Human Resources and Skills Development Canada
Ressources humaines et Développement des compétences Canada

Now and Tomorrow
Excellence in Everything We Do

Essential Skills and Apprenticeship

Using Essential Skills: On the Job with a Carpenter

Are you starting an apprenticeship in carpentry or are you thinking about a career in this trade? Pursuing a career as a carpenter requires strong essential skills such as reading, document use, numeracy and critical thinking.

Use this booklet to:

- learn how carpenters use essential skills;
- follow the daily routine of a carpenter; and
- find out how your essential skills compare to those of a journeyperson in carpentry.

How carpenters use essential skills

Carpenters use essential skills to perform a variety of job-related tasks, for example:

- **document use** to interpret blueprints, verify measurements and identify discrepancies;
- **numeracy** to take measurements and calculate the amount of concrete required for footings (foundations); and
- **problem solving** to adapt plans to the space available.

Carpenter

Essential Skills

Reading
Document Use
Numeracy
Writing
Oral Communication
Working with Others
Thinking
Computer Use
Continuous Learning

Carpenters construct, erect, install, maintain and repair structures and components made of wood, wood substitutes and other materials. They work for construction companies, carpentry contractors and the maintenance departments of factories, plants and other establishments. They may also be self-employed.

WP-147-03-10E

Canada

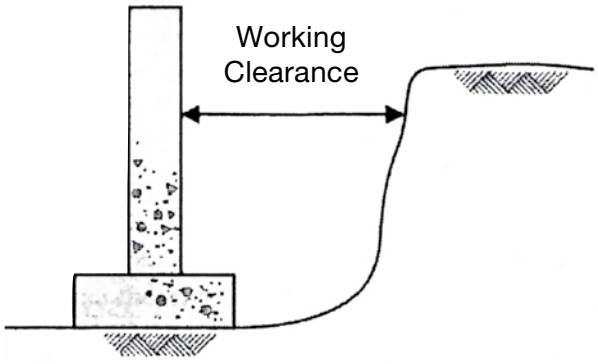
A day in the life of a carpenter: Brenda's story

Preparing the site

Brenda is a residential carpenter. Today she is the only carpenter on the building site of a single-family home. A heavy equipment operator is running an excavator to remove the soil where the foundation will be built. While the operator works, Brenda checks that the excavation is level, reaches the correct depth, and allows for three feet (one metre) of clearance around the outside walls of the house so that she will have enough space to work *(numeracy)*.

The building code specifies that the excavation for the foundation must be below the frost line (depth of frost penetration), which in this case is 18 inches, and must reach a depth where there is no organic material *(reading)*. Luckily, there is no organic material at an 18-inch depth on this job site. Excavating as little as possible will save the company and the homeowner money.

Brenda checks the excavation measurements carefully because once the excavator leaves the site, she will need to correct any discrepancies *(thinking skills – critical thinking)*.



foundation excavation

Section 9.12. Excavation

9.12.1. General

9.12.1.1. Removal of Topsoil and Organic Matter

1) The topsoil and vegetable matter in all unexcavated areas under a building shall be removed.

2) In localities where termite infestation is known to be a problem, all stumps, roots and other wood debris shall be removed from the soil to a depth of not less than 300 mm in unexcavated areas under a building.

3) The bottom of every excavation shall be free of all organic material.

9.12.1.2. Standing Water

1) Excavations shall be kept free of standing water.

9.12.1.3. Protection from Freezing

1) The bottom of excavations shall be kept from freezing throughout the entire construction period.

9.12.2. Depth

9.12.2.1. Excavation to Undisturbed Soil

1) Excavations for foundations shall extend to undisturbed soil.

9.12.2.2. Minimum Depth of Foundations

1) Except as provided in Sentences (4) and (5), the minimum depth of foundations below finished ground level shall conform to Table 9.12.2.2.

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Calculating gravel

Brenda orders gravel to make a solid base for the house. She estimates the volume of the excavation in cubic metres and calculates how many loads of gravel she needs. She then adds an additional 30 percent to her calculation because the gravel will be compacted *(numeracy)*.

Taking delivery

Meanwhile, the lumber supplier has delivered the materials Brenda needs to build the footing ladders that will be used to shape the concrete for the foundation. She checks the delivery slip to make sure that the items listed match what was delivered *(document use)*. Her employer wouldn't want to pay for lumber he didn't receive.

Sales Order

Gilmore's Lumber & Building Supplies

2468 Fraser Street
Vancouver, British Columbia
V6H 1Z9, Canada
Phone: (604) 534-7618
service@gilmores.com

Sold to: Homes by Ngai Ltd
950-1230 West 73rd St

Ship to: Composite Site 92
Anderson Road

*** All orders are F.O.B. Gilmore's Lumber ***

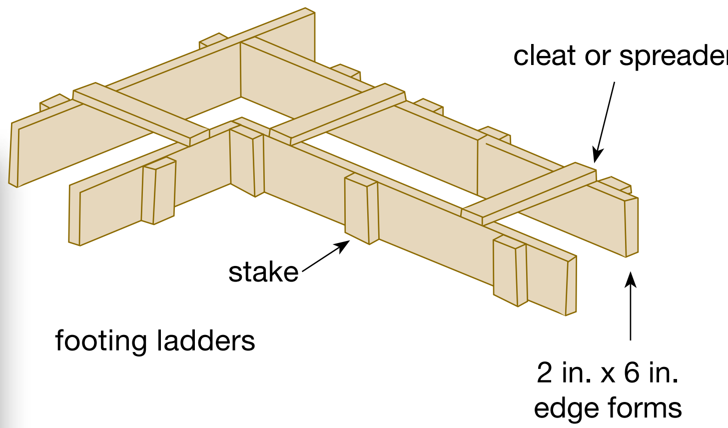
Product Code	Ordered	Description	Shipped
02104SPWRL	3/16	2×10 – 2& BTR SPRUCE SP545	3/16
02084SPWRL	9/16	2×6 – 2& BTR SPRUCE SP545	9/16
02064SPWRL	12/12	2×6 – 2& BTR SPRUCE SP545	12/12
02044SPWRL	30/12	2×4 – 2& BTR SPRUCE SP535	30/12
02024SPWRL	15/16	2×4 – 2& BTR SPRUCE SP535	15/16
01082 SPWRL	2/16	1×6 – 2& BTR SPRUCE SP535	2/16
020141	11SHT	HARDI-PNL PRMD 4×8STH	11

Prefabricating footing ladders

Although the site is not ready for building, Brenda can start prefabricating the footing ladders. She sets up her tools and plans the most efficient way to cut and assemble the pieces *(thinking skills – planning and organizing)*.

Constructing footing ladders

Footing ladders are made using standard-size dimensional lumber. The sides are cut from lengths of 2 in. x 6 in. lumber. Once the sides are in place, Brenda will nail cleats, which are also called spreaders, at three- to four-foot intervals across the top. These cleats are cut from 1 in. × 4 in. lumber and hold the sides of the ladder at a uniform width when the concrete is poured into it *(numeracy)*. Brenda also cuts stakes from 1 in. × 4 in. lumber. Stakes are nailed vertically on the outside edges of the side pieces between the cleats and in the corners for extra support.



Brenda only has four hours to construct the ladders, so she needs to plan a way to get the job done efficiently. She refers to the site plan to find out how long the ladder for each wall of the house needs to be *(document use)*. Since none of the lengths of lumber she has on hand match the finished length of the wall, she will need to either cut a longer piece down to the correct length or piece two or more lengths t*ogether to make the side pieces of the ladders (numeracy)*.

Next, Brenda will cut all the cleats and stakes that are the same length and size of lumber at the same time. Cutting all the cleats and stakes at the same time is more efficient than getting one piece of wood from the lumber pile at a time and measuring, cutting and nailing each cleat or stake individually *(thinking skills – problem solving)*. She does a rough estimate of the number of cleats she will need and cuts them all first. She knows she needs twice as many stakes as cleats, and she cuts these next *(numeracy)*.

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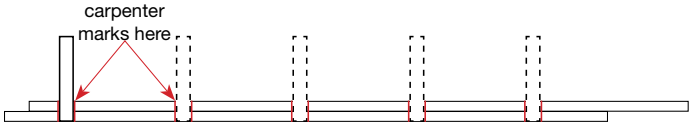
Assembling the side pieces and cleats

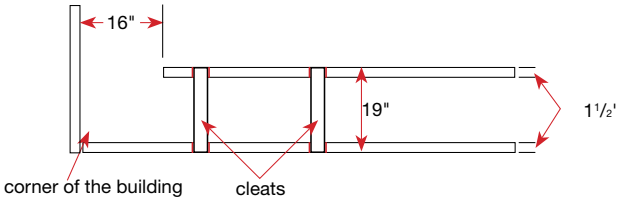
Brenda also figures out a way to assemble the side pieces and the cleats efficiently. The spacing between cleats can vary, but they have to be at right angles to the side pieces to prevent the ladder from twisting. Brenda puts two side pieces together and staggers them to allow for an inside and outside corner. She then places a cleat across the side pieces and, using her carpenter's pencil, she draws a line on both sides of the cleat to mark where it will be nailed. She moves about three feet down the side pieces and uses the cleat to mark the next "rung" on the ladder. When she finishes marking, she can line up the cleats and nail them into place quickly *(thinking skills – critical thinking)*.

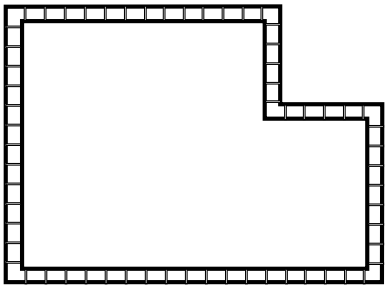
Brenda's boss will arrive on the job site later in the day and will expect the footing ladders for each wall to be ready to place in the excavation. Prefabricating the footing ladders allows them to be moved into place as soon as the gravel has been levelled.

marking the ladder



fitting ladders together



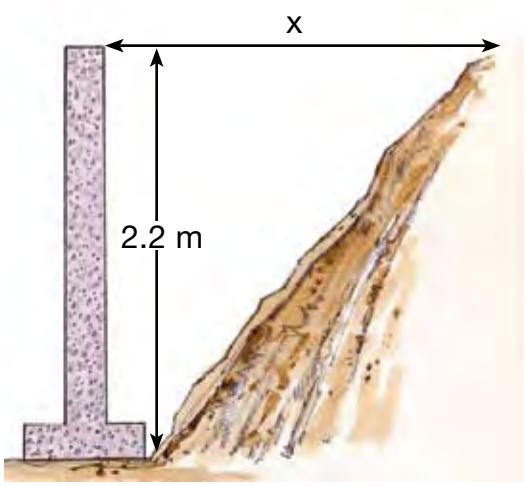


Do you have the essential skills to be a carpenter?

Complete the following questions to see how your skills compare to those of a journeyperson in carpentry. (Answers on page 7.)

1. Calculating setback

Deeper excavations need sloping sides to keep loose material from sliding onto anyone working below. There needs to be a 3:4 ratio between the setback (x) and the depth of the excavation. Calculate the setback needed for a house with a basement that requires an excavation 2.2 m deep. Round your answer to the nearest tenth.



2. Ordering materials

Given the lengths of lumber listed in the sales order below, what is the most efficient combination of lumber pieces that could be used to build the sides of a 27-ft. footing ladder?

Hint: On the order form, 3/16 means 3 pieces of lumber 16 feet long.

Sales Order

Gilmore's Lumber & Building Supplies

2468 Fraser Street
Vancouver, British Columbia
V6H 1Z9, Canada
Phone: (604) 534-7618
service@gilmores.com

Sold to: Homes by Ngai Ltd
950–1230 West 73rd St

Ship to: Composite Site 92
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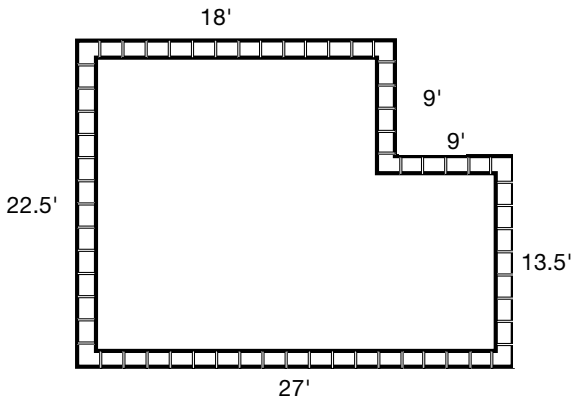
01082 SPWRL	2/16	1×6 – 2& BTR SPRUCE SP535	2/16
020141	11SHT	HARDI-PNL PRMD 4×8STH	11

3. Estimation

Given that cleats need to be placed approximately every three feet, that two stakes are placed between each cleat (one on each outside edge of the ladder) and that one stake is placed in each corner of the assembled footing form, estimate the number of cleats and stakes needed to build footing ladders for the foundation shown below.



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4. Depth of foundations

Carpenters interpret building code to suit the building site conditions. Look at the table below to answer the following questions:

a) How does heating change the minimum depth of the foundation?

b) What types of soil require deeper foundations?

9.12.2.2. Minimum Depth of Foundations

1) Except as provided in Sentences (4) and (5), the minimum depth of foundations below finished ground level shall conform to Table 9.12.2.2.

Table 9.12.2.2.
Minimum Depths of Foundations

Type of Soil	Minimum Depth of Foundation Containing Heated Basement or Crawl Space [1]		Minimum Depth of Foundation Containing No Heated Space [2]	
	Good Soil Drainage[3]	Poor Soil Drainage	Good Soil Drainage[3]	Poor Soil Drainage
Rock	No limit	No limit	No limit	No limit
Course grained soils	No limit	No limit	No limit	Below the depth of frost penetration
Silt	No limit	No limit	Below the depth of frost penetration	Below the depth of frost penetration
Clay or soils not clearly defined	1.2 m	1.2 m	1.2 m but not less than the depth of frost penetration	1.2 m but not less than the depth of frost penetration

Note to Table 9.12.2.2.:

[1] Foundation not insulated to reduce heat loss through the footings.

[2] Including foundations insulated to reduce heat loss through the footings.

[3] Good soil drainage to not less that depth of frost penetration.

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Answers

1. Calculating setback *(numeracy)*

x/2.2 = 3/4

4x = 3 x 2.2

4x = 6.6

x = 1.65

The setback needed is 1.7 metres.

2. Ordering materials *(numeracy, document use)*

The carpenter needs to piece together one 16-ft. length and one 12-ft. length of 2×6 to make a piece of lumber 28-ft. long. The carpenter will then need to saw off 1-ft. to produce a side piece of the correct length.

3. Estimation *(numeracy)*

Perimeter: 27 + 22.5 + 18 + 9 + 9 + 13.5 = 99 ft.
Cleats at 3-ft. intervals: 99 ÷ 3 = 33 cleats
Cleats at both ends of 6 lengths: 33 + 6 = 39 cleats
Total cleats: 39

Twice as many stakes as cleats: 39 × 2 = 78
Two stakes in each of 6 corners: 78 + (2 × 6) = 90
Total stakes: 90

4. Depth of foundations *(thinking skills – problem solving)*

a. Foundations with no heated space need to be deeper.

b. Clay soils and soils that are not clearly defined require deeper foundations.

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