

Nationally Applicable Recommended Rehabilitation Provisions

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Office of Policy Development and Research

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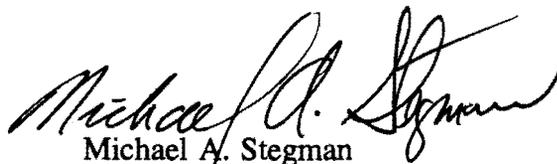
FOREWORD

The Nation's stock of existing buildings, both residential and nonresidential, represents a diverse and valuable asset for our society. As this stock grows older, maintenance and renovation become more common. Moreover, as our collective needs evolve, buildings may be put to new and more productive uses. While it is a relatively straightforward procedure to set out requirements for the design and construction of new buildings, the broad spectrum of activities falling under the general heading of "rehabilitation" have proven more difficult to regulate in a rational, predictable manner. Building officials generally have wide discretion in determining the nature and extent of improvements required when buildings are rehabilitated or converted to new uses. Owners and designers, even after reviewing the applicable codes, are correspondingly uncertain about what they can and cannot do.

Local experiences have indicated that regulatory requirements may serve as a significant barrier to improving buildings that were not built under today's system of codes. The unintended result can be the perpetuation of unsafe or inadequate conditions and the continuing underutilization of existing buildings.

In an attempt to bring order and clarity to the process of regulating work in existing buildings, HUD has sponsored development and publication of the Nationally Applicable Recommended Rehabilitation Provisions (NARRP), which set forth a recommended framework for addressing all types of work in every type of building. These provisions are intended to be suitable for use by State and local jurisdictions or model code organizations with a minimum of adaptation. They incorporate the philosophy that improvements required when work is being done in existing buildings should be proportional to the nature and extent of the underlying work. While such principles have been applied informally in the past, NARRP goes much further by making them explicit.

HUD has a long standing interest in rehabilitation activities, not merely in housing but in all buildings. As a country, we are surrounded by opportunities to improve our built environment. NARRP will help to ensure that we make the most of those opportunities.


Michael A. Stegman
Assistant Secretary for Policy
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PREFACE

The regulation of work in existing buildings is one of the most highly variable parts of the building regulatory system. The major U.S. model codes lack specificity and differ significantly from one another in the way they address rehabilitation. The process of state and local adoption introduces additional variations in an attempt to implement workable rules for application in the field. Unpredictable or unrealistic requirements are an impediment to the beneficial re-use of the existing building stock. The result in too many urban areas is a deteriorating stock of existing buildings that cannot be rehabilitated economically.

The Nationally Applicable Recommended Rehabilitation Provisions (NARRP) contained in this document offer a new approach to regulation of work in existing buildings. They are written to cover the entire spectrum of potential work, from repairs to reconstruction, in every type of building, including historic buildings. They also clarify, for the first time, the extent to which existing conditions that fall short of current code requirements for new construction must be addressed in connection with other building improvements. The provisions are written to ensure that public health, safety and welfare are maintained or enhanced as work is performed, and to require more upgrades to be included as more work is performed on a voluntary basis. While in many cases these upgrades will not bring a building into compliance with current codes for new construction, in every case they represent improvements in conditions that could otherwise be legally permitted to continue unabated in existing buildings.

In addition to the substantive provisions that constitute the NARRP, this document includes extensive Commentary giving background on the underlying issues, explaining how to use the document, discussing the intention of specific provisions, identifying possible alternative approaches and highlighting the relationships between various sections of the NARRP. The Commentary appears in shaded boxes that are clearly set off from the substantive provisions, and is included to assist potential adopters and users in interpretation and application of the provisions.

The NARRP include various references to building, mechanical, plumbing and electrical codes, and are intended to be used in conjunction with such codes. They also require upgrades for accessibility, seismic protection and energy conservation in certain situations, and they generally prohibit the use of obsolete products containing asbestos or lead in any type of work. The underlying philosophy was to remain within the scope of current regulatory requirements for work in existing buildings, so no attempt has been made to introduce expanded requirements for asbestos or lead-based paint abatement, disaster mitigation or similar types of improvements that might be desirable but are not presently required under code provisions relating to existing buildings. The Commentary accompanying the NARRP includes references to a variety of currently available guidance materials on these topics.

At this point the NARRP are the latest word, but certainly not the last word, concerning the regulation of work in existing buildings. Users of the document are encouraged to provide feedback on the NARRP to the Office of Policy Development and Research at the U.S. Department of Housing and Urban Development, 451 Seventh Street, S.W., Washington, D.C. 20410.

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A GUIDE TO USE OF THE NARRP

The following steps are recommended for use in determining how to apply the NARRP to specific work in an existing building:

1. Read Chapters 1 and 2 to determine the applicable category of work, to define the work area, and to determine if the building is a historic building.
2. If the category of work is repair, refer to Chapter 3 for the applicable requirements, and if the building is a historic building, refer to Chapter 9 for applicable exceptions.
3. If the category of work is renovation, refer to Chapter 4 for the applicable requirements, and if the building is a historic building, refer to Chapter 9 for applicable exceptions. Note that Appendix 1 is referenced in Chapter 4.
4. If the category of work is alteration, refer to Chapter 5 for the applicable requirements as well as to Chapter 4 referenced therein, and if the building is a historic building, refer to Chapter 9 for applicable exceptions.
5. If the category of work is reconstruction, refer to Chapter 6 for the applicable requirements as well as to Chapters 4 and 5 referenced therein, and if the building is a historic building, refer to Chapter 9 for applicable exceptions.
6. If the category of work is change of occupancy, refer to Chapter 7 for the applicable requirements as well as to Chapter 6 referenced therein, and if the building is a historic building, refer to Chapter 9 for applicable exceptions. Note that Appendix 2 is referenced in Chapter 7.
7. If the applicable category of work is addition, refer to Chapter 8 for the applicable requirements.

INTRODUCTION

1. Purpose and Intent of the NARRP

The reuse of existing buildings and their adaptation to new uses are currently often discouraged by the extreme non-uniformity in regulation of work in existing buildings across the country, and by the often arbitrary, unreasonable or unjustified application of new construction requirements to such buildings. Furthermore, current regulatory approaches that rely extensively on the judgment of local building officials are not only unpredictable, but can ultimately perpetuate unsafe or inadequate conditions even where beneficial opportunities for adaptation and re-use exist. Such concerns highlight the need for an improved approach to regulating rehabilitation. These Nationally Applicable Recommended Rehabilitation Provisions (NARRP) have been developed in response to problems in the current system.

The purpose of the NARRP is to set forth a regulatory framework that will encourage the continued use or re-use of legally existing buildings through a predictable system of requirements that will maintain or improve public health, safety and welfare. The intention is to clarify the requirements that apply when different types of work are performed in existing buildings, and to establish proportionality between the work an owner of an existing building intends to do on a voluntary basis and the additional improvements required to accompany that work as matter of regulatory policy. A regulatory framework that achieves such proportionality will go far towards ensuring that building rehabilitation work will be both affordable and cost effective.

The NARRP implement this proportionality by expanding the term "alteration", currently used by the model codes to cover work in an existing building, into three terms: "renovation", "alteration" and "reconstruction." These correspond to categories of work to which the NARRP assign requirements that increase both in nature and in scope as the voluntary work changes from one category to the next. By this means the NARRP substitute precision for the often variable and arbitrary requirements currently assigned to the term "alteration." This difference is illustrated in Figures 1 and 2 below, and is explained in more detail in the section "Categories of Work Under the NARRP" later in this Introduction.

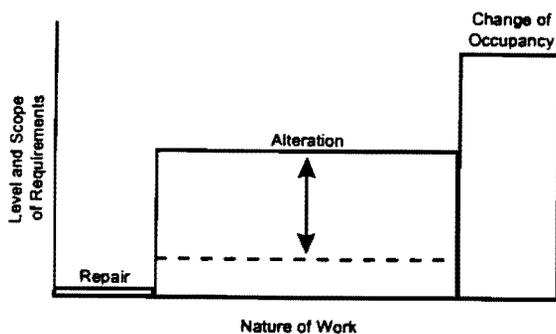


Figure 1
Current Building Codes

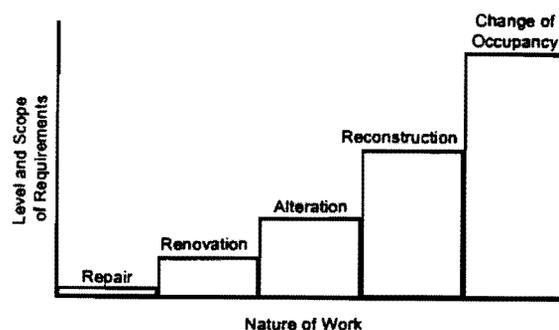


Figure 2
NARRP Proposed Approach

2. The Current Regulatory System as Applied to Rehabilitation

Most states and local jurisdictions adopt (with or without amendments) one of the three model building codes: the *National Building Code* or NBC, published by the Building Officials and Code Administrators International, Inc. (BOCA); the *Standard Building Code* or SBC, published by the Southern Building Code Congress International (SBCCI); and the *Uniform Building Code* or UBC, published by the International Conference of Building Officials (ICBO). All three address work in existing buildings in their respective Chapters 34. While each code addresses existing buildings using the same basic terminology ("repair", "alteration", "additions" and "change of occupancy") a close examination shows that each code is different. All three require alterations to comply with the building code. However, while the NBC and UBC specify that this be done without requiring the rest of the building to comply, the SBC allows the building official to determine the extent to which the rest of the building shall be made to comply. The differences between the three codes are more extensive in the case of change of occupancy, where the UBC requires compliance with the building code with an exception based on risk analysis, the SBC requires compliance with the intent of the building code, and the NBC requires compliance with the intent of the code and provides a detailed rating system that is intended to establish compliance alternatives that meet the code's intent.

In addition, two of the three model code organizations publish separate model codes that address existing buildings: the SBCCI *Standard Existing Buildings Code* (SEBC) and the ICBO *Uniform Code for Building Conservation* (UCBC). These two codes also differ from each other.

When the model building codes are adopted by states and local jurisdictions, Chapter 34 is frequently and extensively amended. This leads to non-uniformity at the local level even within a single model code's region. Massachusetts and New Jersey, for example, are states that use the BOCA National Codes, but both have found that Chapter 34 of the BOCA NBC does not suit their needs, and deleted it in its entirety when adopting the model code. Massachusetts developed its own rehabilitation requirements in 1979, now Article 32 of its building code, with the purpose of encouraging the reuse of existing buildings. New Jersey continued to maintain the "25-50% rule", a cost-based trigger of new construction requirements in existing buildings, even after it was dropped from the NBC.

This situation of diversity among jurisdictions is further compounded because the model codes (to varying degrees) leave much of the regulation of work in existing buildings to the discretion of the local building official. There is evidence that local officials, in exercising this discretion, sometimes fall back on the "25-50% rule", or some other cost-based trigger, in requiring compliance with the code for new construction. And while the SEBC and UCBC were developed to provide uniform guidance to officials in exercising discretion, neither code is widely adopted and there is little information indicating the extent of their use, even as reference materials.

The International Code Council (ICC) has begun the process of developing the *International Building Code* (IBC), and the resolution of differences among the three model codes is one part of that process. Work in existing buildings will be addressed either as Chapter 34 of the IBC, or as a separate code for existing buildings.

3. U.S. Department of Housing and Urban Development Initiative

The National Symposium on the Status of Building Regulations for Housing Rehabilitation, sponsored by the U.S. Department of Housing and Urban Development (HUD), was convened by the NAHB Research Center on May 16-17, 1995. The meeting included representatives of the three model building codes, code enforcement officials operating under these codes, the National Fire Protection Association (NFPA), and the National Institute of Building Sciences (NIBS). Representatives from various states and cities presented their respective alternate approaches to the regulation of rehabilitation. The symposium concluded with a list of five recommendations for follow-on activity that could be accomplished under HUD sponsorship, the third of which was:

- Develop a self-contained, national model rehabilitation code to be proposed for adoption by the three model code organizations.

In pursuit of this recommendation, the NARRP are being developed for HUD with the expectation that they will be made available to interested state and local government agencies and offered for consideration by the ICC in resolving the rather extensive differences among the three current versions of Chapter 34.

4. Related Efforts in New Jersey

The starting point for the development of the NARRP is the *Code for Rehabilitation of Existing Buildings* under development in New Jersey. Three criteria were defined for New Jersey's new system:

- Timeliness (i.e., few projects handled as special cases),
- Predictability (i.e., due process---people need to know the law applicable to them and be free from arbitrary treatment), and
- Reasonableness (i.e., provide a reasonable level of safety without imposing excessive additional costs).

New Jersey analyzed several current approaches to the regulation of work in existing buildings in light of these criteria. The analysis focussed on three approaches:

- Article 32 of the Massachusetts building code,
- the *Uniform Code for Building Conservation*, and
- Chapter 34 of the *BOCA National Building Code*.

New Jersey's intention is for its *Code for Rehabilitation of Existing Buildings* to combine the best features of each of these three approaches.

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5. Relationship to Other Regulatory and Public Policy Goals of Building Rehabilitation

There are several areas of Federal policy that impact buildings and the built environment. These include:

- energy conservation,
- accessibility,
- disaster mitigation (earthquakes, floods, hurricanes, etc.), and
- environmental health, including indoor air quality.

In each of these areas, one vehicle for implementing the Federal policies is building regulation in general, and building codes in particular. Federal efforts in some of these areas have resulted in specific changes to the model building codes. Such changes however, impact mainly new construction, that is to say, a small part of the national inventory of buildings. Many of the Federal agencies involved have recognized that the impact of these policies can be maximized if changes would be made to existing buildings. As a result, they have undertaken efforts to address this issue by developing guidelines or in some cases proposed regulations for application to existing buildings. Some of the materials developed as a result of these efforts are discussed below.

Energy conservation: The following guidance documents have been published in this area:

- *HUD Rehabilitation Energy Guidelines for One-to-Four Family Dwellings* (September 1996)
- *HUD Rehabilitation Energy Guidelines for Multi-Family Dwellings* (September 1996)

Energy upgrades may be required as a condition of project financing, and are often carried out by owners when economically beneficial.

Accessibility: HUD has promulgated regulations applicable to housing at 24 C.F.R. Part 100 in implementation of the Fair Housing Amendments Act of 1988, and the Department of Justice has promulgated regulations and standards applicable to public accommodations and commercial facilities at 28 C.F.R. Part 36 in implementation of the Americans with Disabilities Act of 1990 (ADA). Since passage of the ADA, all three model codes have made revisions to their accessibility requirements, included those applicable to existing buildings, in an attempt to be consistent with the ADA. The NARRP generally incorporate by reference the accessibility requirements in the applicable model code. HUD has also published the following guidance document relating to housing accessibility:

Residential Remodeling and Universal Design (HUD-1604-PDR, June 1996)

Disaster mitigation: The Federal Emergency Management Agency (FEMA) has addressed the areas of flood and earthquake mitigation. FEMA's flood mitigation policy is implemented through the vehicle of the National Flood Insurance Program and corresponding building code requirements. In this area it has published the following document:

- *Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings* (FEMA 259/January 1995)

FEMA's earthquake mitigation policy, in implementation of the National Earthquake Hazards Reduction Program (NEHRP), has relied heavily on building codes in the area of new construction. FEMA's existing buildings program under NEHRP has produced many guidance documents, culminating in the following related documents currently in final stages of development and balloting:

- *NEHRP Guidelines for the Seismic Rehabilitation of Buildings* (FEMA 273/September 1996)
- *NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings* (FEMA 274/September 1996)

It should be noted that FEMA has encouraged the use of financial incentives for earthquake mitigation which, if implemented, would reduce the need to rely on regulation.

Environmental health: Various federal agencies have developed policies addressing environmental hazards in buildings such as asbestos, lead-based paint and radon. The issue of indoor air quality is currently under study by the Environmental Protection Agency (EPA) and others. The building codes and other regulations have addressed the first three issues in new construction, but mitigation in existing buildings through regulation is an evolving area. For the most part, lead-based paint in existing buildings is regulated with little consistency by state and local health departments. Guidance documents in this area have been published by HUD, EPA and NIBS, and include the following:

- *Guidance Manual, Asbestos Operations & Maintenance Work Practices* (NIBS)
- *Asbestos Abatement and Management in Buildings, Model Guide Specifications* (NIBS)
- *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (HUD)
- *Lead-Based Paint Operations & Maintenance Work Practices Manual for Homes and Buildings* (NIBS)
- *Guide Specifications for Reducing Lead-Based Paint Hazards* (NIBS)

The NARRP have not incorporated the guidance materials in the areas of energy conservation, disaster mitigation and environmental health as mandatory requirements. This is because the NARRP is not intended to assume the regulatory policy-making responsibility of the Federal agencies. In the area of accessibility the NARRP has referenced the building code, in which arena the regulatory issue of ADA's application to existing buildings is being addressed.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

Building owners are encouraged to become familiar with the guidance materials and consider making appropriate use of them as they plan and execute rehabilitation projects. The NARRP view such work as voluntary activity of a type that should trigger little or no additional work.

The relationship of the NARRP to other areas regulated by local codes such as fire codes, housing codes and property maintenance codes, is addressed later in this Introduction.

6. Categories of Work Under the NARRP

As previously noted, the model codes currently address work in existing buildings under four categories:

- repair
- alteration
- change of occupancy
- addition

The NARRP expands the model code term "alteration" into three new terms that are defined:

- renovation
- alteration
- reconstruction

Thus the NARRP establishes six categories of work in existing buildings:

- repair
- renovation
- alteration
- reconstruction
- change of occupancy
- addition

Repair (Chapter 3) and *renovation* (Chapter 4) involve no reconfiguration of any space. The difference between the two is one of quantity (i.e., an extensive repair becomes a renovation) and the demarking line between them is left to the interpretation of users of the NARRP and ultimately the building official. Repairs are not likely to require a building permit. Under the NARRP, repairs may be done with like materials (with a few specific exceptions), even if those materials are no longer permitted by the building code, while renovations require the use of materials and methods specified in the building code. In neither case do the NARRP require work above and beyond that intended by the owner, even when the renovation is to the entire building. There are two exceptions in the case of renovations:

- some accessibility improvements (in accordance with the building code), and
- limited seismic improvements in unreinforced masonry buildings in higher seismic zones.

Voluntary structural strengthening of a building, thermal improvement of the building envelope, asbestos and lead-based paint abatement, and similar work are considered renovation as long as they involve no reconfiguration of spaces, and as such would entail no additional work beyond the two exceptions noted above.

Alteration (Chapter 5) is work that involves the reconfiguration of spaces other than exits and shared means of egress. Alterations are treated like renovations, except that alteration of an entire occupancy or over 50 percent of the building area moves it into the next category of *reconstruction*.

Reconstruction (Chapter 6) is work that involves the reconfiguration of spaces that includes exits and/or shared means of egress, or extensive alteration, as noted above. Reconstruction work must comply with the materials and methods specified in the building code (like *renovation* and *alteration*), and in addition it triggers a specified list of life safety (and some other) improvements limited, for the most part, to the work area intended by the building owner. The life safety improvements themselves are mostly less than code requirements for new construction. Some of the life safety improvements are extended to an entire floor when the work area intended by the building owner exceeds 50 percent of the area of the floor, and they extend beyond that when the intended work involves over 50 percent of the floors of a building.

The matrix in Table 1 below displays the main features of the NARRP requirements related to repairs, renovations, alterations and reconstruction as they apply to principal elements of a building. The columns labeled "Planned Work" summarize requirements for different types of work on various parts of the building as planned or intended by the building owner, while the columns labeled "Triggered Work" indicate additional work that the NARRP requires to be performed in addition to the planned work.

The NARRP approach to *change of occupancy* (Chapter 7) adopts the concept of use group hazard indices from the UCBC. A change of occupancy in a building, or portion thereof, to an equal or lower hazard rating is generally treated like a *reconstruction* throughout the portion or building. A change of occupancy to a higher hazard rating also triggers compliance with related building code requirements, with some exceptions.

Additions (Chapter 8) are treated by the NARRP much as they are in the model building codes. The addition must comply with building code requirements, but not the existing building.

Historic buildings (Chapter 9) undergoing repairs, renovations, alterations, reconstruction or change of occupancy are permitted specific additional exceptions to the requirements of the NARRP.

TABLE 1

OVERVIEW OF NARRP FOR REPAIR, RENOVATION, ALTERATION AND RECONSTRUCTION

Building element or system	Chapter 3: Repair		Chapter 4: Renovation		Chapter 5: Alteration		Chapter 6: Reconstruction	
	Planned Work	Triggered Work	Planned Work	Triggered Work	Planned Work	Triggered Work	Planned Work	Triggered Work
Structural system	like material	none	refinishing of load bearing elements (including fire resistance), or changing, strengthening or addition of load bearing elements: materials and methods	no reduction in design capacity accessibility per building code when area > 50%: reinforce URM buildings in high seismic zones	n.a.	no reduction in design capacity	n.a.	design loads at time of construction
Architectural spaces	like material except safety glazing	none	replacement: materials and methods code wall covering and carpeting	accessibility per building code when reroofing: parapet work in seismic zones	reconfiguration of spaces or tenancies: materials and methods	accessibility per building code when area > 50%: treat as reconstruction	n.a.	comply with renovation and alteration requirements
Shared egress spaces	like material except safety glazing	none	replacement: materials and methods	accessibility per building code	n.a.	n.a.	reconfiguration of egress spaces	improvements in work area, floor or building
Fire protection systems	like material	none	replacement of component: materials and methods	accessibility per building code	reconfiguration or extension of a system, or installation of a new system: materials and methods	accessibility per building code few selected improvements	n.a.	improvements in work area, floor or building
Mechanical, electrical and plumbing	like material with some exceptions	none	replacement of component: materials and methods	accessibility per building code		when area > 50%: treat as reconstruction	n.a.	comply with renovation and alteration requirements

Note: "n.a." indicates not applicable.

7. References to the Building Code (and to Other Codes) in the NARRP

The NARRP reflect the principle that an existing building in which work is to be undertaken need not be brought up to full compliance with the code requirements for new construction. Nevertheless, the NARRP contain a variety of references to particular requirements of the building code (and to plumbing, mechanical, electrical and/or fire codes). The reference is frequently to a particular chapter of the Building Code, based on the uniform format used by the three model building codes. These types of specific references and their linking to specific parts of the model codes are included for clarity. Where compliance with a particular model code provision is required, and where there are differences among the model codes, it is intended that users of the NARRP will refer to their own respective model code.

For jurisdictions where the building code is not based on a model code or is based on an earlier edition of a model code (before the adoption of the uniform format), the NARRP will have to be modified to properly reference the particular requirements in the applicable building code. Such modifications should be relatively straightforward, since the references are to specific requirements such as egress lighting or handrails.

Finally, there may be jurisdictions without a building code. In these cases, the references to the building code will be meaningless. A code based on the NARRP cannot realistically be utilized except in conjunction with a comprehensive building code.

8. Use of BOCA *National Building Code* Terminology in the NARRP

Chapter 2 of the NARRP contains definitions of terms used. Some of the definitions include terms used in the model building codes. One area where such terms differ among the three model codes is the definitions of Use Groups. In this case, the NARRP has arbitrarily selected the terminology of the BOCA *National Building Code*, rather than vastly expanding the verbiage in the definitions. Users of the other two model codes will have to convert some of these terms to their own terminology. When the International Code Council completes development of the *International Building Code*, it is expected that the NARRP will adopt its terminology.

9. Relationship of the NARRP to Fire Codes and Housing/Property Maintenance Codes

Some jurisdictions have adopted fire codes and/or housing/property maintenance codes. These codes establish minimum requirements for health and safety that all existing buildings are expected to meet regardless of whether they are undergoing work of any type. The sources of some of the NARRP requirements applicable to reconstruction are codes such as these. However, the NARRP applies them initially to the work area intended by the building owner, and not to the entire building. Thus, in a jurisdiction that has adopted a fire code and/or a housing/property maintenance code, compliance with the NARRP may not assure full compliance with the other codes. The coordination of enforcement of such codes with codes based on the NARRP, and possible revisions to the former, the latter or both, should be subject to local legal review.

CHAPTER 1. ADMINISTRATION

101.0 Purpose and Intent

101.1---The purpose of these provisions is to encourage the continued use or reuse of legally existing buildings and structures. These provisions are intended to permit repairs, renovations, alterations, reconstructions, additions, and/or changes of occupancy that maintain or improve the health, safety and welfare in existing buildings, without requiring full compliance with the Building Code except for proportional additional work as specified in these provisions.

The first sentence follows the *Uniform Code for Building Conservation*. The second sentence follows Article 32 of the Massachusetts Code, with some additional clauses.

101.2---All work shall be classified into six categories: repair, renovation, alteration, reconstruction, addition, and change of occupancy. Specific requirements are established for each work category in these provisions.

Work is classified into these categories in order to facilitate structuring proportional requirements for additional work.

101.3---Work of more than one category may be part of a single work project. All related work permitted within a twelve-month period shall be considered a single work project.

101.3.1---Where a project includes one category of work in one building area and another category of work in a separate and unrelated area of the building, each project area shall comply with the requirements of the respective category of work.

101.3.2---Where a project with more than one category of work is performed in the same area, or in related areas of the building, the project shall comply with the requirements of the more stringent category of work.

The term "related work" refers to work taking place in a contiguous area or areas of a building, as well as work on plumbing, mechanical or electrical systems in other areas that is necessary to complete the work in the contiguous area. The term "unrelated area" refers to a non-contiguous area of a building in which any work undertaken is not "related work."

102.0 Compliance

102.1---Repairs, renovations, alterations, reconstruction, additions, and changes of occupancy shall conform to the requirements of these provisions.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

102.2 Equivalent Alternatives---These provisions are not intended to prevent the use of any alternate material, alternate design or alternate method of construction not specifically prescribed herein, provided any alternate has been deemed to be equivalent and its use authorized by the Building Official.

This sentence follows Section 104.2.8 of the *Uniform Building Code* ("Alternate materials, alternate design and methods of construction"). Section 106.4 of the *BOCA National Building Code* ("Alternative materials and equipment") and Section 103.7 of the *Standard Building Code* ("Alternate Materials and Methods") are similar.

102.3 Other Alternatives---Where compliance with these provisions or with the Building Code or other Code as required by these provisions is technically infeasible or would impose disproportionate costs because of structural, construction or dimensional difficulties, other alternatives may be accepted by the Building Official. These alternatives may include materials, design features and/or operational features.

Section 102.3 provides for acceptance of alternatives that may not be deemed to be of fully equivalent safety in cases where the applicant can demonstrate that full compliance would work a hardship. In Boston, for example, three tests are used to support such a hardship application: (1) The cost of compliance in an existing building versus its cost in new construction, (2) the cost of compliance as a proportion of the cost of the total project, and (3) the cost of the total project versus the replacement cost of the building.

The inclusion of "disproportionate cost" as part of the authority to approve alternative solutions has traditionally been excluded from the model building codes because it is considered too subjective. It is included here because disproportionate cost is usually the reason building rehabilitation is not performed.

Examples of potential compliance alternatives under Sections 102.2 or 102.3 appear in *HUD Rehabilitation Guidelines/1980* No. 5 (*Egress Guideline*), No. 6 (*Electrical Guideline*) and No. 7 (*Plumbing DWV Guideline*). Whatever the source, it is important that records of all approved compliance alternatives be kept by the Building Official and attached to the building permit or the building file. These records may be needed in the future to document compliance with Section 401.3 which states that the "work shall not make the building less conforming with ... any previous approved alternative arrangements ..."

Another method the Building Official can use to judge the acceptability of alternatives under Sections 102.2 or 102.3 is to require peer review of the considered alternatives.

102.4---Buildings or systems in compliance with the current edition of the building, fire, plumbing, electrical or mechanical code shall not be required to comply with any more restrictive requirement of these provisions.

The intent of these provisions is to provide relief for rehabilitation work; it is not expected that these provisions would present more restrictive requirements. Section 102.4 is a contingency.

102.5---Elements, components and systems of existing buildings with features that exceed the requirements of the codes for new construction and not otherwise required as part of approved alternative arrangements, or deemed by the building official to be required to balance other building elements not complying with the codes for new construction shall not be prevented by these provisions from being modified as long as they remain in compliance with the applicable codes for new construction.

103.0 Nonconforming Rights (Existing Buildings)

103.1---Buildings in existence at the time of the adoption of these provisions may have their existing use or occupancy continued, if such use or occupancy was legal at the time of the adoption of these provisions, provided such continued use is not hazardous to life. Nothing in these provisions shall be interpreted as requiring the repair, renovation, alteration or reconstruction of such existing buildings.

104.0 Relationship to Other Codes, Rules, and Ordinances

104.1---It is not the intent of these provisions to supersede any codes or ordinances that address dangerous or unsafe buildings.

104.2---It is not the intent of these provisions to supersede any retroactive regulations that impose stricter requirements.

104.3---It is not the intent of these provisions to establish minimum standards of habitability for housing.

104.4---Renovations, alterations or reconstruction work mandated by any property, housing, or fire prevention code, or mandated by any licensing rule or ordinance, adopted pursuant to law, shall conform only to the requirements of that code, rule, or ordinance and shall not be required to conform to these provisions unless the code requiring such work so provides.

See the section titled "Relationship of the NARRP to Fire Codes and Housing/Property Maintenance Codes" in the Introduction.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

105.0 Preliminary Meeting

105.1---If a building permit is required then at the request of the prospective permit applicant, the Building Official or his designee shall meet with the prospective applicant to discuss plans for any proposed work or change of occupancy under these provisions prior to the application for the permit. The purpose of this preliminary meeting is for the Building Official to gain an understanding of the prospective applicant's intentions for the proposed work, and to determine, together with the prospective applicant, the specific applicability of these provisions.

A variety of issues should be covered in the preliminary meeting. Among the more important are the precise definition of the extent of the work area, as that term is defined in Chapter 2, and the necessary protections required in buildings that will be partially occupied during the work, in accordance with applicable codes.

106.0 Evaluation of an Existing Building

106.1---The Building Official may require an existing building to be investigated and evaluated by a registered design professional in the case of proposed reconstruction of any portion of a building, changes of use, additions, and upon other circumstances agreed upon at the preliminary meeting. The evaluation shall determine the existence of any potential non-conformities with these provisions, and shall provide a basis for determining the impact of the proposed changes on the performance of the building. The evaluation shall utilize the following sources of information, as applicable:

- Available documentation of the existing building.
- Field surveys.
- Tests (nondestructive and destructive).
- Laboratory analysis.

Exception:

1. Simple detached one- or two-family dwellings that are not undergoing an extensive reconstruction or a change of occupancy.

107.0 Permits

107.1---The work area, as defined in Chapter 2, shall be clearly identified on all permits issued under these provisions.

Permit requirements applicable to rehabilitation work are left up to individual jurisdictions. It is likely that some jurisdictions will not require permits for repair work. Whenever a permit is required, it should clearly identify the work area, which may be less than the scope of the project. This is because the scope of the work area is critical to the application of the NARRP.

CHAPTER 2. DEFINITIONS

201.0 General

The words and terms used in these provisions shall have the following meanings unless the context clearly indicates otherwise. Any term not defined herein which is defined in any other code applicable to these provisions shall have the meaning as defined in that code. Where a term is defined in these provisions and is also defined in another code, then the term shall have the meaning as defined herein wherever it is used in these provisions. Words used in the present tense include the future. Words in the masculine gender include the feminine and neuter. The singular number includes the plural and the plural number includes the singular.

202.0 Definitions

Building Code: The currently adopted building code of the jurisdiction.

Note that where reference is made to a particular chapter or section of the "Building code", the reference is based on the current uniform format of the three model codes, which in some cases will not match the format of the adopted building code of the jurisdiction.

Categories of work: The nature and extent of construction work undertaken in an existing building. The following categories of work entail increased requirements respectively:

Repair: The patching, restoration, and/or minor replacement of materials, elements, components, equipment and/or fixtures for the purposes of maintaining such materials, elements, components, equipment and/or fixtures in good or sound condition.

Renovation: The change, strengthening or addition of load bearing elements, the refinishing, replacement, bracing, strengthening, upgrading or extensive repair of existing materials, elements, components, equipment and/or fixtures. Renovation involves no reconfiguration of spaces. Interior and exterior painting are not considered refinishing for purposes of this definition, and are not renovation.

Alteration: The reconfiguration of any space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.

Reconstruction: The reconfiguration of a space which affects an exit, or element of the egress access shared by more than a single tenant; or renovation and/or alteration when the work area is not permitted to be occupied because existing means of egress and fire protection systems, or their equivalent, are not in place or continuously maintained; and/or extensive alterations as defined in Chapter 5 of these provisions.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

Change of occupancy: A change in the purpose or level of activity within a structure that involves a change in application of the requirements of the Building Code or of these provisions.

Addition: An increase in building area, aggregate floor area, height or number of stories of a structure.

"Repair" and "renovation" involve no reconfiguration of any space. The difference between the two is one of quantity (i.e., an extensive repair becomes a renovation) and the demarking line between them is left to the interpretation of users of the NARRP and ultimately the building official. See the Introduction for a detailed discussion of the categories of work.

Dangerous: Where the stresses in any member, the condition of the building or any of its components or elements or attachments, or other condition that results in an overload exceeding 150% of the stress allowed for the member or material in the Building Code.

This definition is extracted from the *Uniform Code for the Abatement of Dangerous Buildings*, where it is one of several conditions that cause a building to be deemed dangerous. The term is used in these provisions in relation to structural loads. In other contexts, the term "hazardous" is used.

Equipment or fixture: Any plumbing, heating, electrical, ventilating, air conditioning, refrigerating and fire protection equipment, and elevators, dumb waiters, escalators, boilers, pressure vessels and other mechanical facilities or installations, which are related to building services. Equipment or fixture shall not include manufacturing, production or process equipment, but shall include connections from building service to process equipment.

Existing building: Any building or structure erected prior to the adoption of the current Building Code of the jurisdiction and that has been issued a certificate of occupancy or has been legally occupied.

This definition is from the *Uniform Code for Building Conservation*.

Historic building: Any building or structure classified as historic by the federal, state or local government authority, or deemed eligible for such classification.

Load bearing element: Any column, girder, beam, joist, truss, rafter, wall, floor or roof sheathing which supports any vertical load in addition to its own weight, and/or any lateral load.

Materials and methods requirements: Those requirements in the building, plumbing, electrical, mechanical and fire codes that specify material standards, details of installation and connection, joints, penetrations and continuity of any element, component or system in the building. The required quantity, fire resistance, flame spread, acoustic or thermal performance, or other performance attribute is specifically excluded from materials and methods requirements.

The phrase "materials and methods requirements" is critical to understanding the requirements applicable to Renovations, Chapter 4, and appears elsewhere as well.

Rehabilitation: Any work, as described by the categories of work defined herein, undertaken in an existing building.

Technically infeasible: A change to a building that has little likelihood of being accomplished because the existing structural conditions require the removal or alteration of a loadbearing member that is an essential part of the structural frame, or because other existing physical or site constraints prohibit modification or addition of elements, spaces or features which are in full and strict compliance with applicable requirements.

Use group: The classification of an occupancy in accordance with the Building Code.

Work area: That portion of a building affected by any renovation, alteration or reconstruction work as initially intended by the owner and indicated as such in the permit. Work area excludes other portions of the building where incidental work entailed by the intended work must be performed, and portions of the building where work not initially intended by the owner is specifically required for a renovation, alteration or reconstruction as per Chapters 4, 5 and 6 of these provisions, respectively.

CHAPTER 3. REPAIRS

301.0 General

301.1---Repairs, as defined in Chapter 2, shall comply with the requirements of this Chapter.

Exception:

1. As modified in Chapter 9 for repairs in historic buildings.

302.0 Requirements

302.1---Except as is otherwise required herein, work shall be done using like materials, or materials permitted by the applicable Code for new construction.

302.1.1---Hazardous materials no longer permitted, such as asbestos and lead-based paint, shall not be used.

302.1.2---The following plumbing materials and supplies shall not be used:

1. All purpose solvent cement;
2. Flexible traps and tailpieces;
3. Sheet and tubular copper and brass trap and tailpiece fittings less than B&S 17 gauge (.045 inch); and
4. Solder having more than 0.2% lead in the repair of potable water systems.

"All purpose solvent cement", which may also be called "transition glue", is used to join different plastics to each other. Its prohibition is to avoid joining incompatible plastic pipes.

302.1.3---When any water closet is replaced, the replacement water closet shall comply with all applicable regulations governing water conservation.

302.1.4---Replacement glazing in hazardous locations shall comply with the Safety Glazing requirements of the Building Code.

302.2---The work shall cause no diminution of structural strength.

302.3---The work shall not make the building less conforming with the building, plumbing, mechanical, electrical or fire codes, or with any previously approved alternative arrangements, than it was before the repair was undertaken.

302.4 Electrical---Existing electrical wiring and equipment undergoing repair shall be allowed to be repaired or replaced with like material.

Exceptions:

1. Replacement of electrical receptacles shall comply with the applicable requirements of the Electrical Code.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

2. Plug fuses of the Edison-base type shall be used for replacements only where there is no evidence of over fusing or tampering per applicable requirements of the Electrical Code.
3. For replacement of non-grounding-type receptacles with grounding-type receptacles and for branch circuits that do not have an equipment grounding conductor in the branch circuitry, the grounding conductor of a grounding type receptacle outlet shall be permitted to be grounded to any accessible point on the grounding electrode system, or to any accessible point on the grounding electrode conductor, as allowed and described in applicable sections of the Electrical Code.
4. Non-"hospital grade" receptacles in patient bed locations of Use Group I-2 shall be replaced with "hospital grade" receptacles, as required by NFPA 99.
5. Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and outlet or junction boxes that are part of the existing branch circuit for these appliances shall be permitted to be grounded to the grounded circuit conductor if all the applicable conditions of the Electrical Code are met.

The difference between "repairs" and "renovations", as these terms are defined in Chapter 2, is mostly one of quantity. An extensive repair becomes a renovation, and a minor renovation may become a repair. Judgement is required in defining the precise demarkation line. The following examples of work may help clarify the difference:

1. The removal or replacement of any wall, partition, or extensive portion thereof, which is a renovation if the wall is replaced, an alteration if it is removed and space is reconfigured, or a reconstruction if it is in a shared means of egress and is removed;
2. The removal or cutting of any load bearing element, which is a renovation;
3. The removal or rearrangement of any part of a means of egress, or rearrangement of parts of a structure affecting egress requirements, which is an alteration if it affects egress within a tenant space, or a reconstruction if it affects shared egress;
4. Any work reducing structural or fire safety, if otherwise allowed by these provisions, which is a renovation;
5. Replacement or upgrading (which is a renovation), and addition to, or relocation (which is an alteration) of:
 - i. Any fire protection piping;
 - ii. Water supply, sewer, drainage, gas, oil, waste, vent, or similar piping;
 - iii. Electrical wiring, other than wiring for a low voltage communication system in a one-or two-family dwelling.
 - iv. Mechanical or other work affecting public health or general safety.

CHAPTER 4. RENOVATIONS

401.0 General Requirements

401.1---Renovations, as defined in Chapter 2, shall comply with the requirements of this Chapter.

Exception:

1. As modified in Section 904.0 for historic buildings.

401.2---All work shall comply with the materials and methods requirements, as defined in Chapter 2.

Note that while repairs are generally permitted to be done with like materials (whether or not those materials are still permitted by the code for new construction), renovations must conform to the materials and methods requirements of the applicable codes. "Materials and methods requirements" is defined in Chapter 2 as:

"Those requirements in the building, plumbing, electrical, mechanical and fire codes that specify material standards, details of installation and connection, joints, penetrations and continuity of any element, component or system in the building. The required quantity, fire resistance, flame spread, acoustic or thermal performance, or other performance attribute is specifically excluded from materials and methods requirements."

401.3---The work shall not make the building less conforming with the building, plumbing, mechanical, electrical or fire codes, or with any previous approved alternative arrangements, than it was before the renovation was undertaken.

Exception:

1. Minor reductions in the clear opening dimensions of replacement doors and windows that result from the use of different materials shall be allowed.

This requirement is intended to prohibit such items as reduction in design capacity to bear structural loads required by the Building Code, to meet water supply requirements, or to meet electrical loads; and reduction in existing light and ventilation to below the levels specified in the Building Code, or below the existing levels, whichever is lower.

402.0 Additional Requirements

402.1---Wood paneling and textile wall coverings used as an interior finish shall comply with the flame spread requirements of the Building Code.

402.2---Carpeting used as an interior floor finish material shall comply with the radiant flux requirements of the Building Code.

These additional requirements are necessary because they call for features that are explicitly excluded from Section 401.2 by the definition of "materials and methods requirements".

403.0 Structural Requirements

403.1---Unreinforced masonry buildings located in a seismic zone where the $A_v > 0.25$ shall have parapet bracing and wall anchors installed at the roof line whenever a reroofing permit is issued. Such parapet bracing and wall anchors shall be designed in accordance with Appendix 1 of these provisions.

A_v is the effective peak velocity-related acceleration, indicated as the decimal equivalent of the percent of gravity (e.g., 0.25 = 25 percent of the acceleration of gravity). Seismic maps are currently undergoing a major revision. According to the 1994 NEHRP maps, $A_v > 0.25$ applies to most of California and portions of Alaska, Arkansas, Hawaii, Idaho, Missouri, Montana, Nevada, Utah, Wyoming and Washington. A similar requirement triggering parapet bracing and wall anchors based on reroofing permits appears in the Utah code.

403.2---Unreinforced masonry buildings undergoing structural renovations where the work area exceeds 50 percent of the building area and located in a seismic zone where the $A_v > 0.35$ shall be strengthened in accordance with the requirements of Appendix 1 of these provisions.

Exception:

1. Buildings of Use Group R with no more than five dwelling units or guest rooms, and used solely for residential purposes.

According to the 1994 NEHRP maps, $A_v > 0.35$ applies to much of California, portions of Alaska and Nevada, and small parts of Idaho, Montana and Wyoming.

404.0 Accessibility

404.1 Materials and Devices---All new material used and new devices installed shall comply with the accessibility requirements of the Building Code.

404.2 Path of Travel---In all Use Groups except R-2, R-3 and R-4, an accessible path of travel shall be provided in accordance with the requirements of the Building Code if required by the Building Code based on the work being performed.

All three model codes include accessibility requirements applicable to existing buildings in their respective Chapters 11, but none has yet received Department of Justice certification that they meet or exceed the ADA. In light of the complexity of the topic, this section of the NARRP does not include substantive requirements. Rather, it incorporates the requirements in the Building Code by reference, with the expectation that those requirements will ultimately be revised as necessary to achieve certification by the Department of Justice. Note that New Jersey, in an effort to develop a complete code for rehabilitation of existing buildings, has undertaken to extract the applicable requirements from its Building Code. The following requirements based on New Jersey's draft are included for reference:

"1 Materials and Devices—All new material used and new devices installed shall comply with the requirements of CABO/ANSI A117.1, where applicable.

"Exceptions:

- "1. Buildings of Use Group R-2, R-3 and R-4 with three or fewer dwelling units are not required to comply.
- "2. Multi-story dwelling units in buildings without elevators are not required to comply.
- "3. Accessory structures for individual exempt dwelling units are not required to comply.

"2—Where it is technically infeasible to comply with the requirements of CABO/ANSI A117.1 or of other technical standards in the Building Code, the work shall comply to the maximum extent feasible.

"3 Path of Travel—In all Use Groups except R-2, R-3 and R-4, where the space renovated includes a primary function space, an accessible path of travel to the primary function space shall be provided unless the cost of providing this accessibility is disproportionate to the cost of the renovation to the primary function space; a cost is disproportionate if it exceeds 20% of the cost of the renovation work.

- "1. The path of travel shall include, but not be limited to, an accessible parking space, an accessible exterior route, an accessible building entrance, an accessible interior route to the renovated area, accessible restrooms, accessible drinking fountains, and accessible telephones.
- "2. In determining disproportionate cost, the following materials may be deducted from the overall cost of the project:
 - "i. Windows, hardware, operating controls, electrical outlets and signage;
 - "ii. Mechanical systems, electrical systems, installations or alterations of fire protection systems, and abatement of hazardous materials; and
 - "iii. The repair or installation of roofing, siding, or other exterior wall facade.
- "3. Where the work consists solely of renovation to building components deducted from the disproportionate cost calculation by 402.3.2 above, no additional accessible building features shall be required.
- "4. Where the renovation work is for the primary purpose of increasing the accessibility of the building or tenancy, the requirement to further improve the path of travel shall not apply.
- "5. Where the tenancy, space, or building being renovated already complies with accessibility requirements in the Building Code, no further improvement shall be required and the disproportionate cost requirement shall not apply."

CHAPTER 5. ALTERATIONS

501.0 General Requirements

501.1---Alterations, as defined in Chapter 2, shall comply with the requirements of this Chapter.
Exception:

1. As modified in Section 904.0 for historic buildings.

501.2---Work shall comply with all the requirements of Chapter 4.

This requirement ensures that all existing elements involved in the work must comply only with the materials and methods requirements of the Building Code, and eliminates the need for repetition of the general, additional, structural and accessibility requirements in Chapter 4.

501.3---All newly constructed elements, components and systems shall comply with the requirements of the Building Code.

Exceptions:

1. Openable windows may be added without requiring compliance with the light and ventilation requirements of the Building Code.
2. Newly installed electrical equipment shall comply with the requirements of Section 504.0.

Section 501.3 is included in this chapter because there are no newly constructed elements in a renovation (Chapter 4). Chapter 4 includes an exception for replacement doors and windows in Section 401.3 because replacement doors and windows (that is, doors and windows installed in existing openings) are not considered to be newly constructed elements. The addition of a door or window, as specifically included in the definition of alteration in Chapter 2, are considered to be newly constructed elements. Hence the need for the exception in Section 501.3.

Some additional clarification on what is or is not a newly constructed element: Alteration of an existing tenant separation is covered by Section 501.2, but construction of a new tenant separation at a different location is covered by Section 501.3. A new enclosure of an existing shaft (not a stair, which would be a reconstruction) is covered by Section 501.2. A new enclosure of a new shaft is covered by Section 501.3.

501.4---The alteration work shall not increase the extent of non-compliance with the requirements of Chapter 6 of these provisions or create a non-conformity with those requirements which did not previously exist.

Chapter 6 establishes requirements for minimal life safety improvements in buildings undergoing reconstruction, that are, for the most part, lower than requirements in the Building Code. This requirement is needed here because alteration work involves reconfiguration of space that could, under certain conditions, increase nonconformity with the Chapter 6 requirements.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

501.5 Extensive Alterations

501.5.1---The alteration of an entire building or an entire occupancy within a building shall be considered as a reconstruction and shall comply with the requirements of Chapter 6 of these provisions for the applicable Use Group.

Exception:

1. Alteration work that is exclusively plumbing, mechanical or electrical shall not be considered a reconstruction, regardless of its extent.

501.5.2---When the total area of all the work areas included in an alteration exceeds 50 percent of the area of the building the work shall be considered as a reconstruction and shall comply with the requirements of Chapter 6 of these provisions for the applicable Use Group.

Exception:

1. Work areas in which the alteration work is exclusively plumbing, mechanical or electrical shall not be included in the computation of total area of all work areas.

502.0 Structural Requirements

502.1---The minimum design loads for the structure shall be the loads applicable at the time the building was constructed, provided that no dangerous condition is created. Structural elements which are uncovered during the course of the alteration and which are found to be unsound or dangerous, shall comply with the applicable requirements of the Building Code.

503.0 Accessibility

503.1---Alterations shall comply with Section 404.0.

504.0 Electrical Equipment and Wiring

504.1---All newly-installed electrical equipment and wiring relating to work done in any work area shall comply with the materials and methods requirements as defined in Chapter 2.

Exception:

1. Electrical equipment and wiring in newly installed partitions and ceilings shall comply with all applicable requirements of the Electrical Code.

504.2---Existing wiring in all work areas in Use Groups A-1, A-2, A-5, H, and I shall be upgraded to meet the materials and methods requirements as defined in Chapter 2.

504.3 Service and/or Feeder in Use Groups R-2, R-3 and R-4---Service to existing dwelling units in any work area shall be a minimum of one hundred ampere, three-wire capacity, and service equipment shall be dead front having no live parts exposed whereby accidental contact could be made. Type "S" fuses shall be installed when fused equipment is used.

Exception:

1. Existing service of sixty ampere three-wire capacity, and feeders of thirty ampere or larger two- or three-wire capacity, shall be accepted if adequate for the electrical load being served.

This is from the HUD Rehabilitation Guidelines 1980 No. 6, Appendix 9 - Detroit Electrical Code.

504.4---In Use Groups R-2, R-3 and R-4, when the work area includes any of the following areas within a dwelling unit, the following requirements shall apply:

504.4.1---All enclosed areas, other than closets, kitchens, basements, garages, hallways, laundry areas and bathrooms shall have a minimum of two duplex receptacle outlets or one duplex receptacle outlet and one ceiling or wall type lighting outlet.

504.4.2---Kitchen areas shall have a minimum of two duplex receptacle outlets.

504.4.3---Laundry areas shall have a minimum of one duplex receptacle outlet located near the laundry equipment and installed on an independent circuit.

504.4.4---Ground fault circuit interruption shall be provided on newly installed receptacle outlets if required by the Electrical Code.

504.4.5---At least one lighting outlet shall be provided in every bathroom, hallway, stairway, attached garage and detached garage with electric power, and to illuminate outdoor entrances and exits.

504.4.6---At least one lighting outlet shall be provided in utility rooms and basements where these spaces are used for storage or contain equipment requiring service.

504.4.7---Clearance for electrical service equipment shall be provided in accordance with the Electrical Code.

505.0 Plumbing Fixtures

505.1---Where the work area is more than 20 percent of the floor area, and the building official determines that the occupant load will be increased as a result of the alteration, plumbing fixtures in all work areas shall be provided in quantities specified in the Plumbing Code based on the increased occupant load.

506.0 Mechanical

506.1---All reconfigured spaces intended for occupancy and all spaces converted to habitable or occupiable space in any work area shall be provided with either natural or mechanical ventilation.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

506.1.1---Natural ventilation shall comply with the requirements of the Mechanical Code.

506.1.2---Newly-installed mechanical ventilation systems shall comply with the requirements of the Mechanical Code.

Exception:

1. Existing mechanical ventilation systems shall comply with the requirements of Section 506.2.

506.2---In mechanically ventilated spaces, existing mechanical ventilation systems that are altered, reconfigured or extended shall provide not less than 5 cubic feet per minute (cfm) per person of outdoor air and not less than 15 cfm of ventilation air per person; or not less than the amount of ventilation air determined by the Indoor Air Quality Procedure of ASHRAE 62-89.

506.3---All newly-introduced devices, equipment or operations that produce airborne particulate matter, odors, fumes, vapor, combustion products, gaseous contaminants, pathogenic and allergenic organisms, and microbial contaminants in such quantities to adversely affect or impair health, or cause discomfort to occupants shall be provided with local exhaust.

These requirements are intended to allow spaces to be reconfigured and, if these spaces are equipped with existing ventilation systems, to allow them to be upgraded rather than requiring the installation of new systems.

CHAPTER 6. RECONSTRUCTION

601.0 General

601.1---Reconstruction work, as defined in Chapter 2, shall comply with the requirements of this Chapter.

Exception:

1. As modified in Section 904.0 for historic buildings.

The exception is included because Chapter 9 contains special requirements for historic buildings that take precedence over the provisions of this chapter. If Chapter 9 does not contain any special provisions for a subject matter addressed by Chapter 6, then historical buildings receive no special consideration in that regard.

601.2---Work shall comply with all the requirements of Chapters 4 and 5.

Exceptions:

1. Buildings in which the reconfiguration of space affecting exits and/or shared egress access is exclusively the result of compliance with the accessibility requirements of Section 404.2 (Path of Travel) shall not be required to comply with this Chapter.
2. Existing dead end corridors may be extended and new dead end corridors may be added in accordance with Section 602.5.

This requirement ensures that all existing elements involved in the work must comply only with the materials and methods requirements of the building code, eliminating the need for repetition of the general, structural and accessibility requirements in Chapter 4, and the requirements in Chapter 5.

Exception 1 ensures that renovation and alteration work do not trigger reconstruction merely due to compliance with the accessibility requirements.

Exception 2 is needed because without it Section 602.5 would contradict Section 401.3, which prohibits making the building less conforming with the Building Code.

602.0 Means of Egress

602.1 General---The means of egress shall comply with the requirements of this section.

Exception:

1. Where the work area and the means of egress serving the work area complies with NFPA 101.

Most of the requirements in this section are more lenient than the requirements in the building code for new construction. It should also be noted that this section does not address all means of egress provisions contained in the building code (e.g., minimum widths, travel distance, corridor wall fire resistance ratings). The philosophy contained in Section 401.3 (triggered by Section 601.2) would not permit the reduction of the level of safety below that which existed prior to the reconstruction. At the same time, the building official retains the authority to determine that an extreme deficiency (e.g., an 18-inch corridor) is a hazard that must be corrected. In addition, Section 501.3 (triggered by Section 601.2) requires that newly constructed elements, such as a new door opening or a new corridor, must comply with the building code.

The reference to NFPA 101 (the *Life Safety Code*) does not require compliance with NFPA 101, but rather offers it as an alternative to the means of egress requirements of this section. Compliance with NFPA 101 is required for new and existing buildings in many jurisdictions. NFPA 101 addresses the application of the requirements to work in existing buildings. If compliance with NFPA 101 is either required or desired, it is not necessary to also verify compliance with the means of egress requirements of this section. The reference to NFPA 101 also includes alternative approaches recognized by NFPA 101 such as those contained in NFPA 101A.

NFPA 101A contains a methodology to evaluate the level of life safety in health care occupancies (Chapter 3), detention and correctional occupancies (Chapter 4), residential board and care occupancies (Chapter 6), and business occupancies (Chapter 7). The methodologies, referred to as "Fire Safety Evaluation Systems", provide an evaluation of the level of life safety as compared to NFPA 101.

602.2 Number of Exits

602.2.1---Every story utilized for human occupancy on which there is a work area shall be provided with the minimum number of exits required by the Building Code.

Exceptions:

1. When more than one exit is required, an existing or newly constructed fire escape, complying with the following limitations, shall be accepted as providing one of the required means of egress unless determined by the Building Official to be hazardous for use under emergency exiting conditions:
 - i. All occupants shall have unobstructed access to the fire escape without having to pass through a room subject to locking.
 - ii. Access to a fire escape shall be through a door, except that windows shall be permitted from single dwelling units or guest rooms in Use Groups R-1, R-2 and I-1 or when serving spaces having a maximum occupant load of 10 in other Use Groups.
 - iii. In all buildings of Use Group E, up to and including the 12th grade, buildings of Use Group I, rooming houses and child care centers, ladders

- of any type are prohibited on fire escapes used as a required means of egress.
- iv. Newly constructed fire escapes shall be permitted only where exterior stairs cannot be utilized due to lot lines limiting stair size or due to the sidewalks, alleys, or roads at grade level. New fire escapes shall not incorporate ladders or access by windows.
 2. Slidescapes or safety chutes shall be permitted as allowed by the Building Code.
 3. Except in buildings of Use Group I and in rooming houses and child care centers, a single exit is permitted in the story at the level of exit discharge when the occupant load of the story does not exceed 50 and the exit access travel distance does not exceed 75 feet.
 4. In buildings of Use Group R-2 that are equipped throughout with an automatic fire sprinkler system, only one exit shall be required from basements or stories below grade.
 5. In buildings of Use Group R-2 that are not equipped throughout with an automatic fire sprinkler system, a single exit shall be permitted from a basement or story below grade if every dwelling unit on that floor is equipped with an approved window providing a clear opening of at least five square feet in area, a minimum net clear opening of 24 inches in height and 20 inches in width, and a sill height of not more than 44 inches above the finished floor.
 6. In multi-level dwelling units in buildings of Use Groups R-1 or R-2, an exit shall not be required from each level of the dwelling unit provided that the following conditions are met:
 - i. The building in which such dwelling units are contained is of Type 1 or Type 2 construction and the travel distance within the dwelling unit does not exceed 75 feet; or
 - ii. The building in which such dwelling units are contained is not more than three stories in height and all third floor space is part of one or more dwelling units located in part on the second floor and no habitable room within any such dwelling unit shall have a travel distance that exceeds 50 feet from the outside of the habitable room entrance door to the inside of the entrance door to the dwelling unit.

It should be noted that this chapter modifies the traditional building code requirement for enclosure of exits. A stairway which is enclosed in accordance with Section 604.0 would be considered an exit.

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602.2.2 Mezzanines---Mezzanines in the work area and with an occupant load of more than 50 or in which the travel distance to an exit exceeds 75 feet shall have access to at least two independent means of egress.

Exception:

1. Two independent means of egress are not required where the travel distance to an exit does not exceed 100 feet and the building is protected throughout with an automatic sprinkler system.

This provision is consistent with the requirements contained in most of the model codes regulating the means of egress within buildings. NFPA 101 permits a single means of egress from a mezzanine in a sprinklered building if the travel distance does not exceed 100 feet.

602.2.3 Single exit buildings---In buildings having only one exit, the single exit condition serving the work area shall be permitted to continue as follows:

1. In buildings permitted to have a single exit in accordance with the Building Code.
2. In buildings of Use Group R-3.
3. In buildings of Use Groups R-1 and R-2, from floors that are not more than 16 feet above exterior grade, except that in community residences for the developmentally disabled, the maximum occupant load, excluding staff, is 12.
4. In buildings of Use Groups R-1 and R-2, not more than two stories in height, from floors that are more than 16 feet above exterior grade, when there are not more than four dwelling units per floor and the exit access travel distance does not exceed 50 feet, except that in community residences for the developmentally disabled, the maximum occupant load, excluding staff, is 12. The minimum fire resistance rating of the exit enclosure and of the opening protection shall be one hour.
5. Any building of Use Group R-2 of three stories or less shall be permitted to have a single exit provided the following conditions are met:
 - i. The stairway is separated from the rest of the building by construction having a minimum fire resistance rating of one hour with self-closing one hour fire doors protecting all openings between the stair enclosure and the building, and
 - ii. The stairway does not serve more than one-half story below the level of exit discharge, and
 - iii. All corridors serving as access to exits from the work area have a minimum fire resistance rating of 20 minutes, and
 - iv. There is not more than 35 ft (10.7m) of travel distance from the entrance door of any living unit in the work area to an exit, and
 - v. Twenty-minute fire resistance rated horizontal and vertical separation between living units in the work area is provided.
6. In buildings of Use Group R-2 of any height with not more than four living units per floor, with a smokeproof enclosure or outside stair as an

- exit, and with such exit within 20 ft (6.1m) of travel to the entrance doors to all living units served thereby.
7. In buildings of Use Group B, F-2, or S-2, not more than two stories in height, which are not greater than 3,000 square feet per floor, when the exit access travel distance does not exceed 75 feet. The minimum fire resistance rating of the exit enclosure and of the opening protection shall be one hour.
 8. In open parking structures where vehicles are mechanically parked.

The list of conditions where a single exit building would be permitted includes all conditions currently permitted by the applicable building code (condition 1 above) and others that in some instances were previously permitted by the model codes.

While not specifically required, if a second exit is required for the work area then prudent design would include an arrangement providing a second exit which is available from the entire floor containing the work area and all floors between the work area and the level of exit discharge, including the level of exit discharge if appropriate. However, due to varying conditions the second exit is not required to be provided for areas outside the work area, because it may be impractical.

602.2.4---All buildings of Use Group A with an occupant load of 100 or more shall be provided with a main entrance capable of serving as the main exit with an egress capacity for at least one-half the total occupant load. The remaining exits shall be capable of providing one-half of the total required exit capacity.

Exception:

1. As permitted by the Building Code.

The building codes typically exempt the stadium and arena type arrangement where multiple entrances are located around the perimeter.

602.3 Capacity of Means of Egress---The capacity of the means of egress in each work area and throughout the egress path of each work area shall be sufficient for the occupant load thereof. Capacity shall be determined in accordance with the Building Code. The occupant load of a space shall be determined by whichever of the following methods provides the higher number:

1. Divide the floor area by the occupant load factor for this use group as provided in the Building Code.
2. The actual number of occupants for whom the work area is designed.

Exception:

1. The Building Official shall be permitted to establish the occupant load as the number of persons for which existing means of egress is adequate, provided that measures are established to prevent occupancy by a greater number of persons.

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The exception to Section 602.3 would permit an occupant load less than that calculated using the appropriate occupant load factor. However, whenever this is done the occupant load used should be a realistic number that is unlikely to be exceeded. Additional precautions should be taken to ensure that the occupant load is not exceeded, such as the issuance of a specific number of tickets or entry passes in a place of assembly.

An example of a condition which has been approved by code officials in the past is the limitation of 49 people in a meeting room area of a hotel, due to either door swing or only one means of egress from the room. The limitation can be included in the contractual agreement between the user of the space and the hotel, and hotel personnel can monitor the use of the space. Furthermore, the posting of an occupant load of 49 can also facilitate compliance.

Another example of a previously approved condition is the issuance of "passes" upon entrance into a place of assembly. The facility has a fixed number of passes and the passes are returned as people leave so that they can be issued to another patron. Whatever the conditions are, the code official must be comfortable enough with the program to approve it and can revoke the approval based upon failure to comply.

602.4 Egress Doorways

602.4.1---In any work area, all rooms and spaces having an occupant load greater than 50 or in which the travel distance exceeds 75 feet shall have a minimum of two egress doorways.

Exceptions:

1. Storage rooms having a maximum occupant load of 10.
2. Where the work area is served by a single exit in accordance with 602.2.3.

602.4.2---In buildings of Use Group I-2, any patient sleeping room or suite of rooms greater than 1,000 square feet in the work area shall have a minimum of two egress doorways.

This provides consistency with the requirements of most of the building codes with respect to exit access doors from patient sleeping rooms.

602.4.3 Corridor doors---Corridor doors in the work area shall not be constructed of hollow core wood and shall not contain louvers. All dwelling units, guest room or rooming unit corridor doors in work areas in buildings of Use Groups R-1, R-2, and I-1 shall be at least 1-3/8 inch solid core wood or approved equal with approved door closers and shall not have any glass panels, other than approved wired glass or other approved glazing material in metal frames. All replacement doors shall be 1-3/4 inch solid bonded wood core or approved equal, unless the existing frame will accommodate only a 1-3/8 inch door.

Exceptions:

1. Corridor doors within a dwelling unit or guest room.

2. Existing doors meeting the requirements of *HUD Rehabilitation Guidelines No. 8* for a rating of 15 minutes or better shall be accepted as meeting the provisions of this requirement.
3. Existing doors in buildings protected throughout with an approved automatic sprinkler system shall be required only to resist smoke; shall not contain louvers; and shall be reasonably tight fitting.
4. In group homes with a maximum of 15 occupants, and which are protected with an approved automatic detection system, closing devices may be omitted.
5. Door assemblies having a fire protection rating of at least 20 minutes.

While not requiring fire doors, this section provides criteria which result in a relatively effective barrier to fire spread through a door opening in a corridor wall. Any fire door with at least a 20 minute fire protection rating should be considered as equivalent, since a 1-3/4 inch solid bonded wood core door can typically achieve a 20 minute fire protection rating (without the hose stream).

There may be instances where the provision of automatic sprinkler protection on a floor may be adequate to permit the use of smoke resistant doors. However, the overall fire protection package including enclosure of vertical openings, travel distance (which is not otherwise regulated by the NARRP) and other fire protection features should be considered prior to permitting a reduction in the corridor doors in a work area which is on a floor protected with automatic sprinklers and where the entire building is not protected throughout with an automatic sprinkler system.

602.4.4 Transoms---In all buildings of Use Group I-1, R-1 and R-2 all transoms in corridor walls in work areas shall be either glazed with 1/4-inch wired glass set in metal frames or other glazing assemblies having a fire protection rating as required for the door and permanently secured in the closed position or sealed with materials consistent with the corridor construction.

Transoms were originally installed in buildings for light and ventilation purposes. If they are open or if they fail during a fire condition, the opening is a convenient method of smoke spread into the corridor. Therefore, existing transoms need to be secured in the closed position and constructed to offer some degree of resistance to the spread of fire.

Section 602.4.3 contains requirements for the protection of door openings in corridor walls for certain use groups. This section requires that the transom must have the same fire protection rating as required for the door. Where a 1-3/4 inch solid bonded wood core door is permitted, glazing assemblies having a fire protection rating of 20 minutes without the hose stream test should also be permitted. Where Section 602.4.3 contains requirements that the door be capable of resisting the passage of smoke, the transom shall be permanently secured in the closed position and sealed, but need not have a fire protection rating.

602.4.5 Other corridor openings---In any work area, any other sash, grill or opening in a corridor, and any window in a corridor not opening to the outside air, shall be sealed with materials consistent with the corridor construction.

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602.4.6 (Supplemental requirements)---The requirements of 602.4.3 through 602.4.5 shall apply on the entire floor when the work area exceeds 50 percent of the floor area.

602.4.7 Door swing---In the work area and in the egress path from any work area to the exit discharge, all egress doors serving an occupant load greater than 50 shall swing in the direction of exit travel.

An occupant load of 50 is a common threshold to regulate the direction of swing of the door. Doors which are not swinging doors would only be permitted as permitted by the applicable building code.

602.4.8---In any work area all doors opening onto an exit passageway at grade or exit stair shall be self-closing or automatic closing by listed closing devices.

Exception:

1. Where exit enclosure is not required by the Building Code.

This requirement should not be limited to Use Groups R-1 and R-2. Exit stairs and exit passageways required to be enclosed by other sections should be protected with the appropriate opening protectives and the opening protectives should be self-closing or automatic closing.

602.4.9---In any work area, and in the egress path from any work area to the exit discharge, in a building or portions thereof of Use Group A with an occupant load greater than 100 all required exit doors equipped with latching devices shall be equipped with approved panic hardware.

602.4.10 (Supplemental requirements)---The requirements of 602.4.7 through 602.4.9 shall apply on the entire floor when the work area exceeds 50 percent of the floor area.

Exception:

1. Means of egress within a tenant space that is entirely outside the work area need not comply.

602.4.11---Work areas in buildings of Use Group I-3 having remote power unlocking capability for more than 10 locks shall be provided with an emergency power source for such locks. Power shall be arranged to automatically operate upon failure of normal power within 10 seconds and for a duration of not less than one hour.

This paragraph does not mandate remote unlocking capability, but if remote power unlocking is provided then the emergency power requirement applies where there are more than 10 locks. It is assumed that a means is provided at the door to allow for the manual operation of the lock in case the remote unlocking capability fails.

602.5 Dead End Corridors---Existing dead end corridors in any work area shall not exceed 35 feet. Newly constructed dead end corridors shall comply with the Building Code.

Exceptions:

1. Where dead end corridors of greater length are permitted by the Building Code.
2. In other than Use Group A and H, the maximum length of an existing dead end corridor shall be 50 feet in buildings equipped throughout with an automatic fire alarm system installed in accordance with the Building Code.
3. In other than Use Group A and H, the maximum length of an existing dead end corridor shall be 70 feet in buildings equipped throughout with an automatic sprinkler system installed in accordance with the Building Code.
4. In other than Use Group A and H the maximum length of a newly constructed or extended dead end corridor shall not exceed 50 feet in buildings equipped throughout with an automatic sprinkler system installed in accordance with the Building Code.

Some building codes allow dead end corridors in excess of the 35 foot limit contained herein, based upon the presence of an automatic sprinkler system and the occupancy of the space. The references to the Building Code requirements for an automatic fire alarm system and an automatic sprinkler system in the exceptions are intended to provide the installation requirements for such system. If any of the exceptions are used, then the fire protection system must meet the installation requirements contained in the applicable building code.

It should be noted that the second and third exceptions apply to existing dead end corridor conditions only. If the arrangement of the reconstructed space either creates a new dead end corridor or extends the length of an existing dead end, the new arrangement shall either meet the Building Code requirements, be limited to 35 feet, or be limited to 50 feet only if the building is protected throughout with an automatic sprinkler system. Again, conditions may exist where automatic sprinkler protection on the floor alone may be adequate based upon other fire protection features in the building.

Since the various codes have modified the requirements for dead end corridors and remoteness of exits over the years, some arrangements may exist where the provisions of this section cannot be met. In such cases the code official may evaluate the "hardship" associated with compliance and may permit a compliance alternative in accordance with Section 102.3.

Where the code permits a single exit condition, it should be noted that dead end corridors must also be permitted. This condition is typically addressed by an exception contained in the Building Code.

602.6 Means of Egress Lighting

602.6.1---Means of egress in all work areas shall be provided with artificial lighting in accordance with the requirements of the Building Code.

602.6.2 (Supplemental requirement)---Where the reconstruction work area on any floor exceeds 50 percent of that floor area, means of egress throughout the floor shall be provided with artificial lighting in accordance with the requirements of the Building Code.

Exception:

1. Means of egress within a tenant space that is entirely outside the work area need not comply.

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602.6.3 (Supplemental requirement)---In a building with work areas involving over 50 percent of the aggregate floor area within the building, means of egress from the floor of the highest work area to the floor of exit discharge, and all intermediate floors, shall be provided with artificial lighting within the exit enclosure in accordance with the requirements of the Building Code.

The text requires 50 percent of the total area of a building to be involved in a reconstruction before the lighting requirement applies throughout the building. This prevents a reconstruction project involving limited areas on multiple floors from triggering the requirement for artificial lighting on multiple floors.

602.7 Exit Signs

602.7.1---Means of egress in all work areas shall be provided with exit signs in accordance with the requirements of the Building Code.

602.7.2 (Supplemental requirement)---Where the reconstruction work area on any floor exceeds 50 percent of that floor area, means of egress throughout the floor shall be provided with exit signs in accordance with the requirements of the Building Code.

Exception:

1. Means of egress within a tenant space that is entirely outside the work area need not comply.

602.7.3 (Supplemental requirement)---In a building with work areas involving over 50 percent of the aggregate floor area within the building, means of egress from the floor of the highest work area to the floor of exit discharge shall be provided with exit signs in accordance with the requirements of the Building Code.

602.8 Handrails---The following requirements shall apply from the highest work area floor to the level of exit discharge.

602.8.1---Every required exit stairway that is part of the means of egress for any work area that has three or more risers and is not provided with at least one handrail, or in which the existing handrails are judged to be in danger of collapsing, shall be provided with handrails for the full length of the run of steps on at least one side. All exit stairways with a required egress width of more than 66 inches shall have handrails on both sides.

Note that the requirement for handrails on both sides only applies where the required egress width, as determined by Section 602.3, exceeds 66 inches. Any existing stairway with handrails on both sides is acceptable regardless of the width of the stairway. Consideration should be given to providing additional handrails to adequately serve the required egress width as required by the Building Code, but this is not required. Also note that any newly constructed stairs would need to comply with the building code requirements which typically would call for a handrail on both sides of any 44-inch stair.

602.8.2---Where there are no handrails or where the existing handrails must be replaced in accordance with Section 602.8.1, the handrails shall be designed and installed in accordance with the provisions of the Building Code.

602.9 Guards---The following requirements shall apply from the highest work area floor to the level of exit discharge, but shall be confined to the egress path of any work area.

602.9.1---Every open portion of a stair, landing, or balcony which is more than 30 inches above the floor or grade below and not provided with guards, or those in which the existing guards are judged to be in danger of collapsing, shall be provided with guards.

602.9.2---Where there are no guards or where the existing guards must be replaced in accordance with Section 602.9.1 the guards shall be designed and installed in accordance with the Building Code.

The text permits existing guards provided they are not in danger of collapsing, irrespective of the spacing between the intermediate rails. However, if a new guard is installed then the requirements of the applicable Building Code, including the four-inch spacing limitations for intermediate rails, will apply.

603.0 Interior Finish

603.1---The interior finish of walls and ceilings in any work area shall comply with the requirements of the Building Code. All existing interior finish materials which do not comply with the requirements of this Section shall be removed or shall be treated with an approved fire retardant coating in accordance with the manufacturer's instructions to secure compliance with the requirements of this Section.

The Building Code requirements for interior finish materials may involve testing other than the traditional tunnel test which provides flame spread ratings. For example, some materials are now required to be subjected to a room corner test.

603.2 (Supplemental requirement)

603.2.1---Where the work area on any floor exceeds 50 percent of that floor area, the requirements of Section 603.1 shall apply to the interior finish in exits and corridors serving the work area on the entire floor.

Exception:

1. Interior finish within a tenant space that is entirely outside the work area need not comply.

603.2.2---In a building with work areas involving over 50 percent of the aggregate floor area within the building, the requirements for interior finishes in exits shall apply from

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the floor of the highest work area to the floor of exit discharge, and all intermediate floors.

604.0 Shaft Enclosures

604.1---In any work area, newly constructed vertical openings connecting two or more floors shall comply with the requirements of the Building Code.

604.2---In any work area, all existing interior vertical openings connecting two or more floors shall be enclosed with approved assemblies having a fire resistance rating of not less than one hour with approved opening protectives.

Exceptions:

1. Where vertical opening enclosure is not required by the Building Code.
2. Interior vertical openings other than stairways may be blocked at the floor and ceiling of the work area by installation of not less than two inches (50.8 mm) of solid wood or equivalent construction.
3. In Use Groups A, B, M, and R-2 a minimum 30 minute enclosure shall be provided to protect all vertical openings not exceeding three stories.
4. In Use Group A the enclosure shall not be required:
 - i. Where connecting the main floor and mezzanines; or
 - ii. Where all the following conditions are met:
 - (1) The communicating area has a low hazard occupancy, or has a moderate hazard occupancy which is protected throughout by an automatic sprinkler system, and
 - (2) The lowest or next to the lowest level is a street floor; and
 - (3) The entire area is open and unobstructed in a manner such that it may be assumed that a fire in any part of the interconnected spaces will be readily obvious to all of the occupants; and
 - (4) Exit capacity is sufficient to provide egress simultaneously for all the occupants of all levels by considering all areas to be a single floor area for the determination of required exit capacity; and
 - (5) Each floor level, considered separately, has at least one-half of its individual required exit capacity provided by an exit or exits leading directly out of that level without having to traverse another communicating floor level or be exposed to the smoke or fire spreading from another communicating floor level.
5. In Use Group B the enclosure shall not be required in a building not exceeding 3,000 square feet per floor or when the building is protected throughout by an approved automatic fire sprinkler system.
6. In Use Group E the enclosure shall not be required for vertical openings not exceeding three stories when the building is protected throughout by an approved automatic fire sprinkler system.
7. In Use Group F the enclosure shall not be required for vertical openings not exceeding three stories:

- i. In special purpose occupancies when necessary for manufacturing operations and direct access is provided to at least one protected stairway; or
 - ii. In buildings which are protected throughout by an approved automatic sprinkler system.
- 8. In Use Group H the enclosure shall not be required for vertical openings not exceeding three stories when necessary for manufacturing operations and every floor level has direct access to at least two remote enclosed stairways or other approved exits.
- 9. In Use Group M the enclosure shall not be required when:
 - i. Openings connect only two floor levels, such as between the street floor and mezzanine or second floor; or
 - ii. Occupancies are protected throughout by an approved automatic sprinkler system.
- 10. In Use Group R-1 the enclosure shall not be required for vertical openings not exceeding three stories:
 - i. In buildings which are protected throughout by an approved automatic sprinkler system; or
 - ii. In buildings with less than 25 guests in which the following conditions are met:
 - (1) Every sleeping room is provided with an approved window having a sill height not greater than 44 inches;
 - (2) Every sleeping room above the second floor is provided with direct access to a fire escape or other approved second exit;
 - (3) Any exit access corridor exceeding eight feet in length which serves two means of egress, at least one of which is an unprotected vertical opening, shall be separated from the vertical opening by a one-hour fire barrier; and
 - (4) The building is protected throughout by an automatic fire alarm system, installed and supervised in accordance with the Building Code.
- 11. In Use Group R-2 the enclosure shall not be required:
 - i. In buildings which are protected throughout by an approved automatic sprinkler system;
 - ii. Where the vertical opening connects not more than two floor levels with not more than four dwelling units per floor and each dwelling unit has access to a fire escape or other approved second exit; or
 - iii. In buildings with not more than four dwelling units per floor, and in which the following conditions are met:
 - (1) Every sleeping room is provided with an approved window having a sill height not greater than 44 inches;
 - (2) Every dwelling unit or sleeping room above the second floor is provided with direct access to a fire escape or other approved second exit; and
 - (3) The building is protected throughout by an automatic fire alarm system, installed and supervised in accordance with the Building Code.

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Exceptions 10 and 11 of this Section refer to windows as being "approved." The specific size of the window opening is not limited, since this is intended to apply to existing conditions. The window size criteria contained in the exceptions to Section 602.2.1 may be appropriate for determining what constitutes an acceptable window for approval. It should be noted however, that the 5 square foot size, while permitted by recent editions of at least one of the three model building codes, may not be adequate to permit ladder access to or egress from the space, especially for a firefighter in full protective gear and self-contained breathing apparatus.

This Section also refers to an "approved" second exit. If evaluating the acceptability of the proposed second exit, the code official must ensure that an adequate means exist for the occupant to access grade level. Depending on height above grade and other conditions, it may be acceptable to permit the occupants to hang over the balcony and fall to grade. The code official has the authority to evaluate the proposed arrangement and determine if a reasonably safe means of egress is provided.

604.3 (Supplemental requirements)

604.3.1---Where the reconstruction work area on any floor exceeds 50 percent of that floor area, Section 604.2 shall apply throughout the floor.

604.3.2---Where the reconstruction work area on any floor exceeds 50 percent of that floor area, stairways that are part of the means of egress serving the work area shall be enclosed with smoke tight enclosures on all floors below the highest work area floor.

Exception:

1. Where stairway enclosure is not required by the Building Code.

604.3.3---In a building with work areas involving over 50 percent of the aggregate floor area within the building, stairways that are part of the means of egress shall be enclosed in accordance with Section 604.2 on the highest work area floor and on all floors below it.

605.0 Fire Separation and Smoke Barriers

605.1 Use Group I-2

605.1.1---Where the work area is on a story used for sleeping purposes for more than 30 patients, the story shall be divided into not less than two compartments by smoke barrier walls complying with the technical requirements of Section 605.1.2 such that each compartment does not exceed 22,500 square feet and the travel distance from any point to reach a door in the required smoke barrier shall not exceed 200 feet.

Exception:

1. Where neither the length nor width of the smoke compartment exceeds 150 feet, the travel distance to reach the smoke barrier door shall not be limited.

This section is written to coordinate with more recent requirements in some of the Building Codes and the NFPA *Life Safety Code* which indicate that the critical criteria is the travel distance to the smoke barrier door, and not necessarily the length and width of the compartment. The exception is necessary since some existing smoke compartments designed under the 150 foot limit may not meet the travel distance criteria.

605.1.2---The smoke barriers specified in Section 605.1.1 shall be constructed in accordance with the following provisions:

1. Smoke barriers shall have a fire resistance rating of not less than one-half hour and shall form an effective membrane continuous from outside wall to outside wall and from floor slab to floor or roof deck above, including continuity through all concealed spaces, such as those found above suspended ceilings, and including interstitial structural and mechanical spaces. Transfer grilles, whether equipped with fusible link-operated dampers or not, shall not be used in these partitions.

There is no need to address glazed opening protectives in this section. The Building Codes already address opening protectives in rated construction.

2. Smoke barriers are not required in interstitial spaces when such spaces are designed and constructed with ceilings that provide resistance to the passage of fire and smoke equivalent to that provided by smoke barriers.
3. Doors in smoke barriers shall have a fire protection rating of not less than 20 minutes when tested in accordance with ASTM E152 without the hose stream and labeled by an approved agency, or shall be 1-3/4 inch solid bonded wood core doors. Newly installed double egress corridor doors shall have approved vision panels. The doors shall close the openings with only the clearance necessary for proper operation under self-closing or automatic closing and shall be without undercuts, louvers or grilles. Rabbits or astragals are required at the meeting edges of newly installed double egress doors, and stops are required on the head and jambs of all doors in smoke barriers. Positive latching devices are not required on double egress corridor doors, and center mullions are prohibited.
4. Protection at the meeting edges of doors and stops at the head and sides of door frames shall not be required in buildings equipped with an approved engineered smoke control system. The engineered smoke control system shall respond automatically, preventing the transfer of smoke across the barrier.
5. Doors in smoke barriers shall be self-closing or shall be provided with approved door hold-open devices of the fail-safe type which shall release the doors causing them to close upon the actuation of smoke detectors as

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well as upon the application of a maximum manual pull of 50 pounds against the hold-open device.

6. An approved damper designed to resist the passage of smoke shall be provided at each point a duct penetrates a smoke barrier. The damper shall close upon detection of smoke by an approved smoke detector located within the duct.
7. In lieu of an approved smoke detector located within the duct, ducts which penetrate smoke barriers above doors are permitted to have the approved damper arranged to close upon detection of smoke on either side of the smoke barrier door opening.
8. Dampers are not required:
 - i. Where not required by the Building Code.
 - ii. In buildings equipped with an approved engineered smoke control system.
 - iii. Where the openings in ducts are limited to a single smoke compartment and the ducts are of steel construction.
 - iv. In fully ducted systems where both sides of the smoke barrier are protected with an approved automatic sprinkler system.

These requirements are similar to the requirements in NFPA 101 for smoke barriers in health care occupancies. Since NFPA 101 is enforced in almost all existing buildings of Use Group I-2, the requirements should not present an undue burden. Some of the building codes permit the omission of the smoke dampers provided the areas on both sides of the smoke barrier are protected with automatic sprinkler protection.

605.2 Use Group R-3

605.2.1---Where the work area is in any attached dwelling unit in Use Group R-3, walls separating the dwelling units which are not continuous from the foundation to the underside of the roof sheathing shall be constructed to provide a continuous fire separation using construction materials consistent with the existing wall or complying with the requirements for new structures. All work shall be performed on the side of the wall of the dwelling unit that is part of the work area.

Exception:

1. Walls are not required to be continuous through concealed floor spaces.

Reconstruction in Use Group R-3 will in most cases be triggered by Section 501.5 (work area exceeding 50 percent of the building area). The intent of this section is to provide an effective separation between attached dwelling units to minimize the likelihood that a fire within one dwelling unit will impact other dwelling units. Historically, the dwelling unit separations were not continuous to the roof allowing for fire spread from one dwelling unit to another in the attic space. While such fire separations are usually required to be continuous through floor assemblies the exception allows for the wall to terminate at the ceiling, primarily because a fire resistance rating is not required. If the wall is not continuous, the ceiling construction is intended to provide the barrier. Also, since a fire resistance rating is not required, work need only occur in dwelling units within the work area and not in other adjacent dwelling units.

606.0 Fire Suppression Systems

606.1---All work areas in any building or portion thereof that is required to be suppressed in accordance with the Building Code shall be provided with an automatic fire suppression system.

Exception:

1. In other than high rise structures, where an automatic water supply for sprinkler protection is not available at that floor level the building official shall be permitted to accept alternative protection.

When sizing the supply piping (feed mains, cross mains and risers) for an automatic sprinkler system, consideration should be given to sizing the pipe to be adequate for automatic sprinkler protection throughout the building. For example, a two-inch riser may be adequate for sprinkler protection on the ground floor, but would not be adequate when sprinkler protection needs to be installed on upper floors.

This section will require automatic fire suppression in all work areas in high rise buildings where the applicable building code requires automatic fire suppression in such high rise buildings. If an adequate water supply is not available on the floor, either the water supply must be provided or a compliance alternative must be approved by the code official as permitted in Chapter 1. Most high rise buildings will have standpipe systems which will be capable of serving as an adequate water supply for an automatic sprinkler system.

606.2 (Supplemental requirements)

606.2.1---Where the work area on any floor exceeds 50 percent of that floor area, Section 606.1 shall apply to the entire floor.

Exception:

1. In other than high rise structures, where an automatic water supply for sprinkler protection is not available at that floor level the building official shall be permitted to accept alternative protection.

606.2.2---In a building with work areas involving over 50 percent of the aggregate building area, Section 606.1 shall apply to the highest floor containing a work area and all floors below.

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606.3 Mixed Uses---In buildings containing mixed uses, one or more of which requires automatic suppression in accordance with Sections 606.1 or 606.2, suppression will not be required throughout the building, provided that the uses requiring suppression are separated from those not requiring suppression by fire resistive construction having a minimum two-hour rating for Use Group H, and a minimum one-hour rating for all use groups other than Use Group H.

This allows an occupancy separation to eliminate the requirement for automatic fire suppression throughout the building where Section 606.2.2 would otherwise require suppression throughout much of the building. In the case of the *BOCA National Building Code*, the fire area concept involving similar use groups would also be a valid approach. However, not all the building codes have such provisions.

606.4 Supervision---Fire suppression systems required by this Section shall be supervised by one of the following methods as determined by the fire official:

1. Approved central station system in accordance with NFPA 72;
 2. Approved proprietary system in accordance with NFPA 72;
 3. Approved remote station system of the jurisdiction in accordance with NFPA 72;
- or
4. Approved local alarm service which will cause the sounding of an alarm in accordance with NFPA 72.

Exceptions:

1. Underground gate valve with roadway boxes;
2. Halogenated extinguishing systems;
3. Carbon dioxide extinguishing systems;
4. Dry and wet chemical extinguishing systems;
5. Limited area sprinkler systems; and
6. Occupancies in Use Group R complying with NFPA 13R or NFPA 13D, as appropriate.

The *BOCA National Building Code* contains provisions for sprinkler systems protecting specific areas or hazards within a building. The systems are limited to a maximum of 20 sprinklers and are permitted to be supplied from a domestic water source. Therefore, the exception should be applicable to any partial sprinkler system containing no more than 20 sprinklers.

606.5 Standpipes---Any work areas in a building that is required to be provided with a standpipe system by the Building Code shall be provided with standpipes up to and including the highest work area floor. The standpipes shall be located and installed in accordance with the Building Code.

Exceptions:

1. No pump shall be required provided that the standpipes are capable of accepting delivery by fire department apparatus of a minimum of 250 gpm at 65 psi to the topmost floor in buildings equipped throughout with an automatic sprinkler system or a minimum of 500 gpm at 65 psi to the topmost floor in all other buildings.

Where the standpipe terminates below the topmost floor, the standpipe shall be designed to meet these requirements (gpm/psi) for possible future extension of the standpipe.

2. The interconnection of multiple standpipe risers shall not be required.

Installation of a fire pump to meet the automatic water supply requirements for a standpipe system can be a costly improvement. If the fire department is capable of providing the required water supply through the fire department connection, the cost of the fire pump during a reconstruction project may not be warranted. This provision is similar to what some building codes and NFPA 14 permit for certain situations.

The second exception eliminates the requirement for interconnection of standpipe risers where the applicable building code requires such interconnection. It should be noted, however, in those instances where risers are not interconnected, multiple fire department connections shall be provided to ensure adequate water supply to all required standpipe risers.

607.0 Fire Alarms

607.1 Smoke Detectors

607.1.1---In Use Groups R-1 and R-2, individual guestrooms and individual dwelling units in any work area shall be provided with smoke detectors complying with the Building Code.

607.1.2---Where the reconstruction work area is in Use Groups R-3 or R-4, smoke detectors complying with the Building Code shall be provided at each level and outside each sleeping area.

Exceptions:

1. Interconnection of smoke detectors shall not be required.
2. Battery-powered single station smoke detectors listed in accordance with UL 217 shall be permitted outside the work area.

Battery-powered smoke detectors are generally not considered as reliable as smoke detectors powered from the building electrical system. Therefore, within the work area battery-powered smoke detectors do not comply. However, if portions of a dwelling unit outside the work area do not have proper smoke detectors then smoke detectors must be provided in the specified locations but those smoke detectors may be battery-powered and need not be interconnected. It should be noted that the section does not require smoke detectors in each bedroom as is currently required by some building codes.

607.2 Manual Fire Alarm Systems

607.2.1---Where the work area on any floor exceeds 50 percent of that floor area and the work area is in a building that is required to have a manual fire alarm system in accordance with the Building Code, a manual fire alarm system shall be provided on the

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floor. Alarm-indicating appliances shall be provided on the floor and shall be automatically activated as required by the Building Code by all new and existing initiating devices.

607.2.2---Where the work area involves over 50 percent of the aggregate building area and the work area is in a building that is required to have a manual fire alarm system in accordance with the Building Code, a manual fire alarm system shall be provided throughout the building in accordance with the Building Code.

607.3 Automatic Fire Detection Systems

607.3.1---Where the work area is in a building that is required to have an automatic fire detection system in accordance with the Building Code, an automatic fire detection system shall be installed in the work area. Existing alarm-indicating appliances shall be automatically activated throughout the building. Where the building is not equipped with a fire alarm system, alarm-indicating appliances within the work area shall be provided and automatically activated.

Exception:

1. Where selective notification is permitted, alarm-indicating appliances shall be automatically activated in the areas selected.

Where selective notification is provided, consideration should be given to providing a means of advising occupants outside the selected area of that status of the fire alarm signal. These occupants may notice the response of fire apparatus and should be given the proper information about the alarm condition and the status of the emergency.

607.3.2---Where the work area on any floor exceeds 50 percent of that floor area and the work area is in a building that is required to have an automatic fire detection system in accordance with the Building Code, an automatic fire detection system shall be installed throughout the floor. Alarm-indicating appliances shall be automatically activated throughout the building.

Exceptions:

1. Where selective notification is permitted, alarm-indicating appliances shall be automatically activated in the areas selected.
2. Where the building is not equipped with a fire alarm system, alarm-indicating appliances on the floor shall be provided and automatically activated.

607.3.3---Where the work area involves over 50 percent of the aggregate building area and the building is required to have an automatic fire detection system in accordance with the Building Code, an automatic fire detection system shall be provided throughout the building in accordance with the Building Code.

608.0 High Rise Buildings

608.1---Any building or structure having one or more floors more than 75 feet above the lowest level accessible to a fire department vehicle shall comply with the requirements of this section.

This section does not simply refer to the definition of "high rise" in the Building Code because that definition might change to reduce the height, which would penalize existing buildings.

608.1.1 Re-circulating Air or Exhaust Systems---When the work area is on a floor that is served by a re-circulating air or exhaust system serving more than one floor, the re-circulating air or exhaust system that serves the work area shall be equipped with approved smoke and heat detection devices installed in accordance with the Mechanical Code. The devices shall stop the fan(s) automatically and shall be of the manual reset type. Automatic fan shutdown is not required when the system is part of an approved smoke removal or smoke control system.

608.1.2 Elevators---When the work area is one entire floor or when the work area is 20 percent or more of the occupied floor area of the building, the elevators in the building shall be equipped with the following emergency control devices:

1. All automatic (non-designated attendant) elevators having a travel of 25 feet or more above or below the designated level shall be equipped with Phase I Emergency Recall Operation as required by ASME A17.1-1987, Rules 211.3a and 211.3b.
2. All floors shall be accessible by at least one elevator equipped with Phase II Emergency In-Car Operation, as required by ASME A17.1-1987, Rule 211.3c.
3. All designated attendant elevators having a travel of 25 feet or more above or below the designated level shall be equipped with emergency controls, as required by ASME A17.1-1987, Rule 211.4.

The specific references to the 1987 edition of ASME A17.1 are appropriate, even though there is a 1993 edition. This is because ASME A17.3-95, *Safety Code for Existing Elevators and Escalators*, which is the source for these requirements, specifies conformance to the 1987 edition as follows:

"3.11.3 Firefighters' Service

"Elevators shall conform to the requirements of ASME/ANSI A17.1-1987 Rules 211.3 through 211.8 unless at the time of installation or alteration it was required to comply with a later edition of A17.1."

608.1.3 Smoke Barriers---Where the work area on any floor exceeds 50 percent of that floor area and is on a floor that is above the main floor level in Use Groups R-1 and R-2, smoke barriers conforming to the requirements of Section 605.1.2 above shall be provided around all elevator landings on the work area floor.

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Exceptions:

1. The smoke barriers shall be permitted to terminate at the ceiling, provided the ceiling membrane provides resistance to the passage of smoke equivalent to that provided by the smoke barriers.
2. The smoke barriers shall not be required in buildings protected throughout by an automatic sprinkler system.

609.0 Boiler/Furnace Equipment Rooms

609.1---Boiler/furnace equipment rooms shall be enclosed by one-hour fire rated construction when the work area is in any of the following facilities: day nurseries, children's shelter facilities, residential child care facilities and similar facilities with children below the age of 2-1/2 years, and which may be classified as Use Group I-2, shelter facilities, residences for the developmentally disabled, group homes, teaching family homes, transitional living homes, rooming and boarding houses, hotels and multiple dwellings.

Exceptions:

1. Furnace and boiler equipment of low pressure type (operating at pressures of 15 psig or less for steam equipment or 160 psig or less for hot water equipment) when installed in accordance with manufacturer recommendations or furnace and boiler equipment of residential (R-3) type (200,000 BTU per hour input rating or less) is not required to be enclosed.
2. Furnace rooms protected with automatic sprinkler protection.

609.2---Emergency controls shall be provided in all structures classified as day nurseries, children's shelter facilities, residential child care facilities and similar facilities with children below the age of 2-1/2 years, and which may be classified as Use Group I-2, and in group homes, teaching family homes, and supervised transitional living homes in accordance with the following:

1. Emergency shutoff switches for furnaces and boilers in basements must be at the top of the stairs leading to the basement;
2. Emergency shutoff switches for furnaces and boilers in other enclosed rooms must be located outside of the room.

CHAPTER 7. CHANGE OF OCCUPANCY

701.0 General

701.1---Any repair, renovation, alteration, or reconstruction work undertaken in connection with a change of occupancy that does not involve a change of Use Group shall conform to the requirements of Chapters 3, 4, 5 and 6 respectively for the applicable Use Group.

701.2---The Use Group of an existing building or structure may be changed, provided the building or structure meets all the requirements of Chapter 6 applied throughout the building for the new Use Group, and the requirements of this Chapter.

Exceptions:

1. Compliance with all the provisions of Chapter 6 is not required where the change of use complies with the requirements of Section 701.11.
2. As modified in Section 905.0 for historic buildings.

The model building codes require compliance with all the requirements of the building code, or with the intent of those requirements, in all changes of use groups. The NARRP follow the UCBC in establishing hazard categories for the use groups. Changes of use to a higher hazard category require compliance with the building code requirements that address that hazard. Changes of use to an equal or lower hazard category require compliance with a minimum level of improvements, which in the NARRP is defined as the reconstruction requirements (Chapter 6) applied throughout the building. The latter (change of use to an equal or lower hazard category) is a significant change from the model codes.

701.3 Special Use and Occupancy

701.3.1---Where the character of use of an existing building or part of an existing building is changed to one of the following special use or occupancy categories as defined in Chapter 4 of the Building Code, the building shall comply with all the applicable requirements of that chapter, regardless of whether a change of Use Group is involved:

1. covered mall buildings,
2. atriums,
3. private garages,
4. public garages,
5. motion picture projection rooms, screening rooms and sound stages,
6. stages and platforms,
7. special amusement buildings, and
8. HPM facilities.

This list of special use and occupancy categories is based on the BOCA *National Building Code*. Jurisdictions using a different code would need to determine the appropriate categories under their code.

701.3.2---An underground building in which there is a change of use shall comply with the requirements of the building code applicable to underground structures.

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701.4 Plumbing Requirements

701.4.1---Where the occupancy of an existing building or part of an existing building is changed such that the new occupancy is subject to increased or different plumbing fixture requirements or to increased water supply requirements in accordance with the Plumbing Code, the intent of the respective Plumbing Code provisions shall be complied with.

701.4.2---If the new occupancy is a food handling establishment, all existing sanitary waste lines above the food or drink preparation or storage areas shall be panned or otherwise protected to prevent leaking pipes or condensation on pipes from contaminating food or drink. New drainage lines shall not be installed above such areas, and shall be protected in accordance with the Plumbing Code.

701.4.3---If the new occupancy will produce grease or oil laden wastes, it shall be provided with interceptors as required in the Plumbing Code.

701.4.4---If the new occupancy will produce chemical wastes, the following shall apply:

1. If the existing piping is not compatible with the chemical waste, the waste shall be neutralized prior to entering the drainage system or the piping shall be changed to a compatible material.
2. No chemical waste shall discharge to a public sewer system without the approval of the sewage authority.

701.4.5---If the Use Group is changed to Use Group I-2, the plumbing system shall comply with the applicable requirements of the Plumbing Code.

701.5 Mechanical Requirements---Where the occupancy of an existing building or part of an existing building is changed such that the new occupancy is subject to different kitchen exhaust requirements or to increased mechanical ventilation requirements in accordance with the Mechanical Code, the intent of the respective Mechanical Code provisions shall be complied with.

The Mechanical Code includes outdoor air rate requirements (in terms of CFM/person or CFM/sq.ft.) for many occupancy classifications. The intent of this requirement is to upgrade the mechanical ventilation if the change of occupancy entails an increased demand for ventilation.

701.6 Electrical Requirements

701.6.1---Where the occupancy of an existing building or part of an existing building is changed to one of the following special occupancies as described in Chapter 5 of the Electrical Code, the electrical wiring and equipment of the building or portion thereof that contains the proposed occupancy shall comply with an applicable requirements of the Electrical Code regardless of whether a change of Use Group is involved:

1. hazardous (classified) locations,

2. commercial garages, repair and storage,
3. aircraft hangars,
4. gasoline dispensing and service stations,
5. bulk storage plants,
6. spray application, dipping and coating processes,
7. health care facilities,
8. places of assembly,
9. theaters, audience areas of motion picture and television studios and similar locations,
10. motion picture and television studios and similar locations,
11. motion picture projectors, and
12. agricultural buildings.

701.6.2---Where the occupancy of an existing building or part of an existing building is changed all unsafe conditions shall be corrected, without requiring that all parts of the electrical system be brought up to the current edition of the Electrical Code.

701.6.3---Where the occupancy of an existing building or part of an existing building is changed electrical service shall be upgraded to meet the requirements of the Electrical Code for the new occupancy.

701.6.4---Where the occupancy of an existing building or part of an existing building is changed the number of electrical outlets shall comply with the Electrical Code for the new occupancy.

Section 701.6.1 includes a complete listing of the occupancies that entail special electrical requirements in the *National Electrical Code* due to the nature of the occupancy. Section 701.6.4 may require increasing the number of outlets when there is a change into use Groups R-2, R-3, and R-4.

701.7 Part Change of Use Group

701.7.1---Where a portion of an existing building is changed to a new Use Group, and that portion is not separated from the remainder of the building with fire separation assemblies having a fire resistance rating as required in the Building Code for the separate Use Groups, or with approved compliance alternatives, the entire building shall comply with all the requirements of Chapter 6 applied throughout the building for the new Use Group, and with the requirements of this Chapter.

Exception:

1. Compliance with all the provisions of Chapter 6 is not required when the change of use complies with the requirements of Section 701.11.

701.7.2---Where a portion of an existing building is changed to a new Use Group, and that portion is separated from the remainder of the building with fire separation assemblies having a fire resistance rating as required in the Building Code for the separate Use Groups, or with approved compliance alternatives, the portion changed shall comply

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with all the requirements of Chapter 6 for the new Use Group, and with the requirements of this Chapter.

Exception:

1. Compliance with all the provisions of Chapter 6 is not required when the change of use complies with the requirements of Section 701.11.

701.8---Every change of use to one classified in a different Use Group shall require a new certificate of occupancy regardless of whether any renovations, alterations, or reconstruction work are required by these provisions.

701.9 Accessibility---Every building undergoing a change of occupancy shall comply with the accessibility requirements in the Building Code applicable to a change of occupancy.

New Jersey, in an effort to develop a complete code applicable to rehabilitation of existing buildings, has undertaken to extract the applicable requirements from its Building Code. The following requirements, based on New Jersey's draft, are included for reference:

1. Where there is no construction associated with a change of occupancy in a building with less than 10,000 square feet total gross enclosed floor area it shall be exempt from the Accessibility requirements of the Building Code.
2. The change of occupancy of a building 10,000 square feet or greater total gross enclosed floor area shall comply with the Accessibility requirements of the Building Code.

701.10 Hazard Category Classifications---The relative degree of hazard between different Use Groups shall be as set forth in the hazard category classifications, Tables A through C of Section 702 and Table D of Section 703.

701.10.1---An existing building or portion thereof may have its use changed to a Use Group within the same hazard classification category or to a Use Group in a lesser hazard classification category (higher number) in all four hazard category classifications, provided it complies with the provisions of Chapter 6 for the new Use Group, applied throughout the building, or portion thereof in accordance with Section 701.7.2, with Sections 703.1 (Live Loads) and 703.2 (Vertical Loads on Roofs), and with Sections 704.0 (Handrails and Guards) and 705.0 (Health and Hygiene).

Exception:

1. Compliance with all the provisions of Chapter 6 is not required where the change of use complies with the requirements of Section 701.11.

The exception references Section 701.11, which addresses the applicable requirements for a change of use involving an equal or lesser hazard category based on Tables A, B and C. Where this occurs, compliance with all provisions of Chapter 6 for the new use is not required, provided compliance with those selected requirements identified in Section 701.11 is achieved.

701.10.2---An existing building shall comply with all the applicable requirements of this Chapter when a change in use will place it in a higher hazard category or when the use is changed within Use Group H.

701.10.3---An existing building may have its use changed to a higher hazard rating (lower number) in all three hazard category classifications designated in Tables A, B, and C provided it complies with this Chapter or with Appendix 2.

701.11 Change of Use to an Equal or Lesser Hazard---A change of use to a Use Group within the same hazard classification category or to a Use Group in a lesser hazard classification category (higher number) in the three hazard category classifications addressed by Tables A, B and C shall be permitted in an existing building or portion thereof provided the provisions of this section are met.

There are instances where the new use group may be considered a lesser hazard in all three of the fire hazard classification tables. One option provided by Section 701.10 would be to comply with the requirements of Chapter 6 for the new use group. However, if the hazard is not as severe as that associated with the prior use, compliance with all the provisions of Chapter 6 may be an unreasonable burden. Therefore, this section permits a change to a lesser hazard as measured in Tables A, B and C provided compliance with selected additional requirements are met to provide an acceptable level of protection for the new use.

Some examples where this condition may occur include the following:

1. Change from an assembly use to Use Group E.
2. Change from an office building to Use Group F-2.
3. Change from a school to Use Group B.
4. Change from an industrial use to Use Group B.
5. Change from an institutional use to use Group R.

This list is not intended to be all inclusive, but does identify some typical scenarios.

701.11.1---Regardless of the Use Group involved, the following requirements shall be met:

1. The capacity of the means of egress shall comply with Section 602.3.
2. The interior finish of walls and ceilings shall comply with the requirements of Section 603.
3. The high rise building requirements of Section 608.0 shall apply.
4. The boiler/furnace room requirements of Section 609.0 shall apply.

Tables A, B, and C do not address the hazards associated with interior finish materials, high rise buildings, and boiler/furnace rooms. Therefore, regardless of the hazard classification, compliance with the referenced sections is required. Likewise, regardless of the new Use Group, the means of egress capacity must comply with the provisions of Section 602.3.

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701.11.2---Where the new use is classified as Use Group I-1, R-1 or R-2, the following requirements shall be met:

1. Corridor doors and transoms shall comply with the requirements of Sections 602.4.3 and 602.4.4.
2. Fire suppression systems shall comply with the requirements of Section 606.0.
3. Fire alarm systems shall comply with the requirements of Section 607.0.

The four sections referenced are intended to ensure that the level of life safety required by current building codes with respect to fire suppression systems, fire alarm system and corridor separation is achieved.

701.11.3---Where the new use is classified as Use Group I-2, the following requirements shall be met:

1. Egress doorways from patient sleeping rooms shall and suites of rooms shall comply with the requirements of Section 602.4.2.
2. Shaft enclosures shall comply with the requirements of Section 604.0.
3. Smoke barriers shall comply with the requirements of Section 605.1.
4. Fire suppression systems shall comply with the requirements of Section 606.0.
5. Fire alarm systems shall comply with the requirements of Section 607.0.

The lack of evacuation capability of the occupants in buildings of Use Group I-2 warrant special consideration in the areas identified.

701.11.4---Where the new use is classified as Use Group I-3, the following requirements shall be met:

1. Locking of egress doors shall comply with the requirements of Section 602.4.11.
2. Shaft enclosures shall comply with the requirements of Section 606.0.
3. Fire suppression systems shall comply with the requirements of Section 606.0.
4. Fire alarm systems shall comply with the requirements of Section 607.0.

The lack of evacuation capability of the occupants in buildings of Use Group I-3 warrant special consideration in the areas identified.

701.11.5---Where the new use is classified as Use Group R-3, the following requirements shall be met:

1. Dwelling unit separation shall comply with the requirements of Section 605.2.
2. The smoke detector requirements of Section 607.1 shall be met.

A change to Use Group R-3 will require compliance with the dwelling unit separations and smoke detector requirements to provide an acceptable level of life safety to the occupants.

There are some use groups which may be conspicuous by their absence under Section 701.11. For example, there are no special considerations for a change to an assembly use. However, about the only times that Section 701.11 would apply to a change to an assembly use would be a change from one assembly use to another or from an educational use to an assembly use. It would also be possible to change from an institutional use to an assembly use, but provided that the provisions of 701.11.1 are met, the resulting increased occupant load should not require additional protection beyond that required for an incapable population. Likewise, while changes to Use Groups F-1, M or S-1 might otherwise require automatic suppression systems, note that changes to such uses will not typically qualify to use Section 701.11 since at least one of the tables would result in a higher hazard classification.

702.0 Fire and Life Safety

702.1 Means of Egress/General

Table A

HAZARD CATEGORIES AND CLASSIFICATIONS: LIFE SAFETY AND EXITS

RELATIVE HAZARD	USE CLASSIFICATION
1 (Highest Hazard)	H
2	I-2, I-3
3	A, E, I-1, M, R-1, R-2
4	B, F-1, R-3, R-4, S-1
5 (Lowest Hazard)	F-2, S-2, U

Table A is based on the travel distances permitted for the various Use Groups in the *BOCA National Building Code*. A further distinction has been made between relative hazard levels 3 and 4 based upon the anticipated characteristics of the occupants such as density, familiarity with surroundings and other characteristics which could impact on evacuation time such as being awake or asleep, age and potential impairments.

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702.1.1---When a change of use is made to a higher hazard category (lower number) as shown in Table A, all elements of the means of egress, including but not limited to the exit access, exit discharge, occupant load, corridors, doors, enclosures, stairs and ramps, guards and handrails, means of egress doorways, fire escapes and exit lighting and signs, shall comply with the requirements of Chapter 10 of the Building Code.

Exceptions:

1. Stairways shall be enclosed in compliance with applicable portions of Section 702.2.
2. Existing stairways including handrails and guards complying with the requirements of Chapter 6 shall be permitted for continued use subject to approval of the building official.
3. Any stairway replacing an existing stairway within a space where, because of existing construction, the pitch or slope cannot be reduced, shall not be required to comply with the maximum riser height and minimum tread depth requirements.
4. Existing corridor walls constructed of wood lath and plaster in good condition or 1/2-inch-thick (12.7 mm) gypsum wallboard shall be permitted.
5. Existing corridor doorways, transoms and other corridor openings shall comply with the requirements in Sections 602.4.3, 602.4.4 and 602.4.5.
6. Existing dead end corridors shall comply with the requirements in Section 602.5.
7. An existing operable window with clear opening area no less than 4 square feet, and with minimum opening height and width of 22 inches and 20 inches respectively shall be accepted as an egress window.

Exception 5 may seem overly permissive for certain high hazard occupancies, but becomes reasonable when considered in the context of other protection provisions triggered in Chapter 6.

702.1.2---When a change of use is made to an equal or lesser hazard category as shown in Table A, existing elements of the means of egress shall comply with the requirements of Section 602.0 for the new Use Group. Newly constructed or configured means of egress shall comply with the requirements of Chapter 10 of the Building Code.

Exception:

1. Any stairway replacing an existing stairway within a space where, because of existing construction, the pitch or slope cannot be reduced, shall not be required to comply with the maximum riser height and minimum tread depth requirements.
2. Compliance with Section 602.0 is not required where the change of use complies with the requirements of Section 701.11.

702.1.3---Egress capacity shall meet or exceed the occupant load as specified in Section 602.0 if the change of use is to an equal or lesser hazard category when evaluated in accordance with Table A.

702.2 Enclosure of Vertical Shafts

702.2.1---Vertical shafts shall be designed to meet the Building Code requirements for atriums or the requirements of this Section.

702.2.2 Stairways---When a change of use is made to a higher hazard category as shown in Table A, interior stairways shall be enclosed as required by the Building Code.

Exceptions:

1. In other than Use Group I Occupancies, an enclosure shall not be required for openings serving only one adjacent floor and not connected with corridors or stairways serving other floors.
2. Unenclosed existing stairways need not be enclosed in a continuous vertical shaft if each story is separated from other stories by one-hour fire-resistive construction or approved wired glass set in steel frames and all exit corridors are sprinklered. The openings between the corridor and occupant space shall have at least one sprinkler head above the openings of the tenant side. The sprinkler system shall be permitted to be supplied from the domestic water-supply systems, provided the system is of adequate pressure, capacity and sizing for the combined domestic and sprinkler requirements.

This exception is also in the *Uniform Code for Building Conservation*.

3. Existing penetrations of stairway enclosures shall be accepted if they are properly protected in accordance with the Building Code.

Penetrations of exit enclosures are restricted by the Building Code. Exception 3 would permit existing penetrations beyond those permitted by the Building Code only if they are properly protected to maintain the fire resistance rating of the exit enclosure. The exception does not, however, permit a new penetration unless it would also be permitted by the Building Code.

702.2.3 Other vertical shafts---Interior vertical shafts other than stairways, including but not limited to elevator hoistways and service and utility shafts, shall be enclosed as required by the Building Code when there is a change of use to a higher hazard category in Table A.

Exceptions:

1. Existing one-hour interior shaft enclosures shall be accepted where a higher rating is required.
2. Vertical openings, other than stairways, need not be enclosed if the entire building is provided with an approved automatic sprinkler system.
3. Where one-hour fire-resistive floor construction is required, vertical shafts need not be enclosed where floor penetrations are firestopped at every floor level.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

702.2.4 Openings---All openings into existing vertical shaft enclosures shall be protected by fire assemblies having a fire-protection rating of not less than one hour and shall be maintained self-closing or shall be automatic closing by actuation of a smoke detector. All other openings shall be fire protected in an approved manner. Existing fusible link-type automatic door-closing devices shall be permitted in all shafts except stairways if the fusible link rating does not exceed 135°F. (75°C.).

702.3 Heights and Areas

Table B

**HAZARD CATEGORIES AND CLASSIFICATIONS:
HEIGHTS AND AREAS**

RELATIVE HAZARD	USE CLASSIFICATIONS
1 (Highest Hazard)	A-2, H, I-3
2	A-1, A-3, A-4, E, I-1, I-2, S-1
3	B, F-1, M, R
4 (Lowest Hazard)	F-2, S-2, U

Table B is based upon the relative hazard associated with the Use Group as determined in Table 503 (allowable heights and areas) of the BOCA *National Building Code*. The relative hazard level is based upon the allowable heights and areas for the respective Use Groups in Type 2A construction.

702.3.1---Where a change of use is made to a higher hazard category as shown in Table B, heights and areas of buildings and structures shall meet the limitations of Chapter 5 of the Building Code for the new Use Group.

Exception:

1. A 1-story building changed into Use Group E shall not be required to meet the area limitations of the Building Code.

702.3.2--- When a change of use is made to an equal or lesser hazard category as shown in Table B, the height and area of the existing building shall be deemed to be acceptable.

Even if the height or area exceeds that permitted by the Building Code, if the change is to a lesser hazard then the existing height and area are deemed to be acceptable. Any additions to the existing building must comply with Chapter 8 of these provisions.

702.3.3 Fire separation assemblies---When a change of use is made to a higher hazard category as shown in Table B, fire separation assemblies in mixed use buildings shall comply with the requirements for Mixed Use Groups in the Building Code.

Exception:

1. Where the fire separation assemblies are required to have a one-hour fire resistance rating, existing wood lath and plaster in good condition or existing 1/2-inch-thick (12.7 mm) gypsum wallboard shall be permitted.

702.4 Exterior Wall Fire Resistance Ratings

Table C

**HAZARD CATEGORIES AND CLASSIFICATIONS:
EXPOSURE OF EXTERIOR WALLS**

RELATIVE HAZARD	USE CLASSIFICATION
1 (Highest Hazard)	H
2	F-1, M, S-1
3	A, B, E, I, R
4 (Lowest Hazard)	F-2, S-2, U

Table C is based on the BOCA code fire resistance rating of the exterior wall at a fire separation distance of 5 feet. A "1" has a required rating of 4 hours, a "2" has a required rating of 3 hours, a "3" has a required rating of 2 hours, and a "4" has a required rating of 1 hour. In addition, Use Group H is assigned a relative hazard level of "1" so that improvements are required whenever a building is converted to Use Group H.

702.4.1---Where a change of use is made to a higher hazard category as shown in Table C, exterior walls shall have fire resistance and exterior opening protectives as required in Chapter 7 of the Building Code. This provision shall not apply to walls at right angles to the property line.

Exception:

1. Where a fire resistance rating greater than two hours is required for a building of any type of construction, existing noncombustible exterior walls having a fire resistance rating equivalent to two hours as determined by *HUD Rehabilitation Guidelines/1980 No. 8*, or other approved sources, shall be accepted, provided the building does not exceed three stories in height and is classified as one of the following Use Groups: A-3 with an occupant load of less than 300, B, F, M, or S.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

702.4.2---When a change of use is made to an equal or lesser hazard category as shown in Table C, existing exterior walls, including openings, shall be accepted.

702.4.3 Opening protectives---Openings in exterior walls shall be protected as required by the Building Code. When openings in the exterior walls are required to be protected due to distance from the property line, the sum of the area of such openings shall not exceed 50 percent of the total area of the wall in each story.

Exceptions:

1. Where the Building Code permits openings in excess of 50 percent.
2. Protected openings shall not be required in buildings of Use Group R which do not exceed three stories in height and which are located not less than 3 feet (914 mm) from the property line.
3. Where exterior opening protectives are required, an automatic sprinkler system throughout may be substituted for opening protection.
4. Exterior opening protectives are not required when the change of occupancy is to an equal or lower hazard classification in accordance with Table C.

703.0 Structural Safety

703.1 Live Loads---Any existing structure in which the proposed new occupancy requires floor live loads equal to or less than required for the existing occupancy is permitted to be continued in use for the originally approved live loads, provided that the structure is not dangerous and is adequate for the proposed occupancy. If the approved live load is less than required by Chapter 16 of the Building Code, the areas designed for the reduced live load shall be posted with the approved load or shall be structurally strengthened to support the new load. Placards shall be of an approved design.

Exception:

1. Analysis and test methods for evaluation of existing materials shall be permitted to use the methods specified in the code under which the building was constructed, the current Building Code, or other standards as approved by the building official.

703.2 Vertical Loads on Roofs---Buildings and structures shall comply with the roof load requirements of Chapter 16 of the Building Code for roof live load.

Exception:

1. Existing roofs shall be permitted to be retained provided any unsafe or overloaded conditions are corrected and where the roof dead load is not increased by use, re-roofing or added equipment.

703.3 Wind and Snow Loads---Where a change of occupancy results in an existing building being assigned a higher wind load or snow load importance factor in accordance with Chapter 16 of the Building Code, the building shall be strengthened to meet the Building Code wind load or snow load requirements, respectively, for new buildings.

703.4 Earthquake Loads---Where a change of occupancy results in an existing building being reclassified to a higher hazard category as shown in Table D, the building shall be strengthened to meet the Building Code seismic requirements for new buildings.

Exceptions:

1. For buildings located in seismic map areas having an effective peak velocity-related acceleration (A_v) value of less than 0.15, strengthening the building to meet the seismic requirements for new buildings is required only where the change of occupancy results in a building being reclassified to hazard category 1 (highest). All other buildings so located shall not be required to be strengthened.
2. Unreinforced masonry bearing wall buildings shall be strengthened to meet the requirements of Appendix 1.

The first exception is based on NEHRP and is in the BOCA and SBCCI building codes. A_v is the effective peak velocity-related acceleration, indicated as the decimal equivalent of the percent of gravity (i.e., 0.15 = 15 percent of the acceleration of gravity). $A_v < 0.15$ applies to most of the United States except for much of California, Alaska, Hawaii and Nevada, and small portions of Arkansas, Idaho, Illinois, Kentucky, Missouri, Mississippi, Montana, Utah, Wyoming, and Washington.

The second exception will permit the lower cost retrofit of URM buildings to be undertaken.

The building official may approve rehabilitation of existing buildings that is based on documents such as FEMA 273 (under development), working with FEMA 178, as a retrofit option rather than full code compliance.

Table D

SEISMIC HAZARD CATEGORIES

RELATIVE HAZARD	USE CLASSIFICATION
1 (Highest hazard)	H-1, H-4 with highly toxic materials I-2 (hospitals) B (fire, rescue and police stations) B (emergency preparedness centers) B (primary communication facilities) S (post-earthquake recovery vehicle garages) F (power-generating stations and other utility facilities required for emergency backup)
2	A, E, I-1, I-2 (all others), I-3, H-2, H-3 F (power-generating stations and other public utilities not listed in Relative Hazard 1) B (used for adult education with an occupant load > 500) Any building with an occupant load > 5000
3	R-1, R-2
4	F-1, S-1, H-4
5	B (all others), F-2, M (all others), S-2
6 (Lowest hazard)	R-3, U

Table D is a combination of the NEHRP Seismic Hazard Exposure Groups included in the BOCA *National Building Code* and in the SBCCI *Standard Building Code* with the hazard classifications in the ICBO *Uniform Code for Building Conservation*.

704.0 Handrails and Guards

704.1 Handrails---Existing stairways shall comply with the handrail requirements in Section 602.7.

704.2 Guardrails---Existing guardrails shall comply with the guardrail requirements in Section 602.8.

705.0 Health and Hygiene

705.1 Light and Ventilation---Light and ventilation shall comply with the requirements of the Building Code for the new Use Group.

706.0 Energy Conservation

706.1---A change of use that would require an increase in space conditioning energy use in an existing building or structure that was constructed under an Energy Code shall not be permitted unless such building or structure is made to comply with the thermal envelope requirements of the Energy Code under which it was constructed for the new Use Group.

Section 706 is intended to avoid requiring costly whole-building work to comply with the latest energy code requirements for simple changes of use, while still requiring any improvements necessary to meet the thermal envelope requirements applicable when the building was constructed.

CHAPTER 8. ADDITIONS

801.0 General Requirements

801.1---An addition to a building or structure shall comply with the building, plumbing, electrical, and mechanical codes, without requiring the existing building or structure to comply with any requirements of those codes or of these provisions.

801.2---An addition shall not create or extend any non-conformity in the existing building to which the addition is constructed with regard to accessibility, structural strength, fire safety, means of egress, or the capacity of mechanical, plumbing or electrical systems.

801.3---Any repair, renovation, alteration or reconstruction work within an existing building to which an addition is being made shall comply with the requirements of Chapters 3, 4, 5 and 6 respectively of these provisions.

802.0 Heights and Areas

802.1---No addition shall increase the height of an existing building beyond that permitted under the applicable provisions of Chapter 5 of the Building Code for new buildings unless fire separation as required in the Building Code is provided.

802.2---No addition shall increase the area of an existing building beyond that permitted under the applicable provisions of Chapter 5 of the Building Code for new buildings unless fire separation as required in the Building Code is provided.

Exceptions:

1. Existing one and two story buildings shall be permitted to be expanded beyond what is permitted by up to 25 percent of the existing floor area, not to exceed an area of 125 percent of that permitted by the Building Code, without providing fire separation.
2. Infilling of floor openings, non-occupiable appendages such as elevator and exit stair shafts, and the addition of mezzanines and equipment penthouses shall be permitted beyond that permitted by the Building Code.

802.3 Fire Protection Systems---Existing fire areas increased by the addition shall comply with Chapter 9 of the Building Code.

803.0 Structural Loads

803.1---An addition shall not impose loads which would cause the existing building to be subject to stresses exceeding those permitted by the Building Code.

803.2---An addition shall not increase the stress in any structural element of the existing building or structure by more than 5 percent, unless the increased stress on the element is still in compliance with the Building Code for new structures.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

804.0 Smoke Detectors in Use Groups R-3 and R-4

804.1---Whenever an addition is made to a building or structure of Use Group R-3 or R-4, hardwired, interconnected smoke detectors meeting the requirements of the Building Code shall be installed and maintained in the addition.

804.2---Whenever an addition is made to a building or structure of Use Group R-3 or R-4, the existing building shall be provided with smoke detectors as required by the Building Code. The smoke detectors are not required to be interconnected.

805.0 Accessibility

805.1---Additions shall comply with the accessibility requirements in the Building Code.

New Jersey, in an effort to develop a complete code applicable to rehabilitation of existing buildings, has undertaken to extract the relevant accessibility requirements from its Building Code. The following requirements based on New Jersey's draft are included for reference:

"1---All work in the addition shall comply with the requirements of Chapter 11, Accessibility, of the building code, where applicable.

"2---The addition shall include an accessible entrance unless the building code requirements for accessible entrances have been met.

 "2.1---If the only accessible entrance to the addition is located in the existing building or facility, at least one interior accessible route shall provide access through the existing building or facility to all rooms, elements, or spaces in the addition.

"3---If there are no toilet rooms in the addition, and if accessible toilet facilities are required by the building code, accessible toilet facilities shall be provided in the existing building."

806.0 Energy Conservation

806.1---Additions to existing buildings or structures may be made to such buildings or structures without making the entire building or structure comply with the requirements of the Energy Code. The addition shall conform to the requirements of the Energy Code as they relate to new construction only.

This is based on the 1995 CABO Model Energy Code.

CHAPTER 9. HISTORIC BUILDINGS

901.0 General

901.1---Historic buildings shall comply with the provisions of this Chapter, or with the provisions of Chapters 3, 4, 5, 6 and 7, relating to their repair, renovation, alteration, reconstruction, movement and change of occupancy.

901.2 Alternatives--- A historic building undergoing repair, renovation, alteration, reconstruction or change of occupancy shall be investigated and evaluated. If it is intended that the building meet the requirements of this chapter, a written report shall be prepared for such a building and filed with the appropriate official by a registered design professional where in the opinion of the official such a report is necessary. Such report shall be in accordance with Chapter 1 of these provisions and shall identify each required safety feature in compliance with this chapter and where compliance with other chapters of these provisions would be damaging to the contributing historic features. In addition, the report shall describe each feature not in compliance with these provisions and demonstrate how the intent of these provisions is complied with in providing an equivalent level of safety.

This section is intended to document the requirements and alternatives accepted by the building official, if the owner wishes to benefit from the exceptions offered by Chapter 9. It is important to have a complete record of any decision made.

The applicant and the building official should coordinate any work with the local or state commission responsible for historic buildings to assure that the work is in compliance with the Secretary of the Interior's Standards for Historic Properties.

901.3 Accessibility Requirements---The accessibility requirements contained in these provisions shall apply to historic buildings undergoing alterations, renovations, reconstruction or a change of occupancy. If the historic character of the building is adversely affected, then alternative provisions of accessibility shall be permitted.

Accessibility requirements may need to be modified based on individual state requirements. Most states and the ADA provisions allow for alternatives and exceptions for historic buildings.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

901.4 Special Occupancy Exceptions - House Museums---When a building that is in Use Group R-3 is also used for A, B, or M purposes such as museum tours, exhibits and other public assembly activities, the building official may make a determination that the Use Group is B when life safety can be demonstrated in accordance with Section 901.2. Adequate means of egress in such buildings, which may include a means of maintaining doors in an open position to permit egress, a limit on building occupancy to an occupant load permitted by the means of egress capacity, a limit on occupancy of certain areas or floors, and/or supervision by a person knowledgeable in the emergency exiting procedures, shall be provided.

House museums are used for tours and other events several times per year while normally functioning as a single family dwelling. This section enables the building official to consider the individual safety of each building so used.

902.0 Repairs

902.1---Repairs to any portion of a historic building or structure shall be permitted to be made with original materials and original methods of construction, subject to provisions of this Chapter.

This is similar to Chapter 3, but may exempt historic buildings from the exceptions therein.

903.0 Relocated Buildings

903.1 Construction---Any repair, renovation, alteration, reconstruction, movement and change of use of relocated historic structures shall comply with the requirements of this Chapter.

903.2 Foundations---Foundations of relocated historic buildings and structures shall comply with the Building Code. Relocated historic buildings shall otherwise be considered as historic buildings for the purposes of these provisions.

Typically the building code treats relocated buildings as new structures. In the case of historic buildings they may be considered as an existing building and accepted. However, any mechanical and electrical safety hazards still need to be corrected.

903.3---Relocated historic buildings and structures shall be so sited that fire separation distance and opening protectives comply with the requirements of the Building Code.

904.0 Repair, Renovation, Alteration or Reconstruction

904.1 General---Historic buildings undergoing repair, renovation, alteration or reconstruction shall comply with all of the applicable requirements of Chapters 3, 4, 5 and 6 of these provisions except as specifically permitted in this Chapter.

The intent of this section is for historic buildings to comply with the minimum requirements of these provisions with some special considerations and exceptions. These special provisions provide a means for retaining the historic character and materials in the building while providing and maintaining their life safety intent.

904.2 Replacement---Replacement of existing or missing features using original materials shall be permitted. Partial replacement for repairs that match the original in configuration, height and size shall be permitted. Such replacements shall not be required to meet the materials and methods requirements in Section 401.2 of these provisions.

Exception:

1. Replacement glazing in hazardous locations shall comply with the Safety Glazing requirements of Chapter 24 of the Building Code.

904.3 Roof Covering---The existing type of roof covering shall be permitted to be continued and replaced with the same materials if the historic materials are documented to the satisfaction of the building official.

904.4 Means of Egress---Existing door openings and corridor and stairway widths of less than those that would be acceptable for non-historic buildings under these provisions shall be approved, provided that in the opinion of the building official there is sufficient width and height for a person to pass through the opening or traverse the exit and that the capacity of the exit system is adequate for the occupant load or where other operational controls to limit occupancy are approved by the building official.

This provision enables the building official to accept conditions in historic buildings that might be considered hazardous in non-historic buildings. See the related introductory commentary to Section 602.0.

904.5 Door Swing---When approved by the building official, the existing front doors need not swing in the direction of exit travel, provided other approved exits having sufficient capacity to serve the total occupant load are provided.

This is an exception to Section 602.4.7, which requires doors serving over 50 occupants to swing in the direction of exit travel.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

904.6 Transoms---In fully sprinklered buildings of Use Group I-1, R-1 and R-2 existing transoms in corridors and other fire rated walls may be maintained if fixed in the closed position. A sprinkler shall be installed on each side of the transom.

This allows non-wired glass transoms to remain. Section 602.4.4 would otherwise require that fixed wired glass be used, regardless of sprinklering.

904.7 Interior Finishes---The existing finishes of walls and ceilings shall be accepted where it is demonstrated that it is the historic finish.

This is an exception to Section 603.0, which requires compliance with the Building Code or treatment with fire retardant coating.

904.8 Stairway Enclosure

904.8.1---Stairway enclosures may be omitted in a historic building where such stairway serves only one adjacent floor.

904.8.2---In buildings of three stories or less, exit enclosure construction shall limit the spread of smoke by the use of tight fitting doors and solid elements. Such elements need not have a fire rating.

This paragraph is intended to control smoke rising upward through a building. By enclosing the stairs with non-rated materials, including plain glass, there is improved safety. This exception goes beyond the various exceptions to stairway enclosure allowed in Section 604.2.

904.9 One-Hour Fire-resistive Assemblies---Where one-hour fire-resistive construction is required by these provisions, it need not be provided regardless of construction or occupancy where the existing wall and ceiling finish is wood lath and plaster.

904.10 Stairway Railings---Grand stairways shall be accepted without complying with the handrail and guardrail requirements. Existing handrails and guards shall be permitted to remain provided they are not structurally dangerous.

This paragraph relieves grand stairways from compliance with Sections 602.8.2 and 602.9.2. In other words, handrails and guards, even when substantially rebuilt, need not comply with the Building Code. This is a specific application of Section 904.2 allowing replacement of historic fabric.

904.11 Exit Signs---The building official shall accept alternate exit sign or egress path marking location where such signs or markings would damage the historic character. Alternative signs shall identify the exits and egress path.

This is an exception to Section 602.7 where exit signs in accordance with the Building Code are required.

904.12 Sprinkler Alternative---Every historic building which does not conform to the construction requirements specified in other chapters of these provisions for the occupancy or use and which, in the opinion of the building official, constitutes a fire safety hazard shall be equipped throughout with an automatic sprinkler system installed in accordance with the Building Code. However, such automatic sprinkler system shall not be used to substitute for, or act as an alternate to, the required number of exits from any facility.

The intent of the fire sprinkler system for life safety hazards is to provide the level of safety intended by the Building Code but without requiring major changes in the building. The section does not identify all the conditions that might require such a system, permitting this to be discussed by the building official and the design professional, then documented as part of the building report in Section 901.2 of this Chapter.

905.0 Change of Occupancy

905.1 General---Historic buildings undergoing a change of occupancy shall comply with the applicable provisions of Chapter 7 except as specifically permitted in this Chapter. Where Chapter 7 requires compliance with specific requirements of Chapter 6, and where those requirements are subject to exceptions in Section 904.0, the same exceptions shall apply in this section.

905.2 Building Area---The allowable floor area for historic buildings undergoing a change of occupancy shall be permitted to exceed the allowable areas specified in Chapter 7 by twenty percent.

905.3 Location on Property---Historic structures undergoing a change of use to a higher hazard category in accordance with Section 702.4.1 of these provisions may use alternative methods to comply with the fireresistance and exterior opening protective requirements. Such alternatives shall comply with Section 901.2.

This paragraph allows the building official to consider the specific building location and site conditions and make allowances beyond those permitted in Chapter 7.

NATIONALLY APPLICABLE RECOMMENDED REHABILITATION PROVISIONS

905.4 Roof Covering---Regardless of occupancy or use group, roof-covering materials not less than Class C shall be permitted where a fire-retardant roof covering is required.

The requirement for a fire-retardant roof is important. However in the case of a historic building it may often be necessary to accept an alternate. This option permits most roofs to remain but to have a fire retardance rating.

905.5 Means of Egress---Existing door openings and corridor and stairway widths of less than those that would be acceptable for non-historic buildings under these provisions shall be approved, provided that in the opinion of the building official there is sufficient width and height for a person to pass through the opening or traverse the exit and that the capacity of the exit system is adequate for the occupant load, or where other operational controls to limit occupancy are approved by the building official.

This provision enables the building official to accept conditions in historic buildings that might be considered hazardous in non-historic buildings. See the related introductory commentary to Section 602.0.

905.6 Door Swing---When approved by the building official, the existing front doors need not swing in the direction of exit travel, provided other approved exits having sufficient capacity to serve the total occupant load are provided.

This is an exception to Section 602.4.7, which requires doors serving over 50 occupants to swing in the direction of exit travel.

905.7 Transoms---In corridor walls required to be fire rated by these provisions, existing transoms, may be maintained if fixed in the closed position and fixed wired glass set in a steel frame or other approved glazing shall be installed on one side of the transom.

Exception:

1. Transoms conforming to Section 904.7 of these provisions shall be accepted.

905.8 Finishes---Where finish materials are required to have a flame-spread classification of Class III or better, existing nonconforming materials shall be surfaced with an approved fire-retardant paint or finish.

Exception:

1. Existing nonconforming materials need not be surfaced with an approved fire-retardant paint or finish when the building is equipped throughout with an automatic fire suppression system installed in accordance with the Building Code and the nonconforming materials can be substantiated as historic in character.

The intent of this exception is to permit the existing finishes, often wood wainscots and paneling, to remain.

905.9 One-Hour Fire-resistive Assemblies---Where one-hour fire-resistive construction is required by these provisions, it need not be provided regardless of construction or occupancy where the existing wall and ceiling finish is wood lath and plaster.

905.10 Stairs and Railings---Existing stairways shall comply with the requirements of these provisions. The building official shall grant alternatives for grand stairways and railings if alternative stairways are found to be acceptable or if judged as meeting the intent of these provisions. Existing stairways shall comply with Section 904.10.

This paragraph extends the exception granted in Section 904.10 to change of occupancy to a higher hazard in accordance with Section 702.1.

905.11 Exit Signs---The building official may accept alternate exit sign locations where such signs would damage the historic character. Such signs shall identify the exits and exit path.

905.12 Exit Stair Live Load---Existing historic stairways in buildings changed to Use Groups R-1 and R-2 shall be accepted where it can be shown that the stairway can support a 75 pounds per square foot live load.

905.13 Natural Light---When it is determined by the Building Official that compliance with the natural light requirements of Section 705.1 will lead to loss of historic character and/or historic materials in the building, the existing level of natural lighting shall be considered acceptable.

In some cases the amount of natural light may be less than the code minimum. However the space may still receive sufficient natural light. The specific area may be inspected and permitted to remain. An example may be a building intended as a bed and breakfast facility that has inadequate window area.

905.14 Energy Conservation---Historic buildings are exempt from the requirements of Section 706.0.

This is paraphrased from the 1995 CABO *Model Energy Code*.

REFERENCED STANDARDS

American Society for Testing and Materials, ASTM E152-81a, *Standard Methods of Fire Tests of Door Assemblies*. Conshohocken PA: 1981.

American Society of Heating, Refrigeration and Air-Conditioning Engineers, ASHRAE 62-89, *Ventilation for Acceptable Indoor Air Quality*. Atlanta GA: 1989.

American Society of Mechanical Engineers, ASME A17.1-1987, *Safety Code for Elevators and Escalators*. New York NY: 1987.

National Fire Protection Association, NFPA 13D-94, *Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*. Quincy MA: 1994.

National Fire Protection Association, NFPA 13R-94, *Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height*. Quincy MA: 1994.

National Fire Protection Association, NFPA 72-93, *National Fire Alarm Code*. Quincy MA: 1993.

National Fire Protection Association, NFPA 99, *Health Care Facilities*. Quincy MA: 1987.

National Fire Protection Association, NFPA 101, *Life Safety Code*. Quincy MA: 1994.

National Fire Protection Association, NFPA 101A, *A Manual on Alternative Approaches to Life Safety*. Quincy MA: 1995.

Underwriters Laboratory, UL 217-93, *Standard for Safety Single and Multiple Station Smoke Detectors*. Northbrook IL: 1993.

U.S. Department of Housing and Urban Development, *Rehabilitation Guidelines/1980 No. 8, Guideline on Fire Ratings of Archaic Materials and Assemblies*. Washington, D.C.: 1980.

ADDITIONAL REFERENCES

American Society of Mechanical Engineers, ASME/ANSI A17.1-1987, *Safety Code for Elevators and Escalators*. New York NY: 1987.

American Society of Mechanical Engineers, ASME A17.3-1995, *Safety Code for Existing Elevators and Escalators*. New York NY: 1995.

Building Officials and Code Administrators International, Inc., *National Building Code/1996*. Country Club Hills IL: 1996.

Code of Federal Regulations, Title 24, Part 100 (Fair Housing regulations).

Code of Federal Regulations, Title 28, Part 36 (Americans with Disabilities Act regulations).

Council of American Building Officials, CABO/ANSI A117.1-1992, *American National Standard for Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People*. Falls Church VA: 1992.

Council of American Building Officials, *Model Energy Code*. Falls Church VA: 1995.

Federal Emergency Management Agency, FEMA 178, *NEHRP Handbook for the Seismic Evaluation of Existing Buildings*. Washington, D.C.: June 1992.

Federal Emergency Management Agency, FEMA 259, *Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings*. Washington, D.C.: January 1995.

Federal Emergency Management Agency, FEMA 273, *NEHRP Guidelines for the Seismic Rehabilitation of Buildings*. Washington, D.C.: September 1996.

Federal Emergency Management Agency, FEMA 274, *NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings*. Washington, D.C.: September 1996.

International Conference of Building Officials, *Uniform Building Code*, Whittier CA: 1994.

International Conference of Building Officials, *Uniform Code for the Abatement of Dangerous Buildings*. Whittier CA: 19__.

International Conference of Building Officials, *Uniform Code for Building Conservation*. Whittier CA: 1994.

National Fire Protection Association, NFPA 14-93, *Standpipe and Hose Systems*. Quincy MA: 1993.

National Fire Protection Association, NFPA 70, *National Electrical Code*. Quincy MA: 1993.

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National Fire Protection Association, NFPA 101, *Life Safety Code*. Quincy MA: 1994.

National Fire Protection Association, NFPA 101A, *A Manual on Alternative Approaches to Life Safety*. Quincy MA: 1995.

National Institute of Building Sciences, *Guidance Manual, Asbestos Operations & Maintenance Work Practices*, Second edition. Washington, D.C.: 1996.

National Institute of Building Sciences, *Asbestos Abatement and Management in Buildings, Model Guide Specifications*, Third edition. Washington, D.C.: 1996.

National Institute of Building Sciences, *Lead-Based Paint Operations & Maintenance Work Practices Manual for Homes and Buildings*. Washington, D.C.: May 1995.

National Institute of Building Sciences, *Guide Specifications for Reducing Lead-Based Paint Hazards*. Washington, D.C.: 1995.

Southern Building Code Congress International, *Standard Building Code*, Birmingham AL: 1994.

Southern Building Code Congress International, *Standard Existing Buildings Code*. Birmingham AL: 1988 with 1991/1994 revisions.

U.S. Department of Housing and Urban Development, *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*. Washington, D.C.: June 1995.

U.S. Department of Housing and Urban Development, *HUD Rehabilitation Energy Guidelines for One-to-Four Family Dwellings*. Washington, D.C.: September 1996.

U.S. Department of Housing and Urban Development, *HUD Rehabilitation Energy Guidelines for Multi-Family Dwellings*. Washington, D.C.: September 1996.

U.S. Department of Housing and Urban Development, *Rehabilitation Guidelines/1980 No. 5, Egress Guideline for Residential Rehabilitation*. Washington, D.C.: 1980.

U.S. Department of Housing and Urban Development, *Rehabilitation Guidelines/1980 No. 6, Electrical Guideline for Residential Rehabilitation*. Washington, D.C.: 1980.

U.S. Department of Housing and Urban Development, *Rehabilitation Guidelines/1980 No. 7, Plumbing DWV Guideline for Residential Rehabilitation*. Washington, D.C.: 1980.

U.S. Department of Housing and Urban Development, *Residential Remodeling and Universal Design*, HUD-1604-PDR. Washington, D.C.: June 1996.

ADDITIONAL REFERENCES

U.S. Department of Housing and Urban Development, *The Status of Buiding Regulations for Housing Rehabilitation*, HUD-1576-PDR. Washington, D.C.. February 1996.

APPENDIX 1

Appendix Chapter 1

SEISMIC STRENGTHENING PROVISIONS FOR UNREINFORCED MASONRY BEARING WALL BUILDINGS

NOTE: This appendix chapter has been revised in its entirety.

SECTION A101 — PURPOSE

The purpose of this chapter is to promote public safety and welfare by reducing the risk of death or injury that may result from the effects of earthquakes on existing unreinforced masonry bearing wall buildings.

The provisions of this chapter are intended as minimum standards for structural seismic resistance, and established primarily to reduce the risk of life loss or injury. Compliance with these provisions will not necessarily prevent loss of life or injury, or prevent earthquake damage to rehabilitated buildings.

SECTION A102 — SCOPE

A102.1 General. The provisions of this chapter shall apply to all existing buildings having at least one unreinforced masonry bearing wall. The elements regulated by this chapter shall be determined in accordance with Table A-1-A. Except as provided herein, other structural provisions of the Building Code shall apply. This chapter does not require alteration of existing electrical, plumbing, mechanical or firesafety systems.

A102.2 Essential and Hazardous Facilities. The provisions of this chapter are not intended to apply to the strengthening of buildings or structures in Occupancy Categories I and II of Table 16-K of the Building Code when located in Seismic Zones 2B, 3 and 4. Such buildings or structures shall be strengthened to meet the requirements of the Building Code for new buildings of the same occupancy category or to such other criteria as have been established by the jurisdiction.

SECTION A103 — DEFINITIONS

For the purpose of this chapter, the applicable definitions in the Building Code shall also apply.

ARCHAIC MASONRY MATERIALS include adobe, unburned clay and rubble and cut stone masonry. These materials shall comply with the requirements of Section A114.

COLLAR JOINT is the vertical space between adjacent wythes and may contain mortar.

CROSSWALL is a new or existing wall that meets the requirements of Section A111.3. A cross-wall is not a shear wall.

CROSSWALL SHEAR CAPACITY is the allowable shear value times the length of the cross-wall, $v_c L_c$.

DIAPHRAGM EDGE is the intersection of the horizontal diaphragm and a shear wall.

DIAPHRAGM SHEAR CAPACITY is the allowable shear value times the depth of the diaphragm, $v_u D$.

ESSENTIAL FACILITY is any building or structure classified in Occupancy Category I of Table 16-K of the Building Code.

HAZARDOUS FACILITY is any building or structure classified in Occupancy Category II of Table 16-K of the Building Code.

NORMAL WALL is a wall perpendicular to the direction of seismic forces.

OPEN FRONT is an exterior building wall line, without vertical elements of the lateral-force-resisting system in one or more stories.

POINTING is the partial reconstruction of the bed joints of an unreinforced masonry wall as defined in U.B.C. Standard 21-8.

UNREINFORCED MASONRY includes adobe, burned clay, concrete or sand-lime brick, hollow clay or concrete block, plain concrete, hollow clay tile, rubble and cut stone and unburned clay masonry. These materials shall comply with the requirements of Section A106 or Section A114 as applicable.

UNREINFORCED MASONRY BEARING WALL is a URM wall which provides the vertical support for the reaction of floor or roof-framing members.

UNREINFORCED MASONRY (URM) WALL is a masonry wall in which the area of reinforcing steel is less than 25 percent of the minimum steel ratios required by the Building Code for reinforced masonry.

YIELD STORY DRIFT is the lateral displacement of one level relative to the level above or below at which yield stress is first developed in a frame member.

SECTION A104 — SYMBOLS AND NOTATIONS

For the purpose of this chapter, the applicable symbols and notations in the Building Code shall apply.

- A = cross-sectional area of unreinforced masonry pier or wall, square inches (10^{-6} m²).
- A_b = total area of the bed joints above and below the test specimen for each in-place shear test, square inches (10^{-6} m²).
- C_p = numerical coefficient as specified in Section 1636 and given in Table 16-O for wall anchorage and parapet strengthening and Table A-1-C for special procedure diaphragm shear transfer.
- D = in-plane width dimension of pier, inches (10^{-3} m), or depth of diaphragm, feet (m).
- DCR = demand-capacity ratio specified in Section A111.4.2.
- F_{wx} = force applied to a wall at level x , pounds (N).
- H = least clear height of opening on either side of a pier, inches (10^{-3} m).
- h/t = height-to-thickness ratio of URM wall. Height, h , is measured between wall anchorage levels and/or slab-on-grade.
- L = span of diaphragm between shear walls, or span between shear wall and open front, feet (m).
- L_o = length of crosswall, feet (m).
- L_i = effective span for an open-front building specified in Section A111.8, feet (m).
- P_D = superimposed dead load at the location under consideration, pounds (kN). For determination of the rocking shear capacity, dead load at the top of the pier under consideration shall be used.
- P_{D+L} = stress resulting from the dead plus actual live load in place at the time of testing, pounds per square inch (psi) (kPa).
- P_w = weight of wall, pounds (N).
- V_a = $v_a A$, the allowable shear in any URM pier, pounds (N).
- V_{cb} = total shear capacity of crosswalls in the direction of analysis immediately below the diaphragm level being investigated, $v_c L_o$, pounds (N).
- V_{ca} = total shear capacity of crosswalls in the direction of analysis immediately above the diaphragm level being investigated, $v_c L_o$, pounds (N).

- V_p = shear force assigned to a pier on the basis of its relative shear rigidity, pounds (N).
- V_r = pier rocking shear capacity of any URM wall or wall pier, pounds (N).
- V_{test} = load at incipient cracking for each in-place shear test per U.B.C. Standard 21-6, pounds (kN).
- V_{wx} = total shear force resisted by a shear wall at the level under consideration, pounds (N).
- v_a = allowable shear stress for unreinforced masonry, psi (kPa).
- v_c = allowable shear value for a crosswall sheathed with any of the materials given in Table A-1-D or A-1-E, pounds per foot (N/m).
- v_t = mortar shear strength as specified in Section A106.3.3.4, psi (kPa).
- v_{t_0} = mortar shear test values as specified in Section A106.3.3.4, psi (kPa).
- v_u = allowable shear value for a diaphragm sheathed with any of the materials given in Table A-1-D or A-1-E, pounds per foot (N/m).
- W = total seismic dead load as defined in Chapter 16 of the Building Code, pounds (N).
- W_d = total dead load tributary to a diaphragm, pounds (N).
- W_w = total dead load of an unreinforced masonry wall above the level under consideration or above an open-front building, pounds (N).
- W_{wx} = dead load of a URM wall assigned to Level X halfway above and below the level under consideration, pounds (N).
- Z = seismic zone factor given in Table 16-I of the Building Code.
- $\Sigma v_u D$ = sum of diaphragm shear capacities of both ends of the diaphragm, pounds (N).
- $\Sigma \Sigma v_u D$ = for diaphragms coupled with crosswalls, $v_u D$ includes the sum of shear capacities of both ends of diaphragms coupled at and above the level under consideration, pounds (N).
- ΣW_d = total dead load to all the diaphragms at and above the level under consideration, pounds (N).

SECTION A105 — GENERAL REQUIREMENTS

A105.1 General. Buildings shall have a seismic-resisting system conforming with Section 1603.3 of the Building Code, except as modified by this chapter.

A105.2 Alterations and Repairs. Alterations and repairs required to meet the provisions of this chapter shall comply with applicable structural requirements of the Building Code unless specifically provided for in this chapter.

A105.3 Requirements for Plans. The following construction information shall be included in the plans required by this chapter:

1. Dimensioned floor and roof plans showing existing walls and the size and spacing of floor and roof-framing members and sheathing materials. The plans shall indicate all existing and new crosswalls and shear walls and their materials of construction. The location of these walls and their openings shall be fully dimensioned and drawn to scale on the plans.

2. Dimensioned wall elevations showing openings, piers, wall classes as defined in Section A106.3.3.6, thickness, heights, wall shear test locations, and cracks or damaged portions requiring repairs, the general condition of the mortar joints and if and where pointing is required. Where the exterior face is veneer, the type of veneer, its thickness and its bonding and/or ties to the structural wall masonry shall also be noted.

3. The type of interior wall and ceiling materials and framing.

4. The extent and type of existing wall anchorage to floors and roof when used in the design.
5. The extent and type of parapet corrections which were previously performed, if any.
6. Repair details, if any, of cracked or damaged unreinforced masonry walls required to resist forces specified in this chapter.
7. All other plans, sections and details necessary to delineate required retrofit construction.
8. The design procedure used shall be stated on both the plans and the permit application.
9. Details of the anchor prequalification program required by U.B.C. Standard 21-7, if utilized, including location and results of all tests.

SECTION A106 — MATERIALS REQUIREMENTS

A106.1 General. Materials permitted by this chapter, including their appropriate allowable design values and those existing configurations of materials specified herein, may be utilized to meet the requirements of this chapter.

A106.2 Existing Materials. Existing materials utilized as part of the required vertical-load-carrying or lateral-force-resisting system shall be in sound condition or shall be repaired or removed and replaced with new materials. Archaic masonry materials shall comply with Section A114. All other unreinforced masonry materials shall comply with the following requirements:

1. The lay-up of the masonry units complies with Section A106.3.2 and the quality of bond between the units has been verified to the satisfaction of the building official;
2. Concrete masonry units are verified to be load-bearing units complying with U.B.C. Standard 21-4 or such other standard as is acceptable to the building official; and
3. The compressive strength of plain concrete walls shall be determined based on cores taken from each class of concrete wall. The location and number of tests shall be the same as prescribed for strength tests in Sections A106.3.3.2 and A106.3.3.3.

The use of archaic and other materials not specified in this code shall be based on substantiating research data or engineering judgment with the approval of the building official.

A106.3 Existing Unreinforced Masonry.

A106.3.1 General. Unreinforced masonry walls utilized to carry vertical loads or seismic forces parallel and perpendicular to the wall plane shall be tested as specified in this section. All masonry that does not meet the minimum standards established by this chapter shall be removed and replaced with new materials or alternatively shall have its structural functions replaced with new materials and shall be anchored to supporting elements.

A106.3.2 Lay-up of walls.

A106.3.2.1 Multiwythe solid brick. The facing and backing shall be bonded so that not less than 10 percent of the exposed face area is composed of solid headers extending not less than 4 inches (102 mm) into the backing. The clear distance between adjacent full-length headers shall not exceed 24 inches (610 mm) vertically or horizontally. Where the backing consists of two or more wythes, the headers shall extend not less than 4 inches (102 mm) into the most distant wythe or the backing wythes shall be bonded together with separate headers whose area and spacing conform to the foregoing. Wythes of walls not bonded as described above shall be considered as veneer. Veneer wythes shall not be included in the effective thickness used in calculating the height to thickness and the shear capacity of the wall.

EXCEPTION: In other than Seismic Zone 4, veneer wythes anchored as specified by the Building Code and made composite with backup masonry can be used for calculation of the effective thickness.

A106.3.2.2 Grouted or ungrouted hollow concrete or clay block, structural hollow clay tile and adobe. Grouted or ungrouted hollow concrete or clay block, structural hollow clay tile and adobe shall be laid in a running bond pattern.

A106.3.2.3 Rubble and stone masonry. Rubble and stone masonry may be laid up randomly. Other lay-up patterns are allowed if their performance can be justified as being at least equal to those specified above.

A106.3.2.4 Other lay-up patterns. Lay-up patterns other than those specified in Sections A106.3.2.1, A106.3.2.2 and A106.3.2.3 above are allowed if their performance can be justified.

A106.3.3 Mortar.

A106.3.3.1 Tests. The quality of mortar in all masonry walls shall be determined by performing in-place shear tests in accordance with U.B.C. Standard 21-6. Alternative methods of testing may be approved by the building official for masonry walls other than brick.

A106.3.3.2 Location of tests. The shear tests shall be taken at locations representative of the mortar conditions throughout the entire building, taking into account variations in workmanship at different building height levels, variations in weathering of the exterior surfaces, and variations in the condition of the interior surfaces due to deterioration caused by leaks and condensation of water and/or by the deleterious effects of other substances contained within the building. The exact test locations shall be determined at the building site by the engineer or architect in responsible charge of the structural design work. An accurate record of all such tests and their location in the building shall be recorded and these results shall be submitted to the building department for approval as part of the structural analysis.

A106.3.3.3 Number of tests. The minimum number of tests per class shall be as follows:

1. At each of both the first and top stories, not less than two tests per wall or line of wall elements providing a common line of resistance to lateral forces.
2. At each of all other stories, not less than one test per wall or line of wall elements providing a common line of resistance to lateral forces.
3. In any case, not less than one test per 1,500 square feet (139.4 m²) of wall surface and not less than a total of eight tests.

A106.3.3.4 Minimum quality of mortar.

1. Mortar shear test values, v_{to} , in psi (kPa) shall be obtained for each in-place shear test in accordance with the following equation:

$$v_{to} = (V_{test}/A_b) - p_{D+L} \quad (A1-1)$$

2. Individual unreinforced masonry walls with v_{to} consistently less than 30 psi (207 kPa) shall be entirely pointed or removed.

3. The mortar shear strength, v_t , is the value in psi (kPa) that is exceeded by 80 percent of the mortar shear test values, v_{to} .

4. Unreinforced masonry with mortar shear strength, v_t , less than 30 psi (207 kPa) shall be removed, pointed and retested or have its structural function replaced and shall be anchored to supporting elements in accordance with Section A106.3.1 and Section A113.8. When existing mortar in any wythe is pointed to increase its shear strength and retested, the condition of the mortar in the adjacent bed joints of the inner wythe or wythes and the opposite outer wythe shall be examined for extent of deterioration. The shear strength of any wall class shall be no greater than that of the weakest wythe of that class.

A106.3.3.5 Collar joints. The collar joints shall be inspected at the test locations during each in-place shear test, and estimates of the percentage of the surfaces of adjacent wythes which are covered with mortar shall be reported along with the results of the in-place shear tests.

A106.3.3.6 Unreinforced masonry classes. Existing unreinforced masonry shall be categorized into one or more classes based on shear strength, quality of construction, state of repair, deteriora-

tion and weathering. A class shall be characterized by the allowable masonry shear stress determined in accordance with Section A108.2. Classes shall be defined for whole walls, not for small areas of masonry within a wall.

A106.3.3.7 Pointing. Deteriorated mortar joints in unreinforced masonry walls shall be pointed according to U.B.C. Standard 21-8. Nothing shall prevent pointing of any deteriorated masonry wall joints before the tests are made, except as required in Section A107.1.

SECTION A107 — QUALITY CONTROL

A107.1 Pointing. Preparation and mortar pointing shall be performed with special inspection.

EXCEPTION: At the discretion of the building official, incidental pointing may be performed without special inspection.

A107.2 Masonry Shear Tests. In-place shear tests shall comply with U.B.C. Standard 21-6.

A107.3 Existing Wall Anchors. Existing wall anchors utilized as all or part of the required tension anchors shall be tested in pullout according to U.B.C. Standard 21-7. The minimum number of anchors tested shall be four per floor, with two tests at walls with joists framing into the wall and two tests at walls with joists parallel to the wall, but not less than 10 percent of the total number of existing tension anchors at each level.

A107.4 New Bolts. Twenty-five percent of all new embedded bolts resisting only shear forces in unreinforced masonry walls shall be tested using a calibrated torque wrench in accordance with U.B.C. Standard 21-7.

EXCEPTION: Special inspection in accordance with the Building Code may be provided during installation in lieu of testing.

All new embedded bolts resisting tension forces or a combination of tension and shear forces shall be subject to periodic special inspection in accordance with Section 1701 of the Building Code prior to placement of the bolt and grout or adhesive in the drilled hole. Five percent of all bolts resisting tension forces shall be subject to a direct-tension test and an additional 20 percent shall be tested using a calibrated torque wrench. Testing shall be performed in accordance with U.B.C. Standard 21-7.

New through bolts need not be tested.

SECTION A108 — ALLOWABLE DESIGN VALUES

A108.1 Allowable Values.

1. Allowable values for existing materials are given in Table A-1-D, and for new materials in Table A-1-E.

2. Allowable values not specified in this chapter shall be as specified elsewhere in the Building Code.

A108.2 Masonry Shear. The allowable unreinforced masonry shear stress, v_a , shall be determined for each masonry class from the following equation:

$$v_a = 0.1v_t + 0.15P_D/A \quad (A1-2)$$

The mortar shear test value, v_t , shall be determined in accordance with Section A106.3.3, and shall not exceed 100 psi (690 kPa) for the determination of v_a .

The one-third increase in allowable values of the Building Code is not allowed for v_a .

A108.3 Masonry Compression. Where any increase in dead plus live compression stress occurs, the allowable compression stress in unreinforced masonry shall not exceed 100 psi (690 kPa). The one-third increase in allowable stress of the Building Code is allowed.

A108.4 Masonry Tension. Unreinforced masonry shall be assumed as having no tensile capacity.

A108.5 Unreinforced Masonry Materials Other Than Solid Masonry Units. The provisions of this chapter are primarily intended for solid masonry unit construction, but are also applicable to other unreinforced masonry materials when the following conditions are satisfied:

1. The building does not exceed two stories in height,
2. The shear stress of hollow-unit masonry is limited to that permitted by Formulas (A1-1) and (A1-2) based on the net area in contact through the bed joints, but not more than that calculated using a mortar shear strength, v_r , of 100 psi (690 kPa).
3. In the case of plain concrete, the compressive strength (f'_c) shall not be less than 900 psi (6200 kPa) and the allowable shear strength is limited to not more than $0.02f'_c$.
4. In the case of all other unreinforced masonry materials, the shear stress is limited to 3 psi (20.7 kPa) based on the net area in contact through the bed joint.
5. The special procedure of Section A111 shall not be used for buildings constructed of archaic masonry materials.

Unreinforced masonry not meeting the above criteria shall have its structural function replaced and shall be resupported, if required, in accordance with Section A113.7.

A108.6 Existing Tension Anchors. The allowable resistance values of the existing anchors shall be 40 percent of the average of the tension tests of existing anchors having the same wall thickness and joist orientation. The one-third increase in allowable value of the Building Code is not allowed for existing tension anchors.

A108.7 Foundations. For existing foundations, new total dead loads may be increased over existing dead load by 25 percent. New total dead load plus live load plus seismic forces may be increased over existing dead load plus live load by 50 percent. Higher values may be justified only in conjunction with a geotechnical investigation.

SECTION A109 — ANALYSIS AND DESIGN PROCEDURE

A109.1 General. Except as modified herein, the analysis and design relating to the structural alteration of existing buildings shall be in accordance with the Building Code.

A109.2 Selection of Procedure. All buildings shall be analyzed by either the general procedure of Section A110, which is based on Chapter 16 of the Building Code, or when applicable, buildings may be analyzed by the special procedure of Section A111.

SECTION A110 — GENERAL PROCEDURE

A110.1 Minimum Design Lateral Forces. Buildings shall be analyzed to resist minimum lateral forces assumed to act nonconcurrently in the direction of each of the main axes of the structure in accordance with the following:

$$V = 0.33 ZW \quad (\text{A1-3.1})$$

for buildings with an occupant load of 100 or more as determined by Table 10-A of the Building Code and without crosswalls complying with Section A111.3 or

$$V = 0.25 ZW \quad (\text{A1-3.2})$$

for all other buildings.

For buildings more than one story in height, the total force shall be distributed over the height of the building in accordance with the procedures of Chapter 16 of the Building Code.

For the purpose of this chapter, a dynamic analysis need not be performed for those buildings with irregularities, as defined in Tables 16-L and 16-M of the Building Code, which would otherwise require such analysis. All other design and analysis requirements of these tables shall apply.

A110.2 Lateral Forces on Elements of Structures. Parts of structures shall be analyzed and designed as required in Chapter 16 of the Building Code.

EXCEPTIONS: 1. Unreinforced masonry walls for which height-to-thickness ratios do not exceed ratios set forth in Table A-1-B need not be analyzed for out-of-plane loading. Unreinforced masonry walls which exceed the allowable h/t ratios of Table A-1-B shall be braced according to Section A113.5.

2. Parapets complying with Section A113.6 need not be analyzed for out-of-plane loading.

A110.3 Shear Walls (In-plane Loading). Shear walls shall comply with Section A112.

SECTION A111 — SPECIAL PROCEDURE

A111.1 Limits. The special procedures of this section may be applied only to buildings with the following characteristics:

1. The building is not an essential or hazardous facility.
2. Flexible diaphragms at all levels above the base of structure.
3. A maximum of six stories above the base of the building.
4. Except for single-story buildings with an open front on one side only, a minimum of two lines of vertical elements of the lateral-force-resisting system complying with Section A112 parallel to each axis. At least one line in each direction shall be a masonry or concrete shear wall. Requirements for open-front buildings are contained in Section A111.8.
5. The building is not constructed of archaic masonry materials.

A111.2 Lateral Forces on Elements of Structures. With the exception of the diaphragm provisions in Section A111.4, elements of structures shall comply with Section A110.2.

A111.3 Crosswalls. Crosswalls when used shall meet the requirements of this subsection.

A111.3.1 Crosswall definition. A crosswall is a wood-framed wall sheathed with any of the materials described in Table A-1-D or A-1-E or other system as defined in Section A111.3.5. Spacing of crosswalls shall not exceed 40 feet (12 190 mm) on center measured perpendicular to the direction of consideration, and shall be placed in each story of the building. Crosswalls shall extend the full story height between diaphragms.

EXCEPTIONS: 1. Crosswalls need not be provided at all levels in accordance with Section A111.4.2, Item 4.

2. Existing crosswalls need not be continuous below a wood diaphragm at or within 4 feet (1220 mm) of grade provided:

- 2.1 Shear connections and anchorage requirements, Section A111.5 are satisfied at all edges of the diaphragm.
- 2.2 Crosswalls with total shear capacity of $0.20Z\Sigma W_d$ interconnect the diaphragm to the foundation.
- 2.3 The demand/capacity ratio of the diaphragm between the crosswalls that are continuous to their foundations shall be calculated as:

$$DCR = (0.83ZW_d + V_{ca}) / 2v_uD \quad (A1-4)$$

and DCR shall not exceed 2.5.

A111.3.2 Crosswall shear capacity. Within any 40 feet (12 190 mm) measured along the span of the diaphragm, the sum of the crosswall shear capacities shall be at least 30 percent of the diaphragm shear capacity of the strongest diaphragm at or above the level under consideration.

A111.3.3 Existing crosswalls. Existing crosswalls shall have a maximum height-to-length ratio between openings of 1.5 to 1. Existing crosswall connections to diaphragms need not be investigated as long as the crosswall extends to the framing of the diaphragm above and below.

A111.3.4 New crosswalls. New crosswall connections to the diaphragm shall develop the crosswall shear capacity. New crosswalls shall have the capacity to resist an overturning moment equal to the crosswall shear capacity times the story height. Crosswall overturning moments need not be cumulative over more than two stories.

A111.3.5 Other crosswall systems. Other systems, such as moment-resisting frames, may be used as crosswalls provided that the yield story drift does not exceed 1 inch (25.4 mm) in any story.

A111.4 Wood Diaphragms.

A111.4.1 Acceptable diaphragm span. A diaphragm is acceptable if the point (L, DCR) on Figure A-1-1 falls within Region 1, 2 or 3.

A111.4.2 Demand-capacity ratios. Demand-capacity ratios shall be calculated for the diaphragm at any level according to the following formulas:

1. For a diaphragm without qualifying crosswalls at levels immediately above or below:

$$DCR = 0.83ZW_d / \Sigma v_u D \quad (A1-5)$$

2. For a diaphragm in a single-story building with qualifying crosswalls:

$$DCR = 0.83ZW_d / (\Sigma v_u D + V_{cb}) \quad (A1-6)$$

3. For diaphragms in a multistory building with qualifying crosswalls in all levels:

$$DCR = 0.83Z\Sigma W_d / (\Sigma \Sigma v_u D + V_{cb}) \quad (A1-7)$$

DCR shall be calculated at each level for the set of diaphragms at and above the level under consideration. In addition, the roof diaphragm shall also meet the requirements of Formula (A1-6).

4. For a roof diaphragm and the diaphragm directly below if coupled by crosswalls:

$$DCR = 0.83Z\Sigma W_d / \Sigma \Sigma v_u D \quad (A1-8)$$

A111.4.3 Chords. An analysis for diaphragm flexure need not be made and chords need not be provided.

A111.4.4 Collectors. An analysis of diaphragm collector forces shall be made for the transfer of diaphragm edge shears into vertical elements of the lateral-force-resisting system. Collector forces may be resisted by new or existing elements.

A111.4.5 Diaphragm openings.

1. Diaphragm forces at corners of openings shall be investigated and shall be developed into the diaphragm by new or existing materials.

2. In addition to the demand-capacity ratios of Section A111.4.2, the demand-capacity ratio of the portion of the diaphragm adjacent to an opening shall be calculated using the opening dimension as the span.

3. Where an opening occurs in the end quarter of the diaphragm span $v_u D$ for the demand-capacity ratio, calculation shall be based on the net depth of the diaphragm.

A111.5 Diaphragm Shear Transfer. Diaphragms shall be connected to shear walls with connections capable of developing a minimum force given by the lesser of the following formulas:

$$V = 1/2 Z C_p W_d \quad (A1-9)$$

using the C_p values in Table A-1-C, or

$$V = v_u D \quad (\text{A1-10})$$

A111.6 Shear Walls (In-plane Loading).

A111.6.1 Wall story force. The wall story force distributed to a shear wall at any diaphragm level shall be the lesser value calculated as:

1. For buildings without crosswalls,

$$F_{wx} = 0.33Z(W_{wx} + W_d/2) \quad (\text{A1-11})$$

but need not exceed

$$F_{wx} = 0.33ZW_{wx} + v_u D \quad (\text{A1-12})$$

2. For buildings with crosswalls in all levels:

$$F_{wx} = 0.25Z(W_{wx} + W_d/2) \quad (\text{A1-13})$$

but need not exceed

$$F_{wx} = 0.25Z [W_{wx} + \Sigma W_d(v_u D / \Sigma \Sigma v_u D)] \quad (\text{A1-14})$$

but need not exceed

$$F_{wx} = 0.25ZW_{wx} + v_u D \quad (\text{A1-15})$$

A111.6.2 Wall story shear. The wall story shear shall be the sum of the wall story forces at and above the level of consideration.

$$V_{wx} = \Sigma F_{wx} \quad (\text{A1-16})$$

A111.6.3 Shear wall analysis. Shear walls shall comply with Section A112.

A111.6.4 Moment frames. Moment frames used in place of shear walls shall be designed as required in Chapter 16 of the Building Code except that the forces shall be as specified in Section A111.6.1 and the story drift ratio shall be limited to 0.005, except as further limited by Section A112.4.2.

A111.7 Out-of-plane Forces—Unreinforced Masonry Walls.

A111.7.1 Allowable unreinforced masonry wall height-to-thickness ratios. The provisions of Section A110.2 are applicable except the allowable height-to-thickness ratios given in Table A-1-C shall be determined from Figure A-1-1 as follows:

1. In Region 1, height-to-thickness ratios for buildings with crosswalls may be used if qualifying crosswalls are present in all stories.
2. In Region 2, height-to-thickness ratios for buildings with crosswalls may be used whether or not qualifying crosswalls are present.
3. In Region 3, height-to-thickness ratios for “all other buildings” shall be used whether or not qualifying crosswalls are present.

A111.7.2 Walls with diaphragms in different regions. When diaphragms above and below the wall under consideration have demand-capacity ratios in different regions of Figure A-1-1, the lesser height-to-thickness ratio shall be used.

A111.8 Open-Front Design Procedure. A single-story building with an open front on one side and crosswalls parallel to the open front may be designed by the following procedure:

1. Effective diaphragm span, L_i , for use in Figure A-1-1 shall be determined in accordance with the following formula:

$$L_i = 2 [(W_w/W_d)L + L] \quad (A1-17)$$

2. Diaphragm demand-capacity ratio shall be calculated as:

$$DCR = 0.83Z(W_d + W_w)/[(v_u D) + V_{cb}] \quad (A1-18)$$

SECTION A112 — ANALYSIS AND DESIGN

A112.1 General. The following requirements are applicable to both the general procedure and special procedure for analysis of vertical elements of the lateral-force-resisting system.

A112.2 Existing Unreinforced Masonry Walls.

A112.2.1 Flexural rigidity. Flexural components of deflection may be neglected in determining the rigidity of an unreinforced masonry wall.

A112.2.2 Shear walls with openings. Wall piers shall be analyzed according to the following procedure which is diagramed in Figure A-1-2:

1. For any pier,

1.1 The pier shear capacity shall be calculated as:

$$V_a = v_a A \quad (A1-19)$$

1.2 The pier rocking shear capacity shall be calculated as:

$$V_r = 0.5P_D D/H \quad (A1-20)$$

2. The wall piers at any level are acceptable if they comply with one of the following modes of behavior:

2.1 Rocking controlled mode. When the pier rocking shear capacity is less than the pier shear capacity, i.e., $V_r < V_a$ for each pier in a level, forces in the wall at that level, V_{wx} , shall be distributed to each pier, in proportion to $P_D D/H$.

For the wall at that level:

$$V_{wx} < \Sigma V_r \quad (A1-21)$$

2.2 Shear controlled mode. Where the pier shear capacity is less than the pier rocking capacity, i.e., $V_a < V_r$ in at least one pier in a level, forces in the wall at the level, V_{wx} , shall be distributed to each pier in proportion to D/H .

For each pier at that level:

$$V_p < V_a \quad (A1-22)$$

and

$$V_p < V_r \quad (A1-23)$$

If $V_p < V_a$ for each pier and $V_p > V_r$ for one or more piers, such piers shall be omitted from the analysis, and the procedure shall be repeated for the remaining piers, unless the wall is strengthened and reanalyzed.

3. **Masonry pier tension stress.** Unreinforced masonry wall piers need not be analyzed for tension stress.

A112.2.3 Shear walls without openings. Shear walls without openings shall be analyzed as for walls with openings except that V_r shall be calculated as follows:

$$V_r = (0.50P_D + 0.25P_w) D/H \quad (A1-24)$$

A112.3 Plywood Sheathed Shear Walls. Plywood sheathed shear walls may be used to resist lateral forces for buildings with flexible diaphragms analyzed according to provisions of Section A110. Plywood sheathed shear walls may not be used to share lateral forces with other materials along the same line of resistance.

A112.4 Combinations of Vertical Elements.

A112.4.1 Lateral-force distribution. Lateral forces shall be distributed among the vertical resisting elements in proportion to their relative rigidities except that moment frames shall comply with Section A112.4.2.

A112.4.2 Moment-resisting frames. A moment frame shall not be used with an unreinforced masonry wall in a single line of resistance unless the wall has piers that are capable of sustaining rocking in accordance with Section A112.2.2 and the frames are designed to carry 100 percent of the lateral forces, and the story drift ratio shall be limited to 0.0025.

SECTION A113 — DETAILED SYSTEM DESIGN REQUIREMENTS

A113.1 Wall Anchorage.

A113.1.1 Anchor locations. Unreinforced masonry walls shall be anchored at the roof and floor levels as required in Section A110.2. Ceilings of plaster or similar materials, when not attached directly to roof or floor framing, and abutting masonry walls, shall be anchored to the walls at a maximum spacing of 6 feet (1830 mm) or removed.

A113.1.2 Anchor requirements. Anchors shall consist of bolts installed through the wall as specified in Table A-1-E, or by an approved equivalent at a maximum anchor spacing of 6 feet (1830 mm). All wall anchors shall be secured to the joists to develop the required forces.

A113.1.3 Minimum wall anchorage. Anchorage of masonry walls to each floor or roof shall resist a minimum force determined in accordance with Chapter 16 of the Building Code or 200 pounds per linear foot (2920 N/m), whichever is greater, acting normal to the wall at the level of the floor or roof. Existing wall anchors, if used, must meet the requirements of this chapter or must be upgraded.

A113.1.4 Anchors at corners. At the roof and floor levels, both shear and tension anchors shall be provided within 2 feet (610 mm) horizontally from the inside of the corners of the walls.

A113.2 Diaphragm Shear Transfer. Bolts transmitting shear forces shall have a maximum bolt spacing of 6 feet (1830 mm) and shall have nuts installed over malleable iron or plate washers when bearing on wood, and heavy-cut washers when bearing on steel.

A113.3 Collectors. Collector elements shall be provided which are capable of transferring the seismic forces originating in other portions of the building to the element providing the resistance to those forces.

A113.4 Ties and Continuity. Ties and continuity shall conform to Section 1637.2.5 of the Building Code.

A113.5 Wall Bracing.

A113.5.1 General. Where a wall height-to-thickness ratio exceeds the specified limits, the wall may be laterally supported by vertical bracing members per Section A113.5.2 or by reducing the wall height by bracing per Section A113.5.3.

A113.5.2 Vertical bracing members. Vertical bracing members shall be attached to floor and roof construction for their design loads independently of required wall anchors. Horizontal spacing of vertical bracing members shall not exceed one half the unsupported height of the wall or 10 feet (3050 mm). Deflection of such bracing members at design loads shall not exceed one tenth of the wall thickness.

A113.5.3 Intermediate wall bracing. The wall height may be reduced by bracing elements connected to the floor or roof. Horizontal spacing of the bracing elements and wall anchors shall be as required by design, but shall not exceed 6 feet (1830 mm) on center. Bracing elements shall be detailed to minimize the horizontal displacement of the wall by the vertical displacement of the floor or roof.

A113.6 Parapets. Parapets and exterior wall appendages not conforming to this chapter shall be removed, or stabilized or braced to ensure that the parapets and appendages remain in their original position.

The maximum height of an unbraced unreinforced masonry parapet above the lower of either the level of tension anchors or roof sheathing, shall not exceed the height-to-thickness ratio shown in Table A-1-F. If the required parapet height exceeds this maximum height, a bracing system designed for the forces determined in accordance with Chapter 16 of the Building Code shall support the top of the parapet. Parapet corrective work must be performed in conjunction with the installation of tension roof anchors.

The minimum height of a parapet above any wall anchor shall be 12 inches (305 mm).

EXCEPTION: If a reinforced concrete beam is provided at the top of the wall, the minimum height above the wall anchor may be 6 inches (152 mm).

A113.7 Veneer.

1. Veneer shall be anchored with approved anchor ties conforming to the required design capacity specified in the Building Code and placed at a maximum spacing of 24 inches (610 mm) with a maximum supported area of 4 square feet (0.372 m²).

EXCEPTION: Existing anchor ties for attaching brick veneer to brick backing may be acceptable provided the ties are in good condition and conform to the following minimum size and material requirements.

Existing veneer anchor ties may be considered adequate if they are of corrugated galvanized iron strips not less than 1 inch (25.4 mm) in width, 8 inches (203 mm) in length and $\frac{1}{16}$ inch (1.6 mm) in thickness or equal.

2. The location and condition of existing veneer anchor ties shall be verified as follows:

2.1 An approved testing laboratory shall verify the location and spacing of the ties and shall submit a report to the building official for approval as part of the structural analysis.

2.2 The veneer in a selected area shall be removed to expose a representative sample of ties (not less than four) for inspection by the building official.

A113.8 Nonstructural Masonry Walls. Unreinforced masonry walls which carry no design vertical or lateral loads and are not required by the design to be part of the lateral-force-resisting system shall be adequately anchored to new or existing supporting elements. The anchors and elements shall be designed for the out-of-plane forces specified in Chapter 16 of the Building Code. The height- or length-to-thickness ratio between such supporting elements for such walls shall not exceed 9.

A113.9 Truss and Beam Supports. Where trusses and beams, other than rafters or joists, are supported on masonry, independent secondary columns shall be installed to support vertical loads of the roof or floor members.

EXCEPTION: Secondary supports are not required in Seismic Zones 1, 2A and 2B.

A113.10 Adjacent Buildings. Where elements of adjacent buildings do not have a separation of at least 5 inches (127 mm), the allowable height-to-thickness ratios for "all other buildings" per Table A-1-B shall be used in the direction of consideration.

SECTION A114 — BUILDINGS OF ARCHAIC UNREINFORCED MASONRY

A114.1 General. A building or structure of archaic unreinforced masonry shall comply with the provisions set forth in this chapter and Chapter 6 of this code if the building is considered historic.

A114.2 Unburned Clay Masonry or Adobe and Stone. Existing or reerected walls of adobe construction shall conform to the following:

1. Exterior bearing walls of unreinforced adobe or stone masonry shall not exceed a height- or length-to-thickness ratio specified in Table A-1-G. Such walls shall be provided with a reinforced concrete bond beam at the top which interconnects all walls. The bond beam shall have a minimum depth of 6 inches (152 mm). The bond beam may have a width equal to the width of the wall less 8 inches (203 mm), provided the resulting width is not less than 8 inches (203 mm). Bond beams of other materials may be used with the approval of the building official.

Exterior bearing walls shall have a minimum wall thickness of 18 inches (457 mm) in Seismic Zones 3 and 4, and 12 inches (305 mm) in other seismic zones. Interior adobe partitions shall be a minimum of 10 inches (254 mm) in thickness. No adobe or stone structure shall exceed one story in height unless the historic evidence, satisfactory to the building official, indicates a two-story height. Bond beams shall be provided at the roof and second-floor levels.

2. Foundations shall be reinforced concrete under newly reconstructed walls and shall be 50 percent wider than the wall above, soil conditions permitting, except that the foundation wall may be 4 inches (102 mm) less in width than the wall if a rock, burned brick or stabilized adobe facing is necessary to provide authenticity.

3. New or existing unstabilized brick and adobe brick masonry shall test to 75 percent of the compressive strength required by the Building Code for new material. Unstabilized brick may be used where existing bricks are unstabilized and where the building is not susceptible to flooding conditions or direct exposure. Adobe may be allowed a maximum value of 3 pounds per square inch (20.7 kPa) for shear with no increase of lateral forces.

4. Mortar may be of the same soil composition and stabilization as the brick in lieu of cement mortar.

5. Nominal tension stresses due to seismic forces normal to the wall may be neglected if the wall meets thickness requirements and shear values allowed by this subsection.

A114.3 Archaic Materials. Allowable stresses for archaic materials not specified in this code shall be based on substantiating research data or engineering judgment with the approval of the building official.

TABLE A-1-A—ELEMENTS REGULATED BY THIS CHAPTER

BUILDING ELEMENTS	SEISMIC ZONE			
	2A	2B	3	4
Parapets	X	X	X	X
Walls, anchorage	X	X	X	X
Walls, <i>h/t</i> ratios		X	X	X
Walls, in-plane shear		X	X	X
Diaphragms ¹			X	X
Diaphragms, shear transfer ²		X	X	X
Diaphragms, demand-capacity ratios ²			X	X

¹Applies only to buildings designed according to the general procedures of Section A110.

²Applies only to buildings designed according to the special procedures of Section A111.

TABLE A-1-B—ALLOWABLE VALUE OF HEIGHT-TO-THICKNESS RATIO OF UNREINFORCED MASONRY WALLS

WALL TYPES	SEISMIC ZONE 2B BUILDINGS	SEISMIC ZONE 3 BUILDINGS	SEISMIC ZONE 4 BUILDINGS WITH CROSSWALLS ¹	SEISMIC ZONE 4 ALL OTHER BUILDINGS
Walls of one-story buildings	20	16	16 ^{2,3}	13
First-story wall of multistory building	20	18	16	15
Walls in top story of multistory building	14	14	14 ^{2,3}	9
All other walls	20	16	16	13

¹Applies to the special procedures of Section A111 only. See Section A111.7 for other restrictions.

²This value of height-to-thickness ratio may be used only where mortar shear tests establish a tested mortar shear strength, v_t , of not less than 100 psi (690 kPa). This value may also be used where the tested mortar shear strength is not less than 60 psi (414 kPa) and a visual examination of the collar joint indicates not less than 50 percent mortar coverage.

³Where a visual examination of the collar joint indicates not less than 50 percent mortar coverage, and the tested mortar shear strength, v_t , is greater than 30 psi (207 kPa) but less than 60 psi (414 kPa), the allowable height-to-thickness ratio may be determined by linear interpolation between the larger and smaller ratios in direct proportion to the tested mortar shear strength.

TABLE A-1-C—HORIZONTAL FORCE FACTOR, C_p ¹

CONFIGURATION OF MATERIALS	C_p
Roofs with straight or diagonal sheathing and roofing applied directly to the sheathing, or floors with straight tongue-and-groove sheathing	0.50
Diaphragms with double or multiple layers of boards with edges offset, and blocked plywood systems	0.75

¹Applicable to the special procedures of Section A111 only.

TABLE A-1-D—ALLOWABLE VALUES FOR EXISTING MATERIALS

EXISTING MATERIALS OR CONFIGURATIONS OF MATERIALS ¹	ALLOWABLE VALUES
	× 14.594 for N/m
1. Horizontal diaphragms ²	
1.1 Roofs with straight sheathing and roofing applied directly to the sheathing	100 lbs. per foot for seismic shear
1.2 Roofs with diagonal sheathing and roofing applied directly to the sheathing	250 lbs. per foot for seismic shear
1.3 Floors with straight tongue-and-groove sheathing	100 lbs. per foot for seismic shear
1.4 Floors with straight sheathing and finished wood flooring with board edges offset or perpendicular	500 lbs per foot for seismic shear
1.5 Floors with diagonal sheathing and finished wood flooring	600 lbs. per foot for seismic shear
2. Crosswalls ^{2,3}	
2.1 Plaster on wood or metal lath	Per side: 200 lbs. per foot for seismic shear
2.2 Plaster on gypsum lath	175 lbs. per foot for seismic shear
2.3 Gypsum wallboard, unblocked edges	75 lbs. per foot for seismic shear
2.4 Gypsum wallboard, blocked edges	125 lbs. per foot for seismic shear
3. Existing footings, wood framing, structural steel and reinforced steel	
3.1 Plain concrete footings	$f'_c = 1,500$ psi (10.34 MPa) unless otherwise shown by tests ⁴
3.2 Douglas fir wood	Allowable stress same as D.F. No. 1 ⁴
3.3 Reinforcing steel	$f_t = 18,000$ lbs. per square inch (124.1 N/mm ²) maximum ⁴
3.4 Structural steel	$f_t = 20,000$ lbs. per square inch (137.9 N/mm ²) maximum ⁴

¹Material must be sound and in good condition.

²A one-third increase in allowable stress is not allowed.

³Shear values of these materials may be combined, except the total combined value shall not exceed 300 pounds per foot (4380 N/m).

⁴Stresses given may be increased for combinations of loads as specified in the Building Code.

**TABLE A-1-E—ALLOWABLE VALUES OF NEW MATERIALS USED
IN CONJUNCTION WITH EXISTING CONSTRUCTION**

NEW MATERIALS OR CONFIGURATIONS OF MATERIALS	ALLOWABLE VALUES ¹
<p>1. Horizontal diaphragms²</p> <p>1.1 Plywood sheathing nailed directly over existing straight sheathing with ends of plywood sheets bearing on joists or rafters and edges of plywood located on center of individual sheathing boards</p> <p>1.2 Plywood sheathing nailed directly over existing diagonal sheathing with ends of plywood sheets bearing on joists or rafters</p> <p>1.3 Plywood sheathing nailed directly over existing straight or diagonal sheathing with ends of plywood sheets bearing on joists or rafters with edges of plywood located over new blocking and nailed to provide a minimum nail penetration into framing and blocking of 1⁵/₈ inches (41 mm)</p>	<p>225 lbs. per foot (3283 N/m)</p> <p>375 lbs. per foot (5473 N/m)</p> <p>75 percent of the values specified in Table 23-J-1 of the Building Code</p>
<p>2. Shear walls: (general procedure) Plywood sheathing applied directly over wood studs. No value shall be given to plywood applied over existing plaster or wood sheathing</p>	<p>100 percent of the value specified in Table 23-K-1 of the Building Code for shear walls</p>
<p>3. Crosswalls: (special procedure only)</p> <p>3.1 Plywood sheathing applied directly over wood studs. No value shall be given to plywood applied over existing plaster or wood sheathing</p> <p>3.2 Drywall or plaster applied directly over wood studs</p> <p>3.3 Drywall or plaster applied to sheathing over existing wood studs</p>	<p>133 percent of the value specified in Table 23-K-1 of the Building Code for shear walls</p> <p>100 percent of the values in Table 25-I of the Building Code</p> <p>The values specified in Table 25-I of the Building Code reduced as noted in Footnote 1 of that table³</p>
<p>4. Tension bolts</p> <p>4.1 Bolts extending entirely through unreinforced masonry walls secured with bearing plates on far side of a three-wythe-minimum wall with at least 30 square inches (19 350 mm²) of area^{4,5}</p> <p>4.2 Bolts extending to the exterior face of the wall with a 2¹/₂-inch (63.5 mm) round plate under the head and drilled at an angle of 22¹/₂ degrees to the horizontal, installed as specified for shear bolts^{4,5,7}</p>	<p>1,800 lbs. (8006 N) per bolt⁶ 900 lbs. (4003 N) per bolt for two-wythe walls⁶</p> <p>1,200 lbs. (5338 N) per bolt</p>
<p>5. Shear bolts Bolts embedded a minimum of 8 inches (203 mm) into unreinforced masonry walls and centered in a 2¹/₂-inch-diameter (63.5 mm) hole filled with dry-pack or nonshrink grout. Through bolts with first 8 inches (203 mm) as noted above and embedded bolts as noted in Item 4b^{5,7}</p>	<p>1/2 inch (12.7 mm) diameter = 350 lbs. (1557 N)⁶ 5/8 inch (15.9 mm) diameter = 500 lbs. (2224 N)⁶ 3/4 inch (19 mm) diameter = 750 lbs. (3336 N)⁶</p>
<p>6. Infilled walls Reinforced masonry infilled openings in existing unreinforced masonry walls. Provide keys or dowels to match reinforcing</p>	<p>-Same as values specified for unreinforced masonry walls</p>
<p>7. Reinforced masonry Masonry piers and walls reinforced per Chapter 21 of the Building Code</p>	<p>Same as values specified in Sections 2106 and 2107 of the Building Code⁸</p>
<p>8. Reinforced concrete Concrete footings, walls and piers reinforced as specified in Chapter 19 of the Building Code and designed for tributary loads</p>	<p>Same values as specified in Chapter 19 of the Building Code⁸</p>

(Continued)

FOOTNOTES FOR TABLE A-1-E

- ¹A one-third increase in allowable stress is not allowed, except as noted.
- ²Values and limitations are for nailed plywood. Higher values may be used for other fastening systems such as wood screws or staples when approved by the building official.
- ³In addition to existing sheathing value.
- ⁴Bolts to be 1/2-inch (12.7 mm) minimum in diameter.
- ⁵Drilling for bolts and dowels shall be done with an electric rotary drill. Impact tools shall not be used for drilling holes or tightening anchors and shear bolt nuts.
- ⁶Other bolt sizes, values and installation methods may be used provided a testing program is conducted in accordance with U.B.C. Standard 21-7. Bolt spacing shall not exceed 6 feet (1830 mm) on center and shall not be less than 12 inches (305 mm) on center.
- ⁷Embedded bolts to be tested as specified in Section A107.
- ⁸Stresses given may be increased for combinations of loads as specified in the Building Code.

TABLE A-1-F—MAXIMUM ALLOWABLE HEIGHT-TO-THICKNESS RATIOS FOR PARAPETS

	SEISMIC ZONE			
	2A	2B	3	4
Maximum allowable height-to-thickness ratio	2.5	2.5	1.5	1.5

TABLE A-1-G—MAXIMUM HEIGHT-TO-THICKNESS RATIOS FOR ADOBE OR STONE WALLS

	SEISMIC ZONE		
	2B	3	4
One-story buildings	12	10	8
Two-story buildings			
First story	14	11	9
Second story	12	10	8

(Figures begin on next page.)

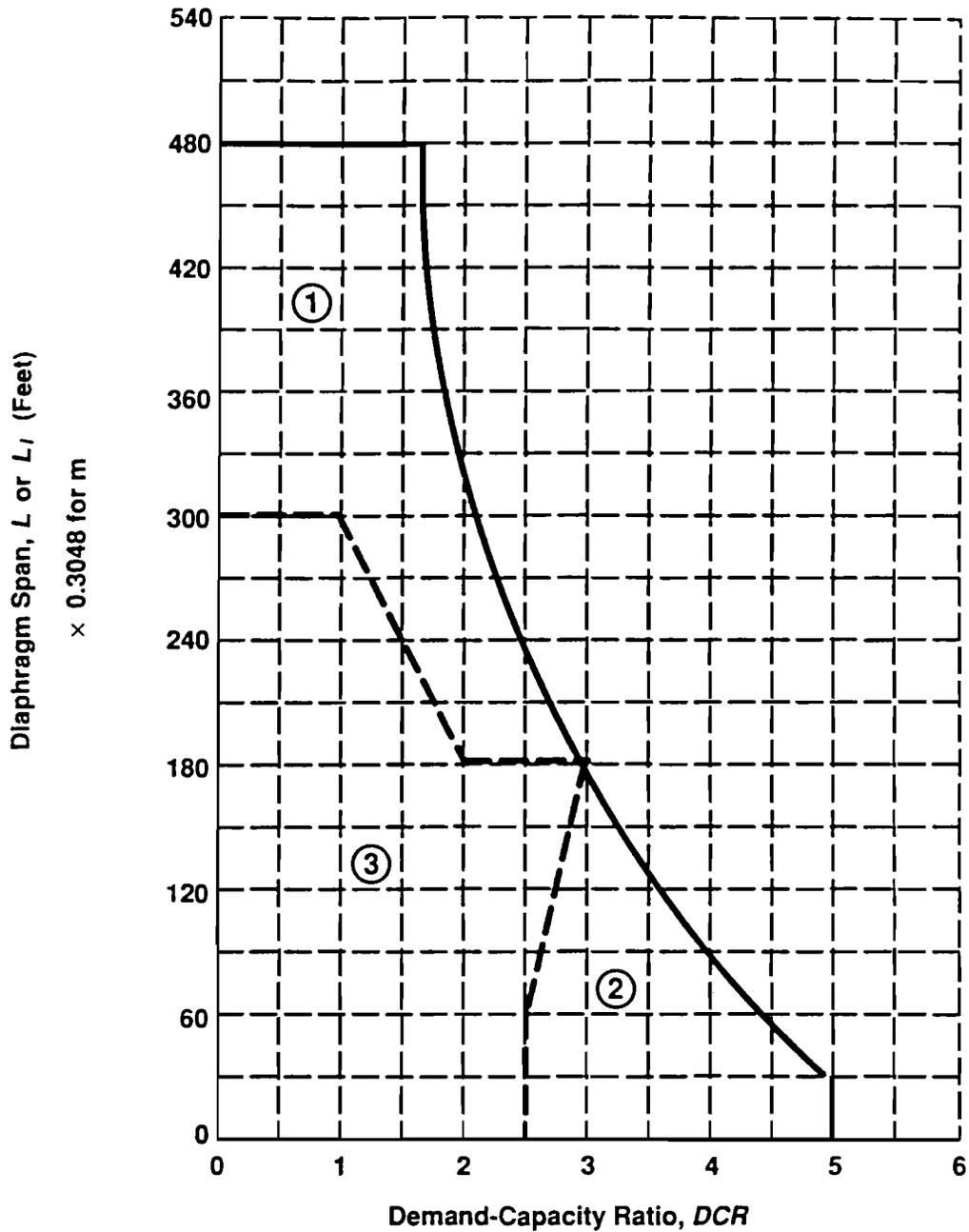


FIGURE A-1-1—ACCEPTABLE DIAPHRAGM SPAN

1. Region of demand/capacity ratios where crosswalls may be used to increase h/t ratios.
2. Region of demand/capacity ratios where h/t ratios of "with crosswalls" may be used.
3. Region of demand/capacity ratios where h/t ratios of "all other buildings" shall be used.

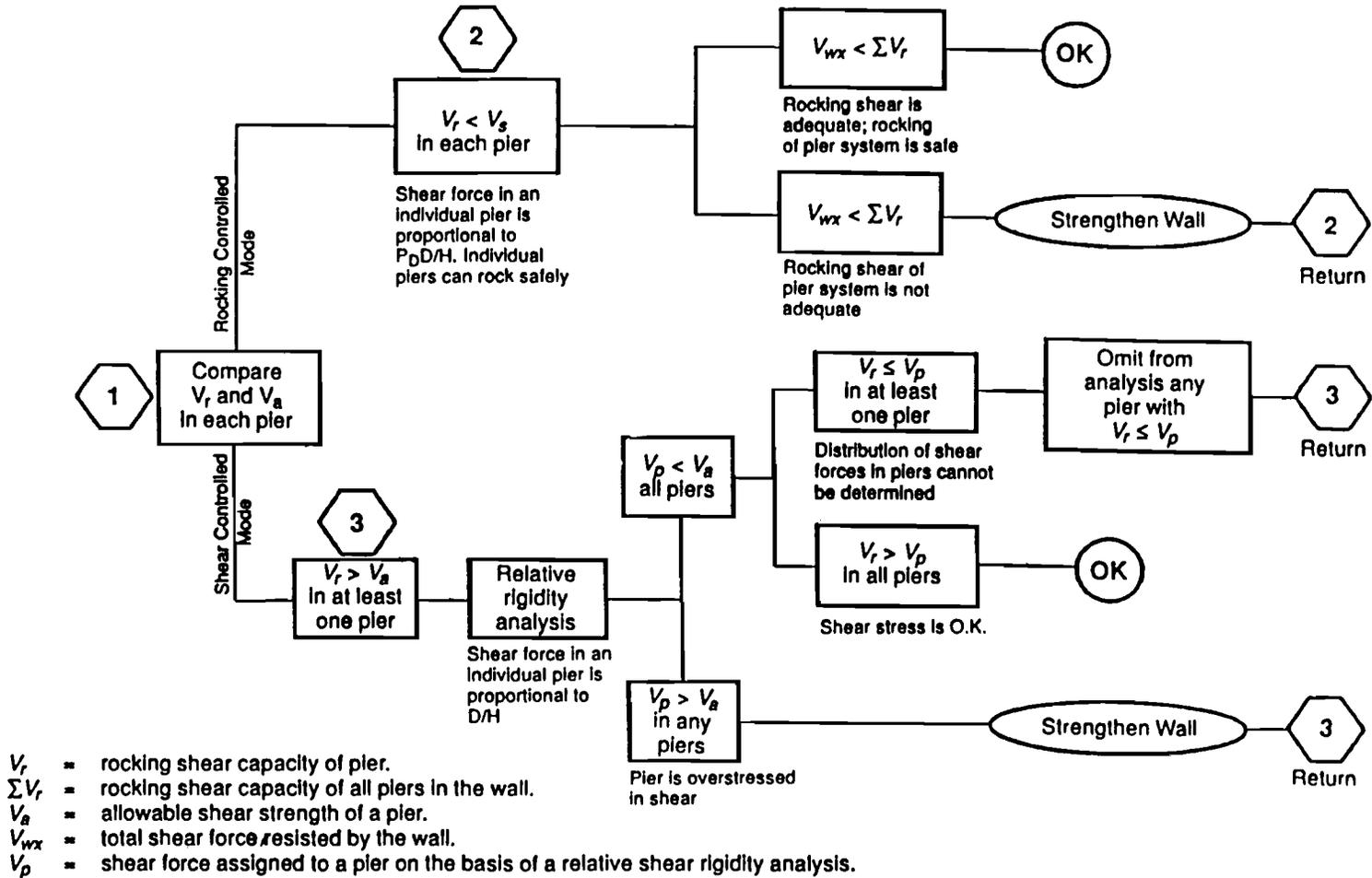


FIGURE A-1-2—ANALYSIS OF URM WALL IN-PLANE SHEAR FORCES

APPENDIX 2



proposed to be, in Use Groups A, B, E, F, M, R and S. These provisions shall not apply to buildings with occupancies in Use Group H or I.

3408.2.1 Change in use group: Where an existing building is changed to a new use group classification and this section is applicable, the provisions of this section for the new use group shall be used to determine compliance with this code.

3408.2.2 Part change in use group: Where a portion of the building is changed to a new use group classification, and that portion is separated from the remainder of the building with *fire separation assemblies* having a fire-resistance rating as required by Table 313.1.2 for the separate use groups, or with approved compliance alternatives, the portion changed shall be made to conform to the provisions of this section.

Where a portion of the building is changed to a new use group classification, and that portion is not separated from the remainder of the building with *fire separation assemblies* having a fire-resistance rating as required by Table 313.1.2 for the separate use groups, or with approved compliance alternatives, the provisions of this section which apply to each use group shall apply to the entire building. Where there are conflicting provisions, those requirements which secure the greater public safety shall apply to the entire building or structure.

3408.2.3 Additions: *Additions* to existing buildings shall comply with all of the requirements of this code for new construction. The combined *height* and *area* of the existing building and the new *addition* shall not exceed the *height* and *area* allowed by Section 503.0. Where a *fire wall* that complies with Section 707.0 is provided between the *addition* and the existing building, the *addition* shall be considered a separate building.

3408.2.4 Alterations and repairs: An existing building or portion thereof which does not comply with the requirements of this code for new construction shall not be *altered* or repaired in such a manner that results in the building being less safe or sanitary than such building is currently. If, in the *alteration* or repair, the current level of safety or sanitation is to be reduced, the portion *altered* or repaired shall conform to the requirements of Chapters 2 through 12 and Chapters 14 through 33.

3408.2.5 Accessibility requirements: All portions of the buildings proposed for *change of occupancy* shall conform to the accessibility provisions of Section 1110.0.

3408.3 Acceptance: For repairs, *alterations*, *additions* and *changes of occupancy* to existing buildings that are evaluated in accordance with this section, compliance with this section shall be accepted by the code official.

3408.3.1 Hazards: Where the code official determines that an unsafe condition exists, as provided for in Section 119.0, such unsafe condition shall be abated in accordance with Section 119.0.

3408.3.2 Compliance with other codes: All buildings that are evaluated in accordance with this section shall comply

SECTION 3408.0 COMPLIANCE ALTERNATIVES

3408.1 Compliance: The provisions of this section are intended to maintain or increase the current degree of public safety, health and general welfare in existing buildings while permitting repair, *alteration*, *addition* and *change of occupancy* without requiring full compliance with Chapters 2 through 33, or Sections 3403.0 through 3407.0, except where compliance with other provisions of this code is specifically required in this section.

3408.2 Applicability: Structures existing prior to [DATE TO BE INSERTED BY THE JURISDICTION. NOTE: IT IS RECOMMENDED THAT THIS DATE COINCIDE WITH THE EFFECTIVE DATE OF BUILDING CODES WITHIN THE JURISDICTION], in which there is work involving *additions*, *alterations* or *changes of occupancy*, shall be made to conform to the requirements of this section or the provisions of Sections 3403.0 through 3407.0.

The provisions in Sections 3408.2.1 through 3408.2.5 shall apply to existing occupancies that will continue to be, or are

with the fire prevention and property maintenance codes listed in Chapter 35.

3408.4 Investigation and evaluation: For all proposed work covered by this section, the building owner shall cause the existing building to be investigated and evaluated in accordance with the provisions of this section.

3408.4.1 Structural analysis: The owner shall have a structural analysis of the existing building made to determine adequacy of all structural systems for the proposed *alteration, addition or change of occupancy*. The existing building shall be capable of supporting the minimum *load* requirements of Section 1606.0.

3408.4.2 Submittal: The results of the investigation and evaluation as required in Section 3408.4, along with all proposed compliance alternatives, shall be submitted to the code official.

3408.4.3 Determination of compliance: The code official shall determine whether the existing building, with the proposed *addition, alteration or change of occupancy*, complies with the provisions of this section in accordance with the evaluation process in Sections 3408.5 through 3408.9.

3408.5 Evaluation: The evaluation shall be comprised of three categories: fire safety, *means of egress* and general safety, as defined in Sections 3408.5.1 through 3408.5.3.

3408.5.1 Fire safety: Included within the fire safety category are the structural fire resistance, *automatic fire detection*, fire alarm and *fire suppression system* features of the facility.

3408.5.2 Means of egress: Included within the *means of egress* category are the configuration, characteristics and support features for *means of egress* in the facility.

3408.5.3 General safety: Included within the general safety category are the fire safety parameters and the *means of egress* parameters.

3408.6 Evaluation process: The evaluation process specified herein shall be followed in its entirety to evaluate existing buildings. Table 3408.7 shall be utilized for tabulating the results of the evaluation. References to other sections of this code indicate that compliance with those sections is required in order to gain credit in the evaluation herein outlined. In applying this section to a building with mixed use groups, where the separation between the mixed use groups does not qualify for any category indicated in Section 3408.6.16, the score for each use group shall be determined and the lower score determined for each section of the evaluation process shall apply to the entire building.

Where the separation between the mixed use groups qualifies for any category indicated in Section 3408.6.16, the score for each use group shall apply to each portion of the building based on the use group of the space.

3408.6.1 Building height: The value for *building height* shall be the lesser value determined by the formula in Section 3408.6.1.1. Section 503.0 shall be used to determine the allowable *height* of the building, including allowable increases due to *automatic sprinklers* as provided for in Section 504.2. Subtract the actual *building height* from the allowable and divide by 12½ feet. Enter the *height* value and its sign

(positive or negative) in Table 3408.7 under Safety Parameter 3408.6.1, *Building Height*, for fire safety, *means of egress* and general safety. The maximum score for a building shall be 10.

3408.6.1.1 Height formula: The following formulas shall be used in computing the building *height* value.

$$\text{Height value in feet} = \frac{(AH) - (EBH)}{12.5} \times CF$$

$$\text{Height value in stories} = (AS - EBS) \times CF$$

where:

- AH* = Allowable *height* in feet from Table 503.
- EBH* = Existing building *height* in feet.
- AS* = Allowable height in stories from Table 503.
- EBS* = Existing building height in stories.
- CF* = 1 if $(AH) - (EBH)$ is positive.
- CF* = Type of construction factor shown in Table 3408.6.6(2) if $(AH) - (EBH)$ is negative.

Note: Where mixed use groups are separated and individually evaluated as indicated in Section 3408.6, the values *AH*, *AS*, *EBH* and *EBS* shall be based on the height of the fire area of the use group being evaluated.

3408.6.2 Building area: The value for *building area* shall be determined by the formula in Section 3408.6.2.2. Section 503.0 and the formula in Section 3408.6.2.1 shall be used to determine the allowable *area* of the building. This shall include any allowable increases due to open perimeter, *automatic sprinklers* and reductions to the *area* due to height as provided for in Section 506.0. Subtract the actual building *area* from the allowable *area* and divide by 1,200 square feet (112 m²). Enter the *area* value and its sign (positive or negative) in Table 3408.7 under Safety Parameter 3408.6.2, Building Area, for fire safety, *means of egress* and general safety. In determining the *area* value, the maximum permitted positive value for *area* is 50 percent of the fire safety score as listed in Table 3408.8, Mandatory Safety Scores.

3408.6.2.1 Allowable area formula: The following formula shall be used in computing allowable *area*.

$$AA = \frac{(SP + OP - HR + 100) \times (\text{area in Table 503})}{100}$$

where:

- AA* = Allowable *area*.
- SP* = Percent increase for *sprinklers* (Section 506.3).
- OP* = Percent increase for open perimeter (Section 506.2).
- HR* = Percent reduction for excess *height* (Section 506.4).

Note: Where mixed use groups are separated and individually evaluated as indicated in Section 3408.6, the value for *HR* shall be based on the height of the fire area of the use group being evaluated.

3408.6.2.2 Area formula: The following formula shall be used in computing the *area* value. Determine the Area Value for each use group fire area on a floor by floor basis.

For each use group, choose the minimum Area Value of the set of values obtained for the particular use group.

$$\text{Area value } i = \frac{\text{Allowable area } i}{1,200 \text{ squarefeet}} \left[1 - \left(\frac{\text{Actual area } i}{\text{Allowable area } i} + \dots + \frac{\text{Actual area } n}{\text{Allowable area } n} \right) \right]$$

where:

- i = value for an individual separated use group on a floor.
- n = number of separated use groups on a floor.

3408.6.3 Compartmentation: Evaluate the compartments created by *fire separation assemblies* which comply with Sections 3408.6.3.1 and 3408.6.3.2 and which are exclusive of the wall elements considered under Sections 3408.6.4 and 3408.6.5. Conforming compartments shall be figured as the *net area* and do not include *shafts*, chases, *stairways*, walls or columns. Using Table 3408.6.3, determine the appropriate compartmentation value (CV) and enter that value into Table 3408.7 under Safety Parameter 3408.6.3, Compartmentation, for fire safety, *means of egress* and general safety.

3408.6.3.1 Wall construction: A wall used to create separate compartments shall be a fire separation assembly conforming to Section 709.0 with a fire-resistance rating of not less than 2 hours. Where the building is not divided into more than one compartment, the compartment size shall be taken as the total floor area on all floors. Where there is more than one compartment within a story, each compartmented area on such story shall be provided with a horizontal exit conforming to Section 1019.0. The *fire door* serving as the *horizontal exit* between compartments shall be so installed, fitted and gasketed that such *fire door* will provide a substantial barrier to the passage of smoke and shall comply with Section 1019.2.1.

3408.6.3.2 Floor/ceiling construction: A floor/ceiling assembly used to create compartments shall conform to Section 713.0 and shall have a fire-resistance rating of not less than 2 hours.

3408.6.4 Tenant and dwelling unit separations: Evaluate the fire-resistance rating of floors and walls separating tenants,

including dwelling units, and not evaluated under Sections 3408.6.3 and 3408.6.5. Under the categories and use groups in Table 3408.6.4, determine the appropriate value and enter that value in Table 3408.7 under Safety Parameter 3408.6.4, Tenant and Dwelling Unit Separation, for fire safety, means of egress and general safety.

3408.6.4.1 Categories: The categories for tenant and dwelling unit separations are:

1. Category a — No fire partitions; incomplete fire partitions; no doors; doors not self-closing or automatic closing.
2. Category b — Fire partitions or floor assembly less than 1 hour fire-resistance rating or not constructed in accordance with Sections 711.0 or 713.0, respectively.
3. Category c — Fire partitions with 1 hour or greater fire-resistance rating constructed in accordance with Section 711.0 and floor assemblies with 1 hour but less than 2 hour fire-resistance rating constructed in accordance with Section 713.0, or with only one tenant within the fire area.
4. Category d — Fire separation walls with 1 hour but less than 2 hours fire-resistance rating constructed in accordance with Section 709.0 and floor assemblies with 2 hours or greater fire-resistance rating constructed in accordance with Section 713.0.
5. Category e — Fire separation wall and floor assemblies with 2 hours or greater fire-resistance rating and constructed in accordance with Sections 709.0 and 713.0, respectively.

Table 3408.6.4 SEPARATION VALUES

Use Group	Categories				
	a	b	c	d	e
A-1	0	0	0	0	1
A-2	-1	-3	0	1	2
A-3, A-4, B, E, F, M, S-1	-4	-3	0	2	4
S-2	-5	-2	0	2	4

3408.6.5 Corridor walls: Evaluate the fire-resistance rating and degree of completeness of walls which create *corridors*

Table 3408.6.3 COMPARTMENTATION VALUES

Use Group	Categories				
	a Compartment size equal to or greater than 15,000 square feet ^b	b Compartment size of 10,000 square feet ^b	c Compartment size of 7,500 square feet ^b	d Compartment size of 5,000 square feet ^b	e Compartment size of 2,500 square feet ^b or less
A-1, A-3	0	6	10	14	18
A-2	0	4	8	12	16
A-4, B, E, S-2	0	4	8	12	16
F, M, R, S-1	0	4	10	16	22

Note a. For areas between categories, the compartmentation value shall be obtained by linear interpolation.
Note b. 1 square foot = 0.093 m².

serving the floor, and constructed in accordance with Section 1011.0. This evaluation shall not include the wall elements considered under Sections 3408.6.3 and 3408.6.4. Under the categories and use groups in Table 3408.6.5, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.5, *Corridor Walls*, for fire safety, *means of egress* and general safety.

3408.6.5.1 Categories: The categories for *corridor walls* are:

1. Category a — No fire partitions; incomplete fire partitions; no doors; or doors not self-closing.
2. Category b — Less than 1 hour fire-resistance rating or not constructed in accordance with Section 711.4.
3. Category c — 1 hour to less than 2 hours fire-resistance rating, with doors conforming to Section 1011.4.2 or without corridors as permitted by Section 1011.4.
4. Category d — 2 hours or greater fire-resistance rating, with doors conforming to Section 1011.4.2.

**Table 3408.6.5
CORRIDOR WALL VALUES**

Use Group	Categories			
	a	b	c ^a	d ^a
A-1	-10	-4	0	2
A-2, A-3, F, M, R, S-1	-9	-12	0	2
A-3, F, M, R, S-1	-7	-3	0	2
A-4, B, E, S-2	-5	-2	0	5

Note a. Corridors not providing at least one-half the travel distance for all occupants on a floor shall use Category b.

3408.6.6 Vertical openings: Evaluate the fire-resistance rating of vertical *exit* enclosures, hoistways, *escalator* openings and other *shaft* enclosures within the building, and all openings between two or more floors. Table 3408.6.6(1) contains the appropriate protection values. Multiply that value by the construction-type factor found in Table 3408.6.6(2). Enter the vertical opening value and its sign (positive or negative) in Table 3408.7 under Safety Parameter 3408.6.6, *Vertical Openings*, for fire safety, *means of egress* and general safety. If the structure is a one-story building, enter a value of 2. Unenclosed vertical openings that conform to the requirements of Section 713.3 shall not be considered in the evaluation of vertical openings.

3408.6.6.1 Vertical opening formula: The following formula shall be used in computing vertical opening value.

$$VO = PV \times CF$$

- VO = Vertical opening value.
- PV = Protection value [Table 3408.6.6(1)].
- CF = Construction-type factor [Table 3408.6.6(2)].

**Table 3408.6.6(1)
VERTICAL OPENING PROTECTION VALUE**

Protection	Value
None (unprotected opening)	-2 times number of floors connected
1 hour	-1 times number of floors connected
2 hours or more	2

**Table 3408.6.6(2)
CONSTRUCTION-TYPE FACTOR**

Factor	Type of construction (refer to Section 602.0)									
	1A	1B	2A	2B	2C	3A	3B	4	5A	5B
	1	1.2	1.5	2.2	3.5	2.5	3.5	2.3	3.3	7

3408.6.7 HVAC systems: Evaluate the ability of the HVAC system to resist the movement of smoke and fire beyond the point of origin. Under the categories in Section 3408.6.7.1, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.7, *HVAC Systems*, for fire safety, *means of egress* and general safety.

3408.6.7.1 Categories: The categories for HVAC systems are:

1. Category a — Plenums not in accordance with Section 2805.1: -10 points.
2. Category b — Air movement in egress elements not in accordance with Section 1005.7: -5 points.
3. Category c — Both categories a and b are applicable: -15 points.
4. Category d — Compliance of the HVAC system with Sections 1005.7 and 2805.0: 0 points.
5. Category e — Systems serving one story; or a central boiler/chiller system without ductwork connecting two or more stories: +5 points.

3408.6.8 Automatic fire detection: Evaluate the smoke detection capability based on the location and operation of *automatic fire detectors* in accordance with Section 919.0 and the mechanical code listed in Chapter 35. Under the categories and use groups in Table 3408.6.8, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.8, *Automatic Fire Detection*, for fire safety, *means of egress* and general safety.

3408.6.8.1 Categories: The categories for *automatic fire detection* are:

1. Category a — None.
2. Category b — Existing smoke detectors in HVAC systems and maintained in accordance with the fire prevention code listed in Chapter 35.
3. Category c — Smoke detectors in HVAC systems. The detectors are installed in accordance with the requirements for new buildings in the mechanical code listed in Chapter 35.
4. Category d — Smoke detectors throughout all floor areas other than individual guest rooms, tenant spaces and dwelling units.
5. Category e — Smoke detectors installed throughout the fire area.

**Table 3408.6.8
AUTOMATIC FIRE DETECTION VALUES**

Use Group	Categories				
	a	b	c	d	e
A-1, A-3, F, M, R, S-1	-10	-5	0	2	6
A-2	-25	-5	0	5	9
A-4, B, E, S-2	-4	-2	0	4	8

3408.6.9 Fire alarm systems: Evaluate the capability of the fire alarm system in accordance with Section 918.0. Under the categories and use groups in Table 3408.6.9, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.9, Fire Alarm, for fire safety, means of egress and general safety.

3408.6.9.1 Categories: The categories for fire alarm systems are:

1. Category a — None.
2. Category b — Manual fire alarm with pull boxes in accordance with Section 918.5 and alarm indicating appliances in accordance with Section 918.8.2.
3. Category c — Fire alarm system in accordance with Section 918.0.
4. Category d — Category c plus a required voice/alarm signaling system and a fire command station that conforms to Section 403.7 and contains the voice/alarm signaling system controls, fire department communication system controls and any other controls specified in Section 403.7 where those systems are provided.

**Table 3408.6.9
FIRE ALARM SYSTEM VALUES**

Use Group	Categories			
	a	b ^a	c	d
A-1, A-2, A-3, A-4, B, E, R	-10	-5	0	5
M, F, S	0	5	10	15

Note a. For buildings equipped throughout with an automatic sprinkler system, add 2 points for activation by a sprinkler water flow device.

3408.6.10 Smoke control: Evaluate the ability of a natural or mechanical venting, exhaust or pressurization system to control the movement of smoke from a fire. Under the categories and use groups in Table 3408.6.10, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.10, Smoke Control, for means of egress and general safety.

**Table 3408.6.10
SMOKE CONTROL VALUES**

Use Group	Categories					
	a	b	c	d	e	f
A-1, A-2, A-3	0	1	2	3	6	6
A-4, E	0	0	0	1	3	5
B, M, R	0	2 ^a	3 ^a	3 ^a	3 ^a	4 ^a
F, S	0	2 ^a	2 ^a	3 ^a	3 ^a	3 ^a

Note a. This value shall be 0 if compliance with Category d, or e in Section 3408.6.8.1 has not been obtained.

3408.6.10.1 Categories: The categories for smoke control are:

1. Category a — None.
2. Category b — The building is equipped throughout with an automatic sprinkler system. Openings are provided in exterior walls at the rate of 20 square feet (1.86 m²) per 50 linear feet (15240 mm) of exterior wall in each story and distributed around the building perimeter at intervals not exceeding 50 feet (15240 mm). Such openings shall be readily openable from the inside without a key or separate tool

and shall be provided with ready access thereto. In lieu of operable openings, clearly and permanently marked tempered glass panels shall be used.

3. Category c — One enclosed exit stairway, with ready access thereto, from each occupied floor of the building. The stairway has operable exterior windows and the building has openings in accordance with Category b.
4. Category d — One smokeproof enclosure and the building has openings in accordance with Category b.
5. Category e — The building is equipped throughout with an automatic sprinkler system. Each fire area is provided with a mechanical air-handling system designed to accomplish smoke containment. Return and exhaust air shall be moved directly to the outside without recirculation to other fire areas of the building under fire conditions. The system shall exhaust not less than six air changes per hour from the fire area. Supply air by mechanical means to the fire area is not required. Containment of smoke shall be considered as confining smoke to the fire area involved without migration to other fire areas. Any other tested and approved design which will adequately accomplish smoke containment is permitted.
6. Category f — Each stairway shall be one of the following: a smokeproof enclosure in accordance with Section 1015.0; pressurized in accordance with Section 1015.7; or shall have operable exterior windows.

3408.6.11 Means of egress capacity and number: Evaluate the means of egress capacity and the number of exits available to the building occupants. In applying this section, the means of egress are required to conform to Sections 1006.0 (with the exception of Section 1006.5), 1008.0, 1009.0 (except that the minimum width required by this section shall be determined solely by the width for the required capacity in accordance with Table 1009.2), 1010.0, 1020.0 and 1025.0. The number of exits credited are the number that are available to each occupant of the area being evaluated. Under the categories and use groups in Table 3408.6.11, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.11, Means of Egress Capacity, for means of egress and general safety.

3408.6.11.1 Categories: The categories for means of egress capacity and number of exits are:

1. Category a — Compliance with the minimum required means of egress capacity or number of exits is achieved through the use of a fire escape in accordance with Section 1025.0.
2. Category b — Capacity of the means of egress complies with Section 1009.0 and the number of exits complies with the minimum number required by Section 1010.0.
3. Category c — Capacity of the means of egress is equal to or exceeds 125 percent of the required means of egress capacity, the means of egress complies with the minimum required width dimensions specified in the code and the number of exits com-

plies with the minimum number required by Section 1010.0.

4. Category d — The number of *exits* provided exceeds the number of exits required by Section 1010.0. All exits shall be located a distance apart from each other equal to not less than that specified in Section 1006.4.1.
5. Category e — The area being evaluated meets both Categories c and d.

**Table 3408.6.11
MEANS OF EGRESS VALUES**

Use Group	Categories				
	a ^a	b	c	d	e
A-1, A-2, A-3, A-4, E	-10	0	2	8	10
M	-3	0	1	2	4
B, F, S	-1	0	0	0	0
R	-3	0	0	0	0

Note a. The values indicated are for buildings six stories or less in height. For buildings over six stories in height, add an additional -10 points.

3408.6.12 Dead ends: In spaces required to be served by more than one means of egress, evaluate the length of the *exit access* travel path in which the building occupants are confined to a single path of travel. Under the categories and use groups in Table 3408.6.12, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.12, Dead Ends, for *means of egress* and general safety.

3408.6.12.1 Categories: The categories for dead ends are:

1. Category a — Dead end of 35 feet (10670 mm) in unsprinklered buildings or 70 feet (21340 mm) in sprinklered buildings.
2. Category b — Dead end of 20 feet (6096 mm); or 50 feet (15240 mm) in Use Group B in accordance with Section 1011.2, exception 2.
3. Category c — No dead ends; or ratio of length to width (l/w) is less than 2.5:1.

**Table 3408.6.12
DEAD-END VALUES**

Use Group	Categories ^a		
	a	b	c
A-1, A-3, A-4, B, E, F, M, R, S	-2	0	2
A-2, E	-2	0	2

Note a. For dead-end distances between categories, the dead-end value shall be obtained by linear interpolation.

3408.6.13 Maximum travel distance to an exit: Evaluate the length of *exit access* travel to an approved *exit*. Determine the appropriate points in accordance with the following equation and enter that value into Table 3408.7 under Safety Parameter 3408.6.13, Maximum *Exit Access* Travel Distance, for *means of egress* and general safety. The maximum allowable exit access travel distance shall be determined in accordance with Section 1006.5.

$$\text{Points} = 20 \times \frac{\text{Maximum allowable travel distance} - \text{Maximum actual travel distance}}{\text{Maximum allowable travel distance}}$$

3408.6.14 Elevator control: Evaluate the passenger elevator equipment and controls that are available to the fire department to reach all occupied floors. Elevator recall controls shall be provided in accordance with fire prevention code listed in Chapter 35. Under the categories and use groups in Table 3408.6.14, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.14, Elevator Control, for fire safety, *means of egress* and general safety. The values shall be zero for a single story building.

3408.6.14.1 Categories: The categories for elevator controls are:

1. Category a — No elevator.
2. Category b — Any elevator without Phase I and II recall.
3. Category c — All elevators with Phase I and II recall as required by the fire prevention code listed in Chapter 35.
4. Category d — All meet category c; or category b where permitted to be without recall; and at least one elevator that complies with new construction requirements serves all occupied floors.

**Table 3408.6.14
ELEVATOR CONTROL VALUES**

Elevator travel	Category			
	a	b	c	d
Less than 25 feet of travel above or below the primary level of elevator access for emergency fire-fighting or rescue personnel ^a	-2	0	0	+2
Travel of 25 feet or more above or below the primary level of elevator access for emergency fire-fighting or rescue personnel ^a	-4	NP	0	+4

Note a. 1 foot = 304.8 mm.

3408.6.15 Means of egress emergency lighting: Evaluate the presence of and reliability of *means of egress* emergency lighting. Under the categories and use groups in Table 3408.6.15, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.15, *Means Of Egress* Emergency Lighting, for *means of egress* and general safety.

3408.6.15.1 Categories: The categories for *means of egress* emergency lighting are:

1. Category a — Means of egress lighting and exit signs not provided with emergency power in accordance with Section 2706.0.
2. Category b — Means of egress lighting and exit signs provided with emergency power in accordance with Section 2706.0.
3. Category c — Emergency power provided to means of egress lighting and exit signs which provides protection in the event of power failure to the site or building.

**Table 3408.6.15
MEANS OF EGRESS EMERGENCY LIGHTING VALUES**

Number of exits required by Section 1010.0	a	b	c
Two or more exits required	NP	0	4
Minimum of 1 exit required	0	1	1

3408.6.16 Mixed use groups: Where a building has two or more occupancies that are not in the same use group classification, the separation between the mixed use groups shall be evaluated in accordance with this section. Where there is no separation between the mixed use groups or the separation between mixed use groups does not qualify for any of the categories indicated in Section 3408.6.16.1, the building shall be evaluated as indicated in Section 3408.6 and the value for mixed use groups shall be zero. Under the categories and use groups in Table 3408.6.16, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.16, Mixed Use Groups, for fire safety and general safety. For buildings without mixed use groups, the value shall be zero.

3408.6.16.1 Categories: The categories for mixed use groups are:

1. Category a — Minimum 1-hour fire separation assemblies between use groups.
2. Category b — Fire separation assemblies between use groups in accordance with Section 313.1.2.
3. Category c — Fire separation assemblies between use groups having a fire-resistance rating of not less than twice that required by Section 313.1.2.

**Table 3408.6.16
MIXED USE GROUP VALUES**

Use Group	Categories ^a		
	a	b	c
A-1, A-2, R	-10	0	10
A-3, A-4, B, E, F, M, S	-5	0	5

Note a. For fire-resistance ratings between categories, the value shall be obtained by linear interpolation.

3408.6.17 Sprinklers: Evaluate the ability to suppress a fire based on the installation of an *automatic sprinkler system* in accordance with Section 906.2. "Required sprinklers" shall be based on the requirements of Sections 904.1 through 904.10; and as referenced in Table 904.11 for covered mall

buildings, high-rise buildings, public garages and unlimited area buildings. Under the categories and use groups in Table 3408.6.17, determine the appropriate value and enter that value into Table 3408.7 under Safety Parameter 3408.6.17, *Automatic Sprinklers*, for fire safety, *means of egress* divided by 2 and general safety.

3408.6.17.1 Categories: The categories for *automatic sprinkler system* protection are:

1. Category a — Sprinklers are required throughout; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected in accordance with Section 906.0.
2. Category b — Sprinklers are required in a portion of the building; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected in accordance with Section 906.0.
3. Category c — Sprinklers are not required; none are provided.
4. Category d — Sprinklers are required in a portion of the building; sprinklers are provided in such portion; the system is one which complied with the code at the time of installation and is maintained and supervised in accordance with Section 924.1.
5. Category e — Sprinklers are required throughout; sprinklers are provided throughout in accordance with Chapter 9.
6. Category f — Sprinklers are not required throughout; sprinklers are provided throughout in accordance with Chapter 9.

**Table 3408.6.17
SPRINKLER SYSTEM VALUES**

Use groups	Categories					
	a	b	c	d	e	f
A-1, A-3, F, M, R, S-1	-6	-3	0	2	4	6
A-2	-4	-2	0	1	2	4
A-4, B, E, S-2	-12	-6	0	3	6	12

3408.6.18 Specific occupancy areas: Evaluate the protection of specific occupancy areas in accordance with Section 302.1.1. Also evaluate compliance with Table 904.11. Do not include those which Table 904.11 requires suppression throughout the building including covered mall buildings, high-rise buildings, public garages and unlimited area buildings. Assign the lowest score for the building or fire *area*

**Table 3408.6.18
SPECIFIC OCCUPANCY AREA VALUES^a**

Protection Required by Table 302.1.1	Protection Provided						
	None	1 Hour	A.F.S.S.	A.F.S.S. with S.P.	1 Hour and A.F.S.S.	2 Hours	2 Hours and A.F.S.S.
2 Hours and A.F.S.S.	-4	-3	-2	-2	-1	-2	0
2 Hours; or 1 Hour and A.F.S.S.	-3	-2	-1	-1	0	0	0
1 Hour and A.F.S.S.	-3	-2	-1	-1	0	-1	0
1 Hour	-1	0	0	0	0	0	0
1 Hour; or A.F.S.S. with S.P.	-1	0	0	0	0	0	0
A.F.S.S. with S.P.	-1	-1	-1	0	0	-1	0
1 Hour; or A.F.S.S.	-1	0	0	0	0	0	0

Note a. A.F.S.S. = Automatic fire suppression system; S.P. = Smoke partitions (see Section 302.1.1.1).

being evaluated. If there are no specific occupancy areas in the building or fire area being evaluated, the value shall be zero.

3408.7 Building score: After determining the appropriate data from Section 3408.6, enter those data in Table 3408.7 and total the building score.

3408.8 Safety scores: The values in Table 3408.8 are the required mandatory safety scores for the evaluation process listed in Section 3408.6.

**Table 3408.8
MANDATORY SAFETY SCORES^a**

Use Group	Fire safety (MFS)	Means of egress (MME)	General safety (MGS)
A-1	16	27	27
A-2	19	30	30
A-3	18	29	29
A-4, E	23	34	34
B	24	34	34
F	20	30	30
M	19	36	36
R	17	34	34
S-1	15	25	25
S-2	23	33	33

Note a. MFS = Mandatory Fire Safety;
MME = Mandatory Means of Egress;
MGS = Mandatory General Safety.

3408.9 Evaluation of building safety: The mandatory safety score in Table 3408.8 shall be subtracted from the building score in Table 3408.7 for each category. Where the final score for any category equals zero or more, the building is in compliance with the requirements of this section for that category. Where the final score for any category is less than zero, the building is not in compliance with the requirements of this section.

**Table 3408.9
EVALUATION FORMULAS^a**

Formula	Table 3408.7	Table 3408.8	Score	Pass	Fail
FS-MFS ≥ 0	_____ (FS)	- _____ (MFS)	= _____	_____	_____
ME-MME ≥ 0	_____ (ME)	- _____ (MME)	= _____	_____	_____
GS-MGS ≥ 0	_____ (GS)	- _____ (MGS)	= _____	_____	_____

Note a.
FS = Fire Safety MFS = Mandatory Fire Safety
ME = Means of Egress MME = Mandatory Means of Egress
GS = General Safety MGS = Mandatory General Safety

3408.9.1 Mixed use groups: For mixed use groups, the following provisions shall apply:

1. Where the separation between mixed use groups does not qualify for any category indicated in Section 3408.6.16, the mandatory safety scores for the use group with the lowest general safety score in Table 3408.8 shall be utilized (see Section 3408.6).
2. Where the separation between mixed use groups qualifies for any category indicated in Section 3408.6.16, the mandatory safety scores for each use group shall be placed against the evaluation scores for the appropriate use group.

**Table 3408.7
SUMMARY SHEET — BUILDING SCORE**

Existing use group _____		Proposed use group _____	
Year building was constructed _____		Number of stories _____	Height in feet _____
Type of construction _____		Area per floor _____	
Percentage of open perimeter _____%		Percentage of height reduction _____%	
Completely suppressed:	Yes _____ No _____	Corridor wall rating _____	
Compartmentation:	Yes _____ No _____	Required door closers: Yes _____ No _____	
Firerestance rating of vertical opening enclosures _____			
Type of HVAC system _____		serving number of floors _____	
Automatic fire detection:	Yes _____ No _____	type and location _____	
Fire alarm system:	Yes _____ No _____	type _____	
Smoke control:	Yes _____ No _____	type _____	
Adequate exit routes:	Yes _____ No _____	Dead ends:	Yes _____ No _____
Maximum exit access travel distance _____		Elevator controls:	Yes _____ No _____
Means of egress emergency lighting: Yes _____ No _____		Mixed use groups:	Yes _____ No _____
Safety parameters	Fire safety (FS)	Means of egress (ME)	General safety (GS)
3408.6.1 Building height			
3408.6.2 Building area			
3408.6.3 Compartmentation			
3408.6.4 Tenant and dwelling unit separations			
3408.6.5 Corridor walls			
3408.6.6 Vertical openings			
3408.6.7 HVAC systems			
3408.6.8 Automatic fire detection			
3408.6.9 Fire alarm system			
3408.6.10 Smoke control	****		
3408.6.11 Means of egress	****		
3408.6.12 Dead ends	****		
3408.6.13 Max. travel distance	****		
3408.6.14 Elevator control			
3408.6.15 Means of egress emergency lighting	****		
3408.6.16 Mixed use groups		****	
3408.6.17 Sprinklers		+ 2 =	
3408.6.18 Specific occupancy area protection			
Building score — total value			

**** No applicable value to be inserted.

