STYROBAR®
Expandable Polystyrene (EPS)
FOR CONSTRUCTION APPLICATIONS

AMC
Foam Technologies Inc.

STYROBAR®

WHAT IS STYROBAR® EPS?

STYROBAR® is an Expandable Polystyrene Insulation (EPS) manufactured by AMC Foam Technologies Inc. Our manufacturing facility is located in Winnipeg, Manitoba. The name STYROBAR® has been registered for our trademark name of block moulded and shape moulded products.

Stryrobar is manufactured from expandable polystyrene resin (bead like granuals) containing a blowing agent and flame-retardant produced by polymerization of styrene monomer with the additive of pentane. Steam heat expands the blowing agent to produce moisture resistant, multi-cellular particles (pre-expanded beads), which can increase up to 40 times their volume during the process.

After an intermediate period of aging during which osmosis occurs meaning the beads loose their miosture while the blowing agent condenses out of the bead as air diffuses into the bead. After the bead has stabalized they are thermally fused into blocks (block moulding) or different three dimensional shapes (shape moulding). Blocks are cured and then cut into sheets or shapes as required.

The special production process makes it possible to vary the apparent density of the STYROBAR® within a wide range. As the physical properties of the foam depend substantially on the apparent density, STYROBAR® can be produced with a variety of qualities suited to particular applications ranging from insulating boards to lightweight structural units. Densities can range from 10 grams per litre (0.6 pounds per cubic foot) to 48 grams per litre (3.0 pounds per cubic foot).

GENERAL APPLICATION

STYROBAR® EPS in whatever size and thickness required, is used for roofing, walls, foundations, and perimeter insulation with relative ease regardless of the structural system or exterior finish.

INDUSTRY ACCEPTANCE

Since 1951, EPS has been one of the most widely used thermal insulations in the world and is applied increasingly in architecturally designed energy-efficient buildings. Its low cost, versatility and high R-value per dollar make EPS insulation the preferred product of architects, specifiers and application contractors across the country. It is recyclable, has no CFC's or HCFC'S.

Construction today and in the future is and will be characterized substantially by requirement for energy savings, noise insulation, environmental protection, LEED certification, etc.

Virtually all industrialized countries today have statutory minimum requirements for the structural thermal insulation of heated and air-conditioned buildings. Now, even in countries with moderate to tropical climates, a comparatively high level of construction thermal insulation is prescribed, as in the case in countries with relatively low winter temperatures. This is due to the fact that in these countries summer thermal insulation – namely the energy lost in the air-conditioning of a building on hot summer days is greater than that in the heating of buildings with cold out-side temperatures in winter.

STYROBAR® PRODUCTS

TYPES AND SIZES

STYROBAR® 16 and 22 are available in all standard sizes starting at 1/2" thick to 30" in 2'x 4', 2'x 8', or 4'x 8' sheets.

STYROBAR® is available with either a butt edge or ship lap edge, and can be ordered with recessed cut-outs on 16" or 24" centers for 1"x 3", 1"x 4" or 2"x 4" dimensional lumber. All products are poly wrapped for ease of handling and shipping.

AVAILABILITY

STYROBAR® insulation is manufactured by AMC Foam Technologies Inc. in Winnipeg, Manitoba. It is readily available for prompt delivery. Offered is one bundle or full truckload lots. Manitoba, Saskatchewan, Northwest Ontario, and the upper mid-USA States are easily accessed from our Winnipeg manufacturing facility.

Contact AMC Foam Technologies Inc. for a list of local distributors.

PARTIAL LIST OF PRODUCTS

Insulworks® for radiant floor heating, Frost Cushion® and StyroVoid® for grade beam void forming systems, pipe insulation, Freshpac® coolers for food and fish, LOGIX® insulated concrete forms.

BUY WITH CONFIDENCE

In Canada, STYROBAR® 16 and 22 comply with CAN/CGSB 51.20-M87, revised to CAN/ULC S701-97 in 1998. STYROBAR® 16 is a Type 1, STYROBAR® 22 is a Type 2. All STYROBAR® products are third party certified by ITS Warnock Hersey to meet or exceed these standards.

CANADIAN APPLICATION STANDARDS CAN/ULC S701-97 PHYSICAL PROPERTIES

PROPERTY	UNITS	REQUIREMENTS			TEST METHOD
		TYPE 1	TYPE 2	TYPE 3	
Thermal resistance (R-value)	$m^2 \bullet °C$ (W•25mm)	0.65	0.70	0.74	ASTM C518
Minimum at 24°C (75°F)	$ft^2 \bullet hr \bullet °F$/ (BTU•in)	3.75	4.04	4.27	ASTM C518
Water Vapour Permeance**	n/g(Pa•s•m^2)	300	200	130	ASTM E96
Maximum	perms	5.2	3.2	2.3	ASTM E96
Dimensional Stability	% linear change	1.5	1.5	1.5	ASTM D2126
Maximum					7 Days @ 70±2C°C
Flexural Strength	kPA	170	240	300	ASTM C203
Minimum	psi	25	35	44	Procedure B
Water Absorbtion	% by volume	6.0	4.0	2.0	ASTM
Maximum					D2842
Compressive Strength	kPA	70	110	140	ASTM D1621
Minimum @10% Deformation	psi	10	16	20	Procedure A
Limiting Oxygen Index	%	24	24	24	ASTM
Minimum					D2863

** The test methods used to determine the above material properties provide a means of comparing different cellular plastic thermal insulations. They are intended for use in specifications, product evaluations and quality control.

U.S.A. APPLICATION STANDARDS

In the U.S.A. the American Society for Testing and Materials (ASTM) has developed the Standard Specification for Rigid Cellular Polystyrene Insulation Thermal Insulations, C578. This guide provides EPS manufacturers as well as specifiers with the types, properties, dimensions, sampling and test procedures, and ordering instruction for EPS foam insulation. The table indicates the minimal requirements for each classification. Specifiers utilize this information to accurately determine the type of EPS needed to meet the required energy codes, thus manufacturers can easily provide the appropriate product without confusion or problems.

STYROBAR® 16 complies as Type I and STYROBAR® 22 complies as a Type II to ASTM C578..

ASTM C578 PERFORMANCE REQUIREMENTS FOR PHYSICAL PROPERTIES

CLASSIFICATION	TYPE XI	TYPE I	TYPE VIII	TYPE XII	TYPE X	TYPE II	TYPE XIII	TYPE IV	TYPE IX	TYPE VI	TYPE XIV	TYPE VII	TYPE V
Compressive resistance at yield or 10% deformaton, whichever occurs first Ù (with skins intact), min, psi (kPa)	5.0 (35)	10 (69)	13.0 (90)	15.0 (104)	15.0 (104)	15.0 (104)	20.0 (138)	25.0 (173)	25.0 (173)	40.0 (276)	40.0 (276)	60.0 (414)	100.0 (690)
Thermal resistance of 1.00-in. (25.4 mm) thickness, min., F-ft²•h/Btu (K-m²/W)													
Mean temperature: 75±2°F (24±1°C)	3.10 (0.55)	3.60 (0.63)	3.80 (0.67)	4.60 (0.81)	5.00 (0.88)	4.00 (0.70)	3.86 (0.68)	5.00 (0.88)	4.20 (0.74)	5.00 (0.88)	4.20 (0.74)	5.00 (0.88)	5.00 (0.88)
Flexural strength, min psi (kPa)	10 (70)	25.0 (173)	30.0 (208)	40.0 (276)	40.0 (276)	35.0 (240)	45.0 (310)	50.0 (345)	50.0 (345)	60.0 (414)	60.0 (414)	75.0 (517)	100.0 (690)
Water vapor permeance of 1.00-in. (25.4•mm) thickness, max, perm (ng/Pa•s•m²)	5.0 (287)	5.0 (287)	3.5 (201)	1.5 (86)	1.5 (86)	3.5 (201)	1.5 (86)	1.1 (63)	2.5 (143)	1.1 (63)	2.5 (143)	1.1 (63)	1.1 (63)
Water absorption by total immersion, max, volume %	4.0	4.0	3.0	0.3	0.3	3.0	0.5	0.3	2.0	0.3	2.0	0.3	0.3
Dimensional stability (change in dimensions), max. %	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Oxygen index, min, volume %	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Density, min, lb/ft³(kg/m³)	0.70 (12)	0.90 (25)	1,15 (18)	1.20 (19)	1.30 (21)	1.35 (22)	1.60 (26)	1.55 (22)	1.80 (29)	1.80 (29)	2.40 (38)	2.20 (35)	3.00 (48)

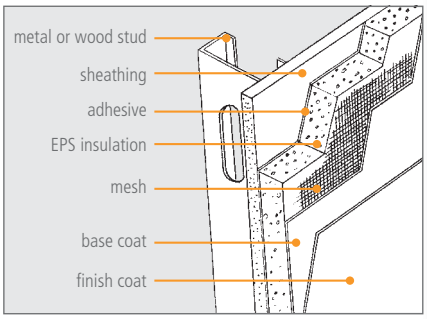
EPS insulation may be manufactured to meet or exceed the requirements of ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation and applicable building codes. For more information about ASTM C578-04. Please refer to the standard in its whole.

CONSTRUCTION WITH STYROBAR®

APPLICATIONS AND USES

STYROBAR® can be used on roofs, under both conventional built-up and single ply membranes. Panels can be produced in flat or tapered configurations that will provide slope-to-drain. STYROBAR® is also used in walls, under slabs and as perimeter insulation for grade beams, foundation walls and buried in soil for shallow foundation designs. STYROBAR® is available in "NR" grade, which is conditioned and sized expressly for exterior insulated finish systems. STYROBAR® is resistant to soil weight and pressure, and can be specified for all below-grade applications. The following is a sampling of common applications.

- above-grade cladding under stucco, siding
- masonry cavity walls
- exterior insulated finish systems (E.I.F.S.)
- conventional and slope-to-drain roofing
- floatation applications
- under concrete slabs on grade
- grade beams, foundation walls, shallow foundations
- coolers, freezers, and ice arenas
- hot tub covers
- packaging, protection, container linings



Typical frame construction.

EARTHWORK/GEOFOAM

The special properties of the closed-cell foamed plastic, such as stability and durability, immunity to moisture and ground bacteria and good thermal insulation, have resulted in rigid foam boards being used as a frost-protecting layer in road and railroad construction. This application, in use since 1968, particularly in Scandinavian countries, provided the basis for a new method of construction, developed in Norway in 1972 and applied successfully in other countries as well: the use of STYROBAR® blocks as a load distributing substructure for road and bridge approach ramps in areas with poor load-bearing soil conditions. In such regions, major settlement of the pavement structure had occurred over the years, requiring expensive renovation work. Use of STYROBAR® rigid foam blocks provided a solution: assuming an apparent density of at least 20 kg/m3, these blocks offered the necessary strength properties. The slab stock foam's high bending and shear strength make good pressure distribution possible on muddy ground, and the lightweight structure permanently prevents the road from sinking.

Claw plates, tacked up to a height of 10 m, secure the rigid foam blocks against slipping. A 10 cm, steel-meshed reinforced trick layer of concrete is applied before paving.

This construction method has been applied very successfully in Canada, the U.S. and Japan for a number of years.

SUPERIOR CHARACTERISTICS

PERMANENT INSULATION VALUE:

STYROBAR® EPS Types 1 and 2 tested at 75ºF (24ºC), provide typical permanent R-values (see table of Typical Physical Properties), STYROBAR® insulation's R-value is permanent thanks to its unique cellular structure, which contains only stabilized, entrapped air. Aging has no effect whatsoever upon STYROBAR® performance.

MOISTURE RESISTANCE:

Of all plastic polymers used for insulation applications STYROBAR® EPS is among the most resistant to the adverse effects of moisture, and has good moisture resistance properties for use in construction. Though its vapor transmission property is moderately low, STYROBAR® EPS is not a vapor barrier; it is reactively permeable. Its uniform cellular closed-cell structure allows the diffusion of moisture/water. Because STYROBAR® EPS will not trap water vapor within the exterior walls, it needs no costly venting as do some of the other relatively impermeable insulation materials. Condensation, which may build up within any insulation materiel under critical vapor flow conditions, only marginally affects Strybor EPS's thermal performance.

FREEZE/THAW RESISTANCE

As part of the Housing and Urban Development Association of Canada's (HUDAC) overall program to evaluate below-grade foundation insulation techniques, a test procedure was developed to define effects of freeze/thaw exposures. Properly fused Type 1 EPS was exposed to freezing action and thawing in a 4% sodium chloride salt solution for 50 cycles. The salt solution added severity to the test. Test results after 50 cycles of freeze/thaw revealed no effect on the exposed EPS board cell structure or structural integrity. Also, where a cementitous protective finish was used, no delamination occurred between the finish and EPS insulation. Furthermore, an EPS sample removed from an aged, existing freezer wall proves the EPS withstands freeze/thaw cycling without loss of structural integrity or physical properties.

STRENGTH

Under normal use conditions, the compressive strength provided by Type 1 STYROBAR® EPS board usually exceeds most design requirements. Depending on load conditions and need for rigidity and long-term compressive strength, a denser Type 2 or Type 3 EPS board provides reasonable absorption of building movement without transferring stress to the outer facings at joints.

MATERIAL PERMANENCE

STYROBAR® EPS insulation is an inert, organic material. It provides no nutritive value to plants, animals or micro-organisms. It will not rot and is highly resistant to mildew.

LOW TOXICITY

Extensive test programs have been conducted to determine if thermal decomposition of expanded polystyrene (EPS) present a toxic hazard. From a report by the National Research Council in Ottawa, relating to a flammability test on polystyrene: "The maximum toxicity index obtained from the combustion of polystyrene was of the same order as that from wood. Thus, on a weight basis, the potential hazard due to toxic combustion is about the same as that from wood."

LIMITATIONS

FLAMMABILITY CHARACTERISTICS

Like many construction materials in use today, STYROBAR® EPS insulation, as all other organic materials manufactured from expandable polystyrene beads must be considered combustible when directly exposed to high-heat energy or to massive, continuous fire sources. Please refer to national building codes or more rigorous construction practice or standards enforce at the place of use.

SOLVENT ATTACK

STYROBAR® EPS is subject to attack by petroleum-based solvents. Care should be taken to prevent contact between STYROBAR® EPS and these solvents or their vapors.

VAPOUR BARRIERS

Although STYROBAR® EPS provides a high level of moisture resistance and moderate water vapor permeability, normal design practices should be followed in the selection of vapor and moisture barriers for severe field exposures.

ULTRA VIOLET DEGRADATION

Prolonged exposure to sunlight will cause dusting of STYROBAR® EPS insulation. The insulating properties will not be significantly affected unless exposure is so extensive that thickness is lost. To prevent ultraviolet degradation, installed STYROBAR® EPS insulation should be covered as soon as possible.

STYROBAR® AND ITS IMPACT ON THE ENVIRONMENT

In principle, there are no problems in recycling or disposing of scrap from STYROBAR® foamed plastic. It does not give off any harmful substances in air, water or soil and so is suitable for whatever method of recycling or disposal to be chosen.

RECYCLING

Within certain limits, clean, grounded foam scrap can be reused in moldings or slabstock. AMC makes use of this cost-effective possibility.

GRINDING

The grinding of used STYROBAR® foamed products produces an additional product: loosefill is the flake size aimed for ranges from 4 to 25 mm. Loosefill is a soil additive that is used to improve substrates and soil, as a composting additive, as a filter material in pipe drainage, and as a filler material in slot drainage, and as a loosefill insulation.

MELTING

STYROBAR® formed plastics are thermoplastics that can be converted by simple melting processes into the compact starting product polystyrene.

INCINERATION

STYROBAR® foamed plastics can be burned in municipal refuse incinerators at the usual temperatures (about 1000°C) if an adequate supply of air is provided. This applies in particular to scrap in a coarsely reduced form and mixed with other types of scrap. When STYROBAR® foam scrap with fire retardant is incinerated, the small quantities of halogen compounds do not cause any measurable changes in the composition of the fumes.
The toxicity of the gas from burning and low temperature carbonization is lower than, for example, that of the same amount of wood or cardboard. The high energy content of STYROBAR® foamed plastics reduce the need for additional firing. In large-scale processing plants, the foam scraps also can be used to generate steam, provided the steam generator is equipped with a special combustion chamber and special control devices. STYROBAR® foam scrap must be burned outdoors due to the considerable formation of soot.

DUMPING

There are no problems in depositing the scrap at properly organized refuse dumps. However, the scrap should be reduced. This saves space, avoids the formation of air pockets and facilities compaction. The foam scrap improves the airing of the dump and thus contributes to a faster degradation of the organic substances dumped with it. This summary illustrates three positive aspects in the handling of STYROBAR® foam scrap:

- The conversion of used foamed recycled polystyrene, produced new saleable products from scrap.
- The high heating energy of the materials can be used cost effectively in refuse incinerators or special combustion chambers.
- If disposed of properly, no environmental pollutions is likely.

THE OZONE LAYER

The EPS foamed product manufactured by AMC does not, and never has, contained any CFC (hydro chlorofluorocarbons) products known to deplete the ozone layer.

RESEARCH AND DEVELOPMENT

The strength of AMC Foam Technologies Inc., lies not only in its product know how but also in its comprehensive knowledge of product processing and applications. Providing technical counsel and assistance to our customers – ranging from questions of construction, packaging design and calculation is also one of our strong points.

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PS (100%)

AMC Foam Technologies Inc. is an ISO9001 designated company

Further information: this brochure provides only a broad outline of STYROBAR® foamed plastics' many applications. Detail on application techniques, structural engineering and construction physics are contained in the "Technical informations" publications published by AMC as well as documents put out by expanded polystyrene resin manufactures. STYROBAR® is a registered trademark, owned by AMC Foam Technologies Inc.

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