SECTION 2603
FOAM PLASTIC INSULATION

2603.1 General. The provisions of this section shall govern the requirements and uses of foam plastic insulation in buildings and structures.

❖ Section 2603 contains all of the life safety provisions for foam-plastic insulation products, such as rigid insulation board, spray-foam insulation and pour-in-place insulation. "Foam plastic" is a general term given to insulating products that have been manufactured by intentionally expanding plastic by the use of a foaming agent. Extruded polystyrene (XPS), expanded polystyrene (EPS), polyisocyanurate (PIR or ISO), open-cell polyisocyanurate, phenolic, polyurethane and polypropylene foam are among the many types of foam plastic insulation products subject to the requirements found in this section. In addition to technical requirements listed below, all packages and containers of foam-plastic insulation must bear a label of an approved agency listing the manufacturer's name, the product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

Compliance with Section 2603 shall be achieved through either a prescriptive method or the performance method. The prescriptive method requires compliance with Sections 2603.4 through 2603.7. The performance method requires compliance with Section 2603.9. Note that both methods require compliance with Section 2603.3, which covers surface-burning characteristics and Section 2603.8, which covers protection against termites.

Figure 2603.1 documents code compliance when foam plastic is used.

2603.2 Labeling and identification. Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the label of an approved agency showing the manufacturer's name, the product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

❖ All foam plastics or packages of foam plastics delivered to the construction site must be labeled. Also, labels are required on containers [usually two components in 55-gallon (208 L) drums] of ingredients delivered for the production of foam plastic at the construction site. The label must include identification of the approved and detailed product identification or information describing the performance characteristics of the product. It is intended that labeling printed on board stock or on packaging be acceptable. It is also intended that the label information include the name of the manufacturer or distributor, the type of foam plastic, the performance characteristics required and the name of the approved testing agency.

2603.3 Surface-burning characteristics. Unless otherwise indicated in this section, foam plastic insulation and foam plastic cores of manufactured assemblies shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested in the maximum thickness intended for use in accordance with ASTM E 84. Loose fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

Exceptions:

1. Smoke-developed index for interior trim as provided for in Section 2604.2.
2. In cold storage buildings, ice plants, food plants, food processing rooms and similar areas, foam plastic insulation where tested in a thickness of 4 inches (102 mm) shall be permitted in a thickness up to 10 inches (254 mm) where the building is equipped throughout with an automatic fire sprinkler system in accordance with Section 903.3.1.1. The approved automatic sprinkler system shall be provided in both the room and that part of the building in which the room is located.

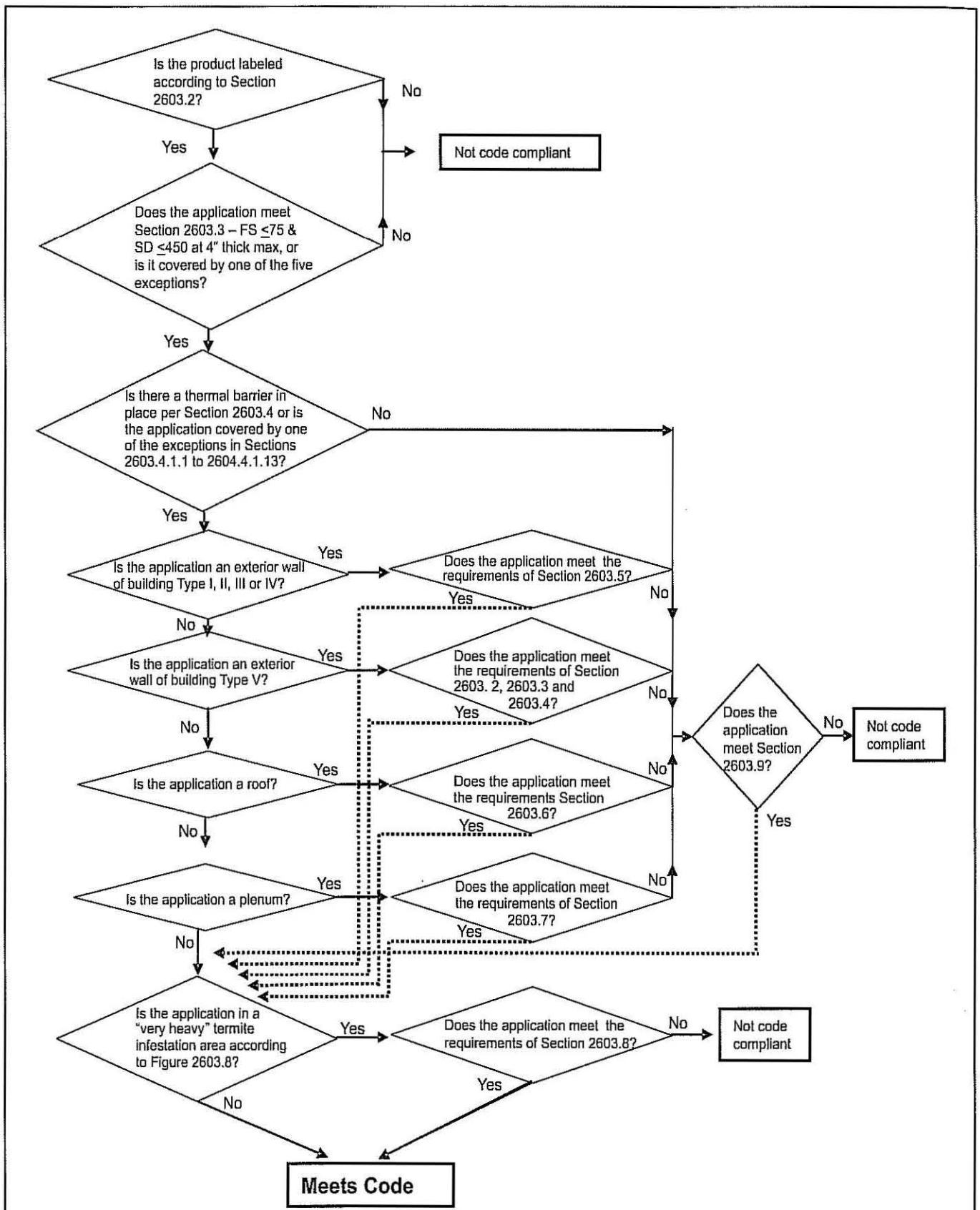


Figure 2603.1
FOAM PLASTIC COMPLIANCE

3. Foam plastic insulation that is a part of a Class A, B or C roof-covering assembly provided the assembly with the foam plastic insulation satisfactorily passes FM 4450 or UL 1256. The smoke-developed index shall not be limited for roof applications.
4. Foam plastic insulation greater than 4 inches (102 mm) in thickness shall have a maximum flame spread index of 75 and a smoke-developed index of 450 where tested at a minimum thickness of 4 inches (102 mm), provided the end use is approved in accordance with Section 2603.9 using the thickness and density intended for use.
5. Flame spread and smoke-developed indexes for foam plastic interior signs in covered mall buildings provided the signs comply with Section 402.15.

❖ Foam plastic insulation or foam plastic cores used as a component in a manufactured assembly are combustible and must be assessed for flame spread index and smoke-developed index. Testing in accordance with ASTM E 84 is required. The foam plastic must be tested in the maximum thickness to be used [up to 4-inch (102 mm) thickness; see Exception 4 for foam thicker than 4 inches (102 mm)] and be limited to a flame spread index of 75 or less and a smoke-developed index of 450 or less. The 4-inch (102 mm) thickness for testing is specifically related to the limitation on testing thickness in ASTM E 84. All foam plastic materials are required to be tested in accordance with ASTM E 84, unless specifically exempted or modified by one of the listed exceptions.

Five exceptions relate to whether the flame spread limitations of 75 and smoke-developed of 450 apply or if the thickness of material is allowed to exceed 4-inches (102 mm) as limited by ASTM E 84:

1. Use as interior trim is not required to meet the smoke-developed index limitation of 450 but must still meet the flame spread index requirement of less than or equal to 75.
2. In fully sprinklered buildings, cold storage construction using foam plastic is allowed to exceed the thickness of 4 inches (102 mm) up to 10 inches (254 mm) even when the material has only been tested at 4 inches (102 mm) with ASTM E 84.
3. When used as part of a Class A, B or C roof covering assembly in which the assembly has successfully passed FM 4450 or UL 1256 testing, foam-plastic insulation is not required to meet the flame spread rating of 75. Also, smoke-developed ratings are not required or limited for any foam-plastic insulation used in roof assemblies. The intent is to recognize that the overall hazards of roofing have already been addressed and additional testing requirements for flame spread would be unnecessary.
4. Foam-plastic insulation thicker than 4 inches (102 mm) is allowed if tested in accordance with Section 2603.9. Such testing would require the full as-installed thickness to be tested. The tests referenced in Section 2603.9 are generally full-scale room corner tests. Such material would also still be required to be tested to ASTM E 84 at a 4-inch (102 mm) thickness and result in a flame spread index no greater than 75 and a smoke-developed index of 450.
5. Use as interior signs in covered mall buildings is required to comply with Section 402.15. Section 402.15 requires compliance with UL 1975, which measures the rate of heat release of burning materials used in the manufacture of such signs. Section 402.15 sets the pass/fail criteria at a maximum heat release rate of 150 kW. Although this test method assesses heat release rate rather than surface burning characteristics, the testing and criteria specified provide material characteristics that address the goal of limiting the spread of fire.

The maximum flame spread value of 75 was chosen on the basis that it is lower than untreated wood (which usually is 100 to 165). The maximum smoke-developed rating of 450 was selected because, at the time, the code permitted interior finish materials that gave off "smoke no more dense than that given off by untreated wood." In selecting the maximum flame spread and smoke values, it was believed that a conservative approach was being taken by requiring an insulation material to meet the same requirements as interior finish, even though the insulation was intended to be covered with an interior finish material. The requirements for surface-burning characteristics of foam plastic apply to foam plastics used as cores of manufactured assemblies. The intent is that, while the finished assemblies are not required to be tested for surface burning characteristics, the foam-plastic core is not exempt from the general requirement; therefore, foam plastic is regulated in factory-manufactured assemblies the same as it is in field-fabricated applications.

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.

❖ The use of an approved thermal barrier to separate foam plastics from the interior of a building is a basic requirement for the use of foam plastics as shown in this section of the code. Sections 2603.4.1 and 2603.9 describe circumstances where the thermal barrier is modified or eliminated for specific uses. The job of a thermal barrier is to limit the temperature rise that the

foam plastic will be exposed to. An approved thermal barrier is defined as 1/2-inch (12.7 mm) gypsum wallboard or the equivalent. This section sets forth the test methods and criteria by which alternative thermal barriers are to be qualified to limit the average temperature rise of the unexposed face to 250°F (121°C) for 15 minutes of fire exposure while complying with the time-temperature conditions of ASTM E 119. The thermal barrier must be installed in such a way that it remains in place for 15 minutes when exposed to fire conditions and that combustible concealed spaces comply with Section 717.

Before 1975, experience had shown that foam plastics covered with plaster or 1/2-inch (12.7 mm) gypsum wallboard had performed satisfactorily in building fires. For this reason, 1/2-inch (12.7 mm) gypsum wallboard was included in the code as a minimum requirement. It was recognized that specifying a single material would not be desirable in a performance code; therefore, the words "or equivalent" were added. The thermal barrier test was selected as the appropriate method to determine equivalent performance. Although regular 1/2-inch (12.7 mm) gypsum wallboard happened to have a 15-minute rating in the prescribed thermal barrier test, there was no intent that the 15-minute requirement for the thermal barrier would ensure 15 minutes of escape time in an actual building fire. This is related to the fact that the time-temperature conditions of ASTM E 119 may not reflect actual fire conditions. Gypsum wallboard is still the most commonly used thermal barrier, but equivalent materials are permitted and have been used when shown to be equivalent. Alternative thermal barriers are listed in evaluation reports issued by ICC Evaluation Services (ICC ES).

2603.4.1 Thermal barrier not required. The thermal barrier specified in Section 2603.4 is not required under the conditions set forth in Sections 2603.4.1.1 through 2603.4.1.13.

❖ A thermal barrier is not required for applications described in Sections 2603.4.1.1 through 2603.4.1.13. The prescriptive installation methods described in these sections must be strictly followed in order to serve as an alternative to the thermal barrier. Furthermore, installations of foam plastics in accordance with these sections do not have to be tested via the alternative approval testing requirements of Section 2603.9.

2603.4.1.1 Masonry or concrete construction. A thermal barrier is not required for foam plastic installed in a masonry or concrete wall, floor or roof system where the foam plastic insulation is covered on each face by a minimum of 1 inch (25 mm) thickness of masonry or concrete.

❖ No thermal barrier is required when 1 inch (25 mm) or more of masonry or concrete is placed between the foam plastic and the interior of the building. The intent is to accept 1 inch (25 mm) of masonry or concrete as equal to (or better than) 1/2-inch (12.7 mm) gypsum wallboard. This condition can arise when foam plastics are installed either within a wall or on the exterior side of a masonry wall. Some common examples are when foam plastics are installed:

- In the cavity of a hollow masonry wall;
- As the core of a concrete-faced panel;
- On the exterior face of a masonry wall and covered with an exterior finish;
- Within the cores of hollow masonry units; or
- Encapsulated within a minimum of 1-inch (25 mm) concrete or masonry wall, floor or roof system, such as in insulated tilt-up or pour-in-place concrete panels.

Note that the exterior surface would be required to comply with Section 2603.5.

2603.4.1.2 Cooler and freezer walls. Foam plastic installed in a maximum thickness of 10 inches (254 mm) in cooler and freezer walls shall:

1. Have a flame spread index of 25 or less and a smoke-developed index of not more than 450, where tested in a minimum 4 inch (102 mm) thickness.
2. Have flash ignition and self-ignition temperatures of not less than 600°F and 800°F (316°C and 427°C), respectively.
3. Have a covering of not less than 0.032-inch (0.8 mm) aluminum or corrosion-resistant steel having a base metal thickness not less than 0.0160 inch (0.4 mm) at any point.
4. Be protected by an automatic sprinkler system. Where the cooler or freezer is within a building, both the cooler or freezer and that part of the building in which it is located shall be sprinklered.

❖ A thermal barrier is not required in cooler and freezer walls insulated with 10 inches (254 mm) or less of foam plastic when all four criteria in Section 2603.4.1.2 are met.

2603.4.1.3 Walk-in coolers. In nonsprinklered buildings, foam plastic having a thickness that does not exceed 4 inches (102 mm) and a maximum flame spread index of 75 is permitted in walk-in coolers or freezer units where the aggregate floor area does not exceed 400 square feet (37 m^2) and the foam plastic is covered by a metal facing not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a minimum base metal thickness of 0.016 inch (0.41 mm). A thickness of up to 10 inches (254 mm) is permitted where protected by a thermal barrier.

❖ A thermal barrier is not required for foam plastics up to 4 inches (102 mm) thick when the minimum thickness metal facings are used in coolers or freezers no greater than 400 square feet (37 m^2) in floor area. The required metal facing is intended to act as a barrier against ignition of the foam plastic. It is not intended to serve as a thermal barrier. This section recognizes the relatively small size of walk-in coolers and the accompanying lower hazard. Foam plastic up to 10 inches

thick (254 mm) is permitted when protected by a thermal barrier.

2603.4.1.4 Exterior walls—one-story buildings. For one-story buildings, foam plastic having a flame spread index of 25 or less, and a smoke-developed index of not more than 450, shall be permitted without thermal barriers in or on exterior walls in a thickness not more than 4 inches (102 mm) where the foam plastic is covered by a thickness of not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a base metal thickness of 0.0160 inch (0.41 mm) and the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

❖ Foam plastics may be used without a thermal barrier in one-story buildings provided that:

- The material is not more than 4 inches (102 mm) thick;
- It has a flame spread index not greater than 25;
- It has a smoke-developed index of not more than 450;
- It is covered with specified metal facings; and
- The building is equipped throughout with an automatic sprinkler system.

This provision is intended to permit the use of metal-faced panels, primarily in storage buildings other than cold-storage construction. Cold-storage construction was also covered in this section (see also Sections 2603.4.1.2 and 2603.4.1.3, and Exception 2 of Section 2603.3). The limitations are based on the results of large-scale tests performed by independent laboratories and sponsored by the plastics industry.

2603.4.1.5 Roofing. Foam plastic insulation under a roof assembly or roof covering that is installed in accordance with the code and the manufacturer's instructions shall be separated from the interior of the building by wood structural panel sheathing not less than 0.47 inch (11.9 mm) in thickness bonded with exterior glue, with edges supported by blocking, tongue-and-groove joints or other approved type of edge support, or an equivalent material. A thermal barrier is not required for foam plastic insulation that is a part of a Class A, B or C roof-covering assembly, provided the assembly with the foam plastic insulation satisfactorily passes FM 4450 or UL 1256.

❖ No thermal barrier is required when foam plastic is used in a roof assembly over wood structural panel sheathing given that the wood product meets all of the following:

- At least $^{15}/_{32}$ inch (12 mm) thick;
- Manufactured utilizing exterior-grade glue; and
- Properly installed to provide adequate edge support.

Equivalent materials to the wood structural panel sheathing described above are specifically allowed by this section. In any situation, the material must be compatible with the type of construction.

Also, no thermal barrier is required when foam plastic is used with a Class A, B or C roof assembly (as prescribed in Section 1505) when the assembly complies with FM 4450 or UL 1256. The intent is to recognize that roof assemblies tested to the criteria of the referenced standards have adequately demonstrated a resistance to fire from the underside of the roof deck; therefore, no additional testing is necessary, nor is an additional thermal barrier needed. It is important to note that this section applies to a specific roof assembly (i.e., specific roof deck, specific foam insulation, fasteners and specific roof membrane). Passing the prescribed tests with one specific roof assembly does not cover all combinations of roof systems where foam-plastic insulation is used. Users must confirm that the specific roof assembly has achieved a Class A, B or C rating. This coordinates with Exception 4 to Section 2603.3 for surface-burning characteristics.

2603.4.1.6 Attics and crawl spaces. Within an attic or crawl space where entry is made only for service of utilities, foam plastic insulation shall be protected against ignition by 1.5-inch-thick (38 mm) mineral fiber insulation; 0.25-inch-thick (6.4 mm) wood structural panel, particleboard or hardboard; 0.375-inch (9.5 mm) gypsum wallboard, corrosion-resistant steel having a base metal thickness of 0.016 inch (0.4 mm) or other approved material installed in such a manner that the foam plastic insulation is not exposed. The protective covering shall be consistent with the requirements for the type of construction.

❖ In an attic or crawl space where entry is made only for service of utilities, and when foam plastics are used, an ignition barrier may be used in place of a thermal barrier to cover the foam plastic. Multiple materials are listed, which can be used as the ignition barrier:

- 1.5-inch-thick (38 mm) mineral fiber insulation;
- 0.25-inch-thick (6.4 mm) wood structural panels;
- 0.375-inch (9.5 mm) particleboard;
- 0.25-inch (6.4 mm) hardboard;
- 0.375-inch (9.5 mm) gypsum board; or
- Corrosion-resistant steel having a base metal thickness of 0.016 inch (0.406 mm).

Note that the ignition barrier must be consistent with the type of construction, which means that combustible coverings are permitted only where combustible materials are otherwise allowed.

The foam-plastic material covered with the ignition barrier can be on the floor, wall or the ceiling of the attic or crawl space. The phrase "where entry is made only for service of utilities" applies to attics or crawl spaces that only contain mechanical equipment, electrical wiring, fans, plumbing, gas or electric hot water heaters, gas or electric furnaces, etc. Such provisions would not be allowed for such spaces used for storage or general occupancy. The reduced provision (from a thermal barrier to an ignition barrier) provides a protective cover that was the sole purpose to prevent the direct impingement of flame on the foam-plastic insulation (see Figure 2603.4.1.6). Note that Section 2603.4 would still require a thermal barrier between

the interior space above (crawl space) or below (attic) in a structure and the foam plastic.

If the foam-plastic insulation has passed large-scale testing in the thickness and density intended for use, in accordance with Section 2603.9, no thermal barrier or ignition barrier is required over the foam-plastic insulation in an attic or crawl space and this section of the code does not apply. It is important to note that the actual configuration must be tested. For example, foam insulation applied to the ceiling of the attic or crawl space must be tested with the foam applied to the ceiling in a room corner test or in an assembly that reflects end use. The same restrictions would apply to those insulations applied to the walls, floors or combination of surfaces.

2603.4.1.7 Doors not required to have a fire protection rating. Where pivoted or side-hinged doors are permitted without a fire protection rating, foam plastic insulation, having a flame spread index of 75 or less and a smoke-developed index of not more than 450, shall be permitted as a core material where the door facing is of metal having a minimum thickness of 0.032-inch (0.8 mm) aluminum or steel having a base metal thickness of not less than 0.016 inch (0.4 mm) at any point.

❖ A thermal barrier is not required when foam plastic is used as a core material for doors, provided that a specified metal facing is used and the door is not required to have a fire-resistance rating. The intent is that doors required to have a fire protection rating must be tested with the foam-plastic cores in place in order to qualify. This section recognizes the limited area of doors compared to the walls in which they are located and regulates foam plastics similar to other materials used in doors.

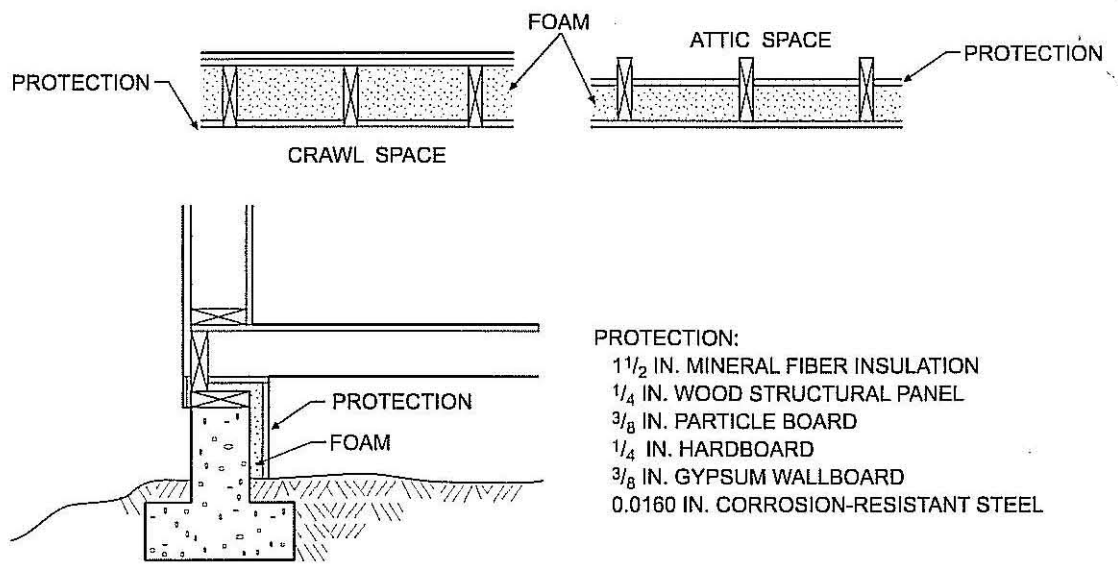
2603.4.1.8 Exterior doors in buildings of Group R-2 or R-3. In occupancies classified as Group R-2 or R-3, foam-filled exterior entrance doors to individual dwelling units that do not require a fire-resistance rating shall be faced with wood or other approved materials.

❖ Wood or other approved facings on foam-filled exterior entrance doors of Group R-2 and R-3 buildings are permitted when the doors are not required to have a fire-resistance rating. Such doors do not need to comply with Section 2603.4.1.7.

2603.4.1.9 Garage doors. Where garage doors are permitted without a fire-resistance rating and foam plastic is used as a core material, the door facing shall be metal having a minimum thickness of 0.032-inch (0.8 mm) aluminum or 0.010-inch (0.25 mm) steel or the facing shall be minimum 0.125-inch-thick (3.2 mm) wood. Garage doors having facings other than those described above shall be tested in accordance with, and meet the acceptance criteria of, DASMA 107.

Exception: Garage doors using foam plastic insulation complying with Section 2603.3 in detached and attached garages associated with one- and two-family dwellings need not be provided with a thermal barrier.

❖ The prescriptive requirements of this section regulate garage doors with foam-plastic cores used in nonfire-resistance-rated applications. The requirements in Section 2603.4.1.9, which governs overhead sectional, coiling or vertical lift-type garage doors, are slightly different from the requirements of Sections 2603.4.1.7 and 2603.4.1.8, which govern means of egress doors, such as side-swinging doors. These garage doors are not limited to such doors used in conjunction with a private or public garage occupancy but



For SI: 1 inch = 25.4 mm.

Figure 2603.4.1.6
FOAM PLASTIC, ATTIC AND CRAWL SPACES

refer to doors for vehicles in any occupancies.

The minimum door-facing material and thickness requirements for garage doors with foam-plastic cores stated in this section were determined based on the results of a fire testing program sponsored by the National Association of Garage Door Manufacturers (NAGDM). This program exposed a variety of commercially manufactured garage doors to a room corner fire test. The results of the testing indicated that garage doors having facings in the minimum thicknesses stated did not spread fire to the edge of the specimen and did not cause flashover in the test room. Other garage door constructions using foam plastics that do not meet minimum code requirements can be brought into compliance by meeting the requirements of testing the complete garage door assembly to ANSI/DASMA 107, *Room Fire Test Standard for Garage Doors Using Foam Plastic Insulation*. This standard includes a description of the test method, performance data to be obtained and the acceptance criteria to use in evaluating the performance data.

This section exempts exterior garage doors used in garages attached to one- and two-family dwellings and detached garages (Group R-3) from the thermal barrier requirements of Section 2603.4. This exemption is similar to that of Section 2603.4.1.8 for exterior egress doors in Group R-2 and R-3 occupancies.

As noted within the section such doors are not intended for installation in fire-rated exterior walls. There are other products, such as rolling steel fire doors, manufactured for this purpose.

2603.4.1.10 Siding backer board. Foam plastic insulation of not more than 2,000 British thermal units per square feet (Btu/sq. ft.) (22.7 MJ/m^2) as determined by NFPA 259 shall be permitted as a siding backer board with a maximum thickness of 0.5 inch (12.7 mm), provided it is separated from the interior of the building by not less than 2 inches (51 mm) of mineral fiber insulation or equivalent or where applied as insulation with re-siding over existing wall construction.

❖ Foam plastic is frequently used in residing applications to provide a leveling surface for new siding, while also bringing additional insulation value to the wall assembly. Also available in the marketplace are products that combine exterior siding material and foam plastic. If these siding/residing products are used on the exterior of a wall and the requirements of Sections 2603.3 and 2603.4 are met, this section of the code does not apply. If a thermal barrier is not used on the interior of the building, then there are limitations placed on the products and their use. In addition to the flame spread limitations of Section 2603.3, other properties of the foam plastic or foam plastic portion of the product include maximum thickness of 0.5 inch (12.7mm) and potential heat of less than 2,000 Btu when tested using NFPA 259. Limitations in foam and siding/foam combination product use includes separation from the interior of the building by 2 inches (51 mm) of mineral fiber insulation, installation over an existing wall finish as part of residing or when the foam plastic insulation is tested in accordance with Section 2603.9. The removal of the thermal barrier requirement in this section is reasonable considering the separation provided by the existing construction and the limitation of the potential heat of the foam plastic imposed by the code. Also, the code requires fire-resistance ratings from the exterior side of walls only when the fire separation distance is 5 feet (1524 mm) or less (see Section 704.5).

2603.4.1.11 Interior trim. Foam plastic used as interior trim in accordance with Section 2604 shall be permitted without a thermal barrier.

❖ This section specifies that a thermal barrier is not needed for interior trim that meets the limitations of Section 2604 and related subsections, which place limitations on foam-plastic density, thickness, wall and ceiling area coverage and flame spread.

2603.4.1.12 Interior signs. Foam plastic used for interior signs in covered mall buildings in accordance with Section 402.15 shall be permitted without a thermal barrier. Foam plastic signs that are not affixed to interior building surfaces shall comply with Chapter 8 of the *International Fire Code*.

❖ A thermal barrier is not required for interior signs that meet the limits stated in Section 402.14, since the hazard from the interior signs is appropriately addressed by test standard UL1975 (see commentary, Section 402.14). If the foam-plastic sign is not affixed to an interior surface of the building, then the requirements of Chapter 8 of the *International Fire Code*® (IFC®) must be met. More specifically, Section 808.2 of the IFC requires compliance with UL 1975 when such signs exceed 10 percent of the wall or ceiling area, whichever is less.

2603.4.1.13 Type V construction. Foam plastic spray applied to a sill plate and header of Type V construction is subject to all of the following:

1. The maximum thickness of the foam plastic shall be $3^1/_4$ inches (82.6 mm).
2. The density of the foam plastic shall be in the range of 1.5 to 2.0 pcf (24 to 32 kg/m^3).
3. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke-developed index of 450 or less when tested in accordance with ASTM E 84.

❖ A thermal barrier is required when foam plastic is spray applied to the sill plate and joist header in Type V construction when all of the conditions listed in Section 2603.4.1.13 are met. Because foam-plastic insulation in this application is left exposed, the four conditions listed limit the hazards of the spray-applied foam plastic used in this application:

- Thickness greater than or equal to $3^1/_4$ inches (82.6 mm);
- Density is between 1.5 to 2.0 pcf (24 to 32 kg/m^3);
- Flame spread index is less than or equal to 25; and

- Smoke-developed index is less than or equal to 450.

This particular allowance was based upon testing in a room corner fire test that compared the performance of an all-wood floor system to that of a wood floor system with foam plastic sprayed on sill plates and headers (see Figure 2603.4.1.13).

2603.5 Exterior walls of buildings of any height. Exterior walls of buildings of Type I, II, III or IV construction of any height shall comply with Sections 2603.5.1 through 2603.5.7. Exterior walls of cold storage buildings required to be constructed of noncombustible materials, where the building is more than one story in height, shall also comply with the provisions of Sections 2603.5.1 through 2603.5.7. Exterior walls of buildings of Type V construction shall comply with Sections 2603.2, 2603.3 and 2603.4.

❖ All foam plastics used on exterior walls of all types of buildings, except wood frame, are to be installed in accordance with Sections 2603.5.1 through 2603.5.7. Installations on one-story, noncombustible walls of cold storage buildings are required to also comply with the provisions of Sections 2603.5.1 through 2603.5.7. Foam plastics used on exterior walls of Type V buildings are required to comply with Sections 2603.2, 2603.3 and 2603.4. The intent is to regulate the use of an insulating envelope over the exterior of a structure when the envelope provides no structural support other than the transfer of wind loads. It is recognized that some envelopes will be constructed in place by installing a rigid foam plastic and covering it with an exterior finish while others will be installed as prefabricated panels complete with exterior finish.

2603.5.1 Fire-resistance-rated walls. Where the wall is required to have a fire-resistance rating, data based on tests conducted in accordance with ASTM E 119 shall be provided to substantiate that the fire-resistance rating is maintained.

❖ Foam plastics are permitted in walls that are required to have fire-resistance ratings. Such assemblies must be fire tested with the foam plastic (at the intended maximum thickness and density) in place.

2603.5.2 Thermal barrier. Any foam plastic insulation shall be separated from the building interior by a thermal barrier meeting the provisions of Section 2603.4, unless special approval is obtained on the basis of Section 2603.9.

Exception: One-story buildings complying with Section 2603.4.1.4.

❖ A thermal barrier is required, unless alternative approval is obtained in accordance with Section 2603.9. The intent is to make it clear that the thermal barrier requirement of Section 2603.4 is applicable. The focus of this section is upon external exposure. The excep-

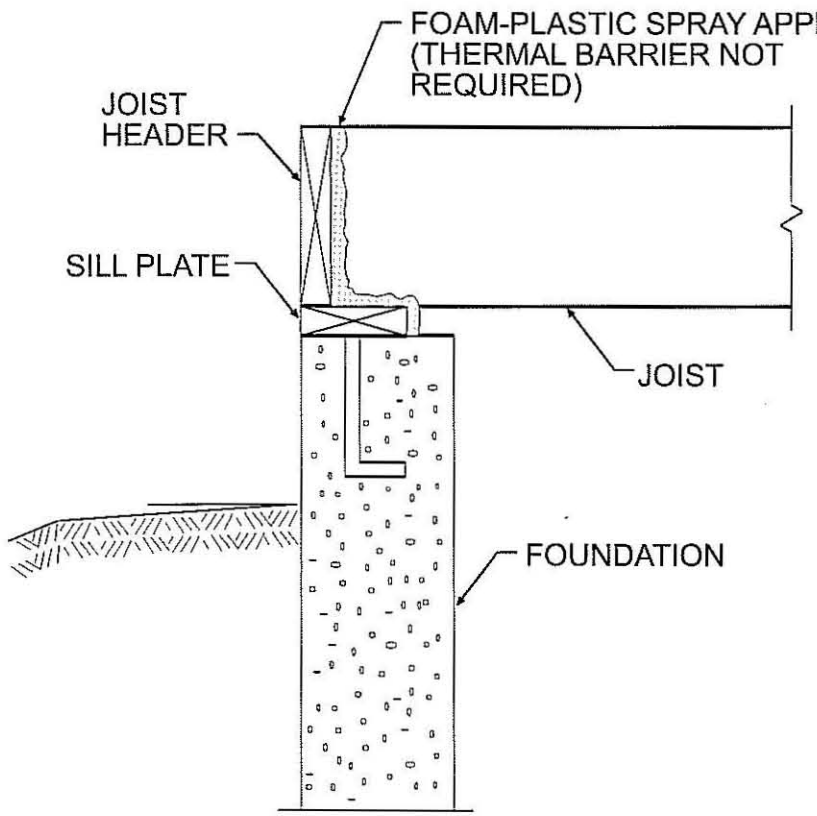


Figure 2603.4.1.13
FOAM-PLASTIC SPRAY APPLIED TO SILL PLATE AND HEADER

tion provides for the reduced requirements of Section 2603.4.1.4 for one-story buildings.

2603.5.3 Potential heat. The potential heat of foam plastic insulation in any portion of the wall or panel shall not exceed the potential heat expressed in Btu per square feet (mJ/m^2) of the foam plastic insulation contained in the wall assembly tested in accordance with Section 2603.5.5. The potential heat of the foam plastic insulation shall be determined by tests conducted in accordance with NFPA 259 and the results shall be expressed in Btu per square feet (mJ/m^2).

Exception: One-story buildings complying with Section 2603.4.1.4.

❖ This section limits the combustible content of exterior walls based on the potential heat of the foam-plastic insulation. Potential heat is essentially the amount of energy potential a particular material contains in terms of its ability to burn. Generally, the higher the potential heat, the higher the fire hazard. The potential heat must not exceed that as found in the tested wall assembly as required in Section 2603.5.5. It is important to note that NFPA 268 addresses flammability not fire resistances as addressed by Chapter 7.

2603.5.4 Flame spread and smoke-developed indexes. Foam plastic insulation, exterior coatings and facings shall be tested separately in the thickness intended for use, but not to exceed 4 inches (102 mm), and shall each have a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E 84.

Exception: Prefabricated or factory-manufactured panels having minimum 0.020-inch (0.51 mm) aluminum facings and a total thickness of 0.25 inch (6.4 mm) or less are permitted to be tested as an assembly where the foam plastic core is not exposed in the course of construction.

❖ Each component, including the foam-plastic core, must be tested and have a maximum flame spread of 25 and a maximum smoke-developed index of 450 when tested in accordance with ASTM E 84. The material should be tested with the same thickness for use, except that ASTM E 84 is limited to a 4-inch (102 mm) thickness for testing. Full-scale testing can address the actual thickness and is required by Section 2603.5.5. Materials should not be restricted by the testing limitations of ASTM E 84 when they perform well at a higher thickness in the full scale test. The exception applies to prefabricated panels that can be installed without exposing the foam plastic.

2603.5.5 Test standard. The wall assembly shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.

Exception: One-story buildings complying with Section 2603.4.1.4.

❖ This section is the only provision dealing with propagation of fire due to exposure from an exterior source. Other combustibles are not allowed as components of noncombustible building exterior walls. The focus is flammability versus fire resistance.

2603.5.6 Label required. The edge or face of each piece of foam plastic insulation shall bear the label of an approved agency. The label shall contain the manufacturer's or distributor's identification, model number, serial number or definitive information describing the product or materials' performance characteristics and approved agency's identification.

❖ Each piece of foam plastic must be labeled. This requirement is somewhat different than the general marking requirement of Section 2603.2, which only requires a manufacturer's identifying mark on either the product or the packaging. The reason for this is that properties other than fire performance of the foam plastic, such as bond strength to the exterior finish, are of significance in this type of application. Additionally, the intent is to provide a means for specific product identification not only during construction but also after construction is complete by the removal of a sample product from the finished structure should a question arise.

2603.5.7 Ignition. Exterior walls shall not exhibit sustained flaming where tested in accordance with NFPA 268. Where a material is intended to be installed in more than one thickness, tests of the minimum and maximum thickness intended for use shall be performed.

Exception: Assemblies protected on the outside with one of the following:

1. A thermal barrier complying with Section 2603.4.
2. A minimum 1 inch (25 mm) thickness of concrete or masonry.
3. Glass-fiber-reinforced concrete panels of a minimum thickness of 0.375 inch (9.5 mm).
4. Metal-faced panels having minimum 0.019-inch-thick (0.48 mm) aluminum or 0.016-inch- thick (0.41 mm) corrosion-resistant steel outer facings.
5. A minimum 0.875 inch (22.2 mm) thickness of stucco complying with Section 2510.

❖ The foam plastic is not to support continued flaming when tested in accordance with NFPA 268, which looks at ignitability when exposed to a radiant heat source. Where the foam plastic is to be used in more than one thickness, the test is to be performed on minimum and maximum thickness. If the assembly is protected on the outside with one of the specified materials, the test is not required.

2603.6 Roofing. Foam plastic insulation meeting the requirements of Sections 2603.2, 2603.3 and 2603.4 shall be permitted as part of a roof-covering assembly, provided the assembly with the foam plastic insulation is a Class A, B or C roofing assembly where tested in accordance with ASTM E 108 or UL 790.

❖ Foam-plastic insulation that meets the labeling and identification, surface-burning characteristics and thermal barrier criteria are permitted as part of a Class A, B or C roof-covering assembly that has been tested in accordance with ASTM E 108 or UL 790. Both

ASTM E 108 and UL 790 cover exterior spread of flame.

2603.7 Plenums. Foam plastic insulation shall not be used as interior wall or ceiling finish in plenums except as permitted in Section 2604 or when protected by a thermal barrier in accordance with Section 2603.4.

❖ This section clarifies how foam plastics are to be applied in plenums as opposed to their use as duct and pipe insulation. Foam plastic found in a plenum must meet one of the following options:

1. Must have a thermal barrier;
2. Pass an appropriate large scale test (Section 2603.9); or
3. Meet the requirements of Section 2604 for trim and finish (i.e., is dense enough, meets area and thickness limitations and complies with flame spread limitations).

2603.8 Protection against termites. In areas where the probability of termite infestation is very heavy in accordance with Figure 2603.8, extruded and expanded polystyrene, polyisocyanurate and other foam plastics shall not be installed on the exterior face or under interior or exterior foundation walls or slab foundations located below grade. The clearance between foam plastics installed above grade and exposed earth shall be at least 6 inches (152 mm).

Exceptions:

1. Buildings where the structural members of walls, floors, ceilings and roofs are entirely of noncombustible materials or preservatively treated wood.
2. An approved method of protecting the foam plastic and structure from subterranean termite damage is provided.
3. On the interior side of basement walls.

❖ This section of the code addresses the use of foam plastics in areas of "very heavy" termite infestation. Termites have been reported to cause damage to foam insulation in very heavy termite infestation areas. These probabilities are referenced in Figure 2603.8. Foam plastic used in the "very heavy" infestation area is prohibited on the exterior face of below-grade foundations walls or slab foundations, under exterior or interior foundation walls or slab foundations below grade or where located within 6 inches (152 mm) of exposed earth, unless the requirement of one of the three specific exceptions is met. Foam plastics are permitted on the interior side of basement walls, where the structural members of the building are either noncombustible or pressure preservatively treated wood, or where the foam plastic is adequately protected from subterranean termite damage.

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.

❖ Foam plastic does not have to comply with the installation and use requirements of Sections 2603.4 through 2603.7 when specific approval is obtained in accordance with this section. This section lists examples of specific large-scale tests, such as: FM 4880, UL 1040, NFPA 286 or UL 1715. Also, other large-scale fire tests related to actual end-use configuration can be used. The intent is to require testing based on the proposed end-use configuration of the foam-plastic assembly with a fire exposure that is appropriate in size and location for the proposed application. These tests are to be performed on full-scale assemblies. The tested assemblies must include typical seams, joints and other details that will occur in the finished installation. The foam plastic must be tested in the maximum thickness and density intended for use. Thorough testing provides an accurate depiction of the in-place fire performance of assemblies and systems using foam plastics.

There are two ways to show code compliance under Section 2603.9. One method is to provide the actual test report that contains a description of the assembly and test results showing that the foam plastic, in the end use application, has passed the test. The second method is to obtain, from the ICC ES, an evaluation report that covers the end-use application. Materials that are being used as interior finish would still need to additionally pass the flame spread requirements of Chapter 8. It should be noted that NFPA 286 is one way of demonstrating compliance with the interior finish requirements of Chapter 8 and with this section.