



Member of the FM Global Group

**Examination Standard
for
Fire Hydrant
(Dry and Wet Barrel Type)
for Private Fire Service**

Class Number 1510/1511

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Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

TABLE OF CONTENTS

1 INTRODUCTION.....	1
1.1 Purpose.....	1
1.2 Scope.....	1
1.3 Basis for Requirements	1
1.4 Basis for Certification	1
1.5 Basis for Continued Certification	2
1.6 Effective Date.....	2
1.7 System of Units	2
1.8 Normative References.....	2
1.9 Terms and Definitions.....	2
2 GENERAL INFORMATION.....	4
2.1 Product Information.....	4
2.2 Certification Application Requirements.....	4
2.3 Requirements for Samples for Examination.....	4
3 GENERAL REQUIREMENTS	5
3.1 Review of Documentation.....	5
3.2 Physical or Structural Features	5
3.3 Markings	6
3.4 Manufacturer’s Installation and Operation Instructions.....	7
3.5 Calibration.....	7
3.6 Tolerances	7
4 PERFORMANCE REQUIREMENTS.....	8
4.1 Examination.....	8
4.2 Shell Strength	8
4.3 Seat Leakage.....	8
4.4 Hose Outlet Strength.....	8
4.5 Stem Strength	8
4.6 Head Loss.....	8
4.7 Traffic Hydrant (Traffic Type Dry Barrel Hydrants Only)	9
4.8 Additional Tests.....	9
5 OPERATIONS REQUIREMENTS.....	10
5.1 Demonstrated Quality Control Program.....	10
5.2 Surveillance Audit	11
5.3 Manufacturer's Responsibilities.....	11
5.4 Installation Inspections.....	11
5.5 Manufacturing and Production Tests	11
6 Appendix A: Tolerances.....	12

1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for dry and wet barrel fire hydrants, traffic and non-traffic types.
- 1.1.2 Testing and certification criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard applies to fire hydrants which are above ground means for obtaining water for fire hose from underground fire protection mains.
- 1.2.2 Certification 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 were also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of dry and/or wet barrel fire hydrants for the purpose of obtaining certification. Dry and/or wet barrel fire hydrants having characteristics not anticipated by this standard may be certified if performance equal to, or superior to, that required by this standard is demonstrated.

1.4 Basis for Certification

Certification 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 for certification; 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 may be made to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include, but is not limited to, the following based upon the certification scheme and requirements of the certification agency:

- Production or availability of the product as currently certified;
- The continued use of acceptable quality assurance procedures;
- Satisfactory field experience;
- Compliance with the terms stipulated by the certification;
- Satisfactory re-examination of production samples for continued conformity to requirements; and
- Satisfactory surveillance audits conducted as part of the certification agencies product surveillance program.

1.6 Effective Date

The effective date of this certification standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard 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. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

Two units of measurement (liter and bar), outside of, but recognized by SI, are commonly used in international fire protection and are used in this standard.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies.

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

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*

1.9 Terms and 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. Acceptance is based upon an overall evaluation of the installation. Acceptance is not a characteristic of a product. It is installation specific. A product accepted for one installation may not be acceptable elsewhere.

End Connections

The method of connecting components to the inlet, pumper outlet, or hose outlet of the dry or wet barrel

hydrant. Typical hydrant inlet connections are flanged or mechanical joint. Typical pumper and hose outlet connections are National Hose “NH” threaded or Storz.

Rated Working Pressure

This is the maximum sustained pressure at or below which the dry or wet barrel fire hydrant shall operate trouble free. This also sets the basis for the testing described in Section 4, Performance Requirements. The minimum rated working pressure considered for certification is 175 psi (1205 kPa).

2 GENERAL INFORMATION

2.1 Product Information

- 2.1.1 This standard applies to dry and wet barrel fire hydrants which are above ground means for obtaining water for fire hoses from underground fire protection mains.
- 2.1.2 Dry barrel fire hydrants are used in locations that are subjected to freezing temperatures and are available as traffic or non-traffic types, please see Section 3.2.15 for traffic type definition. Dry barrel hydrants have a main valve that is located at the hydrant's base which is below the ground/frost line. A dry barrel fire hydrant size is determined by the inside diameter of the main valve's seat ring. Dry barrel hydrants only allow water to flow into the hydrant barrel and body while being manually opened at the operating nut which will open the main valve. When open, water will flow through the main valve and into the hydrant barrel and body and exit through the pumper or hose outlets. After operating or when the dry barrel hydrant is closed, the hydrant's drain valve will allow water to drain out of the hydrant to prevent freezing.
- 2.1.3 Wet barrel hydrants have main valves that are located directly on their pumper or hose outlets. Wet barrel hydrants are always full of water, which means that wet barrel fire hydrants can freeze if they are subjected to freezing temperatures and are always non-traffic types.

2.2 Certification Application Requirements

The manufacturer shall provide the following preliminary information with any request for certification consideration:

- A complete list of all models, types, sizes, and options for the products or services being submitted for certification consideration;
- Detailed component and assembly drawings, one complete set of manufacturing drawings, bill of materials list(s), anticipated marking format, brochures, sales literature, spec. sheets, installation, instruction, operation and maintenance procedures, etc. ; and
- The number and location of manufacturing facilities.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

- 2.3.1 Following authorization of a certification examination, the manufacturer shall submit samples for examination and testing based on the following:
- Sample requirements to be determined by the certification agency.
- 2.3.2 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.
- 2.3.3 The hydrant(s) 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. Any decision to use data generated using prototypes is at the discretion of the certification agency.
- 2.3.4 It is the manufacturer's responsibility to provide any special test fixtures, such as those which may be required to evaluate the dry or wet barrel fire hydrants. Testing may be performed at the certification agency, at the manufacturer's test facility, or at a third-party location, as mutually agreed upon.

3 GENERAL REQUIREMENTS

3.1 Review of Documentation

- 3.1.1 During the initial investigation and prior to physical testing, the manufacturer's specifications and details shall be reviewed to assess the ease and practicality of installation and use. The certification examination results may further define the limits of the final certification.
- 3.1.2 The manufacturer's dimensional specification and/or design drawings shall fully describe the product. All critical dimensions shall be indicated with the allowed upper and lower tolerance limits clearly shown.
- 3.1.3 All documents pertaining to the product materials, dimensions, processing and marking shall be controlled by the manufacturer's quality assurance procedures, and shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. Foreign language documents shall be provided with English translation.

3.2 Physical or Structural Features

- 3.2.1 *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.
- 3.2.2 *Hose Outlets* — Hydrants shall be designed with one, two, three, or four 2-1/2 in. nominal size hose outlets, and may also have one or two pumper outlets in addition to the hose outlets.
- 3.2.3 *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.
- 3.2.4 *Inlet Connection* — The inlet flange shall be an American National Standards Institute (ANSI) flange, or a flange from a nationally recognized standard in the country of installation. The following inlet connections are also acceptable: hub with lugs; flanged; standardized mechanical joint; push-on type joints; threaded. The inlet shall be suitable for connection to not less than 6 in. nominal diameter pipe.
- 3.2.5 *Outlets* — Hose and pumper outlets shall be securely fastened to the barrel.
- 3.2.6 *Hose Valves* — Dry barrel hydrants having three or four hose outlets shall have independent certified hydrant hose valves. They may be built into the barrel or be detachable. Each hose outlet on wet barrel fire hydrants shall have an independent hose valve. They shall be built into the barrel.
- 3.2.7 *Outlet Cap* — Caps shall be fastened to the barrel with a suitable flexible connector.
- 3.2.8 *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.
- 3.2.9 *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.
- 3.2.10 *Drain Valve* — Dry barrel hydrants 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.
- 3.2.11 *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 (dry barrel hydrants only)
 - Permit lubrication of operating stem.
- 3.2.12 *Operating Nut and Hose Outlet Cap Nuts* — The hydrant operating nut and outlet cap nuts shall be pentagonal in shape. The pentagon shall be 1-1/2 in. (38 mm) from point to flat at the base and 1-7/16 in. (36 mm) at the top. Faces shall be tapered uniformly, and the height shall not be less than 1 in. (25 mm).
- 3.2.13 *Hydrant Wrench* — Wrenches shall have minimal or no taper in their opening so as to be readily reversible.
- 3.2.14 *Direction to Open* — Unless otherwise specified, the direction of rotation to open the hydrant shall be counter-clockwise.
- 3.2.15 *Traffic Type Hydrant (dry barrel hydrants only)* — 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.
- 3.2.16 *Smart Hydrant Features and Components* — Dry or wet barrel hydrants that have incorporated smart features, such as additional electronic components and sensors, must meet the performance requirements of this standard. The arrangement of the components shall be examined to ensure that they do not impact the performance requirements of this standard. All smart features are considered optional and therefore will not be examined for functionality.
- 3.2.17 The hydrant shall have a minimum rated working pressure of 175 psi (1205 kPa).

3.3 Markings

- 3.3.1 The hydrants 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 (dry barrel hydrants)
 - Nominal size or inlet (wet barrel hydrants)
 - Year of manufacture;
 - Certification agency's mark of conformity;

- The word “OPEN” and an arrow, showing the direction for opening, shall be located on or near the barrel of each opening nut (for wet barrel hydrants) or the hydrant top (bonnet for dry barrel hydrants).

When hazard warnings are needed, the markings should be universally recognizable.

3.3.2 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the certification agency's mark of conformity.

3.3.3 The certification agency's mark of conformity shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the requirements of the certification agency. The manufacturer shall exercise control of this mark as specified by the certification agency and the certification scheme.

3.3.4 All markings shall be legible and durable.

3.4 Manufacturer's Installation and Operation Instructions

The manufacturer shall perform the following:

- Prepare instructions for the installation, maintenance, and operation of the product;
- Provide facilities for repair of the product and supply replacement parts, if applicable; and
- Provide services to ensure proper installation, inspection, or maintenance for products of such nature that it would not be reasonable to expect the average user to be able to provide such installation, inspection, or maintenance.

3.5 Calibration

3.5.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment is required. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified and traceable to an acceptable reference standard and certified by an ISO/IEC 17025 accredited calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service provider's accreditation certificate as an ISO/IEC 17025 accredited calibration laboratory should be available.

3.5.2 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of thus equipment.

3.6 Tolerances

Tolerances on units of measure shall be as described in Appendix A, unless otherwise specified.

4 PERFORMANCE REQUIREMENTS

4.1 Examination

- 4.1.1 The dry or wet barrel hydrants shall conform to the manufacturer's drawings and specifications and to certification requirements.
- 4.1.2 The sample(s) shall be examined and compared to drawings and specifications. It shall be verified that the sample(s) conforms to the requirements described in Section 3, General Requirements.

4.2 Shell Strength

- 4.2.1 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 main hydrant seat (dry barrel hydrants) or individual hose or pumper main valves (wet barrel hydrants) shall be open during this test.
- 4.2.2 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.

4.3 Seat Leakage

- 4.3.1 The hydrant seat shall withstand exposure to hydrostatic pressure in excess of its rated working pressure.
- 4.3.2 A hydrostatic pressure of twice the rated working pressure shall be applied to the main hydrant seat (dry barrel hydrants) or individual hose or pumper seats (wet barrel hydrants) while in the closed positions. 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.

4.4 Hose Outlet Strength

- 4.4.1 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.
- 4.4.2 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.

4.5 Stem Strength

- 4.5.1 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.
- 4.5.2 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.

4.6 Head Loss

- 4.6.1 A dry barrel hydrant with a depth of bury of 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 2-1/2 in. nominal size hose outlet, shall not have a head loss greater than that shown in the table shown below.

Wet barrel hydrants shall be subjected to the same flow rates with friction loss measured from the inlet flange.

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 one pumper connection, the head loss through the main hydrant valve and pumper connection of a dry barrel hydrant shall not exceed 5.0 psi (34.5 kPa) when flowing 1000 gpm (3785 dm³/min). If the hydrant has two pumper connections, the head loss through the main hydrant valve and both pumper connections of a dry barrel hydrant shall not exceed 18 psi (124.1 kPa) when flowing 2000 gpm (7570 dm³/min). Wet barrel hydrants will be subjected to the same flowrates when flowing through one or two pumper valves.

- 4.6.2 Head loss testing will be conducted on the minimum and maximum number of hose outlets and pumper connections. This means that hydrants with multiple hose outlets and more than one pumper connections will require four total head loss tests. The first head loss test will be conducted through one hose outlet which is the farthest away from the hydrant's inlet. The second test will be through one pumper connection, where the pumper under test should be the furthest away from the hydrant's inlet. The third and fourth tests will be conducted through the maximum number of hose outlets and maximum number of pumper connections per the table shown in Section 4.6.1 above. All head loss values obtained from testing shall not have a head loss greater than required and shown in Section 4.6.1.

4.7 Traffic Hydrant (Traffic Type Dry Barrel Hydrants Only)

- 4.7.1 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. Non traffic type hydrants do not require this test.
- 4.7.2 A force sufficient to break the intentional sections of weakness at or above grade level shall be applied to a sample hydrant at the rated working pressure, with 175 psi (1205 kPa) as the minimum rated working pressure. After separation, the leakage of the main valve shall not exceed 5 gal/min (19 dm³/min) while the rated working pressure is maintained for 2 minutes.

4.8 Additional Tests

Additional tests may be required, at the discretion of certification agency, depending on design features and results of any foregoing tests.

5 OPERATIONS REQUIREMENTS

5.1 Demonstrated Quality Control Program

5.1.1 A quality assurance program is required to assure that subsequent products produced by the manufacturer at an authorized location shall present the same quality and reliability as the specific products examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests and may be documented in the certification report.
- Continued conformance to this standard is verified by the certifiers surveillance program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1.2 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; and
- Handling and disposition of non-conforming materials.

5.1.3 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving 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.

5.1.4 Records

To assure adequate traceability of materials and products, the manufacturer shall maintain a record of all quality assurance tests performed, for a minimum period of two years from the date of manufacture.

5.1.5 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 certification report, may be required to be reported to, and authorized by the certification agency prior to implementation for production.
- Records of all revisions to all certified products shall be maintained.

5.2 Surveillance Audit

- 5.2.1 An audit of the manufacturing facility may be part of the certification agencies surveillance requirements to verify implementation of the quality assurance program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are maintained to insure a uniform product consistent with that which was tested and certified.
- 5.2.2 Certified products or services shall be produced or provided at, or provided from, location(s) disclosed as part of the certification examination. Manufacture of products bearing a certification mark is not permitted at any other location prior to disclosure to the certification agency.

5.3 Manufacturer's Responsibilities

The manufacturer shall notify the certification agency of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

5.4 Installation Inspections

Field inspections may be conducted to review a product's installation. The inspections are conducted to evaluate the performance of the manufacturer's product, the installation relative to the manufacturer's installation, operation and testing manuals.

5.5 Manufacturing and Production Tests

5.5.1 Test Requirement No. 1 – Hydrant seat leakage test

The manufacturer shall perform a hydrant seat leakage test on 100 percent of production hydrants. Every hydrant shall be pressurized internally at the seat inlet/main valve to two times the rated working pressure or 350 psi (2415 kPa), whichever is higher, for a minimum of 1 minute. No leakage across the seat or main valve assembly is allowed.

5.5.2 Test Requirement No. 2 - Hydrant body leakage test

The manufacturer shall perform a body leakage test on 100 percent of production hydrants. Every hydrant assembly shall be pressurized internally to two times the rated working or 350 psi (2415 kPa), whichever is higher, for a minimum of 1 minute. Individual hose or pumper valves (wet barrel hydrants) or main valves (dry barrel hydrants) shall be open during this test. No leakage is allowed through the castings, the gaskets or the seal.

5.5.3 Test Requirement No. 3 – Operational test

The manufacturer shall perform an operational test on 100 percent of production hydrants. Every main hydrant valve (dry barrel hydrant) or individual hose or pumper valve (wet barrel hydrant) shall be opened and closed at least once.

Appendix A: Tolerances

Unless otherwise stated, the following tolerances shall apply:

Flow	± 2 percent of value
Force	± 3 lbs of value
Mass	± 2 percent of value
Length	± 2 percent of value
Pressure	within $+ 5/- 0$ psi of value
Temperature	± 5 percent of value
Time	$+ 5/-0$ seconds $+ 0.1/-0$ minutes

Unless stated otherwise, all tests shall be carried out at a room (ambient) temperature of $68^{\circ}\text{F} \pm 9^{\circ}\text{F}$ ($20^{\circ}\text{C} \pm 5^{\circ}\text{C}$).