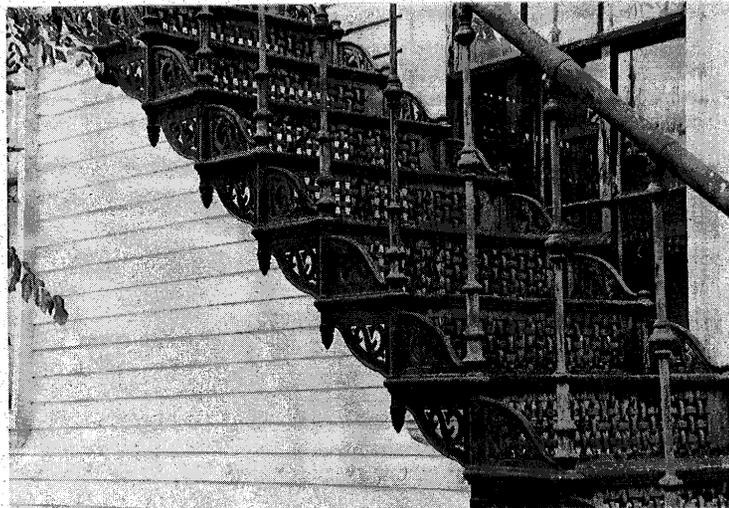


Fire Prevention and Building Code Compliance for Historic Buildings: A Field Guide



**Illustrated Solutions for
Common Life Safety Code
Compliance Issues**

*Prepared by The University of Vermont
Graduate Program in Historic Preservation in Cooperation with
The Vermont Division for Historic Preservation and
The Vermont Department of Labor and Industry*

This project made possible by the generous support of:

Vermont Department of Labor and Industry

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**Vermont Division for Historic Preservation
Department of Housing and Community Affairs
Agency of Commerce and Community Development**

~

Preservation Trust of Vermont

~

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First edition published December 1997

*Front Cover Photo:
Iron Fire Escape, Town Office, Putney Vermont*

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INTRODUCTION

This Field Guide is designed to be used by those involved at all levels in the rehabilitation process of historic and older buildings, including: trades persons, planners, architects, engineers, and property owners. The purpose of the Field Guide is to illustrate and describe successful examples of code compliance that reconcile safety considerations with preservation goals. In addition to including pertinent code and noting sources for further referencing, this manual also encourages and outlines the early and continued cooperation between those directly involved in the project with local code and preservation officials.

Vermont has an unusually high proportion of older buildings, many of which are historic. These buildings contribute substantially to the sense of community and place which makes Vermont unique. Although such structures as house museums and public monuments have long been identified as having historical and cultural significance, the types of buildings determined worthy of our interest has expanded to include a wide variety of building types. Thousands of structures, which include everything from prominent civic buildings to relatively obscure agricultural buildings are currently listed on the National and State Registers of Historic Places, while hundreds more are added each year.

The dilemma facing many older *public buildings* (see definition under Basic Terminology, page x) involves synthesizing modern fire and safety requirements with the traditional goals of historic preservation. As part of a new or continued use, it is often necessary to make modifications to a historic building so it can comply with current fire and safety code requirements. From a preservation standpoint, it is important to integrate those changes into a building without destroying the features that contribute to its historic significance. Therefore, owners of older and historic buildings should seek the assistance of fire safety engineers and architects who specialize in the preservation of these structures (see The Secretary of the Interior's Standards, page 47 and

Fundamental Requirements (for the **Life Safety Code**) page iv).

One of the greatest concerns during any rehabilitation project is the potential threat to the lives of occupants from fire. Therefore, of prime importance to local and state officials is the safety of the building's occupants. Issues such as structural integrity, means of egress, the presence of hazardous materials and fire safety influence much of the decision making during the permitting process. More often than not, rehabilitation projects that involve older buildings have to consider the issue of fire safety code compliance. Historic buildings rarely meet modern life safety code requirements. Making the necessary adaptations to comply with national, state and local building and life safety codes can be one of the most difficult challenges for the owner, builder or architect involved in the project. Issues such as open stairways, narrow or dead-end corridors, doors that are too narrow or swing the wrong way, or unrated materials must be dealt with in ways that satisfy the local code before the building can be occupied.

Planning is the crucial element in any rehabilitation project. It is important to include in the earliest stages of planning input from those code officials whose concern is with life safety and related matters. Official involvement at the very onset of a project assures that these extremely important issues get full and early consideration, and

increases the likelihood that all possible alternatives will be considered.

Building codes are written primarily for new construction. They establish a minimum standard for building construction through the use of prescriptive standards that specify allowable materials or techniques. They further establish performance standards that specify the level of performance which any proposed material or assembly must meet. Building codes often determine allowable construction techniques or materials by weighing the degree of safety provided by the building (known as construction classification) against the degree of hazard presented by the user (occupancy classification) and by taking into account such factors as installed fire detection and suppression systems. Codes are adopted as law based on specific standards prepared by independent associations, such as the National Fire Protection Association (NFPA). These standards are typically narrow in their focus and provide detailed information about safety requirements.

Because of knowledge born from the historical analysis of fire loss, the evolution of life safety codes has grown and surpassed old building designs. Therefore, it remains essential to update code documents at regular intervals in response to new safety formulas and technological advances. New code modifications can present further challenges to the rehabilitation of historic buildings constructed prior to the adoption of the code. These challenges typically must be addressed by local officials with the authority to approve compliance alternatives in special circumstances or through variance hearings, usually conducted at a higher level of authority.

A code review illustrates those areas where code requirements are most stringent, and exposes conflicts between code requirements and historic preservation concerns. In some instances this review might assist in determining use and designs that cause the least damage to a structure's historic character. Typical code or life safety deficiencies found in historic and older buildings might relate to construction types, egress issues, use and occupancy, fire suppression, alarm systems, and site concerns. Some deficiencies can be addressed without any damage to the historic character of the building, while others require innovative compromise solutions.

NFPA 1, Fire Prevention Code developed by the National Fire Protection Association includes a provision, Section 3-9, that authorizes a level of flexibility in the rehabilitation of historic buildings.

“The provisions of this Code relating to the construction, repair, alteration, enlargement, restoration, and moving of buildings or structures shall not be mandatory for existing buildings or structures identified and classified by the state or local government authority as historic buildings where such buildings are judged by the authority having jurisdiction to be safe and do not constitute a serious life safety hazard.”

The Field Guide addresses this flexibility and encourages the builder, trades person, designer, or building owner to seek, with the help of code officials, methods that are effective, innovative and at the same time complimentary to the historic structures they are dealing with. The flexibility allowed under Section 3-9 can be an important

tool for the builder or planner, but should not be misconstrued as an excuse to undermine the intent of the life safety code.

The issues and illustrated solutions covered in the *Field Guide* are frequently encountered in a typical building rehabilitation. Illustrated examples are intended to demonstrate a sympathetic solution for that particular structure and are often also the most economical. The examples are suggestions and are intended to be seen as creative solutions to fire code compliance in older and historic structures.

It is anticipated that updates of *The Field Guide* will be issued in the future. To receive your updates, send the enclosed reply card to the Department of Labor and Industry.

Note: The *Field Guide* addresses life safety requirements. It does not focus on handicapped accessibility in historic buildings; several excellent publications on that topic already exist.

FUNDAMENTAL REQUIREMENTS

Fundamental Requirements *

The goals of the **Life Safety Code** are to ensure a reasonable level of safety in building design and arrangement. These objectives, as stated in the *Life Safety Code® Handbook*, are:

1. To provide for adequate safety without dependence on any single safeguard:

“Every building or structure, new or old, designed for human occupancy shall be provided with exits and other safeguards sufficient to permit the prompt escape of occupants or furnish other means to provide a reasonable degree of safety for occupants in case of fire or other emergency.”

2. To ensure that construction is sufficient to provide structural integrity during a fire while occupants seek refuge within the building or egress to the building exterior:

“Every building or structure shall be so arranged, equipped, maintained, and operated as to avoid undue danger to the lives and safety of its occupants from fire, smoke, fumes, or resulting panic during the period of time reasonably necessary for escape from the building or structure or for that period of time needed to defend in place in case of fire or other emergency.”

3. To provide an appropriate degree of life safety considering the size, shape, and nature of the occupancy:

“Every building or structure shall be provided with exits and other safeguards of kinds, numbers, locations, and capacities appropriate to the individual building or structure, with due regard to the character of the occupancy, the capabilities of the occupants, the number of persons exposed, the fire protection available, the height and type of construction of the building or structure, and other factors necessary to provide all occupants with a reasonable degree of safety.”

4. To ensure that the egress paths are clear, unobstructed, and unlocked:

“In every building or structure, exits shall be so arranged and maintained as to provide free and unobstructed access from all parts of the building or structure at all times when it is occupied. No lock or fastening shall be installed to prevent free escape from the inside of the building.”

5. To ensure that the exits and egress routes are clearly marked to provide the necessary cues and avoid confusion:

“Every exit shall be clearly visible, or the route to reach every exit shall be conspicuously indicated in such a manner that every occupant of every building or structure who is physically and mentally capable will readily know the direction of escape from any point. Each means of egress, in its entirety, shall be so arranged or marked that the way to a place of safety is indicated in a clear manner. Any doorway

* *Life Safety Code®* and *101®* are registered trademarks of the National Fire Protection Association, Inc., Quincy MA 02269.

FUNDAMENTAL REQUIREMENTS

or passageway that is not an exit or a way to reach an exit, but is capable of being confused with an exit, shall be so arranged or marked to prevent confusion with acceptable exits.”

6. To provide adequate lighting:

“Where artificial illumination is required in a building or structure, exit facilities shall be included in the lighting designing an adequate and reliable manner.”

7. To ensure prompt occupant response by providing early warning of fire:

“In every building or structure of such size, arrangement, or occupancy that a fire itself may not provide adequate occupant warning, fire alarm facilities shall be provided where necessary to warn occupants of the existence of fire.”

8. To provide for back-up or redundant egress arrangements:

“Two means of egress, as a minimum, shall be provided in every building or structure, section, and area where their size, occupancy, and arrangement endanger occupants attempting to use a single means of egress that is blocked by fire and smoke. Two means of egress shall be arranged to minimize the possibility that both may be rendered impassable by the same fire or emergency condition.”

9. To ensure the suitable enclosure of vertical openings:

“Every vertical way of exit and every vertical opening between floors of a building shall be suitably enclosed or protected, as necessary, to afford reasonable safety to occupants while using exits and to prevent spread of fire, smoke, or fumes through the vertical openings from floor to floor before occupants have entered exits.”

10. To allow for design criteria that exceeds the scope of the Code and address the normal use and needs of the occupancy in question:

“Compliance with the Code® shall not be construed as eliminating or reducing the necessity for other provisions for safety of persons using a structure under normal occupancy conditions. Also, no provision of the Code® shall be construed as requiring or permitting any condition that may be hazardous under normal occupancy conditions.”

*Reprinted with permission from NFPA 101-1997, *Life Safety Code® Handbook*, Copyright ©1994, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Basic Terminology

For over 65 years, the National Fire Protection Association has been the developer and publisher of the *Life Safety Code* (the Code®). Its contents address specific requirements that directly influence life safety in new construction as well as existing buildings.

Certain basic terminology is used throughout the Code® as well as in local, state, and national ordinances that address life safety in buildings. In order to more clearly comprehend the implications of these regulations included are interpretations and brief explanations of the most essential of these terms.

(The following definitions are, for the most part, as expressed in the Code® and are taken from The Life Safety Code Handbook¹)

1. Area of Refuge

The most recent revision of the Code® defines an additional method of safeguarding human life in a structure. *Areas of Refuge* are defined in the 1994 edition of the Code® as either:

- (a) A floor in a building when such building is protected throughout by an approved, supervised automatic sprinkler system and has at least two accessible rooms or spaces separated from each other by smoke resisting partitions, or
- (b) A space, in a path of travel leading in a public way, that is protected from the effects of fire, either by means of separation

¹ National Fire Protection Association. *Life Safety Code Handbook*. 5th ed. Quincy, MA.: 1991

from other spaces in the same building or by virtue of location, thereby permitting a delay in egress travel from any level.

A means of egress must be accessible to or usable by a person with a severe mobility impairment. This person must be able to travel unassisted through the exit access, exit, and exit discharge to a public way.

An area of refuge has a temporary use during egress. It generally serves as a staging area that provides relative safety to its occupants while potential emergencies are assessed, decisions are made and mitigating activities are begun. An area of refuge might be another building connected by a bridge or balcony, a compartment of a subdivided story, an elevator lobby, or an enlarged story-level exit stair landing.²

2. Building Construction Classification:

A well established means of codifying fire protection and fire safety requirements for buildings is to classify them by types of construction, based on the materials used for structural elements, and the degree of fire resistance afforded by each element.³ NFPA 220, *Types of Building Construction* identifies the five fundamental construction types: (I) fire resistive, (II) noncombustible, (III) ordinary (exterior protected), (IV) heavy timber, and (V) wood frame.

(The following descriptions are taken wholly or in part from The Fire Protection Handbook)

² National Fire Protection Association. *Life Safety Code Handbook*. 5th ed. Quincy, MA.: 1991

³ Gerwain, Richard, & Jeans, David (1991) Classification of Building Construction. In Arthur Cote, P.E. (Ed), *Fire Protection Handbook* (6-13 thru 6-19). Quincy, MA: NFPA

Type I Construction:

In this type of construction the structural members are noncombustible. Although a large number of Type I structures were built around the turn of the century (including Williams

Hall at the University of Vermont in Burlington) Type I construction is rare.

Type II Construction:

In this type of construction structural elements are entirely of noncombustible or limited combustible materials permitted by the Code® and protected to have some degree of fire resistance.

Type III Construction:

In this type of construction, all or part of the interior structure may be of combustible materials or any other material permitted by the particular building code being applied. Exterior walls are required to be of noncombustible or limited noncombustible materials acceptable to the code. Post and beam frames with brick or stone veneer are primary examples of Type III construction. These structures, along with Type IV and V buildings make up the bulk of our historic buildings.

Type IV Construction:

In this type of construction structural members including columns, beams, arches, floors, and roofs, are basically of unprotected wood. No concealed spaces are permitted in the floors and roofs or other structural members (with minor exceptions). Codes set minimum dimensions for the various wood structural members and minimum fire-resistive ratings for structural members other than wood. Heavy timber construction

was developed during the mid-18th century by insurance interests for the purposes of reducing fire losses in New England's textile and paper mills. The absence of concealed spaces in walls and ceilings combined with large timbers lessened the chances of rapid fire spread.

Type V Construction:

In this type of construction the structural members are entirely wood. Post and beam, balloon and platform framed structures are primary examples of Type V construction. Type V is probably more vulnerable to fire than any other building type. Accordingly, it is essential that greater attention be given to details of construction (such as firestopping) in this light wood frame building.

Mixed Types of Construction:

Where two or more types of construction are used in the same building, the structure is considered to be subject to the restrictions of the least fire-resistive type of construction.

3. Compartmentalization:

Fire compartments are formed with fire barriers that are continuous from outside wall to outside wall, from one fire barrier to another, or a combination thereof; including continuity through all concealed spaces, such as those above a ceiling.

4. Means of Egress:

A continuous and unobstructed way of exit travel from any point in a building or structure to a public way consisting of

three separate and distinct parts: (a) the exit access, (b) the exit, and (c) the exit discharge. A means of egress comprises the vertical and horizontal travel and shall include intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts, and yards.

Every building or structure, new or old, designed for human occupancy shall be provided with means of egress and other safeguards to permit the prompt escape of occupants or shall furnish other means to provide a reasonable degree of safety for occupants. The design of means of egress and other safeguards shall be such that reliance for safety to life will not depend solely on any single safeguard; additional safeguards shall be provided for life safety in case any single safeguard is ineffective due to human or mechanical failure.

Exit Access: That portion of a means of egress that leads to an exit. The exit access includes the rooms and building spaces people occupy and the doors, aisles, corridors, unenclosed stairs, and unenclosed ramps that must be traversed in reaching an exit.

Exit: In the case of a stairway, the exit includes the stair enclosure, the door to the stair enclosure, stairs and landings inside the enclosure, the door from the stair enclosure to the outside or to the level of the exit discharge, and any exit passageway and its associated doors if such are provided so as to discharge the stair directly to the outside. In the case of a door leading directly from the street floor to the street or open air, the exit comprises only the door. Doors of small individual

rooms, as in hotel rooms, while constituting exit access from the room are not referred to as exits except where they lead directly to the outside of the building.

Exit Discharge: That portion of a means of egress between the termination of an exit and a public way. Because some exits do not discharge directly into a public way, the exit discharge is defined as providing building occupants with a path of travel from the termination of an exit to a public way.

5. Historic Building:

A structure and its associated additions and site deemed to have historical, architectural, or cultural significance by a local, regional, or national jurisdiction. Recognition might be in an official existing or future national, regional, or local register, listing, or inventory.

Under Vermont law, 21 VSA 251a (d) , “Historic Building” or “Historic Structure” means any structure which has been listed in the National Register of Historic Places or the State Register of historic properties or which has been determined to be historically significant by the Vermont advisory council on historic preservation or which meets the standards adopted by the division for historic preservation pursuant to section 723(a) of Title 22.

Information on buildings listed on the National and State Registers is available from the Vermont Division for Historic Preservation. Over 30,000 buildings are listed on the Registers, and many more are eligible.

6. Occupancy Classification:

NFPA Life Safety Code® is occupancy specific. The 1994 Code breaks occupancy down into 10 distinct classes of use or occupancy. Code® requirements differ for each classification. All buildings or structures fall into one of the following categories:

- **Assembly.** This includes all buildings used for gatherings of 50 or more persons for purposes such as deliberation, worship, entertainment, eating, drinking, amusements, or awaiting transportation.
- **Educational.** These include all buildings or portions of buildings used for educational purposes through the twelfth grade by six or more persons for four or more hours per day or more than 12 hours per week. Educational occupancies also include day-care facilities of any occupant load.
- **Health Care.** This refers to buildings used for purposes such as medical or other treatment or care of persons suffering from physical or mental illness, disease, or infirmity; and for the care of infants, convalescents, or infirm aged persons. Health care occupancies provide sleeping facilities for four or more occupants and are occupied by persons who are incapable of self-preservation because of age, physical or mental disability, or because of security measures not under the occupants control.
- **Detention and Correctional.** Occupancies are used to house individuals under varied degrees of restraint such as substance

abuse centers, juvenile work camps, correctional institutions, and juvenile training schools.

• **Residential.** Residential occupancies are those in which sleeping accommodations are provided for normal residential purposes and include all buildings designed to provide sleeping accommodations. Residential occupancies are treated separately in the Code® and are divided into the following groups:

- (a) Hotels, motels, dormitories
- (b) Apartment buildings
- (c) Lodging or rooming houses
- (d) One and two-family dwellings
- (e) Board and care facilities

• **Mercantile.** These occupancies include stores, markets, and other rooms, buildings, or structures for the display and sale of merchandise.

• **Business.** Business occupancies are those used for the transaction of business, for the keeping of accounts and records, and for similar purposes. Examples of these occupancies are: college and university buildings, city halls, courthouses, doctors and dentist's offices, town halls.

• **Industrial.** Industrial occupancies include factories and properties devoted to operations such as manufacturing, processing, assembling, mixing, packaging, finishing or decorating, and repairing.

• **Storage.** These occupancies include all buildings or structures utilized primarily for the storage or sheltering of goods, merchandise, products, vehicles, or animals. These include: barns, bulk oil storage, parking, warehouses.

• **Mixed Occupancies.** When two or more classes of occupancy occur in the same building or structure and are intermingled so that separate safeguards are impracticable,

safeguards shall comply with the more restrictive of the requirements of the occupancies involved.

7. Public Buildings

(From Title 2 V.S.A. Section 251-A; *Appendix II, 1994 Vermont Fire Prevention and Building Code.*)

As used in this sub-chapter, “public building” means buildings owned or occupied by public utilities, hospitals, schools, houses of worship, convalescent centers and homes for the aged (infirm and disabled), nurseries, kindergartens and day cares, buildings in which people are employed, occasionally enter a part of their employment or are entertained including private clubs and societies, cooperatives and condominiums, buildings in which people rent accommodations whether overnight or for a longer term, restaurants, retail outlets, offices or office buildings, hotels, tents or other structures for public assembly, including outdoor assemblies such as grandstands, buildings owned or occupied by the State of Vermont, a county, a municipality, a village or any public entity, including but not limited a school or fire district. Use of any portion of a building in a manner described in this subsection shall make entire building a public building for purposes of this subsection. Public building does not include an owner-occupied single family residence, or an owner-occupied farm, unless used for a purpose described in this subsection, or a family residence registered as a day care home under Chapter 34, Subchapter 3, of Title 33. *21 V.S.A. Section 251 (D).* Any condominium or multiple dwelling using a common roof or row houses so called, whether any units are owned, or leased, or rented shall be subject to the rules promulgated under this chapter.

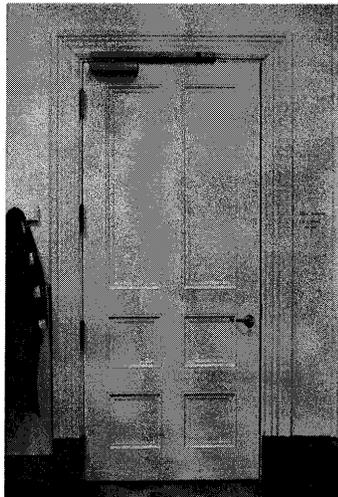
8. Rating

The measure of a material’s ability to withstand fire. A door, wall, floor, or ceiling that is rated at 90 minutes must be able to resist burning through for 90 minutes. In the case of doors, all parts including the jamb, hinges, and latch as well as the door itself must be capable of resisting failure for the rated interval.

9. Separation

Barriers, such as walls, partitions, and floors, separate building spaces. These barriers also delay or prevent fire from propagating from one space to another. In addition, barriers are important features in any fire fighting operation.⁴ Construction details and barrier penetrations modify a barrier’s effectiveness. A rating can be completely voided by inappropriate modifications to designed barriers. The fire resistance of a rated wall is lost when a door is left open.

⁴ Fitzgerald, Dr. Robert W. (1991). *Fundamentals of Firesafe Building Design*. In Arthur Cote, P.E. (Ed), *Fire Protection Handbook* (1-25 thru 1-33). Quincy, MA: NFPA



- Doors
- Transoms

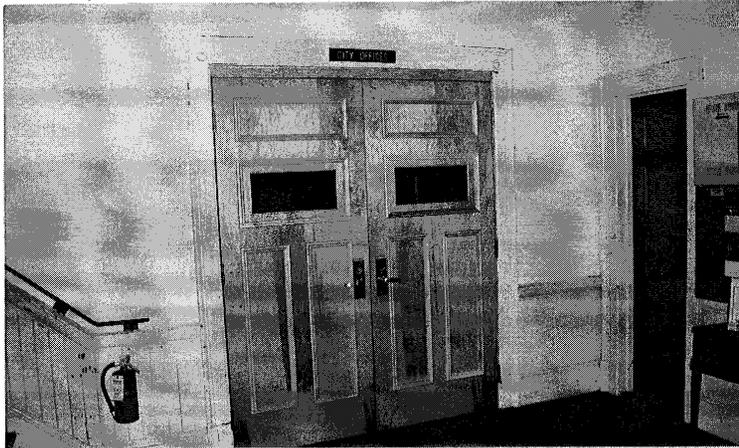


Figure 1: Windows were added to these replicated doors to provide visibility for walk-through traffic. Original casings were saved and reinstalled over steel jambs.



Figure 2: Moldings simulate raised paneling. Makes reference to historic door in background.

DOORS

Issue Fire Rated Doors

NFPA 101 Code References

6-2.4.4 The minimum fire resistance rating for the enclosure of floor openings shall be as follows (*see 5-1.3.1 for enclosure of exits*): c) Enclosures in existing buildings - 1/2 hour fire barriers (a, b, and d refer to new construction).

Vermont Code Requirements

- 1) 28" width required for 1-leaf of double door.
- 2) Outward swing required for occupancy of more than 50 people.

Building Vergennes Opera House
Vergennes, Vermont

Use Assembly

Notes

- 1) Doors have hardwood veneer over the fire-rated core.
- 2) In order to warranty a fire-rating, molding profiles were installed at the factory. Any work done to the door after delivery would void the manufacturer's fire-rating.
- 3) New doors on double unit match the measurements of the original doors. Therefore, altering the existing opening and adjacent historic woodwork is unnecessary.

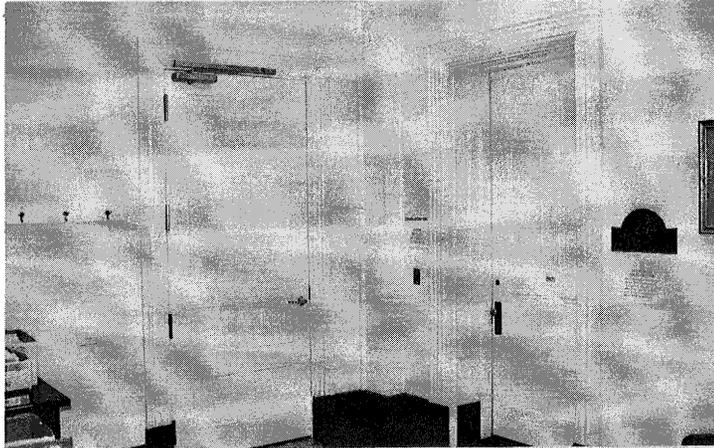


Figure 1: New fire-rated unit complements original door on the right. New molding created to match profile of historic casement.

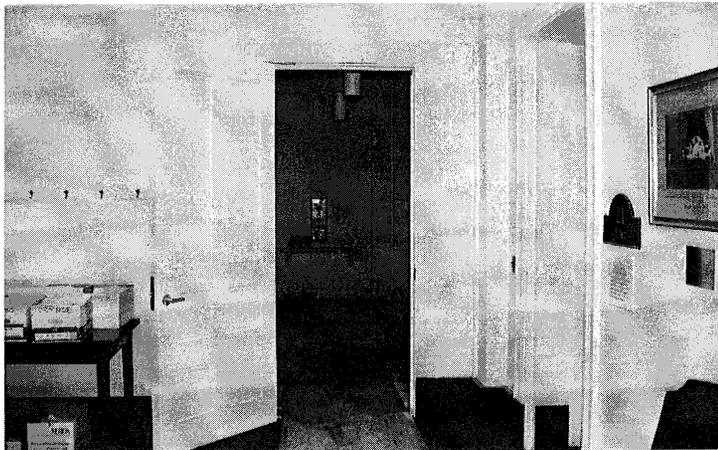


Figure 2: New door utilizes modern door-lever hardware for handicap accessibility. Note slim profile door return mounted above door.

Issue Fire Rated Doors

NFPA 101 Code References

6-2.4.4 The minimum fire resistance rating for the enclosure of floor openings shall be as follows (*see 5-1.3.1 for enclosure of exits*): c) Enclosures in existing buildings - 1/2 hour fire barriers (a, b, and d refer to new construction).

Vermont Code Requirements

- 1) 28" required for 1-leaf of double door.
- 2) Outward swing required for occupancy of more than 50 people.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) Door has a fire-rated core with paintable wood veneer.
- 2) Panel configuration matches that of the historic door on the right.
- 3) Steel door jamb painted white and trimmed with matching wood molding.

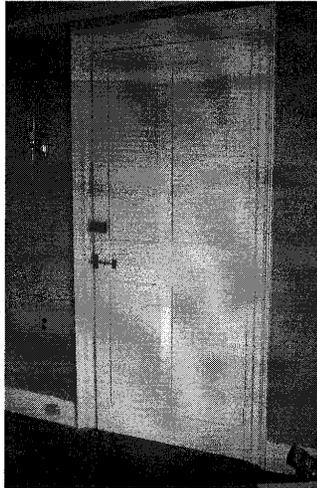


Figure 1: Wood panels are painted to match existing doors and moldings.



Figure 2: Close-up, unfinished side. Edges of new pine panel are chamfered to ease the transition from new to old material.

DOORS

Issue Fire Rated Doors

NFPA 101 Code References

6-2.4.4 The minimum fire resistance rating for the enclosure of floor openings shall be as follows (*see 5-1.3.1 for enclosure of exits*): c) Enclosures in existing buildings - 1/2 hour fire barriers (a, b, and d refer to new construction).

Vermont Code Requirements

- 1) Allows use of NFPA 914 for rating archaic materials.

Building Putney Cares
Putney, Vermont

Use Residential

Notes

- 1) Material added to panels on one side increases fire rating.
- 2) Sympathetic treatment still allows for retention of door's historic character.
- 3) New panel inserts added over existing panels in historic door.



Figure 1: Wood panels are painted to match existing doors and moldings.



Figure 2: Close-up, unfinished side. Edges of new pine panel are chamfered to ease the transition from new to old material.

DOORS

Issue Fire Rated Doors

NFPA 101 Code References

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Vermont Code Requirements

- 1) Allows use of NFPA 914 for rating archaic materials.

Building Putney Cares
Putney, Vermont

Use Residential

Notes

- 1) Material added to panels on one side increases fire rating.
- 2) Sympathetic treatment still allows for retention of door's historic character.
- 3) New panel inserts added over existing panels in historic door.



Figure 1: First floor transom fixed with new wire-glass.



Figure 2: First floor historic door with new wire-glass.

Issue Open Transoms

NFPA 101 Code References

6-3.4.1 Doors in smoke barriers shall close the opening with only a minimum clearance necessary for proper operation and shall be without undercuts, louvers, or grilles.

Vermont Code Requirements

- 1) Fixed transoms acceptable in sprinklered buildings depending on occupancy. For schools, may remain in sprinklered building if fixed to prevent passage of smoke.

Building Barre Opera House
Barre, Vermont

Use Assembly and Business

Notes

- 1) Passage of light retained by using wireglass within steel frame instead of blocking transoms and door windows with panels of wood or metal.
- 2) Historic appearance of transom and door retained.
- 3) Transom is fixed in a closed position.



Figure 1: Transom is secured and unable to be opened.

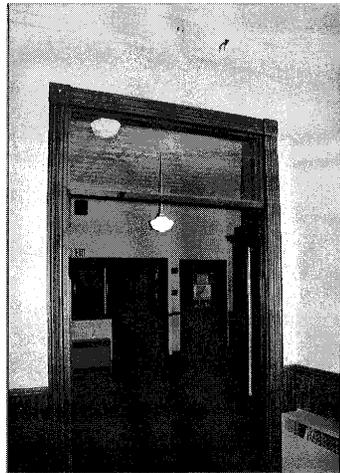


Figure 2: Transom fixed with clear fire-glass using original moldings and corner blocks.

TRANSOMS

Issue Fixed Glass Panels

NFPA 101 Code References

6-3.4.1 Doors in smoke barriers shall close the opening with only a minimum clearance necessary for proper operation and shall be without undercuts, louvers, or grilles.

Vermont Code Requirements

- 1) Fixed transoms in corridors are acceptable in sprinklered buildings depending on occupancy. For schools, may remain in sprinklered building if fixed to prevent passage of smoke.

Building Fig. 1) Johnson School, Johnson, Vermont
Fig. 2) Fairfield St. Apartments, St. Albans

Use Fig. 1) Educational Fig. 2) Residential

Notes

- 1) Fixed glass now acts as a barrier that helps to limit fire and restrict the movement of smoke.
- 2) Original doorway retains historic character.
- 3) Securing transoms in their frames can be a simple and inexpensive solution to satisfying code requirements.



- Emergency Lighting
- Smoke and Fire Detection
- Exit Signs



Figure 1: New solution creates no negative aesthetic impact.



Figure 2: All emergency lights are wired to an alternate power source.

EMERGENCY LIGHTING

Issue Reuse of Existing Fixtures

NFPA 101 Code References

5.91.1 Emergency lighting facilities for means of egress shall be provided in accordance with this section for every building or structure where required in Chapters 8 through 30.

Vermont Code Requirements

- 1) Emergency lighting requirements correlate with building classification.
- 2) Requirements addressed in occupancy chapters.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) Installing modern, emergency light fixtures will disrupt the historic integrity and continuity of the restored House Chamber.
- 2) Existing historic wall sconces are rewired and used as emergency lighting.
- 3) Acting as emergency lights, these sconces are wired separately. They remain on, powered by remotely located batteries, in the event of a power loss.

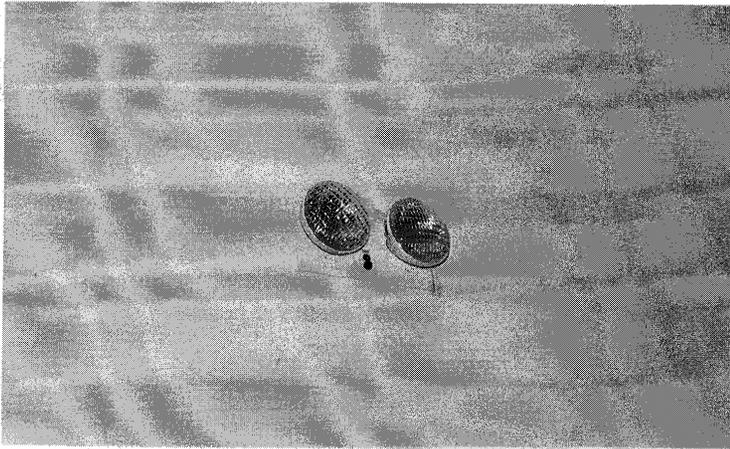


Figure 1: Emergency lights offer minimal aesthetic impact.

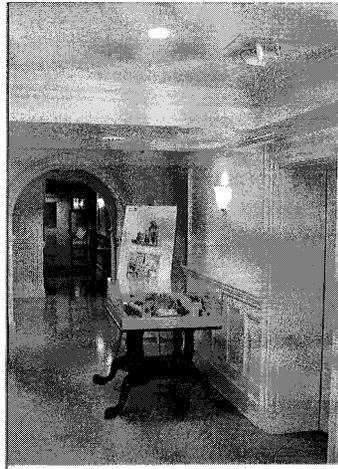


Figure 2: New units do not dominate the ceiling and wall planes of the historic interior.

EMERGENCY LIGHTING

Issue Unobtrusive Fixtures

NFPA 101 Code References

5.91.1 Emergency lighting facilities for means of egress shall be provided in accordance with this section for every building or structure where required in Chapters 8 through 30.

Vermont Code Requirements

- 1) Emergency lighting requirements correlate with building classification.
- 2) Requirements addressed in occupancy chapters.

Building Fig. 1) Fairfield St. Apartments, St. Albans, VT
Fig. 2) Middlebury College, Middlebury, VT

Use

Notes

- 1) Slim-profile units are unobtrusive.
- 2) Fixture color matches existing walls and ceilings.
- 3) Units mounted away from moldings and other historic features.
- 4) Flush-mounted emergency lights are also available with white frosted glass.



Figure 1: Emergency light tucked high into corner, points at door for illuminated egress.

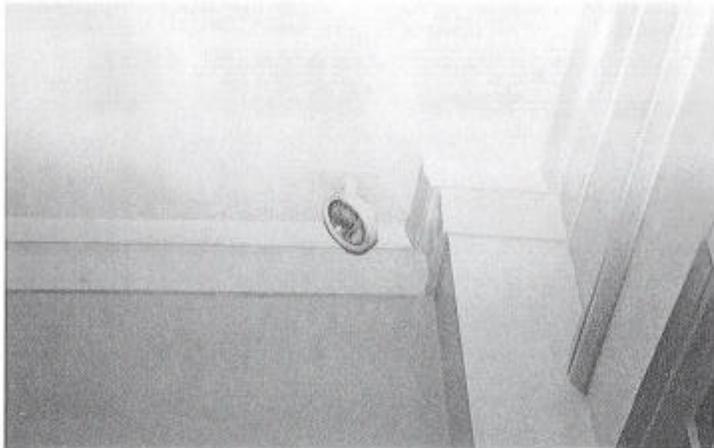


Figure 2: Light fixture is slender. Mounted right next to cornice molding to prevent loss of historic fabric.

EMERGENCY LIGHTING

Issue Unobtrusive Fixtures

NFPA 101 Code References

5.91.1 Emergency lighting facilities for means of egress shall be provided in accordance with this section for every building or structure where required in Chapters 8 through 30.

Vermont Code Requirements

- 1) Emergency lighting requirements correlate with building classification.
- 2) Requirements addressed in occupancy chapters.

Building Follet House
Burlington, Vermont

Use Business

Notes

- 1) Slim-profile units are unobtrusive.
- 2) Fixture color matches existing walls and ceilings.
- 3) Units mounted away from moldings and other historic features.
- 4) These remote heads have a separate power supply; this allows for greater flexibility in placement of the heads.



Figure 1: This room will suffer no aesthetic impact from installation of air sampling detectors.

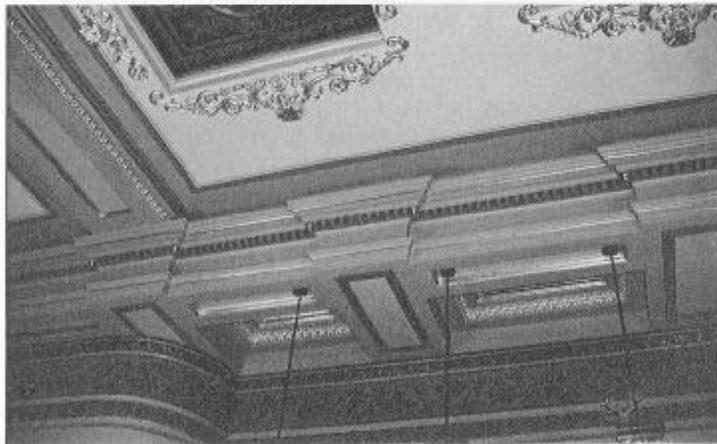


Figure 2: Air sampling points are generally of a nominal one-inch diameter. These components will be hidden from sight, mounted behind the cornice.

SMOKE AND FIRE DETECTION

Issue Unobtrusive Fixtures

NFPA 101 Code References

7-6.1.4 A fire alarm system required for life safety shall be installed, tested and maintained in accordance with applicable requirements of NFPA 70, *National Electric Code* & NFPA 72, *National Fire Alarm Code*.

Vermont Code Requirements

- 1) Requirements vary for occupancy-Life Safety and BOCA.
- 2) Correlates to use.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) In lieu of conventional spot detectors, and/or linear beam devices, an air sampling system is installed.
- 2) Air sampling smoke detection has been selected by Vermont state buildings for public spaces.
- 3) Air sampling detectors consist of a series of pipes or tubes which radiate throughout the protected space. The system functions by constantly drawing air from the room, then analyzing it in a separate detection chamber.

SMOKE AND FIRE DETECTION

Issue Unobtrusive Fixtures

NFPA 101 Code References

7-6.1.4 A fire alarm system required for life safety shall be installed, tested and maintained in accordance with applicable requirements of NFPA 70, *National Electric Code* & NFPA 72, *National Fire Alarm Code*.

Vermont Code Requirements

- 1) Requirements vary for occupancy-Life Safety and BOCA.
- 2) Correlates to use.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) Detectors are placed along ceiling perimeters, near cornice moldings.
- 2) Detectors don't have to be centered in the ceiling.

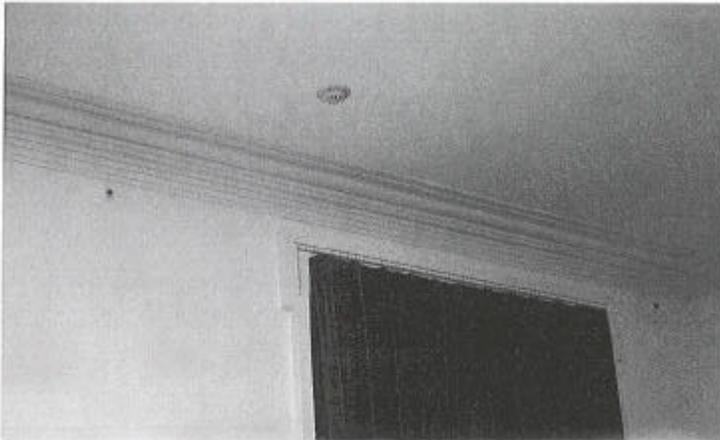


Figure 1: Perimeter application mitigates aesthetic impact of fixtures.

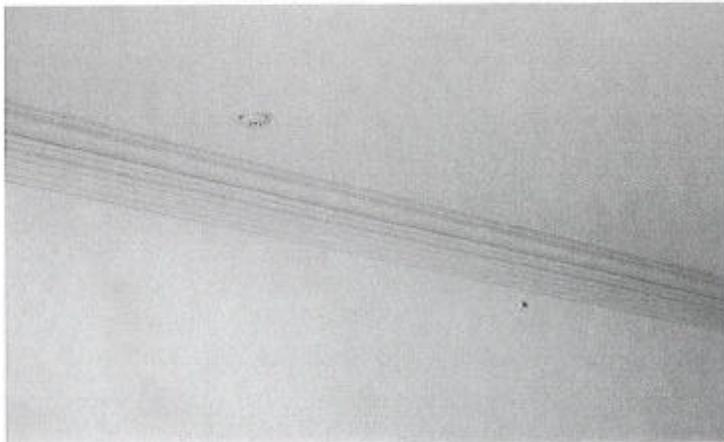


Figure 2: Note how both the detector and sprinkler fixture hug the wall-plane juncture.



Figure 1: Sleek and unobtrusive, this exit sign blends in with the existing surround.



Figure 2: Close-up showing the ultra-slim profile of this internally illuminated exit sign.

EXIT SIGNS

Issue Unobtrusive Fixtures

NFPA 101 Code References

5-10.2 Every sign shall have the word "EXIT" or other appropriate wording in plainly legible letters not less than six inches high and widths not less than two inches wide.

5-10.3.1 Every sign required by 5-10.1.2 or 5-10.1.4 shall be suitably illuminated by a reliable light source. Externally and internally illuminated signs shall be visible in both the normal and emergency lighting mode.

Vermont Code Requirements

- 1) Correlates to use.
- 2) Requirements addressed in occupancy chapters.

Building Fig. 1) Johnson School, Johnson, Vermont
Fig. 2) Fairfield St. Apartments, St. Albans

Use 1) Educational
2) Residential

Notes

- 1) This educational building utilizes an unobtrusive exit sign.
- 2) This model replaces the more imposing box-style unit that often detracts from the historic feel of any building's interior.
- 3) This flat unit blends in with the wall and clearly marks the exit with internally illuminated letters.



Figure 1: Exit sign is mounted in ceiling, apart from wood moldings.



Figure 2: Close-up; white letters against a green background create a softer impact against the wood door and moldings.

Issue Unobtrusive Fixtures

NFPA 101 Code References

5-10.2 Every sign shall have the word "EXIT" or other appropriate wording in plainly legible letters not less than six inches high and widths not less than two inches wide.

5-10.3.1 Every sign required by 5-10.1.2 or 5-10.1.4 shall be suitably illuminated by a reliable light source. Externally and internally illuminated signs shall be visible in both the normal and emergency lighting mode.

Vermont Code Requirements

- 1) Correlates to use.
- 2) Requirements addressed in occupancy chapters.

Building Old Chapel, Middlebury College
Middlebury, Vermont

Use Assembly

Notes

- 1) This building utilizes a less obtrusive exit sign.
- 2) Housing unit trimmed in white, without exposed or unpainted metal, blends in better with wall and moldings.
- 3) This flatter unit blends in with the wall and clearly marks the exit with internally illuminated letters.

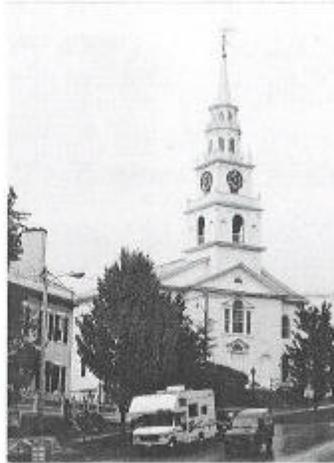


Figure 1: Middlebury Congregational Church.



Figure 2: The exit is clearly marked with an unobtrusive sign utilizing inexpensive materials.

EXIT SIGNS

Issue Unobtrusive Fixtures

NFPA 101 Code References

5-10.2 Every sign shall have the word "EXIT" or other appropriate wording in plainly legible letters not less than six inches high and widths not less than two inches wide.

5-10.3.1 Every sign required by 5-10.1.2 or 5-10.1.4 shall be suitably illuminated by a reliable light source. Externally and internally illuminated signs shall be visible in both the normal and emergency lighting mode.

Vermont Code Requirements

- 1) Correlates to use.
- 2) Requirements addressed in occupancy chapters.

Building Middlebury Congregational Church,
Middlebury, Vermont

Use Assembly

Notes

- 1) The requirements of the code are met by a black and white painted sign on a wooden panel, illuminated from above by a brass fixture with an incandescent bulb.
- 2) The exit is marked without using a larger plastic sign which could detract from the church's aesthetic qualities.
- 3) Emergency signs should be made legible by the use of contrasting colors such as the black and white used in this sign.

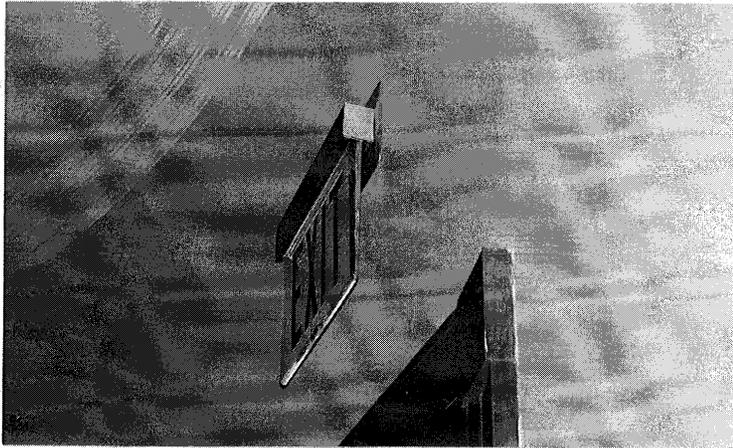


Figure 1: Low-profile unit is easily fastened with one simple mounting plate.

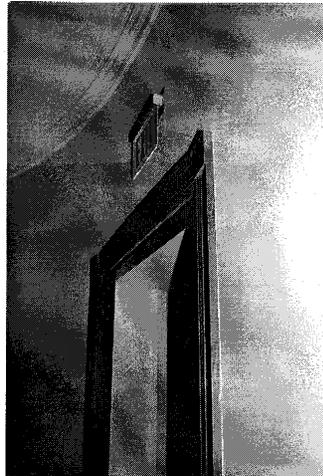


Figure 2: This model does not overpower the historic interior as much as the bulkier box-style exit sign.

EXIT SIGNS

Issue Unobtrusive Fixtures

NFPA 101 Code References

5-10.2 Every sign shall have the word "EXIT" or other appropriate wording in plainly legible letters not less than six inches high and widths not less than two inches wide.

5-10.3.1 Every sign required by 5-10.1.2 or 5-10.1.4 shall be suitably illuminated by a reliable light source. Externally and internally illuminated signs shall be visible in both the normal and emergency lighting mode.

Vermont Code Requirements

- 1) Correlates to use.
- 2) Requirements addressed in occupancy chapters.

Building New England College of Ophthalmology
Boston, Massachusetts

Use Assembly

Notes

- 1) This educational building utilizes a less obtrusive exit sign.
- 2) This model replaces the more imposing box-style unit that often detracts from the historic feel of any building's interior.
- 3) This low-profile example utilizes a lighting scheme that allows the lexan panel to be illuminated from the top down, eliminating the bulkier incandescent unit.



Figure 1: This pie-shaped fixture functions well as an exit sign and complements the c. 1950 construction.



Figure 2: The letters in this exit sign conform to the rounded shape of the fixture. The sign clearly marks an exit while contributing to the character of the building.

Issue Using Existing Fixtures

NFPA 101 Code References

5-10.2 Every sign shall have the word “EXIT” or other appropriate wording in plainly legible letters not less than six inches high and widths not less than two inches wide.

5-10.3.1 Every sign required by 5-10.1.2 or 5-10.1.4 shall be suitably illuminated by a reliable light source. Externally and internally illuminated signs shall be visible in both the normal and emergency lighting mode.

Vermont Code Requirements

- 1) Correlates to use.
- 2) Requirements addressed in occupancy chapters.

Building U.S. Army Reserve Building (The Armory)
Montpelier, Vermont

Use Business

Notes

- 1) These original exit signs, in white and dark red, meet the code requirement for contrasting colors.
- 2) The signs are illuminated from within and the pie-shaped sign in Figure 1 can be read from two sides.
- 3) Retaining the existing signs helps to retain the character of the building.

- Egress

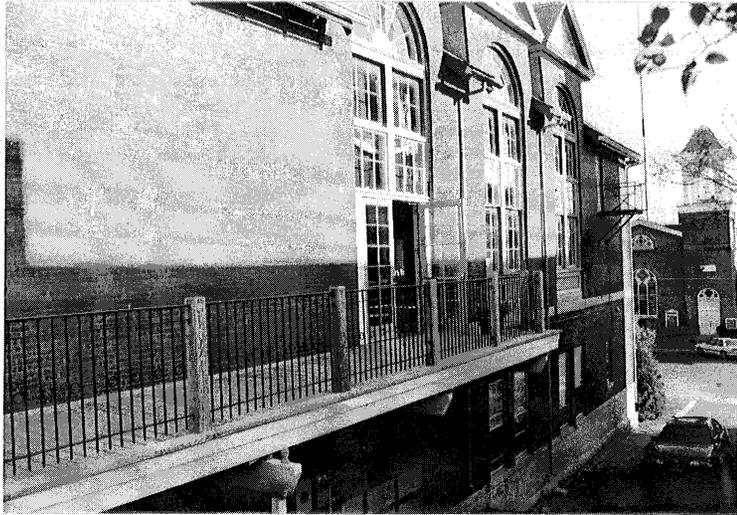




Figure 1: The second floor of the building is at grade on the rear section of the second floor assembly space.

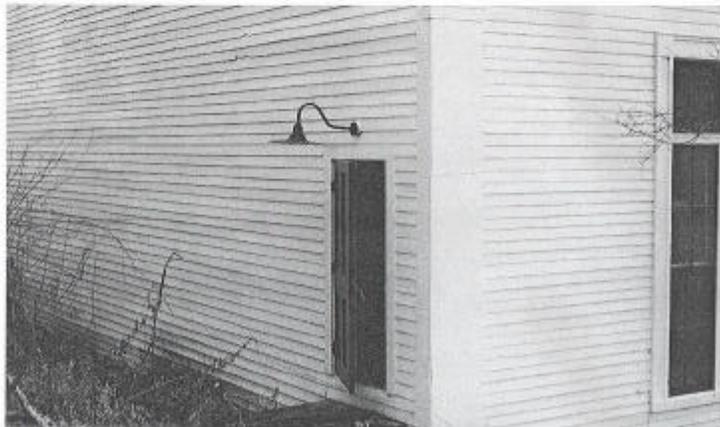


Figure 2: The door opens on to a ramp leading to the ground.

Issue Second Means of Egress Required

NFPA 101 Code References

5-4.1.1 The minimum number of means of egress from any balcony, mezzanine, story, or portion thereof shall be two.

Vermont Code Requirements

- 1) Two means of egress always required, unless addressed by exceptions in occupancy chapters.

Building Plainfield Town Hall/Opera House
Plainfield, Vermont

Use Assembly

Notes

- 1) Assembly area on the second floor required a second means of egress.
- 2) The rear of the building, on the second floor, was at grade.
- 3) A second doorway to the outside was installed at grade at the rear, the least visible side of the building.



Figure 1: The windows were rehung, after the top and bottom sash were joined, and now function as doors leading to fire escape stairs.



Figure 2: These changes were made on the least significant facade of the building (rear).

Issue Second Means of Egress

NFPA 101 Code References

5-4.1.1 The minimum number of means of egress from any balcony, mezzanine, story, or portion thereof shall be two.

Vermont Code Requirements

- 1) Two means of egress always required, unless addressed by exceptions in occupancy chapters.

Building Weathersfield Meeting House
Weathersfield, Vermont

Use Assembly

Notes

- 1) The top and bottom sash were joined to form one panel.
- 2) The window was rehung to swing outward and allow egress to the fire escape stairs.
- 3) This method allows the existing windows to be retained and aesthetically compatible while meeting the requirements of the code.
- 4) The windows used here are replacements for those destroyed in an earlier fire, but historic sash could be similarly treated.



Figure 1: New double door is fitted into the existing window bank. Door sill is flat aluminum stock, flush mounted for easy wheelchair access.

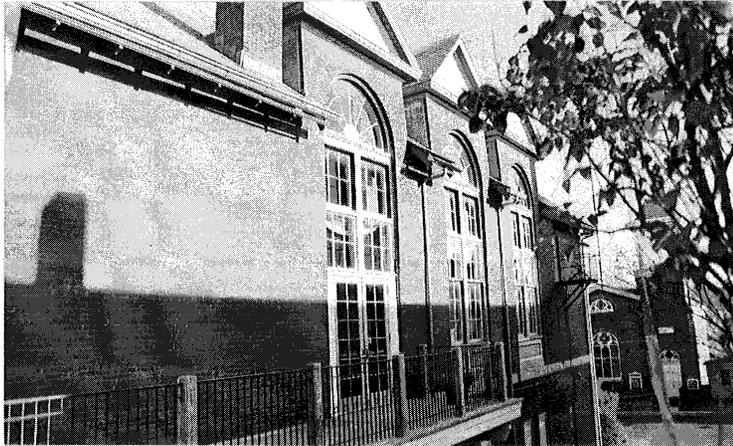


Figure 2: New doors approximate style and rhythm of existing fenestration. New ramp hugs the side of the building.

Issue Sympathetic Additions

NFPA 101 Code References

5-2.5.1 Every ramp used as a component in a means of egress shall conform to the general requirements of Section 5-1 and to the special requirements of this subsection.

Vermont Code Requirements

- 1) Two means of egress always required, unless addressed by exceptions in occupancy chapters.

Building Vergennes Opera House
Vergennes, Vermont

Use Assembly

Notes

- 1) This assembly space required a second egress from the main hall directly outside.
- 2) Design also addresses A.D.A compliance issues.
- 3) Discharge area empties onto cantilevered ramp that travels to the back of the building where it meets grade.

- Stairs

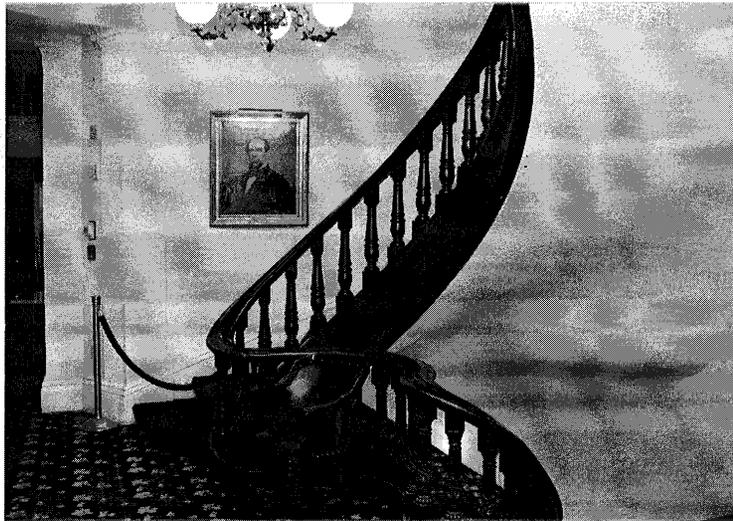




Figure 1: Open stairwell retains original character of historic space. Glassed-in panels and doors still give the area an open feel.



Figure 2: Close-up of panels. Fire-rated glass makes it possible to avoid the use of solid walls or doors.

STAIRS

Issue Open Stair

NFPA 101 Code References

5-1.3.1(b) The separation shall have at least a two-hour fire resistant rating where the exit connects four or more stories, whether above or below the level of exit discharge.

Vermont Code Requirements

- 1) Unenclosed stair requirements vary significantly by use and size.

Building New England College of Ophthalmology
Boston, Massachusetts

Use Assembly

Notes

- 1) This public building was able to keep the existing three floor open stairwell.
- 2) Centrally located, this circular stair system required separation from the rest of the building's other spaces by fire-rated enclosures.
- 3) These original openings were retrofitted with glass panels and doors. This application sensitively mitigates the need to seal the stairwell from the remaining building without defaulting to blank panel inserts or sheetrock.
- 4) A significant factor which allowed for the retention of the open stairwell was the sprinkler system throughout the building.

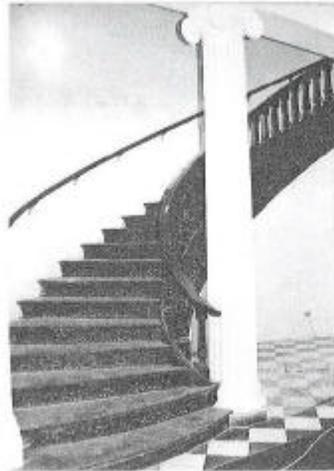


Figure 1: View of spiral staircase on ground floor.



Figure 2: Re-mounting the continuous handrailing required minimal plaster repair to the wall.

STAIRS

Issue Open Stair

NFPA 101 Code References

5-2.2.6.1 All interior stairs serving as an exit or exit component shall be closed in accordance with 5-1.3.1. All other interior stairs shall be protected in accordance with 6-2.4.

Vermont Code Requirements

- 1) Unenclosed stair requirements vary significantly by use and size.
- 2) Existing three-story historic stairs may remain if sprinklered and approved for use.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) This assembly building was able to keep the existing three floor, open stairwell.
- 2) The continuous handrailing against the wall is original to the building.
- 3) To meet minimum height requirements, the continuous handrailing was simply raised and re-fastened to the wall.
- 4) The first floor of the State House is sprinklered above and below the ceiling; this was an important factor in allowing the retention of the open stairwell.
- 5) Existing winder stairs may be approved for continued use.



Figure 1: View of open staircase on ground floor.



Figure 2: Landing at second floor. Modern stairwell, located under the "exit" sign on the right, was built without the addition of an exterior stair tower.

STAIRS

Issue Open Stair

NFPA 101 Code References

5-2.2.6.1 All interior stairs serving as an exit or exit component shall be enclosed in accordance with 5-1.3.1. All other interior stairs shall be protected in accordance with 6-2.4.

Vermont Code Requirements

- 1) Unenclosed stair requirements vary significantly by use and size.
- 2) Existing historic stairs may remain if sprinklered and approved for use.

Building Follett House
Burlington, Vermont

Use Business

Notes

- 1) This building was able to keep the existing open stairwell.
- 2) The continuous handrailing against the wall was installed to meet height requirements.
- 3) Another stairwell was built in the back of the house to provide a second form of egress, allowing the original stairwell to remain.



Figure 1: Stairwell remains open. Archway conceals automated safety doors. No visual impact.



Figure 2: Safety door hidden in ceiling above archway. Only door gasket and slender track are visible.

Issue Open Stair

NFPA 101 Code References

5-2.2.6.1 All interior stairs serving as an exit or exit component shall be enclosed in accordance with 5-1.3.1. All other interior stairs shall be protected in accordance with 6-2.4.

Vermont Code Requirements

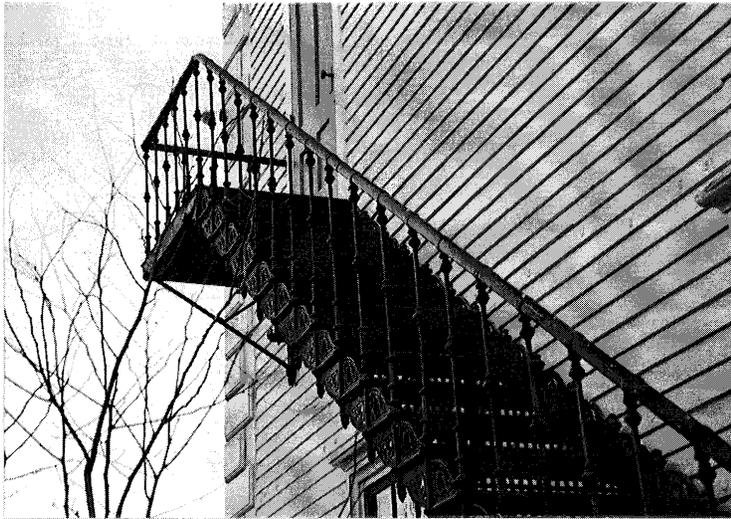
- 1) Unenclosed stair requirements vary significantly by use and size.
- 2) Existing three-story historic stairs remain if sprinklered and approved for use.

Building Old Chapel, Middlebury College
Middlebury, Vermont

Use Business

Notes

- 1) This building was able to keep the existing three floor open stairwell.
- 2) Centrally located in the building, this original stair system required separation from the rest of the building's other spaces by fire-rated enclosures.
- 3) Activated by smoke and heat sensors, fire-rated steel and glass doors located behind the open-arched doorways, drop down automatically, sealing the stairwell enclosure. Once closed, they will not reopen and there is an exit on either side of the closure. The stairs now serve as a protected pathway to the exit discharge.



- Fire Escapes
- Outside Stairs



Figure 1: Existing fire escape at the Putney Town Clerk's Office is in good condition and provides a safe and attractive means of egress.

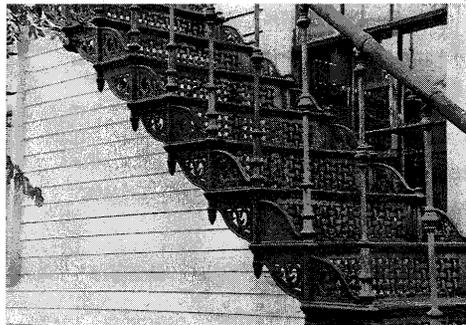


Figure 2: Detail of historic, cast iron fire escape.

FIRE ESCAPES

Issue Using Existing Fire Escapes

NFPA 101 Code References

5-2.8.11 Fire escape stairs shall comply with the provisions of 5-2.8.*

** Exception: Existing noncomplying fire escape stairs shall be permitted to be continued to be used subject to the approval of the authority having jurisdiction.*

Vermont Code Requirements

- 1) Existing can remain if approved by official for specific use group.
- 2) Existing fire escapes on existing buildings are permitted in housing/assembly/mercantile (schools may be permitted with a variance).

Building Putney Town Clerk's Office,
Putney, Vermont

Use Business

Notes

- 1) The existing cast iron fire escape meets code requirements.
- 2) The fire escape provides a means of egress from the second story and contributes to the building's aesthetic qualities with its intricate details.

OUTSIDE STAIRS

Issue Adding Outside Stairs

NFPA 101 Code References

5-2.8.1.3 New fire escape stairs for existing buildings shall be erected only where it has been determined that outside stairs are impractical. New fire escape stairs shall not incorporate ladders or access windows, regardless of occupancy classification or occupant load served.

Vermont Code Requirements

- 1) New fire escape must have proper tread/riser, handrails, guard and safety features.
- 2) Can only add if you cannot build an exit stair due to site constraints.

Building Historical Society,
Middletown Springs, Vermont

Use Assembly

Notes

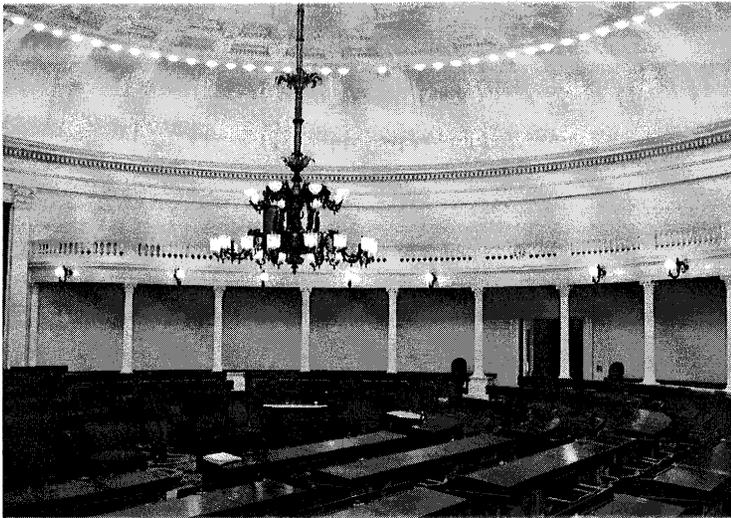
- 1) Stair system concealed in a style that complements main building.
- 2) A second means of egress is provided for the second floor assembly space.
- 3) Materials are painted to match building.



Figure 1: New roofline mimics the old. Use of clapboards on stairwell and similar roof material allows outside stairs to blend in with main building.



Figure 2: Design is compact and unobtrusive. Building is not aesthetically overwhelmed with addition of outside stairs.



- Railings
- Balconies



Figure 1: Steel railing is mounted outside original banister. Historic fabric is left untouched.



Figure 2: Steel railing is painted brown to blend in with original railing.

Issue Insufficient Handrail Height

NFPA 101 Code References

5-2.2.4.5 (a) Handrails on stairs shall not be less than 34" (86 cm) nor more than 38" (96 cm) above the tread, measured vertically to the top of the rail from the leading edge of the tread.

Exception No. 2 to (a): Existing required handrails shall not be less than 30 in. (76 cm) nor more than 38 in. (97 cm) above the upper surface of the tread, measured vertically to the top of the rail from the leading edge of the tread.

Vermont Code Requirements

- 1) Openings in balustrade must be no larger than 6" for existing railing.

Building Johanson Elementary School,
Johanson, Vermont

Use Educational

Notes

- 1) Historic handrail is too low to satisfy code requirements for a 30" minimum height.
- 2) Solution is to fabricate modern railing that wraps around and doesn't alter historic railing.
- 3) Time, money and historic fabric is saved by not having to remove or significantly alter historic railing assembly.
- 4) Railing meets sphere requirements for openings between balusters.

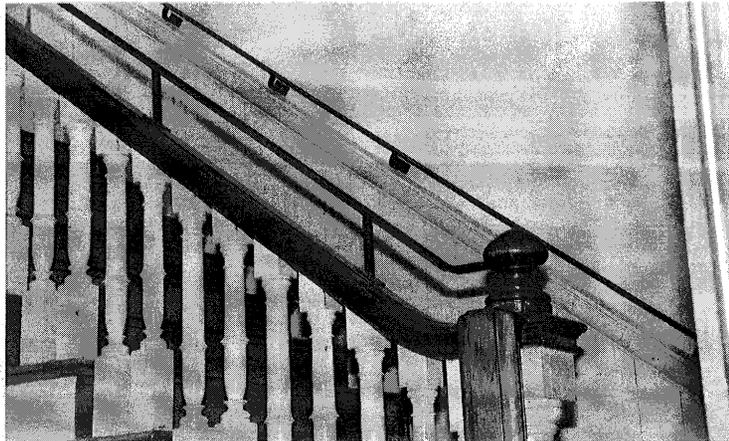


Figure 1: Slender profile of railing cap creates less impact than a complete rail system. The rail on the opposite side is mounted above wainscoting at the correct height.

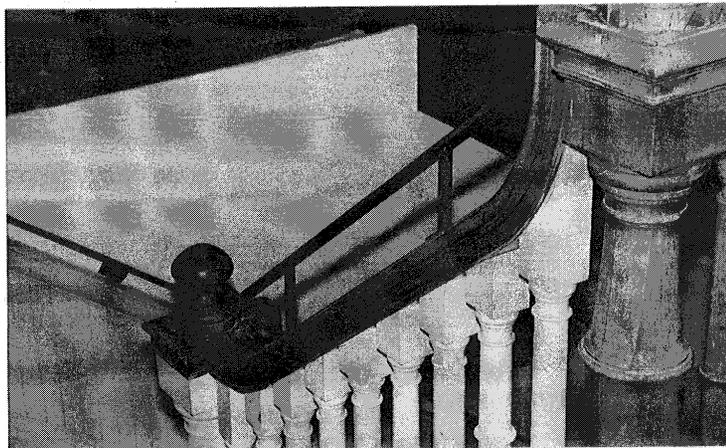


Figure 2: Rail cap painted with a finish color that blends in with the historic banister.

Issue Insufficient Handrail Height

NFPA 101 Code References

5-2.2.4.5 (a) Handrails on stairs shall not be less than 34" (86 cm) nor more than 38" (96 cm) above the tread, measured vertically to the top of the rail from the leading edge of the tread.

Exception No. 2 to (a): Existing required handrails shall not be less than 30 in. (76 cm) nor more than 38 in. (97 cm) above the upper surface of the tread, measured vertically to the top of the rail from the leading edge of the tread.

Vermont Code Requirements

- 1) Openings in balustrade must be no larger than 6" for existing railing.

Building Vergennes Opera House
Vergennes, Vermont

Use Assembly

Notes

- 1) Historic handrail is too low to satisfy code requirements for a 30" minimum height.
- 2) Replacing this banister with longer wood balusters would be expensive and wasteful of historic fabric.
- 3) Steel railing caps of flat, bar stock are mounted directly to the historic railing. This application mitigates the impact of a full modern rail system that would dominate the historic feel of the foyer space where these stairs are located.

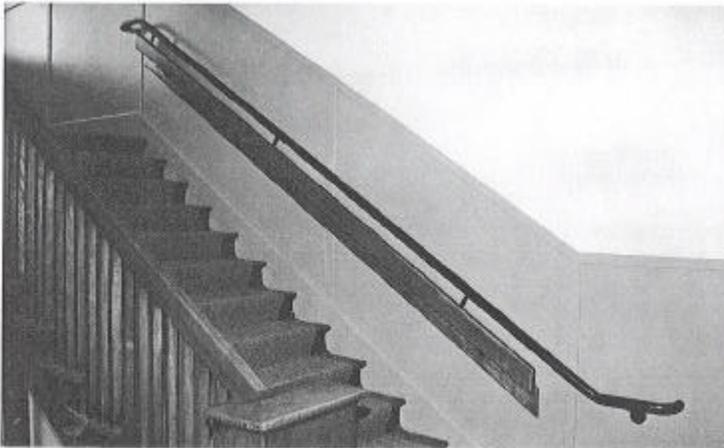


Figure 1: Modern steel railing is mounted at regulation height, opposite stair railing. Historic fabric is left in place.

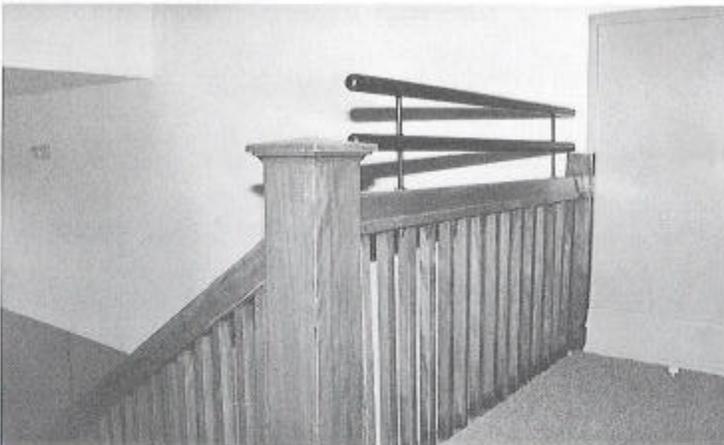


Figure 2: Modern guardrail mounted on top rail cap. Solution is easy and inexpensive.

Issue Insufficient Hand and Guardrail Height

NFPA 101 Code References

5-2.2.4.5 (a) Handrails on stairs shall not be less than 34" (86 cm) nor more than 38" (96 cm) above the tread, measured vertically to the top of the rail from the leading edge of the tread.

Exception No. 2 to (a): Existing required handrails shall not be less than 30 in. (76 cm) nor more than 38 in. (97 cm) above the upper surface of the tread, measured vertically to the top of the rail from the leading edge of the tread.

5-2.2.4.1 Guards Means of egress such as stairs, landings, balconies, corridors, passageways, floor or roof openings, ramps, aisles, porches or mezzanines that are more than 30 in. (76 cm) above the floor or grade below shall be provided with guards to prevent falls over the side.

Vermont Code Requirements

- 1) Must be at least 30" in height for existing handrails.
- 2) Guardrails must be at least 42" in height.

Building Fairfield Street Apartments
St. Albans, Vermont

Use Residential

Notes

- 1) Historic handrail satisfied code requirements for a minimum height of 30".
- 2) Guardrail added at landing.
- 3) With approval of code official, furniture may be permanently placed in front of low guardrail to prevent fall hazard.

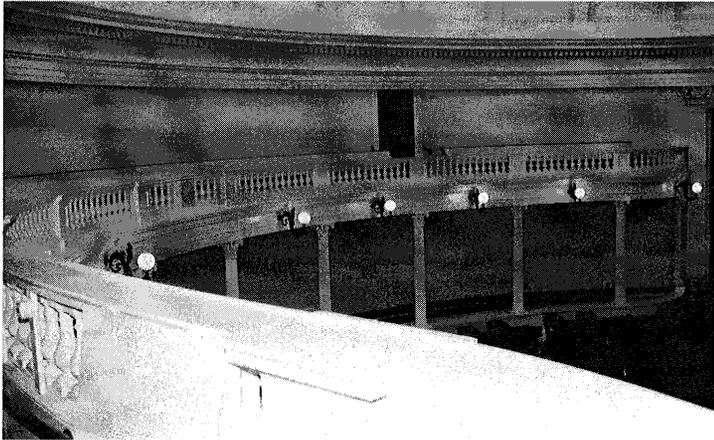


Figure 1: The balcony railings are placed at the end of the aisles and are the equal to the width of the stairs.

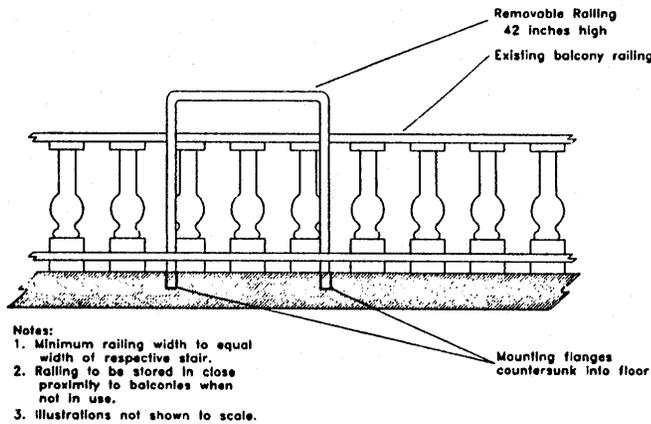


Figure 2: The removable railings are installed anytime balconies are occupied.

Issue Height of Railing at the End of Balcony Aisles

NFPA 101 Code References

8-2.11.1.1 (b) Railings at the ends of aisles shall be not less than 36" (91 cm) high for the full width of the aisle and shall not be less than 42" (107 cm) high for the width of the aisle where steps occur.

Vermont Code Requirements

- 1) Fascia must be at least 20" high.
- 2) Railing at end of aisle must be 42" high.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) Historic railing is too low to satisfy code requirements for a minimum height of 42" at the end of the aisle where the steps occur.
- 2) A removable railing allows the House Chamber to be exhibited in its existing restored condition, when it is not being used for legislative proceedings.
- 3) Figure 2 illustration excerpted from *State House Fire Safety Consultants Report Outline*, 10/31/96; Jack Watts, Fire Safety Institute; Nick Artim, Fire Safety Network.



Figure 1: View toward stage. Historic balcony, seen at right and left, retained.

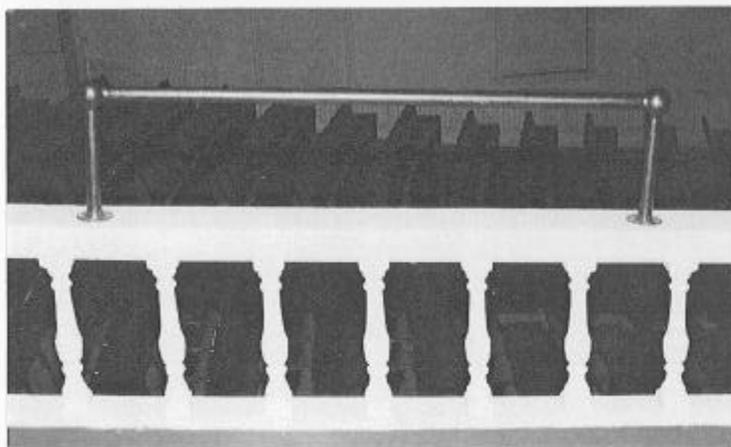


Figure 2: Detail of pipe railing installed at ends of aisles.

Issue Height of Railing at the End of Balcony Aisles

NFPA 101 Code References

8-2.11.1.1 (b) Railings at the ends of aisles shall be not less than 36" (91 cm) high for the full width of the aisle and shall not be less than 42" (107 cm) high for the width of the aisle where steps occur.

Vermont Code Requirements

- 1) Fascia must be at least 20" high.
- 2) Railing at end of aisle must be 42" high.

Building Barre Opera House
Barre, Vermont

Use Assembly

Notes

- 1) Pipe railing was attached to existing wood railing, raising the height to the required 42" at the end of the aisles.
- 2) Historic wood railing was retained. Minimal visual impact on the balcony.
- 3) Theatre-goers view of the stage not affected.

- Sprinklers





Figure 1: The clean lines of the historic cornice remain uninterrupted.



Figure 2: Sprinkler head mounted several inches below cornice.

Issue Unobtrusive Application

NFPA 101 Code References

7-7.1.1* Each automatic sprinkler system required by another section of this Code shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

Vermont Code Requirements

- 1) Requirements vary by occupancy - Life Safety and BOCA
- 2) Vermont allows the use of NFPA 13D, 13R and modifications to 13 sprinkler systems through the variance process to address issues with lower water supplies.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) Sprinkler head is a sidewall head mounted below the historic cornice. Sidewall heads spray water over entire room, without requiring sprinkler heads in the middle of the ceiling.
- 2) Escutcheon plate is painted the same color as the wall to blend further in with the room.



Figure 1: Sprinkler head tucked in between coffered ceiling and door header.

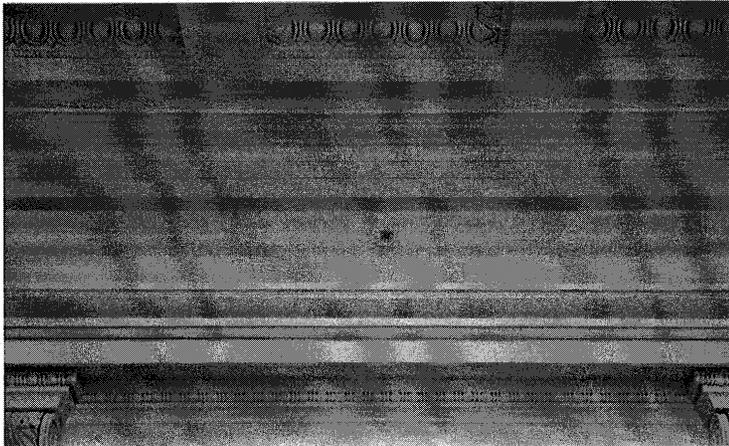


Figure 2: Sprinkler head mounted several inches below cornice.

SPRINKLERS

Issue Unobtrusive Application

NFPA 101 Code References

7-7.1.1* Each automatic sprinkler system required by another section of this Code shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

Vermont Code Requirements

- 1) Requirements vary by occupancy - Life Safety and BOCA
- 2) Vermont allows the use of NFPA 13D, 13R and modifications to 13 sprinkler systems through the variance process to address issues with lower water supplies.

Building Vermont State House
Montpelier, Vermont

Use Assembly

Notes

- 1) Sprinkler point is mounted below historic cornice. Plasterwork is left untouched.
- 2) Escutcheon plate is painted the same color as the wall to further blend in with the room. Some manufacturers offer sprinkler heads in different colors.

SPRINKLERS

Issue Unobtrusive Application

NFPA 101 Code References

7-7.1.1* Each automatic sprinkler system required by another section of this Code shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

Vermont Code Requirements

- 1) Requirements vary by occupancy - Life Safety and BOCA
- 2) Vermont allows the use of NFPA 13D, 13R and modifications to 13 sprinkler systems through the variance process to address issues with lower water supplies.

Building Old Chapel, Middlebury College
Middlebury, College

Use Assembly

Notes

- 1) Flush to the ceiling, plastic disc covers sprinkler fixture. Sprinkler head is now hidden from view.
- 2) Mounted apart from wood cornice work, this sprinkler is a pop-out model that hides the sprinkler head in the ceiling until activated.



Figure 1: Low ceiling interior is not adversely impacted by any exposed pipes or sprinkler heads.



Figure 2: Pop-out unit on right. Note slim-profile emergency light.

SPRINKLERS

Issue Unobtrusive Application

NFPA 101 Code References

7-7.1* Each automatic sprinkler system required by another section of this Code shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

Vermont Code Requirements

- 1) Requirements vary by occupancy - Life Safety and BOCA
- 2) Vermont allows the use of NFPA 13D, 13R, and modifications to 13 sprinkler systems through the variance process to address issues with lower water supplies.

Building Johnson Elementary School
Johnson, Vermont

Use Educational

Notes

- 1) Historic pressed metal ceiling poses specific installation problems.
- 2) Sprinkler pipes and heads are mounted parallel with ceiling beam. Less expensive to install.

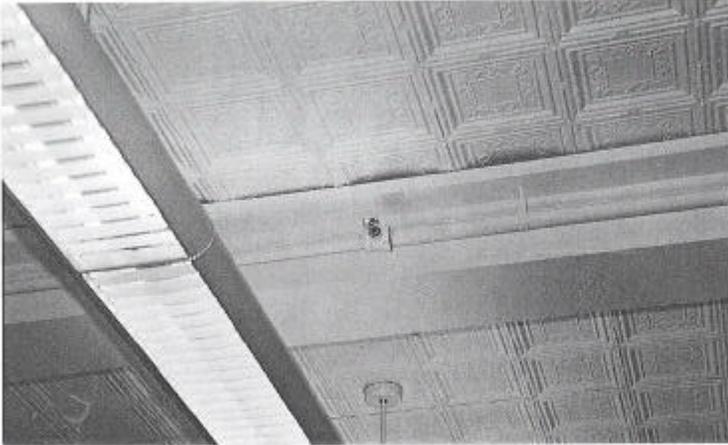


Figure 1: Adverse impact is mitigated by mounting pipes along the side of the beam, bottom face is left untouched.



Figure 2: Pipes are painted to further reduce visual impact.

SPRINKLERS

Issue Inadequate Water Supply

NFPA 101 Code References

7-7.1* Each automatic sprinkler system required by another section of this Code shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

Vermont Code Requirements

- 1) Requirements vary by occupancy - Life Safety and BOCA
- 2) Vermont allows the use of NFPA 13D, 13R, and modifications to 13 sprinkler systems through the variance process to address issues with lower water supplies.

Building West Main Street
Bennington, Vermont

Use Mercantile/Residential

Notes

- 1) Existing connection to municipal water supply was inadequate for water supply needs of the sprinkler.
- 2) Series of 250 gallon tanks in basement provide adequate water supply for new sprinkler system.
- 3) May also be used in communities that do not have a municipal water supply.

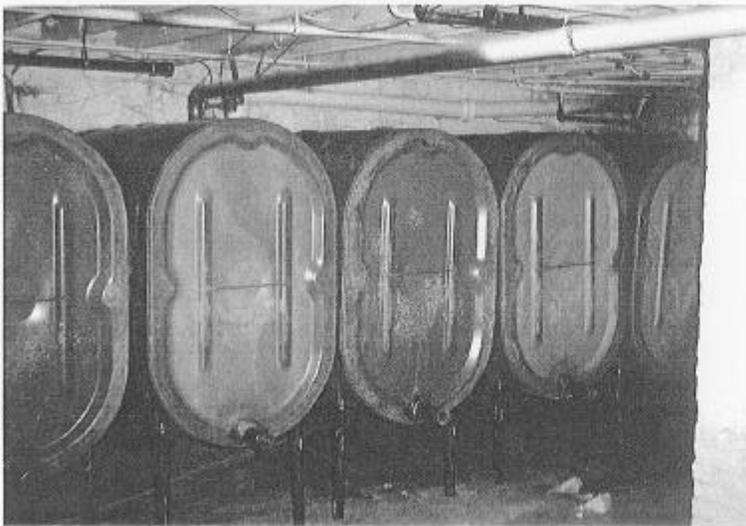


Figure 1: Water tanks located in basement of building.

The Construction Permit Process

Section 4 of the Vermont Fire Prevention and Building Code (the code) requires that a construction permit be obtained for construction work in a public building and the Appendix to the Code provides detailed information on the permit application process. Half of the applications for a construction permit received each year by the Fire Prevention Division are permitted within two weeks. However, the review of an application for a construction permit may take longer. Often the delay is due to incomplete or inadequate information provided by the applicant.

The construction permit application form and all of the supporting documentation are reviewed for compliance with the code by fire prevention division staff. When the proposed project complies with the code a construction permit is issued. This permit is accompanied by a letter from the plans reviewer and contains any conditions of the permit.

For complex buildings, the fire prevention division attempts to provide pre-plan review consultations to assist applicants with complying with the code. Applicants should contact the regional fire prevention division office for assistance.

When the project is complete an occupancy permit will be issued.

The Application

When applying for a permit, a short one or two paragraph statement describing the purpose and scope of the work is helpful to the plan reviewer in establishing the parameters of the project and to the reviewer as an overview of the job. The application needs to be filled

out completely and be legible. The information is very important to the Division and will assist the project in processing smoothly.

The Application requires data concerning the following issues:

- 1) Building Site Information**
- 2) Owner Information**
- 3) Occupancy and Construction Information**
- 4) Project Valuation Information**
- 5) Energy Conservation Certification for Publicly Funded Buildings Only** (This block on the application form only refers to new buildings receiving public funding and certifies that the minimum requirements for energy conservation are met).

Fill out the Construction Permit Application Completely!

One thing the applicant can do to keep a project moving smoothly through the construction permit process is to fill out the construction permit application completely and accurately.

The Plan and Specifications

The fire prevention division (the Division) often receives questions from applicants asking how much detail and information needs to be included in the plans and specifications. There is no one answer to that question because the Division reviews projects which vary from minor renovations or equipment to multi-million dollar complexes. The answer is really contained in section 4(b) of the rules where it indicates the plans "...shall be sufficiently clear, comprehensive, detailed and legible..." so that Division staff, who are familiar with both safety

THE CONSTRUCTION PERMIT PROCESS

requirements and building features, can determine if the minimum requirements of the safety codes are being met. If information is not provided then the Division staff cannot help to identify any problems up front when problems are easy to fix while still on paper.

The following documents and information needs to be included in the plans and specifications:

- 1) Site Plans
- 2) Construction Drawings
- 3) Working Drawings
- 4) Specifications
- 5) Renovations specifications.

If an owner is requesting special consideration for an historic building, the application shall include 1) documentation of the historic designation or evaluation of the building and, 2) information on the important historic features and spaces of the building. This information can be presented in photographs, annotated plans and/or written description.

Most historic building rehabilitations will not require professionally prepared architectural drawings, although they are encouraged, especially for complex projects.

Regional Problem Solving

The regional offices of the fire prevention division are staffed with safety professionals who have training and experience in developing solutions to meet both safety and historic preservation concerns. If a solution to a problem has not been developed after plan review or inspection, the owner or designated representative should contact the

regional manager for assistance. With more experience and resources to draw on the regional manager will often develop a solution without requesting a formal variance.

Variances, Exemptions

A. Variances

The Vermont Fire Prevention and Building Code is designed to provide the owners and tenants of public buildings with alternative ways to comply with the code. Professional designers experienced in the application of the code can frequently develop alternative solutions. However, in some cases compliance is not possible. 21 V.S.A. 252(e) provides that the commissioner may issue a variance from this code when compliance would:

- entail practical difficulty
- would create an unnecessary hardship, or
- is unwarranted, provided:
 - that any such variance or exemption secures the public safety and health; and
 - that any petitioner for such a variance or exemption can demonstrate that the methods, means, or practices proposed to be taken in lieu of the code provides, in the opinion of the commissioner, equal protection of the public safety and health as provided by the code; and,
 - that the portion of the code from which the variance or exemption is sought has not also been promulgated as a rule or

THE CONSTRUCTION PERMIT PROCESS

standards under the Vermont Occupational Safety and Health Program.

Requests for variance from the requirements of the Access Rules shall be to the Access Board as established under Title 21 V.S.A. Section 271-277 and in the Access Rules.

B. Variances for Historic Buildings

There is a special variance process, through the Historic Variance Appeals Board, for requests for variances from this code for historic buildings including any structure which has been listed in the National Register of Historic Places or the State register of historic properties or which has been determined to be historically significant by the Vermont Advisory Council on Historic Preservation shall be to the Historic Appeals as established under 21 V.S.A. 252(a). The owner or a designated representative may request a variance from the code or propose an alternative to the code by submitting a written request or proposal to the Fire Prevention Director at the main office in Montpelier. For many buildings there are alternatives to the standard provisions of the code which will provide an equivalent level of safety for the people using the building. The Code outlines the Historic Variance Appeals Board process. It specifically allows consideration of damage or destruction of historic architectural features as grounds for a variance. When seeking a variance, the owner or designated representative must show that they are providing equivalent safety through some other means. Often, sprinklering a building compensates for other code requirements that would have required damage or removal of historic architectural features. Building owners or their designated representatives must provide oral or written testimony as evidence of

equivalent safety. Section 12 (b) 4 also outlines two other optional approaches to providing information on equivalent safety development of a fire safety plan (described in NFPA 914 Sections 4-3 and 4-4), and completion of an alternatives analysis under NFPA 101A. The latter is an analysis that assigns numerical values to building conditions and safety provisions and defines minimum "scores" for approval.

The Historic Variance Appeals Board is comprised of three members: the Commissioner of Labor and Industry or designee; the State Historic Preservation Officer or designee; and a representative of the preservation community.

The Secretary of the Interior's Standards for Rehabilitation:

The *Secretary of the Interior's Standards for Rehabilitation* are intended to provide guidance to historic building owners and building managers, preservation consultants, architects, contractors, and project reviewers prior to treatment. Developed by the National Park Service in the 1970s the Standards have become the commonly accepted professional preservation guidelines for planning and carrying out work on historic buildings.

The Standards are further explained in *Illustrated Guidelines* that assist in applying the Standards to specific types of work. They are not meant to give case-specific advice or address exceptions or rare instances. Therefore, it is recommended that the advice of qualified historic preservation professionals be obtained early in the planning stage of the project. Such professionals may include architects, architectural historians, historic preservationists, archaeologists and others who have experience working with historic buildings.

The following Standards are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility.

The Secretary of the Interior's Standards for Rehabilitation

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces and spatial relationships.

2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical

development, such as adding conjectural features or architectural elements from other buildings, will not be undertaken.

4. Changes to a property that have required historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archaeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

THE SECRETARY OF THE INTERIOR'S STANDARDS

9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale, and proportion, and massing to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction will be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

NFPA PUBLICATIONS

The National Fire Protection Association distributes a number of publications that focus on individual Code issues. Since these documents are updated along with the Code every three to four years their reference numbers continue to change. Listed below are some of those publications available from the **National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101: 1-800-344-3555.**

NFPA 101 Life Safety Code, principally addresses the protection of people in the event of a fire or similar emergency and has different chapters for new and existing buildings, organized by building use type. It includes provisions for egress, stairs, fire escapes, flame and smoke barriers and emergency lighting.

NFPA 1, Fire Prevention Code, primarily addresses requirements for the maintenance and operation of buildings by use type, and includes provisions for egress, fire detection, and sprinklers.

NFPA 914, Recommended Practice for Fire Protection in Historic Buildings, offers guidance on the importance of preserving historic building features and how to plan a project that preserves a historic building and provides for the public safety and health. It is not a code document and does not offer alternative code provisions for historic buildings. Vermont recognizes NFPA 914 as guidance for treating historic buildings and as a reference for fire ratings for old materials. NFPA contains extensive charts that list the fire ratings of old doors, plaster walls and ceilings, etc.

NFPA 909, Standard for the Protection of Cultural Resources Including Museums, Libraries, Places of Worship, and Historic Places; describes principles and practices of fire safety for cultural properties and for those who operate, use, or visit them. It covers ongoing operation and rehabilitation and acknowledges the need to preserve historical integrity.

Other pertinent publications include:

NFPA 13, Standard for the Installation of Sprinkler Systems

NFPA 13 D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes.

Glossary *

Accessible Means of Egress. A path of travel, usable by a person with a severe mobility impairment, that leads to a public way or an area of refuge.

Approved. Acceptable to the authority having jurisdiction.

Atrium. A floor opening or series of floor openings connecting two or more stories that is covered at the top of the opening and is used for purposes other than an enclosed stairway; elevator hoistway; escalator opening; or utility shaft used for plumbing, electrical, air-conditioning, or communications facilities.

Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

Automatic. Providing a function without the necessity of human intervention.

Building. Any structure used or intended for supporting or sheltering any use or occupancy. The term building shall be construed as if followed by the words "or portions thereof." See also Structure.

Building, Existing. Any structure erected prior to the adoption of the *Code* or for which a permit for construction has been issued.

Collections. An assemblage of objects, works of art, books, and other media and historic documents or natural history specimens, collected according to a rational scheme and maintained so they can be

preserved, studied, or interpreted. Collections might be used in exhibits, as furnishings in period rooms, or for research, or kept in storage.**

Combustible. Capable of undergoing combustion.

Combustion. A chemical process that involves oxidation sufficient to produce light or heat.

Conservation. The broad range of practices involved in the preservation of historic and artistic works. Conservation encompasses four explicit functions: examination, documentation, preservation, and restoration. **

Court. An open, uncovered, unoccupied space, bounded on three or more sides by exterior building walls.

Cultural Properties. Buildings, structures or sites, or portions thereof, that are culturally significant, or that house culturally significant collections. Such properties include, but are not limited to, museums, libraries, historic structures, and places of worship. **

Draft Stop. A continuous membrane used to subdivide a concealed space to restrict the passage of smoke, heat, and flames.

Fire Barrier. A continuous membrane, either vertical or horizontal, such as a wall or floor assembly that is designed and constructed with a specific fire resistance rating to limit the spread of fire and that also will restrict the movement of smoke.

Fire Compartment. A space, within a building, that is enclosed by fire barriers on all sides, including the top and bottom.

Fire Protective System. Any fire alarm device or system or fire extinguishing device or system, or their combination which is designed to detect, control, or extinguish a fire. **

Fire Resistive. Refers to properties or designs to resist the effects of any fire to which a material or structure can be expected to be subjected. **

Flame Spread. The propagation of flame over a surface.

Guard. A vertical protective barrier erected along exposed edges of stairways, balconies, and similar areas.

Handrail. A bar, pipe, or similar member designed to furnish a person with a handhold.

Historic Building. A structure and its associated additions and site deemed to have historical, architectural, or cultural significance by a local, regional, or national jurisdiction. Recognition might be in an official existing or future national, regional, or local register, listing, or inventory. **

Historic Character. The essential quality of a historic building or space that provides its significance. The character might be determined by the historic background, including association with a significant event or person, the architecture or design, or the contents or elements and finishes of the building or space. **

Historic Fabric. Original or added building/construction materials, features, and finishes that existed during the period deemed to be most architecturally or historically significant, or both. **

Historic Preservation. Generic term that encompasses all aspects of the professional and public concern related to the maintenance of a historic structure, site, or element in its current condition, as originally constructed, or with the additions and alterations determined to have acquired significance over time. **

Historic Site. A place, often associated with structures, having historic significance. **

Historic Structure. A structure built or constructed, such as a building, monument, or bridge, that is deemed to have historical, architectural, or cultural significance by a local, regional, or national jurisdiction. **

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Listed. Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials and whose listing states that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

Living Area. Any normally occupiable space in a residential occupancy, other than sleeping rooms or rooms that are intended for combination sleeping/living, bathrooms, toilet compartments, kitchens, closets, halls, storage or utility spaces, and similar areas.

Load, Live. The weight superimposed by the use and occupancy of the building, not including wind load, earthquake load, or dead load.

Means of Escape. A way out of a building or structure that does not conform to the strict definition of means of egress but does provide an alternate way out.

Mezzanine. An intermediate level between the floor and the ceiling of any room or space.

Noncombustible. A material that, in the form in which it is used and under the conditions anticipated, will not aid combustion or add appreciable heat to an ambient fire.

Occupancy. The purpose for which a building or portion thereof is used or intended to be used.

Occupant Load. The total number of persons that might occupy a building or portion thereof at any one time.

Occupiable Story. a story occupied by people on a regular basis. Stories used exclusively for mechanical equipment rooms, elevator penthouses, and similar spaces are not occupiable stories.

Outside Stair. Outside stairs include stairs where at least one side is open to the outer air.

Place of Worship. Any building that functions primarily as a group meeting place for the practice of religion. This includes, but is not limited to, churches, synagogues, cathedrals, temples, and meeting halls.**

Preservation. The act or process of applying measures designed to sustain the existing form, integrity, or materials of a building, structure, or artifact and the existing form or vegetative cover of the site.**

Public. Of, pertaining to, or affecting a population or a community as a whole; open to all persons.

Public Way. Any street, alley, or other similar parcel of land essentially open to the outside air, deeded, dedicated, or otherwise permanently appropriated to the public for public use and having a clear width and height of not less than 10 ft.

Rehabilitation. The act or process of returning a structure to a state of utility through repair or alteration that makes possible an efficient contemporary use, including the preservation of those portions of features of the structure that are significant to its historical, architectural, or cultural values.**

Restoration. The act or process of re-establishing accurately the form and detail of a structure, site, or artifact as it appeared at a particular period in time by means of removal of later work or by reconstruction of missing earlier work.**

Self-Closing. Equipped with an approved device that will ensure closing after having been opened.

Smoke Barrier. A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly, that is designed and constructed to restrict the movement of smoke. A smoke barrier might or might not have a fire resistance rating. Such barriers might have protected openings.

Smoke Compartments. A smoke compartment is a space within a building enclosed by smoke barriers on all sides, including the top and bottom.

Smoke Detector. A device that senses invisible or visible particles of combustion.

Story. That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above.

Street Floor. Any story or floor level accessible from the street or from outside the building at ground level with floor level at the main entrance not more than three risers above or below ground level at these points, and arranged and utilized to qualify as the main floor.

Structure. That which is built or constructed. The term “structure” shall be construed as if followed by the words “or portion thereof.” See Building.

Vertical Opening. An opening through a floor or roof.

Yard. An open, unoccupied space other than a court, unobstructed from the ground to the sky, except where specifically provided by the Code, on the lot on which a building is situated.

* Definitions from *NFPA 101 Sec. 3-2*

** Definitions from *NFPA 909 Standard for the Protection of Cultural Resources Including Museums, Libraries, Places of Worship, and Historic Properties*. 1997 Edition.

Resources for further information.

Organizations

Architectural Conservation and Education Service

University of Vermont,
Historic Preservation Program
Department of History
Burlington, VT 05405
(802) 656-0577

Fire Safety Network

Nick Artim
P.O. Box 895
Middlebury, VT 05753
(802) 388-1064

Department of Labor and Industry

Main Office:
National Life Building
Drawer 20
Montpelier, VT 05620
(802) 828-2286

Regional Offices:

Barre - (802) 479-4434
Rutland - (802) 786-5867
Springfield - (802) 886-2712
Williston - (802) 658-2199

web site: <http://www.cit.state.vt.us/labind/>

Fire Safety Institute

Jack Watts
P.O. Box 674
Middlebury, VT 05753
(802) 462-2663

Historic Preservation Program

Department of History,
University of Vermont,
Wheeler House
Burlington, VT 05405
(802) 656-3180

Preservation Trust of Vermont

104 Church Street
Burlington, VT 05401
(802) 658-6647

Vermont Division for Historic Preservation

National Life Building
Drawer 20
Montpelier, VT 05620
(802) 828-3211

Funding Sources

“Funding for Historic Preservation Projects in Vermont”

Contact: Vermont Division for Historic Preservation

Cultural Facilities Grants

Contact: Vermont Historical Society
109 Main Street
Montpelier, VT 05609-0901
(802) 828-2291

Vermont State Historic Preservation Grants

Contact: Vermont Division for Historic Preservation

Preservation Trust of Vermont - Technical Assistance Grants

Contact: Preservation Trust of Vermont

Rehabilitation Investment Tax Credit

Contact: Curtis Johnson, (802) 828-3047
cjohnson@gate.dca.state.vt.us
Vermont Division for Historic Preservation

Vermont Downtown Program

Contact: Jane Lendway
Vermont Downtown Program
Agency of Commerce and Community Development
135 State Street, Drawer 33
Montpelier, VT 05633-1201
(802) 828-3042; email jlendway@gate.dca.state.vt.us

or

Joss Besse
Vermont Downtown Program
Agency of Commerce and Community Development
Pavilion Office Building
109 Main Street
Montpelier, VT 05609-0501
(802) 828-5212

Acknowledgments

The preparation and publication of this Field Guide was made possible by many people and several organizations. First, we would like to thank Nancy Boone, Vermont Division for Historic Preservation, and Bob Howe, Vermont Department of Labor and Industry, Fire Prevention Division, who provided valuable input into the original draft and subsequent revisions.

We wish to express our gratitude to Emily Wadhams, Adjunct Professor, University of Vermont, Graduate Program in Historic Preservation; Kirk Israel, Regional Manager, Fire Prevention Division, Vermont Department of Labor and Industry; and Jack Watts, Ph.D., Director, Fire Safety Institute, for their advice and guidance throughout the project.

Finally, we would also like to thank Nancy Perkins and Dennis Berry of the National Fire Protection Agency, for taking time to review this work while it was still in manuscript form. The permission of the National Fire Protection Agency for the use of the material from **NFPA 101**, *Life Safety Code*, was essential to the completion of this project.