

Approval Standard for Heat and Smoke Vents

Class Number 4430

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Foreword

Approvals are 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 Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for Approval shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing and/or applications shall ensure a consistently uniform and reliable product or service. Approval Standards strive to be performance-oriented and 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 Master 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 or service/application.

FM Approvals LLC reserves the right in its sole judgement 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 heat and smoke vents.
- 1.1.2 Heat and smoke vents are usually manufactured from plastic or metal and are exposed to a number of hazards, including natural hazards, and must reject wind, hail and other deleterious effects caused from everyday exposure to heat, cold and sunlight.
- 1.1.3 When exposed to a fire from an internal source, automatic operating vents must be provided with a sufficiently rated heat sensing device so that they do not operate prematurely and adversely affect the activation of any sprinklers. Plastic drop-out type vents must maintain their structural integrity for a period of time so that they also won't adversely affect sprinkler operation.
- 1.1.4 Approval criteria shall include, but are not limited to, performance requirements, marking requirements, an examination of manufacturing facility(ies), an audit of quality assurance procedures, and a follow-up program.

1.2 Scope

- 1.2.1 This standard sets the performance requirements for heat and smoke vents under simulated laboratory conditions. They shall be examined for their ability to remain in place until such time as sprinklers would have been expected to operate so as not to adversely affect the sprinkler operation. Additionally, this standard also sets their performance requirements when exposed to various natural hazards such as high wind events, the impact of simulated hail and the possible degradation effects of sunlight. The standard also examines their ability to withstand the impact effects of temporary live loads as well as to be able to operate under anticipated roof live (snow) loads.
- 1.2.2 This standard is not intended to be used to determine when or where heat and smoke vents are to be used or how to determine the amount of vented area needed.
- 1.2.3 This standard is not intended to qualify skylights. For the Approval requirements of skylights, see FM Approval Standard 4431, *Skylights*.
- 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 the 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 or natural hazard conditions as actual fire and natural hazard conditions vary widely.
- 1.2.6 This standard does not examine the product's solar optical values such as transmittance, reflectance or absorbance or other properties such as air leakage, water leakage, solar radiation, insulating properties or other properties related to the resistance of heat flow through the product due to indoor and outdoor temperature differentials.

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, jurisdictions and/or loss control specialists was also considered.

1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of heat and smoke vents for the purpose of obtaining Approval. Heat and smoke vents having characteristics not anticipated by this standard may be FM Approved if performance equal, or superior, to that required by this Standard is demonstrated, or if the intent of the standard is met. Alternatively, heat and smoke vents 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;
- the performance of the product as specified by the manufacturer and 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 consistently produce the product which is examined and tested, and the marking procedures used to identify the product. These examinations may be repeated as part of FM Approvals' product follow-up 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;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- 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

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 **May 1, 2008** 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 10-97, *Standard for Use of the International System of Units (SI): The Modern Metric System*.

1.8 Applicable Documents

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

FM Approvals Standards

Approval Standard 4431, *Skylights*

Test Standard 4473, *Specification Test Protocol for Impact Resistance of Rigid Roofing Materials by Impacting with Freezer Ice Balls*

FM Global Data Sheets

FM Global Property Loss Prevention Data Sheet 1- 10, *Smoke and Heat Venting in Sprinklered Buildings*

FM Global Property Loss Prevention Data Sheet 1- 28, *Wind Design*

FM Global Property Loss Prevention Data Sheet 1- 29, *Roof Deck Securement and Above-Deck Roof Components*

American Society for Testing and Materials (ASTM)

ASTM G154-05, *Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure for Non Metallic Materials*.

1.9 Definitions

For purposes of this standard, the following terms apply:

Crack – to break in such a way that a fine split or splits appear but the section does not come apart.

Fragility – the measure of a materials resistance to damage, brittleness or cracking.

Heat Vent – an operable opening in a roof designed to operate either automatically or manually in the event of a fire to allow heat and smoke to escape the building.

Skylight – an opening in a roof that is permanently covered with a translucent or transparent material. Skylights are generally inoperable and are provided mainly as a means of admitting light while maintaining the building envelope.

Smoke Vent - see Heat Vent.

Thin Break – a flaw that is visible as a thin line or a network of fine cracks.

2. GENERAL INFORMATION

2.1 Product Information

- 2.1.1 Heat and smoke vents were originally used as an aid to firefighting in unsprinklered buildings. In such cases, vents take advantage of the principle that hot air and gases tend to rise. When a fire occurs in an unsprinklered building, the smoke and gases rise until blocked. They then move radially outward in a mushrooming, deepening bank, slowly lowering to floor level and making manual fire fighting difficult.
- 2.1.2 In a sprinklered building, this may not be the case. In sprinklered buildings, the passage of hot air and smoke through the vent opening causes fresh air to enter into the building through any other available opening resulting in greater fuel consumption and an increased water demand. Refer to FM Global Property Loss Prevention Data Sheet 1- 10, *Smoke and Heat Venting in Sprinklered Buildings* (May 1998) for a further discussion of the pros and cons of using heat and smoke vents in sprinklered buildings.
- 2.1.3 The selection of a heat and smoke vent system is a critical component in the overall effectiveness of a building's ability to perform the functions for which it has been designed, especially during fire conditions. It is the first line of defense in combating the effects of natural hazards and protecting the lives of those in or near the building as well as the contents of the building. The system selected must be durable, cost effective, and aesthetically pleasing. It must be able to withstand the design conditions that have been placed on the system from internal sources for which it has been constructed as well as natural external sources such as wind and hail. Selection of a system that has not demonstrated that it can withstand the design conditions over long periods of time can lead to a loss of property as well as a loss of business.
- 2.1.4 Design conditions vary widely throughout the world. The selection of any exterior building component should be based, in part, on the geographical location where it will be constructed, its surroundings as well as the historical meteorological events that have occurred and are likely to occur in the future.
- 2.1.5 Heat and smoke vents are different from skylights. Heat and smoke vents are normally of smaller size and are designed to open automatically in fire situations to vent smoke and hot gases. Skylights are inoperable are mainly provided as a means of supplementing a building's lighting.

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 or services being submitted for Approval consideration;
- general assembly drawings, complete set of manufacturing drawings, materials list, sales literature and installation procedures;

- the number and location of manufacturing facilities and;
- 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 in English or with English translation.

2.3 Requirements for Samples for Examination

- 2.3.1 Following authorization of an Approval examination, the project engineer will inform the manufacturer of the number and type of samples that shall be submitted for examination and testing.
- 2.3.2 The manufacturer shall submit samples representative of production. FM Approvals, at their sole discretion, shall reserve the right to witness production of test samples and/or any components or raw materials that are deemed to be critical to the performance of the product. Any decision to use data generated using prototypes is at the discretion of FM Approvals.
- 2.3.3 Requirements for samples may vary depending on design features, results of prior or similar testing (if applicable), and results of any foregoing tests.

3. GENERAL REQUIREMENTS

3.1 General Information

The requirements of this standard shall be used to measure and describe the performance of heat and smoke vents to simulated fire testing, resistance to wind uplift and wind loading, resistance to hail, the effects of temporary live loads such as those imposed by foot traffic as well as to be able to operate under anticipated roof live (snow) loads. They also take into account the deleterious affects caused from everyday exposure to sunlight.

3.2 Types of Heat and Smoke Vents

- 3.2.1 There shall be two (2) categories of heat and smoke vents. One category shall be identified as automatic operating heat and smoke vents. The other category shall be identified as drop-out type heat and smoke vents. Heat and smoke vents can be further classified based on the material used to manufacture the domes or lids – either metal or plastic. The test requirements for each type of heat and smoke vent, and their material of construction, are shown in Table 1.
- 3.2.2 Automatic operating heat and smoke vents shall be permitted to utilize either metal or plastic lids and shall be provided with a manual opening device that is accessible from floor level. Additional manual opening devices shall be permitted provided that they do not interfere with the automatic opening capabilities of the vent. Automatic heat and smoke vents that utilize a metal lid are not required to be subjected to a fire test as they are provided with a heat activating device. Automatic heat and smoke vents that utilize plastic domes or lids shall be subjected to the fire test to verify that the lids will not melt, drip or drop out prior to activation of the heat activating device.