

NFPA® 276

Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components

2011 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA® DOCUMENTS
NOTICE AND DISCLAIMER OF LIABILITY CONCERNING THE USE OF NFPA DOCUMENTS

NFPA® codes, standards, recommended practices, and guides (“NFPA Documents”), of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in NFPA Documents.

The NFPA disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on NFPA Documents. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making NFPA Documents available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of NFPA Documents. Nor does the NFPA list, certify, test, or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

ISBN: 978-161665071-1 (Print)
ISBN: 978-161665090-2 (PDF)

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA DOCUMENTS

ADDITIONAL NOTICES AND DISCLAIMERS

Updating of NFPA Documents

Users of NFPA codes, standards, recommended practices, and guides (“NFPA Documents”) should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of Tentative Interim Amendments. An official NFPA Document at any point in time consists of the current edition of the document together with any Tentative Interim Amendments and any Errata then in effect. In order to determine whether a given document is the current edition and whether it has been amended through the issuance of Tentative Interim Amendments or corrected through the issuance of Errata, consult appropriate NFPA publications such as the National Fire Codes® Subscription Service, visit the NFPA website at www.nfpa.org, or contact the NFPA at the address listed below.

Interpretations of NFPA Documents

A statement, written or oral, that is not processed in accordance with Section 6 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Patents

The NFPA does not take any position with respect to the validity of any patent rights referenced in, related to, or asserted in connection with an NFPA Document. The users of NFPA Documents bear the sole responsibility for determining the validity of any such patent rights, as well as the risk of infringement of such rights, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on NFPA Documents.

NFPA adheres to the policy of the American National Standards Institute (ANSI) regarding the inclusion of patents in American National Standards (“the ANSI Patent Policy”), and hereby gives the following notice pursuant to that policy:

NOTICE: The user’s attention is called to the possibility that compliance with an NFPA Document may require use of an invention covered by patent rights. NFPA takes no position as to the validity of any such patent rights or as to whether such patent rights constitute or include essential patent claims under the ANSI Patent Policy. If, in connection with the ANSI Patent Policy, a patent holder has filed a statement of willingness to grant licenses under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, copies of such filed statements can be obtained, on request, from NFPA. For further information, contact the NFPA at the address listed below.

Law and Regulations

Users of NFPA Documents should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of its codes, standards, recommended practices, and guides, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

NFPA Documents are copyrighted by the NFPA. They are made available for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of safe practices and methods. By making these documents available for use and adoption by public authorities and private users, the NFPA does not waive any rights in copyright to these documents.

Use of NFPA Documents for regulatory purposes should be accomplished through adoption by reference. The term “adoption by reference” means the citing of title, edition, and publishing information only. Any deletions, additions, and changes desired by the adopting authority should be noted separately in the adopting instrument. In order to assist NFPA in following the uses made of its documents, adopting authorities are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. For technical assistance and questions concerning adoption of NFPA Documents, contact NFPA at the address below.

For Further Information

All questions or other communications relating to NFPA Documents and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA documents during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02169-7471; email: stds_admin@nfpa.org

For more information about NFPA, visit the NFPA website at www.nfpa.org.

Copyright © 2010 National Fire Protection Association®. All Rights Reserved.

NFPA® 276

Standard

**Method of Fire Test for Determining the Heat Release Rate
of Roofing Assemblies with Combustible Above-Deck
Roofing Components**

2011 Edition

This edition of NFPA 276, *Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components*, was prepared by the Technical Committee on Fire Tests. It was issued by the Standards Council on July 2, 2010, with an effective date of July 22, 2010.

This edition of NFPA 276 was approved as an American National Standard on July 22, 2010.

Origin and Development of NFPA 276

Fires involving roof deck assemblies have resulted in significant losses and damage to buildings and structures that otherwise had fire protection systems, construction features, or both in place to minimize the spread of fire. Perhaps the most famous of those fires is the 1953 fire at the General Motors Corporation facility in Livonia, MI. Analysis of that fire indicated that, while the exterior roof surface might have been able to minimize the propagation of fire, the interior portions of the roof decking that included combustible materials installed on the deck allowed the fire to spread along the interior underside of the roof deck assembly.

Although insurance company interests developed some test protocols to address the spread of fire along the underside of steel roof decks, no national test or evaluation standard had been devised to address this potential concern until 2006, when NFPA 276 was proposed. The fire performance of the roof assembly is evaluated by measuring the heat release rate below the roof deck where the assembly incorporates combustible construction components, a common construction technique.

The protocol includes a fire exposure test and an evaluation test with an auxiliary fuel package. To properly characterize the performance of the roof assembly, NFPA 276 specifies the requisite provisions for the furnace construction and configuration; instrumentation needs; size, attributes, and conditioning of the test sample; calibration of the furnace; procedure for running the tests; and the reporting requirements to describe the test results.

NFPA 276 can be referenced in model building codes, state or local regulations, and private sector loss prevention policies to allow for a full and complete evaluation of these common roofing assemblies.



Documents

Document Sharing Hub

Technical Committee on Fire Tests

William E. Fitch, *Chair*
Phyrefish Enterprises, Inc., [SE]

Farid Alfawakhiri, American Iron and Steel Institute, IL [M]

Barry L. Badders, Jr., Southwest Research Institute, TX [RT]

Jesse J. Beitel, Hughes Associates, Inc., MD [SE]

Robert G. Bill, Jr., FM Global, MA [I]

Gordon H. Damant, Inter-City Testing & Consulting Corp. of California, CA [SE]

Thomas W. Fritz, Armstrong World Industries, Inc., PA [M]

Gordon E. Hartzell, Hartzell Consulting, Inc., TX [SE]

Marcelo M. Hirschler, GBH International, CA [SE]

Alfred J. Hogan, Winter Haven, FL [E]

Rep. International Fire Marshals Association

William E. Koffel, Koffel Associates, Inc., MD [SE]

James R. Lawson, National Institute of Standards and Technology, MD [RT]

Michael E. Luna, Intertek, TX [RT]

Rodney A. McPhee, Canadian Wood Council, Canada [M]

Frederick W. Mowrer, University of Maryland, MD [SE]

David T. Sheppard, U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives, MD [RT]

Dwayne E. Sloan, Underwriters Laboratories Inc., NC [RT]

Kuma Sumathipala, American Forest & Paper Association, DC [M]

T. Hugh Talley, Hugh Talley Company, TN [M]

Rep. Upholstered Furniture Action Council

Rick Thornberry, The Code Consortium, Inc., CA [SE]

Robert A. Wessel, Gypsum Association, MD [M]

Alternates

Scott W. Adams, Park City Fire Service District, UT [E]

(Alt. to A. J. Hogan)

Robert M. Berhinig, Underwriters Laboratories Inc., IL [RT]

(Alt. to D. E. Sloan)

Richard J. Davis, FM Global, MA [I]

(Alt. to R. G. Bill, Jr.)

David M. Ewan, Southwest Research Institute, TX [RT]

(Alt. to B. L. Badders, Jr.)

Sam W. Francis, American Forest & Paper Association, PA [M]

(Alt. to K. Sumathipala)

Richard G. Gann, National Institute of Standards and Technology, MD [RT]

(Alt. to J. R. Lawson)

Paul A. Hough, Armstrong World Industries, Inc., PA [M]

(Alt. to T. W. Fritz)

James K. Lathrop, Koffel Associates, Inc., CT [SE]

(Alt. to W. E. Koffel)

James A. Milke, University of Maryland, MD [SE]

(Alt. to F. W. Mowrer)

Arthur J. Parker, Hughes Associates, Inc., MD [SE]

(Alt. to J. J. Beitel)

Deggary N. Priest, Intertek, TX [RT]

(Alt. to M. E. Luna)

Robert J. Wills, American Iron and Steel Institute, AL [M]

(Alt. to F. Alfawakhiri)

Joe Ziolkowski, American Furniture Manufacturers Association, NC [M]

(Alt. to T. H. Talley)

Nonvoting

Robert H. Barker, American Fiber Manufacturers Association, VA [M]

Rohit Khanna, U.S. Consumer Product Safety Commission, MD [C]

Gregory E. Harrington, NFPA Staff Liaison

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

Committee Scope: This Committee shall have primary responsibility for documents on fire testing procedures, for reviewing existing fire test standards and recommending appropriate action to NFPA, for recommending the application of and advising on the interpretation of acceptable test standards for fire problems of concern to NFPA technical committees and members, and for acting in a liaison capacity between NFPA and the committees of other organizations writing fire test standards. This Committee does not cover fire tests that are used to evaluate extinguishing agents, devices, or systems.



Contents

Chapter 1 Administration	276– 4	Chapter 7 Furnace Verification and Calibration	276– 7
1.1 Scope	276– 4	7.1 Verification of Operation Using Blank Test Specimen	276– 7
1.2 Purpose	276– 4	7.2 Calibration Using Calibration Specimen	276– 7
1.3 Application	276– 4	7.3 Preheating	276– 7
Chapter 2 Referenced Publications	276– 4	7.4 Blank Specimen Test Procedure	276– 7
2.1 General	276– 4	7.5 Calibration Test Procedure	276– 8
2.2 NFPA Publications	276– 4	Chapter 8 Conduct of Tests	276– 9
2.3 Other Publications	276– 4	8.1 Calibration Using Calibration Test Specimen	276– 9
2.4 References for Extracts in Mandatory Sections. (Reserved)	276– 4	8.2 Verification Using Blank Specimen	276– 9
Chapter 3 Definitions	276– 4	8.3 Testing	276– 9
3.1 General	276– 4	8.4 Acceptance Criteria	276– 9
3.2 NFPA Official Definitions	276– 4	Chapter 9 Report	276–10
3.3 General Definitions	276– 5	9.1 Data and Information	276–10
Chapter 4 Test Furnace	276– 5	9.2 Calibration Information	276–10
4.1 Furnace Construction	276– 5	9.3 Test Specimen Materials	276–10
4.2 Burner Fuels and Supply Air	276– 5	9.4 Main Burner Fuel Flow	276–10
Chapter 5 Instrumentation	276– 6	9.5 Flue Gas Temperatures	276–10
5.1 Thermocouples	276– 6	9.6 Auxiliary Burner Fuel Flow	276–10
5.2 Pressure Measurement	276– 6	9.7 Heat Release Rate	276–10
Chapter 6 Test Specimens and Conditioning	276– 6	9.8 Visual Observations	276–10
6.1 Blank Test Specimen	276– 6	9.9 Internal Component Description	276–10
6.2 Calibration Specimen	276– 6	9.10 Discussion of Performance	276–10
6.3 Test Specimen	276– 7	Annex A Explanatory Material	276–10
6.4 Conditioning	276– 7	Annex B Informational References	276–11
		Index	276–12