

NFPA 160

Standard for the Use of Flame Effects Before an Audience

2006 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Users of NFPA codes, standards, recommended practices, and guides should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of Tentative Interim Amendments.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 © 2005, National Fire Protection Association, All Rights Reserved

NFPA 160
Standard for the
Use of Flame Effects Before an Audience
2006 Edition

This edition of NFPA 160, *Standard for the Use of Flame Effects Before an Audience*, was prepared by the Technical Committee on Special Effects and acted on by NFPA at its June Association Technical Meeting held June 6–10, 2005, in Las Vegas, NV. It was issued by the Standards Council on July 29, 2005, with an effective date of August 18, 2005, and supersedes all previous editions.

This edition of NFPA 160 was approved as an American National Standard on August 18, 2005.

Origin and Development of NFPA 160

NFPA 160, *Standard for Flame Effects Before an Audience*, was developed by the Technical Committee on Special Effects, which was established in 1994, in response to a recognized need for a document to provide guidance to public safety officials, designers, and operators of flame effects. The purpose of this standard is to provide requirements for reasonable protection for viewing audiences and performers of flame effects.

For the 2001 edition, the Committee completed a partial revision of the standard. Revisions included amendments to standardized definitions, harmonization with the pyrotechnics special effects document, and editorial changes according to the *Manual of Style for NFPA Technical Committee Documents*.

The 2006 edition represents a complete revision of the standard by the Committee. Key changes found in the new edition include revisions to Chapter 3, Definitions; clarification of the document applicability by modifying the document title; definitions for temporary and permanent installations to correlate with the effect classifications based upon those terms; a new requirement for inspection intervals; and a new Annex C on inspection guidelines.

This edition of the standard also incorporates editorial changes according to the *Manual of Style for NFPA Technical Committee Documents*.

Technical Committee on Special Effects

G. Clark Parkhurst, Jr., *Chair*
Bristol, CT [SE]

Edgar C. Buckingham, *Secretary*
Honeywell Inc., CA [M]

Robert Bauer, The Doyle Street Group, CA [IM]
Glenn A. Birket, Birket Engineering, Inc., FL [M]
Jose R. Colon, Connecticut Department of Public Safety,
CT [E]
 Rep. International Fire Marshals Association
Steve A. Coman, RES Specialty Pyrotechnics Inc., MN [M]
 Rep. Pyrotechnics Guild International, Inc.
Ettore Contestabile, Natural Resources Canada, Canada
[RT]
Randall W. A. Davidson, Risk International & Associates,
Inc. CA [SE]
June M. Fields, Henderson, NV [SE]
Jon G. Fuller, Universal Studios, FL [U]
Steven A. Giovagnoli, GE Global Asset Protection
Services, IL [I]
Reuben Goldberg, Technic Services, CA [U]
 Rep. The Alliance of Special Effects & Pyrotechnic
Operators, Inc.
Jeremiah Harris, Harris Production Services/PRG, NY [U]
Kenneth L. Kosanke, PyroLabs, Inc. CO [SE]
Joshua Lazarus, State of New Jersey, NJ [E]

Dave McCulloch, Natural Resources Canada, Canada [E]
Thaine Morris, MP Associates, Inc., CA [M]
Andrew T. Nicholls, Orlando Special Effects, Inc., FL [M]
John T. Rodgers, John T. Rodgers, P.E., CA [M]
Monona Rossol, Arts, Crafts & Theater Safety, Inc., NY
[SE]
R. Scott Schaffner, RADCO, CA [RT]
Larry Schoeneman, Interesting Products, IL [SE]
 Rep. Entertainment Services and Technology
Association (ESTA)
David S. Shatzer, U.S. Bureau of Alcohol, Tobacco,
Firearms, and Explosives, DC [E]
James H. Stannard, Jr., Stannard & Company, GA [SE]
Martin E. Steinke, Busch Entertainment Corporation, FL
[U]
Charles P. Weeth, Weeth & Associates, LLC, WI [SE]
Lawrence Weinman, Luna Tech/Schneider-Weinman
Consultants, AL [M]
Tylor A. Wymer, WOW!WorksSM, A Buckley/Wymer
Company, FL [U]
William J. Young, Superior Energy Systems, Ltd., OH [M]
 Rep. National Propane Gas Association

Alternates

Damon H. Andrew, Busch Entertainment Corporation,
MO [U]
 (Alt. to M. E. Steinke)
Gary R. Barnes, Universal Studios, FL [U]
 (Alt. to J. G. Fuller)
Daniel Birket, Birket Engineering, Inc., FL [M]
 (Alt. to G. A. Birket)
Gregory V. Dumansky, GE Global Asset Protection
Services, CA [I]
 (Alt. to S. A. Giovagnoli)
Bonnie J. Kosanke, Journal of Pyrotechnics, Inc., CO
[SE]
 (Alt. to K. L. Kosanke)
Gregory Meeh, Jauchem & Meeh Inc., NY [U]
 (Alt. to J. Harris)
Robert B. Nicholson III, Eastern Propane Corporation,
NJ [M]
 (Alt. to W. J. Young)

Mark C. Orellana, Penn Township, Indiana Fire
Department, IN [E]
 (Alt. to J. R. Colon)
David J. Pier, MP Associates, Inc., CA [M]
 (Alt. to T. Morris)
Elia P. Popov, J.E.M. F/X Inc., CA [M]
 (Alt. to E. C. Buckingham)
Karl G. Ruling, Entertainment Services & Technology
Association, NY [SE]
 (Alt. to L. Schoeneman)
John R. Steinberg, Pyrotechnics Guild International, Inc.,
MD [M]
 (Alt. to S. A. Coman)
Michael L. Ziemann, RADCO, CA [RT]
 (Alt. to R. S. Schaffner)

Nonvoting

Virginia M. Gilman, U.S. Department of Labor, DC [E]
 Rep. Occupational Safety & Health Administration
 (Alt. to M. W. Hagemann)

Mark W. Hagemann, U.S. Department of Labor, DC [E]
 Rep. Occupational Safety & Health Administration

Guy R. Colonna, 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 the controlled use of flame, pyrotechnics, or other means of special effects for entertainment, exhibition, demonstration, or simulation before a proximate audience; and the design, fabrication, installation, testing, control, operation, and maintenance of user equipment, fuel storage, and sources for special effects before a proximate audience. This Committee does not have responsibility for documents on hazards other than those involving a proximate audience and the life safety considerations of the audience.

Contents

Chapter 1 Administration	160- 4	7.7 Post-Show Operations	160- 8
1.1 Scope	160- 4	7.8 Maintenance	160- 8
1.2 Purpose	160- 4	7.9 Emergency Operations	160- 8
1.3 Application	160- 4	7.10 Protective Clothing	160- 8
1.4 Retroactivity	160- 4	7.11 Security	160- 8
1.5 Equivalency	160- 4		
Chapter 2 Referenced Publications	160- 4	Chapter 8 Flame Effect Operator	160- 8
2.1 General	160- 4	8.1 Operator Qualifications	160- 8
2.2 NFPA Publication	160- 4	8.2 Operator Responsibilities	160- 8
2.3 Other Publications	160- 4	8.3 Substance Abuse and Safety	160- 8
2.4 References for Extracts in Mandatory Sections. (Reserved)	160- 4	8.4 Minimum Age	160- 8
Chapter 3 Definitions	160- 5	Chapter 9 System Components, Flame Effect Control Systems, and Design	160- 8
3.1 General	160- 5	9.1 General Requirements for Flame Effect Control System Design	160- 8
3.2 NFPA Official Definitions	160- 5	9.2 Specific Requirements for Flame Effect Control System Design and Operation, by Group	160- 9
3.3 General Definitions	160- 5	9.3 Implementation of the Required Control Functions	160- 9
Chapter 4 Holding Areas for Flame Effect Materials and Devices	160- 6	Chapter 10 System Installation and Testing	160-12
4.1 General	160- 6	10.1 General	160-12
4.2 Holding Areas	160- 6	10.2 Pressure Testing and Inspection of Piping	160-12
Chapter 5 Permit and Approval Requirements and Terms of Installation	160- 6	10.3 Temperatures of Components	160-12
5.1 Permit Requirements	160- 6	Chapter 11 Fire Protection Provisions	160-12
5.2 Approval Requirements	160- 7	11.1 General	160-12
5.3 Content of Flame Effect Plans	160- 7	11.2 Evaluation for Permanently Installed Flame Effects	160-12
5.4 Flame Effect Demonstration	160- 7	11.3 Additional Fire Safety Provisions for Temporary Installations	160-12
5.5 Interruption of Fire Protection and Life Safety Systems During Flame Effect Demonstrations and Operations	160- 7	11.4 Standby Fire Safety Personnel Requirements	160-12
Chapter 6 Documentation of Flame Effects	160- 7	Annex A Explanatory Material	160-13
6.1 General	160- 7	Annex B Design of Flame Effects	160-19
6.2 Operating Procedures	160- 7	Annex C Inspection Guidelines	160-19
Chapter 7 Use of Flame Effects	160- 8	Annex D Informational References	160-21
7.1 Testing and Evaluation	160- 8	Index	160-22
7.2 Housekeeping	160- 8		
7.3 Site Inspection	160- 8		
7.4 Smoking	160- 8		
7.5 Rehearsal and Pre-Show Operations	160- 8		
7.6 Show Operations	160- 8		

NFPA 160

Standard for the

Use of Flame Effects Before an Audience

2006 Edition

IMPORTANT NOTE: This NFPA document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading "Important Notices and Disclaimers Concerning NFPA Documents." They can also be obtained on request from NFPA or viewed at www.nfpa.org/disclaimers.

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 D.

Chapter 1 Administration

1.1* Scope. This standard shall provide requirements for the protection of the audience, support personnel, performers, the operator, assistants, and property where flame effects are used.

1.2 Purpose. The purpose of this standard shall be to provide minimum requirements for the design, manufacture, and operation of flame effects.

1.3 Application.

1.3.1* This standard shall apply to flame effects for entertainment, exhibition, demonstration, or simulation before an audience, including their design, fabrication, installation, testing, control, operation, and maintenance.

1.3.2 This standard shall apply to the following:

- (1) Use of flame effects before an audience (*see 3.3.11, Flame Effect*)
- (2) Design, fabrication, installation, testing, control, operation, and maintenance of equipment, materials, procedures, and systems used to produce flame effects
- (3) Rehearsal, videotaping, audiotaping, or filming of any television, radio, or movie production if such production is before an audience and includes the use of flame effects
- (4) Rehearsal of any production incorporating flame effects intended to be presented before an audience
- (5) Storage and holding at a venue where flammable and combustible materials are to be used to create flame effects

1.3.3 This standard shall not apply to the following:

- (1) Flame effects produced solely by pyrotechnic special effects devices
- (2)*Use of pyrotechnic special effects
- (3)*Storage of flammable solids, liquids, and gases not to be used to create flame effects
- (4) Manufacture, off-site storage, and transportation of materials and equipment used to produce flame effects
- (5) Use of flame effects in fire training, except where there is an audience that is not part of the training
- (6)*Manufacture, transportation, storage, sale, or use of model or high-power rocket motors

- (7) Traditional nontheatrical public display of flames such as the following:
 - (a) Use of lighted candles in restaurants or religious services
 - (b) Fireplaces in areas open to the public
 - (c) Restaurant cooking visible to the patrons
 - (d) Listed Group II flame effects
- (8) Use of consumer fireworks by the public
- (9) Use of motor vehicles in races or sanctioned competitive sporting events

1.3.4* This standard shall not be used as a product standard.

1.4 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.4.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.4.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

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 Publication. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2002 edition.

2.3 Other Publications.

2.3.1 ASME Publication. American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5900.

ASME *Boiler Pressure Vessel Code*, 1992.

2.3.2 Other Publication. 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* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.3 General Definitions.

3.3.1 Accumulator. A container or piping that holds a predetermined volume of fuel that is ready for use in a flame effect.

3.3.2 Area.

3.3.2.1 Hazard Area. The area made hazardous by the operation of the flame effect.

3.3.2.1.1 Accessible Hazard Area. That area made hazardous by the flame effect that is normally accessible to a person without the deliberate use of an additional means of access that is not normally in place.

3.3.2.2 Holding Area. An area where flame effect material or loaded flame effect devices are held prior to use.

3.3.2.3 Storage Area. An area where flame effect material or flame effect devices are stored prior to use or movement to a holding area.

3.3.3* Arm. That sequence of control system functions for the establishing of a source of ignition that must be complete and verified immediately before the firing of the flame effect.

3.3.4 Cast Members. Performers involved in a production involving the use of flame effects that may or may not be employees. (Many amusement employees are also referred to as "cast members.")

3.3.5 Direct Ignition. An automatic or manual ignition system that ignites fuel without a pilot.

3.3.6 Emergency Stop [Emergency Shutdown (ESD) System]. A circuit or other mechanism that when actuated, results in the complete shutdown and extinguishment of all flame effects that are controlled by it.

3.3.7* Enable. The final set of control system functions that must be verified to be in a specific control mode immediately before the arming and firing of a flame effect may be implemented.

3.3.8 Enable Button. The control operator that is manually actuated by the operator prior to and during the arming and firing of the effect.

3.3.9 Fail-Safe. A state or an attribute of a system such that every single point failure in the system results in all controlling parts of the system with the ability to do harm to humans, animals, or equipment being disconnected from all sources of power and stored energy at the primary disconnect point.

3.3.10* Fire. The sequence of control system functions that result in the deliberate release of fuel for ignition.

3.3.11 Flame Effect. The combustion of flammable solids, liquids, or gases to produce thermal, physical, visual, or audible phenomena before an audience.

3.3.11.1 Automatic Flame Effect. A flame effect that is supervised and fired by an automatic control system.

3.3.11.2 Manual Flame Effect. A flame effect that is operated manually without the use of an automatic control system.

3.3.11.3 Portable Flame Effects. Flame effects that are designed and installed, either in a permanent or temporary installation, that are designed to move or be moved, in the course of operation or installation.

3.3.12 Flame Effect Appliance. The complete assembly of components and devices that controls and generates a flame effect.

3.3.13 Flame Effect Assistant. A person who works under the supervision of the flame effect operator.

3.3.14 Flame Effect Burner. A burner designed to produce specific sizes and configurations of flames for flame effects.

3.3.15 Flame Effect Material. A flammable material that is used as fuel to create a flame effect.

3.3.16 Flame Effect Operator. The single person with overall responsibility for flame effect operations and safety.

3.3.17 Flame Effect Safety Controller. A control system that is part of a flame effect appliance that is used to prove that the source of ignition is present ("flame safeguard control").

3.3.18* Flame Effect System. The complete assembly of interconnected components, devices, and/or appliances that provides all of the functions necessary to fuel, monitor, supervise, generate, and control flame effects, including the emergency shutdown of the flame effects and, where necessary, the monitoring of external conditions that affect operation.

3.3.19* Flame Effect Systems, Classifications.

3.3.19.1 Group I Flame Effect. An attended, manually controlled flame effect.

3.3.19.2 Group II Flame Effect. An individual or group flame effect designed for unattended operation that is temporarily or permanently installed outside any structure.

3.3.19.3 Group III Flame Effect. An attended, temporarily installed flame effect for a specific production with limited operation and fixed time for removal.

3.3.19.4 Group IV Flame Effect. A large individual or group flame effect that is permanently installed inside or outside any structure designed for unattended operation without a main show supervisory control system.

3.3.19.5 Group V Flame Effect. A large individual or group flame effect that is temporarily or permanently installed inside or outside any structure and is designed for intermittent or continuous operation under the supervision of a main show control system but without full-time supervision by a technician.

3.3.19.6 Group VI Flame Effect. A large individual or group flame effect that is temporarily or permanently installed inside or outside any structure and is designed for intermittent operation under the supervision of a main show control system and a technical director, with cast members in close proximity to the effect at the time of operation.

3.3.19.7 Group VII Flame Effect. An individual flame effect that can be temporarily or permanently installed inside or outside any structure that, due to its unique operating requirements, does not fit into any other classification.

3.3.20 Installation, Term of.

3.3.20.1 Permanent Installation. An installation of flame effects for which the governing use permit has a duration longer than 180 days.

3.3.20.2 Temporary Installation. An installation of flame effects for which the governing use permit has a duration of 180 days or less within a twelve-month period in a single venue.

3.3.21 Permit. A document issued by the AHJ for the purpose of authorizing performance of a specified activity. Unless otherwise specified, the word *permit*, when used in this document, refers to a use permit.

3.3.21.1 Use Permit. A document issued by the AHJ for the purpose of authorizing the use of specific flame effects in a specific venue on a specified date and time or within a specified period.

3.3.22 Plan.

3.3.22.1 Design Plan. The plan for a flame effect appliance or design that presents the design criteria and/or assumptions used in the design, along with complete design information.

3.3.22.2 Flame Effect Plan. The document that is used to convey to the AHJ the information needed to evaluate the flame effect for the purpose of applying for a permit.

3.3.23* Primary Safety Control. A control with a sensor that is directly responsive to the ignition device attributes necessary for the safe operation of the effect.

3.3.24 Proven Pilot. A pilot flame supervised by a primary safety control.

3.3.25 Rated. A description of performance derived from testing or evaluation that guides appropriate selection, installation, and use of equipment that is not listed.

3.3.26* Safety Shutdown (Lockout). The safe shutdown of the flame effect in the event of the actuation of any flame effect primary safety control or limit switch.

3.3.27 Safety-Critical. The failure of a device, component, system, or mechanism, which results in a situation that is immediately dangerous to life, health, or property.

3.3.28 Supervisory Cock. A manually actuated valve with two double-pole, double-throw switches that prove the valve position.

3.3.29* Supervisory Control System. A manual or automatic control system that supervises the operation of the flame effect.

3.3.30 Valve.

3.3.30.1 Accumulator Charge Valve. A valve used to control the flow of fuel into an accumulator.

3.3.30.2 Effect Valve. The last fuel shutoff valve before the flame effect burner.

3.3.30.3 Proof-of-Closure Valve. A safety shutoff valve equipped with an interlock switch that is actuated only when the valve is fully closed.

3.3.30.4 Safety Shutoff Valve. A fast-closing valve that automatically and completely shuts off the fuel supply in response to a normal or safety shutdown.

3.3.30.5 Vent Valve. A normally open, power-closed valve, normally located between the two safety shutoff valves.

3.3.31* Venue. The property, facility, building, or room within a building where flame effects are used, intended to be used, or are prohibited.

Chapter 4 Holding Areas for Flame Effect Materials and Devices

4.1* General. All flame effect materials and devices not connected for use shall be stored in accordance with applicable codes and standards and any state and local regulations.

4.2 Holding Areas. All flammable flame effect materials and loaded devices that have been removed from storage areas in anticipation of use shall be stored in a holding area acceptable to the authority having jurisdiction.

4.2.1 Quantity Limitations.

4.2.1.1 The maximum quantity of flammable flame effect materials and loaded devices stored in a holding area shall be that quantity used in one day.

4.2.1.2 Quantities of flammable flame effect materials and devices in excess of those used in one day shall be permitted to be stored in holding areas with the approval of the authority having jurisdiction.

4.2.2 Flammable flame effect materials and loaded devices in holding areas shall be secured or supervised continuously by an attendant trained in emergency response procedures.

Chapter 5 Permit and Approval Requirements and Terms of Installation

5.1 Permit Requirements.

5.1.1* Permit Required. Except when otherwise required by the jurisdiction, a use permit shall be required for the use of flame effects before an audience.