CMHC

Canada Mortgage and Housing Corporation | Société canadienne d'hypothèques et de logement

THE TECHNICAL BUILDERS' BULLETIN

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DESIGN AND DURABILITY REQUIREMENTS FOR NEW CONSTRUCTION UNDER THE NATIONAL HOUSING ACT

PROFESSIONAL STANDARDS DIVISION

Technical Builders'
Bulletin Users

File Number: 0345-4
Date: 1989-12-01

AMENDMENT 13 TO THE
TECHNICAL BUILDERS' BULLETIN

This amendment introduces requirements for floating homes and has been prepared in support of CMHC's Chattel Loan Insurance Program. The requirements are quite general in nature and are based on the National Building Code of Canada for the superstructure or habitable areas and a set of guidelines developed by the American Concrete Institute for the floating support structure. There is, at present, no Canadian standard for the design of floating homes.

The requirements in this amendment presuppose that the floating home will be located in a marina or subdivision designed for the purpose and are applicable only in climatic areas where the water remains unfrozen year round.

For further details on acceptable locations and on the Chattel Loan Insurance Program, contact a branch office of Canada Mortgage and Housing Corporation.

Please insert this amendment into your copy of the Technical Builders' Bulletin in accordance with the attached instructions.

L. Lithgow
Director
Professional Standards Division

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Remove Pages	Replace With
1.3	1.3 to 1.6
Index 1, 2	Index 1, 2

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Amendment 13 - 1989-12-01

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CMHC Publications
Canada Mortgage and
Housing Corporation
682 Montreal Road
Ottawa, Ontario
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This will ensure receipt of periodic supplements to the document as well as any Administrative Builders' Bulletins issued.

The Technical Builders' Bulletin is organized so that its section numbers and titles correspond to those of Part 9 of the National Building Code of Canada. For example, Section 26, THERMAL INSULATION AND VAPOUR BARRIERS, of the Technical Builders' Bulletin corresponds to Section 9.26. of the same name of the National Building Code. The requirements are to be read together.

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The Technical Builders' Bulletin comprises design and durability-related requirements that go beyond the scope of the National Building Code of Canada and that are considered necessary for new residential construction financed by mortgage loans insured under the National Housing Act.

In 1986, CMHC requirements formerly contained in the publication "Residential Standards 1980" were integrated into the Technical Builders' Bulletin. There were no substantive changes to the requirements although some revisions were made to render this document more compatible with the National Building Code of Canada. **This document is to be used in conjunction with the relevant requirements of the National Building Code of Canada 1985.**

The requirements in this document apply to residential buildings regardless of size except that Sections 9, 23, 33, 34 and 36 apply to buildings not exceeding 3 storeys in building height nor 600 m^2 in area on any storey.

The requirements in this document apply only to residential occupancies. Where buildings contain a major, non-residential occupancy, the relevant requirements in the National Building Code of Canada must be applied.

Comments, criticisms and suggestions for the improvement of this document are welcomed and should be addressed to: The Director, Professional Standards Division, Canada Mortgage and Housing Corporation, 682 Montreal Road, Ottawa, Ontario, K1A OP7.

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1. GENERAL

1.1 STANDARDS OF CONSTRUCTION PRESCRIBED BY CMHC

(1) Canada Mortgage and Housing Corporation has adopted the National Building Code of Canada 1985 as its basic standard of construction. Additional design and durability-related requirements for new construction are published in the Technical Builders' Bulletin. These and other documents are described briefly as follows:

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To Order: Publication Sales
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Ottawa, Canada
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To Order: CMHC Publications
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(2) "Builders' Requirements for Obtaining NHA-Insured Mortgages", NHA 5062 06/84 is a booklet published by CMHC to inform applicants, designers and builders of the technical requirements for obtaining mortgages insured under the National Housing Act.

(3) Information regarding other CMHC publications containing requirements for specific NHA programs may be obtained from CMHC offices.

1.2 **FACTORY-BUILT HOUSING**

(1) Factory-built housing, except mobile homes, shall comply with the requirements of the National Building Code of Canada 1985 and the Technical Builders' Bulletin.

(2) Certification by the Canadian Standards Association (CSA) of compliance with CSA A277-M1981, "Procedure for Certification of Factory-Built Houses" will be considered equivalent to CMHC "ready-for-lath" inspections.

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(4) Except as required in (5), site preparation, foundations and anchorage of mobile homes shall conform to CAN3-Z240.10.1-M86, "Recommended Practice for Site Preparation, Foundation and Anchorage of Mobile Homes".

(5) Where provincial or municipal authorities have adopted regulations for site preparation, foundation and anchorage of mobile homes, such regulations shall take precedence.

1.3 **FLOATING HOMES**

(1) Where municipal requirements for floating homes exist, and are more stringent than the requirements of this section, they shall be complied with.

(2) Floating homes shall be limited to single-family dwellings not exceeding three storeys in building height.

(3) Superstructures of floating homes shall conform to Part 9 of the National Building Code of Canada and to the appropriate requirements of this Technical Builders' Bulletin.

(4) Superstructures of floating homes shall be anchored to the float structure with corrosion-resistant anchor bolts installed in accordance with Article 9.23.6.2 of the National Building Code of Canada 1985 or by equivalent means.

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(5) Float structures shall be designed and inspected by an engineer or architect skilled in such design and licensed to practice in the province or territory concerned.

(6) Notwithstanding (5), float structures shall comply with the following general criteria.

(a) Float structures shall be designed individually for each house type, location and loading condition.

(b) Float structures shall be designed to resist all reasonably-anticipated loads including loads such as those imposed by moving and launching, wave action, tides, wind, current and loads imposed by vessels and walkways moored to the structure.

(c) Floats shall be of a positive-flotation design and, for floats of cast-in-place concrete, shall be constructed in accordance with the principles found in the American Concrete Institute publication, ACI 357.2R-88, "State-of-the-Art Report on Barge-Like Concrete Structures".

(d) Concrete compressive strength shall be a minimum of 28 MPa after 28 days, shall have air entrainment of 5 to 8 per cent and reinforcing steel shall be epoxy-coated.

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Amendment 13 - 1989-12-01 1.4

(f) Flotation material shall be protected from mechanical damage due to chafing and floating debris.

(g) All exterior, nominally-horizontal surfaces shall be designed to prevent ponding of water. Downpipes and scuppers shall be provided as necessary.

(h) The top surface of exterior decks shall be separated from the bottom plate of exterior walls by a vertical distance of at least 50 mm to prevent water from penetrating the dwelling unit.

(i) Design freeboard, under the most severe combination of design loads, shall be not less than 100 mm.

(j) Minimum freeboard (the distance from the waterline to the top surface of the lowest deck), under full design load, shall be not less than 450 mm.

(k) Provision shall be made for levelling the float structure at any time during its life.

(l) Decks and walkways, except those at, or near water level, shall be provided with guards and handrails in accordance with Section 9.9 of the National Building Code of Canada 1985.

(m) Walkways serving individual dwelling units shall be designed to be stable under all anticipated loads, including those imposed by moving heavy appliances and furniture.

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1.3 FLOATING HOMES (Cont'd)

(7) Flashing of galvanized steel, or other acceptable material that is resistant to corrosion by salt water, shall be installed behind the wall sheathing membrane and shall extend upward a minimum of 200 mm vertically from the bottom plate of the exterior wall.

(8) Connections of floating homes to mooring piles, walkways and other structures shall be designed to accommodate movement due to tide and wave action.

(9) All exposed fasteners, fittings and materials used in float structures and superstructures of floating homes shall be of material resistant to corrosion by salt water.

(10) Where municipal regulations do not address piling, mooring piles shall be designed to resist all anticipated loads including those imposed by vessels moored to the float structure.

1.4 ADVISORY PUBLICATIONS

(1) CMHC publishes advisory documents on a wide range of housing-related subjects. A catalogue, including a listing of videotaped productions, is available, without cost, from local CMHC offices or by writing to:

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Amendment 9 - 1986-05-30 2.1

3. MATERIALS, SYSTEMS AND EQUIPMENT

3.1 GENERAL

(1) Materials, systems and equipment shall possess the essential properties to perform their intended functions.

(2) When required by the authority having jurisdiction, materials, systems or equipment shall be tested to determine the suitability for the intended use.

(3) Except as provided in (5), the test method used to determine the suitability of materials, systems or equipment shall be one that is published by a recognized agency.

(4) Materials, systems and equipment not specifically described herein, or which vary from the specific requirements of this Technical Builders' Bulletin or the National Building Code of Canada 1985, or for which no recognized test procedure has been established, may be used if it can be shown that the material, system or equipment is suitable on the basis of past performance, or good engineering practice or on the basis of tests described in Sentence (5).

(5) Where no published test method exists, the tests shall be designed to simulate or exceed anticipated service conditions or shall be designed to compare the performance of the material, system or equipment with similar material, system or equipment that is known to be acceptable.

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Amendment 12 - 1988-10-20 3.2

4. STRUCTURAL REQUIREMENTS

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5. ROOM AND SPACE DIMENSIONS

5.1 KITCHENS WITHIN DWELLING UNITS

(1) At least 900 mm clearance shall be provided in front of base cabinets, work surfaces, counter tops and appliances.

(2) Except as provided in (3), every dwelling unit shall have a kitchen counter at least 550 mm in depth providing at least 1.35 m^2 of work surface, including the area occupied by the sink, and 1.8 lineal metres of cabinet front. Counter work surface depth greater than 550 mm shall not be included in calculating the required area.

(3) Every bachelor dwelling unit shall have a kitchen counter at least 550 mm in depth providing at least 1.0 m^2 of work surface, including the area occupied by the sink, and 900 lineal millimetres of cabinet front. Counter work surface depth greater than 550 mm shall not be included in calculating the required area.

(4) In bachelor dwelling units, the shelf area required in (5) may be reduced to 1.5 m^2, with 1.1 m^2 of this area to be at least 280 mm in depth, and with at least 210 mm min. clearance between shelves.

(5) In addition to the base cabinets described in (2), at least 2 m^2 of shelf area not more than 2 m above the floor shall be provided. Of this area, 1.5 m^2 shall be at least 280 mm in depth with at least 210 mm clearance above the shelves. The remaining 0.55 m^2 shall have a depth of at least 130 mm with at least 130 mm clearance above the shelf. The maximum depth for computing shelf areas shall be 280 mm.

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Amendment 9 - 1986-05-30 5.1

5.2 BUILT-IN BEDROOM CABINETS

(1) A built-in cabinet in the first bedroom shall provide at least 0.75 m^3 of storage within 1.5 m of the floor when the bedroom is less than 9.8 m^2.

(2) A built-in cabinet in other than the first bedroom shall provide at least 0.35 m^3 of storage within 1.5 m of the floor when the bedroom area is less than 7 m^2.

(3) Built-in cabinets shall consist of shelves with door fronts or drawers.

(4) When required cabinet storage is by means of shelves, at least 2.5 m^2 shall be provided for the first bedroom and 1.25 m^2 for additional bedrooms. Shelves shall be at least 300 mm but not more than 450 mm in depth. The distance between shelves shall be not less than $\frac{1}{2}$ the depth.

(5) When required cabinet storage is provided by drawers, the drawers shall be not more than 1.2 m wide, not more than 300 mm in height and not more than 600 mm in depth.

5.3 COAT AND CLOTHES CLOSETS

(1) At least 1 clothes closet shall be provided in each bedroom.

(2) At least 1 coat closet shall be provided convenient to an entrance.

(3) Coat and clothes closets shall have at least 0.55 m^2 of floor area. At least 50 per cent of the required area shall be horizontal and not

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5.3 **COAT AND CLOTHES CLOSETS (Cont'd)**

more than 300 mm above the room floor level. Such closets shall have a minimum height of 2 m over the required floor area.

(4) Walk-in closets shall have at least 2 m head room over the required area.

(5) Coat and clothes closets shall be at least 550 mm deep when the width of the opening is at least 530 mm, and at least 350 mm deep when the opening is 1.2 m wide or more.

(6) A shelf not less than 280 mm deep with a clearance of not less than 200 mm above it shall be provided in coat and clothes closets.

5.4 **LINEN CLOSETS**

(1) A linen closet shall be provided in each dwelling unit and shall have a shelf area of not less than 0.55 m^2 for 1- and 2-bedroom dwelling units. Additional shelf area of 0.2 m^2 shall be provided for each additional bedroom.

(2) The maximum depth of shelf to be used in calculating the shelf area shall be 600 mm.

(3) Shelves shall have not less than 350 mm depth, 450 mm width and 300 mm clearance above shelves.

5.5 **BATHROOM AND WATER-CLOSET ROOMS**

(1) A janitor's toilet room shall be provided adjacent to the boiler room (or other work room) in an apartment building when a dwelling unit is not provided for the janitor.

5.3 **COAT AND CLOTHES CLOSETS (Cont'd)**

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5.5 **BATHROOM AND WATER-CLOSET ROOMS (Cont'd)**

(2) At least 530 mm clearance shall be provided in front of the tub or shower stall to an opposite wall face or 450 mm in front to another fixture, over at least a 600 mm length of the bathtub or shower.

(3) The centreline of the water closet shall be at least 380 mm away from an adjacent side wall and from a vanity. At least 450 mm clearance shall be provided in front of the water closet to the opposite wall or another fixture.

(4) The centreline of a lavatory shall be at least 380 mm from and adjacent side wall. At least 530 mm clearance shall be provided in front of the lavatory to an opposite wall or 450 mm clearance in front to another fixture.

(5) A mirror not less than 300 mm by 450 mm in size shall be installed over each lavatory in bathrooms and washrooms. Such mirrors shall conform to Type 1B-polished plate or float glass for high-humidity use in CAN2-12.5-M76, "Mirrors, Silvered," and shall be so labelled.

(6) Wall cabinets shall be at least 230 mm in height or width and be at least 0.15 m^2 in overall size. Cabinets shall be equipped with shelves. Where wall cabinets are not provided, equivalent shelf space shall be provided in a lockable vanity.

(7) Except for bachelor dwelling units, at least 1 bathroom access that does not enter through a bedroom shall be provided to the required bathroom.

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5.5 **BATHROOM AND WATER-CLOSET ROOMS (Cont'd)**

(2) At least 530 mm clearance shall be provided in front of the tub or shower stall to an opposite wall face or 450 mm in front to another fixture, over at least a 600 mm length of the bathtub or shower.

(3) The centreline of the water closet shall be at least 380 mm away from an adjacent side wall and from a vanity. At least 450 mm clearance shall be provided in front of the water closet to the opposite wall or another fixture.

(4) The centreline of a lavatory shall be at least 380 mm from and adjacent side wall. At least 530 mm clearance shall be provided in front of the lavatory to an opposite wall or 450 mm clearance in front to another fixture.

(5) A mirror not less than 300 mm by 450 mm in size shall be installed over each lavatory in bathrooms and washrooms. Such mirrors shall conform to Type 1B-polished plate or float glass for high-humidity use in CAN2-12.5-M76, "Mirrors, Silvered," and shall be so labelled.

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(7) Except for bachelor dwelling units, at least 1 bathroom access that does not enter through a bedroom shall be provided to the required bathroom.

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5.6 **HALLWAYS**

(1) The width of a main vestibule shall be at least 1.1 m.

5.7 **LAUNDRY AND LAUNDRY SPACE**

(1) A clearance of at least 900 mm shall be provided at the front of an automatic washer or dryer.

(2) Where an automatic washer or dryer is not provided, a space to accommodate such equipment shall be provided. Each automatic washer or dryer shall be assumed to occupy a space of a least 760 mm in width and 710 mm in depth, with a clear space of at least 900 mm in front of the equipment.

(3) Where laundry facilities are shared, the laundry space described in Sentence (2) shall be provided for each 20 dwelling units or fraction thereof.

5.8 **GENERAL STORAGE**

(1) Except as provided in (2) and (3), every dwelling unit shall have at least 5.65 m^3 of storage plus at least 2.12 m^3 for each bedroom. Such storage space shall have at least 1.8 m height over at least 50 per cent of the required space and at least 1.2 m height over the remainder of the required space. Required storage space shall be separate from finished areas, and access to such storage space shall be independent from other dwelling units.

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5.8 **GENERAL STORAGE (Cont'd)**

(2) In a building equipped with an elevator, at least 5.65 m^3 of storage conforming to the requirements in (1) shall be provided for each dwelling unit.

(3) Where a portion of the required storage space consists of communal storage as described in (4), the required independent storage space for each dwelling unit may be reduced to 4.25 m^3 for a dwelling unit with not more than 1 bedroom plus 0.85 m^3 for each additional bedroom. Such storage space shall be at least 1.8 m in height and at least 600 mm in depth. When located with a dwelling unit such storage shall be separated from other space. When located outside a dwelling unit the storage space for each dwelling unit shall be in a separate lockable enclosure with direct and convenient access.

(4) Communal storage referred to in (3) shall consist of at least 5.5 m^2 when such storage serves not more than 10 dwelling units plus an additional 0.55 m^2 for each dwelling unit in excess of 10, except that such storage need not exceed 22 m^2.

5.8 **GENERAL STORAGE (Cont'd)**

(2) In a building equipped with an elevator, at least 5.65 m^3 of storage conforming to the requirements in (1) shall be provided for each dwelling unit.

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(4) Communal storage referred to in (3) shall consist of at least 5.5 m^2 when such storage serves not more than 10 dwelling units plus an additional 0.55 m^2 for each dwelling unit in excess of 10, except that such storage need not exceed 22 m^2.

6. DOORS

6.1 ACCESS FOR DISABLED PERSONS

(1) Thresholds in access routes constructed to accommodate physically disabled persons shall be not greater than 13 mm in height, and shall be sloped to facilitate the passage of wheelchairs.

(2) Doorways through which access is required to facilitate the passage of wheelchairs and doorways to bathrooms, water-closet rooms and shower rooms in dwelling units required to accommodate physically disabled persons shall provide a clear opening with the door in the open position of at least 760 mm in width.

6.2 REQUIRED DOORS

(1) A door shall be provided at each entrance to a bedroom and a room containing a water pump.

6.3 INTERIOR WOOD DOORS

(1) The construction of interior doors shall conform to CSA 0132.2, "Wood Doors."

(2) Interior wood doors in dwelling units other than closet doors or cupboard doors shall be at least 35 mm thick.

(3) Interior wood doors to rooms or spaces used for storage, laundry, drying, vestibules, recreation or water closets in apartment buildings but not within dwelling units shall be at least 45 mm thick.

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6.4 EXTERIOR DOORS

(1) Exterior doors shall provide thermal resistance of at least RSI-0.7 except that, where a storm door is provided, any type of door satisfying the other requirements of this section may be used. Where no storm door is provided all openings in exterior doors shall be double-glazed.

(2) Except where doors are weather stripped on all edges and protected with a storm door, exterior swing type door assemblies shall have a rate of air infiltration not exceeding 6.35 dm^3/s for each square metre of door area when tested at a pressure differential of 75 Pa in conformance with ASTM E283-73, "Standard Method of Test for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors".

(3) Patio type sliding glass doors shall have a rate of air infiltration not exceeding 2.5 dm^3/s for each square metre of door area when tested in conformance with ASTM E283-73.

(4) Exterior wood doors shall be at least 45 mm thick, except that doors for secondary entrances serving single dwelling units or balconies may be 35 mm thick if of solid wood, solid core or stile and rail construction.

(5) Storm or combination doors shall be at least 35 mm thick for wood doors and 25 mm for metal doors.

(6) Weatherstripping of metal, plastic, rubber, wood or fabric or combination of these materials shall be installed at the perimeter of all exterior door openings.

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6.4 EXTERIOR DOORS (Cont'd)

(7) Where an exterior door opening is not completely protected from wind blown snow or rain, it shall be provided with a sill that slopes to the exterior and the sill caulked with suitable caulking to prevent the entry of water.

(8) Wood door frames shall be one of the species indicated in Clause 3.1.1. of CSA O132.1, "Wood Windows". Allowable defects shall not exceed those described in Clause 3.2.1. of the same Standard. Such frames shall be treated with preservatives in accordance with Clauses 5.2 and 5.3 of CSA O132.1, "Wood Windows."

(9) Steel frames for exterior doors shall be painted with a rust inhibitive paint or otherwise treated before erection to prevent corrosion. Such frames shall incorporate a thermal break to prevent a through metal path from the interior to the exterior.

(10) A thermal break shall be incorporated in metal door frames where 2 doors are provided, or in the metal double glazing frame where a single door is provided, to reduce the risk of surface condensation on the frame.

6.5 GARAGE DOORS

(1) Garage doors shall be not less than 2.44 m wide for 1-car width and 4.27 m wide for 2-car width. The height of the clear opening with the door in the open position shall be not less than 1.93 m. For parking garages, garage doors shall be not less than 3.05 m wide for 1-way traffic and 4.88 m for 2-way traffic. Hardware

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6.5 **GARAGE DOORS (Cont'd)**

associated with the operation of garage doors shall not project more than 100 mm into the garage door opening.

(2) Wood doors shall be at least 44 mm thick in side hinged or 1-piece overhead and not less than 35 mm thick if sectional overhead.

(3) Steel and aluminum doors shall be made with suitably braced frames clad with not less than 0.61 mm galvanized steel prepared for paint or 0.81 mm thick aluminum.

(4) Overhead doors shall have suitable springs or counterbalances and weather stops.

(5) Side hinged doors shall be equipped with hinges to carry, without sagging, the weight of the door.

(6) Garage doors shall be equipped with locks.

6.6 **DOOR HARDWARE**

(1) Hinges for exterior doors shall consist of "18-8" stainless steel; or brass or bronze of a type conforming to CGSB 69-GP-1M, "Hinges, Hardware, Builders," equipped with ball bearings; or steel, electroplated with 0.013 mm zinc or cadmium and chromate treated; or steel, pretreated and primed for painting in accordance with CGSB 69-GP-1M, "Hinges, Hardware, Builders."

(2) Except as provided in (4), all doors shall be hung with a least three 89 mm by 89 mm solid butt hinges at least 2.5 mm thick.

6.5 **GARAGE DOORS (Cont'd)**

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(2) Except as provided in (4), all doors shall be hung with a least three 89 mm by 89 mm solid butt hinges at least 2.5 mm thick.

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(3) Hinges for interior doors shall be the same as required in (1), except that bronze or brass hinges need not be ball-bearing type or they may be of steel, plated with chrome, brass, bronze, nickel or cadmium in accordance with CGSB 69-GP-1M, "Hinges, Hardware, Builders."

(4) Interior swing type doors within dwelling units shall be hung with at least two 76 mm by 76 mm solid butt hinges at least 2.0 mm thick.

(5) Screws, bolts and other fastening devices for use with door hinges shall be made from materials compatible with and having the same finish as the door hinges.

(6) All exterior doors to a dwelling unit shall be fitted with devices capable of locking the door from either side and capable of being unlocked from the inside without the use of a key, except that exterior doors in addition to the required doors need not be capable of being locked from the outside. Exterior doors to balconies more than 1.8 m above grade shall be designed not to lock automatically.

(7) Additional requirements for exit door hardware shall be as described in Section 9.9.6. of the National Building Code of Canada 1985.

(8) Door stops shall be provided wherever necessary to prevent damage to interior wall finish.

6.6 DOOR HARDWARE (Cont'd)

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7. WINDOWS AND SKYLIGHTS

7.1 GENERAL

(1) The total glazed area including glazing in windows and doors in all exterior surfaces of a dwelling unit shall not exceed 15 per cent of the total building area (as defined in Section 1.3. of the National Building Code of Canada 1985) of the storey served by the glazed areas.

Note: Under certain conditions specified in Article 3.3.6 of the "Measures for Energy Conservation in New Buildings 1978", south-facing windows may be assumed to have 50 per cent of their actual area for the purpose of determining compliance with this requirement.

(2) Triple-glazed windows used in areas where the degree-days are 6500 or less may be assumed to have 67 per cent of their actual area for purposes of determining compliance with (1).

(3) A total glazed area in excess of that permitted in (1) may be used where the thermal resistance of one or more other elements of the building enclosure is increased beyond the minimum required in Section 26, so that the total calculated heat loss from the building enclosure does not exceed the heat loss that would result if the requirements of (1) and Section 26 were followed. The allowance for south-facing windows as specified in Article 3.3.6 of the "Measures", does not apply for this calculation.

. Loan applicants must provide calculations with loan applications to support such an increase.

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. Loan applicants must provide calculations with loan applications to support such an increase.

(4) Except as provided in (5), double-glazing shall be provided for each window between heated space and unheated space or the exterior.

(5) Where a building is located in an area exceeding 6500 degree days, exterior windows shall be triple-glazed or double-glazed insulating glass units incorporating a low-emissivity (low E) layer.

(6) Double-glazing required in (4) shall be double windows or factory-sealed double-glazed units in a single window.

(7) Triple-glazing required in (5) shall be triple-glazed, factory-sealed units or double-glazed, factory-sealed units plus a storm sash. Sealed double-glazed or triple-glazed units shall have at least a 6 mm air space between panes.

(8) Conventional insulating glass units manufactured to the CGSB Standard CAN2-12.8-M76 must be certified by the Insulated Glass Manufacturers' Association of Canada (IGMAC). Each unit shall be identified permanently on the spacer bar or glass with the following information:

(1) IGMAC
(2) the manufacturer's name or an abbreviation approved by IGMAC
(3) the location of the manufacturing plant or an abbreviation approved by IGMAC
(4) the year of manufacture

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7.1 GENERAL (Cont'd)

(4) Except as provided in (5), double-glazing shall be provided for each window between heated space and unheated space or the exterior.

(5) Where a building is located in an area exceeding 6500 degree days, exterior windows shall be triple-glazed or double-glazed insulating glass units incorporating a low-emissivity (low E) layer.

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7.1 **GENERAL (Cont'd)**

Unconventional insulating glass units incorporating heat reflective or absorbing films, non-metallic spacer bars or other innovations may be required to be evaluated by CMHC.

(9) A thermal break shall be incorporated in metal window frames to reduce the risk of condensation on the frame.

(10) Where the January design temperature on a $2\frac{1}{2}$ per cent basis, determined in accordance with "The Supplement to the National Building Code of Canada 1985", is minus 12°C or higher, a thermal break will not be required in metal window and sliding door frames and in the double-glazing sash of single metal windows and sliding doors.

(11) Air infiltration of exterior windows shall not exceed 0.775 dm^3/s for each metre of sash crack when tested at a pressure differential of 75 Pa in conformance with ASTM E283-73 "Standard Method of Test for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors".

(12) Window frames shall be constructed to permit the installation of screens and storm sash, except that where double glazing is provided, provisions may be made for the installation of screens only.

7.2 **WINDOW HARDWARE**

(1) Material for window hinges shall conform to the requirements in Subsection 6.6.(1) for door hinges.

7.1 **GENERAL (Cont'd)**

Unconventional insulating glass units incorporating heat reflective or absorbing films, non-metallic spacer bars or other innovations may be required to be evaluated by CMHC.

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7.2 **WINDOW HARDWARE**

(1) Material for window hinges shall conform to the requirements in Subsection 6.6.(1) for door hinges.

7.2 **WINDOW HARDWARE (Cont'd)**

(2) Every openable window shall be equipped with corrosion-resistant locking devices controlled from the interior.

(3) Either the upper or lower sash of vertical sliding wood sash windows shall be balanced. An unbalanced upper sash shall be fixed in position by means of a block or other sash holding device.

(4) Corrosion-resistant sash lifts shall be provided for vertical sliding sash.

(5) Hinged sash in other than unfinished basements shall be equipped with devices to hold the sash in any position.

7.2 **WINDOW HARDWARE (Cont'd)**

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8. STAIRS, RAMPS, HANDRAILS AND GUARDS

8.1 PEDESTRIAN RAMPS

(1) Where ramps are installed for use by persons in wheelchairs, such ramps shall be at least 870 mm in width and have nonslip surfaces.

(2) Ramps described in (1) shall have a level area of at least 1.5 m by 1.5 m at the top and bottom of the ramp, except that where a doorway at the top of a ramp swings away from the ramp, the depth of the level area at the top of the ramp may be reduced to 870 mm. The level portion at the top of a ramp shall extend at least 300 mm beyond the latch edge of any door.

(3) Where there is an abrupt change in the direction of a ramp described in (1), or where the ramp exceeds 9 m in length, it shall have a level landing at least 1.2 m long, and at least the same width as the ramp at intervals of not more than 9 m.

8.2 HANDRAILS

(1) Where ramps are required to provide access for persons in wheelchairs, a handrail shall be provided on at least one side of the ramp where the slope of the ramp exceeds 1 in 20, and on two sides where the slope exceeds 1 in 12. Such handrails shall conform to Subsection 9.8.7. of the National Building Code of Canada 1985 and shall extend at least 300 mm beyond the top and bottom of the ramp in a manner that will not constitute a hazard.

8. STAIRS, RAMPS, HANDRAILS AND GUARDS

8.1 PEDESTRIAN RAMPS

(1) Where ramps are installed for use by persons in wheelchairs, such ramps shall be at least 870 mm in width and have nonslip surfaces.

(2) Ramps described in (1) shall have a level area of at least 1.5 m by 1.5 m at the top and bottom of the ramp, except that where a doorway at the top of a ramp swings away from the ramp, the depth of the level area at the top of the ramp may be reduced to 870 mm. The level portion at the top of a ramp shall extend at least 300 mm beyond the latch edge of any door.

(3) Where there is an abrupt change in the direction of a ramp described in (1), or where the ramp exceeds 9 m in length, it shall have a level landing at least 1.2 m long, and at least the same width as the ramp at intervals of not more than 9 m.

8.2 HANDRAILS

(1) Where ramps are required to provide access for persons in wheelchairs, a handrail shall be provided on at least one side of the ramp where the slope of the ramp exceeds 1 in 20, and on two sides where the slope exceeds 1 in 12. Such handrails shall conform to Subsection 9.8.7. of the National Building Code of Canada 1985 and shall extend at least 300 mm beyond the top and bottom of the ramp in a manner that will not constitute a hazard.

9. MEANS OF EGRESS

Refer to Section 9.9 of the National Building Code of Canada 1985 for egress requirements.

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Refer to Section 9.9 of the National Building Code of Canada 1985 for egress requirements.

Amendment 11 - 1987-09-11 9.1

10. FIRE PROTECTION

10.1 CHUTES AND VERTICAL SHAFTS

(1) At least 1 refuse chute shall be provided in every building exceeding 3 storeys in building height.

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Amendment 11 - 1987-09-11 10.1

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11. SOUND CONTROL

11.1 FRAME

(1) All joints in frame fire or sound separations shall be caulked where gaps may develop due to shrinkage or movement of framing members, e.g., between the subfloor and the bottom plate.

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12. EXCAVATION

Refer to Section 9.12 of the National Building Code of Canada 1985 for excavation requirements.

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Refer to Section 9.12 of the National Building Code of Canada 1985 for excavation requirements.

Amendment 9 - 1986-05-30 12.1

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13. WATERPROOFING AND DAMPPROOFING

Refer to Section 9.13 of the National Building Code of Canada 1985 for waterproofing and dampproofing requirements.

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Refer to Section 9.13 of the National Building Code of Canada 1985 for waterproofing and dampproofing requirements.

Amendment 9 - 1986-05-30 13.1

14. DRAINAGE

14.1 SURFACE DRAINAGE

(1) Adequate surface water drainage shall be provided over the entire building site.

(2) Where the grading will result in the collection of surface water on the site, catch basins to carry such surface water from the site shall be installed, or other acceptable methods of drainage used to dispose of surface water without soil erosion. Surface drainage shall be directed away from the location of a water supply, well or septic tank disposal bed.

(3) Driveways, walkways, terraces, retaining walls or other construction shall not be constructed to interfere with the flow of surface drainage.

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(3) Driveways, walkways, terraces, retaining walls or other construction shall not be constructed to interfere with the flow of surface drainage.

Amendment 9 - 1986-05-30 14.1

15. FOOTINGS AND FOUNDATIONS

15.1 FOUNDATIONS ON PERMAFROST

(1) The natural ground cover and trees over a construction area shall not be removed without permission of the authority having jurisdiction.

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Amendment 9 - 1986-05-30 15.1

16. **SLABS-ON-GROUND**

See Section 9.16 of the National Building Code of Canada 1985 for requirements for slabs-on-ground.

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See Section 9.16 of the National Building Code of Canada 1985 for requirements for slabs-on-ground.

Amendment 9 - 1986-05-30 16.1

17. **COLUMNS**

See Section 9.17 of the National Building Code of Canada 1985 for requirements for columns.

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See Section 9.17 of the National Building Code of Canada 1985 for requirements for columns.

Amendment 9 - 1986-05-30 17.1

18. CRAWL SPACES

See Section 9.18 of the National Building Code of Canada 1985 for requirements for crawl spaces.

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See Section 9.18 of the National Building Code of Canada 1985 for requirements for crawl spaces.

Amendment 9 - 1986-05-30 18.1

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19. **ROOF SPACES**

See Section 9.19 of the National Building Code of Canada 1985 for requirements for roof spaces.

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19. **ROOF SPACES**

See Section 9.19 of the National Building Code of Canada 1985 for requirements for roof spaces.

Amendment 9 - 1986-05-30 19.1

20. ABOVE-GRADE MASONRY

See Section 9.20 of the National Building Code of Canada 1985 for requirements for above-grade masonry.

20. ABOVE-GRADE MASONRY

See Section 9.20 of the National Building Code of Canada 1985 for requirements for above-grade masonry.

Amendment 9 - 1986-05-30 20.1

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21. CHIMNEYS AND FLUES

See Section 9.21 of the National Building Code of Canada 1985 for requirements for chimneys and flues.

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See Section 9.21 of the National Building Code of Canada 1985 for requirements for chimneys and flues.

Amendment 9 - 1986-05-30 21.1

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22. FIREPLACES

See Section 9.22 of the National Building Code of Canada 1985 for requirements for fireplaces.

22. FIREPLACES

See Section 9.22 of the National Building Code of Canada 1985 for requirements for fireplaces.

Amendment 9 - 1986-05-30 22.1

23. WOOD-FRAME CONSTRUCTION

23.1 FLOOR JOISTS

(1) Alternative means of achieving comparable stiffness to that provided by multiple bridging as required by Subsection 9.23.9.7. of the National Building Code of Canada 1985 may be used provided its performance is established by test or other evidence acceptable to CMHC. More information on this subject is contained in Information Report OPX51, dated 30 April 1973, which can be obtained from either:

FORINTEK CANADA CORPORATION
EASTERN FOREST PRODUCTS LABORATORY
800 Montreal Road
Ottawa, Ontario
K1A 3Z5

OR

FORINTEK CANADA CORPORATION
WESTERN FOREST PRODUCTS LABORATORY
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V6T 1X2

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24. POST, BEAM AND PLANK CONSTRUCTION

See Section 9.24 of the National Building Code of Canada 1985 for requirements for post, beam and plank construction.

24. POST, BEAM AND PLANK CONSTRUCTION

See Section 9.24 of the National Building Code of Canada 1985 for requirements for post, beam and plank construction.

Amendment 9 - 1986-05-30 24.1

25. SHEET STEEL STUD WALL FRAMING

See Section 9.25 of the National Building Code of Canada 1985 for requirements for sheet steel stud wall framing.

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See Section 9.25 of the National Building Code of Canada 1985 for requirements for sheet steel stud wall framing.

Amendment 9 - 1986-05-30 25.1

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26. THERMAL INSULATION AND VAPOUR BARRIERS

26.1 SCOPE

(1) For buildings up to and including 3 storeys in building height and having a gross area not exceeding 600 m^2, the loan applicant has the choice of using the "Measures for Energy Conservation in New Buildings 1978", NRCC No. 16574 as published or the requirements contained in this section. Where the requirements of the local authority having jurisdiction are more stringent, they must take precedence. For buildings more than 3 storeys in building height or having a gross area exceeding 600 m^2, the "Measures" shall apply as published. "Gross Area" means the aggregate area of all floors including and above the first storey.

(2) This Section, which is to be used in conjunction with Section 9.26 of the National Building Code of Canada, applies to the thermal insulation of buildings of residential occupancy intended for use on a continuing basis during the winter months.

26.2 MATERIALS

(1) Insulating materials shall conform to the following standards:

- CSA A101-M1983, "Thermal Insulation, Mineral Fibre for Buildings";
- CSA A247-M1978, "Insulating Fibreboard Sheathing";
- CAN/CGSB-51.20 M86 "Thermal Insulation, Polystyrene Boards and Pipe Covering";

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Amendment 12 - 1988-10-20 26.1

26.2 **MATERIALS (Cont'd)**

- CGSB 51-GP-21M (1978), "Thermal Insulation, Urethane and Isocyanurate, Unfaced";
- CAN/CGSB-51.26 M86 "Thermal Insulation, Urethane and Isocyanurate, Boards, Faced";
- CGSB 51-GP-25M 1978 "Thermal Insulation, Phenolic, Faced";
- CGSB 51-GP-27M, "Thermal Insulation, Polystyrene, Loose Fill";
- CGSB 51-GP-60M (1979) and amendment No. 1, September 1980, "Thermal Insulation, Cellulose Fibre, Loose Fill".

(2) Polyethylene sheet for vapour barriers shall meet the requirements of CAN/CGSB-51.34-M86 and be so certified and listed by the Canadian General Standards Board.

26.3 **AREAS TO BE INSULATED**

(1) The upper part of foundation walls enclosing heated space shall be insulated from the underside of the subfloor to not less than 600 mm below the adjacent finished ground level. Hollow masonry foundation walls shall be insulated for their full height or shall have their cores blocked at the level of the bottom of the insulation.

(2) Where garages are to be heated during the winter months, insulation shall be incorporated into the exterior walls, ceiling or roof assembly of the garage and the construction separating the garage from a dwelling unit.

26.2 **MATERIALS (Cont'd)**

- CGSB 51-GP-21M (1978), "Thermal Insulation, Urethane and Isocyanurate, Unfaced";
- CAN/CGSB-51.26 M86 "Thermal Insulation, Urethane and Isocyanurate, Boards, Faced";
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(2) Where garages are to be heated during the winter months, insulation shall be incorporated into the exterior walls, ceiling or roof assembly of the garage and the construction separating the garage from a dwelling unit.

(3) Access doors and hatches between heated spaces and unheated crawl spaces and roof spaces shall be insulated to achieve at least 50 per cent of the required thermal resistance of the floor, wall or ceiling in which they are located.

(4) Except as provided in (5) and (7), the thermal resistance (RSI) value for the various building assemblies which are required to be insulated, excluding doors and windows, shall conform to Table 26A.

(5) Mobile homes, up to 4.3 m in width, designed to provide the thermal-resistance values required in this bulletin for 6500 degree-days are acceptable in all regions of Canada.

(6) The edges of slabs supported on ground at or near grade level in heated buildings shall be insulated to not less than 600 mm below exterior grade level.

(7) The thermal resistance of a building assembly may be reduced by not more than 20% from that required by Table 26A provided the amount of glazing is less than the maximum permitted in Article 7.1 or the thermal resistance of one or more other building assembly is greater than that required in Table 26A by an amount such that the total heat loss from the building enclosure does not exceed the loss that would result if the requirements of Article 7.1 and Table 26A were followed. In no case shall the thermal resistance for above grade walls and roof/ceilings assemblies be less than RSI-2.5 and RSI-4.7 respectively.

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26.3 AREAS TO BE INSULATED (Cont'd)

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The allowance for south-facing windows as specified in Article 3.3.6 of the "Measures", does not apply for this calculation.

Glazing may not be reduced below the minima in Table 9.7.1.A. of the National Building Code of Canada 1985.

Loan applicants must provide calculations with the loan applications to support such reductions in RSI values.

(8) The junction between the sill plate and the foundation, and other locations where there is a possibility of air leakage into heated space such as around service entrances, shall be caulked or otherwise designed to minimize air leakage.

26.3 AREAS TO BE INSULATED (Cont'd)

The allowance for south-facing windows as specified in Article 3.3.6 of the "Measures", does not apply for this calculation.

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Amendment 12 - 1988-10-20 26.4

TABLE 26A
MINIMUM THERMAL RESISTANCE (RSI VALUE)(1) FOR BUILDING ASSEMBLIES
IN BUILDINGS UP TO AND INCLUDING 3 STOREYS IN
BUILDING HEIGHT AND HAVING A GROSS AREA NOT EXCEEDING 600 m^2

Maximum No. of Degree-days (2)	Foundation Walls Less than 50% Exposed Above Grade (3)	Foundation Walls 50% or more Exposed Above Grade (3)	Perimeter Insulation Around Slabs-on-Grade		Floors	Above Grade Walls	Roof/Ceilings (4)
			Slabs Without Heating	Slabs Incorporating Heating			
3500	1.5	2.5	0.8	1.3	4.7	2.5	4.7
5000	1.5	3.0	1.3	1.7	4.7	3.0	5.6
6500	1.5	3.4	1.7	2.1	4.7	3.4	6.4
8000 (5)	1.5	3.7	2.1	2.5	4.7	3.7	7.1

Notes to Table 26A

(1) Refers to the overall thermal resistance of the various building assemblies. The effects of framing and furring members may be disregarded in calculating thermal resistance. RSI values are in $m^2°C/W$.
(2) Degree-days for various geographical locations are listed in "The Supplement to the NBC of Canada 1985". Where the "degree-days" for a particular area is different from those listed, interpolation between listed values is permitted to obtain the required RSI value.
(3) Percentage of exposure is determined by area considering each wall individually. Where a foundation wall consists of various portions of different types of construction (e.g., poured concrete plus wood frame), percentage of exposure shall be calculated individually for each portion and the minimum RSI value so determined shall apply to that portion only.
(4) Thermal resistance may be reduced near the eaves to the extent made necessary by the roof slope and required ventilation clearances but the minimum thermal resistance at a point directly above the inner surface of the exterior wall shall be not less than RSI-2.1.
(5) Values listed are acceptable for areas with more than 8000 degree-days but higher thermal resistance is recommended for these areas.

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(5) Values listed are acceptable for areas with more than 8000 degree-days but higher thermal resistance is recommended for these areas.

26.4 **EXCEPTIONS**

(1) Where the calculated value for an assembly is within RSI-0.05 of the specified minimum value, the assembly will be considered to have met that minimum.

Note: This tolerance is intended to account for the lack of precision available in determination of the degree-day value for a particular area. It will also permit the use of traditional construction methods for basement wall insulation.

(2) In certain areas of Canada, such as western Canada, stucco is a traditional form of exterior cladding for wood framed housing. However, because of the relatively low "RSI" value assigned to stucco, a wall assembly incorporating stucco may be marginally below a required "RSI" value. Therefore, to permit its continued use, a wall assembly with stucco as the exterior cladding will be acceptable provided that the thermal resistance of the wall is within RSI-0.07 of the required value.

(3) In areas with degree-days less than 3500 a thermal resistance value of RSI-2.43 will be acceptable for walls above ground.

26.5 **INSTALLATION OF INSULATION**

(1) At least 25 per cent of the thermal resistance of a steel stud wall shall be provided in a form which is continuous over either the exterior or interior flanges unless the studs have been specifically designed to provide heat transfer characteristics similar to those of wood studs.

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26.6 FOAMED PLASTIC INSULATION APPLIED TO THE OUTSIDE OF WALLS

(1) Lightweight cellular plastic insulation may be applied to the outside of wood-frame, steel-frame and plank frame walls subject to the following conditions:

(a) The product must be listed in CMHC's "Manual of Building Materials Evaluation Reports";

(b) In walls with no sheathing, lightweight cellular plastic insulation may be considered as a substitute for one of the two required layers of sheathing paper. In any case, at least one layer of sheathing paper shall be installed on the outer surface of the lightweight cellular plastic insulation;

(c) Lightweight cellular plastic insulation shall not be considered as a substitute for sheathing in terms of providing bracing, but can be considered to provide backing for exterior cladding, where required, if installed in the following minimum thicknesses:

- Expanded Polystyrene complying with CAN/CGSB-51.20 M86, "Thermal Insulation, Polystyrene Boards and Pipe Covering".

  Type 1 - 38 mm
  Type 2 - 38 mm
  Type 3 - 25.4 mm
  Type 4 - 25.4 mm

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- Urethane and isocyanurate complying with CAN/CGSB-51.26 M86, "Thermal Insulation, Urethane and Isocyanurate, Boards, Faced".

  Type 1 - 38 mm
  Type 2 - 38 mm
  Type 3 - 25.4 mm
  Type 4 - 25.4 mm

(d) Where lightweight cellular plastic insulation is considered as a substitute for sheathing in terms of backing, it shall be fastened to framing at not less than 150 mm centres along its vertical edges and on not less than a 300 mm x 600 mm grid for the remainder of each sheet. Fasteners shall have heads or washers at least 12.7 mm in diameter where the cladding is applied directly against the insulation and at least 25.4 mm in diameter where there is an air space between the insulation and the cladding;

(e) Cladding materials, including brick ties, shall be fastened through the lightweight cellular plastic insulation into framing or shall be fastened to strapping which has been fastened through the lightweight cellular plastic insulation into the framing;

26.6 **FOAMED PLASTIC INSULATION APPLIED TO THE OUTSIDE OF WALLS (Cont'd)**

- Urethane and isocyanurate complying with CAN/CGSB-51.26 M86, "Thermal Insulation, Urethane and Isocyanurate, Boards, Faced".

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26.6 FOAMED PLASTIC INSULATION APPLIED TO THE OUTSIDE OF WALLS (Cont'd)

(f) Not less than 200 mm clearance shall be provided between the finished ground level and the lightweight cellular plastic insulation unless it is a type which has been listed by The Canadian Construction Materials Centre, in its Manual of Building Materials Evaluation Reports for use as "perimeter insulation";

(g) All spaces between studs shall be completely filled with batt-type insulation.

26.7 THERMAL RESISTANCE VALUES FOR VARIOUS MATERIALS

(1) The values recognized by CMHC for specific products are given in the Manual of Building Materials Evaluation Reports which is available for examination at CMHC offices or the "Manual" may be purchased on a subscription basis.

Information on subscription rates can be obtained by contacting The Canadian Construction Materials Centre, Institute for Research in Construction, National Research Council Canada, Montreal Road, Ottawa, Ontario, K1A OR6.

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27. ROOFING

27.1 DOWNSPOUTS AND EAVESTROUGHS

(1) Sheet metal eavestroughs, where provided, shall be not less than 0.41 mm thick galvanized sheet steel, 0.43 mm thick copper or 0.51 mm thick aluminum. Sheet metal downspouts shall be not less than 0.36 mm thick galvanized sheet steel, 0.38 mm thick copper or 0.46 mm thick aluminum.

(2) Rigid poly vinyl chloride (PVC) eavestroughs, where provided, shall be not less than 1.9 mm in thickness. PVC downspouts shall be not less than 1.8 mm in thickness.

(3) Wood gutters and downspouts, where provided, shall be of durable species or treated with an acceptable wood preservative.

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Amendment 11 - 1987-09-11 27.1

28. SIDING

28.1 EXTERIOR CEILINGS AND SOFFITS

(1) Where provided, ceilings for carports, galleries and porches and eave soffits shall be at least 9.5 mm lumber, 6 mm plywood, 6 mm hardboard or 3.2 mm asbestos-cement board on supports spaced not more than 600 mm o.c. Waferboard used for soffits shall be at least 7.9 mm thick on supports spaced not more than 400 mm o.c. and 9.5 mm thick for supports spaced not more than 600 mm o.c. Other acceptable material may also be used.

(2) Exterior ceilings and soffits shall be fastened with corrosion-resistant nails.

Exterior wood trim shall be one of the species mentioned in Clause 3.1.1. of CSA 0132.1-1975, "Wood Windows." The defects in the lumber shall not exceed those permitted in Clause 3.2.1. of CSA 0132.1-1975, "Wood Windows."

28.2 WOOD TRIM

(1) Wood trim shall be fastened with corrosion-resistant casing or finishing nails.

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Amendment 9 - 1986-05-30 28.1

29. **STUCCO**

Refer to Section 9.29 of the National Building Code of Canada 1985 for requirements for stucco.

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Refer to Section 9.29 of the National Building Code of Canada 1985 for requirements for stucco.

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30. INTERIOR WALL AND CEILING FINISHES

30.1 GYPSUM BOARD FINISH (TAPED JOINTS)

(1) Nail heads and screw heads shall be covered with a suitable filler.

(2) Surfaces to receive tape shall be clean, and torn paper or loose material shall be removed. Openings greater than 3 mm shall be filled with patching plaster that is allowed to dry before joint tape cement is applied.

(3) External corners shall be protected with corrosion-resistant metal corner beads or wood mouldings.

(4) A band of joint cement about 120 mm wide shall be applied along the joints to embed the tape. The tape shall be smoothed out and excess cement removed with a suitable spreader tool.

(5) After the cement has dried, a second layer of cement shall be applied so that it completely covers the tape. The edges of the cement shall be feathered to provide a band about 200 mm wide where the joints are recessed and 250 mm wide where the joints are not recessed.

(6) After the second layer is dry, a third layer of cement shall be applied and feathered to provide a band about 250 mm wide where the joints are recessed and 400 mm wide where the joints are not recessed.

(7) After the third layer of cement has dried, all rough and uneven areas shall be sanded to provide a smooth even surface.

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(7) After the third layer of cement has dried, all rough and uneven areas shall be sanded to provide a smooth even surface.

30.2 INTERIOR TRIM

(1) Interior trim shall be provided where necessary to cover unprotected edges of friable wall finishes or where the junction of 2 surfaces is not finished to provide an acceptable appearance.

(2) Trim shall be made of wood, metal, plastic or other acceptable material.

(3) Steel trim shall be primed with a rust-inhibitive paint before installation or otherwise treated to prevent corrosion.

(4) Aluminum mouldings shall be treated with a protective coating when in contact with masonry, plaster, mortar or concrete.

(5) Wood trim shall be smooth, clean, sound stock suitable for finishing. Moisture content at the time of installation shall not exceed 12 per cent.

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Amendment 9 - 1986-05-30 30.2

31. FLOORING

31.1 RESILIENT FLOORING

(1) Resilient flooring shall conform to one of the following:

CSA A100-1962, "Asphalt Floor Tile,"
CSA A146-1965, "Linoleum Products,"
CSA A126.1-M1984, "Vinyl Asbestos and Vinyl Composition Floor Tile,"
CSA A126.2-M1984, "High Vinyl Floor Tile,"
CSA A126.3-M1984, "Sheet Vinyl Flooring Products,"
CSA A126.4-M1984, "Rubber Floor Tile."

31.2 CERAMIC TILE

(1) When set in a mortar bed the bed shall be not less than 30 mm thick. Asphalt sheathing paper, felt or polyethylene film shall be applied under the mortar bed when the mortar is applied over wood subfloors. The mortar shall consist of 1 part portland cement to not more than 1/4 part lime to not less than 3 nor more than 5 parts of aggregate per part of cementitious material by volume. The tile shall be soaked before installation and pressed firmly into place while the mortar is still plastic. The mortar shall be compressed into the tile joints and the joints tooled the same day the tile is installed. Where no spacers are provided the joints shall not exceed 2 mm in width.

(2) Ceramic tile installed with an adhesive shall be applied over a smooth base of concrete or over a panel-type underlay as described in Subsection 9.31.2. of the National Building Code of Canada 1985, except that particleboard

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31.2 **CERAMIC TILE (Cont'd)**

shall meet the exterior bond and test requirements for Grade N-1 or N-2 board in CAN3-0188.1-M78, "Interior Mat-Formed Wood Particleboard." The adhesive shall be applied to both the base and the tile.

31.3 **CARPETING**

(1) Carpeting shall not be used as a finish flooring in kitchens, bathrooms, washrooms, laundry areas or other areas where excessive amounts of water are likely to be encountered unless accepted.

(2) When carpeting is used it shall be laid over concrete or panel-type subflooring or over lumber subflooring covered with a panel-type underlay conforming to Subsection 9.31.2. of the National Building Code of Canada 1985.

(3) Carpeting shall conform to the following specification:
CGSB 4-GP-161M(1978), "Carpets for Residential Use."

(4) A carpet underlay shall be provided beneath the carpeting. This shall consist of a felt type weighing not less than 1.08 kg/m^2 conforming to CGSB 4-GP-36M(1978), "Carpet Underlay, Fibre Type," Type I, II or III, or sponge or foam type conforming to CGSB 20-GP-23M(1978), "Cushion, Carpet: Flexible Polymeric Material," at least 5 mm thick for Type I and 6 mm thick for Type II or III.

31.2 **CERAMIC TILE (Cont'd)**

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31.4 FELTED-SYNTHETIC-FIBRE FLOOR COVERINGS

(1) Felted-synthetic-fibre floor coverings may be used in all rooms and spaces. When a felted-synthetic-fibre floor covering is used, it shall be laid over concrete or panel-type subflooring or over lumber subflooring covered with a panel-type underlay conforming to Subsection 9.31.2. of the National Building Code of Canada 1985.

(2) A carpet underlay shall not be used beneath felted-synthetic-fibre floor coverings in those areas where carpeting is not permitted (see 31.3).

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32. PLUMBING FACILITIES

32.1 GENERAL

(1) Fixture clearance shall conform to the requirements in Section 5.

(2) Washrooms and water-closet rooms intended for common use in buildings required by Section 9.1 to be accessible to persons in wheelchairs shall conform to the appropriate requirements for public washrooms and toilet rooms in Section 3.7., "Barrier Free Design" of the National Building Code of Canada 1985.

32.2 WATER SUPPLY AND DISTRIBUTION

(1) Where individual wells deliver less than 20 L/min per dwelling unit over a 1 h period, not less than 900 L cold water storage shall be provided per dwelling unit.

32.3 REQUIRED FACILITIES

(1) Every public water-closet room shall be equipped with at least 1 water closet and 1 lavatory (see 5.5).

(2) Every janitor's water-closet room shall be equipped with 1 water closet and 1 lavatory or slop sink (see 5.5).

(3) At least 1 outside hose bib with inside shut-off valve and drain cock or other acceptable draining device shall be provided for each building and for each ground-floor dwelling unit in a building in which there is no dwelling unit above another dwelling unit. In row-housing the bibs are to be provided alternately at front and back.

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32.3 **REQUIRED FACILITIES (Cont'd)**

(4) Bathrooms in dwelling units shall be equipped with a wall cabinet or vanity, a mirror, toilet paper holder, soap dish, grab bar and towel bar. When a shower is provided, a shower rod or enclosure shall be installed.

(5) Where automatic washing machines are provided, there shall be at least 1 machine for every 20 dwelling units.

(6) Where automatic clothes dryers are provided there shall be at least 1 domestic size dryer for every 20 dwelling units, or commercial dryers providing equivalent capacity shall be provided.

32.4 **SERVICE WATER HEATING FACILITIES**

(1) Tanks for service water heaters shall be glass lined in conformance with CSA C309-1977, "Performance Requirements for Glass-lined Storage Tanks for Household Hot Water Service," or be lined with at least 9.5 mm of hydraulic cement covering the inside of the tank without voids, or be constructed of materials capable of providing a minimum service life of 10 years with the kind of water encountered.

(2) Central storage tanks for service water heaters serving more than 1 dwelling unit may consist of non-galvanized steel rated at not less than 860 kPa water pressure.

32.3 **REQUIRED FACILITIES (Cont'd)**

(4) Bathrooms in dwelling units shall be equipped with a wall cabinet or vanity, a mirror, toilet paper holder, soap dish, grab bar and towel bar. When a shower is provided, a shower rod or enclosure shall be installed.

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TABLE 32A--ELECTRIC SERVICE WATER HEATERS, STORAGE TYPE

No. of Bath-rooms(1)	No. of Bed-rooms	Min. Tank Capacity, L	Minimum Wattage of Elements		
			Single Element Type	Dual Element Type (nonsimultaneous operation)	
				Primary Element	Secondary Element
1	1 or 2	90	1 000	750	1 000
	3 or 4	135	1 500	1 000	1 000
2	2 or 3	180	2 000	1 000	1 000
	4 or 5	180	2 500	1 000	3 000
Column 1	2	3	4	5	6

Note to Table 32A:

(1) Rooms containing a shower or bathtub.

(3) The minimum storage tank capacity and watt input for electric storage type service water heaters serving individual dwelling units shall conform to Table 32A. Other combinations of tank capacity and element wattage may be used where it can be shown that such combinations will provide an equivalent supply of hot water.

(4) The minimum storage and heating capacity of nonelectric storage type service water heaters for individual dwelling units shall conform to Table 32B. Other combinations of tank capacity and recovery rates may be used where it can be shown that such combinations will provide an equivalent supply of hot water.

32.4 SERVICE WATER HEATING FACILITIES (Cont'd)

TABLE 32A--ELECTRIC SERVICE WATER HEATERS, STORAGE TYPE

No. of Bath-rooms(1)	No. of Bed-rooms	Min. Tank Capacity, L	Minimum Wattage of Elements		
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1	1 or 2	90	1 000	750	1 000
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(4) The minimum storage and heating capacity of nonelectric storage type service water heaters for individual dwelling units shall conform to Table 32B. Other combinations of tank capacity and recovery rates may be used where it can be shown that such combinations will provide an equivalent supply of hot water.

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TABLE 32B--NONELECTRIC SERVICE WATER HEATERS, STORAGE TYPE

No. of Bathrooms(1)	No. of Bedrooms	Min. Tank Capacity, L	Minimum Heating Capacity, L raised 55°C in 1 h
1	1 or 2	60	55
	3 or 4	70	55
2	2 or 3	100	70
	4 or 5	135	95
Column 1	2	3	4

Note to Table 32B:

(1) Rooms containing a shower or bathtub.

TABLE 32C--MINIMUM HEATING CAPACITY
(L/h at 55°C temperature rise)

Max. No. of Dwelling Units(1)	Min. Storage Capacity per Dwelling Unit, (2)					
	0 Instantaneous	25	50	75	100	125
3	1 330	130	111	96	84	74
5	1 540	215	185	157	137	122
10	1 780	435	371	315	274	231
15	1 950	646	557	472	410	347
20	2 110	865	739	627	542	466
25	2 260	1 040	1 010	755	655	559
30	2 430	1 220	1 040	885	764	655
40	2 730	1 520	1 300	1 100	950	807
50	3 070	1 770	1 500	1 270	1 090	935
60	3 410	2 000	1 690	1 420	1 210	–
80	3 980	2 320	1 940	1 590	–	–
100	4 360	2 420	1 990	–	–	–
150	5 270	2 530	–	–	–	–
200	6 050	3 360	–	–	–	–
250	6 820	–	–	–	–	–
300	7 590	–	–	–	–	–
Column 1	2	3	4	5	6	7

Notes to Table 32C:

(1) For numbers of dwelling units not listed, interpolations may be made to determine recovery capacity.
(2) For storage capacities not listed, interpolations may be made to determine recovery capacity.

32.4 SERVICE WATER HEATING FACILITIES (Cont'd)

TABLE 32B--NONELECTRIC SERVICE WATER HEATERS, STORAGE TYPE

No. of Bathrooms(1)	No. of Bedrooms	Min. Tank Capacity, L	Minimum Heating Capacity, L raised 55°C in 1 h
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(2) For storage capacities not listed, interpolations may be made to determine recovery capacity.

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32.4 **SERVICE WATER HEATING FACILITIES (Cont'd)**

(5) The minimum heating capacity in litres per hour raised through 55°C for instantaneous or tankless heaters serving individual dwelling units shall be 650 for dwelling units with 1 bathroom and 1 100 for dwelling units with 2 bathrooms.

(6) Service water heaters of any type serving more than 1 dwelling unit shall have a minimum heating capacity in litres per hour raised through 55°C conforming to Table 32C.

(7) Storage tanks for service water heaters shall be insulated with mineral wool, cellular asbestos or other acceptable material.

32.5 **SEWAGE DISPOSAL**

(1) Where a piped water supply is provided, every laundry room or space shall have a waste connection for the disposal of laundry water.

32.4 **SERVICE WATER HEATING FACILITIES (Cont'd)**

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33. VENTILATION

33.1 CLOTHES DRYER EXHAUST

(1) A suitable opening to the exterior of sufficient size to accept the exhaust of all anticipated clothes dryers shall be provided. The opening shall be capped with a removable closure when not required for immediate use.

33.2 MECHANICAL VENTILATION SYSTEMS

(1) **BACKGROUND**

The National Building Code of Canada 1985 requires, in subsection 9.33.3., that dwelling units be provided with a mechanical ventilation system capable of providing at least **one-half air change per hour.** A subsequent clause (9.33.3.3) requires that "...provision for introduction of **fresh make-up air** from the exterior" be made. An explanation in Appendix A to the NBC makes it clear that the required system is to be independent of "natural sources including windows and air infiltration." In effect, the building envelope is to be considered airtight.

This section includes requirements for exhaust and make-up air systems proposed for use in single and multiple-unit residential buildings where exhaust and make-up air systems serve not more than one dwelling unit. Systems serving more than one dwelling unit must be designed by a professional competent and licenced to perform such work. **Ventilation systems meeting the requirements of the R-2000 Program, sponsored by Energy, Mines and Resources Canada and delivered by the Canadian Home Builders' Association will be considered to meet the requirements of this section.**

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(2) **INTRODUCTION**

The requirement of the NBC 1985 for mechanical ventilation and make-up air systems capable of providing one-half air change per hour requires interpretation by the user. Professional design of such systems is, of course, the preferred option but may be onerous for small builders and would place a burden of verification on inspectors and plans examiners. In addition, designs might be proposed that do not consider the interaction of ventilation systems with other system in the house - principally heating systems that are subject to back-drafting. It is important to establish a benchmark to indicate the minimum level of performance expected by CMHC. These requirements, therefore, include general criteria and, for those who do not wish to employ a professional designer, tables to match fan capacity to duct layout and house size.

The basis of the fan-sizing table (Table 33.2.A.) is that fan capacity must equal the pressure drop due to friction and fittings in the duct system at the required rate of air flow. The values in Table 33.2.A. were determined using a standard ASHRAE Equal-Friction chart, taking into account flow reductions due to duct length and elbows, grilles and other fittings. A number of assumptions and simplifications were made to minimize the number of calculations necessary. These simplifications are justified in that the requirement for one-half air change per hour is somewhat arbitrary and the design assumes the house to be airtight which is rarely the case.

33.2 MECHANICAL VENTILATION SYSTEMS (Cont'd)

(2) **INTRODUCTION**

The requirement of the NBC 1985 for mechanical ventilation and make-up air systems capable of providing one-half air change per hour requires interpretation by the user. Professional design of such systems is, of course, the preferred option but may be onerous for small builders and would place a burden of verification on inspectors and plans examiners. In addition, designs might be proposed that do not consider the interaction of ventilation systems with other system in the house - principally heating systems that are subject to back-drafting. It is important to establish a benchmark to indicate the minimum level of performance expected by CMHC. These requirements, therefore, include general criteria and, for those who do not wish to employ a professional designer, tables to match fan capacity to duct layout and house size.

The basis of the fan-sizing table (Table 33.2.A.) is that fan capacity must equal the pressure drop due to friction and fittings in the duct system at the required rate of air flow. The values in Table 33.2.A. were determined using a standard ASHRAE Equal-Friction chart, taking into account flow reductions due to duct length and elbows, grilles and other fittings. A number of assumptions and simplifications were made to minimize the number of calculations necessary. These simplifications are justified in that the requirement for one-half air change per hour is somewhat arbitrary and the design assumes the house to be airtight which is rarely the case.

The Table 33.2.A. is limited in scope to a range of air flows of 20-100 L/s (50-200 CFM) which would satisfy the requirements of most houses. Translation of duct length and fittings into an "equivalent duct length" is simplified by dividing duct systems into low, medium and high resistance groupings.

A range of values in the table are in bold-face type to indicate combinations that are recommended for the most efficient performance. Of course, optimum performance will be achieved by making more precise calculations using recognized air-flow principles.

(3) **DEFINITIONS**

(a) Make-up air supply - Fresh air drawn into a dwelling unit to replace air exhausted to the exterior by a mechanical exhaust system.

(b) Stack effect - The tendency of air to flow out of the upper portions of a dwelling unit due to the buoyancy of warmer, less dense air in the dwelling unit as compared to the exterior air.

33.2 MECHANICAL VENTILATION SYSTEMS (Cont'd)

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(c) Naturally-aspirated, fuel-burning appliance - For purposes of this section, space-heating or water-heating equipment, including solid-fuel-burning equipment, that is vulnerable to spillage of combustion products into a dwelling unit. This includes equipment where combustion takes place within the dwelling unit, and where combustion products are intended to vent to the exterior without mechanical aid.

(4) **GENERAL PERFORMANCE CRITERIA**

(a) Fans in exhaust or make-up air systems shall be rated for flow at an external static pressure closely equivalent to the pressure drop of the duct system used. Table 33.2.A may be used to determine the required external static pressure rating. Alternatively, a more accurate determination may be made by matching fan capacity to system pressure loss using recognized air flow principles.

Ratings assigned to fans by manufacturers shall be determined in accordance with "Laboratory Methods of Testing Fans for Rating Purposes", published by the Air Moving and Control Association (AMCA).

33.2 MECHANICAL VENTILATION SYSTEMS (Cont'd)

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(b) Duct work shall be installed in accordance with the standards of the "Sheet Metal and Air-Conditioning Contractors' National Association" (SMACNA).

(c) Make-up air systems shall be capable of matching the demand of all exhaust equipment regardless of wind and stack-effect pressures.

(d) Special-purpose air-exhausting equipment such as central vacuum-cleaning systems, indoor barbeque ranges or clothes dryers shall not be considered to satisfy the requirement for mechanical ventilation.

(e) Systems designed to provide combustion air for fuel-burning equipment shall not be used to supply make-up air for ventilation systems, unless designed to serve both functions simultaneously.

(f) Make-up air shall be introduced into dwelling units at a location and temperature that will not be perceived as a "draft" and cause discomfort to occupants.

(g) Make-up air systems shall be designed to prevent or accommodate the formation of condensation or frost on components of the system.

(h) Inlets for make-up air shall be located so that contaminants, such as automobile exhaust, products of combustion from fuel-burning appliances and stale air from exhaust outlets, are not drawn into the dwelling unit.

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33.2 MECHANICAL VENTILATION SYSTEMS (Cont'd)

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(h) Inlets for make-up air shall be located so that contaminants, such as automobile exhaust, products of combustion from fuel-burning appliances and stale air from exhaust outlets, are not drawn into the dwelling unit.

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(i) In calculating the volume of a dwelling unit as a basis for required air flow, basements capable of being converted to habitable space are to be included.

(5) **DETAILED REQUIREMENTS**

(a) Dwelling units containing no naturally-aspirated, fuel-burning appliances may employ either fan-forced or passive systems to supply make-up air for mechanical exhaust systems.

(b) Dwelling units containing naturally-aspirated, fuel-burning appliances shall be provided with a fan-forced make-up air supply.

(c) Air-exhausting devices, in dwelling units in (b), any one of which is rated at more than 75 litres per second (160 cubic feet per minute) at an external static pressure of 50 pascals (0.2 inches water column), shall be provided with a separate fan-forced make-up air supply of equivalent capacity.

(d) Rooms or spaces containing either exhaust inlets only or make-up air outlets only shall not be sealed off, by means of tightly-fitting doors, from other rooms or spaces within the dwelling unit.

33.2 MECHANICAL VENTILATION SYSTEMS (Cont'd)

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TABLE 33.2.A

(IMPERIAL UNITS)

REQUIRED EXTERNAL STATIC PRESSURE* (INCHES WATER COLUMN)

Required Air Flow (CFM)	DUCT DIAMETER (or rectangular duct having similar cross-sectional area)														
	4 in.			5 in.			6 in.			7 in.			8 in.		
	(i) A	(ii) B	(iii) C	A	B	C	A	B	C	A	B	C	A	B	C
50-60	.10	.19	.45	.03	.06	.15		.02	.06						
61-70	.13	.26		.04	.08	.21	.02	.03	.08			.04			
71-80	.18	.35		.06	.12	.30	.02	.05	.11		.02	.05			.03
81-90	.22	.44		.07	.15	.36	.03	.06	.15		.03	.07			.04
91-100				.09	.18	.45	.04	.07	.18		.03	.08			.04
101-120				.11	.22		.05	.09	.22		.04	.10		.02	.05
121-140				.16	.31		.07	.13	.33	.03	.06	.14		.03	.07
141-160				.20	.40		.08	.17	.43	.04	.08	.19		.04	.10
161-180							.09	.22		.05	.10	.25	.03	.05	.13
181-200							.13	.26		.06	.13	.31	.03	.06	.16

(i) low-resistance duct system having no elbows and with straight, smooth duct not exceeding 20 feet ** in length (maximum calculated equivalent duct length of 50 feet.)

(ii) medium-resistance duct system having not more than two 90° elbows or equivalent restrictions and straight, smooth duct not exceeding 50 feet ** in length (maximum calculated equivalent duct length of 100 feet).

(iii) high-resistance duct system having more than two 90° elbows or equivalent restrictions (maximum calculated equivalent duct length of 250 feet).

IMPORTANT NOTES

* Friction losses of fan housings (0.04 inches water column) and at grilles (0.06 inches water column) must be added to the required external static pressure values determined in accordance with Table 33.2.A. This is intended to allow flexibility in the use of this table where multiple-branch duct systems are installed - some having a fan and others having a grille.

** For flexible ducting designed for use in air-handling systems, divide the allowable length by 2.

External static pressure values in bold-face type are recommended for more satisfactory performance of the system.

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	(i) A	(ii) B	(iii) C	A	B	C	A	B	C	A	B	C	A	B	C
50-60	.10	.19	.45	.03	.06	.15		.02	.06						
61-70	.13	.26		.04	.08	.21	.02	.03	.08			.04			
71-80	.18	.35		.06	.12	.30	.02	.05	.11		.02	.05			.03
81-90	.22	.44		.07	.15	.36	.03	.06	.15		.03	.07			.04
91-100				.09	.18	.45	.04	.07	.18		.03	.08			.04
101-120				.11	.22		.05	.09	.22		.04	.10		.02	.05
121-140				.16	.31		.07	.13	.33	.03	.06	.14		.03	.07
141-160				.20	.40		.08	.17	.43	.04	.08	.19		.04	.10
161-180							.09	.22		.05	.10	.25	.03	.05	.13
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(ii) medium-resistance duct system having not more than two 90° elbows or equivalent restrictions and straight, smooth duct not exceeding 50 feet ** in length (maximum calculated equivalent duct length of 100 feet).

(iii) high-resistance duct system having more than two 90° elbows or equivalent restrictions (maximum calculated equivalent duct length of 250 feet).

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(SYSTÈME INTERNATIONAL (SI) UNITS)

REQUIRED EXTERNAL STATIC PRESSURE* (PASCALS)

Required Air Flow (L/s)	DUCT DIAMETER (or rectangular duct having similar cross-sectional area)														
	102 mm			127 mm			152 mm			178 mm			203 mm		
	A (i)	B(ii)	C(iii)	A	B	C	A	B	C	A	B	C	A	B	C
20-30	**18**	**36**	90	6	12	28		5	13						
31-40	**38**	**76**		12	24	60	5	10	26		5	13			
41-50	**63**	126		21	42	105	9	18	45		9	23			11
51-60	95			33	66		13	27	67	7	14	34		7	17
61-70				45	90		19	38	94	10	19	47		9	22
71-80				60	120		26	51	128	13	26	64	6	12	29
81-90				75			33	66		17	33	83	8	15	38
91-100				96			38	75		20	39	98	9	19	47

(i) low-resistance duct system having no elbows and with straight, smooth duct not exceeding 6 metres** in length (maximum calculated equivalent duct length of 15 metres.)

(ii) medium-resistance duct system having not more than two 90° elbows or equivalent restrictions and with straight, smooth duct not exceeding 15 metres ** in length (maximum calculated equivalent duct lentgh of 30 metres).

(iii) high-resistance duct system having more than two 90° elbows or equivalent restrictions (maximum calculated equivalent duct length of 75 metres).

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34. HEATING AND AIR-CONDITIONING

34.1 SUPPLY OUTLETS FOR WARM-AIR DUCTS

(1) Supply outlets shall be provided near the exterior dwelling unit where such entrances are not heated by warm air from the basement.

34.2 SOLAR HEATING EQUIPMENT

(1) CMHC is prepared to finance or insure loans on housing incorporating solar heating systems where:

(a) the dwelling unit or units, including the solar heating or equipment, meet all applicable lending requirements;

(b) the solar heating is designed and intended for space heating and/or domestic hot water heating only. Heating of swimming pools and cooling equipment of any type will not be considered in the lending value;

(c) the solar heating system is designed or verified by a professional engineer skilled in such design;

(d) changes to the building fabric to incorporate the solar heating system, such as roof truss design to carry the additional load of the solar collectors, are designed or verified by a professional engineer skilled in such design; and

(e) the solar collector performance has been verified by an independent testing agency acceptable to CMHC.

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(e) the solar collector performance has been verified by an independent testing agency acceptable to CMHC.

(2) Five copies of the following information must also be included with the loan application:

(a) system design drawings and installation details bearing the professional seal and signature of an engineer licensed to practice in Canada;

(b) verified solar collector performance data;

(c) calculations for the thermal performance of the system, and heating requirements of the building where applicable;

(d) estimates of the life of the system and maintenance and operating costs;

(e) site layout drawing details;

(f) placement and orientation of collectors;

(g) location and height of existing buildings, fences, trees and other obstructions to the south of the collector panel location; and

(h) zoning of land in the immediate vicinity of the site.

(3) Systems will be evaluated and their lending value determined by the ability of the systems to supply energy over the expected life of the system. It is expected that the lending value established for the system will normally be substantially less than the installed cost of the system.

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34.3 THERMOSTATIC CONTROLS

(1) Except for a dwelling unit heated by a coal or wood-burning appliance which is contained within the dwelling unit, the air temperature shall be controlled by a thermostat in each temperature controlled zone. Each dwelling unit shall be considered to be a separate temperature controlled zone.

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35. ELECTRICAL FACILITIES

Refer to Section 9.35 of the National Building Code of Canada 1985 for requirements for electrical facilities.

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Refer to Section 9.35 of the National Building Code of Canada 1985 for requirements for electrical facilities.

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36. GARAGES AND CARPORTS

36.1 SCOPE

(1) Garage door requirements shall conform to the appropriate requirements in Subsection 6.5.

(2) Insulation of heated garages shall conform to the requirements in Secton 9.26. of the National Building Code of Canada 1985.

36.2 DIMENSIONS

(1) Garages and carports shall have a clear inside length of not less than 6.1 m.

(2) Garages and carports shall have a clear inside width of at least 3.05 m for single car parking, except that where a door in a side wall of a garage swings into the garage or where there is a doorway in a wall between the house or apartment building and the carport, the inside width shall be at least 3.35 m. At least 2.5 m additional clear width shall be provided for each additional car. Where a garage or carport is divided by columns or walls, the dimensions of each section shall conform to the preceding requirements. Measurements shall be taken 200 mm from the floor.

(3) Door heights shall conform to 6.5.

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(3) Door heights shall conform to 6.5.

37. ELEVATORS

37.1 GENERAL

(1) At least 1 elevator shall be accessible to and usable by persons in wheelchairs at the entrance level and all levels normally used by the occupants.

37.2 NUMBER OF ELEVATORS

(1) Except as provided in (2) and (3), at least 1 elevator shall be provided in every building which has dwelling units above the third storey and in buildings in which the vertical distance from the ground level at the main entrance door and floor of the the uppermost dwelling unit exceeds 7.3 m. Where there are exterior stairs or a platform at the main entrance, such vertical distance shall be measured to the bottom of the stair or platform.

(2) At least 2 elevators shall be provided in buildings which have more than 3 dwelling units on the seventh or higher storey, or where the vertical distance between the main entrance door and the floor of the uppermost dwelling unit exceeds 15.2 m. Where there are exterior stairs or a platform at the main entrance, such vertical distance shall be measured to the bottom of the stair or platform.

(3) At least 1 elevator shall be provided in every building which is specifically designed to accommodate elderly persons above the second storey, or where the vertical distance from the ground level at the main entrance door to the uppermost floor level designed to accommodate elderly persons exceeds 4.5 m. Where there are

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exterior stairs or a platform at the main entrance, such vertical distance shall be measured to the bottom of the stair or platform.

37.3 ELEVATOR CAPACITY

(1) The elevators shall have a carrying capacity of not less than 7 per cent of the total building occupant load in 5 min.

(2) The total building occupant load shall be calculated on the basis of 2 persons per bedroom or combination room with sleeping facilities excluding the ground elevator terminal floor.

(3) At least 1 elevator in each building with dwelling units on 7 or more floors shall have a minimum capacity of 900 kg.

37.4 ELEVATOR SPEED

(1) Elevator speeds shall be designed to provide a maximum time interval of 80 s for 2 or more elevators. For single elevator installations the maximum time interval shall be 150 s.

(2) Elevator speed shall be not less than 1 m/s for buildings of more than 10 storeys in building height.

37.5 CONTROLS

(1) In 1-, 2- or 3-car installations, the system shall be not less than simplex, duplex or triplex down collective control, respectively.

37.2 NUMBER OF ELEVATORS (Cont'd)

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37.5 **CONTROLS (Cont'd)**

(2) Hydraulic elevators shall have full electric control and operation.

(3) Where an elevator is required to accommodate physically disabled persons, the uppermost button in the elevator cab control panel shall be not more than 1.5 m above the elevator cab floor.

37.5 **CONTROLS (Cont'd)**

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38. PAINTING

38.1 GENERAL

(1) Paints, other protective coatings and materials for mixing and thinning shall conform to appropriate standards of the Canadian General Standards Board or shall be of a type acceptable to the authority having jurisdiction.

(2) Surfaces that are to be finished shall be free from dirt, grease, asphalt or other foreign material that may harm the finish. If a wood surface is to be painted, a prime coat shall be applied to it, exposed open defects shall be filled with putty or other suitable filler and knots or other resinous areas shall be sealed with suitable knot sealer or aluminum paint.

(3) Paints or other finishes shall be applied at a temperature of not less than 5°C.

38.2 EXTERIOR PAINTING

(1) Except for cedar and redwood, all exposed exterior materials subject to deterioration in their unprotected state, such as wood (including the tops and bottoms of wood doors), hardboard and ferrous metal shall be painted or otherwise suitably treated.

(2) Exterior metal that is to be painted shall receive at least 1 coat of suitable primer plus 2 finish coats of exterior paint.

38. PAINTING

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38.3 **INTERIOR PAINTING**

(1) Bathrooms, kitchens and laundry areas other than in unfinished basements shall be painted or otherwise suitably treated to resist damage from moisture, except that plaster need not be painted.

(2) In habitable rooms, vestibules and halls a suitable finish shall be applied to gypsum board without factory applied decorative finish, wood panelling, trim, cupboards, shelving, sash and window frames, door and door frames.

(3) A suitable finish shall be applied to handrails and stairs to basements, cellars or attics.

(4) Wood floors and stairs between floor levels with habitable rooms shall be treated with at least 1 coat of sealer plus 1 coat of wax or other suitable finish.

(5) All structural steel surfaces shall be painted to resist corrosion.

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(5) All structural steel surfaces shall be painted to resist corrosion.

39. WALKWAYS, DRIVEWAYS AND PARKING AREAS

39.1 PARKING AREAS

(1) Except when equivalent parking is provided in garages or carports, a parking area for the storage of at least 1 car per dwelling unit shall be provided for buildings containing 1 or 2 dwelling units, or provision shall be made on the property for suitable access to and a space for a future parking area, garage or carport.

(2) Except when equivalent parking is provided in garages or carports, at least 1 parking space for each dwelling unit in a building containing more than 2 dwelling units shall be provided on the property. Such parking areas shall not be located so as to impair the view from living rooms, entrances or front yards and shall be at least 6 m away from windows for living rooms, dining rooms, bedrooms or kitchens below grade.

(3) Parking areas shall be at least 6.1 m long and 2.5 m wide with a gradient and cross slope of not more than 60 mm/m and a minimum cross slope of 15 mm/m where the gradient is less than 15 mm/m.

(4) Depending on the angle of parking, sufficient additional space shall be provided to allow for turnout. This space shall be least 5.5 m wide, measured between rows of parked cars or from 1 row to the limit of the paved area. This space may be reduced when permitted by the authority having jurisdiction.

(5) When parking areas are surfaced, the base and topping shall conform to the appropriate requirements in 39.2 for driveways.

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(5) When parking areas are surfaced, the base and topping shall conform to the appropriate requirements in 39.2 for driveways.

(1) A space for a driveway shall be provided to a garage, carport or parking area. Where a garage or carport is provided, a driveway shall be installed to connect with the paved or travelled portion of the street or lane.

(2) Driveways serving not more than 4 dwelling units shall have a minimum width of 2.5 m, except that combined walkway-driveways shall be at least 3 m wide. Two paved ribbons may be used for driveways serving a single dwelling unit provided the ribbons are at least 600 mm wide and are spaced 1.5 m o.c.

(3) Driveways serving more than 4 dwelling units shall be at least 2.5 m wide for 1-way driveways and at least 5.5 m wide for 2-way driveways.

(4) Driveways shall have a maximum cross slope of 60 mm/m and a minimum cross slope of 15 mm/m where the gradient is less than 15 mm/m.

(5) Driveways shall not be constructed on unconsolidated filled ground.

(6) The base for driveways shall be crushed stone, gravel or other coarse clean granular material.

(7) The driveway surface shall consist of stone chips, crushed stone, gravel, asphalt concrete or portland cement concrete.

(8) When the driveway surface consists of stone chips, gravel or crushed stone, the base shall be a least 150 mm thick and the surface material shall be not more than 20 mm size.

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39.2 **DRIVEWAYS (Cont'd)**

(9) When the driveway surface consists of asphalt concrete, the base material shall be at least 100 mm thick and compacted thickness of the concrete at least 40 mm thick.

(10) When the driveway surface consists of portland cement concrete, the base shall be at least 120 mm thick and the concrete at least 75 mm thick, except that the base may be omitted where the ground is solid rock, compacted sand or gravel provided the concrete is 120 mm thick. Concrete shall have at least 20 MPa compressive strength after 28 days and shall have air entrainment of 5 to 8 per cent. Construction joints shall be spaced not more than 3 m apart.

(11) Waterproofing membranes applied to roofs subject to vehicular traffic or used for parking shall be applied to the roof in a manner that will permit differential movement between the surfacing materials and the roof deck without damaging the membrane.

(12) Waterproofing membranes in (11) shall be protected against damage during construction by means of a layer of material of sufficient strength to prevent crushing under traffic loads. The wearing surface shall conform to the requirements in (9) and (10).

39.3 **WALKWAYS**

(1) Every entrance to a building except a patio door shall be served by a walkway or a system of walkways, except that not more than 2 walkways need be provided to a building. A

39.2 **DRIVEWAYS (Cont'd)**

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combined walkway-driveway may be used where the building exit serves not more than 2 dwelling units.

(2) A main walkway shall be provided from the street to the principal entrance of a building on each property.

(3) Where a garage, parking area or driveway serves a building containing more than 2 dwelling units, a main walkway shall be provided between such building and garage, parking area or driveway.

(4) All other walkways may be secondary walkways leading to main walkways or to the street.

(5) The minimum width of walkways shall conform to Table 39A.

INSERT TABLE 39A HERE

(6) Walkways shall have a maximum gradient of 100 mm/m and a maximum cross slope of 60 mm/m. When the gradient is less than 15 mm/m the minimum cross slope shall be 15 mm/m.

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39.3 **WALKWAYS (Cont'd)**

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TABLE 39A--WALKWAY WIDTHS

Type of Walkway	Maximum No. of Dwelling Units Served	Minimum Walkway Width, mm
Main walkways	4	750
	8	900
	16	1 200
	more than 16	1 500
Secondary walkways	4	600
	8	750
	16	900
	more than 16	1 200
Column 1	2	3

(6) Walkways shall have a maximum gradient of 100 mm/m and a maximum cross slope of 60 mm/m. When the gradient is less than 15 mm/m the minimum cross slope shall be 15 mm/m.

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(6) Walkways shall have a maximum gradient of 100 mm/m and a maximum cross slope of 60 mm/m. When the gradient is less than 15 mm/m the minimum cross slope shall be 15 mm/m.

(7) Where steps occur in walkways, there shall be at least 2 risers at any one location. Such steps shall have a rise of not less than 100 mm nor more than 180 mm and a minimum run of 300 mm. The product of the run and rise shall not exceed 54 000. Steps shall be as wide as the walkway and shall be provided with a handrail on one side when there are more than 3 risers.

(8) Walkways shall not be constructed over unconsolidated filled ground.

(9) Except as provided in (10), walkways shall consist of hard burned shale, clay or concrete brick, 40 mm thick smooth, durable flagstone, precast concrete, 100 mm thick portland cement concrete of at least 20 MPa strength after 28 days or 40 mm thick asphalt concrete over a granular base at least 100 mm thick. Portland cement concrete walkways shall have contraction joints spaced not more than $1\frac{1}{2}$ times the walkway width apart.

(10) Walkways serving not more than 2 dwelling units and all secondary walkways shall consist of the materials listed in (9) or shall consist of at least 75 mm of fine gravel or crushed stone.

(11) Where a roof is used for pedestrian traffic, provision shall be made to allow for differential movement between the walking surface and the roof deck in conformance with 39.2(11).

(12) The waterproofing membrane shall be protected against damage during construction in conformance with 39.2(12), and the walking surface in (11) shall conform to the requirements in (9) and (10).

39.3 WALKWAYS (Cont'd)

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40. SITE IMPROVEMENT

40.1 GENERAL

(1) Details of the drainage design for the entire building site shall be submitted for approval to the authority having jurisdiction before commencement of any building.

(2) Construction or other debris such as tree stumps or boulders shall be removed from the site before grading or any subsequent landscaping operations are commenced.

(3) All grade transitions including those associated with swales shall be gradual. Gradients exceeding 6 in 10 shall be suitably landscaped or retained to prevent soil erosion. Existing slopes which are adequately retained by trees, shrubs, turf, rock outcropping or any combinations of these will require no further treatment.

40.2 PROTECTION OF EXISTING TREES

(1) Every effort shall be made to permit the retention of existing, desirable trees.

(2) Where fill occurs around existing trees, the depth of sandy or light sandy loam cover shall not exceed 200 mm over the root area. When heavier soils are used, the depth of cover shall not exceed 150 mm. Such cover shall be kept at least 300 mm away from the tree trunk by a wall of dry stone or unmortared bricks to the depth of the cover.

(3) When a greater depth of fill is required, the entire root area shall be brought to within 150 mm of finished grade by a fill of broken

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(3) When a greater depth of fill is required, the entire root area shall be brought to within 150 mm of finished grade by a fill of broken

40.2 **PROTECTION OF EXISTING TREES (Cont'd)**

stone blinded at its surface with fine stone. The final 150 mm shall be filled with topsoil. A protective wall of stone or brick shall be provided as in (2) to the full depth of the fill, including stone.

(4) Where the grading operation lowers the grade around trees to be retained, the earth around such trees shall be undisturbed for a radius from the tree equal to approximately 2/3 of the branch spread. When such change of level exceeds 250 mm, the soil around such trees shall be contained by stone revetting or a dry stone wall or a well-formed mound extending to the branch spread.

40.3 **GRADING AND TOPSOIL**

(1) The specified lawn area, except for portions of the lot which are covered by rock outcropping, satisfactory tree, shrub or grass growth, shall be subgraded to within 100 mm of the finished lawn grade. All low points shall be filled and compacted.

(2) Where top soil is specified, it shall be reasonably free of stones and capable of supporting good agricultural growth. It shall be applied in a uniform layer to a minimum depth of 100 mm over the area disturbed by the building operation.

(3) In areas where seeding or sodding is specified, the requirement in (2) shall also apply.

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(3) In areas where seeding or sodding is specified, the requirement in (2) shall also apply.

40.4 LAWN AREAS

(1) On areas of the building site on which seeding or sodding is specified, a suitable mixture of low nitrogen, high phosphorous content commercial fertilizer shall be applied evenly and cultivated to the full depth of the topsoil at the rate recommended by the manufacturer.

(2) On areas of the building site on which seeding is specified, a Canada No. 1 mixture grade of permanent lawn grass species known to be successful in the locality shall be applied at the rate of 2 to 2.5 kg/100 m^2. The area shall then be lightly raked, rolled with a light turf roller and watered until the moisture has penetrated to a depth of at least 25 mm.

(3) On areas of the building site on which sodding is specified, sods not less than 20 mm nor more than 40 mm thick containing a good percentage of permanent lawn grass species common to the locality shall be carefully laid over topsoil which has been cultivated and raked level. Sods shall be laid evenly with no overlapping and with tightly closed joints. Immediately after sodding the ground shall be thoroughly watered to ensure a moisture penetration of 100 to 125 mm. After the soil has dried out sufficiently so that its structure will not be damaged, it shall be rolled with a medium weight roller or tamped to provide a uniform surface.

40.5 PLANTING OF TREES AND SHRUBS

(1) Where planting of trees and shrubs is specified the requirements in (2) to (8) shall apply.

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(2) Plant material shall conform to the Guide Specifications for Nursery Stock of the Canadian Nursery Trades Association. Dried out plants shall not be used.

(3) Pits for tree planting shall be at least 600 mm deep and have a diameter of at least 150 mm beyond the root spread, or a diameter not less than 12 times the diameter of the tree at 300 mm above grade.

(4) Pits for shrub planting shall be at least 400 mm deep and have a diameter at least 150 mm beyond the root spread.

(5) Approximately 3 kg of bone meal and 3 kg of activated sludge shall be thoroughly mixed with each cubic metre of topsoil.

(6) Each plant shall be thoroughly watered when the hole is 2/3 filled with soil. After final backfilling and watering, the soil shall be left at least 25 mm lower than the surrounding ground level forming a shallow depression to collect rainwater.

(7) All planted trees with a caliper of 75 mm and over, measured at 300 mm above grade, shall be suitably guyed by at least 3 wires encased at the trunk in water hose or other protective material. Smaller trees shall be supported by a wood stake and suitably protected to prevent damage to the tree.

(8) Pruning of planted material and existing trees shall be done in accordance with good local practice.

40.5 PLANTING OF TREES AND SHRUBS (Cont'd)

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41. CONSTRUCTION IN FLOOD FRINGE AREAS

41.1 BACKGROUND

(1) The Federal Government, in 1975, initiated a National Flood-Damage Reduction Program with a view to identifying flood-risk areas, and to discourage future flood-vulnerable development in such areas. They have, in cooperation with the Provinces, developed Flood-Risk Mapping agreements which provide for flood prone areas to be mapped, and for the maps to be available to the public. The areas for which maps are currently available, as well as the source of maps are listed in 41.18.

41.2 SCOPE

(1) This Section applies to buildings of all types located within the flood fringe area of a floodway within a flood plain which has been designated jointly by the federal Minister of the Environment and the responsible provincial minister.

(2) The requirements in this Section allow for the continued occupancy of the dwelling unit during the early stages of a flood.

(3) For the purpose of this Section "habitable portions of the building" means rooms or spaces required and intended for residential occupancy, during the early stages of a flood, and includes facilities for heating, air-conditioning, electrical, hot water supplies and plumbing waste connections (except as prescribed in Subsection I).

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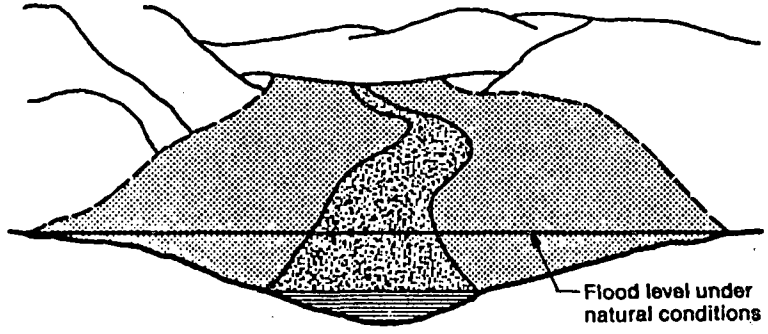
41.2 **SCOPE (Cont'd)**

(4) For the purpose of this Section "design flood level" means the level at which the design flood, not less than the 1-in-100 year event, reaches within the inundated area. The "design flood level" may also be referred to as "flood protection level."

41.3 **DESCRIPTION**

(1) Flood plains are described in two ways:

(a) A one-zone approach where the flood-risk area is defined as the land inundated by the design flood. The definition of design flood varies from province to province but is not less than the 1-in-100 year event.



One Zone Flood Plain

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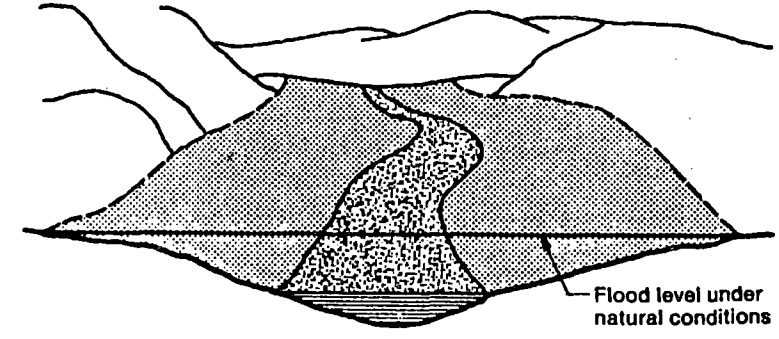

One Zone Flood Plain

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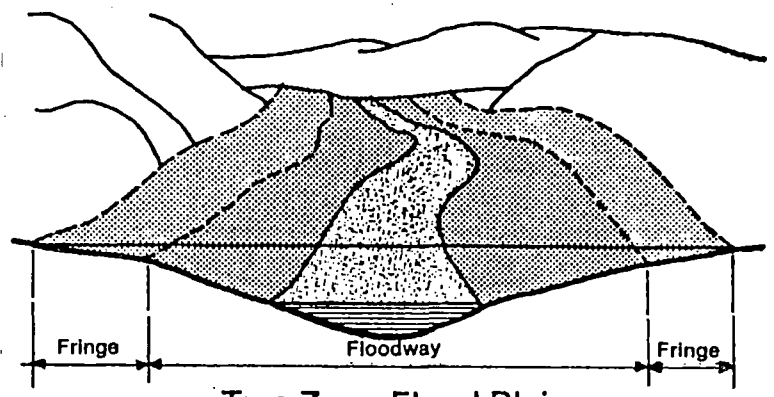
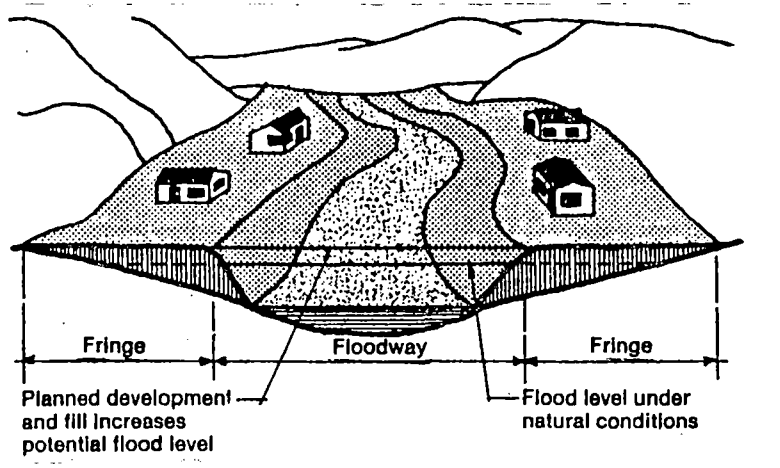
(b) A two-zone approach where both a floodway and flood fringe area are delineated.



Two Zone Flood Plain

In a two-zone approach, the design flood level is determined by taking into account land levels which will be raised during development in the flood fringe area. Using this approach, overall flood-risk area is greater than under natural conditions, but the flood fringe area can be used for flood-proofed construction.



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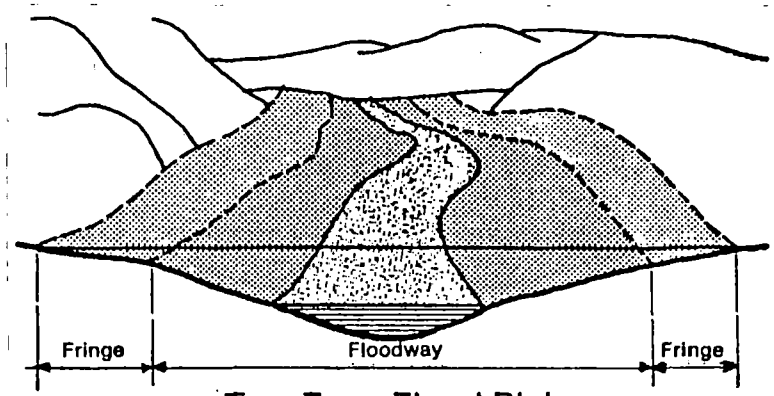
41.3 DESCRIPTION (Cont'd)

(b) A two-zone approach where both a floodway and flood fringe area are delineated.



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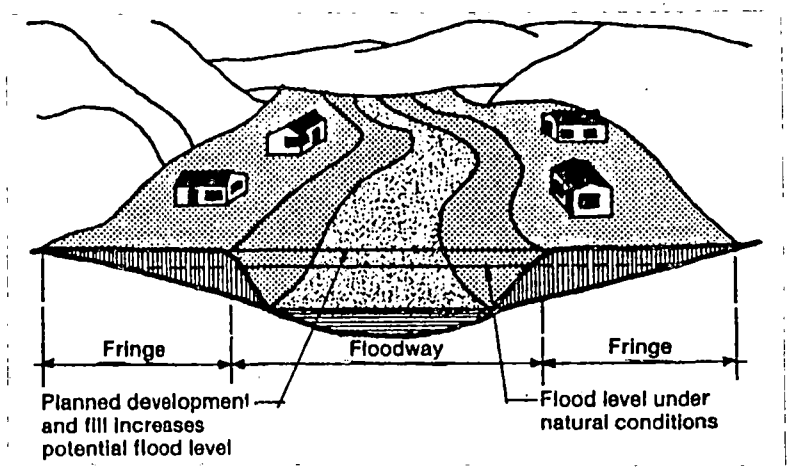

41.4 **DESIGNATED AREAS**
(INCLUDING INTERIM DESIGNATIONS)

(1) Housing projects on which construction was started or was authorized to be started after the date of designation can be financed under the National Housing Act only if all of the following conditions are met:

(a) A floodway was delineated in the designated area;

(b) The project is located in the flood fringe area and not within the designated floodway;

(c) Canada Mortgage and Housing Corporation flood-proofing requirements are met.

(2) Housing projects previously built or on which construction started or was authorized to be started prior to the date of designation may be financed under the NHA without special requirements provided, in the case of projects occupied at or prior to designation, no significant alteration or extension of the original structure is undertaken except with concurrent work designed to meet CMHC flood-proofing requirements.

(3) Housing projects previously built or on which construction started or was authorized to be started prior to the date of designation may be financially assisted under The Residential Rehabilitation Assistance Program provided that:

(a) When the dwelling is located in the fringe area of a designated flood plain, further undertakings/alterations conform with CMHC flood-proofing requirements;

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(INCLUDING INTERIM DESIGNATIONS)

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(a) When the dwelling is located in the fringe area of a designated flood plain, further undertakings/alterations conform with CMHC flood-proofing requirements;

41.4 **DESIGNATED AREAS (INCLUDING INTERIM DESIGNATIONS) (Cont'd)**

(b) When the dwelling is located in the floodway of a designated two-zone flood plain or in the designated one-zone flood plain, only work not considered to be "further undertakings*" may be included.

Those improvements considered not to be "further undertakings*" shall meet CMHC flood-proofing requirements when applicable.

* See 41.18 for definition of "further undertakings".

41.5 **AREAS TO BE MAPPED FOR FUTURE DESIGNATION (AS LISTED IN FLOOD-RISK MAPPING AGREEMENTS)**

(1) NHA loans will not be made or insured without prior consultation with the authority responsible for flood-risk mapping to determine the likelihood of the location falling within (a) the designated area, (b) the floodway. Thereafter, on the basis of this assumed designation, policies as prescribed for designated areas are to be followed.

41.6 **STANDARDS**

(1) NHA financed construction on land subject to flooding, shall, in addition to the requirements of the National Building Code of Canada 1985, meet the standards in this Section.

(2) The use of stable fill to raise the lowest portion of a building permanently above the design flood level is an acceptable alternative to other flood-proofing requirements.

41.4 **DESIGNATED AREAS (INCLUDING INTERIM DESIGNATIONS) (Cont'd)**

(b) When the dwelling is located in the floodway of a designated two-zone flood plain or in the designated one-zone flood plain, only work not considered to be "further undertakings*" may be included.

Those improvements considered not to be "further undertakings*" shall meet CMHC flood-proofing requirements when applicable.

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(2) The use of stable fill to raise the lowest portion of a building permanently above the design flood level is an acceptable alternative to other flood-proofing requirements.

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41.6 **STANDARDS (Cont'd)**

(3) Where provincial requirements are more restrictive they shall apply.

41.7 **PLOT PLANS AND SURVEYORS' CERTIFICATES**

(1) Plot plans for buildings constructed within the flood fringe area shall be submitted for approval to the authority having jurisdiction prior to start of construction.

(2) Plot plans shall indicate the elevation of the design flood level and the lot elevations.

(3) A surveyor's certificate shall be made available for examination to the authority having jurisdiction.

A copy of the surveyor's certificate shall be submitted to CMHC and shall contain one of the following statements:

(a) This is to certify that the top surface of the slab-on-ground supporting habitable portions of this building is a minimum of 300 mm above the design flood level for this location, as established by the municipality of_____.

(b) This is to certify that the top of the foundation wall supporting the habitable portion of this building is a minimum of 300 mm above the design flood level for this location, as established by the municipality of_____.

(4) A surveyor's certificate shall indicate the elevation of either the top of the

41.6 **STANDARDS (Cont'd)**

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(b) This is to certify that the top of the foundation wall supporting the habitable portion of this building is a minimum of 300 mm above the design flood level for this location, as established by the municipality of_____.

(4) A surveyor's certificate shall indicate the elevation of either the top of the

41.7 **PLOT PLANS AND SURVEYORS' CERTIFICATES (Cont'd)**

slab-on-ground or the top of the foundation wall supporting habitable portions of the building. The elevations shall make reference to the design flood level.

41.8 **FILLED GROUND**

(1) The use of stable fill to raise the lowest portion of a building permanently above the design flood level is an acceptable alternative to the other requirements in this Section.

(2) Buildings constructed on filled ground shall not be raised to a height that is not in keeping with surrounding buildings.

(3) Footing sizes shall be designed in conformance with Section 4.2 of the National Building Code of Canada 1985.

41.9 **FOOTINGS AND FOUNDATIONS**

(1) Footings and foundation walls shall be cast-in-place concrete.

(2) Footing, foundation walls and floor slabs-on-ground shall be designed to resist all loads and influences that may be expected including hydrostatic pressure, and shall satisfy the requirements of Part 4 of the National Building Code of Canada 1985.

(3) The designer shall be a professional engineer or architect skilled in such design and licenced to practice in accordance with the appropriate provincial or territorial legislation.

41.7 **PLOT PLANS AND SURVEYORS' CERTIFICATES (Cont'd)**

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41.9 **FOOTINGS AND FOUNDATIONS (Cont'd)**

(4) The clear height from the top of the basement concrete slab-on-ground to the underside of the first storey floor system including the beam shall be not less than 1930 mm.

(5) Basement or cellar walls shall be provided with at least two openable windows located on opposite sides of the building. The top of the window sills shall not be less than 150 mm below grade to allow flood water into the basement to counteract the hydrostatic pressure.

(6) The interior surfaces of basement or cellar walls and floors shall not have any finishing materials covering the concrete.

(7) Basements shall not contain habitable space nor be used for storage of immovable materials or hazardous materials that are buoyant, flammable, explosive or toxic.

(8) Foundation insulation shall be applied to the exterior and be fastened to prevent detachment during flooding.

41.10 **BACKFILL**

(1) Backfill material shall be placed in accordance with Subsection 9.12.3. of the National Building Code of Canada 1985.

(2) Backfill material shall be graded at least up to the design flood level at the exterior of the foundation wall.

41.9 **FOOTINGS AND FOUNDATIONS (Cont'd)**

(4) The clear height from the top of the basement concrete slab-on-ground to the underside of the first storey floor system including the beam shall be not less than 1930 mm.

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41.10 **BACKFILL (Cont'd)**

(3) Backfill material shall be graded away from the foundation at a slope not exceeding 1-in-30 for a minimum distance of 4.5 metres. From this point the slope may be increased to 1-in-4 slope until the original grade level is reached.

41.11 **OTHER SUPPORT SYSTEMS**

(1) The use of piles or other support systems to raise the lowest portion of a building above the design flood level is an acceptable alternative to other requirements in this Section.

(2) The system shall be designed to resist all loads and influences that may be expected and shall satisfy the requirements of Part 4 of the National Building Code of Canada 1985.

(3) The designer shall be a professional engineer or architect skilled in such design and licenced to practice under the appropriate provincial or territorial legislation.

41.12 **FLOOR CONSTRUCTION**

(1) The area enclosed by the foundation walls shall be covered by a concrete slab not less than 75 mm thick exclusive of concrete topping. When concrete topping is provided, it shall be not less than 20 mm thick.

(2) The top of a structural slab-on-ground supporting habitable portions of a building shall be minimum 300 mm above the design flood level.

41.10 **BACKFILL (Cont'd)**

(3) Backfill material shall be graded away from the foundation at a slope not exceeding 1-in-30 for a minimum distance of 4.5 metres. From this point the slope may be increased to 1-in-4 slope until the original grade level is reached.

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41.12 **FLOOR CONSTRUCTION (Cont'd)**

(3) Load-bearing floor slabs-on-ground shall be designed as required in Article D(2) and (3).

(4) The underside of floor joists and sill plates supporting habitable portions of a building shall be minimum 300 mm above the design flood level.

(5) The underside of wood beams supporting floors shall be minimum 300 mm above the design flood level.

(6) Columns supporting floor loads shall be steel columns as required in Subsection 9.17.3. of the National Building Code of Canada 1985.

(7) Load-bearing walls constructed below the design flood level shall be cast-in-place concrete.

41.13 **ANCHORAGE**

(1) Wood and steel frame buildings shall be anchored to the foundation to prevent the unit from floating off the foundation should the design flood level be exceeded.

(2) Exterior walls built on floor slabs-on-ground shall be anchored as required in Article 9.23.6.2. of the National Building Code of Canada 1985.

(3) First floor joists shall either have the ends embedded in the concrete foundation or the header joist mechanically fastened to the sill plate anchor bolts, or any system providing equivalent protection.

41.12 **FLOOR CONSTRUCTION (Cont'd)**

(3) Load-bearing floor slabs-on-ground shall be designed as required in Article D(2) and (3).

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41.14 **BASEMENT DRAINAGE SYSTEMS**

(1) A covered sump pit with an automatic submersible pump shall be provided in all basements or cellars.

(2) The outflow pipe shall discharge above the design flood level.

(3) A separate, electrical circuit shall be provided for the sump pump with the operating switch located above the design flood level.

(4) Granular material under the basement or cellar slabs shall be graded so that the entire area is drained towards the sump pit.

(5) Basements or cellars shall have a floor drain connected to the sump pit.

(6) Basement or cellar slabs shall have a positive slope to the floor drain.

(7) Floor drains or sump pumps shall not discharge to municipal sanitary sewage systems, but may discharge to municipal storm sewage systems when a backwater valve is installed.

41.15 **MEASURES FOR CONTINUED OCCUPANCY**

(1) Casings for vented drilled wells shall extend to a point at least 150 mm above the design flood level or be capped.

(2) Waste connections for plumbing fixtures shall not be made below the design flood level except as permitted in Subsection I.

(3) Central heating units, such as oil, gas or electric forced air furnaces including all

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41.15 **MEASURES FOR CONTINUED OCCUPANCY (Cont'd)**

ductwork and service water heaters, shall not be installed below the design flood level.

(4) Electrical service panels shall not be located below the design flood level. Electrical circuits servicing areas below the design flood level shall be on separate circuits and be capable of disconnection.

41.16 **FLOOD-RISK MAPS**

(1) For copies of maps and an up-to-date list of maps available, contact the following offices:

British Columbia and the Yukon:

Inland Waters Directorate
Environment Canada
Room 502, 1001 West Pender Street
Vancouver, British Columbia
V6E 2M9
(604) 544-3357 (for CENTREX system users)
(604) 666-3357

Alberta, Saskatchewan and Manitoba:

Inland Waters Directorate
Environment Canada
Motherwell Building
1901 Victoria Avenue
Regina, Saskatchewan
S4P 3R4
(306) 569-5319

41.15 MEASURES FOR CONTINUED OCCUPANCY (Cont'd)

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Environment Canada
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(604) 544-3357 (for CENTREX system users)
(604) 666-3357

Alberta, Saskatchewan and Manitoba:

Inland Waters Directorate
Environment Canada
Motherwell Building
1901 Victoria Avenue
Regina, Saskatchewan
S4P 3R4
(306) 569-5319

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Ontario:

Inland Waters Directorate
Environment Canada
P.O. Box 5050
Burlington, Ontario
L7R 4A6
(416) 637-4531

Quebec:

Gouvernement du Québec
Ministère de l'Energie et
des Ressources
Service de la Cartographie
1995 Boulevard Charest ouest
Sainte-Foy (Québec)
G1N 4H9

New Brunswick and Prince Edward Island:

New Brunswick Department of the Environment
Water Resources Branch
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

Newfoundland:

Flood Damage Reduction Program
Department of Environment
Government of Newfoundland and
Labrador
P.O. Box 4750
St. John's, Newfoundland
A1C 5T7

41.16 **FLOOD-RISK MAPS (Cont'd)**

Ontario:

Inland Waters Directorate
Environment Canada
P.O. Box 5050
Burlington, Ontario
L7R 4A6
(416) 637-4531

Quebec:

Gouvernement du Québec
Ministère de l'Energie et
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Service de la Cartographie
1995 Boulevard Charest ouest
Sainte-Foy (Québec)
G1N 4H9

New Brunswick and Prince Edward Island:

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Water Resources Branch
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

Newfoundland:

Flood Damage Reduction Program
Department of Environment
Government of Newfoundland and
Labrador
P.O. Box 4750
St. John's, Newfoundland
A1C 5T7

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Nova Scotia:

The Canada-Nova Scotia Flood
Damage Reduction Program
c/o The Nova Scotia Department
of the Environment
P.O. Box 2107
Halifax, Nova Scotia
B3J 3B7

Northwest Territories:

Community Planning and Development
Division
Department of Local Government
Government of the Northwest
Territories
Yellowknife, Northwest Territories
X1A 2L9

41.16 **FLOOD-RISK MAPS (Cont'd)**

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41.17 DESIGNATIONS UNDER THE FLOOD-DAMAGE REDUCTION PROGRAM

LOCATION	DATE	TYPE
NEWFOUNDLAND		
Stephenville*	June 1984	final
Steady Brook*	Mar. 1985	final
Placentia*	Mar. 1986	final
Badger	Mar. 1986	final
Rushy Pond	Mar. 1986	final
NOVA SCOTIA		
East River*	Feb. 1984	final
Sackville River*	Feb. 1984	final
Antigonish*	Nov. 1984	final
NEW BRUNSWICK		
Fredericton*	Feb. 1980	final
Perth/Andover	Feb. 1980	final
Oromocto to Lower Jemseg*	Mar. 1981	final
Lower Fredericton to Lincoln*	Feb. 1982	final
Sussex*	Sept. 1982	final
Keswick*	Mar. 1983	final
Norton	May 1985	final
(environs/Apohaqui)		interim
Walker Brook	Mar. 1986	interim

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Antigonish*	Nov. 1984	final
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Lower Fredericton to Lincoln*	Feb. 1982	final
Sussex*	Sept. 1982	final
Keswick*	Mar. 1983	final
Norton	May 1985	final
(environs/Apohaqui)		interim
Walker Brook	Mar. 1986	interim

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41.17 **DESIGNATIONS UNDER THE FLOOD-DAMAGE REDUCTION PROGRAM (Cont'd)**

LOCATION	DATE	TYPE
QUEBEC*		
Montréal Region*	May 1978 (revised June 1983)	final
Chaudière Basin*	Mar. 1979	final
Gatineau/Ottawa Rivers*	Oct. 1979	final
Upper Richelieu River*	Apr. 1980	final
du Gouffre*	Apr. 1980	final
Lower Richelieu River*	Nov. 1981	final
Rivière L'Assomption*	May 1982	final
Rivière Saint-François Basin*	Oct. 1982	interim
Rivière Yamaska Basin*	June 1983	final
Rivière Bécancour*	May 1984	final
Rivière Nicolet Basin*	May 1984	final
Trois-Rivières-Ouest	Aug. 1984	interim
ONTARIO		
White River	Aug. 1982	final
Toronto*	Dec. 1982	final
Sturgeon River/ Lake Nipissing/ French River*	Mar. 1983	final
Kaministiquia River*	Aug. 1983	final
Nipigon	Mar. 1986	final
Atikokan	Mar. 1986	final

41.17 **DESIGNATIONS UNDER THE FLOOD-DAMAGE REDUCTION PROGRAM (Cont'd)**

LOCATION	DATE	TYPE
QUEBEC*		
Montréal Region*	May 1978 (revised June 1983)	final
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Rivière L'Assomption*	May 1982	final
Rivière Saint-François Basin*	Oct. 1982	interim
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Kaministiquia River*	Aug. 1983	final
Nipigon	Mar. 1986	final
Atikokan	Mar. 1986	final

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41.17 DESIGNATIONS UNDER THE FLOOD-DAMAGE REDUCTION PROGRAM (Cont'd)

LOCATION	DATE	TYPE
MANITOBA		
Melita	Dec. 1979	interim
Wawanesa	Dec. 1979	interim
Winnipeg	Feb. 1980	interim
Souris	Oct. 1980	final
Elie	Nov. 1980	final
Brandon	Mar. 1982	final
LaSalle	Nov. 1982	final
Sanford	Nov. 1982	final
Starbuck	Nov. 1982	final
Swan River	May 1983	final
Dauphin	Feb. 1984	final
Carman	June 1984	final
Lorette	Sept. 1984	final
SASKATCHEWAN		
Estevan	Aug. 1980	interim
Oxbow	Aug. 1980	interim
Roche Percée	Aug. 1980	interim
Moose Jaw	Oct. 1981	final
NORTHWEST TERRITORIES		
Hay River*	May 1984	final
Fort Simpson	June 1985	final
Aklavik	June 1985	final
Fort McPherson	June 1985	final
Fort Good Hope	June 1985	final

* These designations are on a regional or river basin basis and cover a number of municipalities or parts of municipalities.

41.17 DESIGNATIONS UNDER THE FLOOD-DAMAGE REDUCTION PROGRAM (Cont'd)

LOCATION DATE TYPE

MANITOBA

Melita Dec. 1979 interim
Wawanesa Dec. 1979 interim
Winnipeg Feb. 1980 interim
Souris Oct. 1980 final
Elie Nov. 1980 final
Brandon Mar. 1982 final
LaSalle Nov. 1982 final
Sanford Nov. 1982 final
Starbuck Nov. 1982 final
Swan River May 1983 final
Dauphin Feb. 1984 final
Carman June 1984 final
Lorette Sept. 1984 final

SASKATCHEWAN

Estevan Aug. 1980 interim
Oxbow Aug. 1980 interim
Roche Percée Aug. 1980 interim
Moose Jaw Oct. 1981 final

NORTHWEST TERRITORIES

Hay River* May 1984 final
Fort Simpson June 1985 final
Aklavik June 1985 final
Fort McPherson June 1985 final
Fort Good Hope June 1985 final

* These designations are on a regional or river basin basis and cover a number of municipalities or parts of municipalities.

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41.18 DEFINITION OF "FURTHER UNDERTAKINGS"

Undertakings are defined in the agreements (with additional exceptions specified in certain provinces) as including:

(i) the construction, erection, extension or alteration of any structure other than
  (A) a structure for agricultural use,
  (B) an open-air building for recreational use, or
  (C) a building, for recreational use; and
(ii) the use of land, whether surface or subterranean use, for any purpose other than agriculture or recreation.

However, there is no definition in the agreements of "further undertakings" nor is there any indication of what might be included or excluded. Thus, the following guidelines were prepared in consultation with Legal Services to be used in interpreting the federal commitment.

Any new structure or addition to an existing structure which increases the number or size of structures in the designated flood risk area would be considered a further undertaking. Where two zones are designated, further undertakings that are flood proofed and located in the flood fringe would not be subject to the constraints.

More specifically "further undertaking" does not include investments that could be classified as maintaining, repairing or upgrading existing structures provided such investments do not increase the flood vulnerable floor space of the property. Alterations (i.e. changing the physical nature of a structure) and massive rehabilitation would be considered further undertakings. For example, the following would not be considered "further undertakings".

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(1) insulating
(2) upgrading services (wiring, plumbing)
(3) putting on a new roof
(4) installing a basement if it does not lead to further flood damage
(5) repairing a structure partially damaged by fire, flood, tornado or other natural hazard.

The following are examples of "further undertakings":

(1) finishing a basement
(2) ground floor addition, including enclosing of existing open porches or carports
(3) gutting an old structure and redoing the inside, i.e. massive rehabilitation
(4) rebuilding, after fire, flood, tornado or other natural hazard damage, a structure with a larger flood vulnerable size than the original structure.

These are just guidelines; in some situations, an individual judgement will have to be made. In many instances, local by-laws will guide the decision.

41.18 DEFINITION OF "FURTHER UNDERTAKINGS" (Cont'd)

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42. PARKING STRUCTURES

42.1 GENERAL

(1) Parking structures shall conform to CAN/CSA S413-87, "Parking Structures".

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