NFPA 101A Guide on Alternative Approaches to Life Safety 1995 Edition

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NFPA 101A

Guide on

Alternative Approaches to Life Safety

1995 Edition

This edition of NFPA 101A, *Guide on Alternative Approaches to Life Safety*, was prepared by the Technical Committee on Safety to Life, released by the Technical Correlating Committee on Safety to Life, and acted on by the National Fire Protection Association, Inc., at its Fall Meeting held November 14-16, 1994, in Toronto, Ontario, Canada. It was issued by the Standards Council on January 13, 1995, with an effective date of February 7, 1995, and supersedes all previous editions.

The 1995 edition of this document has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 101A

This 1995 edition of NFPA 101A is the third edition. Prior to the development of the 1988 edition of this document, it was published as several appendices to NFPA *101®, Code for Safety to Life in Buildings and Structures*.

Chapter 3 first appeared as Appendix C in the 1981 edition of the *Life Safety Code®*; Chapters 4, 5, and 6 first appeared in the 1985 edition of the *Life Safety Code* as Appendices E, F, and G; and Chapter 7 was proposed as Appendix H for the 1988 edition but was published as this document. 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). Various subcommittees of the Committee on Safety to Life have reviewed and modified the systems as appropriate for inclusion.

Chapter 2 first appeared as Appendix D in the 1985 *Life Safety Code*. This appendix was prepared by the Subcommittee on Means of Egress and was based primarily on the work of the National Research Council of Canada.

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To the User

This document provides alternative approaches to Life Safety based on the 1994 *Life Safety Code*. It is intended to be used *with* the *Life Safety Code* and not as a substitute. Section 1-5 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 methodologies contained herein can be used to help determine equivalency where used as part of the technical documentation submitted to the authority having jurisdiction.

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Contents

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NOTICE: Information on referenced publications can be found in Chapter 8.

Chapter 1 Introduction

1-1 This guide consists of a number of different alternative approaches to life safety. Each chapter is a different system independent of the others and is to be used in conjunction with the 1994 edition of NFPA *101, Code for Safety to Life in Buildings and Structures.*

1-2 This edition of NFPA 101A contains alternative approaches that are tied to NFPA *101, Life Safety Code.* Each of these systems is recognized by the *Life Safety Code,* Appendix A, as a method that can be used to assist the authority having jurisdiction in determining equivalent compliance with various chapters of the *Code.*

1-3 For further information on alternative approaches to fire safety, see "Systems Concepts for Building Firesafety," Section 1, Chapter 3 of the seventeenth edition of the NFPA *Fire Protection Handbook* and the SFPE *Handbook of Fire Protection Engineering*, Section 2, "Hazard Analysis Calculations."

Chapter 2 Alternative Calculations for Egress Width

The numbers in parentheses following text indicate references provided at the end of this chapter.

NOTE: It is assumed that those using this chapter are generally familiar with performance-based egress design concepts, including an understanding of the meaning of key terms such as "speed," "density," and "flow" — the three main physical characteristics of crowd movement. To minimize misunderstanding, definitions are provided for such terms where they are shown in upper case letters.

2-1 Background to the Calculation Method. This chapter describes a system of calculations used to determine the egress width, especially stair width, needed to provide a given flow capacity and flow time. (FLOW is the number of persons passing a point in a unit of time. FLOW TIME is the total time needed for a crowd to move past a point in the egress system. CAPACITY is the number of persons a movement facility can serve in a certain amount of time; it should not be confused with DEMAND, the number of persons actually attempting to use the facility.) These calculations take into account the following:

(a) Actual number of persons in the egressing crowd;

(b) Varying abilities of different types of crowds;

(c) Direction of crowd movement (ascent or descent);

(d) Stair width as determined by handrail centerlines, wall boundaries, or (in the case of aisle stairs) the ends of seating rows; and

(e) Other details of stair design and construction, including handrail reachability, dimensions of risers and treads, and flight length.

2-2 Effective Width Model.

2-2.1 The calculations relating stair width and egress performance are based on what is called the "effective width model for evacuation flow." The following is a short introduction to this model and the formulas derived from the model.

2-2.2 The EFFECTIVE WIDTH MODEL relates the usable width of a stair and its flow capacity where there is a large, simultaneous demand on an egress system by a crowd of people.

2-2.3 The model describes the following observed phenomena: There is an EDGE EFFECT at the sides of a movement facility (i.e., most people in a crowd tend to keep a small clearance from the side boundaries of a movement facility). Furthermore, because of lateral BODY SWAY (the natural side-to-side swaying to maintain balance when walking slowly) people in a crowd do not walk in regimented lanes, shoulder-to-shoulder fashion, but in a freer, staggered arrangement that makes efficient use of the available space and allows each person to see several steps ahead.

2-2.4 Mean egress flow, plotted against stair width, is a linear function, not a step function as assumed in the traditional model based on lanes of movement and units of exit width. In other words, the regression line for flow as a function of stair width [varying by small increments between 34 in. and 88 in. (86 cm and 229 cm)] does not support any lane model, whether it is based on 22 in., 24 in., 30 in., or 34 in. (55.9 cm, 61 cm, 76 cm, or 86 cm). The mean flow is directly proportional to the EFFECTIVE STAIR WIDTH, as follows:

(a) The nominal or usually credited stair width minus approximately 12 in. (30 cm); or

(b) Where there are two handrails, the handrail centerline spacing minus 7 in. (17.8 cm).

(Figure 2-2.4 shows the relationship between these widths.)

This linearity and proportionality is not surprising in view of the crowd behavior patterns noted in 2-2.3.

2-2.5 MEAN FLOW (the total egress population divided by the time needed for the crowd to move past one point in the egress system) is influenced in a nonlinear fashion by the total population per effective width of stair. For example, increasing the number of persons in a crowd using a stair from 120 to 150 results in a slightly higher flow and a flow time increased by less than the ratio 150:120.

2-2.6 The effective width model and the study methods that lead to its development were described in detail in two chapters of *Fires and Human Behavior* (1, 2). The SFPE *Handbook of Fire Protection Engineering* contains chapters dealing more extensively with egress behavior and egress technology (3, 4, 5).

2-3 Flow Time Performance Criteria.

2-3.1 One use of the model is to clarify the specific traditionally accepted egress performance for former code rules

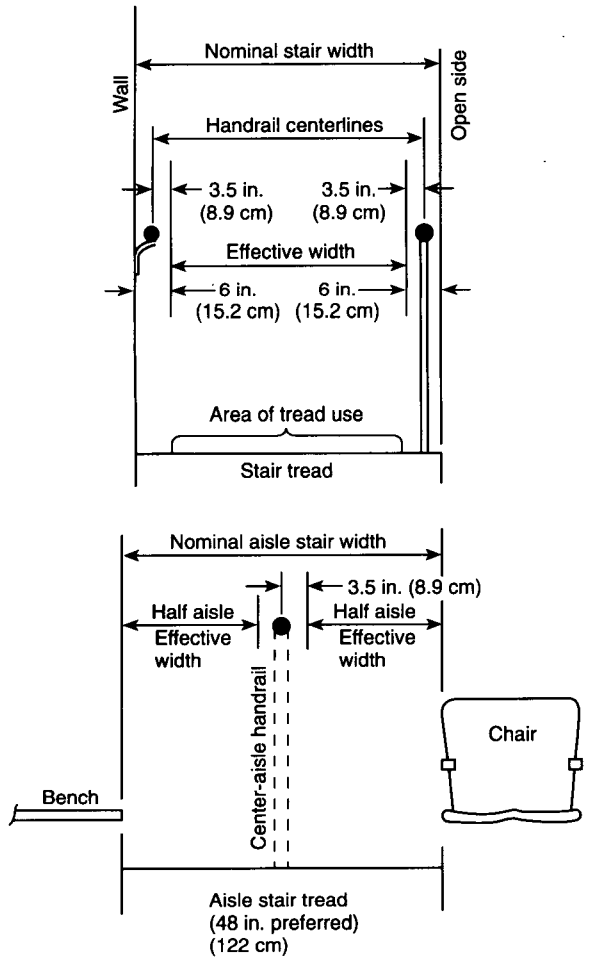

Figure 2-2.4 Measurement of effective width of stairs in relation to walls, handrails, and seating.

that relate evacuation population capacity and stair width based on 22-in. (55.9-cm) "units of exit width." The code rules for 60 or 75 persons per unit of exit stair width led to flow times of approximately 3 to 4 minutes. In recent editions of the *Code* (and the model building codes), with the replacement of the unit exit width method with a more linear method, these rules have been expressed, for example, as 0.3 in. (0.8 cm) of nominal stair width per person and 0.2 in. (0.5 cm) of nominal corridor width per person. Such flow times can be used in equivalency-based calculations to relate stair width and egress capacity.

2-3.2 Thus, one measure of traditionally accepted egress performance is a flow time of approximately 3 to 4 minutes for occupants of a space to evacuate via stairs. In other words, assuming some degree of QUEUING (where demand exceeds capacity) throughout the flow time at the entry to the egress stair, approximately 3 to 4 minutes are needed to clear the space of its able-bodied occupants once mass movement is initiated. In emergency conditions, a significant amount of PRE-FLOW TIME is often necessary for some people to perceive the need for a mass evacuation, to make all present aware of the need to evacuate, and to initiate crowd flow. Such pre-flow components of total evacuation time — perhaps comparable in size to flow time — are not addressed in this chapter. It is assumed that these other components are realistically considered where the method outlined here forms part of any proposal relating hazard development time and evacuation time. Further guidance on this can be found in the SFPE *Handbook of Fire Protection Engineering* (3, 5).

2-3.3 By specifying the width and riser-tread geometry of stairs, it is possible to express flow time performance criteria more precisely. In this chapter, the stair used for reference purposes to suggest a flow time performance criterion is 44 in. (112 cm) wide, and it is used by 150 persons. The reference stair has risers 7 in. (17.8 cm) high and 11-in. (27.9-cm) treads, measured horizontally between nosings. One hundred fifty persons can move past a point on such a stair in a flow time of 3.45 minutes or 207 seconds.

2-3.4 Table 2-3.4 provides a convenient guide to population capacities for various stair widths and riser-tread geometries. It is developed from the calculation method described below and is based on the 3.45-minute flow time related to these population and riser-tread reference conditions.

2-3.5 Other stair rules, more common in previous editions of the *Life Safety Code*, lead to slightly different flow times. On stairs having 7.5-in. (19.1-cm) risers and 10-in. (25.4-cm) treads, the movement of 120 persons on a 44-in. (112-cm) stair results in a flow time of approximately 185 seconds. There is a flow time of approximately 220 seconds where such a stair is used by 150 persons. These reference capacities and flow times are marked on Figure 2-3.5, and the influence of riser-tread dimensions is treated in more detail in Section 2-5.

2-4 Calculation Method Using Graph.

2-4.1 Figure 2-3.5 is a graph generally relating effective stair width per person, several common riser-tread geometries, and flow time. Using the graph, egress performance, in terms of flow time, can be predicted from information about egress population and the width and step-geometry of the egress stair. Alternatively, it is possible to begin with a needed flow time and then choose appropriate stair geometries for a certain egress population. It also is possible to calculate mean evacuation flow over the course of an evacuation simply by dividing the actual number of persons using a stair by the flow time read from the graph. [The mean flows determined in this way fall within the range of Fruin's levels of service: C, D, E, and F (7).]

2-4.2 The graph in Figure 2-3.5 is labeled in terms of effective stair width per person. Figure 2-2.4 shows the relationship between effective width and measurements that are generally shown on design drawings or measured in the field. EFFECTIVE STAIR WIDTH begins as follows:

(a) 6 in. (15.2 cm) from a wall, possibly more or less, depending on surface roughness and cleanliness;

(b) 3.5 in. (8.9 cm) from the centerline of a handrail (the centerline of the handrail is the preferred reference point for determining effective width);

(c) At the farthest projection of seats into an aisle stair.

2-4.3 In Figure 2-3.5, separate curves are provided for three common riser-tread geometries. Data for the upper curve on the graph come from studies of stairs with an average pitch of 37 degrees [e.g., with 7.5-in. (19.1-cm) risers and 10-in. (25.4-cm) treads] the former standard in the

Table 2-3.4 Population Capacities Based on the Effective Width Model for Various Stair Widths and Dimensions for Risers and Treads

			Population (P) that Can Be Evacuated in a Flow Time of 3.45 min—Equivalent to the Estimated Flow Time Where There Are 150 Persons on a 44-in. Wide Stair with 7.0-in. Risers and 11.0-in. Treads			
			Population for Stair with Risers and Treads			
Nominal Width (in.)	Handrail Centers (in.)	Effective Width (W) (in.)	7.5-10.0	7.0-11.0	6.5-12.0	6.5-13.0
			P = W/0.229	P = W/0.213	P = W/0.197	P = W/0.186
36	31	24	105	113	122	129
37	32	25	109	117	127	134
38	33	26	114	122	132	140
39	34	27	118	127	137	145
40	35	28	122	132	142	150
41	36	29	127	136	147	156
42	37	30	131	141	152	161
43	38	31	135	146	157	166
44	39	32	140	150	162	172
45	40	33	144	155	168	177
46	41	34	149	160	173	183
47	42	35	153	164	178	188
48	43	36	157	169	183	193
49	44	37	162	174	188	199
50	45	38	166	178	193	204
51	46	39	170	183	198	209
52	47	40	175	188	203	215
53	48	41	179	193	208	220
54	49	42	184	197	213	225
55	50	43	188	202	218	231
56	51	44	192	207	223	236
57	52	45	197	211	229	242
58	53	46	201	216	234	247
59	54	47	205	221	239	252
60	55	48	210	225	244	258
61	56	49	214	230	249	263
62	57	50	218	235	354	268
Maximum Recommended Width Where Handrails Are 34 in. High.						
63	58	51	223	240	259	274
64	59	52	227	244	264	279
65	60	53	232	249	269	285

For SI units: 1 in. = 2.54 cm.

Life Safety Code. The middle curve, suggesting approximately 7.5 percent improved efficiency, applies to stairs with 7-in. (17.8-cm) risers and 11-in. (27.9-cm) treads — the minimum standard in the *Life Safety Code*, the BOCA *National Building Code*, and the ICBO *Uniform Building Code*. Increased efficiency — an additional 12.5 percent better than the middle curve — is suggested by the third and lowest curve, which applies to moderate-pitch stairs with 6.5-in. (16.5-cm) risers and 13-in. (33-cm) treads.

2-4.4 Improved egress efficiency is one benefit that partially compensates for the additional building area needed by stairs that are less steep. Enhanced safety for people moving on the stairs is the other major benefit.

2-4.5 To provide the traditionally accepted flow time of 185 seconds, resulting where 120 persons use a stair with a nominal width of 44 in. (112 cm) and an effective width of 32 in. (81 cm), the effective widths per person are 0.268 in., 0.248 in., and 0.217 in. (0.68 cm, 0.63 cm, and 0.55 cm), respectively, for the curves for former standard, current standard, and preferred standard riser-tread geometries. This range of egress width provision, as a function of step geometry, falls within the range currently permitted in the *Life Safety Code*. The previous rule, permitting 75 persons per unit of stair width, specifically 150 persons using a two-unit stair, is equivalent to a minimum of 0.213 in. (0.54 cm) of effective stair width per person. A traditionally dimensioned, three-unit stair used by 225 persons provides 0.24 in. (0.61 cm) of effective stair width for each person.

2-5 General Equation and Adjustments.

2-5.1 The central curve in Figure 2-3.5 expresses the following equation:

$$\frac{W}{P} = 317\ T^{-1.37}$$

where:

W = the effective stair width in inches
P = the actual number of persons evacuating
T = the flow time in seconds (not to exceed 600).

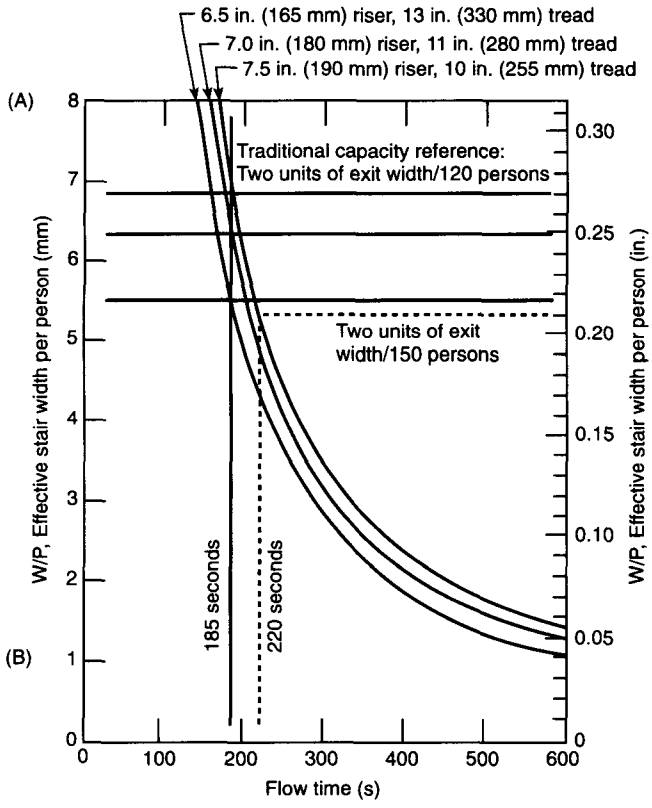

Figure 2-3.5 Relation between effective stair width per person and flow time.

2-5.2 Because of reduced comfort and efficiency (in descent) with stairs having higher risers and smaller treads, there is a case to be made for adjusting W/P (as provided by the equation in 2-5.1 or as read from the central curve in Figure 2-3.5) higher or lower according to riser and tread sizes. The following adjustments are suggested as a guide in cases where a stair is used in the descending direction by a crowd.

(a) Subtract 1 percent from W/P for every 0.2 in. (0.5 cm) that the tread exceeds 11 in. (27.9 cm), up to a maximum of 10 percent.

(b) Add 1 percent to W/P for every 0.2 in. (0.5 cm) that the tread falls below 11 in. (27.9 cm).

(c) Subtract 1 percent from W/P for every 0.2 in. (0.5 cm) that the riser falls below 7 in. (17.8 cm), up to a maximum of 5 percent.

(d) Add 1 percent to W/P for every 0.2 in. (0.5 cm) that the riser exceeds 7 in. (17.8 cm).

2-5.3 Several other adjustments to W/P or to flow time performance might be appropriate to credit properly the performance differences that could be due to other factors of stair design, construction, and use factors. For example:

(a) Add 10 percent to W/P for stairs where crowds must ascend.

(b) Assume that performance in the descending direction is reduced by 15 percent for aisle stairs or other stairs that have one or more of the following:

1. Unusually long flights;
2. Distracting views, tread nosings that are difficult to see; and
3. Large nonuniformities in riser and tread dimensions.

(c) Assume that any portion of a stair that is more than 31 in. (79 cm) away from a graspable handrail performs at least 15 percent more poorly than otherwise calculated where used by a descending crowd. (*See Table 2-3.4 and Section 2-7 for further information.*)

2-5.4 Assume that a stair used by a crowd containing a significant number of persons who are elderly, very young, or unfamiliar with the stair and its surroundings performs up to 20 percent more poorly than otherwise calculated.

2-5.5 There are other use factors that could have significant positive or negative effects on evacuation performance. For example, a stair that is several inches too narrow (relative to some requirement) might perform acceptably well in evacuations if there is sufficient preparedness and familiarity on the part of management and users. Conversely, an otherwise acceptable stair might have its advantages negated by factors such as normal prohibition of use because of security concerns. Generally, the design and approval of egress facilities necessitates good judgment that goes beyond strict adherence to quantitative formulas, whether based on unit width or effective width.

2-6 Example Calculations.

2-6.1 A single-flight stair descending 84 in. (213 cm) is to be used by 310 persons in a transit station with a flow time of 220 seconds. Which widths of stair provide this performance with riser-tread geometry based on (a) 7-in. (17.8-cm) risers and 11-in. (27.9-cm) treads, and (b) 6-in. (15.2-cm) risers and 13-in. (33.0-cm) treads? What are the areas needed for each flight? (The 220-second flow time in this example calculation is slightly longer than the 207 seconds described in Section 2-3, and this accounts for some of the differences noted below in relation to former *Code* requirements based on 75 persons per unit width.)

(a) Using the middle curve in Figure 2-3.5, the flow time of 220 seconds is linked with W/P = 0.19 in. (0.48 cm) of effective stair width per person. Multiplying by 310, obtain an effective width of 59 in. (150 cm). Adding 7 in. (17.8 cm) provides a handrail centerline spacing of 66 in. (168 cm) (which could result in a reduction of about 2 percent in flow performance because of this slightly excessive spacing where used by a descending crowd). Adding 12 in. (30.5 cm), obtain a nominal, wall-to-wall width of 71 in. (180 cm). The area needed for this flight of stairs with 12 risers [at 7 in. (17.8 cm) for a total rise of 84 in. (213 cm)] is 12 × 11 × 71 = 9372 sq in. or 65 sq ft (6.0 sq m).

(b) Using the middle curve in Figure 2-3.5, the flow time of 220 seconds is linked with W/P = 0.19 in. (0.48 cm) of effective stair width per person. This is adjusted for the superior riser (-5 percent) and the superior tread (-10 percent) for a net adjustment of -15 percent. The adjusted W/P is, therefore, 0.162 in. (0.41 cm) of effective stair width per person. Multiplying by 310, the population served by the stair, an effective width of 50 in. (127 cm) is obtained. Adding 7 in. (17.8 cm) provides a handrail centerline spacing of 57 in. (145 cm) or adding 12 in. (30.5 cm) provides a nominal, wall-to-wall width of 62 in. (157 cm). The area needed for the flight of stairs with 14 risers [at 6 in.

(15.2cm)] for a total rise of 84 in. (213 cm) is 14 × 13 × 62 = 11,284 sq in. or 78.4 sq ft (7.3 sq m).

2-6.2 This example illustrates that the stair in 2-6.1(b), built with a superior riser and tread geometry for descent, results in a width that is 13 percent narrower than the stair in 2-6.1(a), built to *Code* minimum; however, the stair in 2-6.1(b) needs 20 percent more building area. The relative performance of the stairs, in terms of flow time, is expected to be within 2 percent, with the stair in 2-6.1(b) having the slight advantage. The benefits of the stair in 2-6.1(b) might be in the areas of comfort and safety, particularly for descent, and these considerations could justify the additional cost.

2-6.3 The example also can be extended to illustrate the virtues of the effective width model over the traditional unit width model. The 1985 *Life Safety Code*, required 4.5 units of exit stair width for 310 persons. (The addition of 10 persons over 300 — a difference of 3 percent — necessitates adding 12.5 percent more width where the relatively crude unit-width model is used.) This translates to a nominal width of 4 × 22 in. (55.9 cm) plus 12 in. (30.5 cm) for a total of 100 in. (254 cm) — at least 40 percent greater width and area than the stair in 2-6.1(a), which presumably would have the same minimum-standard riser-tread geometry. Even more striking is the difference where the traditional 60 persons per unit width rule is used. This results in a requirement for a stair 5.5 units wide or 122 in. (310 cm) — 72 percent larger than the stair in 2-6.1(a).

2-6.4 Paragraph 2-6.1 illustrates the use of the calculation method for cases using a flow time performance criterion different from that assumed in the *Code*. Relating population and stair width, in cases using a code-equivalent flow time of 207 seconds or 3.45 minutes, is greatly simplified through the use of a table such as Table 2-3.4. Populations and stair widths can be read directly. Furthermore, stair width limits are established in relation to handrail height, a topic discussed further in Section 2-7.

2-7 Commentary Regarding Minimum and Maximum Stair Widths.

2-7.1 Various researchers have addressed the subject of appropriate minimum stair width for situations where stairs are heavily used by crowds for unidirectional or bidirectional flows. Based on his belief that a 30-in. (76-cm) "lane" should be provided, particularly in situations where bidirectional flow occurs on a stair, Fruin recommends a nominal stair width of 60 in. (152 cm). Fruin also emphasizes the importance of providing sufficient space for people carrying items such as briefcases and luggage (6). Templer discusses a minimum width between stair walls of 38.5 in. (98 cm) for comfortable movement of a 99th percentile adult and 29 in. (74 cm) as the bare minimum for a 95th percentile adult (7). He recommends that, as a minimum to allow people to walk side by side or pass with comfort, a stair should be based on two lanes 28 in. (71 cm) wide or at least 56 in. (142 cm) between walls. Pauls recommends a minimum handrail-to-handrail centerline spacing of 50 in. (127 cm), which results in a 55-in. (140-cm) minimum clearance between walls (3).

2-7.2 Regarding maximum spacing between handrails, the reasoning is based on safety, specifically handrail reachability on one or both sides of a person on a stair. Pauls recommends that the maximum distance between the center of a person's position on a stair and the centerline of a handrail should not exceed 24 in. (61 cm). This horizontal distance is a function of handrail height and is based on handrails approximately 36 in. (91 cm) above tread nosings. [For handrails as low as 30 in. (76 cm), the 24-in. (61-cm) distance should be reduced drastically.] Adding 14 in. (35.6 cm) for the space used for the clearance from the center body position to a wall results in a maximum wall-to-handrail width of 38 in. (97 cm) where only one handrail is provided 36 in. (91 cm) above tread nosings.

2-7.3 For situations where two handrails are provided and the stair is to be used extensively by crowds, the maximum handrail-to-handrail spacing is 62 in. (157 cm). This assumes that handrails are at least 36 in. (91 cm) above tread nosings. The recommended maximum spacing would be reduced to approximately 57 in. (145 cm) for handrails 34 in. (86 cm) above tread nosings. In view of changes in the *Life Safety Code*, in relation to both height and spacing of handrails, reference also should be made to the *Life Safety Code Handbook* (7).

2-7.4 A special case has been made by Sweden's leading stair researcher, Kvarnstrom, for stairs used by elderly persons and others who need maximum support, with both hands on a handrail, where using a stair (8). A 27-in. (69-cm) spacing is recommended. As well as being recommended for institutions, such a spacing might be warranted in public settings where a special lane might be provided on a wide stair for such persons, who constitute an increasing portion of the total population using buildings.

2-8 Suggestions on Egress Capacity for Corridors.

2-8.1 The matter of appropriate widths for corridors is more straightforward than for stairs. Crowd flow in corridors also is characterized by an effective-width phenomenon with an edge effect (on each side) of approximately 6 in. (15 cm), measured from each of the two boundary walls (3, 9). Figure 2-8.1 shows the relationship between these widths.

2-8.2 For egress capacity, the *Life Safety Code* and the U.S. model building codes now usually require 0.2 in. (5 mm) of nominal width for each person. With 44 in. (1118 mm) being a commonly stipulated minimum dimension, this means that 32 in. (813 mm) of effective width are provided for 220 persons, or 0.145 in. (3.7 mm) per person. The nominal egress flow time where using this minimum dimension is approximately 203 sec (3.4 min).

2-8.3 For corridors wider than 44 in. (1118 mm), a good case can be made for egress capacity calculations based on an effective-width calculation. For example, a corridor needed for egress by 300 people, with a standard flow time of 203 sec (3.4 min), needs to have 43.5 in. (1105 mm) of effective width and [with the 12-in. (30.5-cm) increase needed to obtain nominal dimensions] results in 55.5 in. (1410 mm) of nominal, wall-to-wall width.

2-9 Special Cautions. For all circulation facilities (e.g., stairs, corridors, doorways) designed on the basis of reduced egress width provisions such as in the *Life Safety Code*, careful attention needs to be paid to all potential life safety hazards. In addition to problems arising in fire emergencies, there might be equally serious problems of

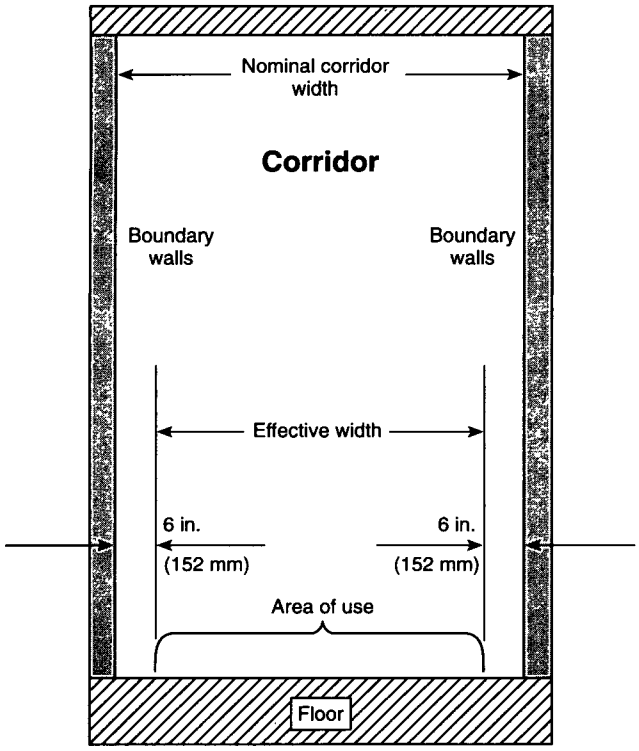

Figure 2-8.1 Measurement of effective width of corridors in relation to walls.

crowd crushing (i.e., low levels of service) that could occur with longer-duration, denser flows of people. Such problems (in the whole context of people movement, building design, facility or event management, and standards, codes, and litigation) are covered extensively by Pauls and Fruin (10).

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Chapter 3 Fire Safety Evaluation System for Health Care Occupancies

3-1 General. 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.

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

This chapter is provided to assist in completion of the "Fire/Smoke Zone Evaluation Worksheet for Health Care Facilities." The step-by-step instructions for completion appear on the worksheet itself. 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 where questions of definitions or interpretation arise. The chapter is organized to follow the format of the worksheet progressively.

3-2 Procedure for Determining Equivalency.

3-2.1 Evaluate every fire zone using the "Fire/Smoke Zone Evaluation Worksheet for Health Care Facilities" (Tables 3-1 through 3-7). Use the text portion (Section 3-3 through 3-6.13.4.3) of this chapter as a guide.

3-2.2 The "Facility Fire Safety Requirements Worksheet" (Table 3-8) is used to determine any nonconformance with the requirements on the worksheet.

3-2.3 Equivalency is achieved if the fire/smoke zone evaluations show equivalency or better in each and every fire zone and the requirements on the Facility Fire Safety Requirements Worksheet (Table 3-8) are met.

3-3 Fire/Smoke Zone.

3-3.1 A fire/smoke zone is a space that is separated from all other spaces by floors, horizontal exits, or smoke barriers. Every zone on a floor that is subdivided into two or more zones shall have exit routes in accordance with 12-2.4.3 or 13-2.4.3 (NFPA *101*). Compartments not meeting these requirements shall be evaluated as part of an adjacent zone. Where a floor is not subdivided by horizontal exits or smoke barriers, the entire floor is considered to be the zone.

3-3.2 Selection of Zones to Be Evaluated. A floor that is not subdivided by horizontal exits or smoke barriers is considered a single zone. The entire facility shall be divided into zones. There shall be no areas that are not in a zone. For a complete evaluation, evaluate individually every zone in the health care facility. From a practical standpoint,

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:

(a) Each type of patient zone having a different type of mobility, density, or attendant ratio as specified in Table 3-1 of the worksheet;

(b) Each zone that represents a significantly different type of construction, finish, or protection system;

(c) Zones containing special medical treatment or support activities (operating suites, intensive care units, laboratories);

(d) Zones not involving housing, treatment, or customary access for patients as follows:

1. 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 case, the value of factor F in Table 3-2 shall be assigned the value of factor L ("Zone Location") from Table 3-1. In such cases, Safety Parameter 10, "Emergency Movement Routes," from Table 3-4 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.

2. If the zone is separated from all patient use zones by 2-hour fire-rated construction (including any members that bear the load of a patient zone and with 1½ hour fire protection rated fire doors on any communicating openings), it shall be permitted to be excluded from evaluation. In such case, that space shall conform with the portion of the *Life Safety Code* appropriate to its use. In addition, appropriate charges under Safety Parameter 8, "Hazardous Areas," in Table 3-4 shall be charged against other zones in the facility.

3. Evaluation of an unoccupied floor(s) located above the highest floor used for health care occupancy is not required, provided the unoccupied floor(s) meets the construction requirements of 12-1.6 (NFPA *101*) for new buildings or 13-1.6 (NFPA *101*) for existing buildings, or if the unoccupied floor(s) is protected by automatic sprinklers.

(e) Patient sleeping rooms or suites exceeding 1,000 sq ft (92.9 sq m) or nonsleeping rooms or suites exceeding 2,500 sq ft (230 sq m) of floor area should be evaluated as follows:

1. If the room or suite has a single exit access door, it should be evaluated as a single dead-end zone.

2. A patient sleeping room or suite of sleeping rooms exceeding 5,000 sq ft (460 sq m) should be evaluated as a separate zone.

3. A room or suite of rooms other than a patient sleeping room, exceeding 10,000 sq ft (930 sq m), should be evaluated as a separate zone.

3-4 Maintenance. Any protection system, requirement, or arrangement that is not maintained in a dependable operating condition or 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.

3-5 Occupancy Risk (Table 3-1). In establishing a system for evaluating occupancy risk, it is recognized that:

(a) There is a basic level of risk inherent in every health care facility;

(b) The fuel characteristics of furniture, equipment, and supplies vary with time; and

(c) The arrangement of these items within the space available also can vary with time.

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.

3-5.1 Patient Mobility.

3-5.1.1 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 upon 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 for that zone. The rationale for this approach is that, if a zone accepts any patient with a reduced mobility status, it might accept other such patients at any time. The impact of this approach is that most health care facilities should be rated in the "not mobile" risk category.

3-5.1.2 Mobility Status Factor. Patient mobility status is based on the capability of each patient to take actions necessary for self-protection. The four classes are defined as follows:

(a) *Mobile.* Capable of readily rising from bed and taking self-protecting actions at approximately the same rate as a healthy adult. In order to be classified as mobile, the patient must not need assistance in getting out of bed and must be able to open a closed or locked door. Persons shall be considered to be mobile if they are not restrained or in any other way limited in response capabilities so that the type of arousal mechanism that normally would awaken an adult is not effective.

(b) *Limited Mobility.* Those patients who have all of the capabilities of a mobile person except that their rate of travel is significantly slower.

(c) *Not Mobile.* Patients incapable of removing themselves from danger exclusively by their own efforts. Examples include persons who are totally bedridden, who need assistance to get out of bed or to move, and who are restrained, locked in their rooms, or otherwise prevented from taking complete emergency self-protection evacuation actions without assistance. Mobility status should be based on the minimum level of mobility in an average 24-hour period.

(d) *Not Movable.* Patients not capable of being moved from the room in which they are housed during the course of a fire. Examples include patients attached to life-support

systems or involved in medical or surgical procedures that prohibit their immediate relocation without extreme danger of death or serious harm.

3-5.2 Patient Density.

3-5.2.1 The occupancy risk evaluation for occupancy density (number of patients within the zone) measures both the inherent increase in the maximum fire death potential that occurs as the number of patients in a zone increases and the problems involved for a limited staff in handling larger numbers of patients during an emergency.

3-5.2.2 Patient Factor. The density of patients is the number of patients that could potentially be housed in the zone. The patient count should be based on the number of assignable beds in the zone, assuming that they might all be occupied at the time of the fire emergency.

3-5.3 Zone Location.

3-5.3.1 This risk factor relates to fire department accessibility to a fire. The rating system recognizes the inherent advantages for the first floor zone. It also recognizes the problems of evacuation from higher floors and the virtual impossibility of using external fire-fighting efforts above the sixth floor in any building.

3-5.3.2 Floor Factor. The measured zone's location shall be considered to be on floor one if the floor has direct access to the exterior at or within less than one-half floor height above or below grade. If a building is on a sloping grade, each floor that has such exterior access shall be considered as a first floor for the purpose of measurement of fire zones on those floors. The measured zone shall be considered to be on the second to third floor range and the fourth to sixth floor range, based on the height of the zone above the nearest grade floor. The zone shall be considered to be above the sixth floor if it is more than six floors above the nearest grade floor. The risk factor value for zones in basements is the same as for zones at or above the seventh floor. The problems involved in emergency internal access, fire fighting and rescue, and the inability to make external attack in basements is approximately equivalent to that in the upper stories of buildings.

3-5.4 Ratio of Patients to Attendants.

3-5.4.1 This risk factor recognizes the importance to patient safety of a staff that is immediately available to respond in an emergency. The emergency actions that might be undertaken by the staff include detection, alarm, fire extinguishment, confinement of the fire, establishing barriers between the patients and the fire (closing patient room doors), rescue, emergency medical aid, and other related functions. A few of these functions, such as detection and alarming, might not be critically related to the ratio of nursing staff to patients, while those related to rescue and the closing of patient room doors have a strong relationship to the staffing ratio. The staff ratio considered is based on the minimum staffing level immediately available (normally the night shift).

3-5.4.2 Patient-Attendant Factor. The ratio of patients to attendants is based on those patients in the fire/smoke zone and the immediately available attendant staff. The ratio calculation shall be based on the minimum staffing level (usually occurring during the night shift). Where nursing stations or other positions of attendants are located at the junction of two or more zones and the location of the station is such that each of the zones has immediate access and view of the nursing station, then the total staffing assigned to the nursing station can be credited to each of the zones. An exception is where staff members are bound by duty assignments (cardiac care units, infant nurseries, operating suites, etc.) that prevent them from responding to other than their assigned zone.

The evaluation system assesses this risk factor at 4.0 in any case where there are periods when there are no attendants immediately available to a zone that houses patients but where attendants are available within one floor of all patient floors. This evaluation system is not intended to be used if there are cases where there are no staff present in the building that houses patients.

3-5.5 Patient Average Age. This risk factor recognizes the increased susceptibility of the elderly and of infants up to one year old to physical harm by smoke particles, gaseous combustion products, and heated air. A larger risk factor is assigned to zones occupied by a population whose average age is above 65 years or below one year. Basically, imposition of this rating demands additional safety protection in nursing homes for the aged and in nurseries.

Age Factor. The mode value is used to arrive at the age factor for the patients in the zone. The calculation should be based on the past record of occupants assigned to the zone. Patients under one year old are classified at the same risk level as those over 65. This is in recognition of the susceptibility of infants to fire.

3-6 Safety Parameters (Table 3-4). Safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons (patients, staff, visitors, others) who might be in the particular zone at the time of a fire.

Each of the safety parameters was analyzed. Where the current *Code* requirements recognize several different approaches to the parameter, the most important alternatives were specified. In addition, conditions likely to be encountered in situations failing to meet the explicit *Code* requirements and conditions exceeding those required by the *Code* but available for increased protection also were specified.

3-6.1 Construction. Construction types are classified in accordance with the definitions of NFPA 220, *Standard on Types of Building Construction*. Major revisions have been made in the categories and definitions in the recent editions of NFPA 220.

NOTE: Prior editions of NFPA 220, *Standard on Types of Building Construction*, included requirements for "interior partitions enclosing stairs or other openings through floors." Current editions do not. This change is fully accounted for in this system. (*See 3-6.7.*)

3-6.1.1 Where the facility includes additions or connected structures of different construction, the rating and classification of the structure shall be based on the following:

(a) Separate buildings if a 2-hour or greater fire-resistance rated separation exists between the portions of the building;

(b) Separate buildings if the additions and connected structure conform to the provisions of applicable sections

of Chapter 12 or 13 (NFPA *101*), whether or not separation is provided; and

(c) The lower safety parameter point score involved if such a separation does not exist.

3-6.1.2 The floor level used to determine the parameter value is the floor of the fire zone being evaluated. The "floor of zone" is the story height above the floor of the primary level of exit discharge as defined by 12-1.6.1 and 13-1.6.1 (NFPA *101*).

3-6.1.3 Where the zone is on a floor below the floor of lowest discharge, the construction value shall be based on the distance of that floor from the closest level of discharge (i.e., one floor below discharge = "second"; two floors below discharge = "third"; three or more floors below discharge = "fourth and above").

3-6.2 Interior Finish (Corridor and Exits). The classification of flame spread is in accordance with Section 6-5 (NFPA *101*). The flame spread classification shall be based on the most combustible surface after deleting trim. No allowance is made in the safety parameter values for Class D or E interior finishes. It is not anticipated that such material will be used in health care facilities. In the rare case such high flame spread interior finish material is involved, an individual appraisal outside the capability of this evaluation system will be required.

3-6.3 Interior Finish (Rooms). See 3-6.2.

3-6.4 Corridor Partitions/Walls. For the purpose of this evaluation, the fire-rated partitions considered are as defined in 12-3.6 (NFPA *101*) for new buildings and 13-3.6 (NFPA *101*) for existing buildings. All elements of the partition, except the door (considered as a separate element in this evaluation), must be included in the determination of its time-rated fire resistance classification according to NFPA 251, *Standard Methods of Fire Tests of Building Construction and Materials*. An exception to the general rule of evaluating doors separately from walls occurs where one or more rooms has no door (*see 3-6.5*). In this instance, it is considered that the worth of the fire resistance capabilities of the corridor partition wall is so reduced that the wall should be graded as having no fire resistance. (*See Table 3-4.*)

3-6.4.1 Corridor partitions shall be graded as "none or incomplete" if they do not meet the requirements of 12-3.6 or 13-3.6 (NFPA *101*), as appropriate, including applicable exceptions. In existing buildings, partitions shall be permitted to be graded as "$< 1/3$ hour," provided the ceiling within the fire/smoke zone is of a design and construction to resist the passage of smoke and the partition either extends through or terminates at the underside of the ceiling with a smoketight joint.

3-6.4.2 Corridor partitions shall be graded as "$\geq 1/3 <$ 1 hour" or "$\geq$ 1 hour" only where the partitions extend to the underside of the floor or roof construction above in accordance with 12-3.6 or 13-3.6 (NFPA *101*), as appropriate.

3-6.5 Doors to Corridor. The classification of doors to the corridor shall be based on the minimum quality of any door in the zone, and the classification shall be determined in accordance with NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*. Doors for protection of vertical openings and hazardous areas that are covered separately in 3-6.7 and 3-6.8 are not included in this evaluation. Doors that do not latch or have louvers opening to toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces that do not contain flammable or combustible materials shall not be considered in classifying doors to corridors.

3-6.5.1 No Door. A room shall be considered as not having a door if there is no door in the opening or if there is some other mechanism that prevents closing of the door or otherwise leaves a significant opening between the patient room and the corridor. Doors with louvers or ordinary glass lights shall be classified as "no door." (Ordinary glass lights shall not be considered as making a partition incomplete in locations where both sides of the glass light are fully protected by automatic sprinkler systems.) Doors that have been blocked open by door stops, chocks, tie backs, or other devices that necessitate manual unlatching or releasing action to close the door shall be classified as "no door." Hold-open devices that release when the door is pushed or pulled (such as friction catches or magnetic catches) shall be permitted, and the door shall be classified under 3-6.5.2, 3-6.5.3, and 3-6.5.4. Also, doors that are not provided with a latch in accordance with 12-3.6.3.2 or 13-3.6.3.2 (NFPA *101*), shall be classified as "no door."

3-6.5.2 Doors of Less than Twenty-Minute Fire Protection Rating ($<$ 20 min FPR). Doors that are not deficient as described in 3-6.5.1, but that do not meet the requirements of 3-6.5.3, shall be classified as less than 20-minute fire protection rating.

3-6.5.3 Doors of Twenty-Minute or More Fire Protection Rating ($\geq$ 20 min FPR). Doors shall be considered as having a 20-minute or greater fire protection rating if they are of $1\frac{3}{4}$-in. (4.4-cm) thick, solid, bonded wood core construction or any other arrangement of equal or greater stability and fire integrity. The thermal insulation capability of the door need not be considered. Hollow or sheet steel doors therefore meet the 20-minute requirement.

3-6.5.4 Twenty-Minute or More Fire Protection Rating and Automatic Closing ($\geq$ 20 min FPR & Auto Clos.). Automatic closing devices shall be considered to be present if the door has an arrangement that holds them open in a manner such that they are released by a smoke-detector operated device (e.g., magnetic or pneumatic hold-open device) prior to the passage of significant smoke from a room of fire origin into the corridor or from the corridor into a room not involved in the fire. Smoke detectors for operation of such doors shall be permitted to be integral with the door closers, mounted at each opening, or operated from systems meeting the requirements for two or more points of credit under 3-6.12. The requirement for 20-minute fire protection rating is the same as in 3-6.5.3.

3-6.5.5 Self-Closing Patient Room Doors. Traditional self-closing doors on individual patient rooms shall be evaluated in the following manner:

(a) If it can be established that the doors are constantly kept in the normally closed position except when persons are actually passing through the openings, the self-closing device shall be considered as equivalent to an automatic closing device and credited accordingly.

(b) If the self-closing doors are blocked open, they shall be classified as "no door" and a parameter value of (–10) invoked.

3-6.6 Zone Dimensions. Zone dimension shall be as calculated per 12-3.7.1 or 13-3.7.1 (NFPA *101*).

3-6.6.1 The length of a corridor "dead end" shall be measured from the point at which a person egressing from the dead end would have an option of egressing in two separate directions.

3-6.6.2 In assessing the values for this parameter, a single value shall be chosen based on the worst safety level in the zone. For example, if one or more dead ends in excess of 50 ft (15 m) but not more than 100 ft (30 m) exist, the parameter value for dead ends (-4) shall be applied regardless of the actual corridor lengths.

3-6.6.3 Since dead-end corridors and single emergency movement routes (*see 3-6.10*) each confine the occupants of a fire zone to a single means of egress, the effect of these two factors on the parameter value is not cumulative. As indicated by footnote b to Table 3-4, the parameter value for dead-end corridors is to be 0 instead of either (-2), (-4), or (-6) in the special case where a value of (-8) is assessed under 3-6.10 for single emergency movement routes.

3-6.7 Vertical Openings. These values apply to vertical openings and penetrations including exit stairways, ramps, and other vertical exits of the type recognized by NFPA *101, Life Safety Code*, plus pipe shafts, ventilation shafts, duct penetrations, and laundry and incinerator chutes. Enclosures shall be of construction having fire resistance rating not less than that prescribed for vertical openings (*see Safety Parameter 7 of Table 3-4*). In addition, they shall be equipped with fire doors or acceptable protection of openings into the shafts, all designed and installed to provide a complete barrier to the vertical spread of fire or smoke.

3-6.7.1 A vertical opening or penetration shall be considered "open" if it is:

(a) Unenclosed;

(b) Enclosed but does not have doors;

(c) Enclosed but has openings other than doorways; and

(d) Enclosed with cloth, paper, or similar materials without any sustained flame-stopping capabilities.

3-6.7.2 Where vertical openings are located outside the fire/smoke zone and the separation between the zone and the vertical opening is of 1-hour or greater fire resistance rating and is of higher fire resistance rating than the protection of the vertical opening itself (for example: an open shaft separated from the zone by a 2-hour fire resistance-rated partition with 1 1/2 hour fire protection rated self-closing fire doors), the rating of this factor for the zone being measured shall be based on the higher of the two fire resistant categories. In this example, a safety parameter value of 3 would be given for the 2-hour fire resistance rating. Where this occurs, however, the space with the vertical opening cannot be considered an exit route or refuge area for that zone where evaluating the emergency movement route parameter addressed in 3-6.10.

3-6.7.3 A vertical opening shall be considered open for more than three floors if there is unprotected penetration of four or more floors on the same shaft without an intervening slab or other cutoff (*also see same area as an unprotected penetration in 3-6.13*). If a shaft is enclosed at all floors except one and this results in an unprotected opening between the shaft and one, and only one, fire/smoke zone, the parameter value assigned for that shaft opening in the fire/smoke zone where the unprotected opening occurs shall be 0.

3-6.8 Hazardous Areas. Hazardous area protection is determined in accordance with Section 6-4 (NFPA *101*). The term "adjacent zone" as used in the evaluation form means any zone, either on the same floor or on the floor immediately below, that physically abuts the zone being evaluated and not separated by 2-hour fire resistance-rated construction.

The term "outside zone" as used in the evaluation form means any place within the building other than the fire/smoke zone being measured and not separated by 2-hour fire resistance-rated construction.

3-6.8.1 In assessing the parameter value for hazardous areas, only one value shall be chosen. It shall be the most severe value corresponding to the deficiencies present. A double deficiency can exist only where the hazard is severe and the space is not sprinkler protected. Double protection consists of both a fire-rated enclosure and automatic sprinkler protection of the hazardous area. If both of these are lacking in a severe hazardous location, the double deficiency value shall be chosen. If double deficiencies exist both within the zone and outside the zone, the higher value (-11) for the condition inside the zone shall be chosen. The values are not cumulative, regardless of how many hazardous areas are present.

3-6.8.2 Where the hazard is not severe, the maximum deficiency that can occur is a single deficiency, which shall be permitted to be countered by either a fire-rated enclosure or automatic extinguishing equipment.

3-6.8.3 A single deficiency situation also is considered to exist where a severe hazard is protected either by automatic extinguishing systems or by fire resistance-rated enclosure, but not by both.

3-6.9 Smoke Control. Smoke control definitions are provided in 3-6.9.1 through 3-6.9.3.

3-6.9.1 No Control. There are no smoke barriers (or horizontal exits) on the floor, and there is no mechanical smoke control system.

3-6.9.2 Smoke Barrier Serves Zone. A smoke barrier consists of a partition extending across the entire width of the zone equipped with doors that either are self-closing or are closed upon detection by smoke detectors located at the door arches or other release mechanism as described in 5-2.1.8 (NFPA *101*). To be credited as a smoke barrier, an existing partition also shall conform with the requirements of 13-3.7.2 through 13-3.7.7 (NFPA *101*). New smoke barriers in either new or existing buildings shall meet the more stringent requirements of 12-3.7.2 through 12-3.7.8 (NFPA *101*). A horizontal exit will act as a smoke partition and is credited as both a smoke barrier (*see 3-6.9*) and an emergency movement route (*see 3-6.10*).

3-6.9.3 Mechanically Assisted Systems — by Zone. Mechanically assisted smoke control on a zone basis shall include a smoke barrier, as in 3-6.9.2, supported by a tested and accepted smoke control system that obstructs the leakage of smoke between zones. One method of judging the acceptability of smoke control systems is contained in NFPA 92A, *Recommended Practice for Smoke-Control Systems*.

3-6.10 Emergency Movement Routes. A movement route is any means of egress meeting the requirements for such means specified in 5-2.2 through 5-2.6 (NFPA *101*). Horizontal exits also shall meet the requirements specified in 3-6.10.4. Doors exiting directly to the exterior also shall constitute a movement route from the room containing such a door.

3-6.10.1 Less than Two Routes. The means of emergency movement from a zone is classified as fewer than two routes if there are not at least two remote movement routes serving the zone. Movement routes shall be permitted to be outside the physical limits of the zone.

3-6.10.2 Multiple Routes. The emergency movement route is multiple if the zone occupants have the choice of two or more distinctly separated movement routes from the zone.

3-6.10.3 Deficient. The choice of parameter value for deficient emergency movement routes is independent of any values determined in 3-6.7.

3-6.10.3.1 An emergency movement route of a type described by 12-2.2 or 13-2.2 (NFPA *101*) is deficient if the door to a patient room or passage through a smoke barrier is less than 32 in. (81 cm) [41.5 in. (105 cm) in new buildings] in clear width, or if the corridor in the zone between patient rooms and smoke barriers and exits is less than 48 in. (122 cm) [8 ft (244 cm) in new buildings] in clear width. These figures are based on the minimum width for a wheelchair to egress a room and the minimum width for the passage of a wheelchair in one direction and an ambulatory person in the opposite direction.

3-6.10.3.2 Exit routes also shall be considered deficient if they fail to meet the requirements of 12-2.1 through 12-2.7 or 13-2.1 through 13-2.7 (NFPA *101*), for the egress route involved. However, any route where the doors from rooms or through partitions or walls are less than 32 in. (81 cm) in the clear, where the corridor(s) involved is less than 34 in. (86 cm) wide, or where stair access is less than 28 in. (71 cm) in the clear shall not be credited as an egress route.

3-6.10.3.3 Exit routes shall be considered deficient if the route does not otherwise conform to the requirements of Section 5-1 through 5-2.8 (NFPA *101*), even if the routes have been or are acceptable to the authority having jurisdiction.

3-6.10.3.4 Exit routes shall be considered deficient if the capacity of the exits serving the floor containing the zone being evaluated is insufficient for the calculated occupant load of the floor.

3-6.10.4 Horizontal Exits. The presence of a single horizontal exit from the zone being evaluated shall be assigned a parameter value of 1, provided the space on the opposite side of the horizontal exit is capable of handling all of the patients from affected zones.

3-6.10.4.1 To be credited as a horizontal exit, the existing arrangement also shall conform with the requirements of 13-2.2.5 (NFPA *101*). New horizontal exits in new or existing buildings shall meet the more stringent requirements of 12-2.2.5 (NFPA *101*).

3-6.10.4.2 To receive credit for horizontal exits, the zone credited shall conform to the requirements of 5-5.1.2 (NFPA *101*) with the zone served considered a separate portion of the building.

3-6.10.4.3 In addition, to receive credit for horizontal exits, each patient sleeping room in the zone shall be within 150 ft (45 m) of travel of a horizontal exit door or exit to grade.

3-6.10.5 Direct Exits. To be credited for direct exits, each patient-use space (except bathrooms, restrooms, and corridors) in the zone shall have a door operable by the room occupant(s) that opens directly to the exterior at grade or onto an exterior balcony with direct access to an exterior exit or a smokeproof enclosure. The direct exit shall be ramped or otherwise without steps or changes in elevation that could prevent or obstruct the movement of wheelchairs or wheel-littered patients through the direct exits to a place of safety and refuge.

3-6.11 Manual Fire Alarm. The manual alarm systems for new construction shall be in accordance with the requirements of 12-3.4.1, 12-3.4.2, 12-3.4.3.1, and 12-3.4.4 (NFPA *101*). Existing construction shall be in accordance with 13-3.4.1, 13-3.4.2, 13-3.4.3.1, and 13-3.4.4 (NFPA *101*). Connection to the fire department shall be considered as being met if the fire alarm system is connected directly to the fire department, through an approved central station, or through other means acceptable to the authority having jurisdiction.

3-6.12 Smoke Detection and Alarm. A detection system as used herein is one based on the use of automatic smoke detectors installed in accordance with Section 7-6 (NFPA *101*). Notification shall be in accordance with 12-3.4.3.1 or 13-3.4.3.1 (NFPA *101*). No recognition is given for thermal detectors; however, credit is given for the use of quick-response sprinklers per Note g of Table 3-4. The detection system categories are described in 3-6.12.1 through 3-6.12.5.

3-6.12.1 None. There are no smoke detectors in the zone, or, if present, they are not included in any of the categories of 3-6.12.2 through 3-6.12.5.

3-6.12.2 Corridor Only. Smoke detectors are installed throughout the corridors of the zone involved in accordance with Section 7-6 (NFPA *101*).

3-6.12.3 Rooms Only. Smoke detectors are installed throughout the rooms of the zone involved. Smoke detectors shall be considered as meeting this requirement where there is at least one smoke detector in each room occupied or used by patients. Detectors are not required in restrooms or closets.

3-6.12.4 Corridor and Habitable Spaces. Detection systems installed throughout the corridors of the zone involved and in the habitable spaces (patient rooms, nurses stations, and other areas basically used for human occupancy) shall be considered as meeting the requirements for a corridor and habitable spaces detection system. Closets, toilet rooms, and other auxiliary spaces as well as ceiling voids, interstitials, and other building spaces not used by humans as a normal part of their regular occupancy are not required to have detectors.

3-6.12.5 Total Spaces in Zone. Total space provision of detectors includes detector coverage of all spaces except noncombustible building voids that contain no combustible materials. The total space credit is to be given if the zone measured meets this criteria, regardless of the presence or lack of detectors in other portions of the building.

3-6.13 Automatic Sprinklers.

3-6.13.1 Wherever sprinkler protection is involved in an area having an unprotected vertical opening, the sprinkler protection around that vertical opening shall conform to Chapter 6 (NFPA *101*). This protection is required to allow the credit for sprinkler protection but shall in no way reduce any assessed value under Safety Parameter 7 in Table 3-4 resulting from an unprotected vertical opening.

3-6.13.2 In Table 3-5, the value for sprinkler protection credited to the people movement safety (S_3) category is divided by 2. This produces a safety parameter value of only one-half the value credited in other categories.

3-6.13.3 Each sprinkler system shall be provided with supervision. Each sprinkler system shall be interconnected electrically with the fire alarm system, and the main sprinkler control valve shall be supervised electrically so that at least a local alarm shall sound in a constantly attended location when the valve is closed.

3-6.13.4 In evaluating sprinkler protection within the zone, the protection or lack of protection of hazardous areas is considered separately and covered under 3-6.8. For all other areas in the zone, sprinklers shall be graded based on the categories specified in 3-6.13.4.1 through 3-6.13.4.3.

3-6.13.4.1 None. No credit is applied if there are no sprinklers or if sprinklers, though present, are not sufficient to qualify for one of the other categories specified.

3-6.13.4.2 Corridor and Habitable Space. Habitable space includes patient rooms, nurses stations, and other areas used basically for human occupancy. Habitable space does not include closets, bathrooms, toilets, elevators, and similar spaces. This safety parameter value is based on standard sprinkler spacings in the areas covered and is conditional, based on the classification of construction type as covered in 3-6.1, as follows:

(a) Safety Parameter 1, "Construction" (*see 3-6.1*), in Table 3-4 is based on a "protected" or "fire-resistive" type of construction. Protected or fire-resistive types of construction include Types I, II(222), II(111), III(211), and V(111). This credit is based on a system that effectively provides coverage for all corridor and habitable space in the zone, plus the establishment of water distribution patterns or other protection in a manner to prevent the advance of fire from nonsprinklered spaces into the sprinklered spaces. In buildings of protected or fire-resistive construction, the credit is to be applied to any zone where these conditions are met, whether or not areas outside the zone are protected similarly.

(b) Safety Parameter 1, "Construction" (*see 3-6.1*), is based on an "unprotected" type of construction. Unprotected types of construction include Types II(000), III(000), and V(000). In any unprotected type of construction, the credit for corridor and habitable space protection is to be given only if, in addition to the conditions described in 3-6.13.4.2(a), sprinkler protection also is provided in all spaces in the building (including attic or loft spaces) with construction elements that are not sheathed, enclosed, or otherwise protected with fire-resistive materials such as gypsum board, plaster, or masonry block.

3-6.13.4.3 Entire Building. Total space automatic sprinkler protection is to be credited only if the entire structure is protected by automatic sprinklers in accordance with 12-3.5 or 13-3.5 (NFPA *101*). This credit also is given where a smoke zone is renovated to install quick-response or residential sprinklers in accordance with 12-1.1.4.5 (NFPA *101*). Wherever quick-response automatic sprinklers are provided for zones as part of the entire building sprinkler system, additional credit shall be permitted to be taken under Safety Parameter 12, "Smoke Detection and Alarm." (*See 3-6.12 and Table 3-4.*)

Fire/Smoke Zone* Evaluation Worksheet For Health Care Facilities
(NFPA 101A-1995/NFPA 101-1994)

Facility _____ Building _____

Zone(s) Evaluated _____

Evaluator _____ Date _____

Complete this worksheet for each zone. Where conditions are the same in several zones, one worksheet can be used for those zones.

*FIRE/SMOKE ZONE is a space separated from all other spaces by floors, horizontal exits, or smoke barriers.

STEP 1: Determine occupancy risk parameter factors — Use Table 3-1.

For each risk parameter in Table 3-1, select and circle the appropriate risk factor value. Choose only one for each of the five risk parameters.

Table 3-1 Occupancy Risk Parameter Factors

Risk Parameters	Risk Factor Values				
1. Patient Mobility (M)	Mobility Status	Mobile	Limited Mobility	Not Mobile	Not Movable
	Risk Factor	1.0	1.6	3.2	4.5
2. Patient Density (D)	No. of Patients	1-5	6-10	11-30	>30
	Risk Factor	1.0	1.2	1.5	2.0
3. Zone Location (L)	Floor	1st	2nd or 3rd	4th to 6th	7th and Above	Basements
	Risk Factor	1.1	1.2	1.4	1.6	1.6
4. Ratio of Patients to Attendants (T)	Patients / Attendant	1-2 / 1	3-5 / 1	6-10 / 1	>10 / 1	One or † More / None
	Risk Factor	1.0	1.1	1.2	1.5	4.0
5. Patient Average Age (A)	Age	Under 65 Years and Over 1 Year		65 Years and Over 1 Year and Younger		
	Risk Factor	1.0		1.2		

†A risk factor of 4.0 is charged to any zone that houses patients without any staff in immediate attendance.

(For use with NFPA 101A-1995/NFPA 101-1994)

STEP 2: Compute occupancy risk factor F — Use Table 3-2.

A. Transfer the circled risk factor values from Table 3-1 to the corresponding blocks in Table 3-2.

B. Compute occupancy risk factor F by multiplying the risk factor values as indicated in Table 3-2.

Table 3-2 Occupancy Risk Factor Calculation

	M		D		L		T		A		F
Occupancy Risk		X		X		X		X		=	

(For use with NFPA 101A-1995/NFPA 101-1994)

STEP 3: Compute adjusted building status R — Use Table 3-3A or 3-3B.

A. If building is classified as "new," use Table 3-3A. If building is classified as "existing," use Table 3-3B.

B. Transfer the value of F from Table 3-2 to Table 3-3A or Table 3-3B, as appropriate. Calculate R.

C. Transfer R to the block labeled R in Table 3-7.

Table 3-3A (New Buildings)

	F		R
1.0 X		=	

(For use with NFPA 101A-1995/NFPA 101-1994)

Table 3-3B (Existing Buildings)

	F		R
0.6 X		=	

(For use with NFPA 101A-1995/NFPA 101-1994)

STEP 4: Determine safety parameter values — Use Table 3-4.

Select and circle the safety value for each safety parameter in Table 3-4 that best describes the conditions in the zone. Choose only one value for each of the 13 parameters. If two or more values appear to apply, choose the one with the lowest point value.

Table 3-4 Safety Parameter Values

Safety Parameters	Parameter Values						
1. Construction	Combustible Types III, IV, and V				Noncombustible Types I and II		
Floor or Zone	000	111	200	211 + 2HH	000	111	222, 322, 433
First	-2	0	-2	0	0	2	2
Second	-7	-2	-4	-2	-2	2	4
Third	-9	-7	-9	-7	-7	2	4
4th and Above	-13	-7	-13	-7	-9	-7	4
2. Interior Finish (Corridors and Exits)	Class C	Class B	Class A				
	-5 (0)[f]	0 (3)[f]	3				
3. Interior Finish (Rooms)	Class C	Class B	Class A				
	-3 (1)[f]	1 (3)[f]	3				
4. Corridor Partitions/Walls	None or Incomplete	<1/3 hr	≥1/3 < 1 hr	≥1 hr			
	-10 (0)[a]	0	1 (0)[a]	2 (0)[a]			
5. Doors to Corridor	No Door	< 20 min FPR	≥ 20 min FPR	≥ 20 min FPR and Auto Clos.			
	-10	0	1 (0)[d]	2 (0)[d]			
6. Zone Dimensions	Dead End			No Dead Ends >30' and Zone Length Is:			
	>100'	>50' to 100'	30' to 50'	>150'	100' to 150'	<100'	
	-6 (0)[b]	-4(0)[b]	-2 (0)[b]	-2	0	1	
7. Vertical Openings	Open 4 or More Floors	Open 2 or 3 Floors	Enclosed with Indicated Fire Resist.				
			<1 hr	≥1 hr < 2 hr	≥ 2 hr		
	-14	-10	0	2 (0)[e]	3 (0)[e]		
8. Hazardous Areas	Double Deficiency		Single Deficiency		No Deficiencies		
	In Zone	Outside Zone	In Zone	In Adjacent Zone			
	-11	-5	-6	-2	0		
9. Smoke Control	No Control	Smoke Barrier Serves Zone	Mech. Assisted Systems by Zone				
	-5 (0)[c]	0	3				
10. Emergency Movement Routes	<2 Routes	Multiple Routes					
		Deficient	W/O Horizontal Exit(s)	Horizontal Exit(s)	Direct Exit(s)		
	-8	-2	0	1	5		
11. Manual Fire Alarm	No Manual Fire Alarm	Manual Fire Alarm					
			W/O F.D. Conn.	W/F.D. Conn.			
	-4		1	2			
12. Smoke Detection and Alarm	None	Corridor Only	Rooms Only	Corridor and Habit. Spaces	Total Spaces in Zone		
	0 (3)[g]	2 (3)[g]	3 (3)[g]	4	5		
13. Automatic Sprinklers	None	Corridor and Habit. Space	Entire Building				
	0	8	10				

NOTES:
[a]Use (0) where Parameter 5 is -10.
[b]Use (0) where Parameter 10 is -8.
[c]Use (0) on floor with less than 31 patients (existing buildings only).
[d]Use (0) where Parameter 4 is -10.
[e]Use (0) where Parameter 1 is based on first floor zone or on an unprotected type of construction (columns marked "U").
[f]Use ( ) if the area of Class B or C interior finish in the corridor and exit or room is protected by automatic sprinklers and Parameter 13 is 0.
[g]Use this value in addition to Parameter 13 if the entire zone is protected with quick-response automatic sprinklers.

For SI units: 1 ft x 0.3048 = 1 m.

(For use with NFPA 101A-1995/NFPA 101-1994)

STEP 5: Compute individual safety evaluations — Use Table 3-5.

A. Transfer each of the 13 circled safety parameter values from Table 3-4 to every unshaded block in the line with the corresponding safety parameter in Table 3-5. For Safety Parameter 13, the value entered in the "People Movement Safety" column is recorded in Table 3-5 as one-half the corresponding value circled in Table 3-4.

B. Add the four columns, keeping in mind that any negative numbers need to be deducted.

C. Transfer the resulting total values for S_1, S_2, S_3, and S_4 to the corresponding blocks in Table 3-7.

Table 3-5 Individual Safety Evaluations

Safety Parameters	Containment Safety (S_1)	Extinguishment Safety (S_2)	People Movement Safety (S_3)	General Safety (S_4)
1. Construction				
2. Interior Finish (Corr. and Exit)				
3. Interior Finish (Rooms)				
4. Corridor Partitions/Walls				
5. Doors to Corridor				
6. Zone Dimensions				
7. Vertical Openings				
8. Hazardous Areas				
9. Smoke Control				
10. Emergency Movement Routes				
11. Manual Fire Alarm				
12. Smoke Detection and Alarm				
13. Automatic Sprinklers			+ 2 =	
Total Value	**S_1 =**	**S_2 =**	**S_3 =**	**S_4 =**

(For use with NFPA 101A-1995/NFPA 101-1994)

STEP 6: Determine mandatory safety requirements values — Use Table 3-6.

A. Using the classification of the building (i.e., new or existing) and the floor where the zone is located, circle the appropriate value in each of the three columns in Table 3-6.

B. Transfer the three circled values from Table 3-6 to the blocks marked S_a, S_b, and S_c in Table 3-7.

C. The mandatory safety requirements values for basements are based on the distance of the basement level from the closest level of discharge. (*Also see 3-6.1.2 and 3-6.1.3.*)

Table 3-6 Mandatory Safety Requirements (For Use in Hospitals or Nursing Homes)

Zone Location	Containment (S_a)		Extinguishment (S_b)		People Movement (S_c)	
	New	Exist.	New	Exist.	New	Exist.
1st story	11	5	15(12)[A]	4	8(5)[A]	1
2nd or 3rd story[B]	15	9	17(14)[A]	6	10(7)[A]	3
4th story or higher	18	9	19(16)[A]	6	11(8)[A]	3

[A] Use ( ) in zones that do not contain patient sleeping rooms.
[B] For a 2nd story zone location in a *sprinklered* EXISTING facility, as an alternative to the mandatory safety requirements values set specified in the table, the following mandatory values *set* shall be permitted to be used:
$S_a = 7$ and $S_b = 10$ and $S_c = 7$

(For use with NFPA 101A-1995/NFPA 101-1994)

STEP 7: Determine zone fire safety equivalency — Use Table 3-7.

A. Perform the subtractions indicated in Table 3-7. Enter the differences in the appropriate answer blocks.

B. For each row, check "yes" if the value in the answer block is zero (0) or greater. Check "no" if the value in the answer block is a negative number.

Table 3-7 Zone Fire Safety Equivalency Evaluation

						Yes	No
Containment Safety (S_1)	minus	Mandatory Containment (S_a)	≥	0	S_1 ☐ − S_a ☐ = C ☐		
Extinguishment Safety (S_2)	minus	Mandatory Extinguishment (S_b)	≥	0	S_2 ☐ − S_b ☐ = E ☐		
People Movement Safety (S_3)	minus	Mandatory People Movement (S_c)	≥	0	S_3 ☐ − S_c ☐ = P ☐		
General Safety (S_4)	minus	Occupancy Risk (R)	≥	0	S_4 ☐ − R ☐ = G ☐		

(For use with NFPA 101A-1995/NFPA 101-1994)

Conclusions

1. ☐ All of the checks in Table 3-7 are in the "Yes" column. The level of fire safety is at least equivalent to that prescribed by the *Life Safety Code.**
2. ☐ One or more of the checks in Table 3-7 are in the "No" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by the *Life Safety Code.**

*The equivalency covered by this worksheet includes the majority of considerations covered by the *Life Safety Code.* There are some considerations that are not evaluated by this method. These must be considered separately. These additional considerations are covered in Table 3-8, the "Facility Fire Safety Requirements Worksheet." One copy of this separate worksheet is to be completed for each facility.

Table 3-8 Facility Fire Safety Requirements Worksheet

Complete one copy of this worksheet for each facility.
For each consideration, select and mark the appropriate column

		Met	Not Met	Not Applic.
A.	Building utilities conform to the requirements of Section 7-1.			
B.	In new facilities only, life-support systems, alarms, emergency communication systems, and illumination of generator set locations are powered as prescribed by 12-5.1.2 and 12-5.1.3.			
C.	Heating and air conditioning systems conform with the air conditioning, heating, and ventilating systems requirements within Section 7-2, except for enclosure of vertical openings, which have been considered in Safety Parameter 7 of Table 3-4.			
D.	Fuel-burning space heaters and portable electrical space heaters are not used.			
E.	There are no flue-fed incinerators.			
F.	An evacuation plan is provided and fire drills conducted in accordance with 31-1.5, 31-4.1, and 31-4.2.			
G.	Smoking regulations have been adopted and implemented in accordance with 31-4.4.			
H.	Combustible draperies, furnishings, and decorations are prohibited in accordance with 31-4.5.			
I.	Fire extinguishers are provided in accordance with the requirements of 12-3.5.4 and 13-3.5.7.			
J.	Exit signs are provided in accordance with the requirements of 12-2.10.1 and 13-2.10.			
K.	Emergency lighting is provided in accordance with 12-2.9.1 or 13-2.9.			
L.	Standpipes are provided in all new high rise buildings as required by 12-4.2.			

All references are to NFPA 101 *Life Safety Code*
(For use with NFPA 101A-1995/NFPA 101-1994)

Chapter 4 Fire Safety Evaluation System for Detention and Correctional Occupancies

4-1 General. 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.

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

4-2 Procedure for Determining Equivalency. Evaluate the entire facility using the "Fire Safety Evaluation Worksheet: Detention and Correctional Occupancies" (Tables 4-1 through 4-5) as defined in Sections 14-1 and 15-1 (NFPA *101*) on a single worksheet. Where different use conditions or fire protection features are involved, portions of the facility separated from each other by 2-hour or greater fire resistance-rated construction (including any members that bear the load of detention use, egress, or refuge space and with 1½-hour fire protection rated doors in any communication opening) shall be permitted to be evaluated separately.

4-3 Maintenance. Any protection system, requirement, arrangement, or procedure that is not maintained in a dependable operating condition, is used in such a manner that the intended fire safety function or hazard constraint is impaired, or is not in a sufficient state of readiness should be considered defective and should receive no credit in the evaluation.

4-4 Safety Parameters (Table 4-1). The safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons who might be in the building at the time of a fire. (*See Table 4-1.*)

Each of the safety parameters is to be analyzed, and the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more values appear to apply, the one with the lowest point value governs.

4-4.1 Construction. Construction types are defined by the fire resistance and combustibility of load-bearing framing members, floor construction, and roof construction in accordance with NFPA 220, *Standard on Types of Building Construction*. Figure 4-4.1 is abstracted from NFPA 220.

4-4.1.1 Where the facility includes additions or connected structures of different construction, the rating and classification of the structure shall be based on the following:

(a) Separate buildings where a 2-hour or greater fire resistance-rated separation exists between the portions of the building; or

(b) The lower safety parameter point score involved; where such a separation does not exist.

4-4.1.2 The story used to determine the parameter value is the highest story used for confinement purposes. Story height is based on stories starting with the primary level of exit discharge. Where there are stories below the primary level of exit discharge, the maximum value assigned to the construction parameter shall be based on a 2-story building or the actual story height, whichever is the lower value.

4-4.1.3 A multitiered open cell block in an existing building shall be permitted to be considered a single story, provided that one or more of the following conditions exist:

(a) A smoke control system is provided (*see recommended design criteria in A-15-3.1.3 of NFPA 101*) to maintain the level of smoke filling from potential cell fires at least 5 ft (152 cm) above the floor level of any occupied tier.

(b) A smoke control system as described in 4-4.1.3(a) is provided to maintain the level of smoke filling at least 5 ft (152 cm) above the exit level where:

1. The cell block is Use Condition II.

2. The cell block is Use Condition III, and all persons housed in the cell block can pass through a free access smoke barrier or freely pass below the calculated smoke level with not more than 50 ft (15 m) of travel from their cell.

(c) Complete automatic sprinkler protection is provided.

4-4.2 Hazardous Areas.

4-4.2.1 The assignment of charges for hazardous areas is a four-step process.

4-4.2.1.1 Step 1 — Identify Hazardous Areas. Hazardous areas are defined in 14-3.2 and 15-3.2 (NFPA *101*).

4-4.2.1.2 Step 2 — Determine the Level of Hazard. A hazardous area is classed as severe if it is an area requiring both automatic sprinkler protection and enclosure per 14-3.2.1 or 15-3.2.1 (NFPA *101*).

4-4.2.1.3 Step 3 — Determine the Fire Protection Provided. The parameter value for hazardous areas is based on the presence or absence of the fire protection necessary to control or confine the hazard. Two levels of fire protection are considered. The first consists of automatic sprinklers or other appropriate extinguishing system covering the entire hazard. The second is based on fire resistance-rated enclosures, including any bearing members in the space, partitions separating the hazardous area from all other spaces, and doors to the space sufficient to exceed the potential of the fire load involved. Any hazardous space that has either protection system is classified as having single protection. Any hazardous space that is both fully enclosed in a capable fire resistance-rated enclosure and is sprinklered is classified as having both (i.e., double-level protection). On this basis, any fuel load that has the potential to overwhelm the available structural capability of both its own enclosure and the basic structure could, as a maximum, have single protection.

4-4.2.1.4 Step 4 — Determine the Degree of Deficiency and Assign Parameter Values. The parameter value ultimately is determined by the degree of the deficiencies of the hazardous area based on the level of protection needed.

4-4.2.2 Figure 4-4.2.2 provides a matrix to be used to determine the degree of deficiency for this parameter.

In some situations, more than one hazardous area with the same or differing levels of deficiency can exist. In this case, the choice is based on the single most serious deficiency for the hazardous area.

4-4.3 Fire Alarm. Fire alarms are defined in 4-4.3.1 through 4-4.3.3.

4-4.3.1 No Alarm. There is no fire alarm system, or the system is incomplete and does not meet the requirements for a higher-scored category.

	Type I		Type II			Type III		Type IV	Type V	
	443	332	222	111	000	211	200	2HH	111	000
Exterior Bearing Walls –										
Supporting more than one floor, columns, or other bearing walls.....	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting one floor only.....	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting a roof only.....	4	3	1	1	0[1]	2	2	2	1	0[1]
Interior Bearing Walls –										
Supporting more than one floor, columns, or other bearing walls.....	4	3	2	1	0	1	0	2	1	0
Supporting one floor only.....	3	2	2	1	0	1	0	1	1	0
Supporting a roof only.....	3	2	1	1	0	1	0	1	1	0
Columns –										
Supporting more than one floor, columns, or other bearing walls.....	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only.....	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only.....	3	2	1	1	0	1	0	H[2]	1	0
Beams, Girders, Trusses & Arches –										
Supporting more than one floor, columns, or other bearing walls.....	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only.....	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only.....	3	2	1	1	0	1	0	H[2]	1	0
Floor Construction	3	2	2	1	0	1	0	H[2]	1	0
Roof Construction	2	1½	1	1	0	1	0	H[2]	1	0
Exterior Nonbearing Walls	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]

Those members that are permitted to be of approved combustible material.

[1] Requirements for fire resistance of exterior walls, the provision of spandrel wall sections, and the limitation or protection of wall openings are not related to construction type. They need to be specified in other standards and codes, where appropriate, and may be required in addition to the requirements of this standard for the construction type.
[2] "H" indicates heavy timber numbers; see NFPA 220 for requirements.

Figure 4-4.1 NFPA 220 construction types.

	No protection	Sprinkler protection	Fire resistance-rated enclosure	Sprinklered & rated enclosure
Hazardous area	Single deficiency	No deficiency		
Severely hazardous area	Double deficiency	Single deficiency	Single deficiency [1] Double deficiency [2]	No deficiency [1] Single deficiency [2]

[1] If fire resistance and structural strength exceed maximum potential of hazard.

[2] If fire resistance and structural strength are not sufficient to withstand potential of hazard.

Figure 4-4.2.2 Hazardous areas — degree of deficiency.

4-4.3.2 Without Fire Department Notification (W/O F.D. Notification). There is a manual fire alarm system or smoke detection system conforming with the appropriate requirements of 14-3.4 or 15-3.4, except that the requirements of 14-3.4.3.2 or 15-3.4.3.2 (NFPA *101*) covering automatic transmission of the alarm to the fire department are not met.

4-4.3.3 With Fire Department Notification (W/F.D. Notification). There is a manual fire alarm or smoke detection system conforming with the appropriate requirements of 14-3.4 or 15-3.4 (NFPA *101*).

(a) *Without Manual Alarm.* There is no manual alarm system, but a smoke detection alarm system or sprinkler system recognized under Safety Parameter 4 or Safety Parameter 5 of this system is provided and is arranged to transmit an alarm automatically to the fire department:

1. If fire resistance and structural strength exceed maximum potential of hazard.

2. If fire resistance or structural strength is not sufficient to withstand potential of hazard.

(b) *With Manual Alarm.* There is a manual alarm system, and it is arranged to transmit an alarm automatically to the fire department.

4-4.4 Smoke Detection.

4-4.4.1 General. A detection system as used herein is one based on use of smoke detectors meeting the installation requirements of 14-3.4.4 and 15-3.4.4 (NFPA *101*) and NFPA 72, *National Fire Alarm Code,* with the extent of coverage as defined in 4-4.4.2. No credit is given for thermal detectors in habitable spaces.

4-4.4.2 The detection system categories are described in 4-4.4.2.1 through 4-4.4.2.5.

4-4.4.2.1 None. There are no smoke detectors, or, if present, they do not meet the requirements for a higher-scored category.

4-4.4.2.2 Corridors, Common Spaces, and Sleeping Rooms for More than Four Persons. Smoke detection requirements of such spaces located within the residential housing area are covered by smoke detector installations in accordance with NFPA 72, *National Fire Alarm Code.*

4-4.4.2.3 All Sleeping Rooms. Smoke detectors shall be considered as meeting the requirement where there is at least one smoke detector in each sleeping room occupied or used by prisoners. In rooms having a dimension in excess of 30 ft (9.1 m), additional detectors are provided so that detector spacing does not exceed approximately 30 ft (9.1 m). Detectors are not required in restrooms or closets.

4-4.4.2.4 Full Coverage. The requirements of 4-4.4.2.2 and 4-4.4.2.3 are met.

4-4.4.2.5 Total Building. Total building detector credit requires conformance with the requirements of NFPA 72, *National Fire Alarm Code,* for total coverage.

4-4.5 Automatic Sprinklers.

4-4.5.1 General. In evaluating sprinkler protection, the protection or lack of protection of hazardous areas is considered separately and covered under 4-4.2, except that total building protection shall include hazardous areas. In addition, the existence or lack of fire department notification is considered separately under 4-4.3. In all other situations, any sprinkler installations shall conform to 14-3.5 and 15-3.5 (NFPA *101*) and be graded based on the categories specified in 4-4.5.1.1 through 4-4.5.1.3.

4-4.5.1.1 None. No credit is given if there are no sprinklers or if sprinklers, though present, are not sufficient to qualify for one of the other categories specified.

4-4.5.1.2 Residential Housing Areas. The credit for sprinkler protection of residential housing areas is given for arrangements where sprinklers are located throughout the areas such that all space within such areas (including cells or sleeping rooms) is covered by the protection spray pattern of sprinkler heads.

4-4.5.1.3 Entire Building. The building is totally sprinkler protected in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems,* for light hazard occupancy (or higher hazard occupancy for any spaces classified as higher hazard by NFPA 13).

4-4.6. Interior Finish.

4-4.6.1 Classification of interior finish is in accordance with Section 6-5 (NFPA *101*).

4-4.6.2 No consideration is included in the safety parameter value for any finish with a flame-spread rating greater than 200 or for any material not rationally measured by NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials.* Materials not rationally measured include foamed plastics and asphalt-impregnated paper or other materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved, the resultant risk is considered to classify any such finish area as a hazardous area to be evaluated under 4-4.2.

NOTE: Plywood of 1/4 in. (0.6 cm) or greater thickness should be considered as having a flame-spread rating of 200 or less.

4-4.7 (Reserved.)

4-4.8 Cell/Sleeping Room Enclosure.

4-4.8.1 The parameter value categories for cell or sleeping room enclosures are divided between those for cells or sleeping rooms that face directly onto a corridor and those where there is an intervening common space (i.e., day room, group activity space, or other space between the sleeping room and the corridor access).

4-4.8.2 Open. Any cell or sleeping room enclosure that includes an opening in excess of 120 sq in. (11.1 sq m). In Use Condition V, the closure shall be considered "open" if there are any openings exceeding the minimum necessary for door swing and latch unless:

(a) The affected cells meet the requirements for mechanically assisted smoke control in 4-4.13.3, or

(b) There is a closure for such openings operable from inside the cell.

4-4.8.3 Smoketight < 1 Hour. An enclosure qualifies in this category if the walls are complete from slab to slab or to a continuous smoketight ceiling and doors are complete,

but some wall aspect (wall, ceiling, etc.) is less than 1-hour fire resistance rated, or the door is not capable of resisting fire for at least 20 minutes.

4-4.8.4 One-Hour Fire Resistance Rated or Greater (≥ 1-Hour Fire Resistance). An enclosure qualifies in this category if it meets all of the requirements of 4-4.8.3, all wall aspects have at least a 1-hour fire resistance rating, and the door is capable of resisting fire for at least 20 minutes.

4-4.9 Separation of Residential Housing Areas from Other Areas.

NOTE: A residential housing area includes sleeping areas and any contiguous day room, group activity space, or other common space.

4-4.9.1 General. The parameter value categories for separation of residential housing areas are based on the quality of the common walls, separating partitions, and door between residential housing areas and the rest of the building. The parameter value is based on the residential housing area that has the lowest quality separation. Where a building contains more than one residential housing area, the separation of residential housing areas from each other also is to be considered equivalent to the separation of a residential housing area from some other type of space. In buildings entirely composed of a single residential housing area, the separation is considered to be fire resistant if there is at least a 30-ft (9.1-m) separation from other structures and smoketight if there is a separation of less than 30 ft (9.1 m).

4-4.9.2 Classification of internal separations is based on the following:

(a) *Incomplete.* Any separation that does not meet the criteria for 4-4.9.2(b) or (c).

(b) *Smoketight < 1 Hour.* An enclosure qualifies in this category if the walls are complete from slab to slab or to a continuous smoketight ceiling and doors are complete, but some wall aspect (wall, ceiling, etc.) is less than 1-hour fire resistance rated, or the door is not capable of resisting fire for at least 20 minutes.

(c) *One-Hour Fire Resistance or Greater (≥ 1-Hour Fire Resistance).* An enclosure qualifies in this category if it meets all of the requirements of 4-4.9.2(b), all wall aspects have at least a 1-hour fire resistance rating, and the door is capable of resisting fire for at least 20 minutes.

4-4.10 Exit System.

4-4.10.1 General. Exit routes are the paths of travel from the residential housing area to outside of any of the types and arrangements described in Chapter 5 (NFPA *101*). The exit route starts at the corridor interface with the cell or common space as indicated by 4-4.8.

4-4.10.2 Multiple Routes. Multiple routes exist where the occupants of any residential housing area have, either from the residential housing area or through access in a corridor adjacent to the residential housing area, a choice of two separate exit routes in accordance with 14-2.4 or 15-2.4 (NFPA *101*) to the outside of the types specified in 14-2.2 and 15-2.2 (NFPA *101*).

4-4.10.3 Deficient. An exit route is deficient if it is usable with reasonable safety but fails to meet any of the applicable criteria in Chapter 5 (NFPA *101*).

4-4.10.4 Direct Room Exits. To be credited with direct room exits, each cell or other sleeping room must have a door that opens to the exterior at grade, or to an unenclosed exterior balcony with direct access to an exterior exit or smokeproof enclosure. The locking of such a door must be no more restrictive than that required for the least restrictive exit or smoke barrier door for the use condition involved. In large rooms, the maximum travel distance from any occupiable location to a direct room exit must not exceed 50 ft (15 m). Where the separation of the individual sleeping rooms from other spaces and from each other is smoketight, the credit for direct room exits is applicable even if there are no other exit routes from the involved sleeping rooms.

4-4.10.5 No exit shall be considered in this parameter unless the locking arrangement conforms with the criteria for the use condition being applied to the facility.

4-4.11 Exit Access.

4-4.11.1 General. Exit access is the travel distance from any point in a room to an exit (or to a smoke barrier in an existing building). In addition, any exit arrangement that does not conform with 14-2.6.1 (NFPA *101*) for new buildings or 15-2.6.1 (NFPA *101*) for existing buildings shall receive a parameter value no higher than the score for egress travel [i.e., > 150 ft (>45 m) and ≤ 200 ft (≤ 61 m)].

4-4.11.2 The penalty for dead-end access shall be assessed where any corridor affords access in only one direction to a required exit from that corridor. The calculation of the distance to determine the parameter value is the measurement from the centerline of the doorway exiting to the corridor to the doorway of the exit from the corridor or building, whichever is shorter. Exit travel is the distance from the door to the corridor to the point where the building is exited or a stairwell is entered, whichever is shorter. Where the distance to the stairwell is the shorter distance, that distance shall be based on the distance to the door enclosing the stairwell, if the stairwell is enclosed, or to the top tread if the stairwell is open.

4-4.12 Vertical Openings.

4-4.12.1 General. These values apply to vertical openings and penetrations including exit stairways, ramps, and any other vertical exits, pipe shafts, ventilation shafts, duct penetrations, and laundry and incinerator chutes. The charge for vertical openings shall be based on the presence or lack of enclosure and the fire resistance rating of the enclosure, if provided.

4-4.12.2 Open or Incomplete. A vertical opening or penetration shall be classified as an "open or incomplete enclosure," provided it is:

(a) Unenclosed.

(b) Enclosed but does not have doors.

(c) Enclosed but has openings other than doorways.

(d) Enclosed with cloth, paper, or similar materials without any sustained firestopping capabilities.

4-4.12.2.1 If a shaft other than a credited exit route (i.e., credited as one of the multiple routes required in 4-4.10 or in determining travel distance in 4-4.11) is enclosed on all floors but one and this results in an unprotected opening between that shaft and one, and only one, floor, the

parameter value assigned to that shaft shall be 0. If a required egress route is contained in that shaft, the parameter value shall be –2.

4-4.12.2.2 If vertical firestopping is incomplete, the vertical opening shall be evaluated using the criteria of 4-4.12.2 and 4-4.12.2.1.

4-4.12.3 Communicating Floors. Communicating floor levels shall be permitted without enclosure protection between levels, provided they meet the requirements of 14-3.1.2 or 15-3.1.2 (NFPA *101*), as appropriate.

4-4.12.4 Open Tiered Cells. The "open or incomplete enclosures" category does not apply to open, multitiered cell blocks in existing buildings classified as single-story buildings in accordance with 4-4.1.

4-4.12.5 Smoketight. A complete enclosure is provided and is capable of resisting the passage of smoke but does not meet the fire-resistance requirements of 6-2.4.4 (NFPA *101*). Unprotected vertical openings in accordance with 14-3.1.1 Exception No. 3 and 15-3.1.1 Exception No. 3 (NFPA *101*) shall be considered to be smoketight.

4-4.12.6 Fire Resistant. A smoketight enclosure that also meets the fire-resistance requirements of 6-2.4.4 (NFPA *101*). Atriums in accordance with 6-2.4.6 (NFPA *101*) shall be considered to be fire resistant.

4-4.13 Smoke Control. Smoke control definitions are provided in 4-4.13.1 through 4-4.13.4.

4-4.13.1 No Control. There are no smoke barriers (or horizontal exits) on the floor and accessible to those confined.

4-4.13.2 Smoke Compartment — Passive. Credit for smoke barriers is given to any facility meeting the requirements of 14-3.7 or 15-3.7 (NFPA *101*), as appropriate.

4-4.13.3 Smoke Compartment — Mechanically Assisted. Mechanically assisted smoke control on a compartment basis must include a smoke barrier (or a horizontal exit) supported by a mechanism of automatic control fans, smoke vent shafts, or a combination thereof to provide a pressure differential that assists in confining smoke to the compartment of origin. Fans involved shall be permitted to be special smoke control fans or special adjustments of the normal building air movement fans.

4-4.13.4 Heat and Smoke Vent System. A heat and smoke vent system is a tested and accepted system that handles smoke in order to maintain the level of smoke above head height in the residential housing area. Methods of judging the acceptability of the system are contained in NFPA 92A, *Recommended Practice for Smoke-Control Systems*; NFPA 92B, *Guide for Smoke Management Systems in Malls, Atria, and Large Areas*; and NFPA *101*, *Life Safety Code*, A-15-3.1.3. Additional credit for this system shall be given if the operation of the exhaust system is initiated automatically by smoke detection available in the zone.

Fire Safety Evaluation Worksheet:
Detention and Correctional Occupancies

Building Identification _____

Evaluator _____ Date _____

Complete one worksheet for each building evaluated.

STEP 1: Provide the building identification, evaluator, and date entries above.

STEP 2: Determine the most restrictive use condition in the facility.
Check the appropriate use condition below.

_____ Use Condition II—Zoned Egress

_____ Use Condition III—Zoned Impeded Egress

_____ Use Condition IV—Impeded Egress

_____ Use Condition V—Contained

NOTE: If Use Condition III or Use Condition IV is involved, staff location, remote release locks, or fire detection, or any combination of these, must be sufficient to ensure the prompt release required by the use condition checked.

STEP 3: Determine safety parameter values — Use Table 4-1.

Select and circle the safety value for each safety parameter that best describes the conditions in the zone. Choose only one value for each of the 13 safety parameters. If two or more values appear to apply, choose the one with the lowest point value.

Table 4-1 Safety Parameter Values

Safety Parameters	Parameter Values							
1. Construction	V (000)	V (111)	IV (2HH)	III (200)	III (211)	II (000)	II (111)	II (222) or I (ANY)
1st flr.	-2	0	0	-2	0	0	2	2
2nd flr.	-2	0	0	-2	0	-2	2	2
3rd flr.	-8 (-2)[A]	-2 (0)[A]	-2 (0)A	-8 (-2)[A]	0	-5 (-2)[A]	2	2
≥4th flr.	-10 (-2)[A]	-4 (0)[A]	-4 (0)A	-10 (-2)[A]	-2 (0)[A]	-8 (-2)[A]	0	2

2. Hazardous Areas	Within Res. Housing Area		Outside Res. Housing Area		None or No Deficiencies
	Double Deficiency	Single Deficiency	Double Deficiency	Single Deficiency	
	-7	-4	-4 (-7)[B]	0	0

3. Fire Alarm	No Alarm	W/O F.D. Notification	W/ F.D. Notification	
			W/O Man. Alarm	W/ Man. Alarm
	-1	0	1	2

4. Smoke Detection	None	Residential Housing Area			Total Bldg.
		Partial Coverage		Full Coverage	
		Corr. + Comm. Spa. + Lrg. Sleeping Rms.	All Sleeping Rms.		
	-4 (-1)[A]	0	2	4	5

5. Automatic Sprinklers	None	Residential Housing Areas	Entire Building
	0	8	10

6. Interior Finish (Corrs. and Egress)	Class C	Class B	Class A
	-3	-1	0

7. Interior Finish (Other Areas)	Class C	Class B	Class A
	-2	-1	0

8. Cell/Sleeping Room Enclosure	Cells (Rooms) Face on Corridor (Each Cell is a Separate Residential Housing Area)	Intervening Common Space Within Resid. Housing Area		
		Open	Smoketight < 1 Hour	≥ 1-Hour Fire Resistance-Rated
	0	-3 (-5)[C] (0)[D]	0 (-2)[C]	2(0)[C]

9. Separation of Resid. Housing Areas from Other Areas	Incomplete		Smoketight <1 Hour	≥1-Hour Fire Resistance-Rated
	Parameter 5 Value <10	Parameter 5 Value = 10		
	-6	2	2 (4)[H]	4 (2)[B]

10. Exit System	<2 Routes	Multiple Routes		
		Deficient	No Deficiencies	Direct Room Exits
	-6	-2	0	3

11. Exit Access	Dead Ends		No Dead Ends >50 Ft and Travel Is[I]		
	>100 ft	> 50 ft[I]	> 200 ft	≤ 200 ft >150 ft	≤150 ft
	-2 (0)[G]	-1 (0)[G]	-2 (0)[G]	-1 (0)[G]	0

12. Vertical Openings	Open or Incomplete Enclosures			Enclosed [E]	
	Thru ≥4 Floors	2-3 Floors	1 Floor	Smoketight	Fire Resistant
	-10 (0)[F]	-7 (0)[F]	-2 (0)[F]	0	2

13. Smoke Control	No Control	Smoke Compartments		Heat + Smoke Vent System
		Passive	Mechanically Assisted	
	-2	2	3	8

(For use with NFPA 101A-1995/NFPA 101-1994)

A — Use ( ) if Parameter 5 is 10.
B — Use ( ) if Parameter 1 is based on II (000), III (200), or V (000) construction and Parameter 5 is 0.
C — Use ( ) for Use Condition V, new construction, where Parameter 5 is 0.
D — Use ( ):
— For Use Condition II.
— For Use Condition III if intervening space in ≤50 ft.
— For Use Condition IV if Parameter 5 is ≥8 and intervening space is <50 ft.
For existing buildings if either:
— Parameter 13 = 8, or
— Parameter 5 is ≥8 and Parameter 4 is ≥0.
E — Use 0 in 1-story buildings.
F — Use ( ) if Parameter 13 is 8.
G — Use ( ) if Parameter 10 is -6.
H — Use ( ) for Use Conditions II, III, and IV, new construction, if cells are facing access corridor.
I — Use 20 ft (6.1 m) for Use Condition V.
For SI units: 1 ft = 0.3048 m.

STEP 4: Compute individual safety evaluations — Use Table 4-2.

A. Transfer each of the 13 circled safety parameter values from Table 4-1 to every unshaded block in the line with the corresponding parameter title in Table 4-2. Where the block is marked "÷ 2," enter one-half the value from Table 4-1.

B. Add the four columns, keeping in mind that any negative numbers need to be deducted.

C. Transfer the resulting values for S_1, S_2, S_3, and S_4 to the corresponding blocks in Table 4-4.

Table 4-2 Individual Safety Evaluations

Safety Parameters	Fire Control Provided (S_1)	Egress Provided (S_2)	Refuge Provided (S_3)	General Fire Safety Provided (S_4)
1. Construction				
2. Hazardous Areas		+ 2 =		
3. Fire Alarm	+ 2 =			
4. Smoke Detection	+ 2 =			
5. Automatic Sprinklers		+ 2 =	+ 2 =	
6. Interior Finish (Corrs. and Egress)				
7. Interior Finish (Other Areas)	+ 2 =			
8. Cell/Sleeping Room Enclosure				
9. Separation of Residential Housing Areas from Other Areas		+ 2 =		
10. Exit System			+ 2 =	
11. Exit Access				
12. Vertical Openings	+ 2 =			
13. Smoke Control				
Total	S_1 =	S_2 =	S_3 =	S_4 =

(For use with NFPA 101A-1995/NFPA 101-1994)

STEP 5: Determine mandatory safety requirements — Use Table 4-3A or 4-3B, as appropriate.

A. Select the proper row in Table 4-3A or 4-3B. For high rise buildings, use Table 4-3B. Circle the appropriate values.

B. Transfer the circled values from Table 4-3A or 4-3B to the blocks marked S_a, S_b, S_c, and S_d in Table 4-4.

Table 4-3A Mandatory Safety Requirements
Partially Sprinklered or Nonsprinklered Buildings Other than High Rise

Use Condition	Height	Fire Control (S_a)		Egress (S_b)		Refuge (S_c)		General (S_d)	
		New	Exist.	New	Exist.	New	Exist.	New	Exist.
II + III	1 Story	4	0	6	4	6	2	6	1
	2 Stories	5	3	8	6	8	6	8	5
	≥3 Stories	7	5	8	6	10	8	10	7
IV	1 Story	6	2	10	8	6	2	10	5
	2 Stories	7	5	12	10	8	6	12	9
	≥3 Stories	9	7	12	10	10	8	14	11
V	1 Story	8	6	10	9	8	6	12	9
	2 Stories	9	9	12	11	10	10	14	13
	≥3 Stories	9	9	12	11	10	10	14	13

(For use with NFPA 101A-1995/NFPA 101-1994)

Table 4-3B Mandatory Safety Requirements
Totally Sprinklered and High Rise Buildings

Use Condition	Height	Fire Control (S_a)		Egress (S_b)		Refuge (S_c)		General (S_d)	
		New	Exist.	New	Exist.	New	Exist.	New	Exist.
II, III, IV	1 and 2 Stories	2	2	4	2	-1	-1	2	0
	≥3 Stories	7	2	6	2	5	-1	8	0
V	1 and 2 Stories	10	10	8	6	7	7	10	8
	≥3 Stories	15	10	10	6	13	7	16	8

(For use with NFPA 101A-1995/NFPA 101-1995)

STEP 6: Fire safety equivalency evaluation.

A. Perform the subtractions indicated in Table 4-4. Enter the differences in the appropriate answer blocks.

B. For each row, check "yes" if the value in the answer block is zero (0) or greater. Check "no" if the value in the answer block is a negative number.

Table 4-4 Fire Safety Equivalency Evaluation

										Yes	No
Control Provided (S_1)	minus	Required Control (S_a)	≥	0	S_1	–	S_a	=	C		
Egress Provided (S_2)	minus	Required Egress (S_b)	≥	0	S_2	–	S_b	=	E		
Refuge Provided (S_3)	minus	Required Refuge (S_c)	≥	0	S_3	–	S_c	=	R		
General Fire Safety (S_4)	minus	Required Gen. Fire Safety (S_d)	≥	0	S_4	–	S_d	=	G		

(For use with NFPA 101A-1995/NFPA 101-1994)

Conclusions:

1. ( ) All of the checks in Table 4-4 are in the "yes" column. The level of fire safety is at least equivalent to that prescribed by NFPA *101, Life Safety Code*.

2. ( ) One or more of the checks in Table 4-4 are in the "no" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by NFPA *101, Life Safety Code*.

The equivalency covered by this worksheet includes the majority of considerations covered by NFPA *101, Life Safety Code*. There are some considerations that are not evaluated by this method. These must be considered separately. These additional considerations are covered in Table 4-5.

STEP 7: Additional Considerations.

(The following items are required by NFPA *101, Life Safety Code*, as fire safety features but are beyond the scope of equivalency evaluation of the Fire Safety Evaluation System. They must be accounted for separately.)

Table 4-5 Facility Fire Safety Requirements Worksheet

		Yes	No
1.	Utilities and building services conform to the requirements of Section 14-5 and Section 15-5, except for enclosure of vertical openings, which have been considered in Safety Parameter 12 of Table 4-1.		
2.	24-hour staffing is provided as required by 31-5.1.		
3.	Furnishing and decorations combustibility is limited in accordance with 31-5.4.		
4.	Portable fire extinghuishers are provided at least at staff locations.		
5.	Standpipes are provided in all buildings over 2 stories in height as required by 14-3.5.5, 14-4.3, or 15-3.5.5.		
6.	If Use Condition III or Use Condition IV is involved, is the combination of staff location, remote release locks, and fire detection sufficient to ensure the prompt release required by those use conditions?		

All references are to NFPA *101, Life Safety Code*
(For use with NFPA 101A-1995/NFPA 101-1994)

Chapter 5 Evacuation Capability Determination for Board and Care Occupancies

5-1 General.

5-1.1 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 system. For ease of reading, only the masculine pronoun is used; however the contents of this chapter apply equally to females and males.

5-1.2 Chapters 22 and 23 (NFPA *101*) specify three sets of requirements for a facility based upon the evacuation capability of that facility. The three levels of evacuation capability defined are (a) prompt, (b) slow, and (c) impractical.

5-1.3 The evacuation capability shall be determined for the residents of a given facility, who are living as a group and are provided with staff assistance, prior to application of the fire protection requirements. This chapter describes one method for determining evacuation capability.

5-1.4 The evacuation capability for specific facilities, with residents living as a group with staff assistance, is determined by a mathematical method that includes the following:

(a) Determining the evacuation assistance scores of the individual residents,

(b) Computing a relative level of evacuation difficulty faced by the resident of a specific facility based on the response capabilities of the staff,

(c) Adjusting for vertical egress travel, and

(d) Calculating an evacuation capability score.

5-1.5 Chapters 22 and 23 (NFPA *101*) define the three evacuation capability levels in terms of performance of the residents in a timely response to an emergency evacuation with assistance from staff members or other residents. Utilization of this chapter provides a numerical score that can be translated into one of the three levels of evacuation capability.

5-1.6 The evacuation capability shall be permitted to be used with either Chapter 6 of this guide or Chapters 22 and 23 (NFPA *101*).

5-2 Procedure for Determining Evacuation Capability.

5-2.1 Methodology. Evacuation capability shall be determined by the use of the forms included in this chapter.

5-2.2 Evacuation Capability by Zones.

5-2.2.1 Small facilities (not greater than 16 residents) shall have their evacuation capability scores based on all the residents and the available staff measured in accordance with the criteria for evaluating residents and staff in this chapter.

5-2.2.2 Large facilities (more than 16 residents) shall be permitted to have the evacuation capability score calculated on the basis of the entire building, as with small facilities, or on the basis of separate fire or smoke zones. The procedure providing the superior (i.e., lower) evacuation capability score shall be permitted to be used. A fire or smoke zone is a portion of the building separated from all other portions of the building by construction having at least 1-hour fire resistance or by a smoke barrier conforming to the requirements of Section 6-3 (NFPA *101*), with the smoke barriers constructed with at least a 20-minute fire resistance rating.

Exception: In buildings protected throughout with an automatic sprinkler system, zoning of the facility shall be permitted to be by construction that is sound and smoke resistant.

5-2.3 If a building is zoned, each zone shall be evaluated separately. The evacuation capability score is based on the residents of that zone and the staff available to that zone in accordance with the staff rating criteria in this chapter.

5-2.4 Where using zones, a separate evacuation capability score shall be determined for zones that include common use spaces where the residents of more than one zone congregate for meals, recreation, or other purposes. In such cases, adjust the resident evacuation assistance scores as appropriate to reflect the different needs that residents might have under such conditions.

5-3 Rating Residents.

5-3.1 Form 5-1, "Worksheet for Rating Residents," is a worksheet for rating the individual resident and is also a form for recordkeeping purposes.

5-3.2 This method of determining evacuation capability has been designed to minimize speculation about how a resident might perform in an actual fire emergency by using ratings based upon observed performance. Instead of speculating, raters who are not familiar enough with a resident to provide ratings confidently should consult with an individual who has observed the resident on a daily basis.

5-3.3 Due to the stress of an actual fire emergency, some residents are not likely to perform at full capacity. Therefore, ratings based on commonly observed examples of poor performance provide the best readily available indication of behavior that could be reduced by the unusually stressful conditions of an actual fire. All persons are less capable on some occasions, and the ratings should be based on examples of resident performance on a typical "bad" day. Ratings should not be based on rare instances of poor performance.

5-4 Rating Residents Using Form 5-1.

5-4.1 Risk of Resistance (Line I).

5-4.1.1 Line I of Form 5-1 rates the risk of a possibility that, during an emergency evacuation, the resident might resist leaving the facility. Unless there is specific evidence that resistance might occur, the resident should be rated as "minimal risk." If more than one rating applies, use the rating with the highest numerical score.

5-4.1.2 Specific evidence of resistance means that staff have had to use some physical force in the past. However, an episode of resistance should not be counted if it was the result of a situation that was different enough from an actual fire emergency that it probably does not predict behavior in such an emergency. For example, an incident in which a resident refuses to visit with parents probably does not predict behavior in an actual fire emergency and should not be counted as specific evidence. Resistance can be active (the resident might have struck a staff member or

attempted to run away) or passive (the resident might have "gone limp" or hid from staff members). Mere complaining or arguing is not considered resistance.

5-4.1.3 Minimal Risk. There is no specific evidence to suggest that the resident might resist an evacuation.

5-4.1.4 Risk of Mild Resistance. There is specific evidence that the resident might resist leaving the facility. Examples of specific evidence are as follows:

(a) The resident has mildly resisted instructions from staff. Further, the resistance was brief or easily overcome by one staff member and occurred in a situation similar enough to a fire emergency to predict that the behavior could recur during an actual fire emergency; or

(b) The resident has hidden from the staff in a situation similar enough to a fire emergency to predict that the behavior could recur during an actual fire emergency. However, once found, the resident offered no further resistance.

5-4.1.5 Risk of Strong Resistance. The resident might offer resistance that necessitates the full attention of one or more staff members. Examples of specific evidence are as follows:

(a) The resident has struggled vigorously in a situation similar enough to a fire emergency to predict that the behavior could recur during an actual fire emergency; or

(b) The resident has totally refused to cooperate in a situation that is similar enough to a fire emergency to predict that the behavior could recur during an actual fire emergency; or

(c) The resident has hidden in a situation that is similar enough to a fire emergency to predict that the behavior could recur during an actual fire emergency. Moreover, once found, the resident continued to offer resistance.

5-4.2 Impaired Mobility (Line II).

5-4.2.1 Line II of Form 5-1 rates the physical ability of the resident to leave the facility. This rating should reflect the current physical environment in the building where the resident lives and should be based on the resident lying awake on his bed. The resident is rated according to how easily he can leave, given the presence of factors such as physical barriers that hinder movement (e.g., stairs), the resident's ability to get out of bed, or the chairs normally used. The resident should be given credit for being able to use devices that aid movement (e.g., wheelchairs, walkers, crutches, and leg braces). However, the rater shall be permitted to give credit for such devices only if the devices are always available for an emergency evacuation.

5-4.2.1.1 The resident should be rated on his ability to use the most accessible route out of the facility. For example, a resident who is "self-starting" where using the back door, but who "needs limited assistance" to get out the front door would be rated as "self-starting."

5-4.2.1.2 The resident should be rated for performance while under the influence of any routine medication that slows movement.

5-4.2.1.3 Where the resident needs physical assistance to make a timely evacuation, the rating of assistance needed is based on the degree of strength used by the staff member to assist the resident. Guiding or directing the resident by giving gentle pushes or leading by the hand is not considered physical assistance. If more than one rating applies, use the rating with the highest numerical score.

5-4.2.1.4 Self-Starting. The resident is physically able to start and complete an evacuation without physical assistance.

5-4.2.1.5 Slow. The resident prepares to leave and travels to the exit (or an area of refuge) at a speed significantly slower than normal. Specifically, the resident is rated "slow" if not able to prepare to leave and then travel from his sleeping room to the exit (or area of refuge) within 90 seconds.

5-4.2.1.6 Needs Limited Assistance. The resident might need some initial or brief intermittent assistance but can accomplish most of the evacuation without assistance. An example of specific evidence is that the resident is physically able to start and complete an evacuation, except for the following:

(a) The resident needs help to get into a wheelchair, or

(b) The resident needs help to descend stairs, or

(c) The resident needs help to get out of bed, or

(d) The resident needs help to open a door.

5-4.2.1.7 Needs Full Assistance or Very Slow. The resident needs "full assistance" or is "very slow" as defined in 5-4.2.1.7.1 and 5-4.2.1.7.2.

5-4.2.1.7.1 Needs Full Assistance. The resident needs either physical assistance from a staff member during most of the evacuation, or it is necessary for staff to:

(a) Carry the resident from the facility,

(b) Help the resident get into a wheelchair and wheel the resident out of the facility, or

(c) Help the resident into leg braces and help the resident to descend the stairs.

5-4.2.1.7.2 Very Slow. The resident is very slow if the time necessary for the resident to prepare to leave and then travel from his sleeping room to the exit is so long that the staff usually assists the resident to evacuate. Specifically, the resident is rated very slow if unable to prepare to leave and then travel to the exit (or area of refuge) within 150 seconds.

5-4.3 Impaired Consciousness (Line III).

5-4.3.1 Line III of Form 5-1 rates the risk that a resident could experience a partial or total loss of consciousness in a fire emergency. Unless there is specific evidence that loss of consciousness might occur during a fire emergency, the resident should be rated as "no significant risk."

5-4.3.2 Specific evidence is an indication that the resident has experienced some temporary impairment of consciousness of short duration (seconds or minutes) six or more times during the three months preceding the rating of the resident. Regardless of frequency, if there is specific evidence that loss of consciousness might be caused by the stress of a fire emergency, the resident should be rated as having impaired consciousness. An episode of partial loss of consciousness should be counted only if the impairment was severe enough to significantly interfere with the resident's ability to leave the facility. Do not count episodes where the loss of consciousness was the result of a temporary medical problem (e.g., a severe infection). If more than one rating applies, use the rating with the highest numerical score.

5-4.3.3 No Significant Risk. The resident is not subject to loss of consciousness, or the resident has had fewer than six episodes of losing consciousness (partial and total) during the three months preceding the rating.

5-4.3.4 Partially Impaired. The resident has had at least six episodes of losing consciousness in the preceding three months, and the most severe of these episodes was only a partial loss of consciousness; that is, the resident still is able to participate in an evacuation to some degree. Specific evidence that a resident should be rated in this category includes loss of consciousness resulting from mild (partial or petit mal) seizures, dizzy spells, intoxication, or any other partially incapacitating impairment of consciousness.

5-4.3.5 Totally Impaired. The resident has had at least six episodes of losing consciousness in the preceding three months, and the most severe of these episodes was total or severely incapacitating loss of consciousness; that is, the resident needs the full assistance of at least one staff member to get out of the building. Specific evidence that a resident should be rated in this category includes losses of consciousness resulting from severe (generalized or grand mal) seizures, fainting spells, intoxication, or other total or severely incapacitating loss of consciousness.

5-4.4 Need for Extra Help (Line IV).

5-4.4.1 Line IV of Form 5-1 rates the possibility that more than one staff member might be needed to evacuate the resident. Specific evidence is a previous need for two or more persons to assist the resident and an indication that the resident could need assistance from two persons in a fire emergency.

5-4.4.2 Where determining the need for additional assistance, the evaluator should disregard the physical strength or weakness of staff members. (For example, a large staff member who is exceptionally strong might be able to assist a resident alone, while a smaller staff member might be unable to assist the resident fully. There is no assurance that a staff member who is able to assist alone always will be able to respond to a resident requiring extra assistance.)

5-4.4.3 Needs at Most One Staff Member. There is no specific evidence that the resident might need help from two or more persons in a fire emergency.

5-4.4.4 Needs Limited Assistance from Two Staff Members. The resident might need some initial or brief intermittent assistance from two staff members, but otherwise needs help from no more than one. Specific evidence is that a resident needs assistance from no more than one person except where:

(a) The resident needs assistance from two persons to get into a wheelchair, or

(b) The resident needs assistance from two persons to descend stairs.

5-4.4.5 Needs Full Assistance from Two Staff Members. The resident might need assistance from two staff members during most of an evacuation. Specific evidence of the need for assistance from two staff members is as follows:

(a) Two persons are needed to carry the resident from the facility; or

(b) Two persons are needed to get the resident into a wheelchair and to get the wheelchair down a flight of stairs; or

(c) The resident might resist an evacuation vigorously, and two persons are needed to get the resident out of the facility.

5-4.5 Response to Instructions (Line V).

5-4.5.1 Line V of Form 5-1 rates the resident's ability to receive, comprehend, and follow through with simple instructions during a staff-directed evacuation. Residents often do not respond equally well to all staff members; therefore, a resident should be rated on his responses to staff members whose directions he is least likely to follow. If more than one rating applies, use the rating with the highest numerical score.

5-4.5.2 Follows Instructions. The resident usually can be depended upon to receive, comprehend, remember, and follow simple instructions.

5-4.5.3 Requires Supervision. The resident generally is capable of following instruction but is not dependable. Therefore, the resident might need to be guided, reminded, reassured, or otherwise accompanied during evacuation but does not require the exclusive attention of a staff member (e.g., a staff member can lead two or more residents who fit this classification simultaneously).

5-4.5.3.1 This category includes elderly persons who sometimes show early signs of senile dementia or Alzheimer's disease (e.g., confusion, disorientation, frequent "misplacement" of possessions) and young children who cannot be depended on to follow through with instructions.

5-4.5.3.2 Residents in this category generally are capable of following instructions except where the following situation exists:

(a) The resident is deaf or hearing impaired and sometimes misinterprets communications from staff using sign language, or

(b) The resident sometimes forgets instructions after a brief period of time, or

(c) The resident is sometimes distracted or confused and fails to follow through with instructions, or

(d) The resident is sometimes groggy and might fail to listen carefully or follow through with instructions, or

(e) The resident is sometimes uncooperative without apparent good reason, or

(f) The resident is elderly and sometimes becomes "lost" in a familiar place, or

(g) The resident is a young child who might become frightened and not follow through with instructions.

5-4.5.4 Requires Considerable Attention or Might Not Respond.

5-4.5.4.1 The resident might fail to receive, understand, or follow through with instructions; i.e., the resident might not respond to instructions or general guidance. Therefore, the resident might require most of the attention of a staff member during an evacuation.

5-4.5.4.2 This category includes elderly persons who have the symptoms of senile dimentia or Alzheimer's disease (e.g., severe confusion, disorientation, very limited short term memory).

5-4.5.4.3 Residents in this category might display one or more of the following characteristics:

(a) The resident sometimes does not understand simple instructions, or

(b) The resident might not respond to instructions from a particular staff member, or

(c) The resident is sometimes emotionally upset and is therefore unwilling to follow instructions, or

(d) The resident is deaf or hearing impaired and the staff cannot communicate reliably with the resident, or

(e) The resident is very forgetful, easily confused, or easily distracted.

5-4.6 Waking Response to Alarm (Line VI).

5-4.6.1 Line VI of Form 5-1 rates the risk that the fire alarm might fail to awaken the resident.

5-4.6.2 Residents should be rated as "response probable" unless any of the following conditions exist:

(a) The building does not have an alarm system meeting the requirements of Chapter 22 or 23 (NFPA *101*), as appropriate, or the alarm is not sufficiently loud where the resident sleeps (doors should be closed and barriers kept in place where determining the audibility of the fire alarm); or

(b) Medication taken by the resident before retiring differs in type or amount (i.e., medication is increased) from the medication taken during waking hours; or

(c) The resident has a readily apparent hearing impairment, or the resident's hearing aid is removed before sleeping; or

(d) There is specific evidence that the resident is an exceptionally sound sleeper. Specific evidence is that the resident previously failed to be awakened by a particularly loud noise, and staff members have had to shake the resident vigorously to awaken him.

5-4.6.3 Where any of the conditions in 5-4.6.2 exists, the resident should be rated as "response not probable" unless the resident's ability to wake up has been demonstrated. The demonstration of the resident's ability to wake up in response to the fire alarm should be conducted after the first half hour of sleep and during the first three hours of sleep. In addition, the resident's ability to wake up in response to the alarm should be demonstrated on two different nights under normal conditions (e.g., without hearing aid, under usual medications). Also, the resident should be alert enough to follow simple instructions within 1 minute after waking. In order to avoid waking other residents during demonstrations of the capability of a particular resident, a device that makes a sound that is similar to but not louder than the fire alarm shall be permitted to be used (e.g., an alarm clock or clock radio with a sound similar to the fire alarm).

5-4.6.4 Response Probable. Either none of the conditions in 5-4.6.2 affect the resident, or, if any of the conditions exist, the resident's ability to be awakened has been demonstrated.

5-4.6.5 Response Not Probable. One or more of the conditions in 5-4.6.2 affect the resident, and either the resident has not been tested for the ability to be awakened by the fire alarm, or the resident has failed to demonstrate the ability to be awakened by the fire alarm.

5-4.7 Response to Fire Drills (Line VII).

5-4.7.1 Line VII of Form 5-1 rates the resident's ability to leave the facility during fire drills, as demonstrated by the resident's performance, without guidance or advice from the staff. A resident must demonstrate three separate responses reliably and without instructions or supervision in order to be rated "yes" in each case. The resident is rated "yes" only where the resident has been specifically trained or instructed in the desired reaction and has demonstrated the desired response in at least three of the last four fire drills in which a response was demonstrated. If the resident has not been involved in four fire drills, the rating shall be permitted to be "yes" only if the resident has demonstrated the desired response during the last two opportunities to demonstrate the response. Ratings are based on demonstrated performance, and any resident who has not been trained to participate in fire drills must be rated "no."

5-4.7.2 This rating covers the ability of the resident to make decisions but does not relate to mobility, which is covered separately. For example, a resident might need assistance only in transferring from a bed to a wheelchair while otherwise able to initiate and complete an evacuation promptly. Such a resident would be rated "yes" for "Initiates and Completes Evacuation Promptly" but would be rated "Needs Limited Assistance," "Impaired Mobility" in Line II.

5-4.7.3 Residents should be rated assuming that an emergency could occur when they are least likely to respond well. For most residents, this is their response after being awakened. Determining the rating should not include difficulties in actually awakening the resident, since there are large differences in how easily the same individual awakens at various times.

5-4.7.4 Initiates and Completes Evacuation Promptly. The resident has demonstrated a proper response to an alarm or warning of a fire by starting and completing the evacuation without unnecessary delay. Specific evidence leading to a rating of "no" is:

(a) The resident might not react to the alarm until alerted by a staff member; or

(b) The resident spends an excessive amount of time preparing to leave (e.g., getting dressed, observing others); or

(c) The resident has a hearing impairment and, therefore, needs to be alerted by a staff member; or

(d) The resident is sometimes upset or confused and, therefore, might seek out a staff member before evacuating; or

(e) The resident consistently begins an evacuation, but is easily distracted and needs some supervision.

5-4.7.5 Chooses and Completes Back-up Strategy. The resident has demonstrated the ability to select an alternative means of escape or has taken other appropriate action if the primary escape route is blocked. Specific evidence leading to a rating of "no" is where the resident is unlikely

to select a good course of action if the primary escape route cannot be used; that is, the resident has not been trained to find alternative escape routes, find an area of refuge, or perform other appropriate action. Where the resident lacks the conceptual ability to understand fire hazards and blocked escape routes, thereby requiring supervision, the rating should be "no."

5-4.7.6 Remains at Designated Location. The resident must have demonstrated willingness to remain at a designated safe location during fire drills. (The whereabouts of already evacuated residents needs to be confirmed to avoid dangerous return trips to look for residents who might have returned to buildings.)

5-4.7.6.1 Specific evidence leading to a "yes" for this rating is:

(a) The resident has been specifically trained to remain at a designated location in a safe area and has demonstrated this ability without the presence of staff members in three of the previous four fire drills; or

(b) The resident is physically immobile and, therefore, cannot leave the designated location; or

(c) The facility uses a motor vehicle (e.g., a van or bus) or a building that is detached and remote from the facility (i.e., another building or a remote garage) as the designated location, and the resident has demonstrated in three of the previous four fire drills the ability to remain there without the presence of a staff member; or

(d) The resident might tend to wander, but a reliable resident has been assigned to keep the wandering resident at the designated location without using any force or coercion. Furthermore, this arrangement has been demonstrated as effective in at least three of the previous four fire drills.

5-4.7.6.2 Specific evidence leading to a "no" for this rating is:

(a) The resident has not been trained to remain at a designated location without any staff supervision, or

(b) The resident has been trained to remain without staff supervision at a designated location but has failed to demonstrate this capability in three of the previous four fire drills.

5-5 Rating the Staff Shift Using Form 5-2.

5-5.1 This rating is intended to predict the promptness of response of a staff member who is present in the facility, at a given time (shift), and who is capable of assisting residents in an evacuation.

5-5.2 Before rating the staff shift, there are five basic requirements relative to the staff response capability, protection plans, and fire drills that shall be met. The determination of whether or not these requirements are met is recorded on Form 5-2, "Staff Shift Score." If the corresponding requirements of 5-5.2.1 through 5-5.2.5 have been met, a "yes" rating should be given.

5-5.2.1 A protection plan shall have been promulgated and all staff members considered in this rating shall have been trained in its implementation. Regardless of the staff's everyday competencies, they cannot be relied upon to innovate effective life safety actions under the extreme stress and time limitation of an actual fire emergency. Notwithstanding the facility's fire protection features, the staff must have a valid and practiced plan of action that can be put into effect immediately in an emergency. The protection plan should include the following features:

(a) A description of all available evacuation, escape, and rescue routes and the procedures and techniques needed to evacuate all the residents using the various routes; and

(b) A fundamental knowledge of fire growth, containment, and extinguishment necessary to make reasonable judgments about action priorities and viable egress routes.

5-5.2.2 The total available staff at any given time shall be able to handle the individual evacuation needs of each resident who might be in the facility. In calculating evacuation capability, it might be possible to have a ratio of staff to residents that appears to be favorable but that still is unacceptable under this system. This would be the case where a resident needs assistance from two staff members where only one staff member is present. Thus, the situation should be such that every resident can be evacuated by the available staff.

Exception: The facility meets the criteria for an evacuation capability level of "impractical," the resident whose evacuation needs cannot be handled is in a sleeping room or other room that provides adequate refuge from fire outside the room, and there is at least one staff member present who can close the door to the room. For example, a very heavy resident is in a facility, meeting the criteria for impractical level of evacuation capability, with one available staff member who cannot transfer the resident from a bed to a wheelchair. Although the staff member is unable to meet all the resident's evacuation assistance needs, the sleeping room provides adequate refuge.

5-5.2.3 Every staff member considered in this rating shall be able to participate meaningfully in the evacuation of every resident. For example, a staff member, due to his own disability, might be unable to assist one or more physically disabled residents and, therefore, shall not be included in the rating. However, if a staff member's disability does not limit his ability to assist the residents, then the staff member shall be permitted to be included in the rating.

5-5.2.4 All staff members considered in this rating shall be in the facility when on duty. This rating is based upon the assumption that there are staff present when residents are in the facility.

Exception No. 1: Unstaffed facilities, which are not covered by this system, shall be permitted to be assigned an evacuation capability level based on the demonstrated ability of the residents to meet the criteria of Chapter 22 or 23 (NFPA 101), as appropriate, without staff assistance.

Exception No. 2: Residents who receive only the most favorable ratings on Form 5-1, Side 2 for rating residents shall be permitted to be present in the facility without the presence of staff members.

Exception No. 3: A staff member shall be permitted to be at a location outside of the facility where his ability to respond to a fire emergency from the location is roughly equivalent to his response ability from within the facility. In determining equivalency, the authority having jurisdiction should consider the following:

(a) Whether the fire alarm meets the minimum loudness criteria (see 5-5.3.3) at the locations outside the facility or whether another staff member who is required to remain in the facility can immediately report a fire emergency to the staff member who is outside; and

(b) Travel time to the facility; and

(c) Detection of fire cues (e.g., smoke, noises) from the locations outside the facility; and

(d) Whether the staff member will be notified immediately about which area of the facility has the fire emergency, if the staff member who is outside is required to report fire emergencies in more than one facility or fire zone.

Exception No. 4: The authority having jurisdiction shall be permitted to grant partial credit (which shall not exceed the promptness of the response score that the staff member receives where required to remain in the facility) for staff members who are permitted at locations outside the facility and who have the ability to respond promptly.

5-5.2.5 Fire drills shall be conducted monthly and at least twelve fire drills shall have been conducted during the previous year.

Exception: A facility in operation for less than one year shall be permitted to have conducted a fire drill for each month of its operation.

5-5.3 Staff Scores (Scoresheet 5-2B).

5-5.3.1 This rating is to determine which staff shift is likely to be the least able to respond promptly to assist residents in an evacuation. If it is not obvious which staff shift will be the least able to respond, complete separate forms for each staff shift and use the staff shift having the lowest score.

5-5.3.2 Promptness of Response Scores (Table 5-2A).

5-5.3.2.1 Staff Availability. This rating determines whether there are circumstances in which a staff member is less able to respond appropriately or might be delayed in his response to a fire emergency. A staff member shall be included in this rating only if:

(a) He is required to remain within the facility while on duty, or

(b) He sleeps less than 100 ft (30 m) from all locations in the portion of the facility being evaluated, or

(c) His travel time to any location in the portion of the facility being evaluated does not exceed 60 seconds.

5-5.3.2.1.1 Standby or Asleep. This rating means that the staff member does not have specific duties that ensure an immediate response to the alarm but is otherwise available to assist in a timely manner. This includes live-in staff who might be asleep, showering, or otherwise unable to respond immediately.

5-5.3.2.1.2 Immediately Available. This rating means that the staff member is required to be on duty to provide immediate assistance but is not required to remain in close proximity to the residents (e.g., the staff member is allowed to wash clothes or do bookkeeping).

5-5.3.2.1.3 Immediately Available and Close By. This rating means that the staff member, in addition to satisfying the requirement for "immediately available," also is required to remain in close proximity to the residents except for brief periods of time.

5-5.3.2.1.4 If the facility is classed as "large" and has multiple fire or smoke zones, some staff members might have responsibilities for residents outside the fire or smoke zone being evaluated. If a staff member's duties include rescue of residents in the fire zone being evaluated, the staff member shall be permitted to be assigned partial or full promptness of response scores. The authority having jurisdiction shall assign the points based on the proximity of the staff member to the zones and the nature of his duties in a fire emergency. This credit shall be given only if there is a smoke detection system that alerts the staff member and a system or procedure for promptly informing the staff member of the general location of the fire.

5-5.3.2.1.5 Individual residents shall be permitted to be assigned responsibilities similar to staff members to assist other residents during fire emergencies. The authority having jurisdiction shall be permitted to assign these individual residents as many as 8 points for promptness of response, each based on their capabilities and responsibilities.

5-5.3.3 Alarm Effectiveness. This rating determines whether smoke detector-activated alarm devices are loud enough to alert the staff to a fire emergency dependably.

5-5.3.3.1 Assured. To be rated "assured," the alarm shall be "easily noticeable" in all locations where the staff member is permitted, regardless of his rating on the promptness of response factor. "Easily noticeable" means the alarm shall be a minimum of 55 dBA measured at ear level. The authority having jurisdiction shall be permitted to require the alarm to be louder than 55 dBA where background noises could interfere with alarm audibility. For example, the alarm might need to be more than 55 dBA in order to be heard over noise such as a washing machine in the laundry or a television in the day room. If there are staff who are permitted to sleep, the alarm shall be a minimum of 70 dBA measured at "pillow" level in any area where the staff might be asleep. The alarm shall be activated by either smoke detectors or an automatic sprinkler system, or both. If the facility has smoke detectors meeting the requirements of Chapter 22 or 23 (NFPA *101*), as appropriate, the smoke detectors shall activate the alarm. If the facility has an automatic sprinkler system whose fire protection properties are considered in the evaluation of the facility, activation of the sprinkler system shall activate the alarm.

5-5.3.3.2 Not Assured. The alarm does not satisfy the conditions specified under "assured." Doors that normally are closed during the staff shift being rated should be closed when determining the loudness of the fire alarm. Any other barriers that could reduce the loudness of the fire alarm also shall be in place.

5-6 Rating the Facility (Form 5-3).

5-6.1 The vertical distance from sleeping rooms to a floor level with exits might affect the risk because of the time and difficulty in moving on the stairs.

5-6.2 Special Definitions.

5-6.2.1 Direct Exit. Direct exit means that there is no more than one step between the inside of the facility and either (1) ground level outside, or (2) a level area outside the facility that is at least 32 sq ft (3.0 sq m). This level area might be a porch or a stairway landing. Where the vertical distance is greater than one step, a ramp shall be permitted to be used to comply with this definition.

5-6.2.2 Vertical Distance. Vertical distance refers to the greatest number of floors that separate any resident sleeping room from its nearest direct exit.

5-6.3 All Sleeping Rooms on Floors with Direct Exit. Every room where residents sleep is on a floor with at least one direct exit. Specific evidence of facilities that fall within this category is:

(a) A one-story building without sleeping rooms in the basement, or

(b) A two-story building without sleeping rooms on the second floor, or

(c) A split-level building with direct exits at each level, or

(d) A two-story building with sleeping rooms on the second floor that has an exterior stairway from the second floor with a landing at the second floor that is greater than 32 sq ft (3.0 sq m).

5-6.4 Any Sleeping Room One Floor from Exit. There is at least one room where residents sleep in which the shortest vertical distance to a direct exit is one floor. Specific evidence of facilities that fall within this category is:

(a) A two-story building with sleeping rooms on the second floor or in the basement, or both; or

(b) A one-story building where all the exits have stairs that lead to grade without a landing or porch of, at minimum, 32 sq ft (3.0 sq m).

5-6.5 Any Sleeping Room Two or More Floors from Exit. There is at least one room where residents sleep in which the shortest vertical distance to a direct exit is two or more floors. Specific evidence of buildings that fall within this category is:

(a) A three-story building with sleeping rooms on the third floor and no exterior fire escape; or

(b) A three-story building with sleeping rooms on the third floor that has an exterior stairway from the third floor, but where the landing at the third floor is less than 32 sq ft (3.0 sq m).

5-6.6 Facilities in an Apartment House. If the facility is located in an apartment house and the unit containing the facility requires ascending or descending stairs to move from any sleeping room to the door to the corridor, a score of 1.2 for "vertical distance from sleeping rooms to exit" should be assigned. In all other apartments, the score for vertical distance from sleeping rooms to exits is 1.0.

5-7 Determining Evacuation Capability (Form 5-4).

5-7.1 When the scores for the residents, the staff, and the vertical travel distances have been determined, the scores are entered on Form 5-4 and the calculation made to obtain a numerical result.

5-7.2 The numerical evacuation capability score then is translated into a level of evacuation capability of either "prompt," "slow," or "impractical." This evacuation capability is a valid assessment that shall be permitted to be used in Chapter 6 of this guide or in Chapter 22 or 23 (NFPA *101*), as appropriate.

FORM 5-1 SIDE 1 **WORKSHEET FOR RATING RESIDENTS**

Complete one worksheet for each resident.

Read Sections 5-3 and 5-4 before filling out this form. Base ratings on commonly observed examples of poor performance.

Resident's Name _____ Evaluator _____

Facility _____ Zone _____ Date _____

Write any explanatory remarks here:

FORM 5-1 SIDE 2 **WORKSHEET FOR RATING RESIDENTS**

Read Sections 5-3 and 5-4 before filling out this form. Base ratings on commonly observed examples of poor performance.

5-1A Rating the Resident on the Risk Factors

Rate the resident on each of the factors below by checking the one circle for each risk factor that best describes the resident. For the first six factors, write the scores for the circles checked in the appropriate score boxes in the far right column. For "Response to Fire Drills," write the three checked scores in the large circles. Write the sum of the three scores in the large box on the right.

					Score Boxes
I. Risk of Resistance (Check only one)	Minimal Risk ○ score=0	Risk of Mild Resistance ○ score=6	Risk of Strong Resistance ○ score=20		
II. Impaired Mobility (Check only one)	Self-Starting ○ score=0	Slow ○ score=3	Needs Limited Assistance ○ score=6	Needs Full Assistance or Very Slow ○ score=20	
III. Impaired Consciousness (Check only one)	No Significant Risk ○ score=0	Partially Impaired ○ score=6	Totally Impaired ○ score=20		
IV. Need for Extra Help (Check only one)	Needs at Most One Staff ○ score=0	Needs Limited Assistance from 2 Staff ○ score=30	Needs Full Assistance from 2 Staff ○ score=40		
V. Response to Instructions (Check only one)	Follows Instructions ○ score=1	Requires Supervision ○ score=3	Requires Considerable Attention/Might Not Respond ○ score=10		
VI. Waking Response to Alarm (Check only one)	Response Probable ○ score=0	Response Not Probable ○ score=6			

VII. Response to Fire Drills (Without guidance or advice from staff)	Initiates and Completes Evacuation Promptly	Yes ○ score=0	No ○ score=8	○ +	
	Chooses and Completes Back-up Strategy	Yes ○ score=0	No ○ score=4	○ +	
	Remains at Designated Location	Yes ○ score=0	No ○ score=6	○ Sum of These Three Scores	

(For use with NFPA 101A-1995/NFPA 101-1994)

5-1B Determining the Resident's Overall Need for Assistance

Compare the numbers in the seven score boxes filled in. Take the highest score from the score boxes and write it in the box at the right.

Evacuation Assistance Score

(For use with NFPA 101A-1995/NFPA 101-1994)

FORM 5-1C **TOTAL RESIDENT EVACUATION ASSISTANCE SCORE**

1. List each resident's name on Scoresheet 5-1C. Use a separate scoresheet for each zone being rated. Use additional scoresheets for a large number of residents.
2. Enter the score from each Form 5-1B, which was completed for each resident.
3. Total the scores for all residents in the facility or zone being rated, as appropriate.

Scoresheet 5-1C	
Resident Scores	
Resident's Name	**Evac. Assist. Score**
Evacuation Assistance Score **Total**	

(For use with NFPA 101A-1995/NFPA 101-1994)

FORM 5-2 SIDE 1 **STAFF SHIFT SCORE**

Facility _____ Zone _____

Evaluator _____ Date _____

Staff Shift: From _____ To _____

This form is to be completed for the time of day, week, etc., when the combined ratings for staff and residents yield the highest score. This usually is late at night. Where it is not obvious which staff shift will score highest, complete separate forms for each staff shift and utilize the highest score. Read Section 5-5 before filling out this form.

CHECKLIST 5-2A	STAFF RESPONSE AND TRAINING	YES	NO
	A protection plan has been promulgated, and all staff members considered in this rating have been trained in its implementation. (*See 5-5.2.1.*)		
	The total available staff at any given time is able to handle the individual evacuation needs of each resident who is in the facility. (*See 5-5.2.2 & exception.*)		
	Every staff member considered in this rating can meaningfully participate in the evacuation of every resident. (*See 5-5.2.3.*)		
	All staff members considered in this rating are required to be in the facility when on duty, except as permitted. (*See 5-5.2.4 & exceptions.*)		
	At least 12 fire drills were conducted during the previous year. (*See 5-5.2.5 & exception.*)		

All items must score "Yes" before proceeding.

(For use with NFPA 101A-1995/NFPA 101-1994)

FORM 5-2 SIDE 2 DETERMINING THE STAFF SHIFT SCORE

NOTE: In large facilities, staff members might be responsible for assisting residents in a fire or smoke zone but also might have responsibilities for residents in other zones. (*See Section 5-5.*)

Table 5-2A Promptness of Response

Promptness of Response Scores		
Staff Availability	Alarm Effectiveness	
	Assured	Not Assured
Standby or asleep	16	2
Immediately available	20	2
Immediately available & close by	20	10

(For use with NFPA 101A-1995/NFPA 101-1994)

1. On Scoresheet 5-2B, list the names of staff members who are required to be on duty in the facility during the shift being rated.
2. Determine whether the effectiveness of the alarm is "assured" or "not assured." (*See Section 5-5.3.*)
3. Using the values from Table 5-2A, determine each staff member's "promptness of response score" for the shift being rated. Enter each staff member's name and score in the appropriate spaces on Scoresheet 5-2B.
4. Total the "promptness of response scores" for the shift rated.

Scoresheet 5-2B Staff Scores	
Staff Name	Promptness of Response Score
Staff Shift Score Total	

(For use with NFPA 101A-1995/NFPA 101-1994)

FORM 5-3 RATING THE FACILITY

Rate the facility by checking the circle that indicates the vertical distance a resident must travel from a sleeping room (SR) to an exit.

	Vertical Distance from Sleeping Rooms to Exits		
	All SR on Floors with Direct Exit	Any SR One Floor from Exit	Any SR Two or More Floors from Exit
Small Facility	○ Score 0.8	○ Score 1.0	○ Score 1.2
Large Facility or Apartment		○ Score 1.0	

NOTE: Small facilities have 16 or fewer residents. See 5-6.6 for apartments.

(For use with NFPA 101A-1995/NFPA 101-1994)

FORM 5-4 DETERMINING EVACUATION CAPABILITY

Multiply the "Total Resident Evacuation Assistance Score" by the facility score ("Vertical Distance, Sleeping Rooms to Exit"); divide the answer by the "Staff Shift Score" to determine the Evacuation Capability Score.

5-4A Calculation of Evacuation Capability Score

Total Resident Evacuation Assistance Score (Scoresheet 5-1C) ☐ X Vertical Distance from Sleeping Room to Exit (Form 5-3) ☐

Staff Shift Score (Scoresheet 5-2B) ☐

= Evacuation Capability Score (go to Form 5-4B) ☐

(For use with NFPA 101A-1995/NFPA 101-1994)

Determine and record evacuation capability below:

5-4B

Evacuation Capability Score	Level of Evacuation Capability	Evacuation Capability for this Facility or Zone
≤ 1.5	Prompt	
> 1.5 ≤ 5.0	Slow	
> 5.0	Impractical	

(For use with NFPA 101A-1995/NFPA 101-1994)

Chapter 6 Fire Safety Evaluation System for Board and Care Occupancies

6-1 Introduction.

6-1.1 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 chapter is applied, the procedures mandated are to be followed to ensure the effectiveness of the evaluation system.

Chapters 22 and 23 (NFPA *101*) define three levels of evacuation capability for residents (with staff assistance): (a) prompt, (b) slow, and (c) impractical. Chapters 22 and 23 (NFPA *101*) also prescribe the fire safety protection requirements for each level of evacuation capability. This chapter describes a procedure for determining whether a combination of fire safety features in a board and care facility, using the known evacuation capability of its residents, provides a level of safety equivalent to that provided by explicit conformance to Chapters 22 and 23 (NFPA *101*). The definition of evacuation capability is given in 22-1.3 and 23-1.3 (NFPA *101*), and one procedure for determining evacuation capability is presented in Chapter 5 of this document.

6-1.2 Subsystems are provided as follows:

(a) Section 6-2 — Evaluating the fire safety protection in a small facility

(b) Section 6-3 — Evaluating the fire safety protection in a large facility

(c) Section 6-4 — Evaluating the suitability of an apartment building to house a board and care occupancy.

6-2 Glossary for Fire Safety Evaluation Worksheet for a Small Facility.

6-2.1 Introduction. This glossary is provided to assist in completing the "Fire Safety Evaluation Worksheet for a Small Facility" to determine the suitability of a small facility to house a board and care occupancy. The instructions for the mechanisms of completing the worksheet are included in the worksheet itself. They are not repeated in this glossary. This glossary provides expanded discussion and definitions for the various items in the worksheet to assist the user where questions of definition or interpretation arise. To the maximum extent possible, the glossary does not repeat the definitions already existing in NFPA *101, Life Safety Code*, but rather references the appropriate paragraphs in Chapters 1 through 31 (NFPA *101*).

6-2.2 Areas of Application.

6-2.2.1 The evaluation shall be completed covering the entire home, including spaces that are not used by the residents of the board and care home. Row houses, townhouses, or other forms of independent living units having all of their entrances and means of escape completely separate from any other unit shall be permitted to be calculated as small facilities where they are separated from any abutting living units. Such separation shall be by fire-resistive partitions or walls having at least a 1-hour fire resistance rating and extending to the roof if it is noncombustible or through the roof if the roof or its covering is of combustible material.

6-2.2.2 For dwelling units (apartments) in general use apartment houses, the worksheet shall be used to evaluate the dwelling unit being used as the board and care home. The remainder of the apartment building shall be evaluated using the worksheet to determine the suitability of apartment buildings to house a board and care occupancy.

6-2.3 Maintenance. All protection systems, requirements, arrangements, and procedures shall be maintained in a dependable operating condition, and a sufficient state of readiness, and shall be used in such a manner that the intended safety function or hazard constraint is not impaired. Otherwise, they shall receive no credit in the evaluation.

6-2.4 Safety Parameters (Table 6-1A). The safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons who might be in the building at the time of a fire.

Each of the safety parameters is to be analyzed, and the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more values appear to apply, the one with the lowest point value shall be used.

6-2.4.1 Construction/Fire Resistance. Construction types are as defined in 6-2.4.1.1 and 6-2.4.1.2, except that sprinkler protection shall not be considered in determining construction classification in any case where credit is given for sprinkler protection as defined in 6-2.4.5.

6-2.4.1.1 Protected (15 minutes). Buildings meeting the requirements of 23-2.1.3.2 (NFPA *101*).

6-2.4.1.2 Protected (1 hour). Buildings meeting the requirements of Type I, Type II(222), Type II(111), Type III(211), Type IV, or Type V(111) construction.

6-2.4.2 Hazardous Areas. The assignment of parameter values for hazardous areas is a four-step process.

6-2.4.2.1 Step 1 — Identify Hazardous Areas. Hazardous areas are as defined in 22-1.3 and 23-1.3 (NFPA *101*).

6-2.4.2.2 Step 2 — Determine the Area Exposed.

(a) *Primary Means of Escape.* Hazardous area is on the same floor as and is in or abuts a primary means of escape, as defined in 22-2.3.2 and 23-2.3.2 (NFPA *101*).

(b) *Sleeping Area.* Hazardous area is on the same floor as and is in or abuts the sleeping area (room).

6-2.4.2.3 Step 3 — Determine the Fire Protection Provided.

(a) *Sprinkler Protection.* The hazardous area is protected by sprinklers (or other appropriate automatic extinguishing system).

(b) *Smoke-Resisting Separation.* The hazardous area is separated from exposed sleeping areas and the primary means of escape routes by a separation that resists the passage of smoke. Any doors in such separation are self-closing or automatic-closing upon detection of smoke.

(c) *20-Minute Fire Resistance-Rated Enclosure.* Enclosures meeting the requirements of 22-2.3.2(b)1 and 23-2.3.2(b)1 (NFPA *101*).

(d) *1-Hour Fire Resistance-Rated Enclosure.* Enclosures meeting the requirements of 22-2.3.2(a)1 and 23-2.3.2(a)1 (NFPA *101*).

6-2.4.2.4 Step 4 — Determine Degree of Deficiency and Assign Parameter Values. The parameter value ultimately is determined on the basis of the area exposed and the level of protection provided. Figure 6-2.4.2.4 provides a matrix to be used to determine the degree of deficiency to be assessed.

In some situations, more than one hazardous area with the same or differing levels of deficiency exists. The parameter value then is based on the single most serious deficiency for the hazardous area.

	Nonsprinklered			Sprinklered	
	Fire resistance rating with automatic fire detection		Unenclosed	Smoke-resistive separation	Unenclosed
	20 min.	1 hr			
Does not expose sleeping area or means of escape routes	No def.	No def.	Single deficiency	No deficiency	No deficiency
Exposes sleeping area or means of escape routes	Single def.	No def.	Double deficiency	No deficiency	Single deficiency

Figure 6-2.4.2.4 Hazardous areas — degree of deficiency.

6-2.4.3 Manual Fire Alarm. Manual fire alarms are defined in 6-2.4.3.1 through 6-2.4.3.3.

6-2.4.3.1 None or Incomplete. There is no manual fire alarm system, or the system is incomplete and does not meet the requirements necessary for a higher-scored category.

6-2.4.3.2 Without Fire Department Notification (W/O F.D. Notification). The credit for this level of protection is to be given for any installation that meets the requirements for a manual fire alarm system in 22-2.3.4.1 and 23-2.3.4.1 (NFPA *101*).

6-2.4.3.3 With Fire Department Notification (W/F.D. Notification). There is a manual fire alarm system meeting the requirements of Section 7-6 (NFPA *101*) including fire department notification as defined in 7-6.4 (NFPA *101*).

6-2.4.4 Smoke Detection and Alarm. A detection system as used herein is one based on the use of smoke detectors. No recognition is given for thermal detectors. The detection system categories are described in 6-2.4.4.1 through 6-2.4.4.5.

6-2.4.4.1 None or Incomplete. There are no smoke detectors in the building, or, if any are present, they do not meet the requirements for a higher-scored category.

6-2.4.4.2 Single Level Detection, Limited Warning. There are one or more detectors in the building, but they do not meet the criteria for every level detection set forth in 6-2.4.4.3. Detectors credited in this category shall be permitted to be any approved smoke detector, including single station detector. At least one detector must be located in the corridor or similar common space (lobbies, lounges, or other spaces that cannot be closed off) in the immediate vicinity of each separate sleeping area. If there is more than one sleeping area, each such area must be protected to obtain this credit.

6-2.4.4.3 Every Level Detection. This credit applies where the detector system meets the requirements of 22-2.3.4.3 and 23-2.3.4.3 (NFPA *101*).

6-2.4.4.4 Every Level Plus Single Station Detection in Each Bedroom. To receive this credit, the requirements of 6-2.4.4.3 must be met in full with the addition of at least one single station detector in each bedroom or other sleeping area.

6-2.4.4.5 Total Coverage System. A minimum of one detector in each occupied room or other habitable space and throughout any basements, storage areas (other than normal clothing closets), or combustible loft spaces. To qualify as a total system, there must be a manual fire alarm system in the building, and the operation of any smoke detector must automatically activate the manual fire alarm system evacuation alarm for the entire building.

6-2.4.5 Automatic Sprinklers. Automatic sprinklers are defined in 6-2.4.5.1 and 6-2.4.5.2.

6-2.4.5.1 Nonsprinklered. No credit is given if there are no sprinklers or if sprinklers, though present, are not sufficient to qualify for the sprinklered category.

6-2.4.5.2 Sprinklered ("Standard Sprinklers" or "Quick-Response or Residential Sprinklers"). The building is sprinklered in accordance with 22-2.3.5.1 through 22-2.3.5.3 and 23-2.3.5.1 through 23-2.3.5.2 (NFPA *101*).

6-2.4.6 Interior Finish. Except as noted in 6-2.4.6.1, classification of interior finish on the walls and ceilings of the occupied space is in accordance with Section 6-5 (NFPA *101*). There are no requirements for interior floor finish.

6-2.4.6.1 No consideration is included in the safety parameter value for any finish with a flame-spread rating greater than 200 or for any material not rationally measured by NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. Materials not rationally measured include foam plastics, asphalt-impregnated paper, or other materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved, the resultant risk is considered beyond the capacity of this evaluation system and requires individual appraisal.

NOTE 1: Plywood of 1/4 in. (0.6 cm) or greater thickness should be considered as having a flame-spread rating of 200 or less.

NOTE 2: Exposed wood open-joist construction or other exposed wood construction areas shall be charged as Class C interior finish, in addition to any charges under 6-2.4.1.

NOTE 3: If a space is classified as hazardous under 6-2.4.2, no additional charge shall be made as the result of interior finish in such areas.

6-2.4.7 Separation of Sleeping Rooms (from other levels and from corridors). Separation of sleeping rooms is described in 6-2.4.7.1 through 6-2.4.7.3.

6-2.4.7.1 Separation of Sleeping Rooms from Other Levels. The classification of separation of sleeping rooms is categorized under the groups headed "Unprotected Vertical Openings" and "Protected Vertical Openings" (Parameter 7 in Table 6-1A). A facility is classed as having protected vertical openings if there are no vertical openings (as in a single-level building) or if the protection of vertical openings meets the requirements of 22-2.3.1.1 and 23-2.3.1.1 (NFPA *101*); otherwise this parameter is assessed on the basis of "Unprotected Vertical Openings."

6-2.4.7.2 Separation of Sleeping Rooms from Corridors and Common Spaces. The charge for "None or Incomplete" (Parameter 3 in Table 6-1A) is assessed in any case where the separation of sleeping rooms from corridors and common spaces is insufficient to meet any of the other classifications in this parameter.

6-2.4.7.3 The following are definitions of the other classifications of sleeping room separation:

(a) *Smoke Resisting.* Sleeping rooms are separated from corridors or other common spaces in accordance with 22-2.3.6 and 23-2.3.6 (NFPA *101*) without the door closer.

(b) *Smoke Resisting with Door Closer.* Sleeping rooms are separated in accordance with 22-2.3.6 and 23-2.3.6 (NFPA *101*).

(c) *20-Minute Fire Resistance.* Meets the requirements of 22-2.3.6 and 23-2.3.6 (NFPA *101*) without the door closer.

(d) *20-Minute Fire Resistance with Door Closer.* Sleeping rooms are separated in accordance with 22-2.3.6 and 23-2.3.6 (NFPA *101*) with door closer.

(e) *20-Minute Fire Resistance with Automatic-Closing Doors.* Automatic-closing doors shall be permitted if the doors have an arrangement that holds them open in a manner such that they are released by a smoke detector-operated device (e.g., magnetic or pneumatic hold-open device) prior to the passage of significant smoke from the space of fire origin into the corridor or from the corridor into the protected room. Smoke detectors for operation of such doors are either integral with the door closers, mounted at each door, or operated from a total smoke detection system covering both the room and corridor.

6-2.4.8 Means of Escape. Means of escape is defined in 6-2.4.8.1 through 6-2.4.8.6.

6-2.4.8.1 Means of Escape on All Sleeping Levels. A building shall be considered as having means of escape on all sleeping levels, provided:

(a) The entire building is on a single level, or

(b) All guest rooms used for sleeping are on a level having an exit door.

6-2.4.8.2 Primary Route. A normal means of escape that might involve interior or exterior stairs, corridors, doors, or other common means of movement through and out of a dwelling unit.

(a) *Protected.* A primary route is classed as "protected" if it provides a path of travel to the outside of the building without traversing any corridor or space exposed to an unprotected vertical opening. Also, where the sleeping room is above or below the level of exit discharge, the primary means is an enclosed interior stair in accordance with 22-2.2.4 or 23-2.2.4 (NFPA *101*) or an exterior stair, or a horizontal exit.

(b) *Unprotected.* A primary route is classed as "unprotected" if it does not meet the requirements for "protected."

6-2.4.8.3 Less than 2 Remote Routes. The egress capability is classed as "<2 remote routes" if each bedroom does not have access to two routes leading to two separate building exit doorways.

6-2.4.8.4 With Alternative Means. The credit for this level of protection applies to any facility that meets the requirements for a second means of escape in 22-2.2.3(a), 22-2.2.3(b), or 22-2.2.3(c), and 23-2.2.3(a), 23-2.2.3(b), or 23-2.2.3(c) (NFPA *101*).

6-2.4.8.5 Two Remote Routes. To meet the requirement for "2 remote routes," each bedroom has access to two routes leading to two separate building exit doorways.

(a) *Separated.* To meet the requirement for "2 remote routes separated," the facility must meet the requirements of 22-2.2.1 and 23-2.2.1 (NFPA *101*).

(b) *Unseparated.* The two remote routes do not meet the requirements for the classification "separated."

6-2.4.8.6 Direct Exit from Each Bedroom. To be credited, each bedroom must have a door operable by the room occupant(s) that opens directly to grade without more than one step, or have a ramp to grade, or have an external porch or landing with external stairs or other suitable access to grade.

Some buildings have a nonsleeping occupants use area (e.g., staff lounge) on a floor without any exit, and the building otherwise qualifies to receive credit for direct exits or for two remote exits. To receive credit for direct exits or for two remote exits, there must be either a protected egress route or two remote routes from the occupants use area.

6-3 Glossary for Fire Safety Evaluation Worksheet for a Large Facility.

6-3.1 Introduction. This glossary is provided to assist in completing the "Fire Safety Evaluation Worksheet for a Large Facility" to determine the suitability of a large facility to house a board and care occupancy. The instructions for the mechanisms of completing the worksheet are included in the worksheet itself. They are not repeated in this glossary. This glossary provides expanded discussion and definitions for the various items in the worksheet to assist the user where questions of definition or interpretation arise. To the maximum extent possible, the glossary does not repeat the definitions already existing in NFPA *101, Life Safety Code*, but rather references the appropriate paragraphs in Chapters 1 through 31 (NFPA *101*).

6-3.2 Areas of Application. The entire residence is evaluated on a single worksheet to the degree indicated by each item on the worksheet. However, spaces that are not used for living units, not in direct utility or maintenance support of the living units, not provided for resident use, or not in any way involved in resident emergency egress shall be permitted to be omitted from the calculation where such space is separated from all of the resident spaces and resident-support spaces by 2-hour fire resistance-rated construction (including any building members that support the resident areas and emergency egress routes). In such a case, however, any appropriate charges under Safety Parameter 2, "Hazardous Areas," in Table 6-2A shall be charged. Also, the assignment of values for

Safety Parameter 3, "Manual Fire Alarm"; Safety Parameter 7, "Exit System"; and Safety Parameter 8, "Exit Access," shall not consider conditions in unoccupied spaces that do not involve any egress paths.

NOTE: Zoning of buildings shall be permitted, and individual zones shall be permitted to have different safety values (levels). Such zoning shall, however, be limited to considerations of differences in Safety Parameters 6, 7, and 8, which cover exits and separation of sleeping areas. Zoning shall be by separate fire/smoke zones. A fire/smoke zone is a portion of the building separated from all other portions of the building by building construction having at least a 1-hour fire resistance rating or smoke barriers, or both, conforming to the requirements of Section 6-3 of NFPA *101, Life Safety Code*, using smoke barriers of at least a 20-minute fire resistance rating. Zoning of the facility also shall be permitted in nonfire-resistive sprinklered buildings, provided the construction separating one zone from another is sound resistant and smoke resistant.

6-3.3 Maintenance. All protection systems, requirements, arrangements, and procedures shall be maintained in a dependable operating condition, and a sufficient state of readiness, and shall be used in such a manner that the intended safety function or hazard constraint is not impaired. Otherwise, they shall receive no credit in the evaluation.

6-3.4 Safety Parameters (Table 6-2A). The safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons who might be in the building at the time of a fire.

Each of the safety parameters is to be analyzed, and the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more values appear to apply, the one with the lowest point value shall be used.

6-3.4.1 Construction.

6-3.4.1.1 Story height is defined in 22-3.1.3.2 and 23-3.1.3.2 (NFPA *101*).

6-3.4.1.2 Where the facility includes additions or connected structures of different construction, the rating and classification of the structure shall be based on the following:

(a) Separate buildings where a 2-hour or greater fire resistance-rated separation exists between the portions of the building, or

(b) The lower safety parameter point score involved where such a separation does not exist.

6-3.4.1.3 The safety parameter values for Type V(000), Type III(200), and Type II(000) receive a higher parameter credit if the building is fully sheathed. This credit is to be given if all portions of the bearing walls, bearing partitions, floor construction, and roofs [or a roof/loft system if the space above the highest ceiling is inaccessible and either is provided with draft stops or other barriers on 30-ft (9.1-m) spacing, or is provided with heat- or smoke-actuated fire detectors that sound the building fire alarm], and all columns, beams, girders, trusses, or similar bearing members either have an inherent fire resistance or are sheathed, encased, or otherwise treated to provide approximately a 20-minute or greater fire resistance rating. Buildings fully sheathed with sound lath and plaster, gypsum board, or equivalent sheathing are considered as meeting this criteria.

6-3.4.2 Hazardous Areas. The assignment of parameter values for hazardous areas is a four-step process.

6-3.4.2.1 Step 1 — Identify Hazardous Areas. Hazardous areas are those having a degree of hazard greater than that normal to the general occupancy of the building, such as areas for storage of combustibles or flammables, for heat-producing appliances, or for maintenance purposes.

6-3.4.2.2 Step 2 — Determine the Level of Hazard. There are two levels of hazard as follows:

(a) *Structurally Endangering.* A hazardous occupancy with sufficient fire or explosion potential to defeat the basic integrity of the building framing as defined in 6-3.4.1.

(b) *Not Structurally Endangering.* A hazardous occupancy with sufficient fire potential to build to full involvement and present a danger of propagating through openings or wall partitions but not possessing sufficient total potential to endanger the structural framing or floor decking as defined in 6-3.4.1.

Figure 6-3.4.2.2 provides an analysis of typical types of hazardous areas relative to inherent potential structural danger to different classes of structural systems.

Large Facility–Inherent Structural Danger from Typical Hazardous Areas

	Minimum Fire Resistance Rating of Bearing Walls, Bearing Partitions, Columns, Beams, Girders, Trusses, and Floor/Ceiling Assemblies Exposed to Hazardous Area		
Exposure (area, space, activity, condition)	≥ 2-hour	< 2-hour; ≥ 1-hour	<1-hour
	Not structurally endangering (N/SE)		Structurally endangering (SE)
Occupational therapy spaces		Varies*	
Craft shop		Varies*	
General storage area		Varies*	
Garage		N/SE	
Boiler, heater, or incinerator rooms		Varies*	
Fuel storage		SE	
Trash chutes		SE	
Trash rooms		SE	
Small trash collection room		N/SE	
Laundries (institutional type)		N/SE	
Repair shops		Varies*	

*Must be judged on the combustibles involved in the individual situation.

Figure 6-3.4.2.2 Hazardous areas — level of hazard.

6-3.4.2.3 Step 3 — Determine the Fire Protection Provided. The parameter value for hazardous areas is based on the presence or absence of the fire protection necessary

to control or confine the hazard. Two different types of fire protection are considered. The first consists of automatic sprinklers or other appropriate extinguishing systems covering the entire hazard. The second is a complete fire resistance-rated enclosure, including the separation of the hazardous area from any bearing members, partitions separating the hazardous area from all other spaces, and doors to the space sufficient to exceed the potential of the fire load involved. Any hazardous space that has either of these protection systems is classed as having single protection. Any hazardous space that is both fully enclosed — as described above — and sprinklered is classed as having both (i.e., double level protection). On this basis, any hazardous area with a fuel load that has the potential of overwhelming the available structural capability could, as a minimum, have a single deficiency as determined in 6-3.4.2.4.

NOTE: Where the hazardous area is within a living unit or abuts an egress route (exit or exit access) addressed in 6-3.4.7 and 6-3.4.8, the credit for sprinklers shall not be permitted unless the hazardous area is separated from the rest of the living unit or the egress route by reasonably smoke-resisting barriers and doors.

6-3.4.2.4 Step 4 — Determine Degree of Deficiency and Assign Parameter Values. The parameter value ultimately is determined by the degree of the deficiency of the hazardous area based on the level of protection needed. Figure 6-3.4.2.4 provides a matrix to be used to determine the degree of deficiency to be assessed.

In some situations, more than one hazardous area with the same or differing levels of deficiency exists. The overall parameter value then is based on the single most serious deficiency for the hazardous area.

	No protection	Sprinkler protection	Fire resistance-rated enclosure	Sprinklered and fire resistance-rated enclosure
Not structurally endangering	Single deficiency	No deficiency		
Structurally endangering	Double deficiency	Single deficiency	No deficiency[a] Double deficiency[b]	No deficiency[a] Single deficiency[b]

[a]If fire resistance and structural strength exceed maximum potential of hazard.

[b]If fire resistance or structural strength is not sufficient to withstand potential of hazard.

Figure 6-3.4.2.4 Hazardous areas — degree of deficiency.

6-3.4.3 Manual Fire Alarm. Fire alarms are defined in 6-3.4.3.1 through 6-3.4.3.3.

6-3.4.3.1 None or Incomplete. There is no fire alarm system, or the system is incomplete and does not meet the requirements for a higher-scored category.

6-3.4.3.2 Without Fire Department Notification (W/O F.D. Notification). There is a fire alarm system that meets the requirements of 22-3.3.4 and 23-3.3.4 (NFPA *101*), as appropriate.

6-3.4.3.3 With Fire Department Notification (W/F.D. Notification). There is a fire alarm system that complies with 6-3.4.3.2 and, in addition, automatically transmits a signal to the fire department in accordance with 7-6.4 (NFPA *101*).

6-3.4.4 Smoke Detection and Alarm. All references to detectors herein refer to smoke detectors. No credit is given for thermal detectors in habitable spaces except as specifically noted. Heat detectors can be credited in uninhabitable spaces where ambient temperatures can be expected to exceed 120°F (50°C) or fall below 0°F (–18°C) (such as in unfinished attics or cocklofts), provided separation from inhabited spaces is at least 20-minute fire resistance rated. The categories under this parameter are described in 6-3.4.4.1 through 6-3.4.4.4.

6-3.4.4.1 None or Incomplete. There are no detectors, or those that are present do not meet the requirements for a higher-scored category.

6-3.4.4.2 Single Station Units in Each Bedroom. There is one single station detector (sounds the alarm only at the responding detector) in each bedroom or sleeping room.

6-3.4.4.3 Interconnected System. Interconnected systems are those systems where the operation of any detector sounds alarm devices that alert all of the occupants. The alarm sounding device shall be permitted to be on other interconnected detectors or shall be permitted to be other separate alarm devices. Where the systems are of the total building variety, the credit shall be permitted to be given only if the system includes manual fire alarm features or the building has a manual fire alarm system and the operation of the detection system sounds the manual fire alarm as though a fire alarm box on that floor had been operated.

(a) *Corridors and Common Spaces without Bedroom/Suite Detectors.* The system meets the requirements of 22-3.3.4.8 and 23-3.3.4.6 (NFPA *101*).

(b) *Corridors and Common Spaces with Single Station Bedroom/Suite Detectors.* There is one single station detector in each bedroom or sleeping room and interconnected detectors in corridors and common spaces that are spaced as described in 6-3.4.4.3(a).

(c) *Corridors and Common Spaces with Interconnected Bedroom/Suite Detectors.* The system is as in 6-3.4.4.3(b), except bedroom/suite detectors are interconnected with corridor/common space detectors. In buildings in which construction as specified in 6-3.4.1 is based on all members having a fire resistance rating of at least 20 minutes or more, a system as described in 6-3.4.4.3(b) that also has a thermal detector in each bedroom/suite connected to the building fire alarm system shall be permitted to be credited in this category.

6-3.4.4.4 Total Building System. This system includes detectors located in every bedroom throughout the building and also provides detector coverage throughout all corridors, common spaces, and hazardous areas, with the system meeting the requirements for an automatic fire alarm system in accordance with the NFPA 72, *National Fire Alarm Code*.

6-3.4.5 Automatic Sprinklers. Any sprinkler installation that meets the requirements of 22-3.3.5.1 and 23-3.3.5.1 (NFPA *101*).

6-3.4.5.1 None or Incomplete. No credit is given if there are no sprinklers or if sprinklers, though present, are not sufficient to qualify for one of the other categories specified herein.

NOTE: Any space credited as being protected by automatic sprinklers that abuts a hazardous area judged deficient in accordance with 6-3.4.2 shall not be permitted to be considered as sprinkler protected unless the hazardous area also is sprinkler protected.

6-3.4.5.2 Bedrooms/Suites Only. All bedrooms/suites have sprinkler protection.

6-3.4.5.3 Corridors and Common Spaces. Sprinkler protection covers all of the corridors and public spaces that separate, directly expose, or are in the egress path from the bedrooms/suites (except fire resistance-rated, enclosed, noncombustible stairwells). Sprinklers shall be installed along the corridor ceiling, and, in addition, one sprinkler shall be installed opposite the center of and inside of any bedroom door opening onto the corridor.

6-3.4.5.4 Bedrooms/Suites, Corridors, and Common Spaces. Sprinkler protection meets the combined requirements for 6-3.4.5.2 and 6-3.4.5.3 and is equipped with an automatic alarm initiating device that activates the building manual fire alarm system or an alternate evacuation alarm.

6-3.4.5.5 Total Building. The building is totally sprinkler protected and is equipped with an automatic alarm initiating device that activates the building manual fire alarm system or an alternate evacuation alarm.

6-3.4.6 Separation of Sleeping Rooms from Exit Access. Separation of sleeping rooms from exit access is based on the wall partitions that make up the separation and the protection of the openings in those partitions.

6-3.4.6.1 The charge for "None or Incomplete" (Safety Parameter 6 in Table 6-2A) is assessed in any case where the separation of sleeping rooms from exit access is insufficient to meet any of the other classifications in this parameter.

6-3.4.6.2 Definitions for "expectation of door closing" are as follows:

(a) *Expectation — Not High.* This credit is given if the requirements for "expectation — high" are not met.

(b) *Expectation — High.* High expectation of a door closing (or being closed at time of fire) shall be considered to be met if the requirements of 22-3.3.6.6 and 23-3.3.6.6 (NFPA *101*) are met.

6-3.4.6.3 Smoke Resisting. Sleeping rooms are separated from corridors or other common spaces by walls, partitions, or other constructions that resist the passage of smoke. There are no louvers, transfer grilles, operable transoms, or other air passages penetrating the wall except properly installed heating and utility installations.

Doors, in walls or partitions that separate sleeping rooms from corridors or other common spaces, resist the passage of smoke and are provided with latches, door closers, or other mechanisms suitable for keeping the doors tightly closed. Vision panels shall be permitted to be installed in doors or partitions without respect to glass type or size.

6-3.4.6.4 20 Minutes. The credit is given if the requirements of 22-3.3.6.3 through 22-3.3.6.5 and 23-3.3.6.3 through 23-3.3.6.5 (NFPA *101*) are met.

6-3.4.6.5 1-Hour Walls, 20-Minute Doors. Sleeping rooms are separated from corridors or other common spaces by walls or partitions and doors meeting the requirements of 6-3.4.6.4, and the walls and partitions have at least a 1-hour fire resistance rating.

Exception: Where doors meet the requirements of 6-3.4.6.4, and automatic sprinklers are provided on both sides of the door.

6-3.4.7 Exit System. Exit systems are the paths of travel from the facility to the outside. For the purposes of this parameter, however, only those exit routes used in fire drills in accordance with 31-7.3 (NFPA *101*) shall be credited.

6-3.4.7.1 Exposed Route. An exit route is exposed if a segment of that route is the only available route for one or more residents and that segment of the exit route is not separated from all other rooms or areas by walls and doors of equivalent separation to that credited in 6-3.4.6.

Exception No. 1: Where rooms or spaces are provided with an automatic sprinkler system.

Exception No. 2: Where rooms or spaces are provided with a smoke detection and alarm system connected to activate the building evacuation alarm; where furnishings, finishes, and furniture, in combination with all other combustibles within the space, are of such minimum quantity and are so arranged that a fully developed fire is unlikely to occur.

6-3.4.7.2 Multiple Routes. Multiple routes exist where the occupants of any sleeping room have, either from the sleeping room or through access in a corridor adjacent to the sleeping room, a choice of two separate exit routes to the outside.

6-3.4.7.3 Deficient. An exit route is deficient if it fails to meet any of the applicable criteria in 22-3.2 and 23-3.2 (NFPA *101*), except those related to travel distances and dead ends. These are evaluated separately in 6-3.4.8.

6-3.4.7.4 Without Horizontal Exit (W/O Horiz. Exit). An egress system is based on this charge if there are multiple routes that are not deficient but the arrangement does not include a horizontal exit as defined in 6-3.4.7.5 or have acceptable direct exit from each sleeping room as defined in 6-3.4.7.7.

6-3.4.7.5 With Horizontal Exit (W/Horiz. Exit). The presence of a single horizontal exit meeting the criteria in 5-2.4 (NFPA *101*) on each floor containing sleeping rooms shall be considered as sufficient criteria to meet this requirement, provided that the space created is of sufficient size to provide at least 3 sq ft (0.28 sq m) of accessible space for all of the potential occupants already present in or evacuating to such space.

6-3.4.7.6 Smokeproof Enclosure. Credit for a smokeproof enclosure shall be permitted to be given for a stairway designed and tested in accordance with the requirements of 5-2.3 (NFPA *101*) for a smokeproof enclosure. To receive credit for a smokeproof enclosure, all exit stairs credited in Safety Parameter 7, "Exit System," and Safety Parameter 8, "Exit Access," shall meet the smokeproof enclosure requirements.

6-3.4.7.7 Direct Exit. To be credited for direct exits, each sleeping room shall have within that unit a door that opens to the exterior at grade level or onto an unenclosed exterior balcony with direct access to an exterior exit or smokeproof

enclosure. Where such openings are directly onto grade in a location where any person egressing can move directly away from the building without further exposure, the credit for direct exit shall be permitted, even if there are no other exit routes from the involved living unit.

NOTE: This parameter value does not cover the charges for the dead-end conditions, travel distance, interior finish in the egress routes (exits or exit access), or enclosure of stairways or other exit routes that pass from floor to floor. These elements are covered separately in 6-3.4.8, 6-3.4.9, and 6-3.4.10.

6-3.4.8 Exit Access. Exit access is a measurement of the travel distance from the sleeping rooms to the outside or to any other point of safety as defined in 22-1.3 and 23-1.3 (NFPA *101*), whichever is shorter.

6-3.4.9 Interior Finish.

6-3.4.9.1 Classification of interior finish on walls and ceilings of the occupied space shall be in accordance with Section 6-5 (NFPA *101*).

Exception: Exposed portions of structural members complying with the requirements of Type IV (2HH) construction shall be permitted.

Only floor coverings in the exit and exit access system are considered. For purposes of assigning the parameter values in Table 6-2A, such floor coverings are considered as having a flame spread ≤25 if they meet the requirements for Class I or II and as otherwise having a flame spread >75.

Exception: Previously installed floor coverings shall be permitted, subject to the approval of the authority having jurisdiction.

6-3.4.9.2 No consideration is included in the safety parameter value for any finish with a flame-spread rating greater than 200 or for any material not rationally measured by NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. Materials not rationally measured include foam plastics, asphalt-impregnated paper, or other materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved, the resultant risk is considered beyond the capacity of this evaluation system and requires individual appraisal.

NOTE: Plywood of 1/4 in. (0.6 cm) or greater thickness should be considered as having a flame-spread rating of 200 or less.

6-3.4.10 Vertical Openings.

6-3.4.10.1 These values apply to vertical openings and penetrations including exit stairways, ramps, and any other vertical exits, pipe shafts, ventilation shafts, duct penetrations, and laundry and incinerator chutes. The charge for vertical openings shall be based on the presence or lack of enclosure and the fire resistance rating of the enclosure, if provided.

6-3.4.10.2 A vertical opening or penetration shall be classified as open, provided:

(a) It is unenclosed.

(b) It is enclosed but does not have doors.

(c) It is enclosed but has openings other than doorways.

(d) It is enclosed with cloth, paper, or similar materials without any sustained firestopping capabilities, except as permitted by 22-3.3.1 and 23-3.3.1 (NFPA *101*), as appropriate.

6-3.4.10.3 If a shaft other than a credited exit route (i.e., credited as one of the multiple routes required in 6-3.4.7.6.2 or in determining travel distance in 6-3.4.8) is enclosed on all floors but one and this results in an unprotected opening between that shaft and one, and only one, floor, the parameter value assigned to that shaft shall be 0. If a required egress route is contained in that shaft, the parameter value shall be (-2).

6-3.4.11 Smoke Control. Smoke control definitions are provided in 6-3.4.11.1 through 6-3.4.11.5.

6-3.4.11.1 None. There are no smoke barriers (or horizontal exits) on the floor, the floor is not served by a smokeproof enclosure, and there are no mechanically assisted smoke control systems serving the floor.

6-3.4.11.2 Smoke Barrier. Smoke barriers consist of installations conforming to the requirements of 22-3.3.7 and 23-3.3.7 (NFPA *101*), as appropriate.

6-3.4.11.3 Mechanically Assisted Systems — by Floor. Mechanically assisted smoke control on a corridor basis is a tested and accepted smoke control system initiated by a method of smoke detection that ensures operation of the smoke control system before significant smoke has entered into the corridor involved. One method of judging the acceptability of smoke control systems is contained in NFPA 92A, *Recommended Practice for Smoke-Control Systems*. The mechanism must be capable of pressurizing the corridor sufficiently to prevent smoke from the room/suite or space of origin from entering the corridor during the entire course of the fire. Such a system must be able to hold back the smoke through the expected maximum severity of the fire. It also must be capable of exhausting smoke from the corridor based on the assumption that the emergency evacuation procedures and other activities involving the opening and closing of doors will cause occasional brief periods during which the smoke control system is overpowered. This results in the movement of the smoke from the fire area into the corridor. (The exhausting of the smoke normally would be accomplished by having an exhaust fan of lower capacity than the fan supplying air for pressurization exhaust from the corridor. The net pressurization force would occur from the effect of the pressurizing fan minus the effect of the removal or purging fan.) The corridor's pressurizing system could involve early warning smoke detection, automatic closing of all room/suite doors, or sprinkler protection, or all three. Where these additional protection devices are provided in order to effect such a smoke control system, the individual credits for each of the involved protection devices are in addition to the credits for the smoke control system.

6-3.4.11.4 Mechanically Assisted Systems — by Zone. Mechanically assisted smoke control on a zone basis shall include a smoke barrier (or a horizontal exit) supported by a tested and accepted smoke control system to provide a pressure differential that assists in confining smoke to the compartment of origin. One method of judging the acceptability of smoke control systems is contained in NFPA 92A, *Recommended Practice for Smoke-Control Systems*. Special smoke control fans shall be permitted to be used, or special adjustments of the normal building air movement fans shall be permitted to be made.

6-3.4.11.5 Mechanically Assisted Systems — by Room/Suite. Mechanically assisted smoke control on a room/suite basis is a tested and accepted smoke control system so designed as to provide a mechanism of automatically controlled fans, smoke vent shafts, or a combination thereof to ensure a positive pressure differential that prevents intrusion of smoke into any room/suite not involved in fire. One method of judging the acceptability of smoke control systems is contained in NFPA 92A, *Recommended Practice for Smoke-Control Systems*. In this method, the rooms have a pressure differential higher than the corridor and higher than any room where fire has been detected. Such systems shall be so arranged that there is detection in each room/suite that prevents a room that is involved in fire from becoming positively pressurized.

6-4 Glossary for Fire Safety Evaluation Worksheet for an Apartment Building with Board and Care Occupancies.

6-4.1 Introduction. This glossary is provided to assist in completing the "Fire Safety Evaluation Worksheet for an Apartment Building with Board and Care Occupancies" to determine the suitability of an apartment building to house a board and care occupancy. This is the second step in a two-step procedure. The first step is to evaluate the portion of the building used as a board and care home; this second step evaluates the remainder of the building. The instructions for completing the worksheet are included in the worksheet itself. They are not repeated in this glossary. This glossary provides expanded discussion and definitions for the various items in the worksheet to assist the user where questions of definition or interpretation arise. To the maximum extent possible, the glossary does not repeat the definitions already existing in NFPA *101*, *Life Safety Code*, but rather references the appropriate paragraphs in Chapters 1 through 31 (NFPA *101*).

6-4.2 Areas of Application.

6-4.2.1 The entire apartment building is evaluated on a single worksheet to the degree indicated by each item on the worksheet. However, spaces that are not used for living units, not in direct utility or maintenance support of the living units, not provided for tenant use, or not in any way involved in resident emergency egress shall be permitted to be omitted from the calculation where such space is separated from all of the tenant and tenant-support spaces by 2-hour fire resistance-rated construction (including any members that bear the load of tenant-use space and with 1½-hour fire doors in any communicating opening). In such case, however, any appropriate charges under 6-4.4.2 in Table 6-3A shall be charged.

6-4.2.2 The suitability of the apartment unit actually used as the board and care home is evaluated separately and shall be permitted to be evaluated before or after evaluating the suitability of the apartment building.

6-4.2.3 Where evaluating an apartment unit, consider the common corridor as equivalent to the outside where evaluating egress routes. Also, where evaluating egress routes, credit a window only if it can be used in an emergency evacuation.

6-4.3 Maintenance. All protection systems, requirements, arrangements, and procedures shall be maintained in a dependable operating condition, and a sufficient state of readiness, and shall be used in such a manner that the intended safety function or hazard constraint is not impaired. Otherwise, they shall receive no credit in the evaluation.

6-4.4 Safety Parameters (Table 6-3A). The safety parameters are a measure of those building factors that bear upon or contribute to the safety of those persons who might be in the building at the time of a fire.

Each of the safety parameters is to be analyzed and the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more values appear to apply, the one with the lowest point value shall be used.

6-4.4.1 Construction. The construction parameter values are applied to the entire building as defined in 6-4.4.1.1 through 6-4.4.1.3.

6-4.4.1.1 In evaluating the construction values, the height of the building is the height of the board and care dwelling unit above grade regardless of the total height of the building.

6-4.4.1.2 Where the facility includes additions or connected structures of different construction, the rating and classification of the structure shall be based on the following:

(a) Separate buildings where a 2-hour or greater fire resistance-rated separation exists between the portions of the building, or

(b) The lower safety parameter point score involved where such a separation does not exist.

6-4.4.1.3 The safety parameter values for Type V(000), Type III(200), and Type II(000) receive a higher parameter credit if the building is fully sheathed. This credit is to be given if all portions of the bearing walls, bearing partitions, floor construction, and roofs [or a floor/loft system if the space above the highest ceiling is inaccessible and either is provided with draft stops or other barriers on 30-ft (9.1-m) spacing, or is provided with heat- or smoke-actuated fire detectors that sound the building fire alarm], and all columns, beams, girders, trusses, or similar bearing members either have an inherent fire resistance or are sheathed, encased, or otherwise treated to provide approximately a 20-minute or greater fire resistance rating. Buildings fully sheathed with sound lath and plaster, gypsum board, or equivalent sheathing are considered to meet this criteria.

6-4.4.2 Hazardous Areas. The hazardous area parameter applies to the entire building except the apartment(s) actually used for the residential board and care facility.

The assignment of charges for hazardous areas is a four-step process.

6-4.4.2.1 Step 1 — Identify Hazardous Areas. Hazardous areas are those having a degree of hazard greater than that normal to the general occupancy of the building, such as areas for storage of combustibles or flammables, for heat-producing appliances, or for maintenance purposes.

6-4.4.2.2 Step 2 — Determine the Level of Hazard. There are two levels of hazard as follows:

(a) *Structurally Endangering.* A hazardous occupancy with sufficient fire or explosion potential to defeat the basic integrity of the building framing as defined in 6-4.4.1.

(b) *Not Structurally Endangering.* A hazardous occupancy with sufficient fire potential to build to full involvement and present a danger of propagating through openings or wall partitions but not possessing sufficient total potential to endanger the structural framing or floor decking as defined in 6-4.4.1.

6-4.4.2.3 Step 3 — Determine the Fire Protection Provided. The parameter value for hazardous areas is based on the presence or absence of the fire protection necessary to control or fine the hazard. Two different types of fire protection are considered. The first consists of automatic sprinklers or other appropriate extinguishing systems covering the entire hazard. The second is a complete fire resistance-rated enclosure, including the separation of the hazardous area from any bearing members, partitions separating the hazardous area from all other spaces, and doors to the space sufficient to exceed the potential of the fire load involved. Any hazardous space that has either of these protection systems is classed as having single protection. Any hazardous space that is both fully enclosed — as described above — and sprinklered is classed as having both (i.e., double level protection). On this basis, any hazardous area with a fuel load that has the potential of overwhelming the available structural capability could as a minimum have a single deficiency as determined in 6-4.4.2.4.

NOTE: Where the hazardous area abuts an egress route (exit or exit access) addressed in 6-4.4.7 and 6-4.4.8, the credit for sprinklers shall not be permitted unless the hazardous area is separated from the rest of the living unit or the egress route by reasonably smoke-resisting barriers and doors.

6-4.4.2.4 Step 4 — Determine Degree of Deficiency and Assign Parameter Values. The parameter value ultimately is determined by the degree of the deficiency of the hazardous area based on the level of protection needed. Figure 6-4.4.2.4 provides a matrix to be used to determine the degree of deficiency to be assessed.

In some situations, more than one hazardous area with the same or differing levels of deficiency exists. The overall charge is based on the single most serious deficiency for the hazardous area.

	No protection	Sprinkler protection	Fire resistance rated-enclosure	Sprinklered and fire resistance-rated enclosure
Not structurally endangering	Single deficiency	No deficiency		
Structurally endangering	Double deficiency	Single deficiency	No deficiency[a] Double deficiency[b]	No deficiency[a] Single deficiency[b]

[a]If fire resistance and structural strength exceed maximum potential of hazard.

[b]If fire resistance or structural strength is not sufficient to withstand potential of hazard.

Figure 6-4.4.2.4 Hazardous areas — degree of deficiency.

6-4.4.3 Manual Fire Alarm. Manual fire alarms are defined in 6-4.4.3.1 through 6-4.4.3.3.

6-4.4.3.1 None or Incomplete. There is no manual fire alarm system, or the system is incomplete and does not meet the requirements for a higher-scored category.

6-4.4.3.2 Without Fire Department Notification (W/O F.D. Notification). There is a manual fire alarm system, regardless of the number of stories or units, meeting the appropriate requirements of 18-3.4.1 through 18-3.4.3 (NFPA *101*) and those requirements applicable to existing Option 1 apartment buildings in 19-3.4.1 through 19-3.4.3 (NFPA *101*).

6-4.4.3.3 With Fire Department Notification (W/ F.D. Notification). There is a manual fire alarm system that complies with the requirements of 6-4.4.3.2 and, in addition, automatically transmits a signal to the fire department in accordance with 7-6.4 (NFPA *101*).

6-4.4.4 Smoke Detection and Alarm. These parameter values apply only to apartments other than the group residence and to the areas used for apartment corridors and other common spaces.

A detection system as used herein is one based on the use of smoke detectors. No credit is given for thermal detectors.

6-4.4.4.1 None or Incomplete. There are no detectors, or, if any are present, they do not meet the requirements for a higher-scored category.

6-4.4.4.2 Single Station Detectors — Living Units Only. Single station detectors are those detectors that sound the alarm only at the location of the detector itself.

(a) *Single Level.* This value applies if each apartment covered by this parameter has at least one smoke detector and a higher value does not apply.

(b) *Every Level.* This parameter applies to those situations where there is one detector or more in each single level living unit or one detector or more on each level of any multilevel living unit. To receive this credit, at least one detector on each level must be loud enough to be heard in each sleeping room of the apartment involved.

The operation of single station units does not involve the transmission of the alarm beyond the sounding of the alarm device in the unit itself.

6-4.4.4.3 Interconnected Systems. Interconnected systems are those systems where the operation of any detector sounds alarm devices on other detectors, or other separate alarm systems, spread sufficiently to alert all of the building occupants. Where the systems are of the total building variety, the credit shall be permitted to be given only if the building has a manual fire alarm system and the operation of the detection system sounds the manual fire alarm as though a fire alarm box on that floor had been operated. Interconnected systems must provide sounding devices that are sufficient in location and loudness to ensure the awakening of persons who sleep normally.

(a) *Corridors and Common Spaces.* This parameter applies to those situations where there is at least one detector spaced every 30 ft (9.1 m) in corridors and an additional detector in all common use spaces for each 900 sq ft (83.6 sq m) or less of floor space. Detectors shall be permit-

ted to be omitted from common use spaces that comply with one of the following:

1. They are both sprinklered and protected from any egress routes or area of refuge or staging that serves the board and care home by the use of automatic-closing doors operated by smoke detection or activation of the sprinkler system; or

2. They are separated from the egress route or area of refuge or staging in 6-4.4.4.3(a)1 by fire resistance-rated construction and by automatic-closing doors of sufficient fire resistance rating to withstand the maximum fire potential in the common space.

(b) *Corridors and Common Spaces Plus Single Station Living Units.* To be credited in this category, detectors that comply with the requirements for detectors for every level in the living units specified in 6-4.4.4.2(b) and with the requirements for corridor and common spaces system in 6-4.4.4.3(a) must be provided.

6-4.4.4.4 Total Building System. A dwelling has a total building system if it meets the requirements of 19-3.4.4.2 for Option 2 (NFPA *101*).

6-4.4.5 Automatic Sprinklers. The parameter values for automatic sprinklers are based on the protection of spaces outside the apartment used for group residences.

6-4.4.5.1 None or Incomplete. No credit is given if there are no sprinklers or if sprinklers, though present, are not sufficient to qualify for one of the other categories specified herein.

NOTE: Any space credited as being protected by automatic sprinklers that abuts a hazardous area judged deficient in accordance with 6-4.4.2 shall not be permitted to be considered as sprinkler protected unless that hazardous area also is sprinkler protected.

6-4.4.5.2 Corridors, Public Spaces. Sprinkler protection covers all of the corridors and public spaces that separate, directly expose, or are in the egress path from the living units (except fire resistance-rated, enclosed, noncombustible stairwells). Sprinklers shall be installed along the corridor ceiling, and, in addition, one sprinkler shall be installed opposite the center of and inside of any living unit door opening onto the corridor.

6-4.4.5.3 Living Units Only. All living units have sprinkler protection complying with the requirements for light hazard protection in NFPA 13, *Standard for the Installation of Sprinkler Systems*; NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes*; or NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, as appropriate.

6-4.4.5.4 Corridor and Habitable Space. Meets the combined requirements for 6-4.4.5.2 and 6-4.4.5.3.

6-4.4.5.5 Total Building. The building is totally sprinkler protected in accordance with Section 7-7 (NFPA *101*) and is equipped with an automatic alarm initiating device that activates the building manual fire alarm system. Credit for total sprinkler protection shall not be given unless the living unit used for board and care purposes also is provided with total sprinkler protection.

6-4.4.6 Separation of Board and Care Home Unit and Its Exit Route from Other Spaces.

6-4.4.6.1 This parameter applies to all living units abutting corridors that might be used or involved in the exit system or to any areas of refuge or staging servicing the board and care unit. The separation requirements also apply to any common wall partitions between the board and care unit and any other living unit in the building.

6-4.4.6.2 Separation of living units from each other and from common spaces shall be based on the wall partition that makes up the separation and the protection of the openings in those partitions.

6-4.4.6.3 Duct penetrations where the duct is open on only one side of the partition and is of sheet steel construction shall be considered as equivalent to doors having a fire protection rating of at least 20 minutes. Where there are duct openings on both sides of the partition, the opening shall be considered unprotected unless there is a fire damper in the duct opening or the duct otherwise meets the requirements for omission of fire dampers as specified in NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*.

6-4.4.6.4 The partition shall be considered as "none or incomplete" if it has unprotected openings (louvers, gaps, transfer grilles, plain glass windows, or plain glass transoms) between the floor and the ceiling. If openings exist above the ceiling level (or even if the partition stops at the ceiling level), the walls shall be considered as complete if the ceiling itself is a complete membrane (such as plasterboard or lath and plaster). In this case, the fire resistance rating shall be based on that of the wall or ceiling system, whichever is less.

6-4.4.6.5 Walls shall be considered to have less than a 30-minute fire resistance rating if they are not equivalent to $\frac{1}{2}$-in. (1.3-cm) gypsum wallboard, on both sides of studs, that is well-nailed or fastened to the studs with appropriate taping and finishing of joints and fasteners. Walls shall be considered to be equivalent to or greater than a 1-hour fire resistance rating if they are part of any of the established systems recognized as having 1-hour or more fire resistance in accordance with recognized tests or approved listings.

6-4.4.6.6 Doors shall be considered as "none or incomplete" if any living unit does not have a door, or if the living unit has a door but there is some mechanism or obstruction that prevents closing of the door or otherwise leaves a significant opening between the door and the corridor, or the door has open louvers, or the door has ordinary glass lights or transoms. Doors that have been blocked open by doorstops, chalks, tiebacks, or other devices that need manual unlatching or releasing action to close the door shall be classified as "none or incomplete." Doors that are not provided with a latch or other device suitable for keeping the door tightly closed also shall be classified as "none or incomplete."

NOTE: Ordinary glass lights shall not be considered as requiring the "none or incomplete" classification in locations where both sides of the glass light are protected by automatic sprinklers.

6-4.4.6.7 Doors shall be considered as having 20-minute or greater fire protection rating if they are of $1\frac{3}{4}$-in. (4.4-cm) thick solid bonded wood core construction or an arrange-

ment of equivalent or greater stability in fire integrity. The thermal insulation capability of the door is not considered. Hollow steel or sheet steel doors, therefore, meet the 20-minute requirement.

6-4.4.6.8 Doors shall be considered automatic-closing if they are provided with either traditional self-closing mechanisms or release mechanisms actuated by smoke detectors. In the case of doors separating living units from each other or from common spaces, self-closing doors shall be permitted whether or not they are equipped with devices that can be used to hold them in the open position, provided the normal routine of the living unit is to keep the door closed, particularly after the occupants have retired for the night.

NOTE: This parameter category does not cover the charges for dead-end conditions, travel distance, interior finish in the egress routes (exit or exit access), or enclosure of stairways or other egress routes that pass from floor to floor. These elements are covered separately in 6-4.4.8, 6-4.4.9, and 6-4.4.10.

6-4.4.6.9 A separation is considered standard (i.e., rated as equivalent to walls greater than 1 hour, doors greater than 20 minutes) if the fire resistance of the doors and walls is equivalent to that specified by Chapters 18 and 19 (NFPA *101*) for the protection level involved.

6-4.4.7 Exit System. This parameter applies to the entirety of the exit routes serving the group residence. Exit routes are the paths of travel from the living unit to the outside, using any of the types and arrangements described in Chapter 5 (NFPA *101*).

6-4.4.7.1 Multiple Routes. Multiple routes exist where the occupants of any living unit have a choice of two separate exit routes to the outside, using those types permitted by Section 18-2 or 19-2, as appropriate (NFPA *101*). Occupants have a choice of routes either from the living unit or through access in a corridor adjacent to the living unit. Single exit routes complying with Exception No. 2 to 18-2.4 or Exception No. 2 or Exception No. 3 to 19-2.4 (NFPA *101*) qualify as multiple routes. [See 6-4.4.7.6 for facilities complying with the single exit route provisions of Exception No. 1 to 18-2.4 or Exception No. 1 to 19-2.4 (NFPA *101*).]

6-4.4.7.2 Deficient. An exit route is deficient if it fails to meet any of the applicable criteria covered by Chapter 5 (NFPA *101*). The exit system also is classed as deficient if a smoke barrier, as required by 19-3.7.1 (NFPA *101*), is not provided.

6-4.4.7.3 Without Horizontal Exit (W/O Horiz. Exit). An egress system is based on this charge if there are multiple routes that are not deficient but the arrangement does not include a horizontal exit as defined in 6-4.4.7.4 or have an acceptable direct exit from each living unit as defined in 6-4.4.7.6.

6-4.4.7.4 With Horizontal Exit (W/Horiz. Exit). A single horizontal exit on each floor containing living units shall be considered a horizontal exit if the space created is of sufficient size to provide at least 3 sq ft (0.28 sq m) of accessible space for all of the potential occupants, including those already present in and those evacuating to such space. The details of horizontal exits also shall meet the requirements of 5-2.4 (NFPA *101*). A horizontal exit acts as a smoke barrier, and, where provided, is credited as both a smoke barrier in 6-4.4.11 and a horizontal exit in 6-4.4.7.

6-4.4.7.5 Smokeproof Enclosure. Credit for a smokeproof enclosure shall be permitted to be given if either the stairway so designated meets the requirements for a smokeproof enclosure specified in 5-2.3 (NFPA *101*) or the stairway has an acceptably designed smoke pressurization system maintaining a positive pressure in the stairwell sufficient to prevent intolerable contamination of the stairwell by smoke or other fire effects. To receive the credit for smokeproof enclosures, all exit stairs credited in 6-4.4.7 and 6-4.4.8 must meet the smokeproof enclosure requirement.

6-4.4.7.6 Direct Exit. To be credited for direct exits, each living unit shall have within that unit a door that opens to the exterior at grade or onto an unenclosed exterior balcony with direct access to an unenclosed exterior exit or smokeproof enclosure. The credit for direct exit is applicable even if there are no other exit routes from the involved living unit and if the following apply:

(a) The opening is directly onto a grade; and

(b) The exit is located so that any person egressing can move directly away from the building without further exposure. Single exit routes complying with Exception No. 1 to 18-2.4 or Exception No. 1 to 19-2.4 (NFPA *101*) qualify as direct exits. [See 6-4.4.7.1 for facilities complying with the single exit route provisions of Exception No. 2 to 18-2.4 or Exception No. 2 or Exception No. 3 to 19-2.4 (NFPA *101*).] Existing buildings more than six stories in height with exterior exit access in accordance with Exception No. 1 to 19-3.5.6 (NFPA *101*) qualify as having a direct exit.

6-4.4.8 Exit Access. This parameter applies only to the exit access route from the board and care home.

6-4.4.8.1 Exit access is a measurement of travel distance from the living unit to the outside or to an enclosed interior stairway or other exit (e.g, horizontal exit), or to a smoke barrier meeting the requirements in 6-4.4.11, whichever is shorter.

6-4.4.8.2 The charge for dead ends shall be made where any corridor affords access in only one direction to a required exit from the corridor. The calculation of the distance to determine the level of charge is the measurement from the centerline of the doorway exiting the living unit to the nearest point where a person has a choice of two directions or routes of egress.

6-4.4.9 Interior Finish (Egress Routes). This parameter applies to all egress routes and areas serving or open to the egress path from the board and care home.

6-4.4.9.1 The interior finish within the living units is evaluated separately from the interior finish in the corridor and egress routes and other public space. Classification of interior finish is based on the flame-spread rating of the interior finish in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. The requirements apply to wall and ceiling finish materials as described in Section 6-5 (NFPA *101*).

Exception: Exposed portions of structural members complying with the requirements of Type IV(2HH) construction shall be permitted.

6-4.4.9.2 Only floor coverings in the exit and exit access system are considered. For purposes of assigning the

parameter values in Table 6-3A, such floor coverings are considered as having a flame spread ≤25 if they meet the requirements for Class I or II and as otherwise having a flame spread >75.

Exception: Previously installed floor coverings shall be permitted, subject to the approval of the authority having jurisdiction.

6-4.4.9.3 No consideration is included in the safety parameter value for any finish with a flame-spread rating greater than 200 or for any material not rationally measured by NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. Materials not rationally measured include foam plastics, asphalt-impregnated paper, or other materials capable of inducing extreme rates of fire growth and rapid flashover. In any case where these materials are involved, the resultant risk is considered beyond the capacity of this evaluation system and requires individual appraisal.

NOTE: Plywood of 1/4 in. (0.6 cm) or greater thickness should be considered as having a flame-spread rating of 200 or less.

6-4.4.10 Vertical Openings. This parameter applies to those portions of vertical openings exposing the floor containing the group residence or the exit routes from an apartment.

6-4.4.10.1 These values apply to vertical openings and penetrations including exit stairways, ramps, and any other vertical exits, pipe shafts, ventilation shafts, duct penetrations, and laundry and incinerator chutes. The charge for vertical openings shall be based on the presence or lack of enclosure and the fire resistance rating of the enclosure, if provided.

6-4.4.10.2 A vertical opening or penetration shall be classified as open or incomplete, provided:

(a) It is unenclosed;

(b) It is enclosed but does not have doors;

(c) It is enclosed but has openings other than doorways; or

(d) It is enclosed with cloth, paper, or similar materials without any sustained firestopping capabilities.

6-4.4.10.3 If a shaft other than a credited exit route (i.e., credited as one of the multiple routes required in 6-4.4.7.1 or in determining travel distance in 6-4.4.8.1) is enclosed on all floors but one and this results in an unprotected opening between that shaft and one, and only one, floor, the parameter value assigned to that shaft shall be 0. If a required egress route is contained in that shaft, the parameter value shall be (–2).

6-4.4.11 Smoke Control. This parameter applies to the floor containing the board and care home. Smoke control definitions are provided in 6-4.11.1 through 6-4.11.5.

6-4.4.11.1 None. There are no smoke barriers (or horizontal exits) on the floor, the floor is not served by a smokeproof enclosure, and there are no mechanically assisted smoke control systems serving the floor.

6-4.4.11.2 Smoke Barriers. Smoke barriers are partitions extending across the entire width of the building or so arranged as to combine a partition in the corridor with existing building elements and subdividing partitions and walls to partition the building into two completely separate units. The smoke barrier must be equipped with doors in the corridor that are self-closing, closed upon detection by smoke detectors located at the door arches, or closed by smoke detector systems that have been credited with a 6-point parameter value in 6-4.4.4. Smoke barriers also shall conform to the requirements of Section 6-3 (NFPA *101*). A horizontal exit acts as a smoke barrier and is credited as both a smoke barrier in 6-4.4.11 and a horizontal exit in 6-4.4.7.

6-4.4.11.3 Mechanically Assisted Automatic Systems — by Zone. Mechanically assisted smoke control systems protected on a zone basis shall include a smoke barrier (or a horizontal exit) supported by a mechanism of automatic control fans, smoke vent shafts, or a combination thereof to provide a pressure differential that assists in confining smoke to the compartment of origin. Fans shall be permitted to be special smoke control fans, or special adjustments of the normal building air movement fans shall be permitted to be made.

6-4.4.11.4 Mechanically Assisted Automatic Systems — by Unit. Mechanically assisted smoke control systems protected on a living unit basis are systems so designed as to provide a mechanism of automatically controlled fans, smoke vent shafts, or a combination thereof to ensure a positive pressure differential that prevents intrusion of smoke into any living unit not involved in fire. Therefore, the living unit has a pressure differential higher than the corridor and higher than any living unit where fire has been detected. Such systems shall be so arranged that the detection mechanism in each living unit prevents a fire-involved living unit from becoming positively pressurized.

6-4.4.11.5 Mechanically Assisted Automatic Systems — by Corridor. A mechanically assisted smoke control system protected on a corridor basis is a system initiated by a method of smoke detection that ensures operation of the smoke control system before significant smoke has entered into the corridor involved. The mechanism must be capable of pressurizing the corridor sufficiently to prevent smoke from the living unit or space of origin from entering the corridor during the entire course of the fire. Such a system must be able to hold back the smoke through the expected maximum severity of the fire. It also must be capable of exhausting smoke from the corridor based on the assumption that the emergency evacuation procedures and other activities involving the opening and closing of doors will cause occasional brief periods during which the smoke control system is overpowered. This results in the movement of the smoke from the fire area into the corridor. (The exhausting of the smoke normally would be accomplished by having an exhaust fan of lower capacity than the fan supplying air for pressurization exhaust from the corridor. The net pressurization force would occur from the effect of the pressurizing fan minus the effect of the removal or purging fan.) The corridor's pressurizing system could involve early warning smoke detection, automatic closing of all living unit doors, or sprinkler protection, or all three. Where these additional protection devices are provided in order to effect such a smoke control system, the individual credits for each of the involved protection devices are in addition to the credits for the smoke control system.

6-1 Fire Safety Evaluation Worksheet for a Small Facility

Facility Identification _____

Evaluator _____ Date _____

(Complete one worksheet for each individual residence or apartment used as a board and care home. A small facility normally means a capacity for 16 or fewer residents.)

Part 1A. DETERMINE SAFETY PARAMETER VALUES — USE TABLE 6-1A.

Select and circle the safety value for each safety parameter in Table 6-1A that best describes the conditions in the facility. Choose only one value for each of the 8 parameters. If two or more values appear to apply, choose the one with the lowest point value.

Table 6-1A Safety Parameter Values – Small Facility

Safety Parameters	Parameter Values								
1. Construction/ Fire Resistance	Exposed Structural Members		Protected 15 min			Protected 1 hr			
	0		1			3			
2. Hazardous Areas	Double Deficiency		Single Deficiency			None or No Deficiency			
	-7		-4			0			
3. Manual Fire Alarm	None or Incomplete		W/O F.D. Notification			W/ F.D. Notification			
	0		1			2			
4. Smoke Detection & Alarm	None or Incomplete	Single Lev. Det./ Limited Warning	Warning to All Bedrooms: Every Lev. Det.[E]	Warning to All Bedrooms: Every Lev. Plus Det. in Each Bdrm.[F]	Total Coverage System				
	-4	0	2	3(4)[G]	4				
5. Automatic Sprinklers	Nonsprinklered		Standard Sprinklers			Quick-Response or Residential Sprinklers			
	0		8			10			
6. Interior Finish	Flame-Spread Ratings								
	>75 to ≤ 200		>25 to ≤ 75			≤ 25			
	-3		-1			0			
7. Separation of Sleeping Rooms (from other levels and from corridors)	Unprotected Vertical Openings			Protected Vertical Openings[D]					
	None or Incomp.	Smoke Resisting w/o Closers	Smoke Resisting w/ Closers	None or Incomp.	Smoke Resisting	20 min	20 min Auto Closing	Smoke Res. w/ Door Closer	20 min w/ Door Closer
	-6	-4	0(0)[C]	-2	0	1(0)[A]	2(0)[A]	1	2(1)[A]
8. Means of Escape — Means of Escape on All Sleeping Levels	<2 Remote Routes: w/o Alt. Means	<2 Remote Routes: w/ Alt. Means	2 Remote Routes Unseparated	2 Remote Routes Separated	Direct Exit from Each Bdrm.				
	-1	0	1(0)[B]	2(0)[B]	3(0)[B]				
Means of Escape Not on All Sleeping Levels	Primary Route Not Protected: <2 Remote Routes: w/o Alt. Means	Primary Route Not Protected: <2 Remote Routes: w/ Alt. Means	Primary Route Not Protected: 2 Remote Routes	Primary Route Protected: <2 Remote Routes: w/o Alt. Means	Primary Route Protected: <2 Remote Routes: w/ Alt. Means	Primary Route Protected: 2 Remote Routes			
	-4	-3	0	-1	0	2(0)[B]			

NOTES:
A — Use ( ) if Parameter 1 is 0 and Parameter 5 is 0.
B — Use (0) if Parameter 7 is based on a "none or incomplete" situation.
C — Use (0) if door is 20-minute and has automatic closer.
D — Consider a single level building as having protected vertical openings.
E — Every level detection is permitted to be omitted with quick-response automatic sprinklers throughout; however, detection in each bedroom is required.
F — Detection in each bedroom is permitted to be omitted with quick-response automatic sprinklers in bedrooms; however, every level detection is required.
G — Use (4) if detection in each bedroom and quick-response automatic sprinklers throughout.

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Small)

Part 1B. COMPLETE INDIVIDUAL SAFETY EVALUATION — USE TABLE 6-1B.

1. Transfer each of the 8 circled safety parameter values from Table 6-1A to every unshaded block in the line with the corresponding safety parameter in Table 6-1B. Where the block is marked "÷ 2," enter one-half the value from Table 6-1A.
2. Add the four columns, keeping in mind that any negative numbers need to be deducted.
3. Transfer the resulting values for S_1, S_2, S_3, and S_4 to the corresponding blocks in Table 6-1D.

Table 6-1B Individual Safety Evaluations – Small Facility

Parameter	Fire Control	Egress	Refuge	General Safety
1. Construction				
2. Hazardous Areas		+2 =		
3. Manaul Fire Alarm	+2 =	(*See Note*)		
4. Smoke Detection & Alarm	+2 =		+2 =	
5. Automatic Sprinklers		+2 =		
6. Interior Finish	+2 =			
7. Separation of Sleeping Rooms				
8. Means of Escape				
Total	**S_1 =**	**S_2 =**	**S_3 =**	**S_4 =**
NOTE: Maximum value of manual fire alarm for means of escape is 1.				

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Small)

Part 1C. DETERMINE MANDATORY REQUIREMENTS — USE TABLE 6-1C.

1. Select the level of requirements from Table 6-1C based on evacuation capability (*see 21-1.3 of NFPA 101*). Circle the appropriate values.
2. Transfer the circled values from Table 6-1C to the corresponding blocks for S_a, S_b, S_c, and S_d in Table 6-1D.

Table 6-1C Mandatory Safety Requirements

Level of Evacuation Difficulty	Control Requirement (S_a)		Egress Requirement (S_b)		Refuge Requirement (S_c)		General Fire Safety Requirement (S_d)	
	New	Exist.	New	Exist.	New	Exist.	New	Exist.
Prompt	10 (1/2)[A]	0	5(5)[A]	4	11(2 1/2)[A]	2	7(2)[A]	1
Slow	10	2	9	7	11	4	8	7
Slow[B]		1		6		2		5
Impractical	10	8	10	9	11	9	12	10

[A]Use ( ) for small board and care homes serving eight or fewer residents with an evacuation capability rating of "prompt."
[B]In existing buildings only, use these mandatory safety requirements if evacuation time is 8 minutes or less or if the evacuation capability score is 3 or less as determined by Chapter 5.

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Small)

Part 1D. EQUIVALENCY EVALUATION.

1. Perform the subtractions indicated in Table 6-1D. Enter the differences in the appropriate answer blocks.
2. For each row, check "yes" if the value in the answer block is zero (0) or greater. Check "no" if the value in the answer block is a negative number.

Table 6-1D Equivalency Evaluation

						YES	NO
Control Provided (S_1)	minus	Required Control (S_a)	≥	0	S_1 □ − S_a □ = □		
Egress Provided (S_2)	minus	Required Egress (S_b)	≥	0	S_2 □ − S_b □ = □		
Refuge Provided (S_3)	minus	Required Refuge (S_c)	≥	0	S_3 □ − S_c □ = □		
General Fire Safety (S_4)	minus	Required Gen. Fire Safety (S_d)	≥	0	S_4 □ − S_d □ = □		

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Small)

Part 1E. EQUIVALENCY CONCLUSIONS.

Complete Tables 6-1A through 6-1D before completing Part 1E.

1. [ ] All of the checks in Table 6-1D are in the "yes" column. The level of fire safety is at least equivalent to that prescribed by NFPA *101, Life Safety Code.**

2. [ ] One or more of the checks in Table 6-1D are in the "no" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by NFPA *101* for small dwelling units.

* The equivalency covered by this worksheet includes the majority of considerations covered by NFPA *101, Life Safety Code*. There are some considerations that are not evaluated by this method. These must be considered separately. These additional considerations are covered in the "Facility Fire Safety Requirements Worksheet." One copy of this worksheet is to be completed for each facility.

Facility Fire Safety Requirements Worksheet

Considerations	Met	Not Met
Complies with the applicable requirements of Chapter 31 (NFPA *101*).		

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Small)

6-2 Fire Safety Evaluation Worksheet for a Large Facility

Facility Identification _____ Zone(s) Evaluated _____

Evaluator _____ Date _____

(Complete one worksheet for each large facility. This normally means a capacity for more than 16 residents.) First complete Table 6-2A. Continue with Tables 6-2B, 6-2C, and 6-2D. Then turn to page 63 to obtain the equivalency conclusions.

Part 2A. DETERMINE SAFETY PARAMETER VALUES — USE TABLE 6-2A

Select and circle the safety value for each safety parameter in Table 6-2A that best describes the conditions in the facility. Choose only one value for each of the 11 parameters. If two or more values appear to apply, choose the one with the lowest point value.

Table 6-2A Safety Parameter Values – Large Facility

Safety Parameters	Parameter Values							
1. Construction	Combustible					Noncombustible		
Building Height	Type V(000)	Type V(111)	Type III(200)	Type III(211)	Type IV(2HH)	Type II(000)	Type II(111)	Type II(222) & Type I
1 Story	-2( )[A]	0	-2( )[A]	0	0	0	2	2
2 Stories	-6( )[A]	0	-6( )[A]	0	0	-5( )[A]	2	2
3-4 Stories	-8( )[A]	-2(0)[Q]	-8( )[A]	0	-2(0)[Q]	-6( )[A]	2	2
5-6 Stories	-8	-2(0)[Q]	-8( )[A]	0	-2(0)[Q]	-6( )[A]	2	2
Over 6 Stories	-10	-4	-10	-2(0)[Q]	-4(0)[Q]	-8	0	2

2. Hazardous Areas	Within Bdrms./Suite or on Exit Routes		Elsewhere in Building		None, or No Deficiency
	Double Deficiency	Single Deficiency	Double Deficiency	Single Deficiency	
	NP	-4	-4(-7)[B]	0(-4)[B]	0

3. Manual Fire Alarm	None or Incomplete	Manual Alarm	
		W/O F.D. Notification	W/ F.D. Notification
	0(2)[F]	2	3

4. Smoke Detection and Alarm	None or Incomplete	Single Station Units in Each Bedroom	Interconnected System[I]			Total Building
			W/O Bdrm./ Suite Detectors	Single Station Bdrm./Suite Detectors	Interconnected Bdrm./Suite Detectors	
	-10(0)[J]	0(2)[J]	2(0)[E]	3(0)[E](6)[P]	5(6)[P]	6

5. Automatic Sprinklers	None or Incomplete	Bdrms./Suites Only	Corrs., Common Spaces	Bdrms./Suites, Corrs., Common Spaces	Total Building	
					AS	QRS
	0	2(0)[C]	4(0)[C]	6	8	10

6. Separation of Sleeping Rooms From Exit Access	None or Incomplete	Fire Resistance/Walls and Doors—Expectation of Door Closing				
		Expectation—Not High		Expectation—High		
		Smoke Resisting[G]	20 min[G]	Smoke Resisting[G]	20 min[G]	1-hr Walls 20-min Doors[G]
	-6	-1(0)[K]	0(1)[K]	1	2(3)[L]	3(4)[L]

7. Exit System	Single or Exposed Route	Multiple Routes				
		Deficient	W/O Horiz. Exit	W/ Horiz. Exit	Smokeproof Enclosure	Direct Exit
	-6(0)[M]	-2(0)[M]	0	2	2	4

8. Exit Access (from living unit)	Max. Dead End		No Dead End >50' and Travel Is:			
	>100'	>50' to ≤100'	>200'	>125' to ≤ 200'	>50' to ≤125'	≤ 50'
	-6(0)[D]	-4(0)[D]	-2	-1	0	2

9. Interior Finish	Flame-Spread Ratings					
Exit Routes	>75 to ≤ 200		>25 to ≤75		≤ 25	
Rooms/Suites	>75 to <200	≤75	>75 to ≤ 200	≤75	>25 to ≤ 200	≤ 25
	-3	-1	0	1	1	2

10. Vertical Openings	Open (or Incomplete Enclosure)			Enclosed[H]		
	Involving 5 or more Floors	3-4 flrs.	2 flrs.	<30 min	≥30 min <1 hr	≥1 hr
	-10	-7	-2	-1	0	1(0)[B]

11. Smoke Control	None	Smoke Barriers	Mechanically Assisted Systems			
			By Floor		By Zone	By Rm./Suite
			W/O Part.	W/ Part.		
	0(2)[N]	2	2	3	3	4

NOTES:
A—Use (-1 X height in stories) if building is fully sheathed with plaster, gypsum board, or similar materials, but not < -2 if Parameter 5 is 8.
B—Use ( ) if Parameter 1 is based on Type V (000), Type III (200), or Type II (000), if Note A does not apply, and if Parameter 5 is ≤4.
C—Use ( ) if Parameter 1 is based on Type V (000), Type III (200), or Type II (000).
D—Use ( ) if Parameter 7 is -6.
E—Use ( ) if Parameter 6 is based on "none or incomplete," or "walls or doors" are <20 min and Parameter 5 is ≤4.
F—Use ( ) for levels "prompt" and "slow" if Parameter 7 is 4 and building height is ≤ 3 stories.
G—Rate separation as:
- 20 minutes (or actual rating, if greater) if Parameter 5 ≥ 6.
- Smoke resisting if Parameter 1 is based on Type V (000), Type III (200), or Type II (000), if building is not fully sheathed per Note A, and if Parameter 5 ≥4.

H—Use 0 in 1-story buildings.
I—Interconnected system covers corridors and common spaces plus indicated bedroom or suite detectors.
J—Use ( ) if Parameter 5 is ≥6.
K—Use ( ) in facilities where each bedroom/suite has occupant controlled personal security access locks.
L—Use ( ) if separations between bedrooms/suites also meet criteria.
M—Use ( ) if requirements for 22-3.3.6.1 Exception No. 3 and 23-3.3.6.1 Exception No. 3 (NFPA *101*) are met.
N—Use ( ) if floor travel does not exceed 150 ft (45 m).
P—Use (6) if facility is protected throughout by quick-response automatic sprinklers and bedroom/suite detectors.
Q—Use (0) if Parameter 5 is 8.
NP—not permitted—system not usable while this condition exists.

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Large)

Part 2B. COMPLETE INDIVIDUAL SAFETY EVALUATIONS — USE TABLE 6-2B.

1. Transfer each of the 11 circled safety parameter values from Table 6-2A to every unshaded block in the line with the corresponding safety parameter in Table 6-2B. Where the block is marked "÷ 2," enter one-half the value from Table 6-2A.
2. Add the four columns, keeping in mind that any negative numbers need to be deducted.
3. Transfer the resulting values for S_1, S_2, S_3, and S_4 to the corresponding blocks in Table 6-2D.

Table 6-2B Individual Safety Evaluations – Large Facility

Safety Parameters	Fire Control (S_1)	Egress Provided (S_2)	Refuge Provided (S_3)	General Fire Safety Provided (S_4)
1. Construction				
2. Hazardous Areas		+2 =		
3. Manual Fire Alarm	+2 =			
4. Smoke Detection & Alarm	+2 =		+2 =	
5. Automatic Sprinklers		+2 =	+2 = (*See Note*)	
6. Separation of Sleeping Rooms From Exit Access		+2 =		
7. Exit System			+2 =	
8. Exit Access (from living unit)				
9. Interior Finish	+2 =			
10. Vertical Openings	+2 =			
11. Smoke Control				
Total	**S_1 =**	**S_2 =**	**S_3 =**	**S_4 =**

NOTE: Use full value if Safety Parameter 1 is based on Type V (000), Type III (200), or Type II (000) construction. Divide by 2 (+2) in all other cases.

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Large)

Part 2C. DETERMINE MANDATORY REQUIREMENTS — USE TABLE 6-2C(1) or 6-2C(2).

1. Select the level of requirements from Table 6-2C(1) or 6-2C(2) based on evacuation capability (*see 22-1.3 and 23-1.3 of NFPA 101*). Circle the appropriate values.

2. Transfer the circled values from Table 6-2C(1) or 6-2C(2) to the corresponding blocks for S_a, S_b, S_c, and S_d in Table 6-2D.

Table 6-2C(1) Mandatory Requirements – Large Facilities (For Use in Any Large Facility)

Level of Evacuation Difficulty and Building Height	Control Requirement (S_a)			Egress Requirement (S_b)			Refuge Requirement (S_c)			General Fire Safety Requirement (S_d)		
	New	Conv.	Exist.	New	Conv.	Exist.	New	Conv.	Exist.	New	Conv.	Exist.
Prompt ≤ 30 residents 1 Story	9	8	1.5	6	5.5	7.5	9.5	8.5	2	9	8	6
Prompt or slow												
1 Story	11	8	3.5	7	5.5	8	11.5	8.5	4	11	8	8
2 Stories	7.5	4.5	2.5	8	6.5	8	8.5	5.5	3	8	5	7
3-6 Stories	11.5	8.5	4.5	8	6.5	8	12.5	9.5	5	12	9	9
Over 6 Stories	13.5	10.5	6.5	8	6.5	8	9.5	6.5	7	14	11	11

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Large)

Table 6-2C(2) Mandatory Requirements – Existing, Sprinkler Protected, Large Facilities

Level of Evacuation Difficulty and Building Height	Control Requirement (S_a)	Egress Requirement (S_b)	Refuge Requirement (S_c)	General Fire Safety Requirement (S_d)
	Exist.	Exist.	Exist.	Exist.
Prompt ≤ 30 residents 1 Story	5.5	3.5	6	5
Prompt or slow				
1 Story	5.5	3.5	6	5
2 Stories	1.5	3.5	2	1
3-6 Stories	5.5	3.5	6	5
Over 6 Stories	7.5	3.5	4	7

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Large)

Part 2D. EQUIVALENCY EVALUATION.

1. Perform the subtractions indicated in Table 6-2D. Enter the differences in the appropriate answer blocks.
2. For each row, check "yes" if the value in the answer block is zero (0) or greater. Check "no" if the value in the answer block is a negative number.

Table 6-2D Equivalency Evaluation

								YES	NO
Control Provided	(S_1)	minus	Required Control	(S_a)	≥	0	S_1 □ − S_a □ = □		
Egress Provided	(S_2)	minus	Required Egress	(S_b)	≥	0	S_2 □ − S_b □ = □		
Refuge Provided	(S_3)	minus	Required Refuge	(S_c)	≥	0	S_3 □ − S_c □ = □		
General Fire Safety	(S_4)	minus	Required Gen. Fire Safety	(S_d)	≥	0	S_4 □ − S_d □ = □		

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Large)

Part 2E. EQUIVALENCY CONCLUSIONS.

Complete Tables 6-2A through 6-2D before completing Part 2E.

1. [ ] All of the checks in Table 6-2D are in the "yes" column. The level of fire safety is at least equivalent to that prescribed by NFPA *101, Life Safety Code*, for large residential board and care facilities.*

2. [ ] One or more of the checks in Table 6-2D are in the "no" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by NFPA *101* for large residential board and care facilities.

* The equivalency covered by this worksheet includes the majority of considerations covered by NFPA *101, Life Safety Code*. There are some considerations that are not evaluated by this method. These must be considered separately. These additional considerations are covered in the "Facility Fire Safety Requirements Worksheet." One copy of this worksheet is to be completed for each facility.

Facility Fire Safety Requirements Worksheet

Considerations	Met	Not Met	Not Applic.
A. Utilities comply with the provisions of 22-3.5.1 and 23-3.5.1.			X
B. Heating, ventilating, and air conditioning equipment comply with the provisions of 22-3.5.2 and 23-3.5.2, except for enclosure of vertical openings, which have been considered in Safety Parameter 10 of Table 6-2B.			X
C. Elevators, dumbwaiters, and vertical conveyors comply with the provisions of 22-3.5.3 and 23-3.5.3.			
D. Rubbish chutes, incinerators, and laundry chutes comply with the provisions of 22-3.5.4 and 23-3.5.4.			
E. Complies with the applicable requirements of Chapter 31.			X

All references are to NFPA *101, Life Safety Code*
(For use with NFPA 101A-1995/NFPA 101-1994, B & C Large)

6-3 Fire Safety Evaluation Worksheet for an Apartment Building with Board and Care Occupancies

Building Identification _____

Evaluator _____ Date _____

(Complete one worksheet for each apartment house containing one or more apartment units with a board and care occupancy.)

First complete Table 6-3A. Continue with Tables 6-3B, 6-3C, and 6-3D. Then turn to page 67 to obtain the equivalency conclusions.

Part 3A. DETERMINE SAFETY PARAMETER VALUES — USE TABLE 6-3A.

Select and circle the safety value for each safety parameter in Table 6-3A that best describes the conditions in the facility. Choose only one value for each of the parameters. If two or more values appear to apply, choose the one with the lowest point value.

Table 6-3A Safety Parameter Values – Apartment Building

Safety Parameters	Parameter Values							
1. Construction	Combustible					Noncombustible		
Building Height	Type V (000)	Type V (111)	Type III (200)	Type III (211)	Type IV (2HH)	Type II (000)	Type II (111)	Type II (222) & Type I
1 Story	-2( )[A]	0	-2( )[A]	0	0	0	2	2
2 Stories	-6( )[A]	0	-6( )[A]	0	0	-5( )[A]	2	2
3-4 Stories	-8( )[A]	-2(0)[K]	-8( )[A]	0	-2(0)[K]	-6( )[A]	2	2
5-6 Stories	-8	-2(0)[K]	-8( )[A]	0	-2(0)[K]	-6( )[A]	2	2
Over 6 Stories	-10	-4	-10	-2(0)[K]	-4(0)[K]	-8	0	2
2. Hazardous Areas (outside board & care home units)	Double Deficiency		Single Deficiency			None or No Deficiency		
	-4(-7)[B,G]		0(-4)[G]			0		
3. Manual Fire Alarm	None or Incomplete		Manual Alarm					
			W/O F.D. Notification			W/ F.D. Notification		
	0(2)[I]		2			3		
4. Smoke Detection and Alarm (outside board & care home units)	None or Incomplete	Single Station Living Units Only		Interconnected System		Total Building		
		Single Level	Every Level	Corrs. & Common Spaces	Corrs., Common Spaces, & Living Units			
	-4(0)[J]	0	2(0)[E]	3(0)[E]	4	6		
5. Automatic Sprinklers (outside board & care home units)	None or Incomplete	Corrs., Public Spaces	Living Units Only	Corrs., Hab., & Public Spaces	Total Building			
	0	2(0)[C]	4(0)[C]	6	8			
6. Separation of Board & Care Home Unit and Its Exit Route from Other Spaces	None or Incomplete	Walls <30 min		Walls ≥ 30 min to < 1 hr		Walls ≥ 1 hr		
		Doors < 20 min W/O Closer	Doors ≥ 20 min W/O Closer	Doors < 20 min W/Closer	Doors ≥ 20 min W/Closer	Doors < 20 min W/Closer	Doors ≥ 20 min W/Closer	
	-6	-2	0(-2)[B]	1(-2)[B]	2(-2)[B]	1(-2)[B]	4(-2)[B]	
7. Exit System (serving board & care home units)	<2 Standard Routes	Multiple Routes						
		Deficient	W/O Horiz. Exit	W/ Horiz. Exit	Smokeproof Enclosure	Direct Exit		
	-6	-2	0	2	2	4		
8. Exit Access (serving board & care home units)	Max. Dead End Is:		No Dead End > 50' and Travel Is:					
	> 100'	>50' or corridor common path >35'	>200'	>150' to ≤ 200'	>100' to ≤150'	>50' to ≤100'	≤ 50'	
	-6(0)[D]	-4(0)[D]	-2	-1	0	1	2	
9. Interior Finish (egress routes serving board & care home units)			Flame-Spread Ratings					
	>75 to ≤ 200		>25 to ≤ 75		≤ 25			
	-3		-1		0			
10. Vertical Openings	Open or Incomplete Enclosure				Enclosed [H]			
	Thru 5 or More Floors		3-4 Floors	2 Floors	<1 hr[F]	≥1 hr [F]		
	-10		-7	-2	0	1(0)[B]		
11. Smoke Control (serving floors having board & care home units)	None	Smoke Barriers	Mechanically Assisted Systems					
			By Zone	By Unit	By Corridor			
	0(2)[L]	2	3	3	4			

NOTES:
A—Use (-1 X height in stories) if building is fully sheathed with plaster, gypsum board, or similar materials but not < -2 if Parameter 5 is 8.
B—Use ( ) if Parameter 1 is based on Type V (000), Type III (200), or Type II (000), if Note A does not apply, and if Parameter 5 is ≤4.
C—Use ( ) if Parameter 1 is based on Type V (000), Type III (200), or Type II (000).
D—Use ( ) if Parameter 7 is -6.
E—Use ( ) if Parameter 6 is based on "None or Incomplete," or "Walls or Doors" are <20 min and Parameter 5 is ≤4.
F—≥ 30 min in existing building.
G—Use ( ) if hazardous area is on exit route or in refuge area serving group home unit.
H—Use 0 in 1-story building.
I— Use (2) in 1-3 story buildings with <12 living units.
J—Use ( ) if Parameter 5 is ≥6.
K—Use (0) if Parameter 5 is 8.
L—Use ( ) where exceptions to 19-3.7.1 (NFPA *101*) apply.

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Apts.)

Part 3B. COMPLETE INDIVIDUAL SAFETY EVALUATIONS — USE TABLE 6-3B.

1. Transfer each of the 11 circled safety parameter values from Table 6-3A to every unshaded block in the line with the corresponding safety parameter in Table 6-3B. Where the block is marked "÷ 2," enter one-half the value shown in Table 6-3A.
2. Add the four columns, keeping in mind that any negative numbers need to be deducted.
3. Transfer the resulting values for S_1, S_2, S_3, and S_4 to the corresponding blocks in Table 6-3D.

Table 6-3B Individual Safety Evaluations – Apartment Buildings

Safety Parameters	Fire Control (S_1)	Egress Provided (S_2)	Refuge Provided (S_3)	General Fire Safety Provided (S_4)
1. Construction				
2. Hazardous Areas		+2 =		
3. Manual Fire Alarm	+2 =			
4. Smoke Detection & Alarm	+2 =			
5. Automatic Sprinklers		+2 =	+2 = (*See Note*)	
6. Separation of Living Units		+2 =		
7. Exit System			+2 =	
8. Exit Access				
9. Interior Finish				
10. Vertical Openings	+2 =			
11. Smoke Control				
Total	**S_1 =**	**S_2 =**	**S_3 =**	**S_4 =**

NOTE: Use full value if Safety Parameter 1 is based on Type V (000), Type III (200), or Type II (000) construction. Divide by 2 (+2) in all other cases.

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Apts.)

Part 3C. DETERMINE MANDATORY REQUIREMENTS — USE TABLE 6-3C.

1. Using the classifications of the building (i.e., "new" or "existing"), the building height, and the level of requirements established for small dwelling units, circle the appropriate value in each of the four columns in Table 6-3C(1) or 6-3C(2).
2. Transfer the circled values from Table 6-3C to the corresponding blocks for S_a, S_b, S_c, and S_d in Table 6-3D.

Table 6-3C(1) Mandatory Requirements — Sprinklered and Nonsprinklered Apartment Buildings

		Control Requirements (S_a)		Egress Requirements (S_b)		Refuge Requirements (S_c)		General Fire Safety Requirements (S_d)	
Building Height	**Level of Evacuation Difficulty**	**New**	**Exist.**	**New**	**Exist.**	**New**	**Exist.**	**New**	**Exist.**
1 Story	Prompt /Slow	10	3	4.5	6	8	3	8	6
	Impractical	11	6	4.5	6	5	6	9	9
2–6 Stories	Prompt/Slow	10.5	4.5	6	7	9	5	9	8
	Impractical	14.5	6.5	6	7	9	7	13	10
>6 Stories	Prompt/Slow	12.5	11.5	6	7.5	7	8	11	10
	Impractical	14.5	13.5	6	7.5	9	10	13	14

(For use with NFPA 101A-1995/NFPA 101-1994, B & C, Apts.)

Table 6-3C(2) Mandatory Requirements — New Nonsprinklered Apartment Buildings Meeting Exception to 18-3.5.2 (NFPA *101*)

		Control Requirements (S_a)	Egress Requirements (S_b)	Refuge Requirements (S_c)	General Fire Safety Requirements (S_d)
Building Height	**Level of Evacuation Difficulty**	**New**	**New**	**New**	**New**
1 Story	Prompt/Slow	5	10	5	11
2 Stories	Prompt/Slow	4.5	11	5	11
3–6 Stories	Prompt/Slow	6.5	11	7	13
>6 Stories	Prompt/Slow	8.5	11	9	15

(For use with NFPA 101A-1995/NFPA 101-1994, B & C, Apts.)

Part 3D. FIRE SAFETY EQUIVALENCY EVALUATION.

1. Perform the subtractions indicated in Table 6-3D. Enter the differences in the appropriate answer blocks.
2. For each row, check "yes" if the value in the answer block is zero (0) or greater. Check "no" if the value in the answer block is a negative number.

Table 6-3D Equivalency Evaluation

							YES	NO
Control Provided	(S_1)	minus	Required Control	(S_a)	≥	0	S_1 □ − S_a □ = □		
Egress Provided	(S_2)	minus	Required Egress	(S_b)	≥	0	S_2 □ − S_b □ = □		
Refuge Provided	(S_3)	minus	Required Refuge	(S_c)	≥	0	S_3 □ − S_c □ = □		
General Fire Safety	(S_4)	minus	Required Gen. Fire Safety	(S_d)	≥	0	S_4 □ − S_d □ = □		

(For use with NFPA 101A-1995/NFPA 101-1994, B & C Apts.)

Part 3E. EQUIVALENCY CONCLUSIONS.

Complete Tables 6-3A through 6-3D before completing Part 3E.

1. [ ] All of the checks in Table 6-3D are in the "yes" column. The level of fire safety is at least equivalent to that prescribed by NFPA *101, Life Safety Code*, for apartments to house a board and care occupancy.*
2. [ ] One or more of the checks in Table 6-3D are in the "no" column. The level of fire safety is not shown by this system to be equivalent to that prescribed by NFPA *101* for apartments to house a board and care occupancy.

* The equivalency covered by this worksheet includes the majority of considerations covered by NFPA *101, Life Safety Code*. There are some considerations that are not evaluated by this method. These must be considered separately. These additional considerations are covered in the "Facility Fire Safety Requirements Worksheet." One copy of this worksheet is to be completed for each facility.

Facility Fire Safety Requirements Worksheet

Considerations	Met	Not Met	Not Applic.
A. Utilities comply with the provisions of 22-3.5.1 and 23-3.5.1.			X
B. Heating, ventilating, and air conditioning equipment comply with the provisions of 22-3.5.2 and 23-3.5.2, except for enclosure of vertical openings, which have been considered in Safety Parameter 10 of Table 6-3A.			X
C. Elevators, dumbwaiters, and vertical conveyors comply with the provisions of 22-3.5.3 and 23-3.5.3.			
D. Rubbish chutes, incinerators, and laundry chutes comply with the provisions of 22-3.5.4 and 23-3.5.4.			
E. Complies with the applicable requirements of Chapter 31.			X

All references are to NFPA *101, Life Safety Code*
(For use with NFPA 101A-1995/NFPA 101-1994, B & C Apts.)

Chapter 7 Fire Safety Evaluation System for Business Occupancies

7-1 Introduction. 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.

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

7-2 Procedure for Determining Equivalency.

7-2.1 Evaluate the factors affecting either every fire zone or the building as a whole using the "Fire Safety Evaluation Worksheet for Business Occupancies" (Tables 7-1 through 7-5).

7-2.1.1 Zoning must divide the building into units that consist of one or more complete fire/smoke zones. A fire/smoke zone is a portion of a building that is separated from all other portions of the building by building construction having at least a 1-hour fire resistance rating or smoke partitions conforming to the requirements of Section 6-3 (NFPA *101*), or both, using smoke barriers of at least a 20-minute fire resistance rating. Any vertical openings (shafts, stairs) involved also must provide 1-hour separation (except that stair doors shall be permitted to be 45-minute fire resistance-rated doors). In facilities completely protected by automatic sprinkler protection, these fire resistance requirements do not apply. The elements separating one zone from another, however, must be of sound, smoke-resisting construction. Doors in zone separations must be either self-closing or equipped with automatic closers operated by smoke detectors.

7-2.1.2 Zones shall be permitted to be either adjacent to each other (e.g., separate wings or building sections) or above each other (e.g., floors or groups of floors).

7-2.1.3 Each zone containing spaces used for business occupancy can be evaluated using this system.

7-2.1.4 Select and circle the safety value for each parameter in Table 7-1 that best describes the conditions in the facility.

7-2.1.5 Each of the safety parameters is to be analyzed, and the safety value for each parameter that best describes the condition in the building is to be identified. Only one value for each of the parameters is to be chosen. If two or more values appear to apply, the one with the lowest point value governs.

7-2.2 Using the "Facility Fire Safety Requirements Worksheet" (Table 7-5), determine the acceptability of the general building systems (utilities; HVAC; elevator installations; standpipes and fire extinguishers; and rubbish chutes, incinerators, and laundry chute installations).

7-2.3 Equivalency is achieved if the building or fire/smoke zone evaluations show equivalency or better in each and every zone and the requirements of the "Facility Fire Safety Requirements Worksheet" (Table 7-5) are met.

7-3 Glossary for Fire Safety Evaluation Worksheet for Business Occupancies.

7-3.1 Introduction. This glossary is provided to assist in completing the "Fire Safety Evaluation Worksheet for Business Occupancies." This glossary provides expanded discussion and definitions for the various items in the worksheet to assist the user where questions of definition or interpretation arise. To the maximum extent possible, the glossary does not repeat the definitions already existing in NFPA *101, Life Safety Code*, but rather references the appropriate paragraphs in Chapters 1 through 31 (NFPA *101*).

7-3.2 Areas of Application.

7-3.2.1 The entire building can be evaluated on a single worksheet. The building might, however, be zoned by considering each zone separately or by using any convenient grouping of zones. The choice of zoning normally is based on the approach that produces the most functional or economical results.

7-3.2.1.1 Charges for Safety Parameter 2, "Segregation of Hazards," in Table 7-1, "Safety Parameters," apply to any hazardous area in the zone being evaluated and to any hazardous area in zones adjacent to or below the zone being evaluated.

7-3.2.1.2 Where zones are located above each other, the value assigned to Parameter 1, "Construction," in Table 7-1, "Safety Parameters," in each zone is based on the highest story used for regular human occupancy in that "stack of zones" and the type of construction for that stack of zones.

7-3.2.1.3 The assignment of values for Safety Parameters 5, "Fire Alarm System"; 10, "Exit System"; and 9, "Exit Access," in Table 7-1, "Safety Parameters," does not consider conditions in unoccupied spaces in other zones where such are not involved in any egress paths.

7-3.2.1.4 The evaluation of Safety Parameter 10, "Exit Systems," in Table 7-1, "Safety Parameters," includes those portions of any exit route that serve the zone being evaluated. Any exposures or deficiencies pertaining to any part of the exit route must be taken into account in the evaluation of the zone.

7-3.2.2 Zones that do not involve regular human occupancy are evaluated the same as those with regular human occupancy with the following variations:

(a) Any such zone shall be permitted to be omitted from the numerical evaluation if both of the following conditions are met:

1. The zone is not involved in the exit route from any space with regular human occupancy.
2. The zone conforms to NFPA *101, Life Safety Code* requirements applicable to its use.

(b) Alternatively, such zones shall be permitted to be evaluated using this system, provided any additional egress capabilities and arrangements appropriate to the specific use of the space are provided.

7-4 Maintenance. All protection systems, requirements, arrangements, and procedures shall be maintained in a dependable operating condition, and a sufficient state of