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Outline of the changes in the National Building Code of Canada 1990: Code Seminar Series

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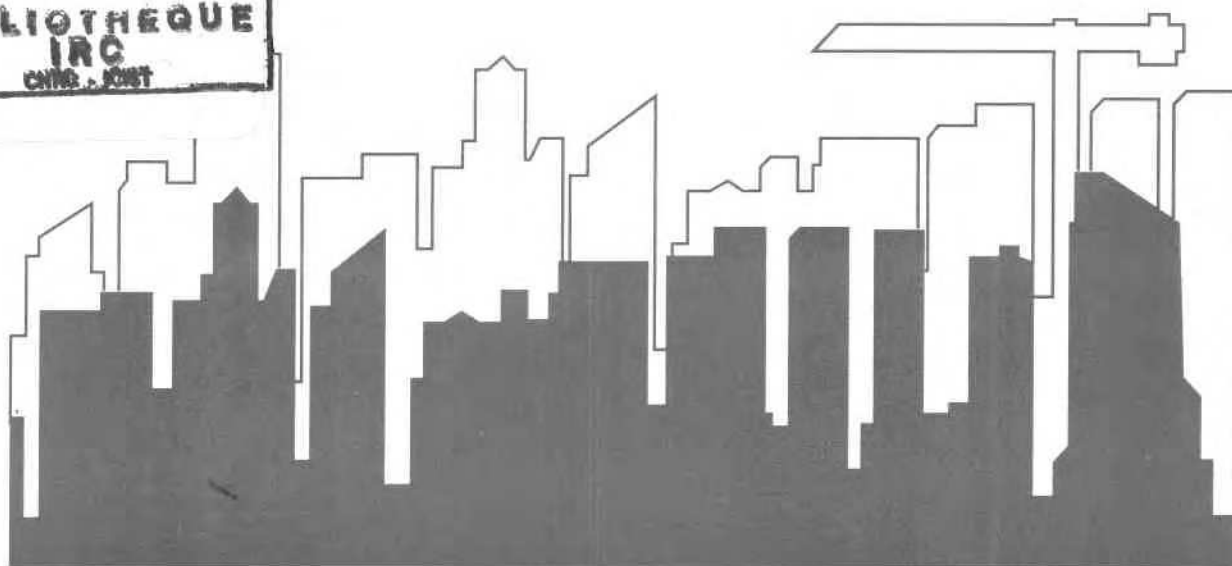
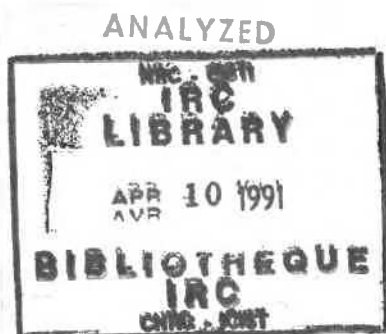
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Research in
Construction

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Institut de
recherche en
construction

Outline of the Changes in the National Building Code of Canada 1990



Canada

***Outline of the Changes in the
National Building Code
of Canada
1990***

Code Seminar Series

ANALYZED

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Preface

The Code Seminar Series 1990 explained the new and revised requirements included in the NBC 1990, with particular emphasis on Parts 3 and 9.

This publication provides in print form the outlines of the speakers' presentations. These outlines were prepared by staff of the Institute for Research in Construction, namely, Alastair Aikman, Richard Desserud, John Haysom, Dale Lutes, Hal Nichol, Mike Swinton and Marc Walsh. The work of all these individuals provided the content for the Code Seminar Series 1990.

The Code Seminar Series 1990 could not have been developed without the support of a very dedicated production group. These people deserve recognition:

Registration and general information

Mrs. Chau Truong

Joanne Wathier

Coordinator of registration and handout material

Alastair Aikman

English editor

Linda Hayes

French editor

Anne-Marie Dorais

Graphics for the promotional flyer and brochure

Christa Gaudert

Production of slides

Don Hobbs

Preparation of French handout material

Ginette Rivard

Recognition is extended to the IRC staff who each year present the Building Science Insight seminar series for their guidance in the setting up of this seminar series.

Hal Nichol

Seminar Coordinator

Code Seminar Series 1990

**1990 Code Seminar
Series**

Introduction

1990 Code Seminar Series

A series of 13 sessions was held across Canada to describe the significant changes in the National Building Code 1990.

A similar series on a very limited scale was offered for the NBC 1985. Because of the demand for more, and the success of the Code Change Forums during the public review period, the program was expanded substantially.

After a brief description of the code-writing process at IRC, this document presents a fairly comprehensive but not too detailed overview of the significant changes to Parts 3, 4, 6 and 9. Information on background or reasons is limited.

National Building Code of Canada
National Fire Code of Canada
Canadian Plumbing Code
Canadian Farm Building Code
Supplement to the NBC

First, what is meant by the National Model Codes?

The National Building Code is the main publication which provides minimum requirements for safe and efficient construction of new buildings in areas of health, life safety and structural sufficiency.

The National Fire Code is designed to provide an acceptable level of fire protection and fire prevention in the on-going operation of buildings.

The Canadian Plumbing Code is concerned with the design and installation of plumbing systems in buildings.

The Canadian Farm Building Code is a special Code dealing with the particular needs of farm buildings.

In order to assist in the application of certain Code requirements, explanatory material is offered in the form of supplements and commentaries.

These Codes are model documents only and must be adopted by an authority having jurisdiction in order to come into effect.



Under the British North America Act and its successor the Constitution Act, responsibility for building regulation in Canada rests with the provinces and territories. In the past, this responsibility was generally delegated to municipalities. Not surprisingly, a multiplicity of regulations developed as each municipality tried to deal with its own needs. These variations from one municipality to the next made it very difficult for designers, product manufacturers and contractors to conduct business in more than one region at a time.

Thus, in 1937, the Department of Finance sought the aid of the National Research Council in developing a model building regulation that could be adopted by all municipalities in Canada. The result of that initiative was the publication of the 1941 National Building Code.



The post-war construction boom resulted in demand for a revised NBC. As a result, in 1948 the NRC created the Associate Committee on the National Building Code (ACNBC) to oversee the updating and continued maintenance of the document. The Associate Committee revised the Code in 1953 and has published new versions approximately every 5 years since. The NBC 1990 is the 10th edition.

The NBC is either adopted unchanged as the building regulations of a province, territory or municipality or, in some cases, changes or additions are made.



The Institute for Research in Construction is involved in every aspect of the development of the National Codes.

Going back to the post-war construction boom, NRC recognized a need to establish a research division that could respond to the needs of an industry that was rapidly expanding. The Division of Building Research was therefore created in 1946. Its name was changed to the Institute for Research in Construction in 1985.

One of its original mandates was to provide research support for the National Building Code of Canada. That mandate continues today at IRC. This close link with the research sections of IRC has maintained the NBC as a world class document.

Codes Section

- **Evaluation of Code Changes**
- **Studies for Committees**
- **Administrative Support**
- **Knowledgeable Application**
- **Coordinate IRC Support**

The essential link between the ACNBC and the research staff is provided through the Codes Section. The staff of this section provides direct assistance to the code committees in a number of ways. For example: The committees receive a continuous stream of suggestions for changes in the Code from all segments of the construction industry. One job is to evaluate those proposals, from both technical and enforcement points of view, so that the committees can be advised on an appropriate course of action. The final decision is then made by the committees.

Where the information the committees need to make informed decisions is not readily available, studies are performed to provide that information, often in cooperation with IRC research sections.

Secretarial support is also provided through the preparation of extensive agenda packages before committee meetings and detailed minutes afterwards.

Another function is to promote knowledgeable application of code requirements. This is done through response to inquiries, participation in seminars and conferences, and preparation of explanatory material such as in the Commentaries or the NBC/NFC News.

Focus is provided for input from the research sections of the Institute into the committee system.

ACOUSTICS SECTION

- **Data for new assemblies**
- **Input for changes to NBC**



The Acoustics Section has developed data on the sound resistance of common construction assemblies found in Part 9 of the NBC. Most recently, it assisted the Part 9 committee in determining the improved requirements for sound resistance between dwelling units that are included in the NBC 1990. It also developed the expanded explanatory material on this subject that is included in the Appendix.

BUILDING PERFORMANCE SECTION

- **Building Envelopes**
- **Indoor Air Quality**
- **Lighting**



The Building Performance Section's area of responsibility includes building envelopes, indoor air quality and lighting. It has provided a valuable resource for the Standing Committees responsible for Part 6 "Heating, Ventilation and Air-conditioning" and Part 9 "Housing and Small Buildings."

Currently, the Building Performance Section is assisting in developing a commentary on Part 5 "Wind, Water and Vapour Protection," is examining exit sign requirements in Part 3 "Use and Occupancy" and is providing major technical input to the process of updating the "Measures for Energy Conservation in New Buildings."

FIRE SECTION

- **Input on changes to NBC**
- **New test for cladding**
- **Testing of assemblies**



The National Fire Laboratory (formerly the Fire Research Section) has provided ongoing assistance to the Code committees, both through direct input from research advisors at the meetings and through fire testing that has resulted in a simple generic approach to the determination of fire resistance ratings of common construction assemblies. Research work at the Laboratory has led to many of the fire related changes in the 1990 Code.

STRUCTURES SECTION

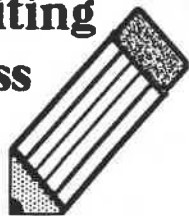
Loading Criteria



- **Snow**
- **Wind**
- **Earthquake**

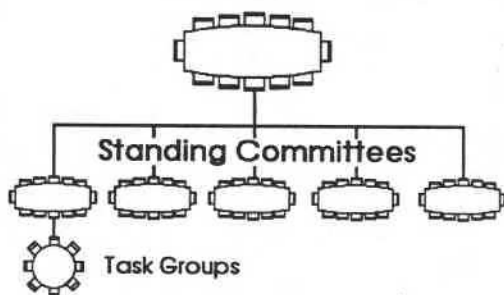
The Structures Section supports the Part 4 committee by providing research information used in the establishment of the loading criteria in the Code – for snow loads, wind loads and earthquake loads. This includes work on the commentaries on structural design in the Supplement to the NBC.

Code writing process



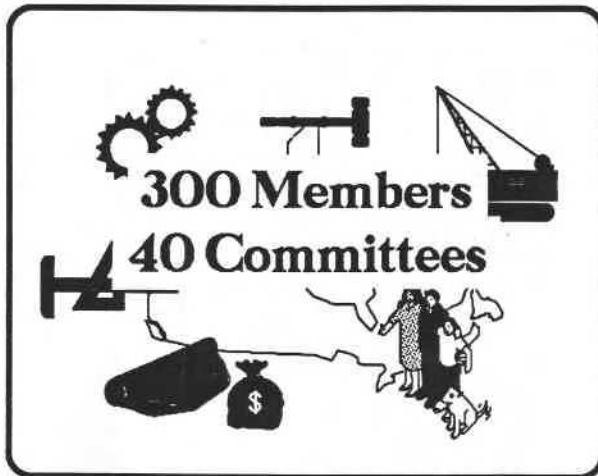
The Associate Committee on the National Building Code is the most senior of the Code writing committees. As well as having responsibility for the overall scope of the NBC, the Associate Committee establishes the Policies and Procedures that are used in making changes to the Code.

Associate Committee



The Associate Committee is aided in its work by a number of Standing Committees that have been delegated the responsibility for the technical content of various parts of the Code. For example there is a Standing Committee for Part 4 and one for Part 9. Due to the complexity of Part 3, three Standing Committees are responsible for different Sections of this part.

These Standing Committees may in turn create Task Groups, which have specific short term objectives. This is particularly useful where special expertise is required from outside the committee, e.g., physical security, or sprinklers in houses.



Members of the committees are drawn from all segments of the construction industry: regulators, architects and engineers, manufacturers and product suppliers, building owners and developers, and, of course, building users. They are appointed as individuals, and not as delegates from a specific association or company. They are also selected in a way that guarantees representation from all geographical regions of the country. In all, there are some 300 members working on about 40 committees.

A unique feature of the Associate Committee process is that NRC pays all travel expenses for the committee members. This allows equal access to the process by all those who have the appropriate expertise, not only those who can afford to attend.

You could become a member of one of our standing committees. If you are interested, just write a letter to the Secretary of the Associate Committee, indicating which standing committee or committees you are interested in joining and enclosing a recent resumé.

The Nominating Committee has established and periodically updates a matrix for each committee that ensures a balance among regulators, the building and supply industry and general interest groups. In selecting people to fill this matrix, the Nominating Committee takes into account not only the qualifications of the available candidates but also the need to maintain an equitable geographic balance.

The membership is reviewed twice during each five-year code cycle and an effort is made to have a significant rate of turnover to avoid any suggestion that the committees are an "old boys club." For example, entering into this code cycle, most of the standing committees have around 50% new members.

Don't be reluctant to participate. Most members enjoy their participation and get a sense of satisfaction from contributing to making the National Building Code of Canada one of the most respected building codes in the world.

Public Participation



Another important feature of the Code development and maintenance process is the extent of public involvement. Originally the committee process was seen to be a pretty closed system:

- Feedback was not provided to those who wrote to the committees recommending Code changes.
- Attendance at meetings by other than members was rarely permitted.
- There was little outside input into changes to the Codes.

Now, responses are sent to those who write to the committees advising what action has been taken in response to their concerns and why. Non-members are welcome to watch the proceedings or to address the committees on agenda items.

Increasingly, meetings are being held outside Ottawa to allow more cross-country involvement.

Most important of all, the Associate Committee code-writing process now has one of the most extensive public review procedures in the world.

8 000 Packages Requested
20 Code Forums / 1300 Participants

Public Review

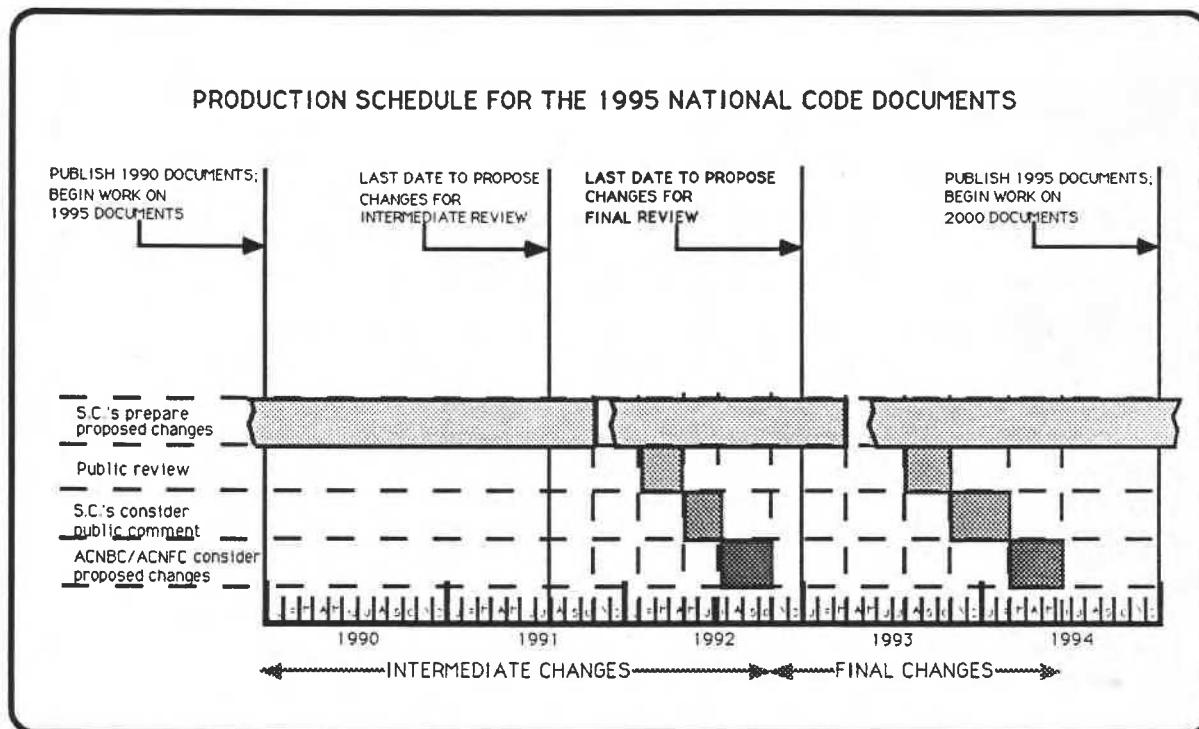
900 Commentors / 4 407 Comments

Twice during every five-year Code cycle, all the technical changes that have been proposed by the committees are circulated for a three-month public comment period. This allows for feedback from those most affected by a proposed change and increases the range of expertise that can be brought to bear on any subject. As a result, the end product is improved.

For example, during the last review period, over 8000 packages of proposed changes were sent out. The availability of these Code change packages is announced in NBC/NFC News and in several trade publications. Anyone who requests a package receives one.

To assist in the understanding of these changes, IRC conducted 20 Code Change Forums across Canada in 1988. Staff explained the changes and the background behind them and as a result, comments received were more informed than previously. More than 900 commentors sent in over 4400 individual comments. Each of those comments was reviewed by the appropriate technical committee and the commentor was advised of the resulting committee action. Approximately one third of all changes were altered as a result; some were withdrawn.

Future Activities



This whole Code writing process follows a rigid schedule.

As mentioned previously, twice during the five-year cycle, the Standing Committees finalize sets of changes, which are then made available for public review. After a three month public review period, the comments are considered by the Standing Committees and final sets of changes are submitted to the Associate Committees for approval. A period of 22 months is required from the time the Standing Committees decide on the final changes they are going to recommend until the Code documents are published.

This means that proposals for changes must be received by the standing committees at least 2 years prior to the end of the cycle.

Memorandum of Understanding



The original goal of the NRC in publishing the NBC was to promote uniformity of building regulations across Canada. The goal is close.

NRC is in the process of signing a memorandum of understanding with the provinces and territories which states that the NBC will be the core document in their building regulations, with as few changes as possible.

At this point it has been signed by all provinces and territories from Ontario west and is circulating in the east.



Computerized Codes



The Codes Section, together with researchers in other Sections of IRC and with a number of private sector companies, is investigating a number of options for computerizing the National Code documents.

We plan to take advantage of the widespread availability of microcomputers to make access to Codes and standards much easier than is presently the case.

Commentaries



A common criticism of the National Codes relates to the legalistic language that must be used to make them enforceable in a court of law. The Code user needs to understand the background and intent of the requirements to ensure that they are being properly applied.

For this reason, new commentaries will be written for use with the NBC 1990, and existing ones will be updated; these include commentaries on:

Part 3 - Use and Occupancy

Part 5 - Wind, Water & Vapour Protection

Part 9 - Housing and Small Buildings

Housing Code



The provinces and territories, at the Deputy Minister level, requested that the Associate Committee publish a separate Housing Code for use by small home builders and by small municipalities across the country.

As a result, a new document has been created that contains all the requirements in the NBC that relate to houses. The Canadian Housing Code covers single-detached, semi-detached and row housing, i.e., any small residential building with no horizontal fire separation or shared egress and this Code is available in the same way as other Code documents.

Performance Codes

The possibility of enhancing the performance oriented nature of the code requirements will be evaluated. There is a move in this direction in other countries and assistance will be provided to the Associate Committee in deciding its position in this regard.



Because so few jurisdictions were enforcing the document and because of cutbacks in energy-related research at NRC, the Associate Committee intended to stop work on the Measures for Energy Conservation in New Buildings and disband the Standing Committee.

Provincial and Federal Energy Ministries and utilities subsequently have found financial resources to fund the research necessary to allow the committee to update the document and renew its work on a performance-related energy code.

**1990 Code Seminar
Series**

Part 3

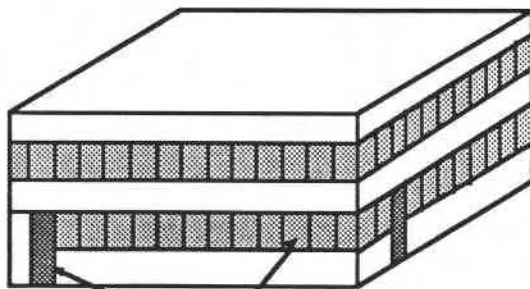
**Significant changes to
Part 3
of the
National Building Code of Canada
included in the 1990 edition**

This presentation briefly addresses significant changes to Sections 3.1 to 3.6 as well as to Section 3.7. Further information will be available in a Commentary on Part 3, which will be published at a later date.

Definitions

Part 1

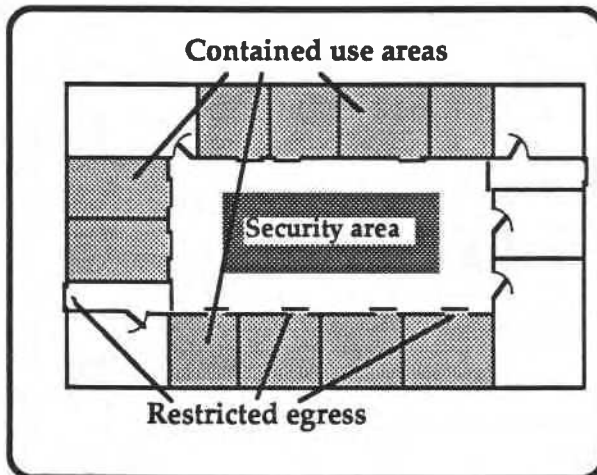
The following few items deal with definitions that are in Part 1 but that affect the understanding of requirements in Part 3.



**Closures in openings of
exposing building face**

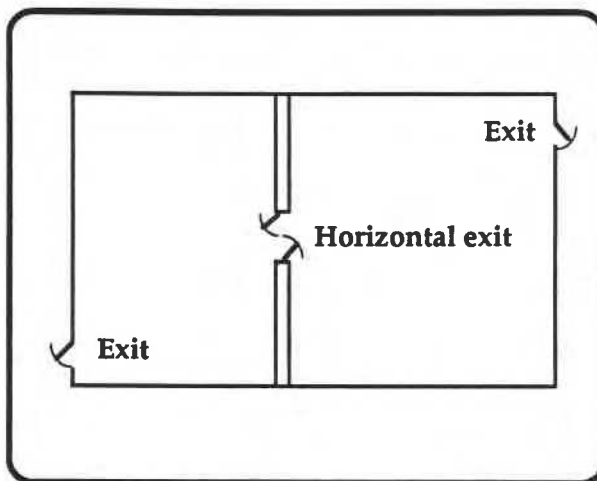
Closure

Previous definitions of a closure addressed a device located within an opening in a fire separation. The revised definition applies to devices located in an exterior wall opening and will permit the opening to be excluded from the area of unprotected openings in an exposing building face, as long as the rise in temperature on its unexposed side does not exceed that permitted for the wall assembly.



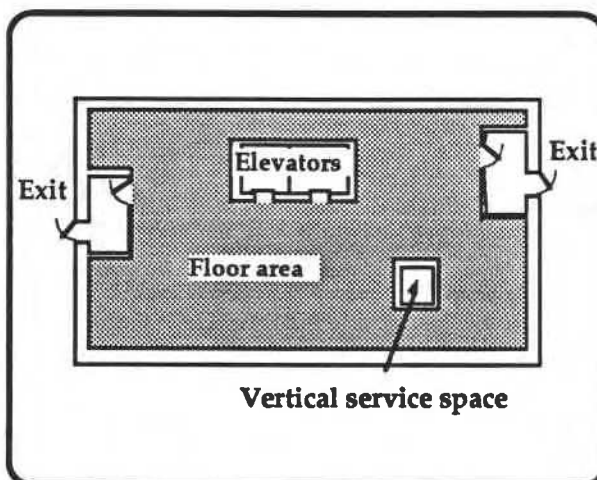
Contained use area

This new definition applies to a space containing rooms from which the occupant cannot escape without the intervention of security staff to release door locking devices. The predominant application will be to correctional institutions, such as detention centres and prisons, however, the requirements will also apply to individual rooms or groups of holding rooms in airports, psychiatric hospitals, ports, courthouses and similar buildings in which individuals rely on other persons to release locking devices.



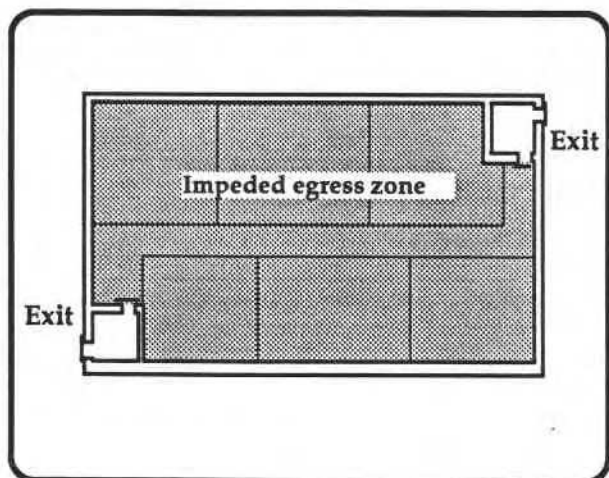
Exit

The definition of exit has been revised to clarify that a horizontal exit to a neighbouring building satisfies the intent of the Code without the need to consider the eventual movement through the neighbouring building to a public thoroughfare or open place.



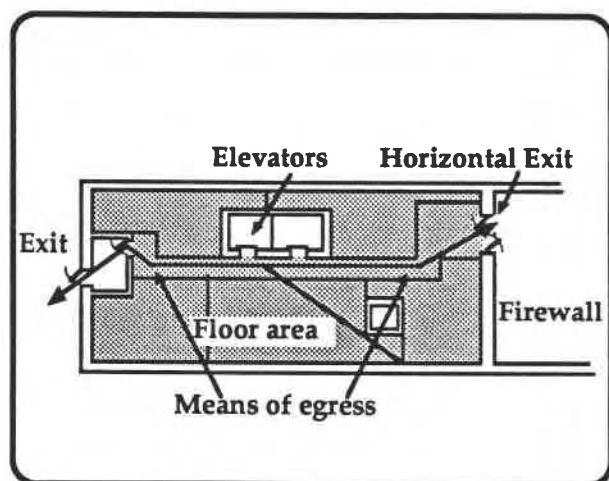
Floor area

The revision to the definition of floor area clarifies that the boundary of a floor area is located at the exterior surface of walls of vertical service spaces and exits. A door in a wall of an exit stairshaft is considered to be within the exit and not within the access to exit.



Impeded egress zone

This new definition applies primarily to buildings that are part of a prison complex but that do not contain rooms that are individually locked against egress (contained use areas). The building is considered to have the occupancy classification of its designated use for application of Code requirements. Some additional requirements are included to compensate for the ability to secure the building perimeter doors against egress by occupants until the fastening devices have been released by security personnel. Typical buildings are recreational buildings and workshop buildings.



Means of egress

The definition of means of egress has been revised in parallel with the revision to the definition of exit. Thus a means of egress can terminate in an adjacent building by use of a horizontal exit.

Service room definition

Examples moved to
Appendix note

Service room

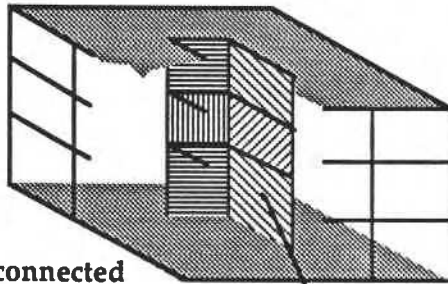
The change to the definition of service room reflects a policy to move examples from the body of the Code to an appropriate Appendix note to convey the intent that the examples are only illustrative and are not inclusive.

Section 3.1

General

Section 3.1

The majority of the changes in Section 3.1 are editorial in nature, including a considerable reorganization of material. Only significant changes are covered in this presentation.

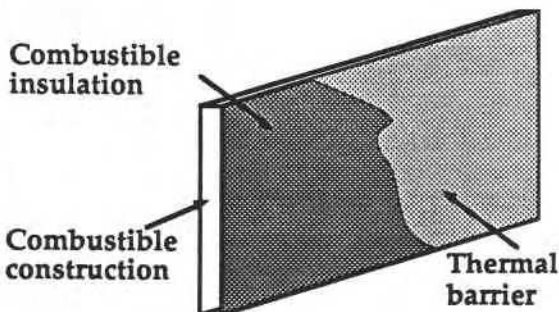


Interconnected
floor space

Separations between
major occupancies

Separation of major occupancies - 3.1.3.6.(3)

The requirement to separate one major occupancy from another would not permit interconnected floor space with different occupancies on different storeys unless a fire separation were located around the perimeter of an opening through an intervening floor assembly. This Sentence waives the need to construct a fire separation between major occupancies around the perimeter of an opening through floor assemblies, provided the building complies with Articles 3.2.8.2. to 3.2.8.9.



Combustible
insulation

Combustible
construction

Thermal
barrier

Protection of foamed plastic - 3.1.4.2.(1)

The change to this Sentence clarifies that thermal barriers in a building of combustible construction may be selected from thermal barriers meeting requirements of standards for noncombustible construction.

FT4 type wiring

**Permitted in
combustible
construction**

Electrical wires and cables - 3.1.4.3.(1)

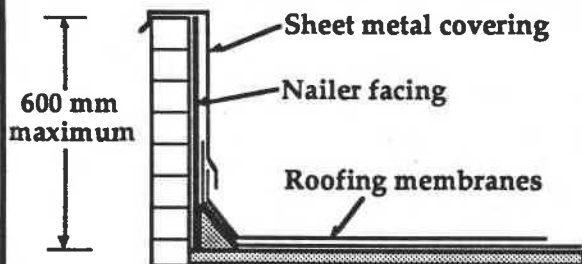
An Appendix note has been added to clarify that FT4 type wires and cables are permitted in a building of combustible construction.

Subsection 3.1.5.

**Revision of Article 3.1.4.5.
of NBC 1985**

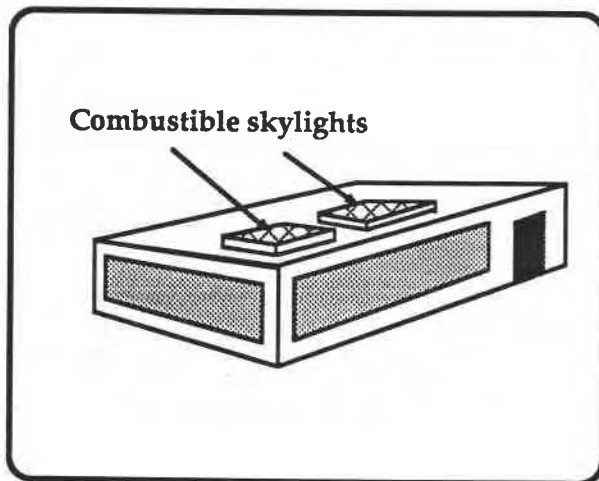
Noncombustible construction - 3.1.5.

Article 3.1.4.5. of the NBC 1985 had become so complex through modification over a number of Code cycles that it was difficult to understand the requirements. The restructuring into a separate Subsection on materials permitted in noncombustible construction has also resulted in new Subsection 3.1.4. for combustible construction and new Subsection 3.1.6. for tents and air-supported structures. Except where modified by other revisions, there are only editorial differences between the new Subsection 3.1.5. and the previous Article 3.1.4.5.



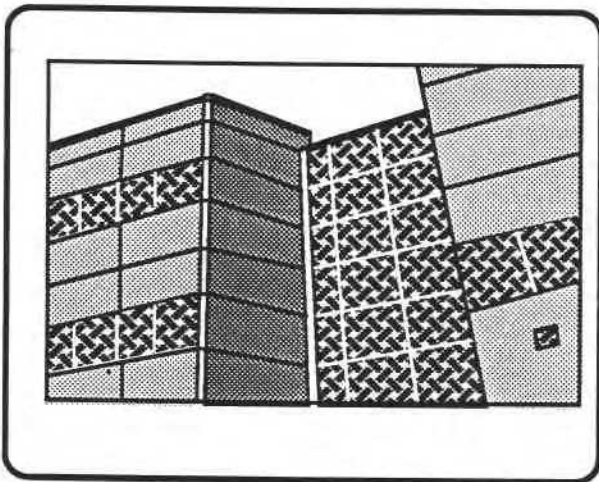
Combustible roofing materials - 3.1.5.3.(4)

A standard practice associated with built-up roofing membranes on sloping roofs is to incorporate a layer of plywood or similar product on the vertical face of a parapet to which the roofing membranes can be attached. This requirement will permit the use of these facing materials, subject to protection of the exposed face by sheet metal.



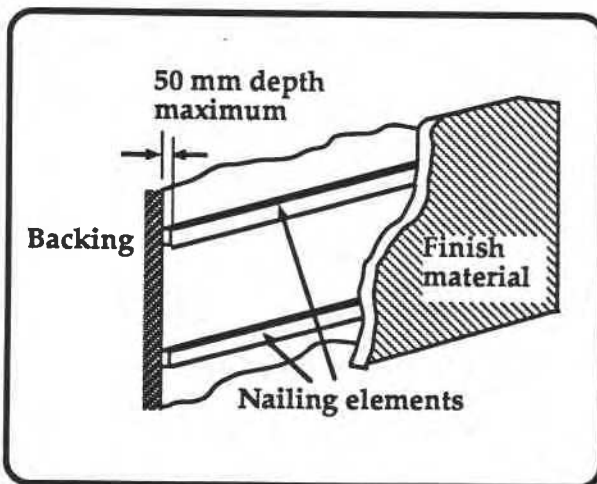
Combustible glazing and skylights - 3.1.5.4.(1)

Changes involving combustible skylights define the method of determining the permissible area in relation to the area of the space in which they are located. The area of the skylight is that which is obtained by vertical projection onto a horizontal plane and not the actual area of the skylight.



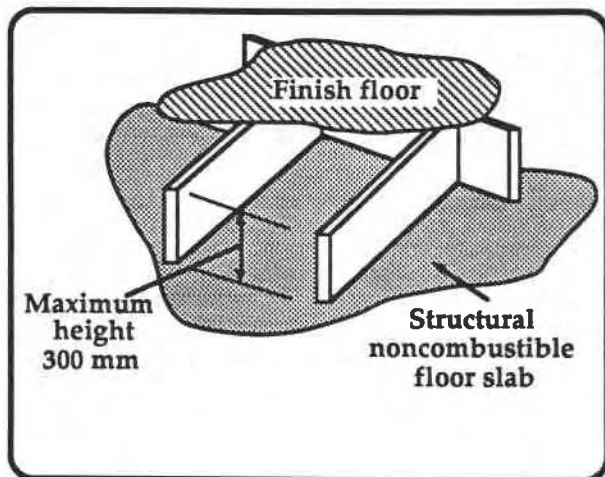
Combustible cladding - 3.1.5.5.

Under recent editions of the Code, exterior cladding on a building required to be of noncombustible construction was required to be constructed of noncombustible materials. This Article will permit tested combustible exterior cladding assemblies to be used on noncombustible buildings, subject to a limit of three storeys for unsprinklered buildings and six storeys for sprinklered buildings. However, these cladding assemblies are not acceptable for building faces for which the area of unprotected openings is restricted to not more than 25% of the area of the exposing building face.



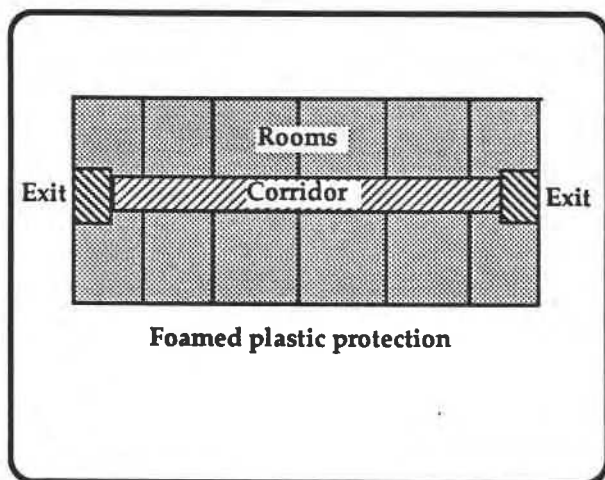
Nailing elements - 3.1.5.6.

Previous dimensional limits on nailing elements, otherwise known as furring strips, would not permit material that exceeded 38 mm by 38 mm. This excluded many commonly used sizes. The new limit of 50 mm for the depth of the space permits the use of various sizes and the use of shims to even up an underlying surface. The concealed areas between the nailing elements for attachment of ceiling membranes are not permitted to exceed 2 m².



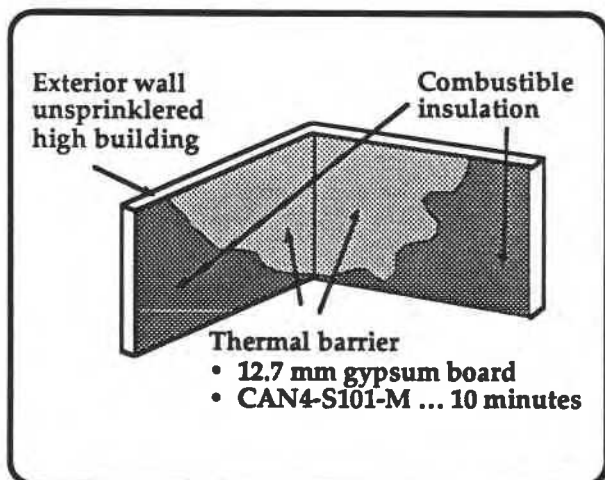
Combustible flooring elements - 3.1.5.8.(2)

A new Sentence permits the installation of raised platforms of combustible materials above a floor assembly of noncombustible materials. The height of the supporting members is limited to 300 mm and the resulting concealed spaces must be fire stopped at intervals of not more than 10 m².



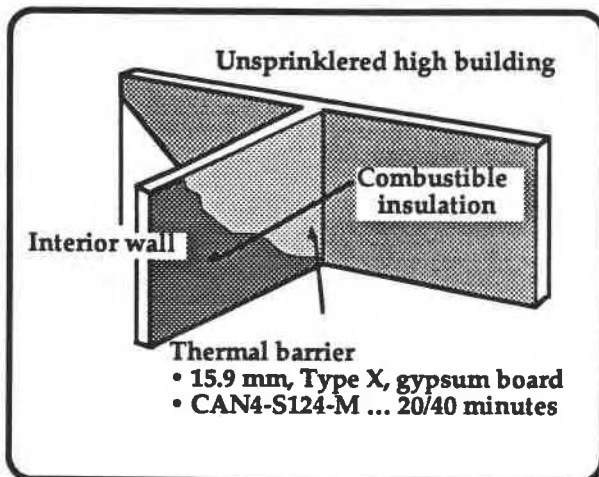
Combustible insulation and its protection - 3.1.5.11.(2)

The primary change affecting the protection of exposed surfaces of combustible insulation is to replace the word "room" by "space" to clarify that spaces within the building other than rooms must also be isolated by thermal barriers from certain combustible insulation materials. Some concealed interior spaces are exempted from this requirement, however, fire stopping of the concealed spaces has to comply with Article 3.1.11.20.



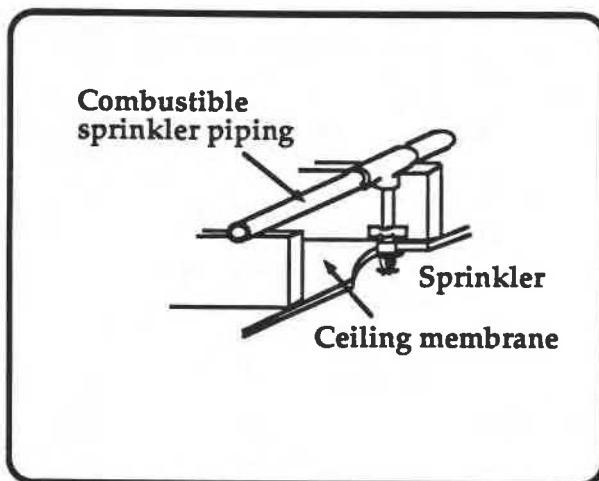
Combustible insulation and its protection - 3.1.5.11.(3)

Previous requirements for the protection of the surface of combustible insulation with medium to high flame spread ratings in exterior walls has been modified to permit plain 12.7 mm gypsum board on the basis of performance tests conducted during the past Code cycle. Some changes to other generic materials are also included for unsprinklered buildings more than 18 m high or regulated by Subsection 3.2.6. In the case of these unsprinklered high buildings, the time and temperature criteria in application of the referenced standard have been modified.



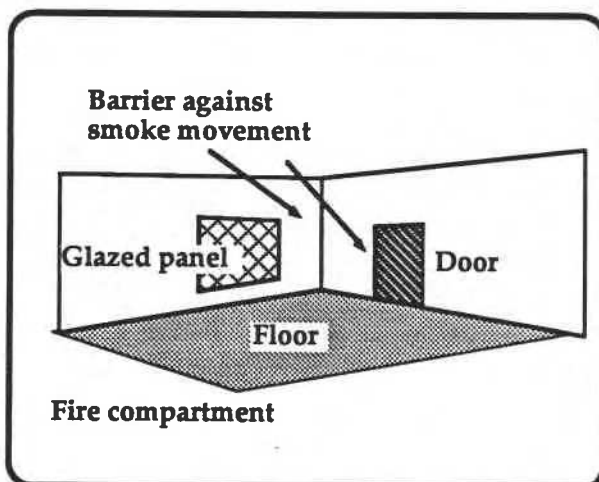
Combustible insulation and its protection - 3.1.5.11.(4)

Although there were no provisions in the NBC 1985 to address protection of combustible insulation in interior walls of buildings, this Sentence requires general protection in all buildings, with more stringent requirements in unsprinklered buildings more than 18 m high or regulated by Subsection 3.2.6.



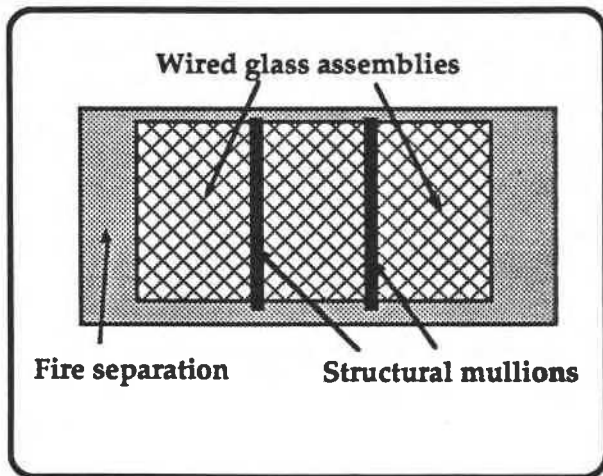
Combustible piping materials - 3.1.5.15.(2)

Although combustible sprinkler piping was not prohibited by NFPA 13, if accepted by the authority having jurisdiction, there were further flammability requirements in the NBC 1985 that also applied. This revision allows the use of combustible sprinkler piping without having to pass the flammability criteria, however further controls are listed in Subsection 3.2.5. (The requirement applies only within a floor area.)



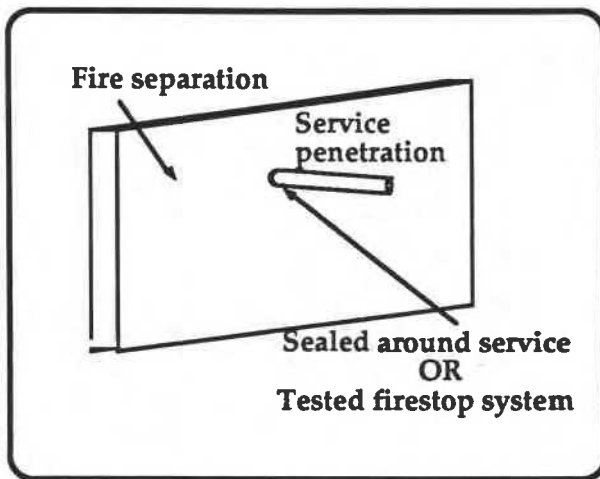
Fire separations - A-3.1.8.1.(1)(b)

An Appendix note, which is an amended version of the previous Appendix note to Sentence 3.3.3.6.(8), has been added to explain the intent of the Code in specifying a fire separation that has no fire-resistance rating. These separations are usually encountered in a sprinklered building. The note clarifies that these fire separations are intended to control the spread of smoke and are expected to remain in place until the sprinklers have actuated and controlled the fire.



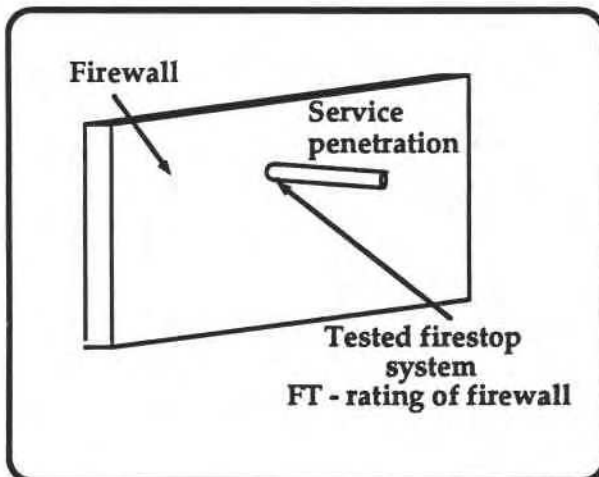
Wired glass and glass block - A-3.1.8.14.(2)(d)(ii)

An Appendix note has been added to clarify that the structural mullions supporting wired glass assemblies used as closures in a fire separation are expected to remain in place and support the assemblies, while exposed to fire, for the time period expected of the wired glass.



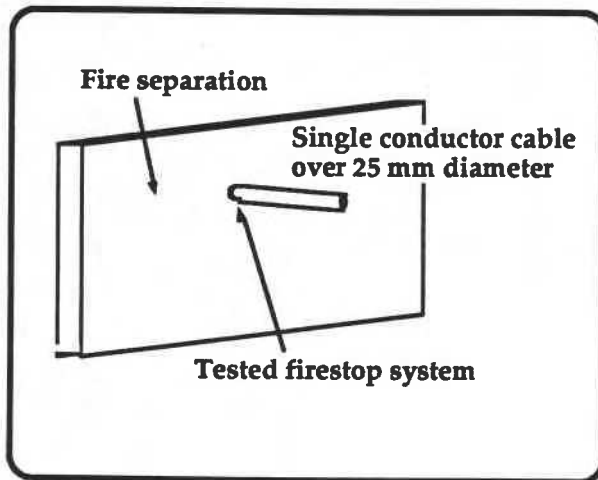
Fire stopping of service penetrations - 3.1.9.1.(1)

A specific ULC standard is referenced for the performance evaluation of fire stop systems for service penetrations through fire separations and through membranes forming part of an assembly with a fire-resistance rating (for example a mezzanine floor assembly). The basic requirement is that the penetrating item be tightly fitted, such as a pipe embedded in concrete or grouted into a concrete slab, or sealed with a system that prevents the passage of flame for the same time period expected of a closure in a fire separation.



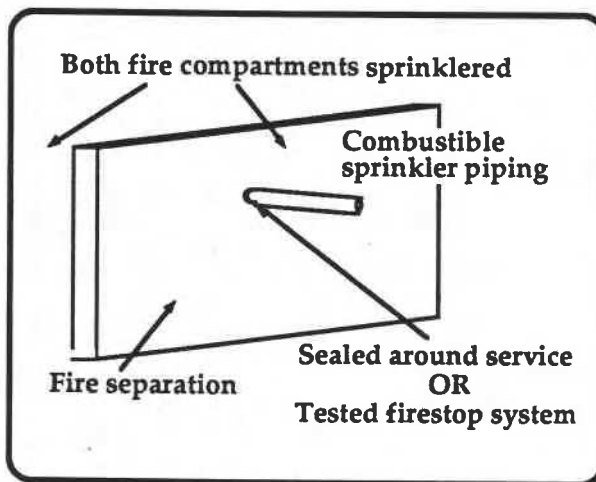
Fire stopping of service penetrations - 3.1.9.1.(2)

In the case of building services that penetrate a firewall, or a horizontal fire separation regulated by Article 3.2.1.2., the fire stop system has to be tested to the ULC standard and resist the passage of flame and rise of temperature for the same period of time as the fire-resistance rating of the fire separation.



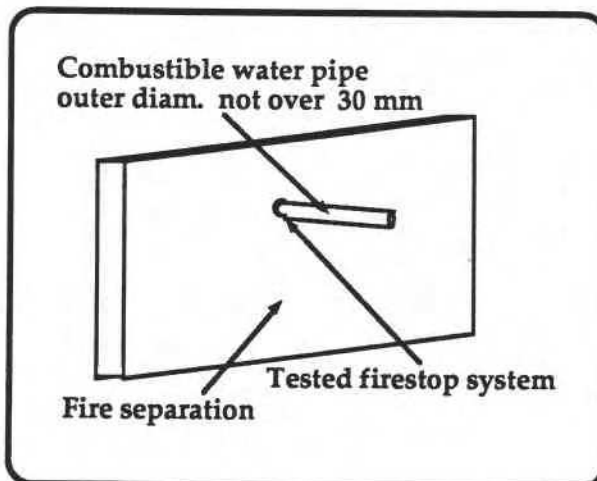
Penetration by wires and cables - 3.1.9.3.(3)

This Sentence allows the use of single conductor metal sheathed cables with combustible jacketing to penetrate a fire separation even though the diameter of the cable is more than 25 mm and the cable has not been incorporated in an assembly while it was tested for fire exposure.



Combustible piping penetrations - 3.1.9.4.(1)

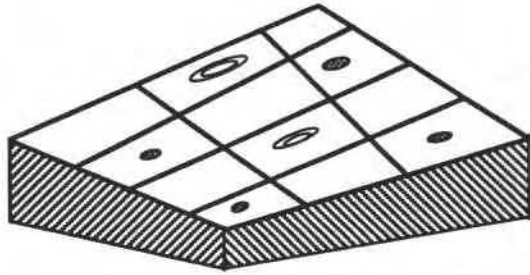
This Sentence permits combustible sprinkler piping to penetrate a fire separation, provided the compartments on each side are sprinklered. It should be noted that combustible sprinkler piping is permitted only within floor areas.



Combustible piping penetrations - 3.1.9.4.(2)

Combustible piping for water distribution is permitted to penetrate a fire separation. The outside diameter is limited to 30 mm, and the pipe has to meet the flammability criteria of Sentence 3.1.5.15.(1) — flame-spread rating not more than 25 and, in high buildings, smoke developed classification not more than 50. (The limits do not apply within walls and concrete floor slabs.)

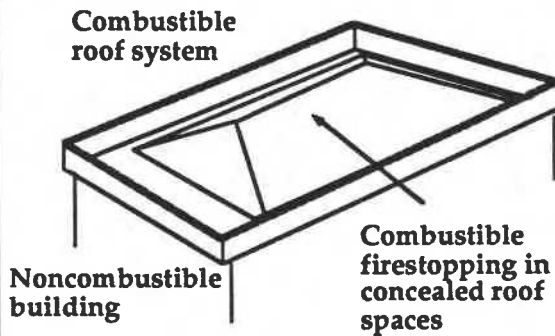
Openings through membrane ceilings - 3.1.9.5.



Openings through membrane ceiling system to Chapter 2 of Supplement

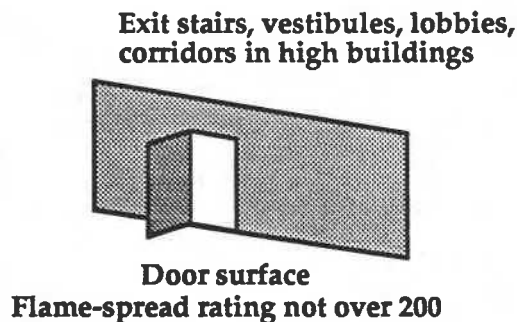
The requirements affecting the penetration of a membrane ceiling that forms part of a fire separation by openings for lighting fixtures and heating and ventilating diffusers and grilles have been relocated to Chapter 2 of the Supplement to the NBC 1990.

Fire stop materials - 3.1.11.7.(4)



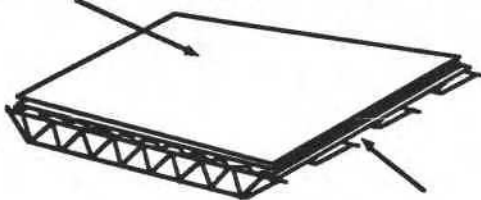
It is considered that no increased hazard to life will result from permitting the use of combustible fire stopping materials for the subdivision of concealed spaces in a combustible roof system built above a concrete roof slab on top of a noncombustible building.

Doors in high buildings - 3.1.13.7.(4)



Changes have been made to requirements affecting the flame spread rating of interior finish in exit facilities of high buildings to permit the use of door facing materials that have a flame spread rating up to 200. This value has been previously accepted for door facings in other areas of a building.

Combustible material above metal deck



Metal roof deck assembly

Test to CAN/ULC S126-M

Metal roof deck assemblies - 3.1.14.2.

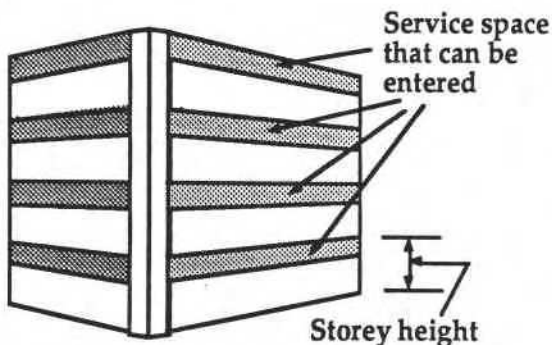
To clarify the situations in which it is necessary to consider the potential for spread of fire beneath a roof deck that supports combustible material, changes have been made that indicate the specific Sentences in Subsection 3.2.2. to which the requirements of Article 3.1.14.2. apply. The conditions under which testing to CAN/ULC S126-M is not required are also written more clearly.

Section 3.2

Size and occupancy requirements for fire safety

Size and occupancy requirements for fire safety - 3.2

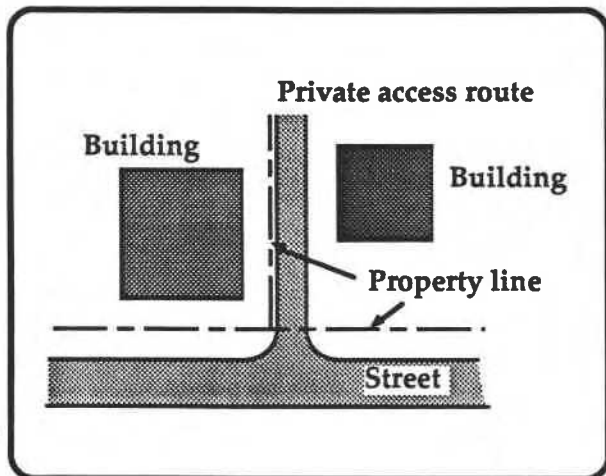
The major changes in this Section reflect additional categories of combustible framing for residential buildings, and treatment of institutional buildings with restricted egress, spatial separation reductions, emergency power and lighting and fire alarm systems.



Exceptions to building height in storeys - 3.2.1.1.(7)

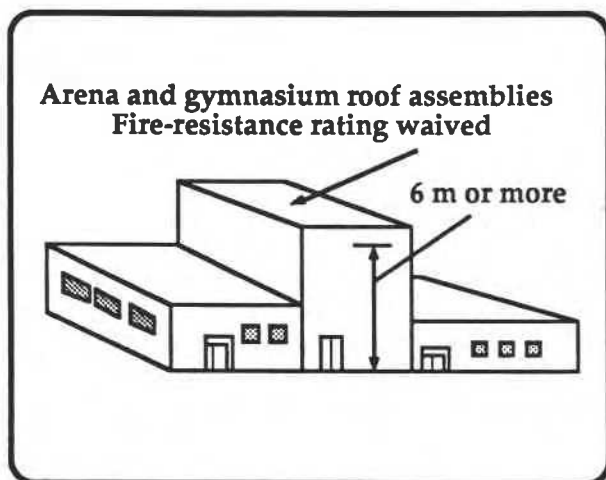
A number of requirements have been added to the Code to address the degree of control that is required for service spaces that are sufficiently large to permit the entry of service personnel to undertake maintenance and renovations. These spaces, which are also termed interstitial service spaces, are large enough to permit the storage of combustible materials. In the event of a fire within the service space or adjacent to the service space, persons working within the space could be trapped if precautions for their safety were not considered.

The requirements are located in various Articles of Part 3 so that they can be covered in the context of the subject area that is being considered. The major areas of concern involve sprinklering of the space, fire alarm and detection requirements and the provision of emergency lighting and directional signs to enable a person to vacate the space expeditiously.



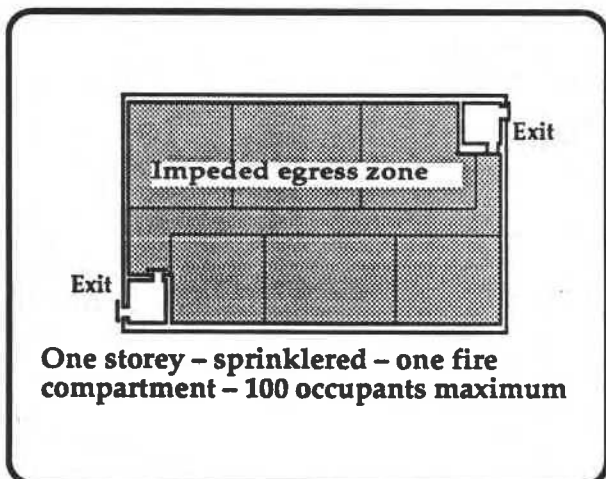
Streets - 3.2.2.6.(2)

The concept of permitting lesser Code requirements when a building faces more than one street has been modified so that the acceptance of an access route as a street applies only when a building is considered to face more than one street for the purposes of fire fighting access and the increase permitted in building area.



Rating waived for arena type building roof - 3.2.2.14.

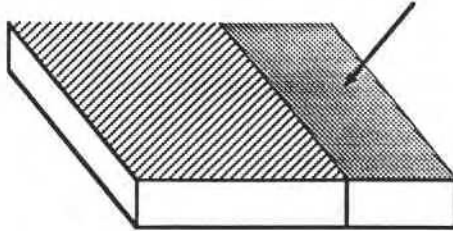
Roofs of arenas and similar spaces that are at least 6 m above the floor are accepted without a fire-resistance rating on the basis of the low fire load that is normal in this type of building. However, if the building is used for occasional trade shows or similar functions then Article 3.1.2.3. requires that the building be sprinklered if the area is more than 1500 m².



Buildings containing impeded egress zones - 3.2.2.15.

This Article sets out the requirements which permit a building with an impeded egress zone to be classified as other than Group B, Division 1 major occupancy. Some of the primary requirements are that the building be sprinklered, the occupant load be limited to 100 persons, the impeded egress zone not consist of more than one fire compartment and the building be not more than one storey in building height.

Sixty per cent increase in building area

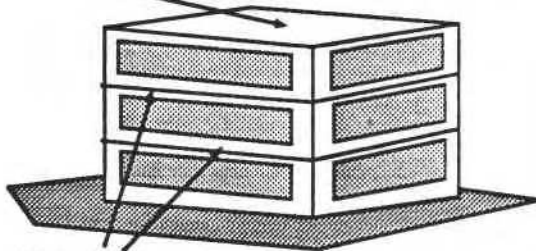


One storey residential building

Residential buildings, up to 3 storeys - Table 3.2.2.E.

The area for a one storey residential building in the category of residential buildings up to three storeys in building height has been increased so that the area bears the same relationship to the two and three storey buildings in this category that applies to most other building classifications. The essential rule is that the total gross area of all floors is constant.

800 square metres 3 storeys

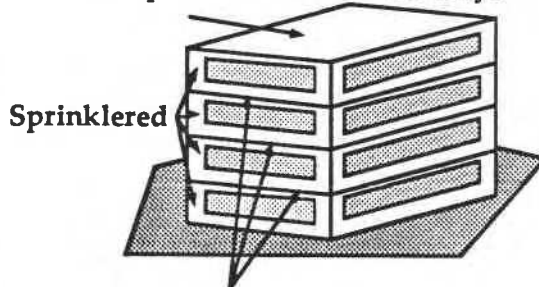


One hour fire-resistance rating

Residential buildings, up to 3 storeys, increased area - 3.2.2.35.

A new category of residential buildings up to three storeys in building height has been created to permit an increased area provided the primary structural assemblies have a one hour fire-resistance rating. The building can be of combustible or noncombustible construction.

1200 square metres 4 storeys

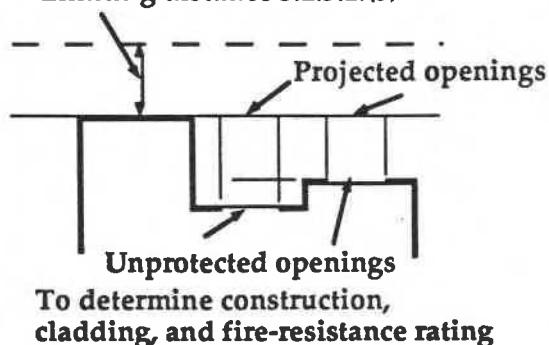


One hour fire-resistance rating

Residential buildings, 4 storeys, sprinklered - 3.2.2.36.

This new category of residential buildings applies to a four storey building of combustible construction, provided the building is sprinklered and the structural assemblies have a one hour fire-resistance rating.

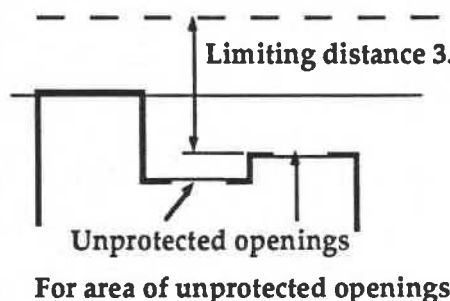
Limiting distance 3.2.3.1.(3)



Limiting distance, unprotected opening area - 3.2.3.1.(3)

The revisions to this Sentence clarify that the determination of the construction requirements for the portions of an exposing building face that surround the openings (if present) must be based on the calculation of limiting distance from a plane through the building face that is closest to the property line (or other imaginary line). Any openings in parts of the building face that are recessed must be projected on to this plane for the calculation of permissible area of unprotected openings.

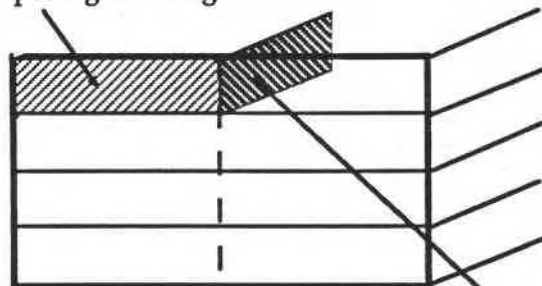
Limiting distance 3.2.3.1.(4)



Limiting distance, unprotected opening area - 3.2.3.1.(4)

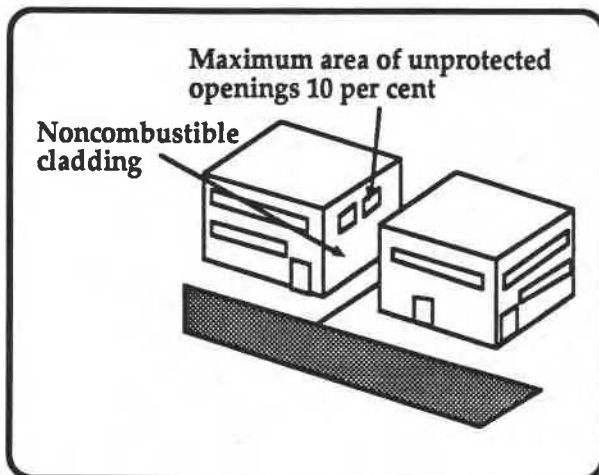
If an exposing building face is made up from several recessed portions and there are no unprotected openings in the part of the exposing building face that is closest to the property line, then a second calculation may be done to determine the area of unprotected openings in the next closest recessed portion as if the exposing building face were placed at that location. This will permit a slightly greater area of unprotected openings in comparison to that allowed in the NBC 1985. This second calculation does not apply to determining the type of construction required for the exposing building face.

Exposing building face



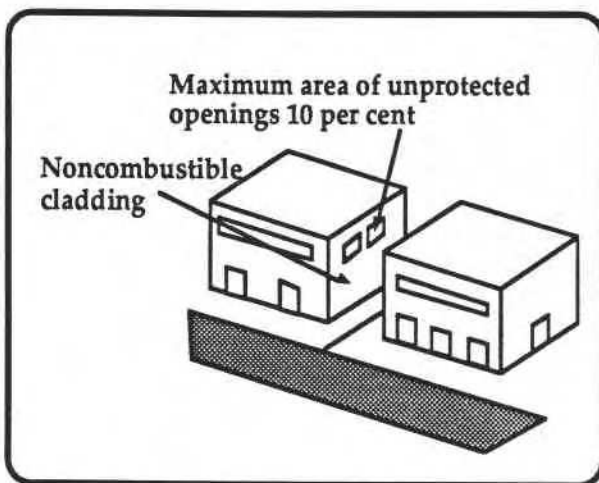
Area of exposing building face - 3.2.3.2.(1)(b)

In the NBC 1985, compartmentation of a building for the purpose of reducing the area of an exposing building face was only recognized for mercantile and high and medium hazard industrial buildings if the internal fire separations between the compartments had a fire-resistance rating of at least two hours. This revision allows the reduction in area of an exposing building face for this category of building provided the internal fire separations have at least the same fire-resistance rating as the floor assemblies, but with a lower limit of 45 minutes.



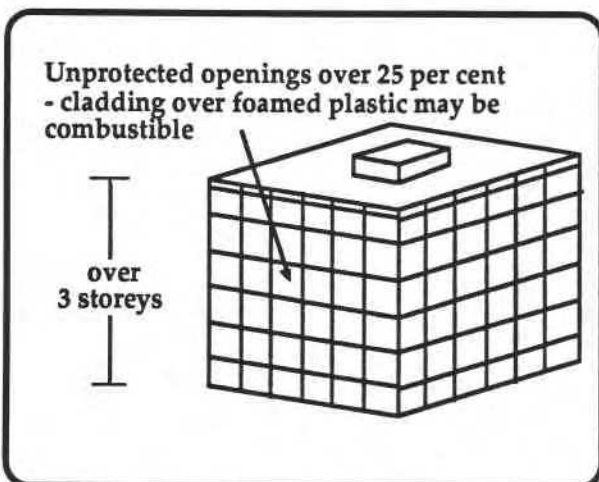
Construction of exposing building face - 3.2.3.7.(1)(a)

This change clarifies that an exposing building face of a building of Group A, B, C, D, or Group F, Division 3 major occupancy that is not permitted to have unprotected openings in excess of ten per cent must be constructed of noncombustible construction and that the exterior cladding assemblies must be constructed of noncombustible materials.



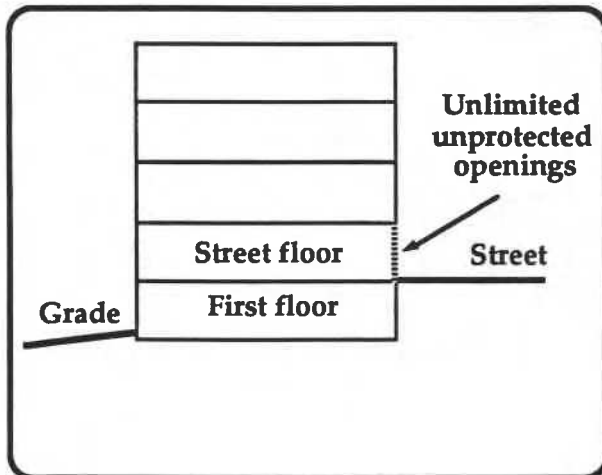
Construction of exposing building face - 3.2.3.7.(2)(a)

This change clarifies that an exposing building face of a building of Group E or Group F, Divisions 1 or 2 major occupancy that is not permitted to have unprotected openings in excess of ten per cent must be constructed of noncombustible construction and that the exterior cladding assemblies must be constructed of noncombustible materials.



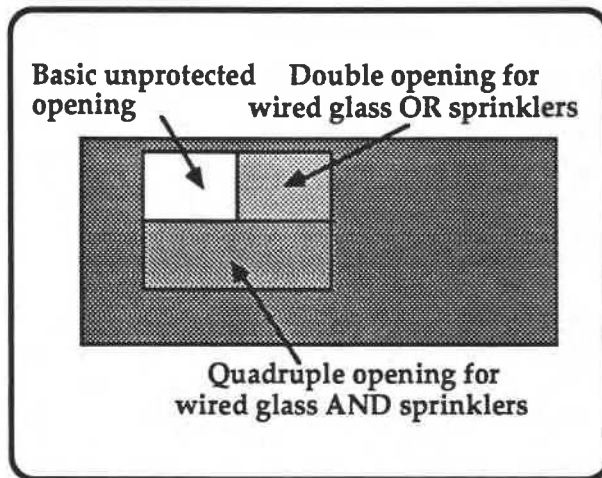
Construction of exposing building face - 3.2.3.7.(3)

A change to requirements affecting the protection of foamed plastic insulation on the exterior walls of buildings more than three storeys in building height, recognizes that combustible cladding systems that have been tested in accordance with Article 3.1.5.5. may be used even when the foamed plastic insulation would be covered by a material that is itself classed as combustible.



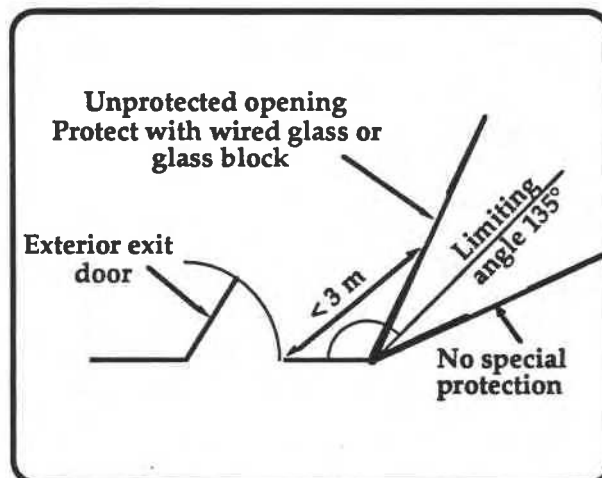
Unlimited unprotected openings - 3.2.3.9.(2)

In the NBC 1985 the permission to have unlimited openings in an exposing building face facing a street applied only to the first storey. In many situations the grade of a sloping site results in the storey at street level being other than the first storey. This change will permit unlimited openings in the storey that fronts on to a street regardless of its specific level within the building. On very large sites in which the building fronts onto different streets at different levels this requirement may be applied to different faces on more than one storey.



Increased openings permitted - A-3.2.3.11.

An Appendix note clarifies that openings in the face of a sprinklered building which are glazed with wired glass in fixed steel frames may be four times the area of openings in an unsprinklered building that are glazed with plain glass or with openable windows. The permission to double the percentage of unprotected openings with fixed wired glass or with sprinklers is intended to be cumulative.



Protection of exit facilities - 3.2.3.13.(3)

This revision clarifies that where the plane of a wall in which an exit door is located forms an angle of not less than 135° to a plane with an unprotected opening there is no need to require special protection of the opening, unlike the situation shown in the diagram, where opening protection is required.

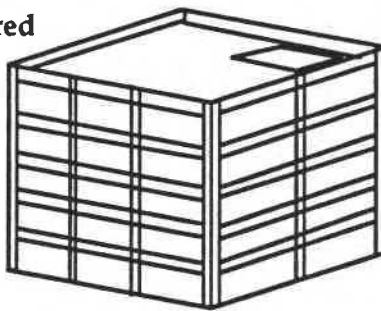
Additional cases requiring fire alarm system

- contained use areas
- impeded egress zone
- child care facilities with occupant load over 40

Requirement for a fire alarm system - 3.2.4.1.(1)

Regardless of building size and occupant load, a fire alarm and detection system is required in any building that has a contained use area or an impeded egress zone, in order to warn security personnel when security devices must be released to permit evacuation. A fire alarm and detection system is required in any child care facility, including a day care facility, in which the occupant load exceeds 40. A day care facility used for very young children and classified by the authority having jurisdiction as Group B, Division 2, requires a fire alarm system when the occupant load exceeds 10.

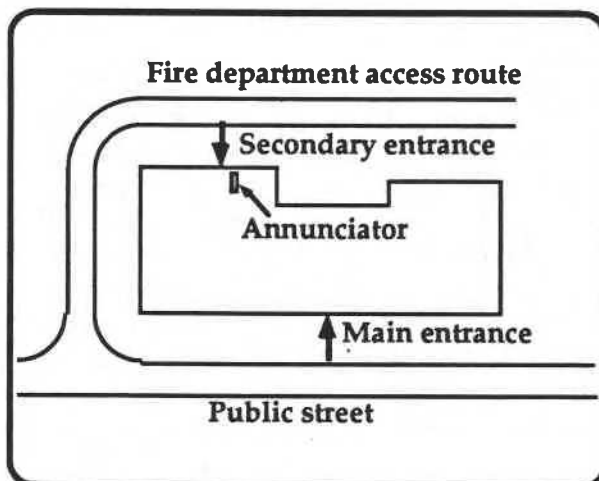
No fire alarm system required



Open air parking garage

Waiver of fire alarm system - 3.2.4.1.(4)

The requirement for a fire alarm and detection system is waived in an open air storage garage in a building conforming to Article 3.2.2.60. Other occupancies are not permitted in the building.



Annunciator and zone indication - 3.2.4.8.(1)

Changes have been made to the requirements for the location of a fire alarm annunciator panel to give greater freedom to meet the needs of the local fire department in responding to a call to the building. The annunciator panel can be located near a building entrance that faces a street or an access route for fire department vehicles. The local fire department should be consulted before determining the location of the annunciator panel.

Single zone fire alarm system



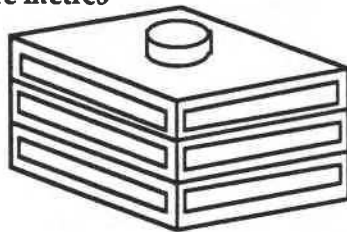
**No annunciator
BUT trouble signal required**

**Annunciator and zone indication -
3.2.4.8.(3)**

There is no longer a requirement to zone a building that has a gross area of less than 2 000 m², thus no annunciator panel is needed. To compensate for the lack of indication of problems with the fire alarm system, a visual and audible trouble signal must be installed near the main entrance of the building. This requirement for a trouble signal will also apply to a small building in which only one zone would be required.

**TOTAL area of all storeys not more
than 2,000 square metres**

**Not more than
3 storeys**

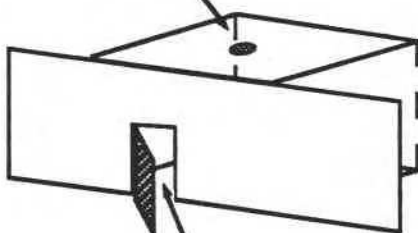


No annunciator required

**Annunciator and zone indication -
3.2.4.8.(4)**

In the case of a building that is not more than three storeys in building height and has a gross area of not more than 2 000 m² for all storeys, the requirement to zone the building and provide a fire alarm annunciator has been waived.

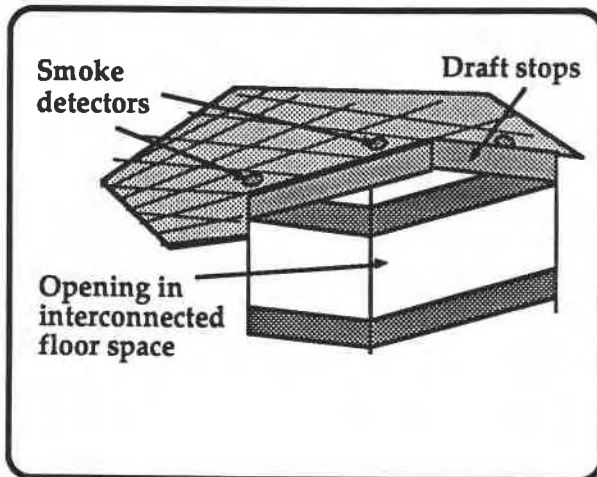
Fire detector



Janitor's room

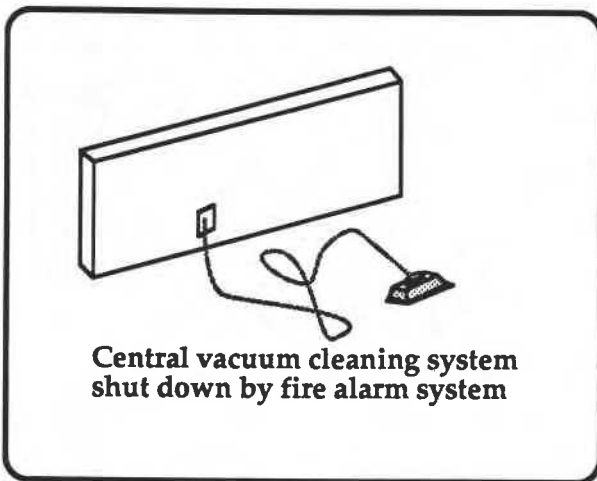
Fire detectors - 3.2.4.10.(2)(c)

A janitor's room is no longer classified as a service room and has separate requirements to address the fire separation around the room. It is clarified that, whenever a fire alarm system is installed in a building, a fire detector is required in a janitor's room.



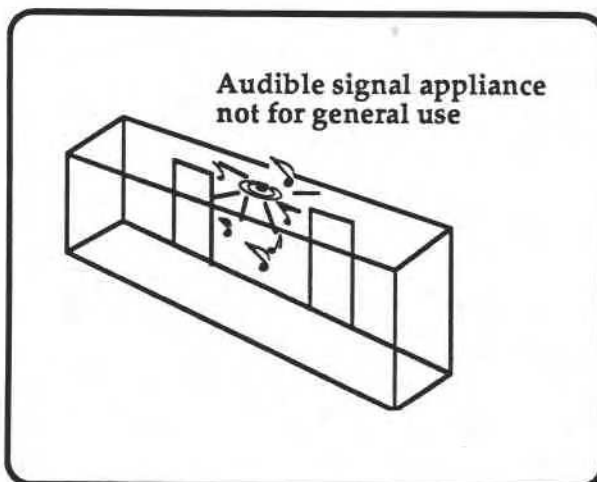
Smoke detectors - 3.2.4.12.(1)(f)

The requirements for smoke detectors near the draft stops around openings through floor assemblies in interconnected floor space have been relocated to the general requirements for fire alarm and detection systems, to make it simpler for a designer of the fire alarm system to locate the relevant requirements.



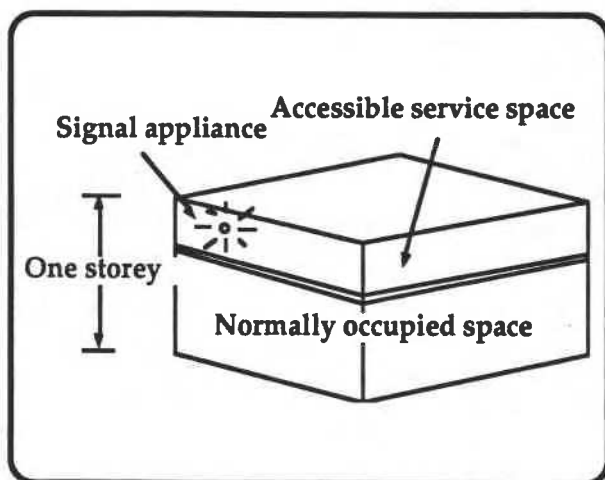
Vacuum cleaning system shutdown - 3.2.4.14.

To limit the potential for a central vacuum cleaning system to circulate smoke throughout a building, the vacuum cleaning system must shut down upon actuation of the fire alarm system.



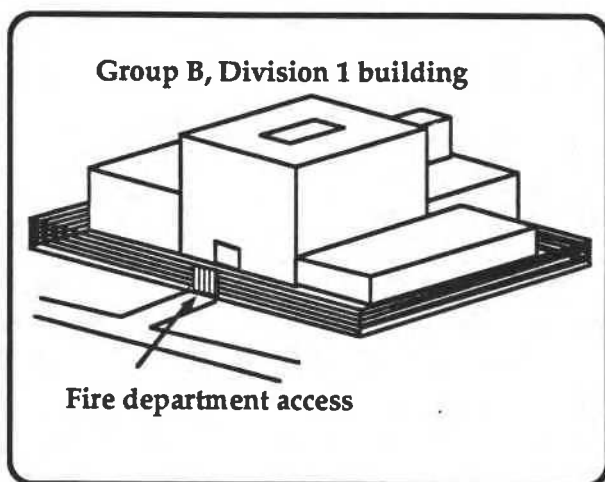
Alert and alarm systems - 3.2.4.18.(4)

Although audible signal appliances that form part of a fire alarm or voice communication system may be used for paging, these appliances must not be used for other purposes including the playing of background music or noise. The annoyance to occupants caused by the continuous use of these systems can lead to the muffling or disconnection of the audible signal appliance. Once this has been done it becomes very difficult to hear the alarm signals in an emergency.



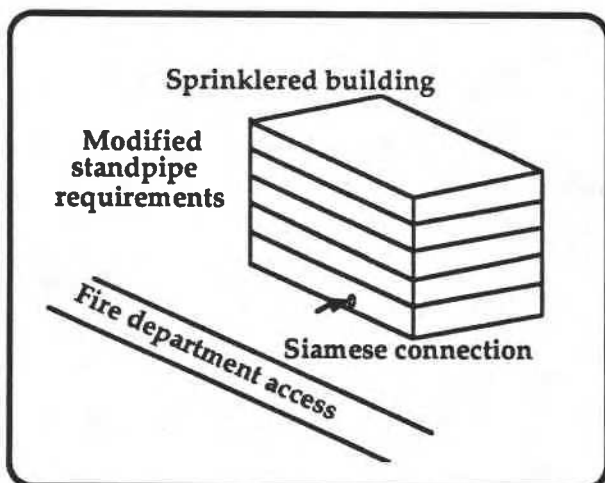
Audibility of alarm systems - 3.2.4.19.(2)

A person working in a concealed service space would not be aware of an emergency in the building if there were no fire alarm signals audible in the concealed space. This Sentence requires audible appliances, connected to the fire alarm system, in all concealed service spaces which are accessible to service personnel.



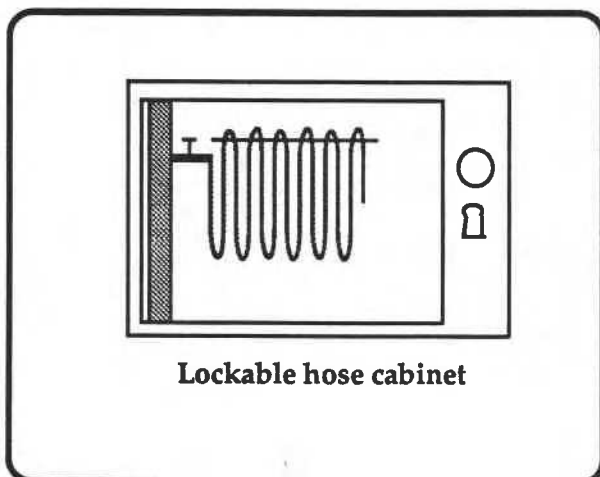
Access routes - 3.2.5.5.(1)(b)

The normal requirement that a fire department can freely enter a building for the purposes of controlling and suppressing fires is not compatible with the security requirements of a Group B, Division 1 building. Accordingly, the general requirements for access routes for fire department vehicles are waived for all purposes, except for a route leading to the principal entrance of the building.



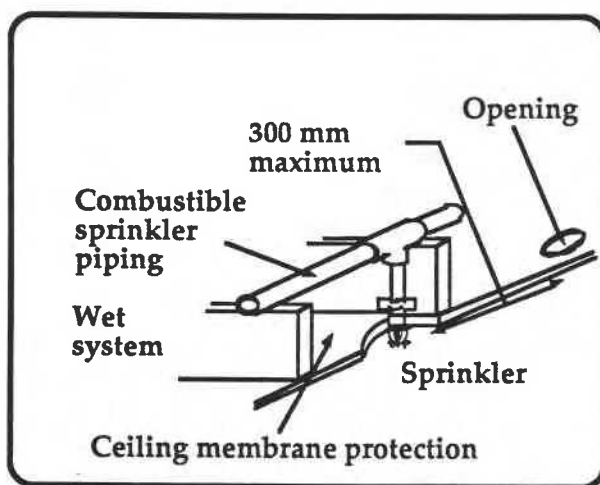
Standpipe and hose system design - 3.2.5.10.(6)

In lieu of the design requirements of NFPA 14, a modified design of a standpipe system for a sprinklered building is available by applying this Sentence. The principal requirements are that the sprinkler system water supply, including inside and outside hose allowance, is fully met and that a fire department siamese connection is provided together with pumping capability and water from outside sources to meet water supply and pressure demands of both sprinkler and standpipe systems.



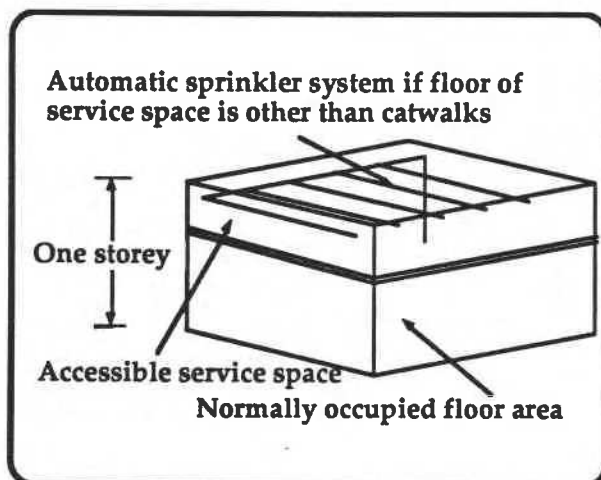
Hose stations and cabinets - 3.2.5.11.(5)

Because of the potential misuse of hose systems by persons under confinement, it is permissible to locate the hose cabinets in secure areas or else lock the cabinets against entry, provided keys are available at security control locations.



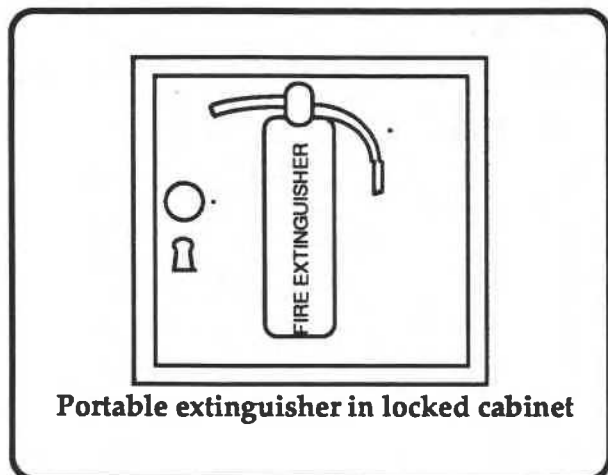
Combustible sprinkler piping - 3.2.5.14.

In addition to its acceptance through NFPA 13, the NBC specifically permits the use of combustable sprinkler piping in any building. Some limits are placed on its use. It must be used only in a wet system and is restricted to floor areas, therefore it must not be installed in vertical service spaces. The combustable piping is acceptable for residential and light hazard occupancies. The system piping must be protected from the sprinklered space and from other fire compartments by one of a variety of protective membranes.



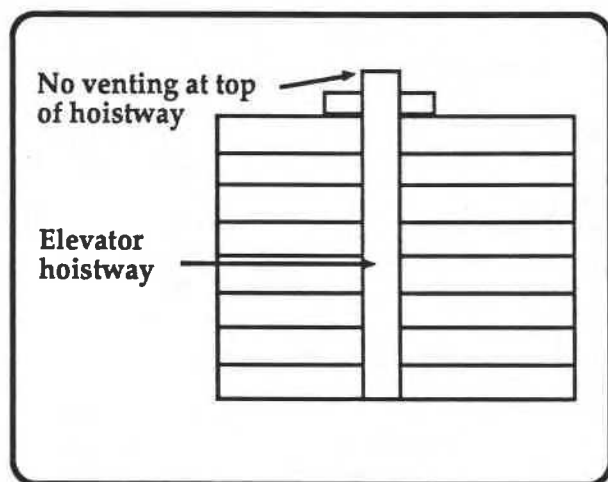
Sprinklered service space - 3.2.5.15.

If an accessible service space has flooring in it, other than catwalks, then the space must be sprinklered. This applies in addition to any sprinkler requirements for the space below the ceiling. Waterflow detecting devices connected to the fire alarm system are required, with each detecting device serving not more than one storey.



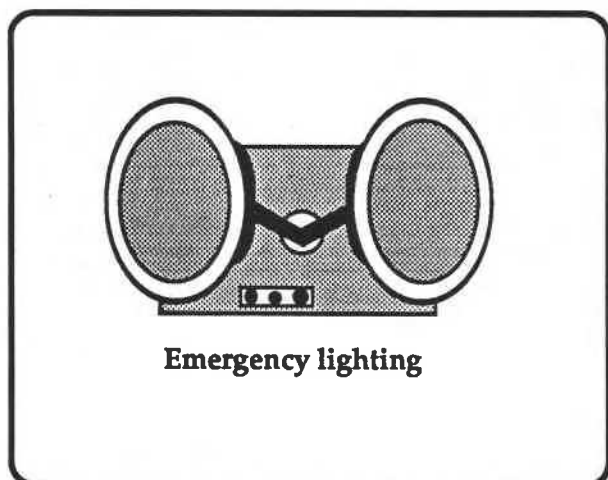
Portable fire extinguishers - 3.2.5.17.(2)

In the same manner that hose systems are not made available to the occupants of a Group B, Division 1 occupancy other than security personnel, portable fire extinguishers are also permitted to be located in secure areas or locked cabinets.



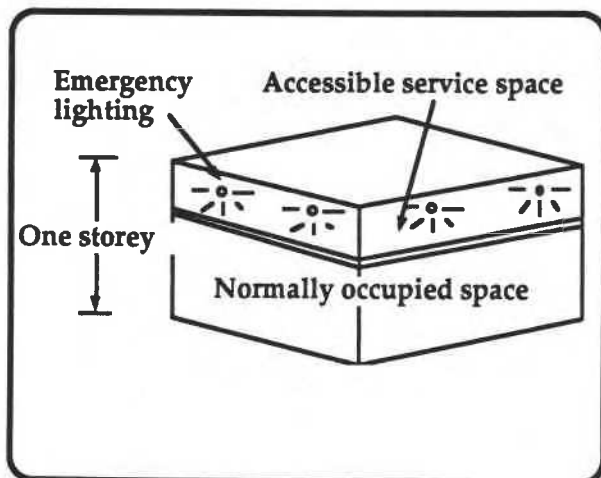
Venting to aid fire fighting - 3.2.6.10.(5)

In past codes it was permissible to vent the top of an elevator shaft. This practice is now prohibited for high buildings. In the event of a fire an opening at the top of an elevator shaft could turn the shaft into a chimney and draw smoke in from a fire floor. The smoke would be a hazard to anyone using the elevator shaft for emergency purposes, including fire fighters and persons with disabilities who might be evacuated by the elevator system.



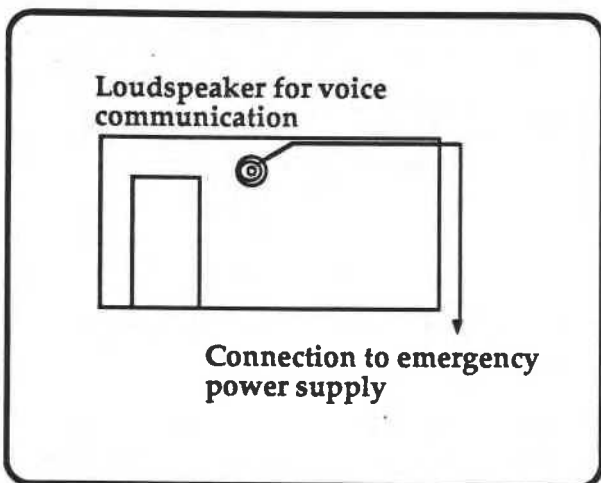
Emergency lighting - 3.2.7.3.(1)

The requirements for emergency lighting have been fully revised. The presence or absence of a fire alarm system or natural lighting are no longer criteria for whether emergency lighting is required. The requirements are based upon the characteristics of the space and the need for persons to be able to recognize the evacuation routes within the space.



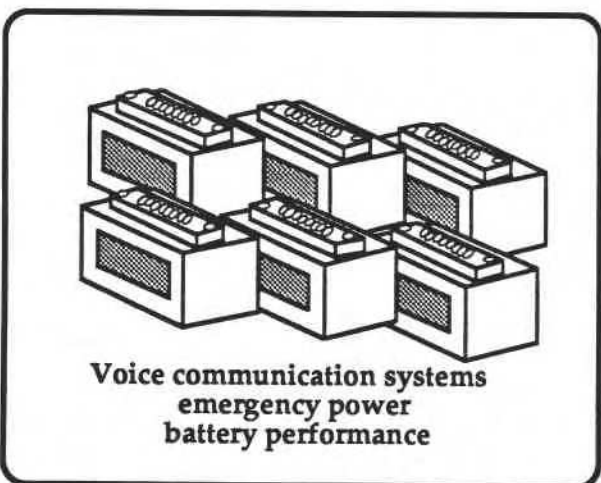
Emergency lighting - 3.2.7.3.(2)

Concealed service spaces that are accessible for service personnel must be equipped with emergency lighting.



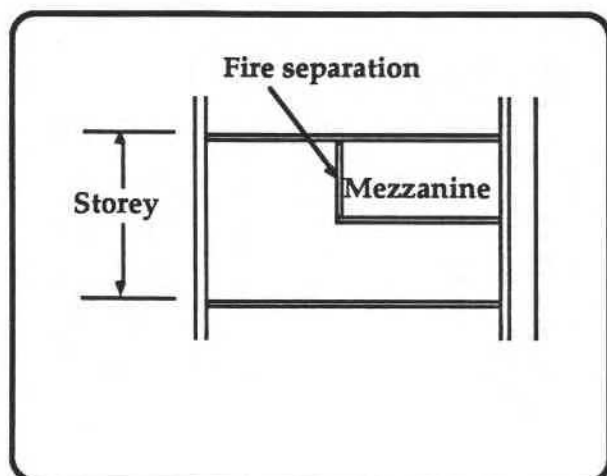
Emergency power supply - 3.2.7.8.(5)

A clarification of the requirement to provide emergency power for the operation of voice communication systems has been included. A voice communication system is expected to be operational for not less than two hours.



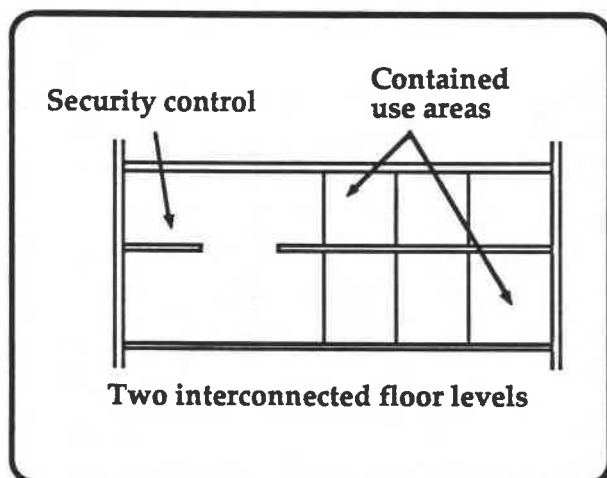
Emergency power supply - 3.2.7.8.(7)

If batteries are used as a source of emergency power for a voice communication system, the sizing of the battery capacity is based on the assumption that the system will not be operated continuously during a period of two hours. Full operation for thirty minutes during the two hour period is the criteria for determining battery capacity.



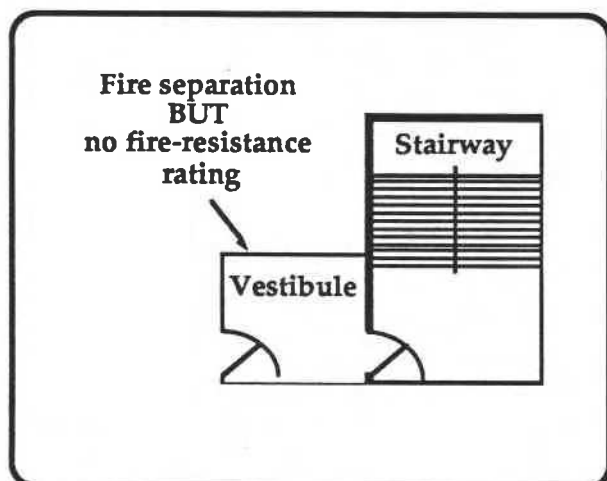
Mezzanines - 3.2.8.1.(1)

It is clarified that a mezzanine floor assembly can terminate at a vertical fire separation that extends from the mezzanine floor assembly to the underside of the floor or roof assembly above. It is not required that the fire separation be continued below the mezzanine floor assembly to the top of the floor beneath. The space that is enclosed may be defined as a mezzanine, but will have to meet other Code requirements for enclosed mezzanine spaces. These may affect the height of the building if the enclosed space exceeds ten per cent of the area of the storey in which it is located.



Exceptions to special protection - 3.2.8.2.(4)

In a building used for correctional services a common arrangement is to have two floor levels interconnected, with a common security station able to overlook both levels. This arrangement is permitted without all of the special requirements applying to interconnected floor space, provided not more than two storeys are interconnected.

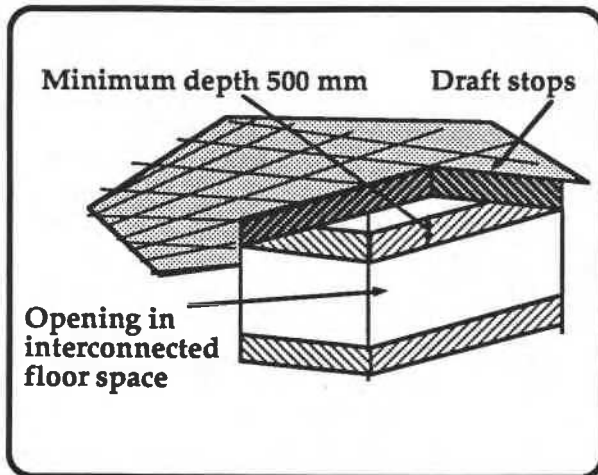


Vestibules - 3.2.8.4.(1)(b)

The critical element in sizing a vestibule is the distance between opposite doors, therefore a dimension of 1.8 m has been left as the sole criterion. The width of the vestibule will depend on the need for occupant passage and general operational needs.

The walls between the vestibule and the rest of the floor area are still required to be fire separations, but are no longer required to have a fire-resistance rating.

The vestibule is required to limit the spread of smoke into the exit stairshaft.



Draft stops - 3.2.8.7.

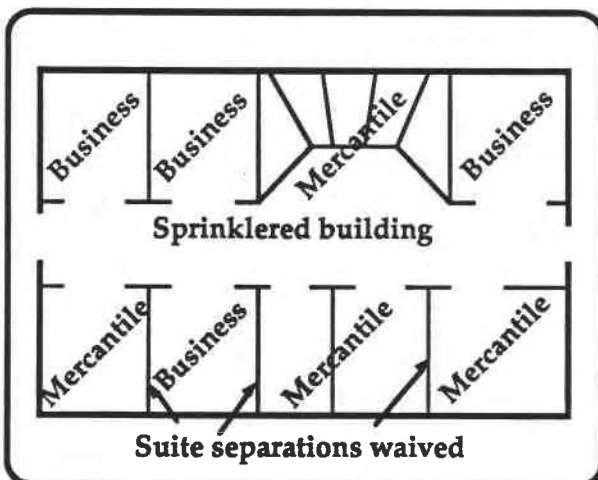
The requirements for draft stops around the perimeter of an opening through a floor assembly that forms part of an interconnected floor space have been specifically included in the Code. The requirement for close spaced sprinklers in the NBC 1985 has been deleted. The requirements for these sprinklers are adequately stated in NFPA 13.

Section 3.3

Safety requirements within floor areas

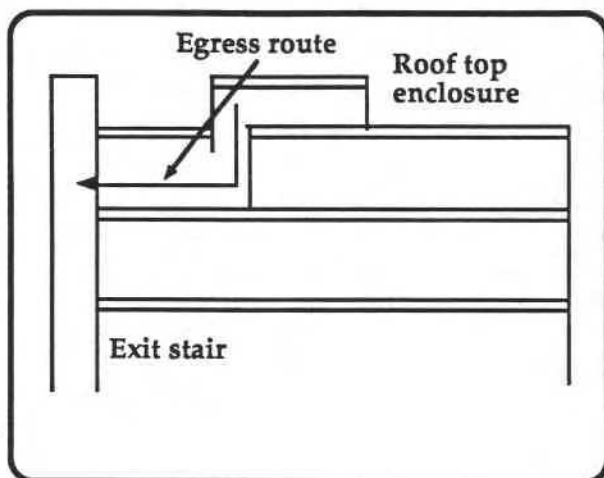
Section 3.3

Section 3.3 is concerned with the requirements for safety within floor areas. There are no longer specific Subsections for mercantile occupancies or business and personal services occupancies. The requirements that were previously contained in those Subsections have been relocated or combined with other more general requirements.



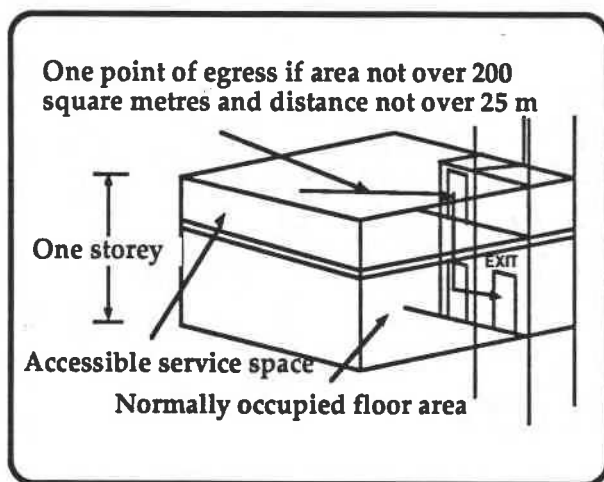
Separation of suites - 3.3.1.1.(2)

Suites in business and personal services occupancies are not required to be separated from one another by fire separations, even in an unsprinklered building. This change will permit the omission of fire separations between mercantile suites and business and personal services suites in any combination in a sprinklered building.



Means of egress - 3.3.1.3.(5) and (6)

Most roof top enclosures are used for service rooms and similar functions. It is not permissible to enter an exit directly from a service room and it would be contrary to good practice for a door from the top of an exit stair shaft to open into a service room, which could have openings to the outdoors. These openings could transform the stair shaft into a chimney, if the intervening door were to be opened, and draw in smoke from an area containing a fire. Roof top enclosures, depending on the size, must have one or more access to exits, and these are permitted to lead to an exit on the storey below.



Means of egress - 3.3.1.3.(7)

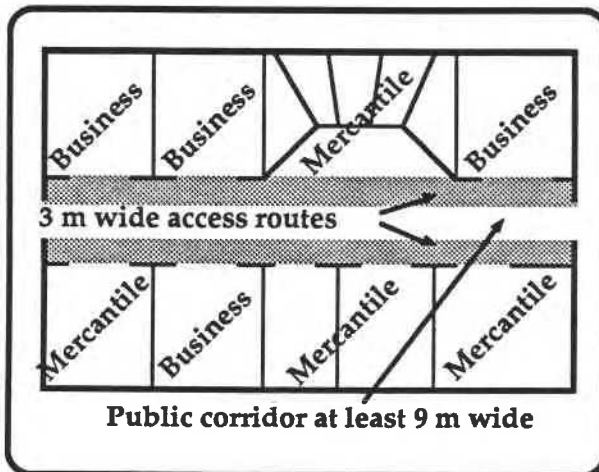
In a concealed space which is sufficiently large to permit the entry of service personnel, means of evacuation must be provided in case of an emergency. The requirement is for two points of egress if the space exceeds 200 m² in area and the distance to any point of egress exceeds 25 m.

Barrier free egress protection

- Storeys above and below first storey
- Provision of zones

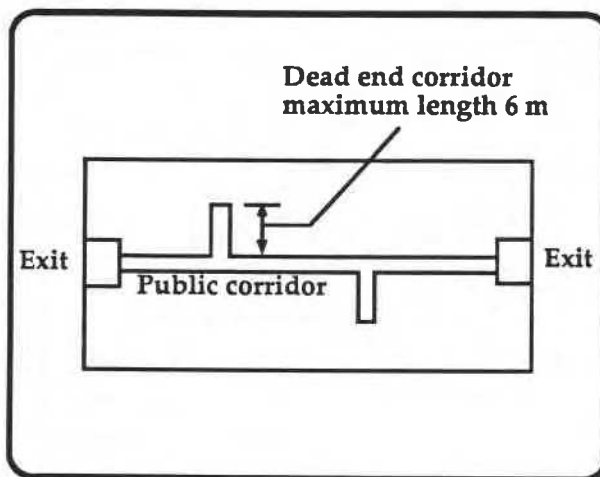
Protection of floor areas with barrier free path of travel - 3.3.1.7.

Some modifications have been made to requirements that affect the ability of persons with physical disabilities to reach a point from which they can be evacuated in an emergency. The requirements now apply to storeys on which a barrier free path of travel is provided both above and below the first storey. One option for protection is the provision of two zones in a floor area, either of which can accommodate persons with physical disabilities, and which are separated from one another by fire separations.



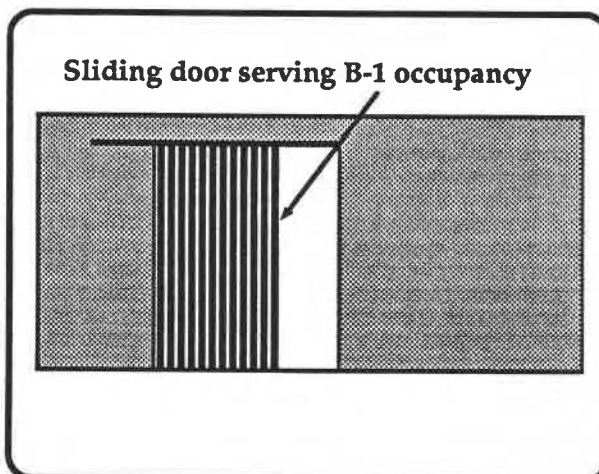
Public corridors - 3.3.1.9.(6)

In wide public corridors used in shopping centres and similar places of commerce, the space in the corridors is frequently used for displays and other merchandising methods to attract large numbers of people into these spaces. In order to maintain a reasonable ability to evacuate the building in an emergency, a clear space for pedestrian travel not less than 3 m wide must be placed along each side of the public corridor adjacent to the rooms and suites that face onto the public corridor.



Dead end corridors - 3.3.1.9.(7)

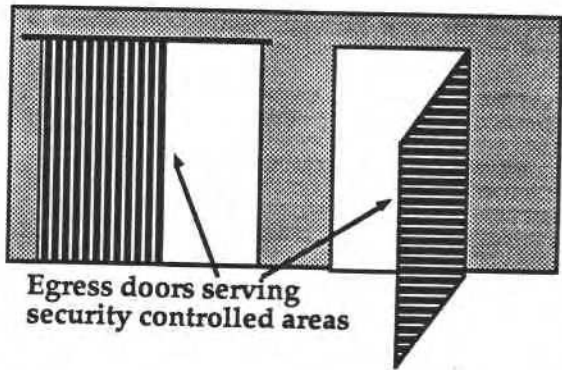
Previous requirements for dead end corridors were located in specific occupancy Subsections and varied between different occupancies. This change permits dead end corridors up to 6 m long and relaxes some of the previous requirements, particularly in residential buildings. In most other buildings there will be little effect on floor plan arrangements compared to those which were permitted by previous Codes.



Sliding doors - 3.3.1.11.(2)

The specialized needs in Group B, Division 1 occupancies require the ability to use sliding doors that do not break away when pressure is applied. This Sentence recognizes that other safeguards included in the NBC 1990 for these special occupancies, justify the use of special sliding doors for security purposes.

Special control hardware permitted



Egress doors serving security controlled areas

Sliding doors - 3.3.1.12.(2)

The requirements in this Sentence apply to doors secured against egress by occupants under detention and recognize the need to release the doors in an emergency by security personnel. Both remote and manual release methods are covered.

Stairs

Dimensions, guards, handrails

Ramps

Stairs and ramps - 3.3.1.13.(1)

The primary safety problems affecting the use of stairs and ramps are encountered in everyday activities. Thus there is no reason to have different standards for stairs depending on their function in emergencies. Geometrical and protection requirements for stairs are contained in Section 3.4 and, to avoid repetition, these are directly referenced for all other stairs in the building.

Stairs

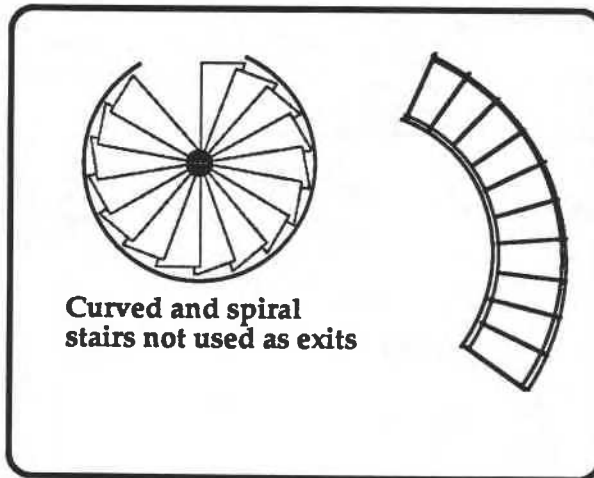
Dimensions, guards, handrails

Ramps

WAIVED FOR SERVICE ROOMS, SERVICE SPACES & INDUSTRIAL

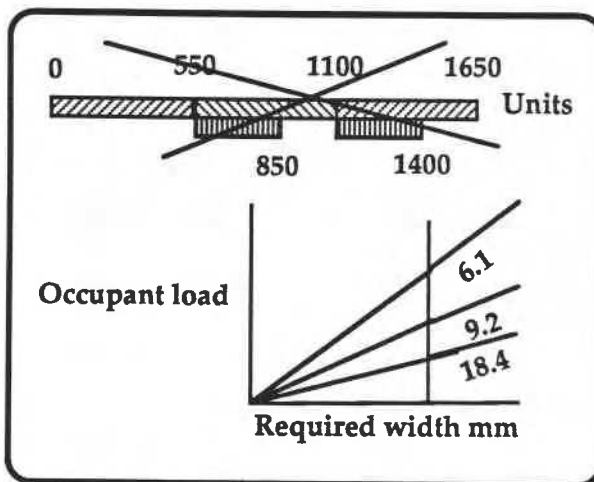
Stairs and ramps - 3.3.1.13.(2)

This Sentence waives the requirements in Sentence 3.3.1.13.(1) for ramps and stairs that serve service rooms and service spaces and industrial occupancies, provided the ramps and stairs are intended only for occasional use for servicing equipment and machinery.



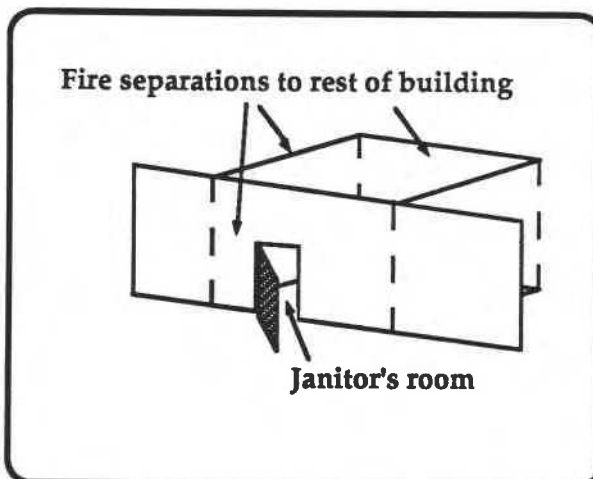
Curved or spiral stairs - 3.3.1.15.

The NBC 1990 will permit the use of spiral and tightly curved stairs that are not used in exits, provided that the tread sizes and rise values are adequate for general safety during their use.



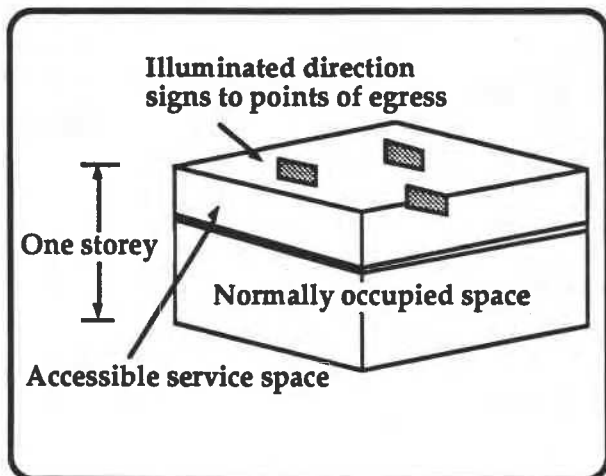
Capacity of access to exits - 3.3.1.16.

The concept of using units of exit width to measure the capacity of means of egress during evacuation has been replaced by a new method that uses minimum widths supplemented by incremental values for the number of persons that will use the facility in an emergency. This will allow a more rational design of egress facilities and will not penalize the designer when the occupant load is marginally above that permitted by the minimum width value. The required width per person varies depending upon the type of facility.



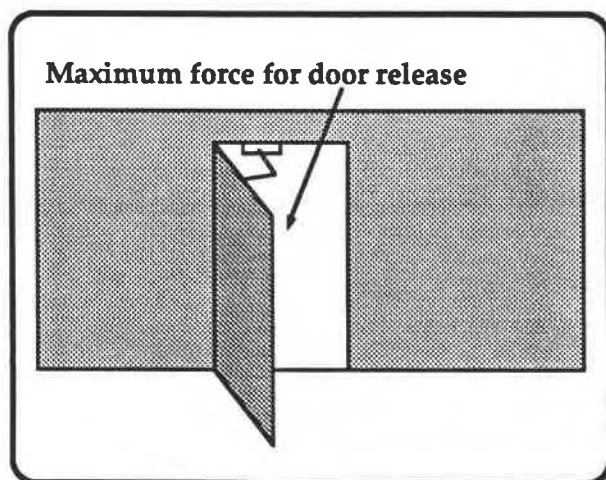
Janitor's room - 3.3.1.20.

Previously janitor's rooms were classed as service rooms. The intent was that they be separated from the remainder of the building to minimize the potential hazard from materials stored in those rooms. Because of changes in the requirements affecting service rooms the requirements for janitor's rooms are now spelled out specifically.



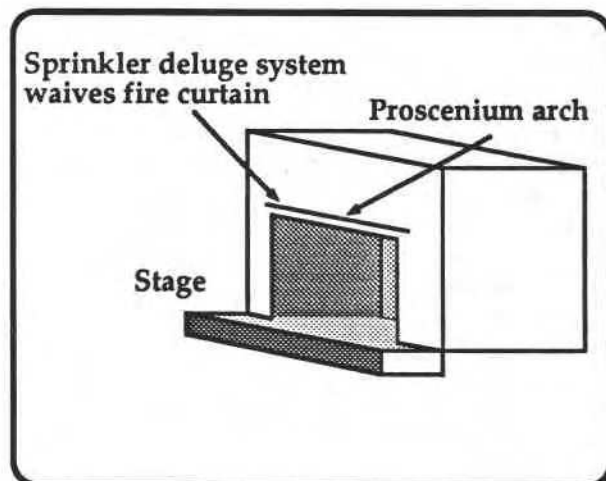
Signs in service spaces - 3.3.1.22.

In large service spaces that can be entered by service personnel a person not familiar with the space could become lost in an emergency and be unable to evacuate in a short period of time. Illuminated signs are required in these spaces to direct a person to the points of egress.



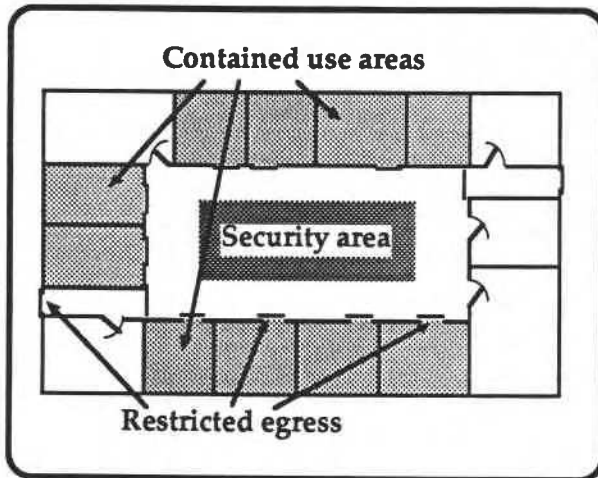
Doors - 3.3.1.6.

With the increasing use of buildings by persons with disabilities as a result of improving barrier free access, the force required to operate door opening hardware has been addressed. Requirements in Sections 3.1 to 3.6 are revised so that the maximum values permitted for the force to release a door are in agreement with those in Section 3.7.



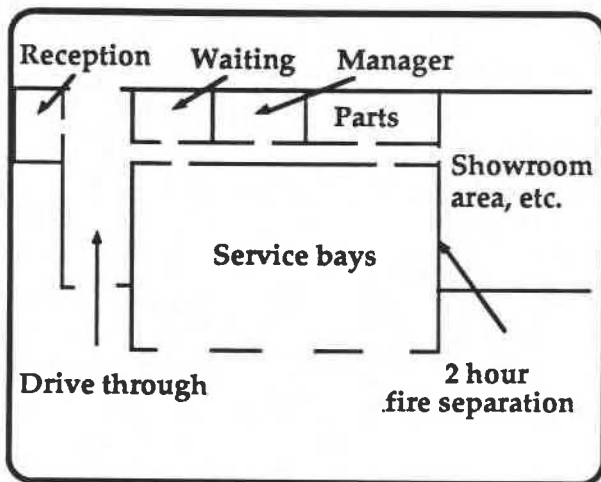
Stages for theatrical performances - 3.3.2.13.(3)(a)

With the gradual replacement of many asbestos containing fire curtains that are used to close off a proscenium archway in case of fire, alternative solutions have been allowed. One of these solutions is the installation of a sprinkler deluge system to protect the opening below the proscenium arch.



Contained use areas - 3.3.3.9.

Contained use areas are primarily encountered in correctional service facilities, but may be found in other buildings with different major occupancy classifications. The requirements of Article 3.3.3.9. address the concern that persons who are detained cannot evacuate the building on their own volition and require the release of security devices by other persons. The requirements can be integrated into any other building design relatively easily.



Repair garage separation - 3.3.5.6.

Most repair garages have customer waiting space and other customer related facilities directly adjacent to the service area. Other related spaces, such as office space for the service manager and parts storage areas, directly serve the repair operations. Instead of having to provide a two hour fire separation between the repair portion and these other spaces, it is now permissible to consider all these spaces as part of the repair garage and separate the total repair facility from other parts of the building by a two hour fire separation.

Section 3.4

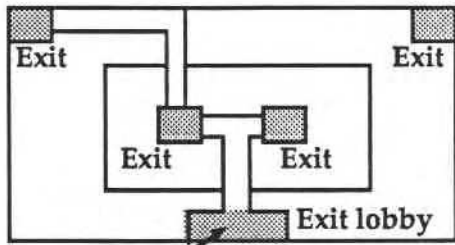
Requirements for exits

Requirements for exits - Section 3.4

Most of the changes in this Section lessen the severity of previous requirements but they also cover special security arrangements for buildings where persons do not have the freedom to evacuate voluntarily.

Separation of exits - 3.4.1.2.(2)

Where more than two exits are provided from a floor area, some of these exits may converge, but the cumulative capacity of any one converged exit can not be more than fifty per cent of the total required exit capacity from the floor area.



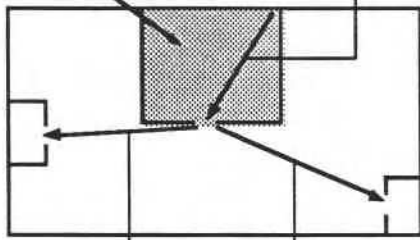
Not more than 50 % of exit capacity

Travel distance - 3.4.2.4.(2)

The measurement of travel distance is permitted to be done in two stages where a room or suite is separated from the remainder of the floor area by a rated fire separation. Part of the distance is measured within the room or suite and the other part is measured from the door of the room or suite to the exit. This change will permit the same type of calculation to be performed in the case of a sprinklered building, in which the fire separation around the room or suite does not have a fire-resistance rating.

Room either separated or in sprinklered floor area

Room travel distance

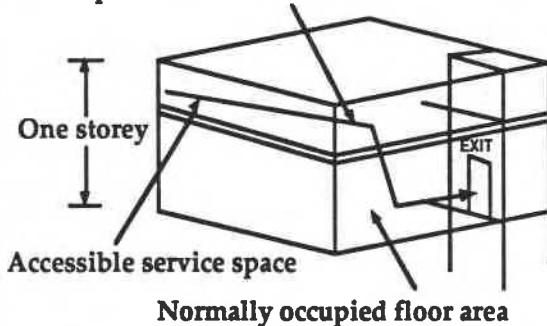


Access to exit travel distance

Travel distance - 3.4.2.4.(3)

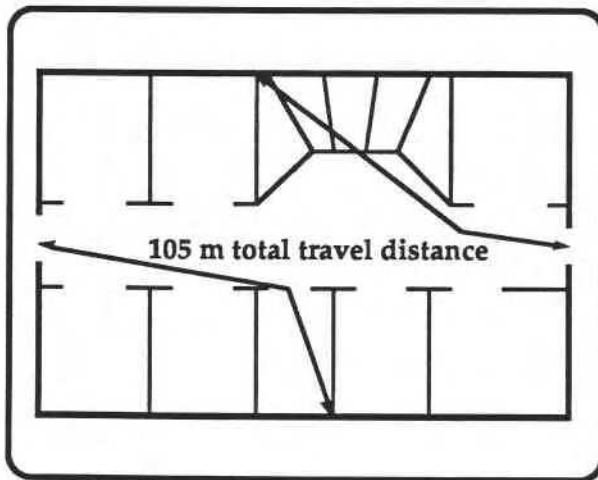
The total travel distance to an exit from any point in a service space large enough to permit the entry of service personnel is not permitted to exceed 50 m.

Travel distance to exit from any point not more than 50 m



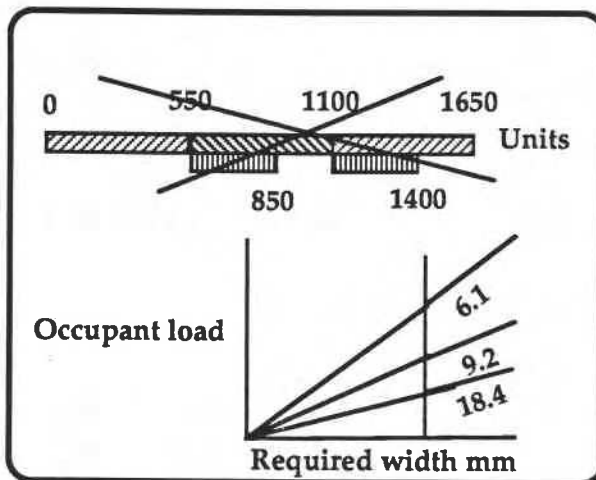
Accessible service space

Normally occupied floor area



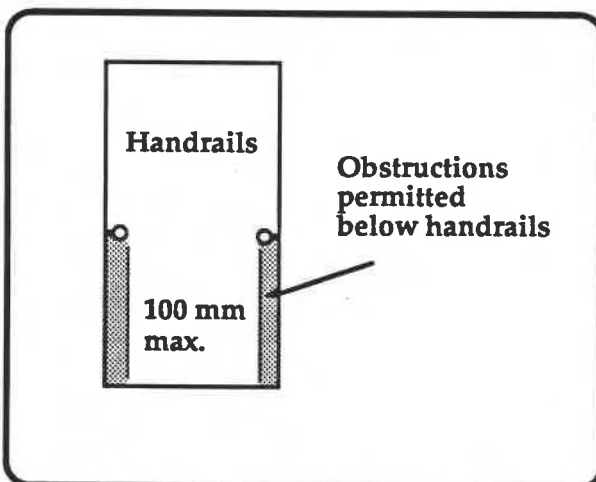
Location of exits - 3.4.2.5.(1)(d)

In addition to relocating requirements governing the design of wide public corridors in mercantile and similar occupancies, the measurement of travel distance has been changed. Instead of measuring 60 m within the public corridor and an additional distance of 45 m within the sprinklered spaces adjacent to the public corridor, the new procedure permits a total distance of 105 m measured from any space within the floor area including the corridor to the nearest exit. This will permit increased design freedom in these facilities.



Exit capacity - 3.4.3.5.

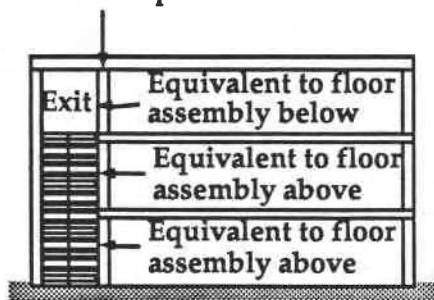
The measurement of exit capacity is no longer determined in terms of units of exit width but has been revised to allow increments of width for each person using the exit facility. Certain minimum values apply in buildings that have a low occupant load, to ensure a reasonable width for egress. The values are similar to those in access to exit facilities.



Exit width reduction - 3.4.3.6.(4)

Since the space below handrails does not contribute to the effective width of a means of egress, this space is permitted to contain obstructions, provided the overall obstruction into the egress path does not exceed 100 mm. This is the same value permitted for the intrusion of handrails into a means of egress.

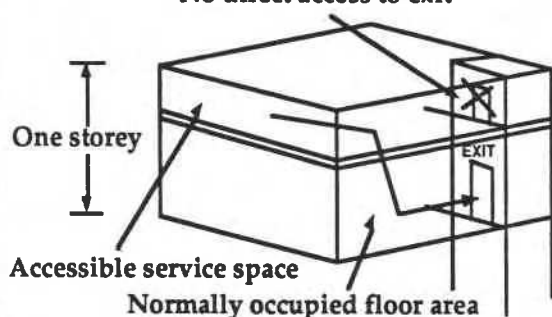
Exit fire separations



Fire-resistance rating of exit separations - 3.4.4.1.(1)

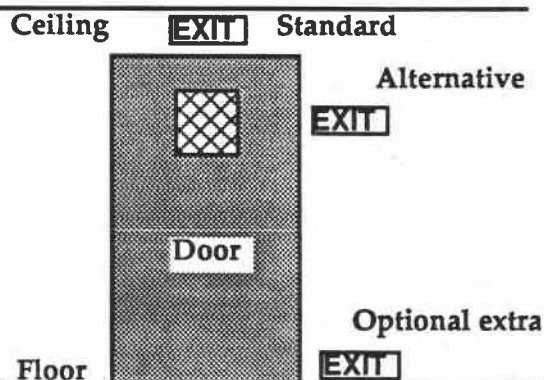
Some minor revisions have been made to the requirements affecting separation of exits from adjacent floor areas. In some low buildings the wording of the previous Code would have required more stringent fire separation values than were intended.

No direct access to exit



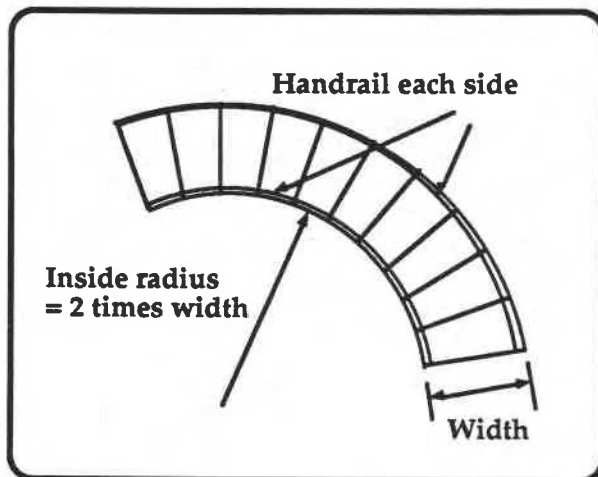
Integrity of exits - 3.4.4.4.(8)

In the same manner as direct movement from a service room into an exit is prohibited, this requirement will prevent the direct connection of a service space to an exit. The service spaces involved are those large enough to permit the entry of service personnel.



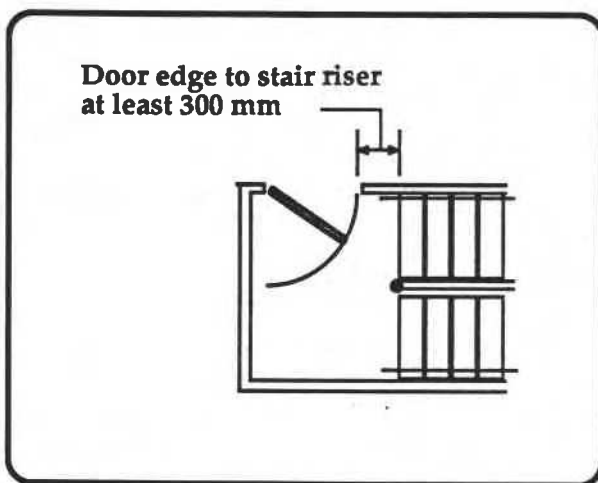
Exit signs - 3.4.5.1.(1)

Instead of requiring that every exit sign be placed above the exit door, this change permits the sign to be placed alongside the door as well as above it. An exit sign should not be moved to a location where it would be difficult to relate the sign to the door to which it belongs.



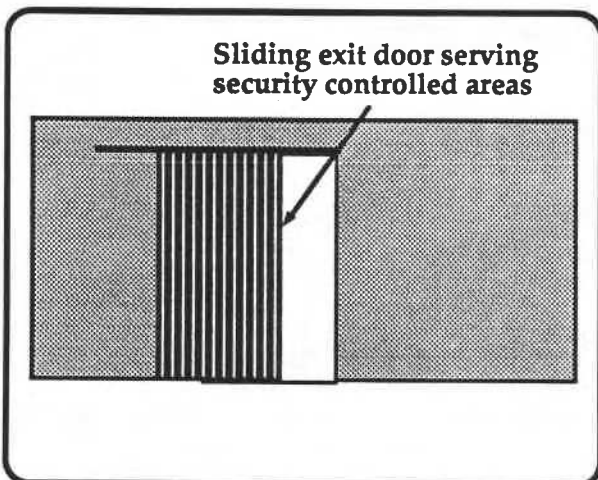
Curved stairs - 3.4.6.8.

In many buildings formal curved stairs with a large radius are used to convey a particular architectural design. This change permits this type of stair to be considered as an exit when the requirements in this Article, as well as other requirements pertaining to exits, are met.



Doors - 3.4.6.10.(1)

Some minor editorial changes clarify the relationship between the arc that is traversed by the leading edge of a door when it swings over a landing and the distance to the nearest riser of a flight of stairs.

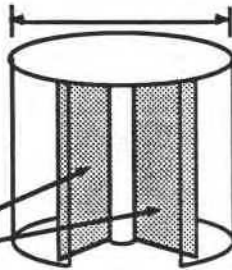


Sliding doors - 3.4.6.13.(2)

Sliding doors have been permitted in exit facilities if the door can rotate about a vertical axis and break away from its track in an emergency to permit the safe evacuation of persons from the building. This is not an acceptable feature in a building where doors are fastened for security reasons and only released by authorized personnel. This change permits the use of security doors that slide horizontally and do not operate in the swinging release mode.

**Diameter 3 metres
or more**

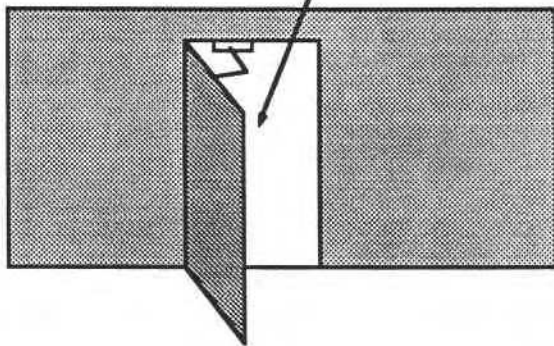
**Door leaves swing to
provide clear passage
in emergency**



Revolving doors - 3.4.6.14.(3)

Previous editions of the NBC gave credit for revolving doors but required that swinging doors be placed adjacent to the revolving doors in case the door were to jam in an emergency. The NBC 1990 permits revolving doors of very large diameter. These doors have leaves that will break free in an emergency and provide adequate egress widths.

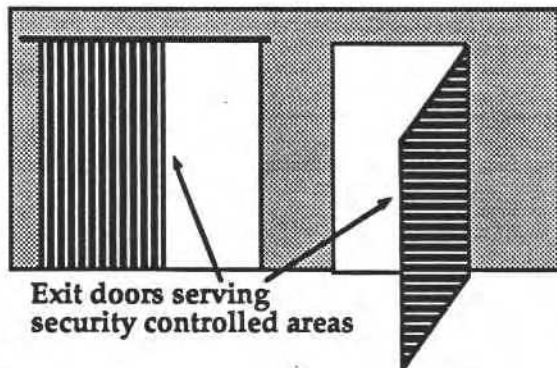
Maximum force for door release



Door release hardware - 3.4.6.15.(2)

A revision has been made to the maximum force required to release and open an exit door. Since some of these doors will have to be operated by persons with physical disabilities, a statement has been added to clarify that the maximum force values from Section 3.7 apply if the door is in a barrier free path of travel.

Special control hardware permitted



Door release hardware - 3.4.6.15.(3)

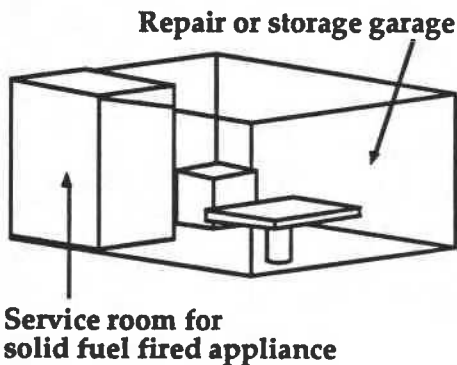
Since doors that are controlled and released by security personnel are not under the control of all building occupants, revisions have been made to the requirements that an exit door can be released by a building occupant without the need for keys, specialized knowledge or special equipment.

Section 3.5

Service facilities

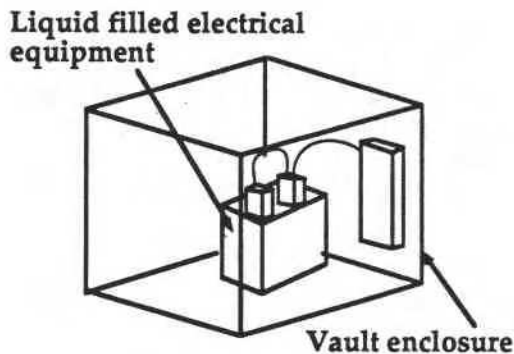
Service facilities - 3.5

The change in title of this Section reflects the full scope, showing that it is not only concerned with service spaces, but also with the contents.



Fire separations around service rooms - 3.5.2.1.(2)

A return to the use of wood and other solid fuels in some areas has led to concern for the safety of persons in garages, where flames in the solid fueled appliance could ignite combustible vapours given off while vehicles are being stored or serviced. This Sentence requires that the fuel fired appliance be located in a separate service room and that the combustion air not be drawn from the space in which the vehicles are located. The heat generated by the appliance will have to be indirectly supplied to the garage area by means of ducts.



Electrical equipment vaults - 3.5.2.9.

Previous editions of the NBC have contained provisions to safeguard a building from problems that could arise in an electrical transformer vault. The problems are not restricted to transformers but apply also to other liquid filled electrical equipment. The revisions to this Article reflect the change in emphasis from transformers to all liquid filled electrical equipment.

Section 3.6

Health requirements

Health requirements - 3.6

There are few changes other than editorial changes in this Section.

Surface protection adjacent to urinals

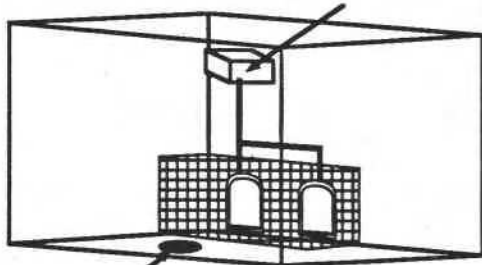


900 mm from projected outline
on wall or floor

Surface protection near urinals - 3.6.4.6.

Requirements for the protection of wall and floor surfaces adjacent to urinals have previously been found in plumbing codes. It was considered that a plumbing code is not an appropriate place to regulate a wall or floor finish and the requirements have been transferred to the Building Code.

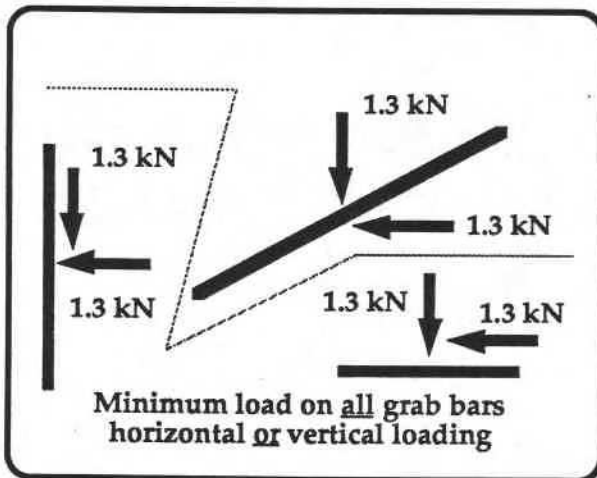
Automatic flushing device



Floor drain

Floor drains - 3.6.4.7.

The requirement for a floor drain in a washroom applies only to a washroom that contains urinals equipped with automatic flushing devices. Although it is good policy to install a floor drain in any washroom, they are only required under these special circumstances.



Grab bar installation - 3.6.4.8.

Other than the grab bar installation requirements in Section 3.7, there have been no requirements for the installation of grab bars in other locations in a building. This Article requires that any grab bar be able to resist certain applied forces. The intent is to prevent accidents by persons who use these grab bars in an emergency.

Barrier free

- No longer restricted to access
- Applicable to other facilities

Barrier free design - 3.7

The term "barrier free access" used in the NBC 1985 is replaced by the more general term "barrier free" so that the concept may be used in a broader sense to describe all facilities within a building to which access must be provided, including barrier free washrooms, drinking fountains and shower stalls.

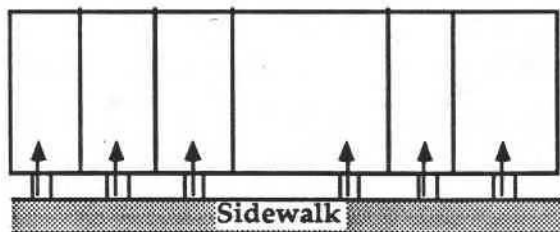
Industrial buildings

- Buildings designed to accommodate process, not persons
- To clarify that discretion should be used in applying Section 3.7 to industrial buildings

Application - A-3.7.1.1.

In some buildings, particularly in industries such as lumber processing and mining operations, the construction normally used and the operations carried out can make compliance with the requirements of Section 3.7 impracticable. These requirements should be applied with discretion in medium and low hazard industrial buildings. However, where industrial buildings contain subsidiary occupancies, such as offices or showrooms, it is reasonable to require that these facilities be barrier free.

Row of stores or business offices



All entrances must be barrier free

Entrances - 3.7.1.2.(2)

An assembly, business or mercantile suite that is located in the first storey of a building and completely separated from the rest of the building, so that there is no access to the rest of the building, shall have at least one barrier free entrance.

Storeys served by escalators

- Elevator required near escalator
- Access to elevated walkways and underground passageways between buildings

Storeys served by escalators - 3.7.1.4.

If escalators are installed to provide access to a second storey or to a basement in buildings such as shopping centres, cinema complexes, or office buildings, elevators must be provided to allow persons in wheelchairs to access those levels. This also ensures that access to an underground or above ground passageway between buildings is not restricted when the level leading to the passageway is only accessible by stairs and escalators.

Some buildings located on a sloping site have more than one floor accessible from street level. If escalators are provided within the building to facilitate movement from one floor to another, wheelchair users should not need to travel outside the building to gain access to another floor level

Barrier free floors

- Washrooms must be barrier free
- "Unisex" washrooms permitted for renovation in existing building
- Appendix note to clarify use of "Unisex" washroom

Washrooms required to be barrier free - 3.7.2.3.

Most regular washrooms in a storey to which a barrier free path of travel is provided will have to be barrier free. An Appendix note explains that washrooms which can accommodate disabled persons need not be much larger than conventional washrooms.

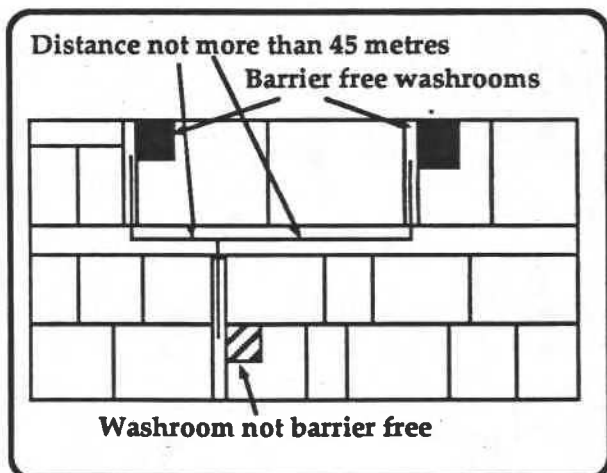
It was not the intent of the NBC 1985 that special washrooms be used in lieu of making regular washrooms available, as the addition of a third "unisex" washroom is more costly than making regular washrooms accessible. These special washrooms are acceptable as an alternative in a renovation project.

Accessible washrooms - exceptions

suites of residential occupancy

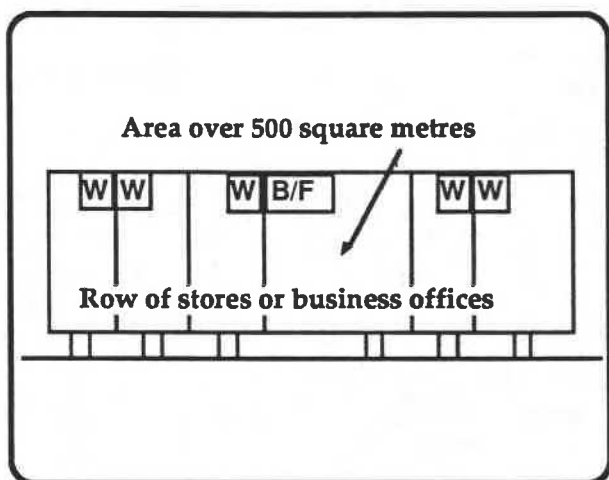
Washrooms required to be barrier free - 3.7.2.3.(2)(a)

It is not intended that a suite of residential occupancy must be provided with a barrier free washroom. However, in the case of hotels and similar buildings providing facilities for meetings and travellers, a certain number of the suites would be expected to have barrier free facilities.



Washrooms required to be barrier free - 3.7.2.3.(2)(b)

If several washrooms are provided in a large floor area, not all need be barrier free, provided that a barrier free washroom is available within 45 m and the location is clearly indicated.



Washrooms required to be barrier free - 3.7.2.3.(2)(c)

It is not the intent that a barrier free washroom be provided in every small store in a series of row stores or within a suite of residential occupancy. Large stores should offer barrier free washrooms since the additional area used by the washroom becomes insignificant.

Accessible washrooms required in Part 3

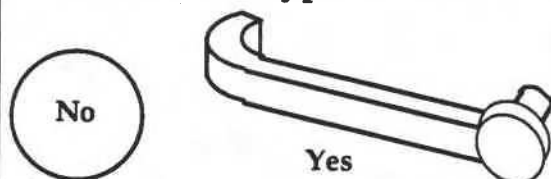
- **barrier free washroom on entrance floor**
- **may be omitted when access provided to other barrier free washroom**

Washrooms required to be barrier free - 3.7.2.3.(3)

A barrier free washroom is required on the entrance storey in buildings less than 4 storeys high which are not equipped with elevators. This requirement will avoid situations where washrooms are located in the basement or on the second floor of a small building which otherwise has accessibility on the entrance storey.

Door handles

- Performance requirement
- Appendix note to encourage use of lever type handles



Doorways and doors - 3.7.3.3.(3)

Door handles must be of a design that does not require tight grasping and twisting of the wrist as the only means of operation. An Appendix note to Sentence 3.7.3.3.(3) points out that lever handles are usable by most persons with limited hand mobility and meet the intent of this requirement and that lever handles with an end return towards the door are less prone to catch the clothing of someone passing through the doorway.

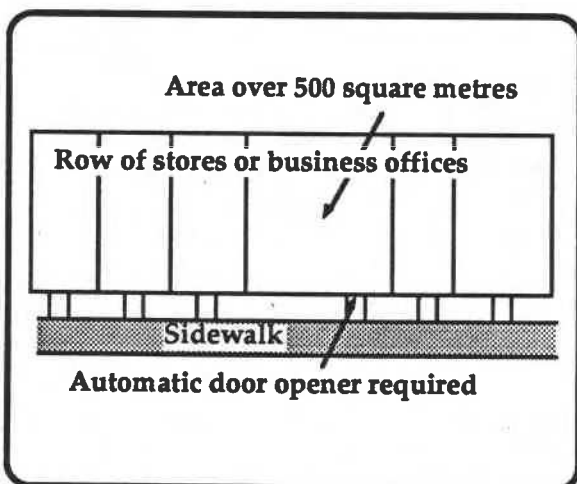
Automatic doors

Required for barrier free entrance in

- hotels
- institutional buildings
- assembly, business and mercantile buildings larger than 500 m²

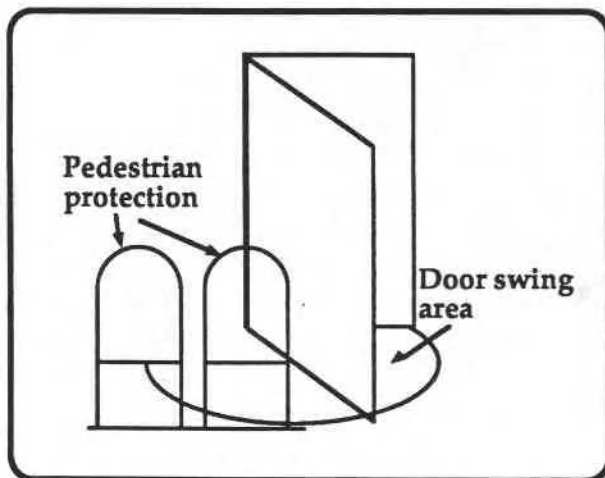
Doorways and doors - 3.7.3.3.(5) and (6)

Entrance doors to hotels, hospitals, nursing homes, and buildings larger than 500 m² that are required to be barrier free and are used for assembly, mercantile and business uses must be equipped with power door operators.



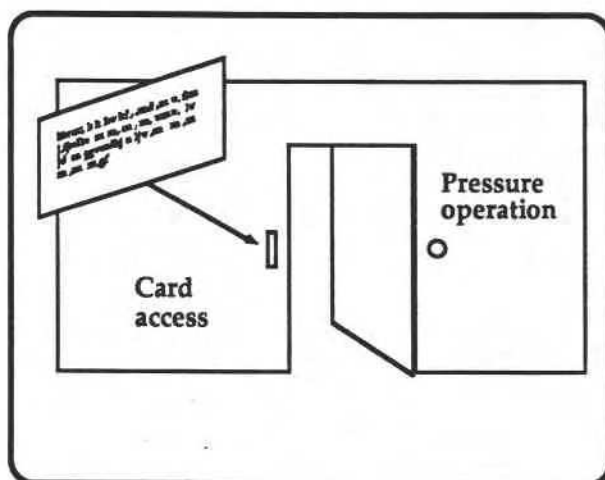
Doorways and doors - 3.7.3.3.(6)

The requirement for a power door operator does not apply to an individual suite with an area of less than 500 m², completely separated from the remainder of the building, in a building having only suites of assembly, mercantile and business uses.

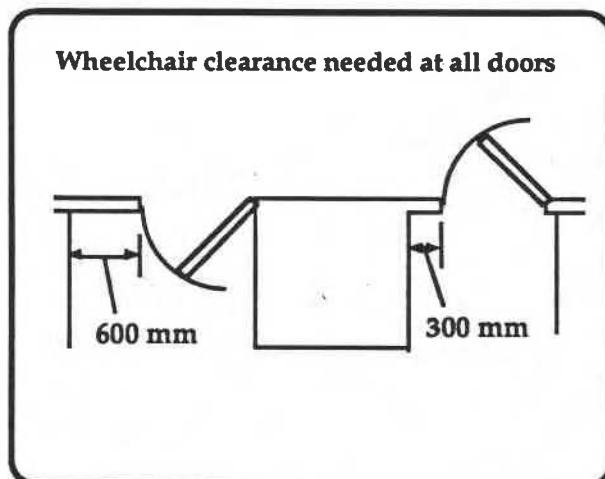


Doorways and doors - A-3.7.3.3.(5)

Swinging doors equipped with power operators which are actuated automatically and open into passing pedestrian traffic must be provided with a guard or other device to prevent pedestrians from stepping into the swing area of the door. These guards or devices should be detectable by blind persons. For example, inverted U-shaped guards should have an additional rail at a height not more than 680 mm so that it is detectable by the long cane. These doors should also have a sensor on the swing side to prevent the door from opening if someone is standing in the swing area.



Doors equipped with a power operator actuated by a pressure plate identified with the international symbol for accessibility or, where security is required, by a key, card or radio transmitter, and that can otherwise be opened manually, meet the intent of the requirement. The location of these actuating devices should ensure that a wheelchair will not interfere with the operation of the door once it is actuated.

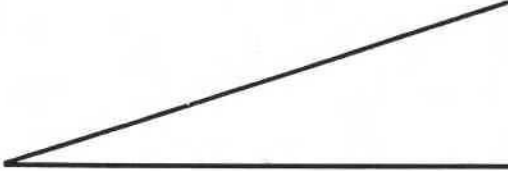


Doorways and doors - 3.7.3.3.(10)

Sufficient clearance must be provided on the latch side of doors for a user to operate the door opening mechanism and open the door without interference from the wheelchair. This is particularly important where the door swings towards the approach side. Although the requirement applies to doors equipped with closers, this clearance should be provided for all doors.

Gradient of ramps

**1 in 10 excessive
Limited to 1 in 12 for safety**



Ramps - 3.7.3.4.(1)(b)

Ramps with a gradient of more than 1 in 16 can be very difficult for disabled persons with upper body mobility to manage. Even though they pose less of a problem for motorized wheelchairs, these ramps can be unsafe to descend, especially in cold climates. Although Article 3.7.3.4. permits slopes on ramps as great as 1 in 12 for distances of up to 9 m, gradients of 1 in 20 are safer and less strenuous. When limited space is available, as may be the case during renovations, ramps of up to 1 in 12 should be restricted to lengths not exceeding 3 m whenever possible.

Assistive listening devices

- **All places of assembly over 100 m²**
- **Appendix note to clarify type of system intended and to give information**

Assistive listening devices - 3.7.3.7.

All places of assembly with an area of more than 100 m² must be equipped with assistive listening systems for the benefit of hearing impaired persons. These include classrooms, auditoria, theatres, motion picture theatres and conference rooms. An Appendix note provides information on currently available systems. The cost of these systems varies with the type and the area to be covered.

Telephone counters

- **To accommodate TDD users and wheelchair users**
- **Telephones within reach of wheelchair user**
- **Appendix note on volume control**

Shelves or counters for telephones - 3.7.3.14.

All counters more than 2 m long where service to the public is involved must have one portion accessible to wheelchair users. If built-in shelves or counters are provided for public telephones, such as those in hotel lobbies and transport terminals, they must be designed to accommodate TDDs (telecommunication devices for the deaf). Where the telephone is wall hung, one section of the counter must be usable by a person in a wheelchair.

An Appendix note recommends that at least one telephone be equipped with a volume control and that it be the same telephone that is provided for wheelchair users.

Drinking fountains

- **At least one drinking fountain usable by a person in a wheelchair**
- **Height of spout specified**
- **Controls easy to operate**

Drinking fountains - 3.7.3.15.

Where drinking fountains are provided in a building that is required to have a barrier free path of travel, at least one shall be barrier free. This requirement ensures that if drinking fountains are provided, at least one can be used by persons in wheelchairs.

**1990 Code Seminar
Series**

Part 4

**Significant changes to
Part 4
of the
National Building Code of Canada
included in the 1990 edition**

Snow loads

- Recalculation
- Extra stations
- 10 more years of data
- Average national decrease
6.6 %

Live loads due to snow - 4.1.7.

In Canada, ground snow loads are used as a basis for the determination of roof snow loads, and form part of the basic climatic information needed for building design. They are included in Chapter 1 of the Supplement to the NBC 1990. The last systematic recalculation of ground snow loads was made in 1977 and used data up to 1975. Data from three times as many stations are now available and there is also an extra 10 years of records. Ground snow loads have been recalculated for the 1990 Supplement. There is an average 6.6% decrease compared to the 1985 values, except in the Northwest Territories, where there is an average 16% increase due to greater snow density.

Ground snow loads

**Two components of ground snow
load**

- Snow component - S_S
- Rain component - S_R

Specified snow loading - 4.1.7.1.(1)

The total snow load has been divided into two components:

1. the snow component, S_S , which is based on a return period of 30 years,
2. the rain component, S_R , which accounts for wetting of the snow by rain.

Roof snow loads

- **Snow load factors**
- **Basic, wind, slope, or accumulation factors**
- **Apply to snow component (S_s) only**

Specified snow loading - 4.1.7.1.(1)

Since there is no such thing as drifting rain, the snow load factors are applied only to the snow component when determining roof snow load.

Wind exposure factor for snow loads

- **Reduced to 0.5 in northern areas**

Specified snow loading - 4.1.7.1.(3)

A wind exposure factor of 0.5 has been introduced for exposed areas north of the treeline to give a more accurate indication of the snow load in those areas.

Roof snow load

- **Slope factor**
- **Slippery roofs**

Specified snow loading - 4.1.7.1.(5)

The greater reduction of snow loads on unobstructed slippery sloping roofs has been recognized and therefore a separate slope reduction relationship has been introduced for these roofs.

Earthquake load

- **Force modification factors**
- **Separate treatment of electrical and mechanical components from architectural components**

Live loads due to earthquakes - 4.1.9.

The changes to Subsection 4.1.9. represent the second stage of a major restructuring of seismic loading provisions begun in the NBC 1985. The first stage was mainly concerned with the development and application of new velocity and acceleration based seismic zoning maps for use in the calculation of base shear. This second stage is primarily concerned with the development of force modification factors to reflect the capability of structural systems to dissipate energy. Another significant change is the separate treatment of electrical and mechanical components in the calculation of forces on parts of a building.

Earthquake loads

- **Importance factor (I)**
- **Post disaster buildings**

Live loads due to earthquakes - 4.1.9.1.(10)

The increase in importance factors for post-disaster buildings is introduced to increase the probability that these buildings will continue to function after a major earthquake; the September 1985 earthquake in Mexico illustrated the need to maintain essential life safety services. These buildings include hospitals, police and fire stations and other buildings providing municipal services.

Earthquake loads

- **Foundation factor**
- **Soft deep soils**

Live loads due to earthquakes - Table 4.1.9.C.

Table 4.1.9.C. has been modified since responses in soft clay soils in Mexico City during the September 1985 earthquake demonstrated the need for increased protection against a large amplification of long period motions in soft clays.

Earthquake load

- **Acceptable deflections**
- **More restrictive for post disaster buildings**

Deflections - 4.1.9.2.(3)

This new requirement defines acceptable deflections, which were not covered in the NBC 1985. Significantly lower deflection limits are required for post-disaster buildings, to ensure a higher probability of functioning after an earthquake.

Earthquake load

- **Sway effects**
- **Impacting buildings**
- **Sum of individual deflections**

Deflections - 4.1.9.2.(6) and (9)

Experience from the 1985 Mexico City earthquake and other earthquakes has demonstrated the serious effect of impacting buildings. The separation requirement is the sum of the individual deflections.

The NBC 1990 requirements maintain the same level of protection for buildings as the NBC 1985, with a good to excellent capability of resisting seismic loads. The overall current level of protection in Canada is considered reasonable and appropriate.

Firewalls

- **Lateral loads specified**
- **Fire conditions**

Firewalls - 4.1.10.3.

Lateral loads for the design of firewalls have been included to ensure integrity when exposed to fire conditions. These loads include explosion, wind, thermal, shock and impacting debris.

Referenced standard

- **CAN/CGSB 12.20, Structural Design of Glass for Buildings**

Design basis for glass - 4.3.6.1.

A new standard has been referenced to provide requirements for the design of glass.

Referenced standard

- **CAN/CSA-S413, Parking Structures**

Design basis for parking structures - 4.4.2.1.

A new standard has been referenced to provide requirements for the design of parking structures.

**1990 Code Seminar
Series**

Part 6

**Significant changes to
Part 6
of the
National Building Code of Canada
included in the 1990 edition**

**Capacity of heating
appliances**

- **New standard CAN/CSA-F280**
- **Single procedure for all energy sources**
- **Dwelling units only**
- **Application manual**

Capacity of heating appliances in dwelling units - 6.2.1.2.

Part 6 now references a new standard CAN/CSA-F280 produced by the Canadian Standards Association. This standard provides a single procedure to size residential heating appliances independent of the energy source used. It replaces several different calculation procedures formerly in use, which often produced differing results and caused confusion among users and building officials.

An application manual based on this standard has been developed by the Heating, Refrigerating and Air Conditioning Institute of Canada (HRAI) and the Ontario Electrical League.

Heat recovery ventilators

- **New standard CAN/CSA-C444**
- **Installation requirements**
- **Between 25 & 200 L/s**

Heat recovery ventilators - 6.2.1.7.

To provide minimum requirements for installation of heat recovery ventilators, Part 6 now references CSA-C444, "Installation Requirements for Heat Recovery Ventilators." That standard in turn refers to other CSA standards for construction and performance of such devices. This applies only to heat recovery ventilators with rated capacities of not less than 25 L/s and not more than 200 L/s.

Ventilation of storage garages

- **Not repair garages**
- **Lower pressure than the rest of the building**
- **Ticket booths separate**

Ventilation of storage garages - 6.2.2.3.

The reference to repair areas in a storage garage in Article 6.2.2.2. has been deleted, since ventilation of such areas is normally covered in provincial or territorial labour regulations.

New Sentence (3) is intended to ensure that the air pressure in an enclosed storage garage does not exceed that in adjoining occupancies. Any air exchange between these areas is therefore from the non-garage area into the garage, and not vice-versa.

New Sentence (5), which requires attendant booths to be pressurized, has been relocated from the Appendix because such ventilation should be mandatory instead of advisory.

Clothes dryer exhaust

- **Don't interconnect with other exhaust ducts**
- **Concern over clogging**

Exhaust ducts and outlets - 6.2.3.10.(5)

New Sentence 6.2.3.10.(5) requires exhaust ducts directly connected to laundry drying equipment to be independent of exhaust ducts serving other areas of the building. This is to prevent the mixing of exhaust air containing significant amounts of lint with exhaust air containing moisture and/or grease, which could result in clogging of exhaust equipment.

Garages

- **Interconnection of air ducts prohibited**
- **Tight backdraft damper not available**
- **Fear of contamination**

Interconnection of systems - 6.2.3.11.(1)

In new Sentence 6.2.3.11.(1), air duct systems serving garages are not permitted to be directly interconnected with other parts of the building. Previously, the Code required that a warm air register serving a garage be fitted with a backdraft damper to prevent garage vapours from entering the heating system when the circulation fan was turned off. However, experience has shown that there are no effective gas- or smoke-tight dampers available.

Electrostatic filters

- **De-energize when furnace motor off**
- **Possible over-heating and corrosive ozone**
- **Residential- type filters**

Filters and odour removal equipment - 6.2.3.14.(2)

Electrostatic-type filters should only operate under air flow conditions; otherwise over-heating could result. As well, the air flow reduces the possibility of unacceptable concentrations of corrosive ozone. This Sentence has been revised to require electrostatic-type filters in dwelling units to be automatically de-energized when the furnace circulating fan is not operating.

Heating supply outlets

- **Only for rooms next to unheated space**
- **Dwelling units only**
- **New appendix note**

Warm air supply outlets - 6.2.4.5.(1) and (2)

The previous requirement that all rooms in a dwelling unit be provided with a warm-air supply outlet has been dropped. Interior rooms without exterior walls, ceilings or floors do not have direct heat loss and they gain heat from the remainder of the dwelling unit. There is also a new Appendix note on this subject.

Warm air supply outlets

- **High wall or ceiling outlets**
- **OK with combined systems**
- **Prevents drafts**

Warm air supply outlets - A-6.2.4.5.(2)

This note explains that, if the heating system is designed to also distribute ventilation air, high inside wall or ceiling outlets with diffusers designed for such applications, may be used. Such devices permit the delivery of cool ventilation air without uncomfortable drafts, which might cause the homeowner to turn off the ventilation system.

Return air inlets

- **One on each finished floor**
- **Dwelling units only**
- **900 mm constitutes a floor level**

Return air system - 6.2.4.8.(12)

Revised Sentence 6.2.4.8.(12) requires at least one return air inlet on each finished floor level, to ensure even heat distribution throughout a dwelling unit. In the case of split-level houses, if the difference in elevation of the levels is greater than 900 mm (3 ft), return inlets are required on both levels.

Steam or hot water radiators

- **Prevent contact if > 70° C**
- **Burn hazard**
- **Protection could include cabinets**

Surface temperature - 6.2.9.4.

New Article 6.2.9.4. has been added to help ensure that high temperature steam or hot water radiators do not constitute a burn hazard. It requires that the exposed surface temperature of every steam or hot water radiator not exceed 70°C unless precautions are taken to prevent human contact. Suitable precautions could include some sort of enclosing cabinet.

Chimneys

- **serving oil - B139**
- **serving gas - B149**
- **serving solid fuel - B365**
- **small masonry - Part 9**
- **large masonry - NFPA 211**

General - 6.3.1.

The specific design requirements for chimneys in the NBC 1985 have been deleted and been replaced by references to other parts of the Code or to separate standards.

Chimneys serving gas- and oil-burning appliances are governed by the installation standards for this equipment — CSA-B139 and CGA-B149.

Chimneys serving solid-fuel burning appliances are governed by the CSA-B365 standard.

Small masonry or concrete chimneys serving fireplaces are governed by Part 9.

Large masonry or concrete chimneys are governed by NFPA Standard 211 "Standard for Chimneys, Fireplaces, Vents and Solid-Fuel Burning Appliances."

- **Entire Subsection deleted**
- **Definition of "Metal Chimney" deleted from Part 1**

Subsection 6.3.2. - NBC 1985

Since all requirements for chimneys are now handled by reference to other documents, Subsection 6.3.2. on clearances and separations could be deleted.

This made it possible to delete the definition for "metal chimney" in Part 1, since this definition was only used in Subsection 6.3.2. Apparently this definition was seldom consulted, since the term was often mistakenly assumed to mean the factory-built metal chimneys covered by ULC standards rather than the large site-built smokestacks it was intended to apply to.

Part 9

1990 Code Seminar Series

**Significant changes to
Part 9
of the
National Building Code of Canada
included in the 1990 edition**

One significant change in Part 9 for 1990 is the extensive re-numbering that resulted from the new layout and the decision to have Sentence and Clause numbering in Part 9 match that in the rest of the Code. The removal of Section 24 resulted in the re-numbering of all subsequent Sections.

Sliding doors

- **New standard -
CAN/CGSB 82.1**
- **All materials**
- **Forced entry test**

Sliding doors - 9.6.4.2.

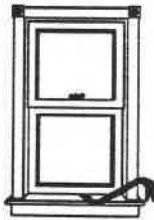
CGSB has published a new edition of CAN/CGSB-82.1, "Sliding Doors." It replaces the two standards previously referenced in Part 9 for aluminum standard duty and medium duty sliding glass doors. The new standard is an omnibus standard covering wood, steel, aluminum and vinyl entrance doors. It includes a mandatory forced entry test.

Mirrored doors

- **New CAN/CGSB-82.6**
- **Sliding or folding**
- **Safety glass or film
backing**
- **Only reach-in closets
(Appendix)**

Mirrored glass doors - 9.6.5.3.

A new CGSB standard provides performance, safety and test procedures for the evaluation of framed mirrored glass sliding or folding doors to be used in reach-in closets. The glass must be tempered, laminated, or film reinforced. An Appendix note points out that the CGSB standard specifies that such doors are not intended for walk-in closets; however, the Code does not preclude such use. This standard replaces the previous requirement for reinforcing with hardboard, plywood or particleboard, which have proven to be unsatisfactory.



Measures for Physical Security in Houses

Burglary is becoming wide ranging and is particularly serious in some urban areas. Many provinces, territories and municipalities are drafting their own requirements for physical security, thus creating disparity and potential conflicts. It is preferable that guidelines and regulations come from a national consensus-based source.

Physical security

- Increasing burglary rate
- Task group
- Non-professional burglar
- Dwelling units only

Resistance to forced entry - 9.6.6.

Changes have been developed to improve the resistance of dwelling units to forcible entry by establishing requirements for windows, entrance doors, frames and hardware. These have been prepared by a task group with members from law enforcement authorities, the design community, home builders and manufacturers of doors and windows. These measures apply only to dwelling units and are intended to defeat or deter only the casual or non-professional burglar.

Physical security

- Swinging entrance doors
- Solid core
- Deadbolt lock
- Fastening of hinges and strike plate

Application - 9.6.6.

The requirements relating to doors apply to swinging entrance doors to dwelling units; this includes doors leading from garages or similar spaces. Wood entrance doors must be solid core or, if stile and rail panel type, have panels not less than 19 mm thick and not more than half the door area. Such doors must also be provided with a deadbolt lock with a 25 mm throw and a housing designed to resist being pried off.

Ineffective fastening of doors to hinges or hinges and strike plates to frames makes break-ins easier. At least two screws per hinge must penetrate at least 30 mm into solid wood. Methods of attachment to metal frames are specified.

Physical security

- **Doors swinging outward**
- **Door viewer**
- **Blocking at frames**
- **Performance test**

Application - 9.6.6.

If a door swings outward it must have non-removable hinge pins or other means to prevent removal of the door while in a closed position. A new Appendix note explains methods of satisfying this requirement.

A viewer is required if there is no sidelight or glazing in the door. Solid blocking is required in the space between the door jamb and the rough framing on both sides at the lock height to prevent spreading of the jamb to disengage the latch bolt.

As an alternative to these requirements, doors, frames and hardware tested in accordance with an ASTM procedure can be used. There is a brief description of the test in a new Appendix note. Only the lowest level of security, Grade 10, is mandatory.

Physical security-windows

- **CAN3-A440**
- **Forced entry test**
- **Within 2 m of ground**
- **Appendix note**

Resistance to forced entry - 9.7.6.1.

The CSA standard for windows, A440, contains a forced entry test as an optional measure. The NBC makes this test mandatory for windows within 2 m of adjacent ground level. The test measures the resistance of the sash to being pried open. It does not deal with glass breakage. Most windows of decent quality will meet this test.

A new Appendix note recommends the application of this requirement to windows on the second storey if there is easy access via roof overhangs or balconies.

Glass in Windows

- **New glass design methods**
- **CAN/CGSB-12.20**
- **Single table not appropriate**
- **Tables in Appendix**

Structural design of glass - 9.7.3.2.

A new standard on the structural design of glass has been produced by CGSB. Assumptions used in preparing the window glass sizes in the NBC 1985 are no longer considered appropriate. Variations in design pressures across Canada make a single table of maximum sizes impracticable; such a table would be overly conservative or result in higher breakage probabilities than are normally considered acceptable.

Two new glass design charts are included in the Appendix as rough guides in choosing appropriate glass thicknesses. However, these are quite conservative, and, in most cases, more detailed charts produced by glass manufacturers, based on the new standard, should be used.

Handrails

- **Attachment to wood studs**
- **Spacing**
- **Fastener penetration**

Attachment of handrails - 9.8.7.10.

Minimum fastening details for handrails are now specified. The spacing of the fasteners must not exceed 1.2 m and, in the case of wood stud walls, at least two screws at each point must penetrate not less than 32 mm into solid wood. The handrail itself is expected to be selected on the basis of experience rather than engineering calculations.

Guards for low porches and decks

- **Height reduced to 900 mm.**

Height of guards - 9.8.8.2.(2)

A guard on a porch, deck, landing or balcony on a dwelling unit and not more than 1.8 m above adjacent ground level is now permitted to be 900 mm high rather than the previous 1070 mm.

Egress and fire safety

- **Part 9 changes from Part 3**
- **Corresponding changes made where appropriate**

Means of egress and fire protection - 9.9 and 9.10

Most of the changes to Section 9.9, "Means of Egress," and Section 9.10, "Fire Protection," are made as a result of identical changes to Part 3. Associate Committee policy states that Part 3 and Part 9 should not differ technically in matters of fire safety unless there is a good reason. If there is an intentional difference, the reason must be explained in the Appendix.

Means of egress

- **Great simplification**
- **Minimum dimensions only**
- **No units of exit width**
- **Due to changes in Part 3**

Dimensions of means of egress - 9.9.3.

Changes in Part 3 eliminate the concept of units of exit width and change the method of determining the capacity of a means of egress. This has the result that, for Part 9 buildings, calculations for widths of exits and access to exits based on occupant load will never exceed the minimum. Therefore reference to these methods in Part 9 is unnecessary. This greatly simplifies the requirements in this Subsection, as only minimum widths need be specified.

Exterior exit stairs

- **Protection from openings**
- **Only where one means of egress**

Openings near unenclosed exit stairs and ramps - 9.9.4.4.

The NBC 1985 required windows close to exterior exit stairs serving upper suites to be glazed with wired glass or some other form of protection.

This had been criticized as unnecessarily restricting the use of common forms of building design, such as duplexes or small apartments which use exterior stairs as the second means of egress. Such designs have been used successfully for many years without apparent undue hazard.

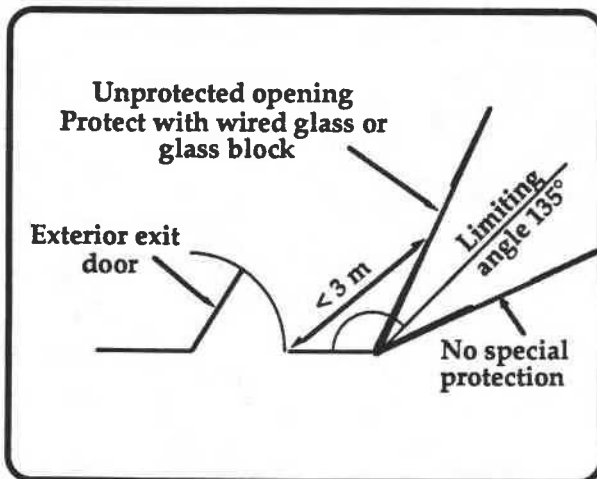
The NBC 1990 relaxes the requirement. Protection is only necessary where that exit is the only means of egress from the suite it serves.

Protection for exit doors

- **Openings in adjacent fire compartment within 3 m**
- **Protect with wired glass or glass blocks**

9.9.4.8. - NBC 1985

Article 9.9.4.8. in the NBC 1985 required that, where a window within 3 m horizontally of a exit door in an adjacent fire compartment would expose that door to the hazards of a fire, the window had to be glazed with wired glass or glass blocks. This has always been difficult to interpret, since no guidance was given as to the meaning of "exposed to the hazards of a fire."



Openings near exit doors - 9.9.4.6.

In the NBC 1990, Article 9.9.4.6. clarifies that, where the opening is located in the same plane as the doorway and there is thus little chance of high radiation levels at the doorway, there is no need to apply protective measures to the opening. Only where the fire compartments intersect at an angle of 135° or less is protection required.

Unenclosed exit stairs

- Single tenancy
- Small office or mercantile building
- 45 min separations
- Max. travel distance

Stairways in 2 storey, Group D or E buildings - 9.9.4.7.

Unenclosed interior stairs may serve as a required exit in one or two story office or mercantile buildings, where the occupancy containing the open stair consists of a single tenancy and is separated from other occupancies by at least a 45 minute fire separation. There is an area limit of 75 m per storey, and a maximum travel distance of 23 m.

Door hardware

- Open from inside without keys
- Applies also to houses
- Prevent double-keyed deadbolts
- Danger of being trapped

Door opening mechanism - 9.9.6.8.

Where double-keyed deadbolts are used on entrance doors, there is a danger that occupants could be trapped inside in an emergency if the inside key could not be located. Therefore, under the NBC 1990, such hardware cannot be used. This change requires that exterior doors to suites, including dwelling units, can be opened from the inside without requiring keys, special devices or specialized knowledge of the door opening mechanism.

Dead-end corridors

- **Max length 6 m**
- **Measured to end of dead-end portion instead of exit**
- **Change from Part 3**

Dead-end corridors - 9.9.7.2.

NBC 1985 requirements forced dead-end portions of corridors to be in the vicinity of exits and thus inhibited planning of floor areas without, many believed, substantially improving the safety level. The NBC 1990 permits the length of dead-end corridors to be measured within the dead-end portion only and not to the nearest exit.

Egress doors

- **Number of storeys up or down to an egress door**
- **Door to be within 1.5 m of ground**

Travel limit to exits or egress doors - 9.9.9.1.(1)

The NBC 1985 did not specify how close to ground level an exterior exit door had to be for purposes of determining the number of storeys crossed before it was necessary to add another egress door or balcony or an escape window. This resulted in dwelling units with single exit doors placed at unsafe elevations above ground level.

In the NBC 1990, the requirements in Part 9 are more in harmony with those in Part 3. It specifies that an exterior exit door from a multi-storey dwelling unit has to be within 1.5 m of ground level.

Emergency lighting

- **All exits and access to exit**
- **Fire alarm system not a factor**
- **Below grade or windowless not a factor**
- **Change from Part 3**

Emergency lighting - 9.9.11.3.(1)

The NBC 1985 required emergency lighting only in windowless and below-grade exits in buildings where a fire alarm was required. Emergency lighting will now be required in exits, corridors used by the public and principal routes providing access to exit in an open floor area, without the condition that they be below-grade or windowless. The presence of windows gives little guarantee of lighting in many circumstances. Also, this lighting will be required whether or not a fire alarm system is required.

Tables of fire and sound ratings

- **Service to Code users**
- **Not mandatory**
- **Fire ratings based on Supplement**
- **Sound ratings on lab test data**

Ratings - A-9.10.3.A and B

The Tables of fire and sound rated assemblies in the Code are provided as a service to Code users to assist them in choosing forms of construction which comply with fire and sound requirements. Their use is not mandatory, since assemblies can also be selected from test data or, in the case of fire ratings, made up from information in the Supplement to the NBC.

The fire ratings in the Tables are based on the Supplement and the sound ratings are based on lab test data provided by IRC's Acoustics Section.

Tables of fire and sound ratings

- **Moved to Appendix**
- **Higher STC ratings required**
- **More assemblies added**
- **Insulation for sound or fire**

Ratings - A-9.10.3.A and B

Because they are advisory only and are not intended to imply that the assemblies listed are the only acceptable ones, the Tables have been moved to the Appendix. The Tables have been revised to reflect changes in the sound control requirements.

More assemblies have been added to show the effect of different materials on the STC ratings and to show some assemblies which are in excess of the minimum required, in case the Code user wishes to build beyond the Code minimum. There is also an attempt to show more clearly whether insulation is required for sound or fire purposes.

Penetrations of assemblies

- **Conform to Part 3**
- **Permit combustible water pipe**
- **Permit combustible sprinkler pipe**
- **Electrical wiring as per noncombustible construction**

Service equipment penetrating a fire separation - 9.10.9.6.

The Article explains what combustible materials are permitted to penetrate an assembly required to have a fire resistance rating without having to be incorporated at the time of testing of the assembly. The change will permit combustible water distribution piping and combustible piping for sprinkler systems under certain circumstances. It will also restrict wiring with combustible insulation which penetrates an assembly to the amount of wiring permitted in buildings required to be of noncombustible construction.

Combustible DW V piping

- One unit of a duplex

Combustible drain, waste and vent piping - 9.10.9.7.(6)

This change will permit plastic DWV piping to be used in a system which passes through a fire separation between duplex units, provided the combustible piping is all on one side of the separation.

Spatial separations

- Limiting distance $< 1.2\text{m}$
- No unprotected openings
- No wired glass or glass block
- Consistent with Part 3

Openings in walls having a limiting distance less than 1.2 m - 9.10.14.5.

This change brings Part 9 into harmony with Part 3 by not permitting unprotected openings where the limiting distance is less than 1.2 m. The use of wired glass or glass block as closures in these circumstances will be prohibited. At such short distances, these closures do not protect against fire spread due to radiation.

Portable extinguishers

- Required as per Fire Code
- Not dwelling units
- Consistent with Part 3

Portable extinguishers - 9.10.19.4.

Portable extinguishers will be required to be installed in all buildings in conformance with the appropriate provincial, territorial or municipal regulations or, in the absence of such regulations, the National Fire Code of Canada 1990. The National Fire Code requires that portable extinguishers be installed in all buildings except dwelling units. This conforms to existing requirements in Part 3.

Increased
Sound
Control



Walls and floors separating dwelling units must provide a minimum level of noise reduction to satisfy privacy needs of most occupants. The requirement of STC 45 for party walls and floors in the NBC 1985 has been in effect for decades and has been found to be too low. Occupants of multi-family homes have been complaining about the lack of privacy and demanding improvement.

Sound control

- Complaints to IRC
- Surveys
- High cost of upgrading existing units
- Already increased in some areas

Sound control - 9.11

Numerous complaints about inadequate soundproofing have been received by IRC. A survey carried out by IRC showed that poor sound insulation was perceived as a significant problem in multi-family dwellings and that occupants are prepared to pay for improved conditions.

Excessive sound transmission sometimes forces expensive renovation to satisfy occupants.

The requirements for sound insulation between units have been increased in some Canadian jurisdictions, for example, British Columbia.

Sound control

- STC 50 for dwelling units
- STC 55 from elevator shafts and garbage chutes

Required sound control locations (airborne sound) - 9.11.2.

The minimum sound transmission class rating between dwelling units has been increased from 45 to 50. The minimum STC between a dwelling unit and an adjacent elevator shaft or refuse chute has been increased from 50 to 55.

Note on sound ratings

- Greatly expanded
- More info on flanking paths
- Good acoustical practice
- Impact and machinery noise

Determination of sound transmission class ratings - A-9.11.1.1.

Additional explanatory material on good acoustical practice has been added to the Appendix. More information is included on the importance of avoiding flanking paths and some advice on construction techniques that affect the sound rating.

Although there are still no requirements for control of impact noise, the Appendix note provides guidance on the principles of impact noise reduction. There are also some suggestions on ways to avoid annoyance from machinery noise.

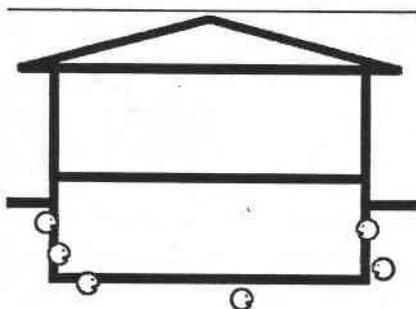
Dampproofing

- Finish for basement walls
- No longer specifies poly
- Reports of moisture problems

Interior dampproofing of walls - 9.13.5.3.

There has been a requirement in the NBC for some years that, where a finish was applied to the inside of a basement wall, wood framing members had to be separated from the concrete by a polyethylene sheet. This sheet stopped at grade and was intended to prevent decay of the wood as a result of dampness migrating through the concrete.

Some jurisdictions have reported moisture problems with this method of dampproofing, particularly on fresh concrete. This change permits any form of dampproofing material to be used.



Measures to Exclude Radon

Radon infiltration

The NBC 1990 incorporates a number of new requirements intended to reduce the risk of radon infiltration into dwellings. Such infiltration can occur in all parts of the country, although it is more frequent in some parts than in others. Because there is no reliable means of determining, prior to construction, whether a given site is likely to be radon-prone, the Code applies these requirements to all houses.

Measures to exclude radon

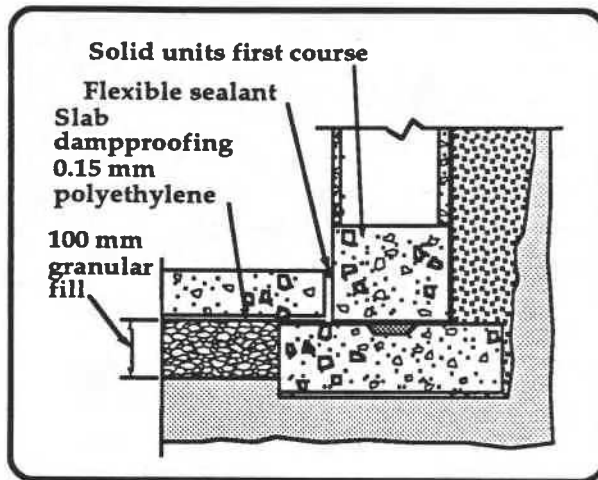
- low cost
- difficult to retrofit
- other benefits (e.g. moisture exclusion)

Radon exclusion

The measures required are all:

- low in cost, and
- difficult to retrofit if a radon problem is discovered after construction.

They also provide other benefits, such as reducing moisture infiltration. In fact, they could all be considered simply as part of good basement construction practice.



Water proofing and dampproofing and slabs-on-ground - 9.13 and 9.16

These are some of the key elements required:

- 100 mm of granular fill beneath the slab, to facilitate the installation of a sub-slab ventilation system if the house should prove to have a radon problem. It also, of course, helps to keep moisture away from the underside of the slab;
- 0.15 mm polyethylene sheet under the slab to act as a barrier to radon leakage through cracks in the slab;
- sealant applied around the perimeter of the slab;
- a solid first course for masonry walls.

Other measures

- Seal all floor penetrations (e.g. teleposts)
- Drains: water down
no soil gas up

Water proofing and dampproofing and slabs-on-ground - 9.13 and 9.16

Other required measures include:

- the sealing of all penetrations of the slab, such as teleposts;
- using a type of floor drain which will prevent the entry of soil gas. Floor drains with self-priming traps can be used. There are also proprietary products now on the market designed specifically for this purpose.

Unvented crawl spaces serving dwellings:

- 0.15 mm polyethylene ground cover
- joints lapped 300 mm and weighted down

Crawl spaces - 9.18

Radon exclusion measures are also required in crawl spaces. A 0.15 mm polyethylene ground cover must be used, with its joints lapped 300 mm and weighted down.

Appendix notes on radon

- Nature of the problem
- Exclusion principles
- Code intent
- Sub-slab ventilation

There are extensive Appendix notes on radon which

- elaborate on the nature of the radon infiltration problem,
- outline basic principles involved in trying to exclude radon from buildings,
- expand on the intent of certain Code requirements, and
- explain the sub-slab ventilation system that can be used to alleviate a radon problem in an existing house.

Attic ventilation

- Drop waiver of ventilation for "perfect" vapour barrier
- Intended for mobile houses
- Actually air barrier protection
- Perfect seal unlikely

Low slope roofs - 9.19.1.2. - NBC 1985

A change in the attic ventilation requirements eliminates the waiver of roof space ventilation previously permitted for situations where a perfect vapour barrier is installed between the interior and that space. This requirement was originally intended to accommodate techniques used in the construction of mobile homes. The intent was that roof space ventilation would be unnecessary if the leakage of heated interior air and moisture diffusion into the roof space could be entirely eliminated. This is now considered unlikely in any form of housing.

Masonry chimneys

- **Size in accordance with installation standards**
- **Previous table deleted**

Size of chimney flues - 9.21.2.4.(1)

The flue sizes in Table 9.21.2.A. of the NBC 1985 have become outdated due to the development of higher efficiency appliances and have therefore been deleted in favour of flue size tables in referenced installation standards such as CSA-B139 and CGA-B149. Appliance installation standards include minimum, and in some cases maximum, flue sizes for particular types of appliances.

Fireplace chimneys

- **New tables of flue sizes**
- **Depends on height and opening size**
- **Conforms with CSA-A405**

Chimney flues - 9.21.2.A and B

The previous NBC requirement for sizing of fireplace chimneys gave only minimum sizes. CSA-A405 includes flue sizes for fireplaces based on the fireplace opening and the height of the chimney. These have been added to Part 9. Sizes are included for both circular and rectangular flues.

Masonry chimneys

- **Concrete chimney liners**
- **Described in CAN/CSA-A405**

Concrete liners - 9.21.3.5.

There are no separate materials standards covering concrete chimney liners. CSA-A405 includes specifications for such units and the NBC now calls these up.

Masonry veneer ties

- Thickness increased to 0.76 mm
- Insufficient corrosion resistance
- Consistent with CSA-A370

Ties for masonry veneer - 9.20.9.5.

The minimum thickness of masonry veneer strap ties has been changed to 0.76 mm from 0.41 mm. The ties permitted in the NBC 1985 are considered too thin to provide protection against corrosion. The revised thickness conforms to CSA-A370, "Connectors for Masonry."

Masonry connectors

- Table of galvanizing
- Corrosion major problem
- Consistent with CSA-A370

Corrosion resistance - 9.20.16.

A table has been added to specify minimum galvanizing for steel masonry connectors. Corrosion has proven to be a major cause of failures of connectors in exterior masonry walls. These requirements are identical to those found in CSA-A370, "Connectors for Masonry."

Masonry chimneys and fireplaces

- CAN/CSA-A405 "Design and Construction of Masonry Chimneys and Fireplaces"
- Not referenced directly

Chimneys and flues, and fireplaces - 9.21 and 9.22

CSA has produced a new standard, CAN/CSA-A405, covering the design and construction of masonry chimneys and fireplaces. The committee decided not to reference the new standard directly, since it would mean deletion of almost all the material in Part 9 on this subject. There have been growing complaints over replacement of material in the NBC with referenced standards. It was agreed, however, to incorporate the A405 requirements which apply to typical construction into Part 9 and to reference the CSA standard for less typical installations.

Masonry chimneys

- **Chimney liners**
- **10 mm space required**
- **Thermal expansion and moisture protection**
- **Similar to CSA-A405**

Spaces between liners and surrounding masonry - 9.21.3.8.(2)

The NBC 1985 did not require a space between the chimney liner and the surrounding masonry. An air space between masonry and liners is considered necessary to prevent deterioration from thermal expansion and moisture penetration.

The NBC 1990 requires a minimum space of 10 mm in accordance with CSA-A405.

Masonry chimneys

- **Mortar for chimney liners**
- **Refractory or sand/cement for solid fuel**
- **Sand/cement for oil and gas**
- **Some controversy**

Mortar for chimney liners - 9.21.3.9.

The NBC 1985 specified air-setting refractory mortar for masonry flue liners. It was intended that 3 to 1 sand/cement mortar be accepted as an equivalent. It now appears that the refractory mortar might not be the best type for oil and gas applications because of the low temperatures of the flue gases and the high volume of water in the products of combustion. The change therefore specifies the refractory type or sand/cement mortar for solid fuel applications and the sand/cement type for oil and gas appliances.

This change was based on requirements in CSA-A405; however, A405 may now be changed, which could necessitate a further change in the NBC.

Masonry chimneys

- **Chimney liners**
- **Projection above cap**
- **Max. 100 mm, min 50 mm**
- **Conforms with CSA- A405**

Extension of chimney liners - 9.21.3.10.

This change limits the projection of a liner above the cap to 100 mm. At present there is no limit. The concern is the cooling effect of a long flue liner extension, with resultant condensation of flue gases.

Note on masonry chimneys

- **Lateral support**
- **3.6 m for 400 mm chimney**
- **Source- CAN/CSA-A405**

Lateral stability - A-9.21.4.5.

The NBC 1985 did not state conditions under which lateral support is required for a chimney and what type of support is acceptable. The Appendix now includes information from CSA-A405. Under the conditions spelled out, a free-standing chimney with a least dimension of 400 mm can extend to 3.6 m. Attachment to the house with metal anchors is considered adequate lateral support for taller chimneys.

Masonry Chimneys

- **Masonry, reinforced concrete or metal chimney cap**
- **Bond break**
- **Conforms with CSA-A405**

Chimney caps - 9.21.4.6.

This change requires concrete caps with nominal reinforcing to prevent cracks, which can result in water leaks. A required bond break will permit differential thermal movement between a cast-in-place concrete cap and the liner, without damage to the cap.

Masonry fireplaces

- **Steel fireplace liners**
- **New CAN/ULC-S639**
- **Installed as per installation instructions**

Steel liners - 9.22.2.3.

A new ULC standard for metal fireplace liners, CAN/ULC-S639M, is now referenced. Installation must be in accordance with the manufacturer's instructions, which are certified along with the product.

Masonry fireplaces

- **Hearth extension**
- **Directly on combustible floor**
- **Installed as per A405**

Hearth extension - 9.22.5.1.(2)

The NBC 1985 required the hearth extension to be supported by concrete or masonry. The new CSA standard permits the hearth extension to be supported on a combustible floor. The standard specifies the type of material permitted and how it must be installed. The requirements in the NBC 1990 are based on the standard.

Fireplace combustion air

- **Details in new Appendix note**
- **Consistent with A405**
- **Further change required?**

Combustion air - 9.22.1.4.

The Appendix now includes details on the supply of combustion air to fireplaces. New information may result in changes in the future.

Steel beams

- **Redesigned limit states**
- **Slightly more conservative**
- **Deflection and dead Loads**
- **New Appendix note**

Allowable spans - 9.23.4.A.

The table of steel basement beam spans has been updated to account for the latest design techniques and the types of structural sections presently being manufactured. Spans are generally slightly more conservative than in the NBC 1985, due to the inclusion of deflection limits and dead loads in the calculations in accordance with accepted design practice. The design assumptions used are included in an Appendix note.

Floor beams

**New table added
Glued-laminated sections**

Allowable spans - 9.23.4.B.

A table giving spans for glued-laminated floor beams is new for 1990.

Long span lintels

- 3 or 4 members or glulam
- Carports and garages
- New table 9.23.12.B

Framing over openings - 9.23.12.B.

A new table provides spans for long-span lintels consisting of 3 or 4 members or glued-laminated members. These lintels can be used for openings into garages or carports.

Wall, floor and roof sheathing

- New CAN/CSA-O325.0
- Wood-based panel products
- Alternate to thicknesses in Part 9

CSA has produced a new performance standard for wood-based construction sheathing. The test methods in this standard and a related quality assurance program allow wood-based panel products to be evaluated and rated for subflooring, wall sheathing and roof sheathing. Panels rated by this procedure can be used as alternatives to panels complying with other standards for which thicknesses are presently specified in Section 9.23.

CAN/CSA-O325.0

- **Based on APA standard**
- **Tests for bond, strength, stiffness, fastener-holding, stability**
- **Panel marks**

CAN/CSA-O325.0 is based almost entirely on a standard developed and used by the American Plywood Association and includes tests for bond, strength, stiffness, fastener-holding and stability. Panels conforming to the standard are marked with acceptable end uses and maximum spacings of supports.

CAN/CSA-O325.0

- **Subfloors, Table 9.23.14.B**
- **Roof sheathing, Table 9.23.15.B**
- **Wall sheathing, Table 9.23.16.B**

Changes relating to the referencing of this standard are Tables 9.23.14.B. for subflooring, 9.23.15.B. for roof sheathing, and 9.23.16.B. for wall sheathing. In each case, a separate table is provided showing the spacing of supports and the corresponding panel mark.

Wall sheathing

- **CSA-A101 Mineral Wool**
- **Rigid board**
- **Type 1 (plain)**
- **Type 2 (faced)**

Wall sheathing - 9.23.16.A.

Rigid mineral fibre has been added to the table of acceptable wall sheathings. This has become a common material, particularly Type 2 board, which incorporates a breather-type membrane. The most familiar example of this material is known by the trade name of Glasclad.

Waferboard and strandboard

- **CAN3-O437.0 referenced in 1987**
- **O-2 grade considered equivalent to plywood**
- **12.5 mm vs 12.7 mm**

Wood-frame construction - 9.23

The reference to the standard for waferboard has been changed to CAN3-O437.0, "Waferboard and Strandboard." Tests have shown one grade of waferboard and strandboard, O-2, to be equivalent to plywood in most applications. This material is manufactured in the same thicknesses as plywood, whereas R-1 and O-1 grades are slightly thicker because of metric nominal sizes.

Note on bracing

- **Explains requirements for bracing**
- **Warning about non-typical designs**
- **Tall, narrow buildings with large openings**

Bracing - A-9.23.18.

A new Appendix note provides the background behind the requirements for diagonal bracing and the permission to omit such bracing. Laboratory tests indicated that the bracing that had been traditionally used contributed relatively little to the overall strength of the wall. Most of the racking resistance was in effect provided by the interior finish. The permission to omit bracing assumes typical designs. Some unusual buildings may have reduced resistance to racking forces as a result of their configuration.

Note on finger-joined lumber

- **Refers to two NLGA standards**
- **SPS-1, Structural Use**
- **SPS-3, Vertical Use**
- **Conditions**

Continuity of studs - A-9.23.10.4.

A new Appendix note advises of the existence of two NLGA standards governing finger-joined lumber. The NLGA "Grading Rules for Canadian Lumber," referenced in Article 9.3.2.1, refers to these standards, SPS-1 "Fingerjoined Structural Lumber," and SPS-3 "Fingerjoined Stud Lumber—Vertical Use Only." The note explains that material identified as conforming to these standards is considered, with some conditions, to meet the requirements in Article 9.23.10.4. for joining with a structural adhesive.

Span Tables

- **Update to CSA O86**
- **Vibration criteria controls some floor joist spans**
- **Developed at Forintek**

Spans for joists, rafters and beams - 9.23.4.1.

The span tables for joists, rafters and beams in the NBC 1990 have been recalculated based on design methods and lumber properties published in the 1989 edition of the CSA Standard O86, "Engineering Design in Wood." Floor joist spans are also based on research done at Forintek on acceptable floor performance, which points to vibration characteristics as the determining factor in floor acceptance by users.

Floor Joist Spans

- **Vibration criteria explained**
- **Only needed if span tables not used**

Spans for joists, rafters and beams - A-9.23.4.1.(2)

A note in the Appendix explains the application of the vibration criteria. The procedure will rarely be used and only by those who are trying to design configurations not specifically covered in the Code. The Canadian Wood Council has reduced the need for this by releasing a volume of additional span tables.

Span Tables

- **Reduce number of species groups**
- **CSA O86-M89**
- **Limit states design**
- **Revised lumber properties**

A-1 to A-9

The complexity of the revised tables has been reduced by cutting the number of species groups from eight to four. The infrequently used species are not included. The tables also conform with limit states design procedures and lumber properties given in the latest edition of CSA-O86.

Span Tables

- **Deflection limits reduced**
- **No. 1 & 2 grades combined**
- **Flexibility re bridging.**

A-1 to A-9

The new strength properties and design assumptions enable simplification of the span tables. For example:

- The number of deflection limits were reduced, by eliminating $L/240$ for certain types of ceilings.
- The number of grades was reduced, by combining No. 1 and No. 2 grades. The results of an in-grade testing program confirmed that No. 1 grade lumber is not appreciably stronger and stiffer than No. 2 grade.

There is also flexibility with respect to bridging.

Floor joists

- **Bridging and restraint**
- **Different spans for strapping, bridging, and bridging + strapping**
- **Strapping as a minimum**

Strapping and bridging in Tables A1 and A2 - 9.23.9.4.

This flexibility enables builders to take proper advantage of improved construction methods, based on Forintek's study of acceptable floor performance.

Three cases are covered in the floor span tables:

- (a) strapping only,
- (b) bridging, and
- (c) bridging plus strapping.

The latter results in the longest spans.

Span Tables

- **Changes vary**
- **SPF up, D Fir down**
- **Larger sizes down**
- **Vibration governs at longer spans**

A-1 to A-9

Spans differ from those in the NBC 1985 to varying degrees, depending on the species, size of lumber, and length of member. Generally speaking, spans for Spruce-Pine-Fir lumber are up slightly and those for Douglas Fir are down slightly. This is as a result of the in-grade testing program. The effect of lumber size on strength values is greater than previously assumed. As a result, spans for some of the larger sizes are down.

For floor joists, the new vibration criteria govern at the longer spans.

Post, beam, and plank construction

- **Section deleted**
- **Requires professional design anyway**
- **Industry literature**

Section 9.24 - NBC 1985

The Section on "Post, Beam and Plank Construction" in the NBC 1985 has been deleted.

To comply with this Subsection, a structural designer was required for the major components of the building frame anyway; there is little reason to continue to provide the minor components of the design in Part 9. Information on these forms of construction is available in literature produced by industry associations.

As mentioned previously, deletion of Section 9.24 has resulted in re-numbering of all subsequent Sections.

Insulation and condensation control

- **Distinction between**
 - **vapour barriers (vapour diffusion)**
 - **air barriers (air leakage)**

It has been recognized for several years now that air leakage is usually a much more important cause of condensation problems than is vapour diffusion; yet the Code continued to refer only to vapour barriers. This has now been corrected. The former Section on thermal insulation and vapour barriers has been extensively re-written and renamed "Thermal Insulation and Control of Condensation." There are very few changes in the actual requirements; the intent behind the re-writing was to make a clear distinction between the vapour barrier function and the air barrier function.

Still no minimum RSI values

- **only enough insulation to avoid condensation**

Thermal insulation and control of condensation - 9.25

Section 9.5 still contains no minimum RSI values. It is only necessary to insulate assemblies to the extent necessary to avoid condensation on their interior surfaces. This is because the National Building Code is concerned with health and safety while energy conservation is an economic concern.

Insulated assemblies must provide:

- **Barrier to vapour diffusion**
- **Continuous barrier to air leakage**
- **Vapour barrier on warm side**
- **Air barrier anywhere unless it is also a vapour barrier**

Thermal Insulation and Control of Condensation - 9.25

Every insulated building assembly must be constructed so as to provide a barrier to vapour diffusion and a continuous barrier to air leakage. There are two key points to note:

First, the assemblies must be constructed so as to provide these barriers; they need not incorporate a separate element specifically identified as a vapour barrier or an air barrier. Thus, for example, the inherent high vapour resistance of certain finish materials or paints can provide the vapour barrier function. Also, various materials occurring in different parts of the assembly can be joined by sealants or gaskets to create an integrated air barrier. The other point to note is that continuity of the air barrier is stressed but this is not the case for vapour barriers. To be effective, an air barrier must be continuous; large amounts of moisture-laden air can leak through relatively small gaps in the air barrier. On the other hand, vapour diffusion is a weak mechanism which requires large areas to transfer significant amounts of moisture. Therefore, small gaps and holes in the vapour barrier are not critical.

The vapour barrier must be placed on the warm side of the assembly. The air barrier can be placed anywhere unless it has the characteristics of a vapour barrier; in this case it must be placed so that, in cold weather, its inner surface will be above the dew point of the interior air. A new Appendix note and example clarifies the method of determining an acceptable location for such air barriers

Polyethylene air or vapour barrier

- **New Standard CAN/CGSB-51.34**
- **Min. thickness 0.15 mm (6 mil)**

Thermal insulation and control of condensation - 9.25

Where polyethylene is used for the air or vapour barrier, it must comply with the new CGSB-51.34. This standard places more emphasis on durability than was previously the case. In order to incorporate enough of the chemicals necessary to resist oxidation and ultra-violet light, the polyethylene must be at least 0.15 mm (6 mil) thick.

Appendix notes

- **Conventional combined air/vapour barrier**
- **Innovative approaches e.g. airtight drywall approach**

An Appendix note makes it clear that the revised wording is intended to allow both the conventional approach of combining the air and vapour barriers in one material, such as polyethylene, and more innovative assemblies such as the airtight drywall.

Asphalt shingles

- **Reference to CSA standards for alternative methods**
- **Regular shingles on low-slope applications**

Alternative installation methods - 9.26.1.2.

Two CSA standards, A123.51 and A123.52, provide details on the application of asphalt shingles, depending on roof slope. The committee decided not to replace the Part 9 requirements with a reference to these standards. Such deletions are considered a disservice to Code users. Instead the committee chose to maintain the requirements for standard shingle applications in Part 9 and reference the standards for alternative methods. For example, CAN3-A123.52 explains how to apply regular shingles on low slope roofs.

Asphalt shingles

- **Eave protection**
- **Alternative materials added**
- **Poly dropped in 1987**

Materials - 9.26.5.2.(1)

Another change allows additional materials to be used as eave protection. These include Type M roll roofing, glass fibre or polyester fibre coated base sheets, and self-sealing composite membranes consisting of modified bituminous coated material.

This requirement was also revised to delete the reference to polyethylene eave protection because of reports of moisture problems leading to decay of roof sheathing.

Shingles

- **Eave protection**
- **Not required on steep slopes**
- **Not required < 3500 degree days**

Required eave protection - 9.26.5.1.(1)

There is a new exemption from the requirement for eave protection for steep roofs, since the high slope reduces the likelihood of ice dams. Eave protection is not required in milder climates such as Vancouver or Victoria, since ice damming is less likely to be a problem in those areas.

Gypsum board application

- **Details for single layer application**
- **Other applications to CSA-A82.31**

Gypsum board finish (taped joints) - 9.29.5.

The Subsection on gypsum board application has been changed to cover only single layer application over wood framing. For other applications, such as multiple layers, adhesive fastening, and application over steel studs or masonry, reference is made to CSA-A82.31 "Gypsum Board Application." The requirements for single-layer application in Part 9 have been revised to be consistent with that standard.

Flooring underlay

- **Required under ceramic tile**
- **6 mm for joists \leq 300 mm o.c.**
- **11 mm for joists > 300 mm o.c.**

Required underlay and materials and thickness - 9.30.2.1.(4) and 9.30.2.2.(2)

New requirements have been added to help reduce tile cracking due to excessive deflection of wood subfloors to which ceramic tiles have been applied with adhesive. For joists spaced up to 300 mm o.c., at least 6 mm thick underlay is required on top of the minimum thicknesses of subflooring. For joists greater than 300 mm o.c., at least 11 mm thick underlay is required.

Grab bars

- **Not required**
- **If installed resist 1.3 kN**
- **Reliance**

Grab bars - 9.31.2.3.

Article 9.31.2.3. requires grab bars, if installed, to be capable of resisting a load of 1.3 kN (292 lb) applied vertically or horizontally. This conforms with a similar change to Part 3.

This requirement does not require that grab bars be installed in any additional locations. This is covered in Section 3.7, "Barrier-Free Design." However, where a grab bar is installed, even if not required, it must be strong enough to perform its intended function.

Hot water supply

- **Lower maximum temperature**
- **Concerns over burns**

Hot water temperature - 9.31.6.1.

There have been complaints that the temperature limits specified for domestic hot water heaters in Part 9 are too high and have led to burns. Article 9.32.6.1. has therefore been changed to require hot water service heaters to have lower maximum temperature settings. The temperature range will be 45° to 60°C instead of 60° to 75°C.

Solid-fuel burning stoves ranges and space heaters

- **Reference to CAN/CSA-B365**
- **Duplications deleted**

Solid-fuel burning appliances - 9.33.1.2.

The requirements in the NBC 1985 covering installation of solid-fuel burning stoves, ranges and space heaters have been dropped in favor of those in CSA-B365 "Installation Code for Solid Fuel Burning Appliances and Equipment."

Mechanical ventilation of dwellings

NBC 1985

- **mechanical ventilation system in every dwelling**
- **0.5 air changes per hour installed capacity**

Mechanical ventilation of dwellings is another area where extensive changes have been made. The NBC 1985 introduced the requirement that all dwellings incorporate mechanical ventilation systems. The required system capacity was 0.5 air changes per hour. The 1985 requirements were criticized as excessive, too simplistic and not explicit enough.

NBC 1990

- **mechanical ventilation system in every dwelling**
- **0.3 air changes per hour installed capacity**

Mechanical ventilation - 9.32.3.

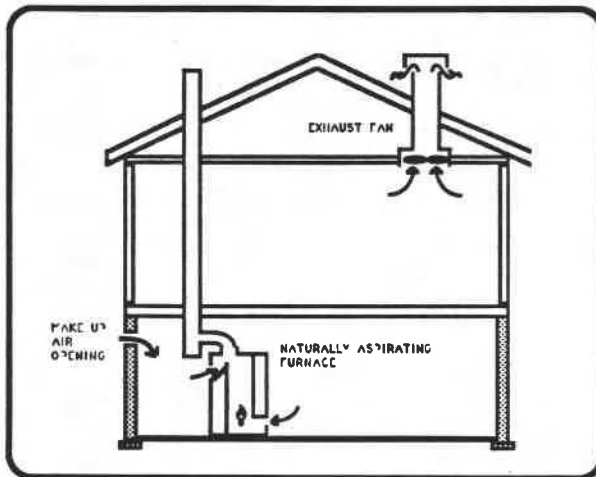
The NBC 1990 retains the requirement that all dwellings incorporate a mechanical ventilation system. However, the required capacity has been reduced to 0.3 air changes per hour. Also, considerably more detail has been included.

System Design Choice

- **Part 6 (ASHRAE, HRAI, etc.)**
- **Part 9 - simple exhaust system**

Mechanical ventilation - 9.32.3.

The system can be designed in accordance with Part 6 of the NBC, which references the ASHRAE Standards and Manuals and several other authorities as examples of "good engineering practice," or it can be designed to conform to a number of specific requirements for a simple exhaust system described in Part 9.



Simple Exhaust System

Mechanical ventilation - A-9.32.3.

A simple exhaust system could consist of no more than a single exhaust fan, such as a kitchen or bathroom exhaust fan. With such a system, make-up air openings are required if the house also incorporates a spillage-susceptible heating system, such as a fireplace or a naturally aspirated gas furnace.

New Appendix note on mechanical ventilation

- **basic principles**
- **make-up air guidance**
- **sample calculation**

Mechanical ventilation - A-9.32.3.

A very extensive Appendix note outlines some basic principles of mechanical ventilation of houses, provides guidance on when and how much make-up air is needed, and includes a sample calculation for determining the required fan and make-up air opening sizes.

Canada Mortgage and Housing Corporation has published an excellent document entitled "How to comply with Residential Ventilation Requirements of the 1990 National Building Code." It provides even more guidance as to the intent of these new requirements and alternative means of complying with them.

Garage floors

- **Slope to the outdoors**
- **CEC hazardous area**
- **Special wiring**

Garage floor - 9.35.2.2.

The floor of an attached or built-in garage is required to be sloped to the outdoors. According to the Canadian Electrical Code, an attached garage without provision to prevent spilled liquids from entering a dwelling unit causes any adjacent areas below the garage, including a basement next to the garage, to be classified as a hazardous area in which special wiring is required. Requiring drainage to the outdoors eliminates this concern.