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NFPA[®] 92 Standard for Smoke Control Systems Handbook 2012

Annotated by Tracy Vecchiarelli



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NFPA[®] 92

Standard for

Smoke Control Systems

2012 Edition

This edition of NFPA 92, *Standard for Smoke Control Systems*, was prepared by the Technical Committee on Smoke Management Systems. It was issued by the Standards Council on May 31, 2011, with an effective date of June 20, 2011.

This edition of NFPA 92 was approved as an American National Standard on June 20, 2011.

▲ Origin and Development of NFPA 92

The NFPA Standards Council established the Technical Committee on Smoke Management Systems in 1985 and charged it with addressing the need for guidelines and materials on smoke management in buildings. The Committee's first document, NFPA 92A, *Recommended Practice for Smoke-Control Systems*, was published in 1988 and addressed smoke control utilizing barriers, airflows, and pressure differentials so as to confine the smoke of a fire to the zone of fire origin to maintain a tenable environment in other zones. The complex problem of maintaining tenable conditions within large zones of fire origin such as atria and shopping malls represented a more difficult issue in terms of the physics involved and thus was reserved for another document, NFPA 92B, *Guide for Smoke Management Systems in Malls, Atria, and Large Areas*, first published in 1991.

Between 1991 and 2009, NFPA 92A and NFPA 92B were separately maintained. In 2006, NFPA 92A was rewritten as a standard with mandatory provisions regarding design, installation, and testing of smoke-control systems and was renamed *Smoke-Control Systems Utilizing Barriers and Pressure Differences*. In 2005 and 2006, both documents were reorganized to comply with the *Manual of Style for NFPA Technical Committee Documents*. Both documents eventually contained many of the same requirements for design objectives, activation, and installation.

In the Annual 2011 revision cycle, NFPA 92A and NFPA 92B were withdrawn and replaced with a new document, NFPA 92, *Standard for Smoke Control Systems*. NFPA 92 was created using requirements from both of the original documents, removing duplicate provisions and making numerous editorial changes. The new document uses the term *smoke control systems* to address both containment and management systems.

With the consolidation effort, the new standard now covers the following topics: design of smoke management systems and calculations, design of smoke containment systems, design of stairwell pressurization systems, and testing requirements.

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Committee Scope: This Committee shall have primary responsibility for documents on the design, installation, testing, operation, and maintenance of systems for the control, removal, or venting of heat or smoke from fires in buildings.

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NFPA 92

Standard for

Smoke Control Systems

2012 Edition

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Information on referenced publications can be found in Chapter 2 and Annex M.

▲ Chapter 1 Administration

1.1* Scope. This standard shall apply to the design, installation, acceptance testing, operation, and ongoing periodic testing of smoke control systems.

▲ 1.2 Purpose.

1.2.1 The purpose of this standard shall be to establish requirements for smoke control systems to accomplish one or more of the following:

- (1) Inhibit smoke from entering stairwells, means of egress, smoke refuge areas, elevator shafts, or similar areas
- (2) Maintain a tenable environment in smoke refuge areas and means of egress during the time required for evacuation
- (3) Inhibit the migration of smoke from the smoke zone
- (4) Provide conditions outside the smoke zone that enable emergency response personnel to conduct search and rescue operations and to locate and control the fire
- (5) Contribute to the protection of life and to the reduction of property loss

1.2.2 The requirements specifying the conditions under which a smoke control system shall be provided are addressed by other codes and standards.

1.2.3 Specific design objectives are established in other codes and standards.

▲ 1.3 Retroactivity.

1.3.1 Unless otherwise noted, it is not intended that the provisions of this document be applied to facilities, equipment, structures, or installations that were existing or approved for

construction or installation prior to the effective date of this document.

1.3.2 In those cases where the authority having jurisdiction determines that the existing situation involves a distinct hazard to life or property, retroactive application of the provisions of this document shall be permitted.

1.3.3 Where a smoke control system is being altered, extended, or renovated, the requirements of this standard shall apply only to the work being undertaken.

1.3.4 Verification is required to ensure that new or modified systems do not adversely affect the performance of existing smoke control systems.

▲ 1.4 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.

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

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

1.5 Units and Formulas. (Reserved)

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

NFPA 70[®], National Electrical Code[®], 2011 edition.

NFPA 72[®], National Fire Alarm and Signaling Code, 2010 edition. NFPA 90A, Standard for the Installation of Air-Conditioning and

Ventilating Systems, 2012 edition.

NFPA 101[®], Life Safety Code[®], 2012 edition.

NFPA 110, Standard for Emergency and Standby Power Systems, 2010 edition.

NFPA 221, Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls, 2012 edition.

2.3 Other Publications.

2.3.1 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 555, Standard for Fire Dampers, 2006, Revised 2010.

ANSI/UL 555S, Standard for Smoke Dampers, 1999, Revised 2010.

ANSI/UL 864, Standard for Control Units and Accessories for Fire Alarm Systems, 2003, Revised 2010.

2.3.2 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, Fire Code, 2012 edition.

NFPA 101[®], Life Safety Code[®], 2012 edition.

NFPA 318, Standard for the Protection of Semiconductor Fabrication Facilities, 2012 edition.

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.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Atrium. A large-volume space created by a floor opening or series of floor openings connecting two or more stories that is covered at the top of the series of openings and is used for purposes other than an enclosed stairway; an elevator hoistway; an escalator opening; or as a utility shaft used for plumbing, electrical, air-conditioning, or communications facilities. [*101*, 2012]

3.3.2* Ceiling Jet. A flow of smoke under the ceiling, extending radially from the point of fire plume impingement on the ceiling.

3.3.3 Covered Mall. A single building enclosing a number of tenants and occupancies wherein two or more tenants have a main entrance into one or more malls.

3.3.4* Design Pressure Difference. The desired pressure difference between the protected space and an adjacent space measured at the boundary of the protected space under a specified set of conditions with the smoke control system operating.

3.3.5 Draft Curtain. A solid material, beam, girder, or similar material or construction that is used to channel or contain smoke and that is attached to the underside of the ceiling and protrudes a limited distance downward.

3.3.6 End-to-End Verification. A self-testing method that provides positive confirmation that the desired result (e.g., airflow or damper position) has been achieved when a controlled device has been activated, such as during smoke control, testing, or manual override operations.

3.3.7 Fire.

3.3.7.1 *Fuel Limited Fire.* A fire that has a heat release rate that is controlled by the material burning.

3.3.7.2 *Sprinkler Controlled Fire.* A fire that has a constant or decaying heat release rate due to the action of sprinkler spray.

3.3.7.3 *Steady Fire.* A fire that has a constant heat release rate.

3.3.7.4 *t-squared* (t^2) *Fire.* A fire that has a heat release rate that grows proportionally to the square of time from ignition. [See Annex B for further information on t-squared (t^2) profile fires.]

3.3.7.5 *Unsteady Fire.* A fire that has a heat release rate that varies with respect to time.

3.3.7.6 *Ventilation Limited Fire.* A fire where every object in the fire compartment is fully involved in fire and the heat release rate depends on the airflow through the openings to the fire compartment.

3.3.8* Fire Fighters' Smoke Control Station (FSCS). A system that provides graphical monitoring and manual overriding capability over smoke control systems and equipment at designated location (s) within the building for use by the fire department.

3.3.9 Growth Time (t_g) . The time interval from the time of effective ignition until the heat release rate of the fire is 1000 Btu/sec (1055 kW).

3.3.10 Plugholing. The condition in which air from below the smoke layer is pulled through the smoke layer into the smoke exhaust due to a high exhaust rate.

3.3.11* Plume. A column of smoke that rises above a fire.

3.3.11.1* *Axisymmetric Plume.* A plume that rises above a fire, does not come into contact with walls or other obstacles, and is not disrupted or deflected by airflow.

3.3.11.2* *Balcony Spill Plume.* A smoke plume that originates from a compartment fire, flows out the doorway, flows under a balcony, and flows upward after passing the balcony edge.

3.3.11.3* *Window Plume.* A plume that flows out of an opening to a room or other compartment that is involved in a ventilation limited fire.

3.3.12 Pressurized Stairwells. A type of containment smoke control system in which stair shafts are mechanically pressurized, with respect to the fire area, with outdoor air to keep smoke from contaminating them during a fire incident.

3.3.13 Smoke. The airborne solid and liquid particulates and gases evolved when a material undergoes pyrolysis or combustion, together with the quantity of air that is entrained or otherwise mixed into the mass. **[318**, 2012]

3.3.13.1* *First Indication of Smoke.* The boundary between the transition zone and the smoke free air.