



Member of the FM Global Group

**Approval Standard
for
Fire Hydrant
(Dry Barrel Type)
for Private Fire Service**

Class Number 1510

November 1990

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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I. INTRODUCTION

1.1 Purpose

This Standard states FM Approval requirements for dry barrel fire hydrants, traffic and non-traffic styles.

1.2 Scope

This standard applies to fire hydrants which are above ground means for obtaining water for fire hose from underground fire protection mains.

1.3 Basis for FM Approval

FM Approval is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

1.3.1 Examination and tests on production samples shall be performed to evaluate

- the suitability of the product;
- the proper operation and 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.

1.3.2 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 is 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.

1.4 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as currently Approved;
- the continued use of acceptable quality control procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Approval Agreement; and
- re-examination of production samples for continued conformity to requirements.

1.5 Basis for Requirements

1.5.1 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 and loss control specialists was also considered.

1.5.2 The requirements of this standard reflect tests and practices used to examine characteristics of fire hydrants for the purpose of obtaining FM Approval. These requirements are intended primarily as guides, and strict conformity is not always mandatory. Fire hydrants having characteristics not anticipated by this standard may be Approved if performance equal or superior to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, fire hydrants which do meet all the requirements identified in this standard may not be Approved if other conditions which adversely affect performance exist or if the intent of this standard is not met.

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 Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval. The effective date shall apply to the entire Approval Standard, or, where so indicated, only to specific paragraphs of the standard.

The effective date of this standard is **July 1, 1991** for full compliance with all requirements.

1.7 System of Units

Units of measurements are U.S. customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. Appendix B lists the selected units for quantities dealt with in testing these products; conversions to SI units are included. Conversion of U.S. customary units is in accordance with ASTM E380.

II GENERAL REQUIREMENTS

2.1 Physical/Structural

2.1.1 *Samples* — In order to qualify for fire protection service, hydrants must be examined on a design-by design, manufacturer-by-manufacturer, and plant-by-plant basis. Sample hydrants, selected in conformance to this criterion, shall satisfy all of the following performance requirements and be installed in a manner identifiable as being within the scope of conditions defined by the testing.

2.1.2 *Hose Outlets* — Hydrants shall be designed with two, three or four 2½ in. nominal size hose outlets, and may also have a pumper outlet in addition to the hose outlets.

2.1.3 *Barrel Section* — Hydrants having two or more barrel sections usually have a joint near the ground line. This joint shall be at least 2 in. (50 mm) above the finished grade line.

2.1.4 *Inlet Connection* — The following inlet connections are acceptable: hub with lugs; flanged; standardized mechanical joint; push-on type joints. The inlet shall be suitable for connection to not less than 6 in. nominal diameter pipe.

2.1.5 *Outlets* — Hose outlets shall be securely fastened to the barrel.

- 2.1.6 *Hose Valves* — Hydrants having three or four hose outlets shall have independent FM Approved hydrant hose valves. They may be built into the barrel or be detachable.
- 2.1.7 *Outlet Cap* — Caps shall be fastened to the barrel with a suitable flexible connector.
- 2.1.8 *Serviceability* — The hydrant shall be so designed that when it is in place, no excavation will be required to remove the main valve and the movable parts of the drain valve.
- 2.1.9 *Operating Mechanism* —
- A. The operating threads shall be so designed that the working of iron or steel parts against iron or steel is avoided. Threaded parts and bushings shall be of corrosion-resistant material.
 - B. The operating mechanism shall have adequate strength for the intended application.
 - C. The operating mechanism shall be so designed that the minimum time to close a hydrant shall not be less than 15.0 seconds when operated with the wrench furnished with the hydrant. Alternatively, ten full turns of the operating nut shall be acceptable.
- 2.1.10 *Drain Valve* — The hydrant shall have a drain valve of corrosion-resistant material suitably placed to drain the barrel after operation. It shall close tight when the hydrant is open. The drain opening through the cast iron boot shall be lined with a corrosion-resistant material.
- 2.1.11 *Hydrant Top* — The hydrant top (bonnet) shall be designed to:
- eliminate accumulation of water at any point on its surface;
 - maintain the operating mechanism in readiness to use under freezing conditions;
 - permit lubrication of operating stem.
- 2.1.12 *Operating Nut and Hose Outlet Cap Nuts* — The hydrant operating nut and outlet cap nuts shall be pentagonal in shape. The pentagon shall be 1½ in. (38 mm) from point to flat at the base and 1⁷/₁₆ in. (36 mm) at the top. Faces shall be tapered uniformly, and the height shall not be less than 1 in. (25 mm).
- 2.1.13 *Hydrant Wrench* — Wrenches shall have minimal or no taper in their opening so as to be readily reversible.
- 2.1.14 *Direction to Open* — The direction of rotation to open the hydrant shall be counter-clockwise.
- 2.1.15 *Traffic Type Hydrant* — The traffic style hydrant shall have a section of weakness in the barrel and shaft, so that when subjected to a severe impact, it shall break readily and maintain pressure integrity.

2.2 Markings

- 2.2.1 The hydrant shall be permanently marked with the following information which may be cast on the barrel or inscribed on a securely attached, corrosion-resistant metal nameplate:
- manufacturer's name or trademark
 - model or type designation
 - maximum rated working pressure
 - size of main valve opening
 - year of manufacture
 - FM Approval mark (see Appendix A)
- 2.2.2 The hydrant top (bonnet) shall have the word "OPEN" and an arrow, showing the counterclockwise direction for opening.

2.3 Rated Working Pressure

The hydrant shall have a minimum rated working pressure of 175 psi (1205 kPa).

2.4 Drawings/Plans/Specifications Required

The hydrant submitted for testing shall be true production samples, and shall be free of sharp edges, burrs or other imperfections liable to injure the installer or interfere with proper installation of the unit.

Detail and assembly drawings plus bill of materials shall be submitted to FM Approvals before any testing, along with installation or instruction sheets and parts lists.

2.5 Manufacturer's Requirements

Each hydrant assembly shall be tested internally to two times the rated working pressure or 350 psi (2415 kPa) minimum for 1 minute. No leakage is allowed through the castings, the gaskets, or the seal. Then each hydrant shall be re-pressurized at the seat inlet. No leakage across the seat or main valve assembly allowed. Each hydrant shall be opened and closed at least once.

III PERFORMANCE REQUIREMENTS — APPROVAL TESTS

3.1 Shell Strength

3.1.1 Requirement

The shell of the hydrant assembly shall withstand a hydrostatic pressure of four times the rated working pressure, with 175 psi (1205 kPa) as the minimum rated working pressure. The seat shall be open during this test.

3.1.2 Test/Verification

The shell of the hydrant assembly shall be subjected to a hydrostatic pressure of four times the rated working pressure for 5 minutes without evidence of physical damage. Gaskets or joint seals may be reinforced, if necessary, in order to hold this pressure.

3.2 Seat Leakage

3.2.1 Requirement

The hydrant seat shall withstand exposure to hydrostatic pressure in excess of its rated working pressure.

3.2.2 Test/Verification

A hydrostatic pressure of twice the rated working pressure shall be applied to the hydrant seat. The pressure shall be held for 5 minutes. During and at the conclusion of the test, no leakage shall result. Additionally, no fracture, permanent distortion or functional impairment shall occur.

3.3 Hose Outlet Strength

3.3.1 Requirement

To determine adequacy of fastening, a single hose outlet shall be subjected to a torque of 300 lb•ft (407 N•m). The torque shall be applied to hose attached to the outlet, or directly to a hose coupling insert.

3.3.2 Test/Verification

No outlet failure or separation from the barrel shall result. If possible, the torque shall be applied in both the direction to loosen and to tighten the joint.

3.4 Stem Strength

3.4.1 Requirement

To determine adequacy of design, the operating mechanism shall be subjected to a torque of 200 lb•ft (271 N•m) applied at the operating nut — first, with the hydrant closed, and second, with the hydrant open.

3.4.2 Test/Verification

After this test, the hydrant shall still be operable, i.e., it shall be possible to open and close the hydrant with the wrench provided with the hydrant.

3.5 Head Loss

3.5.1 Requirement

A hydrant 5 feet (1.5 m) in length, measured from the bottom of the connecting pipe to the ground line, and discharging 250 gpm (946 dm³/min) through each 2½ in. nominal size hose outlet, shall not have a head loss greater than that shown in the following table:

Number of Hose Connections	Flow		Head Loss	
	gpm	(dm ³ /min)	psi	(kPa)
1	250	(946)	1	(6.9)
2	500	(1895)	2	(13.9)
3	750	(2840)	3	(20.7)
4	1000	(3785)	4	(27.6)

If the hydrant has a pumper connection, the head loss through the main hydrant valve and pumper connection shall not exceed 5.0 psi (34.5 kPa) when flowing 1000 gpm (3785 dm³/min).

3.6 Traffic Hydrant

3.6.1 Requirement

The barrel and operating mechanism of traffic type hydrants shall be so designed that, in the event of a severe impact after installation, the upper section of the hydrant will break away, leaving the main valve closed and reasonably tight against leakage.

3.6.2 Test/Verification

A force sufficient to break the intentional sections of weakness at or above grade level shall be applied to a sample hydrant under 175 psi (1205 kPa) pressure. After separation, the leakage of the main valve shall not exceed 5 gal/min (19 dm³/min) while the 175 psi (1205 kPa) pressure is maintained for 2 minutes.

3.7 Other Tests

At the discretion of FM Approvals, other tests may be performed to verify the integrity and reliability of the unusual design or material application.

IV OPERATIONS REQUIREMENTS

4.1 Demonstrated Quality Control Program

4.1.1 A Quality Control Program is required to assure that each subsequent hydrant produced by the manufacturer shall present the same quality and reliability as the specific samples examined. Design quality, conformance to design, and performance are the areas of primary concern.

Design quality is determined during the examination and tests.

Conformance to design is verified by control of quality in the following areas:

- existence of corporate quality control guidelines
- incoming assurance, including testing
- in-process assurance, including testing
- final inspection and test
- equipment calibration
- drawing and change control
- packaging and shipping
- handling discrepant materials.

Quality of performance is determined by field performance and by re-examination and test.

4.1.2 The manufacturer shall establish a system of product configuration control to prevent unauthorized changes, including, as appropriate:

- engineering drawings
- engineering change requests
- engineering orders
- change notices

These shall be executed in conformance with a written policy and detailed procedures. Records of all revisions to all Approved products shall be kept.

- 4.1.3 The manufacturer shall assign an appropriate person or group to be responsible to obtain FM Approvals' authorization of all changes applicable to Approved products. FM Approvals' Form 797, "Approved Product Revision Report or Address/Contact Change Notice", is provided to notify FM Approvals of pending changes.

4.2 Facilities and Procedures Audit (F&PA)

- 4.2.1 An inspection of the product manufacturing facility shall be part of the Approval investigation. Its purpose shall be to determine that equipment, procedures, and the manufacturer's controls are properly maintained to produce a product of the same quality as initially tested.
- 4.2.2 Unannounced follow-up inspections shall be conducted to assure continued quality control and product uniformity.

APPENDIX A: APPROVAL MARKS

REPRODUCTION ART: FM Approval Marks

**For use on nameplates, in literature, advertisements,
packaging and other graphics.**



- 1) The FM Approval diamond mark is acceptable to FM Approvals as an Approval mark when used with the word "Approved."
- 2) The FM Approval logomark has no minimum size requirement, but should always be large enough to be readily identifiable.
- 3) Color should be black on a light background or a reverse may be used on a dark background.

For Cast-On Marks



- 4) Where reproduction of the mark described above is impossible because of production restrictions, a modified version of the diamond is suggested. Minimum size specifications are the same as for printed marks. Use of the word "Approved" with this mark is optional.

NOTE: These Approval marks are to be used only in conjunction with products or services that have been FM Approved. The FM Approval marks should never be used in any manner (including advertising, sales or promotional purposes) that could suggest or imply FM Approval or endorsement of a specific manufacturer or distributor. Nor should it be implied that Approval extends to a product or service not covered by written agreement with FM Approvals. The Approval marks signify that products or services have met certain requirements as reported by FM Approvals.

Additional reproduction art is available through

FM Approvals
P.O. Box 9102
Norwood, Massachusetts 02062
USA

APPENDIX B:
UNITS OF MEASUREMENT

LENGTH:	in. – “inches”; (mm – “millimeters”) $\text{mm} = \text{in.} \times 25.4$ ft = feet (m = meters) $\text{m} = \text{ft} \times 0.03048$
PRESSURE:	psi = “pounds per square inch”; kPa = “kilopascals” $\text{kPa} = \text{psi} \times 6.8948$
FLOW:	gal/min = gallons per minute (dm^3/min = cubic decimeters per minute) $\text{dm}^3/\text{min} = \text{gal}/\text{min} \times 3.7854$
TORQUE or MOMENT:	ft•lb = pound-feet N•m = newton-meters $\text{N}\cdot\text{m} = \text{lb}\cdot\text{ft} \times 1.356$

