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Report to: Plumberex Specialty Products, Inc.

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Pipe Insulation and Fire Safety

Summary:
The insulation kits that go around the lavatory drain pipes for ADA compliance (under lavatory insulation covers) to protect against contact are "flexible removable insulation covers" and are clearly both insulation and interior finish. Therefore they must comply with requirements of tests in accordance with the ASTM E 84 Steiner tunnel flame spread and smoke development test.

Rationale:

1. The **ICC/ANSI A117.1/2003 Standard (Accessible and Usable Buildings and Facilities 606.6 Exposed Pipes and Surfaces)** states that: "*Water supply and drainpipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks.*" This indicates that we are dealing with an exposed insulation product or material.

2. The fact that this is an insulation material is confirmed by the definitions of insulation contained in the terminology standard from the ASTM Technical Committee on Thermal Insulation (committee C16) – ASTM C 168 – Standard Terminology Relating to Thermal Insulating Materials

pipe insulation, *n — insulation in a form suitable for application to cylindrical surfaces.*

thermal insulation, *n — a material or assembly of materials used to provide resistance to heat flow.*

3. The scope of ASTM C16, technical committee on Thermal Insulation, reads as follows: "*The scope of the Committee shall be the development of standards, promotion of knowledge, and stimulation of research pertaining to thermal insulation materials, products, systems, and associated coatings and coverings, but not including insulating refractories. These activities shall be coordinated with those of other ASTM Committees and national and international organizations having similar interest.*" Clearly ASTM C16 deals only with thermal insulation materials and products. It is important to note, therefore, that this same committee, ASTM C16, has issued a document addressing these products, namely ASTM C 1094, entitled "Standard Guide for Flexible Removable Insulation Covers".

4. The 2006 edition of the IBC (latest one actually published) describes, in section 603.1, the combustible materials allowed in buildings of Type I and Type II construction. These materials include the following:

2. Thermal and acoustical insulation, other than foam plastics, having a flame spread index of not more than 25.
Exceptions:
1. Insulation placed between two layers of noncombustible materials without an intervening airspace shall be allowed to have a flame spread index of not more than 100.
2. Insulation installed between a finished floor and solid decking without intervening airspace shall be allowed to have a flame spread index of not more than 200.
3. Foam plastics in accordance with Chapter 26.

This indicates that "thermal insulation" materials must have a flame spread index of not more than 25 (in accordance with ASTM E 84) unless they are covered by exceptions 1 or 2 or unless they are foam plastics. I will address foam plastics later.

5. The same edition of the IBC describes the requirements for exposed thermal insulation materials in section 719.3, which reads as follows:

*"**719.3 Exposed installation.** Insulating materials, where exposed as installed in buildings of any type of construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.*
***Exception:** Cellulose loose-fill insulation that is not spray applied complying with the requirements of Section 719.6 shall only be required to meet the smoke-developed index of not more than 450."*

This indicates that "exposed insulating materials" must have a flame spread index of not more than 25 and a smoke developed index of not more than 450 (in accordance with ASTM E 84) unless they are cellulose loose fill insulation.

6. The same edition of the IBC describes the requirements for "insulation and covering on pipe and tubing" materials in section 719.7, which reads as follows:

*"**719.7 Insulation and covering on pipe and tubing.** Insulation and covering on pipe and tubing shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.*
***Exception:** Insulation and covering on pipe and tubing installed in plenums shall comply with the International Mechanical Code."*

This indicates that "insulation and covering on pipe and tubing" materials must have a flame spread index of not more than 25 and a smoke developed index of not more than 450 (in accordance with ASTM E 84) unless they are installed in plenums. If they are installed in plenums the IMC requires them to meet a flame spread index of not more than 25 and a smoke developed index of not more than 50 (in accordance with ASTM E 84).

7. Chapter 8 of the same edition of the IBC defines both "interior wall and ceiling finish" and "trim", as follows:

INTERIOR WALL AND CEILING FINISH. The exposed interior surfaces of buildings, including but not limited to: fixed or movable walls and partitions; toilet room privacy partitions; columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or for decoration, acoustical correction, surface insulation, structural fire resistance or similar purposes, but not including trim.

TRIM. Picture molds, chair rails, baseboards, handrails, door and window frames and similar decorative or protective materials used in fixed applications.

It is clear that the "flexible removable insulation covers" fall under the definition of interior wall and ceiling finish, although the definition of trim suggests that they may be covered by this also.

8. Section 803.8 of the same edition of the IBC determines how to assess the fire safety of interior finish that is also thermal insulation, as follows:

"803.8 Insulation. Thermal and acoustical insulation shall comply with Section 719."

As already discussed in 5 and 6, this means that the thermal insulation must have a flame spread index of not more than 25 and a smoke developed index of not more than 450 (in accordance with ASTM E 84).

9. Section 2602.1 of the same edition of the IBC defines foam plastic insulation, as follows:

"FOAM PLASTIC INSULATION. *A plastic that is intentionally expanded by the use of a foaming agent to produce a reduced-density plastic containing voids consisting of open or closed cells distributed throughout the plastic for thermal insulating or acoustical purposes and that has a density less than 20 pounds per cubic foot (pcf) (320 kg/m^3)."*

The Plumberex "flexible removable insulation covers" are made from a material with a density of over 23 pounds per cubic foot. This clearly indicates that they are not foam plastic insulation.

10. Section 2604 of the same edition of the IBC describes the requirements for foam plastic insulation and trim, as follows:

"2604.1 General. *Plastic materials installed as interior finish or trim shall comply with Chapter 8. Foam plastics shall only be installed as interior finish where approved in accordance with the special provisions of Section 2603.9. Foam plastics that are used as interior finish shall also meet the flame spread index requirements for interior finish in accordance with Chapter 8. Foam plastics installed as interior trim shall comply with Section 2604.2.*

[F] 2604.2 Interior trim. *Foam plastic used as interior trim shall comply with Sections 2604.2.1 through 2604.2.4.*
[F] 2604.2.1 Density. *The minimum density of the interior trim shall be 20 pcf (320 kg/m^3).*

[F] 2604.2.2 Thickness. *The maximum thickness of the interior trim shall be 0.5 inch (12.7 mm) and the maximum width shall be 8 inches (204 mm).*
[F] 2604.2.3 Area limitation. *The interior trim shall not constitute more than 10 percent of the aggregate wall and ceiling area of any room or space.*
[F] 2604.2.4 Flame spread. *The flame spread index shall not exceed 75 where tested in accordance with ASTM E 84. The smoke-developed index shall not be limited."*

This section sends the requirements for plastic insulation materials back to Chapter 8 of the IBC and it has already been discussed that the requirements of chapter 8 mean that materials must have a flame spread index of not more than 25 and a smoke developed index of not more than 450 (in accordance with ASTM E 84). If the insulation/interior finish materials have a sufficiently high density, like the one of the Plumberex "flexible removable insulation covers", of a material with a density of over 23 pounds per cubic foot, they are not "foam plastic insulation materials" but may be considered foam plastic trim.

11. The same edition of the IBC also states in Chapter 8 that:

*"**[F] 806.5 Interior trim.** Material, other than foam plastic used as interior trim shall have a minimum Class C flame spread and smoke-developed index when tested in accordance with ASTM E 84, as described in Section 803.1. Combustible trim, excluding handrails and guardrails, shall not exceed 10 percent of the aggregate wall or ceiling area in which it is located."*

Clearly if a material is defined as interior trim, unless it is a foam plastic, it must have a flame spread index of not more than 200 and a smoke developed index of not more than 450 (in accordance with ASTM E 84). Moreover trim may not constitute more than 10 percent of wall and ceiling area. The IBC does not establish a minimum coverage area for a material to be considered trim. In fact, the 2009 edition of the IBC clarifies that it is actually the individual area of the wall or of the ceiling that must be taken into account. Again, no minimum coverage area is established for trim in the 2009 edition of the IBC.

12. Section 2604.2 of the same edition of the IBC states, as shown above, that trim may not constitute more than 10 percent of wall and ceiling area. It does not establish a minimum coverage area for a material to be considered trim. In fact, the 2009 edition of the IBC clarifies that it is actually the individual area of the wall or of the ceiling that must be taken into account. Again, no minimum coverage area is established for trim in the 2009 edition of the IBC.

13. As the Plumberex "flexible removable insulation covers", are made of a material with a density of over 23 pounds per cubic foot, they are not "foam plastic insulation materials" and do not need to comply with the requirements for special approval of section 2603.9 of the IBC and do not require the thermal barrier of section 2603.4 of the IBC, as shown below.

"2603.4 Thermal barrier. *Except as provided for in Sections 2603.4.1 and 2603.9, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 0.5-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (120°C) after 15 minutes of*

fire exposure, complying with the standard time-temperature curve of ASTM E 119. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on FM 4880, UL 1040, NFPA 286 or UL 1715. Combustible concealed spaces shall comply with Section 717."

"2603.9 Special approval. *Foam plastic shall not be required to comply with the requirements of Sections 2603.4 through 2603.7 where specifically approved based on large-scale tests such as, but not limited to, NFPA 286 (with the acceptance criteria of Section 803.2), FM 4880, UL 1040 or UL 1715. Such testing shall be related to the actual end-use configuration and be performed on the finished manufactured foam plastic assembly in the maximum thickness intended for use. Foam plastics that are used as interior finish on the basis of special tests shall also conform to the flame spread requirements of Chapter 8. Assemblies tested shall include seams, joints and other typical details used in the installation of the assembly and shall be tested in the manner intended for use."*

14. The combination of Chapters 8 and 26 of the IBC clearly indicate that "flexible removable insulation covers" are insulation and interior finish and must be tested in accordance with ASTM E 84. It is still somewhat debatable as to whether the materials must meet a flame spread index of 25, 75 or 200 but it should not be debatable that they must be tested in accordance with ASTM E 84. However, the majority of the indication by the code sections is that they should comply with a flame spread index of not more than 25 because they are "thermal insulation materials".

15. There are no references to ASTM D 635 in the International Fire Code, IFC, International Plumbing Code, IPC, or the International Mechanical Code, IMC. The only reference to ASTM D 635 in the IBC is in the section 2606.4 addressing light transmitting plastics, as shown below.

"2606.4 Specifications. *Light-transmitting plastics, including thermoplastic, thermosetting or reinforced thermosetting plastic material, shall have a self-ignition temperature of 650°F (343°C) or greater where tested in accordance with ASTM D 1929; a smoke-developed index not greater than 450 where tested in the manner intended for use in accordance with ASTM E84, or not greater than 75 where tested in the thickness intended for use in accordance with ASTM D 2843 and shall conform to one of the following combustibility classifications:*
Class CC1: *Plastic materials that have a burning extent of 1 inch (25 mm) or less where tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use, in accordance with ASTM D 635,*
Class CC2: *Plastic materials that have a burning rate of 2.5 inches per minute (1.06 mm/s) or less where tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use, in accordance with ASTM D 635."*

It is clear that "flexible removable insulation covers" are not made of "light transmitting plastics". In the application of "light transmitting plastics" the fire tests (ASTM D 1929, ASTM D 2843 and ASTM D 635) are basically used as quality control tests since there is an understanding of the fire performance of these materials. Thus it does not make sense for "flexible removable insulation covers" to have fire safety associated only with the excessively mild ASTM D 635 test.

"ASTM D 635: "Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position"

1. Scope*

1.1 This fire-test-response test method covers a small-scale laboratory screening procedure for comparing the relative linear rate of burning or extent and time of burning, or both, of plastics in the form of bars, molded or cut from sheets, plates, or panels, and tested in the horizontal position.

NOTE 1—This test method, and test method A of IEC 60695-11-10 are technically equivalent.

NOTE 2—For additional information on materials which do not burn to the first reference mark by this test, see Test Method D 3801.

1.2 This test method was developed for polymeric materials used for parts in devices and appliances. The results are intended to serve as a preliminary indication of their acceptability with respect to flammability for a particular application. The final acceptance of the material is dependent upon its use in complete equipment that conforms with the standard applicable to such equipment.

1.3 The classification system described in Appendix X1 is intended for quality assurance and the preselection of component materials for products.

1.4 This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazards or fire risk assessment of materials, products, or assemblies under actual fire conditions.

1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For specific hazards statements, see 9.2."

The title and scope of the ASTM D 635 test makes it clear that it is intended for small plastic parts, intended for devices and appliances. The test is not intended for insulation or for interior finish.

Key Points:

1. Flexible removable insulation covers are clearly insulation.
2. The ICC codes do not contain a minimum coverage area before requirements apply.
3. Insulation is covered by IBC section 719.
4. Pipe insulation is covered in Chapter 6 of the IBC.
5. Insulation and pipe insulation must meet ASTM E 84 class A (25 FSI and 450 SDI) per 719.7 of IBC.
6. The density of the flexible removable insulation covers is over 20 lbs per cubic foot and so they are not foam plastic insulation.
7. The flexible removable insulation covers are not a light transmitting plastic and so the ASTM D 635 test does not apply.

Conclusion:
Flexible removable insulation covers are exposed insulation materials and interior finish (or trim) and must be tested in accordance with ASTM E 84 and comply with a flame spread index of not more than 25 and a smoke developed index of not more than 450.

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