PYR 1128

Standard Method of Fire Test for Flame Breaks

The 2013 edition of PYR 1128, *Standard Method of Fire Test for Flame Breaks*, is provided for historical reference only. This edition of PYR 1128 was withdrawn by Standards Council Decision #14-1. In Decision #14-1, the Standards Council directed that NFPA cease all standards development activity regarding the retail sale and storage of consumer fireworks.

2013 Edition

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PYR 1128

Standard Method of

Fire Test for Flame Breaks

2013 Edition

Special Note from the NFPA on Consumer Fireworks. Because the sale and use of consumer fireworks is permitted in many jurisdictions throughout the United States and elsewhere, NFPA standards relating to the storage and retail sales of consumer fireworks, including this standard, are provided in the interest of public safety. The NFPA, however, is opposed to consumer fireworks. Every year thousands of people, most often children and teens, are injured while using consumer fireworks, and the NFPA urges the public to avoid the use of consumer fireworks and, instead, to enjoy displays of fireworks conducted by trained professionals. For more information about the dangers of consumer fireworks, please visit: www.nfpa.org/fireworks

This edition of PYR 1128, *Standard Method of Fire Test for Flame Breaks*, was prepared by the Technical Committee on Pyrotechnics. It was issued by the Standards Council on August 9, 2012, with an effective date of August 29, 2012.

This edition of PYR 1128 was approved as an American National Standard on August 29, 2012.

Origin and Development of PYR 1128

The 2013 edition marks the first edition of the standard. While flame breaks have been included in Chapter 7 of NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles,* since 2003, which was the first edition in which fire and life safety requirements for retail sales venues were added, no specific criteria describing flame breaks existed. Included as a provision required for the shelving on which the "for sale display" would be stocked, the flame break serves as a barrier on each level of shelving distributed along specified distances to block or retard the passage of heat or flame in the event of a fire. What was not clearly identified in the 2003 or the 2006 edition was what materials specifically qualified for use as flame breaks and in what configuration or dimension. The Pyrotechnics Committee requested that the Standards Council permit the committee to develop a fire test standard that would establish the performance characteristics of flame break materials for demonstration in test fires that would define the pass/fail criteria. The Council approved the change in the Committee scope permitting the Pyrotechnics Committee to develop this test standard, provided that the requirements were coordinated with the NFPA Fire Tests Committee.

NFPA 1124 requires flame breaks but currently does not stipulate what constitutes an acceptable installation; PYR 1128 now provides a performance-based means to test the performance of proposed materials.

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Committee Scope: This Committee shall have primary responsibility for documents on the manufacture, transportation, and storage of consumer and display fireworks, pyrotechnic special effects, and model and high power rocket motors. This Committee shall have primary responsibility for the use of display fireworks and for model and high power rocketry, and the construction, launching, and other operations that involve model and high power rocket motors. The Committee shall have primary responsibility for documents on the wholesale and retail sale and storage of consumer fireworks. The Committee shall have responsibility for the development of fire test standards applicable to the packaging, covered fuses, and flame breaks used in retail sales display of consumer fireworks. The Committee shall coordinate the fire test documents with the Fire Tests Committee.

The Committee does not have responsibility for documents on the use of consumer fireworks by the general public; on the use of pyrotechnic special effects before a proximate audience; on the manufacture, transportation, storage for use of military, automotive, agricultural, and industrial pyrotechnics.

Contents

PYR 1128

Standard Method of

Fire Test for Flame Breaks

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

Information on referenced publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1 Scope.

1.1.1* This method of fire test for flame breaks is applicable to materials intended to be used as flame breaks complying with NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles.*

1.1.2 The performance of the flame break is determined by evaluating the ability of the flame break to resist the passage of fire during a standard fire exposure.

1.2 Purpose.

1.2.1 The purpose of this method of fire test is to evaluate the temperature rise (thermal transmission) performance of the flame break and its ability to remain in place and to resist the passage of flame and hot gases and the penetration of fire entirely through the flame break when subjected to a standard fire exposure.

1.2.2 This method of fire test does not evaluate the performance of the flame break with respect to its ability to remain in place under all actual fire exposure conditions.

1.3 Application.

1.3.1 This method of fire test determines the period of time during which the flame break demonstrates the ability to delay ignition of a consumer fireworks device from a standard fire exposure.

1.3.2 This method of fire test also evaluates the ability of the flame break to remain in place during a standard fire exposure for a measured period of time.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles,* 2013 edition.

2.3 Other Publications.

2.3.1 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials,* 2011 edition.

2.3.2 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 263, *Fire Tests of Building Construction and Materials,* 2011 edition.

2.3.3 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections. (Reserved)

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1 Shall. Indicates a mandatory requirement.

3.2.2 Should. Indicates a recommendation or that which is advised but not required.

3.2.3 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Flame Break. A material or construction that prevents ignition of consumer fireworks devices located on the non-fire side of the material or construction when exposed to a fire by limiting the temperature rise on the unexposed surface of the flame break and by acting as a barrier to direct fire exposure for a measured time duration.

3.3.2 Flame Break Rating. The time period in minutes that the flame break exhibits its required performance as determined in accordance with this method of fire test.

3.3.3 Test Sample. A material or construction to be tested in accordance with this method of fire test to determine its performance as a flame break.

Chapter 4 Fire Test Setup

4.1 Test Sample Supporting Structure. The test sample supporting structure shall be constructed as a frame having minimum dimensions of 48 in. (1219 mm) long × 48 in. (1219 mm) wide in accordance with Figure 4.1.

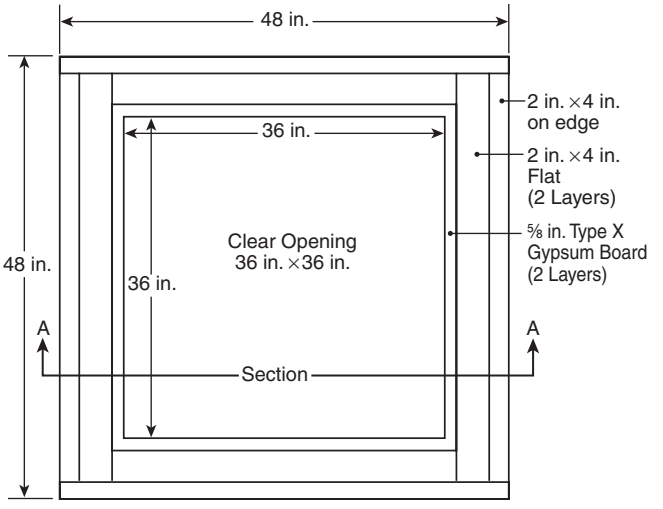


FIGURE 4.1 Test Sample Supporting Structure.

4.1.1 The supporting structure shall be framed by nominal 2 in. × 4 in. (51 mm × 102 mm) wood studs oriented with the nominal 4 in. (102 mm) side vertical.

4.1.2 Two additional wood studs per side shall be positioned around the center opening of the wood stud framing, laid flat on top of each other, to form the minimum 38 in. × 38 in. (965 mm × 965 mm) center opening.

4.1.3 Each wood stud connection point shall be secured using two evenly spaced 10d nails driven into the ends of the studs.

4.1.4 Two layers of ⅝ in. (3.2 mm) thick Type X Gypsum wallboard shall be attached to the side of the frame that will be exposed to the interior of the furnace, with the center portion cut out to leave a clear opening of not less than 36 in. × 36 in. (914 mm × 914 mm), so that the Gypsum wallboard overlaps the framing around the center opening by approximately 1 in. (25 mm).

4.2 Flame Break Test Sample. The test sample shall be installed to completely cover the center-framed opening of the test sample supporting structure so that it rests on the Gypsum wallboard.

4.2.1 The flame break test sample shall be representative of the construction, that will actually be used in a retail sales display containing consumer fireworks devices.

4.2.2 If joints are a component of the flame break installation in actual use, a minimum of one representative joint shall be incorporated into the flame break.

4.3 Test Sample Conditioning. Prior to conducting the fire test, the test sample shall be conditioned to reach a constant weight within 30 minutes of the start of the fire test at a temperature of 73°F ± 5°F (23°C ± 2.8°C) and a relative humidity of 50 percent ± 5 percent.

4.4 Test Furnace.

4.4.1 A horizontal gas-fired furnace shall be used, capable of generating and containing a fire exposure controlled to the time-temperature curve as required by ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, and UL 263, *Fire Tests of Building Construction and Materials*, for a minimum of 15 minutes.

4.4.2 The minimum dimensions of the furnace shall be as shown in Figure 4.4.2.

4.4.3 When the test sample mounted on the test sample supporting construction is placed on the top of the furnace over the furnace opening, the furnace opening shall expose the entire test sample.

Chapter 5 Control of Fire Test

5.1 Time-Temperature Curve.

5.1.1 The conduct of the fire test shall be controlled by the standard time-temperature curve shown in Figure 5.1.1 for a period of not fewer than 15 minutes.

5.1.2 The temperature inside the furnace shall be within the range of 50°F to 90°F (10°C to 32°C) at the start of the fire test.

5.2 Furnace Temperatures. The temperature in the furnace shall be the average temperature measured by not fewer than three furnace thermocouples.

5.2.1 The furnace thermocouples shall be uniformly distributed in a horizontal plane located 12 in. ± ½ in. (305 mm ± 13 mm) below the exposed side of the test sample.

5.2.2 The furnace thermocouples shall be as described in ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, and UL 263, *Fire Tests of Building Construction and Materials*.

5.2.3 The minimum length of the thermocouple wire lead exposed within the furnace shall not be less than 12 in. (305 mm).

5.3 Accuracy of Furnace Control. The area under the time-temperature curve as measured by the average of the furnace thermocouples shall be within 10 percent of the corresponding area under the standard time-temperature curve specified in Section 5.1.

5.4 Furnace Pressure. The pressure differential between the exposed and the unexposed faces of the test assembly shall be measured and controlled in accordance with 5.4.1 through 5.4.6.

5.4.1 The pressure-sensing probes shall be as shown in Figure 5.4.1.

5.4.2 The pressure shall be measured by not less than two pressure-sensing probes using a differential pressure instrument capable of being read in graduated increments no greater than 0.01 in. wg (2.5 Pa), with a precision of not more than ±0.005 in. wg (±1.25 Pa).

5.4.3 The differential pressure measurement instrument shall be located to minimize stack effects caused by vertical runs of pressure tubing between the pressure-sensing probe and the differential pressure measurement instrument location.

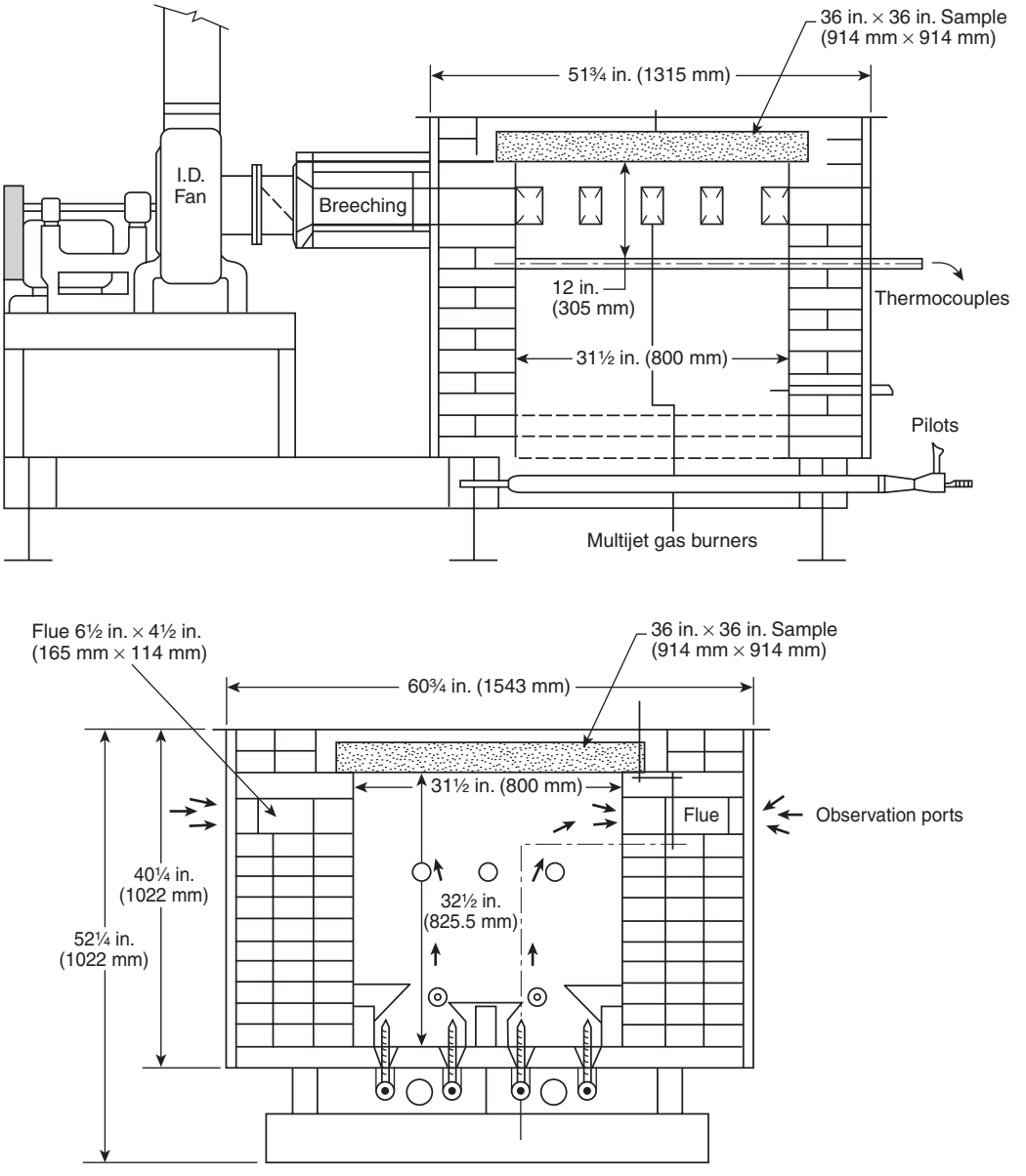


FIGURE 4.4.2 Horizontal Furnace.

5.4.4 Control of the furnace pressure as described in Section 5.4 shall be established beginning no later than 1 minute after the start of the fire test and shall be maintained throughout the remainder of the fire test period.

5.4.5 The furnace pressure shall be measured and recorded throughout the fire test at intervals not exceeding 30 seconds.

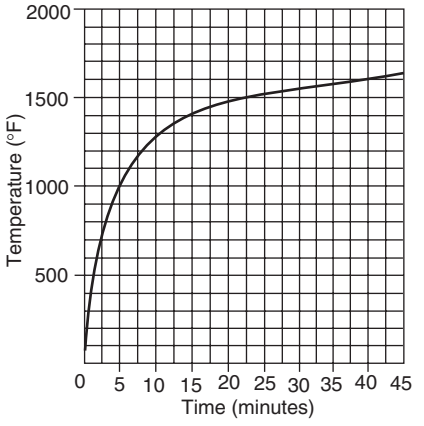
5.4.6 The pressure-sensing probes shall be located along the longitudinal centerline of the furnace within 12 in. ± 1 in. (305 mm ± 25 mm) of the center of the test sample. The tip of the probes shall protrude into the furnace a minimum of 3 in. (76 mm) from the interior surface of a furnace wall and not less than ¾ in. (19 mm) from the exposed face of the test sample.

5.4.7 During the fire test, the neutral pressure plane in the furnace shall be established below the exposed face of the test sample such that a positive pressure exists over the entire exposed face of the test sample after the first minute of the fire test.

5.5 Duration of Test. The test shall be conducted for a maximum period of 15 minutes or until the test sample falls away from the supporting construction, disintegrates, or allows the passage of fire.

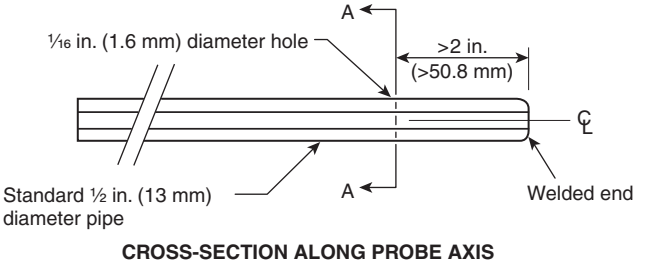
5.6 Test Parameter. Materials intended for use as flame breaks shall be tested in accordance with Section 5.6.

5.6.1 After the test sample is mounted on the test sample supporting structure and placed on top of the furnace over the furnace opening, one sheet of standard newsprint having dimensions of 9 in. × 9 in. (228 mm × 228 mm) ±0.25 in. (6 mm) shall be placed on the unexposed face of the test sample in the center of each of the two quadrants.



1000°F (583°C) ..... at 5 minutes
1300°F (704°C) ..... at 10 minutes
1399°F (760°C) ..... at 15 minutes
1462°F (795°C) ..... at 20 minutes
1510°F (821°C) ..... at 25 minutes
1550°F (843°C) ..... at 30 minutes
1584°F (868°C) ..... at 35 minutes
1613°F (878°C) ..... at 40 minutes
1638°F (892°C) ..... at 45 minutes
1700°F (927°C) ..... at 1 hour
1792°F (978°C) ..... 1½ hours
1925°F (1052°C) ..... at 3 hours

FIGURE 5.1.1 Time-Temperature Curve.



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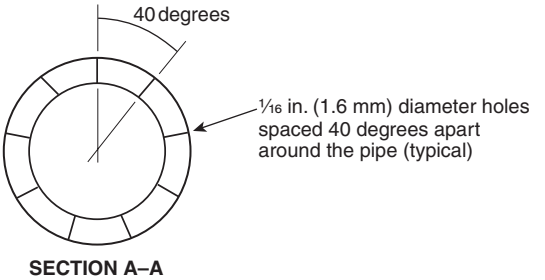

SECTION A–A

FIGURE 5.4.1 Furnace Pressure-Sensing Probe.

5.6.2 The standard newsprint shall be conditioned in the same manner as specified in Section 4.3 for the test sample.

Chapter 6 Determination of Flame Break Rating

6.1 Flame Break Rating. The flame break rating shall be determined as the time at which one of the following events first occurs and shall be rounded to the last whole minute:

(1) Flaming is observed on either of the pieces of newsprint placed on the unexposed surface of the test sample.
(2) Flaming or a visible glowing ember is observed on the unexposed face of the test sample.
(3) The test sample begins to deflect toward the furnace immediately prior to collapsing or disintegrating.

Chapter 7 Test Report

7.1 Test Report. A test report shall be documented and shall include not less than the following information:

(1) Name of the testing laboratory and the test date
(2) Names of the sponsor/customer, the manufacturer, and the material or construction (test sample) tested
(3) Documentation of how and when the test sample was prepared
(4) Temperature readings of the furnace thermocouples and a comparison to the standard time-temperature curve
(5) Pressure measurements in the furnace
(6) Observations made during the test by the laboratory personnel conducting the test, including the time when any of the events specified in Section 6.1 occurred
(7) Statement as to the flame break rating for the test sample based on the determination made in accordance with Chapter 6

7.2* Markings. It shall not be permitted to place the name, acronym or logo of the National Fire Protection Association (NFPA) or any other markings identifying the NFPA on: flame breaks; shelving assemblies with flame breaks; associated packaging or shipping cartons; and associated manufacturer or third party seals, labels, symbols or other markings.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1.1 Subsection 3.3.31 of NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles*, defines a *flame break*. Paragraph 7.3.15.3 of NFPA 1124 specifies where flame breaks are required to be installed within the display fixtures, shelving, cases, or counters where consumer fireworks are displayed for sale within a consumer fireworks retail sales facility or store. Because there was no standardized fire test method for flame breaks when the 2003 edition of NFPA 1124 was developed and subsequently published, A.7.3.15.3 provided guidance as to what materials could be considered for use as flame breaks and what they were intended to do during a fire involving the retail sales displays of consumer fireworks devices. This method of fire test is intended to provide a performance-based test for evaluating the fire performance of such flame breaks, thus eliminating the need for A.7.3.15.3 in NFPA 1124.

A.7.2 In the interest of advancing public safety, NFPA makes available this and other standards related to the distribution and retail sales of consumer fireworks for use in those jurisdictions where such sales are permitted. This provision, therefore, is intended to avoid any implication, direct or indirect, that the NFPA is associated with or endorses the sale, distribution or use of consumer fireworks.

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

B.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-74711.

NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles*, 2013 edition.

B.1.2 Other Publications. (Reserved)

B.2 Informational References. (Reserved)

B.3 References for Extracts in Informational Sections. (Reserved)

Index