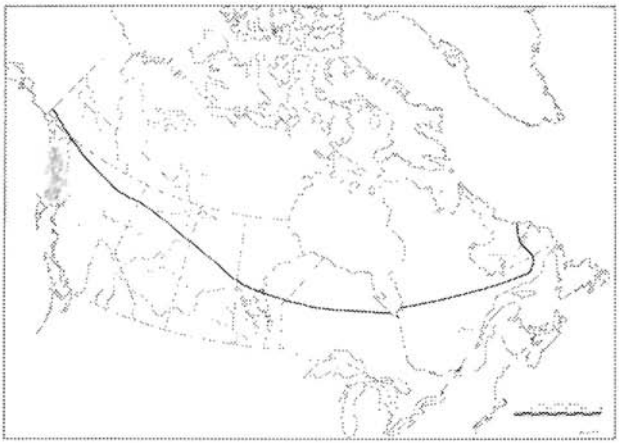
CANADA

BUILDING CODE FOR THE NORTH 1968



Issued by the
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NATIONAL RESEARCH COUNCIL
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NATIONAL RESEARCH COUNCIL OF CANADA
ASSOCIATE COMMITTEE
ON THE NATIONAL BUILDING CODE

BUILDING CODE FOR THE NORTH
FOREWORD

This is a special shortened edition of the National Building Code of Canada, 1965, prepared for use in the northern parts of this country. It is based on the Short Form of the National Building Code with the inclusion of special provisions to cover the somewhat unusual requirements for building in northern regions. It is, therefore, identical in basic content with the National Building Code itself to which reference will be found in Section 1, Clause (d). With the aid of this reference, the complete National Building Code can be used, in association with this document, for the regulation of all types of buildings in the North.

As with the National Building Code itself, this document is advisory only and has no legal standing until and unless it is adopted or enacted for specific use by a local regulating body. The Code in both its forms is essentially a set of minimum provisions designed to protect the safety of the public with respect to the structural sufficiency, fire provisions and health aspects of buildings.

An important feature of this Building Code is the special provisions for foundations in areas where permafrost is encountered. The document contains guides to simple foundation design in such areas. It must be stressed, however, that for any large building or special structure detailed studies of site conditions are esssential prior to the preparation of foundation designs with expert professional assistance.

Although this document has been prepared for use, in the first instance, in the Northwest Territories of Canada, it should also prove of value in the Yukon Territories and in the northern parts of those provinces in which permafrost is encountered. The extent of permafrost in Canada is shown on the "Permafrost Map of Canada" published by the Division of Building Research of the National

Research Council, a copy of which is included in the specially compiled supplement* to the Northern Code.

This Northern Code has been prepared at the request of the Commissioner, Northwest Territories, for the Associate Committee on the National Building Code by a Special Committee, the names of the members of which are listed on the inside cover. The Committee has been assisted most helpfully by the staff of the Department of Indian Affairs and Northern Development and of the Division of Building Research of the National Research Council. Preparation of drafts of those parts of this document which are supplementary to the Short Form of the Code was carried out by the Chairman of the Committee, Mr. H. B. Dickens. To all members of the Special Committee the thanks of the Associate Committee are hereby recorded.

It is the expressed wish of the Associate Committee that this final edition of the Northern Code be subjected to critical review by all who use it. Accordingly, suggestions for its revision and improvement, together with notification of omissions, would be welcomed. These should be submitted in writing, to: The Secretary, Associate Committee on the National Building Code, National Research Council, Ottawa 7, Ontario.

ROBERT F. LEGGET,
Chairman, ACNBC.

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* NOTE RE SUPPLEMENT TO NORTHERN CODE

To assist users of this Northern Code, a special supplement has been prepared containing additional information on Climate, Fire and Sound Resistance, Truss Designs, Soils & Permafrost, together with a sketch illustrating typical Crawl Space and Ventilated Foundation Space Construction. A list of references to DBR/NRC papers on northern building is also included. "This Supplement to the Building Code for the North" is available on request from The Secretary, Associate Committee on the National Building Code, National Research Council, Ottawa, Canada.

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SECTION 1. ADMINISTRATION

Model By-law or Regulation Suggested for Adoption with Suitable Modifications, by a Municipality or other Law Making Authority

BY-LAW NO. ————

A By-law to Regulate the Erection and Provide for the Safety of Buildings

The Council of the Municipality of ..... in regular meeting duly assembled, enacts as follows:

(a) Short Title

This By-law may be cited as the Building By-law.

(b) Interpretation

In this By-law,

(1) "Building Inspector" means the person appointed by the Council to be the Building Inspector;

(2) "building permit" means a permit in writing to perform work, issued by the Building Inspector or the Municipal Council pursuant to this By-law;

(3) "site" means the land and premises upon which work is done or is to be done;

(4) "work" means any act or thing authorized to be done under a building permit.

(c) Classification of Buildings

For the purposes of this By-law *buildings are classified into two groups as follows:**

(1) Group One — comprises (i) *houses* and, (ii) *buildings* other than *houses* that do not exceed two storeys in height or 4000 square feet of ground floor area and which are not used or intended for assembly or institutional purposes and,

(2) Group Two — comprises any *building* that is not included in Group One.

* Words in italics are defined in Section 2.

(d) Application of Building Codes

(1) Subject to (4) the provisions of the Building Code for the North, 1965, shall apply to Group One *buildings*.*

(2) Subject to (3), the provisions of Parts 2 to 9 inclusive of the National Building Code, 1965, shall apply to Group Two *buildings*.

(3) Where any provision of the Building Code for the North differs from the National Building Code the provision of the Building Code for the North applies.

(4) Where the Building Code for the North is silent with respect to any Group One *building* the relevant provisions of the National Building Code, 1965, shall apply.

(e) This By-law applies,

(1) to the design and construction of a *building*.

(2) where any part of a *building* is moved, to all parts of the *building* whether moved or not;

(3) where the whole or any part of a *building* is demolished, to the part of the *building* that remains and to the work involved in the demolition of the *building;*

(4) where a *building* is altered, to the whole *building*; but if the part of the *building* being altered is self-contained as to the facilities and safety measures required pursuant to this or any other By-law, this By-law applies only to the part being altered; and

(5) where the class of occupancy of a *building* or part thereof is changed, to all parts of the *building* affected by such change.

(f) Duties of Building Inspector

(1) There shall be a Building Inspector who shall administer and enforce this By-law, and, without restricting the generality of the foregoing, shall

- **(i) receive and examine all applications for building permits;**
- **(ii) where the proposed work set out in the application conforms with this By-law, issue all building permits subject to this By-law; and**

* Words in italics are defined in Section 2.

(iii) keep all necessary records relating to the processing and granting of building permits; and

(iv) carry out all inspections necessary to enforce the By-law and any condition contained in a building permit.

(2) where an application has been received by the Building Inspector for a building permit for work that does not conform with this By-law, no permit shall be issued unless the Building Inspector has been directed to do so by resolution of the Municipal Council.

(g) Building Permits and Building Requirements

(1) unless a building permit has been issued for the purpose, no person shall

(i) erect, reconstruct, structurally alter or add to a *building*;

(ii) remove or relocate a *building*;*

(iii) make an excavation; or

(iv) demolish a *building* either wholly or part thereof.

(2) Clause (1) does not apply in the case of landscaping works, minor repairs or maintenance of *buildings*.

(3) every application for a building permit shall be accompanied by

(i) a fee of [specify the fee or scale of fees either here or in a schedule to the By-law];

(ii) a plot plan satisfactory to the Building Inspector to a scale of not less than one inch to 50 feet showing the lot, the *building* on the lot, all yards, parking areas and existing *buildings* and the size and location of *buildings* on adjacent lots; and location of existing utilities;

(iii) plans of the proposed development satisfactory to the Building Inspector to a scale of not less than one eighth inch to one foot showing all dimensions with notes of materials to be used;

(iv) a statement of the intended use of the *building* and the estimated date of commencement of the work; and

* Words in italics are defined in Section 2.

(v) such additional information as the Building Inspector may reasonably require.

(4) a building permit authorizes the holder thereof to execute the work in accordance with the application and the plans and specifications as approved by the Building Inspector.

(5) no change in plans or specifications as *approved by the Building Inspector is permitted without the *approval* in writing of the Building Inspector and payment of additional fees, if any.**

(6) where an application for a building permit is refused, the Building Inspector shall notify the applicant in writing stating the reasons for such refusal.

(7) Subject to this Section, every building permit is valid from the day it is granted.

(8) The Building Inspector may revoke or recommend to Council the revocation of a building permit

(i) after six months of its granting, if the work authorized under the building permit is not commenced;

(ii) if work, once commenced, is discontinued for a period of one year;

(iii) if the work authorized under the building permit is not substantially completed within two years of the day the permit was granted; or

(iv) for non-compliance or violation of a provision of the By-law or a condition in the building permit.

(9) All applications for building permits and related documents are open to public inspection during the normal office hours of the Building Inspector.

(10) Every holder of a building permit shall,

(i) post and keep posted a copy of his permit in a conspicuous place at the site;

(ii) keep a copy of the *approval* plans available at the site for inspection by the Building Inspector;

(iii) permit the Building Inspector to enter and inspect the site at any reasonable time to ensure compliance with

* Words in italics are defined in Section 2.

the By-law and conditions applicable to the building permit;

(iv) give in writing at least 48 hours notice to the Building Inspector of his intention to start work on the site; and

(v) where any construction below grade has been placed, give the Building Inspector at least 24 hours notice before any backfilling of the excavation has begun.

(11) Where the Building Inspector considers it necessary to ascertain whether any materials, device, construction or foundation condition meets the requirements of this By-law, he may demand of the permit holder or his agent that such material, device, construction or foundation condition shall be at the expense of the owner, tested in such manner as he considers necessary or proper, and that the results of any such test shall be provided to him certified as correct by the person conducting such tests.

(12) Where tests of any materials are made to ensure conformity with the requirements of this By-law, records of the test data shall be kept available for inspection during the construction of the *building and for such period thereafter as required by the Building Inspector.**

(13) The Building Inspector may

(i) enter the site at any reasonable time for the purpose of administering or enforcing this By-law;

(ii) order the *owner* of any property to correct any condition where, in the opinion of the Building Inspector that condition constitutes a violation of this By-law;

(iii) revoke (or recommend to the Council the revocation of) or refuse to issue a permit where in his opinion the results of the tests referred to in (11) are not satisfactory; or

(iv) where he considers that any work is, has been, or is likely to be done in contravention of this By-law or conditions of the building permit, order that the whole or any part of the work shall cease forthwith or at or

* Words in italics are defined in Section 2.

for such time as he may stipulate in the order and such work shall not recommence until his order has been reviewed by the Council or until such conditions as he stipulates in the order have been fulfilled to his satisfaction.

(14) An order made under this Section shall be in writing, showing the date and time it was made and the reasons for making it and signed by the Building Inspector, and a copy thereof, certified by the Building Inspector, shall be posted at the site.

(15) Upon posting at a site, an order made under this Section, shall have effect with reference to the whole or any part of the work at that site, as set out in the order.

(h) Right of Appeal

(1) A person claiming to be aggrieved by any act or omission of the Building Inspector may apply to the Council to be heard by Council respecting his claim, and shall state in his application

(i) the grounds of his grievance;

(ii) the remedy which he considers should apply to redress his claimed grievance; and

(iii) when he wishes to be heard.

(2) The Council may at any time hear any complaint on application made to it by the Building Inspector respecting any matter arising under this By-law, and so far as may be reasonable, such application shall be notified to the persons who may be affected by any action taken under this By-law with respect thereto.

(3) The Council may also direct that notice of the hearing may be given to such other persons as it may deem fit.

(4) The Council shall hear any person making application under (h) and may make or cause to be made such further enquiries, inspections, tests or studies as it considers necessary and proper to dispose of the application.

(5) Upon having heard an application made under (h) and being satisfied as to the relevant facts, the Council may, by resolution, take such action as it deems proper.

* Words in italics are defined in Section 2.

(i) Prohibited Work

(1) No person shall commence or continue work on a site or *building to which this By-law applies unless a building permit for such work has been granted and is then in force under this By-law.**

(2) No person, being the holder of a building permit or the *owner of a site or *building* respecting work for which such permit has been granted or the employer of any person referred to in (1), shall permit, suffer or allow any person to contravene this By-law.**

(j) Demolition

(1) The Council may, by resolution, authorize the Building Inspector or any other person therein named to pull down and remove any *building* or structure constructed or placed in contravention of this By-law.

(2) The *owner* of any *building* or structure pulled down or removed under (1) of this Section shall on demand pay to the Municipality the cost of all work done respecting the pulling down and removal of such *building* or structure.

(k) Offence

Any person is guilty of an offence who

- **(i) wilfully obstructs or interferes with the Building Inspector in the exercise of his authority under this By-law;**
- **(ii) refuse or neglects to comply with a lawful demand made by a Building Inspector; or**
- **(iii) violates any provision of this By-law;**

is guilty of an offence. (If the Council has the power to impose penalties insert the penalty by adding a subsection to this Clause).

* Words in italics are defined in Section 2.

SECTION 2. DEFINITIONS

In this Code unless the context otherwise requires:

Active Layer **(annual frost zone) means the maximum depth of subsurface material which freezes and thaws seasonally. This depth can vary yearly or after any disturbance of the area resulting from development or occupancy. It should be noted that the bottom of the active layer does not necessarily coincide with the permafrost table. In some areas (particularly marginal permafrost zones) an unfrozen layer may occur between the active layer and the permafrost.**

Adfreezing Strength **means unit bond strength between frozen ground or ice and another material.**

Apartment Building means a type of multiple dwelling comprising of three or more *dwelling units* with shared entrances and other essential facilities and services and with shared *exit* facilities above the first storey.

Approved means acceptable to the *authority having jurisdiction.*

Area of a building means the greatest horizontal projected area at or above *grade,* inside the outside perimeter of the exterior walls.

Assembly occupancy includes auditoria, bowling alleys, places of worship, community halls, court rooms, dance halls, exhibition buildings, licensed beverage establishments, gymnasia, libraries, lodge rooms, theatres, museums, schools, colleges, stations, depots, restaurants, undertaking parlours, arenas, armouries, curling rinks, public baths, skating rinks, amusement park structures, bleachers, grandstands, reviewing stands, stadia.

Authority having jurisdiction means the Municipal Council, **other Legislative Authority or with** respect to the regulation of *buildings,* the Building Inspector.

Building means any structure used or intended for supporting or sheltering any use or occupancy as set forth in this Code.

Business and personal services occupancy means use of a *building* or structure or any portion thereof for the transaction of business, or the rendering or receiving of professional and personal services. These include barber shops, beauty parlours, dental or medical offices, fire stations, office buildings, self service laundries and self service dry cleaning establishments.

Closure means the complete assembly of a door or doors, shutters or hatches, or equipment including hardware, closing devices, frame and anchors that are installed in openings in a *fire separation* to act as a barrier against the spread of fire.

Commercial and industrial occupancy means the use of a *building* for assembling, fabricating, manufacturing, processing and storing of goods and materials.

"*Crawl space*" **means a shallow enclosed space beneath the ground floor of a** *building*. **(See Foreword)**

Dwelling unit means two or more rooms used or intended for the domestic use of one or more individuals living as a single housekeeping unit, with cooking, eating, living, sleeping and sanitary facilities.

Exit means that part of *means of egress* that leads from the floor area it serves including any doorway leading directly from a floor area to another floor area to a public thoroughfare or other acceptable open space.

Fire Load—see *Load, fire.*

Fire separation means a barrier against the spread of fire in the form of construction designed for this purpose.

Heavy timber construction **means that type of wood construction in which a degree of fire endurance is attained by placing limitations on the minimum sizes of wood structural members and on minimum thickness and composition of wood floors and roofs, by avoidance of concealed spaces under floors and roofs, by the use of** *approved* **fastenings, construction details and adhesives for structural members and as further defined in 3.1.3.5(1) of Part 3, NBC, 1965.**

Height of a building in storeys means the number of storeys contained between the highest roof of a *building* (except for penthouses containing no *dwelling units*) and the area of its *first storey*.

High hazard commercial and industrial buildings means *buildings* that contain large quantities of highly combustible and flammable or explosive material such as bulk storage warehouses for hazardous substances; cereal and flour mills; chemical or other plants involving hazardous substances; distilleries; dry-cleaning plants (employing flammable liquids); grain elevators; paint, varnish pyroxylin product factories; and rubber plants.

House means a *building* other than an *apartment building* that contains one or more *dwelling units* provided that there is not more than one *dwelling unit* above another, and there are not more than 2 *storeys* above the top of a foundation where the *building* contains more than one *dwelling unit.*

Institutional Occupancy includes jails, prisons, hospitals, police stations, reformatories, children's shelters, infirmaries, nursing homes, rest homes, old age homes, orphanages, sanitaria.

Load, fire means the average weight per unit area of the combustible contents of a room or floor area in pounds per square foot and includes the furnishings, finished floor, combustible trim, and temporary or movable partitions.

Low hazard commercial and industrial buildings means *buildings* for occupancies with a fire load of 10 pounds per square foot (psf) or less such as: creameries, power plants (excluding substations); storage garages; factories; workshops; salesrooms; storage rooms; barns; stables.

Means of egress means a doorway, hallway, corridor, lobby, stair ramp or other facility or combination thereof, provided for the escape of persons from a *building,* floor area, or room to a public thoroughfare or other *approved* open space. Means of egress includes *exits* and access to *exits.*

Medium hazard commercial and industrial buildings means *buildings* with fire loads of more than 10 pounds per square foot (psf) such as: box factories; candy plants; cold storage plants; mattress factories; planing mills; printing plants; electrical substations; repair garages and service stations; laboratories; woodworking factories; laundries; loft and warehouse *buildings* (containing largely combustible stores); factories; loft *buildings;* salesrooms; storage rooms; workshops; wholesale stores; and dry-cleaning plants (employing no flammable or explosive solvents or cleaners).

Mercantile occupancy means the occupancy or use of a *building* or structure or any portion thereof for the displaying, selling or buying of retail goods, wares or merchandise by large groups of people.

Noncombustible Construction means construction having all

structural elements and assemblies constructed of noncombustible material as described in Section 6(b).

Noncombustible material means a material that is classed as noncombustible when tested in accordance with CSA B54.1-1960.

Non-frost susceptible materials **means cohesionless materials, such as crushed rock, gravel, sand, slag and cinders in which significant detrimental ice segregation does not occur under normal freezing conditions.**

Owner means any person, firm, corporation or agent controlling the property under consideration.

Permafrost **means a thermal condition of subsurface materials whereby their temperature remains below 32°F continuously for 2 or more years.**

Private when used with respect to a room or other space within a *building*, means that such room or space is intended solely for the use of an individual tenant or family and their guests.

Public when used with respect to a room or other space within a *building*, means that such a room or space is intended to be used in common by the occupants of the *building*, their guests or tradesmen.

Storey, First means the *storey* with its floor closest to grade and having its ceiling more than 6 ft. above grade.

Residential occupancy means the occupancy or use of a *building* or structure or portion thereof by persons for whom sleeping accommodation is provided but who are not harboured or detained to receive medical, charitable, or other care or treatment or are not involuntarily detained.

Ventilated Foundation Space **means a space between the underside of a building and the ground that is freely ventilated to minimize heat transfer from the** *building* **to the ground. (See Foreword)**

SECTION 3. CONSTRUCTION SAFETY MEASURES

(a) Fencing and Barricades

(1) When the construction of a *building** will endanger pedestrians, a suitable cover shall be provided over the walkway along the danger area.

(2) Excavations shall be adequately barricaded when required by the *authority having jurisdiction* with a strongly constructed fence at least 6 ft. high.

(3) Excavation in streets or other public property shall be adequately barricaded.

(b) Warning Lights

When required by the *authority having jurisdiction* warning lights shall be placed and maintained during the hours of darkness at all obstructions or excavations on streets or other public places and at excavation on the building site.

(c) Bracing

The structure shall be adequately braced at all stages of construction to withstand all loads to which it may be subjected.

(d) Stability of Banks

Banks or sides of excavations shall be either trimmed to the stable slope of the material excavated, or shall be adequately supported. In all trench excavations, vertical faces shall be sheet-piled or shored and braced when the depth exceeds 4 ft. or as may be required by the *authority having jurisdiction.*

(e) Removal of Water from Excavations

Excavations shall be kept reasonably clear of water so as not to endanger workmen in the excavations or to create a health hazard.

(f) Demolition

(1) All measures required by the *authority having jurisdiction* for the enclosure of the site and protection of the public shall be completed before demolition is commenced.

---

* Words in italics are defined in Section 2.

(2) Warning signs shall be posted, and *owners** of adjacent properties notified, before demolition is commenced.

(3) All services to the site shall be disconnected and capped at the property line.

(g) Sanitation

Adequate toilet facilities shall be provided for the workmen within easy access of their place of work.

* Words in italics are defined in Section 2.

SECTION 4. PLANNING

(a) Room Areas

The minimum areas and dimensions of rooms in residential *buildings* shall conform to Table 4.1

TABLE 4.1

Room Areas and Room Dimensions

Room or Space	Minimum Area		Minimum Dimension
	As Separate Room	In Combination with Other Space[1]	
Living Room or Space	145 sq. ft.	145 sq. ft.[3]	9 ft. 10 in.
Dining Room or Space	75 sq. ft.	35 sq. ft.	7 ft. 6 in.
Kitchen or Kitchen Space	45 sq. ft.	45 sq. ft.[4]	—
First Bedroom	105 sq. ft.[2]	—	8 ft. 10 in.
Each Additional Bedroom	75 sq. ft.[2]	—	6 ft. 6 in.
Bedroom Space	—	45 sq. ft.	7 ft. 6 in.
Passage or Hall,	—	—	2 ft. 10 in.
Main Entrance Hall, or Vestibule	—	—	3 ft. 6 in.

NOTES TO TABLE 4.1

[1]Two or more areas are regarded as a combination room if the dividing wall occupies less than 60 per cent of the separating plane.

[2]When a built-in bedroom cabinet is provided, the area may be reduced to 95 sq. ft. in the first bedroom and 65 sq. ft. in other bedrooms.

[3]May be reduced to 120 sq. ft. for bachelor dwelling units where the space is combined with kitchen, dining and bedroom areas.

[4]May be reduced to 40 sq. ft. for bachelor dwelling units.

(b) Ceiling Heights

The minimum heights of ceilings in residential *buildings* shall conform to Table 4.2.

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* Words in italics are defined in Section 2.

TABLE 4.2
ROOM HEIGHTS

Room or Space	Minimum Heights
Living Room or Space Dining Room or Space Kitchen or Kitchen Space	7 ft. 6 in. over at least 75 per cent of the required floor area with a clear height of 7 ft. at any point.
Bedroom or Bedroom Space	7 ft. 6 in. over at least 50 per cent of the required floor area. Any part of the floor having a clear height of less than 4 ft. 6 in. shall not be considered in computing the required floor area.
Nonhabitable Basement or Cellar including Laundry Area therein	6 ft. 4 in. under beams, in laundry areas, and in any location that would normally be used for passage to laundry and required storage areas.
Bathroom or W.C. and Laundry Area above Grade	7 ft. over any area where a person would normally be in a standing position.
Passage, Hall or Main Entrance Vestibule and Habitable Rooms not specifically mentioned above.	7 ft.

(c) Crawl Space Clearances

(1) Except as noted in h(5) the ground level shall be at least 12 in. below the level of all joists and beams.

(2) Where equipment requiring service such as plumbing clean-outs, traps, burners, etc. is located in *crawl spaces**, an access way with a minimum clear height and width of 2 ft. shall be provided from the access door to the equipment and for a distance of 3 ft. on the side or sides of the equipment to be serviced.

(3) Access opening of not less than 1 ft. 8 in. by 2 ft. 4 in. shall be provided to each separated *crawl space*.

(d) Stairs

Stair dimensions shall conform to the requirements in Section 13. "Stairs, Handrails and Guards".

(e) Structural Design Procedures

All structural elements in a *building* which are not specified elsewhere in this By-law shall be designed to support the design loads in **(f)** in accordance with the appropriate provisions in Part 4 of the National Building Code of Canada, 1965.

* Words in italics are defined in Section 2.

(f) Design Loads

(1) The minimum design load on a floor area due to the use of the area is that listed in Table 4.3 applied uniformly over the entire area, or to a load listed in Table 4.4 applied over an area of 2½ sq. ft. (located so as to cause the maximum effects), whichever causes the greater stresses.

TABLE 4.3
Uniform Design Loads for Floors

Use of Area of Floor	Design Load psf
Apartment Buildings:	
—living and sleeping quarters	40
—locker rooms	50
—entrance halls, ground floor corridors, exits and stairs	100
—corridors, other floors	60
Attics Where There is no Storage of Equipment or Material	10
Hotels, Motels, Restaurants, Club Houses:	
—sleeping quarters	40
—offices, toilets and locker rooms	50
—lobbies, rotundas, conference rooms, kitchen stairs, corridors and exits	100
—retail stores, maintenance and service area	100
Office Buildings:	
—basement, first floor, corridors and exits	100
—upper floors for office use	50
Retail Stores or Shops for Light Merchandise	100
—separate floors for offices, toilets	50
Factories, Warehouses and Storage Buildings	125
—separate floors for offices, toilets	50
Fire Escapes, exterior balconies	100
Garages:	
—for passenger cars	50
—for unloaded buses and light trucks	125
—for loaded trucks and buses and all trucking spaces	250
Sidewalks and Driveways Over Areaways and Basements	250
Houses:	
—bedrooms	30
—all other rooms	40

TABLE 4.4
Concentrated Design loads for Floors

Use of Area of Floor	Concentrated Load. (lb.)
Floors of offices, manufacturing buildings	2,000
Floors and areas used by passenger cars	2,500
Floors and areas used by vehicles not exceeding 8,000 lb. gross weight	4,000
Floors and areas used by vehicles not exceeding 20,000 lb. gross weight	8,000
Floors and areas used by vehicles exceeding 20,000 lb. gross weight	12,000
Driveways and sidewalks over areaways and basements	12,000

(2) The minimum design load on a roof area due to snow shall be . . . ** on a horizontal projection of the surface, except that where the *building** is sheltered from the wind by other *buildings* or trees, the minimum design snow load shall be . . . **.

(3) The minimum design load due to wind shall be . . . ** psf applied perpendicular to the surface.

(g) Lighting

A living room, dining room or bedroom, or a room composed of combinations of any of these rooms with each other or with others not mentioned, shall have a window or windows that have an aggregate unobstructed glass area not less than five per cent of the floor

* Words in italics are defined in Section 2.

** To be inserted by the municipality: information available in Supplement No. 1 to the National Building Code or from the Secretary of the Associate Committee on the National Building Code.
Information on load coefficients for wind and snow loads in relation to building shapes may be found in Supplement No. 3 to the National Building Code of Canada, 1965.

area of the room served but in no case less than 2 ft. 6 in. in any dimension and face directly on a street, yard or court. Unless otherwise permitted by the *authority having jurisdiction electrical illumimination shall be installed within every *building.***

(h) Ventilation

(1) Habitable rooms shall be ventilated by natural or mechanical means except that ventilation may be omitted in living or living-dining rooms.

(2) Opening for natural ventilation shall consist of at least 2 sq. ft. of unobstructed area for each habitable room except that such ventilation may be reduced to 1 sq. ft. in bathrooms.

(3) Where there is a space between insulation and roofing such space shall be adequately vented to the outside air. Natural ventilation shall consist of at least 1 sq. ft. of unobstructed vent area per 300 sq. ft. of insulated ceiling area with the vents distributed uniformly on opposite sides of the *building* and at different levels in the case of sloping roofs to facilitate movement of air through the roof space by convective action.

(4) Unless the *crawl space* is used as a warm air plenum, a *crawl space* shall be ventilated to the outside air. Natural ventilation shall consist of at least 1 sq. ft. of unobstructed opening per 500 sq. ft. of *crawl space* floor area. The openings for natural ventilation shall have tight-fitting covers to control air-leakage in winter.

(5) A *ventilated foundation space* shall have a minimum clear height of 2 ft. and shall provide for relatively unobstructed air movement beneath the *building.*

(i) Class of Interior Finish

The interior surfaces of rooms and connecting passages including the walls, ceilings and floors and such other surfaces as contribute to the interior finish of the room shall be finished in accordance with Table 4.5.

* Words in italics are defined in Section 2.

TABLE 4.5
Class of Interior Finish

Types of Use of Floor Area or Room	Class of Finish (see Note)
Concourses, rotundas, entrance halls	B
Reading or writing rooms or lounges*	B
Dining Rooms*	B
Kitchens*	A
Rooms used for sleeping — single rooms*	B
— dormitory	B
Dwelling units, all rooms	B
Retail sales floors	B
Offices	B
Toilet and locker rooms	A
Cleaning and repair of goods	B
Shops providing services to the person such as hairdressing parlours	A
Exits; and corridors serving as access to exits from rooms or suites	B

* In other than dwelling units.

NOTE TO TABLE 4.5

Interior Finish

Class A—All Class A interior finishes shall be of the type unaffected by repeated washing.

The interior finish shall have high resistance to the passage of water and shall be resistant to change under conditions of varying temperature and humidity anticipated for the type of occupancy concerned.

Class B—All Class B finishes shall be capable of being cleaned, but are not expected to withstand repeated washings with water and common cleaning agents.

(j) All materials, systems and equipment shall meet the requirements of Section 27.

SECTION 5. MEANS OF EGRESS

(a) General

(1) Requirements for wall and ceiling finishes in a *means of egress** shall conform to 6(h).

(2) *Fire separations* of a *means of egress* shall conform to 6(d).

(3) Elevators or windows shall not be considered as being part of a required *means of egress.*

(4) No exterior open fire escape shall be installed on any new *building.*

(5) Every *means of egress* shall have a minimum head room of 7 ft. 0 in.

(b) Number and Location

(1) Where any floor area is divided by walls or partitions into *dwelling units,* rooms that are occupied separately or into suites, each room, *dwelling unit,* or suite shall have an exterior doorway at grade or a doorway leading to an exterior balcony or exterior passageway, which is open to the outside air or to an interior corridor. From the point the doorway enters the balcony, passageway, or corridor, it shall be possible to go in opposite directions to two separate *exits* from the floor area, except as permitted in (2) and (3).

(2) The distance between the dead end of a public hallway and an *exit* door from a floor area shall not exceed the width of the hallway or 20 ft. whichever is the lesser. There shall not be more than three *dwelling unit* entrance doors between the *exit* and the end of the public hallway.

(3) In *apartment buildings* the entrance to a *dwelling unit* may open off a stairway if a second entrance is provided that opens unto a separate stairway, or corridor leading to a second *exit.*

(4) One *exit* is permitted for each *dwelling unit* in a *house* where

* Words in italics are defined in Section 2.

the entrance door to the *dwelling unit* is at or near grade level and the *exit* is not shared with any other *dwelling unit.* All other *dwelling units* in *houses* shall have at least two *exits.*

(5) Required access for a *dwelling unit** to a *floor area exit* shall not be through any other *dwelling unit,* garage space, furnace room, storage room, laundry room or similar service area.

(6) Where separate *exits* are required for a *floor area,* they shall be placed as remote from each other as is practicable.

(7) Every room intended for more than 60 persons or larger than 1000 sq. ft. in area shall have access to 2 *exits* which may be *exit* doorways or doorways to a corridor or corridors giving *access* to *exits.*

(8) The travel distance to an *exit* shall not exceed 100 ft. in unsprinklered *buildings,* except that in high hazard commercial and industrial occupancies the travel distance shall not exceed 75 ft. This distance shall be measured from any point in the *floor area* to any *exit* measured along the path of *exit* travel except that when *floor areas* are subdivided into rooms used singly or suites of rooms and served by corridors or exterior passageways, the travel distance shall be measured from the corridor entrance of such rooms or suites to the nearest *exit.*

(c) Width

(1) Except as otherwise required in (2) and (3) the minimum aggregate width of a *means of egress* shall be at least one unit (22 in.) per 30 persons for occupancies providing sleeping areas and one unit per 60 persons in all other occupancies. The number of persons shall be the normal number of persons for which the *floor area* is designed but not less than the number as determined by dividing the *floor area* by the area per person in Table 5.1.

* Words in italics are defined in Section 2.

TABLE 5.1

Occupant Loads on Different Floor Areas

Occupancy	Area/Person (Sq. Ft.)
Offices, sleeping rooms, kitchens (other than dwelling units) [a]	100
Business, manufacturing, processing, dormitories	50
Retail stores (ground floor, basement)	30
(second floor)	60
Storage	300

NOTE TO TABLE 5.1

[a] In dwelling units, the occupant load shall be assumed to be not less than 2 persons per bedroom or bedroom space.

(2) The minimum width of any corridor which provides access to an *exit** from rooms or suites shall be 44 in.

(3) The minimum width of any *exit* shall be 36 in. except as permitted in (d)(10).

(4) No exit shall decrease in width in the direction of exit travel except as permitted in (d)(10).

(5) The total required *exit* width shall not be reduced by more than 50 per cent if any one *exit* becomes inaccessible in an emergency.

(d) Doors

(1) Every door between an attached or built-in garage and a house shall be tight fitting and have a fire endurance rating of at least 20 minutes or shall be a solid-core wood door at least 1¾ in. thick. Such doors shall be weatherstripped, fitted with a self closing device and shall not open into a room that is intended for sleeping.

* Words in italics are defined in Section 2.

(2) Every door between a *dwelling unit** and an *exit* or a *means of egress* that is common to two or more *dwelling units* shall be tight fitting and have a fire endurance rating of at least 20 minutes or shall be a solid-core wood door at least 1¾ in. thick.

(3) Doors in other fire resistive construction shall conform to 6(d)(22).

(4) Every revolving door used as an *exit* shall be the collapsible type and shall be used only at ground floor level away from the foot of any stairway. Such doors shall be assumed to provide not more than ½ unit of exit width (12 in.) and shall only be used adjacent to a hinged exit door.

(5) No riser of any stair shall be located within 1 ft. of a door in an *exit*.

(6) No hangings or draperies shall be placed over exit doors to obscure any *exit*. No mirrors shall be placed on exit doors.

(7) No door shall open directly on to a step except that where there is a danger of blockage from ice and snow an exit door may open on to not more than one step not exceeding 6 in. in height.

(8) Every door normally required to be kept closed for fire safety shall be provided with a self closing mechanism. Every door in a *fire separation*, other than a door in a stair well, elevator shaft and dumbwaiter shaft that is normally required to be kept open for a specified purpose, shall be equipped with an acceptable rate of heat rise, heat actuated device or fusible links. Such doors are permitted only when the safety of the occupant is not endangered thereby.

(9) Excluding entrance doors in *dwelling units*, every door in a *means of egress* shall be readily openable in the direction of travel to the exterior without the use of keys, except that

(i) where, in the opinion of the *authority having jurisdiction* there is persistent danger of blockage from drifting snow, the door may open inward providing it does not interfere with the operation of adjacent doors in the *means of egress*, and

* Words in italics are defined in Section 2.

(ii) in other than *assembly or *institutional buildings* and providing that the occupant load is less than thirty persons, the door may open inward.**

(10) Doors in *exits* shall be so arranged that when open they will not diminish the required width of an *exit* facility by more than 2 in. for each 22 in. of required exit width. In no case shall the door opening or openings be less than ¾ of the total width of *exit* or *means of egress*.

(11) Swinging doors shall not reduce the effective width of a stair or landing to less than 30 in. nor shall they reduce the effective width of a passageway or hallway to less than the minimum required width.

(12) The minimum clear width of openings for any swinging door shall be not less than 30 in. nor more than 48 in.

(13) All exit doors and passageways other than *exit* serving as the main entrance to a room or *building* shall have exit signs placed over them when the *exits* serve a *building* with an occupant load of over 150.

(14) Doors in a *means of egress* shall be at least 6 ft. 8 in. high.

SECTION 6. FIRE PROTECTION

(a) General

(1) In this Section where the term fire endurance or fire resistance is used, it refers to the ability of construction or element of construction to withstand collapse or undue temperature rise. Fire resistance ratings shall be determined in accordance with Clause 3.1.3.2. of the National Building Code, 1965.

(2) Where the term fire separation is used, it refers to construction acting as a barrier against the spread of fire. Fire resistance ratings for separations shall be determined as in (1).

* Words in italics are defined in Section 2.

(b) Noncombustible Construction

(1) Except as permitted in (2) to (5) *noncombustible construction** shall have all structural elements and assemblies constructed of *noncombustible material.*

(2) Paint, paper coverings and wood veneer may be used where *noncombustible construction* is required, provided they are not more than ⅛ in. thick and are applied without any concealed space. Such coverings shall have a flame spread rating of not more than 50.

(3) Insulation and fill used where *noncombustible construction* is required shall have a flame spread rating of not more than 25 without continued progressive combustion throughout the material except that when applied directly to the top of a roof slab or deck the flame spread limitation does not apply.

(4) Wood furring strips used where *noncombustible construction* is required shall not exceed 2 in. by 2 in. nominal dimension and the spaces shall be adequately fire stopped. In the case of walls, these fire stops shall be placed at floor and ceiling and at intervals not exceeding 8 ft. vertically or horizontally. In the case of floors the fire stopping shall be provided beneath all permanent walls and at intermediate locations so that the area of any open space does not exceed 100 sq. ft.

(5) When *noncombustible construction* is required, the use of combustible caulking, millwork, such as trim, window and door frames, finish flooring and sash may be used. Where wood sash is used in such construction the windows shall not extend continuously from *storey** to *storey* and shall not exceed 40 per cent of the area of the wall of each *storey.*

(c) Fire Endurance

Fire endurance of structural elements in *buildings* other than *houses* shall conform to Table 6.1 but shall not be less than required in **(d)** for *fire separations* between rooms or spaces, or **(g)** for *fire separations* between *buildings,* where applicable.

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* Words in italics are defined in Section 2.

TABLE 6.1

Minimum Required Fire Resistance

Class of Occupancy	Number of Storeys	For Structural Members and Assemblies (in Buildings other than Houses) Minimum Fire Resistance Rating				
		Floors Above Crawl Spaces,[3] Basements or Cellars	Other Floors	Balconies or Mezzanines	Roofs	Load Bearing Walls, Columns and Arches
Residential, other than houses	1	¾ hr.[1]	—	¾ hr. [1] [2]	¾ hr. [1] [2]	¾ hr. [1] [2]
	2	¾ hr.[1]	¾ hr.[1]	¾ hr. [1] [2]	¾ hr. [1] [2]	1 hr. [1] [2]
Business and Personal Services	1	¾ hr.[1]	—	¾ hr. [1] [2]	—	—
	2	¾ hr.[1]	—	¾ hr. [1] [2]	—	—
Mercantile	1	¾ hr.[1]	—	—	—	—
	2	¾ hr.[1]	—	—	—	—
High hazard Commercial and Industrial	1	¾ hr.[1]	—	¾ hr. [1] [2]	¾ hr. [1] [2]	¾ hr. [1] [2]
	2	¾ hr.[1]	¾ hr. [1] [2]	¾ hr. [1] [2]	¾ hr. [1] [2]	¾ hr. [1] [2]
Other Commercial and Industrial	1	¾ hr.[1]	—	¾ hr. [1] [2]	—	¾ hr. [1] [2]
	2	¾ hr.[1]	—	¾ hr. [1] [2]	—	¾ hr. [1] [2]

NOTES TO TABLE 6.1

[1] *Heavy timber construction* is also acceptable. When *heavy timber construction* is used for roofs, the limiting width of beams need not apply.

[2] No limiting fire resistance is required if noncombustible construction is used.

[3] **Subject to the approval of the *authority having jurisdiction*, vertical fire stops constructed in accordance with (e) (3) may be used in *crawl spaces* as an alternative to ¾ hr. fire resistance in the floor. Such fire stops shall separate the *crawl space* into compartments not exceeding 2,000 sq. ft. in area.**

(d) Fire Separation Between Rooms and Spaces

(1) Every required *fire separation** shall be supported by construction having a fire resistance at least equal to that required by the supported separation.

* Words in italics are defined in Section 2.

(2) Where a *fire separation* is required to be noncombustible, it shall be supported by *noncombustible construction.*

(3) Where a *fire separation* that is required to be noncombustible terminates at an exterior wall or roof surface, no combustible material except the roofing membrane and coatings shall extend across the end or top of the *first separation* to form a bridge where fire could cross. Combustible roofing membranes other than in *houses,* shall be covered with a layer of gravel or other noncombustible surface.

(4) Combustible construction which abuts or is supported by a noncombustible *fire separation* shall be constructed in a manner that its collapse would not cause the collapse of the *fire separation.*

(5) No combustible member shall penetrate through a noncombustible *fire separation* nor shall it reduce the thickness of the *fire separation* to less than 4 in.

(6) *Exits* shall be separated from the remainder of the *building* by not less than a ¾ hr. *fire separation.*

(7) Access to *exits* from the *dwelling unit* entrance shall have at least a ¾ hr. *fire separation.*

(8) Where two exit stairs are contiguous, the dividing wall between them shall provide at least ¾ hr. fire resistance, be smoke tight and have no doorways or duct work through it.

(9) The walls, floor and ceiling of every service room or public space such as common lounge areas, storage rooms, laundries, workshops or maintenance rooms in an *apartment building* shall be separated from the remainder of the *building* by a *fire separation* of at least 1 hr.

(10) *Crawl spaces* or attic or roof spaces which adjoin rooms or spaces required to have a *fire separation* shall be divided into separate areas by not less than the grade of separation required for the part of the *building* they adjoin, except that if the ceiling beneath the attic space is at least equal to the grade of separation required, such attic spaces need not be subdivided.

* Words in italics are defined in Section 2.

(11) Attached or built-in garages for *buildings** other than *houses* shall be separated from other parts of the *building* by at least a 1½ hr. *fire separation* except that where there are not more than 5 cars, a 1 hr. *fire separation* is permitted in the case of *apartment buildings*. Garage floors shall be noncombustible.

(12) A ½ hr. *fire separation* shall be provided between an attached or built-in garage and any part of a *house* except rooms intended for sleeping which shall have a 1 hr. *fire separation*.

(13) Except as provided in (14) and (15), every boiler or furnace room, machinery room containing hazardous substances or incinerators shall be separated from the remainder of the *building* by a 1½ hr. *fire separation* except that where there is no occupancy above the room and the enclosing walls pierce the roof, the roof construction shall provide at least a ¾ hr. fire resistance or be of *heavy timber construction*, or be noncombustible. Machinery rooms containing no hazardous substances shall be separated from the remainder of the *building* by a 1 hr. *fire separation*.

(14) In *houses*, a 1 hr. *fire separation* shall be provided between a *dwelling unit* and a room containing a heating unit serving more than one *dwelling unit*.

(15) In low and medium hazard commercial and industrial *buildings*, process rooms where hazardous substances are used shall be separated from the remainder of the *building* by a 2 hr. *fire separation* or shall be protected in other *approved* manner. Vaults or rooms, in such *buildings* where hazardous substances are stored, shall be separated from the remainder of the *building* by a 3 hr. *fire separation*.

(16) Every interior wall enclosing a kitchen, except a kitchen in a *dwelling unit*, shall have a 1 hr. fire resistance rating.

(17) Except as provided for in (18) and (19), the *fire separation* between any two major occupancies in a *building* shall be at least equal to the greater rating required in Table 6.2 for major occupancies concerned.

* Words in italics are defined in Section 2.

TABLE 6.2
Fire Separations Between Occupancies

Major Occupancies	Fire Separation
Residential, Business and Personal Services and Low Hazard Commercial and Industrial	1 hour
Mercantile, Medium Hazard Commercial and Industrial	2 hours
High Hazard Commercial and Industrial	3 hours

(18) Where not more than 2 *dwelling units** are contained within a *building* together with a mercantile occupancy, the separation between the two occupancies may be reduced to a 1 hr. *fire separation.*

(19) Excepting a floor area occupied by a *residential occupancy* or a floor area which is sprinklered, any floor area which is leased to more than one tenant of the same occupancy shall have the space occupied by each tenant separated from other tenant's space by a 1 hr. *fire separation.*

(20) Sleeping rooms occupied individually and suites or *dwelling units* in hotels and other residential *buildings* shall be separated from adjacent rooms, suites and corridors by at least a ¾ hr. *fire separation.*

(21) In *residential occupancies* any room where hazardous substances are used shall be equipped with sprinklers or other suitable fire extinguishing equipment. Such rooms shall be separated from other rooms by a 2 hr. *fire separation.*

(22) When a door way or other opening or a shaft occurs in an interior wall, partition, or floor which is required to provide a *fire separation* the opening shall be equipped with a *closure* conforming to Table 6.3.

* Words in italics are defined in Section 2.

TABLE 6.3
Minimum Fire Resistance of Closures and Shafts in Fire Separations

Required Separation of wall or Floor Construction (hr.)	Required Fire Resistance of Closure (hr.)	Required Fire Resistance of Shafts (hr.)	Required Resistance of Closures in Shafts (hr.)
¾	¾ (1) (2)	¾	¾ (1)
1	¾ (1) (2)	¾	¾ (1)
1½	1	1	¾
2	1½	1	¾

NOTES TO TABLE 6.3

(1) Wired glass at least ¼ in. thick set in steel frames or glass block panels may be considered as providing a fire resistance of ¾ hr. for closures, providing the wired glass area does not exceed 9 sq. ft. per panel.

(2) May be solid-core wood door 1¾ in. thick or equivalent. (See also 5(d) (1) and (2).

(23) Fire protection is not required for steel lintels over openings which are 6 ft. or less in width in load bearing walls, or 8 ft. or less in width in non load bearing walls. Such openings may be wider provided that the lintels are supported at not more than 6 ft. intervals by a construction with the required fire resistance.

(24) The bottom flanges of shelf angles and plates that are not part of the structural frame need not be protected.

(25) Steel stair members need not be protected.

(26) Steel members in porches, exterior balconies, exterior stairs, cornices, marquees and similar construction need not be protected provided they are entirely outside of an exterior wall providing the required fire resistance.

(27) Corridors between *buildings shall have appropriate fire protection as determined by the *authority having jurisdiction.***

(e) Fire Stopping

(1) Fire stops shall be provided at ceiling, floor and roof levels to cut off completely all concealed horizontal and vertical draft

* Words in italics are defined in Section 2.

openings occurring between *storeys** and between the top *storey* and roof space. This includes spaces between furring or framing as well as around ducts and pipes which are not tightly fitted into the surrounding construction. Vertical distance between stops shall not exceed 8 ft.

(2) Fire stopping for pipes and ducts shall consist of tight fitting metal caps or other suitable *noncombustible material.*

(3) Fire stopping between wood framing or furring shall consist of the equivalent of 2 in. nominal thickness of lumber tightly fitted between spaces, ½ in. plywood with joints backed or two thicknesses of not less than 1 in. nominal lumber with joints staggered or other suitable *noncombustible material.*

(4) A duct that passes through a fire-resistive floor, wall or ceiling shall be fitted with an automatic damper that operates at a temperature approximately 50°F above the maximum temperature that will be normally encountered in the system.

(f) Fire Separations Between Houses

(1) Except as provided in (2) to (5) a wall of a *house* shall be at least 12 ft. from the boundary between two properties.

(2) A party wall or a wall of a *house* built on the boundary between two properties shall be a one-hour *fire separation* without window or door openings.

(3) A wall of a *house* that is less than 12 ft. from the boundary between two properties shall be a ¾ hr. *fire separation* without window or door openings.

(4) Where adequate water supply for fire fighting is deemed available by the *authority having jurisdiction* a wall of a *house* may be as close to the boundary between two properties as the aggregate width of the windows in any one room or combination room which are more than 2 ft. high and which face the boundary providing it conforms to the requirements of (5).

* Words in italics are defined in Section 2.

(5) A wall or part of a *house that is less than 6 ft. from the boundary between two properties shall have a *non-combustible* exterior cladding extending down to grade.**

(6) A wall of a garage of an auxiliary *building* that is less than 2 ft. from the boundary between two properties shall be a ¾ *fire separation* and shall have a *noncombustible* exterior cladding extending down to grade.

(7) Where there are two or more *buildings* on the same property or where there are separate *dwelling units* opposite each other on the same property, the requirements of (1) to (6) shall be applicable to "an assumed line between the *buildings*" in lieu of "a boundary between two properties".

(g) Fire Separations Between Buildings (other than houses)

(1) Common or party walls of *buildings* classed as *mercantile or high or medium hazard commercial and industrial occupancy* shall be *noncombustible* and provide at least 4 hrs. fire resistance. In other occupancies, a *noncombustible construction* providing at least 2 hr. fire resistance shall be provided.

(2) Except as provided in (1), exterior walls in *buildings* classed as *mercantile or high or medium hazard commercial and industrial occupancy* shall provide at least 2 hrs. fire resistance and have *noncombustible* exterior cladding when the permitted amount of openings in the wall (see (4)) does not exceed 25 per cent of the total wall area. When the permitted openings are 10% or less, such walls shall be of *noncombustible construction.* When the openings are permitted to be 25 to 99%, the walls shall provide at least ¾ hr. fire resistance or be of *heavy timber construction or noncombustible construction.*

(3) Except as provided in (1), exterior walls in *buildings* of occupancies other than *mercantile or high or medium hazard commercial and industrial,* shall be the same as described in (2) except that the fire resistance may be reduced to 1 hr. where the permitted amount of wall openings in Table 6.4 does not exceed 25 per cent of the exposed wall area.

(4) The unprotected openings in the side or rear walls shall not exceed those listed in Table 6.4.

* Words in italics are defined in Section 2.

TABLE 6.4

Maximum Percentage of Exterior Building Face That May Consist of Unprotected Openings [1]

Maximum Area of Exterior Building Face[2]	Limiting Distance[3]								
	Less than 4 ft.	4 ft.	6 ft.	8 ft.	10 ft.	15 ft.	20 ft.	30 ft.	50 ft.
Up to 300 sq. ft.	0	12	17	25	35	68	100	—	—
300 to 399 sq. ft.	0	11	15	21	29	54	89	100	—
400 to 499 sq. ft.	0	11	14	19	25	45	73	100	—
500 to 999 sq. ft.	0	9	10	14	17	28	43	88	100
Over 999 sq. ft.	0	6	7	10	12	17	23	41	100

NOTES TO TABLE 6.4

[1] For stores and high or moderate hazard commercial and industrial buildings, the allowable percentage of openings shall be ½ the values in the above tabulation.

[2] Exterior building face refers to that portion of a building bounded by the grade lines, the uppermost ceiling, or any wall or floor that provides at least the following fire separation:

Mercantile, or high or medium hazard Commercial and Industrial occupancy ..... 2 hr.
All other occupancies ..... 1 hr.

[3] The limiting distance is the distance measured perpendicular from the exterior wall face to a property line or the centre line of a street or lane, or to an imaginary line between two buildings on the same property or to an imaginary line between two parts of the same building which are required to be separated from each other.

(h) Flame Spread Limitations

(1) Except for doors, interior wall and ceiling finishes in *apartment buildings** shall have a flame spread rating of not more than 150.

(2) Unless a *building* is sprinklered at least 90 per cent of the ceiling in an *exit* or access to an *exit* shall have a flame spread of not more than 25.

(3) Unless a *building* is sprinklered at least 90 per cent of the walls in an *exit* or access to an *exit* shall have a flame spread rating of not more than 75, or the upper half of such walls have a flame spread rating of not more than 25. Doors are excluded from this requirement.

* Words in italics are defined in Section 2.

(4) Flame spread ratings shall be determined in accordance with ASTM Specification E84-61, or shall be as listed by the Underwriters' Laboratories of Canada, or as listed in Supplement No. 2 of the National Building Code.

(i) Laundry Chutes (other than in Houses)

(1) Laundry chutes shall be lined throughout with corrosion resistant sheet metal.

(2) Service openings to such chutes shall be equipped with an acceptable self closing hopper door. Openings to such chutes shall not be located in an *exit** or a stairway.

(3) The minimum cross sectional dimension of the chute shall be 9 in. and the minimum area 1 sq. ft. There shall be neither offset nor decrease in cross section between the top of the chute and the point of discharge.

(j) Refuse Chutes

(1) Refuse chutes shall be of *noncombustible material* separated from the remainder of the *building* by a construction providing a *fire separation* of at least 1 hr. **and equipped with an acceptable self closing hopper door.**

(2) Chutes shall be lined throughout with corrosion resistant sheet metal not less than 28 galvanized steel (sheet) gauge steel or 0.019 in. thick aluminum or equal.

(3) There shall be neither offset nor decrease in cross section between the top of the chute and the point of discharge.

(4) Every service opening into such chutes shall be located in a separate room or compartment enclosed by walls, floor and ceiling providing a *fire separation* of not less than 1 hr.

(6) Such room or compartment shall be of sufficient depth to permit the door to close with the hopper door in any position. Access to such room or compartment shall not be in an *exit.*

(7) Refuse chutes shall discharge into a room or compartment enclosed by walls, floor and ceiling having a *fire separation* not less than 2 hrs. The entrance to such room or compartment shall be equipped with an acceptable self closing door. The discharge end of such chutes shall be equipped with a self closing door or

* Words in italics are defined in Section 2.

with an automatic fire damper operated by a fusible link or similar device.

(8) The installation shall be designed so that the normal accumulation of refuse does not hinder the operation of this self closing door or damper.

(9) Every refuse chute shall be provided with equipment for washing down purposes.

(10) *Approved** automatic sprinklers shall be installed at the top of a refuse chute, at alternate floor levels and in the bin or room into which the chute discharges.

(k) Incinerators

(1) The design, construction and installation of any incinerator shall conform to "The Standard for Incinerators" NFPA-82 published by the National Fire Protection Association, International and to this Section.

(2) Every service opening into a combined flue and chute shall be equipped with an acceptable self-closing hopper door designed and installed so that no part projects into the chute.

(3) No service opening shall be located in a stairway or in any part of the combustion zone of an incinerator.

(4) Every incinerator flue shall terminate in an acceptable spark arrester.

(5) Where auxiliary fuel is supplied to maintain or assist combustion a shut off cock shall be installed in an accessible location on the fuel supply line.

(6) Incinerator rooms shall be supplied with an adequate amount of air for combustion and ventilation.

(l) Alarm and Detection Systems

(1) Fire alarm and fire detection systems shall be provided for *residential occupancies* with sleeping accommodation for 10 or more persons except as permitted in (2).

(2) Where *residential buildings* have direct access to the outdoors from each *dwelling unit* or level or to a balcony leading to stairs to ground level a fire alarm or fire detection system is not required.

* Words in italics are defined in Section 2.

(3) Smoke detectors connected to a restricted alarm shall be installed in all exhaust fans in mechanical ventilation systems serving areas providing sleeping accommodation.

(4) Fire alarm and fire detection systems shall be provided in *low hazard commercial and industrial occupancies** where more than 75 persons are employed above or below street level, and in *high or medium hazard commercial and industrial occupancies* where more than 20 persons are employed above or below street level.

(5) Fire alarm systems required by this Subsection shall be installed in accordance with the requirements of Section 6.7, of Part 6 of the National Building Code.

(m) Sprinkler Systems

(1) Any *building* or part thereof used or intended for *high hazard commercial and industrial* occupancies shall be equipped with suitable fire extinguishing equipment, such as a standard installation of automatic sprinklers, a carbon dioxide system, a dry chemical system or other such protection as is required by the *authority having jurisdiction.*

(2) Sprinkler systems, when provided, shall conform to Subsection 6.7.5 of the National Building Code.

* Words in italics are defined in Section 2.

SECTION 7. FOUNDATIONS IN PERMAFROST** AREAS

(a) Scope

(1) Soil or Rock† Stable on Thawing. Where the *permafrost condition of the supporting soil or rock is such that the material is stable upon thawing no special precautions need be taken and the foundations may be designed in accordance with Section 8.**

(2) Soil or Rock† Unstable on Thawing. Where the *permafrost* condition of the supporting soil or rock is such that the material is unstable upon thawing the foundation shall be designed in accordance with the requirements of this Section.

(b) General

(1) Foundations shall be designed to maintain the *permafrost* in a frozen condition at and below the load carrying level unless it can be shown to the satisfaction of the *authority having jurisdiction* that the design and the construction procedure are such that thawing of the *permafrost* will not result in settlement that will be detrimental to the *building*.

(2) Preservation of the *permafrost* shall be aided by a *ventilated foundation space* or by insulation between the underside of the *building* and the ground surface or by a combination of these. Where a vented foundation space is included to protect the *permafrost* it shall provide at least 2 ft. clear height under the entire *building* to ensure relatively unobstructed air movement beneath the *building* to minimize heat transfer from the *building* to the *permafrost*.

(3) *Buildings* with special thermal* or structural loading conditions or of special design shall have foundations designed by a recognized authority in accordance with the appropriate requirements of Part 4 of the National Building Code and based on design properties of the soil or rock determined from a special investigation.**

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† Rock may contain ice in cracks or fissures within it.
* Words in italics are defined in Section 2.
** See Foreword.
*** Buildings with high heat content such as boiler plants.

(4) *Buildings not more than one *storey* in height and 500 sq. ft. in area, without external plumbing or heating connections, may be supported directly on the ground surface in accordance with Clause (c) (3) of this Section.**

(5) *Buildings* with basements or cellars shall be permitted only where, in the opinion of the *authority having jurisdiction*, the design is such that detrimental settlement will not develop due to thawing of *permafrost* and the adjacent property will not be adversely affected by the construction.

(6) Provision for discharge of liquid wastes from a *building* to the ground shall be permitted only where the wastes are disposed in a manner which will not result in thawing of the *permafrost*, ponding beneath or adjacent to the *building*, erosion of the gravel pad, or cause a public health hazard.

(c) Site Preparation

(1) No disturbance of moss cover over a construction area shall be allowed without permission of the *authority having jurisdiction.*

(2) Subject to the *approval* of the *authority having jurisdiction*, removal of tree growth shall be limited to the area to be occupied by new construction and shall be carried out by methods acceptable to the *authority having jurisdiction.*

(3) Prior to the start of construction a layer of *non-frost susceptible* material at least 6 in. thick shall be placed over the entire working area, except that where such material is not available alternative measures shall be taken to protect the *permafrost* during construction.

(d) Surface Drainage

(1) During construction adequate provision shall be made for removal of surface water and the grade beneath the *building* shall be sloped to prevent future ponding of water.

(2) At the completion of construction all low areas beneath or adjacent to the *building* shall have a grade ensuring proper drainage so that water will not pond. Grading for proper drainage shall be by fill only.

* Words in italics are defined in Section 2.

(e) Excavation

(1) Where excavation is permitted the *owner shall satisfy the *authority having jurisdiction* that any excavation he undertakes will not affect adjacent property or endanger adjacent construction.**

(f) Surface Foundations

(1) Except as provided in (b)(4), surface foundations shall satisfy the intent of Clause (b)(2) and be placed on a gravel pad meeting the following requirements:

(i) the pad shall consist of granular material with a maximum particle size of 3 in.;

(ii) be at least 24 in. in total thickness above existing grade except that for *buildings* over 1,500 sq. ft. in ground area the gravel pad shall be at least 36 in. total thickness;

(iii) the top surface of the pad shall extend a minimum of 3 ft. beyond the edge of the supporting footings or a minimum of 1 ft. from the exterior wall of the *building*, whichever is greater, except that where erosion of the pad is deemed to be a problem, additional protective measures, such as extending the pad or other methods acceptable to the *authority having jurisdiction*, shall be employed;

(iv) the pad shall be placed in 12 in. layers in such a manner as to cause least disturbance to existing ground conditions and be well compacted during placing to ensure support of the load without detrimental settlement. For *buildings* over 1,500 sq. ft. in ground area or where the bearing pressure on the pad exceeds 3,000 lbs. per sq. ft. the pad shall be compacted by the approval of the *authority having jurisdiction.*

(2) Alternate surface foundations may be accepted subject to mechanical means to a degree acceptable to the *authority having jurisdiction.*

* Words in italics are defined in Section 2.

(g) Buried Foundations

(1) Buried foundations shall be permitted only where their suitability has been established to the satisfaction of the *authority having jurisdictionon the basis of past experience in the area or a design by a recognized authority.**

(2) Every buried foundation susceptible to frost action in the active layer shall be embedded in *permafrost* a sufficient depth to ensure firm anchorage or otherwise protected from possible damage by frost action.**

(3) Where embedment of foundation in *permafrost* is required to resist frost action in the active layer* the foundations shall not be loaded until sufficient *adfreezing strength* has been developed by refreezing to provide anchorage against frost heaving.

(4) Foundations shall not be loaded until sufficient refreezing has been developed to support the design load.

(5) Where piles are used for the support of a *building*, each pile shall be embedded in the *permafrost* to a depth at least twice the thickness of the active layer or a minimum of 10 ft.**

(6) Where steaming is used for placing of piles it shall be carefully controlled to keep disturbance of the *permafrost* to a minimum.

(h) Materials

(1) Concrete, masonry and timber used for the support of *buildings* shall meet the appropriate requirements of sections 8(f), 8(g) and 8(h) except that for timber piles that portion of the pile from the permafrost Table to 1 foot above grade shall be given a preservative treatment acceptable to the *authority having jurisdiction*.

(2) Timber piles shall meet the requirements of CSA Specification 056-1962.

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* Words in italics are defined in Section 2.
** Thickness of the active layer shall be established for the area by the *authority having jurisdiction*.

SECTION 8. FOUNDATIONS **

(a) Depth

Foundation depth shall conform to Table 8.1 unless past experience shows that lesser depths are satisfactory, or if the foundation follows a specially prepared engineering design for lesser depths.

TABLE 8.1

Minimum Depths of Foundations

Type of Soil [1]	Foundations Containing Heated Basements, Cellars, or Crawl Space		Foundation Containing No Heated Space	
	Good Soil Drainage to at Least the Depth of Frost Penetration	Poor Soil Drainage	Good Soil Drainage to at Least the Depth of Frost Penetration	Poor Soil Drainage
Rock	No limit	No limit	No limit	No limit
Coarse grained soils	No limit	No limit	No limit	Below the depth of frost penetration [2]
Silt	No limit	No limit	Below the depth of frost penetration [2]	Below the depth of frost penetration [2]
Clay or soils not clearly defined	4 ft.	4 ft.	4 ft. but not less than the depth of frost penetration [2]	4 ft. but not less than the depth of frost penetration [2]

NOTES TO TABLE 8.1

[1] The types of soils listed in Table 8.1 may be identified according to the "Guide to the Field Description of Soil Types" published by the Associate Committee on Soil and Snow Mechanics, National Research Council, Ottawa.

[2] Depth of frost penetration shall be as established by the authority having jurisdiction.

(b) Excavations

The bottom of all excavations shall be level and free from organic materials. For concrete slabs on grade, the base shall be well compacted or consolidated. The soil under footings shall be left undisturbed. (See also Section 3(e)).

** For foundations in permafrost see Section 7.

(c) Fill

(1) Backfill shall be placed carefully against the foundation walls to avoid damaging the walls or injuring any water-proofing, and to a level sufficiently above the finish grade so that future settlement of the backfill will not cause the final grade to slope towards the foundation.

(2) Where a vapour barrier is not installed beneath a basement floor slab, at least 5 in. of coarse clean granular fill shall be provided. Fill beneath slabs on grade shall be well compacted.

(d) Subsurface Drainage

(1) Unless otherwise permitted by the *authority having jurisdiction**, all exterior foundation walls and crawl spaces shall be drained either by gravity or by the use of a sump pump to a suitable drainage system such as a storm sewer or dry well.

(2) Where drainage tile is required it shall be laid around the exterior of foundations so that the top of the pipe is below the bottom of the concrete slab or crawl space floor. Tile or pipe with butt joints shall be laid with ¼ in. to ⅜ in. open joints. These joints shall be covered over at least the top half with not less than 3 in. wide No. 15 asphalt or tar saturated paper or felt. When perforated drain pipe is used the pipe shall be laid with perforations down. Such pipe may be connected with couplings. The drain tile shall be covered with 6 in. of crushed rock, coarse clean gravel or other porous material.

(e) Unstable Soil

All foundations in areas having unstable soil conditions shall be designed by a recognized authority. Actual construction shall be in accordance with the design approved by the *authority having jurisdiction.*

(f) Concrete Footings

(1) Except as provided in (3) below, concrete footings shall be at least 6 in. thick and shall project at least 4 in. on either side of the foundation wall, but not more than the thickness of the footing unless suitably reinforced.

* Words in italics are defined in Section 2.

(2) Concrete footings beneath piers or columns supporting the main structure shall be at least 4 sq. ft. in area for *one-storey buildings** and 6 sq. ft. for two-storey *buildings*.

(3) Footings may be omitted under solid concrete walls, provided the safe-bearing capacity of the soil or rock is not exceeded.

(g) Foundation Walls of Concrete or Unit Masonry

(1) Exterior foundation walls shall extend at least 6 in. above final grade.

(2) Crack control joints shall be placed in foundation walls exceeding 80 ft. in one direction at about 40 ft. intervals, and shall be designed to resist moisture penetration.

(3) The thickness of exterior foundation walls shall conform to Table 8.2 where average, stable soils are encountered.

TABLE 8.2
Minimum Thickness of Foundation Walls
(Unsupported Height not Exceeding 8 Feet)

Type of Foundation Wall	Wall Thickness (in.)	Maximum Height of Finish Grade Above Basement Floor or Inside Grade	
		Foundation Wall Laterally Unsupported at the Top [1] [2]	Foundation Wall Laterally Supported at the Top [1] [2]
Solid Concrete	6	2 ft. 6 in.	5 ft.
	8	4 ft.	7 ft.
	10	4 ft. 6 in.	7 ft. 6 in.
	12	5 ft.	7 ft. 6 in.
Unit Masonry	6	2 ft.	2 ft.
	8	3 ft.	4 ft.
	10	4 ft.	6 ft.
	12	4 ft. 6 in.	7 ft.

NOTES TO TABLE 8.2

[1] Except as provided in Note (2), foundation walls are considered as laterally supported at the top if the floor joists are embedded in the top of the foundation walls or if the floor system is anchored to the top of the foundation walls with anchor bolts. The joists may run either parallel or perpendicular to the foundation wall in such cases.

[2] When a foundation wall contains an opening or openings greater than 4 ft. in length or contains openings in more than 25 per cent of the length of the wall, that portion of the wall beneath such openings shall be considered as being laterally unsupported.

* Words in italics are defined in Section 2.

(4) Where the top of a house foundation wall is reduced in thickness to extend up to the top of the floor joists, the reduced section shall be not higher than 14 in. and not less than 3⅝ in. thick.

(5) Where a foundation wall is reduced in thickness to permit the installation of a masonry exterior facing, the reduced section shall be at least 3⅝ in. thick and not more than 24 in. high unless suitably reinforced.

(6) Concrete shall be kept at a temperature of not less than 50°F for 72 hours after placing. Concrete for footings and foundation walls shall have a minimum compressive strength after 28 days of 2000 psi and shall be mixed and placed in accordance with requirements in Section 4.5 of the National Building Code of Canada, 1965. Solid concrete foundation walls shall not be subjected to any loads until sufficient strength has developed in the concrete to support the loads.

(7) Masonry units shall be of a load-bearing type. Foundation walls made with hollow units shall be capped with solid masonry or concrete, or have the top course filled with mortar or concrete, or be capped with a nominal 2-in. thick wood sill plate the same width as the wall except that a 2 in. by 4 in. sill may be used when the exterior siding is of the type that overlaps the foundation wall at least ½ in.

(h) Timber Foundations

(1) Timber foundations may be used for the support of wood frame structures providing they are so proportioned that the safe bearing capacity of the soil is not exceeded.

(2) Timber exposed to soil shall be at least 6 in. square nominal dimension.

(3) Except as provided in (4) timber exposed to soil above the permanent water table shall be given a preservative treatment acceptable to the *authority having jurisdiction.

(4) Subject to the approval of the *authority having jurisdiction,* untreated timber may be used for surface foundations providing:

(i) the site is well drained;

* Words in italics are defined in Section 2.

(ii) the foundation is supported on a gravel pad above grade;

(iii) the timber is exposed to free circulation of air.

SECTION 9. BASEMENT, CELLAR AND CRAWL SPACE COLUMNS

(a) General

Columns shall be designed to support the applicable design loads in Section 4(e) in accordance with the requirements in Part 4 of the National Building Code of Canada, 1965, except that in residential *buildings** with wood frame floor systems, the columns described in (b), (c), (d) and (e) shall be acceptable.

(b) Unit Masonry Columns

Unit masonry basement, cellar and *crawl space* columns shall be made of load bearing type units with nominal dimensions of not less than 12 in. by 12 in. or 10 in. by 16 in.

(c) Solid Concrete Columns

Solid concrete basement, cellar and *crawl space* columns shall have a cross-section of not less than 8 in. by 8 in. if square and 9 in. dia. if round.

(d) Steel Columns

Steel columns supporting beams in basements, cellars and *crawl spaces* shall be at least 2 ⅞ in. o.d. with not less than $\frac{3}{16}$-in. wall thickness, except that proprietary columns with other dimensions may be used where load bearing capacities have been determined provided columns are spaced so that they will not be overstressed. Steel columns shall have a coating of rust-inhibitive paint and have steel bearing plates at each end.

(e) Wood Columns

Wood columns in basements, cellars and *crawl spaces* shall be at least 6 in. square nominal dimension. Columns shall not be embedded in concrete and shall be separated from the concrete by dampproofing material.

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* Words in italics are defined in Section 2.

SECTION 10. DAMPPROOFING AND WATERPROOFING

(a) Waterproofing Walls Below Grade

Where hydrostatic pressure is likely to occur, all exterior surfaces of basement or cellar walls below grade shall be waterproofed by covering the walls with two layers of bitumen-saturated membrane, with each layer being cemented in place with bitumen and coated overall with a heavy coating of bitumen. Unit masonry walls shall be parged before being waterproofed.

(b) Waterproofing Floors Below Grade

Where hydrostatic pressure is likely to occur, concrete floor slabs adjacent to the ground shall be waterproofed by placing a system of membrane waterproofing between 2 layers of concrete each of which is at least 3 in. thick and by mopping the floor waterproofing membrane to the exterior wall waterproofing to form a complete seal.

(c) Dampproofing Walls Below Grade

(1) Where hydrostatic pressure is not likely to occur, all exterior surfaces of foundation walls below grade shall be dampproofed by applying at least one heavy coat of bituminous or other acceptable dampproofing. Unit masonry walls shall be parged before applying the dampproofing.

(2) Interior surfaces of foundation walls shall be dampproofed below grade if they enclose habitable space. Such dampproofing shall consist of at least 2 mil. polyethylene lapped 4 in. at the joints, at least two mopped-on coats of bitumen, or material providing equivalent performance.

(d) Dampproofing Slabs on Grade

(1) When installed below the slab, dampproofing shall consist of 4-mil. polyethylene applied over dry felt, or 6-mil. polyethylene, or 45-lb. roofing lapped at least 4 in. at the joints.

(2) When installed above the slab, dampproofing shall consist of at least 2-mil. polyethylene lapped at least 4 in. at joints, or 2 mopped-on coats of bitumen.

(e) Crawl Spaces

*Crawl spaces** shall be dampproofed by a layer of 45-lb. roll roofing, or 4-mil. polyethylene, lapped at least 4 in. at the joints.

(f) Dampproofing Basement and Cellar Slabs

Where hydrostatic pressure is not likely to occur, basement and cellar floor slabs shall be dampproofed by means of a vapour barrier installed according to the requirements for slabs on grade, or placed on at least 5-in. thick fill consisting of coarse clean granular material.

(g) Caulking

Caulking shall be provided at any location where necessary to prevent the entrance of water into the structure. Caulking materials shall be of a type suitable for the temperature conditions prevailing at the time of application, and which will remain pliable after completion throughout the range of temperatures encountered in service.

SECTION 11. FLASHING

(a) Material

Flashing shall consist of sheet lead, copper, galvanized steel, zinc, aluminum or roll roofing. Where flashing is concealed, polyethylene film may also be used. Aluminum must be suitably coated to protect it from contact with masonry or concrete.

(b) Required Locations in Walls

(1) Flashing shall be provided over the back and top of parapet walls, over heads of openings (where the vertical distance from the bottom of the eave to the top of the opening is more than ¼ of the horizontal overhang of the eave), under jointed window sills, beneath weep holes in cavity walls or masonry veneer walls and at **all other locations where required to prevent the entry of water.**

(2) Flashing shall be installed so that it leads the water to the exterior and does not trap water within the structure.

* Words in italics are defined in Section 2.

(c) Required Location in Roofs

(1) Flashing shall be installed at the intersection of walls or chimneys with roofs **and at all other locations where required to prevent the entry of water.**

(2) Unless otherwise permitted by the *authority having jurisdiction** **eaves on roofs with a slope of 4 in 12 or more shall be protected against ice damming with 45-lb. roll roofing, 2 layers of 15-lb. felt, or 6-mil. polyethylene extending from the roof edge to a line at least 12 in. inside, and parallel to, the inner face of the exterior wall. Protection may be omitted over unheated garages, carports, porches or where the roof overhang exceeds 3 ft.**

(3) Valley flashing shall consist of 24-in. wide sheet metal or roll roofing.

SECTION 12. THERMAL INSULATION AND VAPOUR BARRIERS

(a) Vapour Barriers

(1) Vapour barriers shall be installed on the warm side of insulation if insulation, when installed, does not effectively limit the passage of water vapour over the entire surface.

(2) Materials for vapour barriers shall conform to CGSB "Vapour Barriers; Sheet for Use in Above-Grade Building Construction". 70-GP-1 1960, published by the Canadian Government Specifications Board. **Type I** Vapour Barriers shall be used where a high resistance to vapour movement is required, such as in wall construction that incorporates exterior cladding or sheathing such as plywood having a low water vapour permanence. **Type II** Vapour Barriers may be used in all other construction.

(3) All joints shall be located over supporting members and lap at least 1 in. The entire surface, including framing members, shall be protected with the vapour barrier so that no gaps occur. Openings shall be cut in such a manner that the vapour barrier

* Words in italics are defined in Section 2.

fits snugly and is sealed tightly around electrical outlets, registers, etc., without damaging the insulation. Damaged vapour barriers shall be repaired or replaced.

(b) Insulation

(1) Material for insulation that is in contact with the ground shall be inert to the action of soil and water. The insulating property shall not be significantly reduced by moisture or corrosion.

(2) Insulation shall be installed in such a manner that there is a reasonably uniform insulating value over the entire face of the insulated area.

(3) Loose fill insulation may be used on horizontal surfaces only, except that specially designed water repellent types are acceptable for cavity wall construction in the cavity between the outer and inner wythes. The insulation shall have a flame spread rating of not more than 25 without continued progressive combustion throughout the material.

(4) Insulation of foundation walls enclosing heated habitable space or a *crawl space** used as a warm air plenum shall extend at least 12 in. below adjacent grade.

(5) Unless otherwise required to prevent thawing of the permafrost insulation around concrete slabs on grade shall extend at least 12 in. below exterior grade and be located so that heat from the *building* is not restricted from reaching the ground beneath the perimeter if exterior walls are not supported by footings extending below frost level.

(6) Where insulation is exposed to the weather and subject to mechanical damage, it shall be protected.

(7) Insulation in construction that is required to be *noncombustible* shall conform to the requirements in Section 6(b).

(8) Where plastic type insulation is freely exposed to air, either within a room or within a wall, floor or ceiling space, it shall be of the self-extinguishing type.

* Words in italics are defined in Section 2.

SECTION 13. STAIRS, HANDRAILS, GUARDS

(a) General

(1) Treads and risers shall have uniform rise and run in any one flight and shall be uniform in width and height in successive flights in any stair system.

(2) At least 3 risers shall be provided for interior stairs located in *exits**. At least two risers should be provided for interior stairs which do not form part of an *exit*, except that a single riser is permitted between a floor level and an adjacent landing within a *dwelling unit* in other than main stairways.

(3) Where the stair forms part of *means of egress*, the appropriate requirements in Section 5, "Means of Egress" and Section 6, "Fire Protection", also apply. Where there is a difference in requirements, the more restrictive requirements shall govern.

(b) Stair Dimensions

(1) Interior stairs within *dwelling units* to areas used only for storage, laundry and mechanical equipment such as unfinished basements, cellars and attics, shall have a maximum rise of 9 in., a minimum run of 8 in. and a minimum tread width of 9 in.

(2) Interior stairs within *dwelling units* other than those listed in (1) and exterior stairs for *houses* shall have a maximum rise of 8 in., a minimum run of 8½ in. and a minimum tread width of 9½ in.

(3) Interior stairs not contained within *dwelling units* and exterior stairs for *buildings* other than *houses* shall have a maximum rise of 7¾ in., a minimum run of 9½ in. and a minimum tread width of 10 in. The product of the run and rise for such stairs shall be not less than 70 or more than 75.

(4) Where the run of any stair is less than 10 in., a nosing of at least 1 in. shall be provided beyond the face of the riser or an equivalent back slope on the risers shall be provided.

* Words in italics are defined in Section 2.

(5) At least one stairway between each floor level in a *dwelling unit** and all common stairways in *buildings* shall have a minimum width between wall faces of at least 3 ft. (See also Section 5, "Means of Egress".)

(6) The clear height, measured vertically from a line drawn through the outer edges of the nosings shall be at least 6 ft. 4 in. for stairs located in *dwelling units* and 7 ft. for all other stairs in a *building*.

(c) Landings

(1) Landings shall be at least as wide and as long as the width of the stairs in which they occur, except that in a straight run, the length of the landing need not exceed 44 in.

(2) Where a door swings towards a stair, the full arc of its swing shall be over a landing. A space equivalent to the dimension for a landing shall be provided at the top and bottom of each flight of stairs, and where a doorway occurs in a stairway. A landing shall be provided at the top of all exterior stairs, except that a landing may be omitted at a secondary entrance to a *house* provided the stair does not contain more than 3 risers.

(3) The vertical height between any landings shall not exceed 12 ft.

(4) The clear height over landings shall be at least 6 ft. 4 in. in *dwelling units* and 7 ft. for all other stairs.

(d) Winders

(1) Winders are not permitted in any *exit* stairway.

(2) A stairway shall have not more than one set of winders between floor levels.

(3) Winders shall provide a turn of not more than 90°.

(4) Winder treads shall form an angle of 30°.

(5) Risers shall equal those of the stair in which the winders occur.

(e) Ramps

(1) The maximum gradient for pedestrian ramps shall be 1 in 10.

* Words in italics are defined in Section 2.

(2) Where a doorway or stairway opens on to a ramp through the side of the ramp there shall be a level area extending across the full width of the passage way and for a distance of at least 12 in. on either side of the wall opening.

(3) Where a doorway or stairway opens on to a ramp at the end of the ramp, there shall be a level area extending across its full width and along its length for at least 36 in.

(f) Handrails and Guards

(1) When an interior stair has more than 2 risers, the sides of the stair and the landing on floor level around the stair well shall be enclosed by walls or be protected by handrails or balustrades, except that a stair to an unfinished basement or cellar in a *dwelling unit** may have one unprotected side. When an exterior stair has more than 3 risers, at least one open side shall be protected by handrails or balustrades.

(2) At least one handrail or balustrade shall be provided for interior stairs of more than 2 risers and exterior stairs of more than 3 risers when the stairs are not more than 44 in. wide. When the stairs are more than 44 in. wide, handrails or balustrades shall be provided on both sides of the stair. When the stairway is more than 88 in. wide, intermediate handrails shall also be provided so that the distance between handrails shall not exceed 66 in.

(3) In closed interior stairways, handrails may be omitted at the landing if the length of the landing between two stair flights is greater than the width of the stairs.

(4) Handrails and balustrades for stairs within *dwelling units* and exterior steps for *houses* shall be at least 2 ft. 6 in. above a line drawn through the outside edges of stair nosings and 2 ft. 8 in. above landings.

(5) Handrails and balustrades for stairs in a shared *means of egress* shall be at least 2 ft. 8 in. above a line drawn through the outside edges of the stair nosings and 3 ft. above landings. All other guard rails or balustrades including balconies shall be at least 3 ft. 6 in. high. Openings in or beneath balcony railings shall not exceed 4 in.

* Words in italics are defined in Section 2.

(6) Handrails shall be so constructed that there will be no obstruction on or above them to break a hand hold.

(7) Handrails shall not project more than 3½ in. into the required stairway or *exit** width.

(8) Where ramps are used in lieu of stairs, the handrail and guard requirements for stairs shall apply.

(g) Construction

(1) Wooden stair stringers shall have a minimum effective depth of 3½ in. and an overall depth of at least 9½ in. Stringers, shall be supported and secured top and bottom. Stringers shall be at least 1$\frac{1}{16}$ in. thick if supported along their length and 1⅝ in. thick if unsupported along their length. Wood stringers shall be spaced not more than 3 ft. o.c. in *dwelling units* and 2 ft. o.c. when located in other than *dwelling units.*

(2) Lumber or plywood treads for stairs within *dwelling units* shall be at least 1 in. thick, except that if open risers are used, and the distance between stringers exceeds 2 ft. 6 in., the treads shall be at least 1⅝ in. thick.

(3) The finish for treads and landings of stairs, other than those in *dwelling units* or at the entrance to *houses,* shall have a non skid finish or shall be provided with non skid strips.

SECTION 14. CONCRETE FLOOR SLABS

(a) Basement and Cellar Floors

Floors shall have a minimum thickness of 3 in., exclusive of topping and shall be sloped to the floor drain.

(b) Slabs on Grade

(1) Slabs on grade with perimeter foundation walls shall be at least 3½ in. thick exclusive of topping. When located in slabs, ducts shall be encased with at least 2 in. of concrete unless crush-resistant waterproof ducts are used. Slabs shall be reinforced with the equivalent of 6 in. by 6 in., 6 ga. mesh. The top of the slab shall be at least 6 in. above grade.

* Words in italics are defined in Section 2.

(2) Slabs on grade that do not have perimeter foundation walls shall be designed for existing soil conditions according to accepted engineering practice and past experience in the area. Requirements for such slabs shall be not less than those described in (1).

(c) Concrete

Unreinforced concrete slabs shall have a minimum compressive strength of 2000 psi and concrete for reinforced slabs shall have a minimum compressive strength of 2500 psi and have a maximum slump of 3 in.

SECTION 15. MASONRY WALLS ABOVE GRADE

(a) General

(1) Used bricks may be employed if they are free of old mortar, soot or other surface coating.

(2) Glass blocks and gypsum masonry shall not be used as load bearing units or in the construction of fireplaces or chimneys. Gypsum block shall not be exposed to soil, weather or other dampness. Masonry made with foamed concrete shall not be used in contact with the soil or exposed to the weather, unless accepted by the *authority having jurisdiction** for this purpose.

(3) Masonry units shall be sound and durable.

(4) Mortar and masonry shall be maintained at a temperature of at least 40°F during laying and for at least 48 hours after laying.

(5) The top surface of uncompleted masonry exposed to the weather shall be completely covered with a waterproof material when construction is not in progress.

(b) Mortar

(1) Water and aggregate shall be clean and free of significant amounts of deleterious materials.

(2) If lime putty is used in preparing mortar, it shall be made by slaking quicklime in water for at least 24 hours or soaking hydrated lime in water for at least 12 hours.

* Words in italics are defined in Section 2.

(3) Mortar shall be mixed to the proportions specified in Table 15.1. Mortar containing cement shall not be used later than 2½ hours after mixing.

TABLE 15.1

MORTAR MIX PROPORTIONS
(by volume)

Permissible Use of Mortar	Portland Cement	Masonry Cement (Type H)	Lime	Aggregate
All locations [1]	½ to 1 1	1 —	— ¼ to ½	Not less than 2¼ and not more than 3 times the sum of the volumes of the cement and lime
All locations,[1] except: foundation walls, and piers	— 1	1 —	— ½ to 1¼	
All locations, except load bearing walls of hollow units	1	—	1¼ to 2½	
All non load bearing partitions and all load bearing walls of solid units except foundations walls	1 —	— —	2¼ to 4 1	

NOTE TO TABLE 15.1

[1] Must not be used for sand-lime brick or concrete brick. Where sand-lime or concrete brick is used, a mix consisting of 1 part masonry cement to 3 parts aggregate by volume may be used.

(4) Mortar for gypsum units shall consist of one part gypsum and not more than 3 parts aggregate by weight.

(5) Mortar for glass block shall consist of 1 part portland cement, 1 part hydrated lime to not more than 4 parts aggregate, by volume.

(c) Mortar Joints

(1) Maximum average joint thickness shall be ½ in. Maximum thickness of an individual joint shall be ¾ in.

(2) Solid masonry units shall be laid with full head and bed joints.

(3) Hollow masonry units shall be laid with mortar applied to head and bed joints of both inner and outer face shells.

(d) Masonry Support

(1) All masonry shall be supported on masonry, concrete or steel.

(2) Masonry over openings shall be supported by steel, reinforced concrete or masonry lintels or arches designed to support the imposed load.

(e) Thickness and Height

(1) Masonry exterior walls, other than cavity walls, in one *storey buildings** and the top *storey* of two *storey buildings* shall be at least 5½ in. thick provided the walls are not more than 9 ft. high at the eave and 15 ft. high at the peak of a gable end. The exterior walls of the bottom *storey* of two *storey buildings* shall be at least 7½ in. thick. In walls composed of more than one wythe, each wythe shall be at least 3⅝ in. thick.

(2) Cavity walls shall have not less than 3⅝ in. thick wythes separated by not less than 2 in. nor more than 3 in. space.

(3) Load bearing interior partitions shall be at least 3⅝ in. thick for walls up to 5 ft. 6 in. in height, 5½ in. thick for walls up to 9 ft. in height, and 7½ in. for walls up to 36 ft. in height.

(4) Interior non load bearing partitions shall be not less than 2⅝ in. thick.

(5) Masonry veneer resting on a bearing support and applied over wood frame walls or masonry back-up shall be at least 3⅝ in. thick. Such veneer over wood frame walls shall have a minimum of 1 in. air space behind the veneer.

(6) Masonry veneer less than 3⅝ in. thick shall be individually supported by the back-up material and shall not extend more than 24 ft. above finish grade. Individual units shall not support any other units.

(7) The height of parapet walls shall be not more than three times its thickness above the adjacent roof surface. They shall be solid from the top of the parapet to at least one foot below the adjacent roof level.

* Words in italics are defined in Section 2.

(f) Chases and Recesses

(1) Where a chase is cut into masonry, the width and depth of the cut shall not be greater than ⅓ the thickness of the masonry and the horizontal projection of the total length shall not be greater than 4 ft. Where a chase is cut into a load bearing wall the wall thickness of the masonry remaining in the chased section shall not be less than 6 in.

(2) Where a recess is built into masonry, the width of the recess shall not be greater than 24 in. and the depth of the recess shall not be greater than ⅓ the thickness of the wall. At least 6 in. of masonry shall remain at the back of the recess in load bearing walls.

(4) Chases and recesses larger than provided for above may be cut or built into masonry but they shall be considered as openings for purposes of design.

(g) Support of Loads

(1) Solid load bearing walls of hollow masonry units supporting roof or floor framing members shall be capped with solid masonry, or have the top course filled with concrete. Capping may be omitted where the roof framing is supported on a wood plate at least 2 in. nominal thickness, the same width as the masonry wall.

(2) Floor joists supported on cavity walls shall be supported on solid units and shall not project into the cavity. Roof and ceiling framing members bearing on cavity walls shall be supported on solid masonry bridging the full thickness of the wall, or a wood plate, at least 2 in. nominal thickness bearing at least 2 in. on each wythe.

(3) The bearing area under beams and joists shall be sufficient to carry the supported load. The minimum length of end bearing shall be at least 3⅝ in. for beams and 1½ in. for joists.

(4) Beams or columns shall be supported on pilasters if the thickness of the masonry wall or wythe is less than 8 in. At least 8 in. thickness of solid masonry or concrete under the beam or column shall be provided. Pilasters shall be bonded or tied to masonry walls or partitions. Pilasters shall be not less than 2 in. by 12 in. if of concrete or 4 in. by 12 in. if of unit masonry.

(h) Bonding and Tying

(1) Vertical joints in adjacent courses of load bearing walls and partitions, shall be offset unless the horizontal joists are suitably reinforced.

(2) Masonry walls, (other than cavity walls), which consist of two or more wythes shall have the wythes bonded or tied together with headers, comprising at least 4 per cent of the wall surface and spaced not more than 24 in. o.c. vertically or horizontally, extending at least 3⅝ in. into each wythe; or tied with metal ties spaced not more than 36 in. horizontally and 18 in. vertically. Wall ties shall be corrosion resistant, shaped to provide a mechanical key at both ends and be the equivalent in strength to $\frac{3}{16}$ in. diameter steel per unit area of wall.

(3) The wythes of cavity walls shall be tied together with not less than the equivalent of $\frac{3}{16}$ in. diameter corrosion resistant steel rods shaped to provide a mechanical key at both ends and a drip near their centres. Such ties shall be spaced not more than 24 in. o.c. horizontally within 4 in. of the bottom of floor joists if the cavity extends below the joists, and not more than 36 in. o.c. around openings within 12 in. of the openings. At intermediate locations, the ties shall be spaced not more than 36 in. o.c. horizontally and 18 in. o.c. vertically.

(4) Masonry veneer which is not individually supported by the back-up shall be tied to masonry back-up or to wood framing members with corrosion resistant straps spaced in accordance with Table 15.2 and shaped to provide a key with the mortar. Alternatively the veneer may be tied to masonry back-up with one header unit per 3 sq. ft. of wall.

TABLE 15.2
VENEER TIE SPACING

Maximum Vertical Spacing (in.)	Maximum Horizontal Spacing (in.)
16	32
20	24
24	16

(5) Masonry veneer individually supported by a masonry back-up shall be secured to the backing with an acceptable adhesive and shall be wired or otherwise supported by special clips, brackets or other suitable devices. The surface of the masonry back-up shall be true and even or shall be evened with mortar.

(6) Glass block shall have horizontal joint reinforcement of expanded metal strips not less than 3 in. wide spaced at vertical intervals not exceeding 24 in. for units 8 in. or less in height and in every horizontal joint for units higher than 8 in. Reinforcement shall be lapped at least 6 in. where it is discontinuous. Panels shall be securely bonded or tied to surrounding masonry.

(i) Lateral Support

Masonry walls and partitions shall be supported at right angles to the wall by floor or roof construction or by means of intersecting walls or buttresses. The spacing of such supports shall not exceed the distances in Table 15.3.

TABLE 15.3

Maximum Distance Between Lateral Wall Supports

Type of Wall	Maximum Spacing of Supports
Load bearing walls or partitions of solid units	20 times the wall thickness
Load bearing walls or partitions of hollow units or cavity walls	18 times the wall thickness
Non load bearing walls or partitions	36 times the wall thickness

(j) Anchorage of Roofs, Floors and Intersecting Walls

(1) Masonry walls abutting a structural frame shall be anchored to it at vertical intervals not exceeding 24 in. with corrosion resistant steel rods $\frac{3}{16}$ in. diameter shaped at both ends to develop the full strength of the tie.

(2) Where required to provide lateral support (see **(i)**) masonry walls shall be anchored to each tier of joists, beams, or floor construction at maximum intervals of 6 ft. 8 in., except that in *houses*,* anchorage of the floor joists resting on the foundation wall may be omitted. Ties shall be corrosion resistant and be not less than the equivalent of ⅛ in. by 2 in. steel trap. Such anchors shall be formed to provide a mechanical key with the masonry. When joists are parallel to the wall, such ties shall extend across at least 3 joists.

(3) Where required to provide lateral support, intersecting walls or partitions shall be bonded or tied together. In masonry walls the units of the intersecting walls shall be overlapped or corrosion resistant metal ties equivalent to not less than ¼ in. by 1¼ in. steel strapping shall be provided. Such anchors shall be spaced not more than 4 ft. o.c. vertically and shaped at both ends to provide a mechanical key. When required lateral support is provided by an intersecting wood frame wall, ties shall extend across at least 3 studs and spaced not more than 36 in. o.c. vertically. Ties shall be corrosion resistant and consist of the equivalent of not less than $\frac{3}{16}$ in. diameter steel rods. The ties shall be anchored to the wood framing at one end and shaped to provide a mechanical key at the other.

(4) Roof systems of wood frame construction shall be tied to exterior walls by not less than ½ in. diameter anchor bolts spaced not more than 8 ft. apart embedded at least 4 in. into the masonry and fastened to a rafter plate of not less than nominal 2 in. thick lumber. Alternatively the roof system may be anchored by nailing the wall furring strips to the side of the rafter plate.

(5) Where anchor bolts are to be placed in the top of a pier, the pier shall be capped with concrete or reinforced masonry at least 12 in. thick.

(k) Corbelling

(1) All corbelling shall consist of solid units. The units shall be corbelled so that the horizontal projection of any unit does not

* Words in italics are defined in Section 2.

exceed 1 in. and the total projection does not exceed ⅓ the total wall thickness.

(l) Weep Holes

Weep holes spaced not more than 2 ft. apart shall be provided at the bottom of the cavity in cavity wall and masonry veneer wall construction to drain the cavity to the exterior.

(m) Dampproofing

(1) Unless protected for its full height by a roof of a carport or porch, exterior walls other than cavity walls shall be dampproofed by parging the interior surface and covering the parging with breather type asphalt saturated paper.

(2) The junction between door and window frames with masonry shall be caulked. (See Clause **10(g)**).

SECTION 16. CONVENTIONAL WOOD FRAMING

(a) General

(1) All members shall be so framed, anchored, fastened, tied and braced together to provide the strength and rigidity necessary for the purpose for which they are used.

(2) Joists, rafters, beams and plank decking in plank and beam construction shall be designed to carry all superimposed loads according to the requirements in Section **4(e)**. For ordinary loading conditions, the maximum permissible spans for wood joists, rafters, beams shall conform to the Span Tables in Appendix A.

(3) Nailing and stapling shall conform to the requirements in Appendix C.

(4) Ends of joists or beams and other members framing into masonry or concrete at or below grade shall be treated with preservative. All components shall be of such a design and construction and connected to other components in such a manner as to ensure a reasonably windtight structure.

(5) All lumber used shall meet the requirements of Clause 27 (d)(2).

(b) Notching and Drilling

(1) Notches in joists and rafters shall be not deeper than ⅓ the depth of the member and within ½ the member depth from the edge of the bearing.

(2) Holes drilled in floor, roof or ceiling framing shall not exceed ¼ the member depth and shall be located at least 2 in. from the edges.

(c) Anchorage

Unless the ends of the first floor joists are embedded in concrete, the sill plate shall be anchored to the foundation with at least ½-in. diameter anchor bolts spaced 8 ft. 0 in. o.c. embedded at least 4 inches.

(d) Sill Plates

Sill plates shall be at least 2-in. by 4-in. material and set in a full bed of mortar or set directly on the wall and caulked if the top of the foundation is level. (See Clause **10(g)**).

(e) Beams

(1) Beams supporting joists shall have at least 3⅝ in. length of end bearing.

(2) Butt joints in built-up wood beams shall be located at the support or at the span quarter points. Joints at quarter points shall not be adjacent to each other or occur in more than half the members at any quarter point.

(f) Floor Joists

(1) Floor joists shall have at least 1½ in. length of end bearing except when supported on ribbon boards.

(2) Joists shall be restrained from twisting at intervals not exceeding 7 ft. by ceiling furring, cross bridging, blocking, or continuous 1-in. by 4-in. strapping nailed across the bottoms of the joists.

(3) Header and trimmer joists around floor openings shall be doubled when the header joist exceeds twice the common joist spacing or 4 ft.

(4) Joists under non load bearing partitions over 6 ft. in length, parallel to the partition shall be doubled.

(g) Walls and Partitions

(1) Load bearing partitions parallel to the floor joists shall be supported on partitions or beams strong enough to transfer the loads to vertical supports.

(2) Load bearing partitions at right angles to the joists shall be within 25 per cent of the span length from the joist support unless the joists are designed to support such loads.

(3) Unless the weakened studs are suitably reinforced, wall studs shall not be notched, drilled or otherwise damaged so that the undamaged portion of the stud is less than ⅔ the depth of the stud if the stud is load bearing, or 1⅝ in. if the stud is non load bearing.

(4) Studs shall be doubled at the sides of openings in load bearing wall plate, and the outer studs extend from top wall plates to the wall plate, and the outer studs extend from top wall plates to the bottom wall plate.

(5) Size and spacing of studs shall conform to Table 16.1.

TABLE 16.1

Size and Spacing of Studs

Type of Wall	Supported Loads (including dead loads)	Minimum Stud Size	Maximum Stud Spacing c. to c.	Maximum Unsupported Height
Interior Partitions	Limited attic storage or no load	2 in. x 3 in. or 2 in. x 4 in.	24 in.	10 ft. 12 ft.
	Full attic storage or roof load, or limited attic storage plus one floor	2 in. x 4 in.	24 in.	12 ft.
	Full attic storage plus one floor, or roof load plus one floor, or limited attic storage plus two floors	2 in. x 4 in.	16 in.	12 ft.
	Full attic storage plus two floors or roof load plus two floors	2 in. x 4 in. 3 in. x 4 in. 2 in. x 6 in.	12 in. 16 in. 16 in.	12 ft. 12 ft. 14 ft.
Exterior Walls	Roof, with or without attic storage	2 in. x 4 in.	24 in.	10 ft.
	Roof, with or without attic storage plus one floor	2 in. x 4 in.	16 in.	10 ft.
	Roof, with or without attic storage plus two floors	2 in. x 4 in. 3 in. x 4 in. 2 in. x 6 in.	12 in. 16 in. 16 in.	10 ft. 10 ft. 12 ft.

(6) Openings in non load bearing partitions shall be bridged by not less than nominal 2-in. thick material the same width as the studs securely nailed to adjacent studs.

(7) Openings in load bearing stud walls shall be bridged with lintels conforming to Table 16.2.

TABLE 16.2

Lintel Spans

(Nominal 4-in. Thick Lumber or Two Thicknesses of Nominal 2-in. Lumber Installed on Edge)

Location of Lintels	Supported Loads Including Dead Loads	Nominal Depth of Lintels (in.)	Maximum Allowable Spans (ft.) (in.)
Interior Partitions or Walls	Limited attic storage	4	4–0
		6	6–0
		8	8–0
		10	10–0
		12	12–6
	Full attic storage, or roof load, or limited attic storage plus one floor	4	2–0
		6	3–0
		8	4–0
		10	5–0
		12	6–0
	Full attic storage plus one floor, or roof load plus one floor, or limited attic storage plus two floors	4	—
		6	2–6
		8	3–0
		10	4–0
		12	5–0
	Full attic storage plus two floors, or roof load plus two floors	4	—
		6	2–0
		8	3–0
		10	3–6
		12	4–0
Exterior Walls	Roof, with or without attic storage	4	4–0
		6	6–0
		8	8–0
		10	10–0
		12	12–0
	Roof, with or without attic storage plus one floor	4	2–0
		6	5–0
		8	7–0
		10	8–0
		12	9–0
	Roof, with or without attic storage plus two floors	4	2–0
		6	4–0
		8	6–0
		10	7–0
		12	8–0

(8) Wall plates shall be at least 2-in. thick, and the same width as the studs. Except over openings, top wall plates shall be doubled in load bearing walls and any joints in the top plates offset at least 16 in. Where plates are not doubled over openings, the section containing the opening shall be suitably tied into the adjacent wall sections.

(h) Roof and Ceiling Framing

(1) Members shall be continuous or spliced directly over vertical supports.

(2) Members shall be doubled on each side of openings greater than 2 rafter or joist spacings.

(3) Lumber roof trusses shall be capable of withstanding a load equal to the ceiling load plus 2⅔ times the design roof snow load (but not less than 60 psf) for 24 hours. Such trusses shall not deflect more than 1/360 of the span after being loaded with the celing load plus 1⅓ the design roof snow load (but not less than 30 psf) after 1 hour.

(4) Rafters shall be supported directly over exterior walls.

(5) Hip and valley rafters shall be at least 2 in. greater in depth than the common rafters and at least 1½ in. thick.

(6) Ceiling joists shall have not less than 1½ in. length of bearing. Ceiling joists supporting part of the roof load shall be 1 in. greater in depth than the sizes shown in "Span Tables for Ceiling Joists" in Appendix A, except that when the roof slope is 3 in 12 or less, the ceiling joist sizes shall be determined from the "Span Tables for Roof Joists".

(7) Unless the bottom ends of rafters are adequately tied to the ceiling joists to resist spreading (see Appendix C Table C2) the ridge beams shall be at least 2 in. by 6 in. lumber vertically supported at not more than 4 ft. intervals by at least 2 in. by 4 in. struts to suitable bearing.

(8) Intermediate rafter support to reduce the rafter span may consist of 2-in. by 4-in. collar ties or ceiling joists when the roof slope is 4 in 12 or greater, or dwarf walls. Collar ties more than 8 ft. long shall be laterally braced at mid span with a 1-in. by 4-in. stringer.

(9) Roof joists shall be restrained from twisting in accordance with (f)(2).

(i) Subfloors

(1) Plywood and particle board thickness for subfloors shall conform to Table 16.3.

TABLE 16.3
Minimum Thickness of Subflooring

Maximum Joist Spacing (in.)	Minimum Plywood Thickness (in.)	Minimum Particle Board Thickness (in.)
16	½	⅝
20	⅝ [a]	¾ [a]
24	¾ [a]	1 [a]

NOTE TO TABLE 16.3
[a] Plywood may be ½ in. thick and particle board ⅝ in. thick if the finished flooring consists of matched wood strip flooring at least ¾ in. thick laid at right angles to the joists.

(2) Plywood subflooring shall be installed with the surface grain at right angles to the joists.

(3) Except as permitted in (4), a separate underlay shall be provided beneath resilient flooring installed over plywood or particle board subfloors.

(4) Resilient flooring may be applied directly over plywood subfloors providing the plywood edges are tongued-and-grooved or blocking is installed beneath the joists to prevent differential movement.

(5) Lumber subfloors shall be at least $1\frac{1}{16}$ in. thick on supports up to 16 in. o.c., and ¾ in. thick on supports up to 24 in. o.c. Boards shall be not more than 8 in. wide and laid at not less than 45° to the joists. All ends shall be supported.

(j) Roof Sheathing

(1) The thickness of plywood and particle board roof sheathing on a flat roof used as a walking deck shall conform to the

requirements in (i) for "Subfloors". The thickness of plywood and particle board roof sheathing on a roof not used as a walking deck shall conform to Table 16.4.

TABLE 16.4
Minimum Thickness of Roof Sheathing

Joists or Rafter Spacing (in.)	Minimum Plywood Thickness (in.)		Minimum Particle Board Thickness (in.)
	Edges Supported	Edges Unsupported	Edges Supported
12	5/16	5/16	3/8
16	5/16	3/8	3/8
20	3/8	1/2	7/16
24	3/8	1/2	7/16
32	1/2	—	—
36	5/8	—	—
40	3/4	—	—
48	7/8	—	—

(2) When the thickness of the plywood is such as to require the support of the plywood edges parallel to the surface grain, the support shall be provided by at least 2 in. by 2 in. blocking securely nailed between framing members, metal H clips, or tongued-and-grooved edge plywood.

(3) Plywood shall be laid with the surface grain at right angles to the supports.

(4) Lumber roof sheathing shall be at least 11/16 in. thick on supports spaced 16 in. o.c. and 3/4 in. thick on supports up to 24 in. o.c.

(k) Wall Sheathing

(1) Wall sheathing shall be installed if the exterior cladding requires solid backing or intermediate nailing between framing members.

(2) Wall sheathing shall consist of $^{11}/_{16}$-in. lumber, $^{7}/_{16}$-in. fibreboard, ½-in. gypsum board, $^{5}/_{16}$-in. particle board or plywood.

(3) Gypsum board, fibreboard and particle board shall not be considered as an acceptable nailing base where the sheathing must be relied upon for the attachment of siding materials.

(l) Sheathing Paper

(1) A layer of sheathing paper shall be provided over all wall sheathings.

(2) At least two layers of vertically applied paper shall be applied under the siding if no sheathing is used and if the siding is not of the panel type.

SECTION 17. POST, BEAM AND PLANK CONSTRUCTION

(a) Posts

(1) Size and spacing of posts shall be determined on the basis of Section 4.3 of the "National Building Code of Canada, 1965".

(2) Posts in exterior walls shall be anchored to the wall plate by at least 18-ga. steel angles if the sheathing does not provide adequate anchorage.

(3) Members used for intermediate framing between posts shall conform to the requirements in Section 16 for non load bearing stud walls.

(b) Beams

(1) The size and spacing of roof, floor or ceiling beams shall be determined on the basis of Section 4.3 of the "National Building Code of Canada, 1965".

(2) Roof beams shall be securely connected to the exterior wall framing and to the centre bearing beams or partitions to resist uplift from wind.

(3) Joints in beams shall be located over solid supports.

(4) Opposite beams shall be tied together at the joints by means of splices or suitable mechanical connections.

(c) Planks

(1) The thickness and span of floor and roof planks shall be determined on the basis of Section 4.3 of the "National Building Code of Canada, 1965".

(2) Planks shall be laid at right angles to the beams.

(3) Flat laid planks for floors shall be tongued-and-grooved or splined unless a separate underlay is used or wood strip flooring is applied at right angles to the planks.

(4) Floor planks shall be not more than 8 in. wide.

SECTION 18. PLANK FRAME WALLS

(a) General

Plank wall construction consists of flat vertical plank framing members supporting horizontal beams with plank in-filling between.

(b) Thickness

Unsheathed plank frame walls shall be at least 3 in. thick and sheathed walls 2 in. thick (nominal).

(c) Vertical Framing

(1) Vertical framing shall consist of not less than 10-in. nominal width planks spaced not more than 8 ft. o.c.

(2) Uprights shall not bear on wood members with grain at right angles to the upright, except where bearing on sills.

(3) Corners shall be formed by butting and fastening face and edge of two planks together.

(4) Uprights shall be provided at each side of every opening except that a window opening 2 ft. 6 in. or less need be supported only on one side by a vertical structural member. In such case, the opposite jamb of the window or short upright to which it is attached shall bear on the filler wall plank immediately below, which in turn shall be notched into the vertical structural members on each side.

(d) Horizontal Framing

(1) Planks acting as lintels over openings in 2-in. thick walls shall

be at least 8 in. deep for openings up to 5 ft. 6 in. wide, 10 in. deep for openings up to 7 ft. wide and 12 in. for openings up to 8 ft. wide.

(2) Planks acting as lintels over openings in 3-in. thick walls shall be at least 8 in. deep for openings up to 7 ft. 10 in. deep for openings up to 8 ft. wide.

(3) Non load bearing horizontal planks shall be nailed securely to the uprights. Load bearing horizontal planks shall be dovetailed into the uprights or otherwise suitably fastened.

(e) Sheathing and Sheathing Paper

(1) Sheathing and sheathing paper application over the exterior of plank frame walls shall be as described in 16(k) and (l).

(2) Sheathing paper shall also be installed over the interior of the planks.

SECTION 19. LOG CONSTRUCTION

(a) General

(1) Logs which are sound and free of fractures may be used for foundations, beams, posts and similar members providing it can be shown by a structural analysis or accepted tests or previous experience that the strength of the member is adequate for its intended purpose.

(2) The portion of any log coming in contact with masonry or concrete at or below grade shall be treated with a preservative.

(3) All exterior joints between logs shall be rendered watertight by machine joints, oakum packing, cement parging or other method acceptable to the *authority having jurisdiction*.*

(b) Walls

(1) Walls may be built of natural or manufactured logs.

(2) Walls made of logs in a horizontal position shall have interlocking intersections which will prevent the collection of water in the joints, or the horizontal logs shall butt to a vertical corner post to which the horizontal logs shall be firmly attached.

* Words in italics are defined in Section 2.

(3) Each log in a horizontal position shall be scribed as close as possible to its bearer and fastened to the bearer in at least three places, throughout its length, by dowels, continuous machined joints, vertical framing members or interlocking intersections or any combination of these, but in no case shall the distance between fastenings exceed six feet.

(4) Each log in a wall built of vertical logs shall be scribed to fit as closely as possible to the adjacent logs.

(5) Logs used in a vertical position shall have a plate at the top and a plate at the bottom which plates are at least as wide as the largest end diameter of any of the logs.

(c) Lintels

(1) Logs placed in vertical position shall be supported over window and door openings by lintels meeting the requirements of Section 16, Table 16.2.

(2) At every opening in a wall made of logs in a horizontal position where shrinkage can occur there shall be a clearance between the rough buck header and the lintel log of not less than one-half inch in width for each foot of height to allow for settlement.**

SECTION 20. HEAVY TIMBER CONSTRUCTION

(a) General

(1) *Heavy timber construction** means that type of wood construction in which a degree of fire endurance is attained by placing limitations on the minimum sizes of wood structural members and on minimum thickness and composition of wood floors and roofs, by avoidance of concealed spaces under floors and roofs, by the use of approved fastenings, construction details and adhesives for structural members. Design of *heavy timber construction* shall be in accordance with Section 4.3 of the National Building Code of Canada, 1965.

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* Words in italics are defined in Section 2.

** This clearance may be reduced where the wood species permits a lower shrinkage factor to be used.

(2) All wood elements shall be arranged in heavy solid masses and smooth flat surfaces so as to avoid thin sections, sharp projections and concealed or inaccessible spaces.

(3) Built-up members shall not be used unless the individual pieces are glued together as in glued laminated construction or the entire assembly complies with the requirements for minimum sizes as set forth herein for solid sawn timber.

(4) All fabricators of glued laminated timber shall be qualified in accordance with the requirements of CSA 0177-1965 "Qualification Code for Manufacturers of Structural Glued-Laminated Timber."

(b) Columns

(1) Wood columns shall be solid or glued laminated and not less than 8 in. nominal in any dimension when supporting floor loads and not less than 6 in. nominal in width and not less than 8 in. nominal in depth when supporting roof and ceiling loads only.

(2) Columns shall be continuous or superimposed throughout all *storeys** by means of reinforced concrete or metal caps with brackets or connected by properly designed steel or iron caps, with pintles and base plates or by timber splice plates affixed to the columns by means of metal connectors housed within the contact faces or by other *approved* methods.

(c) Beams

(1) Beams and girders of wood supporting floors shall be solid sawn or glued laminated and not less than 6 in. nominal in width and not less than 10 in. nominal in depth.

(2) Wall plates, boxes of self-releasing type or approved hangers shall be provided where beams and girders enter masonry. An air space of ½ in. is provided at the top, end and sides of the member unless approved durable or treated wood is used.

(3) Girders and beams shall be closely fitted around columns and adjoining ends cross-tied to each other by *approved* steel or iron post caps or by metal strips lag screwed or bolted to their sides or intertied to and with the columns by through bolted corbel blocks, side bolsters, splice blocks and fillers so that the stresses

* Words in italics are defined in Section 2.

are transferred by means of devices or metal connectors housed within the contacting faces of the members. Wood bolsters may be placed on top of columns which support roof loads only.

(4) Where intermediate beams are used to support a floor they shall rest on top of the girders or shall be supported by *approved* metal hangers into which the ends of the beams are closely fitted.

(d) Arches and Trusses

(1) Arches which spring from the floor line and support floor loads shall be not less than 8 in. nominal in any dimension.

(2) Framed timber trusses supporting floor loads shall have members of not less than 8 in. nominal in any dimension.

(3) Framed or glued laminated arches for roof construction which spring from the floor line and do not support floor loads shall have members not less than 6 in. nominal in width and not less than 8 in. nominal in depth for the lower half of the height and not less than 6 in. nominal in depth for the upper half.

(4) Frames or glued laminated arches for roof construction which spring from the top of walls or wall abutments, framed timber trusses and other roof framing which does not support floor loads shall have members of not less than 4 in. nominal width and not less than 6 in. nominal depth. Spaced members shall be of two or more pieces not less than 3 in. nominal in thickness and shall be blocked solidly throughout their intervening spaces or shall be covered by a continuous wood plate of not less than 2 in. nominal in thickness, secured to the underside of the members. Splice plates are no less than 3 in. nominal thickness. When protected by *approved** automatic sprinklers under the roof deck, roof framing members shall be at least 3 in. nominal width.

(e) Roof Anchorage

(1) Adequate roof anchorage shall be provided against uplift by wind.

(f) Floors

(1) Floors shall be without concealed spaces.

* Words in italics are defined in Section 2.

(2) Floors shall be solid or glued laminated plank, splined or tongue-and-groove, of not less than 3 in. nominal in thickness covered with 1 in. nominal dimension tongue-and-groove flooring laid crosswise or diagonally, or ⅝ in. phenolic bonded plywood or not less than 4 in. nominal width planks set on edge close together and well spiked and covered with 1 in. nominal dimension flooring or ⅝ in. phenolic bonded plywood. The planks shall be laid so that no continuous line of joints will occur except at points of support.

(3) Flooring shall not extend closer than ½ in. to walls to provide an expansion joint and the joint is covered at top or bottom to avoid flue action.

(g) Roofs

(1) Roofs shall be without concealed spaces.

(2) Roof decks shall be solid or glued laminated plank, splined or tongue-and-groove, not less than 2 in. nominal in thickness or not less than 3 in. nominal in width, planks set on edge close together and laid as required for floors. Other types of decking may be used if *noncombustible*.*

SECTION 21. ROOFING

(a) General

(1) All roof coverings shall meet the requirements of Clause (e).

(2) Roofs shall be protected with roofing including flashing (See Section 11) where necessary, installed to effectively shed rain and prevent water due to ice damming from entering the roof.

(3) The slope limits or roof coverings shall conform to Table 21.1.

(b) Asphalt Shingles (see Clause (e))

(1) Asphalt shingles applied to slopes of 4 in 12 or greater shall provide at least double coverage over the entire roof, disregarding cut-outs.

* Words in italics are defined in Section 2.

TABLE 21.1

Slope Limits for Various Roof Coverings

Type of Roofing	Minimum Slope	Maximum Slope
Built-up Roofing:		
— asphalt base (gravelled)	0	3 in 12
— asphalt base (without gravel)	½ in 12	6 in 12
— asphalt base (surface with wide selvage asphalt roofing)	2 in 12	no limit
— coal-tar base (gravelled)	0	1 in 12
— cold process	½ in 12	9 in 12
Asphalt Shingles:		
— normal application	4 in 12	no limit
— low slope application	2 in 12	no limit
Roll Roofing:		
— smooth and 90 lb. mineral surfaced	3 in 12	no limit
— 19 in. wide selvage asphalt roofing	2 in 12	no limit
— cold application felt	½ in 12	9 in 12
Wood Shingles	3 in 12	no limit
Hand-Split Shakes	4 in 12	no limit
Asbestos-Cement Shingles	4 in 12	no limit
Asbestos-Cement Corrugated Sheets	3 in 12	no limit
Sheet Metal Roofing	0	no limit
Corrugated Metal Roofing	3 in 12	no limit
Sheet Metal Shingles	3 in 12	no limit
Slate Shingles	6 in 12	no limit
Clay Tile	6 in 12	no limit

(2) Shingle tabs shall be secured where the shingle exposure is more than 5 in. or in areas where wind may cause damage to shingles.

(3) Asphalt shingles applied to slopes of less than 4 in 12 shall provide at least triple coverage over the entire roof disregarding cut-outs and the first two courses.

(4) The first course of shingles applied to slopes less than 4 in 12 shall be cemented to the roof deck, and succeeding courses cemented to each other with a band of cement to provide an impermeable roof surface.

(c) Wood Shingles and Shakes (see Clause (e))

(1) Shingle exposure shall conform to Table 21.2.

TABLE 21.2
Maximum Exposure of Wood Shingles

	Maximum Shingle Exposure		
Roof Slope	**16-in. Shingles**	**18-in. Shingles**	**24-in. Shingles**
4 in 12 or less	3¾ in.	4¼ in.	5¾ in.
Over 4 in 12	5 in.	5½ in.	7½ in.

(2) Exposure for hand-split wood shakes shall not exceed 8½ in. for 18-in. shakes, 10 in. for 24-in. shakes and 13 in. for 32-in. shakes.

(3) Shingles or shakes shall be offset at least 1½ in. in adjacent courses so that joints in alternate courses do not line up.

(d) Built-up Roofs (see Clause (e))

(1) Coal tar products and asphalt products shall not be used together in built-up roof construction.

(2) Aggregate shall be uniformly graded in particle size from ¼ in. to ⅝ in., dry and free from foreign materials when applied.

(3) Nails used in built-up roofing shall be corrosion-resistant.

(4) Wide-selvage, mineral-surfaced, asphalt roofing used in built-up roofing shall be not less than 120 lb. per roofing square.

(5) Roofing felt used in built-up roofs shall be not less than No. 15 type.

(6) Bituminous materials, aggregate surfacing and roofing felts shall be applied in the quantities indicated in Table 21.2.

(e) Fire Exposure Test

(1) All roof coverings when tested in accordance with the provisions for Class C of the Methods of Fire Tests of Roof Coverings ASTM E108-58 (1965) shall satisfy the following conditions.

(i) At no time during or after the Flame Exposure, Spread of Flame, or Burning Brand portions of the test shall

—(a) any portion of the roof covering material be blown or fall off a test deck in the form of flaming or glowing brands; or

—(b) the roof deck be exposed by breaking, sliding, cracking or warping of the roof covering; or

—(c) portions of the roof deck fall away.

(ii) At no time during the Class C Flame Exposure Test shall there be sustained ignition of the underside of the deck; if any ignition does occur another series of tests shall be conducted and no additional sustained ignition shall occur;

(iii) In the Class C Burning Brand Test there may be sustained ignition on the underside of the deck of not more than 5 of the 25 brands applied;

(iv) At the conclusion of the Spread of Flame Test there shall have been no significant lateral spread from the path directly exposed to the test flame; the flame may spread to the top of the deck (13 ft.).

(v) The Flame Exposure, Spread of Flame and Burning Brand tests required above shall be carried out as described in ASTM E108.

TABLE 21.3

Material Combinations for Built-Up Roofs

Type of Roof	Amount of Bitumen per 100 sq. ft. of Roof Surface		Number of Plies of Dry Sheathing, Roofing Felts			Minimum Amount of Aggregate Surfacing per 100 sq. ft. of Roof Surface
	Mopping Coats Between Plies	Flood Coat	Wood Board or Plywood Deck		All other decks	
			Dry Sheathing	Roofing Felts	Roofing Felts	
Asphalt and Aggregate	20 lb.	60 lb.	1	4 (1)	3 (2)	400 lb. gravel or crushed rock or 300 lb. slag on level roof; 300 lb. gravel or crushed rock or 225 lb. slag on 3 in 12 slope. Proportional weights for intermediate roof slopes
Coal Tar Pitch and Aggregate	25 lb.	75 lb.	1	4 (1)	3 (2)	
Glass Felt and Aggregate	25 lb.	60 lb.	—	3 (3)	2 (4)	
Asphalt—Smooth Surface	20 lb.	25 lb.	1	4 (1)	3 (2)	—
Glass Felt—Smooth Surface	20 lb.	20 lb.	—	3 (3)	3 (4)	—
Cold Process Roofing	1.5 gal. Cold Process Cement	4 gal. Cold Process Top Coating	—	2	—	—

NOTES TO TABLE 21.3

(1) 2 layers laid dry over the sheathing and 2 layers mopped with bitumen.

(2) All layers mopped with bitumen.

(3) 1 combination felt laid dry and 2 layers of glass felts mopped with bitumen.

(4) All layers of glass felt mopped with bitumen.

SECTION 22. SIDING

(a) General

(1) Exterior walls shall be protected with a siding including flashing and trim where necessary which shall provide a reasonably durable surface and shall shed water.

(2) Insulating asphalt siding or metal shall be ventilated by providing a space at least ⅜ in. in depth to allow for the release of water vapour to the exterior.

(3) Gypsum board or fibreboard sheathing shall not be considered as providing sufficient nail holding power for the attachment of siding.

(4) Nails for the attachment of siding shall be corrosion-resistant.

(b) Lumber Siding

(1) Lumber siding shall be sound, free of knot holes, loose knots, through checks, or splits.

(2) Lumber siding shall be fastened to the framing, blocking or furring at not more than 24-in. intervals and lapped or matched in such a way as to prevent the entry of rain.

(c) Wood Shingles and Shakes

(1) A single course application of shingles shall have a maximum exposure of 7½ in. for 16-in. shingles, 8½ in. for 18-in. shingles and 11½ in. for 24-in. shingles.

(2) A double course application shall have a maximum exposure of 12 in. for 16-in. shingles, 14 in. for 18-in. shingles and 16 in. for 24-in. shingles.

(3) Joints in successive courses shall be offset to prevent the entry of rain.

(d) Asbestos-Cement Siding

(1) Asbestos-cement shingles shall weigh not less than 165 lb./square.

(2) Asbestos-cement sheet shall be not less than 3/16 in. thick when applied to studs spaced not more than 16 in. o.c. nor less

than ¼ in. thick when applied to studs spaced not more than 24 in. o.c. Where applied over sheathing, thickness shall be not less than ⅛ in.

(e) Plywood

(1) Plywood shall be the exterior type. Plywood thickness shall conform to Table 22.1 except that plywood siding applied directly over sheathing without an air space may be ¼ in. thick.

TABLE 22.1

Minimum Plywood Thickness, Exterior Wall Finish

	With Sheathing (Over furring)		Without Sheathing	
Spacing of Supports	Face Grain Parallel to Furring	Face Grain Right Angles to Furring	Face Grain Parallel to supports	Face Grain Right Angles to supports
16 in.	¼ in.	¼ in.	⅜ in.	⅜ in.
20 in.	⅜ in.	¼ in.	½ in.	⅜ in.
24 in.	⅜ in.	¼ in.	½ in.	⅜ in.

(2) Horizontal-lapped plywood shall have wedges under all butt joints and at all corners if applied without sheathing.

(f) Hard Pressed Fibreboard

(1) Hard pressed fibreboard shall be of the tempered or treated type at least ¼ in. thick if applied over sheathing 5/16 in. thick if applied without sheathing. If applied without sheathing, maximum spacing of supports shall be 16 in.

(2) Horizontal-lapped hard pressed fibreboard shall have wedges under all butt joints and at all corners.

(g) Metal Siding

(1) Steel siding shall be manufactured from galvanized sheet steel of not less than 30 galvanized (sheet) gauge.

(2) Aluminum siding shall be at least 0.025 in. thick if applied without a backer board and 0.019 in. thick if applied with a backer board.

(h) Stucco

(1) Stucco shall consist of 1 part Portland cement: ¼ to 1 part hydrated lime: 3½ to 4 parts aggregate per part of cementitious material by volume.

(2) Stucco shall be reinforced with metal lath except that such reinforcing may be omitted if the base consists of sound clean masonry, sufficiently rough or prepared to provide a mechanical key.

(3) Stucco reinforcing shall be galvanized and shall consist of expanded metal, weighing at least 1.8 lb./sq. yd., 18-ga. wire mesh, or diamond mesh lath weighing 3.4 lb./sq. yd.

(4) Reinforcing shall be fastened 6 in. o.c. vertically and 16 in. o.c. horizontally or 4 in. o.c. vertically and 24 in. horizontally. Fasteners shall be corrosion resistant and other than aluminum.

(5) Stucco shall be applied in at least two base coats plus finish to a depth of at least ⅝ in.

(6) Stucco shall be applied and maintained at not less than 50°F temperature for at least 48 hrs. after application.

SECTION 23. INTERIOR FINISHES

(a) Lath and Plaster

(1) Gypsum lath shall be at least ⅜ in. thick on supports spaced not more than 16 in. o.c. and at least ½ in. thick on supports spaced not more than 24 in. o.c.

(2) Metal lath weight shall conform to Table 23.1.

TABLE 23.1
Minimum Weight of Metal Lath

Type of Lath	Min. Weight per sq. yd. (lb.)	Maximum Spacing of Supports	
		Walls (in.)	Ceilings (in.)
Diamond Mesh	2.5	12	12
	3.0	16	12
Flat Rib	2.5	16	12
	3.0	16	16
⅜ in. Rib	2.5	16	16
	3.0	20	20
	3.5	24	24

(3) Plaster shall be at least ⅜ in. thick at any point and plaster mixes shall conform to the requirements in (4) to (7) or to CSA A82.30–1965.

(4) Plaster shall be applied in three coats consisting of a scratch coat, brown coat and finish coat, except that where the base consists of gypsum lath or unit masonry other than concrete, a two coat application may be used in which a brown coat is doubled back over the scratch coat.

(5) When plaster is applied over concrete or concrete masonry a special bond coat shall be used as the first coat.

(6) When 3 coat plaster is used, the first or scratch coat shall consist of 1 part gypsum plaster to 2 parts sand by weight. The second or brown coat shall consist of 1 part gypsum plaster to 3

parts sand by weight. The finish coat shall consist of 1 part gypsum plaster to 3 parts lime by volume.

(7) When two coat plaster is used, the first coat shall consist of 1 part gypsum plaster to 2½ parts sand by weight. The finish coat shall consist of 1 part gypsum plaster to 3 parts lime by volume.

(8) Corners of all walls and ceilings and corners over window or door openings shall be reinforced.

(9) In cold weather, plaster shall be applied at 50°F to 70°F and maintained at this temperature range for at least 96 hours and above freezing thereafter. Ventilation shall be provided for the proper drying of the plaster during and subsequent to its application.

(b) Gypsum Board

Gypsum board shall be at least ⅜ in. thick on supports up to 16 in. o.c. and ½ in. thick on supports up to 24 in. o.c.

(c) Plywood

Plywood finishes for ceilings and walls shall have an effective thickness of at least $\frac{3}{16}$ in. on supports up to 16 in. o.c. and ⅜ in. thick on supports up to 24 in. o.c. except that in walls where blocking is provided at midwall height plywood shall have an effective thickness of at least $\frac{3}{16}$ in. thick on supports up to 24 in. o.c.

(d) Hard Pressed Fibreboard

Hard pressed fibreboard shall be at least ⅛ in. thick on continuous back-up, ¼ in. thick on supports up to 16 in. o.c. and ⅜ in. thick on supports up to 24 in. o.c.

(e) Wood Strip Flooring

Wood strip flooring may be applied without a subfloor, providing it is ¾ in. thick and is laid at right angles to joists not more than 16 in. o.c. so that the end joints are staggered and occur over supports, or are end-matched. Such flooring shall be laid so that no two adjoining strips break joints in the same place between supports and each strip bears on at least two supports.

(f) Glazing

Glass thickness shall conform to Table 23.2.

TABLE 23.2
Glass Sizes

Minimum Glass Weight or Thickness	Maximum Perimeter or Area of Glass Sheet		
	Main Exterior Doors	Windows	Storm and Combination Doors
18 oz.	Not permitted	120 in.	Not permitted
24 oz.	72 in.	168 in.	120 in.
32 oz.	100 in.	240 in.	160 in.
3/16 in.	120 in.	280 in.	—
7/32 in.	—	50 sq. ft.	—
1/4 in.	—	Not limited	—

SECTION 24. HEATING

(a) General

(1) Heating devices installed in *buildings** shall be of sufficient capacity to maintain the desired indoor temperature, commensurate with the use of the *building*, assuming an outdoor winter design temperature of . . .**.

(2) Heating systems shall be designed,*** constructed and installed in accordance with good engineering and commercial practice.

(3) Equipment forming part of a heating system except for concealed or embedded pipes or ducts shall have easy accesses for inspection, maintenance and cleaning.

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* Words in italics are defined in Section 2.

** To be inserted by the municipality; information available from the Secretary of the Associate Committee on the National Building Code.

*** The latest issues of the following publications may be used as a guide in the design of heating systems:
Warm air heating systems of all types, (oil, gas, electric). The published Manuals of the National Warm Air Heating & Air Cond. Association. Electric heating systems radiant. The Heating Manual of the National Electrical Manufacturers' Association.
Hot water and steam heating systems—all types (oil, gas, electric). The published manuals of the Institute of Boiler and Radiator Manufacturers and the Guide and Data Book of the ASHRAE.

(4) Oil burning, gas burning or electric heating equipment shall be installed in accordance with the following specifications published by the Canadian Standards Association:

CSA B51 –1965 "Code for the Construction and Inspection of Boilers and Pressure Vessels"

CSA B139–1962 "Installation Code for Oil Burning Equipment"

CSA B149–1966 "Installation Code for Gas Burning Appliances and Equipment"

CSA C.22.1–1967 "Canadian Electrical Code"

(5) Fuel fired heating appliances shall not be installed in an *exit* or access to an *exit**.

(6) *Crawl spaces* used as warm air plenums shall be restricted to one *storey* portions of *dwelling units*. Enclosing material in such spaces, including insulation shall be not more flammable than nominal 1 in. wood. Combustible ground cover in such *crawl spaces* shall be covered with *noncombustible material* or have *noncombustible* receptacles beneath the register openings.

(b) Heating Supply Ducts

(1) Except for ducts encased in concrete in *houses*, ducts shall be *noncombustible* and shall be reasonably air tight. When combustible ducts are used, the material and installation shall conform to manual 4 of the National Warm Air Heating and Air Conditioning Association.

(2) Galvanized steel, aluminum or tin plate supply ducts shall have a thickness, including coating conforming to Table 24.1. Other metals if used shall have equivalent strength and durability. Rectangular panels in plenums and ducts greater than 12 in. wide, shall be stiffened.

(3) Where the installation of heating supply ducts in walls, floors and partitions creates a space between the duct and construction material, the space shall be sealed with *noncombustible material* at each end.

* Words in italics are defined in Section 2.

TABLE 24.1

MINIMUM METAL THICKNESS OF DUCTS

Shape and Location of Duct	Size of Duct (in.)	GALVANIZED STEEL		ALUMINUM		TIN PLATE	
		Min. Thickness (in.)	Equivalent Galvanized (Sheet gauge)	Min. Thickness (in.)	Equivalent B & S or AM wire gauge	Min. Thickness (in.)	Equivalent Lb. per Base Box
All round ducts and enclosed rectangular ducts	14 or less	0.0127 (1)	No. 30	0.0139	No. 26	0.0134	135
	Over 14	0.0157	No. 28	0.0176	No. 24	—	—
Exposed rectangular ducts	14 or less	0.0157 (1)	No. 28	0.0176	No. 24	—	—
	Over 14	0.0187 (1)	No. 26	0.0201	No. 23	—	—

NOTE TO TABLE 24.1

(1) In single family houses, thickness may be reduced to 30 ga. for ducts 14 in. or less in size and to 28 ga. for ducts over 14 in. in size, where the permissible duct clearance is ½ in. or less.

(5) Ducts shall be securely supported by metal hangers, straps, lugs or brackets.

(4) Vertical supply ducts located in closets or rooms shall be covered with at least ¼ in. cellular asbestos insulation or other acceptable *noncombustible** insulation.

(6) The minimum clearance of furnace plenums from combustible construction shall be as described in CSA B139–1962 for oil furnaces, CSA B149–1966 for gas furnaces and Part 6 of the National Building Code for solid fuel burning furnaces.

(7) Ducts from warm air furnaces with minimum plenum clearance of 3 in.** or less shall have at least this clearance from combustible construction where the duct leaves the main plenum. This clearance may be gradually reduced to ½ in. at a distance of at least 18 in. from the furnace plenum and to zero beyond a bend or offset in the duct sufficiently large to shield the remainder of the duct from direct radiation from the furnace heat exchanger.

(8) Supply ducts from warm air furnaces with a minimum furnace plenum clearance of over 3 in. but not more than 6 in. shall have at least this clearance from combustible construction at the main furnace plenum and for a horizontal distance of 6 ft. from the furnace plenum. This clearance may be reduced to ½ in. beyond this point and to zero clearance beyond a bend or offset in the duct sufficiently large to shield the remainder of the duct from direct radiation from the furnace heat exchanger.

(9) Ducts from furnaces with a minimum plenum clearance of more than 6 in. shall have a clearance from combustible construction equal to that specified for the furnace plenum. This clearance shall be maintained for a horizontal distance of at least 3 ft. from the furnace plenum. The clearance may be reduced to 6 in. beyond this point and to 1 in. at a horizontal distance of 6 ft. from the furnace plenum. This clearance may be further reduced to 5/16 in. beyond a bend or offset in the

* Words in italics are defined in Section 2.

** Applies to gas or oil fired warm air furnaces (vertical) with high limit controls of up to 250°F.

duct sufficiently large to shield the remainder of the supply duct from direct radiation from the furnace heat exchanger.

(10) Clearances for boots and register boxes shall be as described for supply ducts when the boot or box is not separated from combustible construction, except that when at least ¼ of cellular asbestos insulation is provided, no clearance is required.

(11) Where a register is installed in a floor directly over a pipeless furnace, a double walled register box with at least 4 in. between walls or a register box with the warm air passage completely surrounded by the cold air passage, shall be permitted in lieu of the specified clearances listed in (7) to (9) inclusive.

(12) The size of supply ducts shall be designed according to recognized engineering practice to have adequate capacity for the heat loss of the area being served.

(13) All round pipe joints shall be lapped not less than 1 inch and shall have a snug fit without undue crimping or distortion. Such joints need not be screw fastened or taped.

(14) Rectangular duct connections shall be made with S and drive cleats or equivalent mechanical connection. Such connections need not be taped if reasonably air tight.

(15) Trunk ducts shall be securely supported by metal hangers, straps, lugs or brackets. The ducts shall not be nailed directly to wood members. Branch pipes shall be supported at suitable spacing to maintain alignment and prevent sagging.

(c) Supply Outlets for Warm Air Ducts

(1) Registers for warm air supply ducts in garages shall be located at least 4 ft. above the floor and be fitted with an automatic *closure** to prevent garage vapours entering the heating system. (See also Subsection 6 **(e)**(4)).

(2) Except for pipeless and floor furnaces, the temperature of supply air at the outlets shall not exceed 160°F.

(d) Return Air Systems

(1) The return air system shall be designed to handle the entire air supply.

* Words in italics are defined in Section 2.

(2) Parts of return air ducts directly above or within 2 ft. of the outside furnace casing shall be *noncombustible**. Return air ducts in other locations shall be constructed of material not more flammable than nominal 1 in. wood.

(3) Combustible return air ducts shall be lined with *noncombustible material* below floor registers, at the bottom of vertical ducts and under furnaces having a bottom return.

(4) Spaces between studs used as return air ducts shall be separated from the unused portions of such spaces by tight fitting stops of metal or nominal 2 in. thick wood.

(5) A vertical return air duct shall have openings to receive return air on not more than one floor.

(6) The return air system shall be designed so that the negative pressure from the circulating fan cannot affect the furnace combustion air supply nor draw combustion products from joints or openings in the furnace or flue pipe.

(7) Return air inlets shall not be located in a garage or an enclosed furnace room or in a *crawl space* if the furnace is installed in the *crawl space.*

(8) Where warm air is exhausted into a garage, special provision shall be made for make up air from the outside to compensate for this air.

(9) Return air from any *dwelling unit* shall not be recirculated to any other *dwelling unit.*

(10) At least one return air inlet shall be provided per *dwelling unit.* Each return shall serve an area having a design heat loss of not more than 60,000 BTU/hr.

(e) Steam and Hot Water Heating Systems

(1) Every steam and hot water pipe shall be constructed of *noncombustible,* corrosion resistant *material* having adequate strength and durability.

(2) Insulation or other covering for steam or hot water pipes shall be *noncombustible.*

* Words in italics are defined in Section 2.

(3) Clearance between steam or hot water pipes and combustible construction shall be at least ½ in. for steam or water temperatures up to 250°F and 1 in. for temperatures over 250°F.

(4) The space around pipes passing through a wall or floor construction shall be fire stopped with *noncombustible material** to prevent the spread of fire between compartments.

(5) When pipes are run in an enclosure, the fire resistance of the enclosure shall be at least equal to that of the construction through which it passes. Such enclosures shall have a *noncombustible* lining if the pipes are not insulated with at least 1 in. of insulation.

(6) Steam and hot water pipes shall be designed to allow expansion and contraction with changes in temperature.

(f) Radiators, Convectors and Heat Exchangers

(1) Every heat exchanger or unit heater using hot water or low pressure steam shall be installed with sufficient clearance to ensure that the temperature of any combustible material will not exceed its safe limit.

(2) Every steam or hot water radiator or convector in a recess or concealed space of combustible construction or attached to a wall shall be provided with a *noncombustible* backing.

(g) Solid Fuel Burning Appliances

(1) Solid fuel burning appliances shall be mounted on *noncombustible* floors or on two courses of 4-in. hollow masonry units, except when the base of the unit is maintained at a relatively cool temperature by means of a fan chamber or water chamber located beneath the unit. If the unit is of the type in which the flame or hot gases do not contact the base, and there is at least 4-in. clearance beneath the unit, it may be mounted on sheet metal over ¼-in. asbestos-cement board.

(2) Automatically stoker-fired forced warm air furnaces with 250° F high limit control, or boilers with 15 psi ga. maximum pressure and 250°F maximum temperature limits shall have at least 6-in. clearance from combustible construction above and at sides of bonnet or at jacket sides and rear. Other types of

* Words in italics are defined in Section 2.

boilers or furnaces shall have 18-in. clearance. At least 48-in. clearance shall be provided at the front of all units. Clearances, except at front, may be reduced if the combustible construction is suitably protected.

(3) All necessary controls shall be installed in such a manner as to ensure the safe operation of the equipment.

(4) Clearances from unprotected combustible construction for stoves, ranges and space heaters shall conform to Table 24.2.

TABLE 24.2
Clearances from Unprotected Combustible Construction for Stoves, Ranges and Space Heaters Burning Solid Fuel

Appliances	Minimum Clearance (Inches)			
	At Top	At Front (2)	At Sides (2)	At Rear
Stoves, ranges and direct-fired water heaters (fire pot without fire-clay lining)	36	48	36(1)	36
Stoves, ranges and direct-fired water heaters (fire pot with fire-clay lining)	36	48	24(1)	12
Space Heaters	36	48	12	12

NOTES TO TABLE 24.2

(1) For other than the fire-box side of a range burning solid fuel, the clearance at side may be 18 in.

(2) Clearance at sides and front may be reduced to half those shown if the combustible construction is protected by sheet metal over ¼-in. asbestos board or ¼-in. asbestos board held out 1 in. by noncombustible material.

(h) Chimneys and Venting Equipment

(1) Unless otherwise specified in the "Installation Code for Oil Burning Equipment", CSA B139–1962, or "Installation Code for Gas-Burning Appliances and Equipment, CSA B149–1966, published by the Canadian Standards Association, the requirements for chimneys and vents in this Subsection apply.

(2) The flue-pipe shall slope upward and the cross-sectional area of the flue pipe shall be at least equal to the area of the flue outlet of the appliance. Connection of the flue pipe to the chimney shall be by a metal thimble or masonry flue ring. The connection shall be tight and made so that the flue pipe does not extend into the chimney flue. The minimum clearance between a flue pipe and unprotected combustible construction shall be 18 in.

(3) A chimney flue serving a fireplace or incinerator shall not serve any other heat producing unit. Two or more heat producing units other than fireplaces or incinerators may be connected to a single chimney flue provided the flue pipe connections to the chimney are made at different levels and in not more than one *storey**, and if the cross-sectional area of the chimney flue is at least equal to the sum of the cross-sectional areas of the flue pipes. The minimum size of flues shall be the equivalent of 6 in. diameter for small stoves, ranges, space heater and water heaters, 8 in. by 8 in. for furnaces and boilers, and 8 in. by 12 in. for fireplaces.

(4) Masonry chimneys shall be at least 3½ in. thick for flue areas of 126 sq. in. or less and at least 7½ in. thick (two wythes of masonry) for flue areas in excess of 126 sq. in. Chimneys shall be at least 3 ft. above the highest point of contact with the roof and 2 ft. above any roof surface within 10 ft. of the chimney. Not more than 8 in. of chimney flue above the top of the chimney cap may be considered in computing this height. The clearance between concrete or masonry chimneys and combustible framing shall be at least 2 in. for interior chimneys and 2½ in. for exterior chimneys.

(5) Every masonry chimney shall have a liner consisting of at least ⅝-in. fired-clay or firebrick, or other acceptable material and be capped to form a drip, with flues separated by at least 3½ in. of masonry.

(6) Factory-built chimneys shall meet the requirements of the "Standards for Factory-Built Chimneys", C103–1963, published by the Underwriters' Laboratory of Canada.

* Words in italics are defined in Section 2.

(7) Factory-built fireplaces shall meet the requirements of the "Standard for Factory-built Fireplaces", UL 127–1960 published by the Underwriters' Laboratories of Canada.

(8) The back and side walls of fireplaces shall be at least 7½ in. of solid brick, block or concrete, or 12 in. of hollow block (at least 2 wythes) or stone; except that 3½ in. solid masonry or 7⅝ in. of hollow masonry is permitted if an acceptable steel liner is used.

(9) The fireplace shall have a fireproof hearth that extends at least 16 in. in front and 8 in. beyond each side of the opening.

(10) The throat of every fireplace shall be equipped with a metal damper sufficiently large to cover the full area of the throat opening.

(11) Mortar for the placing of firebrick shall be the fire clay or other high-temperature type.

SECTION 25. PLUMBING

(a) General

All plumbing systems shall be installed in accordance with local By-laws or regulations relating to such installation. In the absence of such laws, Part 7 Plumbing of the National Building Code of Canada 1965 shall apply.

(b) Private Water Supply and Sewage Disposal Systems

The design and construction of private water supply and sewage disposal systems shall conform to appropriate local By-laws or regulations.

(c) Sanitary Facilities

(1) Where a year-round piped water supply is available, the plumbing fixtures for a dwelling unit shall be connected to the water supply system.

(2) Where a water closet is installed it shall be connected to a sanitary sewer or to an individual sewage disposal system.

(3) Where no water closet is installed a sanitary privy, chemical toilet or other means approved by the *authority having jurisdiction for disposal of excreta shall be provided.**

* Words in italics are defined in Section 2.

SECTION 26. ELECTRICAL SERVICES

(a) General

Unless otherwise permitted by the *authority having jurisdiction electrical services shall be provided for every *building.***

(b) Installation

Electrical installations shall meet

(1) The requirements of the appropriate local By-laws or regulations or, in the absence of such laws,

(2) the requirements of the current edition of the Canadian Electrical Code, Part I, C22.1 published by the Canadian Standards Association.

SECTION 27. MATERIALS, SYSTEMS AND EQUIPMENT

(a) General

(1) All materials, systems and equipment shall possess the essential properties to perform their intended functions in the structure.

(2) The appropriate standards and specifications listed in the National Building Code document "The Appendix" may be used by the *authority having jurisdiction** as a guide to conformance with the requirements of this By-law. (See Foreword)

(b) Testing

(1) When required by the *authority having jurisdiction,* materials, systems or equipment shall be tested to determine acceptability for their intended use.

(2) Except as provided in (c) (2) the test method to determine the acceptability of materials, systems or equipment shall be published by a recognized agency.

(3) All tests shall be carried out by a testing laboratory acceptable to the *authority having jurisdiction.*

* Words in italics are defined in Section 2.

(c) Other Materials, Systems and Equipment

(1) Materials, systems and equipment not specifically described in these standards or for which no recognized test procedure has been established may be used if it can be shown that the materials, system or equipment is suitable on the basis of past performance or sound engineering principles or on the basis of tests described in (2).

(2) Where no published test method exists, (see Appendix to National Building Code of Canada, 1965) the tests shall be designed to simulate or exceed anticipated service conditions or shall be designed to compare the performance of material, system or equipment with similiar material, system or equipment that is known to be acceptable.

(d) Lumber

(1) Lumber grades shall conform to Table 27.1 for the particular use.

(2) Grade stamped lumber shall be identified by the grade stamp of an association or independent grading agency approved to grade stamp lumber by Canadian Lumber Standards Administration Board of the Canadian Standards Association.

(3) Grade stamp marks shall show the insignia of the Association, or independent grading agency, the species, grade and identifying mark of the mill or grader and the rule under which it was graded. (see Appendix B)

(4) Lumber that has not been grade marked may be used only with the approval of the *authority having jurisdiction*.*

(5) All fabricators of glued laminated timber shall be qualified in accordance with the requirements of CSA 0177–1965, "Qualification Code for Manufacturers of Structural Glued-Laminated Timber."

(e) Concrete

(1) Concrete shall be kept at a temperature of not less than 50°F. for at least 72 hours after placing.

(2) Concrete shall be mixed and placed in accordance with the requirements of Section 4.5 of the National Building Code of Canada, 1965.

* Words in italics are defined in Section 2.

TABLE 27.1

Minimum Lumber Grades for Specific End Uses

Uses	Douglas Fir * W. Hemlock W. Red Cedar Spruce—Sitka W. White and Engelmann Yellow Cedar Lodgepole Pine Ponderosa Pine Western White Pine Larch (BCLMA, WCLIB, WWPA) [1]	Eastern Spruce Balsam Fir Jack Pine Eastern Hemlock Eastern Cedar Tamarack Poplar (ESGC) [2]	White Pine Red Pine (EPGC) [2]	White Pine Red Pine (CLA) [2]	Ponderosa Pine W. White Pine Lodgepole Pine Larch White Fir Engelmann Spruce Western White Spruce (WWPA) [2]
Stud Wall Framing (Load Bearing Members)	Standard	Standard (No. 2)	No. 1 Dim.	No. 1 Dim.	Standard
Stud Wall Framing (Non Load Bearing Members)	Utility	Utility (No. 3)	No. 4 Com.	No. 4	Utility
Plank Frame Construction (Load Bearing Members)	Utility	Standard (No. 2)	No. 3 Com.	No. 3	Utility
Plank Frame Construction (Non Load Bearing Members)	Economy	Economy (No. 4)	No. 5 Com.	No. 5	Economy
Posts and Beams	Standard	Standard (No. 2)	No. 1 Dim.	No. 1 Dim.	Standard
Roof Sheathing	Standard	Standard (No. 2)	No. 3 Com.	No. 4	No. 3 Com.
Subflooring	Standard	Standard (No. 2)	No. 3 Com.	No. 3	No. 3 Com.
Wall Sheathing [1]	Utility	Utility (No. 3)	No. 4 Com.	No. 4	No. 4 Com.

NOTES TO TABLE 27.1

[1] Where wall sheathing is not required as a nailing base, one lower grade than those specified is permitted.
[2] Refers to grading rules of different lumber associations.
[3] BCLMA means British Columbia Lumber Manufacturers Association grading rules.
WCLIB means West Coast Lumber Inspection Bureau grading rules.
WWPA means Western Wood Products Association grading rules.
ESGC means Eastern Spruce Grading Committee grading rules.
EPGC means Eastern Pine Grading Committee grading rules.
CLA means Canadian Lumbermen's Association grading rules.
*Includes Mountain Fir.

APPENDIX A

SPAN TABLES FOR JOISTS RAFTERS AND BEAMS

TABLE A-1.

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY

Species	Grade	Nominal Size (2)	LIVE LOAD 10 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Douglas Fir, Western Larch	Construction	2 x 4	11	6	10	1	9	0	8	2	11	7	10	1	9	0	8	2
		2 x 6	17	6	15	11	14	8	13	11	20	0	18	2	16	11	15	11
		2 x 8	23	10	21	8	20	1	18	11	27	4	24	10	23	0	21	7
		2 x 10	29	9	27	1	25	1	23	7	34	1	31	0	28	9	27	0
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	17	6	15	11	14	8	13	11	20	0	18	2	16	5	15	0
		2 x 8	23	10	21	8	20	1	18	11	27	4	24	10	22	5	20	6
		2 x 10	29	9	27	1	25	1	23	7	34	1	31	0	28	0	25	7
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	21	6	18	7	16	8	15	2	21	6	18	7	16	8	15	2
		2 x 10	29	0	25	7	22	6	20	6	29	0	25	7	22	6	20	6
Pacific Coast Hemlock	Construction	2 x 4	10	8	9	2	8	4	7	7	10	8	9	2	8	4	7	7
		2 x 6	17	1	15	6	14	5	13	7	19	7	17	10	16	6	15	6
		2 x 8	23	4	21	2	19	8	18	6	26	8	24	4	22	6	21	2
		2 x 10	29	1	26	6	24	7	32	1	33	5	30	5	28	1	26	6
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	17	1	15	6	14	5	13	7	19	7	17	10	16	5	15	0
		2 x 8	23	4	21	2	19	8	18	6	26	8	24	4	22	5	20	6
		2 x 10	29	1	26	6	24	7	23	1	33	5	30	5	28	0	25	7
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	19	10	17	2	15	5	14	0	19	10	17	2	15	5	14	0
		2 x 10	26	8	23	7	20	10	18	11	26	8	23	7	20	10	18	11

	Construction	2 x 4	9	7	8	4	7	5	6	10	9	7	8	4	7	5	6	10
		2 x 6	15	5	14	0	12	7	11	6	16	2	14	1	12	7	11	6
		2 x 8	21	0	19	1	17	8	16	8	24	1	21	11	19	11	18	2
		2 x 10	26	3	23	11	22	1	20	11	30	1	27	5	24	11	22	9
Spruce (All western species) Lodgepole Pine, Ponderosa Pine	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	12	7	10	11	9	8	8	11	12	7	10	11	9	8	8	11
		2 x 8	20	2	17	6	15	7	14	4	20	2	17	6	15	7	14	4
		2 x 10	26	3	23	0	20	4	18	7	26	4	23	0	20	4	18	7
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	17	10	15	5	13	10	12	7	17	10	15	5	13	10	12	7
		2 x 10	24	0	21	2	18	7	17	0	24	0	21	2	18	7	17	0
	Construction	2 x 4	9	0	7	10	7	0	6	5	9	0	7	10	7	0	6	5
		2 x 6	14	11	13	7	12	7	11	6	16	4	14	1	12	7	11	6
		2 x 8	20	5	18	6	17	2	16	2	23	4	20	11	18	8	17	1
		2 x 10	25	6	23	1	21	6	20	3	29	1	26	1	23	5	21	5
Western Red Cedar Western White Pine (3)	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	12	11	11	2	10	0	9	2	12	11	11	2	10	0	9	2
		2 x 8	19	0	16	6	14	8	13	6	19	0	16	6	14	8	13	6
		2 x 10	24	8	21	7	19	1	17	7	24	8	21	7	19	1	17	7
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	16	8	14	6	12	11	11	10	16	8	14	6	12	11	11	10
		2 x 10	22	6	19	11	17	5	15	11	22	6	19	11	17	5	15	11
	Construction	2 x 4	10	4	9	0	8	0	7	4	10	4	9	0	8	0	7	4
		2 x 6	15	11	14	5	13	5	12	7	18	2	16	2	14	5	13	2
		2 x 8	21	7	19	8	18	4	17	2	24	10	22	6	20	1	18	4
		2 x 10	27	0	24	7	22	11	21	6	31	0	28	1	26	1	24	5
Pacific Coast Yellow Cedar	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	14	10	12	10	11	5	10	5	14	10	12	10	11	5	10	5
		2 x 8	21	7	18	10	16	10	15	4	21	8	18	10	16	10	15	4
		2 x 10	27	0	24	7	21	10	19	11	28	2	24	8	21	10	19	11
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	19	2	16	7	14	11	13	7	19	2	16	7	14	11	13	7
		2 x 10	25	11	22	10	20	1	18	5	25	11	22	10	20	1	18	5

continued next page —

TABLE A-1. (continued)

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY

Species	Grade	Nominal Size (2)	LIVE LOAD 10 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 4	9	7	8	4	7	5	6	10	9	7	8	4	7	5	6	10
		2 x 6	15	5	14	0	13	0	12	2	17	8	16	0	14	7	13	4
		2 x 8	21	0	19	1	17	8	16	8	24	1	21	11	19	11	18	2
		2 x 10	26	3	23	11	22	1	20	11	30	1	27	5	24	11	22	9
	No. 2 (Standard)	2 x 4	8	6	7	4	6	6	6	0	8	6	7	4	6	6	6	0
		2 x 6	15	5	14	0	12	7	11	6	16	4	14	1	12	7	11	6
		2 x 8	21	0	19	1	17	8	16	8	24	1	20	11	18	8	17	1
		2 x 10	26	3	23	11	22	1	20	11	30	1	26	5	23	7	21	7
Jack Pine	No. 1 (Construction)	2 x 4	10	4	9	0	8	0	7	4	10	4	9	0	8	0	7	4
		2 x 6	15	11	14	5	13	5	12	7	18	2	16	6	15	4	14	4
		2 x 8	21	7	19	8	18	4	17	2	24	10	22	6	20	11	19	6
		2 x 10	27	0	24	7	22	11	21	6	31	0	28	1	26	1	24	5
	No. 2 (Standard)	2 x 4	9	1	7	11	7	1	6	5	9	1	7	11	7	1	6	5
		2 x 6	15	11	14	5	13	5	12	5	17	6	15	2	13	7	12	5
		2 x 8	21	7	19	8	18	4	17	2	24	10	22	6	20	1	18	4
		2 x 10	27	0	24	7	22	11	21	6	31	0	28	1	25	5	23	1
	No. 1	2 x 4	9	10	8	11	8	4	7	10	11	4	10	2	9	2	8	5
		2 x 6	14	11	13	7	12	7	11	11	17	1	15	4	13	8	12	6
		2 x 8	20	5	18	6	17	2	16	2	23	4	20	11	18	8	17	1
		2 x 10	25	6	23	1	21	6	20	3	29	1	26	1	23	5	21	5

White Pine Red Pine	Merchantable and No. 2	2 x 4	9	10	8	11	8	2	7	6	10	6	9	1	8	2	7	6
		2 x 6	14	11	13	7	12	7	11	6	16	4	14	1	12	7	11	6
		2 x 8	20	5	18	6	17	2	16	0	22	8	19	7	17	7	16	0
		2 x 10	25	6	23	1	21	6	20	2	28	8	24	8	22	2	20	2
	No. 1 Dimension	2 x 4	9	0	7	10	7	0	6	5	9	0	7	10	7	0	6	5
		2 x 6	14	11	13	4	11	11	10	10	15	4	13	4	11	11	10	10
		2 x 8	20	5	18	6	16	10	15	4	21	8	18	10	16	10	15	4
		2 x 10	25	6	23	1	21	6	20	3	28	10	24	11	22	4	20	4
	No. 2 Dimension (4)	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	11	10	10	2	9	2	8	5	11	10	10	2	9	2	8	5
		2 x 8	16	8	14	6	12	11	11	10	16	8	14	6	12	11	11	10
		2 x 10	22	6	19	7	17	5	15	11	22	6	19	7	17	5	15	11
Poplar	No. 1 (Construction)	2 x 4	9	0	7	10	7	0	6	5	9	0	7	10	7	0	6	5
		2 x 6	14	11	13	7	12	7	11	11	17	1	15	4	13	8	12	6
		2 x 8	20	5	18	6	17	2	16	2	23	4	20	11	18	8	17	1
		2 x 10	25	6	23	1	21	6	20	3	29	1	26	1	23	5	21	5
	No. 2 (Standard)	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	14	11	13	4	11	11	10	11	15	4	13	4	11	11	10	11
		2 x 8	20	5	18	6	17	2	16	0	22	8	19	7	17	7	16	0
		2 x 10	25	6	23	1	21	6	20	2	28	8	24	8	22	2	20	2

NOTES TO TABLE A-1

(1) Includes gypsum board.

(2) Spans for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(3) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(4) When graded by Eastern Pine Grading Committee spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10	15 per cent

TABLE A-2.
FLOOR JOISTS — LIVING QUARTERS

Species	Grade	Nominal Size (1)	LIVE LOAD 40 lb. per sq. ft. — All ceilings — Joist spacing: 12 in.		16 in.		20 in.		24 in.,	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Douglas Fir, Western Larch (dense and non-dense)	Construction	2 x 6	11	0	10	0	9	4	8	8
		2 x 8	15	0	13	7	12	8	11	11
		2 x 10	19	0	17	4	16	0	15	1
		2 x 12	23	0	20	11	19	5	18	4
	Standard	2 x 6	11	0	10	0	9	4	8	6
		2 x 8	15	0	13	7	12	8	11	7
		2 x 10	19	0	17	4	16	0	14	8
		2 x 12	23	0	20	11	19	5	17	10
	Utility	2 x 6	—		—		—		—	
		2 x 8	12	2	10	6	9	5	8	7
		2 x 10	16	8	14	6	13	0	11	10
		2 x 12	19	8	17	0	15	2	13	11
Pacific Coast Hemlock	Construction	2 x 6	10	10	9	10	9	1	8	7
		2 x 8	14	8	13	4	12	5	11	8
		2 x 10	18	7	16	11	15	8	14	10
		2 x 12	22	6	20	6	19	0	17	11
	Standard	2 x 6	10	10	9	10	9	1	8	6
		2 x 8	14	8	13	4	12	5	11	7
		2 x 10	18	7	16	11	15	8	14	8
		2 x 12	22	6	20	6	19	0	17	10
	Utility	2 x 6	—		—		—		—	
		2 x 8	11	2	9	8	8	8	7	11
		2 x 10	15	5	13	5	11	11	10	11
		2 x 12	18	0	15	7	14	0	12	8

	Construction	2 x 6	9	2	8	0	7	1	6	6			
		2 x 8	13	4	12	0	11	2	10	4			
		2 x 10	16	10	15	2	14	2	13	0			
		2 x 12	20	4	18	6	17	1	15	10			
Spruce, all western species Lodgepole Pine, Ponderosa Pine	Standard	2 x 6	7	1	6	2	5	6	5	1			
		2 x 8	11	5	9	11	8	10	8	1			
		2 x 10	15	0	13	0	11	7	10	7			
		2 x 12	19	4	16	8	15	0	13	7			
	Utility	2 x 6	—		—		—		—				
		2 x 8	10	1	8	8	7	10	7	1			
		2 x 10	13	6	12	0	10	8	9	6			
		2 x 12	16	2	14	0	12	7	11	6			
	Construction	2 x 6	9	2	8	0	7	2	6	6			
		2 x 8	12	10	11	8	10	7	9	8			
		2 x 10	16	4	14	10	13	5	12	3			
		2 x 12	19	8	17	11	16	2	14	10			
Western Red Cedar Western White Pine (2)	Standard	2 x 6	7	4	6	4	5	8	5	3			
		2 x 8	10	10	9	4	8	4	7	7			
		2 x 10	14	1	12	2	10	11	10	0			
		2 x 12	18	2	15	8	14	1	12	10			
	Utility	2 x 6	—		—		—		—				
		2 x 8	9	6	8	2	7	4	6	8			
		2 x 10	13	0	11	4	10	1	9	3			
		2 x 12	15	4	13	2	11	10	10	10			
	Construction	2 x 6	10	0	9	1	8	2	7	6			
		2 x 8	13	7	12	5	11	6	10	10			
		2 x 10	17	4	15	8	14	7	13	8			
		2 x 12	20	11	19	0	17	7	16	7			
Pacific Coast Yellow Cedar	Standard	2 x 6	8	5	7	2	6	6	5	11			
		2 x 8	12	4	10	7	9	6	8	8			
		2 x 10	16	1	14	0	12	6	11	5			
		2 x 12	20	8	18	0	16	1	14	8			
	Utility	2 x 6	—		—		—		—				
		2 x 8	10	11	9	5	8	5	7	8			
		2 x 10	14	11	12	11	11	6	10	6			
		2 x 12	17	6	15	1	13	6	12	5			

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TABLE A-2. (continued)
FLOOR JOISTS — LIVING QUARTERS

Species	Grade	Nominal Size (1)	LIVE LOAD 40 lb. per sq. ft. — All ceilings — Joist spacing: 12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 6	9	8	8	10	8	2	7	6
		2 x 8	13	4	12	0	11	2	10	4
		2 x 10	16	10	15	2	14	2	13	0
		2 x 12	20	4	18	6	17	1	16	1
	No. 2 (Standard)	2 x 6	9	2	8	0	7	1	6	6
		2 x 8	13	4	11	10	10	7	9	8
		2 x 10	16	10	15	2	13	7	12	5
		2 x 12	20	4	18	6	17	1	16	1
Jack Pine	No. 1 (Construction)	2 x 6	10	0	9	1	8	5	7	11
		2 x 8	13	7	12	5	11	6	10	10
		2 x 10	17	4	15	8	14	7	13	8
		2 x 12	20	11	19	0	17	7	16	7
	No. 2 (Standard)	2 x 6	9	11	8	7	7	8	7	0
		2 x 8	13	7	12	5	11	5	10	5
		2 x 10	17	4	15	8	14	6	13	4
		2 x 12	20	11	19	0	17	7	16	7

White Pine Red Pine	No. 1	2 x 6	9	5	8	7	7	10	7	1	
		2 x 8	12	10	11	8	10	7	9	8	
		2 x 10	16	4	14	10	13	5	12	2	
		2 x 12	19	8	17	11	16	7	15	7	
	Merchantable and No. 2	2 x 6	9	2	8	0	7	2	6	6	
		2 x 8	12	10	11	1	9	11	9	1	
		2 x 10	16	4	14	2	12	8	11	7	
		2 x 12	19	8	17	11	16	7	15	6	
	No. 1 Dimension	2 x 6	8	8	7	6	6	8	6	1	
		2 x 8	12	4	10	7	9	6	8	8	
		2 x 10	16	4	14	2	12	8	11	7	
		2 x 12	19	8	17	11	16	2	14	10	
	No. 2 Dimension (3)	2 x 6	6	8	5	10	5	2	4	8	
		2 x 8	9	6	8	2	7	4	6	8	
		2 x 10	13	0	11	4	10	1	9	2	
		2 x 12	16	6	14	4	12	10	11	8	
Poplar	No. 1 (Construction)	2 x 6	9	5	8	7	7	10	7	1	
		2 x 8	12	10	11	8	10	7	9	8	
		2 x 10	16	4	14	10	13	5	12	2	
		2 x 12	19	8	17	11	16	7	15	7	
	No. 2 (Standard)	2 x 6	8	8	7	6	6	8	6	1	
		2 x 8	12	10	11	1	9	11	9	1	
		2 x 10	16	4	14	2	12	8	11	7	
		2 x 12	19	8	17	11	16	7	15	6	

NOTES TO TABLE A-2

(1) Spaces for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(2) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(3) When graded by Eastern Pine Grading Committee rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10, 2 x 12	15 per cent

TABLE A-3.

CEILING JOISTS — ATTIC ACCESSIBLE BY A STAIRWAY AND FLOOR JOISTS IN BEDROOMS (HOUSES ONLY)

Species	Grade	Nominal Size (2)	LIVE LOAD 30 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Douglas Fir, Western Larch	Construction	2 x 6	12	1	11	0	10	2	9	7	13	11	12	7	11	8	10	8
		2 x 8	16	6	15	0	13	11	13	1	18	11	17	2	15	11	14	5
		2 x 10	20	11	19	0	17	8	16	7	23	11	21	10	20	2	18	7
		2 x 12	25	4	23	0	21	5	20	1	29	0	26	4	24	6	22	6
	Standard	2 x 6	12	1	11	0	10	2	9	7	13	7	11	10	10	6	9	7
		2 x 8	16	6	15	0	13	11	13	1	18	6	16	1	14	5	13	1
		2 x 10	20	11	19	0	17	8	16	7	23	6	20	4	18	2	16	7
		2 x 12	25	4	23	0	21	5	20	1	28	5	24	7	22	0	20	1
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	13	10	11	11	10	8	9	9	13	10	11	11	10	8	9	9
		2 x 10	19	0	16	5	14	8	13	5	19	0	16	5	14	8	13	5
		2 x 12	22	4	19	4	17	2	15	8	22	4	19	4	17	2	15	8
Pacific Coast Hemlock	Construction	2 x 6	11	11	10	10	10	0	9	5	13	7	12	4	11	5	10	9
		2 x 8	16	2	14	8	13	7	12	10	18	6	16	10	15	7	14	8
		2 x 10	20	6	18	7	17	4	16	4	23	5	21	4	19	10	18	7
		2 x 12	24	10	22	6	20	11	19	8	28	5	25	10	23	11	22	6
	Standard	2 x 6	11	11	10	10	10	0	9	5	13	7	11	10	10	6	9	7
		2 x 8	16	2	14	8	13	7	12	10	18	6	16	1	14	5	13	1
		2 x 10	20	6	18	7	17	4	16	4	23	5	20	4	18	2	16	7
		2 x 12	24	10	22	6	20	11	19	8	28	5	24	7	22	0	20	1
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	12	8	11	0	9	10	9	0	12	8	11	0	9	10	9	0
		2 x 10	17	6	15	1	13	6	12	4	17	6	15	1	13	6	12	4
		2 x 12	20	5	17	8	15	10	14	5	20	5	17	8	15	10	14	5

	Construction	2 x 6	10	5	9	0	8	1	7	5	10	5	9	0	8	1	7	5
		2 x 8	14	7	13	2	12	4	11	7	16	6	14	4	12	8	11	7
		2 x 10	18	6	16	10	15	7	14	8	20	10	18	0	16	1	14	8
		2 x 12	22	5	20	4	18	11	17	8	25	2	21	11	19	6	17	10
Spruce, all Western species Lodgepole Pine, Ponderosa Pine	Standard	2 x 6	8	1	7	0	6	2	5	8	8	1	7	0	6	2	5	8
		2 x 8	12	11	11	2	10	0	9	2	12	11	11	2	10	0	9	2
		2 x 10	17	0	14	8	13	1	12	0	17	0	14	8	13	1	12	0
		2 x 12	21	11	18	11	16	11	15	6	21	11	18	11	16	11	15	6
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	11	5	9	11	8	10	8	1	11	5	9	11	8	10	8	1
		2 x 10	15	8	13	7	12	2	11	1	15	8	13	7	12	2	11	1
		2 x 12	18	4	15	11	14	2	13	0	18	4	15	11	14	2	13	0
Western Red Cedar Western White Pine (3)	Construction	2 x 6	10	5	9	1	8	1	7	5	10	6	9	1	8	1	7	5
		2 x 8	14	1	12	10	11	11	10	11	15	6	13	5	12	0	10	11
		2 x 10	17	11	16	4	15	1	13	11	19	7	17	0	15	2	13	11
		2 x 12	21	8	19	8	18	4	16	10	23	8	20	7	18	5	16	10
	Standard	2 x 6	8	4	7	2	6	5	5	10	8	4	7	2	6	5	5	10
		2 x 8	12	2	10	7	9	5	8	7	12	2	10	7	9	5	8	7
		2 x 10	16	0	13	10	12	5	11	4	16	0	13	10	12	5	11	4
		2 x 12	20	7	17	10	15	11	14	6	20	7	17	10	15	11	14	6
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	10	8	9	4	8	4	7	7	10	8	9	4	8	4	7	7
		2 x 10	14	8	12	10	11	5	10	5	14	8	12	10	11	5	10	5
		2 x 12	17	4	15	0	13	5	12	2	17	4	15	0	13	5	12	2
Pacific Coast Yellow Cedar	Construction	2 x 6	11	0	10	0	9	4	8	6	12	0	10	4	9	4	8	6
		2 x 8	15	0	13	7	12	8	11	11	16	7	14	5	12	11	11	9
		2 x 10	19	0	17	4	16	0	15	1	21	10	19	5	17	4	15	10
		2 x 12	23	0	20	11	19	5	18	4	26	4	23	6	21	0	19	2
	Standard	2 x 6	9	6	8	2	7	4	6	8	9	6	8	2	7	4	6	8
		2 x 8	13	11	12	0	10	8	9	10	13	11	12	0	10	8	9	10
		2 x 10	18	4	15	10	14	2	12	11	18	4	15	10	14	2	12	11
		2 x 12	23	0	20	4	18	2	16	7	23	6	20	4	18	2	16	7
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	12	4	10	7	9	6	8	8	12	4	10	7	9	6	8	8
		2 x 10	16	11	14	7	13	1	11	11	16	11	14	7	13	1	11	11
		2 x 12	19	10	17	1	15	4	14	0	19	10	17	1	15	4	14	0

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TABLE A-3. (continued)

CEILING JOISTS — ATTIC ACCESSIBLE BY A STAIRWAY AND FLOOR JOISTS — BEDROOMS (HOUSES ONLY)

Species	Grade	Nominal Size (2)	LIVE LOAD 30 lb. per sq. ft.													
			Plastered ceiling (1)								Other than plastered ceiling					
			Joist spacing								Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 6	10	8	9	8	9	0	8	6	12	1	10	6	9	4	8	6
		2 x 8	14	7	13	2	12	4	11	7	16	6	14	4	12	8	11	7
		2 x 10	18	6	16	10	15	7	14	8	20	10	18	0	16	1	14	8
		2 x 12	22	5	20	4	18	11	17	8	25	7	23	4	21	0	19	2
	No. 2 (Standard)	2 x 6	10	6	9	1	8	1	7	5	10	6	9	1	8	1	7	5
		2 x 8	14	7	13	2	12	0	10	11	15	6	13	5	12	0	10	11
		2 x 10	18	6	16	10	15	4	14	0	19	10	17	2	15	4	14	0
		2 x 12	22	5	20	4	18	11	17	8	25	7	22	10	20	5	18	7
Jack Pine	No. 1 (Construction)	2 x 6	11	0	10	0	9	4	8	8	12	7	11	2	10	0	9	2
		2 x 8	15	0	13	7	12	8	11	11	17	2	15	4	13	8	12	6
		2 x 10	19	0	17	4	16	0	15	1	21	10	19	5	17	4	15	10
		2 x 12	23	0	20	11	19	5	18	4	26	4	23	11	22	2	20	7
	No. 2 (Standard)	2 x 6	11	0	9	8	8	8	7	11	11	2	9	8	8	8	7	11
		2 x 8	15	0	13	7	12	8	11	8	16	7	14	5	12	11	11	8
		2 x 10	19	0	17	4	16	0	15	0	21	2	18	5	16	6	15	0
		2 x 12	23	0	20	11	19	5	18	4	26	4	23	11	21	11	19	11

White Pine Red Pine	No. 1	2 x 6	10	5	9	5	8	8	8	0	11	4	9	10	8	10	8	0
		2 x 8	14	1	12	10	11	11	10	11	15	6	13	5	12	0	10	11
		2 x 10	17	11	16	4	15	1	13	11	19	7	17	0	15	2	13	11
		2 x 12	21	8	19	8	18	4	17	2	24	10	22	1	19	8	18	0
	Merchantable and No. 2	2 x 6	10	5	9	1	8	1	7	5	10	6	9	1	8	1	7	5
		2 x 8	14	1	12	7	11	2	10	4	14	6	12	7	11	2	10	4
		2 x 10	17	11	16	1	14	5	13	2	18	7	16	1	14	5	13	2
		2 x 12	21	8	19	8	18	4	17	2	24	8	21	5	19	2	17	6
	No. 1 Dimension	2 x 6	9	10	8	6	7	7	6	11	9	10	8	6	7	7	6	11
		2 x 8	13	11	12	0	10	8	9	10	13	11	12	0	10	8	9	10
		2 x 10	17	11	16	1	14	5	13	2	18	7	16	1	14	5	13	2
		2 x 12	21	8	19	8	18	4	16	10	23	8	20	7	18	5	16	10
	No. 2 Dimension (4)	2 x 6	7	7	6	7	5	11	5	4	7	7	6	7	5	11	5	4
		2 x 8	10	8	9	4	8	4	7	7	10	8	9	4	8	4	7	7
		2 x 10	14	8	12	10	11	5	10	5	14	8	12	10	11	5	10	5
		2 x 12	18	8	16	2	14	6	13	2	18	8	16	2	14	6	13	2
Poplar	No. 1 (Construction)	2 x 6	10	5	9	5	8	8	8	0	11	4	9	10	8	10	8	0
		2 x 8	14	1	12	10	11	11	10	11	15	6	13	5	12	0	10	11
		2 x 10	17	11	16	4	15	1	13	11	19	7	17	0	15	2	13	11
		2 x 12	21	8	19	8	18	4	17	2	24	10	22	1	19	8	18	0
	No. 2 (Standard)	2 x 6	9	10	8	6	7	7	6	11	9	10	8	6	7	7	6	11
		2 x 8	14	1	12	7	11	2	10	4	14	6	12	7	11	2	10	4
		2 x 10	17	11	16	1	14	5	13	2	18	7	16	1	14	5	13	2
		2 x 12	21	8	19	8	18	4	17	2	24	8	21	5	19	2	17	6

NOTES TO TABLE A-3

(1) Includes gypsum board.

(2) Spans for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(3) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(4) When graded by Eastern Pine Grading Committee rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10, 2 x 12	15 per cent

TABLE A-4.

ROOF JOISTS — SUPPORTING CEILING — 50 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 50 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Douglas Fir, Western Larch	Construction (dense and non-dense)	2 x 6	10	2	9	4	8	7	8	1	11	8	10	7	9	11	9	4
		2 x 8	13	11	12	8	11	10	11	1	15	11	14	6	13	6	12	8
		2 x 10	17	8	16	0	14	11	14	0	20	2	18	5	17	0	16	0
		2 x 12	21	2	19	2	17	11	16	10	24	2	22	1	20	5	19	2
	Standard	2 x 6	10	2	9	4	8	7	8	1	11	8	10	2	9	1	8	4
		2 x 8	13	11	12	8	11	10	11	1	15	11	13	11	12	5	11	4
		2 x 10	17	8	16	0	14	11	14	0	20	2	17	7	15	8	14	5
		2 x 12	21	2	19	2	17	11	16	10	24	2	21	1	18	10	17	4
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	11	11	10	4	9	2	8	5	11	11	10	4	9	2	8	5
		2 x 10	16	5	14	2	12	8	11	7	16	5	14	2	12	8	11	7
		2 x 12	19	1	16	6	14	10	13	6	19	1	16	6	14	10	13	6
Pacific Coast Hemlock	Construction	2 x 6	10	0	9	1	8	5	7	11	11	5	10	5	9	8	9	1
		2 x 8	13	7	12	5	11	6	10	10	15	7	14	2	13	2	12	5
		2 x 10	17	4	15	8	14	7	13	8	19	10	18	0	16	8	15	8
		2 x 12	20	10	19	0	17	6	16	5	23	10	21	7	20	0	18	10
	Standard	2 x 6	10	0	9	1	8	5	7	11	11	5	10	2	9	1	8	4
		2 x 8	13	7	12	5	11	6	10	10	15	7	13	11	12	5	11	4
		2 x 10	17	4	15	8	14	7	13	8	19	10	17	7	15	8	14	5
		2 x 12	20	10	19	0	17	6	16	5	23	10	21	1	18	10	17	4
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	11	0	9	6	8	6	7	10	11	0	9	6	8	6	7	10
		2 x 10	15	1	13	1	11	8	10	8	15	1	13	1	11	8	10	8
		2 x 12	17	7	15	2	13	7	12	6	17	7	15	2	13	7	12	6

Spruce, all western species Lodgepole Pine, Ponderosa Pine	Construction	2 x 6	9	0	7	10	6	11	6	5	9	0	7	10	6	11	6	5
		2 x 8	12	4	11	2	10	5	9	10	14	1	12	4	11	0	10	1
		2 x 10	15	7	14	2	13	1	12	5	17	10	15	7	14	0	12	8
		2 x 12	18	8	17	0	15	8	14	11	21	5	18	8	16	10	15	2
	Standard	2 x 6	7	0	6	1	5	5	5	0	7	0	6	1	5	5	5	0
		2 x 8	11	2	9	8	8	7	7	11	11	2	9	8	8	7	7	11
		2 x 10	14	8	12	8	11	5	10	5	14	8	12	8	11	5	10	5
		2 x 12	18	8	16	2	14	6	13	2	18	8	16	2	14	6	13	2
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	9	11	8	6	7	7	7	0	9	11	8	6	7	7	7	0
		2 x 10	13	7	11	10	10	6	9	7	13	7	11	10	10	6	9	7
		2 x 12	15	10	13	8	12	2	11	2	15	10	13	8	12	2	11	2
Western Red Cedar Western White Pine (3)	Construction	2 x 6	8	8	7	10	7	0	6	5	9	0	7	10	7	0	6	5
		2 x 8	11	11	10	10	10	0	9	6	13	5	11	7	10	5	9	6
		2 x 10	15	1	13	8	12	8	12	0	17	0	14	8	13	1	12	0
		2 x 12	18	1	16	5	15	2	14	5	20	5	17	7	15	8	14	5
	Standard	2 x 6	7	2	6	2	5	7	5	1	7	2	6	2	5	7	5	1
		2 x 8	10	6	9	1	8	2	7	5	10	6	9	1	8	2	7	5
		2 x 10	13	10	12	0	10	8	9	10	13	10	12	0	10	8	9	10
		2 x 12	17	7	15	4	13	7	12	6	17	7	15	4	13	7	12	6
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	9	4	8	0	7	2	6	6	9	4	8	0	7	2	6	6
		2 x 10	12	8	11	0	9	11	9	0	12	8	11	0	9	11	9	0
		2 x 12	14	10	12	10	11	6	10	6	14	10	12	10	11	6	10	6
Pacific Coast Yellow Cedar	Construction	2 x 6	9	4	8	5	7	10	7	4	10	4	9	0	8	0	7	4
		2 x 8	12	8	11	6	10	8	10	0	14	5	12	5	11	1	10	2
		2 x 10	16	0	14	7	13	6	12	8	18	5	16	8	15	0	13	8
		2 x 12	19	2	17	7	16	2	15	2	22	1	20	0	18	0	16	5
	Standard	2 x 6	8	2	7	1	6	4	5	10	8	2	7	1	6	4	5	10
		2 x 8	12	0	10	5	9	4	8	6	12	0	10	5	9	4	8	6
		2 x 10	15	10	13	8	12	2	11	2	15	10	13	8	12	2	11	2
		2 x 12	19	2	17	5	15	6	14	2	20	1	17	5	15	6	14	2
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	10	7	9	2	8	2	7	6	10	7	9	2	8	2	7	6
		2 x 10	14	7	12	7	11	4	10	4	14	7	12	7	11	4	10	4
		2 x 12	17	0	14	8	13	2	12	0	17	0	14	8	13	2	12	0

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TABLE A-4. (continued)

ROOF JOISTS — SUPPORTING CEILING — 50 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 50 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 6	9	0	8	2	7	7	7	2	10	4	9	0	8	1	7	5
		2 x 8	12	4	11	2	10	5	9	10	14	1	12	4	11	0	10	1
		2 x 10	15	7	14	2	13	1	12	5	17	10	15	7	14	0	12	8
		2 x 12	18	8	17	0	15	8	14	11	21	5	19	5	18	0	16	4
	No. 2 (Standard)	2 x 6	9	0	7	10	7	0	6	5	9	0	7	10	7	0	6	5
		2 x 8	12	4	11	2	10	5	9	6	13	5	11	7	10	5	9	6
		2 x 10	15	7	14	2	13	1	12	1	17	1	14	10	13	4	12	1
		2 x 12	18	8	17	0	15	8	14	11	21	5	19	5	17	7	16	0
Jack Pine	No. 1 (Construction)	2 x 6	9	4	8	5	7	10	7	5	10	7	9	8	8	8	7	11
		2 x 8	12	8	11	6	10	8	10	0	14	6	13	2	11	10	10	10
		2 x 10	16	0	14	7	13	6	12	8	18	5	16	8	15	0	13	8
		2 x 12	19	2	17	7	16	2	15	2	22	1	20	0	18	7	17	6
	No. 2 (Standard)	2 x 6	9	4	8	5	7	6	6	11	9	8	8	5	7	6	6	1
		2 x 8	12	8	11	6	10	8	10	0	14	5	12	5	11	1	10	2
		2 x 10	16	0	14	7	13	6	12	8	18	5	15	11	14	2	13	0
		2 x 12	19	2	17	7	16	2	15	2	22	1	20	0	18	7	17	2
	No. 1	2 x 6	8	8	7	11	7	5	6	11	9	10	8	6	7	7	6	11
		2 x 8	11	11	10	10	10	0	9	6	13	5	11	7	10	5	9	6
		2 x 10	15	1	13	8	12	8	12	0	17	0	14	8	13	1	12	0
		2 x 12	18	1	16	5	15	2	14	5	20	10	18	10	16	10	15	5

White Pine Red Pine	Merchantable and No. 2	2 x 6	8	8	7	10	7	0	6	5	9	0	7	10	7	0	6	5
		2 x 8	11	11	10	10	9	8	8	11	12	7	10	11	9	8	8	11
		2 x 10	15	1	13	8	12	6	11	5	16	1	13	11	12	6	11	5
		2 x 12	18	1	16	5	15	2	14	5	20	10	18	4	16	6	15	0
	No. 1 Dimension	2 x 6	8	6	7	5	6	7	6	0	8	6	7	5	6	7	6	0
		2 x 8	11	11	10	5	9	4	8	6	12	0	10	5	9	4	8	6
		2 x 10	15	1	13	8	12	6	11	5	16	1	13	11	12	6	11	5
		2 x 12	18	1	16	5	15	2	14	5	20	4	17	6	15	9	14	5
	No. 2 Dimension (4)	2 x 6	6	7	5	8	5	1	4	7	6	7	5	8	5	1	4	7
		2 x 8	9	4	8	0	7	2	6	6	9	4	8	0	7	2	6	6
		2 x 10	12	8	11	0	9	11	9	0	12	8	11	0	9	11	9	0
		2 x 12	15	10	13	8	12	5	11	2	15	10	13	8	12	5	11	2
Poplar	No. 1 (Construction)	2 x 6	8	8	7	11	7	5	6	11	9	10	8	6	7	7	6	11
		2 x 8	11	11	10	10	10	0	9	6	13	5	11	7	10	5	9	6
		2 x 10	15	1	13	8	12	8	12	0	17	0	14	8	13	1	12	0
		2 x 12	18	1	16	5	15	2	14	5	20	10	18	10	16	10	15	5
	No. 2 (Standard)	2 x 6	8	6	7	5	6	7	6	0	8	6	7	5	6	7	6	0
		2 x 8	11	11	10	10	9	8	8	11	12	6	10	11	9	8	8	11
		2 x 10	15	1	13	8	12	6	11	5	16	1	13	11	12	6	11	5
		2 x 12	18	1	16	5	15	2	14	5	20	10	18	4	16	6	15	0

NOTES TO TABLE A-4

(1) Includes gypsum board.

(2) Spans for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(3) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(4) When graded by Eastern Grading Committee rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10, 2 x 12	15 per cent

TABLE A-5.

ROOF JOISTS — SUPPORTING CEILING — 40 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 40 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Douglas Fir, Western Larch	Construction (dense and non-dense)	2 x 6	11	0	10	0	9	4	8	8	12	7	11	5	10	7	10	0
		2 x 8	15	0	13	7	12	8	11	11	17	2	15	7	14	6	13	7
		2 x 10	19	0	17	4	16	0	15	1	21	10	19	10	16	5	17	4
		2 x 12	23	0	20	11	19	5	18	4	26	2	23	10	22	1	20	10
	Standard	2 x 6	11	0	10	0	9	4	8	8	12	7	11	2	10	0	9	1
		2 x 8	15	0	13	7	12	8	11	11	17	2	15	2	13	7	12	5
		2 x 10	19	0	17	4	16	0	15	1	21	10	19	4	17	2	15	8
		2 x 12	23	0	20	11	19	5	18	4	26	2	23	2	20	7	18	10
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	13	1	11	4	10	1	9	2	13	1	11	4	10	1	9	2
		2 x 10	18	0	15	6	13	11	12	8	18	0	15	6	13	11	12	8
		2 x 12	21	0	18	0	16	2	14	10	21	0	18	0	16	2	14	10
Pacific Coast Hemlock	Construction	2 x 6	10	10	9	10	9	1	8	7	12	4	11	2	10	5	9	10
		2 x 8	14	8	13	4	12	5	11	8	16	10	15	4	14	2	13	4
		2 x 10	18	7	16	11	15	8	14	10	21	4	19	5	18	0	16	11
		2 x 12	22	6	20	6	19	0	17	11	25	7	23	4	21	7	20	4
	Standard	2 x 6	10	10	9	10	9	1	8	7	12	4	11	2	10	0	9	1
		2 x 8	14	8	13	4	12	5	11	8	16	10	15	2	13	7	12	5
		2 x 10	18	7	16	11	15	8	14	10	21	4	19	4	17	2	15	8
		2 x 12	22	6	20	6	19	0	17	11	25	7	23	2	20	7	18	10
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	12	0	10	5	9	4	8	6	12	0	10	5	9	4	8	6
		2 x 10	16	6	14	4	12	10	11	8	16	6	14	4	12	10	11	8
		2 x 12	19	2	16	7	14	11	13	7	19	2	16	7	14	11	13	7

Spruce, all western species Lodgepole Pine, Ponderosa Pine	Construction	2 x 6	9	8	8	6	7	7	6	11	9	11	8	6	7	7	6	11
		2 x 8	13	4	12	0	11	2	10	6	15	2	13	6	12	1	11	0
		2 x 10	16	10	15	2	14	2	13	4	19	2	17	1	15	4	14	0
		2 x 12	20	4	18	6	17	1	16	1	23	0	20	6	18	5	16	10
	Standard	2 x 6	7	7	6	7	5	11	5	5	7	7	6	7	5	11	5	5
		2 x 8	12	2	10	7	9	6	8	7	12	2	10	7	9	6	8	7
		2 x 10	16	1	13	11	12	6	11	5	16	1	13	11	12	6	11	5
		2 x 12	20	4	17	8	15	11	14	6	20	6	17	8	15	11	14	6
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	10	10	9	5	8	5	7	7	10	10	9	5	8	5	7	7
		2 x 10	14	11	12	11	11	6	10	6	14	11	12	11	11	6	10	6
		2 x 12	17	4	15	0	13	5	12	2	17	4	15	0	13	5	12	2
Western Red Cedar Western White Pine (3)	Construction	2 x 6	9	5	8	7	7	8	7	0	9	11	8	7	7	8	7	0
		2 x 8	12	10	11	8	10	10	10	2	14	8	12	8	11	5	10	5
		2 x 10	16	4	14	10	13	8	12	11	18	7	16	1	14	5	13	1
		2 x 12	19	8	17	11	16	7	15	7	22	4	19	4	17	4	15	8
	Standard	2 x 6	7	11	6	10	6	1	5	7	7	11	6	10	6	1	5	7
		2 x 8	11	6	10	0	8	11	8	2	11	6	10	0	8	11	8	2
		2 x 10	15	1	13	1	11	8	10	8	15	1	13	1	11	8	10	8
		2 x 12	19	2	16	8	14	11	13	7	19	2	16	8	14	11	13	7
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	10	1	8	10	7	11	7	2	10	1	8	10	7	11	7	2
		2 x 10	14	0	12	1	10	10	9	11	14	0	12	1	10	10	9	11
		2 x 12	16	4	14	1	12	7	11	6	16	4	14	1	12	7	11	6
Pacific Coast Yellow Cedar	Construction	2 x 6	10	0	9	1	8	5	7	11	11	4	9	10	8	10	8	0
		2 x 8	13	7	12	5	11	6	10	10	15	7	13	7	12	2	11	1
		2 x 10	17	4	15	8	14	7	13	8	19	10	18	0	16	5	15	0
		2 x 12	20	11	19	0	17	7	16	7	23	10	21	7	19	8	18	0
	Standard	2 x 6	9	0	7	10	6	11	6	4	9	0	7	10	6	11	6	4
		2 x 8	13	1	11	5	10	2	9	4	13	1	11	5	10	2	9	4
		2 x 10	17	4	15	0	13	5	12	2	17	4	15	0	13	5	12	2
		2 x 12	20	11	19	0	17	0	15	6	22	0	19	1	17	0	15	6
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	11	7	10	1	9	0	8	2	11	7	10	1	9	0	8	2
		2 x 10	16	0	13	10	12	5	11	4	16	0	13	10	12	5	11	4
		2 x 12	18	7	16	1	14	5	13	2	18	7	16	1	14	5	13	2

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TABLE A-5. (continued)
ROOF JOISTS — SUPPORTING CEILING — 40 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 40 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 6	9	8	8	10	8	2	7	8	11	1	9	11	8	11	8	1
		2 x 8	13	4	12	0	11	2	10	6	15	2	13	6	12	1	11	0
		2 x 10	16	10	15	2	14	2	13	4	19	2	17	1	15	4	14	0
		2 x 12	20	4	18	6	17	1	16	1	23	0	21	0	19	5	18	0
	No. 2 (Standard)	2 x 6	9	8	8	7	7	8	7	0	9	11	8	7	7	8	7	0
		2 x 8	13	4	12	0	11	2	10	5	14	8	12	8	11	5	10	5
		2 x 10	16	10	15	2	14	2	13	4	18	10	16	4	14	6	13	4
		2 x 12	20	4	18	6	17	1	16	1	23	0	21	0	19	1	17	7
Jack Pine	No. 1 (Construction)	2 x 6	10	0	9	1	8	5	7	11	11	5	10	5	9	6	8	8
		2 x 8	13	7	12	5	11	6	10	10	15	7	14	2	13	0	11	10
		2 x 10	17	4	15	8	14	7	13	8	19	10	18	0	16	5	15	0
		2 x 12	20	11	19	0	17	7	16	7	23	10	21	7	20	0	18	10
	No. 2 (Standard)	2 x 6	10	0	9	1	8	2	7	6	10	7	9	2	8	2	7	6
		2 x 8	13	7	12	5	11	6	10	10	15	7	13	7	12	2	11	1
		2 x 10	17	4	15	8	14	7	13	8	19	10	17	5	15	7	14	2
		2 x 12	20	11	19	0	17	7	16	7	23	10	21	7	20	0	18	8

White Pine Red Pine	No. 1	2 x 6	9	5	8	7	7	11	7	6	10	8	9	4	8	4	7	7
		2 x 8	12	10	11	8	10	10	10	2	14	8	12	8	11	5	10	5
		2 x 10	16	4	14	10	13	8	12	11	18	7	16	1	14	5	13	1
		2 x 12	19	8	17	11	16	7	15	7	22	4	20	4	18	6	16	10
	Merchantable and No. 2	2 x 6	9	5	8	7	7	8	7	0	9	11	8	7	7	8	7	0
		2 x 8	12	10	11	8	10	8	9	8	13	10	11	11	10	7	9	8
		2 x 10	16	4	14	10	13	8	12	6	17	7	15	4	13	8	12	6
		2 x 12	19	8	17	11	16	7	15	7	22	4	20	2	18	1	16	6
	No. 1 Dimension	2 x 6	9	4	8	1	7	2	6	7	9	4	8	1	7	2	6	7
		2 x 8	12	10	11	5	10	2	9	4	13	1	11	5	10	2	9	4
		2 x 10	16	4	14	10	13	8	12	6	17	7	15	4	13	8	12	6
		2 x 12	19	8	17	11	16	7	15	7	22	2	19	4	17	4	15	9
	No. 2 Dimension (4)	2 x 6	7	2	6	2	5	7	5	1	7	2	6	2	5	7	5	1
		2 x 8	10	1	8	10	7	11	7	2	10	1	8	10	7	11	7	2
		2 x 10	14	0	12	1	10	10	9	11	14	0	12	1	10	10	9	11
		2 x 12	17	6	15	1	13	6	12	5	17	6	15	1	13	6	12	5
Poplar	No. 1 (Construction)	2 x 6	9	5	8	7	7	11	7	6	10	8	9	4	8	4	7	7
		2 x 8	12	10	11	8	10	10	10	2	14	8	12	8	11	5	10	5
		2 x 10	16	4	14	10	13	8	12	11	18	7	16	1	14	5	13	1
		2 x 12	19	8	17	11	16	7	15	7	22	4	20	4	18	6	16	10
	No. 2 (Standard)	2 x 6	9	4	8	1	7	2	6	7	9	4	8	1	7	2	6	7
		2 x 8	12	10	11	8	10	8	9	8	13	8	11	11	10	8	9	8
		2 x 10	16	4	14	10	13	8	12	6	17	7	15	4	13	8	12	6
		2 x 12	19	8	17	11	16	7	15	7	22	4	20	2	18	1	16	6

NOTES TO TABLE A-5

(1) Includes gypsum board.

(2) Spans for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(3) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(4) When graded by Eastern Pine Grading Committee Rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10, 2 x 12	15 per cent

TABLE A-6.

ROOF JOISTS — SUPPORTING CEILING — 30 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 30 lb. per sq. ft.							
			Plastered ceiling (1)				Other than plastered ceiling			
			Joist spacing				Joist spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
		inches	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
Douglas Fir, Western Larch	Construction (dense and non-dense)	2 x 6	12 1	11 0	10 2	9 7	13 11	12 7	11 8	11 0
		2 x 8	16 6	15 0	13 11	13 1	18 11	17 2	15 11	15 0
		2 x 10	20 11	19 0	17 8	16 7	23 11	21 10	20 2	19 0
		2 x 12	25 4	23 0	21 5	20 1	29 0	26 4	24 6	23 0
	Standard	2 x 6	12 1	11 0	10 2	9 7	13 11	12 6	11 2	10 2
		2 x 8	16 6	15 0	13 11	13 1	18 11	17 0	15 2	13 11
		2 x 10	20 11	19 0	17 8	16 7	23 11	21 6	19 4	17 7
		2 x 12	25 4	23 0	21 5	20 1	29 0	25 10	23 2	21 1
	Utility	2 x 6	—	—	—	—	—	—	—	—
		2 x 8	14 7	12 7	11 4	10 4	14 7	12 7	11 4	10 4
		2 x 10	20 1	17 5	15 6	14 2	20 1	17 5	15 6	14 2
		2 x 12	23 5	20 4	18 0	16 6	23 5	20 4	18 0	16 6
Pacific Coast Hemlock	Construction	2 x 6	11 11	10 10	10 0	9 5	13 7	12 4	11 5	10 10
		2 x 8	16 2	14 8	13 7	12 10	18 6	16 10	15 7	14 8
		2 x 10	20 6	18 7	17 4	16 4	23 5	21 4	19 10	18 7
		2 x 12	24 10	22 6	20 11	19 8	28 5	25 10	23 11	22 6
	Standard	2 x 6	11 11	10 10	10 0	9 5	13 7	12 4	11 2	10 2
		2 x 8	16 2	14 8	13 7	12 10	18 6	16 10	15 2	13 11
		2 x 10	20 6	18 7	17 4	16 4	23 5	21 4	19 4	17 7
		2 x 12	24 10	22 6	20 11	19 8	28 5	25 10	23 2	21 1
	Utility	2 x 6	—	—	—	—	—	—	—	—
		2 x 8	13 5	11 7	10 5	9 6	13 5	11 7	10 5	9 6
		2 x 10	18 6	16 0	14 4	13 1	18 6	16 0	14 4	13 1
		2 x 12	21 6	18 7	16 7	15 2	21 6	18 7	16 7	15 2

Spruce, all western species Lodgepole Pine, Ponderosa Pine	Construction	2 x 6	10	8	9	7	8	6	7	10	11	0	9	7	8	6	7	10
		2 x 8	14	7	13	2	12	4	11	7	16	8	15	1	13	6	12	4
		2 x 10	18	6	16	10	15	7	14	8	21	1	19	1	17	1	15	7
		2 x 12	22	5	20	4	18	11	17	8	25	7	22	11	20	6	18	8
	Standard	2 x 6	8	6	7	5	6	7	6	1	8	6	7	5	6	7	6	1
		2 x 8	13	8	11	10	10	7	9	8	13	8	11	10	10	7	9	8
		2 x 10	18	0	15	7	13	11	12	8	18	0	15	7	13	11	12	8
		2 x 12	22	5	19	10	17	8	16	2	22	11	19	10	17	8	16	2
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	12	1	10	5	9	5	8	6	12	1	10	5	9	5	8	6
		2 x 10	16	7	14	5	12	11	11	10	16	7	14	5	12	11	11	10
		2 x 12	19	4	16	10	15	0	13	8	19	4	16	10	15	0	13	8
Western Red Cedar Western White Pine (3)	Construction	2 x 6	10	5	9	5	8	7	7	10	11	1	9	7	8	7	7	10
		2 x 8	14	1	12	10	11	11	11	2	16	2	14	2	12	8	11	7
		2 x 10	17	11	16	4	15	1	14	2	20	6	18	0	16	1	14	8
		2 x 12	21	8	19	8	18	4	17	2	24	10	21	7	19	4	17	7
	Standard	2 x 6	8	10	7	7	6	10	6	2	8	10	7	7	6	10	6	2
		2 x 8	12	11	11	2	10	0	9	1	12	11	11	2	10	0	9	1
		2 x 10	16	11	14	7	13	1	12	0	16	11	14	7	13	1	12	0
		2 x 12	21	6	18	7	16	8	15	4	21	6	18	7	16	8	15	4
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	11	4	9	10	8	10	8	0	11	4	9	10	8	10	8	0
		2 x 10	15	7	13	6	12	1	11	0	15	7	13	6	12	1	11	0
		2 x 12	18	2	15	8	14	1	12	10	18	2	15	8	14	1	12	10
Pacific Coast Yellow Cedar	Construction	2 x 6	11	0	10	0	9	4	8	8	12	7	11	0	9	10	9	0
		2 x 8	15	0	13	7	12	8	11	11	17	2	15	2	13	7	12	5
		2 x 10	19	0	17	4	16	0	15	1	21	10	19	10	18	5	16	10
		2 x 12	23	0	20	11	19	5	18	4	26	4	23	11	22	1	20	2
	Standard	2 x 6	10	0	8	8	7	10	7	1	10	0	8	8	7	10	7	1
		2 x 8	14	8	12	8	11	5	10	5	14	8	12	8	11	5	10	5
		2 x 10	19	0	16	10	15	0	13	8	19	5	16	10	15	0	13	8
		2 x 12	23	0	20	11	19	1	17	5	24	8	21	5	19	1	17	5
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	13	0	11	4	10	1	9	2	13	0	11	4	10	1	9	2
		2 x 10	17	11	15	6	13	10	12	7	17	11	15	6	13	10	12	7
		2 x 12	20	10	18	0	16	1	14	8	20	10	18	0	16	1	14	8

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TABLE A-6. (continued)

ROOF JOISTS — SUPPORTING CEILING — 30 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 30 lb. per sq. ft.											
			Plastered ceiling (1)						Other than plastered ceiling					
			Joist spacing						Joist spacing					
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 6	10	8	9	8	9	0	8	6	12	2	11	1	9	11	9	0
		2 x 8	14	7	13	2	12	4	11	7	16	8	15	1	13	6	13	4
		2 x 10	18	6	16	10	15	7	14	8	21	1	19	1	17	1	15	7
		2 x 12	22	5	20	4	18	11	17	8	25	7	23	4	21	7	20	0
	No. 2 (Standard)	2 x 6	10	8	9	7	8	7	7	10	11	1	9	7	8	7	7	10
		2 x 8	14	7	13	2	12	4	11	7	16	5	14	2	12	8	11	7
		2 x 10	18	6	16	10	15	7	14	8	21	0	18	2	16	4	14	10
		2 x 12	22	5	20	4	18	11	17	8	25	7	23	4	21	6	19	6
Jack Pine	No. 1 (Construction)	2 x 6	11	0	10	0	9	4	8	8	12	7	11	5	10	7	9	8
		2 x 8	15	0	13	7	12	8	11	11	17	2	15	7	14	6	13	2
		2 x 10	19	0	17	4	16	0	15	1	21	10	19	10	18	5	16	10
		2 x 12	23	0	20	11	19	5	18	4	26	4	23	11	22	2	20	11
	No. 2 (Standard)	2 x 6	11	0	10	0	9	2	8	5	11	11	10	4	9	2	8	5
		2 x 8	15	0	13	7	12	8	11	11	17	2	15	2	13	7	12	5
		2 x 10	19	0	17	4	16	0	15	1	21	10	19	6	17	5	15	11
		2 x 12	23	0	20	11	19	5	18	4	26	4	23	11	22	2	20	11
	No. 1	2 x 6	10	5	9	5	8	8	8	2	11	11	10	5	9	4	8	6
		2 x 8	14	1	12	10	11	11	11	2	16	2	14	2	12	8	11	7
		2 x 10	17	11	16	4	15	1	14	2	20	6	18	0	16	1	14	8
		2 x 12	21	8	19	8	18	4	17	2	24	10	22	6	20	8	18	11

White Pine Red Pine	Merchantable and No. 2	2 x 6	10	5	9	5	8	7	7	10	11	1	9	7	8	7	7	10
		2 x 8	14	1	12	10	11	11	10	11	15	5	13	4	11	11	10	11
		2 x 10	17	11	16	4	15	1	13	11	19	8	17	1	15	4	13	11
		2 x 12	21	8	19	8	18	4	17	2	24	10	22	6	20	2	18	4
	No. 1 Dimension	2 x 6	10	5	9	0	8	1	7	5	10	5	9	0	8	1	7	5
		2 x 8	14	1	12	8	11	5	10	5	14	8	12	8	11	5	10	5
		2 x 10	17	11	16	4	15	1	13	11	19	8	17	1	15	4	13	11
		2 x 12	21	8	19	8	18	4	17	2	24	10	21	6	19	4	17	6
	No. 2 Dimension (4)	2 x 6	8	0	7	0	6	2	5	8	8	0	7	0	6	2	5	8
		2 x 8	11	4	9	0	8	10	8	0	11	4	9	10	8	10	8	0
		2 x 10	15	7	13	6	12	1	11	0	15	7	13	6	12	1	11	0
		2 x 12	19	6	16	10	15	1	13	8	19	6	16	10	15	1	13	8
Poplar	No. 1 (Construction)	2 x 6	10	5	9	5	8	8	8	2	11	11	10	5	9	4	8	6
		2 x 8	14	1	12	10	11	11	11	2	16	2	14	2	12	8	11	7
		2 x 10	17	11	16	4	15	1	14	2	20	6	18	0	16	1	14	8
		2 x 12	21	8	19	8	18	4	17	2	24	10	22	6	20	8	18	11
	No. 2 (Standard)	2 x 6	10	5	9	0	8	1	7	5	10	5	9	0	8	1	7	5
		2 x 8	14	1	12	10	11	11	10	11	15	5	13	4	11	11	10	11
		2 x 10	17	11	16	4	15	1	13	11	19	8	17	1	15	4	13	11
		2 x 12	21	8	19	8	18	4	17	2	24	10	22	6	20	2	18	4

NOTES TO TABLE A-6

(1) Includes gypsum board.

(2) Spans for size not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(3) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(4) When graded by Eastern Pine Grading Committee rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10, 2 x 12	15 per cent

TABLE A-7.

ROOF JOISTS — SUPPORTING CEILING — 20 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 20 lb. per sq. ft.							
			Plastered ceiling (1)				Other than plastered ceiling			
			Joist spacing				Joist spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
		inches	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
Douglas Fir Western Larch	Construction (dense and non-dense)	2 x 6	13 10	12 7	11 8	11 0	15 11	14 5	13 5	12 7
		2 x 8	18 11	17 2	15 11	15 0	21 8	19 8	18 3	17 2
		2 x 10	23 11	21 9	20 2	19 0	27 5	24 11	23 2	21 9
		2 x 12	29 0	26 4	24 6	23 0	33 2	30 2	28 0	26 4
	Standard	2 x 6	13 10	12 7	11 8	11 0	15 11	14 5	12 10	11 9
		2 x 8	18 11	17 2	15 11	15 0	21 8	19 8	17 7	16 0
		2 x 10	23 11	21 9	20 2	19 0	27 5	24 10	22 3	20 4
		2 x 12	29 0	26 4	24 6	23 0	33 2	20 1	26 11	24 7
	Utility	2 x 6	—	—	—	—	—	—	—	—
		2 x 8	16 10	14 7	13 1	11 11	16 10	14 7	13 1	11 11
		2 x 10	23 2	20 1	17 11	16 5	23 2	20 1	17 11	16 5
		2 x 12	27 3	23 7	21 1	19 3	27 3	23 7	21 1	19 3
Pacific Coast Hemlock	Construction	2 x 6	13 7	12 4	11 5	10 9	15 6	14 1	13 1	12 4
		2 x 8	18 6	16 10	15 7	14 8	21 2	19 3	17 10	16 10
		2 x 10	23 5	21 4	19 9	18 7	26 10	24 5	22 8	21 4
		2 x 12	28 5	25 9	23 11	22 6	32 6	29 6	27 5	25 9
	Standard	2 x 6	13 7	12 4	11 5	10 9	15 6	14 1	12 10	11 9
		2 x 8	18 6	16 10	15 7	14 8	21 2	19 3	17 7	16 0
		2 x 10	23 5	21 4	19 9	18 7	26 10	24 5	22 3	20 4
		2 x 12	28 5	25 9	23 11	22 6	32 6	29 6	26 11	24 7
	Utility	2 x 6	—	—	—	—	—	—	—	—
		2 x 8	15 6	13 5	12 0	11 0	15 6	13 5	12 0	11 0
		2 x 10	21 4	18 6	16 6	15 1	21 4	18 6	16 6	15 1
		2 x 12	24 11	21 7	19 4	17 8	24 11	21 7	19 4	17 8

Spruce, All Western Species Lodgepole Pine Ponderosa Pine	Construction	2 x 6	12	3	11	0	9	10	9	0	12	9	11	0	9	10	9	0
		2 x 8	16	8	15	2	14	1	13	3	19	1	17	4	15	7	14	3
		2 x 10	21	2	19	2	17	10	16	9	24	2	22	0	19	9	18	0
		2 x 12	25	7	23	3	21	7	20	4	29	4	26	7	23	11	21	10
	Standard	2 x 6	9	11	8	7	7	8	7	0	9	11	8	7	7	8	7	0
		2 x 8	15	9	13	8	12	3	11	2	15	9	13	8	12	3	11	2
		2 x 10	20	9	17	11	16	1	14	8	20	9	17	11	16	1	14	8
		2 x 12	25	7	23	2	20	8	18	11	26	9	23	2	20	8	18	11
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	13	11	12	1	10	10	9	10	13	11	12	1	10	10	9	10
		2 x 10	19	2	16	7	14	10	13	7	19	2	16	7	14	10	13	7
		2 x 12	22	5	19	5	17	5	15	10	22	5	19	5	17	5	15	10
Western Red Cedar Western White Pine (3)	Construction	2 x 6	11	10	10	9	9	11	9	1	12	9	11	1	9	11	9	1
		2 x 8	16	2	14	8	13	8	12	10	18	6	16	5	14	8	13	5
		2 x 10	20	6	18	7	17	3	16	3	23	5	20	9	18	7	16	11
		2 x 12	24	10	22	6	20	11	19	8	28	5	25	2	22	6	20	6
	Standard	2 x 6	10	1	8	9	7	10	7	2	10	1	8	9	7	10	7	2
		2 x 8	14	11	12	11	11	6	10	6	14	11	12	11	11	6	10	6
		2 x 10	19	6	16	11	15	1	13	10	19	6	16	11	15	1	13	10
		2 x 12	24	10	21	9	19	6	17	9	25	2	21	9	19	6	17	9
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	13	1	11	4	10	2	9	3	13	1	11	4	10	2	9	3
		2 x 10	18	0	15	7	13	11	12	9	18	0	15	7	13	11	12	9
		2 x 12	21	2	18	4	16	5	15	0	21	2	18	4	16	5	15	0
Pacific Coast Yellow Cedar	Construction	2 x 6	12	7	11	5	10	8	10	0	14	5	12	8	11	4	10	4
		2 x 8	17	2	15	7	14	6	13	8	19	8	17	7	15	9	14	4
		2 x 10	21	9	19	9	18	4	17	3	24	11	22	8	21	0	19	4
		2 x 12	26	4	23	11	22	3	20	11	30	2	27	5	25	5	23	5
	Standard	2 x 6	11	7	10	0	9	0	8	2	11	7	10	0	9	0	8	2
		2 x 8	17	0	14	8	13	2	12	0	17	0	14	8	13	2	12	0
		2 x 10	21	9	19	4	17	4	15	10	22	4	19	4	17	4	15	10
		2 x 12	26	4	23	11	22	3	20	4	28	8	24	10	22	3	20	4
	Utility	2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	15	0	13	0	11	8	10	7	15	0	13	0	11	8	10	7
		2 x 10	20	7	17	10	16	0	14	7	20	7	17	10	16	0	14	7
		2 x 12	24	2	21	0	18	9	17	1	24	2	21	0	18	9	17	1

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TABLE A-7. (continued)

ROOF JOISTS — SUPPORTING CEILING — 20 lb./sq. ft. Live Load

Species	Grade	Nominal Size (2)	LIVE LOAD 20 lb. per sq. ft.											
			Plastered ceiling (1)								Other than plastered ceiling			
			Joist spacing								Joist spacing			
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 6	12	3	11	1	10	4	9	9	14	0	12	9	11	5	10	5
		2 x 8	16	8	15	2	14	1	13	3	19	1	17	4	15	7	14	3
		2 x 10	21	2	19	2	17	10	16	9	24	2	22	0	19	9	18	0
		2 x 12	25	7	23	3	21	7	20	4	29	4	26	7	24	9	23	3
	No. 2 (Standard)	2 x 6	12	3	11	1	9	11	9	0	12	9	11	1	9	11	9	0
		2 x 8	16	8	15	2	14	1	13	3	18	11	16	5	14	8	13	5
		2 x 10	21	2	19	2	17	10	16	9	24	2	21	0	18	9	17	2
		2 x 12	25	7	23	3	21	7	20	4	29	4	26	7	24	9	22	9
Jack Pine	No. 1 (Construction)	2 x 6	12	7	11	5	10	8	10	0	14	5	13	1	12	2	11	2
		2 x 8	17	2	15	7	14	6	13	8	19	8	17	10	16	7	15	3
		2 x 10	21	9	19	9	18	4	17	3	24	11	22	8	21	0	19	4
		2 x 12	26	4	23	11	22	3	20	11	30	2	27	5	25	5	23	11
	No. 2 (Standard)	2 x 6	12	7	11	5	10	8	9	8	13	9	11	11	10	8	9	8
		2 x 8	17	2	15	7	14	6	13	8	19	8	17	7	15	9	14	4
		2 x 10	21	9	19	9	18	4	17	3	24	11	22	6	21	0	18	4
		2 x 12	26	4	23	11	22	3	20	11	30	2	27	5	25	5	23	11
	No. 1	2 x 6	11	10	10	9	10	0	9	5	13	7	12	0	10	9	9	10
		2 x 8	16	2	14	8	13	8	12	10	18	6	16	5	14	8	13	5
		2 x 10	20	6	18	7	17	3	16	3	23	5	20	9	18	7	16	11
		2 x 12	24	10	22	6	20	11	19	8	28	5	25	9	23	11	22	0

White Pine Red Pine	Merchantable and No. 2	2 x 6	11	10	10	9	9	11	9	0	12	9	11	1	9	11	9	0
		2 x 8	16	2	14	8	13	8	12	7	17	9	15	4	13	9	12	7
		2 x 10	20	6	18	7	17	3	16	1	22	9	19	9	17	8	16	1
		2 x 12	24	10	22	6	20	11	19	8	28	5	25	9	23	5	21	5
	No. 1 Dimension	2 x 6	11	10	10	5	9	4	8	6	12	0	10	5	9	4	8	0
		2 x 8	16	2	14	8	13	2	12	0	17	0	14	8	13	2	12	0
		2 x 10	20	6	18	7	17	3	16	1	22	9	19	9	17	8	16	1
		2 x 12	24	10	22	6	20	11	19	8	28	5	25	2	22	6	20	6
	No. 2 Dimension (4)	2 x 6	9	3	8	0	7	2	6	7	9	3	8	0	7	2	6	7
		2 x 8	13	1	11	4	10	2	9	3	13	1	11	4	10	2	9	3
		2 x 10	18	0	15	7	13	11	12	9	18	0	15	7	13	11	12	9
		2 x 12	22	10	19	9	17	8	16	2	22	10	19	9	17	8	16	2
Poplar	No. 1 (Construction)	2 x 6	11	10	10	9	10	0	9	5	13	7	12	0	10	9	9	10
		2 x 8	16	2	14	8	13	8	12	10	18	6	16	5	14	8	13	5
		2 x 10	20	6	18	7	17	3	16	3	23	5	20	9	18	7	16	11
		2 x 12	24	10	22	6	20	11	19	8	28	5	25	9	23	11	22	0
	No. 2 (Standard)	2 x 6	11	10	10	5	9	4	8	6	12	0	10	5	9	4	8	6
		2 x 8	16	2	14	8	13	8	12	7	17	9	15	4	13	9	12	7
		2 x 10	20	6	18	7	17	3	16	1	22	9	19	9	17	8	16	1
		2 x 12	24	10	22	6	20	11	19	8	28	5	25	9	23	5	21	5

NOTES TO TABLE A-7

(1) Includes gypsum board.

(2) Spans for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(3) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(4) When graded by Eastern Pine Grading Committee Rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10, 2 x 12	15 per cent

TABLE A-8.

RAFTERS — NOT SUPPORTING CEILING — 50 and 40 lb./sq. ft. Live Load

Species	Grade	Nominal Size (1)	LIVE LOAD 50 lb. per sq. ft. — Rafter spacing				LIVE LOAD 40 lb. per sq. ft. — Rafter spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
		inches	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
Douglas Fir, Western Larch	Construction	2 x 4	6 8	5 10	5 1	4 8	7 4	6 5	5 8	5 2
		2 x 6	12 11	11 8	10 6	9 7	13 11	12 7	11 7	10 7
		2 x 8	17 7	16 0	14 5	13 1	18 11	17 2	15 10	14 6
		2 x 10	22 2	20 2	18 2	16 7	24 0	21 10	20 1	18 4
	Standard	2 x 4	—	—	—	—	—	—	—	—
		2 x 6	12 2	10 6	9 5	8 7	13 5	11 7	10 5	9 6
		2 x 8	16 7	14 5	12 10	11 8	18 4	15 11	14 2	12 11
		2 x 10	21 0	18 2	16 4	14 11	23 2	20 1	18 0	16 5
	Utility	2 x 4	—	—	—	—	—	—	—	—
		2 x 6	—	—	—	—	—	—	—	—
		2 x 8	12 4	10 8	9 7	8 8	13 7	11 10	10 6	9 7
		2 x 10	17 0	14 8	13 1	12 0	18 8	16 2	14 6	13 2
Pacific Coast Hemlock	Construction	2 x 4	6 1	5 4	4 8	4 4	6 10	5 11	5 2	4 10
		2 x 6	12 7	11 5	10 6	9 7	13 7	12 4	11 5	10 7
		2 x 8	17 2	15 7	14 5	13 1	18 6	16 10	15 7	14 6
		2 x 10	21 10	19 10	18 2	16 7	23 5	21 4	19 10	18 4
	Standard	2 x 4	—	—	—	—	—	—	—	—
		2 x 6	12 2	10 6	9 5	8 7	13 5	11 7	10 5	9 6
		2 x 8	16 7	14 5	12 10	11 8	18 4	15 11	14 2	12 11
		2 x 10	21 0	18 2	16 4	14 11	23 2	20 1	18 0	16 5
	Utility	2 x 4	—	—	—	—	—	—	—	—
		2 x 6	—	—	—	—	—	—	—	—
		2 x 8	11 5	9 10	8 10	8 0	12 6	10 11	9 8	8 11
		2 x 10	15 7	13 6	12 1	11 0	17 2	14 11	13 5	12 2

Spruce, all western species Lodgepole Pine, Ponderosa Pine	Construction	2 x 4	5	6	4	10	4	4	3	11	6	1	5	2	4	8	4	4
		2 x 6	9	4	8	1	7	2	6	7	10	4	8	11	8	0	7	2
		2 x 8	14	8	12	10	11	5	10	5	16	2	14	1	12	7	11	6
		2 x 10	18	8	16	1	14	5	13	2	20	7	17	10	15	11	14	7
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	7	2	6	2	5	7	5	1	8	0	6	11	6	2	5	7
		2 x 8	11	7	10	0	9	0	8	2	12	10	11	0	9	11	9	0
		2 x 10	15	2	13	2	11	10	10	8	16	10	14	6	13	0	11	11
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	10	2	8	10	7	11	7	2	11	4	9	10	8	8	8	0
		2 x 10	14	0	12	2	10	11	9	11	15	6	13	5	12	0	11	0
Western Red Cedar Western White Pine (2)	Construction	2 x 4	5	2	4	6	4	0	3	8	5	8	4	11	4	5	4	0
		2 x 6	9	5	8	1	7	2	6	7	10	4	8	11	8	0	7	4
		2 x 8	13	10	12	0	10	8	9	10	15	4	13	2	11	10	10	10
		2 x 10	17	6	15	2	13	7	12	5	19	5	16	10	15	0	13	8
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	7	5	6	5	5	10	5	2	8	2	7	1	6	4	5	10
		2 x 8	10	11	9	5	8	5	7	8	12	0	10	5	9	4	8	6
		2 x 10	14	4	12	5	11	1	10	1	15	10	13	8	12	2	11	1
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	9	7	8	4	7	5	6	10	10	7	9	2	8	2	7	6
		2 x 10	13	2	11	5	10	2	9	4	14	7	12	7	11	4	10	4
Pacific Coast Yellow Cedar	Construction	2 x 4	5	11	5	1	4	7	4	2	6	6	5	8	5	1	4	7
		2 x 6	10	8	9	4	8	4	7	7	11	10	10	2	9	1	8	4
		2 x 8	14	11	12	11	11	7	10	6	16	5	14	2	12	8	11	7
		2 x 10	20	0	17	5	15	6	14	2	21	10	19	1	17	1	15	7
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	8	6	7	4	6	7	6	0	9	4	8	1	7	2	6	7
		2 x 8	12	5	10	10	9	7	8	2	13	8	11	11	10	7	9	8
		2 x 10	16	4	14	2	12	8	11	7	18	0	15	7	14	0	12	10
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	11	0	9	6	8	6	7	10	12	1	10	6	9	5	8	7
		2 x 10	15	1	13	1	11	8	10	8	16	7	14	5	12	11	11	10

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TABLE A-8. (continued)

RAFTERS — NOT SUPPORTING CEILING — 50 and 40 lb./sq. ft. Live Load

Species	Grade	Nominal Size (1)	LIVE LOAD 50 lb. per sq. ft. — Rafter spacing								LIVE LOAD 40 lb. per sq. ft. — Rafter spacing							
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 4	5	6	4	10	4	4	3	11	6	1	5	2	4	8	4	4
		2 x 6	10	10	9	5	8	5	7	7	11	11	10	4	9	2	8	5
		2 x 8	14	8	12	10	11	5	10	5	16	2	14	1	12	7	11	6
		2 x 10	18	8	16	2	14	5	13	2	20	7	17	10	15	11	14	7
	No. 2	2 x 4	4	10	4	3	3	9	3	5	5	5	4	7	4	2	3	9
		2 x 6	9	5	8	1	7	2	6	7	10	4	8	11	8	0	7	4
		2 x 8	13	11	12	0	10	8	9	10	15	4	13	2	11	10	10	10
		2 x 10	17	8	15	5	13	8	12	6	19	7	16	11	15	2	13	10
Jack Pine	No. 1 (Construction)	2 x 4	5	11	5	1	4	7	4	2	6	6	5	8	5	1	4	7
		2 x 6	11	7	10	0	9	0	8	2	12	7	11	1	9	11	9	0
		2 x 8	15	10	13	8	12	4	11	2	17	2	15	1	13	6	12	4
		2 x 10	20	0	17	5	15	6	14	2	21	10	19	1	17	1	15	7
	No. 2 (Standard)	2 x 4	5	2	4	6	4	1	3	8	5	9	5	0	4	6	4	1
		2 x 6	10	0	8	8	7	10	7	1	11	1	9	7	8	7	7	10
		2 x 8	14	11	12	11	11	6	10	6	16	5	14	2	12	8	11	7
		2 x 10	19	0	16	6	14	8	13	5	21	0	18	2	16	2	14	10
	No. 1	2 x 4	6	10	5	11	5	4	4	10	7	6	6	6	5	10	5	4
		2 x 6	10	2	8	10	7	11	7	2	11	2	9	8	8	8	7	11
		2 x 8	13	10	12	0	10	8	9	10	15	4	13	2	11	10	10	10
		2 x 10	17	6	15	2	13	7	12	5	19	5	16	10	15	0	13	5

White Pine Red Pine	Merchantable and No. 2	2 x 4	6	1	5	2	4	8	4	4	6	8	5	10	5	2	4	8
		2 x 6	9	5	8	1	7	2	6	7	10	4	8	11	8	0	7	4
		2 x 8	13	0	11	3	10	1	9	2	14	4	12	5	11	1	10	1
		2 x 10	16	8	14	5	12	11	11	10	18	5	15	11	14	2	13	0
	No. 1 Dimension	2 x 4	5	2	4	6	4	0	3	8	5	8	4	11	4	5	4	0
		2 x 6	8	10	7	7	6	10	6	2	9	8	8	5	7	6	6	11
		2 x 8	12	5	10	10	9	7	8	10	13	8	11	11	10	7	9	8
		2 x 10	16	8	14	5	12	11	11	10	18	5	15	11	14	2	13	0
	No. 2 Dimension (3)	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	6	10	5	11	5	4	4	10	7	6	6	6	5	10	5	4
		2 x 8	9	7	8	4	7	5	6	10	10	7	9	2	8	2	7	6
		2 x 10	13	2	11	5	10	2	9	4	14	7	12	7	11	4	10	4
Poplar	No. 1 (Construction)	2 x 4	5	2	4	6	4	0	3	8	5	8	4	11	4	5	4	0
		2 x 6	10	2	8	10	7	11	7	2	11	2	9	8	8	8	7	11
		2 x 8	13	10	12	0	10	8	9	10	15	4	13	2	11	10	10	10
		2 x 10	17	6	15	2	13	7	12	5	19	5	16	10	15	0	13	8
	No. 2 (Standard)	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	8	10	7	7	6	10	6	2	9	8	8	5	7	6	6	11
		2 x 8	13	0	11	2	10	1	9	2	14	4	12	5	11	1	10	1
		2 x 10	16	8	14	5	12	11	11	10	18	5	15	11	14	2	13	0

NOTES TO TABLE A-8

(1) Spans for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(2) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(3) When graded by Eastern Pine Grading Committee rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10	15 per cent

TABLE A-9.

RAFTERS — NOT SUPPORTING CEILING — 30 and 20 lb./sq. ft. Live Load

Species	Grade	Nominal Size (1)	LIVE LOAD 30 lb. per sq. ft. — Rafter spacing								LIVE LOAD 20 lb. per sq. ft. — Rafter spacing							
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Douglas Fir, Western Larch	Construction	2 x 4	8	4	7	2	6	5	5	11	9	9	8	5	7	7	6	11
		2 x 6	15	4	13	11	12	11	12	0	17	6	15	11	14	9	13	10
		2 x 8	20	10	18	11	17	7	16	5	23	10	21	8	20	1	15	11
		2 x 10	26	5	24	0	22	2	20	8	30	2	27	5	25	5	23	11
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	15	2	13	1	11	10	10	8	17	6	15	6	13	10	12	7
		2 x 8	20	8	17	11	16	0	14	7	23	10	21	1	18	10	17	3
		2 x 10	26	2	22	8	20	4	18	6	30	2	26	8	23	11	21	10
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	15	5	13	4	11	11	10	11	18	1	15	8	14	0	12	10
		2 x 10	21	2	18	4	16	5	15	0	24	11	21	7	19	3	17	7
Pacific Coast Hemlock	Construction	2 x 4	7	7	6	7	5	11	5	5	9	0	9	9	7	0	6	4
		2 x 6	14	11	13	7	12	7	11	11	17	1	15	6	14	5	13	7
		2 x 8	20	5	18	6	17	2	16	2	23	4	21	2	19	8	18	6
		2 x 10	25	10	23	5	21	10	20	6	29	6	26	10	24	11	23	5
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	14	11	13	1	11	10	10	8	17	1	15	6	13	10	12	7
		2 x 8	20	5	17	11	16	0	14	7	23	4	21	1	18	10	17	3
		2 x 10	25	10	22	8	20	4	18	6	29	6	26	8	23	11	21	10
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	14	2	12	4	11	0	10	0	16	8	14	5	12	11	11	10
		2 x 10	19	6	16	11	15	1	13	10	22	11	19	10	17	9	16	3

Spruce, all western species Lodgepole Pine, Ponderosa Pine	Construction	2 x 4	6	11	5	11	5	4	4	10	8	1	7	0	6	3	5	8
		2 x 6	11	7	10	0	9	0	8	4	13	8	11	10	10	8	9	8
		2 x 8	18	5	15	11	14	2	13	0	21	0	18	9	16	9	15	3
		2 x 10	23	4	20	1	18	0	16	5	26	8	23	8	21	2	19	4
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	9	0	7	10	7	0	6	4	10	8	9	3	8	3	7	6
		2 x 8	14	5	12	6	11	2	10	2	16	11	14	8	13	2	12	0
		2 x 10	19	0	16	5	14	8	13	5	22	4	19	4	17	3	15	9
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	12	8	11	0	9	11	9	0	15	0	13	0	11	7	10	7
		2 x 10	17	6	15	2	13	7	12	5	20	7	17	10	16	0	14	7
Western Red Cedar Western White Pine (2)	Construction	2 x 4	6	6	5	7	5	0	4	7	7	7	6	7	5	11	5	4
		2 x 6	11	8	10	1	9	0	8	2	13	9	11	11	10	8	9	9
		2 x 8	17	4	15	0	13	5	12	2	20	4	17	7	15	9	14	4
		2 x 10	21	11	19	0	17	0	15	6	25	9	22	4	19	11	18	2
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	9	2	8	0	7	2	6	6	10	10	9	4	8	4	7	7
		2 x 8	13	7	11	10	10	6	9	7	16	0	13	10	12	5	11	4
		2 x 10	17	10	15	5	13	10	12	7	21	0	18	2	16	3	14	10
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	11	11	10	5	9	4	8	5	14	1	12	2	10	11	9	11
		2 x 10	16	5	14	2	12	8	11	7	19	4	16	9	15	0	13	8
Pacific Coast Yellow Cedar	Construction	2 x 4	7	5	6	5	5	8	5	2	8	8	7	6	6	9	6	2
		2 x 6	13	4	11	7	10	4	9	5	15	9	13	7	12	2	11	1
		2 x 8	18	6	16	1	14	5	13	1	21	8	18	11	16	11	15	5
		2 x 10	24	0	21	7	19	5	17	8	27	5	24	11	22	9	20	10
	Standard	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	10	7	9	1	8	2	7	6	12	5	10	10	9	7	8	10
		2 x 8	15	6	13	5	12	0	11	0	18	3	15	9	14	1	12	11
		2 x 10	20	5	17	8	15	10	14	5	24	0	20	9	18	7	17	0
	Utility	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	—		—		—		—		—		—		—		—	
		2 x 8	13	8	11	11	10	7	9	8	16	2	14	0	12	6	11	5
		2 x 10	18	10	16	4	14	7	13	4	22	2	19	2	17	2	15	8

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TABLE A-9. (continued)

RAFTERS — NOT SUPPORTING CEILING — 30 and 20 lb./sq. ft. Live Load

Species	Grade	Nominal Size (1)	LIVE LOAD 30 lb. per sq. ft. Rafter spacing								LIVE LOAD 20 lb. per sq. ft. Rafter spacing							
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
		inches	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Eastern Spruce Balsam Fir Eastern Hemlock	No. 1 (Construction)	2 x 4	6	11	5	11	5	4	4	10	8	1	7	0	6	3	5	8
		2 x 6	13	6	11	8	10	5	9	6	15	5	13	9	12	3	11	2
		2 x 8	18	6	15	11	14	2	13	0	21	0	18	9	16	9	15	3
		2 x 10	23	4	20	1	18	0	16	5	26	8	23	8	21	2	19	4
	No. 2 (Standard)	2 x 4	6	1	5	2	4	8	4	3	7	2	6	2	5	6	5	0
		2 x 6	11	8	10	1	9	0	8	2	13	9	11	11	10	8	9	8
		2 x 8	17	4	15	0	13	5	12	2	20	4	17	7	15	9	14	4
		2 x 10	22	1	19	2	17	1	15	7	26	0	22	6	20	2	18	5
Jack Pine	No. 1 (Construction)	2 x 4	7	5	6	5	5	8	5	2	8	8	7	6	6	9	6	2
		2 x 6	13	11	12	6	11	2	10	2	15	11	14	5	13	2	12	0
		2 x 8	18	11	17	1	15	4	13	11	21	8	19	8	18	0	16	5
		2 x 10	24	0	21	7	19	5	17	8	27	5	24	11	22	9	20	10
	No. 2 (Standard)	2 x 4	6	6	5	8	5	0	4	7	7	8	6	7	5	11	5	5
		2 x 6	12	6	10	10	9	8	8	11	14	9	12	9	11	5	10	5
		2 x 8	18	6	16	1	14	5	13	1	21	8	18	11	16	11	15	5
		2 x 10	23	8	20	6	18	5	16	10	27	5	24	2	21	7	19	9
	No. 1	2 x 4	8	6	7	4	6	7	6	0	9	10	8	8	7	9	7	1
		2 x 6	12	8	11	0	9	10	9	0	14	11	12	11	11	7	10	6
		2 x 8	17	4	15	0	13	5	12	2	20	4	17	7	15	9	14	4
		2 x 10	21	11	19	0	17	0	15	6	25	9	22	4	19	11	18	2

White Pine Red Pine	Merchantable and No. 2	2 x 4	7	6	6	6	5	10	5	4	8	10	7	8	6	10	6	3
		2 x 6	11	8	10	1	9	0	8	2	13	9	11	11	10	8	9	8
		2 x 8	16	2	14	0	12	6	11	6	19	1	16	6	14	9	13	6
		2 x 10	20	10	18	0	16	1	14	8	24	5	21	2	18	11	17	4
	No. 1 Dimension	2 x 4	6	6	5	7	5	0	4	7	7	7	6	7	5	11	5	4
		2 x 6	11	0	9	6	8	6	7	10	12	11	11	2	10	0	9	2
		2 x 8	15	6	13	5	12	0	11	0	18	3	15	9	14	1	12	11
		2 x 10	20	10	18	0	16	1	14	8	24	5	21	2	18	11	17	4
	No. 2 Dimension (3)	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	8	6	7	4	6	7	6	0	9	11	8	7	7	8	7	0
		2 x 8	11	11	10	4	9	4	8	5	14	F	12	2	10	11	9	11
		2 x 10	16	5	14	2	12	8	11	7	19	4	16	9	15	0	13	8
Poplar	No. 1 (Construction)	2 x 4	6	6	5	7	5	0	4	7	7	7	6	7	5	11	5	4
		2 x 6	12	8	11	0	9	10	9	0	14	11	12	11	11	7	10	6
		2 x 8	17	4	15	0	13	5	12	2	20	4	17	7	15	9	14	4
		2 x 10	21	11	19	0	17	0	15	6	25	9	22	4	19	11	18	2
	No. 2 (Standard)	2 x 4	—		—		—		—		—		—		—		—	
		2 x 6	11	0	9	6	8	6	7	10	12	11	11	2	10	0	9	2
		2 x 8	16	2	14	0	12	6	11	6	19	1	16	6	14	9	13	6
		2 x 10	20	10	18	0	16	1	14	8	24	5	21	2	18	11	17	4

NOTES TO TABLE A-9

(1) Spans for sizes not listed in the tables (2 x 5, 2 x 7, etc.) may be estimated with sufficient accuracy by straight line interpolation.

(2) When either of these species is graded by Western Wood Products Association Rules, reduce the spans of 2 x 6 members as follows:

Construction Grade	6 per cent
Standard Grade	8 per cent

(3) When graded by Eastern Pine Grading Committee Rules, spans may be increased as follows:

2 x 6, 2 x 8	10 per cent
2 x 10	15 per cent

TABLE A-10.
MAXIMUM SPANS FOR BUILT UP WOOD BEAMS IN BASEMENTS, CELLARS AND CRAWL SPACES (1) TWO STOREY HOUSES (4)

Species	Grade*	Supported Joist Length (2) (3)	Size of built up beam, inches (5) (6) (7)									
			3-2 x 8		4-2 x 8		3-2 x 10		4-2 x 10		3-2 x 12		4-2 x 12	
		ft.	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*in.*
Douglas Fir Western Larch Pacific Coast Hemlock	Construction	8	9	6	10	11	12	0	13	10	14	6	16	9
		10	8	6	9	9	10	9	12	5	13	0	15	0
		12	7	8	8	11	9	8	11	4	11	8	13	8
		14	6	9	8	3	8	6	10	6	10	4	12	8
		16	6	0	7	7	7	8	9	8	9	3	11	8
	Standard	8	8	6	9	9	10	9	12	5	13	0	15	0
		10	7	5	8	9	9	4	11	1	11	4	13	5
		12	6	4	8	0	8	1	10	1	9	9	12	3
		14	5	8	7	1	7	2	9	0	8	8	10	10
		16	5	1	6	4	6	5	8	0	7	9	9	9
Pacific Coast Yellow Cedar Eastern Larch Jack Pine	No. 1 (Construction)	8	7	11	9	4	10	0	11	10	12	1	14	4
		10	6	7	8	4	8	4	10	6	10	0	12	9
		12	5	8	7	2	7	2	9	0	8	8	10	11
		14	5	0	6	3	6	4	8	0	7	9	9	8
		16	4	7	5	8	5	9	7	2	7	0	8	8
	No. 2 (Standard)	8	6	4	7	4	8	4	9	8	10	9	12	5
		10	5	8	6	7	7	6	8	8	9	7	11	1
		12	5	2	6	0	6	10	7	11	8	8	10	1
		14	4	10	5	6	6	4	7	4	7	9	9	4
		16	4	6	5	2	5	9	6	10	7	0	8	8

Fir (Amabilis and Grandis) Balsam Fir Eastern Hemlock Pine (Lodgepole and Ponderosa) Spruce (all species)	No. 1 (Construction)	8	7	6	8	8	9	6	11	0	11	6	13	4
		10	6	3	7	9	7	11	9	10	9	7	11	11
		12	5	5	6	10	6	10	8	8	8	4	10	5
		14	4	10	6	0	6	1	7	8	7	5	9	3
		16	4	4	5	5	5	6	6	10	6	8	8	4
	No. 2 (Standard)	8	5	11	6	10	7	9	9	0	10	0	11	6
		10	5	3	6	1	6	11	8	0	8	11	10	4
		12	4	10	5	7	6	4	7	4	8	2	9	5
		14	4	6	5	2	5	10	6	9	7	5	8	9
		16	4	2	4	10	5	6	6	4	6	8	8	2
Western Red Cedar Red Pine Pine (Eastern and Western White) Poplar (Aspen, Largetooth Aspen, and Balsam Poplar)	No. 1 (Construction) (No. 1 Dimension)	8	6	4	7	4	8	6	9	10	10	6	12	6
		10	5	8	6	7	7	3	8	9	8	9	11	0
		12	5	0	6	0	6	3	7	10	7	7	9	6
		14	4	5	5	6	5	7	7	0	6	10	8	5
		16	4	0	4	11	5	1	6	3	6	2	7	7
	No. 2 (Standard) (No. 2 Dimension)	8	4	11	5	8	6	9	7	9	8	6	9	10
		10	4	4	5	1	6	0	6	11	7	8	8	10
		12	4	0	4	7	5	6	6	4	7	0	8	1
		14	3	8	4	3	5	1	5	11	6	5	7	5
		16	3	6	4	0	4	9	5	6	6	0	7	0

NOTES TO TABLE A-10

*Grading rules listed in Table 27.1

(1) These tables provide maximum allowable spans for main beams or girders which are built-up from nominal 2 in. members in the species, sizes and grades indicated. Allowable spans for solid wood beams, glued-laminated wood beams or built up beams in sizes or grades other than shown, shall he determined from standard engineering formulae.

(2) Supported joist length means ½ the sum of the joist spans on both sides of the beam.

(3) For supported joist lengths intermediate between those shown in the tables, straight line interpolation may be used in determining the maximum beam span.

(4) Beams for 1½ storey houses shall be taken from the table for 2 storey houses.

(5) The 2 in. members shall be laid on edge and fastened together with a double row of common nails not less than 3½ in. in length. Nails shall be spaced not more than 18 in. apart in each row with the end nails placed 4 in. to 6 in. from the end of each piece.

(6) Where built-up wood beams are employed over a single span, the length of each individual piece used to fabricate the beam shall equal the length of the beam.

(7) Where built-up wood beams are continued over more than one span and where lengths of individual pieces are less than the total length of the complete beam, the location of butt joints shall conform to 16 (e) (2).

TABLE A-11.
MAXIMUM SPANS FOR BUILT-UP WOOD BEAMS IN BASEMENTS, CELLARS AND CRAWL SPACES [1] ONE STOREY HOUSES [4]

Species	Grade*	Supported Joist Length (2) (3)	Size of built-up beam, inches (5) (6) (7)					
			3-2 x 8	4-2 x 8	3-2 x 10	4-2 x 10	3-2 x 12	4-2 x 12
		ft.	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*	*ft. in.*
Douglas Fir Western Larch Pacific Coast Hemlock	Construction	8	12 6	14 6	15 11	18 4	19 3	22 2
		10	11 3	12 11	14 2	16 5	17 2	19 10
		12	10 3	11 10	13 0	15 0	15 8	18 1
		14	9 6	10 11	12 0	13 10	14 6	16 9
		16	8 10	10 3	11 3	13 0	13 7	15 8
	Standard	8	11 3	12 11	14 2	16 5	17 2	19 10
		10	10 0	11 7	12 8	14 8	15 5	17 9
		12	9 2	10 7	11 7	13 5	14 0	16 2
		14	8 6	9 9	10 9	12 5	13 0	15 0
		16	7 11	9 2	10 0	11 7	12 2	14 0
Pacific Coast Yellow Cedar Eastern Larch Jack Pine	No. 1 (Construction)	8	10 8	12 4	13 6	15 8	16 5	18 11
		10	9 7	11 0	12 1	14 0	14 8	16 11
		12	8 9	10 1	11 1	12 9	13 5	15 5
		14	7 11	9 4	10 0	11 10	12 1	14 4
		16	7 0	8 9	8 11	11 1	10 9	13 5
	No. 2 (Standard)	8	8 5	9 8	11 1	12 9	14 2	16 5
		10	7 6	8 8	9 11	11 5	12 8	14 8
		12	6 10	7 11	9 0	10 5	11 7	13 5
		14	6 4	7 4	8 4	9 8	10 9	12 5
		16	5 11	6 10	7 10	9 0	10 0	11 7

		8	9	11	11	6	12	7	14	7	15	3	17	7
	No. 1	10	8	11	10	3	11	3	13	0	13	8	15	9
Fir (Amabilis &	(Construc-	12	8	1	9	5	10	3	11	11	12	6	14	5
Grandis)	tion)	14	7	6	8	8	9	6	11	0	11	6	13	4
Balsam Fir		16	6	9	8	1	8	6	10	3	10	4	12	6
Eastern Hemlock														
Pine (Lodgepole		8	7	10	9	0	10	3	11	10	13	3	15	3
and Ponderosa)		10	7	0	8	1	9	2	10	7	11	10	13	8
Spruce (all	No. 2	12	6	4	7	4	8	5	9	8	10	9	12	6
species)	(Standard)	14	5	11	6	10	7	9	9	0	10	0	11	6
		16	5	6	6	4	7	3	8	5	9	4	10	9
	No. 1	8	8	5	9	8	11	3	13	0	14	4	16	7
Western Red	(Construc-	10	7	6	8	8	10	1	11	8	12	10	14	10
Cedar	tion)	12	6	10	7	11	9	2	10	7	11	9	13	6
Red Pine	(No. 1	14	6	4	7	4	8	6	9	10	10	6	12	6
Pine (Eastern and	Dimension)	16	5	11	6	10	7	9	9	2	9	5	11	9
Western White)														
Poplar (Aspen,	No. 2	8	6	6	7	6	8	11	10	3	11	4	13	1
Largetooth	(Standard)	10	5	9	6	8	8	0	9	2	10	1	11	8
Aspen, and	(No. 2	12	5	3	6	1	7	3	8	5	9	3	10	8
Balsam Poplar)	Dimension)	14	4	11	5	8	6	9	7	9	8	6	9	10
		16	4	7	5	3	6	4	7	3	8	0	9	3

NOTES TO TABLE A-11

*Grading rules listed in Table 27.1

(1) These tables provide maximum allowable spans for main beams or girders which are built-up from nominal 2 in. members in the species, sizes and grades indicated. Allowable spans for solid wood beams, glued-laminated wood beams or built up beams in sizes or grades other than shown, shall be determined from standard engineering formulae.

(2) Supported joist length means ½ the sum of the joist spans on both sides of the beam.

(3) For supported joist lengths intermediate between those shown in the tables, straight line interpolation may be used in determining the maximum beam span.

(4) Beams for 1½ storey houses shall be taken from the table for 2 storey houses.

(5) The 2 in. members shall be laid on edge and fastened together with a double row of common nails not less than 3½ in. in length. Nails shall be spaced not more than 18 in. apart in each row with the end nails placed 4 in. to 6 in. from the end of each piece.

(6) Where built-up wood beams are employed over a single span, the length of each individual piece used to fabricate the beam shall equal the length of the beam.

(7) Where built-up wood beams are continued over more than one span and where lengths of individual pieces are less than the total length of the complete beam, the location of butt joints shall conform to 16 (e) (2).

TABLE A-12.
MAXIMUM SPANS FOR STEEL BEAMS IN BASEMENTS, CELLARS AND CRAWL SPACES (1) (3) (4) IN HOUSES

No. of Storeys	Minimum Depth (in.)	Minimum Weight/Foot (lb.)	Width (2) of Floor to be Supported				
			8 ft.	10 ft.	12 ft.	14 ft.	16 ft.
1	4	7.7	10	9	8.5	8	7.5
	5	10.0	12.5	11.5	11	10.5	10
	6	12.5	15	14	13	12.5	12
	7	15.3	18	17	16	15	14.5
	8	18.4	21	19.5	18.5	17.5	16.5
1½ or 2	4	7.7	8	7.5	7	6.5	6
	5	10.0	10.5	9.5	8.5	8	7.5
	6	12.5	12.5	11.5	10.5	9.5	9
	7	15.3	15	14	13	12	11
	8	18.4	17.5	16	15	14	13

NOTES TO TABLE A-12

(1) A beam may be considered to be laterally supported if wood joists bear on its top flange at intervals of 24 in. or less over its entire length and if all the load being applied to this beam is transmitted through the joists and if 1-in. by 2-in. wood strips in contact with the top flange are nailed on both sides of the beam to the bottom of the joists supported. Other additional methods of positive lateral support are acceptable.

(2) Supported joist length means ½ the sum of the joist spans on both sides of the beam.

(3) For supported joist lengths intermediate between those shown in the tables, straight line interpolation may be used in determining the maximum beam span.

(4) This table provides maximum spans for main steel beams or girders, of the sizes and weights indicated. Allowable spans for steel beams in sizes, weights or shapes other than shown, shall be determined from standard engineering formulae.

NOTES TO TABLES

(1) APPENDIX A — The Span Tables in Appendix A have been calculated for the grading rules and the species to which they apply as listed below.

(2) APPENDIX B — The facsimiles of grade marks shown in Column 1 of the tables in Appendix B are those used by the associations listed in Column 2. These associations employ the grading rules listed in Column 3. The grading rules and the species to which they apply are as shown below.

British Columbia Lumber Manufacturers Association (BCLMA) No. 59 Standard Grading and Dressing Rules, Aug. 1959, Revised August 1966.	Douglas Fir Pacific Coast Hemlock Sitka Spruce Western Red Cedar Pacific Coast Yellow Cedar White Spruce same as Sitka Spruce
Canadian Lumbermen's Association (CLA) Standard Grading Rules, revised edition — Jan. 1965.	White Pine Red Pine
Eastern Lumber Grading Authority (ESGC) Standard Grading Rules, dated May 14, 1961, as published by the Canadian Lumbermen's Association, the Quebec Lumber Manufacturers' Association and the Maritime Lumber Bureau, revised September 1964.	Eastern Spruce Balsam Fir Jack (Princess) Pine Eastern Hemlock Poplar Tamarack Eastern Cedar

West Coast Lumber Inspection Bureau (WCLIB) Standard Grading Rules, No. 15, March 1956, revised to June 1967.	Douglas Fir West Coast (Pacific) Hemlock Sitka Spruce Western Red Cedar White Spruce same as Sitka Spruce
Western Wood Products Association (WWPA) Standard Grading Rules, January 1965.	Ponderosa Pine Idaho White (Western White) Pine Sugar Pine Douglas Fir Larch (Western) White Fir Engelmann Spruce Lodgepole Pine Incense Cedar Red Cedar (Western) Western (Pacific Coast) Hemlock
Eastern Pine Grading Committee (EPGC) Rules for White and Red Pine as Published by the Quebec Lumber Manufacturers' Association, revised August 1967.	White Pine Red Pine

Species of lumber appropriately grade stamped by the association listed in the above tables may be employed for the end uses stated in Table 27.1, Section 27.

Grade marked lumber for use as joists or rafters shall be of the species and grades for which allowable spans are listed in the span tables and shall be graded by the Grading Rules as specified above.

APPENDIX B

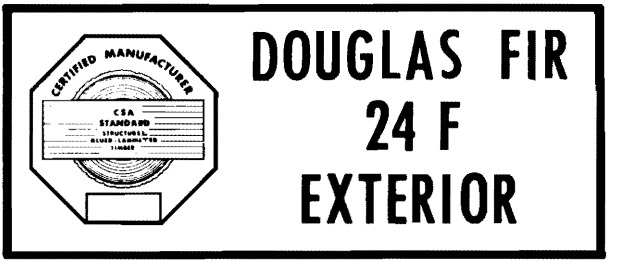
GRADE MARKINGS OF CANADIAN LUMBER

APPENDIX B

STRUCTURAL GLUED-LAMINATED TIMBER QUALITY CONTROL

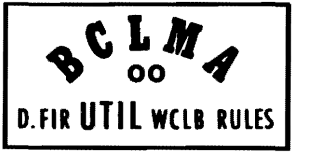
Label used by manufacturers who have been approved by the CSA as conforming with the requirements of CSA Standard O-177 — Qualification Code for Manufacturers of Structural Glued-Laminated Timber

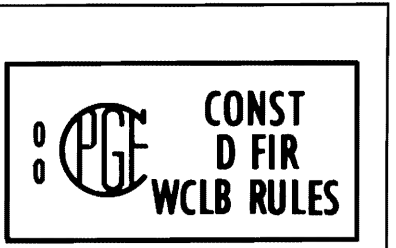
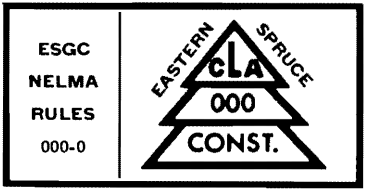
Example of label used by CSA certified manufacturers to identify stock items of glued-laminated posts and beams for use in residential construction.



Similar labels available for 24F Interior, and 18C Exterior and Interior grades.

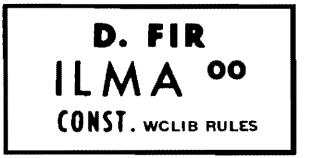
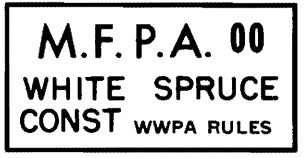
FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED TO GRADE MARK LUMBER IN CANADA.

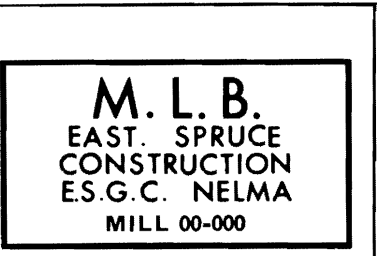
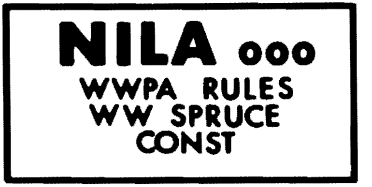
FACSIMILE OF GRADE MARK	ASSOCIATION	GRADING RULES
I. LUMBER MANUFACTURING ASSOCIATIONS		
	Alberta Forest Products Association, 10428 — 123rd Street, Edmonton, Alberta.	W.W.P.A.
	British Columbia Lumber Manufacturers Association, 1477 W. Pender Street, Vancouver 1, B.C.	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.

Column 1	Column 2	Column 3
	Cariboo-Lumber Manufacturers Association, Box 863, Williams Lake, B.C.	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.
	Canadian Lumbermen's Association, 27 Goulbourn Ave., Ottawa 2, Ont.	C.L.A. and E.S.G.C. (N.E.L.M.A.)

Note: There may be minor modifications to these basic grade marks but the same kind of information must be included.

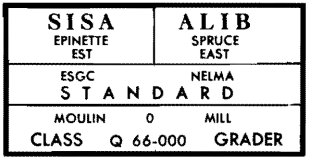
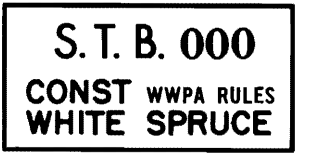
FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED TO GRADE MARK LUMBER IN CANADA.

FACSIMILE OF GRADE MARK	ASSOCIATION	GRADING RULES
	Interior Lumber Manufacturers Association, 304 Martin Street, Penticton, B.C.	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.
	Manitoba Forest Products Association, 88 Elm Park Rd., St. Vital, Winnipeg 8, Man.	W.W.P.A.

Column 1	Column 2	Column 3
	Maritime Lumber Bureau, P.O. Box 459, Amherst, N.S.	E.S.G.C. (N.E.L.M.A.) or C.L.A.
	Northern Interior Lumbermen's Association, 144 George Street, Prince George, B.C.	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.

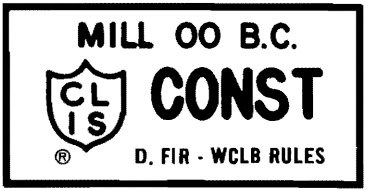
Note: There may be minor modifications to these basic grade marks but the same kind of information must be included.

FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED TO GRADE MARK LUMBER IN CANADA.

FACSIMILE OF GRADE MARK	ASSOCIATION	GRADING RULES
	Eastern Lumber Grading Authority P.O. Box 657, 5 du Parloir Street, Quebec 4, P.Q.	E.L.G.A.
	Saskatchewan Timber Board, Prince Albert, Sask.	W.W.P.A.

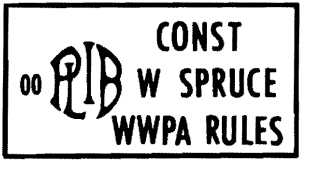
II. INDEPENDENT GRADING AGENCIES

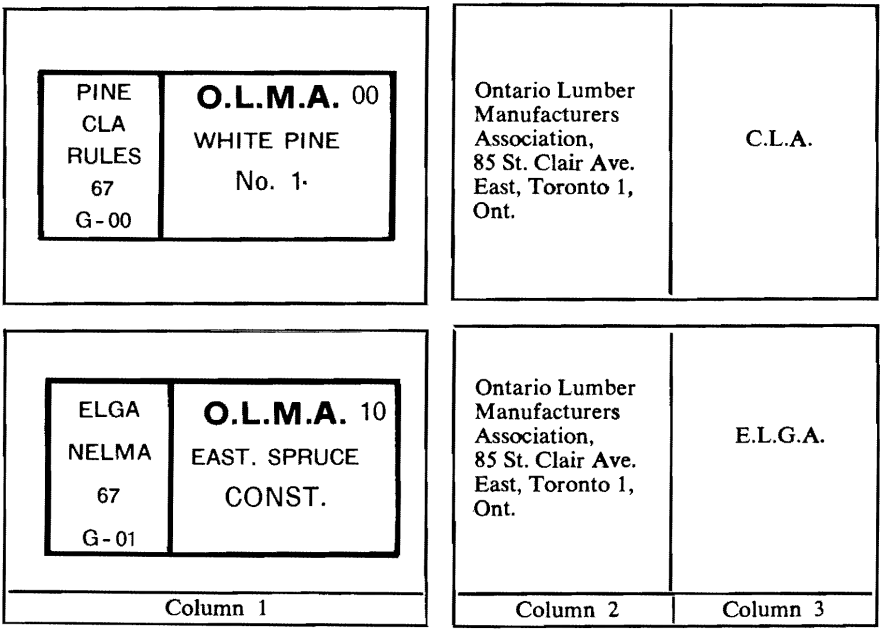
II. INDEPENDENT GRADING AGENCIES

Column 1	Column 2	Column 3
	A. E. Green Lumber Inspection Service, Eugene, Ore.	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.
	California Lumber Inspection Service, San Jose, 25, California, (Branch Office: Kamloops, B.C.)	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.

Note: There may be minor modifications to these basic grade marks but the same kind of information must be included.

FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED TO GRADE MARK LUMBER IN CANADA.

FACSIMILE OF GRADE MARK	ASSOCIATION	GRADING RULES
	Macdonald and Macdonald Limited, 125 East 4th Avenue, Vancouver 10, B.C.	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.
	Pacific Lumber Inspection Bureau, White-Henry-Stuart Building, Seattle 1, Wash. B.C. Division Office, 1477 W. Pender Street, Vancouver 1, B.C.	B.C.L.M.A. W.C.L.I.B. or W.W.P.A.



Note: There may be minor modifications to these basic grade marks but the same kind of information must be included.

APPENDIX C

NAILING AND STAPLING TABLES

APPENDIX C

TABLE C1 — NAILING TABLE

Construction Detail	Minimum Length of Nails (in.)	Minimum Number or Maximum Spacing of Nails
Floor joist to plate — toe nail	3¼	2
Woods or metal strapping to underside of floor joists	2¼	2
Cross bridging to joists	2¼	2 each end
Doubled header or trimmer joists	3¼	12 in. o.c.
Floor joist to stud (balloon construction)	3¼	2
Ledger strip to wood beam	3¼	2 per joist
Joist splice to joist	3¼	2 each end
Tail joist to adjacent header joist (end nailed) around openings	3¼ 4	5 3
Each header joist to adjacent trimmer joist (end nailed) around openings	3¼ 4	5 3
Stud to wall plate (each end) toe nail or end nail	2½ 3¼	4 2
Doubled studs at openings, or studs at partition or wall intersections and corners	3¼	30 in. o.c.
Doubled top wall plates	3¼	24 in. o.c.
Bottom wall plate or sole plate to joists or blocking (exterior walls)	3¼	16 in. o.c.
Interior partitions to framing or subflooring	3¼	24 in. o.c.
Horizontal member over openings in non load bearing partitions — each end	3¼	2
Ceiling joist to plate — toe nail, each end	3¼	2
Roof rafter or roof joist to plate — toe nail	3¼	3

Rafter plate to each ceiling joist	4	2
Rafter to joist (with ridge supported)	3¼	3
Rafter to joist (with ridge unsupported)	See note 1 to table	
Gusset plate to each rafter at peak	2¼	4
Rafter to ridge board — toe nail	2¼	4
—end nail	3¼	3
Collar tie to rafter —each end	3¼	3
Collar tie lateral support to each collar tie	2¼	2
Roof strut to rafter	3¼	3
Roof strut to bearing partition — toe nail	3¼	2
2 by 6 or less plank decking to support	3¼	2
Plank decking wider than 2 by 6 to support	3¼	3
2-in. edge laid plank decking to support (toe nail)	3	1
2-in. edge laid plank to each other	3	18 in. o.c.
¼-in. plywood to supports	1½	
5/16-in. plywood wall sheathing to supports	1¾	6 in. o.c. along edges and 12 in. o.c. along intermediate supports
5/16-in. plywood roof sheathing to supports	2 (3)	
⅜-in. plywood to supports	2 (3)	
½-in. plywood to supports	2 (3)	
5/8-in. plywood to supports	2 (3)	
¾-in. plywood to supports	2 (3)	
⅞-in. plywood to supports	2¼ (3)	
Gypsum board, (2) fibreboard (2) and particle board wall sheathing to supports	1¾	

TABLE C1 (continued)

Construction Detail	Minimum Length of Nails (in.)	Minimum Number or Maximum Spacing of Nails
1 by 6 or less subfloors	2	2
1 by 8 lumber subfloors	2	3
1 by 8 or less lumber roof sheathing	2	2
Lumber roof sheathing wider than 8-in.	2	3
1 by 8 or less lumber wall sheathing	2	2
Lumber wall sheathing wider than 8-in.	2	3

NOTES TO TABLE CI

(1) Where the ridge is unsupported, the rafters shall be nailed to the joists with not less than 3¼ in. nails in the amount specified in the following table. In such cases the ceiling joists shall also be fastened together with not less than 3¼ in. nails. Each such splice shall have at least one nail more than is required for the rafter to joist connection.
(2) Special nails. At least 10 gauge with minimum head diameter of 7/16 in.
(3) Nail length may be reduced ¼ in. if nails are annular grooved.

TABLE C2

Roof Slope	Rafter Spacing (C to C)	Rafter tied to Every Joist						Rafter tied to Joist Every 4 Ft.					
		House Width up to 26 ft.			House Width up to 32 ft.			House Width up to 26 ft.			House Width up to 32 ft.		
		Roof Snow Load (lb./sq. ft.)											
		20 psf or less	30 psf	40 psf or more	20 psf or less	30 psf	40 psf or more	20 psf or less	30 psf	40 psf or more	20 psf or less	30 psf	40 psf or more
4/12	16 in.	3	4	5	4	5	7	9	—	—	—	—	—
	24 in.	5	7	8	7	9	11	9	—	—	—	—	—
5/12	16 in.	3	3	4	4	5	6	6	8	10	8	—	—
	24 in.	4	5	7	6	7	9	6	8	10	—	—	—
6/12	16 in.	3	3	3	3	3	4	5	7	8	7	9	11
	24 in.	3	4	5	4	5	7	5	7	8	7	9	11
7/12	16 in.	3	3	3	3	3	3	4	5	7	6	7	9
	24 in.	3	3	4	4	5	6	4	5	7	6	7	9
9/12	16 in.	3	3	3	3	3	3	3	4	5	4	5	6
	24 in.	3	3	3	3	3	4	3	4	5	4	5	6
12/12	16 in.	3	3	3	3	3	3	3	3	3	3	3	4
	24 in.	3	3	3	3	3	3	3	3	3	3	3	4

TABLE C3 — STAPLING TABLE

(A) 3/8 in. T & G Hardwood Flooring
18 gauge, 1 1/8 in. long, 3/16 in. crown.

(B) Asphalt Shingles to Wood Decks —
16 gauge, 7/8 in. long, 7/16 in. crown.
Corrosion resistant.
1/3 more staples than the number of nails required.
16 gauge, 3/4 in. long, 1 in. crown.
Corrosion resistant.
Equivalent to number of nails required.

(C) Cedar Shingles to Wood Decks —
16 gauge, 1 1/8 in. long, 3/8 in. crown.
Corrosion resistant.

(D) Gypsum Plaster Lath, 3/8 in. thick —
16 gauge, 1 in. long, 3/4 in. crown.
Gypsum Plaster Lath, 1/2 in. thick —
16 gauge, 1 1/8 in. long, 3/4 in. crown.

(E) 5/16 in. and 3/8 in. Plywood Wall Sheathing —
16 gauge, 1 1/2 in. long, 3/8 in. crown.

(F) 3/8 in. Plywood Roof Sheathing —
16 gauge, 1 1/2 in. long, 3/8 in. crown.

(G) 7/16 in. and 1/2 in. Fibreboard Wall Sheathing —
16 gauge, 1 1/2 in. long, 3/8 in. crown.

(H) 1/4 in. and 5/16 in. Plywood, 3/16 in. and 1/4 in. hard pressed fibreboard underlayment —
18 gauge, 7/8 in. long, 3/16 in. crown to 3/8 in. crown.
3/8 in. Plywood Underlayment —
18 gauge, 1 1/8 in. long, 3/8 in. crown.

(I) Metal Plaster Lath —
14 gauge, 1 1/2 in. long, 3/4 in. crown.

(J) Lumber and Plywood Subflooring — Sheathing 1/2 in. up to 3/4 in. thick.
16 gauge, 2 in. long, 3/8 in. crown driven parallel to framing members.