

- 01 INSULATION - RIGID CLASS URETHANE FOAM FOR STEEL TANKS AND VESSELS
WITH OPERATING TEMPERATURES BETWEEN 70° F. AND 220°F.
- 02 SCOPE: Materials, equipment and installation procedures.
- 03 REGULATIONS, as follows, form an integral part of this specification:
-Industrial Insulation Committee, Cellular Plastics Division,
The Society of the Plastics Industry, Inc.
-American Society of Testing Materials
-Underwriters' Laboratories
-Manufacturing Chemists Association, Inc.
Pictorial Surface Preparation Standards
-Steel Structures Painting Council
SSPC - VISI - 67T
- 04 MATERIALS shall be identified and handled in strict accordance with
Section III of "A Guide for the Spray-In-Place Application of Rigid
Urethane Foam" per Industrial Insulation Committee, Cellular Plastics
Division, The Society of the Plastics Industry, with Chemical Safety
Data Sheet SD-73 per reference Paragraph 03, and with manufacturer's
instructions.
- 041 INSULATION shall be rigid class urethane foam with minimum properties
as follows:
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|--|------------------------|
| Nominal density, lbs/cubic foot
(ASTM D-1622-63) | 2.0 |
| Thermal conductivity, btu/hr/sq.ft/°F./m.
"Aged", AST, C 177 | 0.16 |
| Closed cell content, %
ASTM D-1940 | 90 |
| Water vapor transmission, perm-in
ASTM C355 | 3 |
| Water absorption, lbs/sq.ft.
ASTM D-2127 | 0.045 |
| Flammability
ASTM 1692-67T | Self-
Extinguishing |
| Flame Spread
ASTM E-84 | 25 |
| Compressive strength, 5% deflection, PSI
Parallel to foam rise
ASTM D-1621 | 22 |

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Foam systems approved for use under this standard include:

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| <p>1. Isofoam SS-0011A/12B
Witco Chemical Co.
Isocyanate Products Division
New Castle, Del. 19720</p> | <p>3. Retrofoam 25000/293
Hooker Chemical Corp.
Durez Division
N. Tonawanda, NY 14120</p> |
| <p>2. Isonate CPR 425
Upjohn Company
CPR Division
Torrance, CA 90503</p> | <p>4. Owens-Corning F/S 25
Owens-Corning Fiberglass Corp.
Fiberglass Tower
Toledo, Ohio 43659</p> |

Foam systems not listed may be approved by PPG Industries, but only upon submission of data which shows they meet the required minimum properties.

- 042 SEALANT shall be Elastolar 95-46 Sealant (Butyl rubber) as manufactured by Foster Division, Amchem Products, Philadelphia, PA, or other elastomeric sealant specifically approved by PPG Industries
- 043 PROTECTIVE AND BARRIER COATING shall be Jaxsan 601, manufactured by Plastic Coating Corporation, Charleston, W. Va. or other coating specifically approved by PPG Industries.
- 044 PRIMER shall be zinc rich polyamide-epoxy, PPG Industries' Aquapon Zinc-Rich Primer, UC-40059.
- 05 TANK METAL PREPARATION shall conform to Specification SP6-63 Commercial Blast Cleaning per reference Paragraph 03.
- 051 APPEARANCE of the surface after commercial blast cleaning shall correspond to Pictorial Standards BSa2, for partially rusted mill scale, and CSa2, for completely rusted mill scale, DSa2, for completed rusted and pitted surfaces, as shown in SSPC Vis 1-67T per reference Paragraph 03.
- 052 COMMERCIAL BLAST CLEANING shall NOT be conducted when the steel surface is less than 5°F. above the ambient dew point.
- 053 PRIME COATING shall be applied as soon as possible after blast cleaning, the time interval is dependent on environmental conditions, but shall NOT be greater than twenty-four hours. Under NO circumstances shall the steel be permitted to rust before painting, regardless of the time elapsed.
- 054 METAL PRIME COATING shall be applied using airless spray equipment. Equipment and application procedures shall conform to recommendations of PPG Industries, Inc. for Aquapon Zinc Rich Primer.
- 055 THICKNESS of prime coating shall be 2 mils dry film.
- 056 DRYING TIME of 72 hours minimum shall be allowed before application of insulation.

- 06 APPLICATION of rigid urethane foam system shall conform to the manufacturer's technical specification for application to bare metal substrate.
- 061 THICKNESS OF FOAM shall be as specified by PPG Industries. Thickness tolerance shall be minus 0%, plus 25%.
- 062 ROOFS of tanks or vessels, externally supported, shall be insulated to be free draining. The minimum insulation thickness over support members shall be 1".
- 063 APPLIED foam shall have a smooth, even monolithic skin surface free of excessive "orange peel" and having no "tree bark" or "popcorn" surfaces, blisters, delaminations, or other obvious imperfections in workmanship. Such imperfections as well as, damaged areas, breaks, "pin holes", or openings in the monolithic skin, shall be cut out and reinsulated.
- 064 SURFACE shall be dry when foam is applied. Foam shall NOT be applied during periods of rainfall or other visible precipitation. Foam work done on subsequent days or after interruption by rainfall shall proceed only after surfaces have been carefully inspected to be certain they are dry.
- 065 FEATHER SPRAY leveling is acceptable, however, maximum adjustment of thickness shall be 1/2 inch or less.
- 066 INSPECTION by PPG Industries, Inc.'s designated inspector shall include checks for insulation thickness with a wire gauge. When tests indicate insufficient thickness, additional insulation shall be applied.
- 07 EQUIPMENT used to spray apply rigid urethane foam shall incorporate the following features:
- 071 METERING PUMPS shall be synchronized with the action of the spray gun to eliminate excessive pressure build-up or material surging when spray gun is triggered.
- 072 MATERIAL component ratios of $\pm 5\%$ by weight shall be maintained.
- 073 PRESSURIZED FEED TANKS OR POSITIVE TRANSFER PUMPS shall be used to feed the metering pumps.
- 074 SPRAY GUN shall be internal mix type.
- 075 SPRAY GUN shall have positive shut-off at the gun.
- 076 SPRAY GUN shall be self-cleaning type.
- 077 MATERIAL TEMPERATURE shall be controlled throughout the system.
- 078 NITROGEN shall be high purity, dry type.

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- 08 AT PROTRUSIONS through the insulation, such as pipes, supports, etc., rough foam shall be trimmed. Crevices shall be sealed with elastomeric sealant, which shall also be used at the point of union between the protrusion and the foam to form a water shed away from the protrusions.
- 09 THE PROTECTIVE AND BARRIER COATING shall consist of one coat. It shall be applied as soon as possible after the foam has been applied. No foam shall be exposed to sun and weather for more than four days before being coated.
- 091 APPLICATION of the protective and barrier coating shall be as specified by Plastic Coatings Corporation, P. O. Box 4107, Charleston, WVA 25304.
- 092 THICKNESS of coating shall be 50 mils dry (5 gallons per 100 square feet).
- 093 BREAKS, pinholes, skips, or post application damage incurred by removal of scaffolding or other cause shall be repaired before protective coating will be accepted by PPG Industries, Inc.
- 11 SAFETY PROCEDURES shall conform to Section VII of A GUIDE FOR THE APRAY-IN-PLACE APPLICATION OF RIGID AND SEMI-RIGID URETHANE FOAM per reference paragraph 03.

- * 111 All employees using spray equipment or in the immediate vicinity of spray application shall observe the following regulations.¹

"Personnel who will work with or be exposed to polyurethane or polyisocyanurate components should have a complete physical examination before and periodically during such exposure. Personnel with a medical history of chronic respiratory disease, asthmatic or bronchial attacks or indications of allergic responses should not be permitted to handle or work with polyurethane or polyisocyanurate components. Because of the reported possible development of sensitivity to any isocyanate, workers who develop chronic respiratory distress while working with these materials should be removed from further exposure and examined by a physician.

Whatever the mode of contact (respiration; ingestion or absorption through intact skin) with toxic materials, the ease with which excessive amounts may be contacted is more important than the toxicity alone. Toxicity is not a measure of the "practical hazard." The practical hazard is determined by the physical, chemical and physiological properties of a substance plus the circumstances of use (or misuse).

MDI and polymeric isocyanates are lesser practical hazards than TDI because their volatility is considerably lower than that of TDI, and at normal room temperatures they are virtually without vapor hazard. Avoidance of polyurethane systems containing high concentrations of free TDI and substitution of less volatile systems are useful and practical preventative measures.

The practical hazard associated with pour-in-place or frothing applications of polyurethane systems differs from that associated with spray applications. Whereas pour-in-place or frothing may generate only hazardous vapors, spraying can also generate an aerosol containing considerable quantities of isocyanate-polyurethane particulate droplets. This cloud of fine, respirable particles can travel considerable distances from the spraying point.

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During any urethane or isocyanurate operation, adequate mechanical ventilation is essential to maintain concentrations of hazardous vapors well below the acceptable limits. All operations involving the production of such vapors should be enclosed and ventilated.

Maintaining hazardous vapor concentrations at a safe level can be accomplished by providing exhaust ventilation at areas where the concentration of vapors will be high, such as unloading stations, prepolymer preparation vessels, mixing equipment, pouring stations and waste disposal points. Downdraft ventilation is preferable in order to avoid drawing vapors through the breathing zone. The hood faces should be located below the workers' breathing zone. Exhaust ducts should discharge at an adequate height above the building so that exhaust vapors cannot circulate to any work area. Fresh air intakes should be located where exhaust gases cannot contaminate the supply. Periodic maintenance checks should be made to insure proper operation of exhaust equipment. OSHA and local air-pollution regulations should be consulted.

Since all concentrations of isocyanate vapors that have a detectable odor are in at least a ten-fold excess of the absolute maximum acceptable level, quantitative testing of the work area is necessary. Instead of dependence on human detection, periodic or preferably continuous air sampling is required.

Personal protective equipment should not be used as a substitute for adequate engineering control, but should supplement it in protecting personnel. Employees will work far more efficiently in an area specifically designed and engineered for using polyurethane systems than they will in personal face masks. However, in certain circumstances or operations, it is difficult or impossible to institute engineering controls and personnel safety must be predicated on proper utilization of personal protective equipment.

All personnel handling isocyanates in open containers and those working in pouring or frothing areas should wear chemical-type safety goggles or face shields to guard their eyes against accidental splashes or spills. However, goggles or face shields will NOT prevent eye irritation from hazardous vapors.

If prolonged or repeated skin contact with urethane components cannot be prevented, skin protection should be worn. The three principal reasons for skin protection during pouring and particularly during spraying operations are: 1) to protect against isocyanates, solvents, catalysts and polyols used in the operation; 2) to protect against polyurethane over-spray and mist which is difficult to remove; and 3) to protect against the heat of polymerization which may be sufficient to cause primary irritant dermatitis and burns if the liquid mixture comes in contact with the skin.

Mechanical, rather than toxicological considerations dictate the type of respiratory equipment which may be used for short-term exposure when adequate ventilation is not available. Type B (closed) cannister gas masks containing activated carbon afford effective protection during normal pouring and handling operations. The cannister should be checked and replaced periodically.

Spraying of polyurethane foam may result in relatively high concentrations of hazardous vapors and mist. Therefore protection of the eyes and respiratory passages by positive pressure air-supplied masks or hoods is mandatory. Air may be supplied from a tank (self-contained breathing apparatus) or from

a diaphragm compressor and must be oil free. Cannister masks are NOT recommended for spray operations because over-spray and particulate mist may plug the respirators and quickly render them ineffective.

It is strongly recommended that all areas wherein polyurethane components, particularly isocyanates, are handled, be equipped with eyewash fountains and safety showers and that all personnel in these areas be trained in their use."

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- 112 SPACE HEATING EQUIPMENT shall NOT be used within 150 feet of spray operations without prior written approval of PPG Industries, Inc. designated safety personnel.

END

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