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“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangthan
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 12432-3 (2002): Application of Spray Applied Insulation
- Code of Practice, Part 3: Polyurethane/Polyisocyanurate
[CHD 27: Thermal Insulation]
AMENDMENT NO. 1 MARCH 2007
TO
IS 12432 (PART 3) : 2002 APPLICATION OF SPRAY
APPLIED INSULATION — CODE OF PRACTICE
PART 3 POLYURETHANE/POLYISOCYANURATE

(Page 3, clause 6.11) — Substitute the following for the existing clause:

6.11 General

6.11.1 In all cases of overdeck insulation where there is a parapet wall or an
upstand around the roof, effectiveness of junction between roof and vertical
portion would be ensured by continuing the treatment to a vertical extension of
0.5 m, Min around the roof perimeter. Such extra area are to be measured.

6.11.2 For treatments on vertical areas of overdeck insulation, a multiplication
factor of 1.2 shall be applied to the actual area to account for rebound losses/
over thickness.

6.11.3 To account for excess rebound losses in underdeck PUR/PIR Spray in-
situ application, measured area shall be subject to a multiplication factor of 1.4.

6.11.4 Spray treatment is applied as a continuous treatment and hence no
deductions shall be made in measurements for cutouts having area of one
square metre or less.

(Page 4, clause 6.12) — Delete the clause.

(Page 4, clause 6.12.1) — Delete the clause.

(Page 4, clause 6.12.2) — Delete the clause.

(CHD 27)

Reprography Unit, BIS, New Delhi, India
Thermal Insulation Sectional Committee, CHD 27

FOREWORD

This standard (Part 3) was adopted by the Bureau of Indian Standards, after the draft finalized by the Thermal Insulation Sectional Committee had been approved by the Chemical Division Council.

Rigid urethane foam is a generic name given to polyurethane (PUR) or polyisocyanurate (PIR) rigid foam. These are high efficiency thermal insulation material suitable for use on surfaces operating within the temperature range of -180 to 110 °C for PUR and -180 to 140 °C for PIR. When applied by spray application processes, the service temperature range is restricted to -30 to +120 °C for both the materials.

Some conspicuous features of spray polyurethane foam insulation are:

a) the component raw materials are in liquid form which are relatively stable by themselves and afford acceptable shelf life.

b) the process of manufacture does not involve application of external heating or development of high temperatures in the enclosure where the material is getting formed as in-situ insulation.

c) since it is applied as a liquid, urethane spray applied conforms closely to any contour.

These features are exploited in in-situ spray application.

This technique is a preferred method adopted for many thermal insulation application, such as for buildings, storage and other equipment for the range of operating temperatures stipulated above. In-situ spray foaming is particularly suited where:

a) complicated shapes contours are involved which would not lend themselves to easy insulation treatment using preformed rigid materials;

b) a joint free insulation is desired or where the number of joints is to be kept to a minimum; and

c) high disbonding forces are expected to be incident on the insulation system as in cyclone prone areas.

Though this method of insulation can be extremely efficient and cost-effective, it involves carrying out a foaming at site, often under difficult site conditions. Hence, there is need for use of appropriate specialized equipment along with specialized skill, adequate inspection during the actual spray foaming operation, to ensure that the same degree of quality control is obtained comparable to that of preformed insulation materials. The purchaser is advised to thoroughly satisfy himself that the contractor is capable of providing these important inputs that is the required specialized equipment and necessary skilled manpower for the site work. Further, it is necessary to have adequate inspection steps and to have regular test samples at various stages of project execution on which tests are performed to ensure compliance with the specification.

The following two standards are relevant in this field:

<table>
<thead>
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<th>IS No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>14164 : 1994</td>
<td>Industrial application and finishing of thermal insulating materials at temperatures from -80 °C and up to 750 °C — Code of practice.</td>
</tr>
</tbody>
</table>

There is no ISO Standard on the subject. This standard has been prepared based on indigenous data/practices prevalent in the field in India.

The composition of the Committee responsible for formulation of this standard is given in Annex A.
d) Lot or batch number;
e) Recommended storage temperature range;
f) A caution label giving safety instructions for handling and storage temperature range;
g) Mixing instructions; and
h) Listing agency label, if applicable, plus certificate of conformance. The contractor shall keep a record of this information throughout the guarantee period.

5.2.3 Containers shall be stored under cover and shall not be opened until ready for immediate use, undue agitation of containers shall be avoided.

5.2.4 In the case of bulk shipments, the spray foam contractor may transfer each of the urethane components into appropriately sized clean dry containers or containers that have previously contained the same material. Care shall be taken to exclude moisture pick-up during transfer operations. An opened container shall be blanketed with an inert, dry atmosphere, if needed.

6 APPLICATION OF SPRAY FOAM

6.1 Manufacturer’s application instructions should be followed at all times. Only qualified applicators with prior experience of spraying the specified foam system should be deployed. Prior to application of the spray foam, the contractor shall apply a test area on the surface to be insulated. This area shall be checked for:

a) Local surface roughness;
b) General foam surface appearance;
c) Specified foam thickness;
d) Foam quality, such as striations, voids, uniform cells; and
e) Foam adhesion.

6.2 The panel with the accepted/approved foam shall be treated as the standard for the subsequent implementation of the foaming work.

6.3 The foam shall be applied to roof substrate at a surface temperatures in the range of 15°C to 50°C in 12 mm thick (minimum) passes to reach the desired overall thickness with -3 to +10 mm tolerance. The substrate temperatures stated above may vary depending upon the foam system selected. In areas where obstacles do not permit normal spray techniques and the application tolerances specified above can not be met, the contractor may apply the specified minimum thickness of foam required by a suitable method that he shall select. However, the completed application of foam shall be rendered monolithic with adjacent areas where normal spray application is applied. All foam over roofs of buildings or tanks shall be applied in such a manner as to provide easy drainage of water and prevent ponding.

6.4 Extreme caution shall be taken to prevent spraying in the presence of water/moisture (rain, fog, condensation) as well as when wind velocities are greater than 25 km/h. Shielded scaffolds may be used to allow spraying in high wind velocities with client’s approval.

6.5 The equipment shall be operated with the temperature settings within the range specified by the foam manufacturer.

6.6 Compressed air sources shall have moisture traps. Before spray application begins, all hoses and guns shall be solvent-flushed and inspected to ensure that no moisture is present.

6.7 All flames, sparks, welding and smoking shall be prohibited in the application area.

6.8 All affected items, in the surrounding area, shall be protected from over spray. Spray guns must be held near perpendicular to the surface being insulated and pressures adjusted so that over spray is minimized.

6.9 The applicator shall keep with him on the scaffolding or on the roof, or in both locations, sufficient buckets, plastic film, etc, to enable him to discharge any test foam without causing unwanted deposition on the application area.

6.10 Care is required when spraying on roof surfaces through which chimneys/ducts/pipes penetrate when their temperature exceeds the maximum service temperature limit of foam. An appropriate hot face insulating material 25 to 50 mm in thickness shall be installed prior to foam application in the area approximately 600 mm × 600 mm on the surface surrounding all such hot chimney inlet or outlet lines, or any area where hot spots are likely.

6.11 General — Overdeck Insulation

6.11.1 In all cases where there is a parapet wall or an upstand around the roof, effectiveness of junction between roof and vertical portion would be ensured by continuing the treatment to a vertical extension of 0.5 m (min) around the roof perimeter. Such extra area are to be measured and paid for.

6.11.2 For treatments on vertical areas, a multiplication factor of 1.2 shall be applied to the actual area to account for rebound losses/over thickness.
6.12 General — Underdeck Insulation

6.12.1 To account for excess rebound losses in underdeck PUR/PIR spray in-situ application, measured area shall be subject to a multiplication factor of 1.4.

6.12.2 Spray treatment is applied as a continuous treatment and hence no deductions shall be made in measurements for cutouts having area of 1 m² or less.

7 COATINGS

7.1 General

When foam is exposed to the weather/ultra-violet rays, or used in areas where water will accumulate, or in a corrosive atmosphere, a protective coating is necessary. Since coating performance is highly dependent on the applied film thickness, appropriate minimum film coatings should be ensured.

7.2 Selection

7.2.1 Coatings shall be polyurethane based for best compatibility with the sprayed foam and shall be applied within 24 h of completion of spraying application. Brush applied high solid build coatings of 0.5 mm to 1 mm, DFT (Typical) preferably single component moisture cure type are best suited to provide protection to the sprayed foam. Most of these coatings can be spray applied by the use of airless guns as well.

Two component polyurethane coatings are also available but care is needed at construction sites to maintain correct ratio and to ensure that each mix is used within the pot-life of the mix.

Other types of coatings which are suitable include chlorosulphonated polyethylene based solvent bearing products and high solid acrylic latex coatings. When non-urethane based coatings are used, there may be need for a primer. In each case, it must be ensured that:

a) Coating is elastomeric; and
b) Dry film thickness of coating is not less than 0.75 mm.

7.2.2 For selection of coating materials, the following parameters should be considered:

a) Environment to which the insulation system is exposed (high traffic, hail, rain, chemical, etc);
b) Resistance to spilled vessel contents;
c) Life expectancy;
d) Ease of maintenance;
e) History of similar applications or laboratory data relating to the application in question;
f) Combustibility characteristics;
g) Water vapour permeance (where relevant);
h) Application conditions (temperature relative humidity, etc); and
j) Requirements for conformance to building codes, if any.

7.3 Application

7.3.1 The coating shall be applied in accordance with manufacturer’s instructions and shall be applied within 24 h after the foam insulation is installed (except in case of unusual circumstances), and with foam applicator’s approval. In any case the coating should not be applied until the foam has reached its full rigidity.

7.3.2 The foam shall be dry, clean, free of dust, and foam over spray before coating application.

7.3.3 The proper average thickness of the approved coating for the intended application shall be applied. The coating may be installed in one or more passes. If more than one coat is specified, contrasting colours may be used with the final coat being the finished colour. It is also good practice to install additional thickness around heavily worked areas, such as manways, vents, etc.

Mechanical protection in the form of a wearing coarse is also required if frequent-foot traffic is expected.

7.3.4 The first coat shall be stopped approximately 150 to 300 mm from the edge of the applied foam. The final coating can be extended to the edges of the foam and beyond, on to the building structures. Around each protrusion on the roof area and in the area where the stairs adjoin the insulated wall (size of the area selected by client), the coating shall be reinforced in one of the following manners. Prior to application of the final coat in upstand and penetration areas embed an open-weave reinforcing fabric extending to approximately 150 mm from the corner, either way in to the wet first coat. Caution should be taken to embed the reinforcing fabric totally within the coating.

7.3.5 Apply an extra (0.50 mm) minimum of the selected coating in one or more passes.

7.3.6 After the coating application is complete, the following marking should be prominently displayed:
8 SAFETY

8.1 It is important that all persons associated with design, storage, installation, and repair of such insulated areas understand the fire hazards involved, and safety precautions in handling and spraying of PUR/PIR systems. During application there are numerous storage and application safety precautions that should be observed and the owners and applicators are encouraged to familiarize themselves with such data.

8.1.1 It is recommended that personnel involved in the application of foam wear forced air supply masks. Respiratory protective equipment shall be inspected regularly and maintained in good conditions.

Protective clothing and gloves shall be worn. Skin areas not covered by clothing should be protected by a suitable cream.

8.1.2 During application of the spray foam, smoking, open flames, high temperatures, welding or electric sparks shall be strictly prohibited.
ANNEX A
(Foreword)

COMMITTEE COMPOSITION
Thermal Insulation Sectional Committee, CHD 27

Organization

In personal capacity (B-138 Sarita Vihar, New Delhi)
BASF India Limited, Mumbai
Bakelite Hylam Limited, Mumbai
Beardsell Limited, Chennai
BHEL, Hyderabad
Central Building Research Institute, Roorkee
Department of Coal (Ministry of Industries), New Delhi
Department of Industrial Development, New Delhi
Engineers India Limited, New Delhi
Hyderabad Industries Limited, Ballabgarh
Indian Oil Corporation Limited (R&P Division), New Delhi
Lloyd Insulation (India) Limited, New Delhi
Metallurgical and Engineering Consultants (India) Limited, Ranchi
Ministry of Power, New Delhi
Minwool Rock Fibres, Mumbai
National Physical Laboratory, New Delhi
National Thermal Power Commission, New Delhi
Newkem Products Corporation, Mumbai
Nuclear Power Corporation, Mumbai
Petroleum Conservation and Research Association, Dehra Dun
PIBCO Limited, New Delhi
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Research, Design & Standards Organization, Lucknow

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Shri S. N. Pal (Alternate)
Shri P. Roy
Shri P. P. Kaveriappa (Alternate I)
Shri T. R. Gadge (Alternate II)
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Dr S. P. S. Khalsa (Alternate)
Shri R. P. Puni
Shri Gaurov Puni (Alternate)
Shri D. R. Gupta
Shri A. K. Chaudhury (Alternate)

(Continued on page 7)
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Amendments Issued Since Publication

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