UL 852

STANDARD FOR SAFETY

Metallic Sprinkler Pipe for Fire Protection Service

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

Second Edition, Dated October 1, 2008

Summary of Topics

This revision of ANSI/UL 852 dated March 7, 2023 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

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

The requirements are substantially in accordance with Proposal(s) on this subject dated December 30, 2022.

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UL 852

Standard for Metallic Sprinkler Pipe for Fire Protection Service

First Edition – July, 2005

Second Edition

October 1, 2008

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through March 7, 2023.

The most recent designation of ANSI/UL 852 as a Reaffirmed American National Standard (ANS) occurred on March 7, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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

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INTRODUCTION

1 Scope

1.1 These requirements cover metallic pipe intended for use in water based fire protection systems for water distribution or valve trim applications. These pipes may be used in fire protection systems when installed in accordance with the following Standards:

a) Standard for Installation of Sprinkler Systems, NFPA 13;

b) Standard for Installation of Sprinkler Systems in Residential Occupancies up to Four Stories in Height, NFPA 13R;

c) Standard for Installation of Sprinkler Systems in One- and Two- Family Dwellings and Manufactured Homes, NFPA 13D;

d) Standard for Installation of Standpipe, Private Hydrants, and Hose Systems, NFPA 14;

e) Standard for Water Spray Fixed Systems, NFPA 15;

f) Standard for Installation of Foam-Water Spray Systems, NFPA 16; and

g) Standard on Water Mist Fire Protection Systems, NFPA 750.

1.2 Pipe is categorized by size, pressure rating, end configuration, (threaded or unthreaded) and wall thickness designation. Steel pipe is also categorized by the Corrosion Resistance Ratio (CRR).

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 Glossary

5.1 For the purpose of this standard the following definitions apply.

5.2 CORROSION RESISTANCE RATIO (CRR) – A value used to compare the corrosion resistance of black steel pipe that is uncoated or unplated to that of Schedule 40 steel pipe is determined by the following formula:

$$CRR = (X / X_{40})^3$$

Where:

X = Thickness of steel pipe measured either under the first exposed thread for threaded pipe or at the thinnest wall section for unthreaded pipe.

X_{40} = Thickness of Schedule 40 pipe under the first exposed thread. The "first exposed thread" is the minimum pipe thickness exposed to both interior and exterior corrosion and occurs at the threaded joint assembly at a line defined by the thread width, just before the pipe engages the fitting.

5.3 NPS (NOMINAL PIPE SIZE) – A dimensionless designator for pipe sizes defined in standards including ASTM A53, ASTM A135 and ASTM A795 used to replace terms such as "Nominal Diameter" and Nominal Size".

CONSTRUCTION

6 General

6.1 Pipe shall be constructed in a manner that permits joining sections of pipe by welding, brazing, or soldering as appropriate or with the use of fittings specified by the pipe manufacturer. The ends of the pipe are permitted to be plain end, threaded, or grooved.

7 Sizes

7.1 Pipe shall be nominal 1/2-inch NPS or larger.

8 Threaded Ends

8.1 Where steel pipe is intended to be threaded, threads shall comply with the Standard for Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1.

Exception: Steel pipe intended for use in installations where fittings incorporate pipe threads other than NPT type threads, shall be permitted to be provided with pipe threads complying with other nationally or internationally recognized pipe thread standard compatible with those fittings.

9 Pressure Rating

9.1 Pipe shall be constructed for a minimum rated pressure of 175 psig (1206 kPa).

10 Materials

10.1 The pipe shall comply with the dimensional, chemical, and physical properties of the applicable ASTM Standards or other nationally or internationally recognized pipe standards.

Exception: If the pipe is produced to specifications beyond the scope of ASTM Standards, or other nationally or internationally recognized standards, the pipe shall conform to specifications established by the manufacturer.

10.2 Steel pipe shall be made of steel material having corrosion resistance properties at least equivalent to Schedule 40 black steel pipe made in accordance with Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use, ASTM A795, or Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless, ASTM A53 or or Standard Specification for Electric-Resistance-Welded Steel Pipe, ASTM A 135/A 135M.

PERFORMANCE

11 General

11.1 To determine compliance with these requirements, pipe shall be subjected to the performance tests described in Sections 12 – 18, and specified in Table 12.1.

11.2 The number of samples required for investigation varies due to pipe sizes, material, and application. The number of samples required for examination and test are to be determined following a review of detailed drawings, examination of a preliminary sample, or both.

12 Bending Moment Tests

12.1 Sample pipe and joint assembly shall not leak or rupture when subjected to the specified bending moment. During the tests, the assembly is to be pressurized to the rated pressure.

12.2 Sample pipe in each size is to be assembled with a joint representative of the intended application at the center of two lengths of pipe each measuring at least 12 inches (305 mm). With the assembly supported at points located on either side of the center of the joint, a gradually increasing force is to be applied to the center of the coupling until the required bending moment is achieved. See Table 12.1 and Figure 12.1.

Table 12.1
Required bending moment for steel pipe

NPS	Pipe schedule							
	5		10		30		40	
	Lbf·Ft	(N·m)	Lbf·Ft	(N·m)	Lbf·Ft	(N·m)	Lbf·Ft	(N·m)
1	195	(264)	260	(353)	–		300	(407)
1-1/4	274	(371)	362	(491)	–		420	(569)
1-1/2	527	(715)	684	(927)	–		810	(1098)
2	747	(1013)	950	(1288)	–		1150	(1559)
2-1/2	1119	(1517)	1326	(1798)	–		1770	(2400)
3	1533	(2078)	1786	(2421)	–		2426	(3289)
3-1/2	1905	(2583)	2200	(2983)	–		3013	(4085)
4	2318	(3143)	2650	(3593)	–		3645	(4942)
5	3620	(4908)	3892	(5277)	–		5238	(7102)
6	4847	(6572)	5180	(7023)	–		7085	(9606)

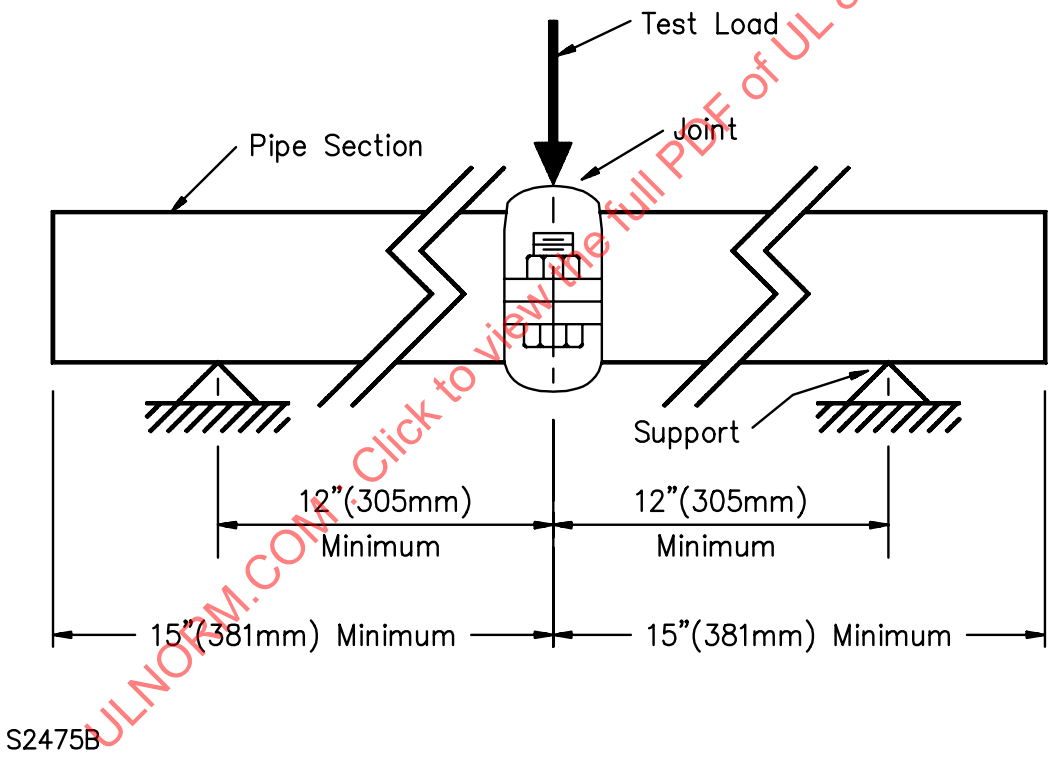
Table 12.1 Continued on Next Page

Table 12.1 Continued

NPS	Pipe schedule							
	5		10		30		40	
	Lbf·Ft	(N·m)	Lbf·Ft	(N·m)	Lbf·Ft	(N·m)	Lbf·Ft	(N·m)
8	7640	(10,358)	9018	(12,227)	10,541	(14,292)	11,304	(15,326)
10	11,836	(16,047)	13,006	(17,634)	15,548	(21,080)	16,785	(22,757)
12	–		–		21,038	(28,524)	22,950	(31,116)
14	–		–		25,718	(34,869)	27,450	(37,217)
16	–		–		31,883	(43,228)	35,843	(48,597)

Figure 12.1

Bending moment test



12.3 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. The required bending moment for pipe not specified in Table 12.1 is to be calculated according to the following formula:

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

Where:

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

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

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

13 Leakage Test

13.1 A pipe assembly shall withstand for 1 minute, without leakage, an internal hydrostatic pressure of two times its rated pressure. No leakage of the pipe or joint assembly shall occur as the pressure is increased to the test pressure.

13.2 Leakage tests are to be conducted on pipe assembled as specified in 12.2. 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.

14 Hydrostatic Test

14.1 A pipe assembly shall be capable of withstanding, for 1 minute without rupture, a test pressure equal to a multiple of the rated pressure as shown in Table 14.1.

Table 14.1
Hydrostatic test pressures

NPS	Multiple of rated pressure
6 and smaller	5X
Greater than 8 – 10	4X
Greater than 10	3X

14.2 Hydrostatic tests are to be conducted on pipe assemblies as specified in 13.2 and with the pressures specified in Table 14.1.

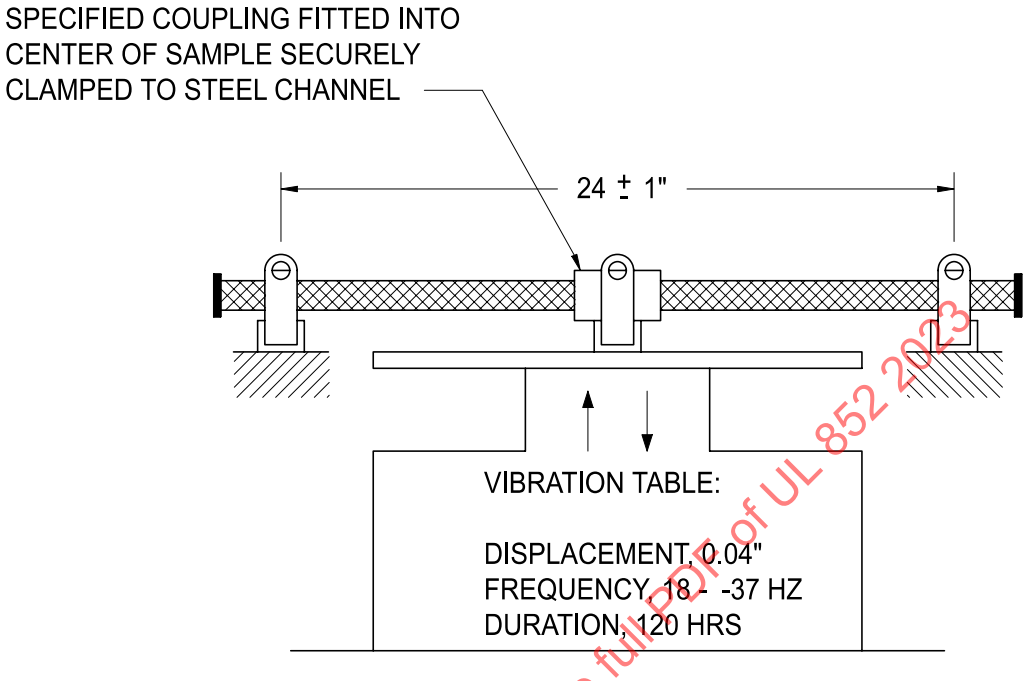
15 Vibration Test

15.1 A pipe assembly shall withstand the effects of vibration as specified in 15.3 without physical damage that affects the performance characteristics of the pipe as demonstrated by compliance with the Leakage Test, Section 13.

15.2 For each test, two lengths of sample pipe at least 14 inches in length shall be assembled with a joint representative of the intended application and mounted on vibration equipment as shown in Figure 15.1. The ends of the assembly shall be adapted for pressurization after the vibration exposure.

Figure 15.1

Vibration assembly



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15.3 The pipe is to be mounted on a vertical or horizontal vibration apparatus by rigidly clamping the pipe assembly at the center onto a bracket secured to the vibration machine table. The assembly shall be secured by attaching the ends of the test pipe to a stationary fixture as shown in Figure 15.1. The assembly is to be subjected to a variable frequency between 18 and 37 hertz with a total displacement of 0.04 inch for a period of 120 hours. After the vibration exposure, the pipe assembly is to be subjected to the Leakage Test, Section 13.

16 Fire Test

Section 16 deleted

16A Fire Test

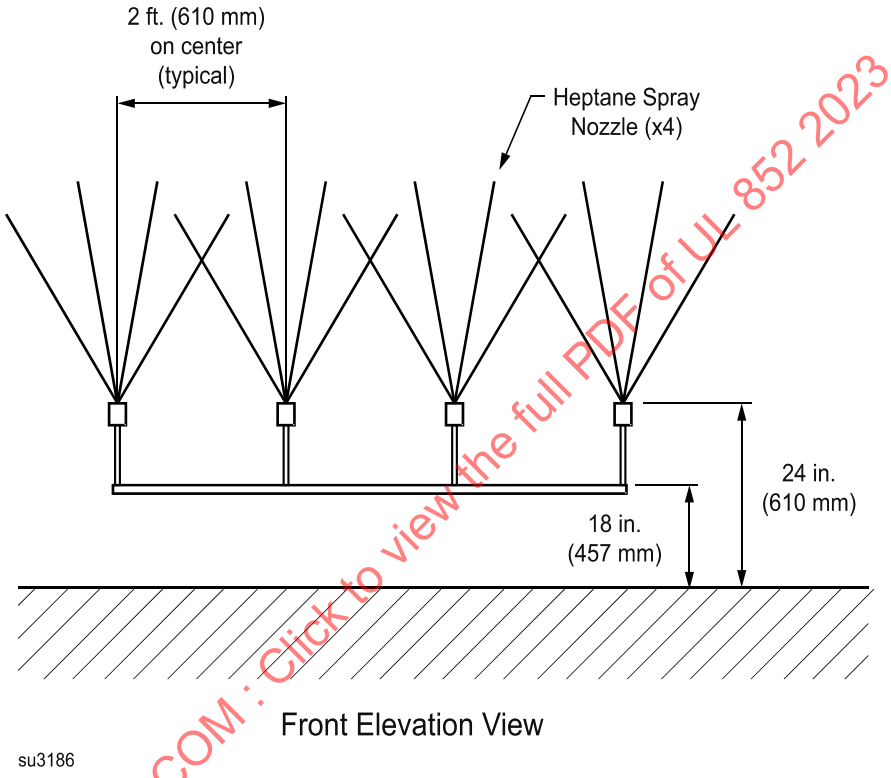
16A.1 Steel pipe having thickness less than Schedule 5 in accordance with Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use, ASTM A795, Standard Specification for Electric Resistance Welded Steel Pipe, ASTM A135, or Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless, ASTM A53, or equivalent, or pipe fabricated of material other than steel, shall withstand the fire exposure specified in 16A.2 – 16A.13 without leakage of the piping material or rupture of the joints or piping material when subjected to the indicated flowing pressures and a post fire exposure hydrostatic test at the rated pressure.

16A.2 For a product type with a size range of analogous design, the smallest diameter pipe and 2 inch size pipe shall be tested. If the entire size range is greater than nominal 2 inch, only the smallest diameter pipe shall be tested. If the entire size range is less than nominal 2 inch, the smallest diameter pipe and largest diameter pipe shall be tested.

16A.3 The fire source is to consist of a line-burner assembly with four spray nozzles arranged to discharge heptane at a nominal flow rate of 1.6 gpm (6.0 l/min) for stage 1 resulting in a fire having a nominal total heat release rate of 3,000 kW. The line-burner assembly shall also be capable of a heptane nominal flow rate of 0.5 gpm for stage 2. The spray nozzles are to be spaced 24 inches (610 mm) apart on the supply line and 24 inches (610 mm) above the floor. A means for supplying and metering the fuel is to be furnished. See Figure 16A.1 below:

Figure 16A.1

Line-burner assembly



16A.4 The heptane is to be commercial grade having distillation characteristics described below:

a) Minimum Initial Boiling Point – 90°C (194°F)

b) Maximum Dry Point – 100°C (212°F)

c) Specific Gravity (60°F/60°F) (15.6°C/15.6°C) – 0.69 – 0.73

16A.5 The heptane line burner shall be calibrated in accordance with this section. The total heat release rate is to be measured using a paramagnetic oxygen analyzer, velocity probe, and a Type K thermocouple or equivalent under a calorimeter having diameter of not less than 25 feet (7.6 m). The instrumentation is to be located in the exhaust duct of the heat release rate calorimeter at a location that minimizes the influence of bends or exhaust devices. The heat release rate measurement system is to be calibrated using an atomized heptane diffusion burner. The calibration is to be performed using flows of 1, 2, 3 and 4 gpm (3.8, 7.6, 11.4 and 15.2 l/min) of heptane. A burner constructed with Model F -80 -30, 70 degree PLP nozzles manufactured by Monarch Nozzle Co. has been found to be acceptable.

16A.6 The fire exposure tests are to be conducted in a room utilizing a ceiling 16 by 16 feet suspended at a height of 8 feet 6 inches above the floor. The room shall have provisions for venting gas around the

ceiling perimeter with at least 0.5 m (1.7 ft) on all sides. The pipe sample shall be 15 ft in length and shall be installed on the ceiling so that the top of the pipe is 2 inches (50.8 mm) from the ceiling as indicated in the figures below. The pipe is to be installed in accordance with the manufacturer's instructions at the maximum hanger spacing, in line with and directly above the heptane burner. A pipe joint is to be centered above the fire. Thermocouples shall be used to record the air temperature 2 inches (50.8 mm) below the ceiling as shown in Figure 16A.2 and Figure 16A.3.

Figure 16A.2

Suspended ceiling and pipe

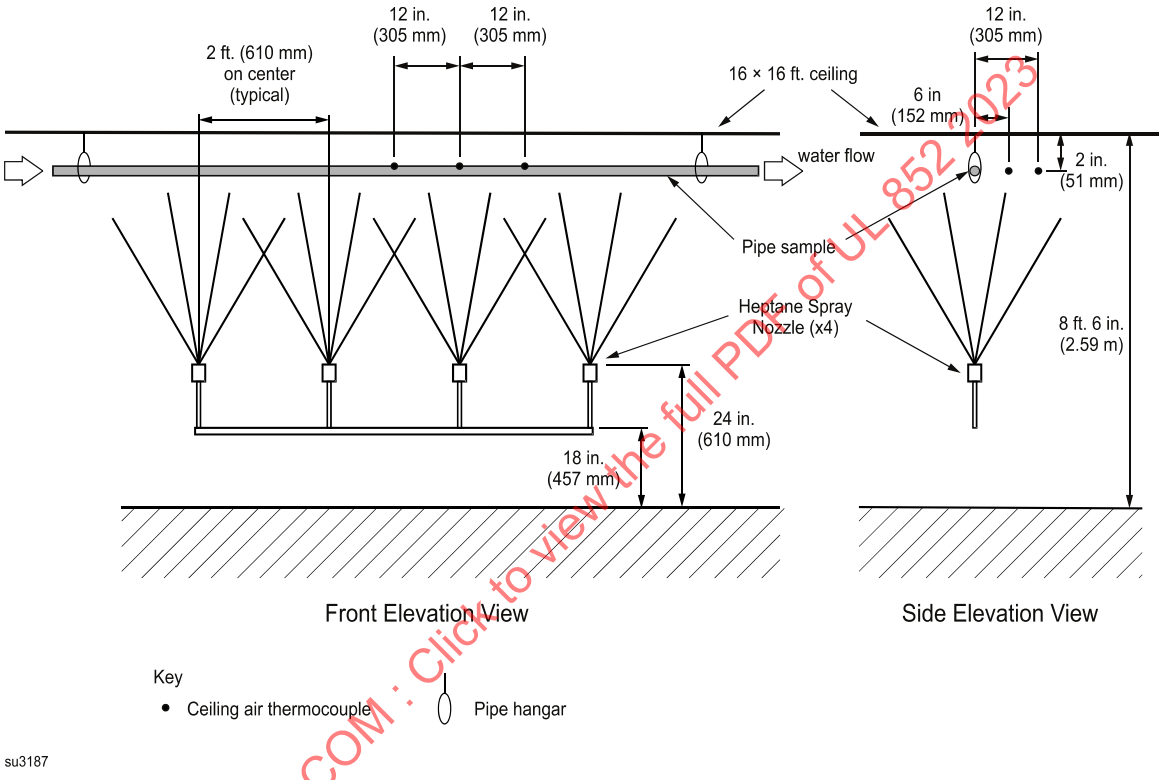
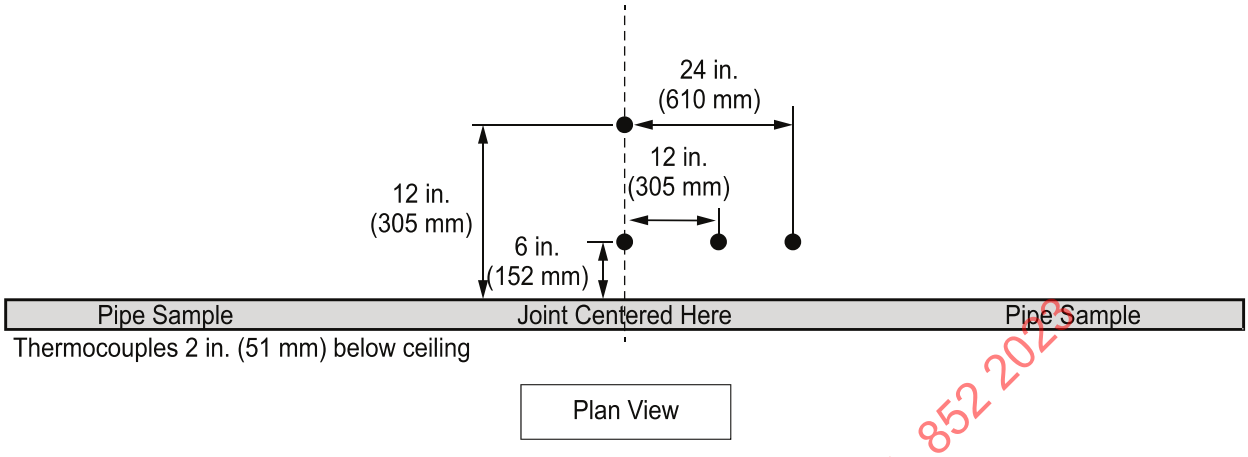


Figure 16A.3

Thermocouple locations



16A.7 The installed product shall be connected to a water supply. When water flow is initiated, the system shall maintain a flow rate equivalent to a nominal K 5.6 sprinkler at 90% of the rated pressure of the pipe system. The water shall flow through the pipe assembly and discharge to an area so the fire is not impacted by the water discharge.

16A.8 For products used in both dry pipe and wet pipe systems:

a) The installed product shall be completely dry prior to test initiation

b) Water flow shall be initiated 2 minutes after ignition

16A.9 For products used only in wet pipe systems:

a) The installed products shall be filled with water, purged of air, and pressurized to rated pressure prior to test initiation

b) Water flow shall be initiated 1 minute after ignition

16A.10 The temperatures at the ceiling level are to be continuously recorded during the test, utilizing an unprotected 20 AWG (0.52 mm^2) chromel-alumel thermocouple located as indicated in Figure 16A.3 above the heptane spray assembly 2 inches (50.8 mm) from the ceiling.

16A.11 The data from the four thermocouples shall be averaged for each 5 min duration in each test stage to determine compliance with the temperature requirements in 16A.13.