

**APPROACH TO BUILDING CODE COMPLIANCE**  
**CHANGE OF MAJOR OCCUPANCY**



*Prepared for*

**Building Standards & Inspections**


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## TABLE OF CONTENTS

	Page
<b>1. PURPOSE.....</b>	<b>1</b>
<b>2. APPLICABLE BUILDING CODE .....</b>	<b>1</b>
<b>3. PROJECT DESCRIPTION .....</b>	<b>1</b>
<b>4. BUILDING CHARACTERISTICS AND CONSTRUCTION .....</b>	<b>1</b>
<b>5. APPLICATION OF BUILDING CODE TO EXISTING BUILDINGS.....</b>	<b>2</b>
<b>6. OTHER BUILDING CODES .....</b>	<b>2</b>
<b>7. MAJOR OCCUPANCIES.....</b>	<b>3</b>
7.1 General Day-to-Day Safety (Stairs, Guards, Handrails) .....	4
7.2 Knowledge of Fire (Alert) .....	4
7.3 Moving to a Safe Place (Egress, Exits).....	5
7.4 Control of Fire by Building Elements.....	6
8.1 Washrooms .....	7
8.2 Floor Loads .....	8
8.3 Exposures .....	8
8.4 Accessibility.....	9
8.5 Commercial Cooking Equipment .....	10
8.6 Vertical Spaces .....	10
8.7 Exclusions .....	10
8.8 Summary Table.....	10
<b>8. USER'S GUIDES TO THE NATIONAL BUILDING CODE.....</b>	<b>14</b>
<b>9. CONCLUSION .....</b>	<b>14</b>



## 1. PURPOSE

This report outlines an approach to Building Code compliance regarding change of major occupancy at buildings originally constructed as single family dwellings (houses) for commercial use.

This report is based on review of information provided by the client. This report addresses fire protection, occupant safety and access for persons with disabilities; it does not address structural, electrical, mechanical, building envelope, or energy conservation other than as specifically described in this report.

The City of Regina has asked GHL to provide recommendations on developing a general approach to Building Code compliance for conversion of existing houses to other occupancies. This report reflects GHL's recommendations based on over 30 years of experience and is believed to reflect 'best practices' in developing a balance between society's needs and fire protection and occupant safety. As the advice herein is inherently general, GHL does not take responsibility for any single project. Each building will be unique and will require a level of technical review and judgment. GHL is available to provide review services for specific buildings on a contractual basis and under that arrangement would take professional responsibility for project specific recommendations.

The report describes existing unsprinklered buildings and assumes that sprinklering is not proposed. The addition of an automatic sprinkler system makes such a significant improvement that it will alleviate most nonconformities related to fire protection and occupant safety in these small buildings. It is possible to develop an alternative solution to sprinkler houses undergoing a change to assembly or business and service occupancy using the standard for houses (NFPA 13D) to make the option of sprinklering less intrusive and more affordable.

## 2. APPLICABLE BUILDING CODE

The applicable Building Code is the National Building Code 2020 and references are to this edition, unless otherwise noted. Other codes that do include acceptable solutions for existing buildings have been used for reference.

## 3. PROJECT DESCRIPTION

We understand the City of Regina includes a large stock of houses that are suitable, in terms of their location, for commercial uses such as offices, service type business, retail, and small restaurant or coffee shops. The question raised with changes of major occupancy is to what extent does the current Building Code apply.

## 4. BUILDING CHARACTERISTICS AND CONSTRUCTION

The approach to Building Code compliance is limited to:

Occupancy	Group D (including small assembly) and Group E
Building height	Up to 3 storeys
Building area	Up to 600m <sup>2</sup>
Construction	Combustible or noncombustible
Sprinklered	No (sprinklering is an option to address other items)
Streets faced	One or two
Dwelling units	None
Daycare	None



Buildings containing one suite (one tenant) and a single major occupancy.

This does not preclude home-based businesses including daycare, the approach outlined in this report is for conversion of single family dwellings to commercial buildings.

## **5. APPLICATION OF BUILDING CODE TO EXISTING BUILDINGS**

The National Building Code (NBC) is intended for construction of new buildings and includes a general statement that it applies to the alteration (which includes change of occupancy) reconstruction, demolition, and occupancy of existing buildings; however, there is little information on how to apply the solutions in Division B to existing buildings. Note A-1.1.1.1.(1) confirms that it is not intended that the solutions be applied retroactively to existing buildings and that application requires careful consideration of the level of safety needed for a specific building and the cost benefit. Several publications are referenced including User's Guides for Parts 3, 4, and 9. The User's Guide to Part 3 includes a detailed method for assessment of conditions in existing buildings including Table B-1 which compares the difficulty in providing a given provision to its impact on occupant safety. The User's Guide for application of Part 9 to existing buildings is similar but less detailed and its focus is on the intent of provisions in the Building Code as it predates publication of the intent statements with the NBC.

## **6. OTHER BUILDING CODES**

### **BC Building Code**

The BC Building Code (BCBC) differs slightly from the NBC in that it includes an additional article, Article 1.1.1.2 in Division A. Sentence 1.1.1.2.(1) states that “...*where a building is altered, renovated, rehabilitated or repaired, or there is a change of occupancy, the level of life safety and building performance shall not be decreased below a level that already exists.*” This establishes a clearer target than the statement in the NBC and thus, makes allowances for existing buildings and enables their useful life to be extended through repairs.

The BC Building Code also includes an alternate compliance method for heritage buildings; however, its designed for larger buildings and compliance is achieved primarily by the addition of a sprinkler system.

Articles 3.1.2.7 and 9.10.2.5 consider assembly occupancies with an occupant load of up to 30 persons or less to be Group D occupancies provided they are not child daycares. This permits their inclusion in Part 9 buildings.

### **Ontario Building Code**

The Ontario Building Code (OBC) includes Part 10 on *change of use* and Part 11 on alterations to existing buildings. Part 10 requires that building performance not be reduced with a change of use, with or without a change of major occupancy. Performance is deemed to be reduced where change of use results in a change to a higher hazard index; detailed tables of occupancies and their hazard indices are from Part 11 of the OBC. It is possible to reduce the hazard index in buildings facing more than one street or other increased Fire Department access or eliminated the change in index entirely with the addition of sprinklers.

Restaurants with an occupant load of 30 persons or less are considered retail occupancies.



## Vancouver Building Bylaw

Part 11 of The Vancouver Building Bylaw (VBBL) specifies upgrading depending on defined categories; rehabilitation, additions (major and minor), and change of occupancy, and uses the same hazard index. There are provisions for “small suites” which are defined as having an occupant load of up to 60 persons. Requirements for small suites, regardless of any change to hazard index are as follows:

- Fire and life safety – exiting to be reviewed to remedy any unsafe condition and to be upgraded with respect to number, capacity, and fire separation.
- Structural – the proposed work must not reduce the structural integrity of the existing building.
- Accessibility – existing level of accessibility must be maintained; no additional enhancements are required.

## US CODES

NPFA 101 and 5000 and the International Existing Building Code include similar methods.

## 7. MAJOR OCCUPANCIES

NFPA data on fires by property use (2018 to 2022) indicates that the majority of fires originate in residential occupancies. Business and retail occupancies account for 4% of fires, assembly occupancies for 2.5% of fires while residential is 40% of fires. This is not a true comparison as there are simply more residential buildings than commercial buildings. Activities that are common in residential occupancies such as smoking, cooking and the use of fireplaces, space heaters, firepits, barbecues, candles, and other contributing factors such as distraction or impairment are the cause of most fires. Thus, in terms of fire safety, which is the greatest risk to occupant safety in buildings, any change from residential to a business, service, retail, or assembly occupancy inherently reduces the risk.

A change of occupancy from residential to assembly, office, business and personal service, or retail has some potential to increase risk on the basis that more occupants equals more risk, however, there is a potential reduction in risk on the basis that fewer fires originate in non-residential occupancies and occupants do not sleep in the building.

The requirements in the Building Code for assembly occupancies are based on potential large occupant loads and, where the occupant load is low, issues related to large numbers of occupants such as crowding at exits are not a concern. This is the basis for other codes considering small assembly occupancies business or retail.

Occupants in office or business settings tend to have a level of familiarity with the space and a relationship with each other that is similar to that at home, without the potential fire hazards or delays in evacuation associated with a residential occupancy. Occupancies in the Group D category pose the least risk and the requirements are the least restrictive in all of the building codes.

A retail occupancy has both a potentially high fuel load (combustible contents) and a high occupant load. The Building Code does not differentiate between large and small retail occupancies or between types of goods; the risk posed in a small shop or a shop selling noncombustible goods is significantly different than a large box store with hundreds of occupants or a dollar store with an extremely high fuel load. Occupancies in the Group E category pose some risk; however, the measures intended to address very high occupant loads or very high fuel loads may not be warranted in small buildings.



## **APPROACH TO BUILDING CODE COMPLIANCE**

New construction is required to comply with the Building Code and existing conditions require a practical approach. Appendix A-1.1.1.1.(1) in the NBC describes application of the Building Code to existing buildings and states that consideration of the level of safety required, similar to the method for alternative solutions, is necessary. Successful application is a matter of balancing cost with the importance of the requirement to the overall Building Code objectives. The User's Guides published with the NBC are referenced as sources for further information.

The Part 9 User's Guide states that the major objectives are the protection of occupants in the event of a fire, structural sufficiency, and the health of the occupants (ventilation, sanitation, contamination). It also states that property protection is not an objective. Items related to occupant safety are alert to fire, protection of egress routes and time for escape, travel distance, and alternative means for escape. These are achieved entirely by provisions to aid occupants in evacuating the building in a fire.

The Part 3 User's Guide describes key elements for consideration (and these align with the Part 9 User's Guide) as follows:

- General day-to-day safety (design of stairs, guards, handrails etc)
- Knowledge of fire (fire detection and alert)
- The ability to move to a safe place (number of exits, travel distance, fire separations)
- Control of fire by building elements (fire separations, closures, firestopping)
- Protection of property (fire compartmentation and spatial separation)

The following is based on the method in the Part 3 User's Guide as its objective is the same as in Part 9.

### **7.1 General Day-to-Day Safety (Stairs, Guards, Handrails)**

It is rarely feasible to change existing stairs in terms of their shape, width, rise and run, or headroom, and existing stairs can typically continue to be safely used. Measures such as increased lighting, marking nosings, marking and mitigating of points of low headroom, and improvements to handrails have been shown to significantly reduce the potential for falls or other injuries.

We recommend improvements to guards and handrails (although occasionally guards may need particular review as alterations may conflict with heritage value), lighting levels, nosing markers, closed risers, and providing tactile indicators at unenclosed stairs. Areas of low headroom should be marked and well lit, and may require some mitigation, such as rounding sharp edges, and padding or protection of protrusions with potential to cause injury.

### **7.2 Knowledge of Fire (Alert)**

Early alert to occupants of a fire elsewhere in the building is critical to occupant safety as it enables the start of evacuation while the fire is relatively small and the escape route still tenable. The best way to address deficiencies that may result in delays in evacuation is to alert occupants sooner, to start evacuation in the earlier stages of a fire. Fire alarm smoke detectors and domestic smoke alarms are extremely sensitive and will operate in the first stages of a fire or in the event of a slowly developing or smouldering fire that may go unnoticed by occupants in the early stages. The User's Guide suggests that in a small building, interconnected smoke alarms can aid in the detection of fire and alerting of occupants where there is no fire alarm system and



the change of occupancy does not result in a fire alarm system being required. Although these devices were developed primarily for the residential market, they could be used in low hazard situations to improve deficiencies in egress facilities.

The Building Code prescribes a fire alarm system in a building where there are more than three storeys, including the basement. In this case, if the installation of a fire alarm system is not practical or desired, the use of the storey needs to be limited to either the upper storey or the basement to reduce the occupied storeys to three.

Where there is no fire alarm system and the change of occupancy does not result in a fire alarm system being required, we recommend interconnected smoke alarms to offset concern, such as number of exits, travel distance, dead ends, interconnected floor spaces, and fire resistance of existing assemblies. The Building Code does not specify locations for smoke alarms except in dwelling units. The intent in using smoke alarms is to alert occupants to a fire elsewhere in the building, in particular, in a storey below them. Alarms should be located at the top and bottom of stairs, in hallways serving multiple rooms, in rooms with doors that are normally closed such as storage, mechanical and janitor rooms, and in attics, basements, and crawlspaces.

### **7.3 Moving to a Safe Place (Egress, Exits)**

There are provisions in Part 9 to address egress in very small buildings. Sentence 9.9.4.7.(1) permits egress from second storeys via an interior open stair where the suite occupies 2 storeys, as follows:

*Where a suite of Group D or E occupancy is located partly on the first storey and partly on the second storey, stairs serving the second storey of that suite need not be constructed as exit stairs provided,*

- a) the building is not greater than 2 storeys in building height*
- b) the suite is separated from other occupancies by at least a 45min fire separation*
- c) the area occupied by the suite is not greater than 100 m<sup>2</sup> per storey*
- d) the maximum travel distance from any point in the suite to an exterior exit is not greater than 25m*
- e) the floor assemblies have a fire-resistance rating of not less than 45min or are of noncombustible construction*
- f) the basement and first storey are separated by a fire separation having a fire-resistance rating of not less than 45 min.*

It is possible to base an approach on the method in Sentence 9.9.4.7.(1) and to offset variations such as the presence of a third storey that is not part of the normally occupied space or the fire resistance rating at the fire separation over a basement by using a fire alarm system or smoke alarms to facilitate evacuation by providing early alert to occupants of the second storey, in case of a fire on the first storey.

Where this method is not feasible, the second storey of a building should be provided with an exit. One exit is typically permitted based on area and travel distance and a single exit may be feasible in conjunction with early alert. In some cases, it may be reasonable that occupants have the option to move to a balcony for refuge in lieu of a second exit, this method requires careful consideration of the location of the balcony on the building, such as potential exposure to the balcony from fire in the building and the means for occupants to alert others or to make themselves known to arriving firefighters.

Where a building includes a third storey, it may not be feasible to provide the two exits prescribed by the Building Code. A reasonable solution may be to limit the use of the third storey to services, more like an attic than a storey, with access permitted for servicing equipment but no storage or use by the public.





Subsection 3.4.7 does include provisions for exterior fire escapes on existing buildings.

### ***Emergency Lighting and Power***

Parts 3 and 9 do not require exit signage in a building of one or two storeys with an occupant load of not more than 150 persons. Emergency lighting is required in all cases in exits and access to exits, and in specific rooms such as washrooms, commercial kitchens, and service rooms.

We recommend the addition of emergency lighting as described in the Building Code. Increased lighting has been proven to aid in reducing falls on stairs or at other trip hazards in conjunction with other visual indicators such as nosing markers and is relatively easy to provide.

### ***Fire Extinguishers***

Fire extinguishers are required by the Fire Code as described in NFPA 10 so that travel distance toward an exit is not more than 23m without passing an extinguisher.

### ***Exit Exposure***

Sentence 9.9.4.4.(1) requires protection at an exit potentially exposed by openings where the exit is the *only means of egress* from a suite and the opening is in a separate fire compartment. Thus, in a full building conversion to a single suite, there is not likely to be exit exposure. Part 3 requires protection at any exterior exit potentially exposed to a fire by openings; Table B-1 in the Users' Guide describes exit exposure protection as moderately important to egress. Where there is only one exit or both exits are confined to a path exposed by the same window, the exit route may be reconfigured or the window may be removed or protected using wired glass in fixed steel frames or a fire shutter as described in Sentence 3.2.3.13.(4). Sprinkler protection of the window may be an option and Article 3.2.5.12 permits up to 8 sprinklers served from the building's domestic water system.

## **7.4 Control of Fire by Building Elements**

### ***Basements***

The User's Guide describes control of fire spread by fire separations including closures, firestopping, fire suppression, construction type and control of hazards or combustible contents. Typically, the only requirement for a fire separation is at the floor between first and second storeys and at the floor over a basement. The Building Code does not prescribe a fire separation over a crawlspace, and defines a crawlspace (as opposed to basement) as more than 1.8m in height and used for an occupancy, as a plenum or for the passage of flue pipes. The limit on height is based on a 1.8m height being comfortably usable by most people which increases its potential to be used for storage. It is possible to make the use of a crawlspace over the 1.8m limit impractical for use by eliminating the interior access and providing only a hatch from the exterior and a lock.

### ***Passive Fire Protection (Fire Separation/Fire Resistance Rating)***

A fire resistance rating at floors is not optional, unless sprinklers are used as an alternative solution, as it is prescribed in Subsection 3.2.2 and Article 9.10.8.1 for structural fire protection to protect both occupants and firefighters and in Sentence 9.9.4.7.(1) for egress from the second storey. It is possible to determine the



existing fire resistance rating if the components of the assembly are known using Appendix D in the Building Code. The addition of a layer of one layer of Type X or Type C gypsum board at the underside of existing wood joists will typically provide a ¾h fire resistance rating per Appendix D.

The formula for regular gypsum board changed in the 1990s and old materials have better fire resistance than new. Likewise, traditional sawn lumber has better fire resistance than new sawn lumber or manufactured joists. Appendix D and the Supplement to the NBC 1990 include information on assessing existing assemblies. Typical wood frame assemblies with a single layer of regular gypsum board provide fire resistance ratings of 25min for floors and 35min for walls. As the objective is occupant safety, occupants of the building need time to evacuate and 25 to 35min is a long time. Structural collapse is rarely a concern for occupants, provided they are alerted of the need to act, they tend to be able to evacuate a small building in minutes. Structural fire protection is a concern for firefighters entering the building in the course of their duties. Firefighters do not typically enter small buildings that can be approached from the outdoors using hose streams from the ground. As a precaution, signage could be posted near the building entry, preferably the white lettering on red background typical in signage related to fire protection, advising responding firefighters that the building has reduced fire resistance rating at its floors.

Structural fire protection is not necessarily a fire separation, both storeys typically form part of a single suite and openings for stairs may be permitted under Article 3.2.8.2. In terms of reliability of fire separations or fire rated assemblies, continuity is more important than the ability to determine an hourly rating.

There is little to be gained by installing fire dampers in an HVAC system within a single suite. The risk of smoke migrating via the HVAC system from one storey to another can be addressed by the use of smoke alarms, in the duct or near openings. The greatest risk is in fire entering the structure via openings around penetrants such as pipes or wires, and moving within concealed spaces, specially in old style balloon framing.

We recommend review of existing assemblies for continuity; existing regular gypsum board or lath and plaster typically has significant fire resistance, and solid wood doors with self-closers provide fire protection. The focus should be on firestopping: closing openings or gaps around penetrations such as pipes, wires, and ducts and at joints where walls meet other walls or ceilings and at doors, that may allow fire to move into concealed spaces inside walls or floors.

### ***Active Fire Protection (Sprinklers)***

The addition of a sprinkler system makes such a significant improvement to occupant safety and property protection including exposures, that it can be used to address any deficiency. NFPA 13D is specifically intended to provide a cost-efficient means of sprinklering houses to prevent loss of life (occupant safety). NFPA 13 is intended for larger and more complex buildings and addresses occupant safety and protection of the building and its contents. The installation of a commercial sprinkler system under NFPA 13 is prohibitive both in terms of cost and difficulty of installation. The NFPA 13D standard is intended for use in houses; however, it can reasonably be used in other small buildings through an alternative solution.

## **8.0 OTHER CONSIDERATIONS**

### **8.1 Washrooms**

The number of washrooms required is typically two, in a new building limit on number of persons served by a single washroom is ten however this is not practical in an existing building. The greatest difficulty in



provision of washrooms is accessibility. We recommend focussing on accessibility over the number of washrooms; one accessible washroom is preferred over multiple washrooms that are not accessible.

## **8.2 Floor Loads**

Live loads on floors in residential occupancies are deemed to be 1.9kPa while assembly, business, and retail occupancies are described in Sentence 9.4.1.1.(2), 2.4kPa. Structural review is not part of this review and we recommend consulting with a structural engineer to establish a reasonable approach.

## **8.3 Exposures**

The intent in Subsections 3.2.3 and 9.10.14 is to limit the spread of fire from a building to adjacent buildings. Protection of one's own property is at the discretion of the owner, according to the Users' Guide, once a building can be safely evacuated and hazards to adjacent buildings are addressed, further protection of a building is the domain of the owner and their insurer.

The intent is to limit fire spread from one building to another in the period prior to the Fire Department arriving and commencing wetting adjacent buildings. The buildings are urban and firefighting response is expected to be within 10 minutes, and it is reasonable that exiting conditions remain unless there are existing nonconforming conditions that already posed a specific hazard, such as very large areas of openings, very small limiting distance or combustible elements that bridge two buildings, or the change of occupancy itself presents a significant change in hazard.

No review is recommended for change from Group C to Group D. While there are specific allowances for housing, it is reasonable to consider Group D occupancy a similar if not lesser, risk than residential.

Although the Building Code describes only exposure from the subject building to adjacent buildings, noncombustible cladding was included partially to limit exposure from an approaching fire. The test series in the 1950s did not specifically investigate exposure from an approaching fire; however, they tested wood and brick clad buildings and understood the effect of the cladding in both directions. The other concern is around combustible cladding in combination with openings; fire spread is out a window to the cladding and it is unlikely that fire would spread to cladding prior to the Fire Department arriving where there are no openings.

Combustible projections on the exterior such as eaves can contribute to spread of fire to adjacent properties. The Building Code includes measures based on distance to property line and prescribes protection in the form of solid soffits at projections nearer than 1.2m to property lines. Solid soffit may be easily added; however, if the existing roof ventilation is through a perforated soffit, measures may be necessary to vent the roof a different way and it may be easier to protect or eliminate windows below the combustible projection as described above. Other projections such as canopies and balconies should be reviewed and conditions where projections on adjacent buildings essentially connect two buildings should be removed.

### ***Group D Occupancies***

Assembly, business, and residential are included in the same category in Subsections 3.2.3 and 9.10.14 and a change within the category would not reduce the level of performance below what already exists. The requirements for houses in Subsection 9.10.15 are less restrictive. The Part 9 User's Guide indicates this is based on the cost of noncombustible construction being cost-prohibitive, there being little risk in terms of occupant safety and a degree of societal tolerance of the risk between houses. Given that the risk of fire



occurring at all is less in Group D occupancies than it is in houses, the existing condition may remain with the exception of a specific element that would facilitate fire spread from one building to another such as balconies, canopies, or other combustible projections that make a connection between two buildings.

### ***Group E Occupancies***

A change to retail increases the potential for fire in the building to expose adjacent buildings because radiation is expected to be higher based on fuel load. A change to retail sales of noncombustible goods may pose no increased hazard. However, the Building Code includes all retail in a single category and, once a building's major occupancy is changed, it may be difficult for regulators to control a further change from a low to high risk operation. Thus, we recommend review of exposure to adjacent buildings with a change to retail occupancy. The area of openings permitted in retail is half that permitted in other occupancies and where a change to retail occupancy creates an overage, a reasonable approach would be to reduce the area of openings to half of what is permitted, plus 15%. The Part 9 User's Guide states that the permitted area of openings in Subsection 9.10.14 are not precise and a variation of up to 15% is tolerable. The area of openings can be reduced, if necessary, by eliminating windows or replacing windows with wired glass or glass block depending on limiting distance, replacing windows with fire rated glass, or adding fire shutters. Sprinkler protection of individual windows may be an option and Article 3.2.5.12 permits up to 8 sprinklers served from the building's domestic water system.

Changes from combustible to noncombustible construction (wood to steel stud) is not practical and may create structural problems. Combustible framing protected from the interior by gypsum board or lath and plaster is not likely to contribute significantly to fire spread prior to Fire Department arrival, the risk is fire spread via windows to exterior cladding or combustible exterior elements and then to adjacent properties.

Where alterations include changes to interior finishes or exterior cladding the new materials should comply with the current requirements. This includes alterations made after the change of major occupancy.

## **8.4 Accessibility**

Part 9 references compliance with Section 3.8 for accessibility. Sentence 3.8.4.5.(1) requires access where providing access is practical. In an assembly, business, or retail operation, it is likely desirable in terms of serving customers and access to the first storey of the building is ideal. Storeys above the first storey typically do not require access where they are less than 600m<sup>2</sup> in area and providing access to them in an existing building is impractical, unless there are specific circumstances such as buildings on sloping sites where both storeys are essentially at grade.

A ramp is typically necessary for wheelchair access into the building and the same ramp provides the means of egress in unsprinklered buildings as described in Article 3.3.1.7. A first storey washroom should be altered to create a universal washroom as much as practical.

Elements related to other disabilities such as visual impairment are addressed by tactile warnings, handrail extensions, and nosing markers at stairs as described previously.



## 8.5 Commercial Cooking Equipment

Commercial cooking equipment is unique in that the fire risk is controlled at the source by the equipment. Sentence 9.10.1.4.(1) references Article 6.3.1.6 which references the NFPA 96 standard for fire suppression and exhaust (grease extraction) from commercial cooking operations that produce grease laden vapour. Most small café and coffee shop operations do not use this kind of equipment; however, those that do must comply. The NFPA standard prescribes minimum clearances to combustible construction for cooking equipment, exhaust hoods, exhaust ducts, and fans. The base line clearance is 450mm (18in) and this can be reduced, except inside a shaft by the addition of a heat shield constructed of sheet metal on 25mm noncombustible spacers. Exhaust ducts are required to terminate outdoors and the standard includes minimum dimensions between the duct's discharge point and combustible elements, windows, doors, air intakes and exhaust openings, exterior exit routes, adjacent buildings, property lines, electrical equipment or lines, and the ground.

## 8.6 Vertical Spaces

Vertical spaces such as chimneys, shafts, and laundry chutes that are not in use should be closed. Ideally at each floor level, however, at the top and bottom may be acceptable where they cannot be accessed at each floor level.

## 8.7 Exclusions

Building envelope, HVAC, plumbing, structural/seismic restraint, hazardous materials abatement, and electrical are not part of this review.

## 8.8 Summary Table

	Building Code Provision	Assembly Business Service		Retail	Code Reference
	Occupancy	Assembly as Group D up to 30 persons	Group D other than assembly	Group E	Article
1	Stairs, guards, and handrails at interior/exterior exits and main entry	Stair width, rise, run can be mitigated by improvements to handrails, nosing markers, normal and emergency lighting.  Handrails – one at 900mm stairs, two at 1100mm stairs, 850 to 1070mm above stair/landing meeting graspability, continuity, 300mm extensions top and bottom.  Guard height at 1070mm, openings at 100mm, limits on climbability.  Nosing markers contrasting colour or pattern.  Tactile indicators at tops of open stairs, designed to CSA B651.  Lighting normal 50Lx emergency 10Lx at treads and landings.  Headroom at 2050mm over stairs, 2030mm at doors or marking and mitigation.			9.8.7.1 to 9.8.7.7  9.8.8.1 to 9.8.8.6  9.9.12.2 9.9.12.3 9.9.3.4



	<b>Building Code Provision</b>	<b>Assembly Business Service</b>	<b>Retail</b>	<b>Code Reference</b>
2	Smoke detection: fire alarm to mitigate other conditions	To address deficiencies in exits. To address reduced fire resistance rating at floor.		9.10.19.1 to 9.10.19.7
3	Smoke detection: smoke alarms to mitigate other conditions	To address deficiencies in exits. To address reduced fire resistance rating at floor.		9.10.19.1 to 9.10.19.7
4.	Egress	Single egress via open stair in 2 storey buildings up to 100m <sup>2</sup> per storey. Single egress via open stairs in larger or higher buildings in combination with smoke alarms for early alert.		9.9.4.7
5.	Exits	Single exit occupant load less than 60 persons and area/travel distance limits: Unsprinklered area: 200m <sup>2</sup> Distance: 25m Sprinklered area: 300m <sup>2</sup> Distance: 25m	Unsprinklered area: 150m <sup>2</sup> Distance: 15m Sprinklered area: 200m <sup>2</sup> Distance: 25m	9.9.7.4
6.	Third storey	Accessed by staff only. Seasonal or long term storage. Not to create 4 storeys in conjunction with basement. To keep third storey and basement. (4 total) requires fire alarm.	Accessed by staff only. Seasonal or long term storage. Not to create 4 storeys in conjunction with basement. To keep third storey and basement (4 total) requires fire alarm. Not to be used for storage of retail inventory.	9.10.18.1
7.	Basements	Defined as higher than 1.8m and having an occupancy. Not to create 4 storeys in conjunction with third storey. >1.8m may be considered crawlspace as described below provided access is restricted to an outdoor hatch. Fire separation required over basement.		9.10.8.9
8.	Crawlspaces	Height 1.8m or less. No occupancy. No flue pipes/is not a plenum. No fire separation required over crawlspace.		9.10.8.9
9.	Emergency lighting	Lighting: normal 50Lx emergency 10Lx at exits, routes providing access to exits including interior stairs, commercial kitchens, and public washrooms.		9.9.12.2 9.9.12.3



	<b>Building Code Provision</b>	<b>Assembly Business Service</b>	<b>Retail</b>	<b>Code Reference</b>
10.	Structural fire protection	<p>Fire resistance rating at floors and their supports 45min.</p> <p>Existing floors with lesser fire resistance ratings in conjunction with smoke detection (fire alarm smoke detectors or interconnected domestic smoke alarms)</p> <p>Signage at the main entry advising responding firefighters of reduced fire resistance rating at floors.</p> <p>Wood I joist floors to be protected with 1/2in gypsum board plus smoke alarms OR sprinklered.</p>		9.10.8.1 to 9.10.8.9
11.	Closures	<p>Existing solid wood doors may remain with addition of self-closers.</p> <p>New solid wood doors subject to Article 9.10.13.2 45mm thickness, 20min fire protection rating, gaps maximum 6mm bottom/3mm sides and top.</p> <p>Unrated solid wood door frames 38mm thickness.</p> <p>Openings for HVAC system (ducts) to be addressed with smoke detection.</p>		9.10.9.3 9.10.13.2 9.10.13.3
12.	Firestopping	<p>Gaps around pipes and wires to be filled with firestop caulking or mineral wool.</p> <p>Gaps at joints in fire separations to be filled with firestop caulking or mineral wool.</p> <p>Ducts may be addressed using interconnected smoke alarms or fire alarm with smoke detectors.</p>		9.10.9.6 9.10.9.7
13.	Exposure to adjacent buildings	<p>Existing openings to remain provided their combined area is not more than 15% more than the calculated limit in the current Subsection (9.10.14).</p> <p>Openings being removed to be finished with gypsum board at the interior and sheathing/cladding at the exterior to match existing.</p> <p>No changes to interior fire resistance rating, wood studs, or cladding unless changes are otherwise proposed (i.e., if the interior is being finished with gypsum board or the exterior cladding is being replaced the wall is to be improved with Type X or Type C gypsum board, mineral wool, exterior gypsum sheathing).</p> <p>Soffit protection within 1.2m of property line.</p>	<p>Existing openings to remain provided their combined area is not more than 15% more than the calculated limit in the current Subsection (9.10.14)</p> <p>Openings being removed to be finished with gypsum board at the interior and gypsum sheathing at the exterior and the concealed space filled with mineral wool.</p> <p>No changes to interior fire resistance rating, wood studs, or cladding unless changes are otherwise proposed (i.e., if the interior is being finished with gypsum board or the exterior cladding is being replaced the wall is to be improved with Type X or Type C gypsum board,</p>	9.10.14.1 to 9.10.14.9



	Building Code Provision	Assembly Business Service	Retail	Code Reference
			mineral wool, exterior gypsum sheathing). Soffit protection within 1.2m of property line.	
14.	Exit exposure	Protection required where building has one exit and exposing window is in different fire compartment. Protection to be closing the window opening or adding wired glass, glass block, or fire shutter. The use of sprinkler protection at the window is possible as an alternative solution.		9.9.4.4
15.	Washrooms	One washroom to serve up to 30 occupants. Washroom to be made barrier free as much as possible.		
16.	Interconnected floor spaces	First storey and one storey above OR first storey and one below. Third storey to be separated by fire separation.		9.10.1.3 3.2.8.2
17.	Flame spread rating	Flame spread rating limit of 150 can be met by all species of wood. Paint and wallpaper take on the flame spread rating of the substrate and thus, have no effect.		9.10.3.2
18.	NFPA 96	Cooking operations producing grease-laden vapour to meet fire suppression and exhaust in NFPA 96. Clearances to combustibles, openings, exit routes, the ground, property lines.		9.10.1.4
19.	Sprinklering	Sprinklering buildings is an option to address exits, fire separations, structural fire resistance, exposure to adjacent buildings. The use of NFPA 13D is possible as an <i>alternative solution</i> and will make sprinklering more practical (domestic water, no fire department connection, no sprinklers in concealed spaces, does not trigger fire alarm etc.) Analysis of the occupancy/hazard is necessary, may require increased design density to address retail occupancy or exposure to adjacent buildings.		9.10.1.3
20.	Smoke detection	The use of fire alarm smoke detectors or domestic smoke alarms to mitigate nonconformities in egress or fire resistance ratings is an option. The intent is to alert persons to a fire elsewhere in the building, the worst case is a fire in the storey below, detection to be located at: <ul style="list-style-type: none"> <li>▪ top and bottom of open stairs.</li> <li>▪ hallways serving multiple rooms.</li> <li>▪ rooms with doors that are normally closed (storage, janitor, mechanical).</li> <li>▪ attics, basements, and crawlspaces.</li> </ul>		9.10.18.3 9.10.18.4 9.10.18.5 9.10.19.1 9.10.19.4 9.10.19.5 9.10.19.6 9.10.19.7
21.	Barrier free	Washroom as much as possible. Main entry.		9.10.1.3 Section 3.8
22.	Vertical spaces	Vertical spaces not in use to be closed at each floor level (chimneys, shafts, laundry chutes). Shafts in use to be addressed by smoke detection.		





## 8. USER'S GUIDES TO THE NATIONAL BUILDING CODE

- Part 3: [PubTeX output 1997.02.28:1540 \(canada.ca\)](#)
- Part 9: [PubTeX output 2000.06.14:1108 \(canada.ca\)](#)

## 9. CONCLUSION

This report summarizes a generic approach to Building Code compliance relative to fire protection and occupant safety for changes of occupancy from residential to small assembly, business and service or retail in houses.

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