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Examination Standard for Telescoping Sprinkler Assemblies for Use in Fire Protection Systems for Anechoic Chambers

Class Number 1632

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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 telescoping sprinkler assemblies for use in fire protection systems for anechoic chambers.

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 applies to any component intended to or for use in telescoping sprinkler assemblies for use in fire protection systems for anechoic chambers. In cases where metric sized telescoping sprinkler assemblies are to be examined for certification, test criteria comparable to the equivalent nominal inch size shall be used.

1.2.2. Other types of telescoping sprinkler assemblies for use in fire protection systems for anechoic chambers may be certified if they meet the requirements and intent of this standard. Telescoping sprinkler assemblies of unusual design may be subjected to special tests to determine their suitability.

1.3. Basis for Requirements

1.3.1. The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.

1.3.2. The requirements of this standard reflect tests and practices used to examine characteristics of telescoping sprinkler assemblies 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.

1.8. Normative References

The following standards, test methods, and practices are referenced in this standard:

ANSI/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.

Anechoic Chambers – Enclosures designed to provide test regions that simulate free space for a variety of measurements including antenna pattern, radar backscatter tests, soundproof measurements, etc. The chambers may also be shielded to provide RF isolation from undesirable external signals as well as to prevent internally generated RF energy from radiating outside the enclosure.

Assembly – A complete unit which can be installed in an anechoic chamber fire protection system and has the ability to extend an appropriate distance into the chamber. These devices have the following: an inlet mounting assembly for attachment to the sprinkler system; an outer tube and an inner tube which gives the assembly "stroke"; and an upright sprinkler at the outlet end of the device.

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.

End Connections – The method of connecting components of a pipe system to the telescoping sprinkler assemblies.

Extension – See Stroke

Operating Pressure – The pressure required to move the piston tube from the fully retracted to the fully extended position in the intended installation position.

Rated Working Pressure – The maximum sustained pressure at, or below, which the telescoping sprinkler assemblies shall reliably operate.

Stroke – Total length of travel from fully retracted to fully extended position.

2 GENERAL INFORMATION

2.1. Product Information

2.1.1. Sprinklers used in the telescoping sprinkler assembly are evaluated as part of this certification for use with the telescoping sprinkler assembly. Sprinklers for use in these assemblies must be certified in addition to being certified for this application.

2.1.2. In order to meet the intent of this standard, telescoping sprinkler assemblies for use in fire protection systems for anechoic chambers 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 telescoping sprinkler assemblies, selected in conformance to this criterion, shall satisfy all of the requirements of this standard.

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, etc... ;
- the number and location of manufacturing facilities; and
- the manufacturer of the telescoping sprinkler assembly, if not also the manufacturer of the certified sprinkler, must have written authorization, from the sprinkler manufacturer, to use a specific certified sprinkler in the telescoping sprinkler assembly. A copy of this written authorization must be supplied to the certification agency prior to an examination or re-examination.

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 manufacturer shall submit samples representative of production.

2.3.4. The manufacturer shall provide any special test fixtures, which may be required to evaluate the telescoping sprinkler assemblies.

3 GENERAL REQUIREMENTS

3.1. Review of Documentation

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.

3.2. Physical or Structural Features

3.2.1. Telescoping sprinkler assemblies shall be designed for a maximum rated working pressure of 175 psi (1205 kPa) and a minimum water discharge density of 0.6 gal/min/ft^2 (24.4 mm/min).

3.2.2. End connections shall be male threaded, female threaded, soldered tube end, or grooved end connections, and shall conform to a nationally or internationally recognized standard. Other types of end connections shall be evaluated on a case-by-case basis. Telescoping sprinkler assemblies with threaded end connections shall be provided with a section to serve as a wrench grip.

3.2.3. Telescoping sprinkler assemblies submitted for testing shall be production samples and shall be free of sharp edges, burrs, or other imperfections that might injure the installer, interfere with proper assembly of the unit, or affect the seals.

3.2.4. Telescoping sprinkler assemblies can be certified for use in the vertical and/or horizontal position. Testing will be conducted in each respective position.

3.2.5. Certified sprinklers (refer to FM 2000, Automatic Sprinklers for Fire Protection) shall be used in telescoping sprinkler assemblies. Telescoping sprinkler assemblies shall be limited to use with the certified automatic sprinklers that have been evaluated for use with that particular telescoping sprinkler assembly.

3.2.6. Telescoping sprinkler assemblies submitted for possible certification shall have a minimum nominal discharge coefficient of 5.6 gal/min/(psi)^{½} [8.1 L/min/(kPa)^{½}].

3.3. Materials

All materials used in telescoping sprinkler assemblies shall be suitable for the intended application.

3.4. Markings

3.4.1. Marking each telescoping sprinkler assembly 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;
- model number, size, rating, capacity,

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

3.4.2. Telescoping sprinkler assemblies that are produced at more than one location shall be identified as a product of a particular location.

3.4.3. A corrosion resistant metal nameplate bearing the information as stated above shall be considered acceptable if permanently fastened to the telescoping assembly. The nameplate can be riveted, screwed or tack welded. Adhesive is not permitted as a means of securing the nameplate.

3.4.4. Other methods of applying permanent markings will be evaluated on a case-by-case basis.

3.4.5. Each required marking listed in Section 3.4.1 shall be legible and durable.

3.4.6. The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the product as certified. The manufacturer shall not place this model or type identification on any other product unless covered by a separate Certification Report.

3.4.7. 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.

3.5. Manufacturer's Installation and Operation Instructions

3.5.1. 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, if applicable; and
- provide services to ensure proper installation, inspection, or maintenance for the product where it is not reasonable to expect the average user to be able to provide the installation, inspection, or maintenance.

3.6. Calibration

3.6.1. 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.

3.6.2. 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 this equipment

4 PERFORMANCE REQUIREMENTS

4.1. Examination

4.1.1. Requirement

The telescoping sprinkler assembly shall conform to the manufacturer's drawings and specifications and to the certification agency's 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. Friction Loss (Equivalent Length of Pipe)

4.2.1. Requirement

To determine the effect of the telescoping assembly on the discharge coefficient of the sprinkler, the average friction loss through the telescoping sprinkler assembly shall be equated to the theoretical length of nominal 1 in. diameter schedule 40 sprinkler pipe which would produce the same amount of friction loss. The results shall be listed in the manufacturer's published literature.

4.2.2. Test/Verification

Samples of each length shall be tested using the test apparatus for determining discharge coefficient (K-factor) shown in Figure A-1 at increasing and decreasing pressures over the complete operating range, 15 through 175 psi (105 through 1205 kPa) in 10 psi (70 kPa) increments. Measurements shall be taken using an open upright sprinkler alone (see Figure A-1), and with the sprinkler mounted to a previously untested telescoping sprinkler assembly (see Figure A-2). The telescoping sprinkler assembly with the sprinkler attached, shall be tested in the fully extended position. The average friction loss through the assembly shall be equated to the theoretical length of nominal 1 inch diameter schedule 40 sprinkler pipe using a flow of 30 gal/min (115 L/min) that would produce the equivalent reduction in the sprinkler discharge coefficient, using the following equations:

$$P = \frac{Q^2}{K_1^2} - \frac{Q^2}{K_2^2} \qquad L = \frac{P}{F_c}$$

Where:

P = Pressure in psi

Q = Flow in gal/min (30 gal/min)

K_1 = Discharge coefficient of the flexible sprinkler hose with fitting assembly and sprinkler in gal/min/(psi)^{½}

K_2 = Discharge coefficient of sprinkler only in gal/min/(psi)^{½}

L = Equivalent length of 1 in. pipe in feet

F_c = Friction loss in 1 in. pipe with a Hazen-William C = 100 (F_c = 0.386 psi for 30 gal/min)

4.3. Minimum Operating Pressure

4.3.1. Requirement

The minimum water pressure required to move the piston tube from the fully retracted to the fully extended position shall not exceed a maximum pressure of 25 psi (170 kPa).

4.3.2. Test/Verification

Six telescoping sprinkler assemblies shall be tested to determine the minimum water pressure required to fully extend the devices. Three sample assemblies shall be tested using a plug, and three assemblies shall be tested using an open upright sprinkler. Each assembly shall be tested five times. The operating pressure shall be determined and shall not exceed a maximum pressure of 25 psi (170 kPa) to move the piston tube to its fully extended position. Testing must be conducted in each position requested, (vertical and/or horizontal).

4.4. Leakage

4.4.1. Requirement

There shall be no visual leakage past the seal while the piston tube is moving or after it has come to rest at the fully extended position.

4.4.2. Test/Verification

A representative sample of a telescoping sprinkler assembly shall be pressurized to 25 psi (170 kPa) with water until fully extended. After the piston tube has come to a rest, the system pressure will be increased to 175 psi (1205 kPa) and held for 5 minutes. There shall be no leakage.

4.5. Hydrostatic

4.5.1. Requirements

The telescoping sprinkler assembly in the fully extended position shall be able to withstand a hydrostatic pressure of 700 psi (4825 kPa) or four times the rated working pressure, whichever is greater, for 5 minutes. During and at the conclusion of the test, no fracture, permanent distortion, or functional impairment shall occur. After this test the telescoping sprinkler assembly shall be fully operable and shall comply with the operating pressure requirements in Section 4.3 (Minimum Operating Pressure).

4.5.2. Tests/Verification

Two telescoping sprinkler assemblies shall be pressurized in the fully extended position with water to 700 psi (4825 kPa) or four times the rated working pressure, whichever is greater. The test pressure shall be held for five minutes. The assemblies shall then be subjected to the Minimum Operating Pressure test as described in Section 4.3.

4.6. High Pressure Operating (Strength)

4.6.1. Requirement

With the piston tube fully retracted, a flow of water at 225 psi (1550 kPa) will be introduced, through a quick opening valve. There shall be no rupture or signs of permanent deformation as a result of this test.

4.6.2. Test/Verification

Three telescoping sprinkler assemblies with an upright sprinkler shall be individually subjected to a sudden water pressure of 225 psi (1550 kPa), a total of 5 times each. After each operation, there shall be no leakage or permanent damage. The samples shall then be visually examined, and there shall be no rupture or signs of permanent deformation as a result of this test. After each operation, the sample shall be put in its fully retracted position without performing maintenance, with the exception of replacing an "O" ring, shock absorber, or sprinkler. The test shall be repeated for a total of 5 times per sample.

4.7. Humidity

4.7.1. Requirement

Telescoping sprinkler assemblies exposed to a high temperature-humidity atmosphere consisting of 98 ± 2 percent humidity and 203 ± 2°F (95 ± 1°C) temperature for 90 days shall still comply with the operating pressure requirements in Section 4.3 (Minimum Operating Pressure).

4.7.2. Tests/Verification

Three previously untested telescoping sprinkler assemblies shall be tested in accordance with Section 4.3 (Minimum Operating Pressure) and then subjected to a high temperature-humidity atmosphere consisting of 98 ± 2 percent humidity and 203 ± 2°F (95 ± 1°C) temperature for a period of 90 days. The samples shall be plugged and not pressurized during exposure. Following this exposure the Minimum Operating Pressure test (Section 4.3) shall be repeated using an open upright sprinkler head. Testing shall be conducted with each of the three assembles, in each position (vertical and/or horizontal) requested by the manufacturer for certification.

4.8. Exposure To Maximum Installation Temperature

4.8.1. Requirements

Telescoping sprinkler assemblies shall be exposed to a 150°F (66°C) environment for a period of 90 days. The Minimum Operating Pressure test (Section 4.3) shall be performed prior to the high temperature exposure, after 30 days and after 90 days. Following this test the telescoping sprinkler assemblies shall still meet the requirements of the Minimum Operating Pressure test (Section 4.3). There shall be no leakage as a result of this exposure.

4.8.2. Tests/Verification

Three previously untested telescoping sprinkler assemblies**,** with the outlet plugged**,** shall be tested to the requirements of Section 4.3 (Minimum Operating Pressure). The minimum operating pressure to move the piston tube to its fully extended position shall be determined. Following this test the three samples shall be placed in an 150°F (66°C) environment for a period of 30 days. Following this exposure the Minimum Operating Pressure test (Section 4.3) shall be repeated using a plug in the outlet. The samples shall then be placed back in the 150°F (66°C) environment for a period of 60 days. Following this second exposure the Minimum Operating Pressure test (Section 4.3) shall be repeated using a plug in the outlet. Testing shall be conducted with the three exposed samples in each position, vertical or horizontal, as requested by the manufacturer for certification.

4.9. Friction Fit (Vertical Position Only)

4.9.1. Requirement

The telescoping sprinkler assembly shall be so designed to prevent the piston tube from extending from its own weight.

4.9.2. Tests/Verification

Two telescoping sprinkler assemblies shall be individually placed in a vertical down position with an open upright sprinkler. The assemblies shall be tested so the piston tube operates to its fully extended position. The assembly shall be slowly retracted by hand pushing the piston tube up to its fully retracted position, with no maintenance performed. When fully retracted, each piston tube shall be capable of remaining in the retracted-up position for 5 minutes, without sliding back out of the assembly. Extension by more than 1 inch (25.4 mm) during the 5 minutes shall be considered a failure.

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 may be 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. 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 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. Product Modifications

5.3.1. 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. Manufacturing and Production Tests

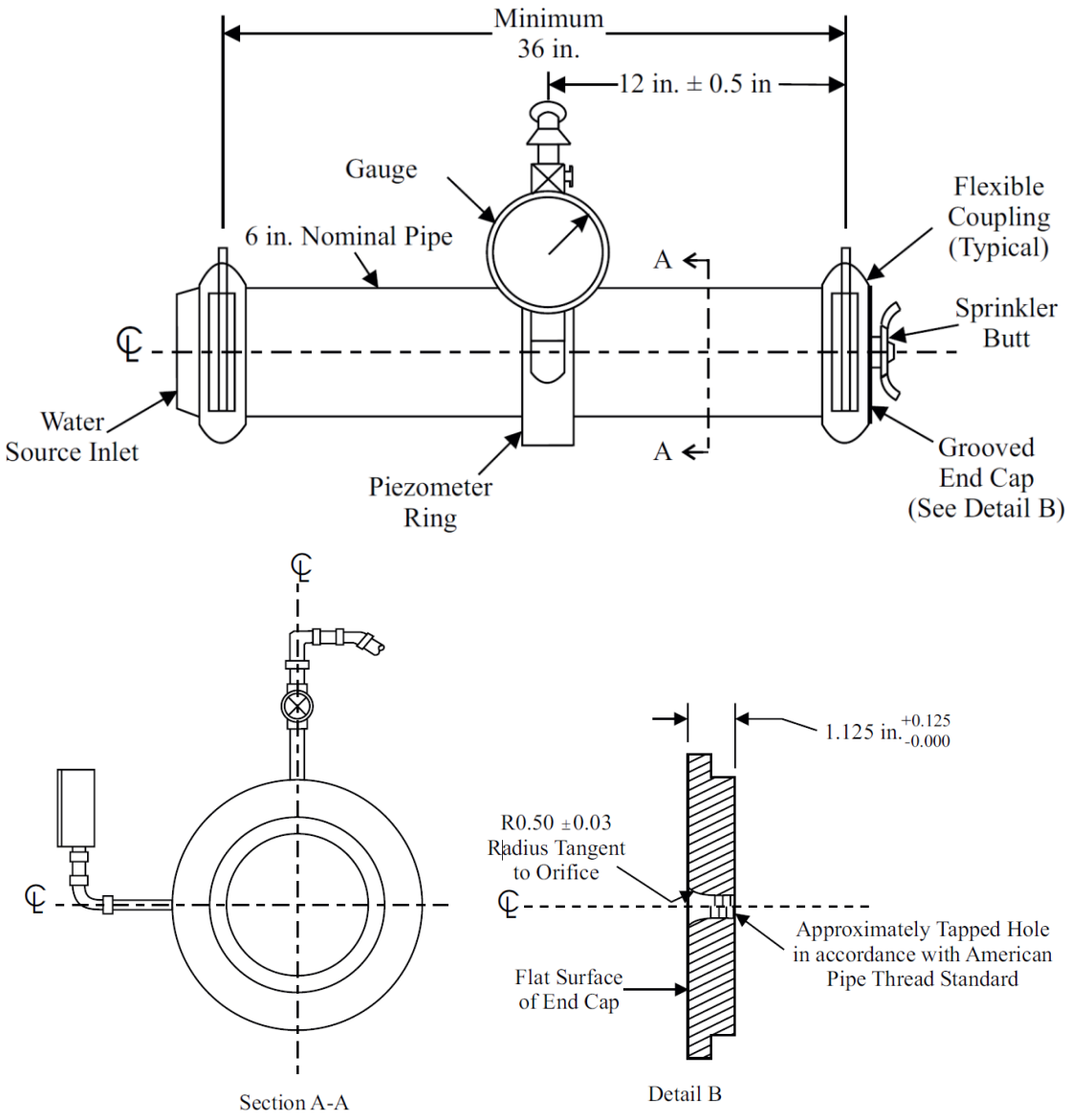
5.4.1. Test Requirement No. 1 — Minimum Operating Pressure

The manufacturer shall test 100 percent of production telescoping sprinkler assemblies for minimum operating pressure. The minimum operating water pressure shall not exceed 25 psi (170 kPa) to move the piston tube to its fully extended position. The outlet shall be plugged for this test.

6 BIBLIOGRAPHY

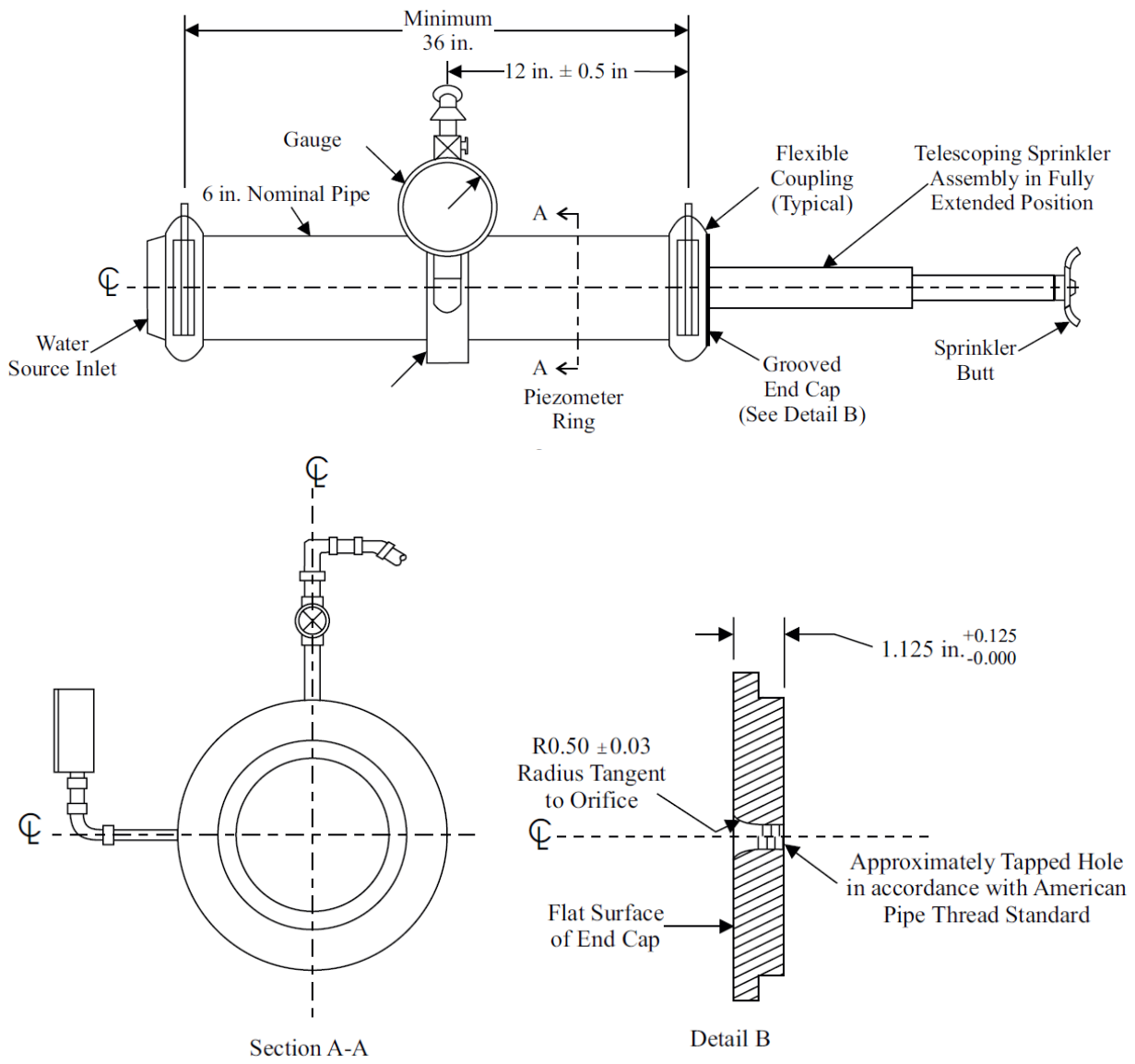
ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*.

APPENDIX A: DRAWINGS



Note: All dimensions are nominal size, unless specified otherwise. Radius on tapped holes equal to, or greater than 1 in. NPT may be truncated on the internal face.

Figure A-1. Test Apparatus for Measuring Nominal K-Factors.



Note: All dimensions are nominal size, unless specified otherwise.
Radius on tapped holes equal to, or greater than 1 in. NPT may be truncated on the internal face.

Figure A-2. Test Apparatus with Telescoping Assembly for Measuring Friction Loss (Equivalent Length of Pipe) with the Assembly in a Fully Extended Position.