Housing and Urban Development
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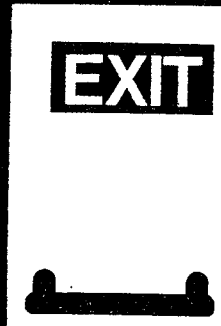
Rehabilitation Guidelines 1980

5 Egress Guideline for Residential Rehabilitation



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Egress—a place of exit, a going out—presents problems for the engineers and architects involved in rehabilitating old buildings. As the brief introduction to this guideline tells us, sometimes old although adequate exits will not pass inspection when judged against building codes developed for new construction. What to do?

Strict compliance with the building code assures that tenants will have proper escape in case of fire. At the same time, strict compliance may mean enormous expense and unnecessary modifications to structurally sound buildings. No one wishes to endanger tenants; no one wishes to waste money. The final resolution must come from each community. What this guideline does is to suggest technical solutions to the conflict.

It is to be used in conjunction with existing codes by people who are knowledgeable about fire protection and building construction. HUD believes they will find it immensely helpful.

The quality of this guideline and the seven others in the series is the result of the invaluable efforts of Robert Kapsch, program manager for HUD's Office of Policy Development and Research; William Brenner, project manager for the National Institute of Building Sciences; and David Hattis, consultant from Building Technology, Inc.

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quite passable. Rather than the absolute values of stair dimensions, it is the nonuniformity of tread or riser dimensions within a set of stairs which is a major cause of stairway accidents. Nonconforming stairs may be considered for acceptance if they are uniform and the occupancy is such that those who may need the stairs in an emergency are familiar with their particular characteristics. As in 11.1 above, the stairs should be otherwise of high quality and passable. Lighting should be improved if necessary; emergency lighting, etc., should be improved or provided.

11.3

Problem: Ceiling heights for stairs, passageways, etc. are lower than the minimum specified by the code in effect.

Solution: Allow the continued use if passable by the occupants, provided the ceiling height is no less than the minimum door height specified by the code in effect.

Discussion: Low ceiling heights make an exit not only physically difficult to traverse, but can create an impression of closeness or of a closed space that may create a sense of apprehension, particularly if the path is also narrow or somewhat lengthy. If the number of occupants is low so that crowding would not be expected and the distance is not excessive, discretion should be exercised. The familiarity of the occupants with this exit element should also be considered. Lighting, particularly emergency lighting, is very important. A regular pattern of markings showing the direction of the ultimate exit to the outside can also be reassuring. Other aspects of the exit element should be improved or provided if missing.

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ability to safely use the exit element as it presently exists. If the numbers are small and the occupants are generally representative of the population at large, then minor deviations should be tolerated.

For additional guidance to understanding potential problems and solutions related to stairway design, refer to NBS Building Science Series, No. 108, *"Safety on Stairs"*, November 1978, and Building Science Series, No. 120, *"Guidelines for Stair Safety"*, May 1979, National Bureau of Standards, U.S. Department of Commerce.

Of the many potential problems, there are three that appear the most common and raise the greatest concern.

11.1
Problem: Existing winding and/or spiral stairs not permitted by the code in effect.

Solution: Allow their continued use if occupants are generally representative of the population at large (mobile, agile, and capable of rapid movement under emergency condition); upgrade stairs in all other respects, particularly handrails and lighting.

Discussion: Winding or spiral stairs are not favored because the uneven tread pattern and changes in direction can make passage difficult. The use of these stairs could be continued if the occupants can be expected to use them safely and the stairs complied in other respects (e.g., not excessively steep or narrow). Lighting should be improved if necessary; emergency lighting, handrails, etc. should be improved or provided.

11.2
Problem: Nonconforming tread and riser dimensions.

Solution: Accept stairs which are steeper than those permitted by the code in effect. Handrails should be provided on both sides, and stairs should be upgraded where necessary. See Section 10: EXIT CAPACITY/WIDTHS for stairs less than the required minimum.

Discussion: All codes contain minimum tread and maximum riser dimensions. Some codes use the mathematical formula that the sum of [(2 x rise) + run] must be between 24 and 25 inches. Such criteria may arbitrarily eliminate stairs which are otherwise

The Rehabilitation Guideline Series

The *Rehabilitation Guidelines* were prepared by the National Institute of Building Sciences for the Department of Housing and Urban Development in response to the requirements of Section 903 of the Housing and Community Development Amendments of 1978.

As Congress intended, the *Rehabilitation Guidelines* are not a code, nor are they written in code language. Rather, they are designed for voluntary adoption and use by States and communities as a means to upgrade and preserve the nation's building stock, while maintaining reasonable standards for health and safety. The term "rehabilitation", as used in the guidelines, includes any set of activities related to the general view of existing buildings as a resource to be conserved, rehabilitated, or reused.

This initial edition of the *Rehabilitation Guidelines* is published in eight separate volumes. The first four guidelines are designed for use by building officials, members of the executive and legislative branches of government, and related commissions and organizations involved in developing or implementing building regulations. These guidelines cover the following topics:

1 The *Guideline for Setting and Adopting Standards for Building Rehabilitation* provides an introduction and background to the building regulations that affect rehabilitation. It describes methods for identifying regulatory problems in a community, and recommends ways to amend, modify, or supplement existing regulations to encourage rehabilitation.

2 The *Guideline for Municipal Approval of Building Rehabilitation* examines the inherent differences between regulating new construction and regulating rehabilitation, and presents specific recommendations for dealing with rehabilitation within municipal building departments.

3 The *Statutory Guideline for Building Rehabilitation* contains enabling legislation that can be directly adopted by communities to provide the legal basis for promoting rehabilitation through more effective regulation.

4 The *Guideline for Managing Official Liability Associated with Building Rehabilitation* addresses the liability of code officials

involved with the administration and enforcement of rehabilitation, and provides recommendations for minimizing liability problems.

The remaining four guidelines are technical in nature, and are intended for use by code officials, inspectors, designers, and builders. They cover the following topics:

5 The *Egress Guideline for Residential Rehabilitation* lists design alternatives for the components of egress that are regulated by current codes such as number and arrangement of exits, corridors, and stairs, travel distance, dead-end travel, and exit capacity and width.

6 The *Electrical Guideline for Residential Rehabilitation* outlines procedures for conducting inspections of electrical systems in existing buildings, and presents solutions to common problems associated with electrical rehabilitation such as eliminating hazardous conditions, grounding, undersized service, number of receptacle outlets, and incompatible materials.

7 The *Plumbing DWV Guideline for Residential Rehabilitation* presents criteria and methods for inspecting and testing existing drain. waste, and vent (DWV) systems, relocating fixtures, adding new fixtures to existing DWV systems, extending existing DWV systems, and installing new DWV systems in existing buildings.

8 The *Guideline on Fire Ratings of Archaic Materials and Assemblies* contains the fire ratings of building materials and assemblies that are no longer listed in current building codes or related reference standards. Introductory material discusses flame spread, the effects of penetrations, and methods for determining the ratings of assemblies not listed in the guideline.

Single editions of the *Rehabilitation Guidelines*—or copies of specific guidelines—are available at no charge, as long as supplies last, from HUD USER, P.O. Box 280, Germantown, Maryland 20767. Phone (301) 251-5154

The *Rehabilitation Guidelines* are also available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

28 inches should be considered, as formerly specified for some elements by all four codes.

Discussion: In most cases, considerations of functionality (movement of furniture, etc.), appearance, marketability, and accessibility to the handicapped will result in minimum dimensions greater than those suggested above, and may, in fact, have been the reason for the higher minimums specified in current codes. For egress only, however, one unit of exit width should be adequate given the low occupant loading. A higher minimum than 22 inches is suggested, since that dimension represents only the median width of the human body at shoulder height.

11
Construction Details and Specifications

Summary of Code Requirements and Intent

CODE INTENT

The codes set out many other requirements for the component parts of the various exit elements that make up a building's egress system. Typical areas include: allowable materials, handrails, tread and riser design, landings, platforms, guards, door hardware, signage, lighting, alarms, and emergency lighting. The intent of these provisions is to ensure a quality design that will promote safe and easy passability. The individual code requirements have not been set out because they are too numerous and highly specific.

Identifying Existing Conditions

Note the relevant features on the building plans or analyze by a visual inspection of the physical structure.

Selected Problems and Representative Solutions

Because these provisions tend to be highly specific and detailed, existing components of the egress system will often not be in compliance. However, the impact or effect of the deficiency must be realistically appraised in light of the number of occupants that will rely upon the exit element in question and their

are close. Only the Basic Code allows an increase in the capacity per unit of egress width if the building is sprinklered.

Minimum widths are generally similar for all the codes except that the Life Safety Code, as currently revised, accepts a minimum corridor width of 32 inches. The other codes require 44 inches in apartment buildings.

Identifying Existing Conditions

- Determine the number of required exit units or feet of exit (depending on the code in effect) for each exit element identified in Section 1: NUMBER OF EXITS above; for each access corridor or hallway leading from any apartment to an exit; and for each grade level egress. Base the computation on the number of occupants served by the element in question, in accordance with the code in effect. When communicating stairs or other openings are present, attention must be given to the potential need for the simultaneous evacuation of multiple floors;

- Determine the required width of each exit element and corridor or hallway, based upon the number of exit units or feet of exit computed above and the minimum dimension requirements;

- Determine or measure the actual width of each exit element, corridor or hallway, and grade level egress identified above by field measurement or scaling dimensioned plans.

Selected Problems and Representative Solutions

10.1
Problem: The width of an existing exit element, or a new exit element constrained by structural or architectural features of the building, is less than the minimum width specified in the code in effect.

Solution: If the element is wide enough to provide the required exit capacity and is equal to or greater than some minimal dimension, though lower than that specified in the code, it should be accepted. This new minimum should be over 22 inches.

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Overall management and production of the *Rehabilitation Guidelines* was directed by William Brenner of the Institute, with David Hattis of Building Technology, Inc. the principal technical consultant. Guideline cover graphics and layouts were designed by the Design Communication Collaborative.

NFPA Life Safety Code - 1976

Exit capacity is based on a unit of exit width of 22 inches with 12 inches or more considered as 1/2 unit in addition to one or more units. (5-3.2)

Exit capacity per unit of exit width (11-1.6.1):

Level egress Class A Ramps, Doors	100 People
Stairways and other types of exits	75 People (see Table 5-2.9.4 for fire escapes)

Minimum width:

Any exit access, Doors	28 inches (currently being changed to 32 inches) (5-2.1.1.3.1)
Stairs	44 inches for occupant load of 50 or more; 36 inches for occupant load of less than 50 (5-2.2.1.2)
Fire Escapes	22 inches; 18 inches for 20 or less occupants (5-2.9.4)
Ramps	44 inches for Class A (5-2.6.1.2) 30 inches for Class B (5-2.6.1.2)
Exit Passageway	Aggregate of tributary capacities (5-2.7.3)
Street Floor Exit	Aggregate capacity of street floor and 3/4 of exit units of stairs from other floors discharging through street floor (11-2.2.3.1)

SUMMARY

Three of the codes use the 22 inch exit unit in computing required exit widths. The Uniform Code differs from the other three codes in the method used; however, the resulting widths

Doors	32 inches (3303(e))
Stairways and Ramps	44 inches for occupant load over 50; 36 inches for load of 50 or less; 30 inches for private stairway (3303(b))
Exit Courts	44 inches or tributary occupant load (3310(b))
Fire Escapes (existing buildings only)	29 inches--clear access opening; 18 inches--stairs (Appendix Chapter 12, 1215(h))

Standard Building Code - 1979

Exit capacity is based on a unit of egress width of 22 inches with 12 inches or more considered as 1/2 unit in addition to one or more units. (1105.2)

Exit capacity per unit of exit width (1105.3):

Stairs	75 People
Level Travel (Doors, Ramps, Corridors)	100 People

Minimum width:

Any means of egress	36 inches (1105.3(e))
Exitway access, Corridors, Ramps	44 inches; 36 inches in one- and two-family dwellings (1105.3(g))
Stairs	44 inches; 36 inches for 50 or less occupants (1115.6(c))
Courts, Passageways	36 inches or aggregate capacity of all tributary means of egress (1112(c)); 44 inches or 3/4 of aggregate tributary stair and door widths (1128.2)
Doors	32 inches (1117.1(b))
Fire Escapes	22 inches--stairs (1116(d))

Introduction

Code requirements for egress can create a great number of technical problems and constraints during building rehabilitation. Existing exits which appear to be adequate will often not comply with the highly specific requirements for new building construction. Adding new exits or upgrading existing ones to meet new construction standards can require the removal or alteration of otherwise sound structural elements such as walls, floors, hallway partitions, and doors.

This guideline applies to one- and two-family dwellings and apartment houses less than 75 feet in height. Dormitories, lodging or boarding houses, and residential hotels meeting the general assumptions noted below could also be within the scope of this guideline. The guideline is not a code, but like a building or fire prevention code, it is intended for use by persons knowledgeable about fire prevention and building construction. Its use should facilitate the maximal re-use of existing egress elements in circumstances where, for some reason, building code requirements for new construction are being applied. In general, there are two such circumstances:

- Repair and improvement of existing residential buildings, when compliance with the code requirements for new construction is triggered by a 25-50% Rule or similar rule which is in effect in the jurisdiction.

- Change of use or occupancy into a residential occupancy (e.g., from one- and two-family dwelling to apartment house, from office building to apartment house), when compliance with the code requirements for new construction is triggered by the provisions of the building code in effect or some other provision.

For rehabilitation involving a change of use or occupancy, this guideline applies when egress elements are already in place or where other building elements (structural or non-structural) make literal code compliance impractical. By contrast, for example, this guideline does not apply to a warehouse that will be completely gutted during conversion to an apartment house. Such a conversion can, in most instances, be designed to meet new code requirements for egress without hardship.

This guideline is an endeavor to suggest solutions which will establish an approximately equivalent overall level of fire safety without attempting to obtain literal code compliance. It is not a criticism of new construction requirements and does not imply that the suggested solutions are equivalent. Where compliance with new construction requirements does not present serious difficulty and is otherwise feasible, this guideline should not be the sole justification for noncompliance.

In communities where new construction requirements would not normally be applied to a rehabilitation project (e.g., the community has enacted its own building rehabilitation code), there may still be use for selected portions of this guideline. There may be other instances, though, where the solutions suggested below are more stringent or restrictive than those already permitted or intended by the community. In such cases, the community must accept the responsibility to devise solutions that respond to unique local needs. The *Guideline for Setting and Adopting Standards for Building Rehabilitation* outlines a procedure to meet this task. Each community must assess its resources and its needs, and then define and set forth the codes, standards, or regulations necessary to meet the common good.

Basic Fire Protection and Egress Principles

A safe means of escape from fire is fundamental to fire protection. But total evacuation of a building is not the only way to provide life safety from fire, and it is not always the most efficient: fire officials would need hours to totally evacuate a very tall building. Different building types will often pose different egress problems. Code requirements for egress must be responsive to the qualities and needs of the people to be protected and the hazards that they face.

The differing requirements of the three model building codes (Basic, Standard, Uniform) and the Life Safety Code illustrate that there is no single correct solution. The codes reflect the differences in opinion and philosophy that exist whenever professional judgment must be exercised. The issue is not which approach is most correct, but which is most appropriate once the character of the building and the occupants are known.

Exit capacity per unit of egress width (608.2):

	Without Fire Suppression System	With Fire Suppression System
Stairways	75	113
Doors, Ramps, Corridors	100	150

Minimum width:

Corridors, Ramps	44 inches; 36 inches in one- and two-family dwellings (610.3, 615.2.1)
Doors	32 inches; 28 inches in one- and two-family dwellings (612.3)
Stairways	44 inches; 36 inches for occupancy load 50 or less (616.2.1)
Fire escapes	22 inches (621.3.1)
Passageways	44 inches or 3/4 of aggregate widths of all stairways and doorways leading thereto, whichever is greater (611.4)

Uniform Building Code - 1979

The total width of exits (measured in feet) cannot be less than the total occupant load served divided by 50, divided about equally among the separate exits. The total exit width for any story is based on the occupant load of that story, plus a percentage of the occupant load of other floors which exit through the story under consideration: 50 percent of the first adjacent story above (and below, if applicable), and 25 percent of the story immediately adjacent to the first adjacent story. (3302(b))

Minimum width:

Corridors, Exit Balconies, and Passageways	44 inches for occupant load of 10 or more; 36 inches within dwelling units (3304(b))

CODE INTENT

It is the intent of the codes to provide an exit capacity large enough to move the total expected occupant load into the exits before the exit access becomes untenable.

Safe exiting time is implied in the codes only, and cannot yet be validly calculated. It was discussed, however, when the values for exit capacity were established by the NFPA Life Safety Code Committee. Doors and other level egress components were considered to have a rated capacity of 60 persons per minute per 22 inch unit of exit width, and stairs were rated at 45 persons per minute per unit of exit width. This is considered a standard 4:3 ratio for pedestrian movement. These values are based on the following studies: National Bureau of Standards, *Design and Construction of Building Exits*, Pub. No. M151, Washington, D.C., 1935; London Transport Board, *Second Report of the Operational Research Team on the Capacity of Footways*, Research Report No. 95, London, 1958. If stairs are sized to a capacity of 75 people per unit, a time of 100 seconds is implied (75 people/unit divided by 45 people/minute-unit). The same result is obtained for horizontal or level travel (100 people/unit divided by 60 people/minute-unit).

The 22 inch unit of exit width, which is used in all but the Uniform Building Code, represents the median width of the human body at shoulder height. Its origin is said to be in experience gained by the military. The Uniform Code's requirements imply an exit capacity of 100 people per 24 inches of exit width. Using the 22 inch exit unit system, this results in an exit capacity of about 92 people per exit unit.

CODE ANALYSIS

Basic Building Code - 1978

Exit capacity is based on a unit of egress width of 22 inches with 12 inches or more considered as 1/2 unit in addition to one or more units (608.1), except that a 40 inch door is considered to have two units of egress width.

Given that a fire ignition has occurred, there are two basic approaches to solving the life safety problem: protect the people or control the fire. The people could either be evacuated from the building or protected in place until the fire is extinguished and the danger passes. The fire could be controlled by suppression (e.g., automatic sprinklers) and/or compartmentation (e.g., fire resistive construction, protection of horizontal/vertical openings).

Smoke control systems attempt to prevent smoke and other fire gases from spreading throughout a burning building. Exits free of smoke can be used more safely and efficiently; the protection of occupants becomes more feasible because life-threatening combustion products are removed from the building. No specific recommendations have been included in this guideline concerning the use of smoke control systems, but the potential of this rapidly improving technology must be recognized.

In low and mid-rise residential buildings, the simplest and most direct solution is to evacuate the occupants. This may avoid the need to upgrade the fire resistance of major structural elements such as walls, floor/ceiling assemblies, and doors. Such major renovation is counter to the goal of decreasing the cost and complexity of building rehabilitation, particularly when alternatives are usually available.

A building's evacuation system consists of three interrelated component parts:

- Fire detection and alarm;
- A path of escape or means of egress; and
- A safe destination.

For a one- and two-family dwelling "fire detection and alarm" is a smoke detector; the "means of egress" is the front door or escape window; the "safe destination" is the outside. This concept is equally applicable to apartment houses, though the problems and requirements become more complex. Fire detection and alarm is more difficult because a single station smoke detector will only warn the occupants of that apartment unit, not the

entire building. Two or more exits, instead of a single exit, are generally required. The door from an apartment unit normally opens onto a corridor, rather than directly to the outside.

The approach taken by the guideline is quite basic: identify what is required under the code, isolate the deficiencies, and then devise solutions to correct or compensate for each problem area. To correct a deficiency is to comply with the code; to compensate for a deficiency is to meet the spirit and general intent of the code. Note again the stated goal of this guideline: "an approximately equivalent *overall* level of fire safety."

There exists no exact method for determining whether one set of corrective measures exactly equals another. But it is possible, with reason and professional judgment, to articulate the intent and purpose of code requirements, and then to select among the available fire protection techniques, systems, and materials to devise a solution which is responsive to the code. The benefit of this approach is that it provides needed flexibility by taking advantage of the different approaches and interrelationships noted above: fire control vs. evacuation, improved detection and alarm vs. upgrading of the escape path, etc.

The task is also made easier because some fire protection measures have more than one impact. For example, a suppression system can potentially control the fire, provide an emergency alarm to building occupants, summon the fire department, and increase the time for safe escape by confining the fire to its compartment of origin and protecting the egress path. Smoke detectors allow more time for escape while the fire is still in its incipient, least threatening stage and may permit early extinguishment.

The problems discussed and solutions presented should by no means be considered exhaustive. There is no intent to limit the types of solutions that may be developed or considered effective. The guideline recognizes this, for the problems and solutions which have been included are headed "Selected Problems and Representative Solutions." Each building will present specific problems that will require specific treatment. Once the intent of the code requirement and the impact of the deficiency are understood, it may be possible to fashion an alternative solution. But the most important consideration will always be the char-

Discussion: The water spray on the exposed surface will compensate for the reduced fire resistance.

-or-

Solution: Upgrade the existing corridor doors. See the *Guideline on Fire Ratings of Archaic Materials and Assemblies.*

9.3
Problem: The corridor walls have openings other than doors which are inadequately protected as required by the code in effect.

Solution: All transoms should be closed with plasterboard, fixed wire glass, or other like materials. Other openings should be improved by repairing the existing construction or adding a new layer(s) of fire rated materials.

Discussion: See the *Guideline on Fire Ratings of Archaic Materials and Assemblies* for guidance. If the fire resistance is upgraded to code requirements, single station smoke detectors need not be installed, unless otherwise locally required.

Where the sealing of transoms or the use of wire glass would seriously compromise the character of a building, flexibility should be shown. Partial sprinkler systems or alternate materials such as polycarbonate could be considered. Single station smoke detectors would still be required unless the fire performance of these materials or systems is documented as meeting code requirements.

10
Exit Capacity/Widths

Summary of Code Requirements and Intent

The codes regulate the capacity of exits by relating the required width of the various exit elements to the occupant load they serve, and by establishing minimum widths for each of the exit elements. Capacity is expressed as the number of building occupants that can be served by an exit element per unit of exit width.

Solution: If the existing corridor wall consists of wood lath and plaster in good condition, it should be accepted as having adequate fire resistance. If of lesser construction or in need of repair, the fire resistance of the corridor enclosure should be improved by repairing the existing construction or adding a new layer(s) of fire rated materials. See the *Guideline on Fire Ratings of Archaic Materials and Assemblies.*

Discussion: If the fire resistance is upgraded to code requirements, single station smoke detectors need not be installed, unless otherwise locally required.

-or-

Solution: A corridor enclosure of 30 minutes fire resistance should be accepted. Buildings with more than three occupiable floors must be equipped with an automatic fire alarm system activated by heat detectors located inside every apartment door that leads to the corridor. The alarm should notify all building occupants. Doors to apartments must be equipped with self-closing devices.

Discussion: The door closers, single station smoke detectors, and automatic fire alarm system (when required) will provide earlier detection and alarm and increase the reliability of the compartmentation. The corridor walls should be carefully inspected to insure that they extend from the floor to the underside of the floor or roof above, are properly firestopped, and that any pokethroughs or penetrations are properly protected. There should not be any other serious code deficiencies.

9.2
Problem: The fire resistance of corridor doors is lower than that required by the code in effect.

Solution: Unrated corridor doors should be accepted if they are protected by a local sprinkler which will spray the door in case of a fire on the room side of the corridor door. Such a sprinkler may be connected to the domestic water supply and need not sound an alarm upon activation. Doors must be equipped with self-closing devices.

acter and status of the occupants and the use and arrangement of the building.

General Assumptions

The following assumptions have been made in developing this guideline, and may impact upon its applicability.

The rehabilitated structure must be intended for general residential use and the resident population representative of the population at large, which may include elderly and handicapped persons. However, housing that is *primarily* directed towards elderly or handicapped persons is not within the scope of this guideline. The inability or increased difficulty of these persons to react quickly and properly, without assistance, to an alarm of danger requires an analysis and degree of safety that is beyond the generalized scope of this guideline.

It has been assumed that the occupants are familiar with their surroundings, particularly the location of exits. This assumption makes the guideline inapplicable to hotels/motels or other occupancies with a transient resident population.

The population density has been assumed to be small enough such that there would be no problem of queuing at the exits. That is, all residents should be able to move continuously towards the exits without having to wait in line. Queuing can be a problem in dormitories, boarding houses, and group residences. Therefore, the number and capacity of exits in these residential buildings must be given special attention.

Building codes contain a number of highly specific provisions controlling the quality of exits such as exit signage, illumination, emergency lighting, handrails, etc. It is assumed that both existing exits and any new exits that may be called for under this guideline will comply fully with these requirements.

It is assumed that the building is not deficient in too many areas. The concept of compensating for one deficiency by relying upon or providing other positive features becomes either too difficult or too tenuous if there are too many problems. For just as a single fire protection feature can provide several positive benefits, a single deficiency can have several negative

impacts, and multiple deficiencies simply compound the problem further.

As used in this guideline, "means of egress" includes those elements of an egress system which are permitted under building codes for new construction (e.g., enclosed interior stairs, smokeproof towers, horizontal exits). "Means of escape" includes all "means of egress" as well as any other elements of an egress system not normally permitted for new construction or considered as a primary egress path (e.g., fire escapes, escape windows, escape ladders).

Arrangement of the Guideline

The various sections of the guideline have been placed in a sequence that parallels the review procedure normally followed by local enforcing officials. They have been arranged as follows:

The occupant load (see discussion below), the physical characteristics of the building (e.g., height, area), and the use (e.g., apartment) determine the *minimum* number of exits that are required. Section 1: NUMBER OF EXITS addresses this area.

Once the required minimum number of exits is known, the number of available exits is counted. The concern is that the exits be of the proper type and that minimum fire resistive enclosure requirements, if any, are met. For example, some codes place limits on the use or number of horizontal exits. Generally, codes require stairs to be enclosed by fire resistive construction. Guidelines have not been developed for every acceptable exit element, but Sections 2-5: HORIZONTAL EXITS; INTERIOR STAIRS/ENCLOSURES; EXTERIOR EXIT STAIRS; and FIRE ESCAPE STAIRS apply here.

The location and layout of the qualifying exits is then examined. See Section 6: ARRANGEMENT OF EXITS. Improper arrangement may require that additional exits be provided.

Access to these exits must also be evaluated and corrective measures taken as needed. Section 7: TRAVEL DISTANCE; Section 8: DEAD-END TRAVEL; and Section 9: CORRIDORS AND EXTERIOR EXIT BALCONIES should be applied at this

SUMMARY

The Basic and Standard Codes require a 1 hour enclosure and 20 minute doors for corridors serving over 30 occupants; the Uniform Code applies similar requirements when the occupant load is 30 or more. The Life Safety Code requires a similar corridor enclosure, irrespective of occupant loading, but allows reduction of the separation requirement as a function of automatic detection and extinguishment. Only the Life Safety Code accepts lower ratings for existing buildings. All codes require doors to have some form of door closing mechanism.

The three model codes disagree on the treatment of exterior exit balconies. The Uniform and Standard Codes treat them as corridors, though the Uniform Code does not require openings in interior walls of exterior exit balconies to be protected. The Basic Code seems to be stricter, treating them as part of the "exitway" rather than "exitway access".

Identifying Existing Conditions

Determine the occupant load served by the corridor in question. If it is in excess of the code specified criteria of 30 occupants (or 6000 sq. ft. of area served), proceed with the following:

- Determine the fire resistance of the corridor wall assembly and doors by reference to the code in effect, current listings, or the *Guideline on Fire Ratings of Archaic Materials and Assemblies*;
- Identify all other openings in corridor walls, such as transoms, and determine their area and the design of their closing devices, if any;
- Determine the presence and operability of door closing devices.

Selected Problems and Representative Solutions

9.1
Problem: The fire resistance of the corridor enclosure, as determined above, is below that required by the code in effect.

self-closing or automatic closing assemblies with a 20 minute fire protection rating. Other openings in corridor walls must be fixed and protected by 1/4" wired glass in steel frames and may not exceed 25% of the wall area separating any room and the corridor. Protection of openings in the interior walls of exterior exit balconies is not required. (3304)

Travel distance in an enclosed corridor may be increased (see Section 7: TRAVEL DISTANCE).

Standard Building Code - 1979

A corridor is not specifically defined.

All exit access corridors serving over 30 occupants (i.e., floor area greater than 6000 sq. ft.) must be enclosed by walls having a minimum of 1 hour fire resistance. An exterior balcony may serve as an exit access corridor if it complies with all the requirements for a corridor. Doors opening onto corridors serving over 30 occupants must be self-closing, tight fitting, smoke and draft assemblies with a 20 minute fire protection rating. (702.3, Table 700 and Notes, 1108)

NFPA Life Safety Code - 1976

A corridor is not specifically defined.

Walls enclosing exit access corridors must have 1 hour fire resistance. The fire resistance may be reduced to 3/4 hour and 1/2 hour for buildings with automatic detectors and automatic sprinklers, respectively; 1/2 hour fire resistance is permitted in existing buildings. Access to an exit may be by means of an exterior balcony, porch, gallery, or roof, in which case the materials of construction are required to be "as permitted for the building served."

Doors opening onto exit access corridors must have a 20 minute fire protection rating, except that previously approved 1-3/4 inch rated bonded wood core doors and frames may remain in use. Doors between apartments and corridors must be self-closing. (5-5.4,11-3.2.8, 11-3.5.3.1.3 and Exception No. 2, 11-3.6.3.1.3, 11-3.7.3.1.3, 11-3.8.3.1.2)

time. As above, additional exits may be required if conditions are too severe.

Once the number of required exits has been provided and their arrangement and access is satisfactory, the capacity of the exits and minimum width dimensions must be considered. Section 10: EXIT CAPACITY/WIDTHS applies here.

Finally, the specific construction details of the egress elements must be evaluated. See Section 11: CONSTRUCTION DETAILS AND SPECIFICATIONS.

Each of the eleven sections is separated into three major parts. First, there is a summary of the code requirements and their intent, including a discussion of the respective requirements of the Basic Building Code, published by the Building Officials and Code Administrators International; the Standard Building Code, published by the Southern Building Code Congress International; and the Uniform Building Code, published by the International Conference of Building Officials. The Life Safety Code, published by the National Fire Protection Association, is not a building code, but it has been included because it deals at length with egress and has been used in a regulatory context.* Second, there is a discussion of how to identify conditions in a building to determine whether a problem exists. Third, there is a discussion of selected problems, some representative solutions, and a general narrative relating the two.

References to the applicable sections of the model codes have been included throughout the guideline. The codes have been abbreviated as follows:

BOCA	Basic Building Code (1978 Edition)
NFPA	NFPA Life Safety Code (1976 Edition)
SBCC	Standard Building Code (1979 Edition)
UBC	Uniform Building Code (1979 Edition)

* There are literally thousands of different building codes being enforced throughout the United States. The model building codes were selected because they are nationally known and have been adopted, either in whole or in part, by many communities.

General Requirements

Smoke Detectors

Smoke detectors cannot control the growth or spread of a fire. But early detection and alarm allows more time for safe escape and possibly control or extinguishment at a time when the fire is still developing. This is particularly important in residential occupancies when all the occupants are asleep. Of course, all detectors must be properly installed, located, and maintained.

Therefore, the installation of a single station smoke detector for each sleeping area of every dwelling unit is hereby required before allowing any significant deviation from the requirements for new construction.

The model codes referenced in the guideline already require the installation of smoke detectors in every dwelling unit.* However, not all local communities have adopted one of the model codes, an earlier edition of a code without the smoke detector requirement may still be in effect, or a community may have deleted the smoke detector requirement.

The net effect of some of the solutions discussed below is to meet the requirements for new construction. In such cases, the requirement for smoke detectors does not apply because there is no significant deviation from the code. Smoke detectors must still be installed if otherwise required under a local code. But when a community has chosen not to adopt such a general provision, this guideline has no basis for imposing a requirement for smoke detectors once a particular deficiency has been corrected to comply with the code. The affected sections of the guideline are noted accordingly.

Height and Area Limitations

Building codes usually limit the allowable height and area of a building as a function of its occupancy and type of construction.

* The Life Safety Code does not require smoke detectors in dormitories and only "on each floor level" of lodging houses. (11-5.3.2.1)

CODE INTENT

Fire resistance requirements for corridor enclosures and doors are intended to maintain the integrity of the corridor and prevent flames and smoke from blocking the exit route. This will enable the occupants to safely travel through the corridors to the exits.

CODE ANALYSIS

Basic Building Code - 1978

A corridor is defined as "a hallway, passageway or other compartmented space providing the occupants with access to the required exitway of the building or floor area". (201.2)

Corridors serving more than 30 occupants (i.e., floor area greater than 6000 sq. ft.) must be enclosed by walls having 1 hour fire resistance. Corridor walls must extend from the floor to the ceiling (need not extend through space above suspended ceiling). Doors opening onto corridors serving over 30 occupants must be self-closing or automatic closing, with a 20 minute fire protection rating. (610.4)

Open porches or balconies leading to exterior exitway stairs must be separated on their interior side by construction having a fire resistance of 1 hour in buildings of three stories or less, and of 2 hours in all other buildings. Doors in such separations must be rated at 3/4 hour and 1-1/2 hours, respectively. Other openings must be protected and are limited in area. (619.1.1)

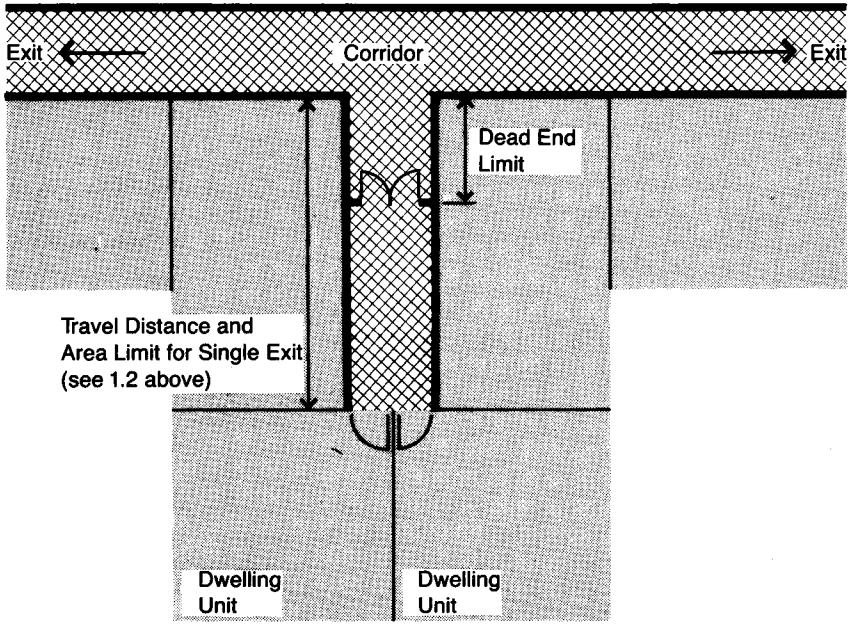
Uniform Building Code - 1979

A corridor is not specifically defined.

Walls of corridors and interior sides of exterior exit balconies serving an occupant load of 30 or more (i.e., floor area 6000 sq. ft. or more) must be of not less than 1 hour fire resistive construction. Ceilings of corridors must be at least that required for a 1 hour fire resistive floor/ceiling assembly.

Where corridor walls are required to be of 1 hour fire resistive construction, doors must be "tight-fitting smoke and draft control,"

The following figure illustrates the approach detailed above. Should the analysis reveal that the conditions for a single exit are not met by this portion of the building, then an additional exit must be provided.



9
Corridors and Exterior Exit Balconies (Separation and Fire Resistance)

Summary of Code Requirements and Intent

Corridors in residential occupancies are the common and public spaces through which occupants travel from their apartments to an exit element. It is the length of corridors that is usually controlled by code provisions governing travel distance. The codes establish certain requirements for the separation of corridors from other building spaces. See also Section 10: EXIT CAPACITY/WIDTHS for dimensional requirements for corridors.

For rehabilitation involving a change of occupancy into a residential occupancy, compliance with the new construction height and area limitations of the code is hereby required before the solutions recommended in this guideline may be applied. Any allowances for increased height and/or area permitted by the code may still be applied.

Occupant Load

The occupant load is the number of people that can be expected to be present in a building. The occupant load is used to calculate the number of exits and the capacity or width of these exits.

For the purpose of specifying the number and capacity of exits, the occupant load may not be reduced below a minimum specified in the code, regardless of the number of people actually expected. However, the actual occupant loading is used whenever it exceeds the minimum specified in the code.

Though each code specifies how the occupant load is to be calculated, the general method is to divide the total gross floor area by a minimum design density of 200 sq. ft. per person. The only exception is 300 sq. ft. per person in one- and two-family dwellings and 50 sq. ft. per person in dormitories under the Uniform Building Code. The occupant load for each floor must also be computed though the method may vary somewhat. (BOCA: 606.0; UBC: 3301(d), Table 33-A; SBCC: 1105.1; NFPA: 5-3.1, 11-1.5).

Given the low population density of most residential use buildings, occupant loading will rarely present a problem. More often, it is the minimum dimension requirement for an exit element, rather than the number of persons who must rely upon that exit element, that is the source of difficulty. In residential rehabilitation, it is usually the size and configuration of the building and the arrangement and quality of the existing exits, not the number of building occupants, that will control the number of exits that must be provided.

1
Number of Exits

Summary of Code Requirements and Intent

The codes specify the minimum number of exits that must be provided. The exits must be adequate for each floor as well as for the building as a whole. Other considerations such as travel distance, remoteness, or capacity of existing exits may require additional exits to be provided. These issues are discussed separately and, therefore, are not considered here.

CODE INTENT

Requirements for a minimum number of exits are established to increase the reliability of the means of egress system. The intent is that for any single fire ignition that prohibits travel to one exit, there will be an alternate exit that can be used. This does not address multiple fire ignitions, as may be likely with fires that are incendiary (intentionally set).

Having a minimum of two means of egress is one of the most fundamental principles of life safety from fire. The codes do allow certain residential configurations to have only a single exit, but every one of these special cases must also comply with the separate, general requirement for operable windows of specified minimum dimensions. These windows allow for escape, provide a source of fresh air if it is necessary to await rescue, and allow for rescue of building occupants by fire service personnel. Therefore, even these buildings could be considered to have two means of escape. All rehabilitated buildings should have escape windows whenever feasible.

CODE ANALYSIS

Basic Building Code - 1978

Not less than two exitways serving every story, except in one- and two-family dwellings, with the following exceptions where one exitway is accepted (609.2, 609.3):

- On the first story of buildings 2000 sq. ft. or less with an occupancy load less than 50 on the first story;

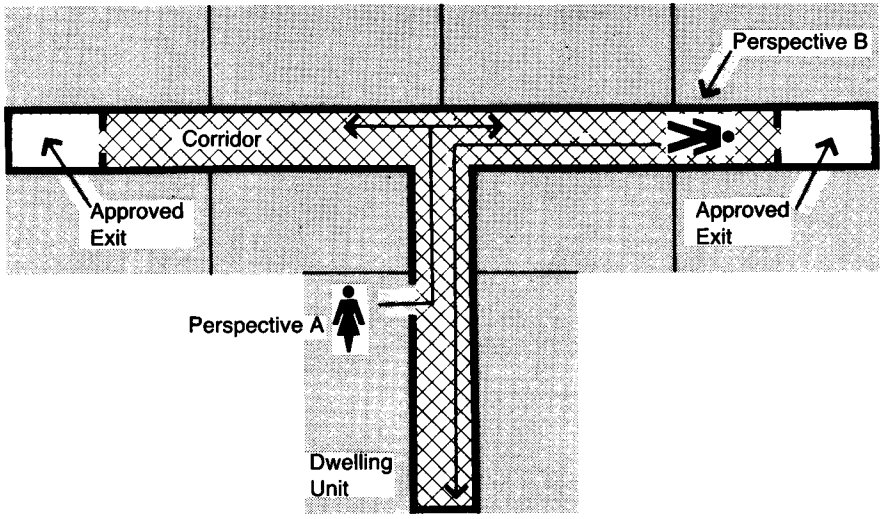
Discussion: By constructing a physical partition, a person who mistakenly turns off the proper path onto a dead-end would be alerted to the mistake. The distance from the proper path to the partition must be within the limits for dead-ends specified within the respective codes, but should be less than that allowed whenever practicable. The partition need not have any fire resistance rating. Any doors may be kept in the open position provided they shall close automatically upon the activation of a local smoke detector. The partition shall be clearly marked to indicate the path is NOT AN EXIT.

This solution does not provide two remote exits for those occupants whose dwelling units access onto the dead-end path. While the codes are not clear on this issue, the following analysis has been used. The portion of the building served by an excessive dead-end path is analyzed as though it were the second story of a two story building. Then, the number of exits required for this portion is determined. The conditions for allowing a single exit are noted in Section 1: NUMBER OF EXITS. If only one exit is required, then the building is considered to be in compliance because the dead-end path still provides one path of escape. The Uniform Building Code provides that "every building or USABLE PORTION THEREOF shall have at least one exit". (3302(a)) (emphasis added) Two exits are required only when certain limits are exceeded.

Travel distances for the dwelling units in this portion of the building are computed as follows:

The regular travel distance limitations outlined in Section 7: TRAVEL DISTANCE must still be met. For example, the travel distance from the door of the most remote dwelling unit in that portion of the building to the nearest exit may not exceed 100 feet in a non-sprinklered building constructed under the Basic Code.

The special limitation on travel distance when a single exit is allowed must also be considered. The distance from the door of the most remote dwelling unit to the point where two remote exits become available must not exceed this limit. The Uniform Building Code has no such limitation. The allowable distances in the Basic and Standard Building Codes are 50 feet and 30 feet, respectively. Though the Life Safety Code allows dead-ends of 35 feet in existing buildings, the maximum travel distance when a single exit is allowable is only 20 feet.



Selected Problems and Representative Solutions

8.1
Problem: Excessive lengths of dead-end travel.

Solution: Provide an additional exit to eliminate the dead-end.

Discussion: The most direct solution is to construct an exit at or near the end of the dead-end path. A person turning off the main corridor would still have access to an exit; a person leaving an individual dwelling unit would have a choice of two remote exits. This exit must be directly accessible from the corridor or hallway. Higher quality exit components such as interior or exterior stairs are preferred. Fire escapes or balconies could be accepted depending upon the nature and characteristics of the occupant loading, fire department capabilities, building height, etc. If high quality exits are provided, single station smoke detectors need not be provided, unless otherwise locally required.

-or-

Solution: Construct a physical partition limiting the path of dead-end travel.

- Residential multi-family buildings, two stories or less, with four or less dwelling units per floor, maximum exitway access travel of 50 ft., minimum 1 hour fire resistance rating of exitway enclosure, and minimum 1 hour opening protection.

The 1980 Supplement added to Section 609.2 the requirement that a minimum of three exits are needed if the occupant load is between 501 and 1000 persons, and a minimum of four exits must be provided for occupant loads in excess of 1000.

Uniform Building Code - 1979

Every building or usable portion thereof must have at least one exit, except if there are over 10 occupants, there must be two exits. Floors above the first story having an occupant load of more than 10 shall have not less than two exits, subject to the following two exceptions:

- Unless the number of occupants exceeds 10, only one exit shall be required from a second floor area within an individual dwelling unit;

- Two or more dwelling units on the second floor may have access to only one common exit when the total occupant load does not exceed 10.

The requirement for two exits is applied to individual dwelling units as well: a single apartment unit larger than 2000 sq. ft. (10 occupants x 200 sq. ft. per occupant) would require two exits from the private unit onto the public exitway; a similar requirement applies to an individual unit of a one- and two-family dwelling larger than 3000 sq. ft. (10 occupants x 300 sq. ft per occupant), even if it were a one story building.

Regardless of the occupant loading, floors above the second story and basements require not less than two exits, except when such floors or basements are used exclusively for the service of the building; only one exit is required from a basement within an individual dwelling unit. As noted above, individual units and basements with an occupant load greater than 10 must have two exits as well. Every story or portion thereof having an occupant load of 501 to 1000 must have not

less than three exits; four exits are required when the occupant load exceeds 1000. (3302(a), Table 33-A, A-1215(b,d)).

Standard Building Code - 1979

Not less than two independent exits except for one- and two-family dwellings and other exceptions noted below.

Minimum Number of Exits	Occupant Load
2	50-500
3	501-1000
4	more than 1000

Residential occupancies having not more than four dwelling units per floor, less than 3500 sq. ft. per floor, and less than three stories in height may be served by one common exit. The travel distance from the entrance door of any living unit to the single exit cannot exceed 30 ft. (1103.2).

NFPA Life Safety Code - 1976

Two separate exits are required with the following exceptions:

- One- and two-family dwellings;
- A unit with direct exit to the street at ground level, by an outside stairway, or by a 1 hour rated enclosed stair serving only that apartment;
- Any height building with four or less units per floor with direct access to a smokeproof tower or outside stair (20 ft. maximum travel distance);
- A building three stories or less with 1 hour exit and protected openings, corridors with 1 hour fire resistance rating, 20 ft. maximum travel distance (11-3.2.4).

The Basic, Uniform, and Standard Codes impose a 20 foot maximum length for dead-ends (BOCA: 610.2; UBC: 3304(e); SBCC: 1104.3). The Life Safety Code imposes a maximum single path corridor length of 30 feet, except that lengths of 35 feet are acceptable in existing or totally sprinklered buildings. (11-3.5, 11-3.6, 11-3.7, 11-3.8, as changed by Tentative Interim Amendment)

Identifying Existing Conditions

There are two approaches, illustrated in the figure below, to the identification of paths of dead-end travel. The result may not be the same in both instances.

From the perspective of an occupant in a corridor moving towards a proper exit (Perspective B), a dead-end is any path of travel onto which the occupant could mistakenly turn that does not lead to an exit. The length of the dead-end is the maximum distance that the occupant could travel before realizing the mistake, i.e., to the end of the dead-end path.

From the perspective of an occupant moving from an individual dwelling unit into the corridor (Perspective A), a dead-end is any path of travel for which no choice of exits exists, assuming that two or more exits are required. That is, an exit can be reached by traveling in a single direction only. The length of the dead-end is the maximum distance that an occupant entering onto the corridor at the most remote point of access would have to travel until alternate paths to remote exits become available. The corridor may extend beyond the most remote point of access from a dwelling unit to the corridor, e.g., to a window or janitor's closet. However, it is assumed that the occupants, familiar with their surroundings, would move towards, not away from, the nearest exit. Therefore, for this perspective only, the length of the dead-end does not include the length of the path that does not lead to an exit. It would be included under the approach in the previous paragraph.

The combinations with an asterisk (*) show no specific increase in travel distance because they perform similar life safety functions of fire detection and/or alarm: the heat detector and sprinkler head inside the apartment door; the alarm sounded automatically by the heat detector or sprinkler head, or manually by an occupant. However, there is an increase in reliability: there is a second system present should the first device fail to operate. There are also different fire scenarios where one system would be more responsive or appropriate than the other. The increase in travel distance is best left to the informed judgment of the local official, applied to the particulars of a specific structure.

8
Dead-End Travel

Summary of Code Requirements and Intent

CODE INTENT

Dead-end corridors of any length are undesirable features in buildings for two reasons. People who must use a dead-end corridor as part of the exit access (no choice of travel to exits) could be trapped by a fire or smoke between them and the exits. The other reason is that people moving within the exit access could enter the dead-end, especially under smoky or low light conditions, and become trapped or confused. Some controversy exists as to which concern the codes are intended to address, if not both. The answer is important because the design solutions differ.

All the codes use the term "dead-end" but do not define it. The Life Safety Code also uses the phrase "maximum single path corridor length", which would indicate a concern for the availability of two remote exits. The model codes appear to focus upon the individual who may turn off onto a dead-end corridor or hallway.

SUMMARY

A minimum of two exits is generally required, although some residential occupancies need have only one if certain requirements are met. The codes are not consistent as to when only one exit will be allowed.

Identifying Existing Conditions

Determine the required number of exits by considering (depending on the particular code in force):

- Occupancy (one- and two-family vs. apartment house);
- Area (for computation of occupant load);
- Number of dwelling units;
- Number of stories;
- Arrangement of spaces (service rooms, two story dwelling units, etc.).

Determine the number of apparent exits for each floor in the proposed building by counting the number of separate paths that discharge to a public way or protected area of refuge. The exits, or exit elements, either alone or in combination, are:

- Interior stairway;
- Exterior stairway;
- Horizontal exit;
- Smokeproof tower;
- Fire escape;
- Ramp;
- Exit passageway;
- Lobby or vestibule;
- Exterior exit door.

The number of exits is "apparent" because an exit or exit element may be found to violate some other code provisions addressed later in the guideline.

Particularly in larger buildings, several required stairways and passageways often combine at a later point and discharge through a single exit passageway, lobby, or vestibule. The codes impose limits upon exits that may combine at a later point and care must be taken that this limit is not violated.

Selected Problems and Representative Solutions

1.1
Problem: Less exits are available than required.

Solution: Consider the use of means of escape, such as fire escapes (see Section 5 below), ladders, fire balconies, etc., which are not normally accepted by codes as exit elements for new construction, in order to provide the required number of exits. At least one exit should be a means of egress in substantial compliance with code requirements (i.e., two means of escape should not be accepted). This exit should preferably follow the path normally used by the building occupants. In an emergency situation, it is common for people to exit from a building the same way they entered and to travel the path most familiar.*

Discussion: In accepting this solution, an analysis should be made which takes into account the public acceptability (e.g., would tenants share a common balcony or accept unlocked doors to create an area of refuge), the climate (e.g., accumulations of snow or ice), the ability of fire service personnel to effect rescue or gain access to the building to fight the fire, and the degree of mobility or agility necessary for safe escape.

* This does not mean that elevators should be accepted as a means of escape. In such a case, it is the exit that most closely follows the normal path of entrance.

Automatic Sprinkler/Automatic Alarm

Solution: If the partial sprinkler system discussed above is equipped to sound an alarm to all building occupants, the allowable travel distance may be increased by up to 100 feet. Doors must still be equipped with self-closing devices.

Discussion: The sprinkler head inside the apartment door will perform a function similar to the heat detector in the Automatic Alarm/Heat Detector solution by initiating an alarm of a fire to the other building occupants. The sprinkler system will help contain the fire within the apartment of origin and keep the corridor passable. Single station smoke detectors are still required to warn the occupants within the apartment of origin.

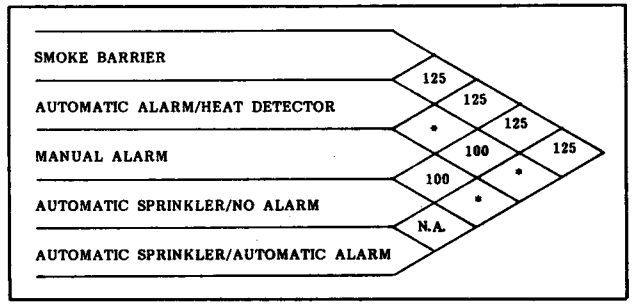
Provide Additional Exit(s)

Solution: Provide additional exit(s) (e.g., stair, fire escape, fire balcony) located so that travel distance limitations are not exceeded.

Discussion: The quality of the additional exit(s) (e.g., interior stair vs. escape ladder) will depend upon the use and occupancy of the building. If a high quality exit is provided (e.g., interior stair), single station smoke detectors need not be provided, unless otherwise locally required.

Suggested Cumulative Increases

The following chart contains the suggested cumulative increases if more than one solution is implemented.



Automatic Alarm/Heat Detector

Solution: The allowable travel distance may be increased by up to 50 feet if the building is equipped with an automatic fire alarm system activated by heat detectors located inside every apartment within 6 feet of the corridor door. The alarm should notify all building occupants. Entrance doors to apartments must be equipped with self-closing devices.

Discussion: While the single station smoke detector will notify the occupants of that apartment, other building residents would not be made aware of the emergency. Interconnection of the individual smoke detectors, which are still required, is not realistic because of the large number of false alarms that may be expected. Heat detectors are less sensitive to the environmental causes of false alarms (e.g., burnt toast), but are still capable of providing an alarm before a fire could develop beyond the apartment of origin.

Manual Alarm

Solution: The allowable travel distance may be increased by up to 50 feet if a manual alarm system, not otherwise required by the code, is installed. The alarm should notify all building occupants. Entrance doors to apartments must be equipped with self-closing devices.

Discussion: The smoke detector within the apartment will allow the occupant to escape while the fire is still small. The other building residents could then be warned by the sounding of the manual alarm.

Automatic Sprinkler/No Alarm

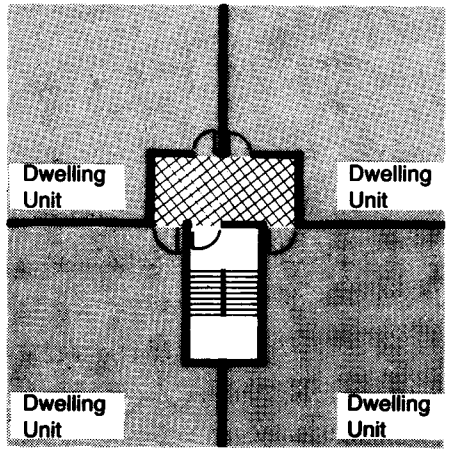
Solution: The allowable travel distance may be increased by up to 50 feet if an automatic sprinkler system is installed in the corridor and an additional sprinkler head is located to protect the apartment side of every corridor door. Such sprinklers need not sound an alarm upon activation. Doors must be equipped with self-closing devices. Single station smoke detectors are still required.

Discussion: The automatic sprinklers and door closers should contain a fire within the apartment of origin and keep the corridor passable.

1.2

Problem: One exit available in a building with three occupiable floors when two exits are required.

Solution: A single exit could be accepted if each floor arrangement meets the special conditions for a single exit for two story buildings (e.g., number of occupants or dwelling units, limitations on exitway access travel), the stairway is well designed (dimensions as required by code, handrails, illumination, etc.), and the requirement for operable windows is met. The exitway must either be enclosed with construction having a minimum 1 hour fire resistance or the apartments must be separated from the exit with construction having a similar rating. Existing wood lath and plaster in good condition may remain. Doors to the exit enclosure or apartment doors opening directly onto stairs must have a minimum 1 hour fire resistance. Existing doors, if substantial (e.g., minimum 1-3/4 inch bonded solid core door), may remain if equipped with self-closing devices. Lesser doors must be protected on both sides by automatic sprinkler protection. These sprinklers may be connected to the domestic water supply and need not be equipped to sound a building alarm. The following figure illustrates the conditions for allowing a single exit.



Notes

- Not more than 4 units, maximum floor area, or 10 occupants, as per code.
- Also, travel distance limitations per code.

Discussion: A single exit is allowed by the codes for the specified arrangements up to two stories because the building is low, an escape window is required, the exit access travel distance is limited, compartmentation or an exit enclosure is required, and the number of occupants is small. The requirement for smoke detectors and a high quality exit, coupled with escape windows, the limited number of occupants, and compartmentation, is the basis for extending the exception for a single exit to include buildings with three occupiable floors.

1.3
Problem: One exit available in a building over three stories.

Solution: A code complying smokeproof tower or exterior stair could be accepted as the single exit. The building must comply with the height and area requirements for new construction. The arrangement of each floor must meet the special conditions for a single exit for two story buildings and the stairway must be well designed and protected against the elements. Access to the exterior stair or smokeproof tower must either be open to the outside or by a protected corridor. Doors opening onto an enclosed corridor must be substantial (e.g., minimum 1-3/4 inch bonded solid core door) and equipped with self-closing devices. Lesser doors must be protected on both sides by automatic sprinkler protection. These sprinklers may be connected to the domestic water supply and need not be equipped to sound a building alarm. Doors to a smokeproof tower must comply with the code.

Discussion: The Life Safety Code accepts a smokeproof tower or exterior stair as the sole exit for any height building with four or less units per floor with direct access to the exit (20 ft. maximum travel distance). It is also the traditional design method in Europe and much of the world. The added requirement for smoke detectors, compliance with height and area requirements, and an open air exit access or protected corridor increases the reliability of the single exit. The ability of the fire service to effect rescue or gain access to the building to fight the fire must also be considered.

Identifying Existing Conditions

Determine the distance from the most remote point on every story of a building or from the most remote apartment entrance door (depending on the local code in effect) to the nearest acceptable exit element. Measure the distance along the most direct natural path of travel.

Selected Problems and Representative Solutions

7.1
Problem: Measured travel distance exceeds the maximum travel distance required by the code in effect.

Six alternative solutions to this problem are suggested below. Some of these solutions may be combined for an additional increase in the allowable travel distance. A table showing suggested increases in travel distance for the different combinations follows the discussion of the individual solutions. The maximum cumulative increase should not exceed 125 feet.

Smoke Barrier

Solution: The allowable travel distance may be increased by up to 75 feet if the path is divided by a smoke barrier with smoke actuated automatic closing door. The smoke barrier could be constructed of wire glass, gypsum, or other suitable materials. The barrier must extend from exterior wall to exterior wall and from the floor to the underside of the floor or roof above, through any concealed or void spaces. The doors need not swing in the direction of exit travel, but double-acting doors are not acceptable. Doors, when closed, must fit tightly and prevent the passage of smoke. Requirements for minimum corridor or hallway dimensions should be complied with as closely as possible.

Discussion: The added compartmentation created by the smoke barrier reduces the chance that the entire path of travel would be blocked by heat or smoke after a given period of time, thereby compensating for the added escape time due to a longer travel distance. The single station smoke detectors will also provide added time for escape.

Standard Building Code - 1979

Maximum travel distance from any point to the "nearest exit" (defined as "that portion of a means of egress which is separated from the area of the building from which escape is to be made, by walls, floors, doors or other means which provide the protected path . . . to the exterior") is as follows:

Unsprinklered	150 feet
Sprinklered	200 feet

If the travel distance within a living unit is less than 50 feet, the distance of travel to an exit is measured from the corridor entrance. (1103.1)

NFPA Life Safety Code - 1976

The following are the requirements for travel distance (11-3.5, 11-3.6, 11-3.7, 11-3.8):

	To the "nearest exit" from an apartment entrance door	To a Corridor door from any room door
No Sprinklers or Detection	100 ft.	50 ft.
Automatic Detectors	150 ft.	75 ft.
Partial Sprinkler Protection	150 ft.	50 ft.
Total Sprinkler Protection	150 ft.	100 ft.

"Exit" is defined similarly to "exitway" in the Basic Code.

SUMMARY

The codes have varying dimensional requirements for travel distance. All allow an increase in exit travel distance if there are automatic sprinklers. Only the Life Safety Code allows an increase with automatic detection. The Uniform Code differs from the other codes by specifying the four exit elements to which the travel distance is to be measured.

2
Horizontal Exits

Summary of Code Requirements and Intent

CODE INTENT

The code intent is to create an area of refuge within a building by providing a continuous barrier that will resist the passage of heat, smoke, and other fire gases. A horizontal exit is a passage from one building area to another. The areas must be separated by fire resistant construction with the appropriate opening protection (self-closing or automatic closing fire doors). A horizontal exit does not have to be limited to one building, and can be a bridge or protected passageway from one building to another.

CODE ANALYSIS AND SUMMARY

A horizontal exit is a way of passage from a building to a protected area of refuge, on approximately the same level, within the same or another building. The area of refuge must afford safety from fire and smoke.

Walls or partitions forming the separation through which the horizontal exits provide passage must provide 2 hours fire resistance. Opening protection (e.g., fire doors, fire dampers) must have 1-1/2 hours fire resistance. Fire doors in horizontal exits must be either self-closing or automatically close upon activation of an associated smoke detector, except that only automatic doors are allowed under the Uniform Code.* Doors must swing in the direction of exit travel, except that the occupant load must be 50 or more under the Uniform and Standard Codes before this requirement is imposed.

The Standard and Life Safety Codes provide that horizontal exits cannot comprise more than 1/2 the required number of exits. The Uniform, Standard, and Life Safety Codes require that the area of refuge into which the horizontal exit leads have an enclosed stair, door, or other "standard" exit that leads directly to

* A current change to the Basic Code only accepts automatic closing doors.

the exterior. The Basic Code requires one interior stairway or smokeproof enclosure on each side of the horizontal exit in multi-story buildings.

The area of refuge must be of sufficient area to be occupied by the total occupant load of the connected areas based upon 3 sq. ft. per person (net). The codes contain various other prescriptive requirements relating to dimensions, materials, and hardware. (BOCA: 614.0 and reported code amendment; UBC: 3307, 3303(b); SBCC: 1119; NFPA: 5-2.4)

Identifying Existing Conditions

Determine the fire resistance of the wall or partition assembly and protection of openings by reference to the code in effect, current or past listings, labels, or the *Guideline on Fire Ratings of Archaic Materials and Assemblies.*

Selected Problems and Representative Solutions

2.1
Problem: The fire resistance of the wall or partition, as determined above, is below that required by code.

Solution: Upgrade the wall or partition construction to meet code requirements.

Discussion: The fire resistance of the wall or partition should be improved by repairing the existing construction or adding a new layer(s) of fire resistive materials. See the *Guideline on Fire Ratings of Archaic Materials and Assemblies.* If the fire resistance is upgraded to code requirements, single station smoke detectors need not be installed, unless otherwise locally required.

-or-

Solution: Accept a wall or partition of 1 hour fire resistance. Doors must provide 1 hour fire resistance and close automatically upon activation of a smoke detector. The wall or partition should be carefully inspected to insure that all penetrations, particularly ducts or other utility services, are properly protected and the existing materials are intact and structurally sound.*

minimum number of exits and for exit remoteness, the limitation on travel distance is intended to assure that even if one exit is blocked by a fire, an occupant will still be able to reach another exit or a location of refuge before the fire has spread in a manner as to prevent it. The actual time for escape implied by the maximum travel distance limitation is not explicitly stated.

CODE ANALYSIS

Basic Building Code - 1978

The maximum length of "exitway access travel" to "an approved exitway" (defined as "that portion of a means of egress which is separated from all other spaces of a building by construction or equipment as required in this code to provide a protected way of travel to the exitway discharge") is as follows:

Without Fire Suppression System	100 feet
With Fire Suppression System	150 feet

If the travel distance within a living unit is less than 50 feet, or 100 feet if sprinklered, the distance of travel is measured from the "exitway access entrance to the nearest exitway" (i.e., from the apartment door). (607.4)

Uniform Building Code - 1979

Maximum distance of travel "from any point to an exterior exit door, horizontal exit, exit passageway or an enclosed stairway" is as follows:

Without Automatic Sprinklers	150 feet
With Automatic Sprinklers	200 feet

These distances may be increased 100 feet when the last 150 feet is within a corridor that meets specific requirements as to width, height, obstructions, dead ends, and openings. (3302(d))

The smoke partitions could be constructed of wire glass, gypsum or other suitable materials. Construction similar to the existing corridor walls is also acceptable. The barriers must extend from exterior wall to exterior wall and from the floor to the underside of the floor or roof above, through any concealed or void spaces. Existing walls and partitions can be used to help form this continuous barrier.

The doors need not swing in the direction of exit travel, but double-acting doors are not acceptable. Doors shall close automatically upon the activation of an associated smoke detector. Doors, when closed, must fit tightly and prevent the passage of smoke. Requirements for minimum corridor or hallway dimensions should be complied with as closely as possible. See Section 7: TRAVEL DISTANCE, if travel distance limitations are exceeded.

-or-

Solution: Provide additional exit(s) (e.g., stair, fire escape, fire balcony).

Discussion: If separation of the exit(s) as discussed above is not possible, then additional exit(s) must be provided so that all occupants will have remote access to the required number of exits. The quality of the additional exit(s) (e.g., interior stair vs. escape ladder) will depend upon the use and occupancy of the building. If a high quality remote exit is provided (e.g., interior stair), single station smoke detectors need not be provided, unless otherwise locally required.

7
Travel Distance

Summary of Code Requirements and Intent

CODE INTENT

The intent of requirements governing the maximum travel distance to an exit is to limit the time an occupant needs to reach an exit. When combined with the requirements for a

Discussion: The single station smoke detector will provide added time for escape. Additionally, the expected severity of fires in residential occupancies should be contained by 1 hour fire resistive construction.

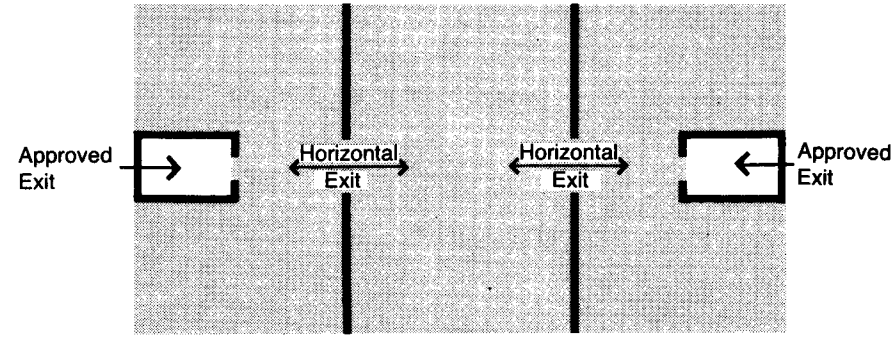
2.2
Problem: Fire resistance of the opening protection, as determined above, is below that required by code.

Solution: One hour doors may be accepted in a wall assembly having 2 hours fire resistance if protected on both sides by automatic sprinkler protection. These sprinklers may be connected to the domestic water supply and need not be equipped to sound a building alarm. Otherwise, the door must be upgraded to meet the code requirements or replaced.

Discussion: The water spray from the local sprinkler will compensate for the reduced fire resistance.

2.3
Problem: The only exit from an area of refuge is another horizontal exit, in violation of the code.

Solution: Accept such an arrangement (i.e., *one* intermediate compartment) if the fire resistance of all walls or partitions separating the compartments, and of the protection of all openings in the walls or partitions, fully complies with the code requirements. The following figure illustrates this solution.



* The area of refuge to which the horizontal exit leads must have either a complying exit stair or exterior exit door.

Discussion: As shown above, the area of refuge reached after passing through the intermediate compartment must have a complying stair or exterior exit door.

3
Interior Stairs/Enclosures

Summary of Code Requirements and Intent

Enclosed stairs are recognized as an exit by all codes if they are properly designed and constructed. In multi-story buildings they are the most likely type of exit to be encountered. They provide a protected means for evacuation of a building by its occupants. By their nature as a vertical shaft through a building, stairs also provide a potential path for the spread of fire from floor to floor.

CODE INTENT

Requirements for a fire resistive enclosure of stairs are established in order to achieve the following objectives:

- To provide a protected way from any story of a building to a public way or to an area of refuge;
- To limit the spread of fire from floor to floor;
- To provide a protected access for fire service personnel.

CODE ANALYSIS

Basic Building Code - 1978

Required interior exitway stairs must have an enclosure of 1 hour fire resistance in buildings three stories or less, 2 hour fire resistance rating in buildings four stories or more. Stairs within a single dwelling unit are excepted. Also excepted, when automatic sprinkler protection is provided, are stairs between no more than three communicating floors close to street level which serve no more than 1/2 the required occupant load and which have adequate capacity for all occupants of all the communicating levels.

Identifying Existing Conditions

Note the arrangement of the acceptable exit elements on the building plans or analyze by a visual inspection of the physical structure.

Selected Problems and Representative Solutions

6.1
Problem: The required exits are not remote from one another.

Solution: Separate the non-remote exits by smoke barriers located as to establish distinct and separate smoke zones.

Discussion: With certain building configurations it is possible to isolate non-remote exits from one another. By constructing smoke barrier partitions, the requirement of direct access to the exits in separate directions can be met. Figure 1 illustrates this concept. No matter where the fire may originate, any occupant can safely pass from one zone into another. This approach would not work for the building in Figure 2 because these exits, though now in separate zones, cannot be reached by moving in separate directions: a fire blocking one exit would block the second.

FIGURE 1
ACCEPTABLE

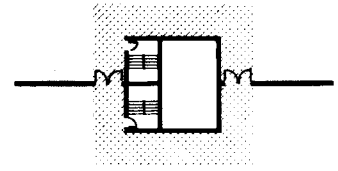
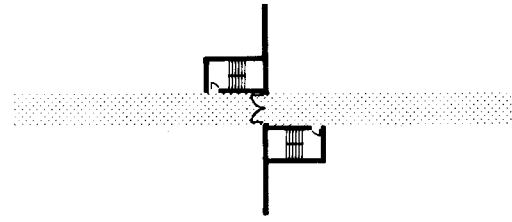


FIGURE 2
NOT ACCEPTABLE



6
Arrangement of Exits

Summary of Code Requirements and Intent

CODE INTENT

The intent of providing exit remoteness, when two or more exits are required, is to minimize the probability that access to the exits will be blocked by any one fire. The term "remote" is subjective and frequently a matter of interpretation.

Exits which appear to be remote from each other sometimes converge at a distant point. Stairways discharging into a common lobby or passageway are examples. These exits are not truly remote because a blockage at the point of confluence renders both exits useless.

CODE ANALYSIS AND SUMMARY

Exits must be located so that they are discernible and have unobstructed access. They also must be arranged to lead directly to the street. When more than one exit is required, exits must be as remote from each other as practicable, and must be arranged to allow direct access in separate directions. Exits shall be arranged and constructed as to minimize any possibility that both may be blocked by any one fire or other emergency condition. (BOCA: 602.2, 602.3; SBCC: 1103.1; NFPA: 5-5)

The Uniform Building Code has a prescriptive technique for determining exit remoteness. If two exits are required, they must be placed a distance apart equal to not less than 1/2 the length of the maximum overall diagonal dimension of the building or area to be served measured in a straight line between exits. An exception is made for exit enclosures interconnected by an approved corridor. Where three or more exits are required, they must be arranged a reasonable distance apart so that if one becomes blocked the others will be available. (UBC: 3302(c))

Stairway doors must be self-closing and have 1 hour fire resistance in 1 hour construction and 1-1/2 hours fire resistance in 2 hour construction. Labeled fire doors shall have a maximum transmitted temperature end point of not more than 450°F above ambient at the end of 30 minutes of standard fire test exposure. Other openings are limited in area and must be protected. (616.6.3, 616.9.2, Table 214)

Uniform Building Code - 1979

For new construction, interior stairways are required to be enclosed, with the following exception: stairways in one- and two-family dwellings and within individual apartment units. Enclosure walls must be a minimum of 2 hour fire resistive construction in buildings more than four stories in height and not less than 1 hour fire resistive construction elsewhere. All exit doors in an exit enclosure must be protected by a fire assembly having a fire resistance of not less than 1 hour where 1 hour shaft construction is permitted and 1-1/2 hours where 2 hour shaft construction is required. Doors must be maintained self-closing or automatic closing by actuation of a smoke detector. The maximum transmitted temperature end point shall not exceed 450°F above ambient at the end of 30 minutes of fire exposure. (3308(a)-(c), 4306(b))

Appendix Chapter 12 is a retroactive provision that establishes minimum requirements for all existing apartment buildings and hotels more than two stories in height. Because all such buildings in a community would be required to comply with these minimum safety regulations, Section 103 of the Uniform Code provides that a community must specifically adopt the Appendix for its provisions to apply.

Appendix Chapter 12 sets forth the following requirements. Every interior stairway must be enclosed with walls of at least 1 hour fire resistive construction. Wood lath and plaster in good condition is acceptable for this purpose. The stairway need not be enclosed in a continuous shaft if cut off at each story by 1 hour fire resistive construction. Enclosure is not required if an automatic sprinkler system is provided in all portions of the building except apartments. Stairway doors must be self-closing and equivalent to a solid wood door not less than 1-3/4 inches thick.

Standard Building Code - 1979

Required exit stairs must be enclosed in 1 hour fire resistive construction in buildings three or less stories in height; 2 hour fire resistive construction in buildings four or more stories in height. Exceptions are similar to those noted above for the Basic Building Code. (1106)

Doors in stairs must be 1-1/2 hour fire resistive assemblies for 2 hour walls, and 1 hour fire resistive assemblies for 1 hour walls. The maximum transmitted temperature end point shall not exceed 450°F above ambient after 30 minutes of standard fire test exposure.

NFPA Life Safety Code - 1976

Stairways must be protected as follows:

Fire resistance of walls in buildings of one-three stories shall be 1 hour; four or more stories, 2 hours. Fire resistance of doors in buildings of one-three stories shall be 3/4 hour; four or more stories, 1-1/2 hours. In buildings provided with total automatic sprinkler protection, the fire resistance of walls in buildings of one-three stories may be reduced to 3/4 hours; four or more stories, 1 hour. The fire resistance of doors in sprinklered buildings of any height shall be 3/4 hour. (11-3.5.3.1.1, 11-3.8.3.1.1)

Exceptions, including the exception allowing unenclosed stairs as part of communicating floors, are similar to those noted above for the Basic Building Code. (6-1)

SUMMARY

The Basic, Standard, and Life Safety Codes generally have identical provisions (2 hours with 1-1/2 hour door over three stories; 1 hour enclosure and door below four stories), except that the Life Safety Code only requires a 3/4 hour door in a 1 hour stair enclosure. The Uniform Code differs in that buildings up to four stories, rather than three stories, only need a 1 hour enclosure. The Uniform Code, Appendix Chapter 12, contains much more lenient requirements for existing residential buildings.

Identifying Existing Conditions

- Determine that the soundness and structural serviceability of the fire escape is as required by code;
- Determine that access to fire escape(s) is as required by code;
- Determine the fire resistance of the protection of openings by reference to labels, the code in effect, current listings, or the *Guideline on Fire Ratings of Archaic Materials and Assemblies.*

Selected Problems and Representative Solutions

5.1

Problem: Fire resistance of the opening protection, as determined above, is below that required by the code in effect.

Solution: Upgrade the fire resistance of the opening protection by repairing the existing construction or adding a new layer(s) of fire rated materials. See the *Guideline on Fire Ratings of Archaic Materials and Assemblies.* Windows must be wire glass in steel frames, sealed, or otherwise made to comply with the code.

-or-

Solution: Install local sprinklers over opening protection. Such sprinklers may be connected to the domestic water supply and need not sound an alarm upon activation. Windows must be protected as above.

Discussion: The water spray on the exposed surface will compensate for the reduced fire resistance. The sprinklers should be located on the inside of the opening.

Uniform Building Code - 1979

Fire escapes are not allowed for new construction.

Appendix Chapter 12, where specifically adopted, permits fire escapes to be used as one means of escape in existing buildings. Under specified conditions a "ladder device" may be used "in lieu of a fire escape". There are no requirements for protection of adjacent openings. (Appendix Chapter 12, 1215(h))

Standard Building Code - 1979

If "more adequate exit facilities cannot be provided", fire escapes can be used on existing buildings four stories or less in height. Fire escapes cannot provide more than 50% of the required exit capacity. All openings within 10 feet of fire escapes must be protected with approved opening protectives of at least 3/4 hour fire resistance. (1116)

NFPA Life Safety Code - 1976

Fire escape stairs may be used only in existing buildings, but cannot constitute more than 50% of the required exit capacity. Openings within specified limits "shall be completely protected by approved fire doors or metal-frame wire glass windows". (5-2.9)

SUMMARY

Fire escapes are not accepted as a means of egress for new construction. The Basic, Standard, and Life Safety Codes permit fire escapes in existing buildings, but only up to 50% of the required exit capacity. Appendix Chapter 12 of the Uniform Code, when adopted, allows a fire escape as "one means of egress" in "existing nonconforming . . . [apartments] more than two stories in height". All codes except Appendix Chapter 12 require adjacent openings to be protected, though the provisions are not consistent and there are exceptions. The codes all contain other highly specific construction specifications.

Identifying Existing Conditions

- Determine the location of all unenclosed stairs;
- Determine the fire resistance of stair enclosures and doors by reference to the code in effect, current listings, or the *Guideline on Fire Ratings of Archaic Materials and Assemblies.*

Selected Problems and Representative Solutions

3.1
Problem: The fire resistance of the stair enclosure, as determined above, is below that required by the code in effect.

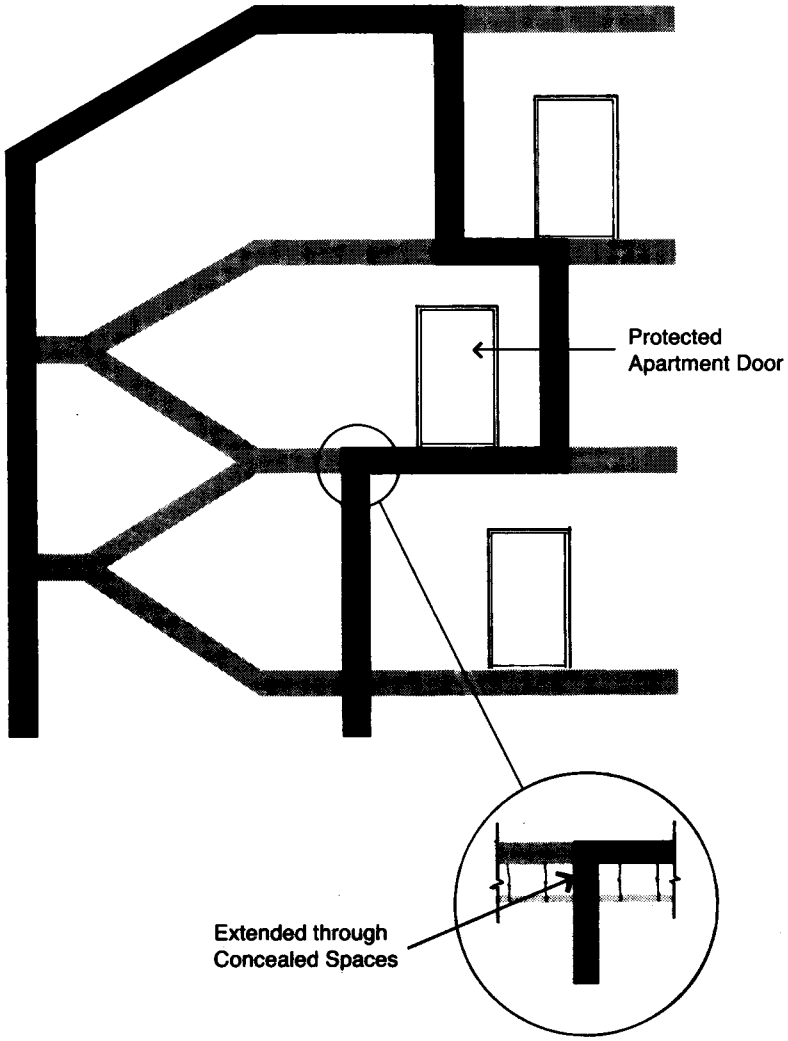
Solution: The fire resistance of the stair enclosure should be improved by repairing the existing construction or adding a new layer(s) of fire resistant materials. See the *Guideline on Fire Ratings of Archaic Materials and Assemblies.*

Discussion: If the fire resistance is upgraded to code requirements, single station smoke detectors need not be installed, unless otherwise locally required.

3.2
Problem: A 2 hour enclosure is required and an unenclosed stair does not meet the applicable code exception for communicating floors.

Solution: The stair may be enclosed at each story by construction having 1 hour fire resistance. The walls forming this enclosure may be located on each story wherever convenient, but as close as possible to the stair. Walls should extend through any concealed or void spaces to the underside of the floor or roof above. Any area or section of a floor/ceiling assembly necessary to form a continuous enclosure from story to story must also have 1 hour fire resistance.

If necessary, a limited number of apartment doors may open directly onto the stair enclosure. These doors must provide 1 hour fire resistance, be self-closing, and meet all other code requirements for stairway doors. The following figure illustrates this solution.



Discussion: If the fire resistance is upgraded to code requirements, single station smoke detectors need not be installed, unless otherwise locally required.

-or-

Solution: Install local sprinklers over opening protection. Such sprinklers may be connected to the domestic water supply and need not sound an alarm upon activation. Windows must be protected as above.

Discussion: The water spray on the exposed surface will compensate for the reduced fire resistance. The sprinklers should be located on the inside of the opening.

5
Fire Escape Stairs

Summary of Code Requirements and Intent

CODE INTENT

The code intent is to regulate the quality of the required means of escape. Fire escapes are not favored because they are more difficult to traverse and afford less protection to occupants than other types of exits, such as enclosed interior stairs or exit passageways. However, properly designed and protected fire escapes can sometimes provide a practical solution when the existing number of exits or exit capacity is less than required.

CODE ANALYSIS

Basic Building Code - 1978

Fire escapes are permitted only on existing buildings, and then only when "more adequate exitway facilities cannot be provided". Fire escapes cannot provide more than 50% of the required exit capacity. Doors and windows "along the fire escape" must be protected with 3/4 hour fire resistance rated opening protectives. (621.0).

Codes only permit exterior stairs in pairs, though a single stairway is acceptable under the Basic Code if the building only requires a single exit. The Uniform Code does not require exterior stairs in pairs, but waives the requirement for opening protection if the second stair is provided. For existing buildings, the Uniform Code, Appendix Chapter 12, does not require the protection of openings for a single exterior stair. Only the Life Safety Code requires a "visual" enclosure for the benefit of persons afraid of heights.

Identifying Existing Conditions

Determine the fire resistance of walls or opening protectives within or adjacent to the exterior stairs by reference to labels, the code in effect, current listings, or the *Guideline on Fire Ratings of Archaic Materials and Assemblies.*

Selected Problems and Representative Solutions

4.1
Problem: The fire resistance of the opening protection, as determined above, is below that required by the code in effect.

Solution: The openings need not be protected if there are a minimum of two exterior stairs located as to provide remote means of egress from an exterior exit balcony.

Discussion: This solution is recognized by the Uniform Code. It is unlikely that a fire would block the access to or the use of both exterior stairs. The requirement for single station smoke detectors is added justification.

4.2
Problem: Fire resistance of the opening protection, as determined above, is below that required, and there is only a single exterior stair.

Solution: Upgrade the fire resistance of the opening protection by repairing the existing construction or adding a new layer(s) of fire rated materials. See the *Guideline on Fire Ratings of Archaic Materials and Assemblies.* Windows must be wire glass in steel frames, either fixed or automatically closing, sealed, or otherwise made to comply with the code.

Discussion: This solution provides a protected way of escape from any story while limiting the potential of fire spreading from floor to floor. The population density is low and the fire loading should not be excessive. Single station smoke detectors will allow more time for escape.

3.3
Problem: A 1 hour enclosure is required, and an unenclosed stair does not meet the applicable code exceptions for communicating floors.

Solution: The stair may be enclosed at each story by construction having a fire resistance of 45 minutes (e.g., 1/2 inch type X gypsum wallboard). Up to 25% of the wall area on any given floor may be fire-rated wire glass in a steel frame. Substantial doors (e.g., minimum 1-3/4 inch solid bonded core door) may be used if equipped with self-closing devices.

Discussion: Reducing the required fire resistance from 1 hour to 45 minutes should still allow adequate time for safe escape given the smoke detectors and low occupant loading. The use of wired glass is often least objectionable from architectural and security considerations.

3.4
Problem: A 1 hour enclosure is required, and the stairway is enclosed with wood lath and plaster construction.

Solution: Accept the existing enclosure if it is in good condition and all penetrations and openings are either sealed or properly protected. A visual check should be made to insure the quality of the existing construction. There should be no other serious code deficiencies in the building.

Discussion: The presence of smoke detectors, the absence of any other serious code deficiencies, and the limited occupant loading make it reasonable to allow the existing enclosure to remain.

4
Exterior Exit Stairs

Summary of Code Requirements and Intent

CODE INTENT

The code intent for exterior stairs is the same as for interior stairs. However, because the stairs are outside the building, they do not create a vertical shaft through which the fire could spread. An important consideration, though, is the proximity of an exterior stair to openings in the exterior walls: a fire inside of the building could break out windows or other openings and cause the stair to become impassable.

A visual enclosure is sometimes required for exterior or outside stairs so that acrophobia (fear of heights) will not impede travel or lead to panic.

CODE ANALYSIS

Basic Building Code - 1978

Exterior stairs are accepted in buildings not exceeding five stories or 65 feet in height and if at least one door from each tenant opens onto a roofed-over open porch or balcony served by at least two stairways. Only one stairway is required if the code only requires a single exit. Requirements for fire doors are not imposed, though handrails and guards must be provided as for interior stairs. In buildings three or more stories in height, openings below and within 10 feet horizontally of the exterior stairs must be protected by "automatic opening protectives" of 3/4 hour fire resistance. Exterior stairs must conform to the requirements for interior stairs in all other respects. (619.0)

Uniform Building Code - 1979

For new construction, exterior stairs must meet the requirements for inside stairs except for opening protection. In buildings three or more stories in height, openings below or within 10 feet mea-

sured horizontally must be protected by a self-closing fire assembly having 3/4 hour fire resistance, except that openings may be unprotected when two separated exterior stairways serve an exterior exit balcony. (3305, 3305(1))

In existing buildings (Appendix Chapter 12, where specifically adopted), the only requirements are that exterior stairs must be noncombustible or of wood of not less than 2 inch nominal thickness with solid treads and risers. (Appendix Chapter 12, 1215(g))

Standard Building Code - 1979

Exterior stairs may be used in buildings not exceeding six stories or 75 feet in height if at least one door from each tenant opens onto a roofed-over open porch or balcony served by at least two stairways so located as to provide a choice of independent means of egress leading directly to grade. Openings below and within 10 feet horizontally of the exterior stair must be protected with 3/4 hour fire resistive automatic opening protectives; opening protection is not required for buildings not more than three stories in height where all parts of the exterior stair are at least 6 feet from the building wall. Exterior stairs must conform to the requirements for interior stairs in all other respects. (1129)

NFPA Life Safety Code - 1976

Where interior stairs are required to be enclosed, exterior stairs must be separated from the interior of the building by fire resistive walls as required for interior stair enclosures; fire doors or fixed wire glass windows must protect any openings therein. Such protection is not required in buildings three stories or less in height where there is a remote second exit. Other openings within specified distances must be protected. A "visual" enclosure must be provided for the benefit of persons afraid of heights. Exterior stairs must conform to the requirements of interior stairs in all other respects. (5-2.5)

SUMMARY

The codes differ as to both when an exterior stair may be allowed and the need for protection of openings. The Basic and Standard