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NFPA 705 Field Flame Test for Textiles and Films 1993 Edition

National Fire Protection Association 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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Statement on NFPA Procedures

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RP, G-FM-92

NFPA 705

Recommended Practice for a

Field Flame Test for Textiles and Films

1993 Edition

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 Fall Meeting held November 16-18, 1992, in Dallas, TX. It was issued by the Standards Council on January 15, 1993, with an effective date of February 12, 1993, and supersedes all previous editions.

The 1993 edition of this document has been approved by the American National Standards Institute.

Origin and Development of NFPA 705

The new NFPA 705 is a complete revision of NFPA 701, Chapter 10, Field Test: Match Flame Test. 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 incorporate an increase in safety precautions during the testing procedure, type of ignition source, and removal of sample prior to testing.

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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 the membership may have occurred.

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.

Committee Scope: To develop standards for fire testing procedures when such standards are not available; review existing fire test standards and recommend appropriate action to NFPA; recommend the application of and advise on the interpretation of acceptable test standards for fire problems of concern to NFPA technical committees and members; act in a liaison capacity between NFPA and the committees of other organizations writing fire test standards. The Committee is not responsible for fire tests that are used to evaluate extinguishing agents, devices or systems.

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NFPA 705

Recommended Practice for a

Field Flame Test for Textiles and Films

1993 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph 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 (1) that have been in use in the field or (2) 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 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 (a) cessation of burning when the igniting flame is removed, (b) failure to burn at all, or (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, comprising 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) 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 ½ 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 ½ 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 two 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 recognized. Field tests should not be relied on as the sole means for ensuring adequate flame resistance of decorative materials but 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 part of the recommendations of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

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*, 1990 edition

NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*, 1989 edition

Appendix A

This Appendix is not a part of the requirements of this NFPA document, but is included for information 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, are likely not intended to be reused, and 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 warrents 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 widths (fill). This can result in a different burning behavior in the two directions of the fabric to the extent that, 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.

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SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

Note: All proposals must be received by 5:00 p.m. E.S.T./E.D.S.T. on the published proposal closing date.

INSTRUCTIONS

Use a separate proposal form for submitting each proposed amendment.

1. Type or print legibly in black ink.

2. Indicate the number, edition year, and title of the document. Also indicate the specific section or paragraph that the proposed amendment applies to.

3. Check the appropriate box to indicate whether this proposal recommends adding new text, revising existing text, or deleting text.

4. In the space identified as "Proposal" indicate the exact wording you propose as new or revised text, or the text you propose be deleted.

5. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal. Include copies of test results, research papers, fire experience, or other materials that substantiate your recommendation.

6. Check the appropriate box to indicate whether or not this proposal is original material, and if it is not, indicate the source of the material.

7. Sign the proposal.

If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee. The technical committee is authorized to abstract the "Statement of Problem and Substantiation for Proposal" if it exceeds 200 words for publication in the Technical Committee Reports.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.

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Note: All proposals must be received by 5:00 p.m. E.S.T./E.D.S.T. on the published proposal closing date.

Date 5/18/85 **Name** John B. Smith **Tel. No.** 617-555-1212

Address 9 Seattle St.. Seattle, WA 02255

Representing (Please indicate organization, company or self) Fire Marshals Assn. of North America

1. a) Document Title: Protective Signaling Systems **NFPA No. & Year** NFPA 72D

b) Section/Paragraph: 2-7.1 (Exception)

FOR OFFICE USE ONLY
Log #:
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2. Proposal recommends: (Check one)
☐ **new text**
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3. Proposal (include proposed new or revised wording, or identification of wording to be deleted):

Delete exception.

4. Statement of Problem and Substantiation for Proposal:

A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

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