NFPA 705
Recommended Practice for a Field Flame Test for Textiles and Films

1997 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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This edition of NFPA 705, *Recommended Practice for a Field Flame Test for Textiles and Films*, was prepared by the Technical Committee on Fire Tests and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 19–22, 1997, in Los Angeles, CA. It was issued by the Standards Council on July 24, 1997, with an effective date of August 15, 1997, and supersedes all previous editions.

This edition of NFPA 705 was approved as an American National Standard on August 15, 1997.

Origin and Development of NFPA 705

The 1993 edition of NFPA 705 was a complete revision of what was Chapter 10, Field Test: Match Flame Test, in the 1989 edition of NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*. Due to the lack of data demonstrating a relationship between the field match test and NFPA 701, small- or large-scale testing, the Committee determined it would be appropriate to create this document so as not to perpetuate any application of a correlation. The field match test does not incorporate the more rigorous laboratory testing methods incorporated into the small- and large-scale testing such as conditioning of specimen, reproducibility, and repeatability. The revisions to NFPA 705 incorporated an increase in safety precautions during the testing procedure, type of ignition source, and removal of sample prior to testing.

This 1997 edition of NFPA 705 is a reconfirmation of the earlier edition.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in membership may have occurred. A key to classifications is found at the back of this document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

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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 Appendix A.

Information on referenced publications can be found in Chapter 5.

Chapter 1 Introduction

1-1 Scope.

1-1.1 This recommended practice provides guidance to enforcement officials for the field application of an open flame to textiles and films (a) that have been in use in the field or (b) for which reliable laboratory data are not available.

1-1.2 There is no known correlation between this recommended practice and NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*, or full-scale fire behavior.

1-1.3 These recommendations apply to materials used in the interior of buildings, for protective outdoor coverings such as tarpaulins and tents, and for plastic films (with or without reinforcing or backing) used for decorative or other purposes inside buildings or as temporary or permanent enclosures for buildings under construction.

1-1.4 Materials applied to surfaces of buildings or backing materials as interior finishes in buildings should be tested and classified in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials.*

1-2 Purpose. The purpose of this recommended practice is to provide authorities having jurisdiction with a field means of determining the tendency of textiles and films to sustain burning subsequent to the application of a relatively small, open flame. The methods described herein and the results do not correlate with any known test method, and factors relating to reproducibility and correlation have not been determined; therefore, they should not be relied upon when more definitive test data are available.

1-3 Definitions.

Film. A flat section of a thermoplastic resin, a regenerated cellulose derivative, or other material that is extremely thin in comparison to its length and breadth and has a nominal maximum thickness of 0.01 in. (0.25 mm).

Kitchen Match. A piece of wood with a combustible mixture at its tip that bursts into flame through friction, with an approximate length of $2^{7}/_{16}$ in. (61.9 mm) and an approximate weight of 1 oz (29 g) per hundred.

Textile. A material made of natural or man-made fibers and used for the manufacture of items such as curtains, clothing, and furniture fittings.

Chapter 2 General

2-1 Application/Specific Limitations.

2-1.1* The field test method may be useful to regulatory officials as an indicator of whether a material being used or installed burns very easily or may be flame resistant as indicated by the following:

(a) Cessation of burning when the igniting flame is removed

(b) Failure to burn at all

(c) Continuing to burn nonaggressively after the igniting flame is removed

The field test method has utility only when the authority having jurisdiction has no reliable data and, therefore, is forced to rely solely on the field test findings.

2-1.2 There are only two types of materials for which the field test method can be deemed to provide foolproof and totally adequate results: those made entirely of noncombustible inorganic material and those that ignite and burn readily on exposure to a small flame. For example, with only limited experience, an inspector will have no difficulty in identifying an all-mineral fiber fabric by employing a small, open flame, and no other procedure is necessary. The only effect of a small fire exposure on a mineral fiber fabric is to burn off the surface coloring, if any, leaving the threads themselves virtually undamaged. This result is not obtained with any other type of decorative fabric and, therefore, is readily recognized. At the other extreme, if a material ignites and burns readily from the application of a small, open flame from a source such as a kitchen match, showing no semblance of flame resistance, no other procedure is necessary, since the material obviously is not acceptable.

2-1.3 Between these two extremes, the field test method has a limited and a varying degree of reliability. Within this large group, which comprises the great majority of materials the enforcement official is likely to encounter in the field, the most reliable results are obtained in the testing of cellulose-based materials (cotton, rayon, and paper) that are flame retardant treated with the common inorganic salt formulations. These materials retain their shape reasonably during testing, and the results are not greatly affected by differences in sample size or severity of fire exposure. However, the least-reliable results are obtained with chemically treated fabrics of synthetic fibers or flexible plastic films and laminates. These materials are subject to a variety of physical changes when exposed to fire, such as shrinking, curling, melting, elongating, and similar distortions, making the examination of small samples quite difficult and the results ambiguous. Furthermore, some of these thermoplastic materials are apt to appear flame resistant with small flame exposures but ignite and burn fiercely with longer exposures to larger ignition sources.

Chapter 3 Procedure

3-1* Materials.

3-1.1 Specimens should be samples removed from the existing material.

3-1.2 Specimens should be dry and should be a minimum of $^{1}/_{2}$ in. × 4 in. (12.7 mm × 101.6 mm).

3-2 Open Flame. The fire exposure should be from a common wood kitchen match or source with equivalent flame properties and should be applied for 12 seconds.

3-3* Method.

3-3.1 The test should be performed in a draft-free and safe location free of other combustibles.

3-3.2 The sample should be suspended (preferably by means of a spring clip, tongs, or similar device) with the long axis vertical, the flame supplied to the center of the bottom edge, and the bottom edge $^{1}/_{2}$ in. (12.7 mm) above the bottom of the flame.

3-3.3 After 12 seconds of exposure, the match is to be removed gently away from the sample.

3-4 Requirements. During the exposure, flaming should not spread over the complete length of the sample or in excess of 4 in. (101.6 mm) from the bottom of the sample (for larger size samples). There should be not more than 2 seconds of afterflame. Materials that break or drip flaming particles should be rejected if the materials continue to burn after they reach the floor.

Chapter 4 Summary

4-1 Limitations. The deficiencies and limitations of the field test method can lead to misleading or erroneous results, and the error can be in both directions. It is quite possible to have a too-small sample show several seconds of afterflaming, causing the material to be rejected. It is equally possible for improper or inadequate field procedures to indicate satisfactory flame resistance. This can result in dangerous errors.

4-2 Precautions. Field procedures are useful, but they must be used with good judgment and their limitations should be recognized. Field tests should not be relied on as the sole means for ensuring adequate flame resistance of decorative materials, but, they are useful in augmenting a comprehensive regulatory program.

Chapter 5 Referenced Publications

5-1 The following documents or portions thereof are referenced within this recommended practice and should be considered as part of its recommendations. The edition indicated for each referenced document is the current edition as of the date of the NFPA issuance of this recommended practice.

5-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 1996 edition.

NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*, 1996 edition.

Appendix A Explanatory Material

This appendix is not a part of the recommendations of this NFPA document but is included for informational purposes only.

A-2-1.1 By far, the greatest benefit can be derived from the field test method when the inspector has had the opportunity to practice and experiment on a variety of decorative materials and particularly to make comparisons between the results of laboratory tests performed in accordance with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*, and the less precise field test method. Experience is the best teacher, and it is strongly recommended that inspectors who may be involved in this activity familiarize themselves with a wide variety of treated and inherently flame-resistant fabrics of many types and their typical behavior under a variety of test conditions. With this background, the inspector possesses a greater capability for properly interpreting field test results.

A-3-1 A difficult and controversial question concerns the minimum number of specimens that should be tested. The answer can be dictated by a number of factors. A good general rule is the more specimens, the better; but, in all cases, the inspector should exercise good judgment. The variety of circumstances that can be encountered can be illustrated by some specific examples:

(a) A dance in a school gymnasium, decorated by students with a profusion of paper banners, crepe paper streamers, figures made of pieces of tissue paper stuffed in chicken wire molds, hay and straw, painted fabrics, dry palm fronds, and similar products, all alleged to be flame resistant: In this situation, the inspector has neither reason nor excuse to be inhibited in taking samples for tests. The materials are inexpensive and are unlikely to be reused. Taking samples for tests will cause little if any change to the decorative effect.

(b) A large assembly tent made of supposedly treated canvas but with no identifying marks and no confirming evidence of such treatment: The life hazard is acute, tent canvas can readily be patched, and, therefore, the situation warrants nothing less-than-sufficient samples from all sections of canvas for the inspector to be satisfied that the quality and uniformity of the treatment are acceptable.

(c) A nightclub with very expensive draperies known to be adequately flame retardant treated when installed two years previously: The only way to be certain that the quality of flame resistance remains acceptable is to take a sample, but in the interest of maintaining good public relations, the inspector should be diplomatic and persuasive. Usually, a place can be found where a small but adequate sample can be extracted without causing any visible damage. Often this is the most the inspector can expect to get.

A-3-3 There can be complications of a technical nature. Decorative fabrics sometimes are installed overhead, in or near a horizontal position. Some plastic films or fabrics woven of thermoplastic synthetic fibers will successfully resist continued burning in the normal vertical position of test, but will exhibit continued burning if exposed in a horizontal position. Fabrics or films installed horizontally may be a serious threat to safety in a fire situation, and, therefore, the inspector is justified in testing the material in a horizontal position.

A somewhat similar problem can exist with some of the new and increasingly popular decorative fabrics with one or more types of fibers in the threads along the length (warp) and different fibers in the threads along the width (fill). This can result in a different burning behavior in the two directions of the fabric. In some fabrics where a flame-retardant treatment has been applied, tests for flame resistance in one direction may be acceptable, but the fabric could show continued burning in the other direction. Where visual examination of the fabric indicates this condition might exist, the inspector should test samples cut with the long dimension paralleling both the length and width of the fabric.