAM™ Brand Insulation under floor slab with cold air ducts
1972	Building	Inuvik, Northwest Territories	R. Angus Alberta Ltd.	STYROFOAM™ Brand Insulation under floor slab with cold air ducts
1972	Culverts	Inuvik Airport, Northwest Territories	Transport Canada	Two culverts each 76 m long and 0.6 m diameter with 75 mm STYROFOAM™ Brand HIGHLOAD 60
1972	Highway ²	Inuvik, Northwest Territories	Dept. of Indian & Northern Affairs	Winter and summer sections built along Mackenzie Highway
1973	Buildings	Asbestos Hill Mine, Québec	Asbestos Corp. Ltd.	Four buildings (total floor area 929 m ²); 100 mm HD-300, 75 mm STYROFOAM™ Brand HIGHLOAD 60
1973	Airport Runway	Resolute Bay, Northwest Territories	Transport Canada	15 m x 15 m insulated with 50 mm STYROFOAM™ Brand HIGHLOAD 60
1974	Fuel Storage Tank ⁹	Inuvik, Northwest Territories	Northern Canada Power Commission	Two 100 mm layers, each made of two layers of 50 mm STYROFOAM™ Brand HIGHLOAD 60, and partial layer between ducts under 30.8 m diameter tank
1974	Highway ¹	Alder Creek S., Alaska	Alaska Department of Highways	0.2 km of 100 mm STYROFOAM™ Brand HIGHLOAD
1974	Highway ¹	Alder Creek N., Alaska	Alaska Department of Highways	0.12 km of 100 mm STYROFOAM™ Brand HIGHLOAD
1975	Work Pad ^{5,6}	North of Brooks Range, Alaska	Alyeska Pipeline Service Co.	240 km length and width 200 m to 275 m; portion used 75 mm and portion used 38 mm STYROFOAM™ Brand HIGHLOAD 40
1978	Railroad	Fairbanks, Alaska	Alaska Railroad	Total 127 m in two sections using 50 mm, 75 mm and 100 mm STYROFOAM™ Brand HIGHLOAD 60
1978	Airstrip ¹⁰	Tunalik, Alaska	Husky Oil Ltd.	1.6 km long x 45.7 m wide using 50 mm STYROFOAM™ Brand HIGHLOAD 60
1978	Airstrip ¹⁰	Inigok, Alaska	Husky Oil Ltd.	1.6 km long x 45.7 m wide using 75 mm STYROFOAM™ Brand HIGHLOAD 60

*The product STYROFOAM™ Brand HIGHLOAD 40 Insulation was called STYROFOAM™ Brand HI-35 at the time of this installation.

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STYROFOAM™ BRAND HIGHLOAD INSULATION FOR PERMAFROST SOILS

STYROFOAM™ Brand HIGHLOAD Insulation products provide excellent compressive strength, very low water and moisture absorption and possess one of the highest thermal resistance values available today – the properties necessary for long-term performance in soil performance applications.

TABLE 1: CONTINUED

Date	Facility	Location	Owner	Comments
1978	Highway	Inuvik, Northwest Territories	Town of Inuvik	Insulation of main street of town
1979	Airstrip ¹⁰	Lisbourne, Alaska	Husky Oil Ltd.	45.7 m x 1.6 km using STYROFOAM™ Brand HIGHLOAD 60
1981	Airstrip ¹	Buckland, Alaska	Alaska Department of Transportation	731 m of 150 mm STYROFOAM™ Brand HIGHLOAD 40
1981	Airstrip ¹	Deering, Alaska	Alaska Department of Transportation	823 m of 50 mm STYROFOAM™ Brand HIGHLOAD 40
1984	Buried Utilidor ⁹	Barrow, Alaska	City of Barrow, Alaska	100 mm of STYROFOAM™ Brand HIGHLOAD
1985	Airstrip ¹	Deadhorse, Alaska	Alaska Department of Transportation	110 m of 50 mm STYROFOAM™ Brand HIGHLOAD 60
1985	Airstrip ¹	Nunapitchuk, Alaska	Alaska Department of Transportation	838 m of 150 mm STYROFOAM™ Brand HIGHLOAD 60
1990	Airstrip	F.O.I., Inuvik, Northwest Territories	Dept. of National Defense	50 mm STYROFOAM™ Brand HIGHLOAD 60

The selected references listed below contain documentation of the performance of insulated structures on permafrost.

- Esch, David C., *Insulation Performance Beneath Roads and Airfields in Alaska*. Alaska Department of Transportation and Public Facilities, Fairbanks, Alaska, 1986.
- Johnston, G.H., *Performance of an Insulated Roadway on Permafrost. Inuvik, NWT*. National Research Council Canada. Permafrost: Fourth International Conference, Fairbanks, Alaska, 1983.
- Auld, R.G., R.J. Robbins, L.W. Rosenegger and R.H.B. Sangster., *Pad Foundation Design and Performance of Surface Facilities in the Mackenzie Delta*. Imperial Oil, Calgary, 1974.
- Esch, David C. and James J. Rhode., *Kotzebue Airport Runway Insulation Over Permafrost*. Second International Symposium on Cold Regions Engineering. University of Alaska, Anchorage, 1976.
- McPhail, James F., William B. McMullen and Allan W. Murfitt, *Yukon River to Prudhoe Bay Highway – Lessons in Arctic Design and Construction*. Civil Engineering-ASCE February, 1976 Ed.
- Metz, Michael C., Thomas G. Krzewinski and Edwin S. Clarke, *The Trans-Alaska Pipeline System Workpad – An Evaluation of Present Conditions*. 4th Canadian Permafrost Conference, 1982.
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- Arctic Town Gets Royal Flush*. Engineering News Record ENR. January 5, 1984 Ed.
- Davison, D.M. and R.C. Lo., *Preservation of Permafrost for a Fuel Storage Tank*. 4th Canadian Permafrost Conference, 1982.
- Crory, Frederick E., *Design and Construction of Temporary Airfields in the National Petroleum Reserve-Alaska*. The Northern Engineer, Vol.10, No. 3., 1980.

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Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mold formation. No material supplier including Dow can give assurance that mold will not develop in any specific system.

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