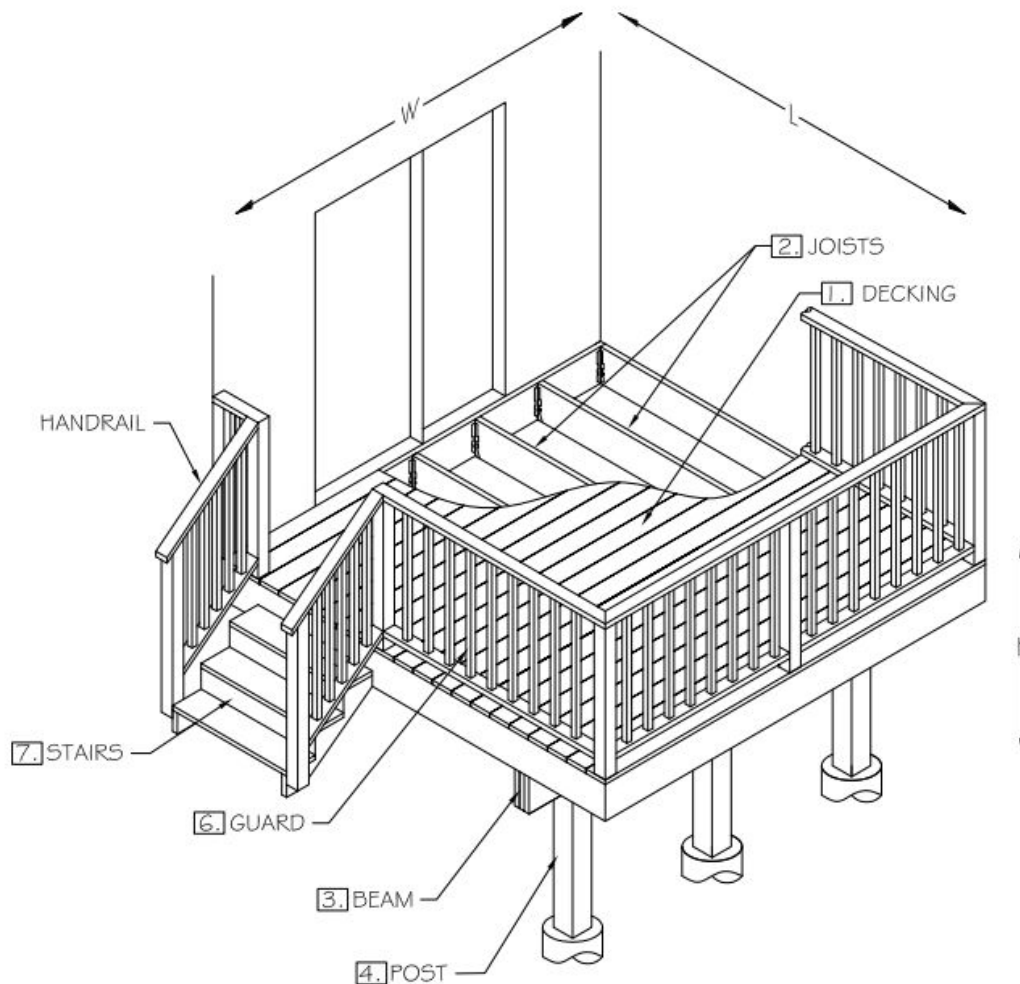


Deck Design Guide Use this guide to help you build your deck.

- [CLICK-Before-You-Dig](#) -OR- DIAL-Before-You-Dig: 1(800)-242-3447 for no-cost utility marking.
- For DECK HEIGHT, the distance of deck walking surface to ground level at the highest point adjacent the deck, of
 - up to and including 0.6m: no building permit is required.
 - more than 1.8m or 71": submit both
 - Engineer-stamped design for the foundation, and
 - CCMC Evaluation Report, Alberta engineering, or product test results for manufactured guards
 - more than 3.66m or 12': also provide Alberta-engineer-stamped design for all deck and all connections.
- Any deck supporting a hot tub or other extraordinary load requires Alberta-engineer-stamped design for all deck and all connections including ledger board connection to house wall.
- Ensure minimum clearance of 3.5 m (11' 6") above deck walking surface to electrical wires.
- Nominal Imperial dimensions are listed. See Alberta Building Code (ABC) for exact requirements.
- OC means "On Centre", measured centre to centre of the member
- < means 'less than' | ≤ means 'less than or equal to' OR 'no more than'
- > means 'greater than' | ≥ means 'greater than or equal' OR 'no less than'



Deck Height is the greatest vertical distance between deck walking surface and finished ground level. Minimum guard height and certain design requirements are determined by the height of the deck. Marked H, above.

Deck Width is measured parallel to the house, OR if a freestanding deck, the dimension at a right angle to joists. For a simple deck plan, the deck width will be the same as the deck beam length. Marked W, above.

Deck Length is measured at a right angle to / projecting from the house OR if a freestanding deck, the dimension in direction of joists. For a simple deck plan, deck length is one factor in choosing a joist size. Marked L, above.

Materials in exposed construction must be resistant to deterioration due to exposure and climatic conditions. Suitable coatings or stains can be used to protect an uncovered deck surface and its structural frame. Factory treatment with preservative reduces untreated lumber allowable spans marginally, as shown in [Prescriptive Residential Exterior Wood Deck Span Guide](#) © 2016 Canadian Wood Council.

We recommend you read up on the handling and use of treated lumber [here](#) and [here](#). Use proper fasteners with treated lumber, as directed by the manufacturer.

1. DECKING

The selected deck surface influences deck floor frame construction, as materials have different tolerances.

Lumber: < 1½" thick (e.g., 5/4x6, etc.) must be supported on joists spaced only up to 16" OC

Lumber: 1½" thick (e.g., 2x4, 2x6, etc.) may be supported on joists spaced up to 24" OC

Manufactured decking made of composite materials, PVC, fibre-reinforced, etc., (e.g., Timbertech, Trex, etc.) and **Liquid membrane** coatings, sheet goods (e.g., Duradek, etc.) or similar products must have Canadian Code approvals or a [CCMC Evaluation Report](#) which lists product uses and limitations.

Obtain this documentation from the material supplier that manufactured decking material or a complete manufactured deck system meets ABC2019 or NBCC 2015--with testing reports, Alberta-engineer-stamped drawings or specifications, or CCMC Evaluation Report. Review and plan to follow those documents carefully, and submit a copy with the Deck Design Form. Follow the joist spacing, floor construction and preparation requirements the manufacturer specifies.

2. JOISTS

Joists are lengths of lumber, spaced in parallel arrangement to support the deck floor.

Joist selection is based on a balance of factors:

- **Span**--distance a joist will safely support design floor loads between supports, measured from mid-support on this form.
- **Spacing** of joist--typically spaced 16" OC but may be restricted by the spacing needed to support the desired decking.
- **Species** & Grade of wood--Spruce-Pine-Fir #1, common Edmonton-area lumber, is listed here.
- **Cantilever**--joist extension beyond the support, measured from mid-support on this form.

Based approximately on common product availability, the lighter-shaded section on the [Deck Design Form](#) indicates non-incised "smooth" or "weather" wood treatment and darker-shaded section indicates pressure-treated 'incised' wood treatment. Blank space indicates material length generally unavailable.

Spans listed on the [Deck Design Form](#) are from the [Prescriptive Residential Exterior Wood Deck Span Guide](#) © 2016 Canadian Wood Council (Spruce-Pine-Fir #1) for factory-treated lumber. Span Tables in

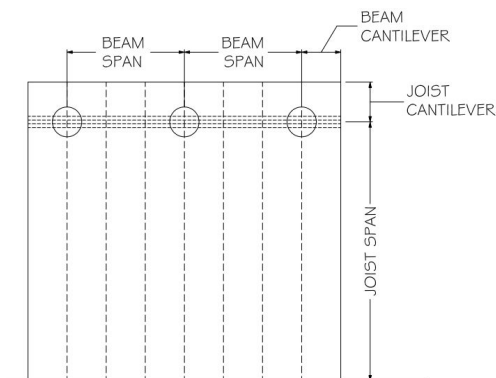
ABC2014 or [Canadian Wood Council Span Book](#) may also be used for lumber not treated in a preservative-treatment factory, and for other species such as Cedar that may be preferred.

Minimum 2" x 8" joist is recommended where wood side-mount guards are planned, to provide adequate vertical connection surface.

Experience in Edmonton has shown that typical settling and seasonal differential movement will not adversely affect the house rim board or wall if the deck frame is connected to a well-installed ledger board. ABC does not provide specific direction on ledger board fastening. *Consider sources such as the [International Residential Code](#), a US model building code, for best practice guidance for ledger installation.*

Laying decking at an angle involves shifting joists closer together or selecting a joist with spacing that accommodates the actual maximum permissible unsupported length of decking, measured along board.

Most often, a hot tub will be supported directly on the ground and a deck will be constructed around it. Any deck supporting a hot tub or other extraordinary load requires Alberta-engineer-stamped design for joists, beam, posts and foundation, and all connections including ledger board connection to a house wall.



There will often be a number of acceptable combinations of joist size and spacing. An example is provided below.

EXAMPLE - How to select floor joists for DECK LENGTH = 13'-3" from DECK APPLICATION

Read the line for 2x4 joist: there is no spacing shown for which 2x4 will provide for the desired 13'-3" length, even with a cantilever.

Move down to 2x6 joist @8" OC spacing: 11'-6" is the allowable span + 16" available cantilever = 12'-10", which falls short of the 13'-3" target.

Move down to 2x8 joist @8" OC: 15'-1" is the allowable span, which exceeds the minimum, even neglecting the cantilever potential.

Move across to 2x8 joist @12" OC: 13'-2" is the allowable span with up to 16" of available cantilever also easily exceeds 13'-3"

Move further to 2x8@16" OC: 12'-0" is allowable span; adding 16" cantilever totals to 13'-4" which is good for 13'-3" deck length.

Move down to 2x10 joist, and scan across the line to 24" OC; 11'5" span + 24" cantilever results in a span that exceeds the target of 13'-3", so this and any closer spaced 2x10 are acceptable. Closer-spaced joists will provide a stiffer floor, all else being equal.

Position the beam to not exceed maximum permissible joist span and not exceed maximum permissible cantilever.

The valid joist choices are: 2x8@ 8", 12" or 16" OC -AND- 2x10@8", 12", 16" or 24" OC spacing, using treated Spruce-Pine-Fir #1

There may be additional factors to consider: material cost and availability, construction ease, ground clearance, etc.

3. BEAM

A **drop beam**--located under the joists--allows the floor to 'cantilever' or extend beyond the beam by up to the amount listed on the Deck Design Form (on the same row as the joist to be chosen). Position the beam such that neither the allowable cantilever nor the maximum acceptable joist span is exceeded (as measured from centre of beam for this application).

A **flush beam**--where joists are fastened to the side of beam--requires that the beam material be at least the same size as the joists. Use acceptable metal joist hangers (e.g., [Simpson](#), etc.) and fasteners (nails, etc) indicated by the hanger manufacturer.

Substitute 2-2" x 10" for 3-2" x 8" OR 2-2" x 12" for 3-2" x 10" in the beam table provided on the Deck Design Form, which lists minimum beam sizes which may be upsized if desired. Untreated lumber may be substituted for treated lumber OR size beams by tables in ABC or in [Canadian Wood Council Span Book](#) .

Position the beam--2 or more plies of lumber laminated together by nailing or bolting--on top of the posts.

Nailing: 2 rows 3½" nails spaced ≤ 18" apart, and also 4-6" from the end of each piece; -OR-

Bolting: min ½" diameter bolts/washers spaced ≤ 4' OC, with the end bolts located ≤ 2' from the ends.

Joints in a 2-ply beam must occur over a post, and both plies should not have a joint over the same post. If a joint cannot be situated over a post, consider 3 plies of lumber built up per ABC as shown in the diagram below and as follows.

Only one joint may occur in any individual member ('layer') of a built-up beam within any one span.

Joints in individual members at or near a ¼ point cannot occur in adjacent members.

The number of jointed members in a span cannot reduce the effective beam width by more than ½ i.e., in a 3-ply beam, only one joint per span of beam; in a 4-ply beam, 2 joints in alternate members is okay.

A-9.23.8.3. Joint Location in Built-Up Beams.



Figure A-9.23.8.3.
Joint location in built-up beams

Beam cantilever is not defined in ABC. A rule of thumb is that the beam should not cantilever more than 1½ times its depth; e.g., 2 ply 2"x8" beam may extend 12" from centre of post. If beam cantilever exceeds this, engineering may be required.

4. POSTS

Wood posts supporting a beam must be of 6"x6", unless supporting a 2-ply beam for a deck ≤1.8m high in which case a 4"x4" post may be used. **Other post materials** proposed, such as iron columns, are to be accompanied by product specifications including connection details.



Framing **lumber < 6" to the ground** must be of lumber pressure-treated with preservative to prevent premature deterioration. Separate it from concrete in contact with the ground by 0.05 mm (2-mil) polyethylene film or roll roofing, or other appropriate solutions such as metal post bases, saddle anchors or neoprene spacers.

Wood posts may be built-up of minimum 1½" -thick full-length lumber bolted together with minimum ¾" diam bolts spaced @ ≤ 18" OC, -OR- nailed together with minimum 3" nails @ ≤ 12" OC.

The deck beam must be fully **supported** on the top of the post, and securely fastened to the post to reduce the likelihood of lateral movement between the post and beam. ABC provides no direction for a 'split beam' bolted to the sides of a post, so do not use it without submitting an engineering detail.

Ground **anchorage** is not specifically required for decks up to 55 sq m in area not supporting a roof.

Posts are to be **centred** on the supporting pad/pile/pier to effectively transfer load to the ground.

Where **Deck Length > Deck Width**, lateral bracing in addition to that provided by the ledger and post-beam connections should be considered. Diagonal members from corner posts to deck frame are typically adequate.

5. FOUNDATION

Pads of concrete on well-drained, undisturbed or compacted soil or rock, largely free of organic material, have proved adequate for supporting attached or freestanding decks near ground level. There must be tolerance for seasonal movement or ground settlement, and a way to access the posts to adjust the level from time to time as needed due to movement.

Where a deck is supported on pads on other than coarse-grained soil with good drainage or rock, access to the foundation positions to permit re-levelling of the platform shall be provided by ensuring either a minimum 2' x 2' accessway to under the deck where joist bottoms are at least 2 ft above the ground, -OR- by installing removable decking in order to make adjustments.

Piles of concrete or metal (also called helical piles, torque piles or screw piles) are not defined in ABC, so require design.

For Deck Height >1.8m (71"), stamped design (sealed/signed by a registered professional) must be submitted with the application. If you have a long-term plan to enclose the deck, then engineering of any of the foundations listed will eventually be required, regardless of deck height.

Piers under decks are typically [pad footings](#) placed below frost level (at least 1.2 m (4') below grade is typical in Edmonton but dependent on soil conditions) -AND- below level of earth disturbed from previous

excavation with an integral minimum 190mm x 190mm (8" x 8") column rising up to at least 150mm (6") above the finished ground level. (And not commonly used today.)

Foundations located on or near **"top-of-bank"** sites must be designed to account for potential slope instability.

For **Deck Height** > 1.8m (71"), engineering is required for any foundation type.

For **Deck Height** >3.6m (11'-8"), submit engineer-stamped drawings for deck foundation, columns, guards, stringers, and all connections--deck ledger to house frame; joists to ledger; joists to beam; beam to posts; posts to foundation.

6. GUARDS

Sides of a deck must be protected by a guard to mitigate fall hazards where the deck is

- not built against a wall that is at least as high as the required guard,
- more than 24" high, or
- where the ground within 48" of the deck is sloping away at a rate steeper than 1:2 (~30°)

Guards must be at least 1.07m (42") high, measured from the deck surface to the top of the guardrail, but may be 0.9 m (36") high if the Deck Height is less than 1.8m (71"). Guards are to be non-climbable, between 150mm and 900mm (6" and 36") above the walking surface.



Blocking should be provided where the guard post is side-mounted to the deck floor structure to ensure that the design loads are met as specified in ABC. Minimum 2"x8" joist is recommended if wood side-mounted guards are proposed, for adequate vertical connection surface.

Guard posts should be fastened with lag bolts or through bolts to ensure they are adequately supported; examples of best practice details are provided in [Supplementary Standard SB-7⁶](#) of the 2012 [Ontario Building Code Compendium](#).

Openings in deck guards must be small enough to prevent the passage of a 100 mm (4") diameter sphere, and designed so no part between 150mm and 900mm (6" and 36") allows for climbing.

For Deck Height ≤ 0.6m (24"), no guard is required but, if one is provided, the openings through the guard must be <100mm (4") -OR- >200mm (8") to prevent a child from accidentally getting stuck in the guard. Glass in guards must be safety glass or wired glass.

The product supplier will provide you documentation that a manufactured guard system meets ABC 2014 or NBCC 2015-- Alberta-engineer-stamped drawings or specifications, or a CCMC Evaluation Report confirming ABC compliance.

Fixed benches around the deck perimeter meeting the height and openings requirements of guards, measured **up** from the seating surface of the bench -AND- meeting the restrictions on guard openings below the seating may serve as a guard.

7. STAIRS, HANDRAILS and GUARD

Minimum overall width of a stair is 860mm. A stair must be consistent in (+/-5mm tolerance from step to step) rise of 5" - 7½" run of 8¼" - 14" treads between 10" - 14" and with tread nosing between 0 - 1".

Exterior wood stairs, like the posts, are not to be in direct ground contact unless treated with a wood preservative or isolated like the posts. Stair stringers are to be 1½" thick. Stringer spacing ≤ 900mm may be increased to ≤ 1200mm if riser boards support the front part of the treads. Stair stringers must be well-supported at the top and bottom. Stringer hangers or other steel connectors may prove more robust than nailing or screwing directly.



Stringers, after shaping, must have at least 90mm (3½") minimum effective depth and at least 235mm (9¼") overall depth, both measured perpendicular to the bottom of the stringer.

A common stair construction error is incorrect top step and bottom step rise, due to not accounting for tread thickness when laying out prior to shaping the stringer.

When the deck requires guards, the stair not against a wall also requires guards ≥ 0.9 m (36") high to top when measured vertically from the nosing of the step. Openings in the stair guards have the same restrictions as listed above for deck guards.

A handrail is required on at least one side of an exterior stair where there are more than 3 risers, and must be smooth, graspable and no closer than 50mm (2") to any wall behind it. Attach a handrail with brackets spaced ≤ 1.2m (48") apart and ≤ 300mm (12") from the ends.

The handrail may be integrated into the top of the guard so long as it sits between 865mm (34") and 965mm (38") above the stair, also measured vertically from the stair nosing, and is smooth and graspable.

- This Guide is not an official interpretation of all codes, standards and resources available. Consult source documents if needed.
- Visit [Edmonton Service Center](https://www.edmonton.ca/service-center) or write BuildingSafetyCodes@edmonton.ca for answers to questions not found here.