ANSI/CAN/UL 213:2023

JOINT CANADA-UNITED STATES
NATIONAL STANDARD

STANDARD FOR SAFETY

Rubber Gasketed Fittings for Fire-Protection Service

ANSI/UL 213-2023

SCC FOREWORD

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UL Standard for Safety for Rubber Gasketed Fittings for Fire-Protection Service, ANSI/CAN/UL 213

Fifth Edition, Dated July 12, 2019

Summary of Topics

This revision of ANSI/CAN/UL 213 dated October 17, 2023 includes the following changes in requirements:

– Side Outlet Fittings with Proprietary Connections; Section 16, Table 16.1, Table 16.2, 20.1

– Metallic Materials; Section 9, Section 7A

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated June 9, 2023.

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Standard for Rubber Gasketed Fittings for Fire-Protection Service

First Edition – August, 1978
Second Edition – April, 1993
Third Edition – July, 2001
Fourth Edition – November, 2004

Fifth Edition

July 12, 2019

This ANSI/CAN/UL Safety Standard consists of the Fifth Edition including revisions through October 17, 2023.

The most recent designation of ANSI/UL 213 as an American National Standard (ANSI) occurred on October 17, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been designated as a National Standard of Canada (NSC) on October 17, 2023.

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Preface

This is the Fifth Edition of the ANSI/CAN/UL 213, Standard for Safety for Rubber Gasketed Fittings for Fire-Protection Service.

ULSE is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL 213 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

Comments or proposals for revisions on any part of the Standard may be submitted at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at http://csds.ul.com.

This Edition of the Standard has been formally approved by the Technical Committee (TC) on Metallic Sprinkler Pipe and Rubber Gasketed Fittings for Fire Protection Service, TC 852.

This list represents the TC 852 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

TC 852 MEMBERSHIP

Name	Representing	Interest Category	Region
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This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

INTRODUCTION

1 Scope

1.1 This standard covers rubber gasketed fittings intended for assembling sections of pipe in fire protection systems, for example, couplings to attach pipe sections end to end, and side outlets to attach pipe sections at right angles.

1.2 The products covered by this standard are intended for use in fire protection service as outlined by the following Standards of the National Fire Protection Association:

a) Installation of Sprinkler Systems, ANSI/NFPA 13;

b) Installation of Standpipe, Private Hydrant, and Hose Systems, ANSI/NFPA 14;

c) Water Spray Fixed Systems for Fire Protection, ANSI/NFPA 15;

d) Installation of Stationary Pumps for Fire Protection, ANSI/NFPA 20; and

e) Installation of Private Fire Service Mains and Their Appurtenances, ANSI/NFPA 24.

1.3 The joints formed with the use of fittings covered by this standard prevent separation under pressure.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

5 Normative References

5.1 The following standards are referenced in this standard, and portions of these referenced standards may be essential for compliance.

American Water Works Association Standards

AWWA C606, *Grooved and Shouldered Joints*

International Standards Organization (ISO) Standards

ISO 6182-12, *Fire protection – Automatic sprinkler systems – Part 12: Requirements and test methods for grooved-end components for steel pipe systems*

National Fire Protection Association (NFPA) Codes and Standards

NFPA 13, *Standard for the Installation of Sprinkler Systems*

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

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

NFPA 20, *Standard for the Installation of Stationary Fire Pumps for Fire Protection*

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*

UL Standards

UL 157, *Standard for Safety for Gaskets and Seals*

UL 852, *Standard for Safety for Metallic Sprinkler Pipe for Fire Protection Service*

6 Glossary

6.1 For the purpose of this Standard the following definitions shall apply.

6.2 FITTING, RUBBER GASKETED – A device used to join pipes, fittings, and valves and uses an elastomeric material to seal the joint.

6.3 FLEXIBLE FITTING, RUBBER GASKETED – A rubber gasketed fitting, which allows axial displacement, rotation and at least 1 degree of angular movement of the pipe without damage to the pipe for nominal pipe diameters of smaller than 203.2 mm (8 inches) or which allows axial displacement, rotation and at least 0.5 degrees of angular movement of the pipe without damage to the pipe for nominal pipe diameters of 203.2 mm (8 inches) and larger. These fittings are intended for installations where protection of piping against damage in areas where subject to earthquakes as required in NFPA 13.

6.4 PROPRIETARY GROOVES – Dimensions of the grooved end of pipe, fittings or valves specified by the rubber gasketed fitting manufacturer that differ by dimension or geometry from Standard Groove Dimensions. Products utilizing proprietary grooves are intended for use with specific rubber gasketed fittings that are compatible with the proprietary grooves.

6.5 STANDARD GROOVES – Dimensions of the grooved end of pipe, fittings, or valves that are considered standardized in the industry. Section 7.3 contains the requirements for determining dimensional compatibility of a rubber-gasketed fitting for use with standard grooves.

CONSTRUCTION

7 General

7.1 Rubber gasketed fittings covered by these requirements shall have a rated pressure of 1.20 MPa (175 psig) or higher.

7.2 Rubber gasketed fittings are intended for use with pipe, valves, and/or fittings that have been prepared to the specifications of the rubber gasketed fitting manufacturer

7.3 Rubber gasketed fittings for use with standard grooves shall be compatible with standard groove dimensions. These dimensions include the pipe outside diameter, gasket seating surface, groove width, and groove diameter. See Table 6.1 for dimensional limits.

7.4 Rubber gasketed fittings for use with proprietary grooves shall be compatible with the proprietary groove specified by the manufacturer.

7.5 A rubber gasketed fitting with a side outlet that utilizes a protrusion inserted into a hole in the wall of a main run pipe shall be designed with a minimum material thickness of 0.07 inches (1.778 mm) for the protrusion.

Table 6.1
Standard Groove Dimensional Limits

Nominal pipe size (in.)	Maximum pipe OD in (mm)	Maximum gasket seat width in (mm)	Minimum groove width in (mm)	Maximum groove diameter in (mm)
3/4	1.066 (27.076)	0.656 (16.662)	0.250 (6.350)	0.938 (23.825)
1	1.331 (33.807)	0.656 (16.662)	0.250 (6.350)	1.190 (30.226)
1-1/4	1.677 (42.596)	0.656 (16.662)	0.250 (6.350)	1.535 (38.989)
1-1/2	1.919 (48.743)	0.656 (16.662)	0.250 (6.350)	1.775 (45.085)
2	2.399 (60.934)	0.656 (16.662)	0.282 (7.163)	2.250 (57.150)
2-1/2	2.904 (73.762)	0.656 (16.662)	0.282 (7.163)	2.720 (69.088)
3	3.535 (89.789)	0.656 (16.662)	0.282 (7.163)	3.344 (84.938)
3-1/2	4.040 (102.616)	0.656 (16.662)	0.282 (7.163)	3.834 (97.384)
4	4.545 (115.443)	0.656 (16.662)	0.313 (7.950)	4.334 (110.084)
4-1/2	5.050 (128.270)	0.656 (16.662)	0.313 (7.950)	4.834 (122.784)
5	5.619 (142.723)	0.656 (16.662)	0.313 (7.950)	5.395 (137.033)
6	6.688 (169.875)	0.656 (16.662)	0.313 (7.950)	6.455 (163.957)
8	8.688 (220.675)	0.781 (19.837)	0.407 (10.338)	8.441 (214.401)
10	10.813 (274.650)	0.781 (19.837)	0.438 (11.125)	10.562 (268.275)
12	12.813 (325.450)	0.781 (19.837)	0.438 (11.125)	12.531 (318.287)
14	14.063 (357.200)	0.969 (24.613)	0.438 (11.125)	13.781 (350.037)

Table 6.1 Continued on Next Page

Table 6.1 Continued

Nominal pipe size (in.)	Maximum pipe OD in (mm)	Maximum gasket seat width in (mm)	Minimum groove width in (mm)	Maximum groove diameter in (mm)
15	15.063 (382.600)	0.969 (24.613)	0.438 (11.125)	14.781 (375.437)
16	16.063 (408.000)	0.969 (24.613)	0.438 (11.125)	15.781 (400.837)
18	18.063 (458.800)	1.031 (26.187)	0.438 (11.125)	17.781 (451.637)
20	20.063 (509.600)	1.031 (26.187)	0.438 (11.125)	19.781 (502.437)
22	22.063 (560.400)	1.031 (26.187)	0.454 (11.532)	21.656 (550.062)
24	24.063 (611.200)	1.031 (26.187)	0.469 (11.912)	23.656 (600.862)
Note: Refer to AWWA C606, Grooved and Shouldered Joints, for diagrams of each column heading used in Table 6.1.				

7A Metallic Materials

7A.1 The manufacturer shall identify the applicable ASTM or similar material specification for the metallic materials used in the rubber-gasketed fitting. The manufacturer shall provide documentation containing the physical property data to determine compliance with the minimum physical property requirements of the latest edition of the applicable ASTM or similar material specification as referenced by the manufacturer.

PERFORMANCE

8 General

8.1 Rubber gasketed fittings intended for installation on pipe without grooves (plain end) are to be tested with the specific pipe type and/or pipe having the minimum wall thickness specified by the manufacturer.

8.2 Rubber gasketed fittings intended for use with cut or rolled groove pipe are to be tested with the specific pipe type and pipe having the minimum wall thickness and groove dimensions specified by the manufacturer.

8.3 Representative sample fittings are to be subjected to the tests described in these requirements.

8.4 Rubber gasketed fittings that are change in direction fittings, lined with an elastomeric material, and intended for use with dry pipe systems shall be subjected to the Fire Test indicated in Section 18. Change in direction fittings include fittings such as elbows and tees.

9 Metallic Materials

9.1 *Deleted*

10 Elastomeric Parts Tests

10.1 An elastomeric part used to provide a seal shall have the following properties when tested as specified in the Standard for Gaskets and Seals, UL 157:

a) For silicone rubber (having poly-organo-siloxane as its constituent characteristic), a minimum tensile strength of 3.4 MPa (500 psi) and a minimum ultimate elongation of 100 percent.

b) For natural rubber and synthetic rubber other than silicone rubber, a minimum tensile strength of 10.3 MPa (1500 psi) and minimum ultimate elongation of 150 percent; or a minimum tensile strength of 15.2 MPa (2200 psi) and a minimum ultimate elongation of 100 percent.

c) Those properties relating to maximum tensile set; minimum tensile strength and elongation after oven aging; and hardness after oven aging, all as specified in UL 157. The maximum service temperature used to determine the oven time and temperature for oven aging is 60°C (140°F).

10.2 The Standard for Gaskets and Seals, UL 157, provides for the testing of either finished elastomeric parts or sheet or slab material. Sheet or slab material is to be tested when the elastomeric parts are O-rings having diameters of less than 25.4 mm (1 inch). The material tested is to be the same as that used in the product, regardless of whether finished elastomeric parts or sheet or slab material is tested.

11 Leakage Test

11.1 A rubber gasketed fitting assembly with pipe shall withstand for 1 minute, without leakage, an internal hydrostatic pressure of two times its rated pressure. No leakage of the fitting shall occur as the pressure is increased to the test pressure.

11.2 Leakage tests are to be conducted on fittings assembled onto sections of pipe at least 381 mm (15 inches) in length. The pipe ends to be joined by the fitting are to be prepared and assembled as specified by the manufacturer. The pipe ends of the test assembly are to be closed to provide for the assembly to be pressurized. The pressure is to be increased to twice the rated pressure and held for 1 minute.

12 Hydrostatic Test

12.1 A rubber gasketed fitting assembly with pipe shall be capable of withstanding, for 5 minutes without rupture, a test pressure equal to a multiple of the rated working pressure as shown in Table 12.1.

Table 12.1
Hydrostatic Test Pressures

Fitting size, inches[a]	Multiple of rated working pressure
Less than 12	4
12 and larger	3
Based on nominal ASTM A 795 Schedule 40 steel pipe sizes.	

12.2 Hydrostatic tests are to be conducted on rubber gasketed fitting and pipe assemblies in accordance with the methods of 10.2, and with the pressure specified in 12.1.

13 Bending Moment Tests

13.1 General

13.1.1 The fitting and pipe joint assembly shall not leak or rupture when subjected to the specified bending moment as determined by 13.1.3.

13.1.2 The pipe ends to be joined by the fitting are to be prepared and assembled as specified by the manufacturer. The assembly is to be pressurized to rated pressure.

13.1.3 The required bending moment is calculated based on twice the weight of water filled pipe over twice the maximum distance between pipe supports specified in the Standard for Installation of Sprinkler

Systems, ANSI/NFPA 13. Table 13.1 contains bending moment requirements for Schedule 5, 10, 30 and 40 steel pipe. The required bending moment for fitting sizes and pipe combinations not specified in Table 13.1 is to be calculated according to the following formula:

$$M = \frac{2wL^2}{8}(lb \cdot ft)$$

where:

M is the required bending moment (lb·ft);

w is the running weight of water filled pipe (lb/ft); and

L is two times l, maximum hanger spacing (ft).

Table 13.1
Required Bending Moment for Steel Pipe

Nominal fitting (coupling or outlet) size, inches	Steel pipe schedule							
	5		10		30		40	
	N·m	(lbf·ft)	N·m	(lbf·ft)	N·m	(lbf·ft)	N·m	(lbf·ft)
1	264	(195)	353	(260)	–		407	(300)
1-1/4	371	(274)	491	(362)	–		569	(420)
1-1/2	715	(527)	927	(684)	–		1098	(810)
2	1013	(747)	1288	(950)	–		1559	(1150)
2-1/2	1517	(1119)	1798	(1326)	–		2400	(1770)
3	2078	(1533)	2421	(1786)	–		3289	(2426)
3-1/2	2583	(1905)	2983	(2200)	–		4085	(3013)
4	3143	(2318)	3593	(2650)	–		4942	(3645)
5	4908	(3620)	5277	(3892)	–		7102	(5238)
6	6572	(4847)	7023	(5180)	–		9606	(7085)
8	10,358	(7640)	12,227	(9018)	14,292	(10,541)	15,326	(11,304)
10	16,047	(11,836)	17,634	(13,006)	21,080	(15,548)	22,757	(16785)
12	–		–		28,524	(21,038)	31,116	(22,950)
14	–		–		34,869	(25,718)	37,217	(27,450)
16	–		–		43,228	(31,883)	48,597	(35,843)

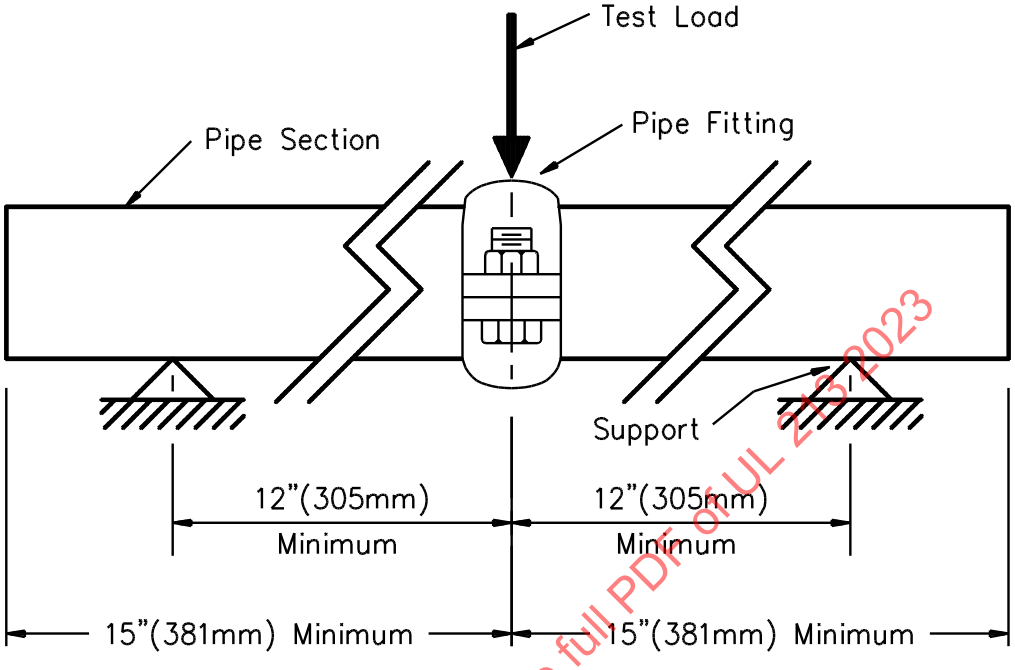
NOTE – See 13.1.2.

13.2 Couplings

13.2.1 With the assembly supported at points located at least 305 mm (12 inches) on either side of the center of the coupling, a gradually increasing force is to be applied to the center of the coupling until the required bending moment is achieved. See Table 13.1 and Figure 13.1.

Figure 13.1

Coupling Bending Moment Test



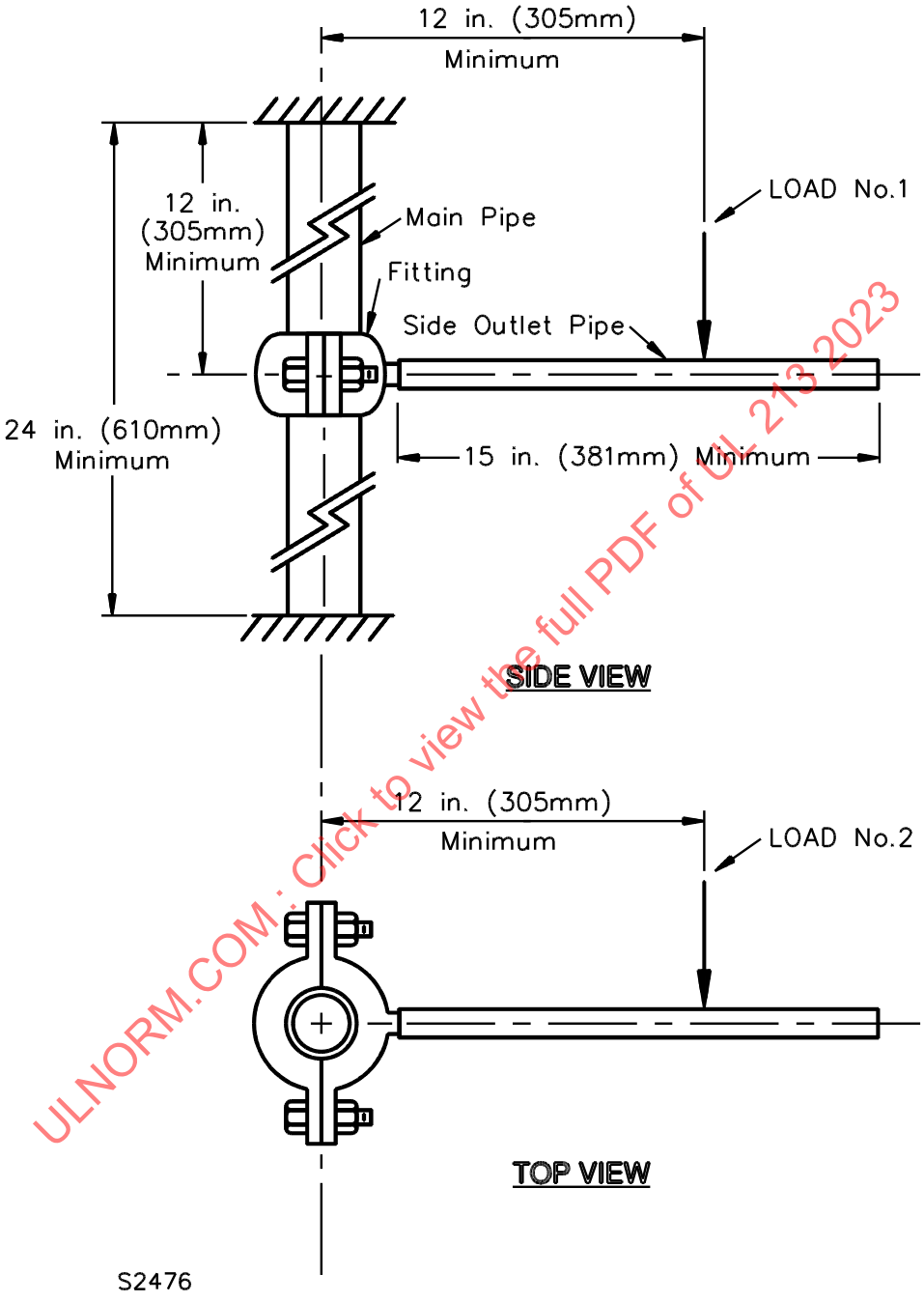
13.3 Side outlets

13.3.1 With the fitting assembled onto a 610 mm (24 inch) minimum length of pipe, and the pipe supported to restrict rotation about the main axis or deflection along the main axis, a gradually increasing force is to be applied to the side outlet pipe at a minimum distance of 305 mm (12 inches) from the center line of the main pipe and in a direction parallel to the center line of the main pipe. See Load No. 1 in Figure 13.2. The force is to be applied until the required bending moment is achieved. See Table 13.1.

13.3.2 The test described in 13.3.1 is to be repeated on a second test assembly, except that the force is to be applied to the side outlet pipe in a direction perpendicular to the axis of both the main pipe and the side outlet pipe. See Load No. 2 in Figure 13.2.

Figure 13.2

Side Outlet Bending Moment Test



14 Flexibility Test for Flexible Fittings

14.1 A flexible fitting shall provide for angular movement and axial displacement as described in 6.3 without leakage or pipe damage when tested in accordance with 14.2 and 14.3.

14.2 The pipe ends to be joined are to be prepared in accordance with the fitting manufacturer's specifications. The pipes are to be joined by the fitting with the pipe ends touching or as close as the fitting permits. A line is to be scribed 25.4 mm (1 inch) from each pipe end. The distance between the two scribed lines is to be measured. The assembly is to be filled with water and pressurized to the rated pressure specified by the manufacturer. The distance between the lines is to be measured, and the difference between the two measurements is the measured axial movement.

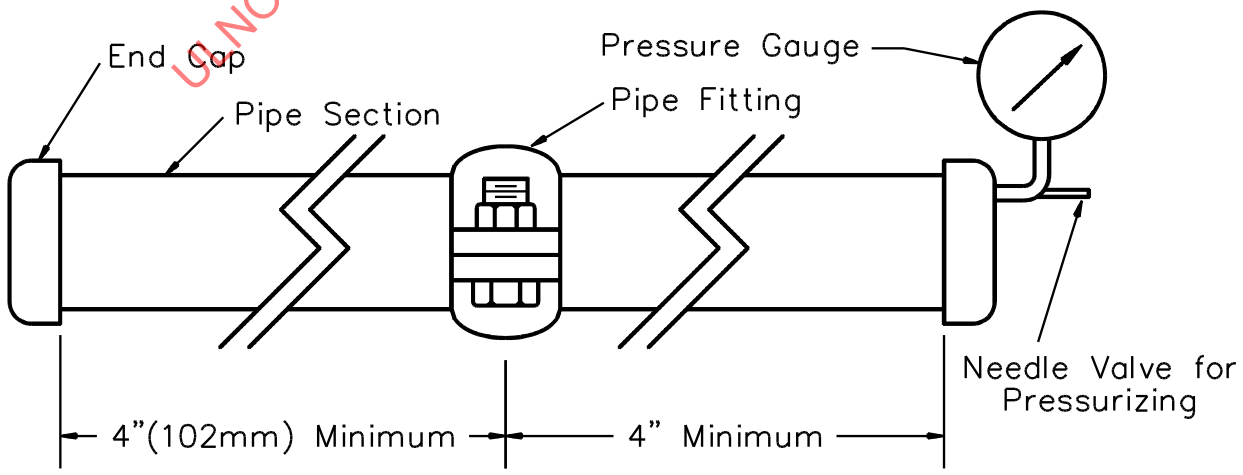
14.3 With the assembly pressurized to its rated pressure, a bending moment is to be applied to deflect the joint to the maximum angle specified by the manufacturer, while not less than 1 degree for nominal pipe diameters less than 203.2 mm (8 inches) or 0.5 degrees for 203.2 mm (8 inches) and larger. The bending moment applied is not to exceed 25 percent of the bending moment specified in Table 13.1 or 13.1.3 whichever is applicable. The angle is to be measured using an inclinometer, or equivalent, or by measuring the deflection and distance between the support points and calculating the angle. Observations are to be made for leakage or pipe damage.

15 Low Temperature Test for Dry Pipe Systems

15.1 Two sections of pipe, each a minimum of 102 mm (4 inches) long, are to be assembled onto a sample coupling, and their open ends fitted with end caps. One end cap is to be provided with threaded holes for attachment to an aerostatic pressure source and a pressure gauge. See Figure 15.1. With the assembly lying on its side, 3.2 mm (1/8 inch) of water is to be introduced into the assembly, and the assembly is then to be sealed and gradually pressurized with air to a pressure of 276 kPa (40 psig). The pressurized assembly is then to be placed in air maintained at a temperature of minus 40°C (minus 40°F) for a period of 24 hours. Following the 24-hour low temperature exposure, the assembly is to be placed in room ambient temperature of 23 ±3°C (73 ±5°F) for an additional 24-hour period. Following the 24-hour exposure to room ambient temperature, there shall be no decrease in the pressure in the assembly from the pressure measured before the low temperature exposure.

Figure 15.1

Low Temperature Test



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15A Sprinkler Outlet Passageway Test

15A.1 When tested as described in 15A.2, a rubber gasketed side outlet fitting for a sprinkler connection shall permit passage of a steel ball or similar instrument of the diameter specified in Table 15A.1 through the outlet.

Table 15A.1
Minimum Sprinkler Outlet Passageway Dimensions

Nominal Sprinkler Outlet Size, inch	Diameter, inch (mm)
1/2	0.622 inch (16 mm)
3/4	0.824 inch (21 mm)
1	1.049 inch (27 mm)
1-1/4	1.380 inch (35 mm)

15A.2 A sprinkler outlet is to be oriented in the vertical position with the discharge end pointing down. The applicable diameter ball or similar instrument is to be inserted into the inlet and observations made for the passing through the outlet without assistance.

16 Side Outlet Flow Characteristics Test – Sprinkler Connections

16.1 When tested as specified in 16.2, the average discharge coefficient of a rubber gasketed side outlet fitting for a sprinkler connection with a nominal outlet size of 1/2, 3/4, or 1 inch shall be not less than the discharge coefficient "K" value in Table 16.1 or shall be tested with a sprinkler installed in the rubber gasketed side outlet fitting and have an average K-factor of at least 95 percent as compared to the average K-factor determined for the sprinkler alone when tested in accordance with 16.3.

Exception No. 1: The minimum discharge coefficient "K" value for a 1/2 inch outlet size shall be permitted to be 8.5 provided the installation instructions limit the use of the fitting to sprinklers with a nominal K-factor of 8.0 or less. See 20.1(f).

Exception No. 2: A rubber gasketed side outlet fitting having a propriety connection shall be permitted to have a minimum average discharge coefficient that is based upon the largest nominal sprinkler discharge coefficient (including the +5 % tolerance) having an inlet connection that is the same nominal size as the outlet fitting. See 20.1(g).

Table 16.1
Minimum Discharge Coefficient

Nominal outlet size, inch	Minimum average discharge coefficient "K" value, gpm/(psi)$^{1/2}$ [L/min/(bar)$^{1/2}$][a]
1/2	12[b] (172.8)[b]
3/4	17.6 (253.4)
1	29.4 (423.4)

[a] A rubber gasketed side outlet fitting having a propriety connection shall be permitted to have a minimum average discharge coefficient that is based upon the largest nominal sprinkler discharge coefficient (including the +5 % tolerance) having an inlet connection that is the same nominal size as the outlet fitting. See 20.1(g).

[b] The minimum discharge coefficient "K" value for a 1/2 inch outlet size shall be permitted to be 8.5 (122.4) provided the installation instructions limit the use of the fitting to sprinklers with a nominal K-factor of 8 (115) or less. See 20.1(f).

16.1A The following main run sizes shall be tested for the specified outlet size:

- Nominal 1-1/4 inch diameter and the largest nominal size but not greater than 6 inch for a 1/2 inch outlet
- Nominal 2 inch diameter and the largest nominal size but not greater than 6 inch for 3/4 inch outlet
- Nominal 2-1/2 inch diameter and the largest nominal size but not greater than 6 inch for 1 inch outlet

16.1B The rubber gasketed side outlet fitting shall be installed on representative main run pipe using a 12 inch (305 mm) ±1 inch (25 mm) long section of schedule 40 pipe in accordance with the manufacturer's installation instructions. The fitting shall be nominally centered on the pipe section. The sprinkler port in the end cap and reducer fittings used for connecting to the test sample shall be concentric with the test apparatus waterway. The side outlet test sample assembly shall be connected to a test apparatus (see Figure 16.1 for an example) using the necessary couplings, fittings, or reducer fittings. Where testing the sprinkler alone, the sprinkler shall be installed into an end cap. When testing the side outlet assembly, the end of the pipe section shall be capped or plugged to prevent water flow through the end of the main run pipe.