Developing Building Code Alternatives and Guidelines for Renovations

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INTRODUCTION

The project documented in this report received a grant under the Affordability and Choice Today (ACT) program. ACT is a housing regulatory reform initiative sponsored by Canada Mortgage and Housing Corporation (CMHC) and jointly managed with the Federation of Canadian Municipalities (FCM), the Canadian Home Builders' Association (CHBA) and the Canadian Housing and Renewal Association (CHRA).

> ACT, launched in 1990, seeks to stimulate changes to planning and building regulations and residential development approval procedures to improve housing affordability, choice and quality. The United Nations Centre for Human Settlements recognized ACT in 1998 as one of the top global best practices for improving the living environment.

ACT awards grants to municipal governments, builders, developers, non-profit organizations, industry associations, educational institutions, planners and architects across Canada to change housing regulations and streamline approval processes. ACT grants are awarded under three categories: Demonstration, Approval Process and Promotion. Assistance has been given to a wide range of projects across Canada.

All completed ACT projects are documented in short project overviews or solution sheets, and a number of case studies have been produced as well, to share the benefits of regulatory reform with others. These documents are available to help builders, developers, local building and planning officials, and others recognize and seize opportunities to improve housing affordability, choice and quality through regulatory reform in their communities.

> For more information on ACT and ACT projects (both completed and in progress), visit the ACT Web site at www.actprogram.com, or contact:

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Project Report Outline

A large portion of Winnipeg's housing stock, particularly in the downtown area, was built between 1890 and 1950. Many of these buildings are still structurally sound, architecturally valuable, and economically viable for the foreseeable future – as long as some renovations occur. There is a need for a standard to apply to these buildings which is both comprehensive and sufficiently flexible to account for older design and building techniques while maintaining an acceptable level of life safety and economy.

The current building code is updated every five years or so, and by now has left these buildings behind in terms of design philosophy and available materials. In almost all cases, it is economically and technically infeasible to renovate buildings existing before 1950 to meet the current edition of the building code. However, the intent of the building code is to establish minimum standards of safety against both structural failure and death or injury due to fire. The intent of the code can still be met within the realities of existing buildings, and this document is an attempt to facilitate this goal.

Most municipalities, and in particular the city of Winnipeg, have a department that is responsible for the application of the Manitoba building code, as well as any additional by-laws, to projects requiring conformance. The process varies by municipality, and this report's focus is the permit granting procedure in the city of Winnipeg.

The report is divided into three sections: a technical document, a process document, and a case study.

1. The technical document is a set of code compliance alternatives developed in consultation with renovators, City inspectors, the public and other stakeholders. The document was presented to the Winnipeg Building Commission in the summer of 2002. Individual board members gave their comments and support for the document, and encouraged its presentation to the province of Manitoba for consideration to be appended to the next edition of the Manitoba Building Code. The document was presented to the Building Standards Board in October of 2002 and is currently under review by the board's technical advisory committee.

2. The process document is a commentary on the building permit application and granting procedure within the city of Winnipeg as of the summer of 2002. It contains comments and suggestions for improvement that are based on consultation with renovators, City inspectors, the public and other stakeholders. The planning and property development department of the city of Winnipeg is currently undergoing streamlining, partially as a result of these consultations, and partially as an ongoing commitment to improvement.

3. The case study is an examination of the renovations of two 'sister' houses in Winnipeg's downtown area. One house is renovated following the proposed code compliance alternatives, and the other according to the current Manitoba Building Code. A comparison is presented showing the estimated and actual labour and materials costs and time requirements.

Technical document

Code Compliance Alternatives for Residential Reconstruction

The Manitoba Building Code is a document regulating the construction of both new and existing buildings. It is updated at regular intervals, and by now has left most pre-WWII buildings behind in terms of design philosophy and available materials. In many cases, it is economically and technically difficult to reconstruct or retrofit buildings existing before 1945 to meet the current edition of the code. However the **intent** of the building code – to establish minimum standards of safety against both structural failure and death or injury due to fire – can still be met within the realities of existing buildings. This guideline is an attempt to facilitate this goal for one- two- and three-unit residential buildings in Manitoba.

To this end, the intent of the code needs to be defined in terms of building and life safety for a number of key points. Also, the **intent** of each original building design needs to be understood and worked with to improve safety, suitability and efficiency where possible, or to maintain these where they cannot reasonably be improved.

1.0 – Buildings covered by these alternatives

This set of code compliance alternatives applies to single-family dwellings, duplexes, and triplexes built before the end of WWII. It also applies to houses originally built as single-family dwellings or duplexes, and later converted to multi-family, rooming or boarding house, where the occupancy is now being returned to single-family or duplex conditions.

In order to maintain a high standard of life safety and prevent abuse of these compliance alternatives, all residential buildings with more than three dwelling units must meet the requirements of the applicable standards as required by the building code and administered by the local municipality. For the purposes of this guideline, occupant load is determined based on two occupants per bedroom per dwelling unit.

2.0 – Definitions of Terms

There is a vocabulary used in construction that varies with geography, but has grown from a core group of terms. The Manitoba Building Code provides definitions for some of these construction terminologies. As part of this attempt to establish equivalencies that meet the intent of the building code, but apply to older buildings, a list of definitions has been compiled.

Every entry's source is listed as: NJ – New Jersey Rehabilitation Subcode, RRAP – Residential Rehabilitation Assistance Program, NFPA 101 – National Fire Prevention Association, 4304/86 – City of Winnipeg Bylaw to improve life safety in Existing Residential Occupancies. Where no source is cited, the definition has evolved from research and discussion in the development of this document. The phrase, 'not in NBC' indicates that the term is used in the National Building Code (1995), but is not specifically defined in section 1 of the code.

> **Alignment** (not in NBC) – the average distance from the street or sidewalk (whichever is closer) to the front of all the buildings on a block. See setback.
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> **Alteration** – the arrangement of any space by the construction of walls or partitions or by a change in ceiling height, the addition or elimination of any door or window, the extension or rearrangement of any system, the installation of any additional equipment or fixtures and any work which reduces

the loadbearing capacity of or which imposes additional loads on a primary structural component. (from NJ)

Air Barrier – materials used to provide a continuous barrier to the movement of air. (modified, from RRAP)

Balloon framing (not in NBC) – wood construction technique where the exterior loadbearing walls extend continuously from the top of the foundation to the bottom of the roof system. Each floor, other than the one directly on top of the foundation, is supported on a ledger board in the exterior wall and usually on an interior loadbearing wall that only runs from the top of the floor to the ceiling of the same storey.

Brick Veneer construction (not in NBC) – masonry finish technique where brick is used as the exterior cladding on a balloon or platform framed building.

Bulk requirements (not in NBC) – the distances required between the buildable area on a property and its neighbouring properties, streets, sidewalks, lanes, or alleys.

Buildable area (not in NBC) – the area, as defined by applicable zoning bylaws, within a property where a building intended for occupancy can legally be constructed. The city's zoning department determines the buildable area for a particular property.

Building envelope (not in NBC) – the system separating the heated living space within a building from it's exterior.

Building footprint (not in NBC) – the size, shape and location of a building on a property, as defined by the building's foundation and any attached porches, verandas, steps, entrances or cantilevers such as bay windows or built-in cabinets.

Change of Use (not in NBC) – a change from one use to another use in a building or tenancy or portion thereof. (from NJ)

Demolition (not in NBC) – the removal of part of a building's structural system, such as a bearing wall, beam or post; or the removal of a structurally self-contained portion of the building such as a porch, step, or veranda. Demolition will result in a change in the loading pattern throughout all or part of the building. Demolition may or may not change the footprint of the building. See gutting.

Duplex – A single structure, comprising of all systems required to support two separate dwelling units excluding laundry facilities, while possibly sharing certain systems or paths of egress.

Dwelling Unit – a single unit, providing complete, independent living facilities for one or more persons; including permanent provisions for living, sleeping, eating, cooking, and sanitation. (from NFPA 101)

Economically Infeasible (not in NBC) – a repair, alteration, renovation or reconstruction that has little likelihood of being accomplished because its cost is greater than 100% of the entire structure's assessed value upon completion of the project.

Fire Alarm System – an early warning system consisting of interconnected devices such as a control unit, manually actuated signalling boxes, heat detectors and smoke detectors and audible signal appliances operating in a co-ordinated manner. (from 4304/86)

Gutting (not in NBC) – the removal of all non-structural interior wall, floor and ceiling materials, including all non-conforming or worn out plumbing, electrical and HVAC fixtures or equipment. See demolition.

Loadbearing element – any column, beam, joist, girder, wall, floor or roof sheathing which supports any load in addition to its own weight. (from NJ)

Means of Egress – a continuous path of travel, provided by a doorway, hallway, corridor, exterior passageway, balcony, lobby, stair, ramp, or other egress facility or combination thereof, for the escape of persons from any point in a building, floor area, room or contained open space to a public thoroughfare or other acceptable space. (from RRAP)

Means of Egress – a continuous and unobstructed way of travel from any point in a building or structure to a public way consisting of three separate and distinct parts: (1) the exit access, (2) the exit, and (3) the exit discharge. (from NFPA 101)

Means of Escape (not in NBC) – a way out of a building or structure that does not conform to the strict definition of means of egress but does provide an alternate way out. (from NFPA 101)

Occupancy, Residential – an occupancy that provides sleeping accommodations for purposes other than health care or detention and correctional. (from NFPA 101)

Occupant Load – the total number of persons that might occupy a building or portion thereof at any one time. (from NFPA 101)

Platform framing (not in NBC) – wood construction technique where each wall is separated from the storey above and below it by a separate floor system.

Reconstruction (not in NBC) – any project where the extent and nature of the work is such that the work area cannot be occupied while the work is in progress and where a building permit is required before the work area can be completed. Reconstruction may include repair, renovation, alteration or any combination thereof. Reconstruction shall not include projects comprised only of floor finish replacement, painting or wallpapering, or the replacement of equipment or furnishings. (modified, from NJ)

Renovation (not in NBC) – the removal and replacement or covering of existing interior or exterior finish, trim, doors, windows, or other materials that serve the same purpose and do not change the configuration of space. Renovation shall include the replacement of equipment or fixtures. (from NJ)

Repair (not in NBC, mentioned often in RRAP but not defined) – the restoration to a good or sound condition of materials, systems and/or components that are worn, deteriorated or broken using materials or components identical to or closely similar to the existing. (from NJ)

Retrofit (not in NBC) – to update the heating, cooling, insulation, ventilation and venting systems of an existing building in order to improve the energy efficiency and air quality levels.

Setback (not in NBC) – the distance from the street or sidewalk (whichever is closer) to the front of a building. Also, the average distance from the property line to the exposing face of the building on the nearest side of the property. See alignment.

Smoke Alarm – a combined smoke detector and audible alarm device designed to sound an alarm within the room or suite in which it is located upon the detection of smoke within that room or suite. (from NBC)

Smoke Alarm System – an early warning system consisting primarily of smoke alarms installed and interconnected so that the activation of any smoke alarm will sound a similar signal in each of the interconnected devices, but which may also utilize heat detectors. (from 4304/86)

Structural Brick construction (not in NBC) – masonry construction technique where the exterior loadbearing walls are made of brick or stone with some non-structural provision made for interior finish. Interior loadbearing walls may or may not be of masonry construction.

Technically Infeasible (not in NBC) – a change that has little likelihood of being accomplished because the existing structural conditions require the removal or alteration of a loadbearing member that is an essential part of the structural frame, or because other existing physical or site constraints prohibit modification or addition of elements, spaces or features which are in full and strict compliance with minimum requirements for new construction. (from NJ)

Tolerance (not in NBC) – an administrative option to allow varying a zoning requirement by not more than 5% or varying any yard or space separation by not more than 0.3 metres (13 inches), which may be granted at the discretion of the Zoning Administrator.

Triplex – A single structure, comprising of all systems required to support three separate dwelling units, excluding laundry facilities, while possibly sharing certain systems or paths of egress.

Undue Deflection – amount of deflection of a structural member causing the failure of finish material, the failure or binding of other elements such as doors and windows, or other noticeable detrimental condition in the building. (from RRAP)

Vent (attic or soffit) (not in NBC) – a system for allowing fresh air to flow into the attic space above the insulation, for the purpose of removing hot air and moisture.

Vent (combustion) – a pipe connected to a fuel-burning appliance to conduct the products of combustion to the exterior. (from RRAP)

Vent (dryer) (not in NBC) – a pipe connected to a clothes dryer to convey humid air to the exterior of the building.

Vent (exhaust) (not in NBC) – a system of ducts, often including fans, to remove stale and humid air from cooking or bathroom areas.

Vent (plumbing) (not in NBC) – a system for allowing good drainage and removing stale air and sewer gases from above traps in the plumbing.

Ventilation – the natural and/or mechanical exchange of air between the heated and unheated spaces in a building, measured in air changes per hour.

Vapour Barrier – material used in a building envelope to retard the diffusion of water vapour from the heated interior space into the insulated wall cavity or attic. (from RRAP)

Variance (not in NBC) – an exception made to existing zoning requirements to allow the construction or reconstruction of a non-conforming structure. Must be applied for, and may be approved, denied or approved with conditions by the Board of Adjustment, Community Committee, or Zoning Administrator.

3.0 – Life Safety Alternatives

House fires can be deadly and expensive. It is the intent of the code to reduce the risk of fire occurrence, ensure the provision of a safe way out of the building in the event of a fire, to contain a fire once it starts, and to minimize the level of personal injury and property damage occurring as the result of a fire. Tables 3.0 and 3.1 summarise the minimum egress sizes for doors and windows respectively.

The required level of life safety features is based on an anticipated increase in occupant load from single-family to duplex and again up to triplex. Accordingly, the standards for life safety become more stringent as the building's intended occupant load increases. The anticipated occupant load needs to be calculated for any building undergoing renovation or rehabilitation so that the appropriate level of life safety features can be planned for and provided.

This document provides a four-category system to outline the necessary life safety features for single-family, duplex and triplex residential buildings. Also included is an alternative five-category point system

for duplex and triplex residential buildings. The categories are: egress, detection, separation, suppression and general fire safety.

Egress – this category outlines what is necessary for people to be able to get out of the building in the event of a fire. Tables 3.0 and 3.1 summarise the minimum egress sizes for doors and windows respectively.

Detection – this category outlines what level of smoke or heat detection and/or alarm system is necessary for the building.

Separation – this category outlines the level of separation, both in terms of fire rating of walls, doors and windows as well as air flow via duct -work and venting systems, that is necessary between suites in multi-family dwellings as well as between buildings themselves.

Suppression – this category outlines the standards that must be met when installing an automatic sprinkler system.

General Fire Safety – this category gives some examples of improvements that can be made to increase the level of safety that the building offers to its occupants.

3.1 – Life Safety – Single-family dwellings

Life safety requirements for single-family dwellings are the least stringent of all buildings covered under the Manitoba Building Code. Articles 3.1.1 through 3.1.4 outline the minimum safety standards that must be applied to single-family dwellings.

3.1.1 ***Egress*** – there shall be at least two means of egress from the dwelling unit, except as permitted by Subsection 9.9.9 of the code. Note: bedroom windows must provide an unobstructed opening to allow for escape in the event of a fire.

3.1.2 ***Fire detection*** – there shall be smoke alarms, conforming to ULC-S531-M, installed on each floor.

3.1.3 ***Fire separation*** – there are no interior fire separation requirements for single-family dwellings. Note: where the exposing building face is within 1.2 m (4 feet) of the property line, the exposing building face shall have a 45-minute fire-resistance rating. Existing lath and plaster finishes, if they are continuous and in good repair, may be considered as achieving the required rating. No rating is required where the building is provided with an approved automatic sprinkler system.

3.1.4 ***Fire suppression*** – where an automatic sprinkler system is provided, it shall be designed and installed according to NFPA 13D, or other acceptable standard.

Table 3.0 – Minimum Door Widths for Egress

Minimum Door Widths for Egress		
Location	Metric	Imperial
Dwelling Unit Entrance	810 mm	31 7/8"
Stairway & Utility	810 mm	31 7/8"
Bedrooms & Bathrooms	610mm	24"
Accessible Bathrooms	810 mm	31 7/8"
Exterior Balconies	760mm	30"

Table 3.1 – Minimum Window Sizes for Egress

Minimum Window Sizes for Egress		
Bedroom - Above Grade	Metric	Imperial
Minimum Unobstructed Opening Area	0.35 m^2	3.16 ft^2
Minimum Dimension	380mm	15"
Bedroom - Below Grade		
Minimum Unobstructed Opening Area	0.385 m^2	4.14 ft^2
Minimum Dimension	500mm	19 3/4"
Access to Smoke Refuge or Fire Escape		
Minimum Unobstructed Opening Area	0.605 m^2	6.51 ft^2
Minimum Dimension - width	550mm	21 5/8"
Minimum Dimension - height	1100mm	43 3/8"
Note: See Code Compliance Alternatives (Table 4.1) for sill height requirements		

3.2 – Life Safety – Duplex and Triplex

Life safety requirements are more stringent for a duplex or a triplex than for a single-family dwelling. Articles 3.2.1 through 3.2.4 outline minimum safety standards applied to duplexes and triplexes.

3.2.1 Egress

3.2.1.1 There shall be at least two remotely placed exits from each suite.

3.2.1.2 In buildings not exceeding two storeys in building height, a single exit is permitted where the suite has an acceptable window and the building is provided with a fire alarm system or an automatic sprinkler system.

3.2.1.3 In buildings not exceeding three storeys in building height, a single exit is permitted where the suite has an acceptable smoke refuge balcony and the building is provided with a fire alarm system or an automatic sprinkler system.

3.2.2 Fire Detection

3.2.2.1 There shall be smoke alarm(s) conforming to CAN/ULC-S531-M installed in each suite.

3.2.2.2 Where a fire alarm system is provided, it shall be installed according to CAN/ULC-S524-M.

3.2.2.3 Where a fire alarm system or automatic sprinkler system is provided and the building has a forced-air heating system, fire stop flaps and fire dampers may be waived where a smoke detection activated shut off is installed in the ducts servicing each suite.

3.2.3 Fire Separation

3.2.3.1 There shall be ¾ hour fire separation between all dwelling units and interior public areas, stairwells and exits. Load-bearing supports shall have a fire-resistance rating equal to the supported construction. Existing interior lathe and plaster finishes, if they are continuous and in good repair, may be considered to be achieve the required rating.

3.2.3.2 If the building construction is balloon framed, fire stopping or adequate insulation to provide fire stopping shall be installed in the wall between each floor.

3.2.3.3 Where the exposing building face is within 1.2 m (4 feet) of the property line, the exposing building face shall have at least a 45-minute fire-resistance rating and a non-combustible cladding.

3.2.4 Fire Suppression

3.2.4.1 Where an automatic sprinkler system is provided, it shall be designed and installed according to NFPA-13D, or other acceptable standard.

3.3 – Life Safety Alternative Point System – Duplex and Triplex

It is not always feasible to meet the standards listed above in a directly conforming manner. However, the important consideration is the intent of each life safety requirement. To this end, Tables 3.3 and 3.4 provide lists of safety items in five categories that are each assigned point values. This point system is based on the Canadian Hospital Fire Safety Evaluation System, which is the result of a federal study of a number of existing hospitals throughout Canada. The system proposed here has evolved from a number of discussions with fire prevention officials, non-profit renovators and housing administrators and renovation professionals. The intent is to provide the highest level of safety possible after a reconstruction project, and to allow for that level of safety to be measured as a system rather than as a separated list of requirements. In all cases, the level of safety in an existing building should improve or at least remain the same after a reconstruction project. Any unsafe condition should not be allowed to remain in any case.

Table 3.3 refers to duplexes. A total of 10 points are necessary to fulfill the life safety requirements for a duplex. At least one of the points must come from each of the first three categories: egress, detection and separation. For example, if an automatic sprinkler system is installed, an acceptable means of egress from each dwelling unit is still necessary, as is fire detection in each dwelling unit, but the requirements for fire separation may be waived.

Table 3.3 – Life Safety Point System – Duplex

Life Safety Point System - Duplex		
Category	Safety Item	Points
Egress	One conforming means of egress provided from each dwelling unit	1
	One conforming means of egress and one means of escape provided from each dwelling unit	2
	Conforming smoke refuge balcony for third floor bedroom	2
	Two conforming means of egress provided from each dwelling unit	3
Detection	Conforming smoke alarms installed in each dwelling unit	1
	Hard-wired, all units inter-connected, smoke alarm system, with detection, installed in each dwelling unit	2
	Fire alarm system conforming to CAN/ULC S524M installed for the entire building	3
Separation	Stairwells and public areas separated from all dwelling units	1
	Fire stopping is provided in all non-insulated concealed wall spaces between each floor	1
	Stairwells and public areas separated from all dwelling units by 20 minute rated doors in acceptable frames as described in 9.10.13.2 and 9.10.13.3 in the NBC	2
	¾ hour fire separation provided between all dwelling units and public or shared areas	3
Suppression	Automatic sprinkler system installed in accordance with NFPA 13D, or other acceptable standard	8
General Fire Safety	Smoke refuges or exterior stairs of non-combustible construction	1
	Non-combustible exterior finish on exposed faces of building	1
	Stairs in good repair, conforming to current code requirements for rise, run, tread death, headroom, handrail height and fire separation	2
	All means of egress conform to the NFPA 101 definition consisting of three parts: 1) exit access; 2) the exit, and; 3) the exit discharge	2

Table 3.4 refers to triplexes. A total of 13 points are necessary to fulfill the life safety requirements for triplexes. At least one of the points must come from each of the first three categories; egress, detection and separation. For example, if an automatic sprinkler system is installed, an acceptable means of egress from each dwelling unit is still necessary, as is fire detection in each dwelling unit, but the requirements for fire separation may be waived.

Table 3.4 – Life Safety Point System – Triplex

Life Safety Point System - Triplex		
Category	Safety Item	Points
Egress	One conforming means of egress provided from each dwelling unit	1
	One conforming means of egress and one means of escape provided from each dwelling unit	2
	Conforming smoke refuge balcony for third floor bedroom	2
	Two conforming means of egress provided from each dwelling unit	3
Detection	Conforming smoke alarms installed in each dwelling unit	1
	Hard-wired, all units inter-connected, smoke alarm system, with detection, installed in each dwelling unit	2
	Fire alarm system conforming to CAN/ULC S524M installed for the entire building	3
Separation	Stairwells and public areas separated from all dwelling units	1
	Fire stopping is provided in all non-insulated concealed wall spaces between each floor	1
	Stairwells and public areas separated from all dwelling units by 20 minute rated doors in acceptable frames as described in 9.10.13.2 and 9.10.13.3 in the NBC	2
	¾ hour fire separation provided between all dwelling units and public or shared areas	3
Suppression	Automatic sprinkler system installed in accordance with NFPA 13D, or other acceptable standard	11
General Fire Safety	Smoke refuges or exterior stairs of non-combustible construction	1
	Non-combustible exterior finish on exposed faces of building	1
	Stairs in good repair, conforming to current code requirements for rise, run, tread death, headroom, handrail height and fire separation	2
	All means of egress conform to the NFPA 101 definition consisting of three parts: 1) exit access; 2) the exit, and; 3) the exit discharge	2

In both tables 3.3 and 3.4, *conforming* means conforming to the Manitoba Fire Code, unless there is specific reference to the NFPA 101 standard.

4.0 – Designing with Code Compliance Alternatives

Part 9 of the Manitoba Building Code applies to the construction of residential buildings. As mentioned previously, attempts to apply continuously updated building code standards to existing houses can be technically difficult and often economically infeasible. However, the intent of the code is to provide standards to ensure safe, healthy and energy efficient housing for everyone. With careful planning these goals can be met in existing residential buildings based on consideration of what is already there that is good, what is there that needs to change, and what options are available for consideration when making the changes.

It is important to consider the house as a system when making these decisions and planning upgrades. Any building, and especially existing buildings, are greater than the sum of their parts when it comes to air quality, energy efficiency, safety, as well as space efficiency and usability. For example, a house may function well in spring and fall, but be too hot in summer and too cold in winter. This situation generally means that there is a lack in terms of air barrier, vapour barrier and/or insulation. However, solving these issues without taking due care for air quality may result in a less healthy building overall.

The following list provides some comments on various building techniques, foundations, plumbing and electrical systems, venting and ventilation and energy efficiency. These are issues that are common to the types of houses referred to throughout this document. The list is by no means exhaustive, but is provided as a source to start planning.

Balloon Framing – In this type of construction, each exterior wall is usually sheathed on both sides with 1x6 shiplap lumber, effectively creating a box beam. Lintels above door and window openings are rare in this type of framing, since the load is designed to flow through the shear planes created by the sheathing on each face of the wall as well as through the continuous 2x4 studs. The continuous stud wall construction creates a natural fire chute that needs to be dealt with to ensure safety. There are several types of insulation that can be blown in from either the interior or exterior of the building to fill in the wall cavity and provide a good air barrier as well as adequate fire stopping.

In many balloon framed houses, floor joists run continuous across the shorter span of the building. They may or may not rest on a bearing wall somewhere in the span, and if a bearing wall exists in the span, it may not run the length of the building. This often leads to differential deflections in the floor systems. Acceptable amounts of deflection are largely governed by aesthetic concerns, but where crushing of bearing areas, checking and cracking of joists and extreme deformations have occurred, a thorough review of the system and a plan for repair or reconstruction is in order.

Platform Framing – In this system of wood framing, the floor joists of each storey rest on the top plates of the storey below (or on the foundation sill in the case of the first storey) and both the bearing and partition walls rest on the subfloor of each storey. Floor joists generally do not run continuous in platform framed houses. This makes the location and continuity of bearing walls extremely important for adequate load support and the minimizing of deflection. Lintels above door and window openings are usually present in this type of framing, and each floor system provides a natural fire stop.

Load-bearing Masonry Walls – In this type of construction, the exterior structure is made up completely of brick or stone masonry. Interior partition walls are generally wood framed, but bearing walls may be wood or masonry. This type of construction has many benefits in terms of breathability and resistance to combustion. However, it may be difficult for the average homeowner to accurately assess the condition of an existing masonry building. It is recommended that a professional be consulted as to the safety, economy and limitations of reconstructing a masonry building.

Foundations – There are a wide variety of foundations present in existing buildings, but most from the pre-WWII era in Winnipeg are made of limestone masonry. These foundations adeptly illustrate the system model, only performing as well as the weakest link in terms of soil strength and variability, moisture control and lateral stability. It is recommended that each foundation be examined on its own for signs of undue stresses, cracking or deformation, as well as moisture levels and drainage capacity.

Electrical System – The current electrical code and its application are not generally obstacles to timely or economical renovation. Homeowners are allowed to take out a permit and perform their own wiring on the house side of the fuse or breaker panel. This work is inspected as required by the permit, and must meet code requirements for the particular application. If the reconstruction plans include leaving some existing wiring in use, this wiring must be thoroughly inspected for fire safety and continuity before any of the new wiring is begun.

Plumbing System – The current plumbing code and its application are not generally obstacles to timely or economical renovation. Homeowners are allowed to take out a permit and perform their own plumbing on the house side of the water meter. This work is inspected as required by the permit, and must meet code requirements for the particular application. If the reconstruction plans include leaving some existing plumbing in use, this plumbing must be thoroughly inspected for health reasons as well as fire safety before any new plumbing is carried out.

Ventilation vs. Venting – Ventilation is the term for the replenishment of fresh air in the heated space of a building. Venting is the term for the systems that carry plumbing fumes, combustion gases and bathroom, kitchen and dryer exhaust air to the outside of a building. Bathroom, kitchen and dryer exhaust vents have an effect on the overall ventilation of a building, and should be considered when planning a retrofit. Plumbing and combustion gas vents are separate from ventilation and should not be confused as providing useable air changes per hour.

Ventilation – Ventilation is an integral part of the whole house system. Proper ventilation of excess humidity and stale air are very important steps in maintaining a healthy house. Maintaining positive or balanced pressure is also important to assure that combustion gases are properly exhausted. When considering ventilation and moisture control, it is a good analogy to think of the ventilation system as the building's lungs and skin. Older buildings were not built to be airtight, and most of the ventilation occurred naturally through the walls, windows and doors. This makes for a drafty, cold house in winter – but it also ensures cycling of air and moisture.

Houses that have a forced-air heating system circulate air everywhere that the ducts reach. In houses having more than one dwelling unit, this often means that air is being shared between separate dwelling units. This is not a safe condition, both in terms of fire safety and environmental or lifestyle concerns. When undergoing a complete retrofit on a building that intends to have more than one dwelling unit, the new or updated HVAC system must keep air separate between each dwelling unit and each public space or shared exit.

When undergoing retrofitting that will decrease the permeability of the building envelope, (i.e. installing a continuous vapour barrier) steps must be taken to ensure that adequate ventilation is maintained. There are many systems available to heat and cool residential buildings. Each one will be unique in its features and requirements. A good motto to follow is: 'Build tight, ventilate right'.

Energy Efficiency – The National Building Code does not contain specific energy efficiency requirements for residential construction. However, the way that the NBC is adopted in the Manitoba Building Code incorporates energy efficiency requirements for different geographic regions of the province. Again, these prescriptive standards may be difficult to achieve in existing buildings, but the intent of the standards can be adhered to.

There are many options available for insulation, air barriers, vapour barriers, ventilation systems as well as heating and cooling appliances. In all cases, consultation with a professional, followed by careful planning should be undertaken to maximize efficiency and reduce health risks when reconstruction and retrofits are being carried out.

Accessibility – Seniors and people living with disabilities occupy many of the houses referred to in this guideline. The original design of these houses rarely incorporated any accessibility features, and this is a limiting factor for many people. While achieving complete accessibility throughout the building may be outside the economical realities of a retrofit, main floor accessibility or visit-ability is possible.

Other Information Sources

Other good sources for information and advice on looking at houses as a system are CMHC, Manitoba Hydro and the R-2000 Program. The CMHC distributes several publications related to the renovation, reconstruction and retrofit of existing houses. Manitoba Hydro also distributes a series of Power Smart guidelines for these purposes. The R-2000 Program provides educational documents and software to analyze and plan how a house breathes. While aimed primarily at new construction, the intent of the R-2000 Program is healthier, more efficient housing, and these goals are the same for the reconstruction and retrofit of existing buildings. The resources listed above will lead to new and innovative techniques as well as tried and true methods to make each reconstruction and retrofit the best it can be.

Code Compliance Alternatives

Table 4.1 is a side-by-side comparison of relevant Manitoba Building Code sections and the proposed compliance alternatives for existing buildings. It is meant to be a reference for the renovator during the proposal stage so that the plans provided reflect the intention of the code for life safety and structural integrity as well as respect for zoning issues. In all cases, the current code should be conformed to when possible, with the compliance alternative table provided as an acceptable solution set for the variability inherent in older buildings.

Table 4.1 – Code Compliance Alternatives

1998 MBC Requirements	Proposed Compliance Alternative
Lumber Grades (9.3.2.2, 9.3.2.4) – Except for joists, rafters, trusses and beams, visually graded lumber shall conform to the grades in Table 9.3.2.1. (9.23.4.2) – Spans for wood joists and rafters shall conform to the spans shown in Tables A-1 to A-7…	*Lumber Grades* (9.3.2.2, 9.3.2.4, 9.23.4.2) – Reclaimed sound lumber, consistent in size and type is allowed for repair and reconstruction of existing and additional walls, floors, sheathing, etc.
Room Heights (9.5.3.1) – Heights of rooms or spaces in residential occupancies shall conform to Table 9.5.3.1.	*Room Heights* (9.5.3.1) – Existing rooms, located above grade and intended for the same use as the original design, may retain the original ceiling height.
Bathroom Doors (9.6.3.3) – Where one or more bathrooms is served by a hallway of not less than 860 mm (33 7/8”), at least one of the bathrooms shall accommodate a door not less than 760 mm (29 7/8”) wide.	*Bathroom Doors* (9.6.3.3) – Where a hallway of less than 860 mm (33 7/8”) serves a bathroom, the door should be not less than 760 mm wide, if room permits. Existing conditions need not be changed to comply.
Fastening of Hinges & Strikeplates (9.6.8.5, 9.6.8.6) – Except as permitted in Article 9.6.8.10, hinges for doors described in Sentence 9.6.8.1.(1) shall be fastened to wood doors with wood screws not less than 25 mm (1”) long and to wood frames with wood screws so that at least 2 screws per hinge penetrate not less than 30 mm (1 1/4”) into solid wood. …Strikeplates for deadbolts described in Article 9.6.8.3 shall be fastened to wood frames with wood screws that penetrate not less than 30 mm into solid wood.	*Fastening of Hinges & Strikeplates* (9.6.8.5, 9.6.8.6) – Where practical, during repairs and reconstruction, solid blocking should be provided around the rough opening for fastening hinges and dead bolt strike plates to provide the maximum solid wood possible for accepting mounting screws. Screws of less than 25 mm (1”) are not considered acceptable.
Minimum Window Areas (9.7.1.2) – Except as required in Article 9.7.1.3, the minimum window glass area for rooms in buildings of residential occupancy or which are used for sleeping shall conform to Table 9.7.1.2.	*Minimum Window Areas* (9.7.1.2) – Where an existing non-bedroom window opening serves a space not undergoing a change in use, the opening shall be considered sufficient, provided there is no modification to decrease the rough opening size.

1998 MBC Requirements	Proposed Compliance Alternative
Height of Window Sills above Floors or Ground (9.7.1.6) – Openable windows in buildings of residential occupancy shall be protected by a), a guard, in accordance with section 9.8, or b) a mechanism capable of controlling the free swinging… Windows need not be protected according to the previous sentence when a) the window serves a dwelling unit that is not located above another suite, b) the only opening greater than…, c) the window sill is located more than 450 mm (17 5/8") above the finished floor on one side of the window, or d) the window is located in a room or space with the finished floor described in Clause c) located less than 1800 mm (70 7/8") above the floor or ground on the other side of the window.	*Height of Window Sills above Floor or Ground* (9.7.1.6) – The intent of this code requirement, according to Appendix A, is to prevent children falling out of windows. Reconstruction plans should take this into account where possible. Egress requirements for bedrooms may take priority over minimum sill heights.
Windows in Exit Stairways (9.7.5.3) – Windows in exit stairways that extend to less than 1070 mm (42 1/8") above the landing shall be a) protected by guards, in accordance with Section 9.8, or b) non-openable and designed to withstand the specified lateral loads for balcony guards as provided in Part 4.	*Windows in Exit Stairways* (9.7.5.3) – If the rough opening is not being altered, existing windows in stairways may be replaced with a non-openable unit. A conforming handrail will suffice where an interior guard is required.
Windows above the Second Storey (9.7.5.4) – Windows in public areas that extend to less than 1 m (39 3/8") from the floor and are located above the second storey in buildings of residential occupancy shall be a) protected by guards, in accordance with Section 9.8, or b) non-openable and designed to withstand the specified lateral loads for balcony guards as provided in Article 4.1.10.1.	*Windows above the Second Storey* (9.7.5.4) – Non-bedroom windows above the second storey should be made so that the lower portion is unopenable to a minimum height of 900 mm (35 7/16").
Rise, Run, and Tread Depth of Stairs (9.8.3.1) – Except as provided in Subsection 9.8.5. (Curved Stairs), the rise, run and tread depth of stairs shall conform to Table 9.8.3.1.	*Rise, Run, and Tread Depth of Stairs* (9.8.3.1) – An existing non-conforming stair shall be improved where room allows, but may also be repaired or reconstructed to its original rise, run and tread depth if the slope of the stair does not exceed 45°, the maximum rise is 210mm (8 1/4") and the minimum run is 220mm (8 11/16") exclusive of nosings.
Stair Width and Head Room (9.8.3.3, 9.8.3.4) – Exit stairs and stairs used by the public shall have a width measured between wall faces or guards, of not less than 900 mm (35 7/16"). At least one stairway between each floor level in a dwelling unit shall have a width between wall faces of not less than 860 mm (33 7/8"). The head room measured vertically from a line drawn through the outer edges of the nosings shall not be less than 1.95 m (76 ¾") for stairs located in dwelling units and 2.05 m (80 11/16") for all other stairs.	*Stair Width and Head Room* (9.8.3.3, 9.8.3.4) – See above.

1998 MBC Requirements	Proposed Compliance Alternative
Dimensions of Landings (9.8.4.1) – Landings shall be as wide and as long as the width of stairs in which they occur, except that a) the length of the landing for exterior stairs serving not more than one dwelling unit need not exceed 900 mm (35 7/16"), and b) the length of landing for all other stairs in a straight run need not exceed 1100 mm (43 5/16").	*Dimensions of Landings* (9.8.4.1) – Unless a door opens over a landing, existing landings may remain or be repaired or reconstructed in their original configuration.
Winders (9.8.5.3) – Stairs within dwelling units may contain winders that converge to a centre point provided a) the winders turn through an angle of not more than 90 degrees, and b) individual treads turn through an angle of 30 degrees with no deviation above or below 30 degrees except for that created by normal construction tolerances.	*Winders* (9.8.5.3) – Where an existing winder box turns a stairway 90 degrees through more or less than three risers, the stair shall be reconstructed so that individual treads turn through an angle of 30 degrees with no deviation above or below 30 degrees except for that created by normal construction tolerances.
Handrail Height (9.8.7.4) – Height of handrails on stairs and ramps shall be measured vertically from a line drawn a) through the outside edges of the stair nosing, or b) from the surface of the ramp, floor or landing below the handrail. Except as provided in Sentences (3) and (4), the height of handrails on stairs and ramps shall be a) not less than 800 mm (31 ½"), and b) not more than 965 mm (38"). Where guards are required, handrails on landings are permitted to be not more than 1070 mm (42 1/8") in height. Handrails not meeting the requirements of Sentences (2) and (3) are permitted provided they are installed in addition to the required handrails.	*Handrail Height* (9.8.7.4) – Where existing balustrade construction does not conform to minimum heights and is at least 750 mm (30") in height, the existing balustrade may be repaired or reconstructed in their original configuration.
Direction of Door Swing (9.9.6.5) – Every door that opens onto a corridor or other facility that provide access to exit from a room or suite having an occupant load of more than 60 persons, and every door that is located within a corridor that is required to be separated from the remainder of the floor area by a fire separation shall swing on a vertical axis in the direction of exit travel and shall not open onto a step.	*Direction of Door Swing* (9.9.6.5) – Original direction of door swing may be retained when spatial considerations or stair location make it impractical to change the swing to the direction of travel to the exit.
Nearness of Doors to Stairs (9.9.6.6) – The distance between a stair riser and the leading edge of a door during its swing shall be not less than 300 mm (11 13/16").	*Nearness of Doors to Stairs* (9.9.6.6) – Where a door is being added to improve fire safety in an existing building, the leading edge of the door during its swing shall be as far from the nearest stair riser as is practically possible.

1998 MBC Requirements	Proposed Compliance Alternative
Exposing Building Face of Houses (9.10.14.12) – For the purposes of this Article, an exposing building face may be considered to be made up of any number of separate portions and the requirements for fire-resistance rating and cladding material and the limits on glazed openings for each portion may be determined based on the limiting distance for that portion. (See Appendix A). Except as provided in sentence (4), in buildings containing only dwelling units in which there is no dwelling unit above another dwelling unit, the requirements of Article 9.10.14.11 do not apply provided that the exposing building face a) has a fire resistance rating of not less than 45 min where the limiting distance is less than 1.2 m (47 ¼"), and b) is clad with non-combustible material where the limiting distance is less than 0.6 m (23 5/8"). Glazed openings in the exposing building face referred to in Sentence (2) a) shall not be permitted where the limiting distance is less than 1.2 m, and b) shall be limited in conformance with the requirements for unprotected openings in Article 9.10.14.1, where the limiting distance is 1.2 m or greater. Cladding on the exposing building face described in Sentence (2) may be vinyl when the limiting distance is less than 0.6 m provided the cladding a) conforms to Subsection 9.27.13, b) is installed directly over 12.7 mm (1/2") gypsum sheathing, c) has a flame spread rating not greater than 25 when tested in accordance with Sentence 3.1.12.1 (2), and d) does not exceed 2 mm in thickness exclusive of fasteners, joints and local reinforcements.	*Exposing Building Face of Houses* (9.10.14.12) – New door or window units may be installed in existing openings in the exposing face of the building. If existing siding and sheathing are to be removed and combustible siding installed, they shall be replaced with minimum 12.7 mm (1/2") gypsum board.
Combustible Projections (9.10.14.13) – Except for buildings containing 1 or 2 dwelling units only, combustible projections on the exterior of a wall that are more than 1 m (39 3/8") above ground level, such as balconies, platforms, canopies, eave projections and stairs, and that could expose an adjacent building to fire spread, shall not be permitted within a) 1.2 m (47 ¼") of a property line or the centreline of a public way, or b) 2.4 m (95 ½") of a combustible projection on another building on the same property.	*Combustible Projections* (9.10.14.13) – Exception to be expanded to include existing triplexes as well as duplexes and single-family dwellings for existing projections. New combustible projections are not allowed
Detached Garage serving one dwelling unit (9.10.14.14) – (4) The requirements for limiting distance shall not apply between a detached garage or accessory building and a dwelling unit where a) the detached garage or accessory building serves only one dwelling unit, b) the detached garage or accessory building is located on the same property as that dwelling unit, and c) the dwelling unit served by the detached garage or accessory building is the only major occupancy on the property.	*Detached Garage serving one dwelling unit* (9.10.14.14) – Exception to be expanded to include existing duplexes. however the distance between the duplex and garage shall not be less than 3m (10 feet) unless the both the garage and duplex walls have a 45-minute fire-resistance rating.

1998 MBC Requirements	Proposed Compliance Alternative
Required Fire Stops in Wall Assemblies (9.10.15.2) – Except as permitted in Sentence (2), fire stops shall be provided to block off concealed spaces within wall assemblies, including spaces created by furring, a) at each floor level, b) at each ceiling level where the ceiling contributes to part of the required fire-resistance rating, and c) at other locations within the wall, so that the distance between fire stops does not exceed 20 m (66') horizontally and 3 m (118 1/8") vertically. Fire stops described in Sentence (1) are not required provided a) the width of the concealed wall space does not exceed 25 mm (1"), b) the exposed construction materials within the space, including insulation, but not including wiring, piping or similar services, have a flame-spread rating of not more than 25, or d) the concealed wall space is filled with insulation.	*Required Fire Stops in Wall Assemblies* (9.10.15.2) – See comments on balloon and platform framing, as well as ventilation and energy efficiency preceding this section.
Sound Transmission (9.11.2.1) – Every dwelling unit shall be separated from every other space in a building in which noise may be generated by a construction providing a sound transmission class rating of at least 50, measured in accordance with Subsection 9.11.1 or as listed in A-9.10.3.1 in Appendix A.	*Sound Transmission* (9.11.2.1) – Where possible, repairs and reconstruction of existing buildings should be carried out to minimize the level of sound transmission from one dwelling unit to another. Any existing assembly that achieves a STC 45 is acceptable.
Spans for Joists, Rafters & Beams (9.23.4.2) – Except as required in Sentence (2), spans for wood joists and rafters shall conform to the spans shown in Tables A-1 to A-7 for the uniform live loads shown in the tables. (See Article 9.4.2.2) Spans for floor joists which are not selected from Tables A-1 and A-2 and which are required to be designed for the same loading conditions, shall not exceed the design requirements for uniform loading and vibration criteria (See Appendix A). Spans for built-up wood and glued-laminated timber floor beams shall conform to the spans in Tables A-8 to A-11 (See Article 9.4.2.2). Spans for roof ridge beams shall conform to the spans in Table A-12 for the uniform snow load shown (See Articles 9.4.2.2 and 9.23.13.8).	*Spans for Joists, Rafters & Beams* (9.23.4.2) – Where a roof or floor system exists that may be shown to have withstood the test of time, it may be repaired or reconstructed as originally built, providing that the load placed on the system is not increased.
Header & Trimmer Joists (9.23.9.6, 9.23.9.7) – Header joists around floor openings shall be double when they exceed 1.2 m (47 ¼") in length. The size of header joists exceeding 3.2 m (126") in length shall be determined by calculations. Trimmer joists around floor openings shall be doubled when the length of the header joist exceeds 800 mm (31 ½"). When the header joist exceeds 2 m (78 ¾") in length, the size of the trimmer joists shall be determined by calculations.	*Header & Trimmer Joists* (9.23.9.6, 9.23.9.7) – Where possible, members forming the openings for stairwells and dormers should be doubled up. Members forming the opening for masonry chimneys should be doubled up as well, but should be framed so that they are not attached to the masonry itself.

1998 MBC Requirements	Proposed Compliance Alternative
Support of Walls (9.23.9.9) – Non-loadbearing walls parallel to the floor joists shall be supported by joists beneath the wall or on blocking between the joists. Blocking referred to in Sentence (1) for the support of non-loadbearing walls shall be not less than 38 mm by 89 mm (nom. 2x4) lumber spaced not more than 1.2 m (47 ¼") apart. Non-loadbearing interior walls at right angles to the floor joists are not restricted as to location. Loadbearing interior walls parallel to floor joists shall be supported by beams or walls of sufficient strength to transfer safely the specified live loads to the vertical supports. Loadbearing interior walls at right angles to floor joists shall be located not more than 900 mm (35 7/16") from the joist support when the wall does not support a floor, and not more than 600 mm (23 5/8") from the joist support when the wall supports one or more floors, unless the joist size is designed to support such loads.	*Support of Walls* (9.23.9.9) – Where a non-loadbearing wall runs parallel to the joists, blocking should be provided, or joists should be placed within 75 mm of either side of the bottom plate with sufficient space to accommodate mechanical systems.
Wall Studs (9.23.10.1) – The size and spacing of studs shall conform to Table 9.23.10.1.	*Wall Studs* (9.23.10.1) – Where a wall system can be shown to have stood the test of time, existing conditions shall be improved or reconstructed as originally designed.
Continuity of Studs (9.23.10.4) – Wall studs shall be continuous for the full storey height except at openings and shall not be spliced except by finger joining with a structural adhesive. (See Appendix A.)	*Continuity of Studs* (9.23.10.4) – Studs may be repaired or extended by cutting a butt joint and laminating a 9.5 mm (3/8") plywood strip, as wide as the stud and continuing 300 mm (11 13/16") on either side of the splice.
Top Plates (9.23.11.3) – Except as permitted in Sentences (2) to (4), at least 2 top plates shall be provided in loadbearing walls. A single top plate is permitted to be used in a section of a loadbearing wall containing a lintel provided the top plate forms a tie across the lintel. A single top plate is permitted to be used in loadbearing walls where the concentrated loads from ceilings, floors and roofs are not more than 50 mm (2") to one side of the supporting studs and in all non-loadbearing walls. The top plates need not be provided in a section of loadbearing wall containing a lintel provided the lintel is tied to the adjacent wall section with not less than a) 75 mm by 150 mm by 0.91 mm thick galvanized steel, or b) 19 mm by 89 mm by 300 mm (nom. 1x3 - 11 13/16" long) wood splice nailed to each wall section with at least three 63 mm nails.	*Top Plates* (9.23.11.3) – Where a single top plate exists, a ledger board (minimum 38 x 64 mm, 2" x 3") can be nailed to one side of the studs and top plate to distribute the load through the wall more effectively.
Lumber Subflooring (9.23.14.7) – Lumber subflooring shall be laid at an angle of not less than 45° to the joists. Lumber subflooring shall be fully supported at the ends on solid bearing. Lumber for subflooring shall be of uniform thickness and not more than 184 mm wide.	*Lumber Subflooring* (9.23.14.7) – Existing subfloor may be repaired or reconstructed at the original angle of installation.

1998 MBC Requirements	Proposed Compliance Alternative
Insulation (9.25.5.1) – The thermal resistance of the building envelope shall conform to Table 9.25.5.2. Trade-offs are permitted in the thermal resistance values specified by Table 9.25.5.2 provided that it is demonstrated, using good engineering practise, that the building will not use more energy than it would if it complied with the Table (See Appendix A).	*Insulation* (9.25.5.1) – Where exterior walls or cavities over unheated spaces are exposed due to interior renovation work, the entire area and depth of cavity between the framing members and sheathing shall be filled with insulation and covered from the interior with a continuous air-vapour barrier. If un-insulated exterior wall or floor cavities will not be exposed by either interior or exterior renovations, the cavities should be blown full with high density cellulose-type insulation (i.e. 'dense pack' method) and the interior surface of the walls or floors sealed to minimize air leakage into the cavity. If a foundation wall is in poor structural condition, preference shall be given to insulating the foundation from the exterior in conjunction with any structural repairs. A foundation with evidence of water seepage or excessive dampness shall be waterproofed before adding any interior insulation. Insulation shall not be added to attics until after all potential sources of air leakage between the living space and attic are examined and sealed to greatest extent practical. All insulation work should conform to the practices recommended by Manitoba Hydro and their Power Smart fact sheets and booklets.
Required venting (9.19.1.1) – Except where it can be shown to be unnecessary, where insulation is installed between a ceiling and the underside of the roof sheathing, a space shall be provided between the insulation and the sheathing, and vents shall be installed to permit the transfer of moisture from the space to the exterior. (See Appendix A.)	*Required venting* (9.19.1.1) – Existing buildings are often constructed with little to no ventilation capacity in the soffits and/or above the walls. The roof must be viewed as a system and the best combination of insulation and venting employed for the given situation.
Clearances (9.19.1.3) – Not less than 63 mm (2 ½") of space shall be provided between the top of the insulation and the underside of the roof sheathing. Ceiling insulation shall be installed in a manner that will not restrict a free flow of air through roof vents or through any portion of the attic or roof space.	*Clearances* (9.19.1.3) – Where it is possible to increase the insulation but not maintain the same level of ventilation, the minimum clearance shall be 19 mm (¾"), providing it is guaranteed as unobstructed space.
Heat Transfer, Air Leakage & Condensation Control (9.25.1) – Except as provided in Sentence (2), any sheet or panel type material with an air leakage characteristic less than 0.1 L/(s·m2) at 75 Pa and water vapour permeance less than 60 ng/(Pa·s·m2) and incorporated in a building assembly required by Article 9.25.2.1. to be insulated shall be installed a) on the warm face of the assembly, b) at a location where the ratio between the total thermal resistance of all materials outboard of its innermost impermeable surface and the total thermal resistance of all materials inboard of that surface is not less than required in Table 9.25.1.2., or c) outboard of an air space that is vented to the outdoors and, for walls, drained.	*Heat Transfer, Air Leakage & Condensation* Control (9.25.1) – Alternative vapour barrier materials such as low-permeability paint may be permitted to allow upgrading of insulation from the exterior in order to preserve interior finishes, provided air sealing is completed.

1998 MBC Requirements	Proposed Compliance Alternative
Waterproof Wall Finish (9.29.2.1) – Waterproof finish shall be provided to a height of not less than a) 1.8 m above the floor in shower stalls, b) 1.2 m above the rims of bathtubs equipped with showers, and c) 400 mm above the rims of bathtubs not equipped with showers.	*Waterproof Wall Finish* (9.29.2.1) – Not required for standalone, claw foot type tubs installed away from walls.
Required Ventilation (9.32.2.1) – Rooms or spaces in dwelling units shall be ventilated during the non-heating season by a) natural ventilation in accordance with Article 9.32.2.2., or b) a mechanical ventilation system conforming to Part 6. Where a habitable room or space is not provided with natural ventilation as described in Sentence (1), mechanical ventilation shall be provided to exhaust inside air from or to introduce outside air to that room or space at the rate of a) one-half air change per hour if the room or space is mechanically cooled during the non-heating season, or b) one air change per hour if it is not mechanically cooled during the non-heating season.	*Required Ventilation* (9.32.2.1) –Older homes can be made air tight enough to require mechanical ventilation. Consideration of all intakes and exhausts must be made when planning ventilation systems. For instance, exhaust systems in bathrooms and kitchens can be used as part of the ventilation system by putting them on a centralized switch governed by a humidistat. The changes per hour may not conform, but the total changes required will be achieved as long as the humidistat is functioning. Heat recovery ventilators (HRVs) and fresh air intakes are important options to consider during planning. Carbon Monoxide detectors should be installed in any house using combustion heating.
Natural Ventilation (9.32.2.2) – The unobstructed openable ventilation area to the outdoors for rooms and spaces in residential buildings ventilated by natural means shall conform to Table 9.32.2.2. Where a vestibule opens directly off a living or dining room within a dwelling unit, ventilation to the outdoors for such rooms may be through the vestibule. Openings for natural ventilation other than windows shall be constructed to provide protection from the weather and insects. Screening shall be of rust-proof material.	*Natural Ventilation* (9.32.2.2) – A blower door test is an inexpensive (~ $200) way to quantify how many air changes per hour are occurring as a result of natural air leakage in an older home. This may be sufficient for the ventilation requirements of the building. It may also provide the information necessary to design a supplementary mechanical ventilation system.
Mechanical Ventilation (9.32.3.1) – Every dwelling unit that is supplied with electrical power shall be provided with a mechanical ventilation system complying with a) CAN/CSA-F326 "Residential Mechanical Ventilation Systems," or b) for mechanical ventilation systems coupled to forced air heating systems, the balance of this Subsection other than Article 9.32.3.7., or c) for mechanical ventilation systems not coupled to forced air heating systems, the balance of this Subsection other than Article 9.32.3.6.(See A-9.32.3. in Appendix A.)	*Mechanical Ventilation* (9.32.3.1) – It is relatively easy to add mechanical ventilation to an existing forced-air system, and not very much more difficult to add an HRV system to complement a hydronic heat system. The primary difficulty is the installation of ductwork if complete gutting is not taking place. Again, the house must be viewed as a system, and analysis of the available and required ventilation carried out.

Process document

Permit Application Alternatives

Residential construction and renovations in Winnipeg require a permit, in most cases. Building permit applications are made at 30 Fort Street, in the planning and property development offices, suite 100. At the front desk, information is available as to which projects require permits and what the various city by-laws are regarding building, occupancy, maintenance, waterways, etc. There is no single information source for details on each by-law's application and enforcement, however. This frequently causes problems in communication and consistency of interpretation.

1.0 – Current Permit Application Process

The permit application process is shown as a flowchart in Figure 2.0. The list that follows is a synopsis of each step in the process. Potential delays that are out of the applicant's control are indicated with an hourglass symbol. Steps where fees or expenses will be assessed are indicated with a dollar symbol.

1. *START* - Once the requirements for the proposed project are determined, a set of plans and description of proposed work need to be drawn up.

2. *Plans brought to 30 Fort St.* – Three copies of your plans and an outline of the proposed work are required.

3. *Meet with Permit Technician* – After you arrive and sign in, you will meet with a permit technician who will begin processing your permit application. The permit tech will go over your plans to check for any obvious errors or omissions, and will discuss the project with you.

4. *Information entered in AMANDA* – AMANDA is the City of Winnipeg's planning department information network program. Files on each property are accessible by Permit Technicians, Zoning Officers, Plan Examiners and Inspectors. The legal and city address of the project will be entered, as well as a description of the proposed work.

5. *Plans go to Zoning Officer* – Plans must pass zoning requirements before they go on through the system.

    a. *Additional info required* – More information, or clarification about the site plan of the property and the changes being made is required.
    b. *Project requires zoning variance* – There is some aspect of the proposed work that requires an exception to be made to city by-laws concerning zoning and land use. A variance requires postings to be made on the job site, in specified locations for a given length of time. This allows the public to be made aware of the proposed work and to have input at a meeting with the project proponent, city councillors and the zoning administrators.
    c. *Project requires zoning tolerance* – A tolerance is an administrative option available to zoning officers as an alternative to a variance when the extent of the non-conformance is below 10% of the governing lot or 300 mm (11 13/16"), whichever is less. If these requirements are met, the zoning officer can grant a tolerance without public consultation.
    d. *Granted* – The tolerance or variance is granted and the permit application process will proceed.

e. *Not Granted* – The tolerance or variance is not granted. The permit application will not proceed without changes.
f. *Plans require modifications* – Changes need to be made to the proposed work in order to meet zoning requirements or to fall within the limits of the public's acceptance.

6. *Plans go to Plan Examiner* – The plans will be checked for basic life safety and structural requirements.

   a. *Additional info required* – More information, or clarification about the building plans and the changes being made is required.
   b. *Engineering required* – Foundation work, or structural changes that will affect the loading of the building need to be checked by a professional engineer.

7. *Fees assessed & Permit issued* – Fees are assessed based on estimated value of work as well as plumbing and electrical fee structures.

8. *Work begins* – Hooray!

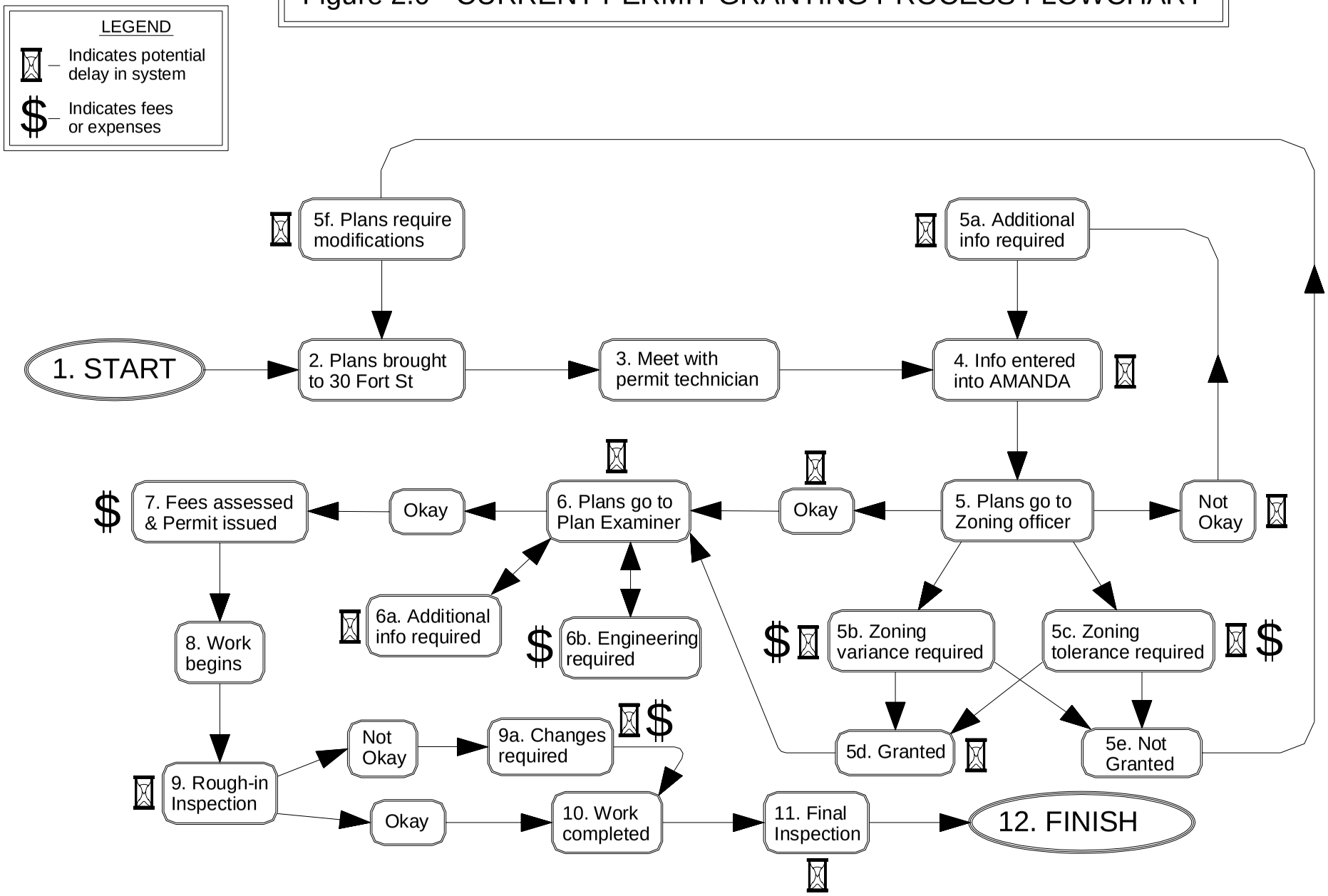
9. *Rough-in Inspection* – All structural work, as well as roughed-in plumbing and wiring must be inspected before it is covered with drywall or other interior finish.

   a. *Changes required* – Inspection reveals work that does not conform to approved plans. Changes to the non-conforming work are required, and changes to the plans may also be required.

10. *Work Completed* – All structural work, including insulation and wall finishes are completed, plumbing and electrical fixtures are installed.

11. *Final Inspection* – If all work meets the inspector's approval, the permit will be signed off as complete. If not, you will have to go back and complete the required work.

Figure 2.0 - CURRENT PERMIT GRANTING PROCESS FLOWCHART



2.0 – Process Streamlining Proposals

Permit applicants need to know exactly what information is required from them. A checklist that both the permit technician and the applicant can use would help give that information and possibly reduce the number of steps involved in the permit granting process for a conforming project. The checklist would cover the majority of renovations requiring a building permit. It would be divided into Zoning Requirements, Life Safety Requirements and Structural Requirements (including HVAC, plumbing, electrical).

Plans can go directly to permit if information is clear and checklist requirements are met. If there are questions regarding zoning or plan details, the current process may have to be followed. This proposed permit application process is shown as a flowchart in Figure 3.0. The list that follows is a synopsis of each step in the process. Potential delays that are out of the applicant's control are indicated with an hourglass symbol. Steps where fees or expenses will be assessed are indicated with a dollar symbol.

1. *START* - Once the requirements for the proposed project are determined, a set of plans and description of proposed work can be drawn up according to approved alternatives.

2. *Plans brought to 30 Fort St.* – Three copies of your plans and an outline of the proposed work are required. A copy of the checklist used to make the plans should be brought in to discuss with the permit technician.

3. *Meet with Permit Technician* – Plans are reviewed according to checklist.

4. *Checklist reviewed and information entered into AMANDA* – Proposed work is entered into the network.

    b. *Additional info required, or plans need modification* – There is a non-conforming aspect to the design, or some missing information is required.
    c. *With regard to zoning*, in the case where an application proposes to revert from a non-conforming use to a conforming use, time can be saved since it shouldn't even have to go to a zoning officer. The redevelopment fee should be waived as well. (Example: we have been charged development fees and permits have been delayed in zoning when we are simply changing a triplex back to a single family use.)
    d. *Too many problems for streamlined process*. *Permit application goes through current process* – In this case, the non-conformity with regards to zoning, structure or life safety is too complicated for the permit technician to deal with. The project needs to go through the entire application process to ensure compliance.

5. *Fees assessed & Permit issued* – Fees are assessed based on estimated value of work as well as plumbing and electrical fee structures.

6. *Work begins* – Hooray!

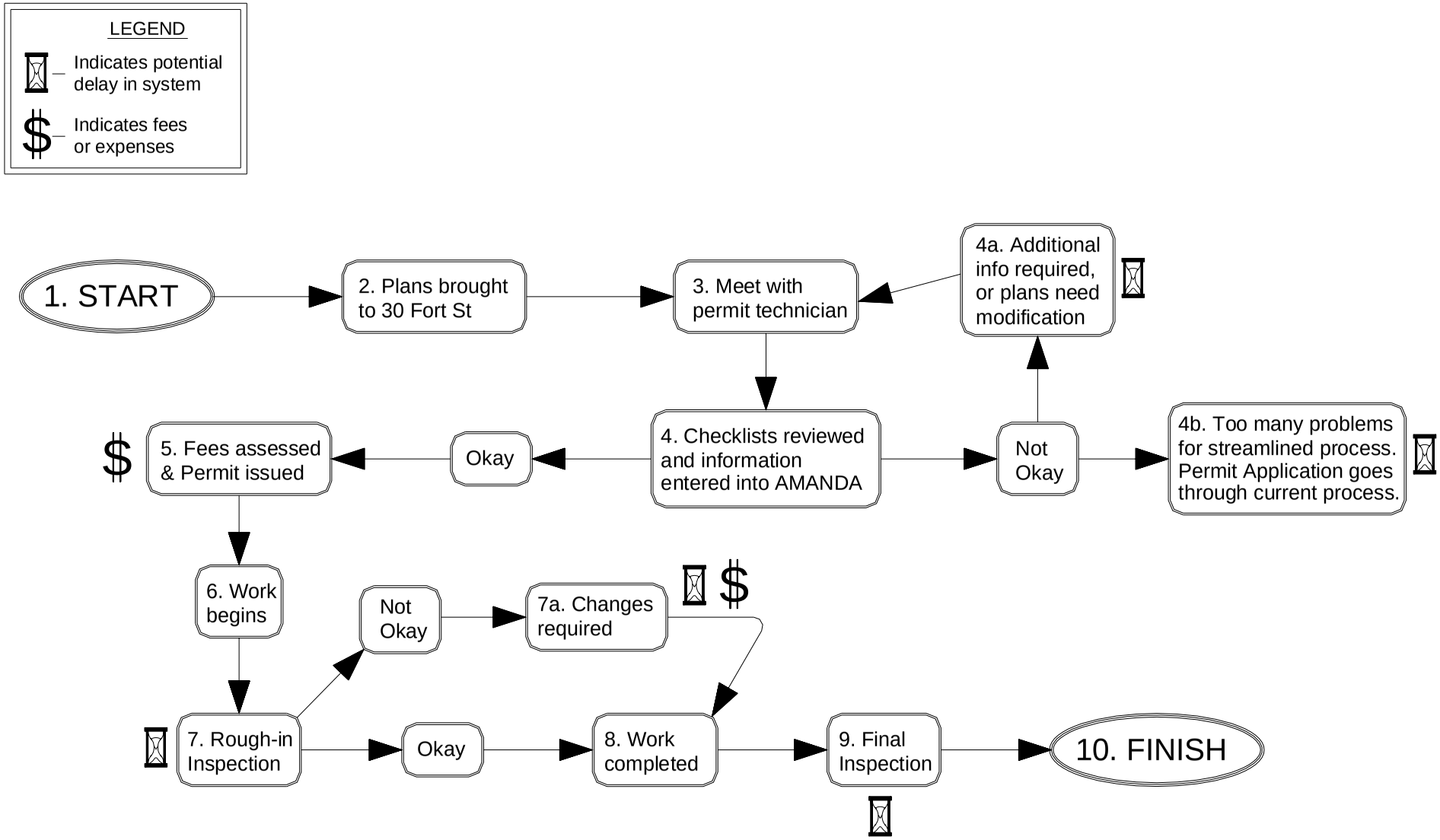
7. *Rough-in Inspection* – All structural work, as well as roughed-in plumbing and wiring must be inspected before it is covered with drywall or other interior finish.
    Changes required – Inspection reveals work that does not conform to approved plans. Changes to the non-conforming work are required, and changes to the plans may also be required.

8. *Work Completed* – All structural work, including insulation and wall finishes are completed, plumbing and electrical fixtures are installed.

9. *Final Inspection* – If all work meets the inspector's approval, the permit will be signed off as complete. If not, you will have to go back and complete the required work as indicated by the inspector.

10. *Finish* – I hope it was worth it!

Figure 3.0 - PROPOSED PERMIT GRANTING PROCESS FLOWCHART



3.0 – Proposed Checklists

The following checklists are for the permit technician and the renovator to go over during the permit application process. Additional checklists for Life Safety or verification of meeting the Life Safety conformance alternative point system, structural, HVAC and energy efficiency conformance can be used by the permit technician to decide whether or not the project can go to permit or if it requires further plan examination and/or zoning review.

Single Family Dwelling Renovations

___ Dimensioned site plan or surveyor's certificate, with details of proposed reconstruction or renovation provided, demonstrating zoning conformance.

___ Drawings of existing condition and proposed change to areas affected by reconstruction; including floor plans with intended uses of rooms, roof plans and elevations showing wall openings and location of grade.

___ Certificate or status of title for projects that include an addition, in order to prove ownership.

___ Engineering for any work on foundations or changes in structural loading.

___ Estimated value of proposed work.

Duplex and Triplex Renovations

___ Details re: means of egress, fire and sound separation conformance or completion of the Life Safety alternative conformance point system.

___ Dimensioned site plan or surveyor's certificate, with details of proposed reconstruction or renovation provided.

___ Drawings of existing condition and proposed change to areas affected by reconstruction; including floor plans with intended uses of rooms, roof plans and elevations showing wall openings and location of grade.

___ Certificate or status of title for projects that include an addition, in order to prove ownership.

___ Engineering for any work on foundations or changes in structural loading.

___ Estimated value of proposed work.

4.0 – Process Problems (or "Why I wouldn't get a permit…")

Property Tax Increase

One of the primary reasons for a homeowner not to get a building permit is the fear of an immediate property value re-assessment and a hike in their property taxes. In Winnipeg, property taxes are re-assessed every five years and at the notification of improvements via the building permit process. However, the market value of a property is not tied to the city's assessed value. So, a homeowner can more than re-coup all of their expenses without paying any additional taxes by completing an illegal renovation and selling before the end of the current property assessment period. This has led to the phenomenon of 'patch-and-paint' speculators who artificially raise the market value of a property by doing surface renovations that hide any real problems, but only for a long enough period of time to sell the property at an over-inflated profit.

'Patch-and-paint' renovations do not help the neighbourhood or the city, because the house will be in the same or worse condition as before the renovation within the next property assessment period. The city does not gain any additional tax revenue, and none of the other properties in the neighbourhood have their long-term market value increased.

Building Inspection

The issue of building inspections is also related to property tax assessments. Many homeowners are afraid of having an inspector look at their home, because they think that any situation found that does not meet code will require upgrading. This is an educational issue more than anything else. Inspections are carried out primarily to ensure that the work proposed in the plans (used to get the building permit) was actually carried out to the proper specifications. Inspectors are obligated to advise the homeowner about any gross outstanding deficiencies or unsafe condition, but their jurisdiction is limited to the items on the building permit.

Lack of Information

The lack of a single information source for residential building and renovations at the city of Winnipeg is another disincentive for renovators to go through the permit granting process. The type, quality and quantity of both the information available and the information required varies depending on which department or employee of the city is contacted. Recently, more of the information has been posted on the internet and is more accessible, but can take some time for the layperson to access or assimilate. All of this creates unforeseen delays, which even the most careful planner could not work around until the process is well known.

The advantage in this area seems to go to experienced builders. While it is not a bad thing for experience to provide a builder access to shortcuts, there is no reason to punish the average homeowner for inexperience.

5.0 – Observations and Further Suggestions

Incentives to Get a Building Permit

While there are no specific statistics available on the subject, professional renovators maintain that over half of the renovation projects undertaken in Winnipeg are completed without a building permit. While it may be difficult to stop people from conducting their renovations illegally, it is possible to increase the incentive to follow the proper procedures and get a building permit:

Tax Breaks

A property tax re-assessment moratorium for five years on renovation permits if the home is owner-occupied or the project is managed by a non-profit renovator recognised by the city would be a good start as an incentive to improve neighbourhoods. The city will gain a larger tax base in the long term, while neighbourhoods get some

short term relief from additional taxes. Property taxes from entire neighbourhoods, maintained properly over a long period of time, should be higher than permit related tax increases based on individual renovations. This holds true especially assuming that at least half of renovations take place without a permit.

Insurance Breaks

A private sector incentive for renovating under a building permit could also be encouraged by the city. Lower home insurance rates for fire safety compliance should be promoted. In neighbourhoods where insurance is not currently available, the city could encourage exceptions based on compliance.

Exemptions for certain projects or stages of a project

It is difficult, if not impossible, to generate accurate drawings for renovations on existing buildings where no original plans are available. Unfortunately, this is the case for most pre-1950 houses in Winnipeg. This makes the requirement to provide complete existing and proposed construction drawings before any work is started very difficult.

Gutting in preparation for a renovation should not require a building permit, because it is very difficult to submit accurate plans for a permit without knowing what's underneath the existing coverings.

A pilot project implementing this idea was documented in the previous A-C-T sponsored research project, "Pre-permit Demolition – O'Bee's Steam Bath", which was carried out in Winnipeg during 1991. Pre-permit demolition has not become a permitted practice for renovations in Winnipeg. The City is concerned that no permit will be applied for after work is begun.

Streamlining the Permit and Inspection System

During the course of research, several attempts were made to obtain actual building permits for current New Life Ministry housing projects, and to simply get information towards obtaining these permits. As an individual calling with no references, very little progress was made. It appeared that a citizen who has not applied for a building permit in the past could easily get frustrated by perceived difficulties in the process and withdraw from the process. Knowledge of the system and the people working within it is the only way to even begin a permit application, and this is still no guarantee that things will go smoothly and that the permit will be granted in a timely manner. This is not entirely unexpected, but there is no single information source for an individual to go to if s/he has no experience with the system.

During this project, renovation professionals were asked, "What is the fastest way to get a permit"? All responded, to various degrees, that *withholding information was the quickest route*. While this is an acknowledged falsification of information, it is perceived that this will lessen differences regarding interpretation of code requirements, and will enable the permit to be received quicker. It was the feeling of renovators that code issues can't all be resolved ahead of time in the application and some can best be resolved on site.

City of Winnipeg property and planning department employees were asked, "What is the fastest way to get a permit"? All responded, to various degrees, that *supplying complete and detailed information was the quickest route*.

Information is the Key

The two most experienced groups at either end of permit application and granting (the City and renovators), agree that information is the key ingredient to success in the process. However, renovators believe that it is the

lack, rather than the abundance, of detail that will speed a project through the paperwork phase. Both groups fully agreed that the system needed to get better at processing permits more quickly.

Both groups believe that they are working towards the best, safest and most economical housing possible in the given situation. The city planning employees are concerned with a project's conformance to current regulations and the documentation to prove this intent. The professional renovators are concerned with completing a project in a timely and economical manner. These views are complementary in a project where safety and craftsmanship are primary goals, and the intent of the Manitoba building code is to facilitate this.

The road from total agreement to total disagreement is through the following three junctions:

1. The building code does not provide alternatives for existing buildings and becomes more difficult to conform to with every update.

2. The planning officials that grant permits generally do not physically visit the building prior to issuing a permit.

3. The inspector's duty is to ensure that the work actually carried out on site agrees with what was proposed on the plans presented during the permit application, and that the work conforms with the health and safety requirements of the code.

Three Further Suggestions

This document is an attempt to deal with the first step on the road. Three suggestions have arisen, from a variety of sources, to address steps two and three:

1. More inspections, with inspectors given the power to suggest alternatives and proven acceptable methods rather than to simply stop a project.

2. City or provincial certification of private inspectors, who are bonded and insured, to act as facilitators and trouble-shooters throughout a project. In the case of a project that has a building permit granted directly by a permit technician under the proposed renovation checklist, these inspectors would be the proponent's liaison with the city, accepting liability and signing off the permit upon a final inspection.

3. City or provincial registration of certified builders/renovators, who are bonded and insured, to handle all aspects of a job under a certain size. These builders/renovators accept the liability and sign off the permit upon completion of the work. They are subject to random inspections, and must meet or exceed all code requirements on new projects or code compliance alternatives on renovations.

The first suggestion is an effort toward making the paper process concurrent with the building process. Rather than a prescriptive plan examination before any work is done, followed by a cursory inspection following the majority of the work, a cooperative arrangement that allows work to progress under a flexible permit is proposed. Renovators agree that this is what happens on site, regardless of whether the city sanctions it or is even aware of it. Many experienced construction professionals do not believe that it is possible to put together an accurate set of plans before a renovation project is physically started. Although preparation and planning ahead of time are also essential skills, the benchmark of a successful renovator is their adaptability and trouble-shooting skill set.

City official's response to the first suggestion is immediately one of liability. How can the city grant open-ended permits without incurring unacceptable risk and/or an unmanageable workload? The second and third suggestions are possible solutions.

Private inspectors have been employed in many areas as licensed and insured agents to go between the project initiator and the local authority having jurisdiction. They can address both the issues of liability for the authority and timeliness for the proponent. Coupled with code alternatives that facilitate the technical aspect of

renovations, private inspectors could promote innovative and economical renewal of existing buildings and neighbourhoods.

Certified builder programs have been implemented in Chilliwack and Surrey, B.C. as a result of two A-C-T case studies. These have proven to be effective in reducing the liability of the authority and improving timeliness for the project proponent. Coupled with code alternatives that facilitate the technical aspect of renovations, certified builders could promote timely, innovative and economical renewal of existing buildings and neighbourhoods.

Code Education Workshops

There are no formal accessible education programs in place to teach the contents of the Manitoba Building Code to builders or designers. There are some courses available through the Office of the Fire Commissioner through the Manitoba Fire College (in Brandon). Inspectors and plan examiners undergo some in-house training regarding the code, but are expected to have experience dealing with it in their past, or to learn as they go on the job. This adds to the inconsistency factor, especially considering that sections of the code can easily be misinterpreted or taken out of context.

Code education workshops for builders, designers, permit technicians and private inspectors would help provide a base of knowledge and consistent interpretation of the Manitoba Building Code and its intent.

Incentives for Plan Examination, Zoning and Inspections to Work Efficiently

One suggestion put forward by a renovation professional at a workshop held for this research project was the implementation of an incentive program for permit technicians, plan examiners and zoning officers to get applications through in a timely manner. The idea was supported by others. Suggestions ranged from a productivity quota system such as the one in place at Taxation Canada (Federal) to discounted permit fees for completed applications which are delayed beyond a prescribed time period.

Case Study

448 and 450 Maryland Street

The following is a summary of the cost comparison of the reconstruction of two Winnipeg houses, 448 and 450 Maryland Street, both built according to the same floor plan in 1905. The cost comparison is limited to the elements of each house that required changes according to the Manitoba Building Code.

448 Maryland has been reconstructed following the code alternatives presented in Table 4.1 of the A-C-T sponsored project report. 450 Maryland has been reconstructed following the current applicable Manitoba building code.

Both houses are 2 ½ storey brick structures on limestone foundations. They are located south of the intersection of Maryland Street and Ellice Avenue. 448 Maryland was in a general state of disrepair when it became available on the real estate market. 450 Maryland had suffered a fire that ruined part of the roof system and most of the stairwell. It was decided that 448 would be reconstructed according to the code alternatives because it had the most rebuildable stairs and roof. The roof on 450 Maryland needed a lot of work, regardless of whether or not it would be replaced or repaired.

The decision to replace the entire roof system on 450 Maryland was made after several estimates and consultations, taking the need for larger stairwell openings, more insulation and ventilation space, and necessary framing repairs into account. The idea was definitely influenced by the fire damage to 450 Maryland, but estimates by all 4 carpenters on site was that it would cost as much, or be equal in costs to modify the existing framing to accommodate the code, regardless of the initial condition roof. The costs of a new dormer over the stairwell alone was estimated to be $3500, and there would be many more costs and unexpected problems along the way.

There is some uncertainty regarding total costs due to the variability of volunteer labour's skill and availability. Using paid trades, the path chosen was certainly more economical, since we were dealing with known results, and known costs. When dealing with non-profit housing projects it is important to remember that volunteer labour is part of the equation. Training crews from the Manitoba Homebuilders Association (Manitoba Renovation Training Institute) were used extensively during the reconstruction of both 448 and 450 Maryland St. In calculating labour costs, each hour spent by a trainee was credited as a ¼ hour of actual professional labour.

Table 5.0 is a comparison of the relevant MBC and Code Alternative items considered in this case study.

Tables 5.1 and 5.2 are comparisons of material and labour costs incurred during the reconstruction of both 448 and 450 Maryland, respectively. It is important to note that the comparison is limited to those aspects of the projects that are directly related to code compliance and building permit acquisition.

Table 5.0 – Comparison of Reconstruction Methods

MBC Item	448 Maryland St	450 Maryland St
9.3.2.2 – Lumber Grades	As much as possible, lumber will be reused and reclaimed throughout the reconstruction.	Where any system is being worked on, new graded lumber will be used throughout the reconstruction.
9.7.5.3 – Windows in Exit Stairways and Exposing Building Face	All window openings will remain as they were originally laid into the masonry. (see also 9.10.14.12)	One window opening will be bricked shut to conform to exposing building face requirements. (see also 9.10.14.12)
9.7.5.4 – Windows above the Second Storey	Northeast bedroom window on the third floor will be unopenable.	Total replacement of the roof system will be designed so that all windows are acceptable.
9.8.3.1 – Rise, Run and Tread Depth of Stairs	The existing stairs will be repaired and reconstructed according to the original layout and dimensions. (see also 9.8.3.3, 9.8.3.4 and 9.8.4.1)	The entire stair system will be replaced with a code compliant set. This requires a good deal of framing on each floor, and is the primary reason for replacing the entire roof system. (see also 9.8.3.3, 9.8.3.4 and 9.8.4.1)
9.23.4.2 – Spans for Joists, Rafters & Beams	The original framing will be maintained where it is not showing signs of distress or deformation.	The original framing will be maintained where it is not showing signs of distress or deformation.
9.23.9.6-7 – Header & Trimmer Joists	Headers and Trimmers will be doubled up where they were not originally, provided there is space to do so. They will not be doubled up if there is no evidence of distress.	Headers and Trimmers will be doubled up where they were not originally.
9.23.10.1 – Wall studs	Existing wooden wall systems will remain where they are in good condition, and improved where necessary.	Existing wooden wall systems will be replaced.
9.23.11.3 – Top Plates	Original single top plate bearing walls will be improved by the addition of a vertically oriented 2x3 alongside the horizontal 2x4 top plate, and2x2 furring will be installed to make the width of the wall uniform.	All interior bearing walls will have double 2x4 top plates.
9.25.5.1 – Insulation	Exterior masonry walls will be strapped and foam insulation installed to the maximum depth possible.	Exterior masonry walls will be strapped and foam insulation installed to the maximum depth possible.
9.19.1.3 – Clearances	Ventilation clearance of 3/4“ will be provided between the top of insulation and the bottom of roof sheathing. Attic insulation will be a combination of R12, R20 & R40 as space permits.	Ventilation clearance of 2 1/2“ will be provided between the top of insulation and the bottom of roof sheathing. Attic insulation will be R40 as required (MBC).

Table 5.1 – Labour Cost Comparison

Labour Costs	448 Maryland St	450 Maryland St
Weighted Labour Time	28 days	68 days
Labour Cost @ $25.00/hr	$5,600.00	$13,600.00

Table 5.2 – Material Cost Comparison

Material	448 Maryland St	450 Maryland St
Beams and Joists	$360.00	$672.00
Stairs	$250.00	$1000.00
Wall Framing	$475.00	$870.00
Windows[1]	$530.00	$1000.00
Roof Reconstruction[2]	$120.00 (ventilation)	$440.00 (gable framing)
Roof Demolition		$390.00
Roof Trusses, Sheathing, Dormer		$2900.00
Totals	$1735.00	$7272.00

Notes:

1. The window comparison is for the cost of two windows for the kitchen of 448 Maryland St as compared to the bricking shut of the same opening in 450 Maryland St due to limited side yard dimensions.

2. The ventilation amount given for 448 Maryland is based on framing materials required to give a ceiling depth adequate for R28 insulation and ¾" ventilation space throughout the roof. The roof renovations in 450 Maryland were not only to repair damage from an earlier fire, but to comply with the code in reference to headroom on stairs and in dormers, as well as stair width and the resulting required increase of the dormer, as well as accommodating the code requirements for roof insulation and ventilation. It should be noted that, in the interests of a fair comparison, not all costs of the roof renovation are reflected in our comparison.

Conclusion

On the items chosen for comparison, strict code compliance resulted in costs of $17,582 for labour and materials, while the same items in the second home cost only $7,335 due to alternatives proposed by New Life Ministries and Lazarus Housing. This resulted in substantial savings of 58.3% on the selected items. Putting it another way, it was 2.4 times as expensive to reconstruct those specific items according to the current Manitoba Building Code as it was to reconstruct according to the proposed Code Alternatives.