

**THE FIRE RISK INDICES FOR THE APPLICATION TO THE  
REHABILITATION AND RE-USE OF EXISTING BUILDINGS IN  
MANITOBA FOR RESIDENTIAL AND BUSINESS AND PERSONAL  
SERVICES OCCUPANCIES**

A Publication of

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# GUIDELINES FOR THE REHABILITATION AND RE-USE OF RESIDENTIAL AND OFFICE BUILDINGS IN MANITOBA

## INTRODUCTORY INFORMATION

### Overview of Guidelines

One of the most perplexing fire safety and code application problems is addressing existing buildings, especially heritage buildings, which are being renovated, enlarged or whose use is changing. The current Manitoba Building Code (MBC 2011) is primarily intended to apply to the "construction and occupancy of new buildings, and the alteration, reconstruction, demolition, removal, relocation and occupancy of existing buildings". While the direct application of the MBC to new buildings can be achieved, in most cases, without significant problems, its direct application to existing buildings often results in considerable debate about the continued use of existing materials, systems and designs, especially when dealing with heritage buildings.

The National Building Code of Canada (NBCC 1995) included a companion document "User's Guide – NBC 1995, Fire Protection, Occupant Safety and Accessibility" which provides some guidance on the application of the fire safety requirements in Part 3 of the NBCC (MBC) to existing buildings. (See Annex A.) In essence, this document relies on the development of equivalent protection measures to compensate for possible fire safety deficiencies in existing buildings – and requires that the authorities having jurisdiction (AHJ) make a decision on each. There is no quantitative guidance to allow the AHJ to know whether equivalent protection has been provided. This absence of quantitative guidance results in problems for both designers/contractors and for AHJs in dealing with fire safety for existing buildings undergoing renovation or change of use. The risk indices described in Parts 2 to 5 of these Guidelines provide the needed quantitative guidance in most cases.

The application of the MBC to heritage buildings is even more problematic given the heritage protection for materials, assemblies and designs – meaning that these features cannot be altered, or hidden, if the heritage preservation goals for the building are to be met. Realizing this dilemma in heritage buildings, the City of Winnipeg developed fire safety alternatives for the rehabilitation of a group of buildings in its Exchange District. Those Alternatives and their separate risk indices are contained in Parts 4 and 5 of these Guidelines. Those risk indices also provide a quantitative means for a designer/contractor or an AHJ to determine if sufficient fire protection has been provided in a heritage building.

These Guidelines contain 5 Parts which address the rehabilitation and re-use of residential and office buildings in Manitoba.

Part 1 – Contains the general requirements primarily related to the application of the Guidelines.

Part 2 – Applies to the rehabilitation and re-use of most residential buildings (Group C major occupancy), with the exception of some heritage buildings in the City of Winnipeg.

Part 3 – Applies to the rehabilitation and re-use of most office buildings (Group D major occupancy), with the exception of some heritage buildings in the City of Winnipeg.

Part 4 – Applies to the rehabilitation and re-use of a group of buildings being converted to or re-used as Group C major occupancy in the Exchange District of the City of Winnipeg.

Part 5 – Applies to the rehabilitation and re-use of a group of buildings being converted to or re-used as Group D major occupancy in the Exchange District of the City of Winnipeg.

### **Fire Risk Indices Explained**

Fire risk indices originated in the insurance industry approximately 100 years ago and have been successfully used for a variety of applications, including as a means to ascertain compliance with codes. In general, fire risk indices assign numerical values to selected fire safety parameters, based on professional judgement, experience or prevailing regulations. The parameters selected for a fire risk index represent both positive and negative fire safety features. The assigned values for each parameter are then combined in various ways to achieve a single value (or a few values) representing risk in a particular building. That value can be compared to other values, calculated utilizing different fire safety features for the same building and using the same methodology, to achieve a relative ranking of risk for different designs or materials in a building. For example, by calculating the risk for a code-complying design and using that as a benchmark, the calculated risk using other designs, materials and systems can be compared to that benchmark to determine if the code-intended level of safety has been achieved using the risk index as a basis.

Some examples of where risk indices have been used include:

- Insurance Rating Schedules
- Fire and Explosion Indices
- Fire Safety Evaluation Systems (NFPA 101A).

It is this last risk index (NFPA 101A) which provides the model used in developing fire risk indices for residential and office building rehabilitation and re-use in Manitoba. (See Appendix A.) The NFPA 101A – "Guide on Alternative Approaches to Life Safety" approach is essentially a quantitative means to ascertain whether equivalent fire safety to the NFPA Life Safety Code has been attained for selected occupancies. (See Appendix A.) NFPA 101A was developed first to promote economical upgrading of health care facilities and later extended to other occupancies as the need was identified. A similar approach, using the Manitoba Building Code (MBC) as the equivalent benchmarks for residential and office occupancies in Parts 2 and 3, has been used in developing these Guidelines. For heritage buildings covered in Parts 4 and 5, the MBC and the Fire Safety Alternatives contained in those parts have been used together to establish the benchmarks.

Effectively, what the Fire Safety Alternatives for heritage buildings in Parts 4 and 5 do is to establish goals related to occupant fire safety, consistent with the MBC 2011; to prescribe alternatives to address those goals; and to test them against potential fire

scenarios that could occur in the Heritage Buildings. The Fire Safety Alternatives for heritage buildings provide means, consistent with the intent of the MBC, to provide occupant safety, but also acknowledging heritage preservation and cost effectiveness goals that need to be addressed as well. They do so on a global basis rather than on a requirement by requirement basis, however.

### **Buildings and Parameters Addressed**

The risk indices described in these Guidelines apply to residential (MBC Group C) and office (MBC Group D) major occupancy buildings which are being rehabilitated or renovated for continued use, or buildings whose major occupancy is being changed to a residential occupancy or an office occupancy.

It is intended that the risk indices apply to both MBC Parts 3 and 9 buildings which have shared egress facilities or require more than one exit. For example, this means that the residential risk index in Part 2 is not intended for application to 1 and 2 family dwellings, townhouses, walk-ups (duplexes) or similar types of buildings in which each suite (unit) has separate, independent egress facilities at or near ground level. At the same time, it would apply to hotels, motels, apartment buildings and rooming houses. The office risk index in Part 3 applies to office buildings which have shared egress facilities.

The risk indices in Parts 2 and 3 are not intended to replace those in Parts 4 and 5 for heritage buildings in Winnipeg. Those risk indices were designed to apply specifically to a group of heavy timber, heritage buildings in the downtown area of Winnipeg (Exchange District) and the risk indices contain elements specific to the heritage issues that need to be addressed in those buildings. The risk indices in Parts 2 and 3 are intended to apply to the broad range of other buildings proposed for use as residential and office occupancies and which do not have major heritage issues that need to be addressed. Other municipalities, which can comply with the assumptions made for heritage buildings in Parts 4 and 5, may wish to use those Parts for heritage buildings within their jurisdictions. Users are cautioned that these Parts were custom-designed for the Winnipeg Exchange District buildings and that other applications should be undertaken only after a complete understanding of all of the issues addressed by that custom design.

The risk indices address only the most significant fire safety parameters related to building rehabilitation and re-use. In the rehabilitation, conversion or re-use of any building, other code compliance issues, such as barrier-free design, accessibility and plumbing systems, must still achieve MBC compliance, or have specific alternative solutions to those MBC requirements developed.

### **Heritage Buildings Addressed**

A cross section of the typical type of heritage building to which Parts 4 and 5 apply is shown in the table below. As can be seen, the typical heritage building is four to seven storeys high with a building area (per storey) of approximately 250 m<sup>2</sup> to 1000 m<sup>2</sup>.

Address	Building Height (storeys)	Building Area (m <sup>2</sup> )
181 Bannatyne	6	380
104 King	4	230
476 Main	6	860
165 McDermot	6	380
245 McDermot	4	610
288 McDermot	6	410
290 McDermot	7	550
296 McDermot	6	550
263 Portage	6	950
104-108 Princess	5	280
123 Princess	4	350

The typical construction of the heritage buildings is heavy timber with masonry exterior walls. It is the exterior masonry walls which face major streets that constitute one of the most significant historic aspects of the buildings. The construction of the floors, roofs, columns and beams is typically heavy timber with dimensions in excess of those required for such construction in the MBC. This assumption is based on observations and on the fact that the buildings were designed originally to carry significantly greater loads (warehouses or industrial) than will be imposed by residential or office occupancies and thus greater sized members were employed.

Most heritage buildings face a major street on at least one side and a second side faces at least a lane, which could provide fire department access to the building and potentially a route for occupant escape. Fire department response time to any of these Heritage Buildings has been reported by the Winnipeg Fire and Paramedic Department to be not greater than 5 minutes from receipt of alarm.

It is likely that the Street Level floor and/or Basement Level floor of the heritage buildings will contain a combination of mercantile and restaurant occupancies, in addition to office or residential occupancies. These are "major occupancies" from the MBC perspective. It is also possible that the Street Level or Basement Level may contain small Day-Care Centres. This is also a major occupancy. It is proposed that all of these occupancies be treated as "hazardous areas" in the building with respect to the major occupancy (Group C or D) rather than apply structural fire protection to that portion as though the entire building were an assembly or retail major occupancy.

## How the Manitoba Risk Indices Work

A risk index, in the context of these Guidelines, will assess the overall safety in a residential or office building by focusing on the relative contributions of selected fire safety parameters. It does not address all fire safety features that are included in the MBC, however, it focuses on those which are considered to have the greatest overall positive or negative contributions to occupant fire safety.

By assigning point scores to the contributions of the various selected parameters and by achieving a certain minimum point score, a user quantitatively demonstrates that equivalency to the MBC for an existing building has been achieved. The risk index provides the user with a uniform means of knowing the major fire safety features to address, the relative importance of each and the collective importance of all of them to overall building fire safety.

Identifying the Critical Fire Zone – The user of the risk index first selects a “fire zone” (or zones) which is a space in a building separated from all other spaces by fire-rated construction. Most often, that will be the highest storey of a building, or a portion of that storey depending on fire compartmentation. The objective is to determine the zone that may have the greatest impact on occupant fire safety. In a typical building, given the distance from an outside exit and hence the greatest distance for an occupant to travel in an emergency, the highest floor is most often the most critical fire zone. This is not always the case, especially if lower floors (or zones) in a building have different layouts, use different construction materials, or if they are exposed to additional hazards, such as vertical openings or hazardous areas. In cases where a building is not essentially uniform from basement to top storey, then, a user may have to evaluate a number of fire zones to establish the one which is the critical fire zone.

Point Scores - Having identified the critical fire zone, the user then completes the analysis to establish the point scores for the fire safety parameters for the fire zones and the building. Positive and negative points are assigned to each fire safety parameter depending on its extent of positive contribution to fire safety or negative impact on occupant safety. The maximum number of positive or negative points assigned to a parameter is a relative indication of its overall importance compared to other parameters. For example, under the construction parameter in Part 2, the maximum number of positive points is 2 – indicating that any additional fire resistance provided for the building will have little additional impact on occupant safety. At the same time, the maximum number of negative points is -8 indicating that an existing building of that height and construction presents a significant risk to occupants.

Basic Requirements – In developing the risk indices, it was noted that there are certain basic fire safety issues that must be met in total for occupant fire safety to be achieved. These have been called “basic requirements” and are listed in Parts 2 to 5. These basic requirements demand specific compliance to the MBC or the Manitoba Fire Code (MFC), depending on the fire safety issue. A user may negotiate an alternative solution to one or more of these basic requirements, however, the negotiation of such alternatives is beyond the scope of these risk indices. Compliance, or an acceptable alternative solution, is required for those items prior to applying the risk indices.

Comparisons to Benchmarks – Having assigned point scores to all parameters for the selected fire zones, the user then assembles those scores under four assessments for the building. The scores for the assessments for the fire zones are then compared to the prescribed minimum scores to determine if equivalent fire safety to the MBC, or the MBC and the Fire Safety Alternatives for heritage buildings, has been achieved. If not, certain fire safety features may need to be changed and the analysis completed again to eventually establish point scores for the assessments which equal or exceed the minimum required scores for a particular building as indicated by the benchmarks.

## **Layout of Guidelines**

Each Part in these Guidelines provides the guidance and requirements for the application of the specific risk index to the applicable buildings. Each Part also contains the Worksheets needed to develop the quantitative fire risk assessments for a particular building. The Guidelines are intended for use by those assessing a building or for those AHJs who are reviewing a design proposal based on the use of a risk index.

Specifically, Parts 2 and 3 contain four segments:

- The guidance text to enable users to apply the risk index.
- A Worksheet containing the parameters and basic requirements that need to be assessed.
- A second Worksheet containing the means to calculate the levels of fire safety provided by the existing building in four broad areas: fire control, refuge, egress and overall fire safety; and
- A third Worksheet showing the minimum benchmarks that the building must meet in the four broad areas in order to provide equivalent safety to the MBC for an existing building.

Similar to Parts 2 and 3, Parts 4 and 5 contain five segments applicable to heritage buildings:

- The Fire Safety Alternatives for either residential or office heritage buildings.
- The guidance text to enable users to apply the risk index.
- A Worksheet containing the parameters and basic requirements that need to be assessed.
- A second Worksheet containing the means to calculate the levels of fire safety provided by the existing building in four broad areas: fire control, refuge, egress and overall fire safety; and
- A third Worksheet showing the minimum benchmarks that the building must meet in the four broad areas in order to provide equivalent safety to the MBC and Fire Safety Alternatives for an existing heritage building.



## PART 1 – GENERAL REQUIREMENTS

### Section 1.1 – General

1.1.1 These Guidelines apply to the fire safety risk indices for *residential and business and personal services occupancies*. They contain the instructions necessary to complete the worksheets and develop point values for a particular *building* design.

1.1.2 The MBC requirements may be used in lieu of the provisions of these Guidelines. These Guidelines contain alternative means of achieving compliance with the Manitoba Building Code (MBC) for existing *buildings* which, following rehabilitation or change of use, will result in MBC Group C or D *major occupancies*. The alternative means developed using the risk indices are considered to provide equivalent safety to the MBC for existing *buildings* provided that the specified minimum point values are achieved. Either the risk index method, described in these Guidelines, or the MBC shall be used independently. Except where specifically indicated in these Guidelines, they are not intended to be used interchangeably.

1.1.3 These Guidelines address the most significant fire safety parameters which have an impact on the occupants of existing *buildings* in the event of a fire. They do not address all aspects of fire safety contained in the MBC, such as stair geometry, corridor widths and exposure protection.

1.1.4 Fire safety features not addressed in these Guidelines shall comply with the MBC or alternative solutions developed in conformance with Section 2.3, Part 2, Division C of the MBC.

1.1.5 These Guidelines are intended for use with the MBC, 2011 edition (NBCC 2015).

1.1.6 Terms in these Guidelines that are shown in italics (*italics*) are defined terms in the MBC and have the same meaning in these Guidelines.

### Section 1.2 – Application

- 1.2.1 These Guidelines are intended for application to existing *buildings* which
- a) are required to conform to Parts 3 or 9 of the MBC,
  - b) are intended primarily for Group C or D *major occupancies*, but which may contain ancillary *occupancies*,
  - c) contain egress facilities and *exits* that are shared among two or more *suites*, and  
 Note: A common exterior passageway leading to exit stairs is considered as being shared egress for the purpose of application of these Guidelines.
  - d) are served by fire departments essentially conforming to either NFPA 1710 – "Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments" or NFPA 1720 – "Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments". (See Appendix A.)

- 1.2.2 These Guidelines apply to existing *buildings* which
- a) are being altered or renovated to contain primarily Group C or D *major occupancies* regardless of what the *major occupancy* of the *building* may have been previously, or
  - b) have a change of *occupancy* to contain primarily a Group C or D *major occupancy*.

1.2.3 These Guidelines may apply when only a major portion of a *building* is undergoing renovation or change of *major occupancy*. (For example, one complete *storey* of a *building* would usually constitute a major portion.) The extent to which the Guidelines are applied in those cases will depend on the extent of fire hazard in the unrenovated portions of the *building* and the potential impact of that fire hazard on the renovated portions. The *authority having jurisdiction* shall be consulted as to the applicability of these Guidelines in these cases.

- 1.2.4 These Guidelines do not apply to
- a) vertical or horizontal additions to *buildings* (New construction portions shall conform to the MBC.),
  - b) *buildings* which are not provided with an adequate water supply for firefighting in conformance with the MBC,
  - c) *buildings* which have been constructed under, or after, the MBC, 1998 edition (NBCC 1995), and
  - d) *buildings* containing Group F Division 1 and Group F Division 2 *major occupancies*. *Buildings* containing such *major occupancies* shall conform to the MBC.

### **Section 1.3 – Procedure for Determining Equivalency Using the Fire Risk Indices**

1.3.1 The fire risk indices in Part 2 to 5 for *residential* and *business and personal services occupancies* are measuring systems which compare the level of safety provided by selected fire safety parameters in a *building* to that provided by those *buildings* that directly comply with the MBC.

1.3.2 The fire risk index evaluates the level of fire safety in selected or all fire zones in the *building*.

#### **1.3.3 Fire Zones**

1.3.3.1 A fire zone is a portion of a *building* that is separated from all other portions of the *building* by *fire separations* having a *fire resistance rating* at least equal to that required for floor assemblies for the specific *building* size in Subsection 3.2.2 of the MBC.

1.3.3.2 The *building height* and *building area* of the *building* shall be used to establish the referenced *fire separation* and *fire resistance rating* requirements from Subsection 3.2.2 of the MBC.

1.3.3.3 Openings in the boundaries of a fire zone shall be protected in conformance with the MBC. Doors protecting these openings shall be equipped with self-closing

devices and shall be normally closed or self-closing by signals from *smoke detectors* located near the doors.

1.3.3.4 The fire safety parameters shall be determined for all fire zones, or selected fire zones, in accordance with Parts 2 to 5. Only those fire zones containing primarily *residential* or *business and personal services occupancies* are to be addressed. Fire zones containing only other *occupancies* shall be addressed using the Hazardous Areas parameter or shall require specific fire safety engineering analysis.

1.3.4 Each fire safety parameter shall be assessed for each fire zone or for the *building* as a whole, as required. The objective for each parameter is to establish which features of the parameter best describe the conditions in that fire zone. If two or more point scores could apply, the lowest point score shall be chosen as representative of that fire zone.

1.3.5 The fire zone which has the lowest overall point scores shall be considered the critical fire zone for the *building*.

1.3.6 The point scores for the fire safety parameters for the critical fire zone shall be totalled to obtain four evaluations: Fire Control, Refuge, Egress and Overall Fire Safety.

1.3.7 The four evaluations for the critical fire zone (or *building*) shall be compared to the Fire Safety Benchmarks for a *residential* or *business and personal services major occupancy building* of the same *building height*.

1.3.8 Equivalency is achieved when the point scores for the four evaluations for the critical fire zone (or *building*) equal or exceed the Fire Safety Benchmarks for a *residential* or *business and personal services major occupancy building* of the same *building height*.

## PART 2 –THE MANITOBA RESIDENTIAL OCCUPANCY FIRE RISK INDEX

### Section 2.1 – General

2.1.1 Part 2 applies to the fire safety risk index for *residential* (Group C) *occupancies*, except for heritage *buildings* covered in Part 4.

2.1.2 Each fire safety parameter for *buildings* of Group C residential *major occupancy* (Subsections 2.2.1 to 2.2.14) shall be analyzed using this Part and Worksheet 2-1.

2.1.3 Only one point value shall be selected for each fire safety parameter for each fire zone. If more than one value can apply, the lowest point value shall govern.

### Section 2.2 – Fire Safety Parameters for Residential Occupancy Buildings

#### 2.2.1 Construction of Structural Members and Floor and Roof Assemblies Parameter

2.2.1.1 The construction of structural members and assemblies shall be assessed using Table 2.1 in Worksheet 2-1. The construction type and *fire resistance rating* in the fire zone which provide the lowest point value shall govern. This assessment shall apply to each fire zone.

2.2.1.2 Construction types shall be classified as *combustible construction*, *noncombustible construction*, or *heavy timber construction* as described in the MBC.

2.2.1.3 The structural members and assemblies to which the *fire resistance ratings* in this parameter apply are those that require *fire resistance ratings* for a similar *building* size and height in Subsection 3.2.2 of the MBC.

2.2.1.4 For the purposes of this parameter, *building height* and *building area* are determined as per the MBC.

2.2.1.5 For the purposes of these Guidelines, except for *heavy timber construction*, a structural assembly or member shall have a minimum *fire resistance rating* of at least equivalent to one layer of regular 12.7 mm thick gypsum board covering the structural member or assembly.

2.2.1.6 The fire zone to be used for the application of this parameter is generally the highest *storey* used for sleeping purposes.

Note: The fire zone used for application of this parameter may be a storey or zone lower in the building if different types of construction occur in the building.

2.2.1.7 Where two or more construction types are present in an existing *building*, the governing point value for this parameter shall be the fire zone which gives the lowest value in Worksheet 2-1.

2.2.1.8 Where fire zones of *combustible construction* are located below fire zones of *noncombustible construction*, the upper *noncombustible construction* fire zones shall be considered as *combustible construction* for the purposes of this parameter.

2.2.1.9 *Fire resistance ratings* for the purposes of this parameter may be determined using any of the following regardless of the height and area of the *building*:

- a) Methods stated in Subsection 3.1.7 of the MBC,
- b) Tables A-9.10.3.1.A and B of the MBC, or
- c) Other methods or calculations supported by historical test information or appropriate engineering analysis.

## 2.2.2 Hazardous Areas Parameter

2.2.2.1 Each hazardous area in the *building* shall be assessed using Table 2.2 in Worksheet 2-1. The hazardous area which provides the lowest point value shall govern. This assessment shall apply to each fire zone.

2.2.2.2 For the purposes of these Guidelines, hazardous areas, are those spaces in *residential occupancy buildings* that the MBC considers to possess sufficient fire risk that they are required to have *fire separations*, sprinkler protection, or both.

2.2.2.3 Hazardous areas which are located immediately adjacent to *exits*, *exit lobbies* or *public corridors* shall be separated from the *exits*, *exit lobbies* or *public corridors* by at least a *fire separation* without a *fire resistance rating* (smoke separation) or the protection shall be rated as "No Fire Separations, No Sprinklers". (See also 2.2.10.5.)

2.2.2.4 For the purposes of these Guidelines, *storage garages* are to be assessed in all cases where the garage serves more than one *dwelling unit*.

2.2.2.5 In *buildings* where the aggregate area of an *office occupancy* exceeds 10 percent of the *floor area* on which it is located, the *office occupancy* shall be assessed using Part 3 of these Guidelines.

## 2.2.3 Vertical Openings Parameter

2.2.3.1 Each vertical opening shall be assessed using Table 2.3 in Worksheet 2-1. The vertical openings entry which provides the lowest point value shall govern for the *building*. This assessment shall apply to the *building* as a whole.

2.2.3.2 For the purposes of this parameter, a vertical opening is any situation in a *building* where multiple *storeys*, a *storey* (including *basement storeys*) and a *vertical service space*, or a *horizontal service space* and a *vertical service space* are connected in such a manner that they can be simultaneously affected by fire or smoke from a single fire incident. Vertical openings include shafts, chases, chutes, ducts and other vertical service penetrations.

2.2.3.3 A vertical opening is considered to be enclosed when a continuous *fire separation* (or smoke separation) exists between the *vertical service space* and the adjacent *storey* or *horizontal service space*.

2.2.3.4 A vertical opening is considered to be unenclosed if:

- a) No *fire separation* exists, or
- b) A *fire separation* exists but it is either incomplete or does not have appropriate *closures* as required by the MBC.

2.2.3.5 A vertical opening is considered to be enclosed if a continuous *fire separation* exists and openings are protected with *closures*, but the *closures* do not have the *fire protection ratings* required by the MBC. For the purposes of this parameter, the entry for "Enclosed, <1 h" shall be used.

2.2.3.6 Existing stairs and elevators, which are combined in the same shaft, are not required to be fire separated from each other for the purposes of this parameter. The combined shaft shall be considered when assigning point values for this parameter.

## **2.2.4 Automatic Sprinkler System Parameter**

2.2.4.1 Automatic sprinkler systems shall be assessed using Table 2.4 in Worksheet 2-1. This assessment shall apply to the *building* as a whole.

2.2.4.2 New automatic sprinkler systems installed in existing *buildings* shall conform to the MBC.

2.2.4.3 Refurbished automatic sprinkler systems in existing *buildings* shall conform to the MBC, except that unsupervised systems may be used.

2.2.4.4 An incomplete or partial automatic sprinkler system is one in which sprinklers are not installed in all spaces throughout the *building* as required by NFPA 13 or NFPA 13R, whichever is applicable to the *building* being assessed.

2.2.4.5 To qualify as a supervised system for the purposes of this parameter, the electrical supervision of valves and water flow shall conform to the MBC.

## **2.2.5 Fire Alarm System Parameter**

2.2.5.1 Fire alarm systems shall be assessed using Table 2.5 in Worksheet 2-1. This assessment shall apply to the *building* as a whole.

2.2.5.2 New fire alarm systems installed in existing *buildings* shall conform to the MBC.

2.2.5.3 An incomplete fire alarm system is one in an existing *building* which does not have fire alarm devices installed in all areas of a *building* as required by the MBC. An incomplete system shall be capable of operation, when needed, and of being heard in all areas of the *building* to be considered incomplete. Non-operational systems or systems which cannot be heard in all areas of the *building* shall be rated as "None".

2.2.5.4 Voice communication, supervision, fire department notification and the installation of fire detectors shall conform to the MBC to be credited in the higher-point value categories in Worksheet 2-1.

## 2.2.6 Smoke Alarms within Suites Parameter

2.2.6.1 *Smoke alarms* within *suites* shall be assessed using Table 2.6 in Worksheet 2-1. This assessment shall apply to each fire zone.

2.2.6.2 The installation of *smoke alarms* shall comply with the MBC.

2.2.6.3 Single Station Units are *smoke alarms* which sound only at the device that has activated. Interconnected Units are *smoke alarms* connected by wiring in such a manner that all devices in a *suite* shall operate when one device is in alarm mode.

2.2.6.4 For the purposes of this parameter, level means a *storey* or portion of a *storey* within a *suite* that contains space that can be occupied by persons.

2.2.6.5 Battery-powered *smoke alarms* are not considered to provide full compliance with this parameter. *Smoke alarms* with non-tamper, lithium batteries designed to provide power for at least 10 years are considered to provide partial compliance provided they are approved by the local *authority having jurisdiction*.

## 2.2.7 Suite Fire Compartmentation Parameter

2.2.7.1 The *fire separations* between *suites* and between *suites* and *public corridors* or other common spaces shall be assessed using Table 2.7 in Worksheet 2-1. This assessment shall apply to each fire zone.

2.2.7.2 This parameter applies to the vertical *fire separations* only. The horizontal *fire separations* are addressed in Subsection 2.2.1.

2.2.7.3 *Fire resistance ratings* for vertical *fire separations* in this parameter may be determined using any of the following, regardless of the height and area of the *building*:

- a) Methods stated in Subsection 3.1.7 of the MBC,
- b) Tables A-9.10.3.1.A and B of the MBC, or
- c) Other methods or calculations supported by historical test information or appropriate engineering analysis.

2.2.7.4 For a *fire separation* to be rated as "Walls < 45 min FRR", it shall have a minimum *fire resistance rating* of at least equivalent to one layer of regular 12.7 mm thick gypsum board on both sides of steel or wood studs. Walls possessing a lesser *fire resistance rating* shall be rated as "Incomplete".

2.2.7.5 Vertical *fire separations* which have openings which are not protected by appropriate *closures* or firestopping shall be rated as "Incomplete", except for doors as shown in Table 2.7 in Worksheet 2-1.

## 2.2.8 Temporary Refuge Areas Parameter

2.2.8.1 The vertical *fire separations* between bedrooms and the other spaces in *suites* shall be assessed using Table 2.8 in Worksheet 2-1. This assessment shall apply to each fire zone.

2.2.8.2 For the purposes of this parameter, vertical *fire separations* between bedrooms and the other spaces in *suites* shall be constructed as smoke separations to be considered as fulfilling the requirements.

2.2.8.3 Where vertical *fire separations* between bedrooms and the other spaces in *suites* contain unprotected openings (i.e., no smoke separation exists), those separations shall be rated as "Incomplete".

2.2.8.4 Doors in *fire separations* between bedrooms and other spaces in *suites* do not need to have a *fire protection rating* nor do they need to be self-closing.

2.2.8.5 Exterior balconies with direct access from each *suite* are considered to be temporary refuge areas provided they are at least 1.5 m deep and have an area of at least 1 m<sup>2</sup> per bedroom in the *suite*.

## 2.2.9 Access to Exits Parameter

2.2.9.1 Access to *exits* from *suites* shall be assessed using Table 2.9A or 2.9B in Worksheet 2-1, using the appropriate table which depends on whether the *building* is *sprinklered* or not. This assessment shall apply to each fire zone.

2.2.9.2 Direct access to a fire escape means that each *suite* contains a window, openable without the use of tools or specific knowledge, or a door leading directly from the *suite* to a fire escape, or directly to an exterior passageway leading to a fire escape.

2.2.9.3 For the purposes of this parameter, "travel" means the distance an occupant must move from the most remote point in a *suite* to an *exit* door, whether through a *public corridor* or not. It is calculated as the total distance travelled inside and outside the *suite* to reach an *exit* door.

2.2.9.4 The length of a dead end *public corridor*, for the purposes of this parameter, shall be measured from the centre of a *suite* doorway to an *exit* or to a point where the occupant may move in either of two directions to two separate *exits*.

2.2.9.5 For the purposes of this parameter, fire escapes shall conform to Subsection 2.2.10.

2.2.9.6 For the purposes of this Subsection, *public corridors* shall conform to the MBC.

## 2.2.10 Exits Parameter

2.2.10.1 *Exits* shall be assessed using Table 2.10 in Worksheet 2-1. This assessment shall apply to each fire zone.

2.2.10.2 For the purposes of this parameter, a horizontal *exit* shall:

- a) conform to the MBC in all aspects, or
- b) conform to the MBC, except that it need not pass through a *firewall* but may pass through a vertical *fire separation* having a *fire resistance rating* of 2 h. Such *fire separations* shall conform to the MBC, divide all *floor areas* of the *building* and shall be in essentially a vertical line through the *building*. *Building* segments on both sides of such *vertical fire separations* shall be



provided with at least one enclosed stair *exit* or *exit* door directly to the outside.

2.2.10.3 For the purposes of this parameter, existing fire escapes and the replacement of existing fire escapes are considered to provide compliance with this parameter on *buildings 6-storeys or less in building height* provided that all other aspects of the fire escapes conform to the MBC. New fire escapes shall conform to the MBC and shall be limited to *buildings 5-storeys or less in building height*.

2.2.10.4 For the purposes of this parameter, cross-corridor barriers shall be *fire separations* but need not have a *fire resistance rating*. Doors installed in cross-corridor barriers shall be self-closing, be weather-stripped, permit movement in both directions in the corridor and have positive latching to ensure that they remain closed following a fire alarm signal. In existing corridors which are wide enough to accommodate only a single door, doors in cross-corridor barriers need not swing in the direction of travel to the *exit* from both directions where the *occupant load* on both sides of the cross-corridor barrier does not exceed 60.

2.2.10.5 Where an *exit* discharges through a lobby, all aspects of the lobby shall conform to the MBC to be classified as a "Complying Lobby". Should any aspects not conform to the MBC, the lobby shall be classified as a "Non-Complying Lobby".

2.2.10.6 Existing *exit* stairs with non-conforming aspects, such as tread/riser dimensions, winders, width, handrail height and openings in guards, not addressed in other parameters in this Subsection, shall be permitted to be considered as *exits* for the purposes of this parameter provided:

- a) they are enclosed by *fire separations* and *closures* conforming to the MBC, and
- b) the non-conforming aspects do not in themselves constitute undue hazards to *building* occupants or fire fighters.

## 2.2.11 Interior Finishes of Walls and Ceilings Parameter

2.2.11.1 The *flame spread ratings* of the interior finishes of walls and ceilings in *exits*, *public corridors* and other spaces, including *suites*, shall be assessed using Table 2.11 in Worksheet 2-1. This assessment shall apply to each fire zone. The space which provides the lowest point value shall govern.

2.2.11.2 Exposed *heavy-timber construction* need not meet the *flame spread ratings* in this parameter.

2.2.11.3 For the purposes of this parameter, the *smoke developed classification* of interior finishes in high *buildings*, required to conform to MBC Subsection 3.2.6, shall conform to the MBC.

2.2.11.4 The interior finishes of walls and ceilings in bathrooms inside *suites* are permitted to have *flame spread ratings* not exceeding 200 and be classified as " $\leq 150$ " for the purposes of this parameter.

2.2.11.5 Where the *flame spread rating* of an interior finish of a wall or ceiling exceeds 200, these Guidelines shall not be used. The presence of such finishes requires a specific evaluation given the potential hazard that such finishes represent.

2.2.11.6 *Flame spread ratings* for interior finishes may be assigned on the basis of published reports of tests on equivalent materials or on previous editions of the MBC.

## 2.2.12 Smoke Control Systems Parameter

2.2.12.1 Smoke control systems shall be assessed using Table 2.12A or 2.12B in Worksheet 2-1. This assessment shall apply to:

- a) each fire zone for *buildings* whose uppermost floor level is 18 m or less above *grade*, and
- b) the *building* as a whole and each fire zone for *buildings* whose uppermost floor level is greater than 18 m above *grade* (high rise *buildings*).

2.2.12.2 For *sprinklered* high-rise *buildings* (as per Article 2.2.12.1), new smoke control systems utilizing vented stairwells or mechanical pressurization for stairwells shall conform to the MBC. For high-rise *buildings* that are not *sprinklered*, the impact of these smoke control measures is not known so no points are assigned for this parameter.

2.2.12.3 For the purposes of this parameter, cross-corridor barriers shall be *fire separations* but need not have a *fire resistance rating*. Doors installed in cross-corridor barriers shall be self-closing, be weather-stripped, permit movement in both directions in the corridor and have positive latching to ensure that they remain closed following a fire alarm signal. In existing corridors which are wide enough to accommodate only a single door, doors in cross-corridor barriers need not swing in the direction of travel to the *exit* from both directions where the *occupant load* on both sides of the cross-corridor barrier does not exceed 60.

2.2.12.4 For the purposes of this parameter, corridor pressurization shall be any system designed to maintain *public corridors* smoke free during a fire and can be either constantly running or activated by a fire alarm signal. A corridor pressurization system for odour control is acceptable provided it also meets the needs for preventing smoke movement from a fire in a *suite* into a *public corridor*.

## 2.2.13 Fire Safety Planning Parameter

2.2.13.1 Fire safety planning shall be assessed using Table 2.13 in Worksheet 2-1. This assessment shall apply to the *building* as a whole.

2.2.13.2 To be considered as fulfilling the requirements of this parameter, fire safety plans shall conform to the MFC and shall be reviewed and approved by the responding fire department to the *building*.

2.2.13.3 To be considered as fulfilling the requirements of this parameter, *exit* drills shall involve all staff normally expected to play a role in the fire safety plan.

2.2.13.4 *Exit* drills involving occupants of the *building* shall be considered as fulfilling the requirements of this parameter only if a majority of occupants normally occupying the *building* are involved in the drills.

### 2.2.14 Fire Brigade Response Parameter

2.2.14.1 The response of the fire department shall be assessed using Table 2.14A or 2.14B in Worksheet 2-1, using the appropriate table which depends on whether the *building* is *sprinklered* or not. This assessment shall apply to the *building* as a whole.

2.2.14.2 For the purposes of these Guidelines, fire departments shall essentially conform to Clause 1.2.1(d) which establishes a maximum fire department response time of 6 min as a time objective.

2.2.14.3 Response time for the fire department to reach the *building* shall be measured as the time between receipt of a fire alarm by the fire department to the time that it arrives at the *building*.

2.2.14.4 For the purposes of this parameter, fire department elevators shall conform to the MBC. An elevator not conforming to those requirements shall not be considered as a fire department elevator for the purposes of this parameter.

### 2.2.15 Basic Requirements

2.2.15.1 For the purposes of these Guidelines, all Basic Requirements shown in Table 2.15 in Worksheet 2-1 shall conform to the MBC or MFC, or specific equivalent protection shall be provided in accordance with Section 2.3, Part 2, Division C of the MBC or Subsection A-1.2.1.1.(1)(b), Part 1, Division A of the MFC.

2.2.15.2 These Guidelines apply only to *buildings* of residential *occupancy* as described in the MBC. *Occupancies* requiring trained staff to assist occupants in evacuation, such as day-care centres, are *care occupancies* and are beyond the scope of these Guidelines. The MBC shall be used to address such *occupancies*.

Note: These Guidelines acknowledge that a typical residential occupancy building will contain occupants with a broad spectrum of capabilities related to evacuation in the event of a fire. The various fire safety measures, described in these Guidelines, are intended to provide safety for all occupants provided they are able to sense and interpret fire cues and move from a fire location at least to an exit where temporary refuge is available.

2.2.15.3 For the purposes of these Guidelines, fire zones in *buildings* that are not *sprinklered* shall be provided with protection for *floor area*, with a *barrier-free* path of travel, in conformance with the MBC.

## Section 2.3 – Calculating Fire Safety

2.3.1 Fire safety for the *building* shall be assessed using four evaluations shown in Worksheet 2-2: Fire Control, Refuge, Egress and Overall Fire Safety.

2.3.2 The governing scores evaluated for each parameter in Subsections 2.2.1 to 2.2.14 (Tables 2.1 to 2.14 in Worksheet 2-1) shall be transferred to the appropriate rows in Worksheet 2-2. (For example, if the governing point score for “Fire Alarm Systems” is -2, the -2 shall be entered in all columns opposite the Fire Alarm Systems entry in Worksheet 2-2. The resulting point score under the “Fire Control Provided” column for this parameter would be  $-2/2 = -1$ . All other columns in this row would have the entry -2;

except the "Refuge Provided" column.) In Worksheet 2-2, the term "/2" means that the parameter point value from Worksheet 2-1 is divided by 2 and the resulting score shown in that entry. The term "N/A" means that the parameter from Worksheet 2-1 does not apply to this evaluation.

2.3.3 The columns in Worksheet 2-2 shall be totalled to obtain the aggregate point scores for the four evaluations. These totals shall be transferred to Worksheet 2-3 and used for comparison to the benchmarks in that worksheet.

## **Section 2.4 – Comparison to Benchmarks for Residential Occupancies**

2.4.1 The totals obtained for the four evaluations in Worksheet 2-2 shall be included in the appropriate locations in Column 1 in Worksheet 2-3.

2.4.2 For the height of the *building* being assessed, the minimum benchmarks for the four evaluations shall be identified using Worksheet 2-3 and the benchmark values included in Column 2 in Worksheet 2-3.

2.4.3 Equivalency to the requirements of the MBC for existing *buildings* shall be deemed to have been achieved if the point values of all four evaluations are greater than the minimum point values for the benchmarks for the height of the *building*. (From Worksheet 2-3, Column 1 must be equal to or greater than Column 2 for equivalency to have been achieved.)

Note: The minimum required benchmarks for residential buildings shown were derived from designs for a typical residential building of the same building height complying to the MBC but without considering building area as a determining factor in establishing risk.

# WORKSHEET 2-1

## THE MANITOBA RESIDENTIAL OCCUPANCY FIRE RISK INDEX

### FIRE SAFETY PARAMETER VALUES

**TABLE 2.1 CONSTRUCTION OF STRUCTURAL MEMBERS AND FLOOR AND ROOF<sup>(1)</sup> ASSEMBLIES**  
(Applies to each fire zone)

Building Height, Storeys	Combustible Construction				Protected <sup>(4)</sup> Heavy Timber FRR	Heavy Timber FRR	Noncombustible Construction			
	<45 min <sup>(2)</sup> FRR	45 min FRR	1 h FRR	2 h FRR			<45 min <sup>(2)</sup> FRR	45 min FRR	1 h FRR	2 h FRR
1 to 3	-3	0	1	2	2	1	-1	2	2	2
4	-4	-2	0	2	2	0	-2	0	2	2
5 to 6	-8	-6	-4	-2	-2	-4	-4	-2	0	2
>6	NP <sup>(3)</sup>	-7	-6	-4	-4	-6	-8	-3	-2	0

Notes:

<sup>(1)</sup> *Fire resistance ratings* for roof assemblies are required only when the applicable article in MBC Subsection 3.2.2. requires a rated roof assembly.

<sup>(2)</sup> <45 min requires a minimum FRR equivalent to 1 layer of regular 12.7 mm thick gypsum board covering the structural member or assembly.

<sup>(3)</sup> NP = not permitted.

<sup>(4)</sup> Protected Heavy Timber means heavy timber construction as per the MBC protected by 2 layers of 15.9 mm thick Type X gypsum board or equivalent thermal protection.

**TABLE 2.2 HAZARDOUS AREAS IN RESIDENTIAL BUILDINGS**  
(Applies to each fire zone)

	No Fire Separations No Sprinklers	No Fire Separations <sup>(4)</sup> + Sprinklers	Non-Rated Fire Separations <sup>(1)</sup> No Sprinklers	Non-Rated Fire Separations <sup>(1)</sup> + Sprinklers	Fire Separations ≥1 h No Sprinklers	Fire Separations ≥1 h + Sprinklers
Tenant Storage Rooms	-7	-2	-3	-1	-2 <sup>(3)</sup>	0
Furnace/Service Rooms	-4	0	-1	1	0	2
Common Laundry Rooms	-4	-2	-2	0	0 <sup>(3)</sup>	2
Common Janitors' Rooms	-4	-2	-2	0	0 <sup>(3)</sup>	2
Office, Assembly, or Light Industrial Occupancy in building	-4	-2	-2	0	0	2
Mercantile Occupancy or Storage Garage in building	-5	-4	-3	-2 <sup>(5)</sup>	-1 <sup>(6)</sup>	1
Elevator Machine Rooms <sup>(2)</sup>	-4	-2	-2	0	0 <sup>(3)</sup>	2
Refuse Storage Rooms	-7	-2	-3	-1	-2	0

Notes:

<sup>(1)</sup>Fire separations must be present to act as smoke separations regardless of the FRR.

<sup>(2)</sup>Elevator Machine Rooms need not be separated from the elevator hoistway provided both the room and the hoistway are fire separated from the remainder of the building as per the MBC.

<sup>(3)</sup>Where the MBC permits floor assemblies to have a 45 min fire resistance rating, rated enclosures of 45 min FRR shall be considered to be 1 h FRR for the purposes of application of this parameter.

<sup>(4)</sup>Where hazardous areas are located immediately adjacent to exits, exit lobbies or public corridors, no credit is to be given for sprinklers for the purposes of this parameter if there is no smoke separation present. Such situations shall be considered "No Fire Separations, No Sprinklers" for the purposes of application of this parameter.

<sup>(5)</sup>Where the storage garage contains 5 vehicles or less, the score for this parameter should be "0".

<sup>(6)</sup>If the FRR of Storage Garage fire separations are at least 90 min, the score for this parameter should be "0".

**TABLE 2.3 VERTICAL OPENINGS** (Applies to entire building)

Vertical Opening Types	Unenclosed - Number of storeys <sup>(1)</sup> open to a vertical service space <sup>(2)</sup>			Enclosed <sup>(3)</sup> – Fire Resistance Rating of Enclosure		
	>3 sto	2-3 sto	1 sto	<1 h <sup>(6)</sup>	1 h <sup>(5) (6)</sup>	>1 h
Exit Stair Shafts	NP <sup>(4)</sup>	-7	-2	-1	0	1
Refuse Chutes/Linen Chutes	-10	-7	-3	-1	0	1
Vertical Service Spaces	-10	-7	-2	-1	0	1
Elevator Shafts	-10	-7	-2	-1	0	1
Existing Stair/Elevator Shafts (combined)	-10	-7	-2	-1	0	1

## Notes:

<sup>(1)</sup>Includes basement storeys and roof spaces.

<sup>(2)</sup>Means no fire or smoke separation exists between storey and vertical service space, or it is incomplete.

<sup>(3)</sup>Enclosed means a fire or smoke separation exists and is continuous throughout the enclosure.

<sup>(4)</sup>NP = Not Permitted.

<sup>(5)</sup>Existing wired glass or glass block enclosures, regardless of area of glass, are considered to have a rating of 1 h.

<sup>(6)</sup>Where the MBC permits floor assemblies to have a 45 min fire resistance rating, rated enclosures of 45 min FRR shall be considered to be 1 h FRR for the purposes of application of this parameter.

**TABLE 2.4 AUTOMATIC SPRINKLERS<sup>(1)</sup>** (Applies to entire building)

Incomplete or None or Partial	Unsuper-vised using NFPA 13 with Std Sprinklers	Unsuper-vised using NFPA 13R System <sup>(2)(3)</sup>	Unsuper-vised using NFPA 13 with Residential Sprinklers	Supervis-ed <sup>(4)</sup> using NFPA 13 with Std Sprinklers	Supervised <sup>(4)</sup> using NFPA 13R System <sup>(2)(3)</sup>	Supervi-sed <sup>(4)</sup> using NFPA 13 with Residential Sprinklers
0	4	4	6	8	8	10

## Note:

<sup>(1)</sup>New and refurbished automatic sprinkler system installations shall conform to the MBC.

<sup>(2)</sup>NFPA 13 requires residential sprinklers to be installed in all residential spaces.

<sup>(3)</sup>NFPA 13R sprinkler systems are limited to buildings 4-storeys or less in height

<sup>(4)</sup>Supervision as required in the MBC.

**TABLE 2.5 FIRE ALARM SYSTEMS** (Applies to entire building)

None	Incomplete <sup>(1)</sup>	2 Stage System <sup>(3)</sup>	Single Stage System			
			Without Voice Comm	+ Voice Comm or Supervision <sup>(2)</sup>	+ Voice Comm <sup>(2)</sup> + Supervised <sup>(2)</sup> with FD Notification	+ Voice Comm <sup>(2)</sup> + Supervised with FD Notification <sup>(2)</sup> + Fire Detectors <sup>(2)</sup>
-4	-2	-1	0	1	2	3

Note:

<sup>(1)</sup>Incomplete means that the existing system does not meet all of the requirements of the MBC related to the specific building, but that a fire alarm system exists in the building and is operational. (See Article 2.2.5.3)

<sup>(2)</sup>As per MBC

<sup>(3)</sup>Where a 2-stage fire alarm system is continuously monitored by supervisory staff such that there is no delay in evacuation of occupants or notification of the fire department, a 2-stage system can be treated as a single-stage system for the purposes of this parameter.

**TABLE 2.6 SMOKE ALARMS WITHIN SUITES<sup>(1)</sup>** (Applies to each fire zone)

None or Battery-Powered Units	Units with Minimum 10-year Non-Tamper Lithium Batteries	Single Station Units <sup>(2)</sup>		Interconnected Units <sup>(2)</sup>	
		Every Level	Every Level and All Bedrooms	Every Level	Every Level and All Bedrooms
-4	-2	0	1	0	2

Note:

<sup>(1)</sup>Installed in conformance with the MBC.

<sup>(2)</sup>Hard-wired units are required.

**TABLE 2.7 SUITE FIRE COMPARTMENTATION (Suite to Suite and Suite to Corridor)** (Applies to each fire zone)

Incomplete/None <sup>(1)</sup>	Walls <45 min FRR <sup>(2)</sup>		Walls ≥45 min FRR <sup>(6)</sup>		Walls ≥1 h FRR <sup>(3)(6)</sup>	
	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR
-6	-3	-2	-2	-1	-1	0

Notes:

<sup>(1)</sup>Incomplete/none refers to the case where there is no smoke separation between the spaces.

<sup>(2)</sup>At least equivalent to 12.7 mm thick regular gypsum board on both sides of steel or wood studs.

<sup>(3)</sup>Existing wired glass or glass block enclosures, regardless of area of glass, are considered to have an FRR of 1 h.

<sup>(4)</sup>These door assemblies are not required to have a fire protection rating and do not require a rated frame or rated hardware but must have self-closing and latching devices to ensure that they can prevent smoke movement into the corridor.

<sup>(5)</sup>Conforming to the MBC.

<sup>(6)</sup>Where the MBC permits floor assemblies to have a 45 min fire resistance rating, walls having an FRR of 45 min shall be considered to be 1 h FRR for the purposes of application of this parameter. The assigned score will therefore be "0" or "-1" depending on the type of door.



**TABLE 2.8 TEMPORARY REFUGE AREAS** (Applies to each fire zone)

Incomplete/No Door <sup>(1)</sup>	Walls <sup>(2)</sup> + Door <sup>(3)</sup>		Exterior Balconies <sup>(5)</sup>
	Walls <20 min FRR	Walls ≥20 min FRR <sup>(4)</sup>	
-1	0	1	1

Notes:

<sup>(1)</sup>Incomplete/no door refers to the case where there is no smoke separation between the spaces.<sup>(2)</sup>Walls shall be at least smoke separations or be rated as "Incomplete".<sup>(3)</sup>Doors do not need to have an FPR nor do they need to be self-closing.<sup>(4)</sup>Wired glass or glass block assemblies, regardless of the area of glass, are considered to have an FRR ≥20 min.<sup>(5)</sup>Balconies must have direct access from each suite, be at least 1.5 m deep and have an area of at least 1 m<sup>2</sup> per bedroom in the suite.**TABLE 2.9A ACCESS TO EXITS FROM SUITES**  
**BUILDING NOT SPRINKLERED THROUGHOUT** (Applies to each fire zone)

Suite Has Direct Access to Fire Escape <sup>(3)</sup> + Dead End Public Corridor	Suite on Dead End Public Corridor <sup>(1)</sup> >6 m +		Suite on Dead End Public Corridor <sup>(1)</sup> ≤6 m +			Suite on 2 Directional Public Corridor +		
	≤15 m Travel <sup>(2)</sup>	>15 m Travel <sup>(2)</sup>	≤15 m Travel <sup>(2)</sup>	≤30 m Travel <sup>(2)</sup>	≤45 m Travel <sup>(2)</sup>	≤15 m Travel <sup>(2)</sup>	≤30 m Travel <sup>(2)</sup>	≤45 m Travel <sup>(2)</sup>
0	-2	-4	2	1	0	2	1	0

Note:

<sup>(1)</sup>Dead end public corridor must lead to 2-directional corridor or 2 exits<sup>(2)</sup>Travel is the total distance an occupant must walk to move from the most remote point in a suite to an exit door.<sup>(3)</sup>Existing fire escapes are permitted on buildings 6-storeys and less in height and other aspects conform to MBC. New fire escapes must conform to MBC.**TABLE 2.9B ACCESS TO EXITS FROM SUITES**  
**BUILDING SPRINKLERED THROUGHOUT** (Applies to each fire zone)

Suite Has Direct Access to Fire Escape <sup>(3)</sup> + Dead End Public Corridor	Suite on Dead End Public Corridor <sup>(1)</sup> >6 m +		Suite on Dead End Public Corridor <sup>(1)</sup> ≤6 m +				Suite on 2 Directional Public Corridor +			
	≤15 m Travel <sup>(2)</sup>	>15 m Travel <sup>(2)</sup>	≤15 m Travel <sup>(2)</sup>	≤45 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>	≤80 m Travel <sup>(2)</sup>	≤15 m Travel <sup>(2)</sup>	≤45 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>	≤80 m Travel <sup>(2)</sup>
0	-1	-3	2	1	0	-2	2	1	0	-2

Note:

<sup>(1)</sup>Dead end public corridor must lead to 2-directional corridor or 2 exits<sup>(2)</sup>Travel is the total distance an occupant must walk to move from the most remote point in a suite to an exit door.<sup>(3)</sup>Existing fire escapes are permitted on buildings 6-storeys and less in height and other aspects conform to MBC. New fire escapes must conform to MBC.

**TABLE 2.10 EXITS** (Applies to each fire zone)

<2 Exits	Enclosed Stairs <sup>(1)</sup> + Horizontal Exit <sup>(5)</sup>			2 or more Enclosed Stairs <sup>(1)</sup>				1 Enclosed Stair <sup>(1)</sup> + 1 Fire Escape (FE) <sup>(2)</sup> + Cross Corridor Barrier <sup>(3)</sup>		
	Stair Direct to Outside	Stairs Direct to Outside	Stairs Through Complying Lobby <sup>(4)</sup>	Stairs Through Non-Complying Lobby	All Stairs Direct to Outside	One Stair Through Complying Lobby <sup>(4)</sup>	One Stair Through Non-Complying Lobby	With Cross Corridor Barrier <sup>(3)</sup>	Stair Direct to Outside + FE	Stair Through Complying Lobby <sup>(4)</sup> + FE
-6	2	1	0	1	0	-1	4	1	0	-1

## Notes:

<sup>(1)</sup>Enclosure by a fire separation conforming to MBC. Existing wired glass assemblies with unlimited areas of glass are permitted where required FRR is 1 h or less.

<sup>(2)</sup>Existing fire escapes permitted only on buildings 6-storeys or less and other aspects conform to MBC. New fire escapes must conform to the MBC.

<sup>(3)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FRR (see Article 2.2.10.4).

<sup>(4)</sup>Lobby complying with MBC.

<sup>(5)</sup>Horizontal exit conforms to MBC except that, for the purposes of this parameter, exiting through a vertical fire separation with a 2 h FRR, which divides all floors of a building, shall be considered as horizontal exiting (see Article 2.2.10.2).

**TABLE 2.11 INTERIOR FINISHES OF WALLS AND CEILINGS<sup>(1)</sup>**

(Applies to each fire zone)

Exits FSR <sup>(2)(3)</sup>			Public Corridors FSR <sup>(2)</sup>		Other Spaces, including suites FSR <sup>(1)(2)(4)</sup>	
≤25	>25≤75	>75≤150	≤75	>75≤150	≤150	≤200
0	-1	-2	0	-1 <sup>(5)</sup>	0	-1

## Note:

<sup>(1)</sup>For high buildings required to conform to Subsection 3.2.6 of the MBC, requirements for smoke developed classifications of interior finishes must also be met.

<sup>(2)</sup>Does not apply to exposed heavy timber construction.

<sup>(3)</sup>Includes exit lobbies where exits are permitted to discharge through a lobby.

<sup>(4)</sup>Does not apply to wall and ceiling finishes of bathrooms provided that their FSR does not exceed 200.

<sup>(5)</sup>For sprinklered buildings, interior finishes in public corridors with FSR ≤ 150 shall be scored as "0".

**TABLE 2.12A SMOKE CONTROL FOR BUILDINGS WHOSE UPPERMOST FLOOR LEVEL IS 18 m OR LESS ABOVE GRADE**  
(Applies to each fire zone)

None	Vented Stairwells <sup>(1)</sup>	Mechanical Pressurization of Stairwells <sup>(1)</sup>	Cross Corridor Barriers	Pressurized Corridors	Pressurized Corridors + Cross Corridor Barriers <sup>(2)</sup>
0	1	1	1	2	3

Note:

<sup>(1)</sup>As per Subsection 3.2.6 of MBC.

<sup>(2)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FPR (see Article 2.2.10.4).

**TABLE 2.12B SMOKE CONTROL FOR BUILDINGS WHOSE UPPERMOST FLOOR LEVEL IS GREATER THAN 18 m ABOVE GRADE**  
(Applies to entire building)

None	Vented Stairwells <sup>(1)</sup>	Mechanical Pressurization of Stairwells <sup>(1)</sup>	Vented Stairwells <sup>(1)</sup> or Mech Press <sup>(1)</sup> + Cross Corridor Barriers	VS <sup>(1)</sup> or MP <sup>(1)</sup> + Pressurized Corridors	VS <sup>(1)</sup> or MP <sup>(1)</sup> + Pressurized Corridors + Cross Corridor Barriers <sup>(3)</sup>
NP <sup>(2)</sup>	0	0	1	1	2

Note:

<sup>(1)</sup>As per Subsection 3.2.6 of MBC

<sup>(2)</sup>NP = Not Permitted

<sup>(3)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FPR (see Article 2.2.10.4).

**TABLE 2.13 FIRE SAFETY PLANNING**  
(Applies to entire building)

No FSP <sup>(1)</sup> or No Exit Drills	FSP <sup>(1)</sup> Developed & Approved <sup>(2)</sup> + 1 Exit Drill/Year Involving Staff Only	FSP <sup>(1)</sup> Developed & Approved <sup>(2)</sup> + 1 Exit Drill/Year involving Staff and Occupants
-2	0	2

Notes:

<sup>(1)</sup>Fire safety plan as per MFC.

<sup>(2)</sup>Approved by fire department.

**TABLE 2.14A FIRE BRIGADE RESPONSE  
BUILDING NOT SPRINKLERED THROUGHOUT**  
(Applies to entire building)

FD Response <sup>(1)</sup> ≤6 min		FD Response <sup>(1)</sup> >6 min but ≤ 9 min		FD Response <sup>(1)</sup> >9 min	
With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator
1	0	-1	-2	-2	-3

Notes:

<sup>(1)</sup>Fire department response time means processing time plus travel time from the fire station to the building and excludes setup time which is estimated as 5 additional minutes

<sup>(2)</sup>Conforms to MBC requirements for fire department elevators.

**TABLE 2.14B FIRE BRIGADE RESPONSE  
BUILDING SPRINKLERED THROUGHOUT**

FD Response <sup>(1)</sup> ≤5 min		FD Response <sup>(1)</sup> >5 min but ≤ 9 min		FD Response <sup>(1)</sup> >9 min	
With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator
2	1	0	-1	-1	-2

Notes:

<sup>(1)</sup>Fire department response time means processing time plus travel time from the fire station to the building and excludes setup time which is estimated as 5 additional minutes

<sup>(2)</sup>Conforms to MBC requirements for fire department elevators.

**TABLE 2.15 BASIC REQUIREMENTS**

The following must conform to the MBC or MFC:

Basic Requirement	Yes – Complies with MBC/MFC	No – Requires Upgrading to Comply with MBC/MFC
Utilities Installation, including electrical equipment vaults		
HVAC Installation		
New Elevator Installation		
Fire-stopping		
Standpipe System		
New Sprinkler Systems comply with MBC		
Fire Alarm Audibility in all spaces		
New Fire Alarm Systems comply with MBC		
Testing/Maintenance of fire safety equipment complies with MFC and MBC testing requirements for control of smoke movement and mechanical venting		
Occupants must care for themselves in evacuation, except infants in care of responsible persons. (No trained staff to assist egress.)		
Non-sprinklered zones provided with protection for a floor area, with a barrier free path of travel, in conformance with the MBC.		
High buildings, as defined in MBC, conform to MBC additional requirements for high buildings, except for parameters addressed in this risk index.		

## WORKSHEET 2-2

### FIRE SAFETY EVALUATION FOR RESIDENTIAL OCCUPANCIES

Table No.	Occupant Safety Parameter	Fire Control Provided	Refuge Provided	Egress Provided	Overall Fire Safety
1	Construction			N/A	
2	Hazardous Areas			/2 =	
3	Vertical Openings				
4	Automatic Sprinklers		/2 =	/2 =	
5	Fire Alarm	/2 =	N/A		
6	Smoke Alarms	/2 =	N/A		
7	Apartment Fire Compartmentation			/2 =	
8	Bedroom Fire Compartmentation	N/A		N/A	
9	Access to Exits	N/A	N/A		
10	Exits	N/A	/2 =		
11	Interior Finishes	/2 =	N/A		
12	Smoke Control	N/A			
13	Fire Safety Planning	N/A	N/A		
14	Fire Brigade Response		N/A		
	<b>EVALUATION TOTALS<sup>(1)</sup></b>				

Notes:

<sup>(1)</sup>Totals to be transferred to Worksheet 2-3

## WORKSHEET 2-3

### COMPARISON TO BENCHMARKS FOR RESIDENTIAL OCCUPANCY BUILDINGS<sup>(1)</sup>

MBC Reference <sup>(2)</sup>	Building Height	Fire Control Benchmark	Refuge Benchmark	Egress Benchmark	Overall Fire Safety Benchmark
3.2.2.52	1-3 storeys	-2.5	-3	-3	-5
3.2.2.50 3.2.2.48	4-6 storeys	5	2	-1	2
3.2.2.47	>6 storeys	6.5	3	1	4

Notes:

<sup>(1)</sup>Scores shown are those calculated for a typical building of the same height complying with the MBC.

<sup>(2)</sup>While building heights were used in determining applicable MBC 2011 article for reference, building areas are not considered in determining benchmark values.

### EQUIVALENCY EVALUATION FOR RESIDENTIAL OCCUPANCY BUILDINGS

Fire Safety Provided (Total from above)	Fire Safety Required (Benchmark from above)	Column 1 $\geq$ Column 2	
		Yes	No
	Fire Control Benchmark =		
	Refuge Benchmark =		
	Egress Benchmark =		
	Overall Fire Safety Benchmark =		
Column 1	Column 2	Column 3	

## **PART 3 –THE MANITOBA OFFICE OCCUPANCY FIRE RISK INDEX**

### **Section 3.1 – General**

3.1.1 Part 3 applies to the fire safety risk index for *business and personal services* (Group D) *occupancies*, except for heritage *buildings* covered in Part 5.

3.1.2 Each fire safety parameter for *buildings* of Group D *major occupancy* (Subsections 3.2.1 to 3.2.12) shall be analyzed using this Part and Worksheet 3-1.

3.1.3 Only one point value shall be selected for each fire safety parameter for each fire zone. If more than one value can apply, the lowest point value shall govern.

### **Section 3.2 – Fire Safety Parameters for Office Occupancy Buildings**

#### **3.2.1 Construction of Structural Members and Floor and Roof Assemblies Parameter**

3.2.1.1 The construction of structural members and assemblies shall be assessed using Table 3.1 in Worksheet 3-1. The construction type and *fire resistance rating* in the fire zone which provide the lowest point value shall govern. This assessment shall apply to each fire zone.

3.2.1.2 Construction types shall be classified as *combustible construction*, *noncombustible construction*, or *heavy timber construction* as described in the MBC.

3.2.1.3 The structural members and assemblies to which the *fire resistance ratings* in this parameter apply are those that require *fire resistance ratings* for a similar *building* size and height in Subsection 3.2.2 of the MBC.

3.2.1.4 For the purposes of this parameter, *building height* and *building area* are determined as per the MBC.

3.2.1.5 For the purposes of these Guidelines, except for *heavy timber construction*, a structural assembly or member shall have a minimum *fire resistance rating* of at least equivalent to one layer of regular 12.7 mm thick gypsum board covering the structural member or assembly.

3.2.1.6 The fire zone to be used for the application of this parameter is generally the highest *storey* used for *office occupancy* purposes.

Note: The fire zone used for application of this parameter may be a storey or zone lower in the building if different types of construction occur in the building.

3.2.1.7 Where two or more construction types are present in an existing *building*, the governing point value for this parameter shall be the fire zone which gives the lowest value in Worksheet 3-1.



3.2.1.8 Where fire zones of *combustible construction* are located below fire zones of *noncombustible construction*, the upper *noncombustible construction* fire zones shall be considered as *combustible construction* for the purposes of this parameter.

3.2.1.9 *Fire resistance ratings* for the purposes of this parameter may be determined using any of the following regardless of the height and area of the *building*:

- a) Methods stated in Subsection 3.1.7 of the MBC,
- b) Tables A-9.10.3.1.A and B of the MBC, or
- c) Other methods or calculations supported by historical test information or appropriate engineering analysis.

### **3.2.2 Hazardous Areas Parameter**

3.2.2.1 Each hazardous area in the *building* shall be assessed using Table 3.2 in Worksheet 3-1. The hazardous area which provides the lowest point value shall govern. This assessment shall apply to each fire zone.

3.2.2.2 For the purposes of these Guidelines, hazardous areas, are those spaces in *office occupancy buildings* that the MBC considers to possess sufficient fire risk that they are required to have *fire separations*, sprinkler protection, or both.

3.2.2.3 Hazardous areas which are located immediately adjacent to *exits*, *exit lobbies* or *public corridors* shall be separated from the *exits*, *exit lobbies* or *public corridors* by at least a *fire separation* without a *fire resistance rating* (smoke separation) or the hazardous area shall be rated as "No Fire Separations, No Sprinklers". (See also Article 3.2.8.5.)

3.2.2.4 In *buildings* where the aggregate area of a *residential occupancy* exceeds 10 percent of the *floor area* on which it is located, the *residential occupancy* shall be assessed using Part 2 of these Guidelines.

### **3.2.3 Vertical Openings Parameter**

3.2.3.1 Each vertical opening shall be assessed using Table 3.3 in Worksheet 3-1. The vertical openings entry which provides the lowest point value shall govern for the *building*. This assessment shall apply to the *building* as a whole.

3.2.3.2 For the purposes of this parameter, a vertical opening is any situation in a *building* where multiple *storeys*, or a *storey* (including *basement storeys*) and a *vertical service space*, or a *horizontal service space* and a *vertical service space* are connected in such a manner that they can be simultaneously affected by fire or smoke from a single fire incident. Vertical openings include shafts, chases, chutes, ducts and other vertical service penetrations.

3.2.3.3 A vertical opening is considered to be enclosed when a continuous *fire separation* (or smoke separation) exists between the *vertical service space* and the adjacent *storey* or *horizontal service space*.

3.2.3.4 A vertical opening is considered to be unenclosed if:

- a) No *fire separation* exists, or

- b) A *fire separation* exists but it is either incomplete or does not have appropriate *closures* as required by the MBC.

3.2.3.5 A vertical opening is considered to be enclosed if a continuous *fire separation* exists and openings are protected with *closures*, but the *closures* do not have the *fire protection ratings* required by the MBC. For the purposes of this parameter, the entry for "Enclosed, <1 h" shall be used.

3.2.3.6 Existing stairs and elevators, which are combined in the same shaft, are not required to be fire separated from each other for the purposes of this parameter. The combined shaft shall be considered when assigning point values for this parameter.

### **3.2.4 Automatic Sprinkler System Parameter**

3.2.4.1 Automatic sprinkler systems shall be assessed using Table 3.4 in Worksheet 3-1. This assessment shall apply to the *building* as a whole.

3.2.4.2 New automatic sprinkler systems installed in existing *buildings* shall conform to the MBC.

3.2.4.3 Refurbished automatic sprinkler systems in existing *buildings* shall conform to the MBC, except that unsupervised systems may be used.

3.2.4.4 An incomplete or partial automatic sprinkler system is one in which sprinklers are not installed in all spaces throughout the *building* as required by NFPA 13.

3.2.4.5 To qualify as a supervised system for the purposes of this parameter, the electrical supervision of valves and water flow shall conform to the MBC.

### **3.2.5 Fire Alarm System Parameter**

3.2.5.1 Fire alarm systems shall be assessed using Table 3.5 in Worksheet 3-1. This assessment shall apply to the *building* as a whole.

3.2.5.2 New fire alarm systems installed in existing *buildings* shall conform to the MBC.

3.2.5.3 An incomplete fire alarm system is one in an existing *building* which does not have fire alarm devices installed in all areas of a *building* as required by the MBC. An incomplete system shall be capable of operation, when needed, and of being heard in all areas of the *building* to be considered incomplete. Non-operational systems or systems which cannot be heard in all areas of the *building* shall be rated as "None".

3.2.5.4 Voice communication, supervision, fire department notification and the installation of fire detectors shall conform to the MBC to be credited in the higher-point value categories in Worksheet 3-1.

### **3.2.6 Suite to Corridor Fire Compartmentation Parameter**

3.2.6.1 The *fire separations* between *suites* and *public corridors* or other common spaces shall be assessed using Tables 3.6A or 3.6B in Worksheet 3-1, using the

appropriate table which depends on whether the *fire zone* is *sprinklered* or not. This assessment shall apply to each fire zone.

3.2.6.2 This parameter applies to the vertical *fire separations* only. The horizontal *fire separations* are addressed in Subsection 3.2.1.

3.2.6.3 *Fire resistance ratings* for vertical *fire separations* in this parameter may be determined using any of the following, regardless of the height and area of the *building*:

- a) Methods stated in Subsection 3.1.7 of the MBC,
- b) Tables A-9.10.3.1.A and B of the MBC, or
- c) Other methods or calculations supported by historical test information or appropriate engineering analysis.

3.2.6.4 In non-*sprinklered* fire zones, for a *fire separation* to be rated as "Walls < 45 min FRR", it shall have a minimum *fire resistance rating* of at least equivalent to one layer of regular 12.7 mm thick gypsum board on both sides of steel or wood studs. Walls possessing a lesser *fire resistance rating* shall be rated as "Incomplete".

3.2.6.5 Vertical *fire separations* which have openings that are not protected by appropriate *closures* or fire-stopping shall be rated as "Incomplete", except for doors as shown in Tables 3.6A and 3.6B of Worksheet 3-1.

3.2.6.6 Where a fire zone does not contain a *public corridor*, this parameter shall be scored as "0".

### **3.2.7 Access to Exits Parameter**

3.2.7.1 Access to *exits* from *suites* shall be assessed using Table 3.7A or 3.7B in Worksheet 3-1, using the appropriate table which depends on whether the *building* is *sprinklered* or not. This assessment shall apply to each fire zone.

3.2.7.2 Direct access to a fire escape means that each *suite* contains a door leading directly from the *suite* to a fire escape, or directly to an exterior passageway leading to a fire escape.

3.2.7.3 For the purposes of this parameter, "travel" means the distance an occupant must move from the most remote point in a *suite* to an *exit* door, whether through a *public corridor* or not. It is calculated as the total distance travelled inside and outside the *suite* to reach an *exit* door.

3.2.7.4 The length of a dead end *public corridor*, for the purposes of this parameter, shall be measured from the centre of a *suite* doorway to an *exit* door or to a point where the occupant may move in either of two directions to two separate *exits*.

3.2.7.5 For the purposes of this parameter, fire escapes shall conform to Subsection 3.2.8.

3.2.7.6 For the purposes of this parameter, *public corridors* shall conform to the MBC.

### 3.2.8 Exits Parameter

3.2.8.1 *Exits* shall be assessed using Table 3.8 in Worksheet 3-1. This assessment shall apply to each fire zone.

3.2.8.2 For the purposes of this parameter, a horizontal *exit* shall:

- a) conform to the MBC in all aspects, or
- b) conform to the MBC, except that it need not pass through a *firewall* but may pass through a vertical *fire separation* having a *fire resistance rating* of 2 h. Such *fire separations* shall conform to the MBC, shall divide all *floor areas* of the *building*, and shall be in essentially a vertical line through the *building*. *Building* segments on both sides of such vertical *fire separations* shall be provided with at least one enclosed stair *exit* or *exit door* directly to the outside.

3.2.8.3 For the purposes of this parameter, existing fire escapes and the replacement of existing fire escapes are considered to provide compliance with this parameter on *buildings* 6-storeys or less in *building height* provided that all other aspects of the fire escapes conform to the MBC. New fire escapes shall conform to the MBC and shall be limited to *buildings* 5-storeys or less in *building height*.

3.2.8.4 For the purposes of this parameter, cross-corridor barriers shall be *fire separations* but need not have a *fire resistance rating*. Doors installed in cross-corridor barriers shall be self-closing, be weather-stripped, permit movement in both directions in the corridor and have positive latching to ensure that they remain closed following a fire alarm signal. In existing corridors which are wide enough to accommodate only a single door, doors in cross-corridor barriers need not swing in the direction of travel to the *exit* from both directions where the *occupant load* on both sides of the cross-corridor barrier does not exceed 60.

3.2.8.5 Where an *exit* discharges through a lobby, all aspects of the lobby shall conform to the MBC to be classified as a "Complying Lobby". Should any aspects not conform to the MBC, the lobby shall be classified as a "Non-Complying Lobby".

3.2.8.6 Existing *exit* stairs with nonconforming aspects, such as tread/riser dimensions, winders, width, handrail height and openings in guards, not addressed in other parameters in this Subsection, shall be permitted to be considered as *exits* for the purposes of this parameter provided:

- a) they are enclosed by *fire separations* and *closures* conforming to the MBC, and
- b) the non-conforming aspects do not in themselves constitute undue hazards to *building* occupants or fire fighters.

### 3.2.9 Interior Finishes of Walls and Ceilings Parameter

3.2.9.1 The *flame spread ratings* of the interior finishes of walls and ceilings in *exits*, *public corridors* and other spaces, including *suites*, shall be assessed using Table 3.9 in Worksheet 3-1. This assessment shall apply to each fire zone. The surface in the fire zone which provides the lowest point value shall govern.

3.2.9.2 Exposed *heavy-timber construction* need not meet the *flame spread ratings* in this parameter.

3.2.9.3 For the purposes of this parameter, the *smoke developed classification* of interior finishes in high *buildings*, required to conform to MBC Subsection 3.2.6, shall conform to the MBC.

3.2.9.4 Where the *flame spread rating* of an interior finish of a wall or ceiling exceeds 200, these Guidelines shall not be used. The presence of such finishes requires a specific fire safety evaluation given the potential hazard that such finishes represent.

3.2.9.5 *Flame spread ratings* for interior finishes may be assigned on the basis of published reports of tests on equivalent materials or on previous editions of the MBC.

### **3.2.10 Smoke Control Systems Parameter**

3.2.10.1 Smoke control systems shall be assessed using Tables 3.10A or 3.10B in Worksheet 3-1. This assessment shall apply to:

- a) each fire zone for *buildings* whose uppermost floor level is 36 m or less above grade, and
- b) the *building* as a whole and each fire zone for *buildings* whose uppermost floor level is greater than 36 m above grade (high rise buildings).

3.2.10.2 For *sprinklered* high rise *buildings* (as per Article 3.2.10.1), new smoke control systems utilizing vented stairwells or mechanical pressurization for stairwells shall conform to the MBC. For high rise *buildings* that are not *sprinklered*, the impact of these smoke control measures is not known so no points are assigned for this parameter.

3.2.10.3 For the purposes of this parameter, cross-corridor barriers shall be *fire separations* but need not have a *fire resistance rating*. Doors installed in cross-corridor barriers shall be self-closing, be weather-stripped, permit movement in both directions in the corridor and have positive latching to ensure that they remain closed following a fire alarm signal. In existing corridors which are wide enough to accommodate only a single door, doors in cross-corridor barriers need not swing in the direction of travel to the *exit* from both directions where the *occupant load* on both sides of the cross-corridor barrier does not exceed 60.

3.2.10.4 For the purposes of this parameter, corridor pressurization shall be any system designed to maintain corridors smoke free during a fire and can be either constantly running or activated by a fire alarm signal.

### **3.2.11 Fire Safety Planning Parameter**

3.2.11.1 Fire safety planning shall be assessed using Table 3.11 in Worksheet 3-1. This assessment shall apply to the *building* as a whole.

3.2.11.2 To be considered as fulfilling the requirements of this parameter, fire safety plans shall conform to the MFC and shall be reviewed and approved by the responding fire department to the *building*.

3.2.11.3 To be considered as fulfilling the requirements of this parameter, *exit* drills shall involve all staff normally expected to play a role in the fire safety plan.

3.2.11.4 *Exit* drills involving occupants of the *building* shall be considered as fulfilling the requirements of this parameter only if a majority of occupants, normally occupying the *building*, are involved in the drills.

### **3.2.12 Fire Brigade Response Parameter**

3.2.12.1 The response of the fire department shall be assessed using Tables 3.12A or 3.12B in Worksheet 3-1, using the appropriate table which depends on whether the *building* is *sprinklered* or not. This assessment shall apply to the *building* as a whole.

3.2.12.2 For the purposes of these Guidelines, fire departments shall essentially conform to Clause 1.2.1.(d) which establishes a maximum fire department response time of 6 min as a time objective.

3.2.12.3 Response time for the fire department to reach the *building* shall be measured as the time between receipt of a fire alarm by the fire department to the time that it arrives at the *building*.

3.2.12.4 For the purposes of this parameter, fire department elevators shall conform to the MBC. An elevator not conforming to those requirements shall not be considered as a fire department elevator for the purposes of this parameter.

### **3.2.13 Basic Requirements**

3.2.13.1 For the purposes of these Guidelines, all Basic Requirements shown in Table 3.13 in Worksheet 3-1 shall conform to the MBC or MFC, or specific equivalent protection shall be provided in accordance with Section 2.3, Part 2, Division C of the MBC or Subsection A-1.2.1.1.(1)(b), Part 1, Division A of the MFC.

3.2.13.2 These Guidelines apply only to *buildings* of office *occupancy* as described in the MBC. *Occupancies* requiring trained staff to assist occupants in evacuation, such as day-care centres, are *care occupancies* and are beyond the scope of these Guidelines. The MBC shall be used to address such *occupancies*.

Note: These Guidelines acknowledge that a typical office occupancy building will contain occupants with a broad spectrum of capabilities related to evacuation in the event of a fire. The various fire safety measures, described in these Guidelines, are intended to provide safety for all occupants provided they are able to sense and interpret fire cues and move from a fire location at least to an exit where temporary refuge is available.

3.2.13.3 For the purposes of these Guidelines, fire zones, in *buildings* that are not *sprinklered*, shall be provided with protection for a *floor area*, with a *barrier-free* path of travel, in conformance with the MBC.

## **Section 3.3 – Calculating Fire Safety**

3.3.1 Fire safety for the *building* shall be assessed using four evaluations shown in Worksheet 3-2: Fire Control, Refuge, Egress and Overall Fire Safety.

3.3.2 The governing scores evaluated for each parameter in Subsections 3.2.1 to 3.2.12 (Tables 3.1 to 3.12 in Worksheet 3-1) shall be transferred to the appropriate rows in Worksheet 3-2. (For example, if the governing point score for “Fire Alarm Systems” is -2, then -2 shall be entered in all columns opposite the Fire Alarm Systems entry in Worksheet 3-2. The resulting point score under the “Fire Control Provided” column for this parameter would be  $-2/2 = -1$ . All other columns in this row would have the entry -2 except the "Refuge Provided" column.) In Worksheet 3-2, the term "/2" means that the parameter point value from Worksheet 3-1 is divided by 2 and the resulting score shown in that entry. The term "N/A" means that the parameter from Worksheet 3-1 does not apply to this evaluation.

3.3.3 The columns in Worksheet 3-2 shall be totalled to obtain the aggregate point scores for the four evaluations. These totals shall be transferred to Worksheet 3-3 and used for comparison to the benchmarks in that worksheet.

### **Section 3.4 – Comparison to Benchmarks for Office Occupancies**

3.4.1 The totals obtained for the four evaluations in Worksheet 3-2 shall be included in the appropriate locations in Column 1 in Worksheet 3-3.

3.4.2 For the height of the *building* being assessed, the minimum benchmarks for the four evaluations shall be identified using Worksheet 3-3 and the benchmark values included in Column 2 in Worksheet 3-3.

3.4.3 Equivalency to the requirements of the MBC for existing *buildings* shall be deemed to have been achieved if the point values of all four evaluations are greater than the minimum point values for the benchmarks for the height of the *building*. (From Worksheet 3-3, Column 1 must be equal to or greater than Column 2 for equivalency to have been achieved.)

Note: The minimum required benchmarks for office buildings shown were derived from designs for a typical office building of the same building height complying with the MBC but without considering building area as a determining factor in establishing risk.

## WORKSHEET 3-1

### THE MANITOBA OFFICE OCCUPANCY FIRE RISK INDEX

#### FIRE SAFETY PARAMETER VALUES

**TABLE 3.1 CONSTRUCTION OF STRUCTURAL MEMBERS AND FLOOR AND ROOF<sup>(1)</sup> ASSEMBLIES** (Applies to each fire zone)

Building Height, Storeys	Combustible Construction				Protected <sup>(4)</sup> Heavy Timber FRR	Heavy Timber FRR	Noncombustible Construction			
	<45 min <sup>(2)</sup> FRR	45 min FRR	1 h FRR	2 h FRR			<45 min <sup>(2)</sup> FRR	45 min FRR	1 h FRR	2 h FRR
1 to 3	-2	0	1	2	2	1	0	1	2	3
4	-3	-2	0	1	1	0	-2	-1	1	2
5 to 6	-8	-6	-4	-2	-2	-4	-4	-2	0	1
>6	NP <sup>(3)</sup>	-7	-6	-4	-4	-6	-8	-3	-2	0

Notes:

<sup>(1)</sup> *Fire resistance ratings* for roof assemblies are required only when the applicable article in Subsection 3.2.2. of the MBC requires a rated roof assembly.

<sup>(2)</sup> <45 min requires a minimum FRR equivalent to 1 layer of regular, 12.7 mm thick, gypsum board covering the structural member or assembly.

<sup>(3)</sup> NP = not permitted.

<sup>(4)</sup> Protected Heavy Timber means heavy timber construction as per the MBC protected by 2 layers of 15.9 mm thick Type X gypsum board or equivalent thermal protection.



**TABLE 3.2 HAZARDOUS AREAS IN OFFICE BUILDINGS**  
(Applies to each fire zone)

	No Fire Separations No Sprinklers	No Fire Separations <sup>(4)</sup> + Sprinklers	Non-Rated Fire Separations <sup>(1)</sup> No Sprinklers	Non-Rated Fire Separations <sup>(1)</sup> + Sprinklers	Fire Separations ≥1 h No Sprinklers	Fire Separations ≥1 h + Sprinklers
Furnace/Service Rooms	-4	0	-1	1	0	2
Common Janitors' Rooms	-4	-2	-2	0	0 <sup>(3)</sup>	2 <sup>(3)</sup>
Residential, Assembly, or Light Industrial Occupancy in building	-4	-2	-2	0	0	2
Mercantile Occupancy or Storage Garage in Building	-5	-4	-3	-2	-1 <sup>(5)</sup>	1
Elevator Machine Rooms <sup>(2)</sup>	-4	-2	-2	0	0 <sup>(3)</sup>	2 <sup>(3)</sup>
Refuse Storage Rooms	-7	-2	-3	-1	-2	0

Notes:

<sup>(1)</sup> Fire separations must be present to act as smoke separations regardless of the FRR.

<sup>(2)</sup> Elevator Machine Rooms need not be separated from the elevator hoistway provided both the room and the hoistway are fire separated from the remainder of the building as per the MBC.

<sup>(3)</sup> Where the MBC permits floor assemblies to have a 45 min fire resistance rating, rated enclosures of 45 min FRR shall be considered to be 1 h FRR for the purposes of application of this parameter.

<sup>(4)</sup> Where hazardous areas are located immediately adjacent to exits, exit lobbies or public corridors, no credit is to be given for sprinklers for the purposes of this parameter if there is no smoke separation present. Such situations shall be considered "No Fire Separations, No Sprinklers" for the purposes of application of this parameter.

<sup>(5)</sup> If the FRR of the Storage Garage fire separations is at least 90 min, the score for this parameter should be "0".

**TABLE 3.3 VERTICAL OPENINGS** (Applies to entire building)

Vertical Opening Types	Unenclosed <sup>(2)</sup> - Number of storeys <sup>(1)</sup> open to a vertical service space			Enclosed <sup>(3)</sup> – Fire Resistance Rating of Enclosure		
	>3 sto	2-3 sto	1 sto	<1 h <sup>(6)</sup>	1 h <sup>(5)(6)</sup>	>1 h
Exit Stair Shafts	NP <sup>(4)</sup>	-7	-2	-1	0	1
Refuse Chutes/Linen Chutes	-10	-8	-3	-1	0	1
Vertical Service Spaces	-10	-7	-2	-1	0	1
Elevator Shafts	-10	-7	-2	-1	0	1
Existing Stair/Elevator Shafts (combined)	-10	-7	-2	-1	0	1

## Notes:

<sup>(1)</sup>Includes basement storeys and roof spaces.

<sup>(2)</sup>Unenclosed means no fire or smoke separation exists between a storey and vertical service space, or it is incomplete.

<sup>(3)</sup>Enclosed means a fire or smoke separation exists and is continuous throughout the enclosure.

<sup>(4)</sup>NP = Not Permitted.

<sup>(5)</sup>Existing wired glass or glass block enclosures, regardless of area of glass, are considered to have a rating of 1 h.

<sup>(6)</sup>Where the MBC permits floor assemblies to have a 45 min fire resistance rating, rated enclosures of 45 min FRR shall be considered to be 1 h FRR for the purposes of application of this parameter.

**TABLE 3.4 AUTOMATIC SPRINKLERS<sup>(1)</sup>** (Applies to entire building)

None, Incomplete or Partial	Unsupervised <sup>(1)</sup> using NFPA 13 with Std Sprinklers	Unsupervised <sup>(1)</sup> using NFPA 13 with Quick Response Sprinklers	Supervised <sup>(2)</sup> using NFPA 13 with Std Sprinklers	Supervised <sup>(2)</sup> using NFPA 13 with Quick Response Sprinklers
0	4	6	8	10

## Note:

<sup>(1)</sup>Only refurbished automatic sprinkler system installations are permitted to be unsupervised.

<sup>(2)</sup>Supervision as described in the MBC.

**TABLE 3.5 FIRE ALARM SYSTEMS** (Applies to entire building)

None	Incomplete <sup>(1)</sup>	2 Stage System <sup>(3)</sup>	Single Stage System			
			Without Voice Comm	+ Voice Comm <sup>(2)</sup> or Supervision <sup>(2)</sup>	+ Voice Comm <sup>(2)</sup> or Supervised <sup>(2)</sup> + FD Notification <sup>(2)</sup>	+ Voice Comm <sup>(2)</sup> + Supervised <sup>(2)</sup> + FD Notification <sup>(2)</sup> + Fire Detectors <sup>(2)</sup>
-4	-2	-1	0	1	2	3

Note:

<sup>(1)</sup>Incomplete means that the existing system does not meet all of the requirements of the MBC related to the specific building, but that a fire alarm system exists in the building and is operational (see Article 3.2.5.3).

<sup>(2)</sup>As per MBC

<sup>(3)</sup>Where a 2-stage fire alarm system is continuously monitored by supervisory staff such that there is no delay in evacuation of occupants or notification of the fire department, a 2-stage system can be treated as a single-stage system for the purposes of this parameter.

**TABLE 3.6A SUITE TO PUBLIC CORRIDOR FIRE COMPARTMENTATION – FIRE ZONE NOT SPRINKLERED THROUGHOUT** (Applies to each fire zone)

Incomplete/None <sup>(1)</sup>	Walls <45 min FRR <sup>(2)</sup>		Walls ≥45 min FRR <sup>(6)</sup>		Walls ≥1 h FRR <sup>(3)(6)(7)</sup>	
	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR
-6	-3	-2	-2	-1	-1	0

Notes:

<sup>(1)</sup>Incomplete/none refers to the case where there is no smoke separation between the spaces.

<sup>(2)</sup>At least equivalent to 12.7 mm thick regular gypsum board on both sides of steel or wood studs.

<sup>(3)</sup>Existing wired glass or glass block enclosures, regardless of area of glass, are considered to have an FRR of 1 h.

<sup>(4)</sup>These door assemblies are not required to have a fire protection rating and do not require a rated frame or rated hardware but must have self-closing and latching devices to ensure that they can prevent smoke movement into the corridor.

<sup>(5)</sup>Conforming to the MBC.

<sup>(6)</sup>Where the MBC permits floor assemblies to have a 45 min fire resistance rating, walls having an FRR of 45 min shall be considered to be 1 h FRR for the purposes of application of this parameter. The assigned score will therefore be "0" or "-1" depending on the type of door.

<sup>(7)</sup>Where suite to suite fire separations of at least 1 h are also provided for all suites, one (1) additional point may be added to this score.

**TABLE 3.6B SUITE TO PUBLIC CORRIDOR FIRE COMPARTMENTATION  
FIRE ZONE SPRINKLERED THROUGHOUT**  
(Applies to each fire zone)

Incomplete/None <sup>(1)</sup>	Walls <45 min FRR <sup>(2)</sup>		Walls ≥45 min FRR <sup>(3)(6)</sup>	
	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR	Doors <sup>(4)</sup> <20 min FPR	Doors <sup>(5)</sup> ≥20 min FPR
-2	0	1	1	2

Notes:

<sup>(1)</sup>Incomplete/none refers to the case where there is no smoke separation between the spaces.

<sup>(2)</sup>A minimum smoke separation is required between the corridor and the adjacent suites.

<sup>(3)</sup>Existing wired glass or glass block enclosures, regardless of area of glass, are considered to have an FRR of 45 min.

<sup>(4)</sup>These door assemblies are not required to have a fire protection rating and do not require a rated frame or rated hardware but must have self-closing and latching devices to ensure that they can prevent smoke movement into the corridor.

<sup>(5)</sup>Conforming to the MBC.

<sup>(6)</sup>Where suite to suite fire separations of at least 45 min FRR are also provided for all suites in a fire zone, one (1) additional point may be added to this score.

**TABLE 3.7A ACCESS TO EXITS – BUILDING NOT SPRINKLERED THROUGHOUT**  
(Applies to each fire zone)

Suite Has Direct Access to 2 Exits + ≤40 m Travel <sup>(2)</sup>	Suite Has Direct Access to 1 Exit + Dead End Public Corridor + ≤40 m Travel <sup>(2)</sup>	Suite Has Direct Access to Fire Escape <sup>(3)</sup> + Dead End Public Corridor + ≤40 m Travel <sup>(2)</sup>	Suite on Dead End Public Corridor <sup>(1)</sup> >6 m +		Suite on Dead End Public Corridor <sup>(1)</sup> ≤6 m +			Suite on 2 Directional Public Corridor +		
			≤25 m Travel <sup>(2)</sup>	>25 m Travel <sup>(2)</sup>	≤25 m Travel <sup>(2)</sup>	≤65 m Travel <sup>(2)</sup>	≤80 m Travel <sup>(2)</sup>	≤25 m Travel <sup>(2)</sup>	≤65 m Travel <sup>(2)</sup>	≤80 m Travel <sup>(2)</sup>
0	0	0	-2	-4	2	1	0	2	1	0

Note:

<sup>(1)</sup>Dead end public corridor must lead to 2-directional corridor or 2 exits

<sup>(2)</sup>Travel is the total distance an occupant must walk to move from the most remote point in a suite to an exit door.

<sup>(3)</sup>Existing fire escapes are permitted on buildings 6-storeys and less in height and other aspects conform to MBC. New fire escapes must conform to MBC.

**TABLE 3.7B ACCESS TO EXITS – BUILDING SPRINKLERED THROUGHOUT**  
(Applies to each fire zone)

Suite Has Direct Access to 2 Exits + ≤45 m Travel <sup>(2)</sup>	Suite Has Direct Access to 1 Exit + Dead End Public Corridor + ≤45 m Travel <sup>(2)</sup>	Suite Has Direct Access to Fire Escape <sup>(3)</sup> + Dead End Public Corridor + ≤45 m Travel <sup>(2)</sup>	Suite on Dead End Public Corridor <sup>(1)</sup> >6 m +		Suite on Dead End Public Corridor <sup>(1)</sup> ≤6 m +			Suite on 2 Directional Public Corridor +		
			≤25 m Travel <sup>(2)</sup>	>25 m Travel <sup>(2)</sup>	≤25 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>	≤90 m Travel <sup>(2)</sup>	≤45 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>	≤90 m Travel <sup>(2)</sup>
0	0	0	-1	-3	2	1	0	2	1	0

Note:

<sup>(1)</sup>Dead end public corridor must lead to 2-directional corridor or 2 exits

<sup>(2)</sup>Travel is the total distance an occupant must walk to move from the most remote point in a suite to an exit door.

<sup>(3)</sup>Existing fire escapes are permitted on buildings 6-storeys and less in height and other aspects conform to MBC. New fire escapes must conform to MBC.

**TABLE 3.8 EXITS** (Applies to each fire zone)

<2 Exits	Enclosed Stairs <sup>(1)</sup> + Horizontal Exit <sup>(5)</sup>			2 or more Enclosed Stairs <sup>(1)</sup>				1 Enclosed Stair <sup>(1)</sup> + 1 Fire Escape (FE) <sup>(2)</sup> + Cross Corridor Barrier <sup>(3)</sup>		
	Stair Direct to Outside	Stairs Direct to Outside	Stairs Through Complying Lobby <sup>(4)</sup>	Stairs Through Non-Complying Lobby	All Stairs Direct to Outside	One Stair Through Complying Lobby <sup>(4)</sup>	One Stair Through Non-Complying Lobby	With Cross Corridor Barrier <sup>(3)</sup>	Stair Direct to Outside + FE	Stair Through Complying Lobby <sup>(4)</sup> + FE
-8	2	1	0	1	0	-1	4	1	0	-1

Notes:

<sup>(1)</sup>Enclosure by a fire separation conforming to MBC. Existing wired glass assemblies with unlimited areas of glass are permitted where required FRR is 1 h or less.

<sup>(2)</sup>Existing fire escapes permitted only on buildings 6-storeys or less and other aspects conform to MBC. New fire escapes must conform to the MBC.

<sup>(3)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FRR (see Article 3.2.8.4).

<sup>(4)</sup>Lobby complying with MBC.

<sup>(5)</sup>Horizontal exit conforms to MBC except that, for the purposes of this parameter, exiting through a vertical fire separation with a 2 h FRR, which divides all floors of a building, shall be considered as horizontal exiting (see Article 3.2.8.2).

**TABLE 3.9 INTERIOR FINISHES OF WALLS AND CEILINGS<sup>(1)</sup>** (Applies to each fire zone)

Exits FSR <sup>(2)(3)</sup>			Public Corridors FSR <sup>(2)</sup>		Other Spaces, including corridors in suites and suites FSR <sup>(2)</sup>	
≤25	>25≤75	>75≤150	≤75	>75≤150	≤150	≤200
0	-1	-2	0	-1 <sup>(4)</sup>	0	-1

Note:

<sup>(1)</sup>For high buildings, required to conform to Subsection 3.2.6 of the MBC, requirements for smoke developed classifications of interior finishes must also be met.

<sup>(2)</sup>Does not apply to exposed heavy timber construction.

<sup>(3)</sup>Includes exit lobbies where exits are permitted to discharge through a lobby.

<sup>(4)</sup>For sprinklered buildings, interior finishes in public corridors with FSR ≤ 150 shall be scored as "0".

**TABLE 3.10A SMOKE CONTROL FOR BUILDINGS WHOSE UPPERMOST FLOOR LEVEL IS 36 m OR LESS ABOVE GRADE** (Applies to each fire zone)

None	Vented Stairwells <sup>(1)</sup>	Mechanical Pressurization of Stairwells <sup>(1)</sup>	Cross Corridor Barriers	Pressurized Corridors	Pressurized Corridors + Cross Corridor Barriers <sup>(2)</sup>
0	1	1	1	2	3

Note:

<sup>(1)</sup>As per Subsection 3.2.6 of MBC

<sup>(2)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FPR (see Article 3.2.8.4).

**TABLE 3.10B SMOKE CONTROL FOR BUILDINGS WHOSE UPPERMOST FLOOR LEVEL IS GREATER THAN 36 m ABOVE GRADE** (Applies to entire building)

None	Vented Stairwells (VS) <sup>(1)</sup>	Mechanical Pressurization (MP) of Stairwells <sup>(1)</sup>	VS <sup>(1)</sup> or MP <sup>(1)</sup> + Cross Corridor Barriers <sup>(3)</sup>	VS <sup>(1)</sup> or MP <sup>(1)</sup> + Pressurized Corridors	VS <sup>(1)</sup> or MP <sup>(1)</sup> + Pressurized Corridors + Cross Corridor Barriers <sup>(3)</sup>
NP <sup>(2)</sup>	0	0	1	1	2

Note:

<sup>(1)</sup>As per Subsection 3.2.6 of MBC

<sup>(2)</sup>NP = Not Permitted

<sup>(3)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FPR (see Article 3.2.8.4).

**TABLE 3.11 FIRE SAFETY PLANNING**  
(Applies to entire building)

No FSP <sup>(1)</sup> or No Exit Drills	FSP <sup>(1)</sup> Developed & Approved <sup>(2)</sup> + 1 Exit Drill/Year Involving Staff Only	FSP <sup>(1)</sup> Developed & Approved <sup>(2)</sup> + 1 Exit Drill/Year involving Staff and Occupants
-2	0	2

Notes:

<sup>(1)</sup>Fire safety plan as per MFC.

<sup>(2)</sup>Approved by fire department.

**TABLE 3.12A FIRE BRIGADE RESPONSE  
BUILDING NOT SPRINKLERED THROUGHOUT**  
(Applies to entire building)

FD Response <sup>(1)</sup> ≤6 min		FD Response <sup>(1)</sup> >6 min but ≤ 9 min		FD Response <sup>(1)</sup> >9 min	
With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator
1	0	-1	-2	-2	-3

Notes:

<sup>(1)</sup>Fire department response time means processing time plus travel time from the fire station to the building and excludes setup time which is estimated as 5 additional minutes

<sup>(2)</sup>Conforms to MBC requirements for fire department elevators.

**TABLE 3.12B FIRE BRIGADE RESPONSE  
BUILDING SPRINKLERED THROUGHOUT**  
(Applies to entire building)

FD Response <sup>(1)</sup> ≤6 min		FD Response <sup>(1)</sup> >6 min but ≤ 9 min		FD Response <sup>(1)</sup> >9 min	
With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator
2	1	0	-1	-1	-2

Notes:

<sup>(1)</sup>Fire department response time means processing time plus travel time from the fire station to the building and excludes setup time which is estimated as 5 additional minutes

<sup>(2)</sup>Conforms to MBC requirements for fire department elevators.

**TABLE 3.13 BASIC REQUIREMENTS**

The following must conform to the MBC or MFC:

Basic Requirement	Yes – Complies with MBC/MFC	No – Requires Upgrading to Comply with MBC/MFC
Utilities Installation, including electrical equipment vaults		
HVAC Installation		
New Elevator Installation		
Fire-stopping		
Standpipe System		
New Sprinkler Systems comply with MBC		
Fire Alarm Audibility in all spaces		
New Fire Alarm Systems comply with MBC		
Testing/Maintenance of fire safety equipment complies with MFC and MBC testing requirements for control of smoke movement and mechanical venting		
Occupants must care for themselves in evacuation, except infants in care of responsible persons. (No trained staff to assist egress.)		
Non-sprinklered fire zones provided with protection for a floor area, with a barrier free path of travel, in conformance with the MBC.		
High buildings, as defined in MBC, conform to MBC additional requirements for high buildings, except for parameters addressed in this Guide.		



## WORKSHEET 3-2

### FIRE SAFETY EVALUATION FOR OFFICE OCCUPANCIES

Table No.	Occupant Safety Parameter	Fire Control Provided	Refuge Provided	Egress Provided	Overall Fire Safety
B-1	Construction			N/A	
B-2	Hazardous Areas			/2 =	
B-3	Vertical Openings				
B-4	Automatic Sprinklers		/2 =	/2 =	
B-5	Fire Alarm	/2 =	N/A		
B-6	Suite/Corridor Fire Compartmentation			/2 =	
B-7	Access to Exits	N/A	N/A		
B-8	Exits	N/A	/2 =		
B-9	Interior Finishes	/2 =	N/A		
B-10	Smoke Control	N/A			
B-11	Fire Safety Planning	N/A	N/A		
B-12	Fire Brigade Response		N/A		
	<b>EVALUATION TOTALS<sup>(1)</sup></b>				

Notes:

<sup>(1)</sup>Totals to be transferred to Worksheet 3-3

## WORKSHEET 3-3

### BENCHMARKS FOR OFFICE OCCUPANCY BUILDINGS<sup>(1)</sup>

MBC Reference <sup>(2)</sup>	Building Height	Fire Control Benchmark	Refuge Benchmark	Egress Benchmark	Overall Fire Safety Benchmark
3.2.2.58	1-3 storeys	-1.5	-0.5	-0.5	-1.5
3.2.2.57	4 storeys – combustible construction	3.5	2	2	4
3.2.2.55	4-6 storeys – non-combustible construction	-2.5	0	-3	-2
3.2.2.54	>6 storeys	7	4	4	8

**Notes:**

<sup>(1)</sup>Scores shown are those calculated for a typical building of the same height complying with the MBC.

<sup>(2)</sup>While building heights were used in determining applicable MBC 2011 article for reference, building areas are not considered in determining benchmark values.

### EQUIVALENCY EVALUATION FOR OFFICE OCCUPANCY BUILDINGS

Fire Safety Provided (Total from above)	Fire Safety Required (Benchmark from above)	Column 1 ≥ Column 2	
		Yes	No
	Fire Control Benchmark =		
	Refuge Benchmark =		
	Egress Benchmark =		
	Overall Fire Safety Benchmark =		
Column 1	Column 2	Column 3	

## PART 4 – THE MANITOBA RESIDENTIAL OCCUPANCY FIRE RISK INDEX FOR HERITAGE BUILDINGS

*Note: It is important that users of Part 4 be aware of the fact that this risk index is based partly on a set of Fire Safety Alternatives to the MBC for the heritage residential buildings in Winnipeg's Exchange District which are being re-used as or converted to residential buildings. The Fire Safety Alternatives and fire risk index described in Part 4 provide those wishing to renovate those heritage buildings with solutions that may not comply directly with the MBC but provide for occupant safety commensurate with the MBC, while enabling historic preservation and cost effectiveness goals to be met. All aspects of the renovation or conversion, not addressed by the Fire Safety Alternatives, must be assessed for impact on fire safety and, in many cases, must comply with the appropriate requirements of the MBC, as described in this Part. Other municipalities, which can demonstrate compliance with the Assumptions in Section 4.2 and the Fire Safety Alternatives in Section 4.3, may wish to use this Part for the assessment of heritage residential buildings within their jurisdictions. Users are cautioned that compliance with the Assumptions and Fire Safety Alternatives (or MBC) is essential for the safe application of this Part.*

### Section 4.1 – General

4.1.1 Part 4 applies to the fire safety risk index for *residential occupancies*, (Group C) in heritage *buildings* located in the Exchange District of the City of Winnipeg. An existing heritage building is a building that has been maintained and does not include buildings that have been gutted. In those instances Part 2 shall be used.

4.1.2 Each fire safety parameter for *buildings* of Group C *residential major occupancy* (Subsections 4.4.1 to 4.4.16) shall be analyzed using this Part and Worksheet 4-1.

4.1.3 Only one point value shall be selected for each fire safety parameter for each fire zone. If more than one value can apply, the lowest point value shall govern.

### Section 4.2 – Assumptions

#### 4.2.1 Assumptions Regarding the Heritage Residential Buildings

4.2.1.1 The assumptions regarding the heritage *buildings* being rehabilitated to or re-used as Group C *major occupancy* (residential) *buildings* are as follows:

- The *buildings* are 7-storeys or less in height.
- The *buildings* are 1500 m<sup>2</sup> or less in *building area* per storey.
- The *buildings* are typically constructed of timber members at least as large as those which classify as *heavy timber construction* in the MBC.
- The exterior walls are masonry.
- The *buildings* are located so that at least one exterior wall faces a street and a second faces a laneway.
- The *major occupancy* is to be residential (apartments) with some office, restaurant, shops or day-care space on the *first storey* or *basement*.
- The contents will be typical of a Group C *occupancy*, except that Artist Live/Work spaces may incorporate some studio/workshop space.
- Existing stairs, facades, construction and elevators are part of the historic fabric of many of the *buildings* and, as such, may not be significantly changed.
- For the most part, the unrenovated *buildings* are assumed to be clear (i.e., no partitions) inside the exterior walls, except for elevator and stair shafts.

## 4.2.2 Assumptions Regarding Fire Safety Systems

4.2.2.1 The assumptions regarding the fire safety systems in the heritage residential *buildings* are as follows:

- New and renovated fire safety systems will comply with applicable installation standards as required by the MBC, unless explicitly modified in these Guidelines.
- During the *occupancy* of the heritage *buildings*, new and renovated fire safety systems are fully operational and reliable.
- Fire safety systems are to be tested and maintained in conformance with the Manitoba Fire Code.

## 4.2.3 Assumptions Regarding Occupants

4.2.3.1 The assumptions regarding the occupants of the heritage residential *buildings* are as follows:

- 1) The profile of the occupants in the heritage residential *buildings* is assumed to be similar to the broad spectrum of capabilities of the population that occupies residential *buildings* conforming to the MBC.
- 2) Occupants are assumed to respond to a fire emergency in a manner that is typical of the population that occupies residential *buildings* conforming to the MBC. Except for infants in the care of responsible persons, occupants of residential *buildings* will typically be capable of:
  - a) sensing fire cues and sounding an alarm;
  - b) interpreting fire cues correctly and taking appropriate action; and
  - c) moving to a place of safety.
- 3) Except as permitted in the MBC, it is assumed that there will be no occupants requiring trained staff assistance for evacuation and no such assistance is assumed to be available. Should occupants requiring such assistance wish to reside in the heritage residential *buildings*, special provisions for their safety, as accepted by the Winnipeg Fire and Building Departments, need to be made.
- 4) Occupant travel time to the outside, using the *building exits*, or to reach a place of safety, is assumed to be approximately 1 minute or less. This time to reach a place of safety is assumed to be low due to the relatively small *floor areas* of the heritage residential *buildings*, compared to the size permitted by the MBC, and their limitation in height to 7-storesys.
- 5) Occupants, upon sensing a fire alarm signal, are assumed to begin evacuation or movement to a place of safety within a reasonable length of time, and instructions for evacuation or movement to a place of safety are assumed to be included in the Fire Safety Plan for the *building*.

## 4.2.4 Assumptions Regarding Fire Department Response

4.2.4.1 The assumptions regarding the fire department response to the heritage residential *buildings* are as follows:

- Fire department personnel will be available to assist in fire suppression and occupant rescue approximately 6 minutes following an alarm.

- Fire department response will be reliable and effective as required by Part 1.

## **Section 4.3 – Fire Safety Alternatives**

### **4.3.1 Alternatives for Building Construction**

4.3.1.1 Columns, beams, floor assemblies and roof assemblies with minimum dimensions at least equal to those required for *heavy timber construction* in the MBC shall be considered acceptable in lieu of *noncombustible construction* and *fire resistance ratings* required in Subsection 3.2.2 of the MBC.

4.3.1.2 Heavy timber floors shall be "topped" with *noncombustible* materials designed to fill cracks and minor holes in the floors.

Note: A topping, such as "Gypcrete", is also required to ensure good acoustic performance of the floors.

4.3.1.3 The construction of structural assemblies, other than *heavy timber construction*, is permitted to be *combustible* and shall have a  $\frac{3}{4}$  hour *fire resistance rating*.

### **4.3.2 Alternatives for Fire Separation Construction**

4.3.2.1 Wired glass, as described in the MBC, may be used in any *fire separation* with no limit on dimensions or areas of individual panes.

4.3.2.2 Tempered or heat strengthened glass, protected by automatic sprinklers, may be used in accordance with the limits described in the following report for protecting openings in exterior walls [Kim, A.K., et al, Sprinkler Protection of Exterior Glazing, Fire Technology, Vol. 34, No. 2]. (See Appendix A.)

4.3.2.3 Tables A-9.10.3.1.A and B of the MBC may be used to establish the *fire resistance ratings* of any *fire separation* used in the heritage residential buildings.

4.3.2.4 Existing wall, floor and roof assemblies in the heritage residential buildings may have *fire resistance ratings* assigned on the basis of NFPA 914 – Code for Fire Protection of Historic Structures. (See Appendix A)

4.3.2.5 Fire dampers are not required in those locations where *fire separations* are penetrated by *noncombustible* ducts having a melting point above 760°C.

### **4.3.3 Alternatives for Compartmentation**

4.3.3.1 The *fire separations* between residential *suites* and between *suites* and *public corridors* shall have a  $\frac{3}{4}$  hour *fire resistance rating*.

Note: Both fire and acoustic ratings can be achieved by insulated wood or steel stud assemblies with one layer of 12.7 mm Type X gypsum board on one side and two layers on the other, in some cases with resilient channels. Other assemblies with one layer of 12.7 mm Type X gypsum board on each side have been listed by Certification Agencies as having fire resistance ratings of  $\frac{3}{4}$  hour or 1 hour. The Sound Transmission Class of these assemblies would have to be determined prior to their use in the heritage residential buildings.

4.3.3.2 *Major occupancies* shall be separated from each other by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating*.

4.3.3.3 Vertical service spaces, including shafts, shall be separated from adjacent spaces by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating* and they shall be *sprinklered* in accordance with the MBC.

4.3.3.4 Service rooms shall be separated from adjacent spaces by *fire separations*, without a *fire resistance rating*, and they shall be *sprinklered* in accordance with the MBC.

4.3.3.5 *Exits* shall be separated from adjacent spaces by fire separations having a  $\frac{3}{4}$  hour *fire resistance rating*. Such enclosure shall be continuous throughout the length of the exit to a safe exterior location.

*Exception: One exit is permitted to discharge through a lobby conforming to the MBC.*

4.3.3.6 Existing elevator shafts need not be separated from existing *exit* stair shafts provided the enclosure containing the elevator and *exit* stairs is separated from adjacent spaces by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating*.

4.3.3.7 Other elevator shafts shall be separated from adjacent spaces by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating*.

#### **4.3.4 Exposure Protection Alternatives**

4.3.4.1 Existing openings in exterior walls which face *streets* may be retained with no additional protection provided.

4.3.4.2 In lieu of *closures*, other openings in exterior walls may be protected by automatic sprinklers as described in Article 4.3.2.2.

4.3.4.3 *Combustible* elements in existing exterior walls may be retained or replaced with *combustible* materials.

4.3.4.5 Existing exterior walls are not required to have a *fire resistance rating*.

#### **4.3.5 Flame Spread Rating Alternatives**

4.3.5.1 Exposed *heavy timber construction* may be left exposed in all locations in the heritage residential *buildings*.

#### **4.3.6 Fire Detection and Alarm Systems Alternatives**

4.3.6.1 A single-stage fire alarm system (as per MBC) shall be installed in all heritage residential *buildings*.

4.3.6.2 Loudspeakers shall be used for all audible signal devices in heritage residential *buildings*.

Note: Loudspeakers are required to enable the fire department to provide instructions to any occupants who may not have begun to evacuate, even though the Fire Safety Plan instructs them to do so.

4.3.6.3 Fire alarm systems shall be equipped with a means to provide voice messages over all loudspeakers from the fire alarm control panel. Such messages shall be permitted only after the alarm signal has sounded initially for not less than 60 seconds.

4.3.6.4 Fire alarm systems shall be electrically supervised with signals being automatically transmitted to the fire department in accordance with the MBC.

#### 4.3.7 Fire Suppression System Alternatives

4.3.7.1 Automatic sprinkler systems (as per MBC) shall be installed throughout the heritage residential *buildings*. Residential type sprinklers shall be used in all residential spaces.

4.3.7.2 Automatic sprinkler systems shall be zoned and supervised as required in the MBC.

4.3.7.3 Existing sprinkler systems in the heritage residential *building* shall be thoroughly flushed and refurbished prior to new components being installed.

Note: Refurbished sprinkler systems may not comply in all respects with the current editions of the MBC and NFPA 13. The City of Winnipeg shall assess the impact on overall fire safety of any deficiencies and determine the acceptability of the refurbished system.

#### 4.3.8 Egress System Alternatives

4.3.8.1 Occupants of *floor areas* shall have unrestricted access to at least two exits in accordance with the MBC or Article 4.3.8.2.

4.3.8.2 *Floor areas* shall be served by at least two *exits* as follows:

- a) One exit shall be a stairway separated as per Article 4.3.3.5 except that wired glass may be used as per Article 4.3.2.1, and
- b) A second *exit* may be a fire escape as described in this Subsection.

4.3.8.3 As per the MBC, where *exits* are served by a *public corridor*, it shall be possible for occupants, upon entering the corridor, to move in two separate directions to reach an exit.

*Exception: Dead-end corridors in accordance with the MBC are acceptable.*

4.3.8.4 Where a fire escape is used as a second *exit* from a *floor area* and is directly accessed from a corridor, the corridor, connecting the *exit* stair and the fire escape, shall be divided at approximately its mid-length point by a smoke partition (*fire separation* not having a *fire resistance rating*) to create two enclosed smoke compartments on the *floor area*. This smoke partition shall penetrate any concealed space above a suspended ceiling and from a smoke-tight joint at the wall/floor interface.

Note: This cross corridor barrier is intended to provide an area of temporary refuge for occupants while waiting to enter an exit or a fire escape.

4.3.8.5 Doors in the smoke partition in Article 4.3.8.3 shall:

- a) be normally held open and released automatically on a signal from the fire alarm system,
- b) be equipped with self-closing devices,
- c) be equipped with positive latching to keep the door closed,

- d) be equipped with weather-stripping or similar material to prevent smoke movement through them,
- e) not include louvres or other through openings, and
- f) not be required to have a *fire protection rating*.

4.3.8.6 Fire escapes are permitted on all heritage residential *buildings* not exceeding 7-storeys in *building height* and shall be constructed according to the MBC requirements for such fire escapes.

Note: While fully open fire escapes are permitted by the MBC, for security and all-weather use reasons, it may be preferable to provide enclosures for fire escapes. Such enclosures must, however, meet the heritage preservation goals of the exterior facades, as well.

4.3.8.7 Where access to a fire escape is directly from a *dwelling unit*, existing windows may be used for evacuation to the fire escape provided they are of sufficient dimensions to allow an occupant to pass through them and provided the occupants are capable of using these windows. Should occupants not be capable of using window evacuation to a fire escape, alternative fire safety measures, accepted by the City of Winnipeg, shall be provided.

Note: Where access to a fire escape is from a public corridor, such access must be via a doorway opening. Direct access to a fire escape via openable windows is permitted only when it is directly from a dwelling unit (apartment). In such cases, the second means of egress from the apartment would be via a corridor to an interior, enclosed exit stair.

4.3.8.8 Openings in an existing exterior wall within the protection zone described in the MBC may be protected by automatic sprinklers as described in Article 4.3.2.2.

#### **4.3.9 Fire Safety Planning**

4.3.9.1 Each heritage residential *building* shall have a detailed Fire Safety Plan developed in conjunction with the Winnipeg Fire Department.

4.3.9.2 Occupants in each apartment/compartments in the heritage residential *buildings* shall be provided with the fire safety plan indicating actions expected from them in the event of a fire in the *building*. The need for such instructions shall be incorporated into all lease agreements. The plan shall include instructions for all occupants who may require assistance to fully evacuate the *building* in the event of a fire, including the need to identify those locations where such occupants may be located in the *building* to assist the fire department in rescue operations.

4.3.9.3 The Fire Safety Plan shall contain provisions for at least one exit drill for all occupants of the *building* each year.

#### **4.3.10 Ignition Prevention Provisions**

4.3.10.1 Heritage residential *buildings* containing Artist Live/Work spaces shall be provided with means on each *storey* to ensure the safe disposal of materials soaked with flammable or combustible liquids in accordance with the MFC.

4.3.10.2 Heritage residential *buildings* containing Artist Live/Work spaces shall be provided with mechanical means to remove accumulations of airborne combustible dusts or flammable vapours for any operations intended to produce such dusts and vapours (e.g., woodworking).



4.3.10.3 The fire safety plans for heritage residential *buildings* with Artist Live/Work spaces shall address potential hazards resulting from the work activity and appropriate fire safety measures, accepted by the City of Winnipeg, shall be required.

#### **Section 4.4 – Fire Safety Parameters for the Residential Occupancy of Heritage Buildings**

4.4.1 Each fire safety parameter for heritage *buildings* of Group C office *major occupancy* in Subsections 4.4.3 to 4.4.16 shall be analyzed using this Section and Worksheet 4-1.

4.4.2 Only one point value shall be selected for each fire safety parameter for each fire zone. If more than one value can apply, the lowest point value shall govern.

#### **4.4.3 Construction of Structural Members and Floor and Roof Assemblies Parameter**

4.4.3.1 The construction of structural members and assemblies shall be assessed using Table 4.1 in Worksheet 4-1. This assessment shall apply to each fire zone.

Note: The major divisions in the building height column in Table 4.1 essentially align with the structural fire protection requirements contained in Articles 3.2.2.47. to 3.2.2.53. of the MBC (residential occupancies). The fire resistance ratings shown in Table 4.1 use heavy timber construction or 45 minutes rated construction (combustible or noncombustible) as the base requirement, and are assigned scores of zero.

4.4.3.2 This parameter is intended to assess the basic construction of the *building*, in particular, the major structural components. The construction types evaluated are *heavy timber construction*, *combustible* and *noncombustible construction*. *Building height* refers to *storeys above grade*, starting with the *first storey*.

4.4.3.3 Users are advised that the minimum dimensions for *heavy timber construction* are typically contained in the MBC but other reference documents may be used to assess the *fire resistance rating of heavy timber construction* as described in Subsection 4.3.2. The *fire resistance ratings* for *combustible* and *noncombustible construction* in Table 4.1 have been compared to the rating for *heavy timber construction* (or 45 minutes fire resistance) to establish their relative scores in Table 4.1. Unprotected floor assemblies of *combustible* or *noncombustible construction* are beyond the scope of Table 4.1.

4.4.3.4 The maximum height of *building* considered appropriate for application of Table 4.1 is 7-storeys which is reported to be the highest *building* of the type being considered in the Exchange District of the City of Winnipeg.

#### **4.4.4 Hazardous Areas Parameter**

4.4.4.1 Each hazardous area in the *building* shall be assessed using Table 4.2 in Worksheet 4-1. The hazardous area which provides the lowest point score shall govern. The assessment shall apply to each fire zone.

4.4.4.2 A hazardous area is defined as any space or compartment that contains a storage or other activity that is not part of the normal *residential occupancy* and

has the potential of producing a fully developed fire. Hazardous areas are typically those which the MBC and Section 4.3 of these Guidelines consider to require special attention, usually in the form of fire separations or automatic fire suppression (sprinklers), or both. In some cases, only one protection means is required; in others, both are required. The points assigned to each column in Table 4.2 are based on those requirements.

4.4.4.3 This parameter applies to the vertical *fire separations* surrounding the hazardous area. Floor/ceiling *fire separations* are covered in Subsection 4.4.3.

4.4.4.4 To be considered as a hazardous area in Table 4.2, the area may be in or adjacent to an apartment or adjacent to an egress route. In either case, points are assigned as per Table 4.2.

4.4.4.5 Artist Live/Work Spaces are typically apartments in which an artist has incorporated a workshop. Should the workshop hazard be no greater than a typical *residential occupancy* (e.g., wood carving, sculpture from clay, painting), it should be classified a "Lower Hazard" in Table 4.2 and the protection provided by the apartment's sprinklers is considered sufficient. Should the workshop hazard be considered greater than a typical *residential occupancy* (e.g., metal sculpture involving welding, wood finishing involving wood dusts), it should be classified a "Higher Hazard" in Table 4.2 and two protection means are required, as shown in Table 4.2.

#### **4.4.5 Vertical Openings Parameter**

4.4.5.1 Each vertical opening shall be assessed using Table 4.3 in Worksheet 4-1. The vertical openings entry which provides the lowest point score shall govern. The assessment shall apply to the *building* as a whole.

4.4.5.2 Vertical openings provide a means for fire, and especially smoke, to spread rapidly from floor to floor and hence constitute a significant hazard to occupants on floors away from the origin of the fire. An enclosed opening in Table 4.3 is one that has a *fire separation* that may not have a *fire resistance rating* (e.g., plain glass) but which acts as a smoke barrier. An unenclosed opening in Table 4.3 is one which does not have a *fire separation* of any sort, which has a *fire separation* but no *closures* (e.g., doors), or one in which fire-stopping has not been provided to completely seal the openings in the enclosure. Unenclosed openings may occur anywhere through the height of a *building*.

4.4.5.3 An unenclosed opening on one *storey* means that the shaft or chute has no *fire* or *smoke separation* on one *storey* but is enclosed on all other *storeys*.

4.4.5.4 Due to the age of heavy timber floors in the heritage *buildings*, a number of openings have developed due to warpage and shrinkage. These openings could provide an avenue for unchecked smoke and fire spread unless appropriate means are provided to contain such spread. Section 4.3 requires that such floors be "topped" with *noncombustible* materials designed to fill cracks and minor holes in the floors. Where such "topping" is not provided, Table 4.3 considers the arrangement to be unenclosed.

#### **4.4.6 Automatic Sprinklers Parameter**

4.4.6.1 Automatic sprinkler systems shall be assessed using Table 4.4 in Worksheet 4-1. The assessment shall apply to the *building* as a whole.

4.4.6.2 For occupant safety and preservation of heritage property, Section 4.3 of these Guidelines and the MBC consider automatic sprinklers as the most effective protection means currently available. Given the quicker response (and usually greater occupant safety) associated with residential sprinklers, Table 4.4 assigns greater points to systems with such sprinklers.

4.4.6.3 An incomplete sprinkler system (i.e., not conforming to the requirements for sprinkler installation in the MBC) is not assigned any points since fires could be ignited in the unsprinklered portion of the *building*. To ensure operation when required, appropriate supervision is preferable. Without such supervision, the reliability of sprinkler systems is considered to be reduced and fewer points assigned.

#### **4.4.7 Fire Alarm Parameter**

4.4.7.1 Fire alarm systems shall be assessed using Table 4.5 in Worksheet 4-1. The assessment shall apply to the *building* as a whole.

4.4.7.2 Section 4.3 considers a single stage fire alarm system with speakers and voice communication capability as a basic feature to provide occupant notification in the event of a fire. Installation of these fire alarm systems shall be in accordance with the MBC. Voice communication, to enable the fire department to notify occupants of the situation, is considered an essential element in ensuring that occupants begin to evacuate (or stay in place) and that they use the safest way out. This responds to the research indicating that many occupants do not evacuate upon hearing an alarm or choose contaminated egress routes when uncontaminated ones may be available.

4.4.7.3 With the addition of supervision, fire department notification and smoke detectors as required by the MBC, additional points are assigned as shown in Table 4.5. An incomplete system is one which does not have the required elements from Section 4.3.

4.4.7.4 A two-stage system is assigned negative points in Table 4.5 since typically there is no assurance of trained staff to take action in the event of a first-stage alert. Without that assurance, the two-stage alarm will result in greater delays in notifying occupants of the need to evacuate.

#### **4.4.8 Smoke Alarms Parameter**

4.4.8.1 Smoke alarms in *suites* (apartments) shall be assessed using Table 4.6 in Worksheet 4-1. The assessment shall apply to each fire zone.

4.4.8.2 Within *suites*, smoke alarms provide the earliest warning of an incipient fire. The installation of smoke alarms shall be in accordance with the MBC, however, Table 4.6 acknowledges that single station (not interconnected) smoke alarms may be provided in some cases, with a lower point score. All smoke alarms must be hard wired to count for points, except as permitted in Article 4.4.8.3.

4.4.8.3 Battery-powered *smoke alarms* are not considered to provide full compliance with this parameter. *Smoke alarms* with non-tamper lithium batteries designed to provide power for at least 10 years are considered to provide partial compliance provided they are approved by the Winnipeg Fire Department.

#### **4.4.9 Suite Fire Compartmentation Parameter**

4.4.9.1 The *fire separations* between *suites* (apartments) and between *suites* and *public corridors* shall be assessed using Table 4.7 in Worksheet 4-1. The assessment shall apply to each fire zone.

4.4.9.2 Section 4.3 requires that *suite to suite* and *suite to public corridor fire separations* have a  $\frac{3}{4}$  h *fire resistance rating* with unlimited areas of wired glass. Using door assemblies with a 20 min *fire protection rating*, these *fire separations* provide the basic compartmentation building block as shown in Table 4.7.

4.4.9.3 This parameter applies to the vertical *fire separations* only. The floor/ceiling *fire separations* are addressed in Subsection 4.4.3.

4.4.9.4 *Fire resistance ratings* for wall assemblies can be assigned using a variety of methods shown in Section 4.3. Fire dampers are not required where *fire separations* are penetrated by steel ducts as per Section 4.3. If there are completely unprotected openings (i.e., no smoke barrier, louvres, etc.), then the wall is to be considered incomplete. Walls with less than a 45 min *fire resistance rating* shall be at least one layer of 12.7 mm gypsum board (any type) on both sides of wood or steel studs. Such assemblies are often assigned *fire resistance ratings* in the range of 30 min.

4.4.9.5 The term “doors” in Table 4.7 refers to door assemblies comprised of the door, frame and associated hardware.

4.4.9.6 The term “closers” in Table 4.6 means a device which will either maintain the door in the closed position or will cause it to close automatically in the event of a fire alarm signal.

#### **4.4.10 Temporary Refuge Areas**

4.4.10.1 The vertical *fire separations* between bedrooms and other spaces in *suites* shall be assessed using Table 4.8 in Worksheet 4-1. The assessment shall apply to each fire zone.

4.4.10.2 For the purposes of this parameter, vertical *fire separations* between bedrooms and the other spaces in *suites* shall be constructed as smoke separations to be considered as fulfilling the requirements.

4.4.10.3 Where vertical *fire separations* between bedrooms and the other spaces in *suites* contain unprotected openings (i.e., no smoke separation exists), those separations shall be rated as "Incomplete".

4.4.10.4 Doors in *fire separations* between bedrooms and other spaces in *suites* do not need to have a *fire protection rating* nor do they need to be self-closing.

4.4.10.5 Exterior balconies with direct access from each *suite* are considered to be temporary refuge areas provided they are at least 1.5 m deep and have an area of at least 1 m<sup>2</sup> per bedroom in the *suite*.

4.4.10.6 Wired glass or glass block enclosures are considered to have a *fire resistance rating* of greater than 20 min, regardless of the area of the glass.

#### **4.4.11 Access to Exits Parameter**

4.4.11.1 *Access to exits* from residential *suites* shall be assessed using Table 4.9 in Worksheet 4-1. The assessment shall apply to each fire zone.

4.4.11.2 The points for *access to exit* relate to the value placed on these facilities in the MBC and Section 4.3. The basic egress system is 2 ways out from a residential *suite*: either access to a 2-directional corridor, with dead-ends ≤6 m permitted; or access to a dead-end corridor with direct access to a fire escape directly from the *suite*. Points in Table 4.9 are also assigned on the basis of the distance an occupant must travel to move from the most remote point in a *suite* to an *exit* door (e.g., common fire escape, *exit* stair). Since increases in distance travelled typically result in increased time exposed to fire effluents, the greater the distance, the greater the time and thus the greater the risk to occupants. For the purposes of this parameter, an *exit* is a fire escape, an enclosed stair or an outside door at grade.

4.4.11.3 A dead end corridor length is measured from the centre of the *suite* door to an *exit*, or to a point where an occupant may move in two directions to two separate *exits*.

#### **4.4.12 Exits Parameter**

4.4.12.1 *Exits* shall be assessed using Table 4.10 in Worksheet 4-1. The assessment shall apply to each fire zone.

4.4.12.2 Section 4.3 considers the baseline *exit* arrangement to be one enclosed stair, one fire escape complying with the MBC and, if a corridor connects the two, cross corridor barriers (smoke separations) at approximately mid length in the corridor. The points assigned in Table 4.10 reflect this basic structure.

4.4.12.3 Enclosed stairs mean that the *exit* shaft *fire separation* has a minimum *fire resistance rating* of  $\frac{3}{4}$  hour, however, unlimited areas of wired glass (glass block) are permitted. A complying lobby is one which meets the requirements of the MBC for *exit* discharge through a lobby. If any of the requirements in the MBC are not met, the lobby shall be considered non-complying.

4.4.12.4 Cross corridor barriers are an effective means to subdivide corridors into two smoke zones. While not requiring a *fire resistance rating*, they need to be smoke separations with self-closing doors or doors that are activated by the fire alarm system. Positive latching and weather-stripping is required for these doors. What must be assured is that they will close on a fire alarm signal and that they will remain closed (except when occupants are moving through them) from that point in time to retard the passage of smoke. In existing corridors which are wide enough to accommodate only a single door, doors in cross-corridor barriers need not swing in the direction of travel to

the *exit* from both directions where the *occupant load* on both sides of the cross-corridor barrier does not exceed 60.

4.4.12.5 Existing fire escapes must comply with the MBC with the exception of those aspects addressed in Section 4.3. The details of the construction of fire escapes are contained in the MBC and Section 4.3 of these Guidelines. Should openings in an existing exterior wall expose the fire escape to a fire in a *suite*, a *sprinklered-window* system can be used to protect the opening as described in Section 4.3.

4.4.12.6 Section 4.3 addresses the major life safety issues surrounding *exits* such as *exit* enclosures, number of *exits* and quality of *exit* or facilities. Existing stairs with non-conforming items such as tread/riser dimensions, width, handrail height and openings in guards are intended to be acceptable in the context of Section 4.3 provided the non-conforming item does not in itself constitute an undue hazard.

#### **4.4.13 Interior Finishes of Walls and Ceilings Parameter**

4.4.13.1 The flame spread ratings of the interior finishes of walls and ceilings in *exits*, *public corridors* and other spaces, including *suites*, shall be assessed using Table 4.11 in Worksheet 4-1. This assessment shall apply to each fire zone. The surface in the fire zone which provides the lowest point value shall govern.

4.4.13.2 The baseline for *flame spread ratings* for interior finishes is the MBC, with the exception that exposed *heavy timber construction* can be used in any location. The point scores, for interior finishes which exceed the MBC *flame spread rating* requirements for corridors and apartments, assume that *flame spread ratings* do not exceed 200. Any interior finish with a *flame spread rating* greater than 200 would be considered a hazard and would need to be treated under the Hazardous Areas parameter in Subsection 4.4.4.

4.4.13.3 *Exits*, corridors and residential *suites* are evaluated separately. The point score in Table 4.11 which reflects the worst case (i.e., most negative) will be considered the composite score for interior finishes. Section 4.3 permits exposed *heavy timber construction* to be used in all locations even though it has a *flame spread rating* of 75 to 150, depending on the thickness and species of wood.

#### **4.4.14 Smoke Control Systems Parameter**

4.4.14.1 Smoke control systems shall be assessed using Table 4.12 in Worksheet 4-1. This assessment shall apply to each fire zone.

4.4.14.2 In the context of this parameter, smoke control is a means to contain smoke inside a residential *suite* or other space using standard mechanical or other similar equipment. Should the corridors serving *exits* be pressurized to limit odour spread to apartments, this will normally provide a means to keep smoke out of the corridor from the residential *suite* of fire origin, especially if the apartment/corridor door remains closed.

4.4.14.3 Cross corridor barriers (see Article 4.4.12.4) also provide a passive means to restrict smoke movement to one half of the corridor or *floor area*. Together, pressurization and cross corridor barriers can provide considerable safety for occupants

by increasing the time to smoke contamination of the corridor through which occupants must pass to reach *exits*.

#### **4.4.15 Fire Safety Planning Parameter**

4.4.15.1 Fire safety planning shall be assessed using Table 4.13 in Worksheet 4-1. This assessment shall apply to the *building* as a whole.

4.4.15.2 Research has shown that the preparation of plans for fire safety and occupant egress, and the practice of those plans by exit drills, improves the potential for safe actions in a fire. These are especially effective when coordinated with the responding fire department.

4.4.15.3 Fire safety plans are stipulated in Section 4.3 of these Guidelines and outlined in the MFC. It is important that these plans be provided to all occupants of the residential *suites*. This can be best accomplished through some means in conjunction with the lease agreements. Approval of the plans by the fire department is essential since the objective is to improve occupant safety, aspects of which are provided by the responding firefighters.

4.4.15.4 With the addition of *exit* drills (at least one per year), occupant safety is greater enhanced since occupants have the opportunity to practice evacuation using the prescribed exits and learn more about the fire alarms and the role of the fire department. These drills can be especially effective in ensuring safety for occupants who may have difficulty in evacuating the *building* and who may be instructed by the fire department to remain in their residential *suites* in some circumstances.

#### **4.4.16 Fire Brigade Response Parameter**

4.4.16.1 The response of the fire department shall be assessed using Table 4.14 in Worksheet 4-1. This assessment shall apply to the *building* as a whole.

4.4.16.2 Section 4.3 assumes a fire department response to the heritage *buildings* in 6 min or less. In addressing occupant safety (primarily rescue) by the fire brigade, the MBC utilizes two primary means: the number of *streets* which the *building* faces (and hence the potential for window rescue) and the presence of a properly equipped firefighters' elevator, which can be used to rescue occupants who may not be able to evacuate easily on their own.

4.4.16.3 Part 4 and this Subsection are not intended for occupants who are not capable of self-preservation or who require trained staff assistance (except for infants in arms) but are intended for occupants who may have physical disabilities which may slow their evacuation.

#### **4.4.17 Basic Requirements**

4.4.17.1 For the purposes of Part 4, all Basic Requirements in Table 4.15 in Worksheet 4-1 shall conform to the MBC or the MFC, or specific equivalent protection shall be provided in conformance with Section 2.3, Part 2, Division C of the MBC or Subsection A-1.2.1.1.(1)(b), Part 1, Division A of the MFC.

4.4.17.2 Table 4.15 lists the requirements that are not addressed in the Fire Safety Parameters but which are necessary for overall occupant safety in a renovated heritage *building*. Where any of these Basic Requirements are not met, the features must be made compliant or an acceptable equivalent means provided. In the requirements for Elevator Installations and Exposure Protection, users are directed to Section 4.3 where certain existing arrangements are permitted to remain in place and may not require major changes for compliance purposes.

4.4.17.3 The requirement concerning self-egress with no trained staff to assist evacuation is important. Part 4 is intended to address situations where occupants are capable of self-preservation. While evacuation might be somewhat delayed due to some disability, the occupant could still evacuate the *building* (or be evacuated), using the egress facilities provided, without significant assistance. Facilities requiring trained staff to ensure evacuation are beyond the scope of this Part.

### **Section 4.5 – Calculating Fire Safety**

4.5.1 Fire safety for the heritage residential *building* shall be assessed using the 4 evaluations in Worksheet 4-2: Fire Control, Refuge, Egress and Overall Fire Safety.

4.5.2 The governing scores determined for each parameter in Subsections 4.4.3 to 4.4.16 from Worksheet 4-1 shall be transferred to the appropriate rows in Worksheet 4-2. (For example, if the governing point score for “Fire Alarm Systems” is -2, then -2 shall be entered in all columns opposite the Fire Alarm Systems entry in Worksheet 4-2. The resulting point score under the “Fire Control Provided” column for this parameter would be  $-2/2 = -1$ . All other columns in this row would have the entry -2 except the “Refuge Provided” column.) In Worksheet 4-2, the term “/2” means that the parameter point value from Worksheet 4-1 is divided by 2 and the resulting score shown in that entry. The term “N/A” means that the parameter from Worksheet 4-1 does not apply to this evaluation.

4.5.3 The columns in Worksheet 4-2 shall be totalled to obtain the aggregate point scores for the four evaluations. These totals shall be transferred to Worksheet 4-3 and used for comparison to the benchmarks in that worksheet.

### **Section 4.6 – Comparison to Benchmarks for Heritage Residential Buildings**

4.6.1 The totals obtained for the four evaluations in Worksheet 4-2 shall be included in the appropriate locations in Column 1 in Worksheet 4-3.

4.6.2 For the height of the *building* being assessed, the minimum benchmarks for the four evaluations shall be identified using Worksheet 4-3 and the benchmark values included in Column 2 in Worksheet 4-3.

4.6.3 Equivalency to the requirements of the MBC and the Fire Safety Alternatives for existing residential *buildings* shall be deemed to have been achieved if the point values of all four evaluations are greater than the minimum point values for the benchmarks for the height of the *building*. From Worksheet 4-3, Column 1 must be equal to or greater than Column 2 for equivalency to have been achieved.



Note: The minimum benchmarks for heritage residential *buildings* were derived from designs complying with the MBC 1995 for sprinklered and unsprinklered options for buildings of 1 to 6-storeys in height and the MBC sprinklered option for buildings of 7-storeys in height. The layout of an existing building in the Exchange District of Winnipeg was used as the prototype for a case study using three different height ranges, to correspond to the changes in structural fire protection requirements in the MBC.

## WORKSHEET 4-1

### THE MANITOBA FIRE RISK INDEX FOR THE RESIDENTIAL OCCUPANCY OF HERITAGE BUILDINGS

#### FIRE SAFETY PARAMETERS

**TABLE 4.1 CONSTRUCTION OF STRUCTURAL MEMBERS AND FLOOR AND ROOF ASSEMBLIES** (Applies to each fire zone)

Building Height	Construction Type						
	Heavy Timber	Combustible			Noncombustible		
		<45 min FRR <sup>(1)</sup>	45 min FRR	>45 min FRR	<45 min FRR <sup>(1)</sup>	45 min FRR	>45 min FRR
1-3 storeys	0	-1	0	2	-1	0	2
4-6 storeys	0	-3	0	1	-2	0	1
>6 ≤7 storeys	0	-5	0	0	-3	0	1

Note:

<sup>(1)</sup>This Table assumes that while the FRR may be less than 45 min, it is at least equivalent to the FRR typically provided by 12.7 mm thick gypsum board on wood or steel joists.

**TABLE 4.2 HAZARDOUS AREAS**  
(Applies to each fire zone)

	MBC Requirement	No Fire Separations No Sprinklers	No Fire Separations + Sprinklers	Fire Separations <sup>(1)</sup> <45 min No Sprinklers	Fire Separations <sup>(1)</sup> <45 min + Sprinklers	Fire Separations ≥45 min No Sprinklers	Fire Separations ≥45 min + Sprinklers
Tenant Storage Rooms	3.3.4.3	-7	-2	-2	-1	-1	0
Furnace/Service Rooms	3.6.2.1	-7	-2	-2	-1	-1	0
Common Laundry Rooms	3.3.1.22	-7	-2	-1	0	0	1
Common Janitors' Rooms	3.3.1.21	-7	-2	-1	0	0	1
Mercantile, Office, Assembly, or Light Industrial Occupancy on Ground Floor	3.1.3.1	-7	-2	-2	-1	-1	0
Elevator Machine Rooms	3.5.3.3	-7	-2	-2	-1	-1	0
Refuse Storage Rooms	3.6.2.5	-7	-2	-2	-1	-1	0
Artist Live/Work Spaces	Higher Hazard <sup>(2)</sup>	-7	-2	-2	-1	-1	0

Notes:

<sup>(1)</sup>Fire separations must be present to act as smoke separations regardless of the FRR.

<sup>(2)</sup>Higher hazard Artist Live/Work Spaces are those in which the materials used create a greater hazard than a normal residential occupancy.

**TABLE 4.3 VERTICAL OPENINGS**

(Applies to entire building)

	Unenclosed <sup>(1)</sup>			Enclosed <sup>(2)</sup>		
	>3 sto	2-3 sto	1 sto <sup>(3)</sup>	<45 min	45 min <sup>(4)</sup>	>45 min
Exit Stair Shafts	-10	-7	-2	-1	0	1
Refuse Chutes	-10	-7	-3	-1	0	1
Vertical Service Spaces	-10	-7	-3	-1	0	1
Elevator Shafts	-10	-7	-2	-1	0	1
Existing Stair/Elevator Shafts (combined)	-10	-7	0	0	0	1
Heavy Timber Floors <sup>(5)</sup>	-10	-7	N/A	0	0	1

## Notes:

<sup>(1)</sup>Unenclosed means no fire or smoke separation exists<sup>(2)</sup>Enclosed means a fire or smoke separation exists<sup>(3)</sup>An unenclosed opening on one storey means that the shaft or chute has no fire or smoke separation on one storey but is enclosed on all other storeys.<sup>(4)</sup>Wired glass enclosures, regardless of area of wired glass, are considered to have a rating of 45 min<sup>(5)</sup>Untopped heavy timber floors which have openings due to shrinkage or warpage are considered to be unenclosed. If one floor is unenclosed (i.e., no topping), then 2-storeys are exposed to the same fire.**TABLE 4.4 AUTOMATIC SPRINKLERS**

(Applies to entire building)

Incomplete	Unsupervised <sup>(1)</sup> with Std Sprinklers	Unsupervised <sup>(1)</sup> with Residential Sprinklers	Supervised with Std Sprinklers <sup>(1)</sup>	Supervised with Residential Sprinklers <sup>(1)</sup>
0	3	7	6	10

## Note:

<sup>(1)</sup>Supervision for water flow and valve tamper as required in the MBC.

**TABLE 4.5 FIRE ALARM SYSTEMS** (Applies to entire building)

Incomplete <sup>(1)</sup>	2 Stage	Single Stage			
		Without Voice Comm	+ Voice Comm	+ Voice Comm + Supervised with FD Notification	+ Voice Comm + Supervised with FD Notification + Smoke Detectors <sup>(2)</sup>
-2	-1	0	1	2	3

Note:

<sup>(1)</sup>Incomplete means that the system does not meet the requirements of Section 4.3 related to the specific building.

<sup>(2)</sup>With smoke detectors in corridors and exit stairs as per MBC

**TABLE 4.6 SMOKE ALARMS** (Applies to each fire zone)

Single Station Units <sup>(1)</sup>		Interconnected Units <sup>(1)</sup>	
Every Level	Every Level and Bedrooms	Every Level	Every Level and Bedrooms
0	2	0	4

Note:

<sup>(1)</sup>Hard-wired units are required. For smoke alarms with non-tamper, lithium batteries subtract two (2) points.

**TABLE 4.7 SUITE FIRE COMPARTMENTATION (Suite-Suite and Suite-Corridor)**  
(Applies to each fire zone)

Incomplete/ None <sup>(1)</sup>	Walls <45 min FRR <sup>(2)</sup>		Walls ≥45 min FRR <sup>(3)</sup>		Walls ≥1 h FRR	
	Doors <sup>(4)</sup> <20 min	Doors ≥20 min	Doors <sup>(4)</sup> <20 min	Doors ≥20 min	Doors <sup>(4)</sup> <20 min	Doors ≥20 min
-6	-2	-1	0	1	1	2

Notes:

<sup>(1)</sup>Incomplete/none refers to the case where there is no smoke separation between the spaces.

<sup>(2)</sup>At least equivalent to 12.7 mm thick gypsum board on both sides of steel or wood studs

<sup>(3)</sup>Wired glass enclosures, regardless of area of wired glass, are considered to have an FRR of 45 min.

<sup>(4)</sup>These door assemblies are not required to have a fire protection rating and do not necessarily need a rated frame or rated hardware but should have self-closing devices to ensure that they can prevent smoke movement into the corridor following occupant egress.

**TABLE 4.8 TEMPORARY REFUGE PARAMETER** (Applies to each fire zone)

Incomplete/No Door <sup>(1)</sup>	Walls + Door		Exterior Balconies <sup>(3)</sup>
	<20 min FRR	≥20 min FRR <sup>(2)</sup>	
-1	0	1	1

Notes:

<sup>(1)</sup>Incomplete/no door refers to the case where there is no smoke separation between the spaces.<sup>(2)</sup>Wired glass or glass block, regardless of the area, is considered to have an FRR ≥20 min.<sup>(3)</sup>See Article 4.4.10.5.**TABLE 4.9 ACCESS TO EXITS FROM SUITES** (Applies to each fire zone)

Apartment Direct Access to Fire Escape + Dead End Corridor	Apartment on Dead End Corridor <sup>(1)</sup> >6 m +		Apartment on Dead End Corridor ≤6 m +			2 Directional Corridor +		
	≤15 m Travel <sup>(2)</sup>	>15 m Travel <sup>(2)</sup>	≤15 m Travel <sup>(2)</sup>	≤45 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>	≤15 m Travel <sup>(2)</sup>	≤45 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>
0	-2	-4	0	-1	-2	2	1	0

Note:

<sup>(1)</sup>Dead end corridor must lead to 2-directional corridor or 2 exits.<sup>(2)</sup>Travel is the same distance an occupant must walk to move from the most remote point in a suite to an exit door.**TABLE 4.10 EXITS** (Applies to each fire zone)

2 Enclosed Stairs <sup>(1)</sup>				1 Enclosed Stair <sup>(1)</sup> + 1 Fire Escape (FE) <sup>(2)</sup> + Cross Corridor Barrier <sup>(3)</sup>		
Stairs Direct to Outside	Stairs Through Complying Lobby <sup>(4)</sup>	Stairs Through Non-Complying Lobby <sup>(4)</sup>	With Cross Corridor Barrier <sup>(3)</sup>	Stair Direct to Outside + FE	Stair Through Complying Lobby <sup>(4)</sup> + FE	Stair Through Non-Complying Lobby <sup>(4)</sup> + FE
2	1	0	4	1	0	-1

Notes:

<sup>(1)</sup>Enclosure by a fire separation with ≥45 min FRR. Unlimited area wired glass permitted.<sup>(2)</sup>Fire escape conforms to Article 4.4.12.5.<sup>(3)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FRR (see Article 4.4.12.4).<sup>(4)</sup>Lobby complying with MBC.

**TABLE 4.11 INTERIOR FINISHES OF WALLS AND CEILINGS**

(Applies to each fire zone)

Exits FSR <sup>(1)</sup>		Public Corridors FSR <sup>(1)</sup>			Suites FSR <sup>(1)</sup>	
≤25	>25≤150	≤75	>75≤150	>150≤200	≤150	>150≤200
0	-2	1	0	-3	0	-3

Note:

<sup>(1)</sup>Does not apply to exposed heavy timber construction**TABLE 4.12 SMOKE CONTROL**

(Applies to each fire zone)

None	Cross Corridor Barriers	Pressurized Corridors	Pressurized Corridors + Cross Corridor Barriers
0	1	2	3

**TABLE 4.13 FIRE SAFETY PLANNING**

(Applies to entire building)

No FSP <sup>(1)</sup>	FSP <sup>(1)</sup> Developed & Approved <sup>(2)</sup>	FSP Developed & Approved <sup>(2)</sup> + 1 Exit Drill/Year
-2	0	2

Notes:

<sup>(1)</sup>Fire safety plan as per MFC.<sup>(2)</sup>Approved by fire department.**TABLE 4.14 FIRE BRIGADE RESPONSE**

(Applies to entire building)

One Street <sup>(1)</sup> Access		Two or Three Street <sup>(1)</sup> Access	
With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator
1	0	2	1

Notes:

<sup>(1)</sup>Conforms to MBC for buildings facing streets.<sup>(2)</sup>Conforms to MBC requirements for fire department elevators.

**TABLE 4.15 BASIC REQUIREMENTS FORE HERITAGE RESIDENTIAL BUILDINGS**

The following must conform to the MBC or MFC or Section 4.3 of these Guidelines:

Basic Requirement	Compliant	
	Yes	No
Utilities Installation		
Electrical equipment vaults, required by the Canadian Electrical Code, Part 1, are protected as required in Article 3.6.2.7 of MBC.		
HVAC Installation		
Elevator Installation (except heritage elevators) <sup>(1)</sup>		
Refuse Chutes		
Exposure Protection (except existing facades) <sup>(2)</sup>		
Fire-stopping		
Standpipe System		
Fire Alarm Audibility in all spaces		
Testing/Maintenance of fire safety equipment		
Occupants must care for themselves in evacuation, except infants in care of responsible persons. (No trained staff to assist egress.)		
Fire Department response $\leq 6$ min to building		

Notes:

<sup>(1)</sup>See Section 4.3 for provisions for heritage elevators.

<sup>(2)</sup>See Section 4.3 for provisions for windows etc. in heritage facades.

## WORKSHEET 4-2

### FIRE SAFETY EVALUATION FOR HERITAGE RESIDENTIAL BUILDINGS

Occupant Safety Parameter	Fire Control Provided	Refuge Provided	Egress Provided	Overall Fire Safety
Construction			N/A	
Hazardous Areas			/2 =	
Vertical Openings	/2 =			
Automatic Sprinklers		/2 =	/2 =	
Fire Alarm	/2 =	N/A		
Smoke Alarms	/2 =	N/A		
Suite Compartmentation			/2	
Bedroom Compartmentation	N/A		N/A	
Access to Exits	N/A	N/A		
Exits	N/A	/2 =		
Interior Finishes	/2=	N/A		
Smoke Control	N/A			
Fire Safety Planning	N/A	N/A		
Fire Brigade Response		N/A		
<b>TOTALS<sup>(1)</sup></b>				

Notes:

<sup>(1)</sup>Totals to be transferred to Worksheet 4-3.



## WORKSHEET 4-3

### BENCHMARKS FOR FIRE SAFETY FOR HERITAGE RESIDENTIAL BUILDINGS

Building Height	Control Benchmark	Refuge Benchmark	Egress Benchmark	Overall Fire Safety Benchmark
1-3 storeys	1	-0.5	3	2
4-6 storeys	13	5	7.5	12
7 storeys	13	5	7.5	12

### EQUIVALENCY EVALUATION FOR HERITAGE RESIDENTIAL BUILDINGS

Fire Safety Provided (Totals from Table 4-2)	Fire Safety Required (Benchmark from above)	Column 1 $\geq$ Column 2	
		Yes	No
	Fire Control Benchmark =		
	Refuge Benchmark =		
	Egress Benchmark =		
	Overall Fire Safety Benchmark =		
Column 1	Column 2	Column 3	

## PART 5 – THE MANITOBA OFFICE OCCUPANCY FIRE RISK INDEX FOR HERITAGE BUILDINGS

*Note: It is important that users of Part 5 be aware of the fact that this risk index is based partly on a set of Fire Safety Alternatives to the MBC for the heritage office buildings in Winnipeg's Exchange District which are being re-used as or converted to office buildings. The Fire Safety Alternatives and fire risk index described in Part 5 provide those wishing to renovate those heritage buildings with solutions that may not comply directly with the MBC but provide for occupant safety commensurate with the MBC, while enabling historic preservation and cost effectiveness goals to be met. All aspects of the renovation or conversion, not addressed by the Fire Safety Alternatives, must be assessed for impact on fire safety and, in many cases, must comply with the appropriate requirements of the MBC, as described in this Part. Other municipalities, which can demonstrate compliance with the Assumptions in Section 5.2 and the Fire Safety Alternatives in Section 5.3 may wish to use this Part for the assessment of heritage residential buildings within their jurisdictions. Users are cautioned that compliance with the Assumptions and Fire Safety Alternatives (or MBC) is essential for the safe application of this Part.*

### Section 5.1 – General

5.1.1 Part 5 applies to the fire safety risk index for *business and personal services occupancies*, (Group D) in heritage *buildings* located in the Exchange District of the City of Winnipeg. An existing heritage building is a building that has been maintained and does not include buildings that have been gutted. In those instances Part 3 shall be used.

5.1.2 Each fire safety parameter for *buildings* of Group D *business and personal services major occupancy* (Subsections 5.4.1 to 5.4.14) shall be analyzed using this Part and Worksheet 5-1.

5.1.3 Only one point value shall be selected for each fire safety parameter for each fire zone. If more than one value can apply, the lowest point value shall govern.

### Section 5.2 – Assumptions

#### 5.2.1 Assumptions Regarding the Heritage Office Buildings

5.2.1.1 The assumptions regarding the heritage *buildings* begin rehabilitated to or re-used as Group D *major occupancy* (office) *buildings* are as follows:

- The *buildings* are 7-stories or less in height.
- The *buildings* are 1500 m<sup>2</sup> or less in *building area*.
- The *buildings* are typically constructed of timber members at least as large as those which classify as *heavy timber construction* in the MBC.
- The exterior walls are masonry.
- The *buildings* are located so that at least one exterior wall faces a *street* and a second faces a laneway.
- The *major occupancy* is to be offices with some restaurant, shops or day-care space on the *first storey* or *basement*.
- The contents will be typical of a Group D *occupancy*.
- Existing stairs, facades, construction and elevators are part of the historic fabric of many of the *buildings* and, as such, may not be significantly changed.
- For the most part, the unrenovated *buildings* are essentially clear (i.e., no partitions) inside the exterior walls, except for elevator and stair shafts.

## 5.2.2 Assumptions Regarding Fire Safety Systems

5.2.2.1 The assumptions regarding the fire safety systems in the heritage office *buildings* are as follows:

- New and renovated fire safety systems will comply with applicable installation standards as required by the MBC, unless explicitly modified in these Guidelines.
- During the *occupancy* of the heritage *buildings*, new and renovated fire safety systems are fully operational and reliable.
- Fire safety systems are to be tested and maintained in conformance with the Manitoba Fire Code.

## 5.2.3 Assumptions Regarding Occupants

5.2.3.1 The assumptions regarding the occupants of the heritage office *buildings* are as follows:

- 1) The profile of the occupants in the heritage office *buildings* is assumed to be similar to the broad spectrum of capabilities of the population that occupies office *buildings* conforming to the MBC.
- 2) Occupants are assumed to respond to a fire emergency in a manner that is typical of the population that occupies office *buildings* conforming to the MBC. Except for infants in the care of responsible persons, occupants of office buildings will typically be capable of:
  - a) sensing fire cues and sounding an alarm;
  - b) interpreting fire cues correctly and taking appropriate action; and
  - c) moving to a place of safety.
- 3) Except as permitted in the MBC, there will be no occupants requiring trained staff assistance for evacuation and no such assistance is assumed to be available. Should occupants requiring such assistance wish to occupy the heritage office *buildings*, special provisions for their safety, as accepted by the Winnipeg Fire and Building Departments, need to be made.
- 4) Occupant travel time to the outside, using the *building exits*, or to reach a place of safety, is assumed to be approximately 1 minute or less. This time to reach a place of safety is assumed to be low due to the relatively small *floor areas* of the heritage office *buildings*, compared to the size permitted by the MBC, and their limitation in height to *7-storeys*.
- 5) Occupants, upon sensing a fire alarm signal, are assumed to begin evacuation or movement to a place of safety within a reasonable length of time, and instructions for evacuation or movement to a place of safety are included in the Fire Safety Plan for the *building*.

## 5.2.4 Assumptions Regarding Fire Department Response

5.2.4.1 The assumptions regarding the fire department response to the heritage office *buildings* are as follows:

- Fire department personnel will be available to assist in fire suppression and occupant rescue approximately 6 minutes following an alarm.
- Fire department response will be reliable and effective as required by Part 1.

## Section 5.3 – Fire Safety Alternatives for Heritage Office Buildings

### 5.3.1 Alternatives for Building Construction

5.3.1.1 Columns, beams, floor assemblies and roof assemblies, with minimum dimensions at least equal to those required for *heavy timber construction* in the MBC, shall be considered acceptable in lieu of *noncombustible construction* and *fire resistance ratings* required in Subsection 3.2.2 of the MBC.

5.3.1.2 *Heavy timber construction* floors shall be "topped" with *noncombustible* materials designed to fill cracks and minor holes in the floors.

5.3.1.3 The construction of structural assemblies, other than *heavy timber construction*, is permitted to be *combustible* and shall have a  $\frac{3}{4}$  hour *fire resistance rating*.

### 5.3.2 Alternatives for Fire Separation Construction

5.3.2.1 Wired glass, as described in the MBC, may be used in any *fire separation* with no limit on dimensions or areas of individual panes.

5.3.2.2 Tempered or heat strengthened glass, protected by automatic sprinklers, may be used in *fire separations* in accordance with certification provisions or with the limits described in the following report for protecting openings in exterior walls [Kim, A.K., et al, Sprinkler Protection of Exterior Glazing, Fire Technology, Vol. 34, No. 2]. (See Appendix A.)

5.3.2.3 Tables A-9.10.3.1.A and B of the MBC may be used to establish the *fire resistance ratings* of any *fire separation* used in the heritage office *buildings*.

5.3.2.4 Existing wall, floor and roof assemblies in the heritage office *buildings* may have *fire resistance ratings* assigned on the basis of NFPA 914 – Code for Fire Protection of Historic Structures. (See Appendix A.)

5.3.2.5 Fire dampers are not required in those locations where *fire separations* are penetrated by *noncombustible* ducts having a melting point above 760°C.

### 5.3.3 Alternatives for Compartmentation

5.3.3.1 *Fire separations*, without a *fire resistance rating*, are permitted between office *suites* and between office *suites* and *public corridors*.

5.3.3.2 *Major occupancies* shall be separated from each other by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating*.

5.3.3.3 Vertical service spaces, including shafts, shall be separated from adjacent spaces by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating* and they shall be *sprinklered* in accordance with the MBC.

5.3.3.4 Service rooms shall be separated from adjacent spaces by *fire separations*, without a *fire resistance rating*, and they shall be *sprinklered* in accordance with the MBC.

5.3.3.5 *Exits* shall be separated from adjacent spaces by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating*. Such enclosure shall be continuous throughout the length of the *exit* to a safe exterior location.

*Exception: One exit is permitted to discharge through a lobby conforming to the MBC.*

5.3.3.6 Existing elevator shafts need not be separated from existing *exit* stair shafts provided the enclosure containing the elevator and *exit* stairs is separated from adjacent spaces by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating*.

5.3.3.7 Other elevator shafts, including new elevators, shall be separated from adjacent spaces, including *exit* stairs, by *fire separations* having a  $\frac{3}{4}$  hour *fire resistance rating*.

#### **5.3.4 Exposure Protection Alternatives**

5.3.4.1 Existing openings in exterior walls which face *streets* may be retained with no additional protection provided.

5.3.4.2 In lieu of *closures*, other existing openings in exterior walls may be protected by automatic sprinklers as described in Article 5.3.2.2.

5.3.4.3 *Combustible* elements in existing exterior walls may be retained or replaced with *combustible* materials.

5.3.4.4 Existing exterior walls are not required to have a *fire resistance rating*.

#### **5.3.5 Flame Spread Rating Alternatives**

5.3.5.1 Exposed *heavy timber construction* may be left exposed in all locations in the heritage office *buildings*.

#### **5.3.6 Fire Detection and Alarm Systems Alternatives**

5.3.6.1 A single-stage fire alarm system (as per MBC) shall be installed in all heritage office *buildings*.

5.3.6.2 Loudspeakers shall be used for all audible signal devices in heritage office *buildings*.

Note: Loudspeakers are required to enable the fire department to provide instructions to any occupants who may not have begun to evacuate, even though the Fire Safety Plan instructs them to do so.

5.3.6.3 Fire alarm systems shall be equipped with a means to provide voice messages over all loudspeakers from the fire alarm control panel. Such messages shall be permitted only after the alarm signal has sounded initially for not less than 60 seconds.

5.3.6.4 Fire alarm systems shall be electrically supervised with signals being automatically transmitted to the fire department in accordance with the MBC.

### 5.3.7 Fire Suppression System Alternatives

5.3.7.1 Automatic sprinkler systems shall be installed throughout the heritage office *buildings*. Quick-response type sprinklers shall be used where permitted by the MBC and NFPA 13 – Installation of Sprinkler Systems. (See Appendix A)

5.3.7.2 Automatic sprinkler systems shall be zoned and supervised as required in the MBC.

5.3.7.3 Existing automatic sprinkler systems in heritage office *buildings* shall be thoroughly flushed and refurbished prior to new components being installed.

Note: Refurbished sprinkler systems may not comply in all respects with the current editions of the MBC and NFPA 13. The City of Winnipeg shall assess the impact on overall fire safety of any deficiencies and determine the acceptability of the refurbished system.

### 5.3.8 Egress System Alternatives

5.3.8.1 Occupants of *floor areas* shall have unrestricted access to at least two exits in accordance with the MBC or Article 5.3.8.2.

5.3.8.2 *Floor areas*, as defined in the MBC, shall be served by at least two exits as follows:

- a) One *exit* shall be a stairway separated as per Article 5.3.3.5, except that wired glass may be used as permitted in Article 5.3.2.1.
- b) A second *exit* may be a fire escape as described in this Subsection.

5.3.8.3 As per the MBC, where *exits* are served by a *public corridor*, it shall be possible for occupants, upon entering the corridor, to move in two separate directions to reach an *exit*.

*Exception: Dead-end corridors in accordance with the MBC are acceptable.*

5.3.8.4 Where a fire escape is used as a second *exit* from a *floor area* and is directly accessed from a corridor, the corridor, connecting the *exit* stair and the fire escape, shall be divided at approximately its mid-length point by a smoke partition (*fire separation* not having a *fire resistance rating*) to create two enclosed smoke compartments on the *floor area*. This smoke partition shall penetrate any concealed space above a suspended ceiling and form a smoke-tight joint at the wall/floor interface.

Note: This cross corridor barrier is intended to provide an area of temporary refuge for occupants while waiting to enter an exit or a fire escape.

5.3.8.5 Doors in the smoke partition in Article 5.3.8.4 shall:

- a) be normally held open and released automatically on a signal from the fire alarm system,
- b) be equipped with self-closing devices,
- c) be equipped with positive latching to keep the door closed,
- d) be equipped with weather-stripping or similar material to prevent smoke movement through them,
- e) not include louvres or other through openings, and
- f) not be required to have a *fire protection rating*.

5.3.8.6 Fire escapes are permitted on all heritage *buildings* not exceeding 7-*storeys* in *building height* and shall be constructed according to the MBC requirements for such fire escapes.

Note: While fully open fire escapes are permitted by the MBC, for security and all-weather use reasons, it may be preferable to provide enclosures for fire escapes. Such enclosures must, however, meet the heritage preservation goals of the exterior facades, as well.

5.3.8.7 Where access to a fire escape is directly from an office *suite*, existing windows may be used for evacuation to the fire escape provided they are of sufficient dimensions to allow an occupant to pass through them and provided the occupants are capable of using these windows. Should occupants not be capable of using window evacuation to a fire escape, alternative fire safety measures, accepted by the City of Winnipeg, shall be provided.

Note: Direct access to a fire escape via openable window(s) is permitted only when it is directly from an office suite and all occupants of the floor area have unrestricted access to the openable window(s). In such cases, the second means of egress from the office suite would be directly into an enclosed exit stair or via a corridor to an enclosed stair exit.

5.3.8.8 Where access to a fire escape is from a *public corridor*, such access shall be via a doorway opening.

5.3.8.9 Openings in an existing exterior wall within the protection zone described in MBC may be protected by automatic sprinklers as described in Article 5.3.2.2.

### **5.3.9 Fire Safety Planning**

5.3.9.1 Each heritage office *building* shall have a detailed Fire Safety Plan developed in conjunction with the Winnipeg Fire Department.

5.3.9.2 Occupants in each *suite* in the heritage office *buildings* shall be provided with the fire safety plan indicating actions expected from them in the event of a fire in the *building*. The need for such instructions shall be incorporated into all lease agreements. The plan shall include instructions for all occupants who may require assistance to fully evacuate the *building* in the event of a fire, including the need to identify those locations where such occupants may be located in the *building* to assist the fire department in rescue operations.

5.3.9.3 The Fire Safety Plan shall contain provisions for at least one exit drill for all occupants of the *building* each year.

## **Section 5.4 – Fire Safety Parameters for the Office Occupancy of Heritage Buildings**

5.4.1 Each fire safety parameter for heritage *buildings* of Group D office *major occupancy* in Subsections 5.4.3 to 5.4.14 shall be analyzed using this Section and Worksheet 5-1.

5.4.2 Only one point value shall be selected for each fire safety parameter for each fire zone. If more than one value can apply, the lowest point value shall govern.

### 5.4.3 Construction of Structural Members and Floor and Roof Assemblies Parameter

5.4.3.1 The construction of structural members and assemblies shall be assessed using Table 5.1 in Worksheet 5-1. This assessment shall apply to each fire zone.

Note: The major divisions in the building height column in Table 5.1 essentially align with the structural fire protection requirements contained in Articles 3.2.2.54. to 3.2.2.57. of the MBC (office occupancies). The fire resistance ratings shown in Table 5.1 use heavy timber construction or 45 minutes rated construction (combustible or noncombustible) as the base requirement and are assigned scores of zero.

5.4.3.2 This parameter is intended to assess the basic construction of the *building*, in particular, the major structural components. The construction types evaluated are *heavy timber construction*, *combustible* and *non-combustible construction*. *Building height* refers to *storeys above grade*, starting with the *first storey*.

5.4.3.3 Users are advised that the minimum dimensions for *heavy timber construction* are typically contained in the MBC but other reference documents may be used to assess the *fire resistance rating of heavy timber construction* as described in Subsection 5.3.2. Totally unprotected floor assemblies of *combustible or noncombustible construction* (i.e., no *fire resistance rating*) are beyond the scope of Table 5.1. A minimum *fire resistance rating* at least equivalent to 12.7 mm thick regular gypsum board on wood or steel joists has been assumed to be available for all assemblies.

5.4.3.4 The maximum height of a *building* considered appropriate for application of Table 5.1 is 7-storeys which is reported to be the highest *building* of the type being considered in the Exchange District of the City of Winnipeg.

### 5.4.4 Hazardous Areas Parameter

5.4.4.1 Each hazardous area in the *building* shall be assessed using Table 5.2 in Worksheet 5-1. The hazardous area which provides the lowest point score shall govern. The assessment shall apply to each fire zone.

5.4.4.2 A hazardous area is defined as any space or compartment that contains a storage or other activity that is not part of the normal office *occupancy* and possesses the potential of producing a fully developed fire. Hazardous areas are typically those which the MBC and Section 5.3 of these Guidelines consider to require special attention, usually in the form of *fire separations* or automatic fire suppression (sprinklers), or both. In some cases, only one protection means is required; in others, both are required. The points assigned to each column in Table 5.2 are based on those requirements.

5.4.4.3 This parameter applies to the vertical *fire separations* surrounding a Hazardous Area. Floor/ceiling *fire separations* are covered in Subsection 5.4.3.

5.4.4.4 Open plan office spaces are not considered hazardous areas for the purposes of application of Table 5.2 unless the space is not *sprinklered* to a level required to protect the hazards of an office *occupancy* (e.g., only light hazard sprinkler coverage when higher sprinkler densities are required for some library shelf storage in an open plan office).



5.4.4.5 To be considered as a hazardous area in Table 5.2, the hazardous area may be in or adjacent to an office *suite* or adjacent to an egress route. In either case, points are assigned as per Table 5.2.

#### **5.4.5 Vertical Openings Parameter**

5.4.5.1 Each vertical opening shall be assessed using Table 5.3 in Worksheet 5-1. The vertical openings entry which provides the lowest point value shall govern. The assessment shall apply to the *building* as a whole.

5.4.5.2 Vertical openings provide a means for fire, and especially smoke, to spread rapidly from floor to floor and hence constitute a significant hazard to occupants on floors away from the origin of the fire. An enclosed opening in Table 5.3 is one that is enclosed by *fire separations* that may not have a *fire resistance rating* (e.g., plain glass) but which act as a smoke barrier. An unenclosed opening in Table 5.3 is one which is not enclosed by *fire separations* of any sort, which has *fire separations* but no *closures* (e.g., doors), or one in which fire-stopping has not been provided to completely seal openings in the enclosure. Unenclosed openings may occur anywhere through the height of a *building*.

5.4.5.3 An unenclosed opening on one *storey* means that the shaft or chute has no *fire* or *smoke separation* on one *storey* but is enclosed on all other *storeys*.

5.4.5.4 Due to the age of heavy timber floors in the heritage *buildings*, a number of openings have developed due to warpage and shrinkage. These openings could provide an avenue for unchecked smoke and fire spread unless appropriate means are provided to contain such spread. Section 5.3 requires that such floors be "topped" with *noncombustible* materials designed to fill cracks and minor holes in the floors. Where such "topping" is not provided, Table 5.3 considers the arrangement to be unenclosed.

#### **5.4.6 Automatic Sprinklers Parameter**

5.4.6.1 Automatic sprinkler systems shall be assessed using Table 5.4 in Worksheet 5-1. This assessment shall apply to the *building* as a whole.

5.4.6.2 For occupant safety and preservation of heritage property, Section 5.3 of these Guidelines and the MBC consider automatic sprinklers as the most effective protection means currently available. Given the quicker response (and usually greater occupant safety) associated with quick response sprinklers, Table 5-4 assigns greater points to systems with such sprinklers.

5.4.6.3 An incomplete sprinkler system (i.e., not conforming to the requirements for sprinkler installation in the MBC) is not assigned any points since fires could be ignited in the unsprinklered portion of the *building*. To ensure operation when required, appropriate supervision is preferable. Without such supervision, the reliability of sprinkler systems is considered to be reduced and fewer points assigned.

#### **5.4.7 Fire Alarm Parameter**

5.4.7.1 Fire alarm systems shall be assessed using Table 5.5 in Worksheet 5-1. This assessment shall apply to the *building* as a whole.

5.4.7.2 Section 5.3 considers a single-stage fire alarm system with speakers and voice communication capability as a basic feature to provide occupant notification in the event of a fire. Installation of these fire alarm systems shall be in accordance with the MBC. Voice communication, to enable the fire department to notify occupants of the situation, is considered an essential element in ensuring that occupants begin to evacuate (or stay in place) and that they use the safest way out. This responds to the research indicating that many occupants do not evacuate upon hearing an alarm or choose contaminated egress routes when uncontaminated ones may be available.

5.4.7.3 With the addition of supervision, fire department notification and smoke detectors as required by the MBC, additional points are assigned as shown in Table 5.5. An incomplete system is one which does not have the required elements from Section 5.3.

5.4.7.4 A two-stage system is assigned negative points in Table 5.5 since typically there is no assurance of trained staff to take action in the event of a first-stage alert. Without that assurance, the two-stage alarm will simply result in greater delays in notifying occupants of the need to evacuate.

#### **5.4.8 Office Suite/Corridor Fire Compartmentation Parameter**

5.4.8.1 The *fire separations* between office *suites* and between office *suites* and *public corridors* or other common spaces shall be assessed using Table 5.6 in Worksheet 5-1. This assessment shall apply to each fire zone.

5.4.8.2 Section 5.3 permits office *suite* to office *suite* and office *suite* to *public corridor fire separations* to be smoke separations. This parameter addresses the walls only. The floor/ceiling separations are addressed in Subsection 5.4.3. The purpose of this minimal degree of compartmentation is to permit some time for occupants to use common egress routes (corridors) prior to the routes becoming smoke-logged.

5.4.8.3 *Fire resistance ratings* for wall assemblies may be assigned using a variety of methods shown in Section 5.3. Fire dampers are not required where *fire separations* are penetrated by steel ducts as per Section 5.3. If there are completely unprotected openings (i.e., no smoke barrier, louvres, etc.), then the wall is to be considered incomplete. Walls with less than a 45 min *fire resistance rating* are assumed to be at least equivalent to a smoke separation.

5.4.8.4 The term “closers” in Table 5.6 means a device which will either maintain the door in the closed position or will cause it to close automatically in the event of a fire alarm signal.

#### **5.4.9 Access to Exits from Offices Parameter**

5.4.9.1 *Access to exits* from office *suites* shall be assessed using Table 5.7 in Worksheet 5-1. This assessment shall apply to each fire zone.

5.4.9.2 The points for *access to exit* relate to the value placed on these facilities in the MBC and Section 5.3. The basic egress system is 2 ways out from an office *suite*: either access to a 2-directional corridor, with dead-ends  $\leq 6$  m permitted; or access to a dead-end corridor leading to an exit with direct access to a fire escape from within the

office *suite*. Points in Table 5.7 are also assigned on the basis of the distance an occupant must travel to move from the most remote point in an office *suite* to an *exit* door (e.g., common fire escape, *exit* stair). Since increases in distance travelled typically result in increased time exposed to fire effluents, the greater the distance, the greater the time and thus the greater the risk to occupants. For the purposes of this parameter, an *exit* is a fire escape, an enclosed stair or an outside door at grade.

5.4.9.3 A dead end corridor length is measured from the centre of the office *suite* door to an *exit*, or to a point where an occupant may move in two directions to two separate *exits*.

#### 5.4.10 Exits Parameter

5.4.10.1 *Exits* shall be assessed using Table 5.8 in Worksheet 5-1. This assessment shall apply to each fire zone.

5.4.10.2 Section 5.3 considers the baseline *exit* arrangement to be one enclosed stair, one fire escape complying with the MBC and, if a corridor connects the two, cross corridor barriers (smoke separations) at approximately mid length in the corridor. Alternatively, if an office *suite* occupies an entire *floor area* with no common corridor, direct access to both a fire escape and an enclosed *exit* is the baseline. The points assigned in Table 5.8 reflect this basic structure.

5.4.10.3 Enclosed stairs mean that the *exit* shaft fire separation has a minimum fire *resistance rating* of  $\frac{3}{4}$  hour, however, unlimited areas of wired glass (glass block) are permitted. A complying lobby is one which meets the requirements of the MBC for *exit* discharge through a lobby. If any of these requirements in the MBC is not met, the lobby would be considered non-complying.

5.4.10.4 Cross corridor barriers are an effective means to subdivide corridors into two smoke zones. While not requiring a *fire resistance rating*, they need to be smoke separations with doors that close on a signal from the fire alarm system. Positive latching and weather-stripping are required for these doors. What must be assured is that they will close on a fire alarm signal and that they will remain closed (except when occupants are moving through them) from that point in time to retard the passage of smoke. In existing corridors which are wide enough to accommodate only a single door, doors in cross-corridor barriers need not swing in the direction of travel to the *exit* from both directions where the *occupant load* on both sides of the cross-corridor barrier does not exceed 60.

5.4.10.5 Existing fire escapes must comply with the MBC with the exception of those aspects addressed in Section 5.3. The details of the construction of fire escapes are contained in the MBC and Section 5.3 of these Guidelines. Should openings in an existing exterior wall expose the fire escape to a fire in an office *suite*, a *sprinklered*-window system can be used to protect the opening as described in Section 5.3.

5.4.10.6 Section 5.3 addresses the major life safety issues surrounding *exits* such as *exit* enclosures, number of *exits* and quality of *exit* or facilities. Existing stairs with non-conforming items, such as tread/riser dimensions, windows, width, handrail height and openings in guards, are intended to be acceptable in the context of this parameter provided the non-conforming item does not in itself constitute an undue hazard.

#### **5.4.11 Interior Finishes of Walls and Ceilings Parameter**

5.4.11.1 The *flame spread ratings* of the interior finishes of walls and ceilings in *exits*, *public corridors* and other spaces, including *suites*, shall be assessed using Table 5.9 in Worksheet 5-1. This assessment shall apply to each fire zone. The surface in the fire zone which provides the lowest point value shall govern.

5.4.11.2 The baseline for *flame spread ratings* for interior finishes is the MBC, with the exception that exposed *heavy timber construction* can be used in any location. The point scores for interior finishes, which exceed the MBC *flame spread rating* requirements for corridors and apartments, assume that *flame spread ratings* do not exceed 200. Any interior finish with a *flame spread rating* greater than 200 would be considered a hazard and would need to be treated under the Hazardous Areas parameter in Subsection 5.4.4.

5.4.11.3 *Exits*, *public corridors* and office *suites* are evaluated separately. The point score in Table 5.9 which reflects the worst case (i.e., most negative) will be considered the score for interior finishes. Section 5.3 permits exposed *heavy timber construction* to be used in all locations even though it has a *flame spread rating* of 75 to 150, depending on the thickness and species of wood.

#### **5.4.12 Smoke Control Systems Parameter**

5.4.12.1 Smoke control systems shall be assessed using Table 5.10 in Worksheet 5-1. This assessment shall apply to each fire zone.

5.4.12.2 In the context of this parameter, smoke control is a means to contain smoke inside an office *suite* or other space using standard mechanical or other similar equipment. Should corridors serving *exits* be pressurized, this will normally provide a means to keep smoke out of the corridor from the office *suite* of fire origin, especially if the office/corridor door remains closed.

5.4.12.3 Cross corridor barriers (see Article 5.4.10.4) also provide a passive means to restrict smoke movement to one half of the corridor or *floor area*. Together, pressurization and cross-corridor barriers can provide considerable safety for occupants by increasing the time to smoke contamination of the entire corridor through which occupants must pass to reach *exits*.

#### **5.4.13 Fire Safety Planning Parameter**

5.4.13.1 Fire safety planning shall be assessed using Table 5.11 in Worksheet 5-1. This assessment shall apply to the *building* as a whole.

5.4.13.2 Research has shown that the preparation of plans for fire safety and occupant egress, and the practice of those plans by *exit* drills, improves the potential for safe actions by occupants in a fire. These are especially effective when coordinated with the responding fire department.

5.4.13.3 Fire safety plans are required in Section 5.3 of these Guidelines and outlined in the MFC. It is important that these plans be provided in all office *suites* and that all occupants be made aware of them. This can be best accomplished through some

means in conjunction with the lease agreements. Approval of the plans by the fire department is essential since the objective is to improve occupant safety, some aspects of which are provided by the responding firefighters.

5.4.13.4 With the addition of *exit* drills (at least one per year), occupant safety is greatly enhanced since occupants have the opportunity to practice evacuation using the prescribed *exits* and learn more about the fire alarms and the role of the fire department. These drills can be especially effective in ensuring safety for occupants who may have difficulty in evacuating the *building* and who may be instructed by the fire department to remain in their office *suites* in some circumstances.

#### **5.4.14 Fire Brigade Response Parameter**

5.4.14.1 The response of the fire department shall be assessed using Table 5.12 in Worksheet 5-1. This assessment shall apply to the *building* as a whole.

5.4.14.2 The Fire Safety Alternatives in Section 5.3 assume a fire department response to the heritage *buildings* in 6 min or less. In addressing occupant safety (primarily rescue) by the fire brigade, the MBC utilizes two primary means: the number of *streets* which the *building* faces (and hence the potential for window rescue) and the presence of a properly equipped firefighters' elevator, which can be used to rescue occupants who may not be able to evacuate easily on their own.

5.4.14.3 Part 5 and this Subsection are not intended for occupants who are not capable of self-preservation or who require trained staff assistance (except for infants in arms) but are intended for occupants who may have physical disabilities which may slow their evacuation.

#### **5.4.15 Basic Requirements**

5.4.15.1 For the purposes of Part 5, all Basic Requirements in Table 5.13 in Worksheet 5-1 shall conform to the MBC or the MFC, or specific equivalent protection shall be provided in conformance with Section 2.3, Part 2, Division C of the MBC or Subsection A-1.2.1.1.(1)(b), Part 1, Division A of the MFC.

5.4.15.2 Table 5.13 lists the requirements that are not addressed in the Fire Safety Parameters but which are necessary for overall occupant safety in a renovated heritage *building*. Where any of these Basic Requirements are not met, the features must be made compliant or an acceptable equivalent means provided. In the requirements for Elevator Installations and Exposure Protection, users are directed to Section 5.3 where certain existing arrangements are permitted to remain in place and may not require major changes for compliance purposes.

5.4.15.3 The requirement concerning self-egress with no trained staff to assist evacuation is important. Part 5 is intended to address situations where occupants are capable of self-preservation. While evacuation might be somewhat delayed due to some disability, the occupant could still evacuate the *building* (or be evacuated), using the egress facilities provided, without significant assistance. Facilities requiring trained staff to ensure evacuation are beyond the scope of this Part.

## Section 5.5 – Calculating Fire Safety

5.5.1 Fire safety for the heritage office *building* shall be assessed using the 4 evaluations in Worksheet 5-2: Fire Control, Refuge, Egress and Overall Fire Safety.

5.5.2 The governing scores determined for each parameter in Subsections 5.4.3 to 5.4.14 from Worksheet 5-1 shall be transferred to the appropriate rows in Worksheet 5-2. (For example, if the governing point score for “Fire Alarm Systems” is -2, then -2 shall be entered in all columns opposite the Fire Alarm Systems entry in Worksheet 5-2. The resulting point score under the “Fire Control Provided” column for this parameter would be  $-2/2 = -1$ . All other columns in this row would have the entry  $-2$  except the “Refuge Provided” column.) In Worksheet 5-2, the term “/2” means that the parameter point value from Worksheet 5-1 is divided by 2 and the resulting score shown in that entry. The term “N/A” means that the parameter from Worksheet 5-1 does not apply to this evaluation.

5.5.3 The columns in Worksheet 5-2 shall be totalled to obtain the aggregate point scores for the four evaluations. These totals shall be transferred to Worksheet 5-3 and used for comparison to the benchmarks in that worksheet.

## Section 5.6 – Comparison to Benchmarks for Heritage Office Buildings

5.6.1 The totals obtained for the four evaluations in Worksheet 5-2 shall be included in the appropriate locations in Column 1 in Worksheet 5-3.

5.6.2 For the height of the *building* being assessed, the minimum benchmarks for the four evaluations shall be identified using Worksheet 5-3 and the benchmark values included in Column 2 in Worksheet 5-3.

5.6.3 Equivalency to the requirements of the MBC and the Fire Safety Alternatives for existing office *buildings* shall be deemed to have been achieved if the point values of all four evaluations are greater than the minimum point values for the benchmarks for the height of the *building*. From Worksheet 5-3, Column 1 must be equal to or greater than Column 2 for equivalency to have been achieved.

Note: The minimum benchmarks for heritage office *buildings* were derived from designs complying with the MBC 1995 for sprinklered and unsprinklered options for buildings of 1 to 6-storeys in height and the MBC sprinklered option for buildings of 7-storeys in height. The layout of an existing building in the Exchange District of Winnipeg was used as the prototype for a case study using three different height ranges, to correspond to the changes in structural fire protection requirements in the MBC.

## WORKSHEET 5-1

### THE MANITOBA FIRE RISK INDEX FOR THE OFFICE OCCUPANCY OF HERITAGE BUILDINGS

#### FIRE SAFETY PARAMETERS

**TABLE 5.1 CONSTRUCTION OF STRUCTURAL MEMBERS AND FLOOR AND ROOF ASSEMBLIES** (Applies to each fire zone)

Building Height	Construction Type						
	Heavy Timber	Combustible			Noncombustible		
		<45 min FRR <sup>(1)</sup>	45 min FRR	>45 min FRR	<45 min FRR <sup>(1)</sup>	45 min FRR	>45 min FRR
1-4 storeys	0	-1	1	2	-1	1	2
5-6 storeys	0	-3	0	1	-2	0	1
7 storeys	0	-5	-1	0	-3	-1	0

Note:

<sup>(1)</sup>This Table assumes that while the FRR may be less than 45 min, it is at least equivalent to the FRR provided by 12.7 mm thick regular gypsum board on wood or steel joists.

**TABLE 5.2 HAZARDOUS AREAS** (Applies to each fire zone)

	No Fire Separations No Sprinklers	No Fire Separations + Sprinklers	Fire Separations <sup>(1)</sup> <45 min No Sprinklers	Fire Separations <sup>(1)</sup> <45 min + Sprinklers	Fire Separations ≥45 min No Sprinklers	Fire Separations ≥45 min + Sprinklers
Assembly or Retail Occupancy	-7	-2	-2	-1	-1	0
Common Janitors' Rooms	-7	-2	-1	0	0	1
Elevator Machine Rooms	-7	-2	-2	-1	-1	0
Furnace/Service Rooms	-7	-2	-2	-1	-1	0
Refuse Storage Rooms	-7	-2	-2	-1	-1	0

Notes:

<sup>(1)</sup>Fire separations must be present to act as smoke separations regardless of the FRR.

**TABLE 5.3 VERTICAL OPENINGS**  
(Applies to entire building)

	Unenclosed <sup>(1)</sup>					Enclosed <sup>(2)</sup>		
	>4 sto	4 sto	3 sto	2 sto	1 sto <sup>(3)</sup>	<45 min	45 min <sup>(4)</sup>	>45 min
Exit Stair Shafts	-10	-7	-5	-4	-2	-1	0	1
Refuse Chutes	-10	-7	-5	-4	-3	-1	0	1
Vertical Service Spaces	-10	-7	-5	-4	-3	-1	0	1
Elevator Shafts	-10	-7	-5	-4	-2	-1	0	1
Existing Stair/Elevator Shafts (combined)	-10	-7	-5	-4	0	0	0	1
Heavy Timber Floors <sup>(5)</sup>	-10	-7	-5	-4	N/A	0	0	1

Notes:

<sup>(1)</sup>Unenclosed means no fire or smoke separation exists

<sup>(2)</sup>Enclosed means a fire or smoke separation exists

<sup>(3)</sup>An unenclosed opening on one storey means that the shaft or chute has no fire or smoke separation on one storey but is enclosed on all other storeys.

<sup>(4)</sup>Wired glass enclosures, regardless of area of wired glass, are considered to have a rating of 45 min

<sup>(5)</sup>Untopped heavy timber floors which have openings due to shrinkage or warpage are considered to be unenclosed. If one floor is unenclosed (i.e., no topping), then 2-storeys are exposed to the same fire.

**TABLE 5.4 AUTOMATIC SPRINKLERS**  
(Applies to entire building)

Incomplete	Unsupervised with Std Sprinklers	Unsupervised with Quick Response Sprinklers	Supervised with Std Sprinklers <sup>(1)</sup>	Supervised with Quick Response Sprinklers <sup>(1)</sup>
0	4	7	8	10

Note:

<sup>(1)</sup>Supervision for water flow and valve tamper as required in the MBC.



**TABLE 5.5 FIRE ALARM SYSTEMS** (Applies to entire building)

None	Incomplete <sup>(1)</sup>	2 Stage	Single Stage		
			With Voice Communication	+ Supervised with FD Notification	+ Supervised with FD Notification + Smoke Detectors <sup>(2)</sup>
-4	-2	-1	0	1	2

Note:

<sup>(1)</sup>Incomplete means that the system does not meet the requirements of Section 5.3 related to the specific building.

<sup>(2)</sup>With smoke detectors in exit stairs and return air ducts as per MBC

**TABLE 5.6 OFFICE SUITE FIRE COMPARTMENTATION (Office Suite-Office Suite and Office Suite-Corridor)** (Applies to each fire zone)

Incomplete/None <sup>(1)</sup>	Walls <45 min FRR <sup>(2)</sup>		Walls ≥45 min FRR <sup>(3)</sup>	
	Doors <sup>(4)</sup> Without Closers	Doors With Closers	Doors <sup>(4)</sup> Without Closers	Doors With Closers
-4	-1	0	0	2

Notes:

<sup>(1)</sup>Incomplete/none refers to the case where there is no smoke separation between the spaces or where there are through openings such as louvres.

<sup>(2)</sup>At least equivalent to a smoke separation.

<sup>(3)</sup>Wired glass enclosures, regardless of area of wired glass, are considered to have an FRR of 45 min.

<sup>(4)</sup>These door assemblies are not required to have a fire protection rating and do not necessarily need a rated frame or rated hardware.

**TABLE 5.7 ACCESS TO EXITS FROM OFFICE SUITES** (Applies to each fire zone)

Direct Access to Fire Escape from Office Suite + Dead End Corridor (≤45 m Travel)	Office Suite on Dead End Corridor <sup>(1)</sup> >6 m long +		Office Suite on Dead End Corridor <sup>(1)</sup> ≤6 m long +			Office Suite on 2 Directional Corridor +		
	≤25 m Travel <sup>(2)</sup>	>25 m Travel <sup>(2)</sup>	≤25 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>	≤90 m Travel <sup>(2)</sup>	≤25 m Travel <sup>(2)</sup>	≤70 m Travel <sup>(2)</sup>	≤90 m Travel <sup>(2)</sup>
0	-2	-4	2	1	0	2	1	0

Note:

<sup>(1)</sup>Dead end corridor must lead to 2-directional corridor or 2 exits.

<sup>(2)</sup>Travel is the total distance an occupant must walk to move from the most remote point in an office suite to an exit door.

**TABLE 5.8 EXITS** (Applies to each fire zone)

2 Enclosed Stairs <sup>(1)</sup>				1 Enclosed Stair <sup>(1)</sup> + 1 Fire Escape (FE) <sup>(2)</sup> + Cross Corridor Barrier <sup>(3)</sup>			1 Enclosed Stair <sup>(1)</sup> + 1 Fire Escape (FE) <sup>(2)</sup> + Direct Access to Both for All Occupants of Floor Area		
Stairs Direct to Outside	Stairs Through Complying Lobby <sup>(4)</sup>	Stairs Through Non-Complying Lobby <sup>(4)</sup>	With Cross Corridor Barrier <sup>(3)</sup>	Stair Direct to Outside + FE	Stair Through Complying Lobby <sup>(4)</sup> + FE	Stair Through Non-Complying Lobby + FE	Stair Direct to Outside	Stair Through Complying Lobby <sup>(4)</sup>	Stair Through Non-Complying Lobby
2	1	0	4	1	0	-1	1	0	-1

## Notes:

<sup>(1)</sup>Enclosure by a fire separation with  $\geq 45$  min FRR. Unlimited area of wired glass permitted.<sup>(2)</sup>Fire escape conforms to Section 5.3.<sup>(3)</sup>Cross corridor barriers are smoke partitions and need not have an FRR nor do doors in them need to have an FRR (see Article 5.4.10.4).<sup>(4)</sup>Lobby complying with MBC.**TABLE 5.9 INTERIOR FINISHES OF WALLS AND CEILINGS** (Applies to each fire zone)

Exits FSR <sup>(1)</sup>			Office Suites and Public Corridors FSR <sup>(1)</sup>		
25	>25 ≤75	>75≤150	≤75	>75≤150	>150≤200
0	-1	-2	1	0	-3

## Notes:

<sup>(1)</sup>Does not apply to exposed heavy timber construction.**TABLE 5.10 SMOKE CONTROL** (Applies to each fire zone)

None	Cross Corridor Barriers	Pressurized Corridors	Pressurized Corridors + Cross Corridor Barriers
0	1	2	3

**TABLE 5.11 FIRE SAFETY PLANNING** (Applies to entire building)

No FSP <sup>(1)</sup>	FSP <sup>(1)</sup> Developed & Approved <sup>(2)</sup>	FSP <sup>(1)</sup> Developed & Approved <sup>(2)</sup> + 1 Exit Drill/Year for all Occupants
-2	-1	0

## Notes:

<sup>(1)</sup>Fire safety plan as per MFC.<sup>(2)</sup>Approved by fire department.

**TABLE 5.12 FIRE BRIGADE RESPONSE** (Applies to entire building)

One Street <sup>(1)</sup> Access		Two or Three Street <sup>(1)</sup> Access	
With FD Elevator <sup>(2)</sup>	Without FD Elevator	With FD Elevator <sup>(2)</sup>	Without FD Elevator
1	0	2	1

Notes:

<sup>(1)</sup>Conforms to MBC for buildings facing streets.<sup>(2)</sup>Conforms to MBC requirements for fire department elevators.**TABLE 5.13 BASIC REQUIREMENTS FOR HERITAGE OFFICE BUILDINGS**

The following must conform to the MBC or MFC or Section 5.3 of these Guidelines:

Basic Requirement	Compliant	
	Yes	No
Fire Department response $\leq 6$ min to building		
Occupants must care for themselves in evacuation, except infants in care of responsible persons. (No trained staff to assist egress.)		
Utilities Installation (MBC)		
HVAC Installation (MBC)		
Elevator Installation (except heritage elevators) <sup>(1)</sup> (MBC)		
Refuse Chutes (if installed) (MBC)		
Exposure Protection (except existing facades) <sup>(2)</sup> (MBC)		
Testing/Maintenance of fire safety equipment as per MFC		

Notes:

<sup>(1)</sup>See Section 5.3 for provisions for heritage elevators.<sup>(2)</sup>See Section 5.3 for provisions for windows etc. in heritage facades.

## WORKSHEET 5-2

### FIRE SAFETY EVALUATION FOR HERITAGE OFFICE BUILDINGS

Occupant Safety Parameter	Fire Control Provided	Refuge Provided	Egress Provided	Overall Fire Safety
Construction			N/A	
Hazardous Areas			/2 =	
Vertical Openings	/2 =			
Automatic Sprinklers		/2 =	/2 =	
Fire Alarm	/2 =	N/A		
Office Suite Compartmentation			/2=	
Access to Exits	N/A	N/A		
Exits	N/A	/2 =		
Interior Finishes	/2 =	N/A		
Smoke Control	N/A			
Fire Safety Planning	N/A	N/A		
Fire Brigade Response		N/A		
<b>EVALUATION TOTALS<sup>(1)</sup></b>				

Notes:

<sup>(1)</sup>Totals to be transferred to Worksheet 5-3

## WORKSHEET 5-3

### BENCHMARKS FOR FIRE SAFETY FOR HERITAGE OFFICE BUILDINGS

Building Height	Fire Control Benchmark	Refuge Provided Benchmark	Egress Provided Benchmark	Overall Fire Safety Benchmark
1-4 storeys	5	4	3	7
5-6 storeys	5	3	3	6
7 storeys	7	3.5	5	8

### EQUIVALENCY EVALUATION FOR HERITAGE OFFICE BUILDINGS

Fire Safety Provided (Totals from Table 5-2)	Fire Safety Required (Benchmark from above)	Column 1 $\geq$ Column 2	
		Yes	No
	Fire Control Benchmark =		
	Refuge Benchmark =		
	Egress Benchmark =		
	Overall Fire Safety Benchmark =		
Column 1	Column 2	Column 3	

## APPENDIX A

The following publications were used in the preparation of these Guidelines or are directly referenced in the Guidelines.

- DiNenno, P. (Ed.), *The SFPE Handbook of Fire Protection Engineering*, 2<sup>nd</sup> Edition (Section 5, Chapter 2 – Fire Risk Ranking), National Fire Protection Association, Quincy, MA, 1995.
- Fire Safety Alternatives for Heritage Buildings in Winnipeg's Downtown Core*, Ken Richardson Fire Technologies Inc. (prepared for the City of Winnipeg Property and Development Services Department), 1999.
- ICC Performance Code for Buildings and Facilities*, International Code Council, Country Club Hills, IL, 2001.
- Kaplan, M.E. and Watts, J.M., *A Prototypical Historic Fire-Risk Index to Evaluate Fire Safety in Historic Buildings*, *Journal of Preservation Technology*, Vol. XXX, No. 2-3, The Association for Preservation Technology, 1999.
- Kim, A.K., et al, *Sprinkler Protection of Exterior Glazing*, *Fire Technology*, Vol. 34, No. 2, National Fire Protection Association, Quincy, MA, 1998.
- Nelson, H.E. and Shibe, A.J., *A System for Fire Safety Evaluation for Multifamily Housing*, NBSIR 82-2562, National Bureau of Standards, Gaithersburg, MD, 1982.
- Nelson, H.E., et al, *Fire Safety Evaluation System for National Park Service Overnight Accommodations*, NBSIR 84-2896, National Bureau of Standards, Gaithersburg, MD, 1984.
- Nelson, H.E., *Fire Safety Evaluation System for NASA Office/Laboratory Buildings*, NBSIR 86-3404, National Bureau of Standards, Gaithersburg, MD, 1986.
- NFPA 101 – *Life Safety Code*, National Fire Protection Association, Quincy, MA, 2000.
- NFPA 101A – *Guide on Alternative Approaches to Life Safety*, National Fire Protection Association, Quincy, MA, 2001.
- NFPA 13 – *Installation of Sprinkler Systems*, National Fire Protection Association, Quincy, MA, 2002.
- NFPA 13R – *Standard for the Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height*, National Fire Protection Association, Quincy, MA, 2002.
- NFPA 914 – *Code for the Fire Protection of Heritage Structures*, National Fire Protection Association, Quincy, MA, 2001.
- NFPA 1710 – *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, Quincy, MA, 2001.
- NFPA 1720 – *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments*, Quincy, MA, 2001.
- Users' Guide – NBC 1995, Fire Protection, Occupancy Safety and Accessibility*, Canadian Commission on Building and Fire Codes, National Research Council of Canada, Ottawa, ON, 1997.