City of Whitehorse Builders Permit and Code Education webinar series

Session 03

Framing including S406-16 PWF

February 12, 2025 (Revised March 7/25)

Presenter – Ken Kunka AScT, BCQ

FLYWHEEL BUILDING SOLUTIONS

Workshop Series

As part of the City's commitment to improving the permit process and communication with building industry members, the city will be providing 5 online sessions to review local building regulations, the 2020 National Building Code and an overview on the building permit process.

This presentation is conceptual and for informal educational purposes only. Material presented must not be considered complete or exhaustive. Code provisions have been generally represented and may not reflect all provisions.

Workshop Series

2025 Education Webinar Sessions

1. ~~Jan 15 –~~ Part 9 overview & what makes up a complete permit submission
2. ~~Jan 22 –~~ Excavation, Footings/Foundations, Radon and Drainage,
3. Feb 12 – Framing including PWF S406-16, (updated)
4. March 5- Fire Protection (Part 9.10),
5. March 26 – Building Envelopes & Mechanical Systems

These sessions will lead into the creation of building permit guide for Part 9 buildings – March 2025.

Workshop Series Content

The NBC is broken into 5 main categories:

- Use and Egress
- Fire Protection
- Building Structure
- Environmental Separations
- Building Science

Session 03 will concentrate in the area of

- Building Structure.

Image from 2015 NBC Illustrated Guide

Contents of NBC Part 9

NBC Section	Use and Egress	Fire Protection	Building Structure	Environmental Separation	Building Services
9.1.			General		
9.2.			Definitions		
9.3.			Materials, Systems and Equipment		
9.4.			Structural Requirements		
9.5.	Design of Areas and Spaces				
9.6.				Glass	
9.7.				Windows, Doors and Skylights	
9.8.	Stairs, Ramps, Handrails and Guards				
9.9.	Means of Egress				
9.10.		Fire Protection			
9.11.				Sound Transmission	
9.12.			Excavation		
9.13.				Dampproofing, Waterproofing and Soil Gas Control	
9.14.				Drainage	
9.15.			Footings and Foundations		
9.16.				Floors-on-Ground	
9.17.			Columns		
9.18.				Crawl Spaces	
9.19.				Roof Spaces	
9.20.			Masonry and Insulating Concrete Form Walls Not in Contact with the Ground		
9.21.		Masonry and Concrete Chimneys and Flues			Masonry and Concrete Chimneys and Flues
9.22.		Fireplaces			
9.23.			Wood-Frame Construction		
9.24.			Sheet Steel Stud Wall Framing		
9.25.				Heat Transfer, Air Leakage and Condensation Control	
9.26.				Roofing	
9.27.				Cladding	
9.28.				Stucco	
9.29.		Interior Wall and Ceiling Finishes			
9.30.	Flooring			Flooring	
9.31.					Plumbing Facilities
9.32.					Ventilation
9.33.					Heating and Air-conditioning
9.34.					Electrical Facilities
9.35.			Garages and Carports		
9.36.				Energy Efficiency	
9.37.	Objectives and Functional Statements				

Workshop Series – reference material

Workshop sessions along with updated PowerPoint presentations will be available for review on the city's website.

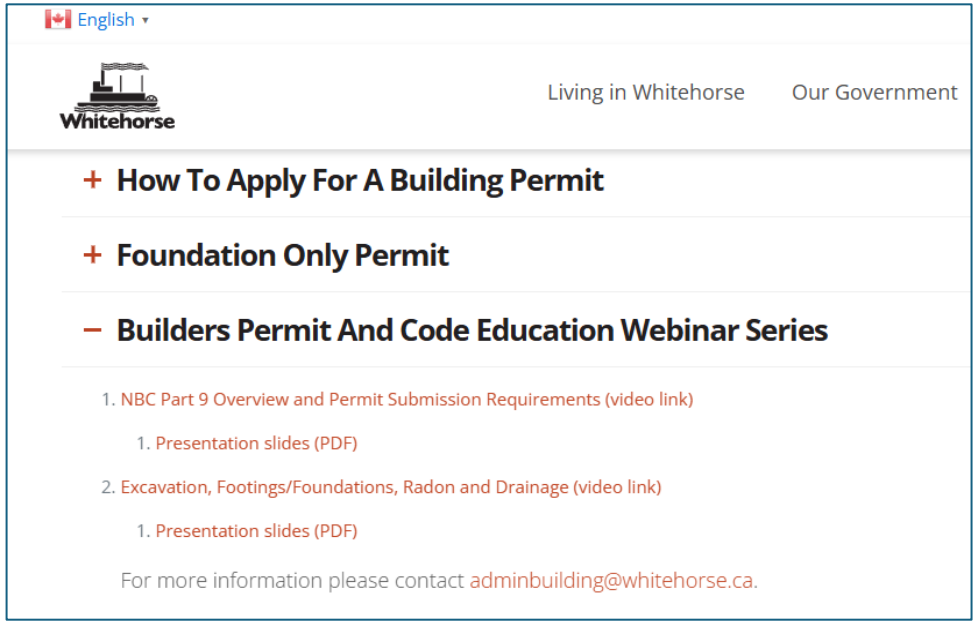
Please note new Building Department Bulletins for 2025!

NEW Building Bulletins

The following **Building Bulletins** have been created by the Land and Building Services Department. These Building Bulletins are designed to provide clarity and up-to-date information to builders, contractors, suppliers, and others in the construction industry on changes to building requirements under the National Building Code and amendments to the City's Building and Plumbing Bylaw.

Check back often for updates. To sign up for email updates, please contact adminbuilding@whitehorse.ca.

- Truss Design (Jan. 20, 2025)
- Permanent Wood Foundations (Jan. 20, 2025)
- Cast-in-Place and ICF Foundations (Jan. 20, 2025)



English

Whitehorse

Living in Whitehorse Our Government

+ How To Apply For A Building Permit

+ Foundation Only Permit

− Builders Permit And Code Education Webinar Series

1. NBC Part 9 Overview and Permit Submission Requirements (video link)
    1. Presentation slides (PDF)
2. Excavation, Footings/Foundations, Radon and Drainage (video link)
    1. Presentation slides (PDF)

For more information please contact adminbuilding@whitehorse.ca.

https://www.whitehorse.ca/city-launches-building-bulletins

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Learning Objectives – Session 03

This session has been developed to assist building industry partners to gain a better understanding of the following topics:

- Code requirements related to Framing, ICF and S406-16 PWF
- Site Safety (framing)
- Minimum drawing requirements – framing
- Minimum inspection requirements – what to be ready for and documents provided
- When professional involvement may be required (Excavations, Bearing, Structural Design - Part 4)

Learning Objectives – Session 03

NBC Code Section focus

- 9.3. Materials, Systems and Equipment
- 9.4 Structural Requirements related to footing/foundations
- 9.15.2.4. Wood-Frame Foundations
- 9.17 Columns (9.15 Footing and Foundations)
- ~~9.20.17 Above-Ground Flat Insulating Concrete Form Walls~~
  - Anchorage
- 9.23. Wood-Frame Construction

Separate Part 9 layout guide to be created.

Learning Objectives – Session 03

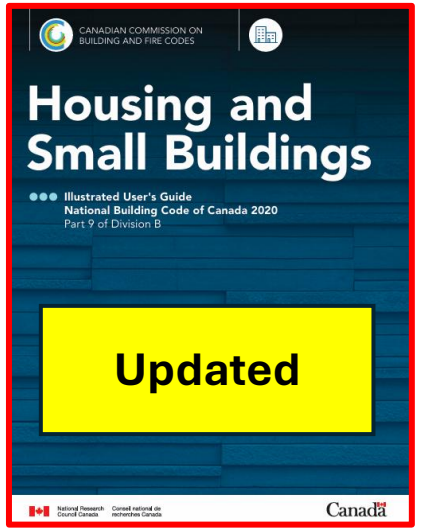
Staff concerns

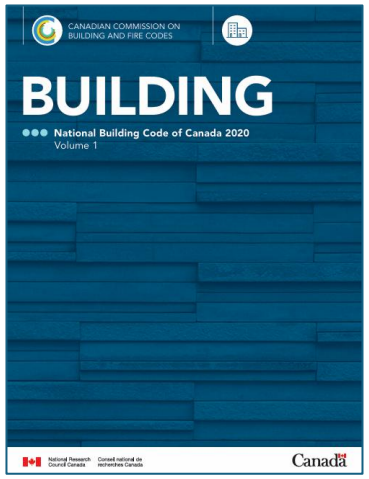
1. Deck beams that cantilever. Not allowed
2. Decks lateral support.
3. Decks that have cantilever joists. Follow code requirements. Only 2x8 and larger can cantilever. Follow code ratio.
4. Deck attachment and ledger attachment and or structural support for the ledger.
5. Beams that go over garages to pick up second floor, exterior wall and trusses or it may just have a 2’ floor load but an exterior wall and gable end truss. (when they step the floor back for curb appeal) and that same LVL beam has monos hanging on the front side of it. Engineer required, with stamp, not in part 9.

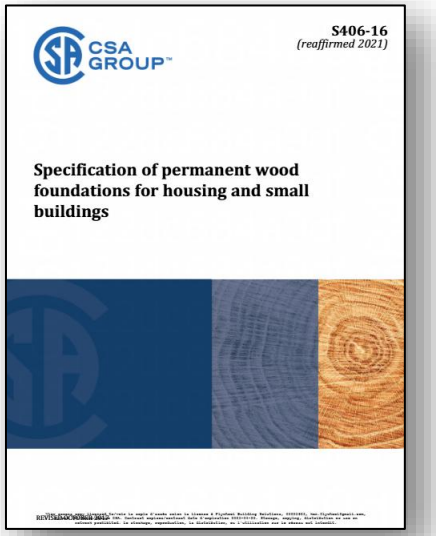
Learning References

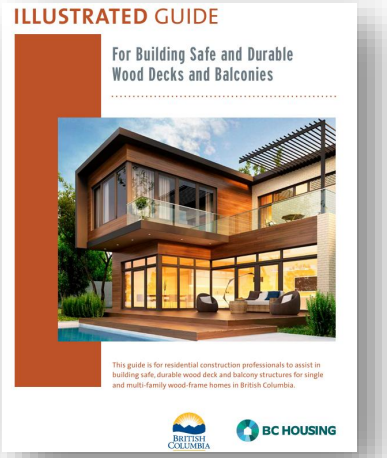
Reference material for this session :

- 2020 National Building Code
- CSA-S406-16 (reconfirmed 2021)
- **2020 Illustrated Users Guide**
- BC Housing – Safe and Durable Wood Decks and Balconies
- Cdn Wood Council – Span Book
- Prescriptive Residential Exterior Wood Deck Span guide





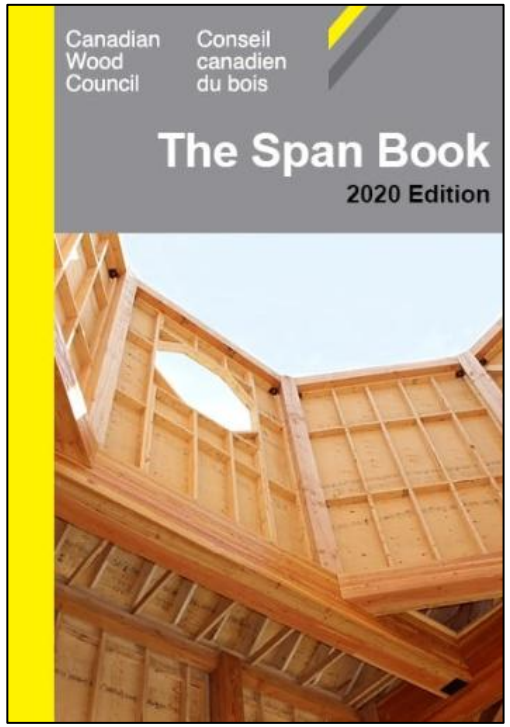




Learning References

2020 NBC Code Reference to Span Book

Span Tables 9.23.4.2.-A to 9.23.12.3.-D cover only the most common configurations. Especially in the area of floors, a wide variety of other configurations is possible: glued subfloors, concrete toppings, machine stress rated lumber, etc. The Canadian Wood Council publishes "The Span Book," a compilation of span tables covering many of these alternative configurations. Although these tables have not been subject to the formal committee review process, the Canadian Wood Council generates, for the CCBFC, all of the Code's span tables for wood structural components; thus Code users can be confident that the alternative span tables in "The Span Book" are consistent with the span tables in the Code and with relevant Code requirements.



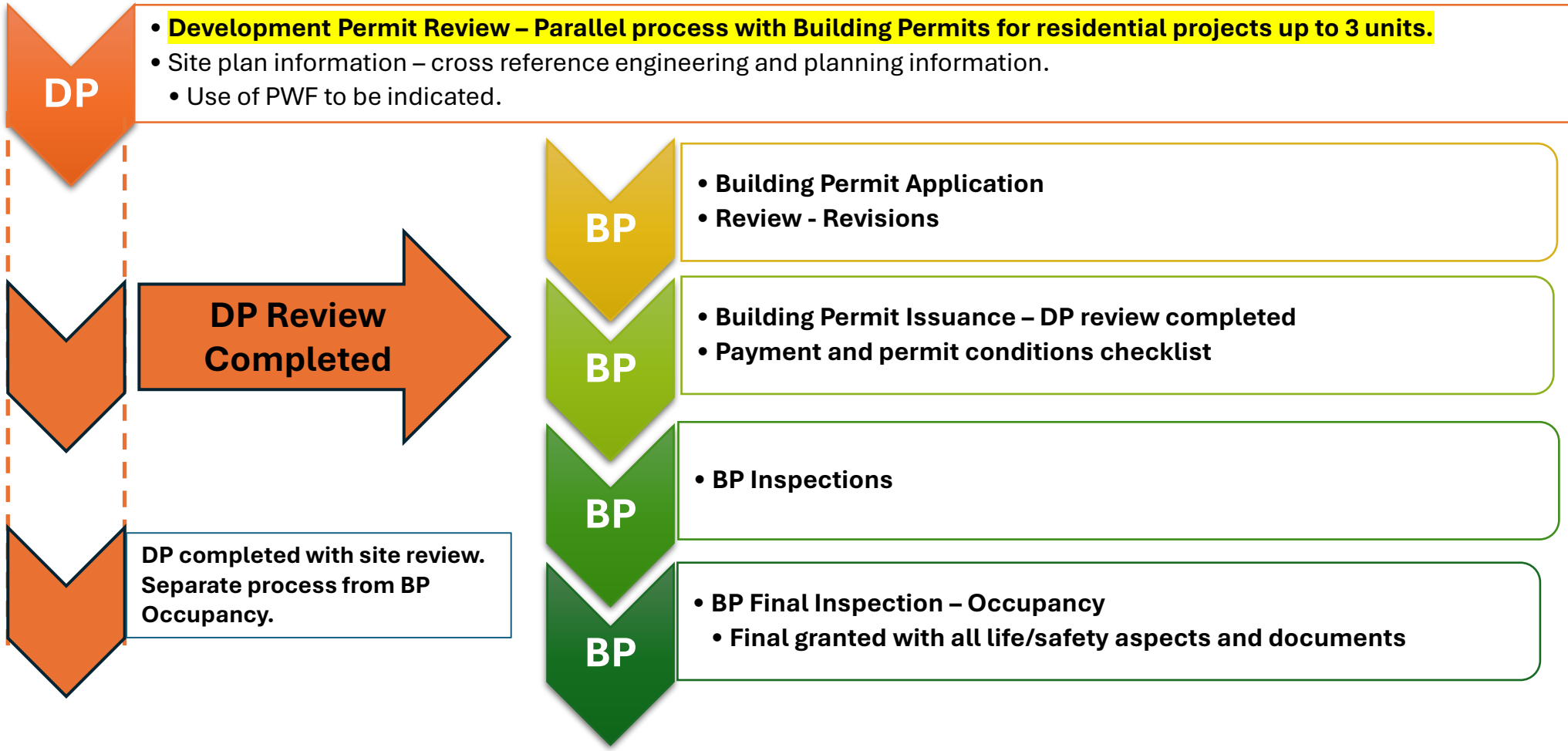
Design parameters – Session 02

Design references shall be related to:

- 2 storey over basement single family home with decks,
- Climatic conditions of the city of Whitehorse,
- Soil bearing capacity is 75 kPa (1566 psf) or more,
- Standard load bearing for Single Family home – Part 9
- Dimensional lumber – preservative-treated wood as applicable
- Permanent Wood Foundations (CSA S406-16) with concrete footings over a drainage layer,
- PWF (basements) with concrete slab or suspended floor,
- Strip and Pad footings design to 9.15 of the NBC,
- 9.15.4 Flat Insulating Concrete Form Units – below grade.

Typical Building Permit Process – Part 9

Overview of typical Building permit flow for a new Residential projects – up to 3 units



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Building Permit Application

BP

- BP Application

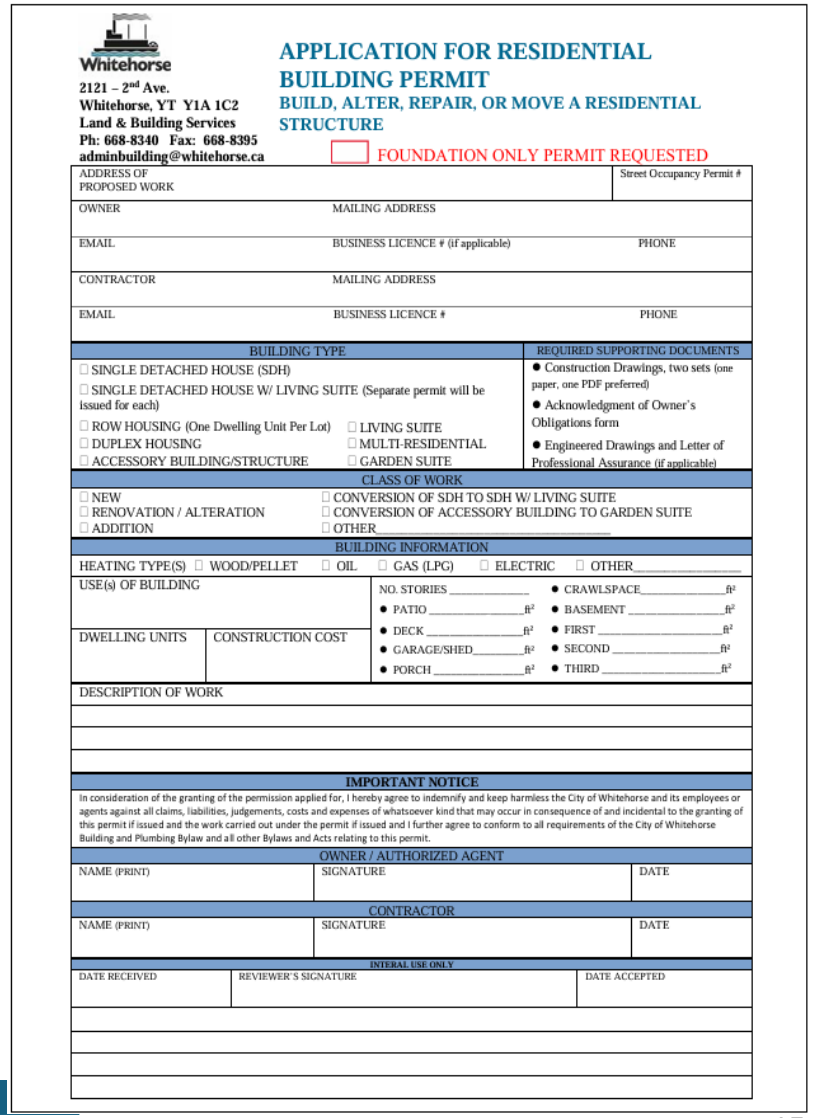
It is critical to ensure that the BP application is filled out and all required information has been provided. Please read the application package in full to ensure all the required information is provided.

In 2025, to improve the efficiency of the plan review process, incomplete building permit applications will not be accepted.

Please note that the DP site plan and lot grading information matches the BP drawings.

Separate projects such as a Garden Suites will require a separate BP application.

Link - 1Residential-Permit-Application-Form-V.3.1-July-2019.pdf



Whitehorse
2121 – 2nd Ave.
Whitehorse, YT Y1A 1C2
Land & Building Services
Ph: 668-8340 Fax: 668-8395
adminbuilding@whitehorse.ca

APPLICATION FOR RESIDENTIAL BUILDING PERMIT
BUILD, ALTER, REPAIR, OR MOVE A RESIDENTIAL STRUCTURE

☐ FOUNDATION ONLY PERMIT REQUESTED

ADDRESS OF PROPOSED WORK | Street Occupancy Permit #
OWNER | MAILING ADDRESS
EMAIL | BUSINESS LICENCE # (if applicable) | PHONE
CONTRACTOR | MAILING ADDRESS
EMAIL | BUSINESS LICENCE # | PHONE

BUILDING TYPE
☐ SINGLE DETACHED HOUSE (SDH)
☐ SINGLE DETACHED HOUSE W/ LIVING SUITE (Separate permit will be issued for each)
☐ ROW HOUSING (One Dwelling Unit Per Lot) ☐ LIVING SUITE
☐ DUPLEX HOUSING ☐ MULTI-RESIDENTIAL
☐ ACCESSORY BUILDING/STRUCTURE ☐ GARDEN SUITE

REQUIRED SUPPORTING DOCUMENTS
- Construction Drawings, two sets (one paper, one PDF preferred)
- Acknowledgment of Owner's Obligations form
- Engineered Drawings and Letter of Professional Assurance (if applicable)

CLASS OF WORK
☐ NEW
☐ RENOVATION / ALTERATION
☐ ADDITION
☐ CONVERSION OF SDH TO SDH W/ LIVING SUITE
☐ CONVERSION OF ACCESSORY BUILDING TO GARDEN SUITE
☐ OTHER_____

BUILDING INFORMATION
HEATING TYPE(S) ☐ WOOD/PELLET ☐ OIL ☐ GAS (LPG) ☐ ELECTRIC ☐ OTHER_____
USE(s) OF BUILDING
DWELLING UNITS | CONSTRUCTION COST
NO. STORIES _____
- PATIO _____ ft²
- DECK _____ ft²
- GARAGE/SHED _____ ft²
- PORCH _____ ft²
- CRAWLSPACE _____ ft²
- BASEMENT _____ ft²
- FIRST _____ ft²
- SECOND _____ ft²
- THIRD _____ ft²

DESCRIPTION OF WORK

IMPORTANT NOTICE
In consideration of the granting of the permission applied for, I hereby agree to indemnify and keep harmless the City of Whitehorse and its employees or agents against all claims, liabilities, judgements, costs and expenses of whatsoever kind that may occur in consequence of and incidental to the granting of this permit if issued and the work carried out under the permit if issued and I further agree to conform to all requirements of the City of Whitehorse Building and Plumbing Bylaw and all other Bylaws and Acts relating to this permit.

OWNER / AUTHORIZED AGENT
NAME (PRINT) | SIGNATURE | DATE

CONTRACTOR
NAME (PRINT) | SIGNATURE | DATE

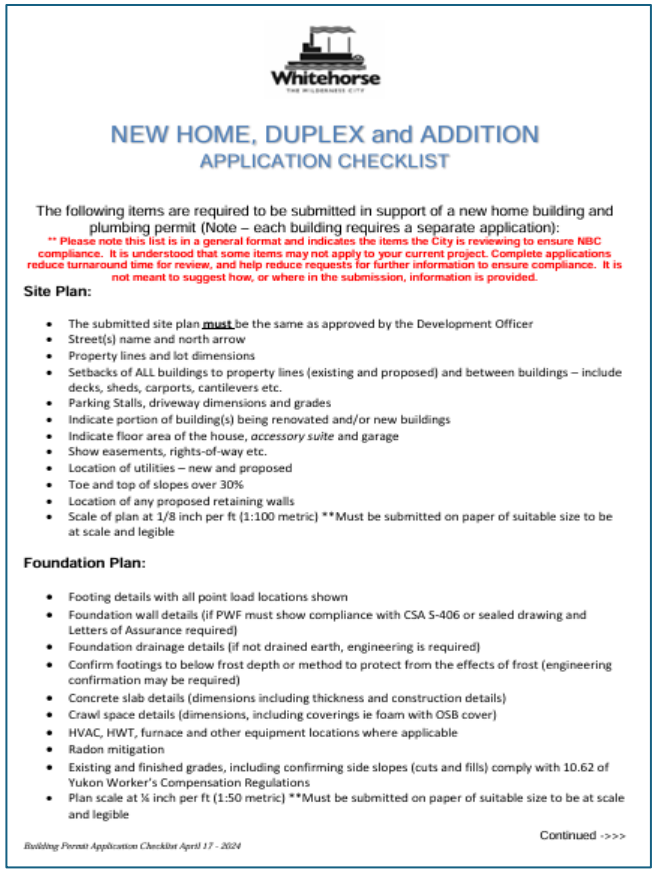
INTERAL USE ONLY
DATE RECEIVED | REVIEWER'S SIGNATURE | DATE ACCEPTED

Building Permit Application

BP

- **BP Application**

Refer to the City's permit drawing checklist to ensure the minimum requirements to show substantial compliance with the National Building Code. It is understood that some items may not apply to your current project. Drawings should provide enough information to show substantial compliance to Code and city regulations, which will reduce turnaround time for review, and help reduce requests for further information to ensure compliance.



Whitehorse

NEW HOME, DUPLEX and ADDITION
APPLICATION CHECKLIST

The following items are required to be submitted in support of a new home building and plumbing permit (Note – each building requires a separate application):
** Please note this list is in a general format and indicates the items the City is reviewing to ensure NBC compliance. It is understood that some items may not apply to your current project. Complete applications reduce turnaround time for review, and help reduce requests for further information to ensure compliance. It is not meant to suggest how, or where in the submission, information is provided.

Site Plan:

- The submitted site plan must be the same as approved by the Development Officer
- Street(s) name and north arrow
- Property lines and lot dimensions
- Setbacks of ALL buildings to property lines (existing and proposed) and between buildings – include decks, sheds, carports, cantilevers etc.
- Parking Stalls, driveway dimensions and grades
- Indicate portion of building(s) being renovated and/or new buildings
- Indicate floor area of the house, *accessory suite* and garage
- Show easements, rights-of-way etc.
- Location of utilities – new and proposed
- Toe and top of slopes over 30%
- Location of any proposed retaining walls
- Scale of plan at 1/8 inch per ft (1:100 metric) **Must be submitted on paper of suitable size to be at scale and legible

Foundation Plan:

- Footing details with all point load locations shown
- Foundation wall details (if PWF must show compliance with CSA S-406 or sealed drawing and Letters of Assurance required)
- Foundation drainage details (if not drained earth, engineering is required)
- Confirm footings to below frost depth or method to protect from the effects of frost (engineering confirmation may be required)
- Concrete slab details (dimensions including thickness and construction details)
- Crawl space details (dimensions, including coverings ie foam with OSB cover)
- HVAC, HWT, furnace and other equipment locations where applicable
- Radon mitigation
- Existing and finished grades, including confirming side slopes (cuts and fills) comply with 10.62 of Yukon Worker's Compensation Regulations
- Plan scale at ⅛ inch per ft (1:50 metric) **Must be submitted on paper of suitable size to be at scale and legible

Continued ->>>

Apply for your BP as early as possible!!

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Building Permit Drawings

BP

- **BP Application**

Import to ensure the

- **Foundation**
- **Floorplans, and**
- **Sections clearly show**

Framing Systems:

- Dimensioned
- Location of all walls and point loads to foundations,
- Joists, rafter, truss, beam size and layouts**
  **See below if manufactured components are being proposed, in which case only beam spans, joist/truss direction and point load locations need to be shown
- Any required bridging and/or blocking
- Manufactured beams, lintels, roof trusses floor systems etc. stamped by P. Eng or equivalent certification from the manufacturer ** These items may be submitted prior to request for framing inspection and seals are NOT required to be provided until further notice, unless the spans exceed 12.2 m or the values contained in the Span Tables of the NBC

BP Application - Professional Involvement

BP • Application

As outlined in Building Bylaw 99-50 and 9.4 of the Code, there will be more SFH projects requiring the involvement of an Engineer (geotechnical and or structural), which will require submission of sealed drawings and Letters of Design confirmation time of BP application.

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- **Truss Design (Jan. 20, 2025)**
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- **Cast-in-Place and ICF Foundations (Jan. 20, 2025)**

Factors for the city requiring increased involvement of engineers are:

- **New house designs are narrower open plan layouts with larger point loads outside the scope of Part 9,**
- **Increase in engineered building components and propriety products**
- Soil conditions that can create concerns related to site safety, bearing capacity, drainage and backfill.

Questions?

Climatic Data overview

Whitehorse is in Climatic Zone 7B
(6000 to 6999 HDD)

- Climatic data is found in

Illustrated Guide - Energy Efficient Houses - Zone 7B-8-North

Division B	Acceptable Solutions
Part 1	General
Part 2	Farm Buildings
Part 3	Fire Protection, Occupant Safety and Accessibility
Part 4	Structural Design
Part 5	Environmental Separation
Part 6	Heating, Ventilating and Air-conditioning
Part 7	Plumbing Services
Part 8	Safety Measures at Construction and Demolition Sites
Appendix C	Climatic and Seismic Information
Appendix D	Fire-Performance Ratings

Snow Loads
Ss = 2.0Kpa Sr = 0.1kPa
Hourly Wind Pressure – 1/50 = 0.38 kPa

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Whitehorse	655	-41	-43	25	15	6580	8	43	170	0.5	275	40	2.0	0.1	0.29	0.38
Fort St. John	685	-35	-37	26	18	5750	15	72	320	0.5	475	100	2.8	0.1	0.29	0.39
Kelowna	350	-17	-20	33	20	3400	12	43	260	0.3	325	80	1.7	0.1	0.30	0.40

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Seismic Data overview

SeismicHazardforPart9 Table C 3 lists the seismic hazard values to be used in the application of the prescriptive requirements in Part9 relating to lateral loads due to earthquake (these values are the same as those listed in Table C-3 of the NBC 2015).

Province and Location	$S_a(0.2)$ for Seismic Design in Part 9
Whitehorse	0.334

9.23.13. Bracing to Resist Lateral Loads Due to Wind and Earthquake

(See Note A-9.23.13.)

9.23.13.1. Requirements for Low to Moderate Wind and Seismic Forces

(See Note A-9.23.13.1.)

1) This Article applies in locations where the seismic spectral acceleration, $S_a(0.2)$, is not more than 0.70 and the 1-in-50 hourly wind pressure is less than 0.80 kPa.

Therefore, no additional lateral bracing required as seismic is 0.334 kPa and 1/50 wind velocity at 0.38 kPa. (Including PWF construction)

There may be some modifications in the 2025 National Building Code

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2020 NBC - Defined Terms – Framing

Braced wall band means an imaginary continuous straight band extending vertically and horizontally through the building or part of the building, within which braced wall panels are constructed.

Braced wall panel means a portion of a wood-frame wall where bracing, sheathing, cladding or interior finish is designed and installed to provide the required resistance to lateral loads due to wind or earthquake.

Dead load means the weight of all permanent structural and non-structural components of a building.

Defined Terms (2020 NBC)

Live load means a variable load due to the intended use and occupancy that is to be assumed in the design of the structural members of a building. It includes loads due to cranes and the pressure of liquids in containers.

Loadbearing (as applying to a building element) means subjected to or designed to carry loads in addition to its own dead load, excepting a wall element subjected only to wind or earthquake loads in addition to its own dead load.

Rim joist means the outermost member in floor framing, other than blocking, be it parallel, perpendicular or on an angle to the floor joists. (See Note A-1.4.1.2.(1).)

A-Rim Joist - In the field, rim joists may also be referred to as rim boards, headers or header joists.

Unsafe condition means any condition that could cause undue hazard to the life, limb or health of any person authorized or expected to be on or about the premises.

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Numbering System (2020 NBC)

Numbering System

A consistent numbering system has been used throughout the National Model Codes. The first number indicates the Part of the Code; the second, the Section in the Part; the third, the Subsection; and the fourth, the Article in the Subsection. The detailed provisions are found at the Sentence level (indicated by numbers in brackets), and Sentences may be broken down into Clauses and Subclauses. This structure is illustrated as follows:

3	Part
3.5.	Section
3.5.2.	Subsection
3.5.2.1.	Article
3.5.2.1.(2)	Sentence
3.5.2.1.(2)(a)	Clause
3.5.2.1.(2)(a)(i)	Subclause

British Columbia Building Codes 2024

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NBC 9.3. Materials, Systems and Equipment

The materials, systems and equipment commonly used in the construction of buildings are covered by standards prepared by various organizations. These standards are referenced throughout NBC Part 9. NBC Section 9.3. was developed to provide requirements specific to three basic construction materials: concrete, wood and metal.

In relation to Framing and above ground Flat Insulating Concrete Forms

- Article 9.3.2.2. Lumber Grades
- Article 9.3.2.5. Moisture Content
- Article 9.3.2.8. Undersized Lumber
- Article 9.3.2.9. Termite and Decay Protection

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Section 9.3. Materials, Systems and Equipment

9.3.2.1. Grade Marking

1) Lumber for joists, rafters, trusses and beams and for the uses listed in Table 9.3.2.1.shall be identified by a grade stamp to indicate its grade as determined by NLGA 2017, "Standard Grading Rules for Canadian Lumber."(See Note A-9.3.2.1.(1).)

9.3.2.2. Lumber Grades

1) Except for joists, rafters, trusses and beams, visually graded lumber shall conform to the grades in Table 9.3.2.1.(See Article 9.23.4.2.for joists, rafters and beams and Article 9.23.14.11. for trusses.)

Table 9.3.2.1.
Minimum Lumber Grades for Specific End Uses
Forming Part of Sentence 9.3.2.1.(1)

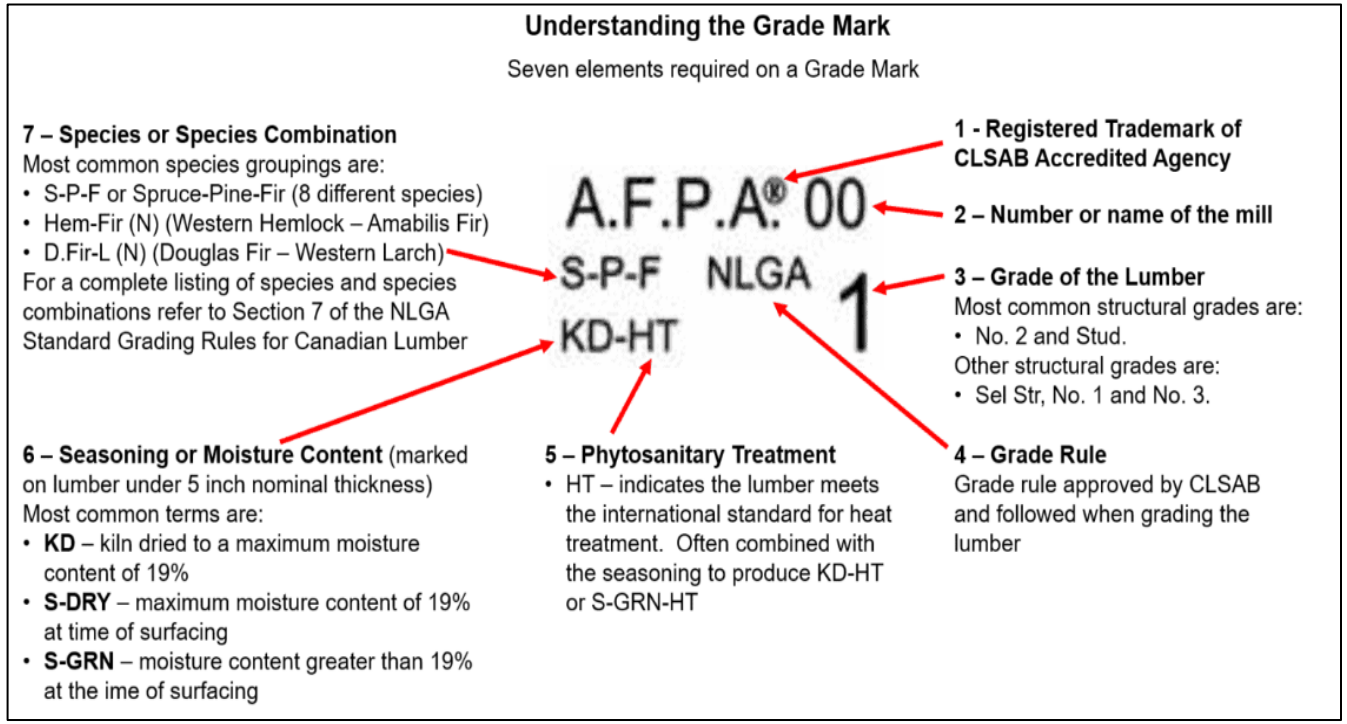
Use	Boards (1)			Framing
	Paragraph in the NLGA Grading Rules under which boards are graded			
	All Species		Eastern White Pine & Red Pine	All Species
	Para 113	Para 114	Para 118	
Stud wall framing (*loadbearing* members)	-	-	-	Stud, Standard, No. 2
Stud wall framing (non-*loadbearing* members)	-	-	-	Stud, Utility, No. 3
Plank frame construction (*loadbearing* members)	No. 3 Common	-	No. 3 Common	No. 2
Plank frame construction (non-*loadbearing* members)	No. 5 Common	-	No. 5 Common	Economy, No. 3
Posts and beams less than 114 mm in thickness	-	-	-	Standard, No. 2
Posts and beams not less than 114 mm in thickness	-	-	-	Standard
Roof sheathing	No. 3 Common	Standard	No. 4 Common	-
Subflooring	No. 3 Common	Standard	No. 3 Common	-
Wall sheathing when required as a nailing base	No. 4 Common	Utility	No. 4 Common	-
Wall sheathing not required as a nailing base	No. 5 Common	Economy	No. 5 Common	-

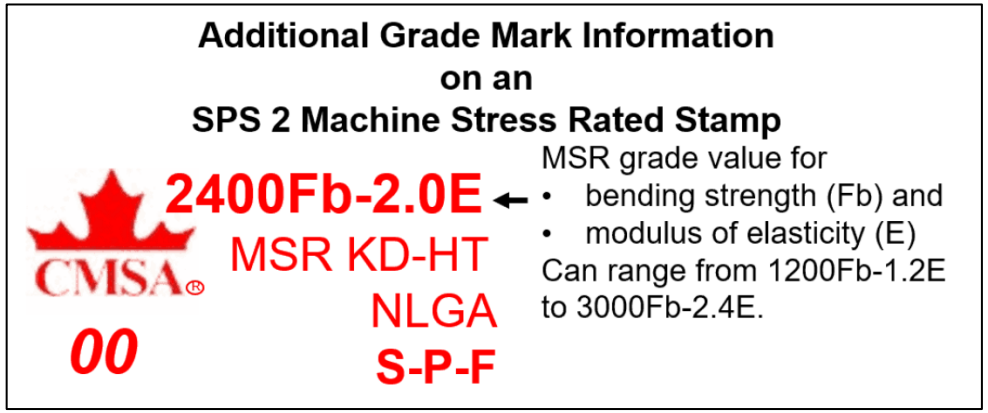
Notes to Table 9.3.2.1.:
(1) See Note A-Table 9.3.2.1.

Section 9.3. Materials, Systems and Equipment

• 9.3.2.2. Lumber Grades

- Why a Grade Mark?
- The National Building Code of Canada and all Provincial Building Codes call for lumber to be grade stamped or certified, referencing standards approved by CLSAB. Enabling building inspectors to ensure that the product on site meets the specifications, design and/or engineering requirements.





Canadian Lumber Standards Accreditation Board

Use of ungraded timber framing may trigger an engineer.

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Section 9.3. Materials, Systems and Equipment

9.3.2.3. Machine Stress Rated Lumber

Machine stress rated lumber shall conform to the requirements of Subsection 4.3.1.

9.3.2.4. OSB, Waferboard and Plywood Marking

1) OSB, waferboard and plywood used for roof sheathing, wall sheathing and subflooring shall be legibly identified on the face of the material indicating

a) the manufacturer of the material,

b) b) the standard to which it is produced, and

c) c) that the material is of an exterior type.

9.3.2.5. Moisture Content

1) Moisture content of lumber shall be not more than 19% at the time of installation

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Section 9.3. Materials, Systems and Equipment

9.3.2.5. Moisture Content

1) Moisture content of lumber shall be not more than 19% at the time of installation

The maximum moisture content permitted for lumber at the time of installation is 19%. At this moisture level, more than half of the wood's normal shrinkage will have occurred. Additional drying and shrinkage will usually occur before the interior vapour barriers and finishes enclose the wood.

If lumber with a moisture content in excess of 19% is installed, moisture may become trapped between vapour-resisting materials, and the wood may retain excess moisture long enough to allow decay to start.

NOTE – Precautions should be taken with heating in winter months to prevent moisture being trapped in assemblies.

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BUILDING SOLUTIONS

Section 9.3. Materials, Systems and Equipment

9.3.2.9. Termite and Decay Protection

Termite and Decay Protection

3) Structural wood elements shall be pressure-treated with a preservative to resist decay,

a) where the vertical clearance between structural wood elements and the finished ground level is less than 150 mm (see also Articles 9.23.2.2. and 9.23.2.3.), or

b) where

i) the wood elements are not protected from exposure to precipitation,

ii) the configuration is conducive to moisture accumulation, and

iii) the moisture index is greater than 1.00. (See Note A-9.3.2.9.(3).)

5) Where wood is required by this Article to be treated to resist termites or decay, such treatment shall be in accordance with Table2, Use Categories for **Specific Products, Uses, and Exposures**, of CAN/CSA-O80.1, "Specification of treated wood,"

There are many above ground structural wood systems where precipitation is readily trapped or drying is slow, creating conditions conducive to decay: e.g., beams extending beyond roof decks, junctions between deck members, and connections between balcony guards and walls.

Section 9.3. Materials, Systems and Equipment

9.3.2.9. Termite and Decay Protection

9.23.2.2 Protection from Decay

1) Ends of wood joists, beams and other members framing into masonry or concrete shall be treated to prevent decay where the bottom of the member is at or below ground level, or a 12 mm air space shall be provided at the end and sides of the member.
2) Airspaces required in Sentence (1) shall not be blocked by insulation, vapour barriers or airtight materials.

9.23.2.3 Protection from Dampness

1) Except as permitted in Sentence (2), **wood framing members that are not pressure-treated with a wood preservative and that are supported on concrete in contact with the ground or fill shall be separated from the concrete by not less than 0.05 mm polyethylene film or Type S roll roofing.**
2) Dampproofing material referred to in Sentence (1) is not required where the wood member is **at least 150 mm above the ground**.

9.23.3.2.(2)
Therefore, take precautions for your finished ground levels.

Also note cladding clearances to protect against in floor and wall assemblies

Questions?

9.4 Structural Requirements

That houses and small buildings have the ability to withstand the loads imposed on them is an important Code requirement. Such buildings must be able to withstand dead loads (their own weight and contents) and live loads due to use and occupancy, as well as wind, snow and seismic loads.

In relation to Framing

- 9.4.1. Structural Design Requirements and Application Limitations
- 9.4.4.2 Specified Snow Loads
- 9.4.2.3. Platforms Subject to Snow and Occupancy Loads
- 4 - Part Roofs with solar panels
- Engineered Trusses & PWF

Section 9.4. Structural Requirements

9.4.1. Structural Design Requirements and Application Limitations

9.4.1.1. General

(See Note A-9.4.1.1. and Article 2.2.7.6. of Division C.)

1) Subject to the application limitations defined elsewhere in this Part, structural members and their connections shall

a) conform to requirements provided elsewhere in this Part,

b) be designed according to good engineering practice such as that provided in CWC2014, “Engineering Guide for Wood Frame Construction,” or

c) Be designed according to Part 4 using the loads and deflection and vibration limits specified in

i) Part 9, or

ii) Part 4.

2) Where floor framing is designed in accordance with Clause (1)(b) or (c), and where supporting wall framing and fastenings, or footings are designed according to Clause (1)(a), the maximum specified live load on the floor according to Table 4.1.5.3. shall not exceed 2.4 kPa.

Section 9.4. Structural Requirements

Part 9 structural design (without a registered professional) are based on uniformly distributed loads.

9.4.2. Specified Loads

9.4.2.1. Application

(See Note A-9.4.2.1. and 9.4.2.2.)

1) This Subsection applies to light-frame constructions whose wall, floor and roof planes are generally comprised of frames of small repetitive structural members, and where

a) the roof and wall planes are clad, sheathed or braced on at least one side,
b) the small repetitive structural members are spaced not more than 600 mm o.c.,
c) the clear span of any structural member does not exceed 12.2 m,
d) the maximum deflection of the structural roof members conforms to Article 9.4.3.1.,
e) the maximum total roof area, notwithstanding any separation of adjoining *buildings* by *firewalls*, is 4 550 m^2, and
f) for flat roofs, there are no significant obstructions on the roof, such as parapet walls, spaced closer than the distance calculated by

$$D_o = 10\,(H_o - 0.8S_s/\gamma)$$

where

D_o = minimum distance between obstructions, m,
H_o = height of the obstruction above the roof, m,
S_s = ground snow load, kPa, and
γ = specific weight of snow taken as 4.0 kN/m^3 or $0.43S_s + 2.2$ kN/m^3, whichever is lesser.

***Building and Plumbing Bylaw**

55. Where the dimensions of a structural component are not provided in Part 9 of the *National Building Code of Canada* for use in a building within the scope of that part, and such dimensions are to be determined on the basis of calculation, testing or other means of evaluation, the owner shall:

(1) retain the services of a designer competent to undertake such work; or

(2) provide evidence to show that the member size has been determined in conformance with engineering practice accepted by the authority having jurisdiction where the nature or complexity of the work does not warrant retaining the services of a professional designer.

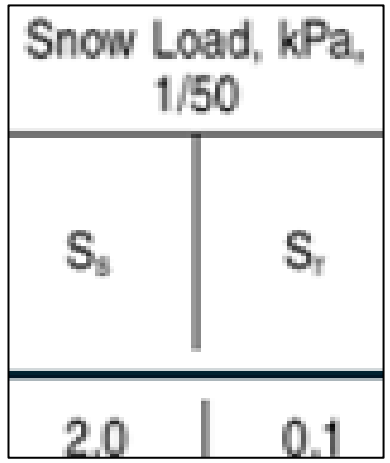
67. Where the site conditions, the size or complexity of a building, part of a building or building component warrant, the authority having jurisdiction may require:

(1) appropriate plans, specifications and related documents to bear the seal or stamp of an architect or engineer; and

(2) the work be reviewed during construction by the designer or other competent person.

Section 9.4. Structural Requirements - Roofs

- **9.4.2.2 – Specific Snow Loads**
  - Whitehorse Specific snow load
  - S = (0.45 x 2.0) + 0.1
    = 1.0 kPa



$$S = C_b S_s + S_r$$

where
S = specified snow load,
C_b = basic snow load roof factor, which is 0.45 where the entire width of the roof does not exceed 4.3 m and 0.55 for all other roofs,
S_s = 1-in-50-year ground snow load in kPa, determined according to Subsection 1.1.3., and
S_r = associated 1-in-50-year rain load in kPa, determined according to Subsection 1.1.3.

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Section 9.4. Structural Requirements - Roofs

9.4.2.3 – Platforms Subject to Snow and Occupancy Loads

1) Balconies, decks and other accessible exterior platforms intended for an occupancy and subject to snow loads shall be designed to carry the specified roof snow load or 1.9kPa, which ever is greater, where the platform, or each segregated area of the platform, serves a single dwelling unit. (SeeNoteA-9.4.2.3.(1).

Note: Platforms subject to larger loads from built in planters or hot tubs will need to be designed by an Engineer.

Whitehorse Specific snow load

S = (0.45 x 2.0) + 0.1

= 1.0 kPa

Therefore

1.9 kPa controls

Updated

A-9.4.2.3.(1) Accessible Platforms Subject to Snow and Occupancy Loads. Many platforms are subject to both occupancy loads and snow loads. These include balconies, decks, verandas, flat roofs over garages and carports. Where such a platform, or a segregated area of such a platform, serves a single dwelling unit, it must be designed for the greater of either the specified snow load or an occupancy load of 1.9 kPa. Where the platform serves more than one single dwelling unit or an occupancy other than a residential occupancy, higher occupancy loads will apply as specified in Table 4.1.5.3.

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Section 9.4. Structural – Solar Panels (Part 4)

- **Roofs with solar panels – design required for every building type.**

4.1.6.16. Roofs with Solar Panels
(See Note A-4.1.6.16.)

1) Where solar panels are installed on a roof, the snow loads, S, shall be determined in accordance with Sentences (2) to (6) or with the requirements for roofs without solar panels, whichever produces the most critical effect.

2) For the purposes of this Article, solar panels shall be classified as
a) Parallel Flush, where the panels are installed parallel to the roof surface with their upper surface less than or equal to $C_bC_wS_s/\gamma$ above the roof surface,
b) Parallel Raised, where the panels are installed parallel to the roof surface with their upper surface greater than $C_bC_wS_s/\gamma$ above the roof surface, or
c) Tilted, where the panels are installed at an angle to the roof surface with their highest edge greater than $C_bC_wS_s/\gamma$ above the roof surface.

3) For sloped roofs with solar panels, the snow loads, S, shall be determined in accordance with the requirements for roofs without solar panels, except that the slope factor, C_s, shall be
a) taken as 1.0 for roof areas extending upslope from the downslope edge of a panel or array of panels at an angle of 45° from each side edge of the panel or array, and
b) as specified in Sentences 4.1.6.2.(5) to (7) for all other roof areas.
(See Note A-4.1.6.16.(3).)

4) For sloped roofs with Parallel Flush solar panels, the snow loads, S, shall be determined in accordance with the requirements for roofs without solar panels, except that

A-4.1.6.16.(4)(b) Snow Loads for a Sloped Roof with Parallel Flush Solar Panels Where $w_g \geq w_p$. Figure A-4.1.6.16.(4)(b) shows the snow loads for a sloped roof with Parallel Flush solar panels where the gap width, w_g, between the panels is greater than or equal to the panel width, w_p.

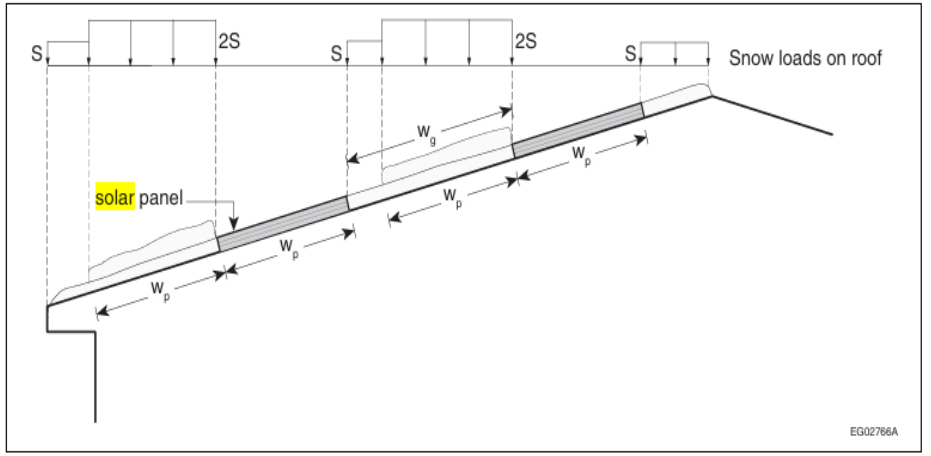
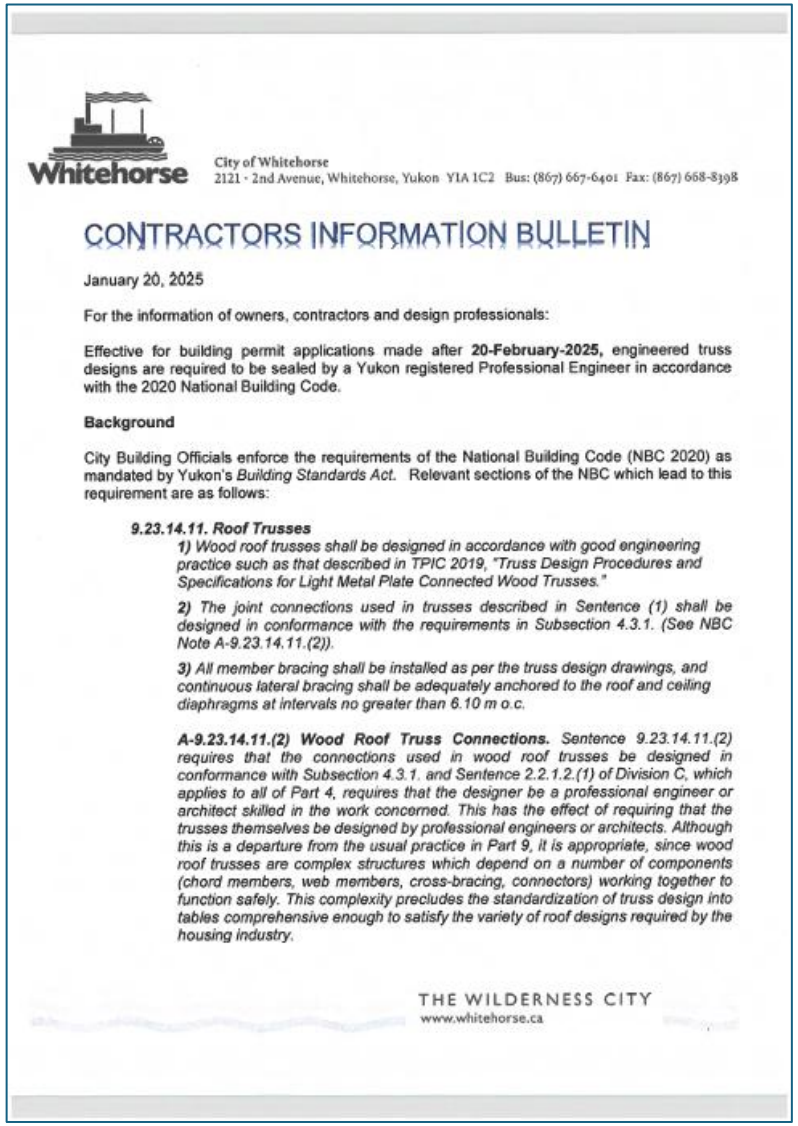


Figure A-4.1.6.16.(4)(b)
Snow loads for a sloped roof with Parallel Flush solar panels where $w_g \geq w_p$

Also note uneven loading creating by metal roof – snow brakes.

Engineered Trusses



Whitehorse

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CONTRACTORS INFORMATION BULLETIN

January 20, 2025

For the information of owners, contractors and design professionals:

Effective for building permit applications made after **20-February-2025,** engineered truss designs are required to be sealed by a Yukon registered Professional Engineer in accordance with the 2020 National Building Code.

Background

City Building Officials enforce the requirements of the National Building Code (NBC 2020) as mandated by Yukon's *Building Standards Act*. Relevant sections of the NBC which lead to this requirement are as follows:

9.23.14.11. Roof Trusses

1) Wood roof trusses shall be designed in accordance with good engineering practice such as that described in TPIC 2019, "Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses."

2) The joint connections used in trusses described in Sentence (1) shall be designed in conformance with the requirements in Subsection 4.3.1. (See NBC Note A-9.23.14.11.(2)).

3) All member bracing shall be installed as per the truss design drawings, and continuous lateral bracing shall be adequately anchored to the roof and ceiling diaphragms at intervals no greater than 6.10 m o.c.

***A-9.23.14.11.(2) Wood Roof Truss Connections.** Sentence 9.23.14.11.(2) requires that the connections used in wood roof trusses be designed in conformance with Subsection 4.3.1. and Sentence 2.2.1.2.(1) of Division C, which applies to all of Part 4, requires that the designer be a professional engineer or architect skilled in the work concerned. This has the effect of requiring that the trusses themselves be designed by professional engineers or architects. Although this is a departure from the usual practice in Part 9, it is appropriate, since wood roof trusses are complex structures which depend on a number of components (chord members, web members, cross-bracing, connectors) working together to function safely. This complexity precludes the standardization of truss design into tables comprehensive enough to satisfy the variety of roof designs required by the housing industry.*

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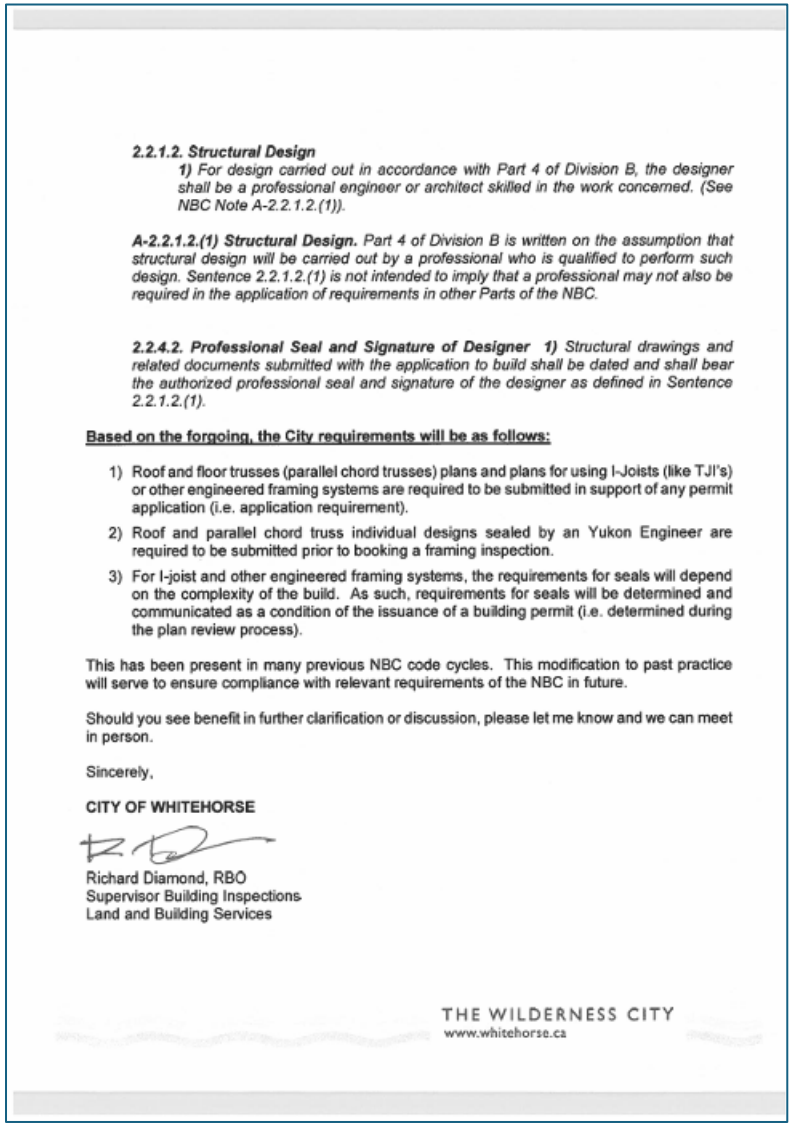

2.2.1.2. Structural Design

1) For design carried out in accordance with Part 4 of Division B, the designer shall be a professional engineer or architect skilled in the work concerned. (See NBC Note A-2.2.1.2.(1)).

***A-2.2.1.2.(1) Structural Design.** Part 4 of Division B is written on the assumption that structural design will be carried out by a professional who is qualified to perform such design. Sentence 2.2.1.2.(1) is not intended to imply that a professional may not also be required in the application of requirements in other Parts of the NBC.*

***2.2.4.2. Professional Seal and Signature of Designer** 1) Structural drawings and related documents submitted with the application to build shall be dated and shall bear the authorized professional seal and signature of the designer as defined in Sentence 2.2.1.2.(1).*

Based on the forgoing, the City requirements will be as follows:

1) Roof and floor trusses (parallel chord trusses) plans and plans for using I-Joists (like TJI's) or other engineered framing systems are required to be submitted in support of any permit application (i.e. application requirement).
2) Roof and parallel chord truss individual designs sealed by an Yukon Engineer are required to be submitted prior to booking a framing inspection.
3) For I-joist and other engineered framing systems, the requirements for seals will depend on the complexity of the build. As such, requirements for seals will be determined and communicated as a condition of the issuance of a building permit (i.e. determined during the plan review process).

This has been present in many previous NBC code cycles. This modification to past practice will serve to ensure compliance with relevant requirements of the NBC in future.

Should you see benefit in further clarification or discussion, please let me know and we can meet in person.

Sincerely,

CITY OF WHITEHORSE

Richard Diamond, RBO
Supervisor Building Inspections
Land and Building Services

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CONTRACTORS INFORMATION BULLETIN

January 20, 2025

For the information of owners, contractors and design professionals:

Effective for building permit applications made after **20-February-2025,** engineered truss designs are required to be sealed by a Yukon registered Professional Engineer in accordance with the 2020 National Building Code.

Truss-Bulletin_signed.pdf

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Engineered Trusses

Floor and truss layouts required a time of application?
Sealed Truss Specs at Frame Inspection

Trusses – required an engineered sealed design

9.23.14.11. Roof Trusses

1) Wood roof trusses shall be designed in accordance with good engineering practice such as that described in TPIC 2019, "Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses."

2) The joint connections used in trusses described in Sentence (1) shall be designed in conformance with the requirements in Subsection 4.3.1. (See Note A-9.23.14.11.(2).)

3) All member bracing shall be installed as per the truss design drawings, and continuous lateral bracing shall be adequately anchored to the roof and ceiling diaphragms at intervals no greater than 6.10 m o.c.

- **Trusses cannot be modified unless reviewed by the manufacturer (Engineer)**

9.23.5.5. Roof Trusses

1) Roof truss members shall not be notched, drilled or otherwise weakened unless such notching or drilling is allowed for in the design of the truss.

- **Ensure all climatic data is on design layouts and address.**
- **Ensure sealed truss specs** and layouts are on site at time of frame inspection. Ensure all bracing is completed.

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Engineered Trusses

A-9.23.14.11.(2) Wood Roof Truss Connections. Sentence 9.23.14.11.(2) requires that the connections used in wood roof trusses be designed in conformance with Subsection 4.3.1. and Sentence 2.2.1.2.(1) of Division C, which applies to all of Part 4, requires that the designer be a professional engineer or architect skilled in the work concerned. This has the effect of requiring that the trusses themselves be designed by professional engineers or architects. Although this is a departure from the usual practice in Part 9, it is appropriate, since wood roof trusses are complex structures which depend on a number of components (chord members, web members, cross-bracing, connectors) working together to function safely. This complexity precludes the standardization of truss design into tables comprehensive enough to satisfy the variety of roof designs required by the housing industry.

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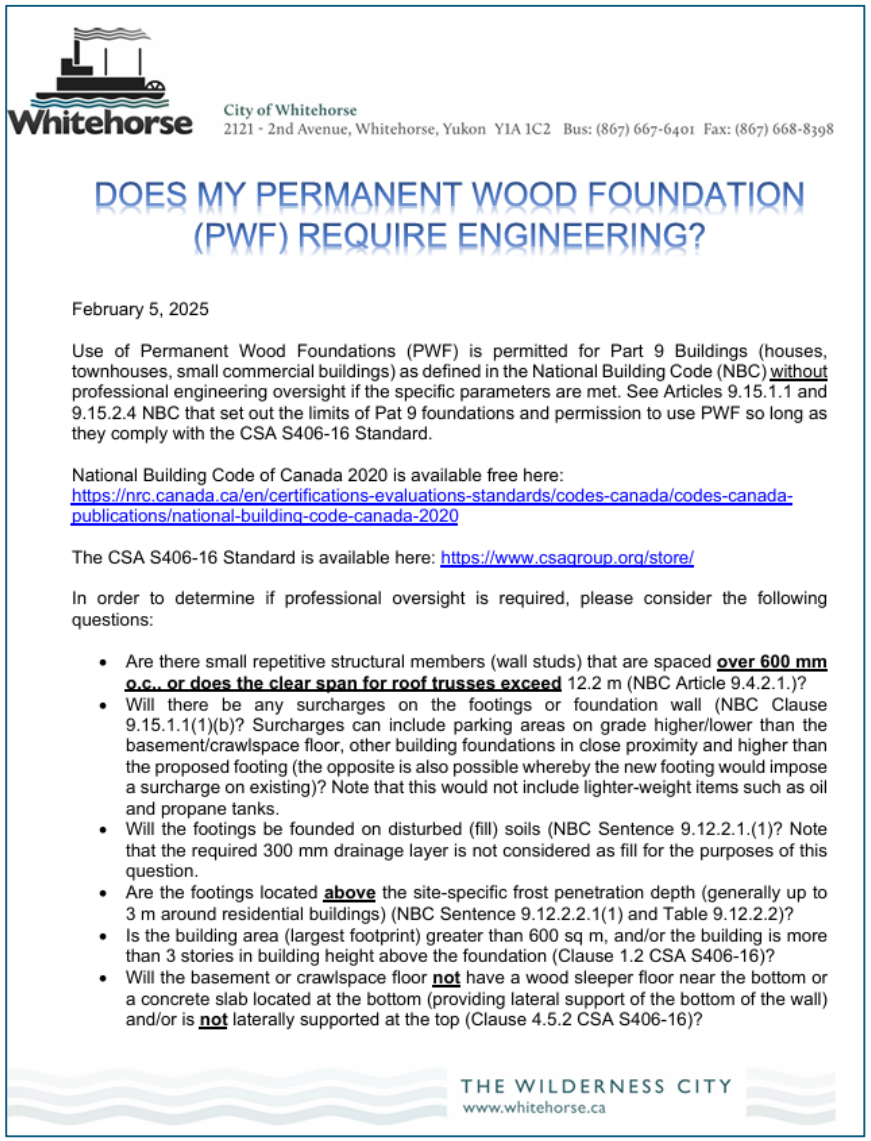
PWF Engineering



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DOES MY PERMANENT WOOD FOUNDATION (PWF) REQUIRE ENGINEERING?

February 5, 2025

Use of Permanent Wood Foundations (PWF) is permitted for Part 9 Buildings (houses, townhouses, small commercial buildings) as defined in the National Building Code (NBC) without professional engineering oversight if the specific parameters are met. See Articles 9.15.1.1 and 9.15.2.4 NBC that set out the limits of Pat 9 foundations and permission to use PWF so long as they comply with the CSA S406-16 Standard.

National Building Code of Canada 2020 is available free here: https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-publications/national-building-code-canada-2020

The CSA S406-16 Standard is available here: https://www.csagroup.org/store/

In order to determine if professional oversight is required, please consider the following questions:

- Are there small repetitive structural members (wall studs) that are spaced **over 600 mm o.c.. or does the clear span for roof trusses exceed** 12.2 m (NBC Article 9.4.2.1.)?
- Will there be any surcharges on the footings or foundation wall (NBC Clause 9.15.1.1(1)(b)? Surcharges can include parking areas on grade higher/lower than the basement/crawlspace floor, other building foundations in close proximity and higher than the proposed footing (the opposite is also possible whereby the new footing would impose a surcharge on existing)? Note that this would not include lighter-weight items such as oil and propane tanks.
- Will the footings be founded on disturbed (fill) soils (NBC Sentence 9.12.2.1.(1)? Note that the required 300 mm drainage layer is not considered as fill for the purposes of this question.
- Are the footings located **above** the site-specific frost penetration depth (generally up to 3 m around residential buildings) (NBC Sentence 9.12.2.2.1(1) and Table 9.12.2.2)?
- Is the building area (largest footprint) greater than 600 sq m, and/or the building is more than 3 stories in building height above the foundation (Clause 1.2 CSA S406-16)?
- Will the basement or crawlspace floor **not** have a wood sleeper floor near the bottom or a concrete slab located at the bottom (providing lateral support of the bottom of the wall) and/or is **not** laterally supported at the top (Clause 4.5.2 CSA S406-16)?

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February 5, 2025

Use of Permanent Wood Foundations (PWF) is permitted for Part 9 Buildings (houses, townhouses, small commercial buildings) as defined in the National Building Code (NBC) without professional engineering oversight if the specific parameters are met. See Articles 9.15.1.1 and 9.15.2.4 NBC that set out the limits of Pat 9 foundations and permission to use PWF so long as they comply with the CSA S406-16 Standard.

National Building Code of Canada 2020 is available free here: https://nrc.canada.ca/en/certifications-evaluations-standards/codes-canada/codes-canada-publications/national-building-code-canada-2020

The CSA S406-16 Standard is available here: https://www.csagroup.org/store/

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BUILDING SOLUTIONS

Part 10 - Construction and Building Safety

Workers' Safety and Compensation Board Yukon

GENERAL

10.02 Duties

The prime contractor or owner of a project shall ensure that where a project involves the work of two or more employers or their workers

(a) all employers and workers shall comply with the requirements of the Occupational Health and Safety Regulations,

(b) **a competent person shall be designated as site coordinator** and coordinate the health and safety activities and programs at the site by
i. informing the employers and workers of the hazards created and present,
ii. ensuring the hazards are addressed appropriately, and
iii. keeping readily available on site an updated copy of construction safety procedures and drawings showing the first aid station, emergency transportation provisions and evacuation marshalling station,

(c) all employers and workers involved shall be informed of their responsibilities and duties with respect to health and safety, and

(d) the owner, prime contractor and project manager shall be informed in advance of any undertaking likely to create a hazard for a worker of another employer.

Safety - Framing

10.06 BUILDING STRUCTURES

10.08 Wooden trusses
(1) Wooden trusses shall be erected in accordance with the manufacturer's specifications.
(2) The manufacturer's specifications shall be kept readily available on the project site.

10.11 Fall protection

10.20 Temporary stairs on a project

10.25 LADDERS – PORTABLE

10.30 WORK PLATFORMS

10.33 SCAFFOLDS – GENERAL

10.61 HOUSEKEEPING
Daily disposal of debris
(1) Waste material and debris shall be removed at least daily, or as often as necessary to a disposal area or if material is reusable, to a storage area.

Questions?
10 Minute Break

9.17. Columns

Columns transfer beam loads down to solid bearing. In basements, columns carry the load directly to the footings, which distribute the concentrated loads over a wider area. The beam loads depend on the type of occupancy, the size of the supported floor or roof assembly, and the number of floors that are carried by the beams.

Where is the height limit found for exterior (wood) columns in the Part 9?

9.17.1. Scope

9.17.1.1. Application

1) This Section applies to columns used to support

a) beams carrying loads from not more than 2 wood-frame floors where
   i) the supported length of joists bearing on such beams does not exceed 5 m, and
   ii) the *live load* on any floor does not exceed 2.4 kPa (see Table 4.1.5.3.),

b) beams or header joists carrying loads from not more than 2 levels of wood-frame balconies, decks or other accessible exterior platforms, or 1 level plus the roof, where
   i) the supported length of joists bearing on such beams or joists does not exceed 5 m,
   ii) the sum of the specified snow and *occupancy* loads does not exceed 4.8 kPa (see Sentence 9.4.2.3.(1) for the determination of load on platform-type constructions), and
   iii) the platform serves only a single *suite* of *residential occupancy*, or

c) carport roofs (see Section 9.35.).

2) Columns for applications other than as described in Sentence (1) shall be designed in accordance with Part 4.

9.17.2. General

9.17.2.1. Location

1) Columns shall be centrally located on a footing conforming to Section 9.15.

9.17. Columns

9.17.2.2. Lateral Support

1) Columns shall be securely fastened to the supported member to reduce the likelihood of lateral differential movement between the column and the supported member. (See also Article 9.23.6.2.)

2) Except as permitted by Sentence (3), columns shall be laterally supported to resist racking

a) directly, or

b) by connection to the supported members.

(See Note A-9.17.2.2.(2).)

3) Columns need not be provided with lateral support as described in Sentence (2), where

a) the distance from finished ground to the underside of the joists is not more than 600 mm, and

b) the columns support a deck with no superstructure.

Because the NBC does not provide prescriptive criteria to describe the minimum required lateral support, constructions are limited to those that have demonstrated effective performance over time and those that are designed according to NBC Part 4. Verandas on early 20th century homes provide one example of constructions whose floor and roof are typically tied to the rest of the building to provide effective lateral support. Large decks set on tall columns, however, are likely to require additional lateral support even where they are connected to a building on one side.

Illustrated Users Guide – NBC 2020.

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9.17. Columns

9.17.4. Wood Columns

9.17.4.1. Column Sizes

1) The width or diameter of a wood column shall be not less than the width of the supported member.

2) Except as provided in Article 9.35.4.2., columns shall be not less than 184 mm for round columns and 140 mm by 140 mm for rectangular columns, unless calculations are provided to show that lesser sizes are adequate.

9.17.4.2. Materials

1) Wood columns shall be either solid, glued-laminated or built-up.

2) Built-up columns shall consist of not less than 38 mm thick full-length members
a) bolted together with not less than 9.52 mm diam bolts spaced not more than 450 mm o.c., or
b) nailed together with not less than 76 mm nails spaced not more than 300 mm o.c.

3) Glued-laminated columns shall conform to Section 4.3.

9.17.4.3. Columns in Contact with Concrete

1) Wood columns shall be separated from concrete in contact with the ground by 0.05 mm polyethylene film or Type S roll roofing.

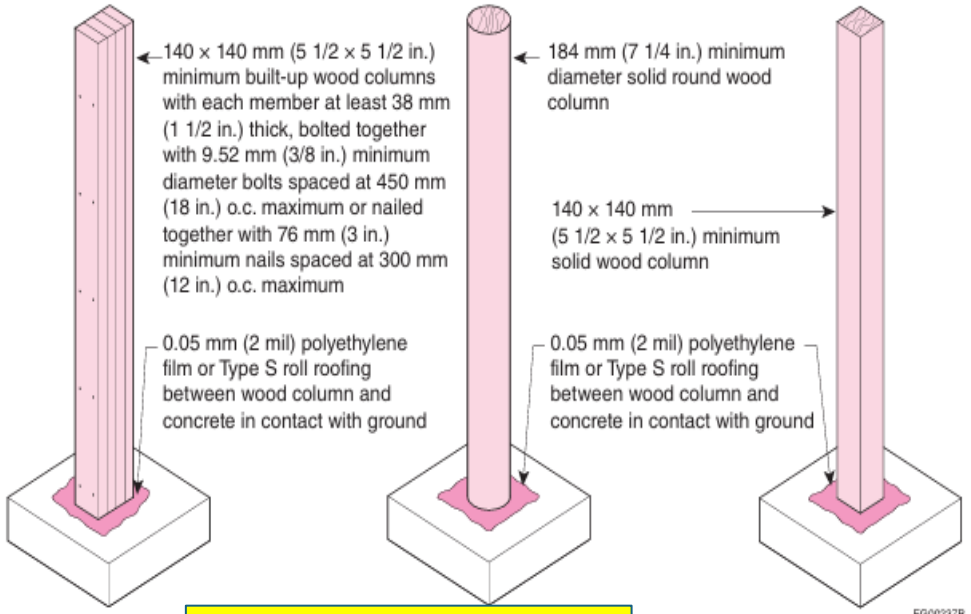


Figure 9.17.-2
Types of wood columns

Note to Figure 9.17.-2:
(1) See NBC Article 9.3.2.9. for termite and decay protection requirements.

Not requirements for under ground situations.

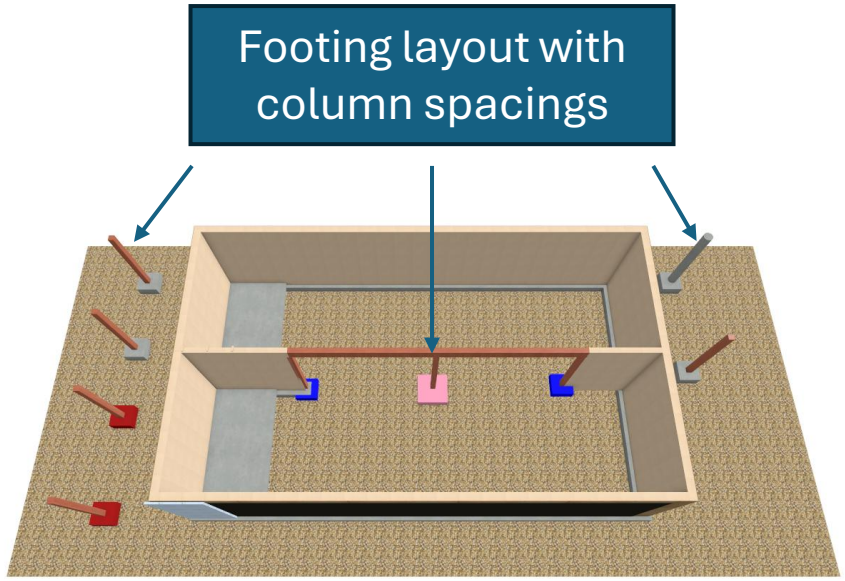
When a wood column is subjected to a vertical load, its resistance to buckling will depend on its slenderness ratio (the length divided by the least dimension).The larger the slenderness ratio, the greater the tendency to buckle. Therefore, if a column is built up with a series of wooden members, it will not be as strong as a one-piece column of the same cross-section, unless the individual pieces are joined to act in unison. Figure 9.17.2 show nails or bolts may be used to connect individual laminations together.

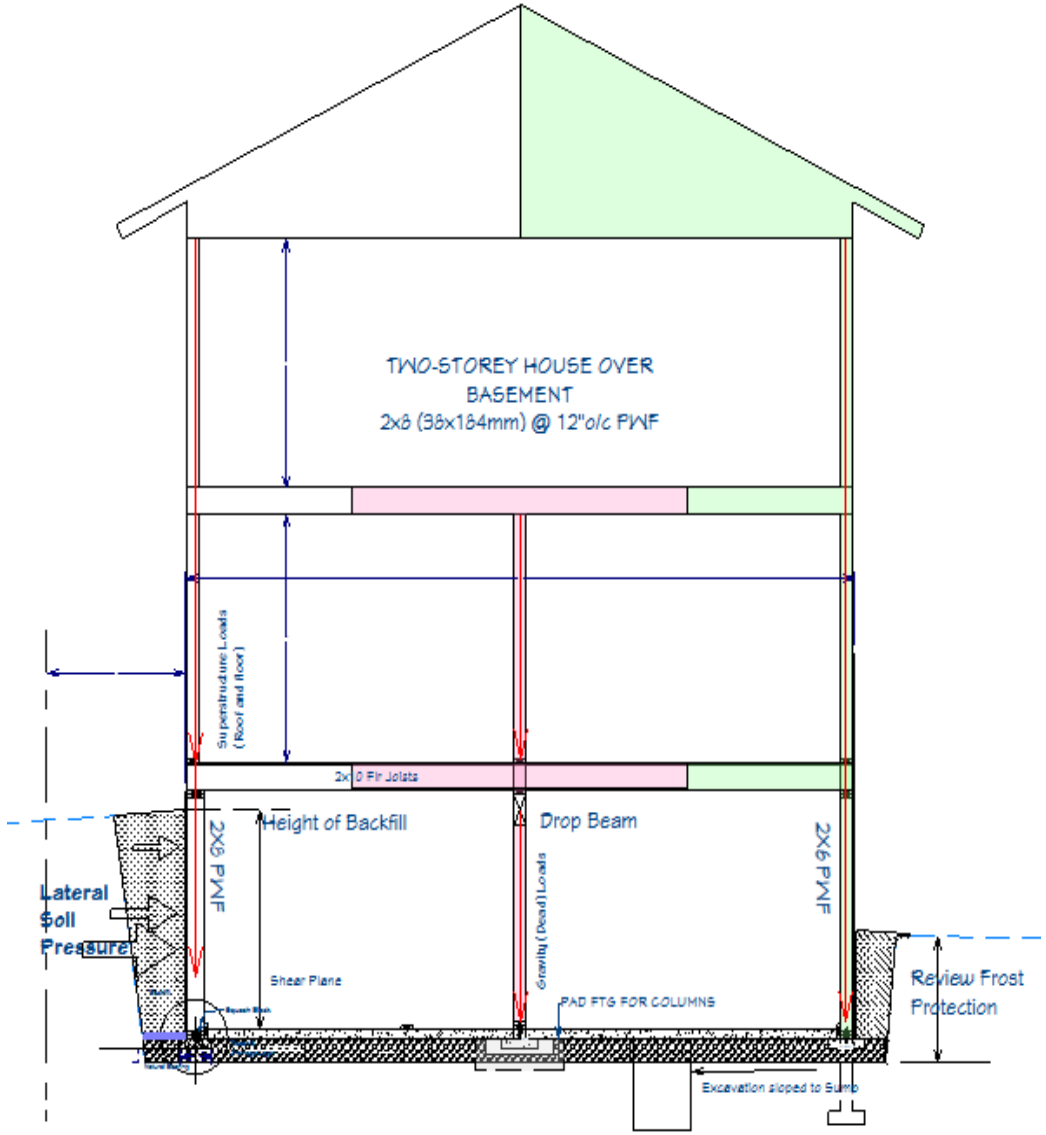
Notes and Figures from Illustrated Users Guide – NBC 2020.

FLYWHEEL BUILDING SOLUTIONS

9.15.3. Layout Considerations Case Example

Two storey house over PWF basement
House 24ft w X 40ft L
Attic Trusses – mid bearing wall/beam support
Concrete bsmt slab & footings



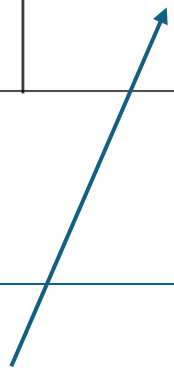


9.15.3. Footings

Table 9.15.3.4.
Minimum Footing Sizes
Forming Part of Sentence 9.15.3.4.(1)

No. of Floors Supported	Minimum Width of Strip Footings, mm		Minimum Footing Area for Columns Spaced 3 m o.c.,(1) m²
	Supporting Exterior Walls(2)	Supporting Interior Walls(3)	
1	250	200	0.4
2	350	350	0.75
3	450	500	1.0

Notes to Table 9.15.3.4.:
(1) See Sentence 9.15.3.7.(1).
(2) See Sentence 9.15.3.5.(1).
(3) See Sentence 9.15.3.6.(1).



9.15.3.7. Adjustments to Footing Area for Columns
1) The footing area for column spacings other than shown in Table 9.15.3.4. shall be adjusted in proportion to the distance between columns.

9.15.3.5. 1) Adjustments to Footing Widths for Exterior Walls
1) The strip footing widths for exterior walls shown in Table 9.15.3.4. shall be increased by a) 65mmfor each storey of masonry veneer over wood-frame construction supported by the foundation wall,
b) 130mm for each storey of masonry construction supported by the foundation wall, and
c) 150 mm for each storey of flat insulating concrete form wall construction supported by the foundation wall.

9.15.3.6. 1) Adjustments to Footing Widths for Interior Walls
1) The minimum strip footing widths for interior loadbearing masonry walls shown in Table 9.15.3.4. shall be increased by 100 mm for each storey of masonry construction supported by the footing.

9.15.3. Footings

9.15.3.7.Adjustments to Footing Area for Columns

This Article permits an adjustment of footing area to support loads from interior columns. The sizes of column footings are based on the assumptions and limitations discussed previously (Figure9.15.-6). The maximum spacing between columns is assumed to be 3.0m(9ft.10in.). Where this is exceeded, the size of the column footing in NBC Table 9.15.3.4. must be increased accordingly.

Example 18 – Footing Sizes for Columns

In Example 16, the required column footing area is 0.75 m² (8 ft.²) (two floors supported) when columns are spaced up to 3.0 m (9 ft. 10 in.) apart. If the columns are to be spaced 4 m (13 ft. 1 in.) apart, the required footing area

$$= \frac{4}{3} \times 0.75\,\mathrm{m}^2$$
$$= 1.0\,\mathrm{m}^2\ (11\,\mathrm{ft.}^2)$$

(i.e., 1 000 mm × 1 000 mm) (NBC Article 9.15.3.7.).

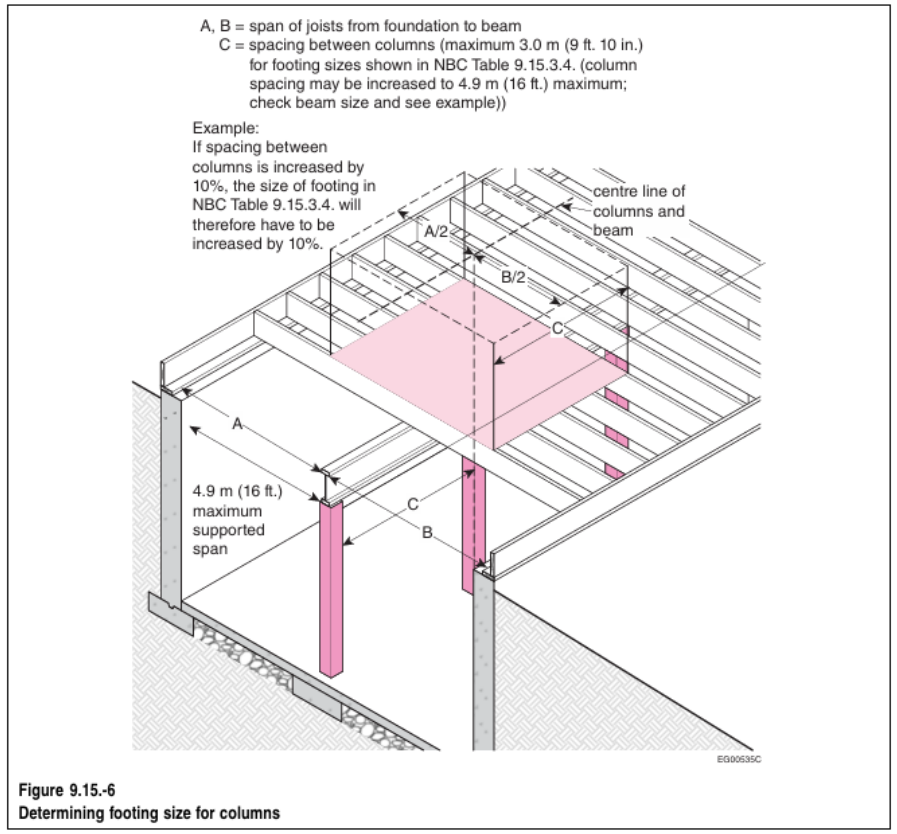


Figure 9.15.-6
Determining footing size for columns

Notes and Figure from Illustrated Users Guide – NBC 2020.

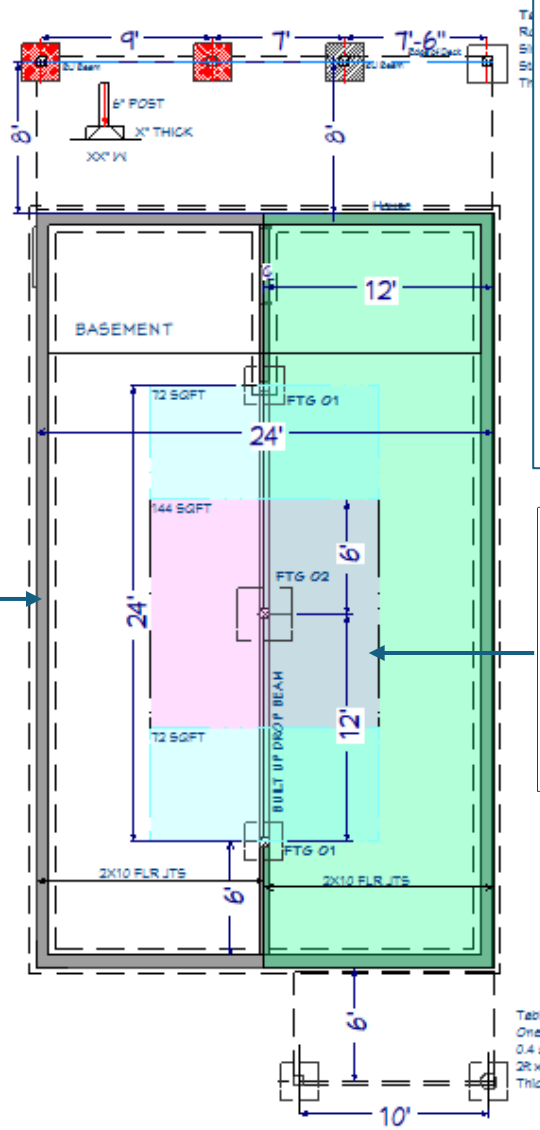
9.15.3. Footings Case Example

Two storey house over PWF basement
House 24ft w X 40ft L
Attic Trusses
Concrete footings

Exterior Strip Footing
2 storeys = 350mm (14")

Interior Strip Footing
2 storeys = 350mm (14")

Ftg depth (unreinforced)
14" – 7.5" (2x8 wall) = 6.5
D = 6.5/2 = 4" minimum (100mm)



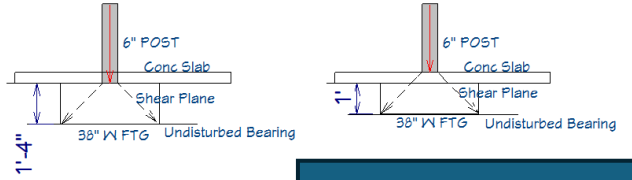
Prelim – Foundation Plan

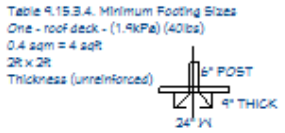
Table 9.15.3.4.
Minimum Footing Sizes
Forming Part of Sentence 9.15.3.4.(1)

No. of Floors Supported	Minimum Width of Strip Footings, mm		Minimum Footing Area for Columns Spaced 3 m o.c.,(1) m²
	Supporting Exterior Walls(2)	Supporting Interior Walls(3)	
1	250	200	0.4
2	350	350	0.75
3	450	500	1.0

Notes to Table 9.15.3.4.:
(1) See Sentence 9.15.3.7.(1).
(2) See Sentence 9.15.3.5.(1).
(3) See Sentence 9.15.3.6.(1).

Table 9.15.3.4. Minimum Footing Sizes
FTG 02 - Interior column spacing (12ft) 3.65m
Supporting 2 floors (2.4kPa) (50 psf = 40 Dead 10 Live)
9.15.3.7. Adjustment for Footing Area for Columns
Two Storeys supported
Table 9.15.3.4. = 0.75 sqm (8 sqft)
Spacing ratio adjustment
12ft/10ft x 0.75 = 0.9 sqm (9.7 sqft) round up 10 sqft (1,440 sq in)
38x38 Proposed Ftg = 1,444 sq in - OK
Depth = 16" or 12"





The Framing layout is tied to the footing/column design.

Footing and Frame layout Case Example

Rear Deck – Single level (storey)

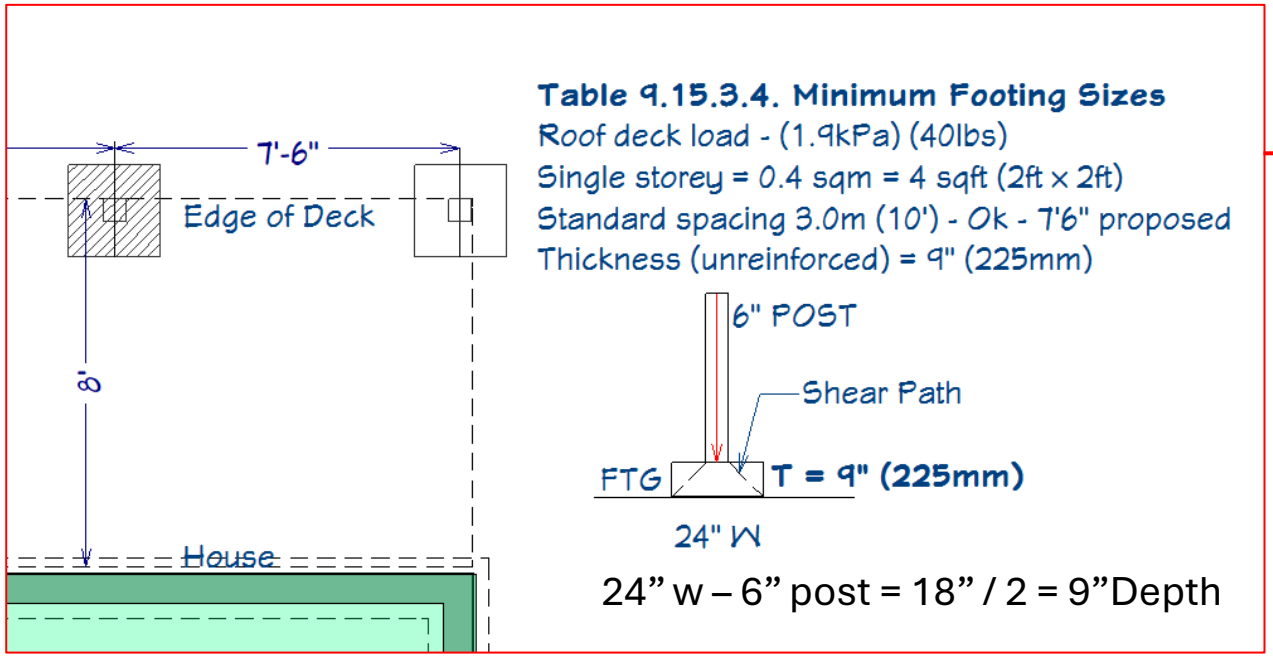
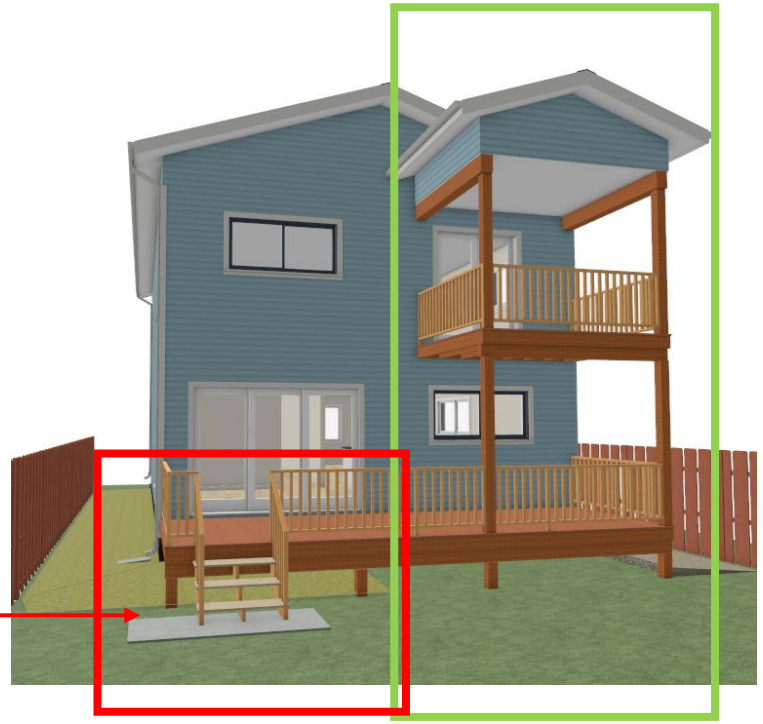
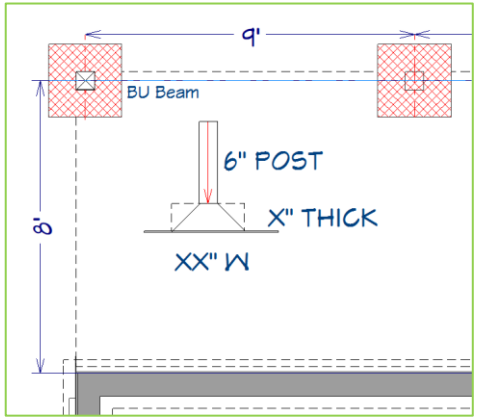


Table 9.15.3.4. Minimum Footing Sizes
Roof deck load - (1.9kPa) (40lbs)
Single storey = 0.4 sqm = 4 sqft (2ft x 2ft)
Standard spacing 3.0m (10') - Ok - 7'6" proposed
Thickness (unreinforced) = 9" (225mm)

24" w – 6" post = 18" / 2 = 9"Depth



Can this - two deck and roof be designed to Part 9? See SL 54 – 9.17.1.1.(1)(b)



Remember

Columns transfer beam loads down to solid bearing. In basements, columns carry the load directly to the footings, which distribute the concentrated loads over a wider area. The beam loads depend on the type of occupancy, the size of the supported floor or roof assembly, and the number of floors that are carried by the beams.

Where is the height limit found for exterior (wood) columns in the Part 9?

9.17.1. Scope

9.17.1.1. Application

1) This Section applies to columns used to support

a) beams carrying loads from not more than 2 wood-frame floors where
   i) the supported length of joists bearing on such beams does not exceed 5 m, and
   ii) the *live load* on any floor does not exceed 2.4 kPa (see Table 4.1.5.3.),

b) beams or header joists carrying loads from not more than 2 levels of wood-frame balconies, decks or other accessible exterior platforms, or 1 level plus the roof, where
   i) the supported length of joists bearing on such beams or joists does not exceed 5 m,
   ii) the sum of the specified snow and *occupancy* loads does not exceed 4.8 kPa (see Sentence 9.4.2.3.(1) for the determination of load on platform-type constructions), and
   iii) the platform serves only a single *suite* of *residential occupancy*, or

c) carport roofs (see Section 9.35.).

2) Columns for applications other than as described in Sentence (1) shall be designed in accordance with Part 4.

9.17.2. General

9.17.2.1. Location

1) Columns shall be centrally located on a footing conforming to Section 9.15.

Questions?

9.23 Wood-Frame Construction

Platform framing is the most common wood-frame construction method (Figure 9.23.-1). In this method, each floor is constructed independently of the walls and provides a working surface for the construction and erection of the wall framing for that storey. As a general rule, wall sections can be tipped into place without the need for heavy equipment.

Once very common, balloon framing is now only used occasionally. It involves the use of wall framing that extends more than one storey. Intermediate floors are then secured to the walls. While platform construction automatically provides fire blocking between floors, balloon framing requires that designated fire blocks be installed in all gaps between storeys that occur at floor and roof intersections.

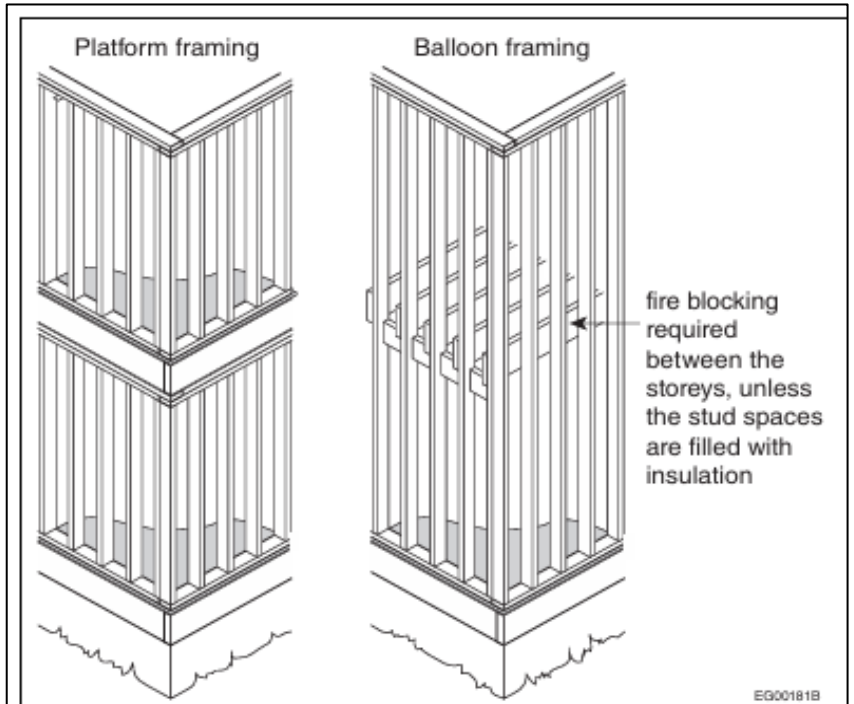


Figure 9.23.-1
Wood-frame construction methods

Q What was one major factor to switch to platform framing.

FLYWHEEL BUILDING SOLUTIONS

9.23 Wood-Frame Construction

Framing without an Engineer

9.23.1. Application

9.23.1.1. Limitations

(See Note A-9.23.1.1.)

Also, 4.9m (16 ft) max joist-supported spans.

1) This Section applies to constructions where wall, floor and roof planes are generally comprised of lumber frames of small repetitive structural members, or engineered components, and where

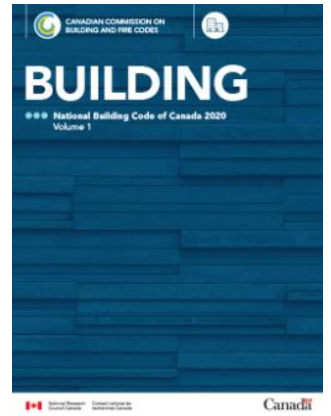
a) roof and wall planes are clad, sheathed or braced on at least one side,
b) the small repetitive structural members are spaced not more than 600 mm o.c.,
c) the constructions do not serve as *foundations*,
d) the specified *live load* on supported subfloors and floor framing does not exceed 2.4 kPa, and
e) the span of any structural member does not exceed 12.20 m.

(See Note A-9.23.1.1.(1).)

2) Where the conditions in Sentence (1) are exceeded for wood constructions, the design of the framing and fastening shall conform to Subsection 4.3.1.

Framing - Foundation Types

Permanent Wood Foundations (PWF) – Session 03



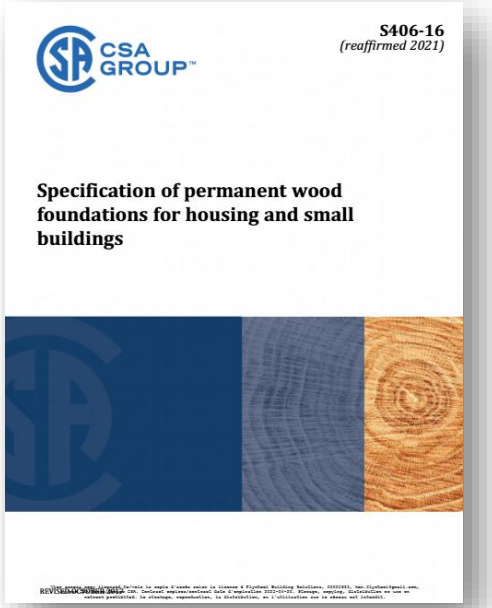
9.15.2.4. Wood-Frame Foundations

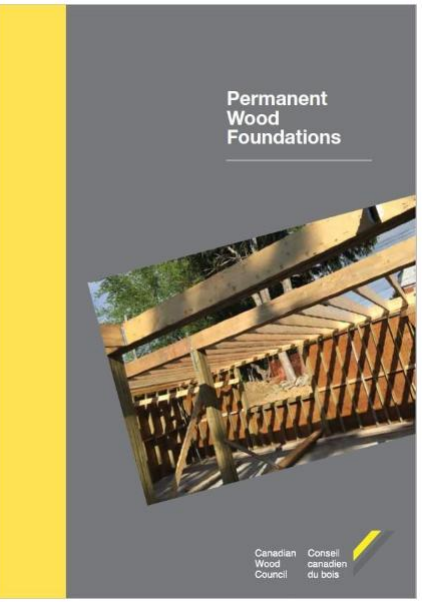
1) Foundations of wood-frame construction shall conform to
a) CSA S406, "Specification of permanent wood foundations for housing and small buildings," or
b) Part 4.
(See Note A-9.15.2.4.(1).)

9.16.5.1. Wood

Wood-Frame Floors

1) Floors-on-ground constructed of wood shall conform to CSA S406, "Specification of permanent wood foundations for housing and small buildings."





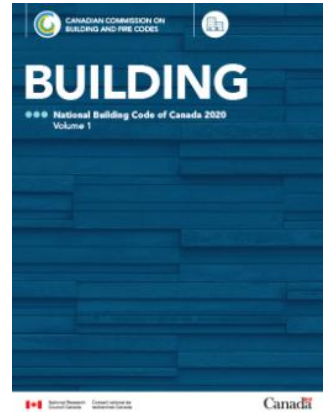
CSA S406 Permanent Wood Foundations - The Canadian Wood Council - CWC

CSA	S406-16	Specification of permanent wood foundations for housing and small buildings	9.15.2.4.(1) 9.16.5.1.(1) A-9.15.2.4.(1)

FLYWHEEL BUILDING SOLUTIONS

Foundation Types

Permanent Wood Foundations (PWF)



A-9.15.2.4.(1) Preserved Wood Foundations – Design Assumptions. Tabular data and figures in CSA S406, "Specification of permanent wood foundations for housing and small buildings," are based upon the general principles provided in CSA O86, "Engineering design in wood," with the following assumptions:

- soil bearing capacity: 75 kPa or more,
- clear spans for floors: 5 000 mm or less,
- floor loadings: 1.9 kPa for first floor and suspended floor, and 1.4 kPa for second storey floor,
- foundation wall heights: 2 400 mm for slab floor, 3 000 mm for suspended wood floor,
- top of granular layer to top of suspended wood floor: 600 mm,
- lateral load from soil pressure: equivalent to fluid pressure of 4.7 kPa per metre of depth,
- ground snow load: 3 kPa,
- basic snow load coefficient: 0.6,
- roof loads are carried to the exterior wall,
- dead loads:

roof	0.50 kPa
floor	0.47 kPa
wall (with siding)	0.32 kPa
wall (with masonry veneer)	1.94 kPa
foundation wall	0.27 kPa
partitions	0.20 kPa

- Table 9.4.4.1. Allowable Bearing Pressure for Soil or Rock
- 5.0m =
- Standard loads – 1.9kPa & 1.4kPa
- Fdn wall – 2.4m (ft), 3.0m (ft)
-

CSA	S406-16	Specification of permanent wood foundations for housing and small buildings	9.15.2.4.(1) 9.16.5.1.(1) A-9.15.2.4.(1)

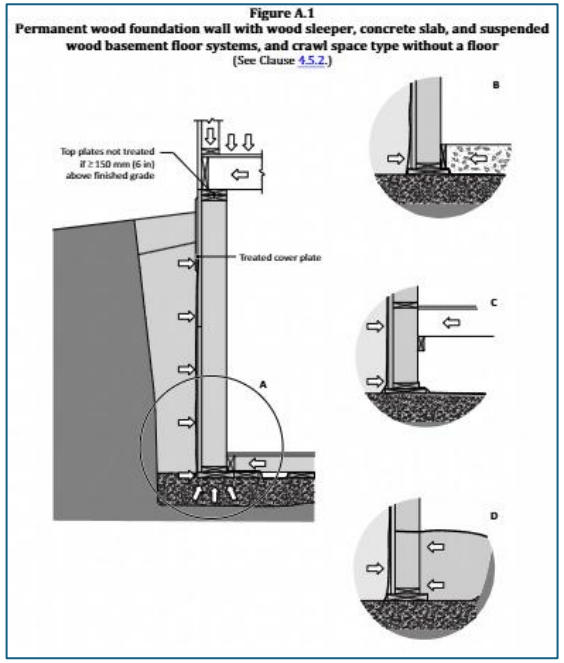
Foundation Types - Framing

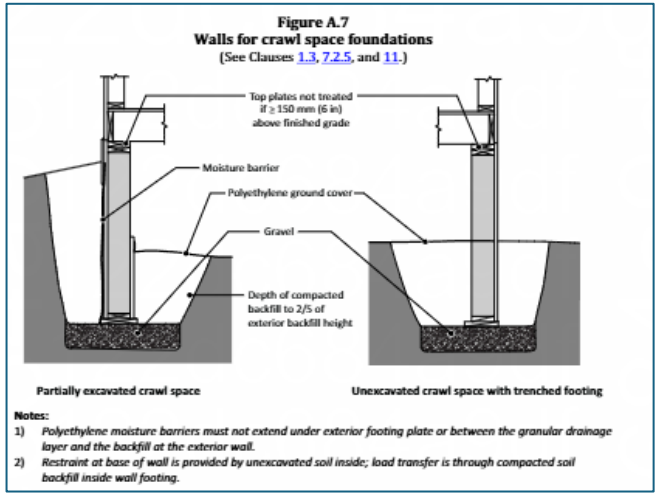
Permanent Wood Foundations (PWF) – CSA S406-16

Scope

1.2 buildings up to three storeys in building height above the foundation and having a building area not exceeding 600 sqm.

1.3. This standard provides for the optional use of wood sleeper, poured concrete slab, and suspended wood basement floor systems as components of the permanent wood foundation, and for the use of permanent wood foundations enclosing crawl spaces (see Figures A.1 and A.7)





Permanent Wood Foundations

Benefits of PWF

- Cold weather application
- Trade centric – framing
- Lower cost over concrete

Challenges

- Backfilling – specific materials
- Framing – Part 9 (ledgers)
- Wall height limitations (w/out Eng)

5.11 Backfill

Native soils as permeable as the granular drainage material specified in Clause 5.10.1 may be used as backfill material when the backfill must be drained. All backfill material placed within 600 mm (24 in) of the foundation walls shall be free of deleterious debris, frozen clumps, and boulders larger than 150 mm (6 in) in diameter.

Note: *See also Clause 16.*

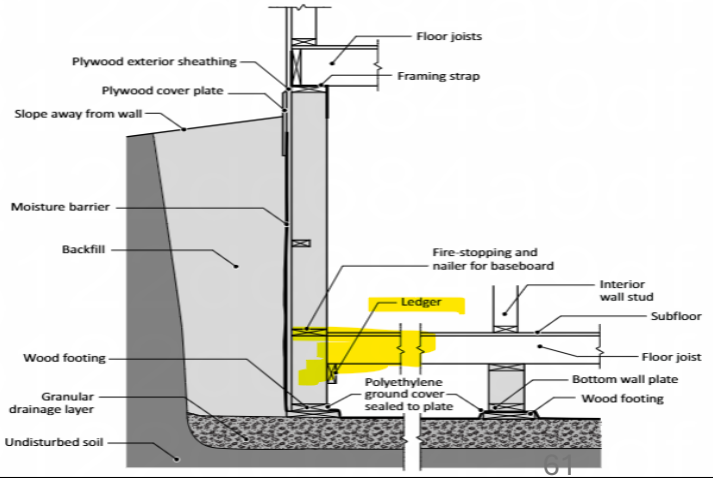
16.6 Problem soils

The backfill and drainage system shall be designed by a qualified engineer when the foundation is to be installed in a soil having a high volume change potential or where soils susceptible to frost heave are present around unheated portions of foundation walls.

16.7 Site grading

Backfill shall be placed such that the final grade after the fill settles shall fall away from the walls at a minimum slope of 1 in 12 (see Figure A.4).

Figure A.17
Exterior foundation wall and interior loadbearing foundation wall with suspended wood floor
(See Clauses 10.1, 10.6, and 13.7.2.)



Permanent Wood Foundations

- Framing – Part 9 (ledgers)

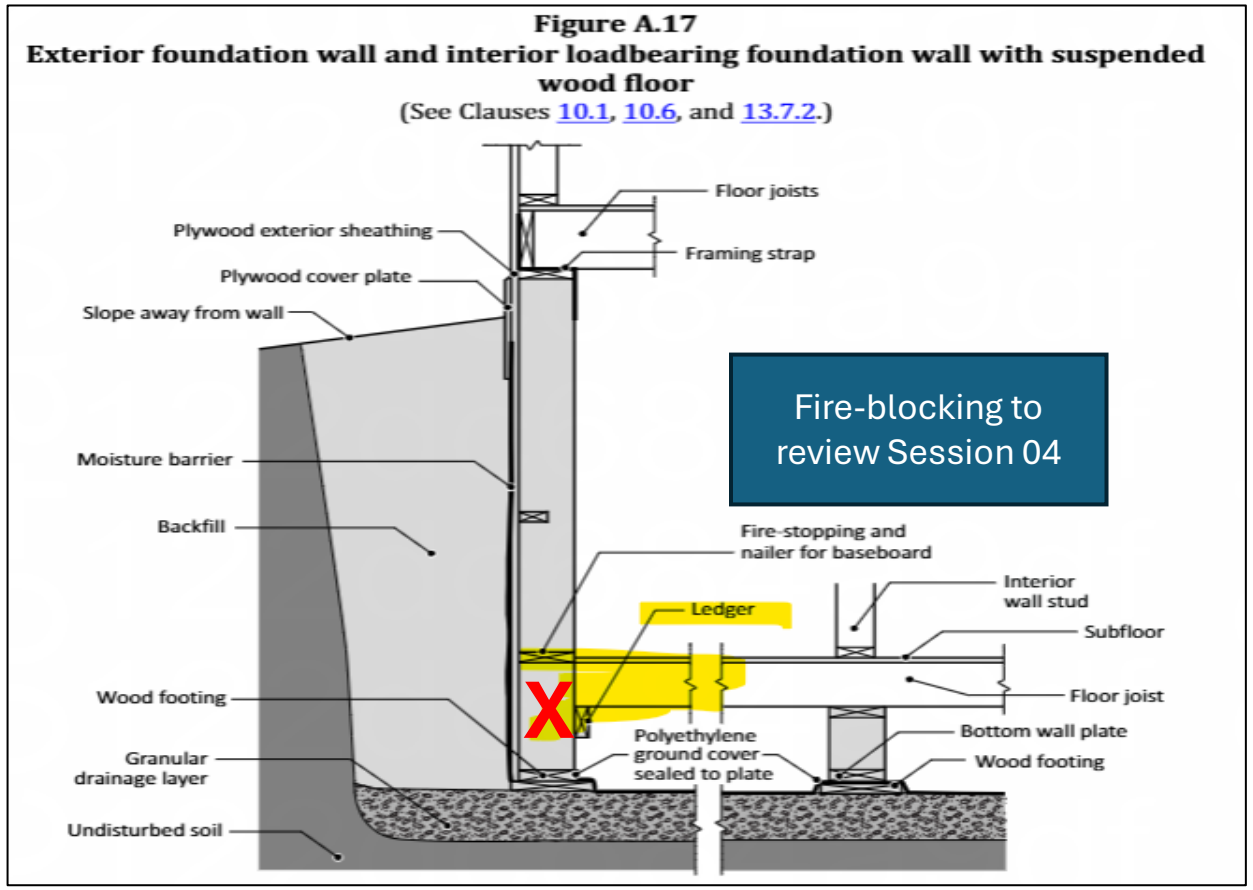


Figure from CSA S406-16

As there a no ledger details within Part 9, an Engineer is required to design this assembly.

An alternative would be the use of a ribbon board with the joist directly secured to the studs.

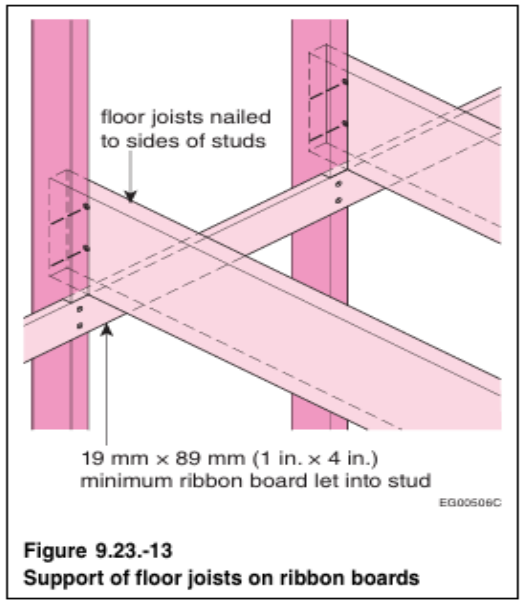
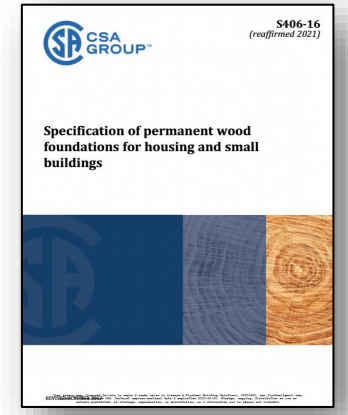
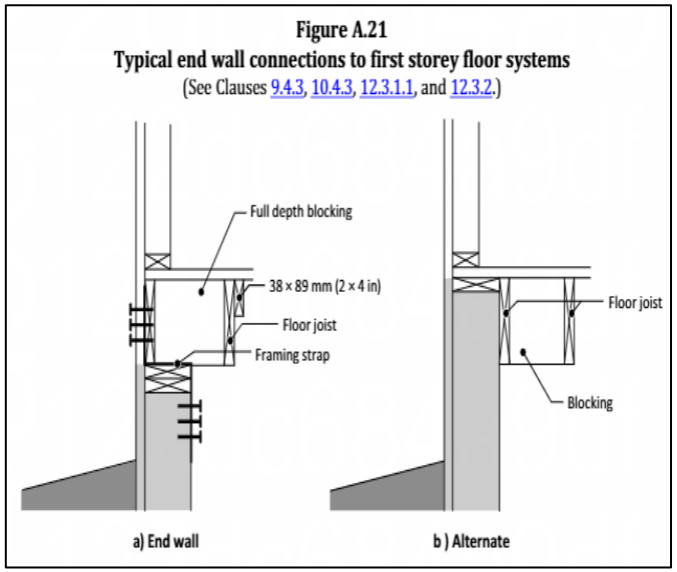


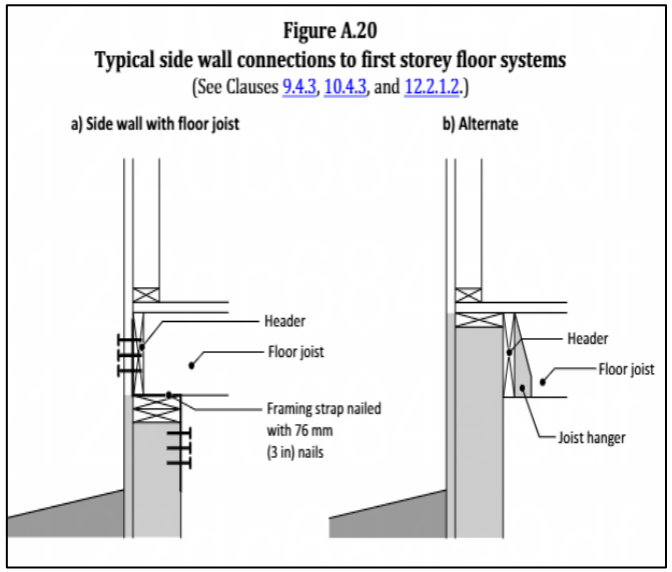
Figure from Illustrated Users Guide – NBC 2020.

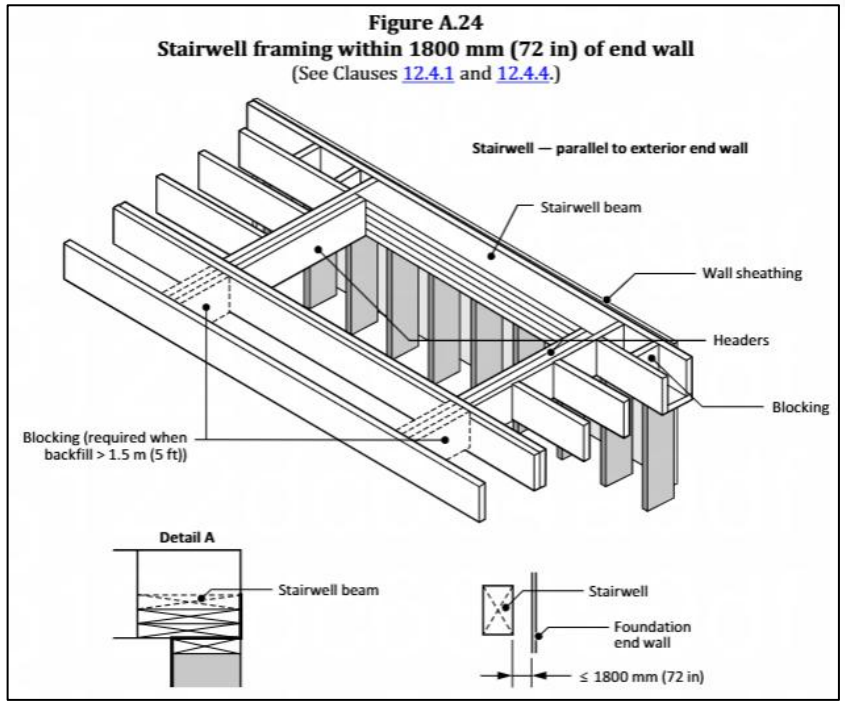
9.23 - Framing – PWF- S406

Note the following framing details to tie into the conventional framing of Part 9.23.





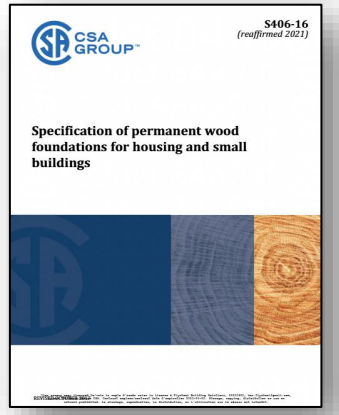




Figures from CSA S406-16

FLYWHEEL BUILDING SOLUTIONS

9.23 - Framing – PWF- S406



4.5 Structural integrity

4.5.1

Walls shall be aligned, plumbed, and squared before they are nailed permanently in place. When required, shear walls shall comply with Clause 9.4.4 or 10.4.4, as appropriate.

4.5.2

To resist inward pressures, exterior foundation walls shall be braced laterally by the floor system at the top of the wall, and at the bottom (see Figure A.1) by

a) a concrete slab floor;
b) a suspended wood floor;
c) a wood sleeper floor;
d) bracing in the case of a crawl space foundation, as specified in Clause 11.2; or
e) other construction methods, in accordance with Clause 4.2.

4.5.3

Single top plates may be used where the floor joists or floor trusses are not offset more than 50 mm (2 in) to one side of foundation studs. Joints in single top plates shall be located over studs and shall be tied with at least 75 × 150 × 0.9 mm thick (3 × 6 in × 240 ga) galvanized steel straps, conforming to ASTM A653/A653M, nailed to each plate with at least three 63 mm (2-1/2 in) nails. Single top plates shall not be used over openings (see Figure A.12).

Note: *Single top plates are not permitted in high seismic locations, as specified in Clause 13.3.3.*

4.5.4

Except where a single top plate is permitted in Clause 4.5.3, a second top plate shall be nailed to the top plate of the wall sections with end joints offset a minimum of two stud spaces from the end joints of the lower top plate.

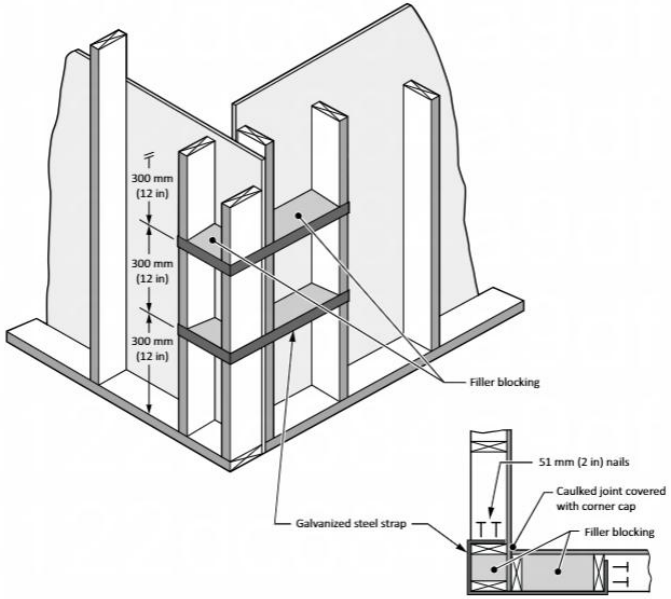
4.5.5

Minimum fastening requirements shall be as specified in this Standard or in Part 9 of the appropriate building code, whichever is the more restrictive.

4.5.6

Additional fastening and structural reinforcement shall be provided at interior corner locations to resist inward soil pressure and prevent perpendicular walls from being forced apart (see Figure A.2).

Figure A.2
Additional reinforcement at interior corner locations
(See Clause 4.5.6.)



urce: *Image from* Permanent Wood Foundations – The Illustrated Practical Applications Manual *by Gary J* ɔbson.

Notes and Figure from CSA S406-16

FLYWHEEL BUILDING SOLUTIONS

9.23 Wood-Frame Construction

9.23.2.4.Connections to Preservative-Treated Wood

9.23.2.4. Connections to Preservative-Treated Wood

1) Except as provided in Sentence (3), connectors in contact with preservative-treated wood shall be made of

a) hot-dipped, zinc-coated galvanized steel with a coating weight not less than Z550 conforming to ASTM A653/A653M, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process,"

b) a material that provides an equivalent level of corrosion protection to that provided by the material described in Clause (a), or

c) stainless steel.

2) Fasteners used to attach the connectors referred to in Sentence (1) shall be made of

a) galvanized steel coated with zinc in accordance with ASTM A153/A153M, "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware," or

b) a material that provides an equivalent level of performance and is compatible with the connector.

3) Connectors and fasteners that are in contact with wood that has been treated with a disodium octaborate tetrahydrate (SBX (DOT)) or zinc borate preservative and is installed in a dry interior environment are permitted to be made of uncoated carbon steel. (See Note A-9.23.2.4.(3).)

FLYWHEEL BUILDING SOLUTIONS

9.23 Wood-Frame Construction

9.23.3. Fasteners and Connectors

9.23.3.1.Standards for Nails and Screws

1) Except as provided in Sentence (2) and unless otherwise indicated, nails specified in this Section shall be **common steel wire nails or common spiral nails** conforming to

a) ASTM F1667, “Standard Specification for Driven Fasteners: Nails, Spikes, and Staples,” or

b) b) CSA B111, “Wire Nails, Spikes and Staples.”

2) **Nails** used to comply with Table 9.23.3.4. shall have a diameter not less than that stated in Table 9.23.3.1. (See Note A-9.23.3.1.(2).)

3) **Wood screws** specified in this Section shall conform to ASME B18.6.1, “Wood Screws (Inch Series).” (See Note A-9.23.3.1.(3).)

Table 9.23.3.1.
Diameter of Nails
Forming Part of Sentence 9.23.3.1.(2)

Minimum Length of Nails, mm	Minimum Diameter of Nails, mm
57	2.87
63	3.25
76	3.66
82	3.66
101 or greater	4.88

The use of Screws are only outlined for sheathing and sub-flooring.

FLYWHEEL BUILDING SOLUTIONS

9.23 Wood-Frame Construction

Framing without an Engineer

9.23.4. Maximum Spans

9.23.4.1. Application

1) Spans provided in this Subsection for joists, beams and lintels supporting floors shall apply only where

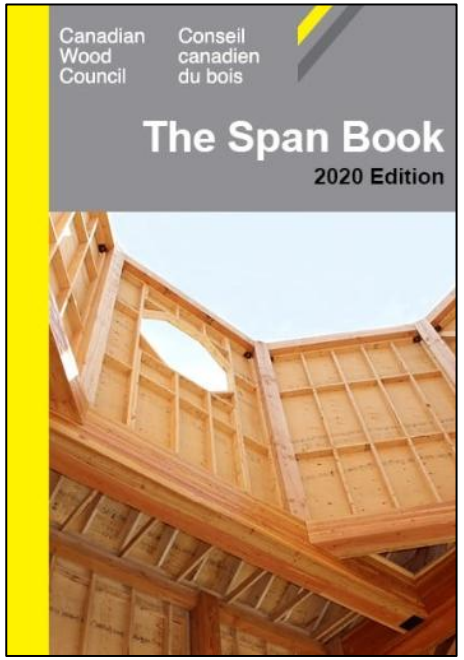
a) the floors serve residential areas as described in Table 4.1.5.3., or

b) the uniformly distributed *live load* on the floors does not exceed that specified for residential areas as described in Table 4.1.5.3.

2) Spans for joists, beams and lintels supporting floors shall be determined according to Subsection 4.1.3. where the supported floors

a) serve other than residential areas, or

b) support a uniform *live load* in excess of that specified for residential areas.



FLYWHEEL BUILDING SOLUTIONS

9.23 Wood-Frame Construction

Framing without an Engineer

9.23.4.2. Spans for Joists, Rafters and Beams

(See Note A-9.23.4.2.)

1) Except as required in Sentence (2) and Article 9.23.14.10., spans for wood joists and rafters shall conform to the spans shown in Span Tables 9.23.4.2.-A to 9.23.4.2.-G for the uniform *live loads* shown in the Tables. (See Article 9.4.2.2.)

2) Spans for floor joists that are not selected from Span Tables 9.23.4.2.-A and 9.23.4.2.-B and that are required to be designed for the same loading conditions, shall not exceed the design requirements for uniform loading and vibration criteria. (See Note A-9.23.4.2.(2).)

3) Spans for built-up wood and glued-laminated timber floor beams shall conform to the spans in Span Tables 9.23.4.2.-H to 9.23.4.2.-K. (See Article 9.4.2.2.)

4) Spans for roof ridge beams shall conform to the spans in Span Table 9.23.4.2.-L for the uniform snow load shown. (See Articles 9.4.2.2. and 9.23.14.8.)

Span Tables

Table 9.23.4.2.-A
Maximum Spans for Floor Joists – General Cases(1)
Forming Part of Sentences 9.3.2.8.(1), 9.23.4.2.(1) and (2), 9.23.4.4.(1) and 9.23.9.4.(1) to (3)

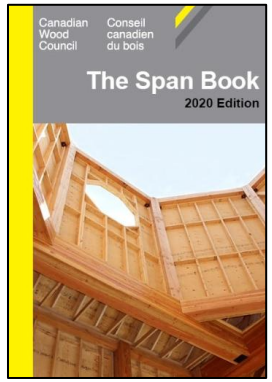
Commercial Designation	Grade	Joist Size, mm	Maximum Span, m								
			With Strapping(2)			With Bridging			With Strapping(2) and Bridging		
			Joist Spacing, mm			Joist Spacing, mm			Joist Spacing, mm		
			300	400	600	300	400	600	300	400	600
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	2.13	1.97	1.73	2.19	1.99	1.73	2.19	1.99	1.73
		38 × 140	3.23	3.07	2.73	3.44	3.12	2.73	3.44	3.12	2.73
		38 × 184	3.88	3.69	3.51	4.18	3.92	3.59	4.37	4.07	3.59
		38 × 235	4.57	4.34	4.13	4.86	4.57	4.29	5.05	4.70	4.39
		38 × 286	5.21	4.95	4.71	5.49	5.16	4.85	5.66	5.28	4.92
	No. 1 and No. 2	38 × 89	2.00	1.85	1.66	2.09	1.90	1.66	2.09	1.90	1.66
		38 × 140	3.09	2.91	2.62	3.29	2.99	2.62	3.29	2.99	2.62
		38 × 184	3.71	3.53	3.36	4.00	3.76	3.44	4.19	3.90	3.44
		38 × 235	4.38	4.16	3.96	4.66	4.38	4.11	4.84	4.51	4.20
		38 × 286	4.99	4.75	4.52	5.26	4.94	4.65	5.43	5.06	4.72
	No. 3	38 × 89	1.90	1.69	1.38	1.95	1.69	1.38	1.95	1.69	1.38
		38 × 140	2.78	2.41	1.97	2.78	2.41	1.97	2.78	2.41	1.97
		38 × 184	3.38	2.93	2.39	3.38	2.93	2.39	3.38	2.93	2.39
		38 × 235	4.14	3.58	2.93	4.14	3.58	2.93	4.14	3.58	2.93
		38 × 286	4.80	4.16	3.39	4.80	4.16	3.39	4.80	4.16	3.39
	Construction	38 × 89	1.90	1.77	1.61	2.03	1.84	1.61	2.03	1.84	1.61
	Standard	38 × 89	1.81	1.63	1.33	1.88	1.63	1.33	1.88	1.63	1.33
Hem – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	2.08	1.93	1.71	2.16	1.96	1.71	2.16	1.96	1.71
		38 × 140	3.18	3.03	2.69	3.39	3.08	2.69	3.39	3.08	2.69
		38 × 184	3.82	3.64	3.46	4.12	3.87	3.54	4.31	4.02	3.54
		38 × 235	4.50	4.28	4.08	4.80	4.51	4.23	4.98	4.64	4.33
		38 × 286	5.14	4.89	4.65	5.42	5.09	4.78	5.59	5.21	4.86
	No. 1 and No. 2	38 × 89	2.00	1.85	1.66	2.09	1.90	1.66	2.09	1.90	1.66
		38 × 140	3.09	2.91	2.62	3.29	2.99	2.62	3.29	2.99	2.62
		38 × 184	3.71	3.53	3.36	4.00	3.76	3.44	4.19	3.90	3.44
		38 × 235	4.38	4.16	3.96	4.66	4.38	4.11	4.84	4.51	4.20
		38 × 286	4.99	4.75	4.52	5.26	4.94	4.65	5.43	5.06	4.72
	No. 3	38 × 89	1.90	1.77	1.61	2.03	1.84	1.61	2.03	1.84	1.61
		38 × 140	2.99	2.78	2.43	3.19	2.90	2.43	3.19	2.90	2.43
		38 × 184	3.60	3.42	2.95	3.88	3.61	2.95	4.06	3.61	2.95
		38 × 235	4.24	4.03	3.61	4.51	4.24	3.61	4.68	4.37	3.61
		38 × 286	4.84	4.60	4.19	5.10	4.79	4.19	5.26	4.90	4.19
	Construction	38 × 89	1.90	1.77	1.61	2.03	1.84	1.61	2.03	1.84	1.61
	Standard	38 × 89	1.81	1.68	1.39	1.96	1.71	1.39	1.96	1.71	1.39

9.23 Wood-Frame Construction

Can also use the Cdn Wood Council Span Book

Types

- Joist Spans
- Roof Joists
- Rafter Spans
- Roof Rafters
- Truss Spans
- Beams
- Lintels
- Deck Joists & Beams



5. Spans

The maximum span is the clear distance between supports. Spans in the tables are given in terms of horizontal projection as follows:

- For horizontal pieces such as floor and ceiling joists, the horizontal projection is the clear length of the piece (see Fig. 1).
- For sloping pieces such as roof rafters, the horizontal projection is the distance measured parallel to the ground (see Fig. 2).

Table G provides a quick method for converting horizontal distance to sloping distance, and vice versa. The overall rafter length however depends on the length of the overhang. (The conversion factor is also shown at the bottom of the rafter tables for convenience.)

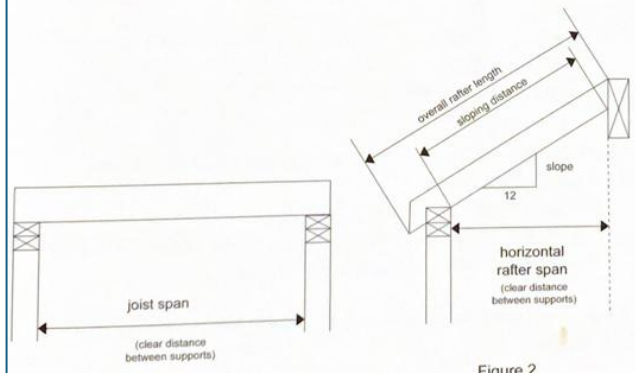


Figure 1

Figure 2

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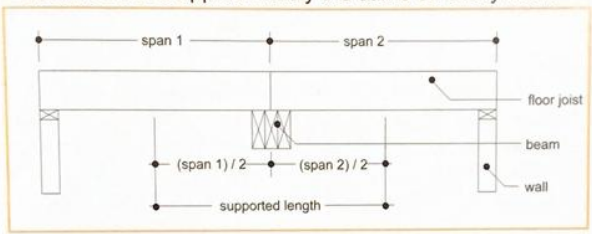
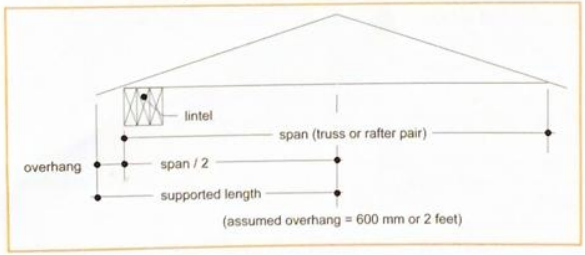
6. Supported Length

The supported length is used to determine the loads on a beam or lintel. Spans for beams and lintels are based on the following assumptions about supported length:

- For **floor beams** in Tables 5 and 6, and for exterior **deck beams** in Table 10, the supported length is half the sum of the joist spans on both sides of the beam as shown in the diagram below. The supported length is assumed to be approximately the same on every floor.



- For **built-up lintels** supporting roof loads in Tables 7 and 8, the supported length is half the span of the roof truss or rafter pair plus the length of the overhang as shown in the diagram below.



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9.4.2. Specified Loads

9.4.2.1. Application

(See Note A-9.4.2.1. and 9.4.2.2.)

1) This Subsection applies to light-frame constructions whose wall, floor and roof planes are generally comprised of frames of small repetitive structural members, and where

a) the roof and wall planes are clad, sheathed or braced on at least one side,
b) the small repetitive structural members are spaced not more than 600 mm o.c.,
c) the clear span of any structural member does not exceed 12.2 m,
d) the maximum deflection of the structural roof members conforms to Article 9.4.3.1.,
e) the maximum total roof area, notwithstanding any separation of adjoining *buildings* by *firewalls*, is 4 550 m^2, and
f) for flat roofs, there are no significant obstructions on the roof, such as parapet walls, spaced closer than the distance calculated by

$$D_o = 10\,(H_o - 0.8S_s/\gamma)$$

where

D_o = minimum distance between obstructions, m,
H_o = height of the obstruction above the roof, m,
S_s = ground snow load, kPa, and
γ = specific weight of snow taken as 4.0 kN/m^3 or $0.43S_s + 2.2$ kN/m^3, whichever is lesser.

Figures from CWC 2020 Span Book – 2020 Edition

9.23 Wood-Frame Construction

Spans

5. Spans

The maximum span is the clear distance between supports. Spans in the tables are given in terms of horizontal projection as follows:

- For horizontal pieces such as floor and ceiling joists, the horizontal projection is the clear length of the piece (see Fig. 1).
- For sloping pieces such as roof rafters, the horizontal projection is the distance measured parallel to the ground (see Fig. 2).

Table G provides a quick method for converting horizontal distance to sloping distance, and vice versa. The overall rafter length however depends on the length of the overhang. (The conversion factor is also shown at the bottom of the rafter tables for convenience.)

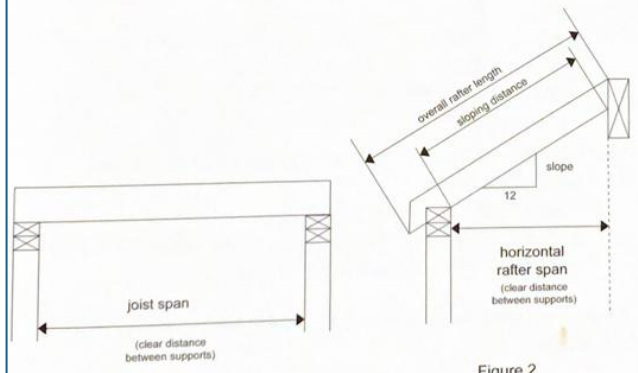


Figure 1

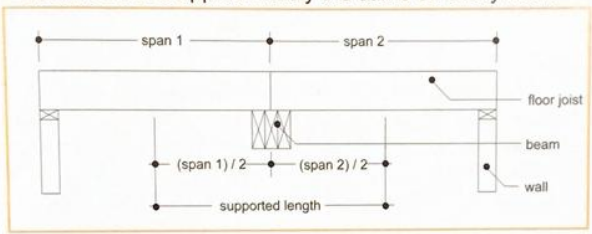
Figure 2

21

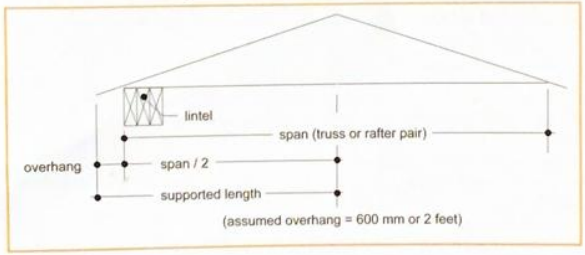
6. Supported Length

The supported length is used to determine the loads on a beam or lintel. Spans for beams and lintels are based on the following assumptions about supported length:

- For **floor beams** in Tables 5 and 6, and for exterior **deck beams** in Table 10, the supported length is half the sum of the joist spans on both sides of the beam as shown in the diagram below. The supported length is assumed to be approximately the same on every floor.



- For **built-up lintels** supporting roof loads in Tables 7 and 8, the supported length is half the span of the roof truss or rafter pair plus the length of the overhang as shown in the diagram below.



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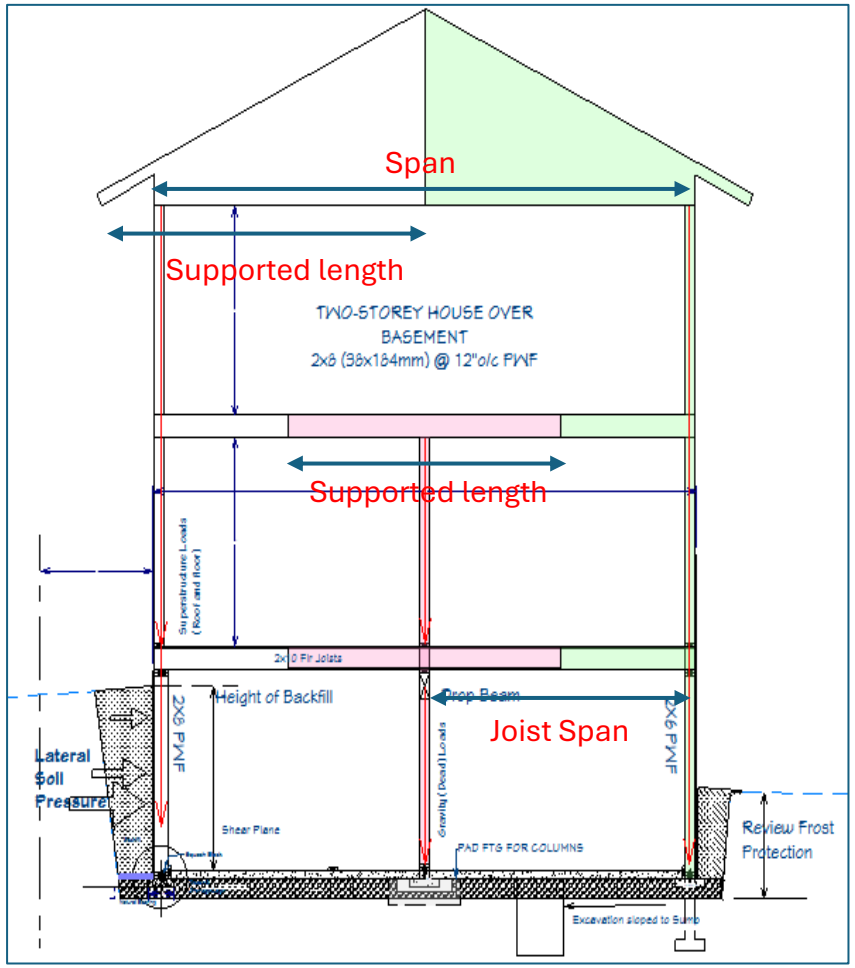

Figures from CWC 2020 Span Book – 2020 Edition

Floor Joist Selection

Span Book has multiple bracing options

Strapping, Bridging, Bridging and Strapping, etc

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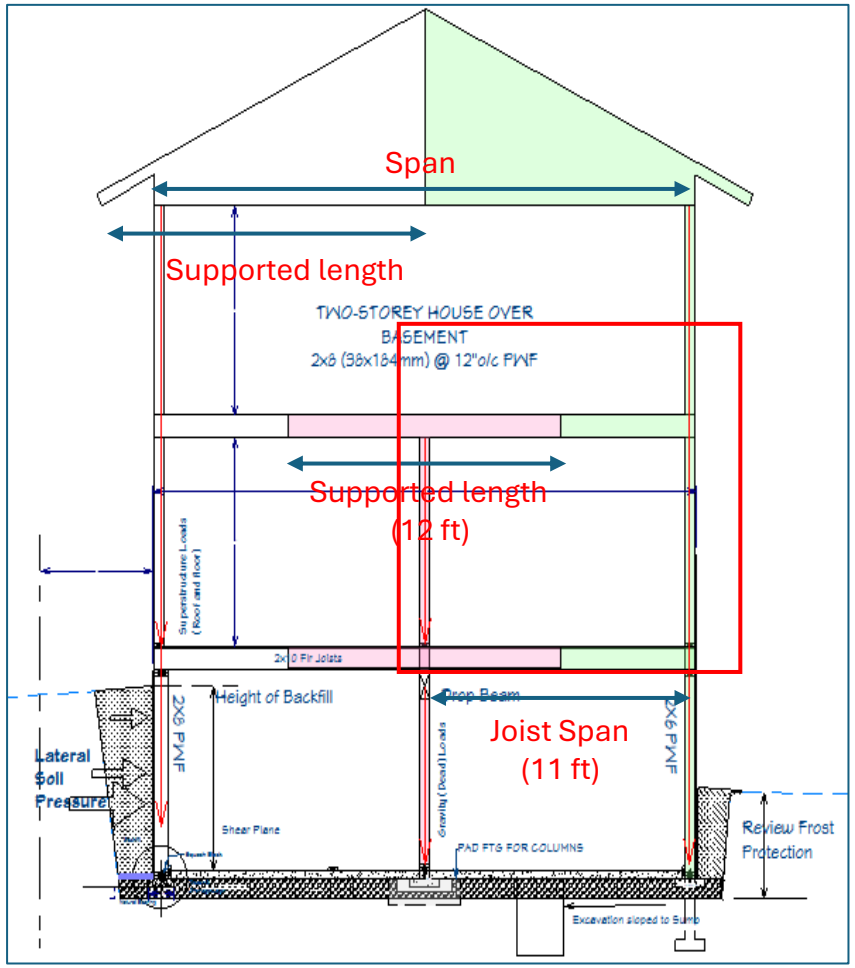
Table 1.3 — **Maximum Spans (ft.-in.)**

Joist Span (11 ft)

Floor Joists — **S-P-F**

Grade		2x6			2x8			2x10			2x12		
Nailed subfloor thickness (in.)	**Strapping** Joist spacing (in.)	12	16	24	12	16	24	12	16	24	12	16	24
⅛	SS	9-12	9-4	8-5	11-12	11-5	10-10	14-2	13-5	12-9	16-1	15-4	14-7
	No.1/No.2	9-7	8-11	8-2	11-7	11-0	10-6	13-8	13-0	12-4	15-7	14-10	14-1
	No.3	9-4	8-8	7-11	11-5	10-10	9-8	13-5	12-9	11-10	15-4	14-7	13-9
¼	SS	10-7	9-8	8-5	12-9	11-12	11-1	15-0	14-2	13-4	17-1	16-1	15-2
	No.1/No.2	10-3	9-4	8-2	12-4	11-7	10-9	14-6	13-8	12-11	16-7	15-7	14-8
	No.3	10-1	9-2	7-11	12-1	11-5	9-8	14-3	13-5	11-10	16-3	15-4	13-9
Nailed & Glued subfloor thickness (in.)	**Strapping** Joist spacing (in.)	12	16	24	12	16	24	12	16	24	12	16	24
⅛	SS	10-8	9-8	8-5	13-3	12-7	11-1	15-7	14-10	14-2	17-10	16-11	16-1
	No.1/No.2	10-4	9-4	8-2	12-10	12-2	10-9	15-1	14-4	13-8	17-3	16-5	15-7
	No.3	10-1	9-2	7-11	12-7	11-10	9-8	14-10	14-1	11-10	16-11	16-1	13-9
¼	SS	10-8	9-8	8-5	13-12	12-9	11-1	16-7	15-7	14-2	18-11	17-10	16-9
	No.1/No.2	10-4	9-4	8-2	13-6	12-4	10-9	16-1	15-1	13-9	18-4	17-3	16-3
	No.3	10-1	9-2	7-11	13-3	11-10	9-8	15-9	14-6	11-10	17-12	16-10	13-9

Chart from CWC 2020 Span Book – 2020 Edition



FLYWHEEL BUILDING SOLUTIONS

Basement Beam Selection

12’Supported Length

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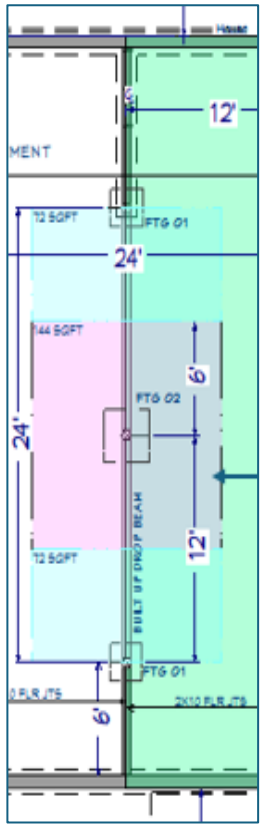
Table 5.2b **Maximum Spans (ft.-in.)**

Built-Up Floor Beams **Supporting 2 Floors in a House**

Species	Grade	Supported length (ft.)	2x10 3-Ply	2x10 4-PLY	2x10 5-PLY	2x12 3-PLY	2x12 4-PLY	2x12 5-PLY
D.Fir-L	SS	8	11-5	12-11	13-11	13-3	15-4	16-11
		10	10-3	11-10	12-11	11-11	13-9	15-4
		12	9-4	10-9	12-1	10-10	12-6	13-12
		14	8-8	9-12	11-2	10-0	11-7	12-11
		16	8-1	9-4	10-5	9-5	10-10	12-1
		18	7-8	8-10	9-10	8-10	10-3	11-5
		20	7-3	8-4	9-4	8-5	9-8	10-10
	No.1/No.2	8	8-11	10-3	11-6	10-4	11-11	13-4
		10	7-12	9-2	10-3	9-3	10-8	11-11
		12	7-3	8-5	9-5	8-5	9-9	10-11
		14	6-9	7-9	8-8	7-10	9-0	10-1
		16	6-4	7-3	8-2	7-4	8-5	9-5
		18	5-11	6-10	7-8	6-11	7-11	8-11
		20	5-6	6-6	7-3	6-6	7-7	8-5



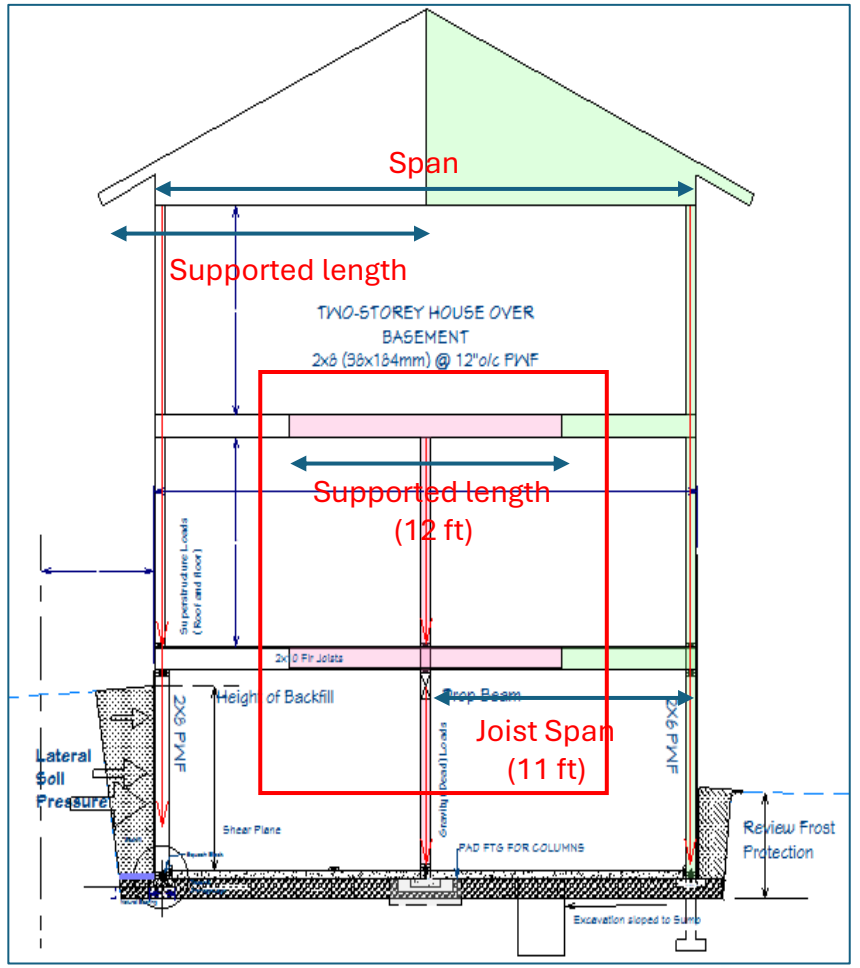


Chart from CWC 2020 Span Book – 2020 Edition

Rear Deck Joist

1.9kPa = 39.7 psf

Not Pressure Treated

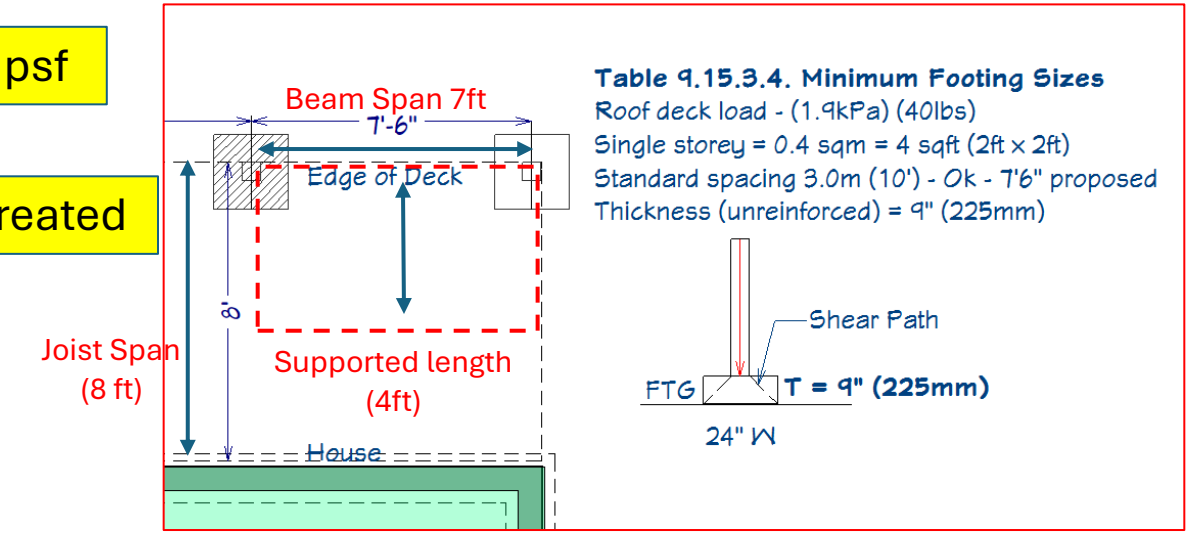


Table 10.1a Maximum Spans, Not Incised (ft-in.)

Deck Joists

Live Load = 39.7 psf

Species	Grade	2x4 Joist spacing (in.) 8	12	16	24	2x6 8	12	16	24	2x8 8	12	16	24
D.Fir-L	No.1/No.2	7-7	6-8	6-1	5-3	12-0	10-6	9-4	7-7	15-10	13-2	11-5	9-3
Hem-Fir	No.1/No.2	7-7	6-8	6-1	5-3	12-0	10-6	9-6	8-0	15-10	13-9	11-11	9-9
S-P-F	No.1/No.2	7-3	6-4	5-9	5-0	11-5	10-0	9-1	7-11	15-1	13-2	11-11	10-1
Northern	No.1/No.2	6-7	5-9	5-2	4-6	10-4	9-0	8-2	6-8	13-7	11-5	9-11	8-1

Species	Grade	2x10 Joist spacing (in.) 8	12	16	24	2x12 8	12	16	24
D.Fir-L	No.1/No.2	19-9	16-1	13-11	11-4	22-11	18-8	16-2	13-2
Hem-Fir	No.1/No.2	20-2	16-10	14-7	11-11	24-0	19-7	16-11	13-10
S-P-F	No.1/No.2	19-3	16-10	15-2	12-4	23-5	20-3	17-7	14-4
Northern	No.1/No.2	17-2	14-0	12-2	9-11	19-11	16-3	14-1	11-6

Notes: See note of Table 10.2b.

Table 10.1b Maximum Spans, Incised (ft.-in.)

Deck Joists

Live Load = 39.7 psf

Species	Grade	2x4 Joist spacing (in.) 8	12	16	24	2x6 8	12	16	24	2x8 8	12	16	24
D.Fir-L	No.1/No.2	7-6	6-6	5-11	4-11	11-10	9-11	8-7	7-0	14-10	12-1	10-6	8-7
Hem-Fir	No.1/No.2	7-6	6-6	5-11	5-2	11-10	10-4	9-0	7-6	14-10	12-9	11-0	9-0
S-P-F	No.1/No.2	7-2	6-3	5-8	4-11	11-3	9-10	8-11	7-6	14-10	12-11	11-5	9-4
Northern	No.1/No.2	6-5	5-7	5-1	4-3	10-2	8-8	7-6	6-1	12-11	10-7	9-2	7-5

Species	Grade	2x10 Joist spacing (in.) 8	12	16	24	2x12 8	12	16	24
D.Fir-L	No.1/No.2	18-2	14-10	12-10	10-6	21-1	17-3	14-11	12-2
Hem-Fir	No.1/No.2	19-1	15-7	13-6	11-0	22-1	18-1	15-8	12-9
S-P-F	No.1/No.2	18-11	16-1	13-11	11-5	22-11	18-8	16-2	13-3
Northern	No.1/No.2	15-10	12-11	11-2	9-1	18-5	15-0	13-0	10-7

Notes: See note of Table 10.2b.

Pressure Treated

Chart from CWC 2020 Span Book – 2020 Edition

Rear Deck Beam

Nominal Supported Length

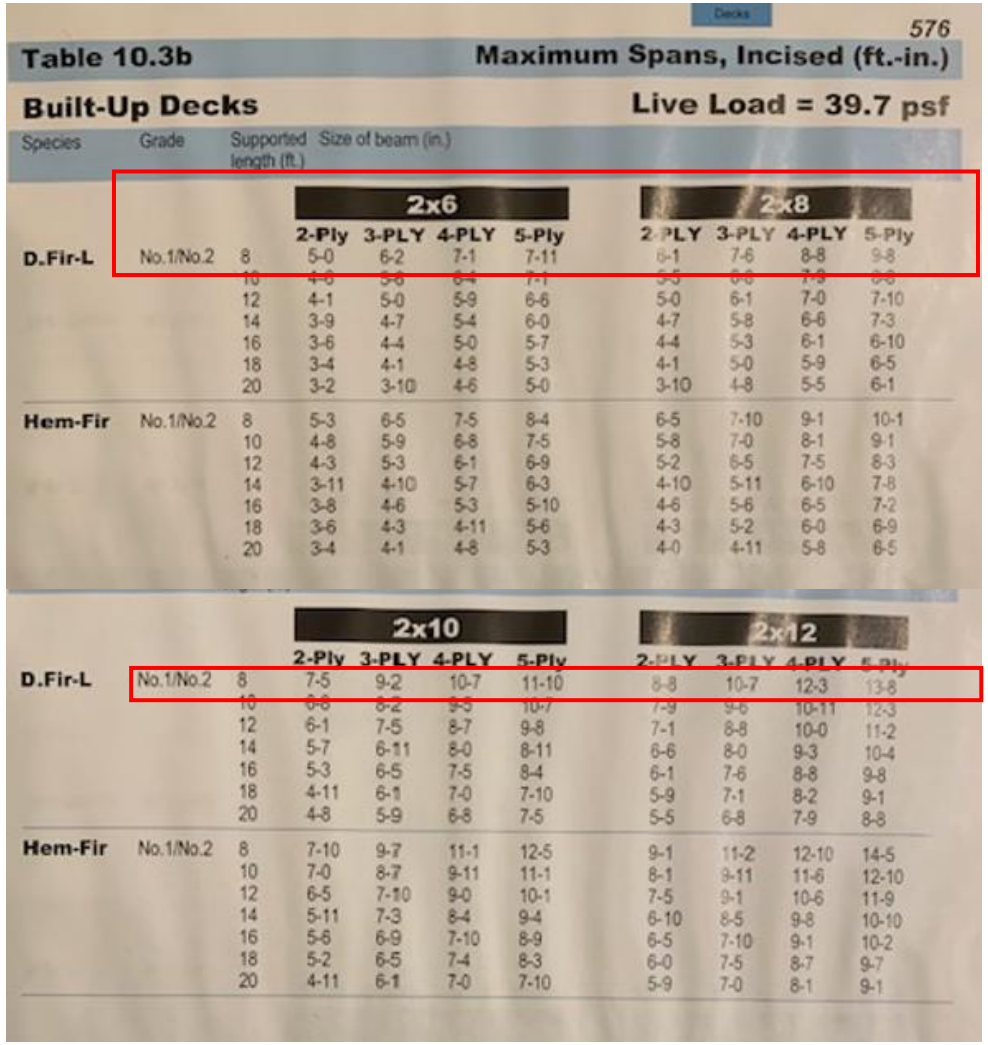


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Table 10.3b **Maximum Spans, Incised (ft.-in.)**

Built-Up Decks **Live Load = 39.7 psf**

Species	Grade	Supported length (ft.)	2x6 2-Ply	2x6 3-PLY	2x6 4-PLY	2x6 5-Ply	2x8 2-PLY	2x8 3-PLY	2x8 4-PLY	2x8 5-Ply
D.Fir-L	No.1/No.2	8	5-0	6-2	7-1	7-11	6-1	7-6	8-8	9-8
		10	4-6	5-6	6-4	7-1	5-5	6-6	7-3	8-3
		12	4-1	5-0	5-9	6-6	5-0	6-1	7-0	7-10
		14	3-9	4-7	5-4	6-0	4-7	5-8	6-6	7-3
		16	3-6	4-4	5-0	5-7	4-4	5-3	6-1	6-10
		18	3-4	4-1	4-8	5-3	4-1	5-0	5-9	6-5
		20	3-2	3-10	4-6	5-0	3-10	4-8	5-5	6-1
Hem-Fir	No.1/No.2	8	5-3	6-5	7-5	8-4	6-5	7-10	9-1	10-1
		10	4-8	5-9	6-8	7-5	5-8	7-0	8-1	9-1
		12	4-3	5-3	6-1	6-9	5-2	6-5	7-5	8-3
		14	3-11	4-10	5-7	6-3	4-10	5-11	6-10	7-8
		16	3-8	4-6	5-3	5-10	4-6	5-6	6-5	7-2
		18	3-6	4-3	4-11	5-6	4-3	5-2	6-0	6-9
		20	3-4	4-1	4-8	5-3	4-0	4-11	5-8	6-5

Species	Grade	Supported length (ft.)	2x10 2-Ply	2x10 3-PLY	2x10 4-PLY	2x10 5-Ply	2x12 2-PLY	2x12 3-PLY	2x12 4-PLY	2x12 5-Ply
D.Fir-L	No.1/No.2	8	7-5	9-2	10-7	11-10	8-8	10-7	12-3	13-8
		10	6-6	8-2	9-5	10-7	7-9	9-6	10-11	12-3
		12	6-1	7-5	8-7	9-8	7-1	8-8	10-0	11-2
		14	5-7	6-11	8-0	8-11	6-6	8-0	9-3	10-4
		16	5-3	6-5	7-5	8-4	6-1	7-6	8-8	9-8
		18	4-11	6-1	7-0	7-10	5-9	7-1	8-2	9-1
		20	4-8	5-9	6-8	7-5	5-5	6-8	7-9	8-8
Hem-Fir	No.1/No.2	8	7-10	9-7	11-1	12-5	9-1	11-2	12-10	14-5
		10	7-0	8-7	9-11	11-1	8-1	9-11	11-6	12-10
		12	6-5	7-10	9-0	10-1	7-5	9-1	10-6	11-9
		14	5-11	7-3	8-4	9-4	6-10	8-5	9-8	10-10
		16	5-6	6-9	7-10	8-9	6-5	7-10	9-1	10-2
		18	5-2	6-5	7-4	8-3	6-0	7-5	8-7	9-7
		20	4-11	6-1	7-0	7-10	5-9	7-0	8-1	9-1

Chart from CWC 2020 Span Book – 2020 Edition

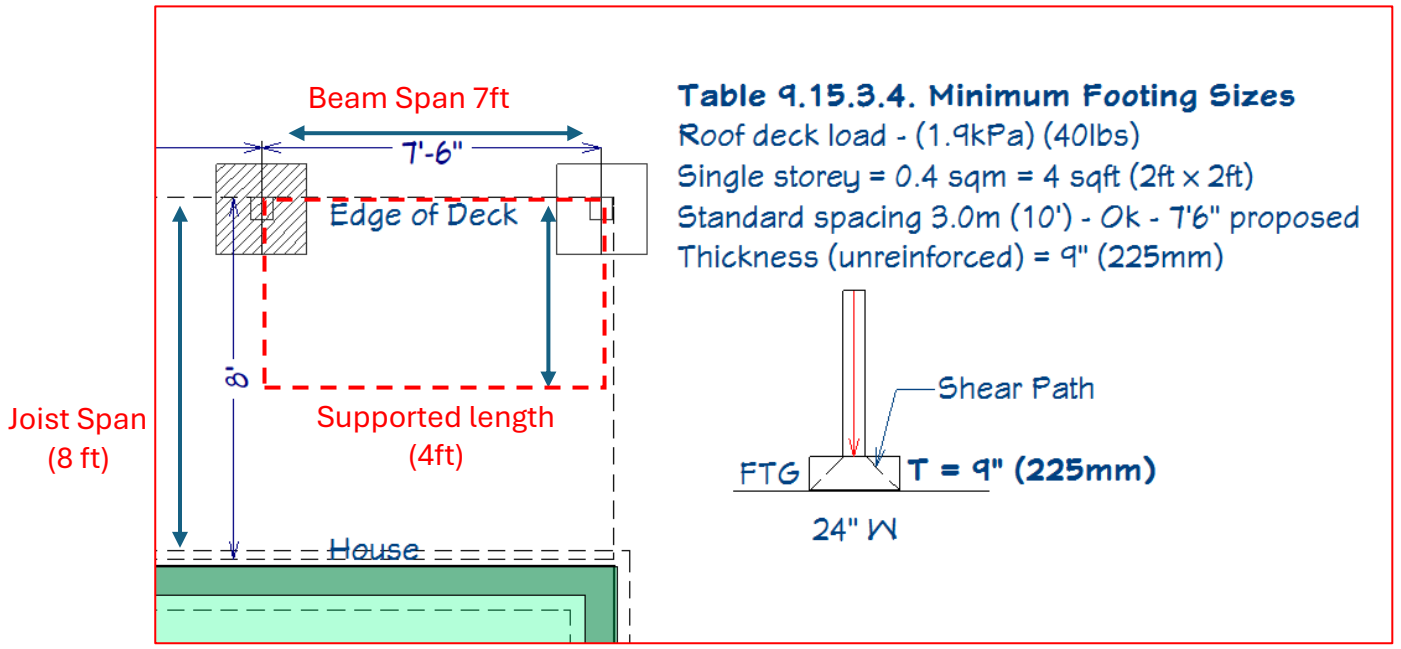


Table 9.15.3.4. Minimum Footing Sizes

Roof deck load - (1.9kPa) (40lbs)

Single storey = 0.4 sqm = 4 sqft (2ft x 2ft)

Standard spacing 3.0m (10') - Ok - 7'6" proposed

Thickness (unreinforced) = 9" (225mm)

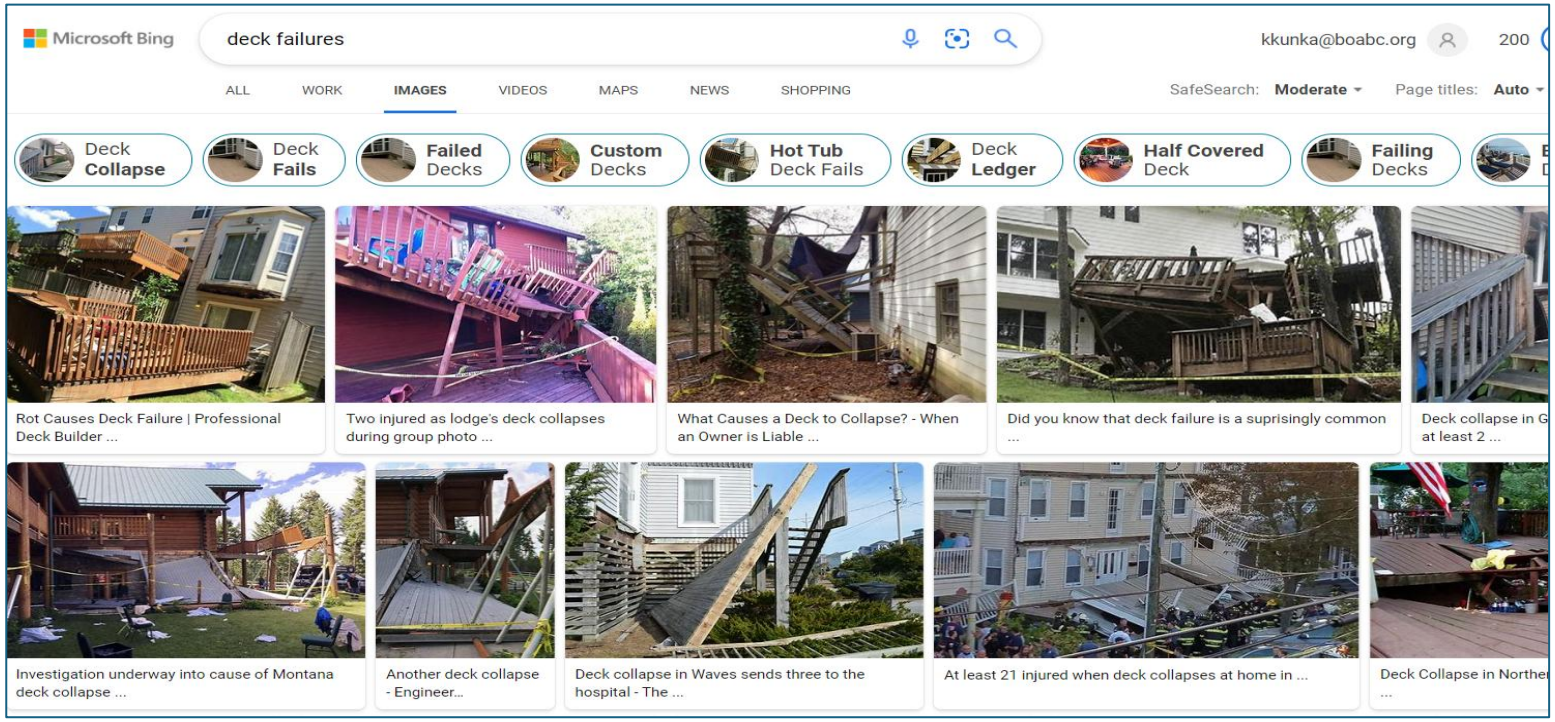
Deck and Balcony Design

BOABC Lunch and Learn

March 2022

Go to Lunch & Learn Webinars – BOABC

Preventing Failures (100's documented across North America



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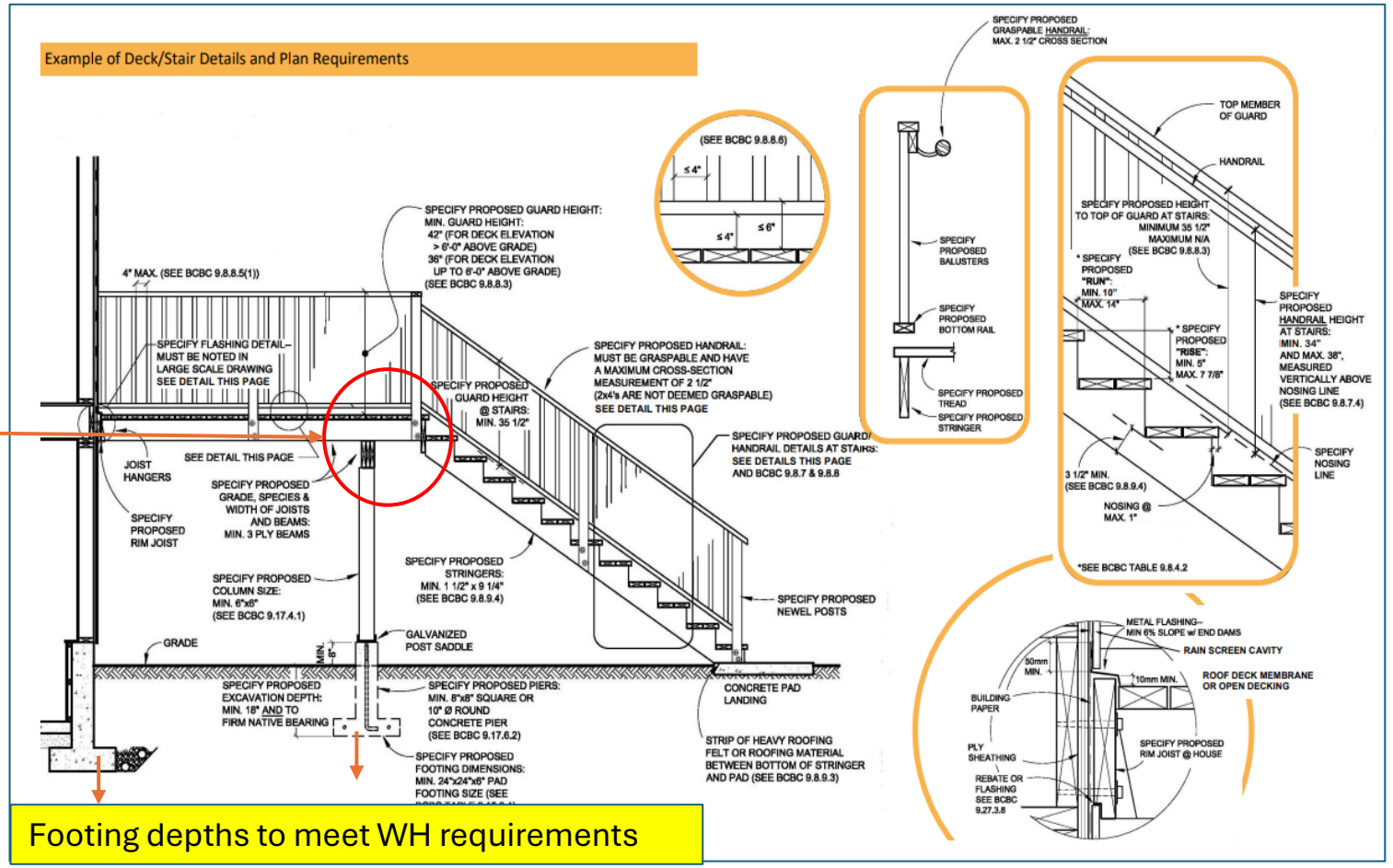
Deck and Balcony Design

Ensure a detailed design layout for permit review.



Refer to slide 90 - cantilevered joists.

Footing depths to meet WH requirements

FLYWHEEL BUILDING SOLUTIONS

Deck and Balcony Design

Slope Instability and Footings – 9.4

Increasing failures related to post/column rotation.

Caused by poor backfill stability on sloped lots. Some suggestions to tie deck footing back to main house foundations

Images from Fine Homebuilding magazine.

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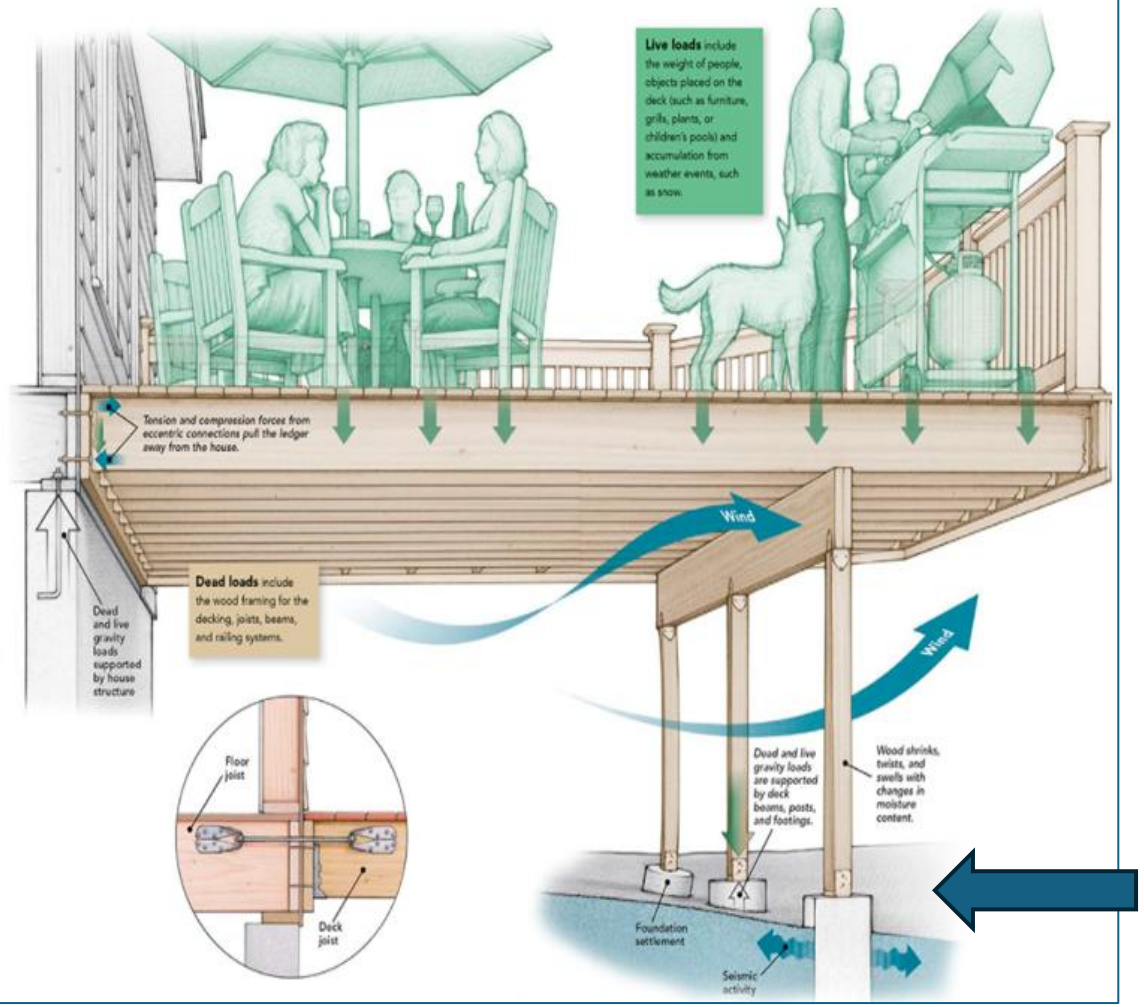
Deck and Balcony Design

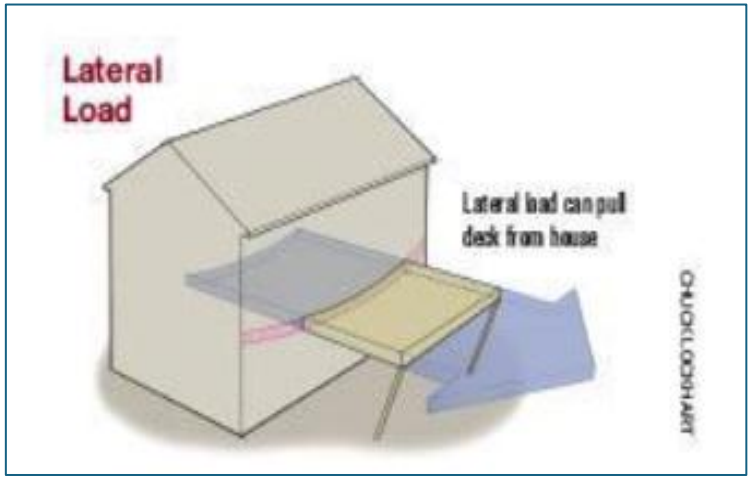
Deck Loads

Fine Homebuilding – How deck load capacity works (US Codes – note potential issues)

TOP 3 weakest points??

Spot the non-compliant BCBC details





Images from Fine Homebuilding magazine.

Lateral load failures most common with inadequate ledger attachments to building.

Not of lot of support when you really look at it.

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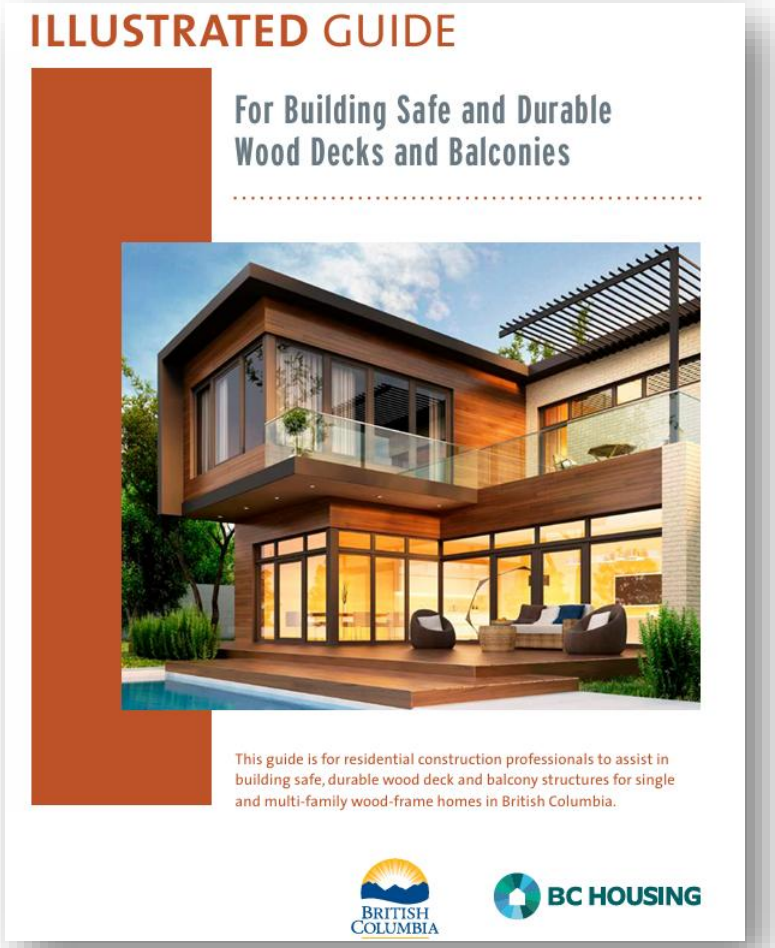
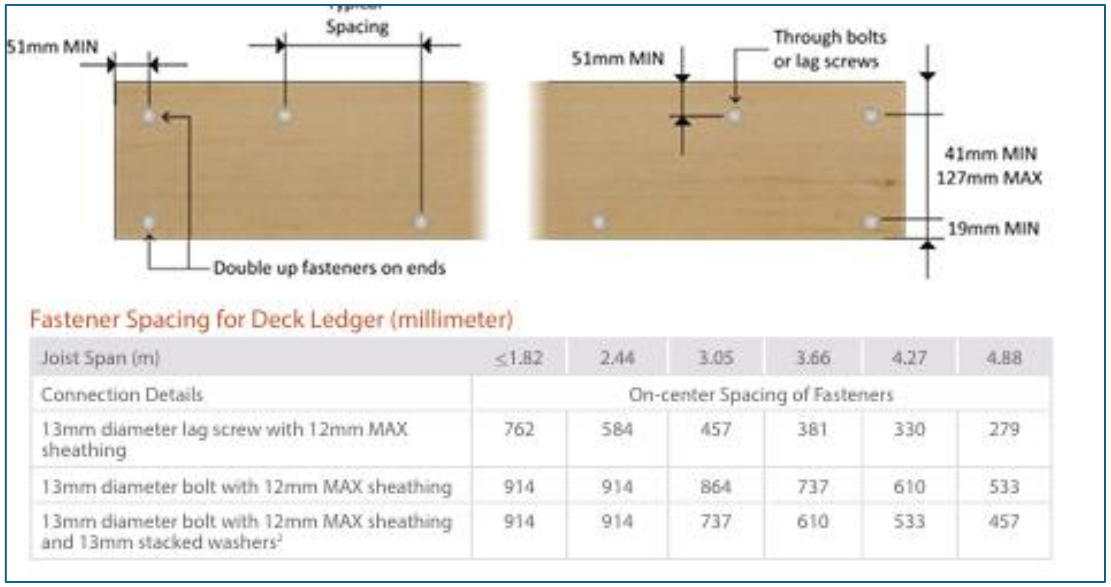
Decks and Balconies

Refer to BC Housings

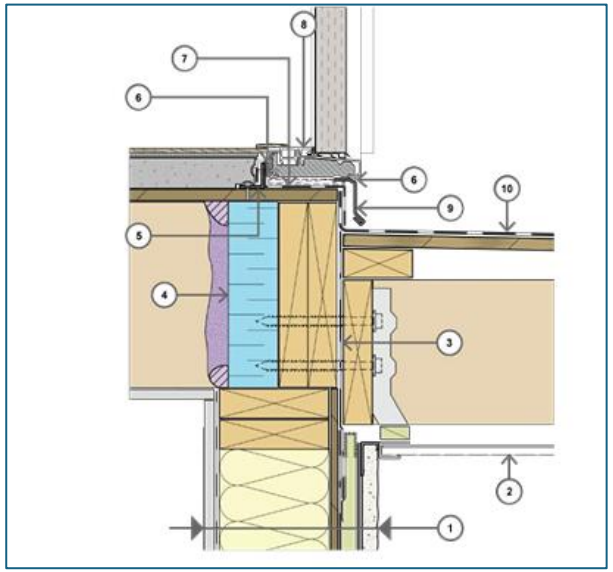


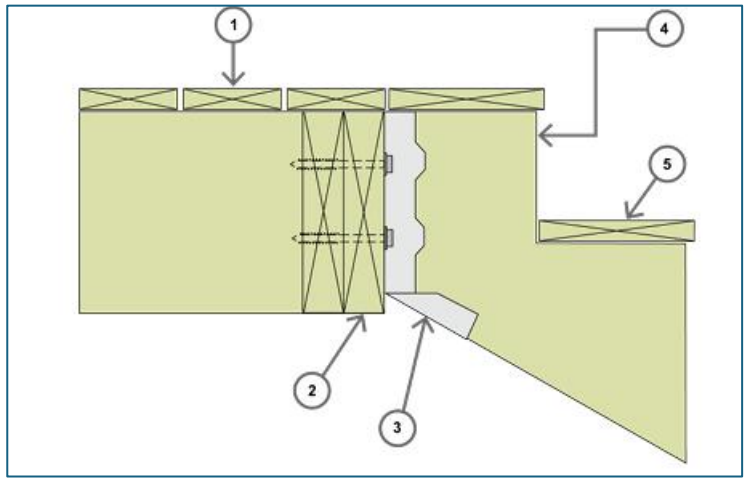
[Illustrated Guide - Building Safe and Durable Wood Decks and Balconies]



Fastener Spacing for Deck Ledger (millimeter)

Joist Span (m)	≤1.82	2.44	3.05	3.66	4.27	4.88
Connection Details	On-center Spacing of Fasteners					
13mm diameter lag screw with 12mm MAX sheathing	762	584	457	381	330	279
13mm diameter bolt with 12mm MAX sheathing	914	914	864	737	610	533
13mm diameter bolt with 12mm MAX sheathing and 13mm stacked washers[2]	914	914	737	610	533	457

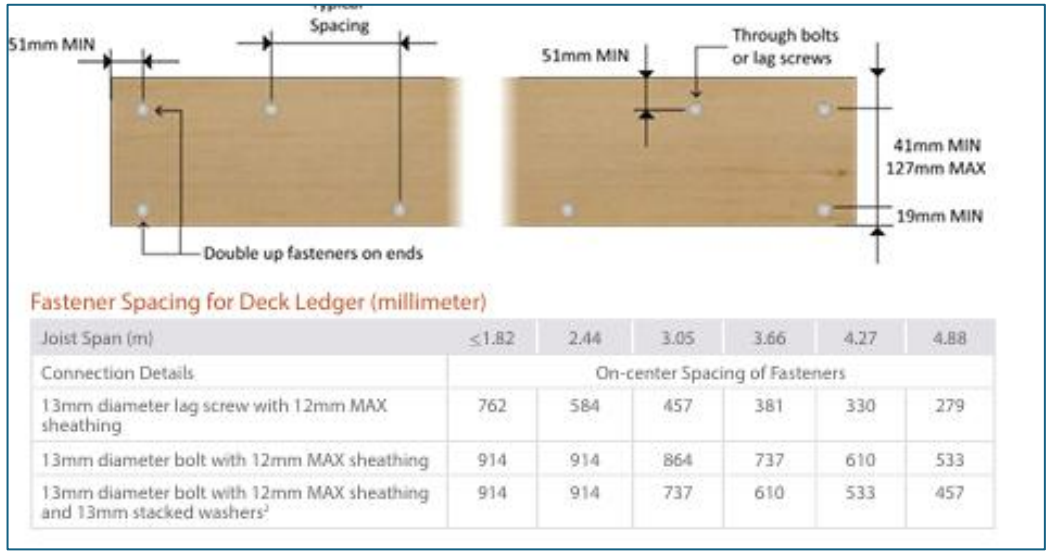




FLYWHEEL BUILDING SOLUTIONS

9.23.5 Ledgers

No ledger outline other than ICF in the code



Fastener Spacing for Deck Ledger (millimeter)

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13mm diameter lag screw with 12mm MAX sheathing	762	584	457	381	330	279
13mm diameter bolt with 12mm MAX sheathing	914	914	864	737	610	533
13mm diameter bolt with 12mm MAX sheathing and 13mm stacked washers[2]	914	914	737	610	533	457

If a ledger attachment is used, an adequate water management strategy must be developed to reduce the potential for periods of extended wetting as poor detailing at the ledger connection is a common cause of failure in this deck/balcony type. While BCBC does not provide comprehensive guidance on ledger fastening patterns, *Section R507.2*[5] of the International Residential Code (IRC), the model building code adopted throughout most of the United States, has requirements for both fastener selection and placement.

Best practices dictates that lag bolts or through bolts with washers be used to secure the ledger to the appropriate backing within the building structure. Fasteners should be 13mm (0.5") in diameter and must fully penetrate through the ledger and rim joist. A gap of 13mm (0.5") is structurally allowable between the ledger and wall and is recommended for open decks to provide space for drainage and drying to occur. In order to ensure a robust connection to the building and sufficient support for the deck structure, fasteners should be installed in a staggered fashion at a spacing corresponding to the joist span. The table and corresponding figure below provide guidance on fastener spacing and placement at the ledger.

Does it matter what rim joist material it is attaching to??

FLYWHEEL BUILDING SOLUTIONS

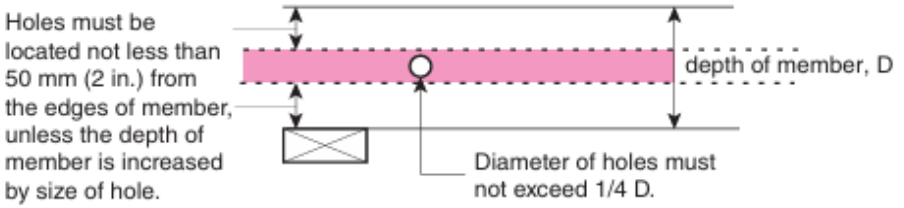
9.23.5 Notching and Drilling

Standard framing

Typical failure item at frame inspection. Work with your trades to avoid damage and correct before inspection.

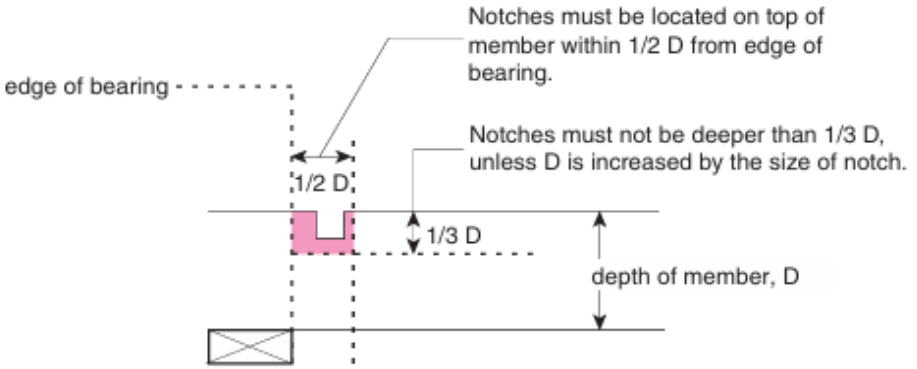
Engineering components

Please ensure you do not notch or drill into engineered components (floor joists, beams, etc) without first reading the manufactures instructions or contacting them. engineering



Member Size	Maximum Hole Diameter
38 × 89 mm (2 × 4 in.)	not permitted
38 × 140 mm (2 × 6 in.)	35 mm (1 3/8 in.)
38 × 184 mm (2 × 8 in.)	46 mm (1 3/4 in.)
38 × 235 mm (2 × 10 in.)	58 mm (2 1/4 in.)
38 × 286 mm (2 × 12 in.)	71 mm (2 3/4 in.)

Drilling of holes in framing members



Member Size	Maximum Distance from Edge of Bearing	Maximum Depth of Notch
38 × 89 mm (2 × 4 in.)	44 mm (1 3/4 in.)	30 mm (1 1/8 in.)
38 × 140 mm (2 × 6 in.)	70 mm (2 3/4 in.)	46 mm (1 3/4 in.)
38 × 184 mm (2 × 8 in.)	92 mm (3 5/8 in.)	61 mm (2 3/8 in.)
38 × 235 mm (2 × 10 in.)	117 mm (4 5/8 in.)	78 mm (3 in.)
38 × 286 mm (2 × 12 in.)	143 mm (5 5/8 in.)	95 mm (3 3/4 in.)

Notching of framing members

EG00487B

Figures from Illustrated Users Guide – NBC 2020.

9.23.5 Notching and Drilling

9.23.5.3. Wall Studs

This Article limits the size of holes and notches permitted in wall framing members. Wall studs can be notched and drilled within established limits as shown in Figure 9.23.-7. No more than one third of the depth of the stud can be drilled or notched if the stud is loadbearing. At least 40 mm (1 5/8 in.) of stud must remain undamaged if the stud is non-loadbearing. Larger notches and holes are possible if the stud is suitably reinforced.

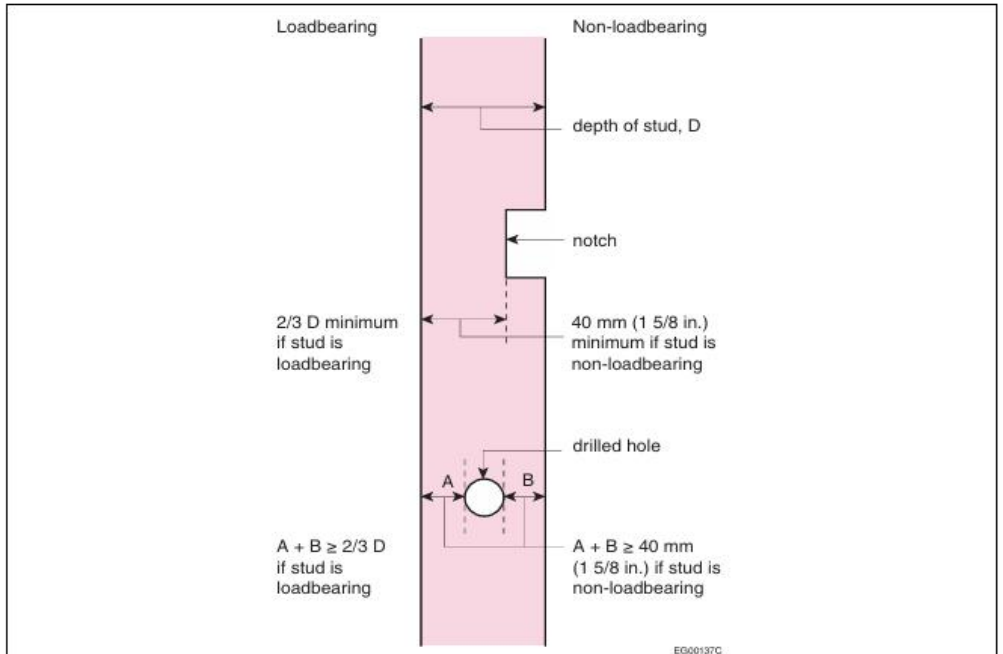


Figure 9.23.-7
Notching and drilling of wall studs

9.23.5.4. Top Plates

Top plates can be notched and drilled provided that the undamaged width of the top plate is not less than 50 mm (2 in.). Reinforcing the top plate can allow larger notches and holes to be used where necessary, as shown in Figure 9.23.-8.

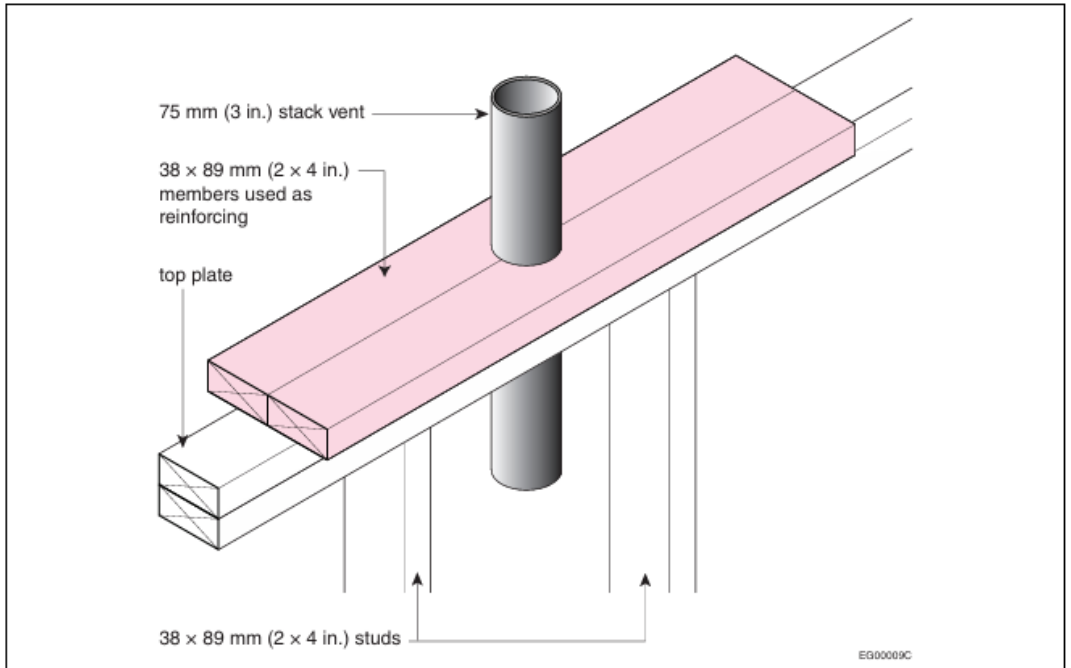


Figure 9.23.-8
Reinforcing top plates

Figures from Illustrated Users Guide – NBC 2020.

9.23.6.1. Anchorage (ICF)

9.23.6. Anchorage

9.23.6.1. Anchorage of Building Frames

1) Except as required by Sentence 9.23.6.3.(1), *building* frames shall be anchored to the *foundation* unless a structural analysis that considers wind and earthquake loads and lateral earth pressures shows that anchorage is not required.

2) Except as provided in Sentences (3) to (6), anchorage shall be provided by
a) embedding the ends of the first floor joists in concrete, or
b) fastening the sill plate to the *foundation* with not less than 12.7 mm diam anchor bolts spaced not more than 2.4 m o.c.

Required in Whitehorse

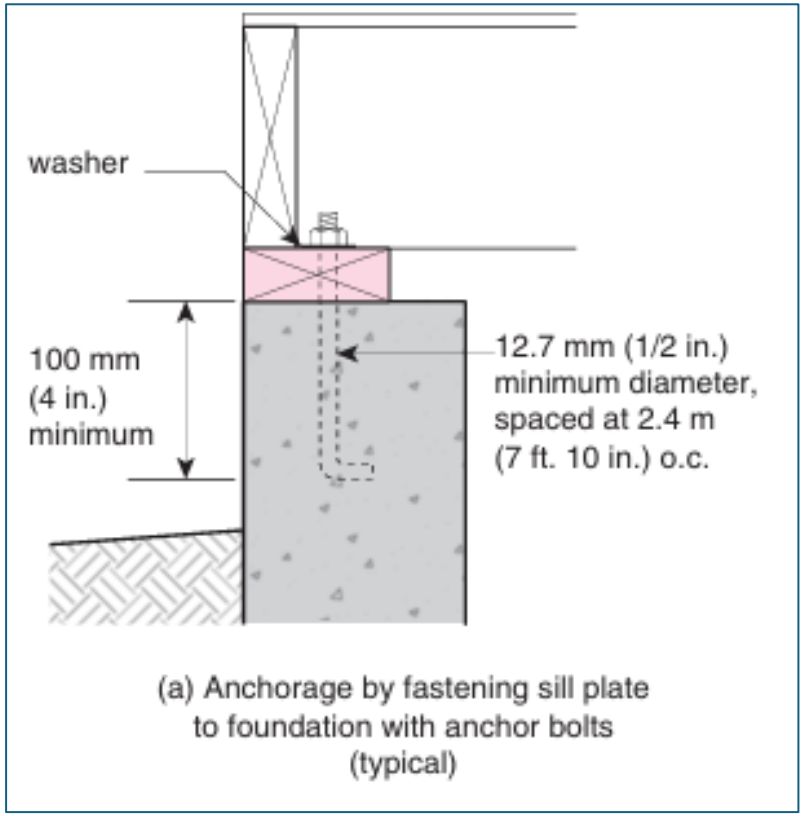
3) For *buildings* with 2 or more floors supported by frame walls that are in areas where the seismic spectral acceleration, $S_a(0.2)$, is not greater than 0.70 or the 1-in-50 hourly wind pressure (HWP) is equal to or greater than 0.80 kPa but not greater than 1.20 kPa, anchorage shall be provided by fastening the sill plate to the *foundation* with not less than two anchor bolts per *braced wall panel*, where all anchor bolts used are
a) not less than 15.9 mm in diameter, located within 0.5 m of the end of the *foundation*, and spaced not more than 2.4 m o.c, or
b) not less than 12.7 mm in diameter, located within 0.5 m of the end of the *foundation*, and spaced not more than 1.7 m o.c.

5) Anchor bolts referred to in Sentences (2) to (4) shall be
a) fastened to the sill plate with nuts and washers,
b) embedded not less than 100 mm in the *foundation*, and
c) so designed that they may be tightened without withdrawing them from the *foundation*.

Additional requirements not required under 2020 NBC.

FLYWHEEL BUILDING SOLUTIONS

9.23.6.1 Anchorage



Also, for ICF layouts

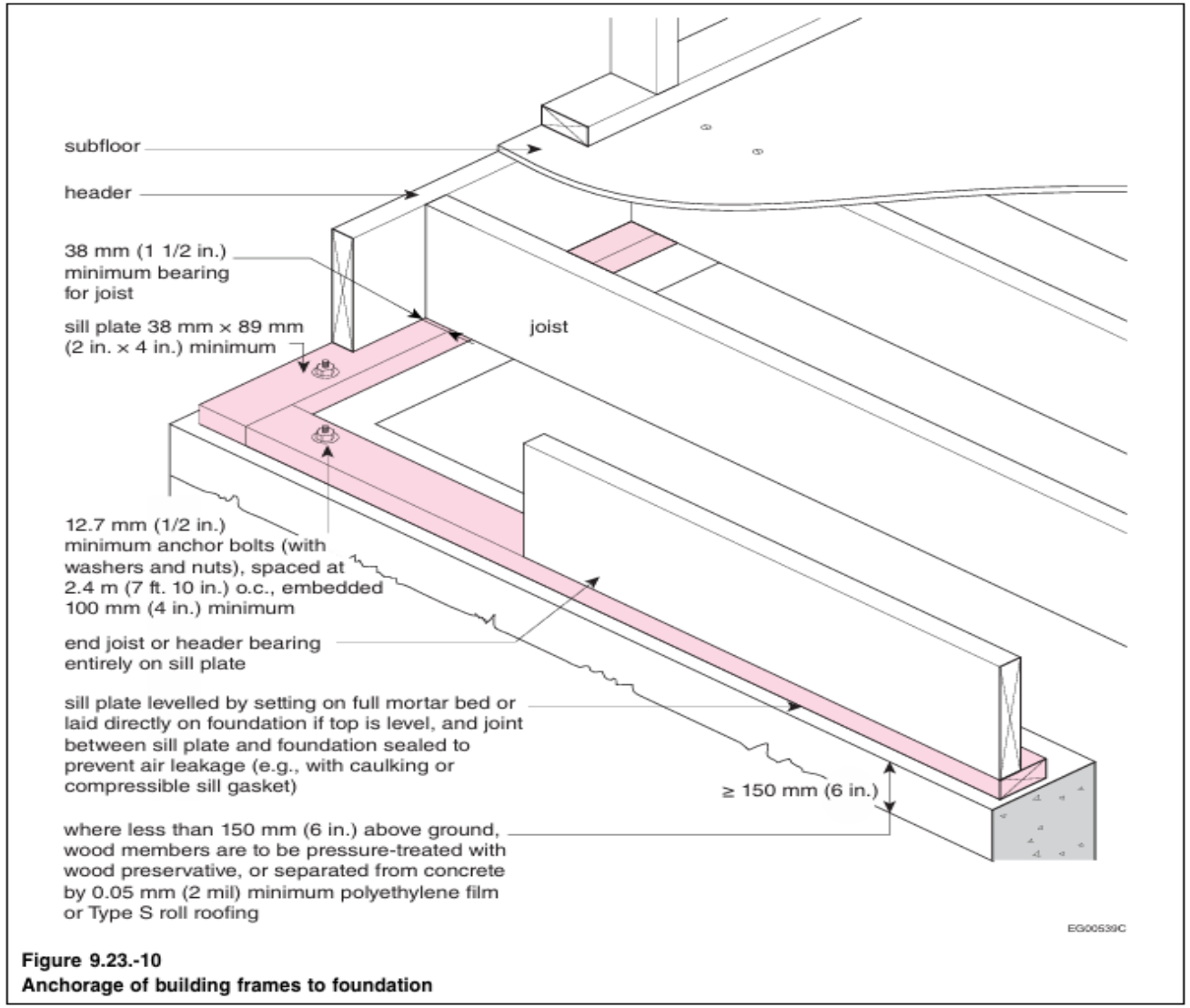


Figure 9.23.-10
Anchorage of building frames to foundation

Figures from Illustrated Users Guide – NBC 2020.

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BUILDING SOLUTIONS

9.23.6.1 Anchorage

9.23.6.1 Anchorage
This Article requires that columns and posts be anchored to resist uplift. Buildings are attached to the tops of columns in a manner that will keep the superstructure from sliding or being lifted up due to wind action.

Exterior columns and posts need to be anchored to resist uplift and lateral movement. Where columns or posts support balconies, decks or verandas, and where the distance from the ground to the underside of joists does not exceed 600 mm (24 in.), the columns or posts must be anchored to the foundation, or the supported joists or beams must be directly anchored to the ground to resist uplift.

Illustrated Users Guide – NBC 2020.

9.23.6.2. Anchorage of Columns and Posts

1) Except as provided in Sentences (2) and (3), exterior columns and posts shall be anchored to resist uplift and lateral movement.

2) Except as provided in Sentence (3), where columns or posts support balconies, decks, verandas or other exterior platforms, and the distance from finished ground to the underside of the joists is not more than 600 mm,

a) the columns or posts shall be anchored to the *foundation* to resist uplift and lateral movement, or

b) the supported joists or beams shall be directly anchored to the ground to resist uplift.

3) Anchorage is not required for platforms described in Sentence (2) that

a) are not more than 1 *storey* in height,

b) are not more than 55 m² in area,

c) do not support a roof, and

d) are not attached to another structure, unless it can be demonstrated that differential movement will not adversely affect the performance of the structure to which the platform is attached.

FLYWHEEL BUILDING SOLUTIONS

Anchorage – ICF Details – 9.20.17

Review ICF manufactures specifications as well as Code.

9.20.17.5. Framing Supported on Flat Insulating Concrete Form Walls

This Article contains requirements for framing supported on flat ICF walls. The connections at intersections between flat ICF walls and floor framing should be capable of transferring the expected loads. Floor framing supported on the side of flat ICF walls must be anchored as shown in Figure 9.20.-29. Maximum spacings for anchor bolts used to secure ledger boards to ICF walls for the support of floor framing are provided in NBC Table 9.20.17.5.

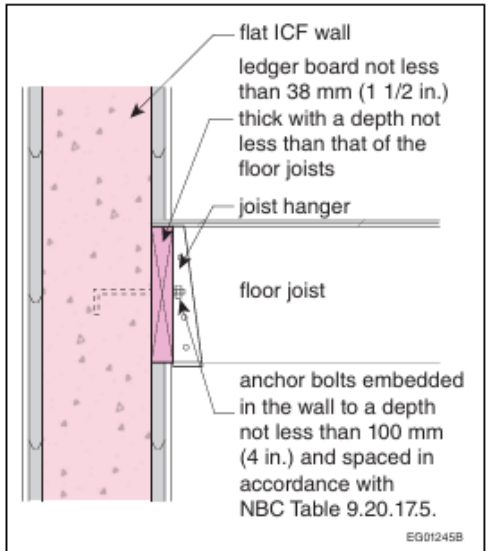


Figure 9.20.-29
Anchoring of floor framing on the side of flat ICF walls

9.20.17.6. Anchoring of Roof Framing to the Top of Flat Insulating Concrete Form Walls

This article contains requirements for the anchoring of roof framing to the top of flat ICF walls. The connections at intersections between flat ICF walls and roof framing should be capable of transferring the expected loads. Roof framing supported on the top of flat ICF walls must be fixed to the top plates, which must be anchored to the walls with anchor bolts placed in the centre of the wall and embedded not less than 100 mm (4 in.) into the concrete (Figure 9.20.-30). The bolts must be not less than 12.7 mm (1/2 in.) in diameter and spaced at not more than 1 200 mm (4 ft.) on centre.

9.20.17.7. Protection from Precipitation and Damage

This Article requires that above-ground flat ICF walls be protected from precipitation and damage in accordance with NBC Section 9.27.

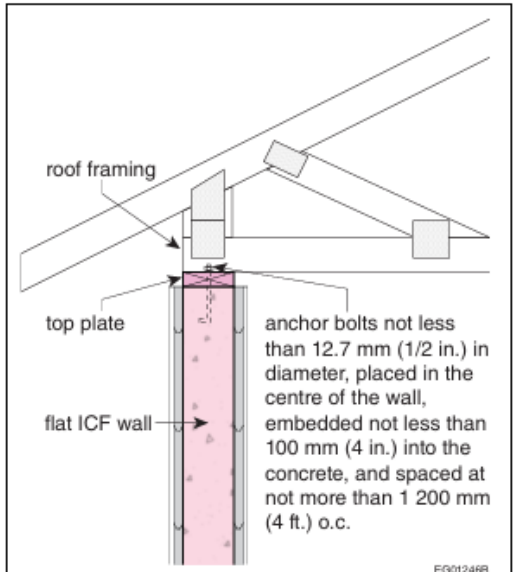


Figure 9.20.-30
Anchoring of roof framing to the top of flat ICF walls

Table 9.20.17.5.
Maximum Anchor Bolt Spacing for the Connection of Floor Ledgers to Flat Insulating Concrete Form Walls
Forming Part of Sentence 9.20.17.5.(3)

Maximum Clear Floor Span, m	Maximum Anchor Bolt Spacing, mm	
	Staggered 12.7 mm Diameter Anchor Bolts	Staggered 16 mm Diameter Anchor Bolts
2.44	450	500
3.0	400	450
4.0	300	400
5.0	275	325

Figures from Illustrated Users Guide – NBC 2020.

FLYWHEEL
BUILDING SOLUTIONS

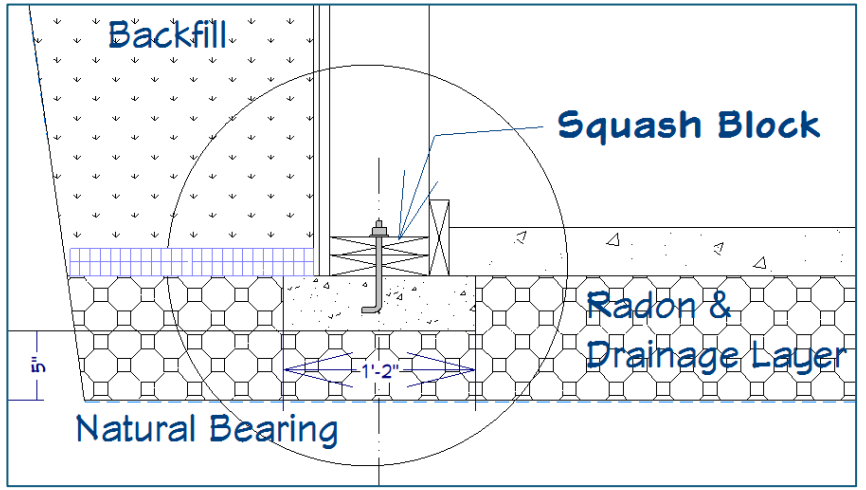
Anchor Bolts – PWF - lateral support

8.4 Concrete Footings (S406-16)

If holes are to be drilled through the bottom plate to accept anchor bolts or hold downs to connect exterior or interior loadbearing walls to concrete footings, then

a) The holes shall be slightly larger than the anchor bolt;
b) Two applications of preservative treatment shall be poured into the hole prior to placement of the washer and nut;
c) For anchor bolts, a squash block of the same cross-sectional dimensions as the bottom plate shall be nailed on top of the bottom plate with the anchor bolt passing through both. The bottom plate and the squash block, and a 50 mm (2 inch) washer shall be installed below the nut; and
d) Lateral resistance to inward soil pressure at the bottom of the exterior wall shall be provided in accordance with Clauses:

- 4.5.2.,
- 9.7.2,
- 9.8.1., and
- 9.8.2.



4.5.2

To resist inward pressures, exterior foundation walls shall be braced laterally by the floor system at the top of the wall, and at the bottom (see Figure A.1) by

a) a concrete slab floor;
b) a suspended wood floor;
c) a wood sleeper floor;
d) bracing in the case of a crawl space foundation, as specified in Clause 11.2; or
e) other construction methods, in accordance with Clause 4.2.

FLYWHEEL
BUILDING SOLUTIONS

9.23.9. Floor Joists

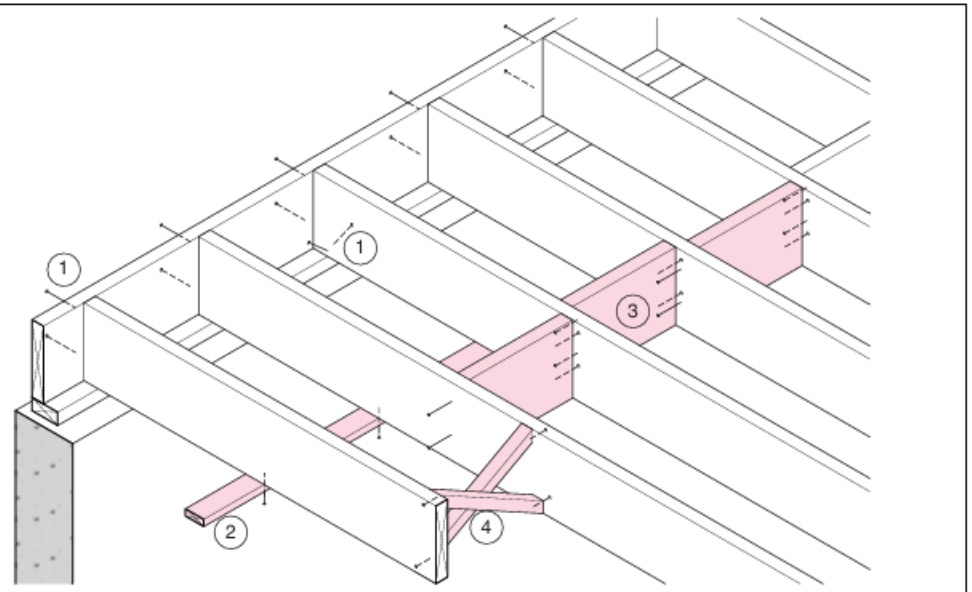
9.23.9.3.Restraint of Joist Bottoms

1) Except as provided in Sentence 9.23.9.4.(1), bottoms of floor joists shall be restrained from twisting at each end by toe-nailing to the supports, end-nailing to the header joists or by providing continuous strapping, blocking between the joists or cross-bridging near the supports.

Or a combination – note CWC Span Book.

9.23.9.3. Restraint of Joist Bottoms

This Article requires that the bottom of joists be restrained from twisting. Figure 9.23.-16 shows the methods used to resist joist twisting. Bridging, strapping, or both bridging and strapping also increase stiffness and reduce the vibration of floor joists. Strapping is not required where furring strips or a panel-type ceiling finish is attached directly to the joists.



Options for restraining floor joists from twisting:
(1) end-nailing to header or toe-nailing to support
(2) continuous 19 mm × 64 mm (1 in. × 3 in.) minimum strapping (not required if furring strips or panel-type ceiling finish attached directly to joists)
(3) 38 mm (2 in.) solid blocking
(4) 38 mm × 38 mm (2 in. × 2 in.) or 19 mm × 64 mm (1 in. × 3 in.) minimum cross-bridging

EG00045C

Figure 9.23.-16
Restraint of floor joists from twisting

Figure from Illustrated Users Guide – NBC 2020.

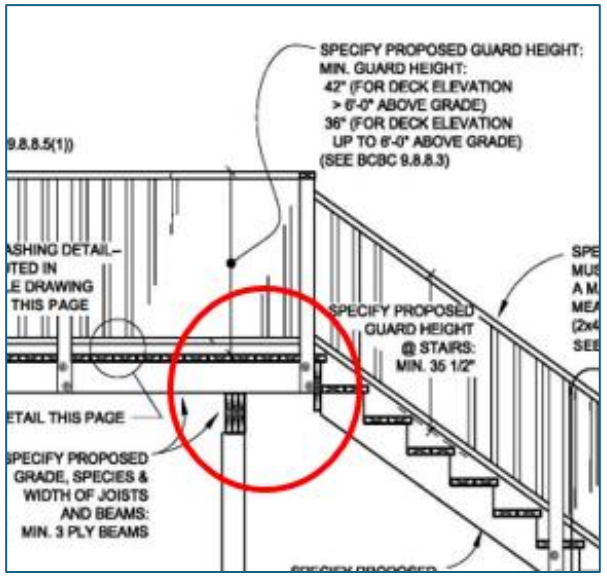
9.23.9. Floor Joists

9.23.9.9. Cantilevered Floor Joists

1) Floor joists supporting roof loads shall not be cantilevered more than 400 mm beyond their supports where 38 mm by 184 mm joists are used and not more than 600 mm beyond their supports where 38 mm by 235 mm or larger joists are used.

2) The cantilevered portions referred to in Sentence (1) shall not support floor loads from other *storeys* unless calculations are provided to show that the design resistances of the cantilevered joists are not exceeded.

3) Where cantilevered floor joists described in Sentences (1) and (2) are at right angles to the main floor joists, the tail joists in the cantilevered portion shall extend inward away from the cantilever support a distance equal to not less than 6 times the length of the cantilever, and shall be end nailed to an interior doubled header joist in conformance with Table 9.23.3.4.



Are deck joists allowed to cantilever?

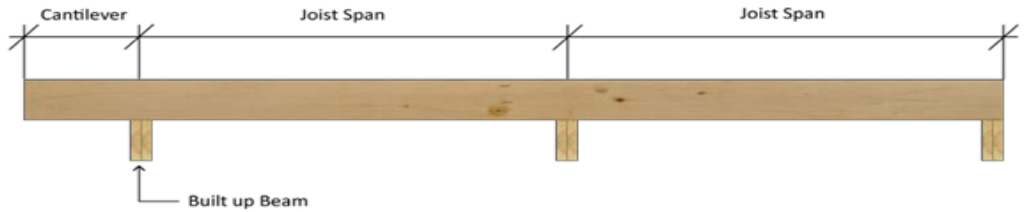
Deck beams should not cantilever beyond columns.

9.23.9. Floor Joists

Structural reference to cantilevered deck joists in Span book and other guides

Framing (Joists and Beams)

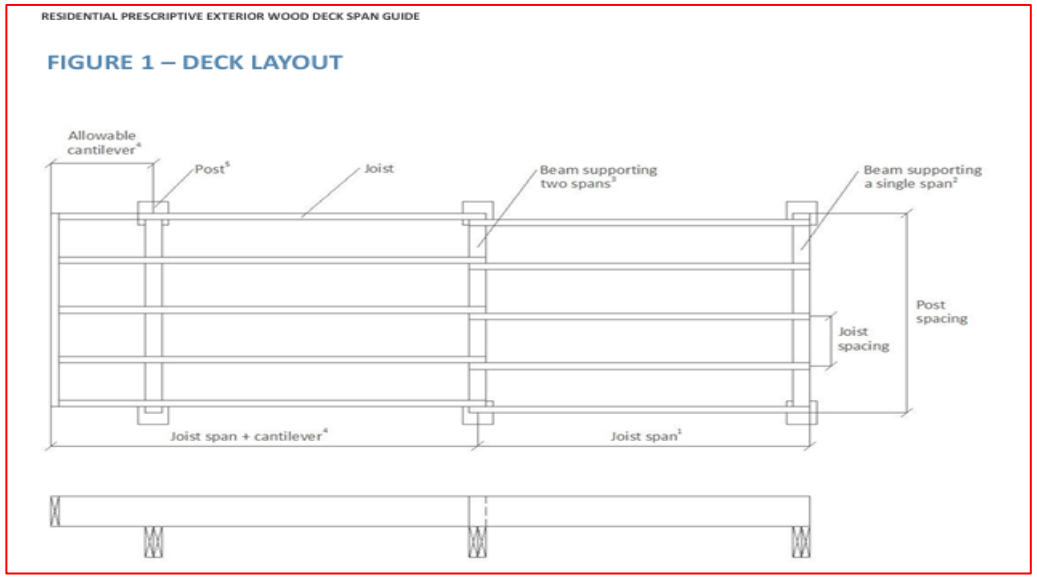
Once the deck or balcony dimensions and design loads are determined, structural framing members (joists and beams) can usually be selected from span tables in the Code. Framing members are highly influenced by wood species, preservative treatment process (incising), service conditions, and joist spacing and dimensions. The following tables are reproduced from the CWC *Prescriptive Residential Exterior Wood Deck Span Guide*[4] and can be used for incised (treated) wood products in wet service conditions. Note that wet service conditions and the use of pressure treated lumber will reduce allowable spans compared to untreated, protected framing members. As a result, untreated framing members in protected balconies will generally require different span tables.

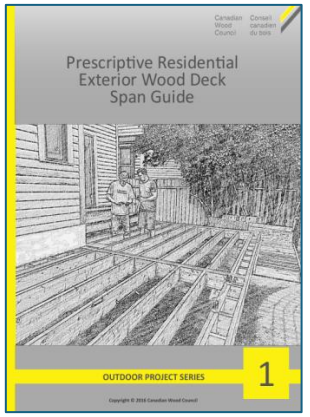


Allowable Joist Spans (meters)

Joist Size (mm)	300mm Joist Spacing				400mm Joist Spacing				600mm Joist Spacing				Maximum Allowable Cantilever (mm)
	DF-L	H-F	S-P-F	Nor	DF-L	H-F	S-P-F	Nor	DF-L	H-F	S-P-F	Nor	
38 x 89	2.01	2.01	1.91	1.73	1.82	1.82	1.74	1.57	1.51	1.58	1.52	1.32	200
38 x 140	3.05	3.16	3.01	2.66	2.64	2.77	2.73	2.30	2.15	2.26	2.34	1.88	400
38 x 184	3.71	3.89	3.95	3.23	3.21	3.37	3.49	2.80	2.62	2.75	2.85	2.28	400
38 x 235	4.53	4.75	4.92	3.95	3.92	4.12	4.26	3.42	3.20	3.36	3.48	2.79	600

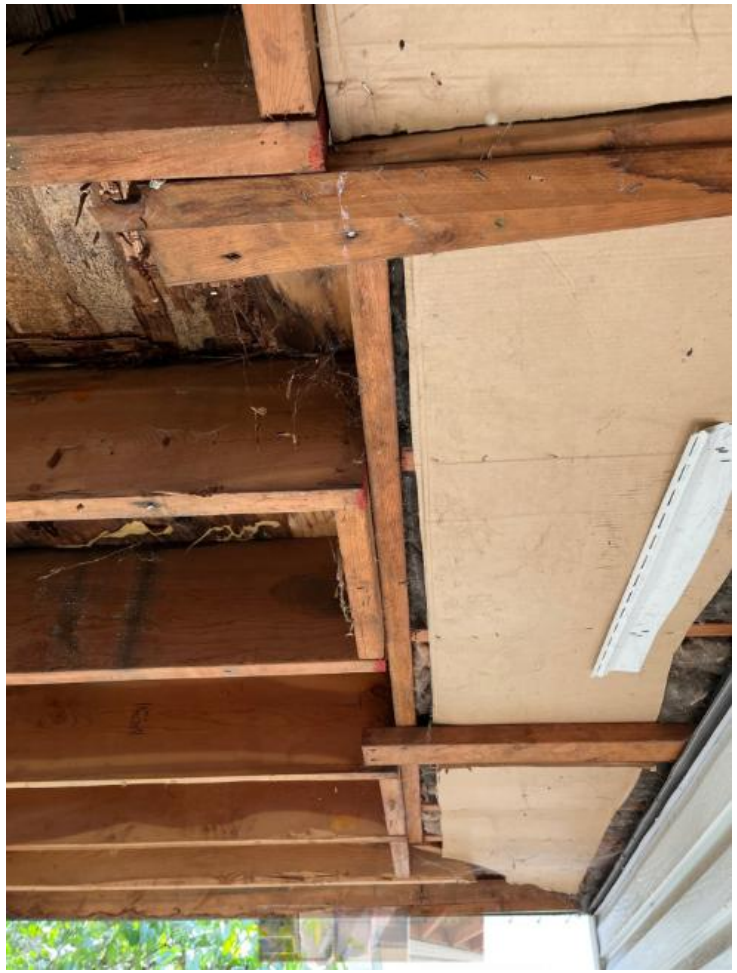
Illustrated Guide - Building Safe and Durable Wood Decks and Balconies





Prescriptive-Residential-Exterior-Wood-Deck-Span-Guide.pdf

9.23.9. Floor Joists – framing error



Typical framing error (member note)

In some homes (1970 – 1980) decks were bult by attaching to the rim joist of a cantilevered bay and squash blocks were used in lieu of hangers. A good sign of a deck built with-out permits.

The deck joists should be brought back to exterior bearing wall.

9.23.10 Wall Studs

9.23.10 Maximum wall heights.

Note commercial tenant space demising walls – typically greater than in the table. Fire can also put additional pressure on walls and therefore high walls to be engineered.

Table 9.23.10.1.
Size and Spacing of Studs
Forming Part of Sentence 9.23.10.1.(1)

Type of Wall	Supported Loads (including *dead loads*)	Minimum Stud Size, mm	Maximum Stud Spacing, mm	Maximum Unsupported Height, m
Interior	No load	38 x 38	400	2.4
		38 x 89 flat(1)	400	3.6
	Attic not accessible by a stairway	38 x 64	600	3.0
		38 x 64 flat(1)	400	2.4
		38 x 89	600	3.6
		38 x 89 flat(1)	400	2.4
	Attic accessible by a stairway plus one floor Roof load plus one floor Attic not accessible by stairway plus 2 floors	38 x 89	400	3.6
	Roof load Attic accessible by a stairway Attic not accessible by a stairway plus one floor	38 x 64	400	2.4
		38 x 89	600	3.6
	Attic accessible by a stairway plus 2 floors Roof load plus 2 floors	38 x 89	300	3.6
		64 x 89	400	3.6
		38 x 140	400	4.2
	Attic accessible by a stairway plus 3 floors Roof load plus 3 floors	38 x 140	300	4.2
Exterior	Roof with or without attic storage	38 x 64	400	2.4
		38 x 89	600	3.0
	Roof with or without attic storage plus one floor	38 x 89	400	3.0
		38 x 140	600	3.0
	Roof with or without attic storage plus 2 floors	38 x 89	300	3.0
		64 x 89	400	3.0
		38 x 140	400	3.6
	Roof with or without attic storage plus 3 floors	38 x 140	300	1.8

Notes to Table 9.23.10.1.:
(1) See Article 9.23.10.3.

9.23.10.6. Studs at Sides of Openings

1) Where the lintel spanning the opening is more than 3 m long, studs shall be tripled on each side of the opening so that

a) the two inner studs on each side extend from the bottom of the supported lintel to the top of the bottom wall plate, and

b) the outer stud on each side extends from the bottom of the top wall plate to the bottom wall plate.

2) Except as provided in Sentence (3), where the lintel spanning the opening is not more than 3 m long, studs shall be doubled on each side of the opening so that

a) the inner studs on each side extend from the bottom of the supported lintel to the top of the bottom wall plate, and

b) the outer stud on each side extends from the bottom of the top wall plate to the bottom wall plate.

3) Single studs are permitted to be used on either side of openings

a) in non-*loadbearing* interior walls not required to have *fire-resistance ratings*, provided the studs extend from the top wall plate to the bottom wall plate, or

b) in *loadbearing* or non-*loadbearing* interior or exterior walls, provided

i) the opening is less than and within the required stud spacing, and

ii) no 2 such openings of full stud-space width are located in adjacent stud spaces.

(See Note A-9.23.10.6.(3).)

A-9.23.10.6.(3) Single Studs at Sides of Openings.

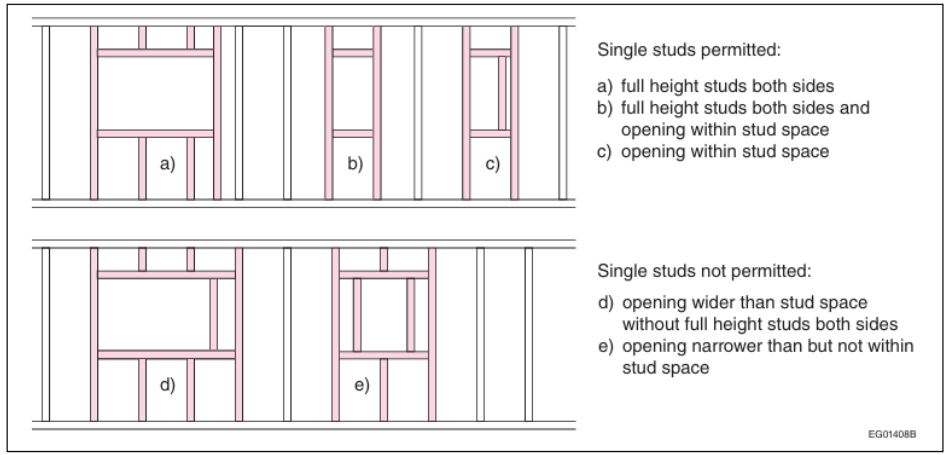


Figure A-9.23.10.6.(3)-A
Single studs on sides of openings in non-loadbearing interior walls not required to have a fire-resistance rating

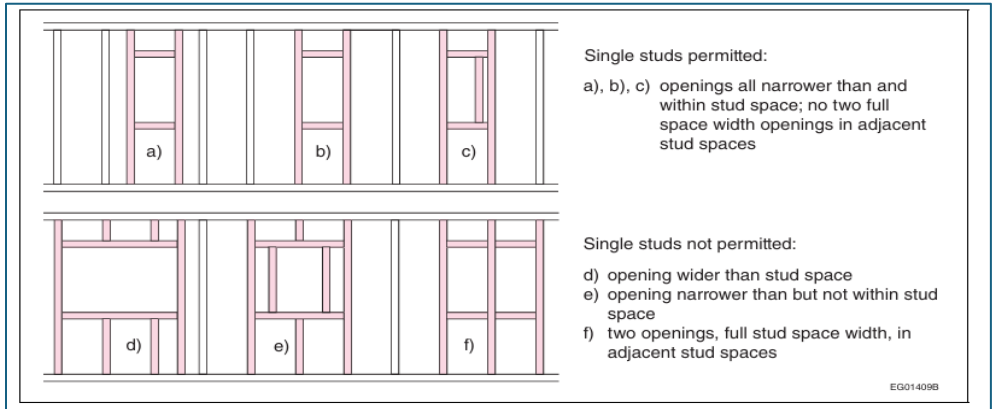


Figure A-9.23.10.6.(3)-B
Single studs on sides of openings in all other walls

9.23.13. Bracing to Resist Lateral Loads Due to Wind and Earthquake

Whitehorse wind and earthquake design parameters currently do not require the application of bracing as outlined in 9.23.13., however changes may apply under the 2025 NBC set for adoption in December.

Province and Location	$S_a(0.2)$ for Seismic Design in Part 9
Whitehorse	0.334

Table A-9.23.13.
Application of Lateral Load Requirements

Applicable Requirements	Wind (HWP)			Earthquake $S_a(0.2)$				
	Low to Moderate	High	Extreme	Low to Moderate	High	Extreme	High	Extreme
	HWP < 0.80 kPa	0.80 ≤ HWP < 1.20 kPa	HWP ≥ 1.20 kPa	$S_a(0.2) \leq 0.70$	$0.70 < S_a(0.2) \leq 1.8$	$S_a(0.2) > 1.8$	$0.70 < S_a(0.2) \leq 1.8$	$S_a(0.2) > 1.8$
	All Construction			All Construction	Heavy Construction(1)		Light Construction	
Design requirements in 9.23.16.2., 9.27., 9.29.	X(2)	N/A	N/A	X	N/A	N/A	N/A	N/A
Bracing requirements in 9.23.13.	X	X	N/A	X	X(3)(4)	N/A	X(4)(5)	N/A
Part 4 or CWC Guide	X	X	X	X	X	X	X	X
X = requirements are applicable								

Notes to Table A-9.23.13.:

(1) See Note A-9.23.13.2.(1)(a)(i).
(2) Requirements apply to exterior walls only.
(3) Requirements apply where lowest exterior frame walls support not more than one floor.
(4) All constructions may include the support of a roof in addition to the stated number of floors.
(5) Requirements apply where lowest exterior frame walls support not more than two floors.

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9.23. Framing

Continue to review

9.23.11. Wall Plates

9.23.14. Roof and Ceiling Framing

9.23.15. Subflooring

9.23.16. Roof Sheathing

9.23.17. Wall Sheathing

FLYWHEEL
BUILDING SOLUTIONS

Building Permit Inspections – New SFH

2) Foundation and Damp-proofing/Plumbing Rough-in Under Slab

Minimum on-site conditions and documents reviewed:

- Previous deficiencies to be corrected
- Permit package on site
- Wood foundation (if applicable) shall comply with CSA-S406 "Specification of permanent wood foundations for housing and small buildings" or Part 4 (Engineering) including but not limited to lateral restraint requirements in compliance with S406-16 clause 4.5.2 and inside corner reinforcement in compliance with S406-16 clause 4.5.6
- ICF and Rebar installation
- Dampproofing appropriate for use (PWF, ICF, etc)
- Radon control
- Confirmation of back-fill material to be used.

Typical deficiencies to avoid:

- plumbing tests to be in place to be verified by Building Official
- galvanized fasteners for PWF and treat all cut/drilled areas
- no notching or drilling of pwf
- underslab insul and poly in the right order (poly in top)

NOTE – this is a benchmark inspection – all previous deficiencies, required documents and updated drawings (when applicable) are required prior to continuing (backfilling). Failure to ensure all outstanding items are provided may result in a Stop Work posting.

FLYWHEEL BUILDING SOLUTIONS

Building Permit Inspections – New SFH

• BP Inspections

3) Framing,

Minimum on-site conditions and documents reviewed:

- Previous - inspection deficiencies completed,
- Review of substantial changes of layout or use,
- Substantial completion of framing - **All framing to be visible**
  - **Note – insulation including spray foam not to be applied.**
- Review for cuts, notches and drilling damage
  - Rough-in's (plumbing, Elec, Gas) should be completed
- Completion of roof truss/floor system bracing as per design
- Verification of spatial calculation – no changes to window sizes
- Insulated Concrete Forms (ICF) installation (if applicable for above ground use)
- Back-framing and fire blocking to be substantial completed,
- Columns, centrally located on footing pad or foundation wall - size and attachment,
- Stairs and headroom clearances,
- Lintel sizing for window/door openings,
- Anchorage of building frame.

Standard documents required.

- Heat loss calcs and TECA/HRAI ventilation checklist to be provided prior to booking
- Engineers field review if applicable
- Sealed engineered truss specs – note also beams if applicable
- Permit package including permit drawings and roof/floor layouts

Note – The NBC sets maximum moisture content for wood products at 19%. Precautions should be taken to ensure weather conditions or moisture laden air from heating equipment does not create higher moisture levels.

FLYWHEEL BUILDING SOLUTIONS

Building Permit Inspections – New SFH

• BP Inspections

3) Framing,

NOTE

1) Roof and parallel chord truss individual designs sealed by a Yukon Engineer are required to be submitted prior to booking a framing inspection.

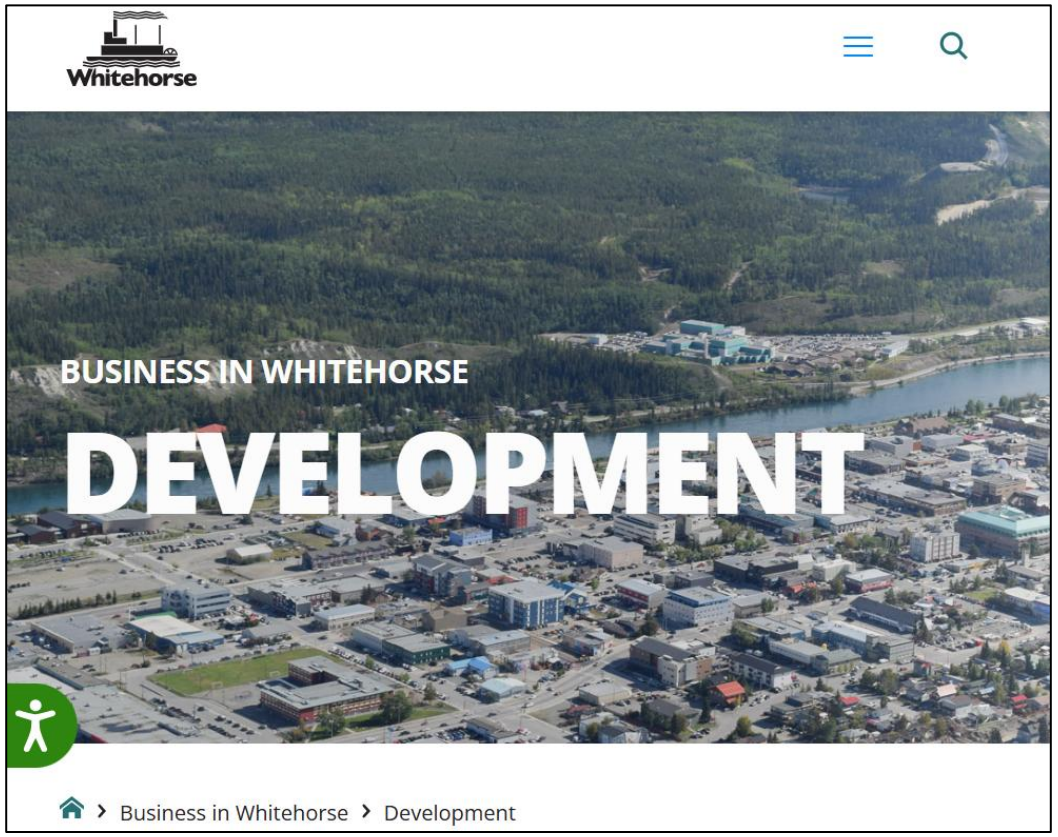
2) For I-joist and other engineered framing systems, the requirements for seals will depend on the complexity and whether there are point loads. As such, requirements for seals will be determined and communicated as a condition of the issuance of a building permit (ie determined during the plan review process).

Although it may seem as a 'new' requirement, our research has confirmed this has been present in many previous NBC code cycles and is currently applied as a standard across Canada. While the city understands that this is a modification to past and present practice in Whitehorse, this will serve to ensure compliance with relevant requirements of the NBC in future.

FLYWHEEL BUILDING SOLUTIONS

When in doubt – reach out

Development - City of Whitehorse



– Land And Building Services

Land and Building Services: 867-668-8346, 867-668-8340, or 867-668-8330
Land Services including subdivisions and lot sales: land@whitehorse.ca
Business Licenses: adminbuilding@whitehorse.ca
Building Inspections: inquirybuilding@whitehorse.ca
Development Permits, Zoning Inquiries: development@whitehorse.ca

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Acting Director, Development Services
lindsay.schneider@whitehorse.ca

Contact Us - City of Whitehorse

FLYWHEEL BUILDING SOLUTIONS

Next Session – February 19th – 9am

Fire Protection (Part 9.10)

- Principles of Fire
- Assisted Living
- Fire compartments
- Fire Separations
- Fire-stopping and blocking
- Fire Fighting and Water Supply
- Spatial

Please forward any questions or comments to Ken at ken.flywheel@gmail.com

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