Approval Standard for Hose Racks and Reels

Class Number 2141

December 2015

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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1. INTRODUCTION

1.1 Purpose

1.1.1 This standard states Approval requirements for racks and reels designed to store fire hose in an occupancy.

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
2141	Hose Racks and Reels

1.2.2 This standard is applicable to racks and reels which provide readily accessible storage of fire hose. They are intended for use by building occupants in controlling incipient fires.

1.2.3 Requirements for the installation, use, inspection, service testing, and replacement for such fire hose storage devices are detailed in the following National Fire Protection Association standards:

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

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

1.2.4 Hose racks and reels of unusual design may be subjected to special tests to determine their suitability.

1.2.5 FM Approvals 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 national and international 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 hose racks and reels for the purpose of obtaining Approval. These requirements are intended primarily as guides, and strict conformity is not always mandatory. Hose racks and reels 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, hose racks and reels which do not 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 audit of quality control procedures shall be made to evaluate the manufacturer's ability to produce the product as 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

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 Agreement;
- satisfactory re-examination of production samples for continued conformity to requirements;
- satisfactory Surveillance Audits 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 forfeit Approval.

The effective date of this standard is **one year from publish date** 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 American National Standards Institute (ANSI)/Institute of

Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI10-2010, *''American National Standard for Metric Practice.''*

1.8 Applicable Documents

The latest versions of the following standards, test methods, and practices are referenced in this standard:

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

FM Global property loss prevention data sheets.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

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.*

National Fire Protection Association (NFPA) 1965, *Standard for Fire Hose Appliances.*

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

1.9 Definitions

For purposes of this standard, the following terms apply:

Angle Hose Valve

A valve used to connect a fire hose or other device to the standpipe and water supply.

Maximum Service Pressure

The maximum static outlet pressure at the standpipe that a rack or reel is able to effectively operate at.

Semi-Automatic Rack or Reel

A rack or reel designed to automatically activate the hose and commence the flowing of water once it has been manually removed from the storage position. The semi-automatic operation is achieved by a water retention device near the standpipe connection which releases once the hose is deployed.

Standpipe

This term refers to the piping within a building that provides water supply to the hose connections and hose stations.

Support Pins

Metal pins on a rack used as a means for the hose to be looped over and supported to allow for storage in a folded, compact fashion.

2. GENERAL INFORMATION

2.1 Product Information

2.1.1 Hose racks and reels provide convenient and readily accessible storage of fire hose in an occupancy. Hoses can be deployed and operated manually or semi-automatically.

2.1.2 In order to meet the intent of this standard, racks and reels 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 racks or reels, 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:

Fire Protection Manager
FM Approvals Hydraulics Laboratory
743A Reynolds Road
West Glocester, RI 02814
U.S.A.

The rack or reel manufacturer shall provide the following preliminary information with any request for Approval consideration:

- a complete list of all trade names or designations, and sizes for the products or services being submitted for Approval consideration, and
- the number and location(s) of manufacturing facilities.

If the rack or reel is being submitted for Approval as an assembly, the manufacturer shall specify the make and model of all components included in the assembly.

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 any special test fixtures that may be required to evaluate the rack or reel.

3. GENERAL REQUIREMENTS

3.1 Review of Documentation

During the initial investigation and prior to physical testing, the manufacturer's specifications, technical data sheets, and design details shall be reviewed to assess the ease and practicality of installation and use. The product shall be capable of being used within the limits of the Approval investigation.

3.2 Physical or Structural Features

3.2.1 Racks and reels shall:

- have capacity for a maximum of 100 ft. of 1 ½" or 2 ½" nominal diameter fire hose.
- be designed such that a single operator can turn on the water and then lay out the preconnected hose. The action of the hose leaving the rack or reel shall be free and, as far as possible, progressive from the nozzle.
- be of sufficient durability to resist damage from normal wear and abuse.
- be constructed of corrosion resistant materials or be treated with protective coatings.
- be arranged to permit secure hose storage in the rack or reel. Hose shall be stored securely so as not to become dislodged until it is purposely removed.
- be designed so as not to damage the hose during loading, storing, or removal. The rack or reel shall be of sufficient manufacturing quality and free of rough or sharp edges or any projections that may potentially damage the hose or interfere with operation.
- be of sufficient manufacturing quality and free of rough or sharp edges.
- have means to be securely mounted to a building structure or standpipe.
- be provided with a means to secure the hose nozzle when not in use.
- provide accessibility to the hose valve.
- operate as intended at a maximum service pressure of 150 or 175 psi (10.3 or 12.1 bar).

3.2.2 Any moving parts shall remain attached to the rack or reel when the hose is withdrawn and shall have sufficient clearance to avoid any binding.

3.2.3 The fire hose, when installed in the rack or reel, shall be able to lie or hang in natural folds or be coiled on a spool.

3.2.4 Hose racks shall incorporate a means for semi-automatic operation via a water retention device.

3.3 Materials

All materials shall be suitable for the intended application. Any materials used in these products shall have physical properties necessary to render them suitable for their intended use. When unusual materials are used, special tests may be necessary to verify their suitability.

3.4 Assemblies

Racks or reels may be Approved as a stand-alone device or as an assembly including an angle hose valve,

fire hose, and hose nozzle. The manufacturer shall be able to supply the components included in the assembly. All components must be FM Approved for the assembly to be eligible for Approval. The manufacturer must specify the make and model of all components and FM Approvals must be notified of any changes.

3.5 Markings

3.5.1 Each rack or reel shall be permanently marked on its external surface with the following information:

- manufacturer's name or identifying symbol,
- trade name or model designation,
- operating instructions for the device,
- the maximum rated service pressure,
- if provided without a hose, length and nominal diameter of the appropriate hose to be installed, and
- the FM Approvals Certification Mark.

3.5.2 The trade name or designation 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.

3.5.3 The Approval Mark shall be displayed visibly and permanently on the product. The manufacturer shall not use this Mark on any other product unless such product is covered by separate agreement with FM Approvals.

3.5.4 All markings shall be legible and durable.

3.6 Manufacturer's Installation and Operation Instructions

Maintenance, operation, and installation instructions, including any special dimension requirements, shall be furnished by the manufacturer. Instructions shall be provided with each rack or reel.

3.7 Calibration

All equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage or the equipment. A copy of the calibration certificate for each piece of test equipment in required for FM Approvals' records, indicating that the calibration was performed against working standards whose calibration is certified as traceable to the National Institute of Standards and Technology (NIST) or to other acceptable reference standards and certified by a ISO 17025 calibration laboratory. The test equipment must be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service accreditation certificate as an ISO 17025, "General Requirements for the Competence of Testing and Calibration Laboratories", calibration laboratory is required for FM Approvals' records.

The calibration of recently purchased new equipment is also required. Documentation indicating either the date of purchase or date of shipment, equipment description, model and serial number is required for identification. The period from the time the equipment was put into service to the date of testing must be within an interval that does not require the equipment to be calibrated as determined on the basis of the parameters mentioned above.

3.8 Tolerances

Tolerance on units of measure shall be as described in Appendix B, unless otherwise specified.

4. PERFORMANCE REQUIREMENTS

4.1 Examination

4.1.1 Requirements

The rack or reel shall conform to the manufacturer's specifications and to FM Approvals requirements.

4.1.2 Test/Verification

Samples shall be examined and compared to the specifications. It shall be verified that the sample conforms to the physical and structural requirements described in Section 3, General Requirements.

4.2 Loading and Removal

4.2.1 Requirements

It shall be possible for a single operator to effectively lay out the hose and activate water spray at service pressures of 30 psi (2.1 bar) and the maximum specified service pressure. There shall be no damage to the rack or reel and no kinking, binding, or tangling of the hose. If the rack or reel is of semi-automatic type, the water retention device shall not permit water to fill the hose beyond the third fold from the standpipe end until released. Additionally, the force to release the water retention device and activate the hose shall not exceed 25 lb_f (111 N). The water retention device shall not show any evidence of wear after operation.

4.2.2 Test/Verification

A rack or reel equipped with the maximum specified length of hose shall be tested. A means to supply a constant water pressure of 30 psi (2.1 bar) to the hose valve under static and flowing conditions shall be established. Once the required pressure is obtained, the valve shall be opened. If the rack or reel is of semi-automatic type, the pressure shall be applied to the water retention device for a period of 2 minutes and observations of any filling past the water retention device shall be made. A single operator shall lay out the full length of hose. Upon deployment, the force to release the water retention device shall be measured on semi-automatic type racks or reels. After the full length of hose is deployed, the water shall be turned off and the hose reloaded onto the rack. The removal process shall then be repeated at the maximum specified service pressure. Observations of any damage to the rack or reel or any kinking, binding, or tangling of the hose during the loading and removal process shall be made.

4.3 Rough Usage Tests

4.3.1 Requirements

A. A rack or reel shall withstand an applied static load of 150 lbs. (68 kg) without any damage or distortion.

B. A rack or reel shall withstand damage that would impede its proper function after impact from a 5 lb. (2.3 kg) weight.

4.3.2 Test/Verification

A. A rack shall be mounted as intended and swung out to the position considered most severe with respect to maintaining support. A static load of 150 lbs. (68 kg) shall be applied for 5 minutes vertically downward at the furthest point from the connection/mounting end. Observations of any

damage or distortion to the rack including its supporting means and any other components shall be made.

B. A 5 lb. weight shall be dropped from a height of 3 ft. onto the rack or reel at the locations determined to be the most prone to impact damage. The locations shall include, at minimum, the mounting components and the point furthest from the connection/mounting end. For reels equipped with a hand crank, impacts shall also be performed on the moving components. The weight shall be dropped a total of 3 times onto each location. Observations of any damage that would impede proper function of the rack or reel shall be made.

4.4 Accelerated Air-Oven Aging Test

4.4.1 Requirements

The requirements of Sections 4.2.1 and 4.3.1 shall be met after accelerated aging of the rack or reel.

4.4.2 Test/Verification

The rack or reel shall be conditioned at 150°F (66°C) for 180 days. After the conditioning period, the rack or reel shall be subjected to the loading and removal and rough usage tests described under Sections 4.2.2 and 4.3.2.

4.5 Corrosion – Salt Spray

4.5.1 Requirements

Rack or reel construction materials shall withstand a 240 hour exposure to the processes described in 4.5.2 without incurring excessive corrosion damage that would impair function.

4.5.2 Tests/Verification

Racks or reels shall be exposed to salt spray (fog) as specified in the latest version of ASTM B 117, *Standard Practice for Operating Salt Spray (Fog) Apparatus.* The salt solution shall consist of 20 percent (by weight) of common salt (NaCl) dissolved in deionized water with a pH between 6.5 and 7.2 and a specific gravity between 1.126 and 1.157.

Following the exposure period, the rack or reel shall be inspected for corrosion damage that would impair proper function. If deemed necessary, the sample shall be subjected to the loading and removal test described in Section 4.2.

4.6 Additional Tests

Additional tests may be required, depending on design features, results of any tests, material application, or to verify the integrity and reliability of the rack or reel, at the discretion of FM Approvals.

Unexplainable failures shall not be permitted. A re-test shall only be acceptable at the discretion of FM Approvals and with adequate technical justification of the conditions and reasons for failure.

5. OPERATIONS REQUIREMENTS

A quality assurance program is required to ensure that subsequent racks or reels produced by the manufacturer at an authorized location present the same quality and reliability as the specific products that were examined. Design quality, conformance to design, and performance are the areas of primary concern. Design quality is determined during the Approval examination and tests, and is covered in the Approval Report. Conformance to design is verified by control of quality and is covered in the Surveillance Audits. Quality of performance is determined by field performances 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;
- handling and disposition of non-conformance materials.

5.1.2 Documentation/Manual

There shall be an authoritative collection of quality procedures and policies. Such documentation shall provide an accurate description of the quality management system and serve 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

In order to ensure adequate traceability of materials and products, the manufacturer shall maintain records of all quality control tests performed, and shall maintain these records 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 reporting proposed changes to Approved or Listed products to FM Approvals prior to implementation. The manufacturer shall notify FM Approvals of changes in the product or of persons responsible for keeping FM Approvals advised by means of the *FM Approved Product/Specification Tested Revision Request Form*. Records of all revisions to all FM Approved products shall be maintained.

5.2 Surveillance Audits

5.2.1 An initial surveillance audit of the manufacturing facility(ies) is part of the Approval examination to

verify implementation of the quality control program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are implemented and maintained to ensure uniform and reliable product consistent with that tested and FM Approved. Initial inspections of facilities already producing similar FM Approved products may be waived at the discretion of FM Approvals.

5.2.2 Each facility shall then remain part of the FM Approvals Surveillance Audit program as a condition of ongoing Approval. Surveillance audits shall be conducted at least annually by FM Approvals, or its representative, to determine continued compliance. More frequent audits may be required by FM Approvals or jurisdictional requirements.

5.2.3 The client shall manufacture the product or service only at the location(s) audited by FM Approvals and as specified in the Approval Report. Manufacture of products bearing the FM Approval Mark is not permitted at any other locations without prior written authorization by FM Approvals.

5.3 Manufacturer's Responsibilities

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

APPENDIX A: Units of Measurement

LENGTH:	in. - ‘‘inches’’; (mm - ‘‘millimeters’’) mm = in. × 25.4 ft - ‘‘feet’’; (m -‘‘meters’’) m = ft × 0.3048
MASS:	lb - ‘‘pounds’’; (kg -‘‘kilograms’’) kg = lb x 0.453
FLOW:	gal/min - ‘‘gallons per minute’’; (L/min -‘‘Liters per minute’’) L/min = gal/min x 3.7854
PRESSURE:	psi - ‘‘pounds per square inch’’; (kPa -‘‘kilopascals’’) kPa = psi x 6.895 bar - ‘‘bar’’; (kPa -‘‘kilopascals’’) bar = kPa x 0.01 bar = psi x 0.06895
AREA:	in^2 - ‘‘square inches’’ (mm^2 -‘‘square millimeters’’) $mm^2 = in^2 \times 6.4516 \times 10^2$ ft^2 - ‘‘square feet’’ (m^2 - ‘‘square meters’’) $m^2 = ft^2 \times 0.0929$
TEMPERATURE:	°F - ‘‘degrees Fahrenheit’’ (°C-‘‘degrees Celsius’’) °C= (°F - 32) × 0.556
TORQUE/MOVEMENT:	ft·lb – “foot pound” (N·m – “Newton-meters”) N·m = lb·ft x 1.356
FORCE:	lb – “pounds”, (N – Newtons) N = lb x 4.448

APPENDIX B: Tolerances

Unless otherwise stated, the following tolerances shall apply:

Angle:	± 2°
Flow:	± 3% of value
Frequency (Hz):	± 5% of value
Length:	± 2% of value
Volume:	± 5% of value
Force:	± 2% of value
Torque:	± 2% of value
Rotation:	± 1 RPM
Pressure:	± 5% of value
Temperature:	± 5% of value
Time:	+ 5/-0 seconds + 0.1/-0 minutes + 0.1/-0 hours + 0.25/-0 days

Unless stated otherwise, all tests shall be carried out at a room (ambient) temperature of 68°F ± 18°F (20°C ± 10°C).