



Approval Standard for Fire Protection Monitor Assemblies

Class Number 1421

May 2018

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet FM Approvals' stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for 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 criteria for monitor assemblies that deliver and distribute water for fire protection purposes. These assemblies must operate reliably for many years at rated capacities and pressures during emergency fire incidents, despite being idle for extended periods.
- 1.1.2 Approval criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up program.

1.2 Scope

- 1.2.1 This standard sets performance requirements for the following product categories and associated class numbers:

Class Number	Product Category
1421	Monitor Assemblies

- 1.2.2 This standard is applicable to monitor assemblies designed to discharge and direct water spray and/or foam onto a fire. Monitors are most commonly operated by manual means but may also have the capability to operate remotely or automatically. In cases where metric sized monitor assemblies are to be examined for Approval, test criteria comparable to the United States equivalent size shall be used.
- 1.2.3 Master stream nozzles are typically used in conjunction with monitors as a discharge device. Performance requirements for master stream nozzles are established in FM Approval Standard Class 5511.
- 1.2.4 Requirements for the installation, use, inspection, service testing, and replacement for such monitor assemblies are detailed in the following National Fire Protection Association standards:

NFPA 1962, Standard for the Care, Use, Inspection, Service Testing, and Replacement of Fire Hose, Couplings, Nozzles, and Fire Hose Appliances

NFPA 1965, Standard for Fire Hose Appliances
- 1.2.5 Approval standards are intended to verify that the product described will meet stated conditions of performance, safety, and quality useful to the ends of property conservation.

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 monitor assemblies for the purpose of obtaining Approval. These requirements are intended primarily as guides, and strict conformity is not always mandatory. Monitor assemblies 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, monitor assemblies that meet all of the requirements identified in this standard may not be FM Approved if other conditions that 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 shall be made to evaluate the manufacturer's ability to produce the product which was examined and tested, and the marking procedures used to identify the product. These examinations are repeated as part of FM Approvals product follow-up program.

1.5 Basis for Continued Approval

1.5.1 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 Master Agreement;
- Satisfactory re-examination of production samples for continued conformity to requirements; and
- Satisfactory Surveillance Audits conducted as part of FM Approvals product follow-up program.

1.5.2 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 forfeit Approval.

The effective date of this standard is **May 1, 2019** for full 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 Institute of Electrical and Electronics Engineers (IEEE)/American

Society for Testing Materials (ASTM) SI10-2010, “*American National Standard for Metric Practice*. Two units of measurement (liter and bar), outside of, but recognized by SI, are commonly used in international fire protection and are used in this standard.

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. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*
ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*
ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension*
ASTM D 573, *Standard Test Method for Rubber - Deterioration in an Air Oven*
FM Approvals’ Approval Standard 1112, *Indicating Valves (Butterfly or Ball Type)*
FM Approvals’ Approval Standard 3010, *Fire Alarm Signaling Systems*
FM Approvals’ Approval Standard 3232, *Video Image Fire Detectors for Automatic Fire Alarm Signaling*
FM Approvals’ American National Standard ANSI/FM 3260, *Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling*
FM Approvals’ Approval Standard 3600, *Electrical Equipment for Use in Hazardous (Classified) Locations – General Requirements*
FM Approvals’ Approval Standard 3611, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*
FM Approvals’ Approval Standard 3615, *Explosionproof Electrical Equipment General Requirements*
FM Approvals’ Approval Standard 3810, *Electrical and Electronic Test, Measuring and Process Control Equipment*
FM Approvals’ Approval Standard 5130, *Foam Extinguishing Systems*
FM Global Property Loss Prevention Data Sheets
IEEE/ASTM SI 10, *American National Standard for Use of the International System of Units (SI): The Modern Metric System*
National Fire Protection Association (NFPA) 1962, *Standard for the Care, Use, Inspection, Service Testing, and Replacement of Fire Hose, Couplings, Nozzles, and Fire Hose Appliances*
NFPA 1965, *Standard for Fire Hose Appliances*

1.9 Definitions

For purposes of this standard, the following terms apply:

Accepted

This term refers to installations acceptable to the authority enforcing the applicable installation rules. When the authority is FM Global, such locations are termed “FM Global Accepted”. Acceptance is based upon an overall evaluation of the installation. Factors other than the use of FM Approved equipment impact upon the decision to accept, or not to accept. Acceptance is not a characteristic of a product. It is installation specific. A product accepted for one installation may not be acceptable elsewhere. (Contrast with FM Approved.)

Area of Coverage

The maximum area which can be protected by a foam discharge device, based upon the minimum effective application rate for the hazard, the maximum application rate which will not cause substantial differences in foam quality from that producing successful extinguishment in tests, and the maximum distance from the application device to the burning surface which will also not significantly effect foam quality.

Automatic Oscillating Monitors

Monitor assemblies affixed with an automatic oscillator, a mechanical or electrical device that automatically oscillates the monitor across the full range of horizontal rotation. See *Electrically Operated Monitors* and *Oscillating Flange* definitions for more information.

Automatic Water Control Valves

A valve used to automatically control (on/off) the flow through a monitor assembly. Automatic operation is achieved through loss of system or supervisory pressure, or signal from a detection device. For the purposes of this standard, examples of automatic water control valves include deluge or pre-action type valves.

Automatically Operated Self-Targeting Monitor Systems

Monitor assemblies designed to operate automatically without the need for any human intervention. Automatic systems typically consist of a flame detector, a monitor equipped with electric motors & a fire scanner, and a central control unit. When a fire event occurs within the protected space, the flame detector sends a signal to the control unit which then mobilizes the monitor assembly to locate the fire. The fire scanner is typically an image-based flame detector equipped with a pair of cameras (either visual or infrared). Once the fire scanner locates the flame, the monitor will be adjusted to its final position and water spray will be delivered upon activation of the control valve.

Cannon Scanning Time

In an automatically operated self-targeting monitor system, the cannon scanning time is defined as the time period from the triggering of the detection alarm to the moment when the water flow control valve is opened.

Class A Fires

Fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics.

Class B Fires

Fires in ignitable liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.

Corrosion Resistant

Having resistance to corrosion equal to or exceeding that of bronze alloy having a minimum copper content of 80 percent, or constructed of Series 300 Stainless Steel.

Electrically Operated Monitor Assembly

A monitor assembly equipped with electrical motors to operate the horizontal and vertical rotation of the assembly. This allows for stream positioning from remote locations or automatic operation. Manual stream positioning at the monitor device is not required. An additional electric motor is typically mounted on the nozzle to operate the spray pattern adjustment.

FM Approvals Certification Mark

The FM Approvals Certification Marks are mandatory on all units of FM Approved monitor assemblies. These registered marks cannot be used except as authorized by FM Approvals via the granting of Approval to a specific product.

FM Approved

This term refers to products FM Approved by FM Approvals. Such products are listed in the Approval Guide, an online resource of FM Approvals. All products so listed have been successfully examined by FM Approvals, and their manufacturers have signed and returned a Master Agreement to FM Approvals. This form obligates the manufacturer to allow re-examination of the product and audit of facilities and procedures at FM Approvals discretion. It further requires the manufacturer not to deviate from the as-FM Approved configuration of the product without review by, and agreement of, FM Approvals.

FM Global Standard Class II Commodity

A commodity product consisting of a 42 in. (1.1 m) cube, double tri-wall corrugated carton with a steel liner. The double carton has a combined nominal 1 in. (25.4 mm) thickness; the open-bottom liner measures 38 in. x 38 in. x 36 in. high (1m x 1m x 0.9m). Each pallet load consists of one double tri-wall carton placed upon a 42 in. x 42 in. x 5 in. (107 cm x 107 cm x 13 cm) two-way, slatted deck hardwood pallet. The vendor requirements for the carton are as follows:

1. “AAA” flute configuration;
2. PPP-B640d (as amended) Class II Government Grade;
3. 1100TW test;
4. RSC Style, triple wall;
5. Conforms with all the requirements of:
 - a. Rail Classification Rule 41, Section 3;
 - b. National Motor Freight Classification Rule 222;
 - c. IATA & ATA shipment by air, both domestic and overseas;
6. Plain printed except certification; and,
7. Dimensions:
 - a. One each, 40-7/8 in. x 40-7/8 in. x 40 in. high (1.04 m x 1.04 m x 1.02 m high); and,
 - b. One each, 39-5/8 in. x 39-5/8 in. x 37-3/4 in. high (1.01 m x 1.01 m x 0.96 m high).

FM Global Standard Igniter

A standard igniter is the ignition source used for all FM Approvals full scale fire tests. A standard igniter consists of either 2 or 4 half-igniters, depending on the ignition location. **For the purposes of this standard, 2 half igniters are used in the Class A fire tests for automatic self-targeting monitor systems.** Each half-igniter consists of a 3 in. diameter by 3 in. long (76 mm x 76 mm) cylinder of rolled cellucotton, soaked with 4 fluid ounces (118 ml) of gasoline, then sealed in a polyethylene plastic bag. Igniters are prepared no more than 15 minutes prior to testing. They are positioned at the base of the bottom tier pallet loads, lit with a propane torch to signal the start of the test, and the fires are allowed to develop naturally.

FM Global Standard Plastic Commodity

A commodity product of cartoned Group A unexpanded plastic, consisting of rigid crystalline polystyrene jars (empty, 16 oz. size) packaged in compartmented, single wall, corrugated cartons measuring 21 in. x 21 in. x 20 in. (53 cm x 53 cm x 51 cm). Jars are arranged in five layers, 25 per layer for a total of 125. Each pallet load consists of eight cartons, arranged in a 2x2x2 array upon a 42 in. x 42 in. x 5 in. (107 cm x 107 cm x 13 cm) two-way, slatted deck hardwood pallet.

Master Stream Nozzle

A nozzle designed to be directly attached to the outlet of a monitor assembly.

Maximum Operating Pressure

See *Rated Working Pressure*.

Monitor

A water discharge device upon which a fire fighting nozzle may be mounted, that has a base which may be secured to absorb reaction forces, and which is adjustable to direct discharge through a range of vertical and horizontal angles. FM Approved monitors are specially designed with large clear waterways to give a powerful, far-reaching stream for the protection of pulpwood piles, lumber yards, or other locations where a large amount of water must be instantly available without the delay of laying hose lines.

Oscillating Flange

A mechanical device installed between the monitor and the flange connection which automatically oscillates the monitor assembly throughout the full range of horizontal rotation. Oscillating flanges are typically powered by the flow of extinguishing system water through the pipework and require no external power sources (self-oscillating flanges).

Rated Working Pressure

The maximum pressure at which a monitor assembly is designed to operate.

Shutoff Valve

A valve, typically manually operated, that is mounted directly underneath a monitor assembly used to control the flow of water (on/off) to the monitor assembly. Examples of types of shutoff valves include Outside Stem & Yoke (OS&Y) gate valves, Non Rising Stem (NRS) gate valves, ball, or butterfly valves.

Underwriters Playpipe

A large bore, straight stream fire hose nozzle. Before the introduction of spray nozzles, playpipes were the only nozzles used with 2-1/2 in. (65 mm) fire hose for industrial fire fighting. Playpipes are now primarily used as water measuring devices during water testing. One type has a 30 in. (760 mm) barrel and is known as the standard Underwriters playpipe with a 1-3/4 in. (45 mm) nozzle tip and an alternate attachable 1-1/8 in. (30 mm) nozzle tip. The other type has a 15 in. (380 mm) barrel and is known as the short playpipe. The detachable tip for the barrel has a 1-1/8 in. (30 mm) orifice. Swivel handles provide a good handgrip for two persons. The short playpipe, when used for fire fighting, usually has a detachable 1 in. (25 mm) shutoff tip.

2. GENERAL INFORMATION

2.1 Product Information

- 2.1.1 Monitor assemblies covered by this standard include those designed for 100 gal/min through 5000 gal/min (380 L/min through 18 925 L/min) or larger capacities. Monitor assemblies designed for rated capacities greater than 5000 gal/min (18 925 L/min) shall be evaluated on a case-by-case basis.
- 2.1.2 In order to meet the intent of this standard, monitor assemblies must be examined on a model-by-model, type-by-type, manufacturer-by-manufacturer, and plant-by-plant basis. This is predicated on the basis that identical designs, fabricated in identical materials by different manufacturers or, even by different plants of the same manufacturer, have been seen to perform differently in testing. Sample monitor assemblies, selected in conformance to this criterion, shall satisfy all of the requirements of this standard.

2.2 Approval Application Requirements

To apply for an Approval 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, one complete set of manufacturing drawings, materials list(s) and material specifications (such as ASTM A48 CL 40 - Cast Iron), anticipated marking format, brochures, sales literature, specification 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 foreign language documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

Following set-up and authorization of an Approval examination, the manufacturer shall submit samples for examination and testing. Sample requirements are to be determined by FM Approvals following review of the preliminary information. Sample requirements may vary depending on design features, results of prior testing, and results of the foregoing tests. It is the manufacturer's responsibility to submit samples representative of production. Any decision to use data generated utilizing prototypes is at the discretion of FM Approvals. The manufacturer shall provide all equipment to perform the tests.