



Member of the FM Global Group

Approval Standard for Insulated Wall Curtain Products

Class Number 4883

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Foreword

The FM Approvals certification mark 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 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 curtain products for use as modular workspace area separators in general use and smoke sensitive occupancies.
- 1.1.2 Approval criteria includes, but may not be limited to, observation of test sample production, performance requirements, marking requirements, examination of manufacturing facilities, audit of quality assurance procedures, and a Surveillance Audit program.

1.2 Scope

- 1.2.1 This standard applies to the fire performance requirements for insulated wall curtain products for use in facilities protected in accordance with FM Global Data Sheets. These products shall not be installed against a substrate. These products shall be FM Approved with specific height installation requirements, ceiling construction requirements and smoke generation requirements.
- 1.2.2 Insulated wall curtain products shall be FM Approved for installations:
 - with a maximum height restriction of 50 ft (15.2 m) with a noncombustible ceiling, or Class 1 ceiling or;
 - without height restrictions (i.e. unlimited height).
- 1.2.3 Insulated wall curtain products shall be FM Approved with a specific smoke rating:
 - For use in highly smoke sensitive occupancies including cleanroom and similar occupancies;
 - For use in smoke sensitive occupancies including food, pharmaceutical and other occupancies.

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 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 curtain products for the purpose of obtaining Approval. Insulated wall curtain products 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 curtain products which meet all of 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 shall be performed to evaluate:

- the suitability of the product for its intended end use as an FM Approved insulated wall curtain;
- the performance of the product as required by FM Approvals; and as far as practical, the durability and reliability of the product when used as an FM Approved insulated wall curtain.

1.4.2 An examination of the manufacturing facilities and audit of quality control procedures for completed assemblies and components are made 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. These examinations are conducted at a minimum frequency of annually as part of FM Approvals' Surveillance Audit Program.

1.5 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as currently FM Approved;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Approval Report and Master Agreement;
- re-examination of production samples for continued conformity to requirements; and
- satisfactory examinations conducted at least annually as part of FM Approvals' Surveillance Audit 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

The effective date of an Approval standard mandates that all products tested for Approval after the effective date shall satisfy the requirements of that standard. Products FM Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval.

The effective date of this standard is upon publication 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. Appendix A lists the selected units and conversions to SI units for measures appearing in this standard. Conversion of U.S. customary units is in accordance with the American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI 10-2010, "American National Standard for Metric Practice."

1.8 Applicable Documents

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

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

Test Procedure Class Number 4883: *FM Approvals 16 Ft (4.9m) High Parallel Wall Curtain Test*

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

Agarwal, G. and Chaos, M., " Investigation of the Fire Propagation Behavior of Insulated Wall Curtain Products for AS 4883 Development," Technical Report, October 2016

1.8.3 *FM Global Engineering Standards, 1151 Boston-Providence Turnpike, Norwood Massachusetts 02062*

FM Global Property Loss Prevention Data Sheet 1-57 Plastics in Construction

1.8.4 *International Organization for Standardization, Case Postale 56, CH1211 Geneva 20, Switzerland*

ISO 12136, Reaction to Fire Tests - Measurement of Material Properties Using a Fire Propagation Apparatus

1.8.5 *ASTM, 1000 Bar Harbor Drive, West Conshohocken, Pennsylvania 19428*

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

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:

Average Smoke Emission Rate (\dot{G}_{smoke}) - Total smoke emitted in mg divided by the time period during which smoke is emitted in seconds.

Critical Heat Flux (CHF) - the maximum heat flux at or below which there is no ignition.

Fire Propagation Index (FPI) - ratio of the one-third power of the radiative fraction of the chemical heat release rate per unit of width of a sample to the ignition resistance of the sample, defined as the Thermal Response Parameter (TRP). It is an indicator of the propensity of the material to support fire propagation.

PCHRR - peak chemical heat release rate.

Smoke Development Index (SDI) - Smoke Yield (y_s) multiplied by Fire Propagation Index (FPI). It is an indicator of the potential for smoke contamination during fire propagation.

Smoke Sensitive Occupancy – an occupancy which is susceptible to property loss due to smoke infiltration or contamination.

Smoke Yield (y_s) - ratio of the total mass of smoke released to the total mass of the material vaporized.

Thermal Response Parameter (TRP) - indicator of the ignition resistance or the thermal inertia of a material.

2 GENERAL INFORMATION

2.1 Product Information

Insulated wall curtain products are supplied in the form of lightweight flexible modular separators. They can consist of an exterior fabric wrapped around an internal thermal insulation. When assembled, the modular separators can be connected to one another with various types of closures and to the structure at the ceiling or roof with various fasteners.

Insulated wall curtain products may be fabricated in various thicknesses or multiple layers of insulation and fabric. The exterior fabric is usually manufactured from industrial-grade, high-strength vinyl. The interior thermal insulation is varied and can be manufactured from polyester fiber batting, metalized polyethylene bubble wrap, and insulations with various types of fire retardants.

2.2 Approval Application Requirements

To apply for an Approval or Identified Component examination the manufacturer, or its authorized representative, should submit a request to information@fmapprovals.com.

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 or services being submitted for Approval consideration;
- general assembly drawings, 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; 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 Approval Examination Requirements

2.3.1 In order to qualify as FM Approved insulated wall curtain products, the Approval examination shall include:

- review of component formulation(s) and/or specification(s);
- observation of test sample production (as applicable);
- Flammability Characterization Testing ;
- FM Approvals 16 ft. High Parallel Wall Curtain Testing;
- 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 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.
- 2.3.2 Requirements for samples may vary depending on design features, product composition, results of prior or similar testing, and results of any ongoing tests.

3 GENERAL REQUIREMENTS

3.1 Markings

- 3.1.1 Marking 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 FM Approval or Identified Component mark as detailed below
 - “Must be installed in accordance with the Approved installation provided with the products.”

For FM Approved products, the Approval Mark 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.

For Identified Components products, as detailed in section 3.7 of this standard, “FM 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 FM Approved.

- 3.1.2 When hazard warnings are needed, the markings should be universally recognizable.
- 3.1.3 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the product as FM Approved. The manufacturer shall not place this model or type identification on any other product unless covered by a separate agreement.
- 3.1.4 All markings shall be legible and durable.

3.2 Manufacturer's Installation and Operation Instructions

The manufacturer shall provide the user with:

- instructions for the installation, maintenance, and operation of the product; and
- services to ensure proper installation, inspection, or maintenance for products of such nature that it would not be unreasonable to expect the average user to be able to provide such installation, inspection, or maintenance

3.3 Calibration

- 3.3.1 All examinations and tests performed in evaluation to this Standard shall use calibrated measuring instruments traceable and certified to acceptable national standards in accordance with ISO/IEC 17025.

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 insulated wall curtain product, and all components of the product (e.g. exterior facers, internal thermal insulation, joint sealing products, etc.).
- 3.4.2 The formulation and specifications of all components shall be provided and will be kept on file at FM Approvals on a confidential basis, including, but not limited to:
- exterior facers,
 - internal insulation, and
 - joint sealing products.
- 3.4.3 The formulation and specifications of other components shall be required at the discretion of FM Approvals.

3.5 Observation of Test Sample Production

- 3.5.1 A representative of FM Approvals shall witness the production of all insulated wall curtain products to be evaluated. During the witness the manufacturer is responsible for providing:
- the formulation to be using during the production, including a list of components,
 - a Certificates of Analysis for each component used in production,
 - verification of authenticity for each component which a Certificates of Analysis has been provide (e.g. label on sealed component container matches Certificates of Analysis batch, product, and/or lot number).
 - verification of authenticity for any "FM Specification Tested: Identified Component" (e.g. proper markings per Section 3.1), as applicable,
 - verification of any previous witnessed materials (e.g. internal insulation) by FM Approvals, as applicable. Any previous witnessed and signed materials must be verified by the FM Approvals representative in its original sealed packaging prior to production.
- 3.5.2 If an insulated wall curtain product has one or more non-inert components, production of the non-inert component(s) shall be witnessed by a representative of FM Approvals prior to the witness of the insulated wall curtain product. This includes, but is not limited to, the production of the

internal thermal insulation, joint sealing material or the exterior facer material. The manufacturer of the non-inert component is responsible for providing all items detailed in Section 3.5.1 above.

- 3.5.3 At the discretion of FM Approvals, any components may require a witness of production if the component is considered critical and may affect the results of the performance testing.

3.6 Formulation Changes

- 3.6.1 All formulation changes of an FM Approved insulated wall curtain product or an Identified Component shall be reviewed by FM Approvals 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 Approved formulation.

All formulation changes shall be requested by an FM Approved Product/Specification-Tested Revision Report. Formulation changes shall be determined by FM Approvals as significant or insignificant. Significant changes will require reexamination of the product to ensure that it still meets the requirements of this standard.

- 3.6.2 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.

3.7 Identified Components

- 3.7.1 Components of insulated wall curtain products, such as, but not limited to, internal thermal insulation, exterior facer and joint sealing products, can be recognized by FM Approvals as *Identified Components* and listed under the Specification Tested section in www.ApprovalGuide.com.
- 3.7.2 An Observation of Test Sample Production, as detailed in Section 3.5, shall be required for components that have one or more non-inert ingredients.

An Observation of Test Sample Production shall be required at a minimum of one manufacturing location of the Identified Component. At the discretion of FM Approvals, an Observation of Test Sample Production shall be required at additional manufacturing locations if:

- the manufacturing location is not under the FM Approvals 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 FM Approvals.

- 3.7.3 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.
- 3.7.4 Requirements from the following sections may apply to Identified Components:
- Section 3 - General Requirements, and
 - Section 5 - Operations Requirements.
- 3.7.5 An Identified Component does not require Performance Requirements (Section 4). Insulated wall curtain products that utilize an Identified Component are required to meet all Performance Requirements as detailed in Section 4.
- 3.7.6 FM Approval is not granted as part of *Identified Component* recognition.

4 PERFORMANCE REQUIREMENTS

Performance Requirements are based on product type and the desired FM Approval ratings. Not all tests listed under this section are applicable to every product type and/or rating.

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

Confirming tests may be required, at the sole discretion of FM Approvals, 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 FM Approvals and with a technical justification of the conditions or reasons for the failure. When a test specimen fails to meet the Approval acceptance criteria for a given classification/rating, two successful test specimens of the same or similar construction shall meet the Approval 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 FM Approval.

4.1 Flammability Characterization

4.1.1 Requirement

The chemical heat of combustion (ΔH_{CH}), Smoke Yield (y_s), critical heat flux for ignition (CHF), thermal response parameter (TRP), fire propagation index (FPI) and Smoke Development Index (SDI) of the insulated curtain wall product shall be determined and reported.

Note: This test is conducted to establish a base from which requests for product revisions are evaluated. 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, Standard Test Methods for Measurement of Material Flammability Using a Fire Propagation Apparatus (FPA) or ISO 12136, Reaction to Fire Tests - Measurement of Material Properties Using a Fire Propagation Apparatus.

4.2 FM Approvals 16 Ft. High Parallel Wall Curtain Test

4.2.1 Requirement

The peak vertical charred height of the sample assembly after a 16 ft (4.9 m) High Parallel Wall Curtain fire test with a propane gas ignition source of 200 kW shall be less than 10 ft (3 m) total.

A. Height Restrictions

For no height restriction, the peak chemical heat release rate (PCHRR) during a 16 ft (4.9 m) High Parallel Wall Curtain fire test with a propane gas ignition source of 200 kW shall be less than, or equal to, 670 kW.

For a maximum height of 50 ft (15.2 m) with a noncombustible ceiling or Class 1 ceiling, the peak chemical heat release rate (PCHRR) during a 16 ft (4.9 m) High Parallel Wall Curtain fire test with a propane gas ignition source of 200 kW shall be less than, or equal to, 940 kW.

B. Smoke Generation Thresholds

For smoke sensitive occupancies including food, pharmaceutical and other occupancies, the net average smoke emission rate (\dot{G}_{smoke}) threshold during the first 15 minutes of a 16 ft (4.9 m) High Parallel Wall Curtain fire test with a propane gas ignition source of 200 kW shall be less than, or equal to, 300 mg/s.

For highly smoke sensitive occupancies including cleanroom or similar occupancies, the net average smoke emission rate (\dot{G}_{smoke}) threshold during the first 15 minutes of a 16 ft (4.9 m) High Parallel Wall Curtain fire test with a propane gas ignition source of 200 kW shall be less than, or equal to, 120 mg/s.

C. Peak Charred Height

The peak charred height of the sample shall be less than, or equal to, 10 ft. (3.05 m) at the conclusion of the test

4.2.2 Tests/Verification

FM Approvals 16 ft (4.9 m) High Parallel Wall Curtain Test, Test Procedure Class Number 4883: *FM Approvals 16 Ft (4.9m) High Parallel Wall Curtain Test.*

4.3 Surface Burning Characteristics (Optional)

4.3.1 Requirement:

The flame spread and smoke developed indices shall be reported of an insulated wall curtain products 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. FM Approvals places no limits on the values obtained for the purpose of this Standard.

4.3.2 Test/Verification:

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

4.4 Additional Tests

Additional tests may be required, at the discretion of FM Approvals, depending on design features and results of any foregoing tests.

Any test following a failure shall be acceptable only at the discretion of FM Approvals and with a technical justification of the conditions or reasons for failure.

5 OPERATIONS REQUIREMENTS

A quality assurance program is required to assure that insulated wall curtain products, identified components, and/or other critical components of insulated wall curtain products 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 Approval Report or Specification Test Report for Identified Components.
- Continued conformance of the FM Approved product is verified by the Surveillance Audit Program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1 Demonstrated Quality Control Program

5.1.1 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.

5.1.2 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.

5.1.3 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.

5.1.4 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 Approval Report, must be reported to, and authorized by, FM Approvals prior to implementation for production.
- The manufacturer shall assign an appropriate person or group to be responsible for, and require that, proposed changes to FM Approved or Listed products be reported to FM Approvals before implementation. The manufacturer shall notify FM Approvals of changes in the product or of persons responsible for keeping FM Approvals advised by means of FM Approvals' Revision Request, FM Approved Product/Specification-Tested Revision Report or Address/Main Contact Change Report.
- Records of all revisions to all FM Approved products shall be maintained.

5.2 Surveillance Audit

- 5.2.1 An audit of the manufacturing facility is part of the Approval or Identified Component investigation 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 insure a uniform product consistent with that which was tested and FM Approved.
- 5.2.2 These audits shall be conducted periodically but at least annually by FM Approvals or its representatives.
- 5.2.3 FM Approved products, Identified Component products, or services shall be produced or provided at or from the location(s) audited by FM Approvals and as specified in the Approval Report or Specification Test Report for Identified Components. Manufacture of products bearing the Approval Mark or "FM Specification Tested: Identified Component" mark is not permitted at any other location without prior written authorization by FM Approvals.

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 FM Approvals.

5.4 Manufacturer's Responsibilities

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

APPENDIX A: UNITS OF MEASUREMENT

LENGTH:	in. - "inches"; (mm - "millimeters") mm = in. x 25.4
	ft - "feet"; (m - "meters") m = ft x 0.3048
AREA:	in ² - "square inches"; (mm ² - "square millimeters") mm ² = in ² x 6.4516 x 10 ²
	ft ² - "square feet"; (m ² - "square meters") m ² = ft ² x 0.0929
MASS:	lb - "pounds"; (kg - "kilograms") kg = lb x 0.454
PRESSURE:	psi - "pounds per square inch"; (bar - "bar") kPa = psi x 6.895
	bar - "bar"; (kPa - "kilopascals") bar = kPa x 0.01 bar = psi x 0.06895
HEAT:	Btu - "British thermal units"; (J - "joules") J = Btu x 1.0551 x 10 ³
HEAT RELEASE RATE:	Btu/min - "British thermal units per minute"; (kW - "kilowatts") kW = Btu/min x 0.0176
TEMPERATURE:	°F - "degrees Fahrenheit"; (°C - "degrees Celsius") °C = (°F - 32) x 0.556
LIQUID:	gal - "gallons"; (L - "liter") L = gal x 3.785
	L - "liter"; (dm ³ - "cubic decimeters") L = dm ³
FLOW RATE:	gal/min - "gallon per minute"; (L/min - "liters per minute") L/min = gal/min x 3.785