

Fire Protection

CANADIAN STEEL CONSTRUCTION COUNCIL

201 Consumers Road, Suite 300
Willowdale, Ontario, M2J 4G8

THE 1995 NATIONAL BUILDING CODE OF CANADA

INTRODUCTION

The National Building Code of Canada (NBCC) is generally published on a five year cycle, with the latest edition released in November 1995.

In 1989, the Canadian Steel Construction Council (CSCC) published Fire Protection Bulletins Nos. 17 and 18. **Bulletin 17** described the 1985 NBCC as it related to designing for fire safety in multi-storey buildings, and **Bulletin 18** continued that theme with the emphasis on low-rise buildings. With the publication of the 1995 NBCC, many aspects of designing for fire safety in buildings have changed, some quite fundamentally.

Part 3 of the NBCC is entitled “**Fire Protection, Occupant Safety and Accessibility**”. The purpose of this Bulletin is to provide designers with an overview of the **Fire Protection aspects of Part 3**, in order that the most efficient and economical fire-resistance and fire protection requirements can be ascertained and designed for.

It should be noted at the outset that the 1995 NBCC has placed increased emphasis on the use of supervised and monitored automatic sprinkler systems as a primary means of fire safety, especially in larger non-residential buildings governed by Part 3. While this has not, as yet, translated into any major relaxations in the requirements for passive fire safety measures (such as fire-resistance ratings for floor assemblies), it has simplified design requirements in some instances.

Emphasis in this Bulletin has been given to the structural fire protection aspects of Part 3 (primarily

Section 3.1. and Section 3.2. Subsections 3.2.1. to 3.2.3.). The remainder of Part 3 is reviewed here in terms of the changes that have occurred since the 1990 NBCC, and that have some impact on steel construction.

DESIGNING FOR FIRE SAFETY - METHODOLOGY

There are five basic steps in designing a building for fire safety in accordance with the NBCC:

1. Classify Building by Occupancy
2. Classify Building by Size (Height and Area)
3. Determine Fire-Resistance Requirements
4. Determine Additional Requirements Related To Size And Occupancy
5. Design Appropriate Fire Protection.

This Bulletin describes the most important points to consider - but it is NOT a complete synopsis of the NBCC. The NBCC must be consulted before any design decisions are made.

STEP 1 - CLASSIFY BUILDING BY OCCUPANCY

Article 3.1.2.1., together with Table 3.1.2.1., lists the categories of Major Occupancy to which all buildings must be classified as belonging. The full list of examples of buildings in each Occupancy is set out in NBCC Appendix A (A-3.1.2.1.(1)). The following table provides an abbreviated summary of the NBCC's Occupancy classifications:



Algoma Steel Inc. Dofasco Inc. ISPAT Sidbec Inc. Stelco Inc.
Canadian Fasteners Institute Canadian Institute of Steel Construction Canadian Sheet Steel Building Institute
Steel Service Centre Institute Corrugated Steel Pipe Institute Canadian Welding Bureau (Associate Member)

Group	Division	Occupancy	Examples
A	1	Assembly	Cinemas, Theatres, Opera Houses, TV Studios
A	2	Assembly	Art Galleries, Dance Halls, Libraries, Restaurants, Court Rooms, Schools, Gymnasias
A	3	Assembly	Arenas, Indoor Pools, Rinks
A	4	Assembly	Bleachers, Grandstands, Stadia
B	1	Care/Detention	Jails/Prisons, Psychiatric Hospitals with Detention Facilities
B	2	Care/Detention	Hospitals, Nursing Homes, Reformatories
C	-	Residential	Apartments, Houses, Hotels, Dormitories
D	-	Business/Services	Offices, Beauty Parlours, Banks, Medical/Dental Offices, Radio Stations, Police Stns
E	-	Mercantile	Shops/Stores, Exhibition Halls
F	1	High Hazard Ind'l.	All Manufacturing/Storing/Processing of Hazardous Materials, Feed Mills, Distilleries
F	2	Medium Hazard Ind'l.	Hangars, Substations, Repair Garages, Woodworking Factories, Laboratories
F	3	Low Hazard Ind'l.	Factories, Power Plants, Salesrooms, Storage Garages, Studios, Laboratories

Articles 3.1.2.3., 3.1.2.4. and 3.1.2.5. of the NBCC may restrict, relax or otherwise qualify certain occupancy classifications.

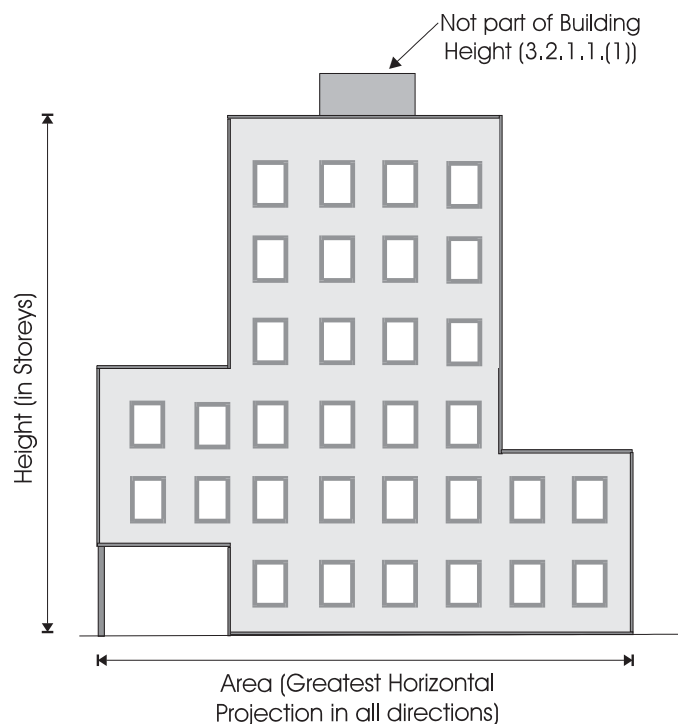
Where two or more occupancies adjoin, NBCC Table 3.1.3.1. specifies the hourly fire separations between them. Such separations must have the same fire-resistance rating (3.1.8.1.(1)). Note that, unless Article 3.1.3.1. specifies a more restrictive requirement, where a floor is used as a fire separation, the fire-resistance rating of the floor is determined by the occupancy below (3.2.2.7.(2)).

STEP 2 - ESTABLISH BUILDING SIZE

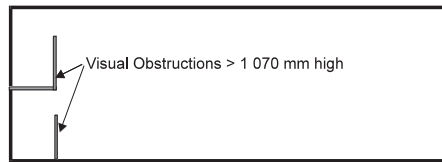
Two primary calculations establish a building's size - its Height and its Area. The diagram to the right illustrates what the NBCC means by these two terms. These two criteria (along with Occupancy) are used as the basis for determining almost all requirements for fire safety in a building.

A firewall (see Subsection 3.1.10.) may be used to divide a large building into separate smaller buildings.

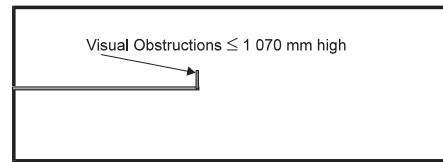
A basement storage garage can be considered as a separate building as long as all exterior walls above the adjoining ground level, and all floor/roof assemblies above the basement, are built in masonry or concrete as fire separations with a 2 h fire-resistance rating (3.2.1.2.(1)). See also the first paragraph under Step 3 on Page 3.



Subsection 3.2.1. also specifies a number of other qualifications in calculating building size. The most important of these concern mezzanines. The following diagrams on Page 3 illustrate how mezzanines affect building size (3.2.1.1.(3) and (4)):



If mezzanine >10% of floor under, it counts as a Storey



If mezzanine >40% of floor under, it counts as a Storey

Each additional wholly or partly superimposed mezzanine within the same floor area counts as a storey (3.2.1.1.(5)), and must be constructed in conformance with the fire separation requirements of Articles 3.2.2.20. to 3.2.2.83. (3.2.1.1.(6)).

STEP 3 - DETERMINE FIRE-RESISTANCE REQUIREMENTS

Floor assemblies over basements not considered as separate buildings must be constructed as fire separations having a fire-resistance rating the same as for any suspended floors above, but with an overall minimum of 45 minutes (3.2.1.4.(1)). The exception to this is **multi-storey dwelling units** in Group C (Residential) Occupancy, where floors over basements (and **entirely contained** within these dwelling units) must have a fire-resistance rating of either 45 minutes or 1 h, depending on the size of the building above. These floors however need not be constructed as fire separations (Sentence (3) in each of Articles 3.2.2.42. to 3.2.2.48.).

Subsection 3.2.2. regulates building construction relative to building occupancy and size. Where a building contains more than one major occupancy, it shall be designed as if the *entire building* was the most restricted major occupancy (3.2.2.6.). Where wholly superimposed major occupancies occur (i.e. one major occupancy completely above another), each major occupancy shall be designed as if the *entire building* was of that occupancy (3.2.2.7.).

Various minor steel components, such as lintels, are exempt from fire-resistance ratings in buildings that

otherwise require them (3.2.2.3.). Rooftop enclosures for elevator machine rooms, stair tower enclosures and the like are also generally exempt from fire-resistance ratings, although their construction must conform with the rest of the building in all other respects (3.2.2.14.).

Fire-resistance ratings for roofs are **waived** for arena-type buildings, such as gymnasias, swimming pools, arenas and rinks, as long as all parts of the roof are more than **6 m** above the floor or balcony below (3.2.2.17.).

Supervised and monitored sprinkler systems are required in many building classifications in Part 3 (3.2.2.18.(1)). The following Table summarizes the **sprinkler requirements** contained in Articles 3.2.2.20. to 3.2.2.83. In this Table, S = must be sprinklered, and the numerical values are the maximum permitted Area (m²), in buildings facing three streets, without sprinklering.

There are often options permitting less restrictive construction requirements, or fewer number of streets faced, in which case the maximum permitted Area without sprinklering reduces accordingly.

Occupancy		1 storeys	2 storeys	3 storeys	4 storeys	5 storeys	6 storeys	over 6 storeys
A1	Theatres, etc	S	S	S	S	S	S	S
A2	Restaurants, schools, etc	2 400	1 200	S	S	S	S	S
A3	Arenas, etc	6 000	3 000	S	S	S	S	S
A4	Grandstands, etc	Usually not required						
B1	Forced detention facilities	S	S	S	S	S	S	S
B2	Hospitals, nursing homes	S	S	S	S	S	S	S
C	Apartments, Hotels	No limit	No limit	6 000	S	S	S	S
D	Offices, etc	No limit	No limit	7 200	5 400	4 320	3 600	S
E	Mercantile	1 500	1 500	1 500	S	S	S	S
F1	High hazard industrial	800	S	S	S	S	S	S
F2	Medium hazard industrial	1 500	1 500	1 500	S	S	S	S
F3	Low hazard industrial	No limit	10 800	7 200	5 400	4 320	3 600	S

If any part of a building is required to be sprinklered, then all storeys below must also be sprinklered, regardless of what may otherwise be permitted (3.2.2.18.(2)).

Articles 3.2.2.20. to 3.2.2.83. regulate building construction (combustible or noncombustible, sprinkler requirements, fire separations and fire-resistance ratings) relative to Occupancy and building size (Height and Area). For the 1995 NBCC, these Articles have been re-arranged - instead of starting with the least stringent construction within any one occupancy group or division, they now start with the most stringent (i.e. Any Height, Any Area, Sprinklered).

The **Table on Pages 6 and 7** summarizes the requirements for **sprinklering, combustibility, and fire resistance for suspended floor construction**, for each occupancy classification in **Articles 3.2.2.20. to 3.2.2.83.** Columns, arches, etc., must have the same rating as the assembly immediately above that they support.

As a general rule, where floors (not mezzanines) are required to have a fire-resistance rating, such floors must also be built as **fire separations**.

The exception to this is **interior** storeys entirely within Group C dwelling units of more than one storey, where this requirement is waived (Sentence (3) in each of Articles 3.2.2.42. to 3.2.2.48.). Where the dwelling units are not stacked (i.e. no unit above another), fire-resistance ratings to such floors are also waived (Sentence (4) in each of Articles 3.2.2.45. to 3.2.2.48.).

Fire-resistance ratings for roof construction have been eliminated in sprinklered buildings. Fire-resistance ratings for roofs may still be required for certain sizes of buildings in those occupancy classifications still permitted to be unsprinklered.

However, for every occupancy classification that permits an unsprinklered building, there is an equivalent sprinklered classification. The **equivalent sprinklered** classification, as well as not requiring a fire-resistance rating to roofs, also permits other relaxations, such as increased *Area* (doubled in most instances), as well as no restrictions or requirements on the number of streets faced.

STEP 4 - DETERMINE ADDITIONAL REQUIREMENTS RELATED TO SIZE AND OCCUPANCY

Subsection 3.2.3. - Limiting Distance

Subsection 3.2.3. contains some important provisions relating to spatial separation. **CSCC Fire Protection Bulletin No. 20**, which describes the CSCC 1 h fire rated sheet steel wall program, also explains the concept of Limiting Distance, and how to calculate any required correction factor when a 1 h fire-rated sheet steel wall is used where the required Limiting Distance calls for a 2 h wall (NBCC 3.2.3.1.(6)).

For the 1995 NBCC, the Tables showing the required Limiting Distance based on both Occupancy and the configuration of the exposing building face have been segregated between unsprinklered and sprinklered buildings (NBCC Tables 3.2.3.1.A. and 3.2.3.1.B. for unsprinklered buildings; Tables 3.2.3.1.C. and 3.2.3.1.D. for sprinklered buildings).

The tables for **sprinklered** buildings have been **greatly simplified**, and permit **significantly reduced minimum Limiting Distances**. Limiting Distances for unsprinklered buildings have not been changed.

As before, a **low hazard industrial building**, complying with Article 3.2.2.82., is permitted to have an exposing building face without a fire-resistance rating as long as it is of noncombustible construction, and the limiting distance not less than 3 m (3.2.3.10.).

Subsections 3.2.4. and 3.2.5. - Alarm and Fire Fighting Systems

Subsections 3.2.4. and 3.2.5. specify respectively the required alarm and fire fighting systems. In general, there is much more integration of these two aspects of fire safety.

For the 1995 NBCC, any building in which an automatic sprinkler system is installed (whether it is required or not) must have an **alarm system** (3.2.4.1.(1)). In addition, a number of situations involving certain types of building or occupancy must also have an alarm system (3.2.4.1.(2)).

Where fire fighting requirements include the installation of a sprinkler system, it must be installed in accordance with **NFPA 13** "Standard for the Installation of Sprinkler Systems"; NFPA 13R and 13D may be used for residential occupancies under 4 storeys and one- and two-family dwellings as appropriate (3.2.5.13.).

Combustible sprinkler piping may be used only for residential and light hazard occupancies. Such piping must be fire separated from the area served by the sprinkler system (3.2.5.14.).

All buildings over 3 storeys or 14 m in height must have a standpipe (3.2.5.8.). Both the standpipe and the sprinkler system must have a fire department connection (3.2.5.16.).

Subsection 3.2.6. - Additional Requirements for High Buildings

A **High Building**, in simplified terms, is any building that exceeds the following dimensions (not number of storeys) in building height:

Groups A, D, E, or F:	> 36 m high
Groups B or C:	> 18 m high.

These dimensions are measured between Grade and the floor level of the topmost storey. There are some additional restrictions and qualifications to this broad classification, and Article 3.2.6.1. should be consulted to determine whether a specific building is in fact a High Building.

Appendix B - 'Fire Safety in High Buildings' - has replaced the former Supplement Chapter 3, "Measures for Fire Safety in High Buildings". With all High Buildings now required to be sprinklered, emphasis is given on designing for the control of smoke movement.

Appendix B adds some cautionary notes on the necessity of understanding the principles involved.

Subsection 3.2.7. - Lighting and Emergency Power Systems

Subsection 3.2.7., mostly unchanged from the 1990 NBCC, is outside the context of this Bulletin.

Subsection 3.2.8. - Mezzanines and Openings Through Floor Assemblies

Subsection 3.2.8. is also virtually unchanged from the 1990 NBCC. For 1995, any building with interconnected floor spaces must be sprinklered throughout (3.2.8.4.). The previous requirements concerning sprinkler operation detection and fire department notification are deleted, as these are now mandated in the overall NBCC sprinkler requirements.

Section 3.3. - Safety Within Floor Areas

Section 3.3. specifies additional fire safety requirements for floor areas **within** a building, with varying requirements for different occupancies (including subsidiary occupancies).

The few changes here are mostly editorial, as well as reflecting the increased mandatory sprinkler requirements - i.e. specific sprinkler requirements or options have been deleted. **Some** (but not all) previously required fire separations between occupied spaces and exit corridors are eliminated provided the building is sprinklered throughout.

A new requirement mandates a 1 h fire separation to common laundry rooms in residential occupancies (45 minutes if the adjacent floor construction is less than 1 h), unless the building is sprinklered throughout.

Another new requirement requires multi-tenanted self-storage warehouses to be either sprinklered throughout, or with 45-minute fire rated separations between each unit (3.3.5.10.).

The Subsection dealing with unsprinklered hospitals and nursing homes has been deleted, as these are no longer permitted.

Section 3.4. - Requirements for Exits

Section 3.4. contains a number of detail changes from 1990, mostly editorial, or eliminating anomalies. Combustible glazing in exits is no longer permitted (3.4.1.10.). Some increases in maximum floor areas served by only one exit are permitted in fully sprinklered buildings (Table 3.4.2.1.B.).

Section 3.5. - Vertical Transportation

This is a new Section for 1995. Fire separations of elevator hoistways and machine rooms must be no less than the fire-resistance rating of the floor above, or below if no floor above, with an **overall minimum of 45 minutes**. Dumbwaiter hoistways

Articles 3.2.2.20. To 3.2.2.83. - Sprinklering, Construction Type and Fire-resistance Ratings:

Group	Div.	Occupancy	Size	Sprinklered	Construction *	Qualifications	Floor FRR **	NBCC Art.
A	1	Assembly	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.20.
A	1	Assembly	One Storey, Limited Area, Sprinklered	Yes	N/C	< 40% of Area is mezzanine, Area <600 m ² , Occupant Load <600 ²	45 min	3.2.2.21.
A	1	Assembly	One Storey, Sprinklered	Yes	Comb or N/C	Auditorium floor to be within 5 m of Grade, Auditorium Occupant Load to be <300 ²	45 min	3.2.2.22.
A	2	Assembly	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.23.
A	2	Assembly	Up to 6 Storeys, Any Area, Sprinklered	Yes	N/C	-	1 h	3.2.2.24.
A	2	Assembly	Up to 2 Storeys	Not required	Comb or N/C	Max Area = 1 200 m ² ³	Not required ⁴	3.2.2.25.
A	2	Assembly	Up to 2 Storeys, Increased Area, Sprinklered	Yes	Comb or N/C	Max Area = 2 400 m ² ⁵	Not required ⁴	3.2.2.26.
A	2	Assembly	Up to 2 Storeys, Sprinklered	Yes	Comb or N/C	Max Area = 600 m ² ⁵	Not required	3.2.2.27.
A	2	Assembly	1 Storey	Not required	Comb or N/C	Max Area = 600 m ² ⁶	Not required	3.2.2.28.
A	3	Assembly	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.29.
A	3	Assembly	Up to 2 Storeys	Not required	N/C	Max Area = 3 000 m ² ⁷	1 h	3.2.2.30.
A	3	Assembly	Up to 2 Storeys, Sprinklered	Yes	N/C	Max Area = 6 000 m ² ⁵	1 h	3.2.2.31.
A	3	Assembly	1 Storey, Increased Area	Not required	Comb or N/C	Max Area = 3 600 m ² ⁶	Not required ⁸	3.2.2.32.
A	3	Assembly	1 Storey, Sprinklered	Yes	Comb or N/C	Max Area = 7 200 m ²	Not required	3.2.2.33.
A	3	Assembly	1 Storey	Not required	Comb or N/C	Max Area = 1 500 m ² ⁶	Not required	3.2.2.34.
A	4	Assembly	-	Yes ⁹	N/C ¹⁰	-	Not required	3.2.2.35.
B	1	Care/Detention	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.36.
B	1	Care/Detention	Up to 3 Storeys, Sprinklered	Yes	N/C	See Note ¹¹ for Area limits	1 h	3.2.2.37.
B	2	Care/Detention	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.38.
B	2	Care/Detention	Up to 3 Storeys, Sprinklered	Yes	N/C	See Note ¹¹ for Area limits	1 h	3.2.2.39.
B	2	Care/Detention	Up to 2 Storeys, Sprinklered	Yes	Comb or N/C	Max Area = 1 600 m ² ⁵	45 min ⁸	3.2.2.40.
B	2	Care/Detention	1 Storey, Sprinklered	Yes	Comb or N/C	Max Area = 500 m ²	Not required	3.2.2.41.
C	-	Residential	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹ ¹²	3.2.2.42.
C	-	Residential	Up to 6 Storeys, Sprinklered	Yes	N/C	See Note ¹³ for Area limits	1 h ¹²	3.2.2.43.
C	-	Residential	Up to 3 Storeys, N/C	Not required	N/C	Max Areas = Unlimited/6 000 m ² ¹⁴	1 h ¹²	3.2.2.44.
C	-	Residential	Up to 4 Storeys, Sprinklered	Yes	Comb or N/C	See Note ¹⁵ for Area limits	1 h ¹²	3.2.2.45.
C	-	Residential	Up to 3 Storeys, Increased Area	Not required	Comb or N/C	Max Areas = 1 800 m ² /1 200 m ² ¹⁶	1 h ¹²	3.2.2.46.
C	-	Residential	Up to 3 Storeys	Not required	Comb or N/C	Max Areas = 1 350 m ² /900 m ² ¹⁷	45 min ⁸ ¹²	3.2.2.47.
C	-	Residential	Up to 3 Storeys, Sprinklered	Yes	Comb or N/C	See Note ¹⁸ for Area limits	45 min ⁸ ¹²	3.2.2.48.
D	-	Business	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.49.
D	-	Business	Up to 6 Storeys	Not required	N/C	See Table 3.2.2.50. for Area limits/Streets faced	1 h	3.2.2.50.
D	-	Business	Up to 6 Storeys, Sprinklered	Yes	N/C	See Note ¹⁹ for Area limits	1 h	3.2.2.51.
D	-	Business	Up to 4 Storeys, Sprinklered	Yes	Comb or N/C	Max Area = 3 600 m ²	1 h	3.2.2.52.
D	-	Business	Up to 3 Storeys	Not required	Comb or N/C	Restrictions if combustible roof. See Table 3.2.2.53. for Area limits/Streets faced	Not required ⁴	3.2.2.53.
D	-	Business	Up to 3 Storeys, Sprinklered	Yes	Comb or N/C	See Note ²⁰ for Area limits	Not required ⁴	3.2.2.54.
D	-	Business	Up to 2 Storeys	Not required	Comb or N/C	Max Area = 1 200 m ² ²¹	Not required ⁴	3.2.2.55.
D	-	Business	Up to 2 Storeys, Sprinklered	Yes	Comb or N/C	See Note ²² for Area limits	Not required ⁴	3.2.2.56.
E	-	Mercantile	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.57.
E	-	Mercantile	Up to 4 Storeys, Sprinklered	Yes	Comb or N/C	Max Area = 1 800 m ²	1 h	3.2.2.58.
E	-	Mercantile	Up to 3 Storeys	Not required	Comb or N/C	Max Area = 1 500 m ² ²³	45 min ⁸	3.2.2.59.
E	-	Mercantile	Up to 3 Storeys, Sprinklered	Yes	Comb or N/C	See Note ²⁴ for Area limits	45 min ⁸	3.2.2.60.
E	-	Mercantile	Up to 2 Storeys	Not required	Comb or N/C	Max Area = 900 m ² ²⁵	45 min	3.2.2.61.

Group	Div.	Occupancy	Size	Sprinklered	Construction *	Qualifications	Floor FRR **	NBCC Art.
* Comb = Combustible Permitted: N/C = noncombustible Required. ** FRR = Fire-resistance rating								
E	-	Mercantile	Up to 2 Storeys, Sprinklered	Yes	Comb or N/C	See Note ²⁶ for Area limits	45 min	3.2.2.62.
F	1	High Hazard Ind.	Up to 4 Storeys, Sprinklered	Yes	N/C	See Note ²⁷ for Area limits	2 h ¹	3.2.2.63.
F	1	High Hazard Ind.	Up to 3 Storeys, Sprinklered	Yes	N/C	See Note ²⁸ for Area limits	45 min	3.2.2.64.
F	1	High Hazard Ind.	Up to 2 Storeys, Sprinklered	Yes	Comb or N/C	See Note ²⁹ for Area limits	Not required ⁴	3.2.2.65.
F	1	High Hazard Ind.	1 Storey	Not required	Comb or N/C	Max Area = 800 m ²	N/A	3.2.2.66.
F	2	Med. Hazard Ind.	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹	3.2.2.67.
F	2	Med. Hazard Ind.	Up to 4 Storeys, Increased Area, Sprinklered	Yes	N/C	See Note ³⁰ for Area limits	1 h	3.2.2.68.
F	2	Med. Hazard Ind.	Up to 3 Storeys	Not required	Comb or N/C	Max Area = 1 500 m ² ³¹	45 min ⁸	3.2.2.69.
F	2	Med. Hazard Ind.	Up to 4 Storeys, Sprinklered	Yes	Comb or N/C	See Note ³² for Area limits	45 min ⁸	3.2.2.70.
F	2	Med. Hazard Ind.	Up to 2 Storeys	Not required	Comb or N/C	Max Area = 900 m ² ³³	Not required ⁴	3.2.2.71.
F	2	Med. Hazard Ind.	Up to 2 Storeys, Sprinklered	Yes	Comb or N/C	See Note ³⁴ for Area limits	Not required ⁴	3.2.2.72.
F	3	Low Hazard Ind.	Any Height, Any Area, Sprinklered	Yes	N/C	-	2 h ¹ ³⁵	3.2.2.73.
F	3	Low Hazard Ind.	Up to 6 Storeys	Not required	N/C	See Table 3.2.2.74. for Area limits	1 h	3.2.2.74.
F	3	Low Hazard Ind.	Up to 6 Storeys, Sprinklered	Yes	N/C	See Note ³⁶ for Area limits	1 h	3.2.2.75.
F	3	Low Hazard Ind.	Up to 4 Storeys	Not required	Comb or N/C	See Table 3.2.2.76. for Area limits	Not required ⁴	3.2.2.76.
F	3	Low Hazard Ind.	Up to 4 Storeys, Sprinklered	Yes	Comb or N/C	See Note ³⁷ for Area limits	Not required ⁴	3.2.2.77.
F	3	Low Hazard Ind.	Up to 2 Storeys	Not required	Comb or N/C	Max Area = 1 200 m ² ³⁸	Not required ⁴	3.2.2.78.
F	3	Low Hazard Ind.	Up to 2 Storeys, Sprinklered	Yes	Comb or N/C	See Note ³⁹ for Area limits	Not required ⁴	3.2.2.79.
F	3	Low Hazard Ind.	1 Storey	Not required	N/C	See Note ⁴⁰ for Area limits	N/A	3.2.2.80.
F	3	Low Hazard Ind.	1 Storey, Sprinklered	Yes	N/C	Max Area = 16 800 m ²	N/A	3.2.2.81.
F	3	Low Hazard Ind.	1 Storey, Any Area, Low Fire Load	Not required	N/C	Used only for low fire load occupancy (see Article for examples)	N/A	3.2.2.82.
F	3	Low Hazard Ind.	Storage garages up to 22 m high	Not required	N/C	Max 22 m high, 10 000 m ² Area	Not required	3.2.2.83.
* Comb = Combustible Permitted: N/C = noncombustible Required. ** FRR = Fire-resistance rating								

Footnotes to Table:

- ¹ 1 h permitted for Mezzanines
- ² No Occupancy above or below Auditorium
- ³ Maximum Area for 2 Storeys facing 3 streets - see Table 3.2.2.25. for other options
- ⁴ 45 min FRR required if of combustible construction
- ⁵ For 2 Storeys - see relevant Article for 1 Storey limits
- ⁶ Facing 3 streets - see relevant NBCC Article for facing 1 and 2 streets
- ⁷ Maximum Area for 2 Storeys facing 3 streets - see Table 3.2.2.30. for other options
- ⁸ 45 min FRR required for Mezzanines if of combustible construction
- ⁹ Only below seating tiers used for occupancy
- ¹⁰ Combustible construction permitted if maximum occupant load is 1 500, minimum limiting distance is 6 m
- ¹¹ Area Limits: 1 Storey - Unlimited, 2 Storeys - 12 000 m², 3 Storeys - 8 000 m²
- ¹² Floors within multi-storey dwelling units need not be separations, need 1 h FRR
- ¹³ Area Limits: 1 and 2 Storeys - Unlimited, 3 Storeys - 12 000 m², 4 Storeys - 9 000 m², 5 Storeys - 7 200 m², 6 Storeys - 6 000 m²
- ¹⁴ Maximum Areas for 2 and 3 Storeys facing 3 streets - see Table 3.2.2.44. for other options
- ¹⁵ Area Limits: 1 Storey - 7 200 m², 2 Storeys - 3 600 m², 3 Storeys - 2 400 m², 4 Storeys - 1 800 m²
- ¹⁶ Maximum Areas for 2 and 3 Storeys facing 3 streets - see Table 3.2.2.46. for other options
- ¹⁷ Maximum Areas for 2 and 3 Storeys facing 3 streets - see Table 3.2.2.47. for other options
- ¹⁸ Area Limits: 1 Storey - 5 400 m², 2 Storeys - 2 700 m², 3 Storeys - 1 800 m²
- ¹⁹ Area Limits: 1 and 2 Storeys - Unlimited, 3 Storeys - 14 400 m², 4 Storeys - 10 800 m², 5 Storeys - 8 640 m², 6 Storeys - 7 200 m²
- ²⁰ Area Limits: 1 Storey - 14 400 m², 2 Storeys - 7 200 m², 3 Storeys - 4 800 m²

- ²¹ Maximum Area for 2 Storeys facing 3 streets - see Table 3.2.2.55. for other options
- ²² Area Limits: 1 Storey - 3 000 m², 2 Storeys - 2 400 m²
- ²³ Maximum Area for 1, 2 and 3 Storeys facing 3 streets - see Table 3.2.2.59. for other options
- ²⁴ Area Limits: 1 Storey - 7 200 m², 2 Storeys - 3 600 m², 3 Storeys - 2 400 m²
- ²⁵ Maximum Area for 2 Storeys facing 3 streets - see Table 3.2.2.61. for other options
- ²⁶ Area Limits: 1 Storey - 3 000 m², 2 Storeys - 1 800 m²
- ²⁷ Area Limits: 1 Storey - 9 000 m², 2 Storeys - 4 500 m², 3 Storeys - 3 000 m², 4 Storeys - 2 250 m²
- ²⁸ Area Limits: 1 Storey - 3 600 m², 2 Storeys - 1 800 m², 3 Storeys - 1 200 m²
- ²⁹ Area Limits: 1 Storey - 2 400 m², 2 Storeys - 1 200 m²
- ³⁰ Area Limits: 1 Storey - 18 000 m², 2 Storeys - 9 000 m², 3 Storeys - 6 000 m², 4 Storeys - 4 500 m²
- ³¹ Maximum Area for 1, 2 and 3 Storeys facing 3 streets - see Table 3.2.2.69. for other options
- ³² Area Limits: 1 Storey - 9 600 m², 2 Storeys - 4 800 m², 3 Storeys - 3 200 m², 4 Storeys - 2 400 m²
- ³³ Maximum Area for 2 Storeys facing 3 streets - see Table 3.2.2.71. for other options.
- ³⁴ Area Limits: 1 Storey - 4 500 m², 2 Storeys - 1 800 m²
- ³⁵ 1 h for Open-Air Storage Garages
- ³⁶ Area Limits: 1 Storey - Unlimited, 2 Storeys - 21 600 m², 3 Storeys - 14 400 m², 4 Storeys - 10 800 m², 5 Storeys - 8 640 m², 6 Storeys - 7 200 m²
- ³⁷ Area Limits: 1 Storey - 14 400 m², 2 Storeys - 7 200 m², 3 Storeys - 4 800 m², 4 Storeys - 3 600 m²
- ³⁸ Maximum Area for 2 Storeys facing 3 streets - see Table 3.2.2.78. for other options
- ³⁹ Area Limits: 1 Storey - 7 200 m², 2 Storeys - 2 400 m²
- ⁴⁰ Area Limits: 5 600 m² facing 1 street, 7 000 m² facing 2 streets, 8 400 m² facing 3 streets

may be less than the equivalent floor rating (see Table 3.5.3.1.). The 45 minute minimum applies only where a floor is required to have a fire-resistance rating.

Section 3.6. - Service Facilities

Again, only minor changes appear in Section 3.6. (formerly 3.5.), reflecting the increased mandatory sprinkler requirements in most buildings, and the removal of elevator hoistways to its own section. Vertical service spaces now require the same fire separations (see Table 3.6.3.1.) as dumbwaiters (see Section 3.5.).

Appendix D - 'Fire-Performance Ratings'

Appendix D of the NBCC (which replaces Chapter 2 of the former Supplement) will reflect a number of changes that have occurred in the construction marketplace regarding the practicality or availability of various materials used to achieve fire resistance.

The most important of these concern the use of gypsum wallboard in fire-rated assemblies. For 1995, the use of generic wallboard is no longer permitted, primarily because its density has decreased by as much as 30% since the underlying tests were performed. Consequently, only Type X wallboard, manufactured to specified standards, is now listed for use in fire-rated assemblies.

STEP 5 - DESIGN APPROPRIATE FIRE PROTECTION

This Bulletin will not go into any detail in designing appropriate fire protection - Bulletins 7 and 8 did that for direct-applied (sprayed on) and membrane type protection methods respectively. While the costing in those Bulletins must be updated to reflect today's price levels, the explanatory material they contained is still relatively current. CSCC plans to update both Bulletins.

In general, for larger buildings, especially those requiring more than 1 h of fire resistance for floor assemblies, sprayed on applications (fibrous or cementitious) to structural members will generally prove the more economical. For smaller buildings, requiring 1 h or less of fire resistance, membrane protection (acoustic ceilings; gypsum wallboard to walls, columns and ceilings) will usually be more appropriate. Judicious building design may often eliminate the need for such protection altogether.

The design of such fire protection can be effected by using an Underwriters Laboratories of Canada (ULC) Listed Design (Underwriters Laboratories Inc. designs from the US may also be used). Where there is no suitable Listed Design, NBCC Appendix D - Fire Performance Ratings - may be used, although the resulting fire protection will be very conservative, with commensurate cost penalties.

CSCC Fire Protection Bulletin 19, issued in 1990, details a **preferred 'short list'** of ULC/ULI Listed Designs, which enables designers to quickly select a suitable Design for a particular application. While changes in the marketplace have made some parts of this Bulletin obsolete, it is still substantially current. A new version is in course of preparation.

It is expected that the future will see less emphasis on passive structural fire-resistance ratings as the fundamental concept of fire safety in buildings, and more emphasis placed on active measures, integrated into a methodology involving risk-cost assessment.

Future editions of the NBCC will incorporate the concept of risk-cost assessment that is now being developed at the National Research Council of Canada (NRC). This includes a sophisticated computer program (called FiRECAM) that can **assess the risk-cost safety factor (compared with the current NBCC) for a particular type of building**. This analytical approach to fire safety will give designers more flexibility in achieving the most economical fire protection requirements for a particular building.