



# **Approval Standard for Pipe Hanger Components for Automatic Sprinkler Systems**

**Class Number 1951-1952-1953**

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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.

# TABLE OF CONTENTS

|          |                                                              |           |
|----------|--------------------------------------------------------------|-----------|
| <b>1</b> | <b>INTRODUCTION .....</b>                                    | <b>1</b>  |
| 1.1      | Purpose .....                                                | 1         |
| 1.2      | Scope .....                                                  | 1         |
| 1.3      | Basis for Requirements .....                                 | 2         |
| 1.4      | Basis for FM Approval .....                                  | 2         |
| 1.5      | Basis for Continued FM Approval .....                        | 2         |
| 1.6      | Effective Date .....                                         | 2         |
| 1.7      | System of Units .....                                        | 3         |
| 1.8      | Applicable Documents .....                                   | 3         |
| 1.9      | Definitions .....                                            | 3         |
| <b>2</b> | <b>GENERAL INFORMATION .....</b>                             | <b>6</b>  |
| 2.1      | Product Information .....                                    | 6         |
| 2.2      | Approval Application Requirements .....                      | 6         |
| 2.3      | Requirements for Samples for Examination .....               | 6         |
| <b>3</b> | <b>GENERAL REQUIREMENTS .....</b>                            | <b>7</b>  |
| 3.1      | Review of Documentation .....                                | 7         |
| 3.2      | Physical or Structural Features .....                        | 7         |
| 3.3      | Design Requirements .....                                    | 8         |
| 3.4      | Materials .....                                              | 11        |
| 3.5      | Markings .....                                               | 11        |
| 3.6      | Manufacturer's Installation and Operation Instructions ..... | 11        |
| 3.7      | Calibration .....                                            | 11        |
| <b>4</b> | <b>PERFORMANCE REQUIREMENTS .....</b>                        | <b>12</b> |
| 4.1      | Examination .....                                            | 12        |
| 4.2      | Tensile Tests .....                                          | 12        |
| 4.3      | Coating Evaluation .....                                     | 14        |
| 4.4      | Mechanical Locking .....                                     | 14        |
| 4.5      | Additional Tests .....                                       | 15        |
| <b>5</b> | <b>OPERATIONS REQUIREMENTS .....</b>                         | <b>15</b> |
| 5.1      | Demonstrated Quality Control Program .....                   | 15        |
| 5.2      | Surveillance Audit Program .....                             | 17        |
| 5.3      | Manufacturer's Responsibilities .....                        | 17        |
| 5.4      | Manufacturing and Production Tests .....                     | 17        |
|          | <b>APPENDIX A .....</b>                                      | <b>18</b> |
|          | <b>APPENDIX B .....</b>                                      | <b>19</b> |
|          | <b>APPENDIX C .....</b>                                      | <b>21</b> |
|          | <b>APPENDIX D .....</b>                                      | <b>22</b> |
|          | <b>APPENDIX E .....</b>                                      | <b>23</b> |
|          | <b>APPENDIX F .....</b>                                      | <b>24</b> |

# 1 INTRODUCTION

## 1.1 Purpose

- 1.1.1 This standard states FM Approval criteria for pipe hanger components used in automatic sprinkler systems. FM Approvals Class 1951 encompasses most pipe hanger components including attachments to steel and wood building members; Class 1952 encompasses concrete expansion shields, anchors and screws (i.e. post-installed concrete anchors installed in hardened concrete); and Class 1953 encompasses concrete inserts (devices installed before the concrete pour and embedded in concrete).
- 1.1.2 FM 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 audit program.

## 1.2 Scope

- 1.2.1 This standard encompasses the design and performance requirements for pipe hanger components used in automatic sprinkler systems. Appendix C illustrates various sprinkler pipe hanger components, and is intended to serve as a guide to consistent use of nomenclature for the examination and listings. In cases where metric sized pipe hanger components are to be examined for Approval, test loads comparable to the English equivalent shall be used.
- 1.2.2 Pipe hangers encompassed by this standard are designed to support NPS  $\frac{3}{4}$ , 1, 1 $\frac{1}{4}$ , 1 $\frac{1}{2}$ , 2, 2 $\frac{1}{2}$ , 3, 3 $\frac{1}{2}$ , 4, 5, 6, 8, 10, and 12 in. (20, 25, 32, 40, 50, 65, 80, 90, 100, 125, 150, 200, 250, and 300 mm) nominal pipe sizes.
- 1.2.3 FM 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.
- 1.2.4 Pipe Hanger Types — Some common types of sprinkler pipe hanger components covered by this standard are:

### Pipe Support Components

Eye Rods  
U-Type Hangers  
Swivel Hangers  
Clevis Hangers  
Hinge Hangers  
Ring Hangers  
Steel Band Hangers

### Building Attached Components

C-Type Clamps  
Cantilever Brackets  
Channel Clamps  
I-Beam Clamps  
Ceiling Flanges  
Angle Brackets  
Expansion Shields  
Concrete Inserts  
Trapeze Hangers  
Tipping Dowels

- 1.2.5 Other types of hanger components may be FM Approved if they meet the requirements and intent of this standard. Components of unusual design may be subjected to special tests to determine their suitability.
- 1.2.6 This standard does not evaluate pipe hanger components with respect to their adequacy to resist earthquake forces and pipe displacements in earthquake-exposed areas (FM Global 50-year through 500-year earthquake zones as shown in Data Sheet 1-2, Earthquakes).
- 1.2.6.1 Where post-installed concrete anchors are to be used in earthquake-exposed areas they should be separately determined, based on a recognized national or international standard (e.g., American Concrete Institute [ACI] standard 355.2 "Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary"), to be allowed and adequate for the test loads specified in this Approval Standard when installed in cracked concrete.

1.2.6.2 Adequacy of pipe hanger components to resist the upward or downward reaction from earthquake sway bracing is not evaluated by this standard.

1.2.6.3 Adequacy of pipe hanger components subject to swinging of unbraced piping in an earthquake is not evaluated by this standard.

### 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 pipe hanger components for the purpose of obtaining FM Approval. Pipe hanger components 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, pipe hanger components 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 FM Approval

FM 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 consistently 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' Surveillance Audit program.

### 1.5 Basis for Continued FM 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;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory Surveillance Audits conducted as part of FM Approvals' product surveillance audit program.

Also, as a condition of retaining FM 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 FM 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 FM Approval.

The effective date of this Standard is **One Year from Issue Date** 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 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:

IEEE/ASTM SI 10-2010, *American National Standard for Metric Practice*

American Concrete Institute (ACI) 355.2-07, *Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary*

American Concrete Institute (ACI) 318-08, *Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary*

ASTM A6/A6M-02b, *Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling*

ASTM A653/A653M-02, A635/A635M-02, *Standard Specification for General Requirements for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Commercial Steel, Drawing Steel, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, Hot-Rolled*

ASTM A924/A924M-99, *Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process*

ASTM B117-16, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

ASTM B633-15, *Specification for Electrodeposited Coatings of Zinc on Iron and Steel*

ASTM C33/C33M, *Standard Specification for Concrete Aggregates*

ASTM D1654-08, *Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments*

FM Global Property Loss Prevention Data Sheets

International Organization for Standardization (ISO) 3575:1996, *Continuous Hot-Dip Zinc-Coated Carbon Steel Sheet of Commercial, Lock-Forming and Drawing Qualities*

ISO 4998:1996, *Continuous Hot-Dip Zinc-Coated Carbon Steel Sheet of Structural Quality*

Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS), SP-69-02, *Pipe Hangers and Supports — Selection and Application*

## 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.)

### ***Adjustable Swivel Band Hanger***

A type of band hanger that is adjustable and swivels.

### ***Band Hanger***

A type of hanger that is adjustable and utilizes a band looped around the pipe.

***Bracket***

A cantilever-type hanger that is attached directly to a vertical surface of the building structure.

***Building Attached Component***

A product that is used to make load carrying connection to a building structural element.

***“C” Clamp***

A product that is used to provide a load carrying connection to a building structural element, usually by use of a jaw and setscrew combination.

***Ceiling Flange***

A product that is used to provide a load carrying connection to the ceiling for installation of pipe hangers.

***Beam Clamp***

A clamp that is rigidly attached to both edges of the bottom flange of a structural member.

***Top or Bottom Beam Clamp***

A clamp that is rigidly attached to one edge of the top or bottom flange of a structural member.

***Clevis Hanger***

A type of split ring hanger.

***Concrete Anchor***

A bolt, screw or explosive-driven fastener installed in concrete used to transfer forces to a structural member. Can be installed before the concrete is poured (i.e., a cast-in-place anchor), but is more often installed after the concrete is hardened (i.e., a post-installed anchor)

***Concrete Insert***

Concrete inserts provide anchorage to concrete building structures for supporting pipe hangers. Concrete inserts must be installed before the concrete is poured.

***Concrete, Normal Weight***

Structural concrete conforming to ACI 318-08, containing coarse and fine aggregates that conform to ASTM C33. Typically has a density of approximately 145 to 150 lb/ft<sup>3</sup>

***Coupling***

A hanger part used to connect expansion shields or fasteners to a rod. Couplings may have male or female threads and may have a straight or reducing pattern.

***Expansion Shield (Case, Shell, or Base)***

An anchor that is inserted into a self-drilled or predrilled hole in hardened concrete (i.e. post-installed) and then “set”, usually by tightening of a bolt, setting of a cam or semisoft member, or forced expansion over a hardened steel plug.

***FM Approvals Certification Mark***

The FM Approvals Certification Mark. Its use is mandatory on all units of FM Approved products. These registered marks cannot be used except as authorized by FM Approvals via the granting of FM Approval to a specific product.

***FM Approved***

This term refers to products Approved by FM Approvals. Such products are listed in the *Approval Guide*, an on-line 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 surveillance audits of at FM Approvals' discretion. It further requires the manufacturer not to deviate from the as-Approved configuration of the product without review by and agreement of FM Approvals. Approval is product and site specific.

***Non-Heat Sensitive Material***

A material whose measured tensile strength at 1005 °F  $\pm$  50 °F (540 °C  $\pm$  10 °C) is at least 90 percent of the value measured at 68 °F  $\pm$  41°F (20 °C  $\pm$  5 °C).

***Post-Installed Concrete Anchor***

An anchor that is installed in hardened concrete. Examples include expansion shields, adhesive anchors, driven fasteners and screws.

***Retaining Strap***

A component used to hold a top or bottom beam clamp in its intended position.

***Ring***

A pipe hanger that completely encircles a pipe without a positive gripping action.

***Riser Clamp***

A style of pipe clamp used to prevent downward movement of risers at each floor within a building.

***Solid Ring***

A ring that has to be slipped onto the end of the pipe and cannot be opened in any way for attachment to the pipe after the pipe line is made up.

***Split Ring***

A ring that can be opened in some way to allow it to be put on the pipe after the pipe line is made up.

***Swivel Ring***

A solid or split ring that has a top swivel allowing the hanger to be connected to a rod after it has been installed on the pipe.

***Screw***

Threaded head screws used to provide anchorage to concrete, steel or wood building structural members for supporting pipe hangers.

***Trapeze Hanger***

A building attached component that attaches to the rib width underside of a structural steel deck.

***Tipping Dowel***

A building attached component that inserts into the rib width opening of a structural steel deck.

## **2 GENERAL INFORMATION**

### **2.1 Product Information**

- 2.1.1 A pipe hanger usually consists of two or more components combined to make a functional assembly. One part of a hanger attaches to a structural element of the building and another part supports the pipe. Pipe hangers encompassed by this standard are used to support overhead piping in an automatic sprinkler system. Complete hanger assemblies or individual components may be tested for Approval. Installation shall be in accordance with FM Global Property Loss Prevention Data Sheet 2-0 and the manufacturer's installation instructions.
- 2.1.2 Pipe hanger components shall be examined on a type-by-type, manufacturer-by-manufacturer, and plant-by-plant basis. This is predicated on the basis that identical products, produced with identical materials by different manufacturers, or even by different plants of the same manufacturer, have been seen to perform differently in testing. Sample pipe hanger components, 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 written request to [information@fmaprovals.com](mailto:information@fmaprovals.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 FM Approval consideration,
- General assembly drawings, 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, etc;
- 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**

- 2.3.1 Sample requirements are to be determined by FM Approvals following a review of the preliminary information used in the preparation of the examination proposal. Sample requirements may vary depending on size range of product under consideration, design features, or results of prior testing. Following the authorization of the examination