

NFPA® 550

Guide to the Fire Safety Concepts Tree

2017



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NFPA® 550

Guide to the

Fire Safety Concepts Tree

2017 Edition

This edition of NFPA 550, *Guide to the Fire Safety Concepts Tree*, was prepared by the Technical Committee on Fire Risk Assessment Methods. It was issued by the Standards Council on November 11, 2016, with an effective date of December 1, 2016, and supersedes all previous editions.

This edition of NFPA 550 was approved as an American National Standard on December 1, 2016.

Origin and Development of NFPA 550

The NFPA Committee on Systems Concepts was organized to be responsible for developing systems concepts and criteria for fire protection in structures. A primary accomplishment of this committee was the development of the Fire Safety Concepts Tree. This *Guide to the Fire Safety Concepts Tree* was developed by the Committee on Systems Concepts in 1985. Appreciation is extended to Dr. John M. Watts, Jr., of the Fire Safety Institute for his major contribution to the contents of this document.

The Committee on Systems Concepts was discharged in October 1990, at which time the Standards Council assumed responsibility for this document.

The 1995 edition represented a reconfirmation of the 1986 edition with editorial clarifications.

The 2002 edition represented the majority of the 1995 edition with changes reflecting NFPA's requirements for document uniformity as prescribed by the *Manual of Style for NFPA Technical Committee Documents*. The changes consisted of formatting, renumbering, and editorial clarifications. Minor changes were made to content and several deletions made with respect to unreferenced text.

The 2007 edition represented a reconfirmation of the 2002 edition.

The 2012 edition represented a reconfirmation of the 2007 edition with updates to referenced publications where necessary.

The 2017 edition represents a reconfirmation of the 2012 edition with updates to references where necessary.

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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 covering the following: (1) frameworks that identify the relationships of fire safety concepts used for fire prevention and fire control, including codes, standards and recommended practices, and (2) frameworks that describe the properties of risk assessment methods for use in regulations.

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Guide to the

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2017 Edition

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2.

Chapter 1 Administration

1.1 Scope. This guide describes the structure, application, and limitations of the Fire Safety Concepts Tree.

1.2 Purpose. This guide is intended to provide tools to assist the Fire Safety Practitioner (e.g., Designer, Engineer, Code Official) in communicating fire safety and protection concepts. Its use can assist with the analysis of codes or standards and facilitate the development of performance-based designs.

1.3 Application. The Fire Safety Concepts Tree provides an overall structure with which to analyze the potential impact of fire safety strategies. It can identify gaps and areas of redundancy in fire protection strategies as an aid in making fire safety decisions. The use of the Fire Safety Concepts Tree should be accompanied by the application of sound fire protection engineering principles.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this guide and should be considered part of the recommendations of this document.

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

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2016 edition.

NFPA 70®, *National Electrical Code®*, 2014 edition.

NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*, 2016 edition.

National Fire Protection Association “Fire Safety Concepts Tree,” 2002 edition.

2.3 Other Publications.

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

ANSI/UL 913, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous (Classified) Locations*, 2006, revised 2013.

2.3.2 SFPE Publications. Society of Fire Protection Engineers, 9711 Washingtonian Boulevard, Suite 380, Gaithersburg, MD 20878.

SFPE *Engineering Guide to Performance-Based Fire Protection*, 2nd edition, 2007.

2.3.3 Other Publications. Merriam-Webster’s *Collegiate Dictionary*, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Advisory Sections. (Reserved)

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter apply to the terms used in this guide. Where terms are not defined in this chapter or within another chapter, they should be defined using their ordinarily accepted meanings within the context in which they are used. Merriam-Webster’s *Collegiate Dictionary*, 11th edition, is the source for the ordinarily accepted meaning. Descriptions of elements or concepts in the Fire Safety Concepts Tree have been provided to help convey the intent of the Systems Concepts Committee. These descriptions are intended as a guide to the thinking that framed the tree and should not restrict alternative interpretation of the concepts if such alternative descriptions are based on appropriate fire protection engineering principles. For example, it might be appropriate to a specific application of the tree to define “Prevent Fire Ignition” in terms of a flame height or a rate of heat release. At the same time, this is the only published source of definitions of these concepts and is, therefore, a step toward better communication through common understanding. Italicized terms in the descriptions of Fire Safety Concepts Tree elements are defined in Section 3.4, Glossary Terms.

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 Guide. A document that is advisory or informative in nature and that contains only nonmandatory provisions. A guide may contain mandatory statements such as when a guide can be used, but the document as a whole is not suitable for adoption into law.

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. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Accomplish by Administrative Action. Eliminate, *limit*, *control*, or accomplish other actions referenced in the Fire Safety Concepts Tree.

3.3.2 Apply Sufficient Suppressant (Automatically). *Automatically* perform *suppressive* action in response to *automatic* detection.

3.3.3 Apply Sufficient Suppressant (to Manually Suppress). *Manually* perform *suppressive* action given response to the proper site.

3.3.4 Automatically Suppress Fire. *Automatically* perform actions on a *fire* process in order to *limit* the growth of or extinguish the *fire*.

3.3.5 Cause Movement of Exposed. Initiate movement of the *exposed* to and along a safe path.

3.3.6 Communicate Signal. Transmit knowledge of a detected *fire* via human or *automatic* or a combination of human and *automatic* means to a responsible recipient of the information.

3.3.7 Confine/Contain Fire. Provide building construction features and built-in equipment in order to *limit* the *fire* or *fire products*, or both, to within the *barriers* surrounding the area where the *fire* originated.

3.3.8 Control Chemical Composition of Environment. Limit the quantity of oxidizer available for combustion or inhibit the chemical combustion process.

3.3.9 Control Combustion Process. *Control* the inherent *fire* behavior.

3.3.10 Control Fire by Construction. *Control* the growth of the *fire* and the movement of *fire products* by performing actions involving building construction features and built-in equipment without intentionally acting upon the inherent *fire* process.

3.3.11 Control Fuel (Manage Fire). Influence the combustion process by *pre-ignition control* of the inherent or situational characteristics of the *fuel*.

3.3.12 Control Fuel (Prevent Fire Ignition). *Limit* the characteristics and uses of *fuel(s)*.

3.3.13 Control Fuel Distribution. *Control* the arrangement of the *fuel* within its environment.

3.3.14 Control Fuel Ignitability. *Control* the ease of *ignition* of *fuels* that are present.

3.3.15 Control Fuel Properties. *Control* the inherent properties of the *fuel*.

3.3.16 Control Fuel Transport. Prevent the *fuel* from moving to a location where *ignition* can result.

3.3.17 Control Heat-Energy Sources. *Limit* the characteristics and uses of *heat-energy sources*.

3.3.18 Control Heat-Energy Source Transport. Prevent the *heat-energy source* from moving to a location where an *ignition* can result.

3.3.19 Control Heat-Energy Transfer Processes. Alter the rate(s) at which the *fuel(s)* receives heat by *control* of the *heat transfer* mechanisms, such that *ignition* cannot result.

3.3.20 Control Movement of Fire. *Control* the movement of *fire* or *fire products*, or both, by providing and (where a normal functional necessity) activating building construction features and built-in equipment.

3.3.21 Control Physical Properties of Environment. Interfere in the combustion process through a heat transfer process.

3.3.22 Control Rate of Heat-Energy Release. *Control* the rate of thermal energy release of existing *heat-energy sources*.

3.3.23 Control Source-Fuel Interactions. *Control* the relationships of *source* and *fuel* so as to *limit* the *heat* communicated from the *source* to the *fuel* in order that *fuel* temperature remains below that required for *ignition*.

3.3.24 Control the Environment. *Control* the inherent or situational characteristics of the environment.

3.3.25 Decide Action. Determine a proper reaction given the communication of the existence of a *fire*.

3.3.26 Defend Against Fire Products. *Safeguard* the *exposed* using measures that prevent the presence of, or *control* the impact of, *fire products* at the *place*.

3.3.27 Defend Exposed in Place. *Defend* the *exposed* in the *place(s)* where they were located at the time of *ignition*.