



Examination Standard for Vane-Type Waterflow Alarm Indicators

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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.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for vane-type waterflow alarm indicators for installations in automatic sprinkler systems. Other applications shall be evaluated on a case-by-case basis.
- 1.1.2 Testing and certification criteria may include 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 encompasses the design and performance requirements of vane-type waterflow alarm indicators for use in aboveground automatic sprinkler systems.
- 1.2.2 This standard encompasses Nominal Pipe Size (NPS) 1, 1-1/4, 1-1/2, and 2 inch vane-type waterflow alarm indicators that are installed in piping via threaded connection.
- 1.2.3 This standard encompasses NPS 2, 2-1/2, 3, 4, 5, 6, and 8 inch vane-type waterflow alarm indicators that are installed in piping via a pre-cut hole in system piping with a U-bolt connection.
- 1.2.4 The minimum rated working pressure for vane-type waterflow alarm indicators evaluated using this standard is 175 psi (1205 kPa).

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of vane-type waterflow alarm indicators for the purpose of obtaining certification.

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;
 - the durability and reliability of the product.
- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures may be conducted 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 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;
- 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 agency's product surveillance program.

1.6 Effective Date

The effective date of this examination 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 (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:

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

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.

Corrosion Resistant

Having resistance to corrosion equal to or exceeding that of bronze alloy having a minimum copper content of 80 percent, or constructed of Series 300 Stainless Steel.

Retard

The time delay between paddle response to waterflow and the switch output. This delay is typically controlled by a pneumatic or electronic delay assembly.

Rated Working Pressure

The maximum sustained pressure in pounds per square inch - psi (kilopascals -kPa) at or below which the vane-type waterflow alarm indicator shall operate trouble free. This value sets the basis for the testing described in Section 4.

2 GENERAL INFORMATION

2.1 Product Information

2.1.1 In order to meet the intent of this standard, vane-type waterflow alarm indicators 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 devices, selected in conformance to this criterion, shall satisfy all of the requirements of this standard.

2.1.2 Vane-type waterflow indicators discussed in this standard are for use in wet sprinkler systems.

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;
- general assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, piping and electrical schematics, nameplate format, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures, 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 foreign language documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

2.3.1 Following authorization of 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 manufacturer shall submit samples representative of production.

2.3.4 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the vane-type waterflow alarm indicators.

3 GENERAL REQUIREMENTS

3.1 Review of Documentation

- 3.1.1 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 certification investigation.
- 3.1.2 The manufacturer's dimensional specification and/or dimensional drawings shall fully describe the product. All critical dimensions shall be identified with the allowed upper and lower tolerance levels clearly shown.

3.2 Physical or Structural Features

- 3.2.1 Vane-type waterflow alarm indicators shall be designed for a minimum rated working pressure of 175 psi (1205 kPa).
- 3.2.2 Vane-type waterflow alarm indicators covered by this standard are for installations in Schedule 10 and Schedule 40 steel pipe in nominal sizes of 1 inch (25 mm) through 8 inch (200 mm). Other sizes of vane-type waterflow alarm indicators shall be evaluated on a case-by-case basis.
- 3.2.3 The vane-type waterflow alarm indicators shall be fitted with a mechanical or electronic retard assembly which will permit the adjustment of an alarm delay from an instantaneous alarm up to a maximum 120 seconds retard. This retard adjustment shall be such that the user can select predefined delay points within this range.
- 3.2.4 The retard assembly design shall completely reset when waterflow ceases before the retard time has elapsed. After resetting the complete predetermined retard time must elapse after a successive waterflow condition in order for the switch output to take place.
- 3.2.5 An enclosure that is adequate for the service conditions shall be provided to protect the retard assembly and electrical components.
- 3.2.6 Vane-type waterflow alarm indicators shall be provided with two electrical switches which provide output at the same time. Electrical switch design shall permit wiring normally open or normally closed.
- 3.2.7 Vane-type waterflow alarm indicators shall be designed so that they can be installed in either horizontal or vertical directions and that after proper initial factory setting they will:
 - a. provide a switch output at a minimum flow rate between 4 and 20 gpm (15 and 75 L/min) at any service pressure between 20 psi (140 kPa) and the rated working pressure;
 - b. return to the original switch position immediately after water flow ceases;
 - c. transmit successive switch outputs without manual resetting.
- 3.2.8 Samples submitted for testing shall be true production samples and shall be free of sharp edges, burrs, or other imperfections which might injure the installer or interfere with proper assembly of the unit.
- 3.2.9 Waterflow detectors shall be evaluated for their electrical performance. The test requirements listed below define the minimum requirements for certification. In order to establish the electrical test program, the manufacturer is required to submit documentation outlining the location of intended

use, enclosure, design features, wiring diagrams, and detail drawings for review. After review, the certification agency will advise the required test program.

3.2.10 Vane-type waterflow alarm indicators shall provide a leak free seal to the pipe they are installed on.

3.3 Markings

3.3.1 Marking on the product or, if not possible due to size, on its packaging or label accompanying the product, shall include the following information:

- name and address of the manufacturer or marking traceable to the manufacturer;
- date of manufacture or code traceable to date of manufacture or lot identification;
- date of manufacture or code traceable to date of manufacture or lot identification.

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 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.

3.3.5 Wiring instructions shall be permanently attached to the inside cover.

3.4 Manufacturer's Installation and Operation Instructions

3.4.1 The manufacturer shall

- prepare instructions for the installation, maintenance, and operation of the product;
- provide facilities for repair of the product and supply replacement parts; and
- provide services to ensure proper installation, inspection, or maintenance for products where it is not reasonable to expect the average user to be able to provide the 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 the 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 Requirements

The vane-type waterflow alarm indicator shall conform to the manufacturer's drawings and specifications and to certification requirements.

4.1.2 Test/Verification

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

4.2 Gasket Leakage

4.2.1 Requirement

The vane type waterflow alarm indicator when hydrostatically tested at a pressure equal to two times the rated working pressure for duration of five minutes shall not leak.

4.2.2 Test/Verification

A sample of each size device submitted for certification shall be installed in accordance with the manufacturer's installation instructions in a short section of appropriately sized pipe (approximately 3-4 ft. in length) such that the sample can be subjected to a hydrostatic pressure equal to two times the rated working pressure for a duration of five minutes. There shall be no leakage of the test sample as a result of this test.

4.3 Hydrostatic Strength

4.3.1 Requirement

The vane type waterflow alarm indicator shall have sufficient strength to withstand a hydrostatic pressure equal to four times the rated working pressure for duration of five minutes.

4.3.2 Test/Verification

A sample of each size device submitted for certification shall be tested. The test will consist of installing the sample in accordance with the manufacturer's installation instructions in a short section of appropriately sized pipe such that the sample can be subjected to a hydrostatic pressure equal to four times the rated working pressure for a duration of five minutes. There shall be no rupture, cracking, or permanent distortion of the test sample as a result of this test.

4.4 Operational

4.4.1 Requirements

The vane-type alarm waterflow indicators mechanical or electronic retard assembly shall permit the adjustment of an alarm delay from an instantaneous alarm up to a maximum 120 seconds retard. This adjust shall be such that the user can select predefined delay points within this range.

4.4.2 Tests/Verification

One or more representative samples of the product line will be used for this test. The test consists of forcing the paddle to its forward flow position and measuring the reaction time of the switches at each retard setting. This test will be conducted three times for each retard setting and for each switch. A retard value in excess of 120 seconds is not permitted.

4.5 Sensitivity

4.5.1 Requirements

Vane-type waterflow alarm indicators shall be designed so that they can be installed in either horizontal or vertical installations and that after proper initial factory setting they will provide a switch output at a minimum flow rate between 4 and 20 gpm (15 and 75 L/min) at any service pressure between 20 psi (140 kPa) and the rated working pressure, return to the original switch position immediately after waterflow ceases, and transmit successive switch outputs without manual resetting.

4.5.2 Test/Verification

A vane-type waterflow alarm indicator of each size submitted shall be tested in horizontal and vertical installations. After installation of the vane-type waterflow alarm indicator in a section of appropriately sized pipe, the minimum flow-rate necessary to produce a switch output shall be determined. This flow rate shall be determined by using a device to determine the switch status while waterflow is gradually increased. The flow will be recorded at the point of switch actuation. This flow rate shall be between 4 and 20 gpm (15 and 75 L/min) and the switch output must occur on both switches simultaneously. Once the flow rate has been determined, the water flow shall be lowered while the system pressure is maintained. Each switch must return to its normal position and the retard assembly must reset completely. This test shall be repeated two additional times at the same system pressure. Subsequently, the system pressure shall be increased and the three tests will be conducted again. This series of tests shall be repeated a minimum of seven times between 20 psi (140 kPa) and the rated working pressure.

4.6 Fatigue

4.6.1 Requirement

In order to determine the vane-type waterflow alarm indicator's ability to withstand flows created by fluctuating water pressures, systems tests and operation of sprinklers one or more representative sample(s) shall be subjected to 100,000 cycles of repeated flexing at a rate of 15 to 20 cycles/min. There shall be no deterioration of the performance characteristics as a result of this test. Following the cycling test the test sample shall comply with the sensitivity requirements of Section 4.5 (Sensitivity).

4.6.2 Test/Verification

One or more representative sample(s), selected as representative samples, shall be subjected to 100,000 cycles. A single cycle is defined as flexing the vane in the forward direction through an angle of 45° from the "normal" (zero flow) position and then permitting it to return to the "normal" position. The rate of the cycling shall be between 15-20 cycles per minute.

A rubber faced roller (approximately O.D. of 3 in.) connected to the end of an air powered oscillating rod will be arranged to translate the vane at its center when it is in the "normal" position. The roller moves at all times in a direction perpendicular to the plane of the vane when in its "normal" position.

There shall no failure or significant change in performance characteristics as a result of this test. Following the cycling test, the sample shall be tested to verify compliance with the sensitivity requirements in Section 4.5 (Sensitivity).

4.7 Friction Loss

4.7.1 Requirements

The construction of the vane-type waterflow alarm indicators shall be such that the loss in pressure across the device shall not exceed 5.0 psi (34 kPa) at a flow producing a velocity of 20 ft/sec (6 m/s).

4.7.2 Test/Verification

A sample vane-type waterflow alarm indicator of each size shall be tested to verify that the friction loss through the vane-type waterflow alarm indicator does not exceed 5.0 psi (34 kPa) at a flow producing a velocity of 20 ft/sec (6m/s). A minimum of three data points shall be obtained including the value at 20 ft/sec (6 m/s) plus at least one point above and below this value. This test or a portion thereof may be waived at the option of the examining engineer if a drawing and calculation review are satisfactory, or a review of manufacturer’s supplied friction loss data is deemed satisfactory.

4.8 Durability

4.8.1 Requirements

The construction of the vane-type waterflow alarm indicators shall be such that device can withstand high flow rates in both the forward and reverse flow directions.

4.8.2 Test/Verification

One or more vane-type waterflow alarm indicator(s), selected as representative samples, shall undergo testing in which the indicator is subjected to a flow rate which will product 20 ft/sec (6 m/s) for thirty minutes in both the forward and reverse directions. There shall be no failure or significant change in performance characteristics as a result of this test. Following the durability test, the sample shall be tested to verify compliance with the sensitivity requirements in Section 4.5 (Sensitivity).

4.9 Supervisory Switches - Dielectric

4.9.1 Requirement

The switch shall withstand, for a time period one minute, high potential applied between the switch contacts and the valve enclosure (body), and between the switch contacts and the switch enclosure. During this test there shall be no signs of arcing or breakdown.

4.9.2 Test/Verification

The voltage, based on the switch rating, as shown in Table 4.9.2, shall be applied between the switch contacts and the vane-type waterflow alarm indicator enclosure and between the switch contacts and the switch enclosure. This voltage shall be applied in each test for a duration of 1 minute. During the dielectric test there shall be no signs of arcing or breakdown.

Table 4.9.2 Dielectric Test

Switch Ratings	Test Parameters
24 Volt	500 Volts
60 Volt, or higher	1000 Volts + 2 * (AC Voltage if over 60 Volts)

4.10 Supervisory Switches - Bonding Resistance

4.10.1 Requirement

The resistance measured between the grounding screw and/or terminal and various locations shall be less than 1 ohm.

4.10.2 Test/Verification

Using an ohmmeter, the resistance measured between the grounding screw and/or terminal and various locations on the vane-type waterflow alarm indicator housing and enclosure shall be measured.

5 MANUFACTURER'S 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 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 is documented in the certification report.
- Continued conformance to this standard is verified by the certifier's 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 Program

- 5.2.1 An audit of the manufacturing facility may be part of the certification agency's 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 ensure 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 Installation Inspections

Field inspections may be conducted to review an installation. The inspections are conducted to assess ease of application, and conformance to written specifications. When more than one application technique is used, one or all may be inspected at the discretion of the certification agency.

5.4 Product Modification

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.

5.5 Manufacturing and Production Tests

5.5.1 Test Requirement No. 1 – Hydrostatic Test

The manufacturer shall perform hydrostatic pressure testing on a sample basis. Testing shall be conducted to twice the rated working pressure for a minimum of 15 seconds with no body leakage. The manufacturer shall have a controlled procedure on file for conducting this test.

5.5.2 Test Requirement No. 2 – Retard Adjustment

The manufacturer shall perform a retard adjustment test on a sample basis. Samples shall be adjusted to a common retard delay, and the vane moved in the direction of waterflow and held until the switch is observed to activate. The vane will be returned to the original position and the retard will automatically reset. The manufacturer shall have a controlled procedure on file for conducting this test.

6 BIBLIOGRAPHY

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

APPENDIX A: TOLERANCES

Unless otherwise stated, the following tolerances shall apply:

Flow: ± 2 percent of value

Length: ± 2 percent of value

Volume: ± 5 percent of value

Resistance ± 0.25 percent of value

Pressure: within $+5/-0$ psi of value

Temperature: ± 4 °F (2 °C)

Time: $+ 5.0/-0$ seconds
 $+0.1/-0$ minutes

Volts ± 5 Volts

Unless stated otherwise, all tests shall be carried out at a room (ambient) temperature of 68 °F ± 9 °F (20 °C ± 5 °C).

APPENDIX B: SAMPLE LISTING

Waterflow Detectors, Vane Type

Waterflow detectors installed in sprinkler systems provide an electrical alarm when a flow of water from the system equals or exceeds that of a single sprinkler. They can be used with either open or closed signaling circuits.

They may consist of a flexible vane which projects into the waterway or a pressure-sensing device. For the flexible vane type, water movement deflects the vane, and the motion is transmitted to an alarm-actuating switch after a predetermined time delay. The time delay is accomplished by the use of an instantly recycling retard.

Waterflow detectors should not be specified for those systems where the time duration of a pressure fluctuation is greater than the retard time. Instantly recycling retards will not transmit an electrical alarm until the time duration of the pressure fluctuation or waterflow past the vane of the flow detector has exceeded the predetermined time setting. Unless otherwise noted in the listing, these detectors have 175 psi (1205 kPa) rated working pressure.

Model ASB

Model ASB-XX. 2 through 8 in. NPS as indicated in Table below. 2 through 4 in. NPS have a 300 psi (3105 kPa) rated working pressure. 6 and 8 in. NPS have a 175 psi (1205 kPa) rated working pressure.

All sizes rated for Schedule 10 and 40 pipe.

<i>Model No.</i>	<i>Nominal Pipe Size, in.</i>
ASB-2	2
ASB-2.5	2 1/2
ASB-3	3
ASB-3.5	3 1/2
ASB-4	4
ASB-5	5
ASB-6	6
ASB-8	8