



*Member of the FM Global Group*

**Approval Standard  
for  
Class 1 Fire Rating of  
Insulated Wall or Wall and  
Roof/Ceiling Panels,  
Interior Finish Materials  
or Coatings  
and Exterior Wall Systems**

**Class Number 4880**

**May 2010**

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# Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet FM Approvals' stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for FM Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for certification by FM Approvals shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing shall ensure a consistently uniform and reliable product. Approval Standards strive to be performance-oriented. They are intended to facilitate technological development.

For examining equipment, materials and services, Approval Standards:

- a) must be useful to the ends of property conservation by preventing, limiting or not causing damage under the conditions stated by the Approval listing; and
- b) must be readily identifiable.

Continuance of Approval and listing depends on compliance with the Approval Agreement, satisfactory performance in the field, on successful re-examinations of equipment, materials, and services as appropriate, and on periodic follow-up audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgment to change or revise its standards, criteria, methods, or procedures.

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# 1 INTRODUCTION

## 1.1 Purpose

- 1.1.1 This standard states Approval requirements for insulated wall or wall and roof/ceiling panels, interior finish materials or coatings and exterior wall systems for use where a Class 1 fire rating is needed in wall or wall and roof/ceiling constructions.
- 1.1.2 Approval criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up program.

## 1.2 Scope

- 1.2.1 This standard sets the fire performance requirements for Class 1 fire rated insulated wall or wall and roof/ceiling panels, interior finish materials or coatings and exterior wall systems in wall or wall and roof/ceiling constructions installed to maximum heights of 30 or 50 ft (9.1 or 15.2 m) or without height restriction when exposed to an ignition source simulating a building fire. If building use, occupancy or furnishings are combustible and can be expected to sustain a fire, installation of an automatic sprinkler system is recommended.
- 1.2.2 The performance of insulated wall or wall and roof/ceiling panels, interior finish materials or coatings and exterior wall systems depends in part on the fasteners, adhesives or other accessories used in their installation and the substrate over which they are installed. It is therefore necessary to evaluate all of the components of the construction and include them in the constructions tested.
- 1.2.3 This standard evaluates insulated wall or wall and roof/ceiling panels, interior finish materials or coatings and exterior wall systems for their performance in regard to fire. Roof panels and other roofing materials covered by this standard shall also meet the combustibility from above the roof assembly and wind uplift, foot traffic, hail and water leakage resistance requirements of FM Approvals Standard 4470 — Class 1 Roof Covers or FM Approvals Standard 4471 — Class 1 Metal Panel Roofs. Exterior wall panels and exterior wall systems covered by this standard shall also meet the windload and impact resistance requirements of FM Approvals Standard 4881 - Class 1 Exterior Wall Systems. Interior wall and ceiling materials or systems covered by this standard used in smoke sensitive occupancies shall also meet the requirements of FM Approvals Standard 4882 — Class 1 Interior Wall and Ceiling Materials or Systems for Smoke Sensitive Occupancies. Insulated walls shall have the option to be evaluated using FM Approvals Standard 4411 — Insulated Wall Constructions.
- 1.2.4 This standard is intended to evaluate only those hazards investigated, and is not intended to determine suitability for the end use of a product.
- 1.2.5 The results of tests conducted under the controlled conditions required by this standard shall not be used to describe or appraise performance under actual fire conditions. Actual fire conditions vary widely.
- 1.2.6 This standard shall not qualify exterior insulated finish systems (EIFS) or other exterior wall coating systems.

### 1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing and/or the standards of other national and international organizations. The advice of manufacturers, users, trade associations and loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of insulated wall or wall and roof/ceiling panels, interior finish materials or coatings and exterior wall systems for the purpose of becoming FM Approved. These requirements are intended primarily as guides, and strict conformity is not always mandatory. Insulated wall or wall and roof/ceiling panels, interior finish materials or coatings and exterior wall systems having characteristics not anticipated by this standard may be Approved if performance equal, or superior, to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, insulated wall or wall and roof/ceiling panels, interior finish materials or coatings and exterior wall systems which do meet all the requirements identified in this standard may not be FM Approved if other conditions which adversely affect performance exist or if the intent of this standard is not met.

### 1.4 Basis for Approval

Approval is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

1.4.1 Examination and tests on production samples are performed to evaluate

- the suitability of the product for its intended end use;
- the performance of the product as required by FM Approvals; and, as far as practical;
- the durability and reliability of the product.

1.4.2 An examination of the manufacturing facilities and audit of quality control procedures is made to evaluate the manufacturer's ability to produce the product which is examined and tested, and the marking procedures used to identify the product. These examinations are repeated as part of FM Approvals' Facilities and Procedures Audit follow-up program.

### 1.5 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as currently Approved;
- the continued use of acceptable quality control procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Agreements of FM Approvals; and
- re-examination of production samples for continued conformity to requirements.
- satisfactory Facilities and Procedures Audits (F&PAs) conducted as part of FM Approvals' product follow-up program.

Also, as a condition of retaining Approval, manufacturers may not change a product or service without prior authorization by FM Approvals.

### 1.6 Effective Date

- 1.6.1 The effective date of an Approval Standard requires that all products tested for Approval after the

effective date satisfy the requirements of that standard. Products Approved under a previous edition must comply with the new version by the effective date or forfeit Approval. The effective date applies to the entire Approval Standard, or, where so indicated, only to specific paragraphs of the standard.

1.6.2 The effective date of this standard is June 1, 2010

## 1.7 System of Units

Units of measurement are U.S. customary units. These are followed by their arithmetic equivalents in International System of Units (SI) units, enclosed in parentheses. Appendix A lists the selected units for quantities dealt with in testing these products; conversions to SI units are included. Conversion of U.S. customary units is in accordance with SI10-02 IEEE/ASTM SI 10 American National Standard for Use of the International System of Units (SI): The Modern Metric System.

## 1.8 Applicable Documents

The following are standards, test methods and practices referenced in this standard.

1.8.1 *FM Approvals, 1151 Boston-Providence Turnpike, Norwood Massachusetts 02062*

FM Approvals Standard 4470 — Class 1 Roof Covers

FM Approvals Standard 4471 — Class 1 Metal Panel Roofs

FM Approvals Standard 4411 — Insulated Wall Constructions

FM Approvals Standard 4881 — Class 1 Exterior Wall Systems

FM Approvals Standard 4882 — Class 1 Interior Wall and Ceiling Materials or Systems for Smoke Sensitive Occupancies

Test Procedure Class Number 4880: FM Approvals 25 Ft (7.6 M) High Corner Test.

Test Procedure Class Number 4880: FM Approvals 50 Ft (15.2 M) High Corner Test.

Test Procedure Class Numbers 4880 and 4882: FM Approvals 16 Ft (4.9m) High Parallel Panel Test.

Test Procedure Uniform Building Code Standard 26-3 Room Fire Test Standard For Interior Of Foam Plastic Systems

*FM Global Research, 1151 Boston-Providence Turnpike, Norwood Massachusetts 02062*

Newman, J. S. and Steciak, J., “Characterization of Particulates from Diffusion Flames”, *Combustion and Flame*, 67, 55-64, 1987.

Newman, J. S. and Steciak, J., “Particulate Generation from Diffusion Flames”, *Proceedings of the 1987 ASME/JSME Thermal Engineering Joint Conference*, March 22-27, 1987. The American Society of Mechanical Engineers, NY.

Newman, J. S., “Analysis of the FM Approvals Building Corner Fire Test,” *FM Approvals*, J.I. 0Q5E5.RC, April 1989.

- Newman, J. S. and Dunn, E. R., "Impact of Alternative Blowing Agents on Polyurethane/Polyisocyanurate Flame Spread Characteristics," Proceedings of the SPI 33rd Annual Technical/Marketing Conference, September 30-October 3, 1990.
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- Newman, J. S., "Smoke Characterization of Rigid Polyurethane/ Isocyanurate Foams," Proceedings of the SPI 34th Annual Technical/Marketing Conference, October 21-24, 1992.
- Tewarson, A., "Generation of Heat and Chemical Compounds in Fires", Chapter 4, Section 3, pp. 3-53 to 3-124. The SFPE Handbook of Fire Protection Engineering, 2nd Edition. The National Fire Protection Association Press, Quincy, MA, June 1995.
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- Alpert, R. L., and Khan, M.M., "Rating Materials as Noncombustible," IAFSS, Proceedings of the 7th International Symp., 791-802, 2002
- Nam, Soonil. "A New Parallel Panel Test, Part 1: Measurements", FM Global Technical Report, J.I.Project ID 0003021848 (Part 1), June 2006, revised April 2007.
- Nam, Soonil, "A New Parallel Panel Test, Part 2: Comparison with the 25-ft and the 50 ft Corner Tests for Wall Panels", FM Global Technical Report, Project ID 0003021848 (Part 2), April 2007.
- Nam, Soonil, "Extended Application of Parallel Panel Tests to Wall/Ceiling Panels", Research Technical Memorandum, January 2008.
- Nam, S. and Bill, R.G., Jr., "A New Intermediate-scale Fire Test for Evaluating Building Flammability," J. Fire Protect. Engr., 19, 157-176, 2009.
- 1.8.2 *International Organization for Standardization, Case Postale 56, CH1211 Geneva 20, Switzerland.*
- ISO 1716:2002: Reaction-To-Fire Tests for Building Products - Determination of the Heat of Combustion.
- ISO 9705:1993 - Fire Tests - Full-Scale Room Test for Surface Products.
- 1.8.3 *ASTM, 1916 Race Street, Philadelphia, Pennsylvania 19103.*
- SI10-02 IEEE/ASTM SI 10 American National Standard for Use of the International System of Units (SI): The Modern Metric System.
- ASTM C167, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
- ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Broad-Type Thermal Insulation.

ASTM D482, Standard Test Method for Ash from Petroleum Products.

ASTM D792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement, volume 8.01.

ASTM D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.

ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

ASTM D1929, Standard Test Method for Determining Ignition Temperature of Plastics.

ASTM D4809, Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Precision Method).

ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM E711, Standard Test Method for Gross Calorific Value of Refuse-Derived Fuel by the Bomb Calorimeter.

ASTM E2058, Standard Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA).

## 1.9 Definitions

For purposes of this standard, the following terms apply:

*FSP<sub>C</sub>* - convective flame spread parameter.  $FSP_C = Q_C / (TRP * A)$  where  $Q_C$  is the 5 second average peak convective heat release rate and TRP is the thermal response parameter determined per ASTM E2058 and A is the area of the combustion sample used to determine  $Q_C$ .

*PCHRR* - peak chemical heat release rate.

*inert faced*: Faced with a material which is considered noncombustible (steel, aluminum, gypsum wall board, cement board, masonry).

*roof/ceiling panels*: Building panels that are installed to form (1) the finished ceiling of a building or room or (2) the roof of a building and the finished ceiling of the space immediately beneath the roof.

*thermosetting*: capable of becoming permanently rigid when heated or cured.

*thermoplastic*: capable of softening when heated and of hardening again when cooled.

*wall and roof/ceiling panels*: Building panels that are installed to form adjoining wall and roof/ceiling surfaces.

*wall/ceiling coatings*: Coatings that are installed over adjoining wall and ceiling surfaces.



## 2 GENERAL INFORMATION

### 2.1 Product Information/Application

- 2.1.1 Insulated wall or wall and roof/ceiling panels are supplied in the form of field or factory fabricated panels which are connected to one another and to the substrate with various types of closures and joint treatments. They consist of an insulating core material (usually rigid plastic foam or glass fiber batts) faced with aluminum (including foil), steel, gypsum wallboard, plastic, masonry or other cementitious materials. They are secured to a structural framework or designed as load bearing members. They are installed to reduce heat (and sound) transmission through wall, floor/ceiling or roof/ceiling constructions and in many cases to protect a structure and its contents from the weather. They are not intended as, but may be, fire resistive structures. Insulated assemblies are tested with the maximum core thickness and the minimum facing thickness for which Approval is sought.
- 2.1.2 Interior finish materials are usually supplied in sheet form. They may be reinforced or unreinforced, thermoplastic or thermoset plastics. They are usually installed over combustible materials such as thermoplastic or thermoset plastic foams or noncombustible materials such as masonry block, brick, precast concrete or gypsum board where a smooth washable surface is required to comply with sanitary requirements. They are not intended as fire barriers. They are usually secured through the substrate over which they are installed to a structural framework or directly to the substrate and are therefore not designed as load bearing members. Interior finish materials are tested at the maximum thickness and over the most critical substrate for which Approval is sought.
- 2.1.3 Interior wall/ceiling coating systems include fire retardant treated cellulose, mineral or glass fiber insulations and intumescent paints and mastics for use as interior finishes or insulation to reduce heat or sound transmission through a wall or ceiling assembly. They are applied over combustible or noncombustible substrates by trowel, brush, spray or roller usually by installers licensed or approved by the coating manufacturer. The protection afforded to combustible substrates is generally proportional to the thickness of the application but the coatings are not intended as long-term fire barriers. Their use over combustible substrates is particularly applicable to low hazard areas containing limited combustible materials. Interior wall/ ceiling coating systems are tested at the minimum thickness and over the most critical substrate for which Approval is sought.
- 2.1.4 Exterior wall systems can be made from a variety of materials including, but not limited to, metal, concrete, composite and glass. They are fastened to the building framework using a variety of fastening techniques. Exterior wall systems shall be fire tested using the minimum exterior material thickness and the maximum insulation thickness over the most critical substrate for which Approval is sought.

### 2.2 Approval Application Requirements

To apply for an Approval examination the manufacturer, or its authorized representative, should submit a request to

Materials Director  
FM Approvals  
1151 Boston-Providence Turnpike  
PO Box 9102  
Norwood, MA 02062  
U.S.A.

The manufacturer shall provide the following preliminary information with any request for Approval consideration:

- A complete list of all models, types, sizes, and options for the products being submitted for Approval consideration;
- General assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, brochures, sales literature, spec. sheets and installation; and
- the number and location of manufacturing facilities.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.

### **2.3 Requirements**

In order to qualify as Class 1 fire rated insulated wall or wall and roof/ceiling panels, interior finish materials or coatings or exterior wall systems the Approval examination shall include 1) observation of test sample manufacture, 2) review of component formulation(s) and/or specification(s), 3) flammability characterization of combustible components, 4) 25 ft (7.6 m) high corner test (see 4.2.1 for exceptions), 5) 50 ft (15.2 m) high corner test [optional for Approval to heights in excess of 30 ft (9.14 m), see 4.3.1 for exceptions], 6) room test and 7) other tests as noted. A complete review of installation specifications and, at the sole discretion of FM Approvals, inspection of one or more field installations shall be conducted to assure, as far as possible, the practicality and reliability of product installation. See also exceptions in Section 4 PERFORMANCE REQUIREMENTS.

## **3 GENERAL REQUIREMENTS**

### **3.1 Markings**

- 3.1.1 Each package, container or bill of lading for bulk shipments of FM Approved Class 1 fire rated insulated wall or wall and roof/ceiling panels, interior finish materials or coatings, and exterior wall systems components shall bear the manufacturer's name, product name and the Approval mark of FM Approvals (see Appendix B).

### **3.2 Instructions**

Printed installation instructions shall be provided by the manufacturer detailing the necessary installation procedures to be followed by installers.

### **3.3 Drawings/Formulations/Specifications Required**

- 3.3.1 The manufacturer shall provide assembly drawings, materials lists, brochures, sales literature, and specification sheets for each insulated wall or wall and roof/ceiling panel, foam system component for insulated panels, interior finish material, component or exterior wall system component.
- 3.3.2 The formulation and specifications for any components of insulated wall or wall and roof/ceiling panels, interior finish materials or coatings, or exterior wall systems shall be submitted to FM Approvals for review and be kept on file at FM Approvals on a confidential basis.

### 3.4 Manufacturers Responsibilities

The manufacturer shall notify FM Approvals of any change in product construction, components, raw materials or component formulation prior to sale or distribution.

### 3.5 Observation of Test Sample Production

3.5.1 A representative of FM Approvals shall inspect the manufacturing facility for, witness the production of, and place their mark on, each wall or wall and roof/ceiling panel, interior finish material, interior wall/ceiling coating system component or exterior wall system component to be evaluated.

3.5.2 If a wall or wall and roof/ceiling panel, interior finish material or coating, interior wall/ceiling coating system or exterior wall system has one or more plastic components, production of the plastic component(s), including the blending of the polyol (B) side or isocyanate (A) side of any thermoset plastic foam, shall be witnessed.

### 3.6 Formulation Changes

3.6.1 Approval of formulation changes involving a single major ingredient (polyol, fire retardant, resin, blowing agent) of a plastic component of a previously FM Approved insulated wall or wall and roof/ceiling panel, interior finish material or coating, exterior wall system shall be based on a favorable comparison of the flammability characterization of the component produced from the modified formulation with the flammability characterization of the originally Approved plastic component.

3.6.2 Approval of formulation changes involving more than one major ingredient or a single major ingredient where flammability characterizations of the modified and previously Approved components do not compare favorably, shall be based on all the requirements of this standard.

### 3.7 Insulated Panel Joint Changes

Approval of alternate joint geometries between insulated wall or wall and roof/ceiling panels shall be based on a favorable comparison of the results of room tests of insulated panels with the alternate joint geometry and insulated panels using the previously Approved joint geometry.

### 3.8 Approval Extension

3.8.1 Programs for Approval of metal faced thermoset plastic foam insulated wall or wall and roof/ceiling panels shall be permitted to be sponsored by the manufacturer of a thermoset plastic foam insulation system. Approval of insulated wall or wall and roof/ceiling panels using an insulation system Approved in this manner shall be permitted to be extended to one or more manufacturers of insulated panels. The extended Approval shall be based on a written release of the data developed in the Approval program sponsored by the manufacturer of the insulation system and an abbreviated Approval program sponsored by each panel manufacturer.

3.8.2 Abbreviated Approval programs shall consist of the observation by FM Approvals personnel of the production of test panels by the panel manufacturer using the Approved foam system, a room test, the determination of the surface burning characteristics of the bare plastic insulating core foam and other small scale bare plastic insulating core foam identification testing required below.

- 3.8.3 Approval extension shall be based on a favorable comparison of the results of the room tests sponsored by the panel manufacturer and the manufacturer of the FM Approved foam system.

## 4 PERFORMANCE REQUIREMENTS

### 4.1 Flammability Characterization

#### 4.1.1 Requirement:

For Class 1 Approval to the maximum height of 30 ft (9.1 m) of inert faced thermoset plastic foam core panels without an FM Approvals 25 ft (7.6 m) High Corner Test, the bare thermoset plastic foam core of the panels shall have a convective flame spread parameter (FSP<sub>C</sub>) of less than or equal to  $0.39 \text{ s}^{-1/2}$ . A successful FM Approvals 25 ft (7.6 m) High Corner Test is required for all other assemblies covered by this standard unless the criteria for exception 2 or 3 below are met.

For plastic or other combustible components of assemblies covered by this standard, the chemical heat of combustion ( $\Delta H_{\text{ch}}$ ), critical heat flux for ignition ( $\dot{q}_{\text{cr}}''$ ), thermal response parameter (TRP) and convective flame spread parameter (FSP<sub>C</sub>) shall be determined and reported.

**Note:** These tests are conducted to establish a base from which requests for formulation revisions are evaluated. With the exception of FSP<sub>C</sub> of bare thermoset plastic foam cores for Approval of inert faced thermoset plastic foam core panels, FM Approvals places no limits on the values obtained.

#### 4.1.2 Test/Verification:

Flammability Characterization using an FM Approvals Fire Propagation Apparatus per ASTM E2058).

### 4.2 FM Approvals 25 ft (7.6 m) High Corner Test

#### 4.2.1 Requirement:

For Class 1 Approval to the maximum height of 30 ft (9.1 m), assemblies covered by this standard shall not support a self-propagating fire which reaches any of the limits of the 25 ft (7.6 m) high corner test structure as evidenced by flaming or material damage.

Exception 1: The FM Approvals 7.6 m (25 ft) High Corner Test is waived for inert faced thermosetting plastic foam core panels if the bare thermosetting plastic foam core has a convective flame spread parameter (FSP<sub>C</sub>) of less than or equal to  $0.39 \text{ s}^{-1/2}$ .

Exception 2: For wall and wall and ceiling panels other than those with thermoplastic foam cores, the FM Approvals 7.6 m (25 ft) High Corner Test is waived if the peak chemical heat release rate (PCHRR) during a 4.9 m (16 ft) parallel panel fire test with a propane gas ignition source of 360 kW is less than, or equal to, 1100 kW for combustible walls with a noncombustible ceiling or less than, or equal to, 830 kW for combustible walls with a combustible ceiling.

Note - See also Exception 3 below for inert faced panels with noncombustible cores and Exception 5 below for faced insulations with low density noncombustible cores.

#### 4.2.2 Test/Verification:

FM Approvals 25 ft (7.6 m) High Corner Test, TEST PROCEDURE CLASS NUMBER 4880:

FM APPROVALS 25 ft (7.6 m) HIGH CORNER TEST.

For Exception 1, Flammability Characterization using the FM Approvals Fire Propagation Apparatus per ASTM E2058, Standard Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA).

For Exception 2, FM Approvals 16 ft. High Parallel Panel Test, TEST PROCEDURE CLASS NUMBERS 4880 AND 4882: FM APPROVALS 16 ft (4.9m) HIGH PARALLEL PANEL TEST.

### 4.3 FM Approvals 50 ft (15.2 m) High Corner Test

#### 4.3.1 Requirement:

For Class 1 Approval to the maximum height of 50 ft (15.2 m), assemblies covered by this standard shall have met the requirements for Class 1 Approval to the maximum height of 30 ft (9.1 m) and shall not support a self-propagating fire which reaches any of the limits of the 50 ft (15.2 m) high corner test structure as evidenced by flaming or material damage.

For Class 1 Approval with no height restriction, assemblies covered by this standard shall have met the requirements for Class 1 Approval to the maximum height of 30 ft (9.1 m), the assembly shall not support a self-propagating fire which reaches any of the limits of the 50 ft (15.2 m) high corner test structure as evidenced by flaming or material damage and ignition of the ceiling of the assembly in the 50 ft (15.2 m) high corner test shall not occur.

Exception 3: Both the FM Approvals 15.2 m (50 ft) High Corner Test and the FM Approvals 7.6 m (25 ft) High Corner Test are waived for inert faced panels with noncombustible cores provided all of the following criteria are met:

- 1 The core material 1) has a minimum ash content of 90% when tested without adhesive or facers. Where a single test produces a result of less than, but close to 90%, two additional tests shall be conducted and the results of the three tests shall be averaged.
- 2 The core material has a maximum gross heat of combustion of 2.0 kJ/g (860 BTU/lb) when tested without adhesive or facers (where a single test produces a result of greater than, but close to 2.0 kJ/g (860 BTU/lb), two additional tests shall be conducted and the results of the three tests shall be averaged).
- 3 The core material shows no visible flaming when tested at an applied heat flux of 50 kW/m<sup>2</sup> in air enriched to 40% oxygen without adhesive or facers:
  - a. for 15 minutes from the start of the combustion test or
  - b. until mass loss from the sample has ceased if mass loss from the sample has not ceased by 15 minutes after the start of the combustion test or
  - c. until visible vapors have ceased to be generated if visible vapors are being generated by the sample 15 minutes after the start of the combustion test at an applied heat flux of 50 kW/m<sup>2</sup> in air enriched to 40% oxygen.

Exception 4: For wall and wall and ceiling panels other than those with thermoplastic foam cores, the FM Approvals 7.6 m (50 ft) High Corner Test is waived for Approval without height restriction if the peak chemical heat release rate (PCHRR) during a 4.9 m (16 ft) parallel panel fire test with a propane gas ignition source of 360 kW is less than, or equal to, 830 kW for combustible walls with a noncombustible ceiling or combustible walls with a combustible ceiling.

Exception 5: Both the FM Approvals 15.2 m (50 ft) High Corner Test and the FM Approvals 7.6 m (25 ft) High Corner Test are waived for faced insulations with low density noncombustible cores, such as fiberglass or mineral wool batts or blankets, meeting the criteria of Exception 3 above, with adhered thin [ $\leq 0.010$  in. (0.25 mm) thick] facings consisting of various plastic films, aluminum foil, Kraft papers, fabrics and/or reinforcements laminated together with an adhesive or adhesives.

#### 4.3.2 Test/Verification:

FM Approvals 50 ft (15.2 m) High Corner Test, TEST PROCEDURE CLASS NUMBER 4880: FM APPROVALS 50 ft (15.2 m) HIGH CORNER TEST.

For Exception 3, ASTM D482, Standard Test Method for Ash from Petroleum Products for ash content, ISO 1716:2002: Reaction-To-Fire Tests for Building Products - Determination of the Heat of Combustion for heat of combustion and ASTM E2058, Standard Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA) for the combustion test.

For Exception 4, FM Approvals 16 ft. High Parallel Panel Test, TEST PROCEDURE CLASS NUMBERS 4880 AND 4882: FM APPROVALS 16 ft (4.9m) HIGH PARALLEL PANEL TEST.

For Exception 5, ASTM D482, Standard Test Method for Ash from Petroleum Products for ash content, ISO 1716:2002: Reaction-To-Fire Tests for Building Products - Determination of the Heat of Combustion for heat of combustion and ASTM E2058, Standard Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA) for the combustion test.

## 4.4 Room Test

### 4.4.1 Requirement:

For Class 1 Approval, assemblies covered by this standard shall be subjected to a: 1) UBC Standard No. 26-3; 2) or ISO 9705 room test. When tested in accordance with UBC Standard No. 26-3, an assembly shall meet the conditions of acceptance of UBC Standard No. 26-3. When tested in accordance with ISO 9705, an assembly shall (1) not support a self-propagating fire which extends to the outer extremities of the test area within the 20 minute test as evidenced by flaming or material damage (including charring of core materials); (2) not generate excessive smoke during the test period; and (3) sustain the applied load, if any, for the duration of the test period.

### 4.4.2 Test/Verification:

TEST PROCEDURE UNIFORM BUILDING CODE STANDARD 26-3 ROOM FIRE TEST STANDARD FOR INTERIOR OF FOAM PLASTIC SYSTEMS or ISO 9705:1993 - Fire Tests - Full-Scale Room Test for Surface Products.

## 4.5 Surface Burning Characteristics of Plastic Foam Insulating Cores

### 4.5.1 Requirement:

For insulated building panels with a plastic foam core, the flame spread and smoke developed shall be reported for the bare plastic foam core at a thickness of 4 in. (100 mm) or the maximum core thickness, whichever is less. A minimum of 3 tests shall be conducted<sup>1</sup>.

4.5.2 Test/Verification:

ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

**Note 1:** These tests are conducted to satisfy building code requirements or for identification purposes. FM Approvals places no limits on the values obtained.

#### 4.6 Density of Panel Insulating Cores

4.6.1 Requirement:

For insulated building panels, the density of the bare insulating core shall be determined and reported<sup>2</sup>.

4.6.2 Test/Verification:

ASTM C167, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations, ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block or Broad-Type Thermal Insulation or ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

**Note 2:** These tests are conducted to satisfy building code requirements or for identification purposes. FM Approvals places no limits on the values obtained.

#### 4.7 Density of Plastic Panels or Panel Facings

4.7.1 Requirement:

For plastic or plastic faced building panels, the density of the panel or facings shall be determined and reported<sup>3</sup>.

4.7.2 Test/Verification:

ASTM D792, Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement or ASTM D1505, Test Method for Density of Plastics by the Density-Gradient Technique.

**Note 3:** These tests are conducted to satisfy building code requirements or for identification purposes. FM Approvals places no limits on the values obtained.

#### 4.8 Ignition Properties of Plastic Panels or Panel Components

4.8.1 Requirement:

For plastic building panels or building panels with a plastic component (foam core, facings), the self-ignition and flash-ignition temperatures of the plastic panels or panel components shall be determined and reported<sup>4</sup>.

4.8.2 Test/Verification

ASTM D1929, Standard Test Method for Determining Ignition Temperature of Plastics.

**Note 4:** These tests are conducted to satisfy building code requirements or for identification purposes. FM Approvals places no limits on the values obtained.

#### **4.9 Heat Content of Plastic Panels or Panel Components**

##### 4.9.1 Requirement:

For plastic building panels or building panels with a plastic component (foam core, facings), the heat content of the plastic panels or panel components shall be determined by oxygen bomb calorimetry and reported<sup>5</sup>.

##### 4.9.2 Test/Verification:

ISO 1716:2002: Reaction-To-Fire Tests for Building Products - Determination of the Heat of Combustion, ASTM D4809, Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Intermediate Precision Method) or ASTM E711, Standard Test Method for Gross Calorific Value of Refuse-Derived Fuel by the Bomb Calorimeter.

**Note 5:** These tests are conducted to satisfy building code requirements or for identification purposes. FM Approvals places no limits on the values obtained.

#### **4.10 Ash Content of Plastic Panels or Panel Components**

##### 4.10.1 Requirement:

For plastic building panels or building panels with a plastic component (foam core, facings), the total ash content of the plastic panels or panel components shall be determined and reported<sup>6</sup>.

##### 4.10.2 Test/Verification:

ASTM D482, Standard Test Method for Ash of Petroleum Products.

**Note 6:** These tests are conducted to satisfy building code requirements or for identification purposes. FM Approvals places no limits on the values obtained.

## **5 OPERATIONS REQUIREMENTS**

### **5.1 Demonstrated Quality Control Program**

5.1.1 A Quality Control Program is required to assure that subsequent Class 1 fire rated insulated wall or wall and roof/ceiling panels, interior finish materials or coatings, exterior wall systems produced by the manufacturer exhibit the same quality and reliability as the specific samples examined. Design quality, conformance to design, and performance are the areas of primary concern.

Design quality is determined during the examination and testing.



Conformance to design is verified by control of quality in the following areas:

- existence of corporate quality control guidelines
- incoming assurance, including testing
- in-process assurance, including testing
- final inspection and test
- equipment calibration
- drawing and change control
- packaging and shipping
- handling discrepant materials

Quality of performance is determined by field performance and by re-examination.

5.1.2 The manufacturer shall establish a system of product configuration control to prevent unauthorized changes, including, as appropriate:

- engineering drawings
- engineering change requests
- engineering orders
- change notices

These shall be executed in conformance with a written policy and detailed procedures. Records of all revisions to all Approved products shall be kept.

5.1.3 The manufacturer shall assign an appropriate person or group to be responsible to obtain FM Approvals authorization of all changes applicable to Approved products. FM Approvals Form 797, Approved Product/Specification Tested — Revision Report or Address/Contact Change Report, is provided to notify FM Approvals of pending changes.

## **5.2 Facilities and Procedures Audit (F&PA)**

5.2.1 An inspection of the product manufacturing facility shall be part of the Approval investigation. Its purpose is to determine that equipment, procedures, and the manufacturer's controls are properly maintained to produce a product of the same quality as initially tested.

5.2.2 Unannounced follow-up inspections shall be conducted to assure continued quality control and product uniformity.

**APPENDIX A: CONVERSION OF MEASUREMENT UNITS**

**LENGTH:** in. -“inches”; (mm -“millimeters”)  
mm = in.  $\times$  25.40 ft -“feet”  
(m -“meters”)  
m=ft  $\times$  0.3048

**PRESSURE:** psi -“pounds per square inch”  
(kPa -“kilopascal”)  
kPa = psi  $\times$  6.895

**HEAT:** Btu -“British thermal unit”  
(J -“joule”)  
J = Btu  $\times$  1055

**TEMPERATURE:** °F -“degrees Fahrenheit”  
(°C -“degrees Celsius”)  
°C=(°F-32) $\times$   $\frac{5}{9}$

**MASS:** lb -“pound”  
(kg -“kilogram”)  
kg=lb  $\times$  0.4536

**FORCE:** lbf -“pound force”  
(N -“newton”)  
N = lbf  $\times$  4.448

**TORQUE or MOMENT:** lbf.ft -“pound force feet”  
(N.m -“newton meter”)  
N.m = lbf.ft  $\times$  1.356

## APPENDIX B: FM APPROVALS CERTIFICATION MARKS

FM Approvals certifications marks are to be used only in conjunction with products or services that have been Approved by FM Approvals and in adherence with usage guidelines.



### FM APPROVED mark:

Authorized by FM Approvals as a certification mark for any product that has been FM Approved. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable. The mark should be produced in black on a light background, or in reverse on a dark background.



### Cast-On FM Approvals marks:

Where reproduction of the FM Approved mark described above is impossible because of production restrictions, use these modified versions of the FM Approved mark. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable.



### FM Approved Mark with “C” only:

Authorized by FM Approvals as a certification mark for any product that has been evaluated by FM Approvals in accordance with Canadian codes and standards. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable. The mark should be produced in black on a light background, or in reverse on a dark background.



### FM Approved mark with “C” and “US”:

Authorized by FM Approvals as a certification mark for any product that has been evaluated by FM Approvals in accordance with US and Canadian codes and standards. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable. The mark should be produced in black on a light background, or in reverse on a dark background.

# FM Approvals Certification Marks

## USAGE GUIDELINES

All FM Approvals certification marks are the sole property of FM Approvals LLC (“FM Approvals”) and are registered or the subject of applications for registration in the United States and many other countries. They are for use only according to these guidelines.

FM Approvals certification marks may be used only on FM Approved products and related product packaging, in advertising material, catalogs and news releases. Use of FM Approvals certification marks on such material is not a substitute for use of the complete FM Approvals certification mark on FM Approved products and/or product packaging.

No FM Approvals certification mark or aspect thereof may be incorporated as part of a business name, Internet domain name, or brand name/trademark for products/product lines. This includes both design aspects (the FM Approvals “diamond,” etc.) and word aspects (“FM,” “Approved,” etc.). The use of any FM Approvals certification mark as a trademark is strictly prohibited.

The Approval Standard number or class number may not be incorporated as part of a business name, Internet domain name, or brand name/trademark for products/product lines. For example, a company may not say “ABC Company’s 4100 Fire Door is FM Approved”; the proper terminology is, “ABC Company’s Fire Door is FM Approved per Approval Standard 4100.”

FM Approvals certification marks, except for the FM Approvals Quality System Registration mark, may not be used on business stationery/cards/signage because this could mischaracterize the relationship with FM Approvals. Additionally, these items should not reference any FM Approvals certification mark.

Products or services may not be marketed under any mark or name similar to “FM Global,” “FM Approvals” or any of the FM Approvals certification marks. Further, products or services may not be marketed to imply a relationship beyond the scope of any Approval made by FM Approvals.

When an FM Approvals certification mark is used in advertising material or on product packaging, all material must reflect the specific circumstances under which the product was FM Approved. The material must clearly differentiate between products that are FM Approved and those that are not, and may not, in any way, imply a more substantial relationship with FM Approvals.

A company may not reference the intent to submit a product for Approval or the expectation that a company will have a certain product FM Approved in the future. For example, a company may not state, “Approval by FM Approvals pending” or “Approval by FM Approvals applied for.”

FM Approvals certification marks should not be preceded or followed by a qualifier that indicates a degree of certification or acceptability. For example, “exceeds,” “first” or “only” may not be used to qualify any FM Approvals certification mark.

Only original artwork issued by FM Approvals should be used. The FM Approvals certification marks should not be altered in any way other than to resize the artwork proportionately. Unacceptable uses of the marks include, but are not limited to, adding/deleting wording or artwork, reducing the artwork to an illegible size, animation or distortion.

The text of the FM Approvals certification marks may not be translated into any language other than English.

FM Approvals certification marks must appear in a size and location that is readily identifiable, but less prominent than the name of the owner of the certification or the manufacturer/seller/distributor of the certified products.