

# Approval Standard

## Flexible Sprinkler Hose With Threaded End Fittings

Class Number 1637  
February 2010

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*Member of the FM Global Group*

# **Approval Standard for Flexible Sprinkler Hose With Threaded End Fittings**

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# Foreword

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

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

For examining equipment, materials and services, Approval Standards:

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

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

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

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# Table of Contents

|                                                                                                                                                                                      |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1. INTRODUCTION .....                                                                                                                                                                | 1  |
| 1.1 PURPOSE.....                                                                                                                                                                     | 1  |
| 1.2 SCOPE.....                                                                                                                                                                       | 1  |
| 1.3 BASIS FOR REQUIREMENTS .....                                                                                                                                                     | 1  |
| 1.4 BASIS FOR APPROVAL.....                                                                                                                                                          | 2  |
| 1.5 BASIS FOR CONTINUED APPROVAL .....                                                                                                                                               | 2  |
| 1.6 EFFECTIVE DATE .....                                                                                                                                                             | 2  |
| 1.7 SYSTEM OF UNITS.....                                                                                                                                                             | 2  |
| 1.8 APPLICABLE DOCUMENTS .....                                                                                                                                                       | 3  |
| 1.9 DEFINITIONS .....                                                                                                                                                                | 3  |
| 2. GENERAL INFORMATION .....                                                                                                                                                         | 5  |
| 2.1 PRODUCT INFORMATION.....                                                                                                                                                         | 5  |
| 2.2 APPROVAL APPLICATION REQUIREMENTS .....                                                                                                                                          | 5  |
| 2.3 REQUIREMENTS FOR SAMPLES FOR EXAMINATION .....                                                                                                                                   | 5  |
| 3. GENERAL REQUIREMENTS .....                                                                                                                                                        | 6  |
| 3.1 REVIEW OF DOCUMENTATION .....                                                                                                                                                    | 6  |
| 3.2 PHYSICAL OR STRUCTURAL FEATURES.....                                                                                                                                             | 6  |
| 3.3 MATERIALS .....                                                                                                                                                                  | 7  |
| 3.4 MARKINGS.....                                                                                                                                                                    | 7  |
| 3.5 MANUFACTURER'S INSTALLATION AND OPERATION INSTRUCTIONS.....                                                                                                                      | 7  |
| 3.6 CALIBRATION .....                                                                                                                                                                | 8  |
| 3.7 TOLERANCES .....                                                                                                                                                                 | 8  |
| 4. PERFORMANCE REQUIREMENTS.....                                                                                                                                                     | 8  |
| 4.1 EXAMINATION .....                                                                                                                                                                | 8  |
| 4.2 FATIGUE .....                                                                                                                                                                    | 8  |
| 4.3 VIBRATION .....                                                                                                                                                                  | 9  |
| 4.4 PRESSURE CYCLING TEST.....                                                                                                                                                       | 10 |
| 4.5 VACUUM TEST.....                                                                                                                                                                 | 11 |
| 4.6 FRICTION LOSS (EQUIVALENT LENGTH OF PIPE) .....                                                                                                                                  | 11 |
| 4.7 HYDROSTATIC STRENGTH .....                                                                                                                                                       | 12 |
| 4.8 SEAL INTEGRITY.....                                                                                                                                                              | 13 |
| 4.9 HIGH PRESSURE FLOW.....                                                                                                                                                          | 13 |
| 4.10 ELONGATION .....                                                                                                                                                                | 14 |
| 4.11 ADDITIONAL TESTS .....                                                                                                                                                          | 14 |
| 5. OPERATIONS REQUIREMENTS .....                                                                                                                                                     | 14 |
| 5.1 DEMONSTRATED QUALITY CONTROL PROGRAM .....                                                                                                                                       | 14 |
| 5.2 FACILITIES AND PROCEDURES AUDIT (F&PA) .....                                                                                                                                     | 16 |
| 5.3 MANUFACTURER'S RESPONSIBILITIES.....                                                                                                                                             | 16 |
| 5.4 MANUFACTURING AND PRODUCTION TESTS.....                                                                                                                                          | 17 |
| 5.4.1 TEST REQUIREMENT - PRESSURE TEST.....                                                                                                                                          | 17 |
| 5.4.2 TEST REQUIREMENT - VISUAL INSPECTION.....                                                                                                                                      | 17 |
| 5.5 WELDER TRAINING REQUIREMENTS.....                                                                                                                                                | 17 |
| APPENDIX A: UNITS OF MEASUREMENT .....                                                                                                                                               | 18 |
| APPENDIX B: FM APPROVALS CERTIFICATION MARKS .....                                                                                                                                   | 19 |
| APPENDIX C: FIGURES .....                                                                                                                                                            | 21 |
| FIGURE C-1. TEST APPARATUS FOR FATIGUE TEST.....                                                                                                                                     | 21 |
| FIGURE C-2. TEST APPARATUS FOR MEASURING SPRINKLER NOMINAL K-FACTORS .....                                                                                                           | 22 |
| FIGURE C-3. TEST APPARATUS WITH FLEXIBLE SPRINKLER HOSE WITH THREADED END FITTINGS FOR MEASURING<br>FRICTION LOSS (EQUIVALENT LENGTH OF PIPE) WITH ONE OR TWO BENDS ON THE HOSE..... | 23 |

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|                                                                                                                                                                                         |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| FIGURE C-4. TEST APPARATUS WITH FLEXIBLE SPRINKLER HOSE WITH THREADED END FITTINGS FOR MEASURING<br>FRICTION LOSS (EQUIVALENT LENGTH OF PIPE) WITH THREE OR FOUR BENDS ON THE HOSE..... | 24 |
| FIGURE C-5. TEST ARRANGEMENT FOR VIBRATION TEST.....                                                                                                                                    | 25 |
| FIGURE C-6. TEST ARRANGEMENT FOR PRESSURE CYCLING TEST .....                                                                                                                            | 26 |
| APPENDIX D: SAMPLE LISTING .....                                                                                                                                                        | 27 |
| APPENDIX E: TOLERANCES.....                                                                                                                                                             | 28 |

## 1. INTRODUCTION

### 1.1 Purpose

- 1.1.1 This standard states Approval criteria for flexible sprinkler hose with threaded end fittings for use in clean rooms, commercial suspended ceilings, and ducts. Other applications shall be evaluated on a case-by-case basis.
- 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 encompasses the design and performance requirements for flexible sprinkler hose with threaded end fittings for their intended application of connecting the sprinklers in a clean room, commercial suspended ceiling, or duct to the sprinkler piping.
- 1.2.2 A commercial suspended ceiling is a type of ceiling used predominately in Light Hazard Occupancies. It is also used less frequently in Ordinary Hazard Occupancies. A typical commercial suspended ceiling system is a "T-Bar Grid". In a T-Bar Grid ceiling, a metal component with an inverted "T" cross-section is used to secure and support acoustical lay-in panels.
- 1.2.3 Rigid furring channel is another type of commercial ceiling system.
- 1.2.4 Other applications shall be evaluated on a case-by-case basis. In cases where metric sized flexible sprinkler hose with threaded end fittings are to be examined for Approval, test criteria comparable to the equivalent or nearest nominal inch size shall be used.
- 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 flexible sprinkler hose with threaded end fittings for the purpose of obtaining Approval. Flexible sprinkler hose with threaded end fittings 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, flexible sprinkler hose with threaded end fittings 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 facility(ies) and an 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 and audits are 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 Master Agreement;
- Satisfactory re-examination of production samples for continued conformity to requirements; and
- Satisfactory Facilities and Procedures Audits (F&PA's) conducted as part of FM Approvals' product follow-up program.

Also, as a condition of retaining Approval, manufacturers shall 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 **(January 31, 2011)** 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 Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing and Materials (ASTM) SI 10-2002, *American National Standard for Use of the International System of Units (SI): The Modern Metric System*. Two units (liter and bar), outside of, but accepted by, SI are commonly used in international fire protection and are used in this standard.

## 1.8 Applicable Documents

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

ANSI/ASME B1.20.1-1983 (R2006), *Pipe Threads, General Purpose (Inch)*

FM Global Property Loss Prevention Data Sheets

IEEE/ASTM SI 10-2002, *American National Standard for Use of the International System of Units (SI): The Modern Metric System*

International Organization for Standardization (ISO) 7369 - 2004, *Pipework - Metal Hoses and Hose Assemblies - Vocabulary*

ISO 10380 - 2003, *Pipework -- Corrugated Metal Hoses and Hose Assemblies*

ISO 17025 (2005), *General Requirements for the Competence of Testing and Calibration Laboratories*

## 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 (Authority Having Jurisdiction). 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 the product. Acceptance is not a characteristic of a product, it is installation specific. A product accepted for one installation may thus not be acceptable elsewhere. (Contrast with FM Approved.)

### **Attachment**

Method of joining end fittings to a flexible metal hose.

### **Braid**

Tubular woven stocking of metal wires used to provide pressure strength and/or external protection.

### **Clean Rooms**

A clean room is an enclosed space in which airborne particulates, contaminants, and pollutants are kept within strict limits.

### **Corrosion Resistant**

Flexible sprinkler hose with threaded end fittings shall be termed corrosion resistant if its interior surface exhibits equivalent resistance to aqueous corrosion as steel pipe which is internally coated with zinc.

### **Corrugated Metal Hose**

Pressure-tight hose with corrugations, helicoidally (formed or arranged in a spiral) or annular (formed in a ring) to the axis of the hose. Made by deforming the metal, the corrugations provide flexibility.

### **Discharge Coefficient (K-Factor)**

The coefficient of discharge as expressed in the equation:

$$K = \frac{Q}{P^{1/2}}$$

Where Q is the flow in gallons per minute (gal/min), and P is the pressure in pounds per square inch (psi). Expressed in SI units: Q is the flow in liters per minute (l/min) and P is the pressure in bar.

**End Connection**

The fitting/component used to connect components of a pipe system or an individual sprinkler to the flexible sprinkler hose with threaded end fittings.

**End Fitting**

Permanently attached fitting which allows metal hose to be connected to other components.

**Flexibility**

The capability of a metal hose to be repeatedly bent elastically during operation.

**FM Approvals Certification Mark**

The FM Approvals Certification Marks are detailed in Appendix B. Their use is mandatory on all units of FM Approved flexible sprinkler hose with threaded end fittings. 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 agreement obligates the manufacturer to allow re-examination of the product and audit of facilities and procedures at the discretion of FM Approvals. 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. Approval is product specific.

**Light Hazard Occupancy**

An occupancy in which the quantity and/or combustibility of contents is low and fires with relatively low rates of heat release are expected. Light Hazard Occupancies include occupancies having conditions similar to: apartments, churches, clubs, eaves and overhangs (if combustible construction with no combustibles beneath), educational facilities, hospitals, institutional facilities, libraries (except large stack rooms), museums, nursing or convalescent homes, office (including data processing), residential facilities, restaurant seating areas, theaters and auditoriums (excluding stages and prosceniums), and unused attics. Refer to the FM Global Property Loss Prevention Data Sheets for more specific information.

**Minimum Bend Radius**

The minimum radius [expressed in inches (mm)], specified by the manufacturer, at which a hose is designed to operate.

**Metal Hose Assembly**

Assembly of a metal hose with its end fittings.

**Ordinary Hazard Occupancy**

An occupancy where the quantity and combustibility of contents is greater than that of a Light Hazard Occupancy. Refer to the FM Global Property Loss Prevention Data Sheets for more specific information.

**Pendent Sprinkler**

An automatic sprinkler designed such that the water exiting its orifice is directed downward against the deflector.

**Rated Working Pressure**

The maximum sustained pressure at which the flexible sprinkler hose with threaded end fittings may operate.

**Sidewall Sprinkler**

An automatic sprinkler intended for installation near a wall and ceiling interface and designed to discharge water horizontally outward and onto adjacent walls.

**Suspended Ceiling**

A ceiling in which the main runners and cross furring are suspended below the structural members of the building.

## 2. GENERAL INFORMATION

### 2.1 Product Information

In order to meet the intent of this standard, flexible sprinkler hose with threaded end fittings shall 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 using identical materials by different manufacturers or, even by different plants of the same manufacturer, have sometimes been shown to perform differently in testing. Sample hoses, 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 their authorized representative, shall submit a request to:

Hydraulics Group Manager  
FM Approvals Hydraulics Laboratory  
743 Reynolds Road  
West Glocester, RI 02814 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
- The minimum bend radius of the flexible sprinkler hose
- The type of application for the flexible sprinkler hose: clean room, commercial suspended ceiling or duct
- General assembly drawings, one complete set of manufacturing drawings, materials list(s), anticipated marking format, brochures, sales literature, specification sheets, installation, operation and maintenance procedures
- All drawings are required to identify the manufacturer's name, document number, title, date of last revision, and revision level
- The number and location(s) of manufacturing facilities

All foreign language documents shall be provided with English translation.

### 2.3 Requirements for Samples for Examination

Following generation and authorization of an Approval examination, the manufacturer shall submit samples for examination and testing. Sample requirements are 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 any special test fixtures which may be required to evaluate the flexible sprinkler hose with threaded end fittings.

### 3. GENERAL REQUIREMENTS

#### 3.1 Review of Documentation

During the initial investigation and prior to physical testing, FM Approvals shall review the manufacturer's specifications, technical data sheets, and design details to assess the ease and practicality of installation and use of the flexible sprinkler hose with threaded end fittings. The product shall be capable of being used within the limits of the Approval investigation.

#### 3.2 Physical or Structural Features

- 3.2.1 Flexible sprinkler hose are for use in wet pipe and dry pipe systems.
- 3.2.2 Flexible sprinkler hoses with threaded end fittings shall be designed for a minimum rated working pressure of 175 psi (1205 kPa). Other pressures may be considered at the discretion of FM Approvals.
- 3.2.3 Flexible sprinkler hose with threaded end fittings covered by this standard shall be a nominal 3/4, 1, 1-1/4 or 1-1/2 in. diameter. The smallest inside diameter allowed for the flexible sprinkler hose is 0.75 inch (19.05 mm).
- 3.2.4 A flexible sprinkler hose assembly, including end connections, shall have a maximum length of 6 ft (1.8 m). Both ends of the flexible sprinkler hose assembly shall come equipped with end connections.
- 3.2.5 All flexible sprinkler hoses shall have end connections such that they cannot be interconnected to create longer lengths.
- 3.2.6 Flexible sprinkler hoses with threaded end fittings submitted for testing shall be true production samples and shall be free of sharp edges, burrs, or other imperfections which might injure the installer or interfere with proper assembly of the unit.
- 3.2.7 Threaded end fittings on flexible sprinkler hose shall be fabricated from metal.
- 3.2.8 Flexible sprinkler hoses with threaded end fittings shall have a stainless steel braided metallic outer jacket with stainless steel internal bellows.
- 3.2.9 Non-metallic bellows are permitted but are restricted to Polytetrafluoroethylene (PTFE) convoluted hose, with a minimum thickness of 0.039 in. (1 mm).
- 3.2.10 Technical data sheets shall be provided by all manufacturers.
- 3.2.11 All connections shall be suitable for use with fittings having tapered pipe threads which conform to a national or internationally recognized standard. Sprinklers which are to be sold in the United States shall be threaded to suit fittings manufactured in accordance with ANSI/ASME B1.20.1, *Pipe Threads, General Purpose (Inch)*, per Table 3.2.11.

Table 3.2.11. Threaded Connections

| <b>Nominal K-Factor<br/>gal/min/(psi)<sup>1/2</sup></b> | <b>U.S. Nominal Pipe Thread<br/>Size (NPT), in.</b> |
|---------------------------------------------------------|-----------------------------------------------------|
| 5.6                                                     | 1/2                                                 |
| 8.0                                                     | 1/2 or 3/4                                          |
| 11.2                                                    | 1/2 or 3/4                                          |
| 14.0                                                    | 3/4                                                 |
| 16.8                                                    | 3/4                                                 |
| 19.6                                                    | 1                                                   |
| 22.4                                                    | 1                                                   |
| 25.2                                                    | 1                                                   |