

NFPA 291

Recommended Practice for Fire Flow Testing and Marking of Hydrants

2007 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, 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 its codes and standards.

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 this document. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this document 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 this document. 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.

ADDITIONAL NOTICES AND DISCLAIMERS

Updating of NFPA Documents

Users of NFPA codes, standards, recommended practices, and guides should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of Tentative Interim Amendments.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 asserted in connection with any items which are mentioned in or are the subject of NFPA codes, standards, recommended practices, and guides, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on these documents. Users of these documents are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

NFPA adheres to applicable policies of the American National Standards Institute with respect to patents. For further information contact the NFPA at the address listed below.

Law and Regulations

Users of these 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

This document is copyrighted by the NFPA. It is 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 this document available for use and adoption by public authorities and private users, the NFPA does not waive any rights in copyright to this document.

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 codes, standards, recommended practices, and guides 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 02269-9101.

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

Copyright © 2006 National Fire Protection Association. All Rights Reserved.

NFPA 291

Recommended Practice for Fire Flow Testing and Marking of Hydrants

2007 Edition

This edition of NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants*, was prepared by the Technical Committee on Private Water Supply Piping Systems and released by the Technical Correlating Committee on Automatic Sprinkler Systems. It was issued by the Standards Council on July 28, 2006, with an effective date of August 17, 2006, and supersedes all previous editions.

This edition of NFPA 291 was approved as an American National Standard on August 17, 2006.

Origin and Development of NFPA 291

The NFPA Committee on Public Water Supplies for Private Fire Protection presented the idea of indicating the relative available fire service water supply from hydrants in its 1934 report. The Committee felt then and feels now that such an indication is of substantial value to water and fire departments. The following recommendations were initially adopted in 1935. The Committee agreed that tests of individual hydrants did not give as complete and satisfactory results as group testing but expressed the opinion that tests of individual hydrants did have sufficient value to make the following recommendations worthy of adoption. This was reconfirmed with minor editorial changes in 1974.

The 1977 edition was completely rewritten and a chapter on the flow testing of hydrants was added.

The 1982 edition was reconfirmed by the Committee. The 1988 edition of the document noted several changes that clarified and reinforced certain recommendations. Specific guidance was added on the correct method of utilizing a pitot tube to gain accurate test results.

The 1995 edition incorporated several changes in an attempt to make the document more user friendly. Changes were also incorporated with regard to the layout of hydrant and water flow tests.

The 2002 edition clarified the recommendations for flow tests and was restructured to comply with the *Manual of Style for NFPA Technical Committee Documents*.

The 2007 edition represents a reconfirmation of the 2002 edition, as there are no technical changes.

Technical Correlating Committee on Automatic Sprinkler Systems (AUT-AAC)

John G. O'Neill, Chair

The Protection Engineering Group, PC, VA [SE]

Christian Dubay, Nonvoting Secretary

National Fire Protection Association, MA

Jose R. Baz, International Engineered Systems Limited, Inc., FL [M]

Rep. NFPA Latin American Section

Kerry M. Bell, Underwriters Laboratories Inc., IL [RT]

Russell P. Fleming, National Fire Sprinkler Association, NY [M]

Scott T. Franson, The Viking Corporation, MI [M]

Raymond A. Grill, The RJA Group, Inc., NC [SE]

James B. Harmes, Grand Blanc Fire Department, MI [E]

Rep. International Association of Fire Chiefs

Luke Hilton, Liberty Mutual Property, FL [I]

Alex Hoffman, Viking Fire Protection Inc., Canada [IM]

Rep. Canadian Automatic Sprinkler Association

Roland J. Huggins, American Fire Sprinkler Association, Inc., TX [IM]

Sultan M. Javeri, SC Engineering, France [IM]

Andrew Kim, National Research Council of Canada, Canada [RT]

Joe W. Noble, Clark County Fire Department, NV [E]

Rep. International Fire Marshals Association

Eric Packard, Local 669 JATC Education Fund, MD [L]

Rep. United Association of Journeymen & Apprentices of the Plumbing & Pipe Fitting Industry of the U.S. & Canada

Chester W. Schirmer, Schirmer Engineering Corporation, NC [I]

Robert D. Spaulding, FM Global, MA [I]

Rep. FM Global

Lynn K. Underwood, Axis U.S. Property, IL [I]

Alternates

Donald "Don" D. Becker, RJC & Associates, Inc., MO [IM]

(Alt. to R. J. Huggins)

George Capko, Jr., FM Global, MA [I]

(Alt. to R. D. Spaulding)

Randall S. Chaney, Liberty Mutual Property, CA [I]

(Alt. to L. Hilton)

Kenneth E. Isman, National Fire Sprinkler Association, NY [M]

(Alt. to R. P. Fleming)

George E. Laverick, Underwriters Laboratories Inc., IL [RT]

(Alt. to K. M. Bell)

Donald C. Moeller, The RJA Group, Inc., CA [SE]

(Alt. to R. A. Grill)

Garner A. Palenske, Schirmer Engineering Corporation, CA [I]

(Alt. to C. W. Schirmer)

Donato A. Pirro, Electro Sistemas De Panama, S.A., Panama [M]

(Alt. to J. R. Baz)

J. Michael Thompson, The Protection Engineering Group, PC, VA [SE]

(Alt. to J. G. O'Neill)

Nonvoting

Antonio C. M. Braga, FM Global, CA [I]

Rep. TC on Hanging and Bracing of Water-Based Systems

Edward K. Budnick, Hughes Associates, Inc., MD [SE]

Rep. TC on Sprinkler System Discharge Criteria

Robert M. Gagnon, Gagnon Engineering, MD [SE]

Rep. TC on Foam-Water Sprinklers

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

Rep. Safety to Life Correlating Committee

Kenneth W. Linder, GE Global Asset Protection Services, CT [I]

Rep. TC on Sprinkler System Installation Criteria

Christian Dubay, 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 overall responsibility for documents that pertain to the criteria for the design and installation of automatic, open and foam-water sprinkler systems including the character and adequacy of water supplies, and the selection of sprinklers, piping, valves, and all materials and accessories. This Committee does not cover the installation of tanks and towers, nor the installation, maintenance, and use of central station, proprietary, auxiliary, and local signaling systems for watchmen, fire alarm, supervisory service, nor the design of fire department hose connections.



Technical Committee on Private Water Supply Piping Systems (AUT-PRI)

J. William Sheppard, *Chair*
General Motors Corporation, MI [U]
Rep. NFPA Industrial Fire Protection Section

Christian Dubay, *Nonvoting Secretary*
National Fire Protection Association, MA

James B. Biggins, Marsh Risk Consulting, IL [I]
Richard W. Bonds, Ductile Iron Pipe Research Association, AL [M]
Phillip A. Brown, American Fire Sprinkler Association, Inc., TX [IM]
Richard R. Brown, Brown Sprinkler Corporation, KY [IM]
Rep. National Fire Sprinkler Association
Stephen A. Clark, Jr., Allianz Risk Consultants, GA [I]
Brandon W. Frakes, GE Insurance Solutions, NC [I]
Robert M. Gagnon, Gagnon Engineering, MD [SE]
David M. Gough, Global Risk Consultants Corporation, CT [SE]
Luke Hilton, Liberty Mutual Property, FL [I]
Rep. Property Casualty Insurers Association of America
Gerald Kelliher, Westinghouse Savannah River Company, SC [U]
Kevin J. Kelly, National Fire Sprinkler Association, NY [M]

Marshall A. Klein, Marshall A. Klein & Associates, Inc., MD [SE]
Alan R. Laguna, Merit Sprinkler Company, Inc., LA [IM]
John Lake, Marion County Fire Rescue, FL [E]
George E. Laverick, Underwriters Laboratories Inc., IL [RT]
James M. Maddry, James M. Maddry, P.E., GA [SE]
Kevin D. Maughan, Tyco Fire & Building Products, RI [M]
David S. Mowrer, HSB Professional Loss Control, TN [I]
Robert A. Panero, Pacific Gas and Electric Company, CA [U]
Rep. Edison Electric Institute
Sam (Sat) Salwan, Environmental Systems Design, Inc., IL [SE]
James R. Schifiliti, Fire Safety Consultants, Inc., IL [IM]
Rep. Illinois Fire Prevention Association
James W. Simms, The RJA Group, Inc., CA [SE]

Alternates

Mark A. Bowman, GE Insurance Solutions, OH [I]
(Alt. to B. W. Frakes)
James K. Clancy, The RJA Group, Inc., CA [SE]
(Alt. to J. W. Simms)
W. Clark Gey, Wayne Automatic Fire Sprinklers, Inc., FL [IM]
(Alt. to R. R. Brown)
David M. Hammerman, Marshall A. Klein & Associates, Inc., MD [SE]
(Alt. to M. A. Klein)

Charles F. Hill, Ryan Fire Protection, Inc., IN [M]
(Alt. to K. J. Kelly)
Blake M. Shugarman, Underwriters Laboratories Inc., IL [RT]
(Alt. to G. E. Laverick)
Lawrence Thibodeau, Hampshire Fire Protection Company Inc., NH [IM]
(Alt. to P. A. Brown)

Nonvoting

Geoffrey N. Perkins, Bassett Consulting Engineers, Australia [SE]

Christian Dubay, 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 the primary responsibility for documents on private piping systems supplying water for fire protection and for hydrants, hose houses, and valves. The Committee is also responsible for documents on fire flow testing and marking of hydrants.

Contents

Chapter 1 Administration	291- 5	4.2 Procedure	291- 6
1.1 Scope	291- 5	4.3 Layout of Test	291- 6
1.2 Purpose	291- 5	4.4 Equipment	291- 6
1.3 Application	291- 5	4.5 Test Procedure	291- 7
1.4 Units	291- 5	4.6 Pitot Readings	291- 7
Chapter 2 Referenced Publications	291- 5	4.7 Determination of Discharge	291- 7
2.1 General	291- 5	4.8 Use of Pumper Outlets	291- 7
2.2 NFPA Publications. (Reserved)	291- 5	4.9 Determination of Discharge Without a Pitot	291- 8
2.3 Other Publications	291- 5	4.10 Calculation Results	291- 8
2.4 References for Extracts in Recommendations Sections. (Reserved)	291- 5	4.11 Data Sheet	291-11
Chapter 3 Definitions	291- 5	4.12 System Corrections	291-12
3.1 General	291- 5	Chapter 5 Marking of Hydrants	291-13
3.2 NFPA Official Definitions	291- 5	5.1 Classification of Hydrants	291-13
3.3 General Definitions	291- 5	5.2 Marking of Hydrants	291-13
Chapter 4 Flow Testing	291- 6	Annex A Explanatory Material	291-14
4.1 Rating Pressure	291- 6	Annex B Informational References (Reserved)	291-14
		Index	291-15