

NFPA®

101A

**Guide on
Alternative Approaches
to Life Safety**

2019



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NFPA® 101A

Guide on

Alternative Approaches to Life Safety

2019 Edition

This edition of NFPA 101A, *Guide on Alternative Approaches to Life Safety*, was prepared by the Technical Committee on Alternative Approaches to Life Safety and released by the Correlating Committee on Safety to Life, and acted on by NFPA at its Association Technical Meeting held June 11–14, 2018, in Las Vegas, NV. It was issued by the Standards Council on August 14, 2018, with an effective date of September 3, 2018, and supersedes all previous editions.

This edition of NFPA 101A was approved as an American National Standard on September 3, 2018.

Origin and Development of NFPA 101A

Before the development of the 1988 edition of this document, it was published as several appendixes to NFPA 101®, *Life Safety Code*®. NFPA 101A is revised every 3 years on a schedule that lags that of NFPA 101 by 1 year to accurately reflect the requirements of NFPA 101, against which the NFPA 101A Fire Safety Evaluation Systems (FSESs) measure equivalency.

Chapter 4 first appeared as Appendix C in the 1981 edition of the *Life Safety Code* and Chapters 5, 6, and 7 first appeared in the 1985 edition of the *Life Safety Code* as Appendixes E, F, and G. Chapter 8 was proposed as Appendix H for the 1988 edition of the *Life Safety Code* but instead was published as a chapter of the 1998 edition of NFPA 101A. These chapters were originally prepared by the Center for Fire Research of the National Institute of Standards and Technology (then the National Bureau of Standards). The Committees on Safety to Life have reviewed and modified the systems as appropriate for inclusion. Chapter 9 appeared first in the 2004 edition and provides an FSES for educational occupancies.

This document provides alternative approaches to life safety based on the 2018 edition of *Life Safety Code*. It is intended to be used *with* NFPA 101 and not as a substitute. Section 1.4 of the *Life Safety Code* permits alternative compliance with the *Code* under equivalency concepts where such equivalency is approved by the authority having jurisdiction. The methods contained in this guide can be used to help determine equivalency where used as part of the technical documentation submitted to the authority having jurisdiction.

The figures contained in this guide are copyrighted by NFPA, but users are hereby given permission to copy the worksheets for private use only.

The 2019 edition includes changes to the mandatory safety values in the various fire safety evaluation systems so that equivalency is measured accurately against the requirements of the 2018 edition of NFPA 101.

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Guide on

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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 advisory sections of this document are given in Chapter 2 and those for extracts in the informational sections are given in Annex B. 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 should be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope. (Reserved)

1.2 Purpose. (Reserved)

1.3 Application.

1.3.1* This guide consists of a number of alternative approaches to life safety. Each chapter is a different system independent of the others and is to be used in conjunction with the 2018 edition of NFPA 101.

1.3.2 This edition of NFPA 101A contains alternative approaches that are tied to NFPA 101. Each of these approaches, where approved by the AHJ, is recognized in Annex A of the *Life Safety Code*, as a method that can be used in determining equivalent compliance with various chapters of the *Code*.

1.3.3 The method described in this guide is an index method. Index methods are a type of qualitative risk assessment. Quantitative risk assessments can also be used to evaluate designs that are proposed as alternative approaches to life safety. For information on developing fire risk assessments, see the *SFPE Engineering Guide to Fire Risk Assessment*. Guidance on reviewing fire risk assessments can be found in NFPA 551.

1.3.4 For further information on alternative approaches to fire safety, see “Systems Approach to Fire-Safe Building Design,” Section 1, Chapter 9, of the 20th edition of the NFPA *Fire Protection Handbook* and the *SFPE Handbook of Fire Protection Engineering*, 5th edition, Chapter 82, “Fire Risk Indexing.”

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 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 2016 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*, 2016 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, 2016 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2018 edition.

NFPA 92, *Standard for Smoke Control Systems*, 2015 edition.

NFPA 101®, *Life Safety Code*®, 2018 edition.

NFPA 204, *Standard for Smoke and Heat Venting*, 2015 edition.

NFPA 220, *Standard on Types of Building Construction*, 2018 edition.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, 2017 edition.

NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*, 2017 edition.

NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls*, 2015 edition.

NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, 2015 edition.

NFPA 551, *Guide for the Evaluation of Fire Risk Assessments*, 2016 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2018 edition.

NFPA *Fire Protection Handbook*, 20th edition.

2.3 Other Publications.

2.3.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, www.astm.org.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2015b.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2016.

2.3.2 SFPE Publications. SFPE, 9711 Washington Blvd., Suite 380, Gaithersburg, MD 20878.

SFPE Engineering Guide to Fire Risk Assessment.

SFPE Handbook of Fire Protection Engineering, 5th edition, 2016.

2.3.3 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096, www.ul.com.

ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008, revised 2013.

2.3.4 Other Publications.

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

2.4 References for Extracts in Advisory Sections.

NFPA 5000®, *Building Construction and Safety Code*®, 2018 edition.

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.

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 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.

3.2.5* 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.

3.2.6 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions. See Section 3.3 of NFPA 101.

Chapter 4 Fire Safety Evaluation System for Health Care Occupancies

4.1 General.

4.1.1 This chapter is part of an NFPA guide and, therefore, is not mandatory. The term *shall* in this chapter is used to indicate that if the provisions of the chapter are applied, the procedures mandated are to be followed to ensure the effectiveness of the evaluation system.

4.1.2 The Fire Safety Evaluation System (FSES) is a measuring system. It compares the level of safety provided by an arrangement of safeguards that differ from those specified in NFPA 101 to the level of safety provided in a building that conforms exactly with the details of the *Code*.

4.1.3 This chapter is provided to assist in completion of Figure 4.7, Worksheets for Evaluating Fire/Smoke Zones. The step-by-step instructions for completion appear on the worksheets. They are not repeated within the chapter. This chapter provides expanded discussion and definition of the various items in the worksheet to assist the user when questions of definition or interpretation arise. The chapter is organized to follow the format of the worksheet progressively.

4.2 Procedure for Determining Equivalency.

4.2.1 Evaluate fire/smoke zones using Figure 4.7 (Worksheets 4.7.1 through 4.7.11). Use the text portion (Section 4.3 through 4.6.13.4.3) of this chapter as a guide.

4.2.2 The Facility Fire Safety Requirements Worksheet (Worksheet 4.7.10) is used to determine any nonconformance with the requirements on the worksheet.

4.2.3 Equivalency is achieved if the fire/smoke zone evaluations show equivalency or better in each and every fire/smoke zone and the requirements of the Facility Fire Safety Requirements Worksheet (Worksheet 4.7.10) are met.

4.3 Fire/Smoke Zone.

4.3.1 A fire/smoke zone is a space that is separated from all other spaces by floor assemblies, horizontal exits, or smoke barriers. Every zone on a story that is subdivided into two or more zones shall have exit routes in accordance with 18.2.4 or 19.2.4 of NFPA 101. Compartments not meeting these requirements shall be evaluated as part of an adjacent zone. Where a story is not subdivided by horizontal exits or smoke barriers, the entire story is considered to be the zone.

4.3.2 Selection of Zones to Be Evaluated.

4.3.2.1 The entire facility shall be divided into zones. There shall be no areas that are not in a zone.

4.3.2.2 For a complete evaluation, evaluate every zone in the health care facility individually.

4.3.2.3 Where the system is used to evaluate conditions unique to a selected number of zones, the entire building should be evaluated for compliance with the *Life Safety Code* and

the FSES evaluation shall be completed on the specific zones where the condition occurs.

4.3.2.4 Most health care facilities have repetitive arrangements so that a complete picture can be developed by evaluating typical zones until all combinations are evaluated. The zones selected should include the following:

- (1) Each type of patient zone having a different type of mobility, density, or attendant ratio, as specified in Worksheet 4.7.2
- (2) Each zone that represents a significantly different type of construction, finish, or protection system
- (3) Zones containing special medical treatment or support activities (e.g., operating suites, intensive care units, laboratories)
- (4) Zones not involving housing, treatment, or customary access for four or more inpatients simultaneously who are incapable of self-preservation; such zones should be evaluated as follows:
 - (a) Any zone, whether or not used for patient egress, shall be permitted to be evaluated on the same basis as a patient use zone. In such cases, the value of factor *F* in Worksheet 4.7.3 shall be assigned the value of factor *L* ("Zone Location") from Worksheet 4.7.2. In such cases, Safety Parameter 10, "Emergency Movement Routes," from Worksheet 4.7.6 shall be graded "deficient" if the exit capacity is less than that prescribed for the actual occupancy of the space and "<2 routes" if less than 75 percent of the prescribed exit capacity is present.
 - (b) If the zone is separated by 2-hour fire-rated construction from all patient use zones, including any members that bear the load of a patient use zone, and if any communicating openings through the 2-hour fire-rated construction are protected by 1½-hour fire protection-rated fire doors, the zone shall be permitted to be excluded from evaluation. In such cases, that space shall conform with the portion of NFPA 101 appropriate to its use. In addition, appropriate charges under Safety Parameter 8, "Hazardous Areas," in Worksheet 4.7.6 shall be charged against other zones in the facility.
 - (c) Evaluation of any unoccupied story or stories located above the highest floor used for health care occupancy is not required, provided each such unoccupied story meets the construction requirements of 18.1.6 of NFPA 101 for new buildings or 19.1.6 of NFPA 101 for existing buildings, or if each unoccupied story is protected by automatic sprinklers.
- (5) Patient sleeping rooms or suites exceeding 1000 ft² (92.9 m²) of floor area should be evaluated as follows:
 - (a) If the room or suite has a single exit access door, it should be evaluated as a single dead-end zone.
 - (b) A patient sleeping room or suite of sleeping rooms exceeding the 5000 ft² (460 m²) limitation of 19.2.5.7.2.3(A) of NFPA 101 should be evaluated as a separate zone that is not a suite.
 - (c) A patient sleeping room or suite of sleeping rooms exceeding the 7500 ft² (700 m²) limitation of 18.2.5.7.2.3(B) or 19.2.5.7.2.3(B) of NFPA 101 should be evaluated as a separate zone that is not a suite.
 - (d) A patient sleeping room or suite of sleeping rooms exceeding the 10,000 ft² (930 m²) limitation of 18.2.5.7.2.3(C) or 19.2.5.7.2.3(C) of NFPA 101 should be evaluated as a separate zone that is not a suite.
- (6) Patient care nonsleeping rooms or suites exceeding 2500 ft² (230 m²) of floor area should be evaluated as follows:
 - (a) If the room or suite has a single exit access door, it should be evaluated as a single dead-end zone.
 - (b) A patient care nonsleeping room or suite of nonsleeping rooms exceeding the 10,000 ft² (930 m²) limitation of 19.2.5.7.3.2 of NFPA 101 should be evaluated as a separate zone that is not a suite.
 - (c) A patient care nonsleeping room or suite of nonsleeping rooms exceeding the 12,500 ft² (1160 m²) limitation of 18.2.5.7.3.2(A) or 19.2.5.7.3.2(A) of NFPA 101 should be evaluated as a separate zone that is not a suite.
 - (d) A patient care nonsleeping room or suite of nonsleeping rooms exceeding the 15,000 ft² (1390 m²) limitation of 18.2.5.7.3.2(B) or 19.2.5.7.3.2(B) of NFPA 101 should be evaluated as a separate zone that is not a suite.

4.4 Maintenance. Any protection system, requirement, or arrangement that is not maintained in a dependable operating condition or that is used in such a manner that the intended fire safety function or hazard constraint is impaired should be considered defective and receive no credit in the evaluation.

4.5 Occupancy Risk (Worksheet 4.7.2). In establishing a system for evaluating occupancy risk, the following facts are recognized:

- (1) There is a basic level of risk inherent in every health care facility.
- (2) The fuel characteristics of furniture, equipment, and supplies vary with time.
- (3) The arrangement of these items within the space available can vary with time.
- (4) Consequently, these three factors are not included as parameters in a safety equivalency measurement; to account for these factors, the occupancy risk baseline is set at the inherent risk level, with the presumption that the furniture, equipment, and supplies are the most combustible and adversely located (from a fire safety standpoint) of those items normally found in health care facilities.

4.5.1 Patient Mobility.

4.5.1.1 The single most important factor controlling risk in a health care facility is the degree to which patients need assistance in taking the actions necessary for their safety. The level of capability in health care facilities varies from patients who, if informed or directed, are able to take positive, self-protecting actions to those patients who have no ability to move or even to take the simplest actions to safeguard themselves. In some cases, patients are directly connected to a fixed life-support system and are so dependent on it that, regardless of their physical condition or the availability of assistance, they cannot be moved without jeopardy of death or serious harm. In the measurement of occupancy risk factors, the least mobile category of patient expected in the zone determines the risk factor