



Member of the FM Global Group

Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials

Class Number 4880

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Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for building panels or interior finish materials for use where a Class 1 fire rating is needed for wall and/or ceiling constructions.
- 1.1.2 Testing and certification criteria may include observation of test sample production, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard applies to the fire performance requirements for a Class 1 fire rating of building panels or interior finish materials. These products shall be certified with specific height installation requirements and combustibility ratings.
- 1.2.1.1 Building panels or interior finish materials shall be certified for installations:
- with a maximum height restriction of 30 ft (9.1 m),
 - with a maximum height restriction of 50 ft (15.2 m) or
 - without height restrictions (i.e. unlimited height).
- 1.2.1.2 The combustibility of a core insulation or interior finish materials shall be identified as combustible or noncombustible.
- 1.2.2 Building panels or interior finish materials include, but are not limited to:
- insulated or non-insulated wall and/or ceiling panels with an inert or non-inert facer and combustible core or noncombustible core;
 - doors manufactured with the same facers and core as wall panels included in the scope, used to access partition or enclosure assemblies made with wall panels included in the scope; and
 - interior finish materials:
 - thermoplastic panels
 - thermoset panels, and
 - coatings systems and exposed interior insulations.
- 1.2.3 Any component which may be used in the installation of a building panel or interior finish material such as fasteners, adhesives, sealants, flashing, substrates, or any other accessories, are considered part of the scope of the product and must be evaluated in conjunction with the product. At the discretion of the certification agency, any component that may affect the test performance must be included in the test sample construction.
- 1.2.4 This standard evaluates building panels or interior finish materials for an interior installation application only. For exterior installation applications, occupancies with limited smoke requirements (e.g. clean room or food storage), data processing centers, and cavity wall and rainscreen application, the certification requires successful examination in accordance with the following applicable standards:
- FM 4411- *Examination Standard for Cavity Walls and Rainscreens.*
 - FM 4470 – *Examination Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction,*
 - FM 4471 – *Examination Standard for Class 1 Panel Roofs*

- FM 4881 – *Examination Standard for Class 1 Exterior Wall Systems*
- FM 4882 – *Examination Standard for Class 1 Interior Wall and Ceiling Materials or Systems for Smoke Sensitive Occupancies*
- FM 4884 - *Examination Standard for Panels Used in Data Processing Center Hot and Cold Aisle Containment Systems*

- 1.2.5 Building panels or interior finish materials, which meet the requirements of this standard, in and of themselves, would not create a need for automatic sprinklers.
- 1.2.6 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.
- 1.2.7 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 Meeting the requirements qualifies the wall/ceiling assemblies as certified Class 1 building panels or interior finish materials. Requirements prohibit component substitutes without prior authorization by the certification agency.
- 1.3.3 The requirements of this standard reflect tests and practices used to examine characteristics of building panels or interior finish materials for the purpose of obtaining certification. Building panels or interior finish materials having characteristics not anticipated by this standard may be certified if performance equal, or superior, to that required by this standard is demonstrated.

1.4 Basis for Certification

Certification 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 as a certified Class 1 building panel or interior finish material;
 - the performance of the product as specified by the manufacturer and required for certification;
 - the durability and reliability of the product when used as a certified Class 1 building panel or interior finish material.
- 1.4.2 An examination of the manufacturing facilities for completed assemblies and components and audit of quality control procedures may be conducted to evaluate the manufacturer's ability to consistently produce the products which are examined and tested, and the marking procedures used to identify the products. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agency's product surveillance program.

1.6 Effective Date

The effective date of this examination standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

1.7 System of Units

Units of measurement used in this standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies.

American Society for Testing and Materials (ASTM International)

- ANSI/ IEEE/ASTM SI 10 *American National Standard for Metric Practice.*
- ASTM C167, *Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations*
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- 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)*

International Organization for Standardization (ISO)

- ISO 871, *Plastics -Determination of Ignition Temperature Using a Hot-Air Furnace*
- ISO 1716, *Reaction-To-Fire Tests for Building Products - Determination of the Heat of Combustion*
- ISO 9705, *Fire Tests - Full-Scale Room Test for Surface Products*
- ISO 12136, *Reaction to Fire Tests - Measurement of Material Properties Using a Fire Propagation Apparatus*

FM Approvals LLC (FM)

- FM 4411, *Examination Standard for Cavity Walls and Rainscreens*
- FM 4470, *Examination Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction*
- FM 4471, *Examination Standard for Class 1 Panel Roofs*
- FM 4881, *Examination Standard for Class 1 Exterior Wall Systems*
- FM 4882, *Examination Standard for Class 1 Interior Wall and Ceiling Materials or Systems for Smoke Sensitive Occupancies*
- FM 4884, *Examination Standard for Panels Used in Data Processing Center Hot and Cold Aisle Containment Systems*
- ANSI FM 4880, *American National Standard for Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials*

1.9 Terms and Definitions

For purposes of this standard, the following terms apply:

Caulking

A filler used to seal openings and joints in wall and/or ceiling assemblies. Caulking is typically not intended for fire-resistance and typically does not react with heat from a fire.

Certificate of Analysis

A Certificate of Analysis is a document issued by a manufacturer that confirms that the product meets its product specifications. It usually contains quality control test results for the product.

Combustible Core or Combustible Interior Finish Material

A combustible core or combustible interior finish material is one that has not been tested for or does not pass the requirements listed in Appendix A of this standard for a noncombustible rating.

Combustibility of Core or Interior Finish Material

The combustibility of a core insulation or interior finish material will be identified as “Combustible” or “Noncombustible.” A rating shall only be obtained from successfully completing the requirements listed in Appendix A of this standard.

Component

A component is a part or element of a building panel, interior finish material, foam system, etc., and/or part or element of an assembly of a building panel or interior finish material. Examples of components are, but not limited to, foam systems, ingredients of foam systems (e.g. polyol or isocyanine), noncombustible cores, and/or joint sealants.

Door

A hinged or slide mounted panel on a frame used to access a partition or enclosure that can include components such as latch, sill, inside release, ventilator port, sweep, and gasket. The frame usually includes a hinge jamb, latch jamb, and header. A hinged door frame usually includes a hinge jamb, latch jamb, and header. A slide door frame usually includes a sliding track, bottom guides, top glide rollers, and a header.

Fire-resistant Caulking, Gaskets, or Sealants

Fire-resistant caulking, gaskets, or sealants are made of various components and may be used to seal openings and/or joints in wall and/or ceiling assemblies. Fire-resistant caulking, gaskets, or sealants may react with heat from a fire. Examples include, but are not limited to, firestops and intumescent materials.

EPS

Expanded polystyrene (EPS) is a thermoplastic, rigid cellular plastic or closed-cell foam which can be used as an insulation for insulated wall and/or ceiling panels.

FSP_C

The convective flame spread parameter (FSP_C). The $FSP_C = Q_C / (TRP * a)$ 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 total surface area of the combustion sample used to determine Q_C .

Gasket

A shaped piece of rubber or other material used to seal openings and/or joints in wall and/or ceiling assemblies. A gasket is typically not intended for fire-resistance and typically does not react with heat from a fire.

Identified Component

Identified Components are components of building panels or interior finish materials assemblies, such as, but not limited to, foam systems, components of foam systems, noncombustible cores, and/or joint sealants. Identified Components are components that have been placed under the certification agency's surveillance program and can be utilized in building panels or interior finish material assemblies.

Inert Facer

Facer with a material which is considered noncombustible (e.g. steel, aluminum, gypsum wall board, cement board, masonry).

Intumescent

The act of swelling when heated by a fire. Intumescent materials (e.g. firestop sealant) are typically used with the intention of sealing an opening and/or joint in order to protect the material underneath.

Joint Treatment

A material used for sealing joints in wall and/or ceiling assemblies. Examples for joint treatments are caulking, gaskets, and/or sealants.

Multiple Ingredient Change

A multiple ingredient change is two or more significant component changes, deemed by the certification agency, from the original formulation utilized for satisfying all required performance tests under this standard. One component change may be considered a multiple ingredient change if it is the second ingredient change from the original formulation utilized for satisfying all required performance tests under this standard. Changes deemed by the certification agency as insignificant are not considered a multiple ingredient change.

Noncombustible Core or Noncombustible Interior Finish Material

A noncombustible core or noncombustible interior finish material is one that has met the requirements listed in Appendix A of this standard for a noncombustible rating.

Non-Inert Facer

Facer with a material which is considered combustible (e.g. paper, plastic, etc.).

Non-Intumescent

Materials which do not expand when exposed to heat from a fire. Non-intumescent materials (e.g. silicone or butyl sealant) are typically used with the intention of sealing an opening and/or joints.

PIR

Polyisocyanurate (PIR) is a thermoset plastic commonly used as an insulation for insulated wall and/or ceiling panels.

PUR

Polyurethane (PUR) is a thermoset plastic commonly used as an insulation for insulated wall and/or ceiling panels.

Sealant

A material made of one or more components used for sealing openings and/or joints in wall and/or ceiling assemblies. A sealant may or may not be intended for fire-resistance.

Significant Ingredient Change

A change to a formulation of a certified product that has been reviewed by the certification agency and categorized as either a single ingredient change or a multiple ingredient change. Significant ingredient changes include, but are not limited to, changing an ingredient, changing a supplier of an ingredient, and/or changing manufacturing tolerances of ingredients of an existing certified formulation.

Silicone

A synthetic material made of one or more components used to seal openings and/or joints in wall and/or ceiling assemblies. Silicone is not intended for fire-resistance and does not react with heat from a fire.

Single Ingredient Change

A single ingredient change is one significant component change, deemed by the certification agency, from the original formulation utilized for satisfying all required performance tests under this standard. Changes deemed by the certification agency as insignificant are not considered a single ingredient change.

Thermoset

Capable of becoming permanently rigid when heated or cured. (e.g. PIR or PUR insulated foam system).

Thermoplastic

Capable of softening when heated and of hardening again when cooled. (e.g. EPS).

Wall and/or Ceiling Panels

Building panels or interior finish materials that are installed to form adjoining wall and/or ceiling surfaces.

Wall/Ceiling Coatings

Coatings that are installed over adjoining wall and/or ceiling surfaces.

2 GENERAL INFORMATION

2.1 Product Information

2.1.1 Insulated or non-insulated wall and/or ceiling panels and doors are supplied in the form of field or factory fabricated panels. They consist of a core material and are faced with steel, aluminum (including foil), gypsum wallboard, plastic, masonry, or other materials. When assembled the panels are connected to one another and to the substrate with various types of closures and joint treatments.

The panels and doors can be secured to a structural framework or designed as free-standing. Insulated wall and/or ceiling panels are installed to reduce heat (and sound) transmission through wall and/or ceiling constructions. They are not intended as, but may be, fire resistive structures. Insulated or non-insulated wall and/or ceiling panels are tested with the most critical composition (e.g. facer thickness, panel thickness, joint type, etc.) and most critical panel assembly, deemed by the certification agency, for which is requested for obtaining certification.

Doors included in this standard are not fire doors. Fire door assemblies with degree or hourly ratings are examined under FM 4100, *Fire Door Assemblies*.

2.1.2 Interior finish materials include:

2.1.2.1 Thermoplastic or thermoset plastics/panels, which are usually supplied in sheet form and may be reinforced or unreinforced. 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 with the most critical composition (e.g. thickness) over the most critical substrate, deemed by the certification agency, for which is requested for obtaining certification.

2.1.2.2 Coating systems and exposed interior insulations include: fire retardant treated cellulose, mineral or glass fiber insulations, and intumescent paints and mastics. They are typically used as interior finish or insulation to reduce heat or sound transmission through a wall and/or ceiling assemblies. They are applied over combustible or noncombustible substrates by trowel, brush, spray, or roller. Installers are typically 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 with the most critical composition (e.g. thickness) over the most critical substrate, deemed by the certification agency, for which is requested for obtaining certification.

2.2 Certification Application Requirements

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

- a complete list of all models, types, sizes, and options for the products or services being submitted for certification consideration;
- general assembly drawings (including caulking, sealants gaskets, flashing, fastener spacing, etc.), complete set of manufacturing drawings, raw material suppliers and specifications, proprietary

formulations, anticipated marking format, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures;

- the number and location of manufacturing facilities; and
- desired combustibility rating and maximum installation height (i.e., unlimited height, 50 ft (15.2m), or 30 ft (9.1 m) height restriction).
- 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 Certification Examination Requirements

In order to qualify as Class 1 fire rated building panel or interior finish material, the certification examination shall include:

- review of component formulation(s) and/or specification(s);
- observation of test sample production;
- performance requirements which are based on the type of product(s) and desired ratings. Testing requirements for each type of product and rating are outlined in Appendix A. Tests of alternate constructions may be waived if considered less hazardous than those previously tested;
- an examination of the manufacturing facilities, critical supplier / subcontractor locations and review of the quality assurance procedures as part of the surveillance audit program; and
- a complete review of installation specifications and, at the sole discretion of the certification agency, inspection of one or more field installations shall be conducted to assure, as far as possible, the practicality and reliability of product installation.

3 GENERAL REQUIREMENTS

3.1 Markings

3.1.1 Markings on the product or, if not possible, on its packaging or label accompanying the product, shall include the following information:

- name and address of the manufacturer or marking traceable to the manufacturer,
- date of manufacture or code traceable to date of manufacture or lot identification,
- model number or product identification, and
- the certification or Identified Component mark as detailed below, and
- “Must be installed in accordance with the certified installation provided with the panels.”

The certification agency’s mark of conformity shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the requirements of the certification agency. The manufacturer shall exercise control of this mark as specified by the certification agency and the certification scheme.

For Identified Components products, as detailed in Section 3.8 of this standard, “Specification Tested: Identified Component” shall be displayed visibly and permanently on the product and/or packaging, as appropriate. The manufacturer shall not use this mark on any other product unless such product is covered by a separate report. Identified Components are not permitted to claim by mark, symbol, or words that the product is certified.

3.1.2 When hazard warnings are needed, the markings shall be universally recognizable.

3.1.3 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the certification agency’s mark of conformity.

3.1.4 All markings shall be legible and durable.

3.2 Manufacturer’s Installation Instructions

3.2.1 The manufacturer shall supply all necessary instructions and other assistance to the installer to ensure proper installation in accordance with the certified wall/ceiling assembly. Printed instructions shall be provided by the manufacturer to demonstrate proper installation procedures.

3.2.2 As part of the certification examination, and at the discretion of the certification agency, at least one inspection of a field installation during and/or after completion may be required. In some cases, a continued program of inspections shall be necessary to assess the application procedures or changes within the application techniques.

3.2.3 The manufacturer shall supply written information to the installer detailing the specific installation requirements.

3.3 Calibration

3.3.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment is required. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified and traceable to an acceptable reference standard and certified by an ISO/IEC 17025 accredited calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration and

the next due date. A copy of the service provider's accreditation certificate as an ISO/IEC 17025 accredited calibration laboratory should be available.

- 3.3.2 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of this equipment

3.4 Drawings/Formulations/Specifications Required

- 3.4.1 The manufacturer shall provide assembly drawings, materials lists, brochures, sales literature, specification sheets, technical data sheets, and safety data sheets for each building panel or interior finish material, and all components of the product (e.g. foam systems, sealants, etc.).
- 3.4.2 The formulation and specifications of the following shall be provided and will be kept on file at the certification agency on a confidential basis:
- insulating foam systems,
 - a component of the foam system which has one or more plastic ingredients (e.g. polyol),
 - mineral or glass cores,
 - interior finish materials systems, and
 - coatings systems and exposed interior insulations.
- 3.4.3 The formulation and specifications of other components shall be required at the discretion of the certification agency.

3.5 Observation of Test Sample Production

- 3.5.1 A representative of the certification agency shall witness the production of all building panels or interior finish materials to be evaluated. During the witness the manufacturer is responsible for providing:
- the formulation to be used during the production, including a list of components,
 - Certificates of Analysis for each component used in production,
 - verification of authenticity for each component which Certificates of Analysis have been provided (e.g. label on sealed component container matches Certificates of Analysis batch, product, and/or lot number).
 - verification of authenticity for any "Specification Tested: Identified Component" (e.g. proper markings per Section 3.1), as applicable,
 - verification of any previously witnessed materials (e.g. polyol) by the certification agency, as applicable. Any previously witnessed and signed materials must be verified by the certification agency representative in its original sealed packaging prior to production.
- 3.5.2 If a building panel or interior finish material has one or more plastic component, production of the plastic component(s) shall be witnessed by a representative of the certification agency prior to the witness of the building panels or interior finish materials. This includes, but is not limited to, the blending of the polyol of any thermoset plastic foam. The manufacturer of the plastic component is responsible for providing all items detailed in Section 3.5.1 above.
- 3.5.3 At the discretion of the certification agency, additional components may require a witness of production if the component is considered critical and may affect the results of the performance testing.

3.6 Use of Sealants, Gaskets, and/or Caulking

- 3.6.1 All sealants, gaskets, and/or caulking that may be used in the installation of a building panel or interior finish material assembly shall be evaluated in conjunction of the product.
- 3.6.2 Sealants, gaskets, and/or caulking may affect the results of the test performance and shall be included in the test sample construction as detailed in Table 3.6.2 for the following performance test assemblies:
- Section 4.1 - Room Test
 - Section 4.3 - 16 ft High Parallel Panel Test
 - Section 4.4 - 25 ft (7.6 m) High Corner Test
 - Section 4.5 - 50 ft (15.2 m) High Corner Test

Table 3.6.2 Test samples and installation requirements for sealant, gaskets, and/or caulking

Sealant, Gasket, and/or Caulking Product Type	Included in Test Sample Assemblies	Certified Installations Requirements
Non-intumescent or non-fire resistant (e.g. butyl, silicone)	Yes	Must be used in all installations
	No	Optional use
Intumescent or fire-resistant	Yes	Must be used in all installations
	No	Not permitted for use

- 3.6.3 Application of the sealant, gasket, and/or caulking must be the same for all tests listed in Section 3.6.2 unless deemed acceptable by the certification agency.
- 3.6.4 If multiple sealants, gaskets, and/or caulking are desired, an insulated pan combustion test per ASTM E2058 shall be used to determine the most critical sealant, gasket, and/or caulking. The most critical must be used for the test listed in Section 3.6.2.
- 3.6.5 Safety data sheets, technical data sheets, etc. of a sealant, gasket, and/or caulking, including those listed in Table 3.6.2, shall be reviewed by the certification agency prior to performance testing.
- 3.6.6 For intumescent or fire-resistant sealants, gaskets, and/or caulking, an examination of the manufacturing facilities, audit of quality assurance procedures, and a surveillance audit program shall be required at each sealant, gaskets, and/or caulking manufacturing facility.
- 3.6.7 Application instructions and requirements of sealants, gaskets, and/or caulking must be detailed in a certified building panel or interior finish material manufacturer's installation and operation instructions.

3.7 Formulation Changes

- 3.7.1 All formulation changes of a certified building panel, certified interior finish material, or an Identified Component shall be reviewed by the certification agency prior to implementing a change. Formulation changes include, but are not limited to:
- ingredient change(s),
 - changing a supplier of an ingredient, and/or
 - changing manufacturing tolerances of ingredients of an existing certified formulation.

Formulation changes shall be determined by the certification agency as significant or insignificant. Significant changes will be categorized by the certification agency as either a single or multiple

ingredient change.

3.7.1.1 A single ingredient change is one significant component change from the original formulation utilized for satisfying all required performance tests under this standard. A single ingredient change shall require:

- a flammability characterization test, and
- a density of panel insulating cores test or density of plastic panels or panel facings test (as applicable).

The convective flame spread parameter (FSP_c) from the flammability characterization test shall be less than or equal to the FSP_c of the original formulation utilized for satisfying all required performance tests under this standard. If the single ingredient change results in a greater FSP_c than the original formulation, all remaining performance tests (applicable to product type) under this standard are required.

In addition, the density test results shall be +/- 5% of the original formulation density utilized for satisfying all required performance tests under this standard. If the density test results vary beyond the original formulation density by +/- 5%, all remaining performance tests (applicable to product type) under this standard are required. Note: If the product is certified for an exterior application, which is not covered by this standard, additional requirements may be applicable.

Only one single significant ingredient change shall be allowed from the original formulation utilized for satisfying all required performance tests under this standard. Any further ingredient changes shall be considered a multiple ingredient change.

3.7.1.2 A multiple ingredient change is two or more significant components changes from the original formulation utilized for satisfying all required performance tests under this standard. A multiple ingredient change requires all performance tests (applicable to product type) under this standard to be conducted.

3.7.1.3 An alternate supplier of an ingredient shall be reviewed by the certification agency in order to determine if any testing is necessary. At the discretion of the certification agency, alternate suppliers may be considered a single or multiple ingredient change as detailed above.

3.7.1.4 All changes to the manufacturing tolerances of ingredients of an existing certified formulation shall be reviewed by the certification agency. Changes to tolerances that require testing may be considered a single or multiple ingredient change as detailed above

3.7.2 All changes to the formulation shall be submitted with adequate information for review. This information can include, but is not limited to the following: safety data sheets, technical data sheets, formulation details, etc.

3.8 Identified Components

3.8.1 Components of building panels or interior finish materials assemblies, such as, but not limited to, foam systems, components of foam systems, noncombustible cores, and intumescent or fire-resistant sealants, gaskets, and/or caulking, can be recognized by the certification agency as *Identified Components*.

3.8.2 An observation of test sample production, as detailed in Section 3.5, shall be required for components that have one or more plastic ingredients, including, but not limited to, blending of

the polyol side of a thermoset plastic foam system.

An observation of test sample production shall be required at a minimum of one manufacturing location of the Identified Component. At the discretion of the certification agency, an observation of test sample production shall be required at additional manufacturing locations if

- the manufacturing location is not under the Surveillance Audit Program,
- there is a difference in the formulation including tolerances, or
- there is a difference in the raw materials and/or vendors of the raw materials.

An observation of test sample production shall be required for other types of components at the discretion of the certification agency.

- 3.8.3 An examination of the manufacturing facilities, audit of quality assurance procedures, and a Surveillance Audit Program shall be required at each Identified Component manufacturing facility.
- 3.8.4 Requirements from the following sections shall apply to Identified Components:
- Section 3 - General Requirements, and
 - Section 5 - Operations Requirements.
- 3.8.5 An Identified Component does not require Performance Requirements (Section 4) unless testing for a noncombustible rating of a core, which includes, but is not limited to: heat content, ash content, and combustion testing. Building panels and interior finish materials that utilize an Identified Component are required to meet all performance requirements as detailed in Appendix A.
- 3.8.6 Certification is not granted as part of *Identified Component* recognition.

4 PERFORMANCE REQUIREMENTS

Performance requirements are based on product type and the desired certification ratings. Not all tests listed under this section are applicable to every product type and/or rating. The requirements for each product type and rating covered by this standard are listed in Appendix A, "Performance Requirements Based on Product Type and Desired Certification Ratings."

Tests of alternate constructions may be waived if considered less critical than those previously tested.

Confirming tests may be required, at the discretion of the certification agency, depending on design features and results of any foregoing tests.

Following a test failure, a re-test of an identical or similar assembly shall be at the sole discretion of the certification agency and with a technical justification of the conditions or reasons for the failure. When a test specimen fails to meet the certification acceptance criteria for a given classification/rating, two successful test specimens of the same or similar construction shall meet the certification acceptance criteria to qualify for the given classification/rating. For each failed specimen, two successful test specimens are required. Any test specimen that fails more than three times is no longer considered a candidate for certification.

4.1 Room Test

4.1.1 Requirement:

Assemblies covered by this standard shall be subjected to an ANSI FM 4880 Room Test or an ISO 9705 room test.

When tested in accordance with an ANSI FM 4880 Room Test:

When exposed to heat from a simulated internal fire for a period of 15 minutes with flames impinging directly on the internal corner of an 8 x 8 x 8 ft (2.44 x 2.44 x 2.44 m) construction, assemblies covered by this standard shall satisfy the following requirements:

- charring of the panel core (or panel for single skin) shall not extend to the outer extremities of the test area. Discoloration extending up to 1/4 in. (6.4 mm) into the core is not considered to be charring, and
- structural panels (if applicable) must sustain the applied load during the test period.

When tested in accordance with ISO 9705, an assembly shall:

- 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), and
- structural panels (if applicable) must sustain the applied load during the test period.

4.1.2 Test/Verification:

ANSI FM 4880 Room Test, as described in Appendix C of ANSI FM 4880: Room Test or ISO 9705 - Fire Tests - Full-Scale Room Test for Surface Products.

4.2 Flammability Characterization

4.2.1 Requirement:

The chemical heat of combustion (ΔH_{CH}), critical heat flux for ignition (\dot{q}''_{cr}), thermal response parameter (TRP), and convective flame spread parameter (FSP_C) shall be determined.

Note: This test is conducted to establish a base from which requests for formulation revisions are evaluated. The certification agency places no limits on the values obtained, with the exception of thermoset plastic foam cores with an inert facer with a 30 ft (9.1 m) height restriction as details in Appendix A.

4.2.2 Test/Verification:

Flammability Characterization using a Fire Propagation Apparatus per ASTM E2058, Standard Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA) or ISO 12136, Reaction to Fire Tests - Measurement of Material Properties Using a Fire Propagation Apparatus.

4.3 16 ft (4.9 m) High Parallel Panel Test

4.3.1 Requirement:

For no height restriction, the maximum gross chemical heat release rate (PCHRR) during a 16 ft (4.9 m) High Parallel Panel fire test with a propane gas ignition source of 360 kW shall be less than, or equal to, 830 kW.

For a maximum height of 50 ft (15.2 m) for combustible walls with a noncombustible ceiling, the maximum gross chemical heat release rate (PCHRR) during a 16 ft (4.9 m) High Parallel Panel fire test with a propane gas ignition source of 360 kW shall be less than, or equal to, 1100 kW.

4.3.2 Test/Verification:

ANSI FM 4880 16 ft (4.9 m) High Parallel Panel Test, as described in Appendix D of ANSI FM 4880: 16 Ft (4.9 m) High Parallel Panel Test.

4.4 25 ft (7.6 m) High Corner Test

4.4.1 Requirement:

For a 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.

4.4.2 Test/Verification:

FM 4880 25 ft (7.6 m) High Corner Test, as described in Appendix E of ANSI FM 4880: 25 Ft (7.6m) High Corner Test.

4.5 50 ft (15.2 m) High Corner Test

4.5.1 Requirement:

For a maximum height of 50 ft (15.2 m), assemblies shall not support a self-propagating fire which extends to the outer extremities of the 50 ft (15.2 m) high corner test structure as evidenced by flaming or material damage.

For no height restriction, ignition of the ceiling of the assembly in the 50 ft (15.2 m) high corner test shall not occur, and assemblies shall not support a self-propagating fire which extends to the outer extremities of the 50 ft (15.2 m) high corner test structure as evidenced by flaming or material damage.

4.5.2 Test/Verification:

FM 4880 50 ft (15.2 m) High Corner Test, as described in Appendix F of ANSI FM 4880: 50 Ft (15.2 m) High Corner Test.

4.6 Density of Insulating Cores

4.6.1 Requirement:

The density of the insulating core (with no adhesives or facers) shall be determined.

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.

4.7 Density of Plastic Panels or Panel Facings

4.7.1 Requirement:

The density of the plastic panel or plastic panel facings shall be determined.

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.

4.8 Surface Burning Characteristics (Optional Test, not required for certification)

4.8.1 Requirement:

The flame spread and smoke developed shall be reported of a core material or single skin product at a thickness of 4 in. (100 mm) or the maximum thickness, whichever is less. A minimum of 3 tests shall be conducted.

Note: This test is conducted to satisfy certain building code requirements and/or for identification purposes. The certification agency places no limits on the values obtained for the purpose of this standard.

4.8.2 Test/Verification:

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

4.9 Ignition Properties

4.9.1 Requirement:

The self-ignition and flash-ignition temperatures of a core material or facer shall be determined.

Note: These tests are conducted for identification purposes. The certification agency places no limits on the values obtained.

4.9.2 Test/Verification

ISO 871, Plastics -Determination of Ignition Temperature Using a Hot-Air Furnace or ASTM D1929, Standard Test Method for Determining Ignition Temperature of Plastics.

4.10 Heat Content

4.10.1 Requirement:

The heat content of a core material or facer shall be determined by oxygen bomb calorimetry.

For a noncombustible rating, the core material shall have a maximum gross heat of combustion of 2.0 kJ/g (860 BTU/lb) when tested without adhesive or facers. Three tests shall be conducted and the test results shall be averaged.

Note: With the exception of noncombustible products, this test is conducted for identification purposes. The certification agency places no limits on the values obtained.

4.10.2 Test/Verification:

ISO 1716, 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.

4.11 Ash Content

4.11.1 Requirement:

The total ash content of a core material or facer shall be determined.

For a noncombustible rating, the core material shall have a minimum ash content of 90% when tested without adhesive or facers.

Note: With the exception of noncombustible products, this test is conducted for identification purposes. The certification agency places no limits on the values obtained.

4.11.2 Test/Verification:

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

4.12 Combustion

4.12.1 Requirement:

For a noncombustible rating, the core material shall show no visible flaming when tested at an applied heat flux of 50 kW/m² in air enriched to 40% oxygen without adhesive or facers:

- for 15 minutes from the start of the combustion test or
- 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
- 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/m² in air enriched to 40% oxygen.

If the use of multiple sealant, gaskets, and/or caulking is desired for use in product assemblies, an insulated pan combustion test per ASTM 2058 shall be used to determine the most critical sealant, gaskets, and/or caulking. The most critical shall be used for performance tests listing in section 3.6.2.

4.12.2 Test/Verification:

ASTM E2058, Standard Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA) for the combustion or insulated pan combustion test.

4.13 Identification Test – Thermal Desorption Gas Chromatography Mass Spectrometry (TD/GC/MS)

4.13.1 For foam plastic and other applicable materials TD/GC/MS Spectrograms shall be determined at the discretion of the certification agency ¹.

4.13.2 Test/Verification: Standard Practice for General Techniques of Gas Chromatography Infrared (GC/IR) Analysis. ASTM E1642

NOTE 1: These tests are conducted for identification purposes at the sole discretion of the certification agency. They are not required. There are no limits on the values obtained.

5 OPERATIONS REQUIREMENTS

5.1 Demonstrated Quality Control Program

5.1.1 A quality assurance program is required to assure that building panels, interior finish materials, Identified Components, and/or other critical components of building panels or interior finish materials produced by the manufacturer shall present the same quality and reliability as the specific product construction examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests, and is documented in the certification report or Specification Test Report for Identified Components.
- Continued conformance to this standard is verified by the certifier's surveillance program.
- Quality of performance is determined by field performance and by periodic re-examination and testing

5.1.2 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- existence of corporate quality assurance guidelines;
- incoming quality assurance, including testing;
- in process quality assurance, including testing;
- final inspection and tests;
- equipment calibration;
- drawing and change control;
- packaging and shipping; and
- handling and disposition of non-conforming materials.

5.1.3 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.4 Records

To assure adequate traceability of materials and products, the manufacturer shall maintain a record of all quality assurance tests performed, for a minimum period of two years from the date of manufacture.

5.1.5 Drawing and Change Control

- The manufacturer shall establish a system of product configuration control that shall allow no unauthorized changes to the product. Changes to critical documents, identified in the certification Report or Specification Test Report for Identified Components, may be required to be reported to, and authorized by the certification agency prior to implementation for production.
- Records of all revisions to all certified products shall be maintained.

5.2 Surveillance Audit

- 5.2.1 An audit of the manufacturing facility may be part of the certification agency's surveillance requirements to verify implementation of the quality assurance program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are maintained to ensure a uniform product consistent with that which was tested and certified.
- 5.2.2 Certified products, Identified Component products, or services shall be produced or provided at, or provided from, location(s) disclosed as part of the certification examination. Manufacture of products bearing a certification mark is not permitted at any other location prior to disclosure to the certification agency.

5.3 Installation Inspections

Field inspections may be conducted to review an installation. The inspections are conducted to assess ease of application, and conformance to written specifications. When more than one application technique is used, one or all may be inspected at the discretion of the certification agency.

5.4 Manufacturer's Responsibilities

The manufacturer shall notify the certification agency of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

6 BIBLIOGRPAHY

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*.

APPENDIX A: PERFORMANCE REQUIREMENTS BASED ON PRODUCT TYPE AND DESIRED CERTIFICATION RATINGS

Panel Type		Desired FM Approval Rating		Required Tests															
Core Type	Facer	Combustibility of Core or Interior Finish Materials	Height Limitation	Room Test	Flammability Characterization	16ft (4.9 m) High Parallel Panel Test	25 ft (7.6 m) High Corner Test	50 ft (15.2 m) High Corner Test	Density of Insulating Cores	Density of Plastic Panels or Plastic Facings	Surface Burning Characteristics	Ignition Properties		Heat Content		Ash Content		Combustion	
												Core	Facer	Core	Facer	Core	Facer		Core
Thermoset (e.g. PIR, PUR)	Inert (e.g. Metal)	Combustible	30 ft (9.1 m)	R	R ¹	A		R			O	O		O		O			
			Unlimited ³	R	R	R	A	A	R			O	O		O		O		
	Non-Inert		30 ft (9.1 m)	R	R		R		R	M		O	O	M	O	M	O	M	
			Unlimited ³	R	R		R	R	R	M		O	O	M	O	M	O	M	
Thermoplastic (e.g. EPS)	Inert (e.g. Metal)		30 ft (9.1 m)	R			R		R			O	O		O		O		
			Unlimited ³	R			R	R	R			O	O		O		O		
	Non-Inert		30 ft (9.1 m)	R			R		R	M		O	O	M	O	M	O	M	
			Unlimited ³	R			R	R	R	M		O	O	M	O	M	O	M	
Mineral wool, Glass Fiber, or Similar type cores	Inert (e.g. Metal)	Combustible	30 ft (9.1 m)	R	M		A		R		O	O		O		O			
		Unlimited ³	R	M	R	A	A	R			O	O		O		O			
	Noncombustible	Unlimited ³	R					R			O	O		R		R		R	
		Combustible	30 ft (9.1 m)	R	M		R		R	M		O	O	M	O	M	O	M	
	Noncombustible ²	Unlimited ³	R	M		R	R	R	M		O	O	M	O	M	O	M		
		Combustible	Unlimited ³	R					R	M		O	O	M	R	M	R	M	R
	Non-Inert > 0.010 in (0.25 mm)	Combustible	30 ft (9.1 m)	R	M		R		R	M		O	O	M	O	M	O	M	
			Unlimited ³	R	M		R	R	R	M		O	O	M	O	M	O	M	
Noncombustible		30 ft (9.1 m)	R			R		R	M		O	O	M	R	M	R	M	R	
		Unlimited ³	R			R	R	R	M		O	O	M	R	M	R	M	R	
Single Skin (i.e. no core)	N/A	N/A	30 ft (9.1 m)	R	M ¹		A		M	M	O		O		O		O		
			Unlimited ³	R	M	R	A	A	M	M		O		O		O		O	

R = Required O = Optional A = Alternative Test M = Material evaluation required. Test required on a case-by-case basis.

¹ Maximum height of 30 ft (9.1 m) shall be granted with an FSP_c less than or equal to 0.39 s^{-1/2}. For an FSP_c greater than 0.39 s^{-1/2} certification shall be granted with one of the following;

- a successful 25 ft (7.6 m) High Corner for a 30 ft (9.1 m) height restriction,
- a successful 16 ft (4.9 m) Parallel Panel Test for a 50 ft (15.2 m) height restriction or unlimited height, or
- a successful 50 ft (15.2 m) High Corner Test for a 50 ft (15.2 m) height restriction or unlimited height.

² Applies to low density batts or blankets with adhered thin [≤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.

³ Testing requirements for a 50 ft (15.2 m) height restriction are the same as the unlimited height. The results of the 50 ft (15.2 m) High Corner Test or 16 ft (4.9 m) High Parallel Panel Test may restrict installations to 50 ft (15.2 m) and/or restrict installations to a noncombustible ceiling (see applicable performance requirements for details).