Learning Objectives:
• The features and benefits of the products you sell.
• How to answer your customers’ product-related questions.
• How to help your customer choose the right products.
• How to increase transaction sizes by learning more about add-on sales and upselling techniques.

Chapter 1: Types of Lumber

Module 1: Softwood Lumber

Wood is often classified by the species of tree it is from. Here, we’ll discuss wood from softwood, or conifer, trees.

Product Knowledge:

Fir
• Fir is one of the most abundant and most commonly used woods.
• It is lightweight, versatile and strong. It is one of the most common western softwoods used in construction and the first choice of builders and engineers. It has good performance against high winds and earthquakes.
• Fir holds nails, plates and glue well. It also responds well to use with machine or hand tools.
• It is used for framing in residential construction and a wide range of commercial applications. It also stains well and is often used for exposed applications, such as windows, doors, paneling or beams.
• The most common type is Douglas Fir. Western Larch is another wood species that is often mixed with Douglas Fir in dimensional lumber products. However, they are separated in appearance-grade lumber. They are also available in treated wood.
• Douglas Fir and Western Larch have essentially the same physical and working characteristics.
• They have a smooth texture and a straight grain. Their color can be almost pure white or orange/red, depending on which part of the trunk they are cut from.
• A mixture of Douglas Fir and Western Larch is marked “DF-L”, or with symbols assigned by the Western Wood Product Association (WWPA).

Hemlock
• Hemlock is strong, free from pitch and easy to work.
• Hemlock has a straight grain and a fine texture that resists splitting and holds stain well.
• Its color ranges from an off-white to a faint reddish-brown.
• Popular uses include framing, trusses, decking, paneling and cabinet work.
• Hemlock is often grouped with fir wood and referred to as Hem-Fir. These two species are often grown, harvested, milled and marketed together because of their similar characteristics. It is one of the most popular softwoods in the Western region.
• The Hem-Fir variety is a popular choice for pressure treated woods.
Pine
- Pine has high strength and nail-holding ability.
- It is used for a variety of applications, from construction to furniture making.
- Pine is the most common wood to be pressure treated to give it extra durability in outdoor applications.
- The most common type of pine is Southern Pine or Southern Yellow Pine.
- Another type is Ponderosa Pine, which has a softer texture. This type is best for light framing applications and outdoor applications. It also holds stain well and is often used for furniture and woodwork.
- Radiata pine is sold for finish boards, but used primarily for manufactured products, such as moldings and finger-jointed materials.

Spruce
- Spruce is used for a variety of general construction work, as well as highly specialized uses, such as building musical instruments.
- It is often combined with pine and fir, which share similar characteristics, including high strength, lightweight and durability.
- A mixture of spruce, fir and pine wood is referred to as SPF.

Cedar
- Cedar is used for siding, decking and fences, as well as interior paneling, molding, doors, windows and furniture.
- One common type is Western Red Cedar. It is the largest of all cedars. It contains no resin and is a very decay resistant species for both interior and exterior uses.
- Its color ranges from white to a dark reddish brown to a light yellow. It also has a strong aromatic or spicy odor.
- It has a fine, straight grain and uniform texture.

Redwood
- Redwood has the least amount of shrinkage compared to other common softwoods. That means in exterior use it stays straight and flat.
- Redwood has little pitch or resin, which allows it to take and retain finishes well.
- It is lightweight and strong, easy to saw, glue, nail or drill.
- Redwood is strong for its weight and can be used for load bearing supports such as posts, stringers and deck framing. However, it should not be used in ground contact and needs to be preserved to prevent rot and insect damage like any other wood.

Common Defects in Softwood
Lumber is graded according to its quality, or how many defects it has. The grade of each piece of lumber will determine how it can be used. We'll learn more about grading softwood in the Dimensional Lumber module, but here, we'll introduce some common defects that can affect the grade of a piece of lumber.
- Twist is curving so the four corners are no longer in one plane. The board is curved in a spiral like way.
- Cupping is a deviation from the flat plane. The wide surface of the board is curved across the face.
- Bow is the lengthwise curvature of the wide face of the board.
- Crook is the lengthwise curvature of the narrow edge.
- Knots are classified by size, from pin knots to large knots.
For an explanation of more defects, see the appendix.
Taking it to the Floor:

Frequently Asked Questions

Q: Should I use a special type of fastener for wood I’ll be using outside?
A: For exterior wood applications, use a corrosion-resistant fastener, such as stainless steel or hot-dipped galvanized steel.

Q: What is kiln dried lumber?
A: Kiln drying is sending lumber through an oven to drive the moisture out of the wood. The alternative is air drying, which means the lumber is stacked outside until the moisture evaporates from the wood. Lumber used in homes must be dried before it is used. Otherwise, it will shrink and cause problems in the structure. It is often labeled KD on the stamp.

Q: What type of wood is usually pressure treated?
A: Pressure treated wood is commonly pine. This gives it extra durability in outdoor applications.

Add-on Sales

- Suggest a square and tape measure for measuring boards to the desired length.
- Most customers will want a power saw for cutting lumber.
- Suggest a hammer and nails for fastening lumber together.
- A tool pouch is handy for keeping tools and fasteners close at hand while working on a project.

Module 2: Dimensional Lumber

Softwood lumber cut and sold in lumberyards is divided into three categories: dimensional lumber, timbers and boards. In this module, we’ll discuss dimensional lumber.

Product Knowledge:

Sizing Lumber

- Much of the lumber you sell at your store has been cut to standard dimensions. It is usually planed smooth on all four sides. Most of this lumber, however, is referred to by its nominal size, not by its actual size.
- The nominal size is the size of the lumber before it has been dried and planed. Therefore, the actual size will be smaller than the nominal size. For example, lumber that is sold as a 2x6 (nominal size) is actually 1-1/2" deep x 5-1/2" wide.
- Lumber sized between 2” and 4” thick (nominal) is often referred to as dimensional lumber.
- When referring to the nominal size of dimensional lumber, refer first to width and depth. When length is stated, it is the actual length, not nominal length.
- When selling packages of lumber, you may sell in terms of board feet. We’ll discuss that in Chapter 2, module 2.
- In the chart on the following page, you’ll see some of the common nominal sizes followed by the actual sizes.
Nominal Size | Actual Size
---|---
1” | 3/4”
2” | 1-1/2”
4” | 3-1/2”
6” | 5-1/2”
8” | 7-1/4”
10” | 9-1/4”
12” | 11-1/4”

Grading

- Lumber is also sold according to its grade. Each piece of wood is graded by national standards developed by the U.S. Department of Commerce. Those standards are then enforced by regional associations. Most of the information in this course is based on information from one of the largest of those lumber producing associations, the Western Wood Products Association (WWPA).

- Lumber may be graded for strength or appearance. Since it is used for structural applications, dimensional lumber is graded for strength.

- Following are the grading guidelines established for Southern Pine. These grades are similar to other species grades but they have more grade separations available. However, most mills do not manufacture all products and make all grade separations.
  - Select Structural: High quality, relatively free of characteristics that may impair strength or stiffness.
  - No. 1: Provides high strength, recommended for general utility and construction purposes.
  - No. 1 Dense: Good appearance, especially suitable where exposed because of knot limitations.
  - No. 2: Although less restricted than No. 1, it is suitable for all types of construction.
  - No. 2 Dense: Allows well-spaced knots of any quality.
  - No. 3: Assigned design values meet wide range of design requirements. Recommended for general construction purposes where appearance is not a controlling factor. Many pieces included in this grade would qualify as No. 2 except for a single limiting characteristic. Provides high quality and low cost construction.
  - Stud: Composite of No. 3 strength and No. 1 nailing edge characteristics.
  - Economy: Usable lengths suitable for bracing, blocking, bulk heading and other utility purposes where strength and appearance are not controlling factors.

The Grade Stamp

- The WWPA Certification Mark certifies that the lumber has been judged by WWPA standards.

- Mill Identification —allows WWPA to identify which mill produced a piece of lumber.

- Grade Designation—identifies the grade of the lumber.

- Species Identification—indicates the species or group of species of tree.

- Condition of Seasoning—indicates the moisture content of the board at the time it was cut.
Light Framing

• Light framing lumber is used where high strength values are not required.
• It is typically available in SPF, or spruce, pine, fir.
• It is usually sized 2” to 4” thick and 2” to 4” wide.
• Most of the uses for 2x4s in residential construction are non-structural.
• It is available in construction, standard, utility and economy grades.

Studs

• Studs are used for structural purposes, including load bearing walls.
• Its sizes are usually 2x4 or 2x6 and 10’ long or shorter.
• One common length of precut stud is 92-5/8”. This is used where a sole plate is put under the stud and two plates are put on top, making a total inside floor-to-ceiling height of about 8’.
• Another common length of precut stud is 94-1/8”. This is used in cases where there is a sole plate under and only one top plate, still making a finished height of 8’.
• A third common length of precut stud is 92-1/4”. This is common with slab construction where carpet will be applied directly over the slab. It’s popular in Texas and the Southwest.
• Stud is its own grade, and is a composite of No. 3 strength and No. 1 nailing edge characteristics.

Structural Light Framing

• Structural light framing lumber is used for engineering applications where higher bending strength ratios are needed in light framing sizes. It is typically used in trusses and concrete pier wall forms.
• Sizes are 2” to 4” thick and 2” to 4” wide, the same as light framing sizes.
• Many stores will not carry this kind, except for 4x4s.
• Grades are often mixed and labeled “Standard & Better.” This means the buyer may receive a mixture of Standard and Construction graded pieces.

Structural Joists & Planks

• Structural joists and planks are used for engineering applications for lumber 5” and wider, such as joists, rafters and general framing uses. They are also used for beams or girders, posts, stair stringers or any other load-carrying purpose.
• Sizes are usually 2x6 through 4x16.
• The typical store stock includes 2x6, 2x8, 2x10 and 2x12.
• Stores generally only stock one specie for each size.
• Grades are often mixed and labeled “#2 and Better.” This means the buyer may receive a mixture of #2, #1 and Select Structural. Each lumber is stamped with its specific grade, but most consumers will not need to pick out all of one type.
Taking it to the Floor:

Frequently Asked Questions

Q: Why is it called a 2x4 if it is really only 1-1/2” x 3-1/2”?
A: The piece of wood started out 2” x 4”, but the process of drying and planning made it smaller. How much it shrinks depends on whether the lumber has been left green (undried) or has been dried to a moisture content of 19% or less (which is considered dry).

Q: Why are some 2x4s more expensive than others?
A: The quality is very different between the two. One is a Stud grade piece of lumber and the other is Utility grade. The Utility grade is much lower quality and shouldn’t be used for construction in load bearing walls. There is a big difference in quality between the two.

Q: What grade of board should I use for building a wall?
A: If the wall won’t be carrying any weight above it, you can use a light framing 2x4. The other option is a stud, which can be used for load bearing walls.

Add-on Sales

• Customers purchasing dimensional lumber will likely also need common nails for general construction applications.
• Customers involved in general construction may also need framing straps and ties, such as joist hangers, tie plates and nail plates.
• A carpenter’s pencil is another item the pro customer may need to buy frequently.
• Customers purchasing a large quantity of lumber may want to consider extra saw blades, in case the ones they are using start to get dull.
• Always suggest personal safety equipment, such as gloves, safety glasses and ear protection.

Module 3: Timber, Beams, Posts and Trusses

Product Knowledge:

Timbers and Beams

• Timbers and beams can be grouped into two categories: beams and stringers and posts and timbers.
• Beams and stringers are pieces of lumber sized 5” and thicker where the width is more than 2” greater than the thickness. These are normally used as beams placed horizontally, and they carry a load along its length.
• Posts and timbers are pieces of lumber sized 5” and thicker where the width is not more than 2” greater than its thickness. They are normally used as posts carrying loads placed on their end as they stand vertically.

Trusses

• Trusses are engineered framing components pre-built at the factory so they can simply be installed at the jobsite.
• A truss contains three parts: the top member or top chord that replaces the rafter, the bottom member or bottom chord that replaces the ceiling joist, and the interior pieces or webs that help hold it together.
• Biggest reason they are used is that they can be engineered to specific design loads, which makes them structurally superior to a roof designed at the jobsite.
• Most trusses are placed 24” on center (as opposed to the standard 16”) so fewer materials and less labor are needed.
Truss Types

- There are three common truss shapes: Kingspost, Scissor and Fink or "W".
- These are examples of roof trusses, which support the roof. They can also be designed to span long distances, sometimes the entire length from outside wall to outside wall, eliminating the need for load-bearing interior walls.
- Floor trusses are flat trusses that replace floor joists. They can be designed to support a long span, but a load-bearing wall in the basement isn't unusual. The longer span unsupported by a wall requires a taller truss, which raises the profile of the house or requires a deeper basement.

MSR Lumber

- MSR lumber, or machine stress-rated lumber, is graded by testing it on a machine. This is different than most other types of lumber that are graded visually.
- By putting the lumber on a machine to grade it, the manufacturer can find its actual strength and can use pieces that are just the right strength for the application.
- Strength and stiffness are the important factors in determining the specification of MSR lumber, and are marked on the MSR grade stamp.

Treated Wood

- Treated lumber has been chemically treated to resist decay, insects and deterioration over time.
- The most common preservative is alkaline copper quaternary (ACQ). Use it on woods like Southern Pine.
- This treatment usually doesn't provide mold treatment, so the user must apply a separate moldicide.
- ACQ is corrosive to ferrous metals that make up most fasteners. Use a fastener that will stand up to that corrosion, such as stainless steel or hot-dipped galvanized.
- Another type of treated wood is micronized copper quaternary, or MCQ. Unlike ACQ treated wood, MCQ treated wood causes little to no corrosion in the wood, does not change the natural color of the wood and does not pose the safety concerns often associated with ACQ.

Taking it to the Floor:

Frequently Asked Questions

Q: Are chemicals used to treat pressure treated wood dangerous?
A: Previously, pressure treated wood was treated with a chemical called CCA preservative, which was banned for residential uses in the U.S. at the end of 2003. This chemical was considered unsafe for certain uses. ACQ (alkaline copper quaternary) is replacing CCA in most of the country (where Southern Pine is used) except the far west, where CA (copper azole) is more common (Hem-Fir and SPF are the most common species treated).

Q: Do I need to let treated lumber dry?
A: Yes. The treatment process saturates wood with a chemical that is carried in water. The wood will take several months to dry out after the treatment. As the wood dries, there is the possibility it may shrink or warp. You should not paint or stain the wood until it has thoroughly dried out.

Q: Are there differences in the types of treated lumber I can buy?
A: The difference you need to be concerned about is what kind of use it's qualified for. The grade stamp will indicate whether it is rated for ground contact, above ground use or below ground use. You'll want to use the proper concentration, as the higher concentration lumber costs more and wears out saw blades more quickly.

- Above ground is for use in applications such as decking, fences and railings.
- Ground contact is for use for posts, retaining walls and landscape timers.
- In-ground is for use on wood foundation materials.
Q: Is it dangerous to cut treated wood?
A: You can cut treated wood safely if you follow a few safety precautions. First, wear a mask to prevent inhaling the dust and use gloves to prevent splinters. Also wear eye protection to protect from particles flying into your eye. Then, dispose of the dust in the trash; do not burn scraps or sawdust. Always cut in a well-ventilated area. Thoroughly wash hands and face before eating or smoking to avoid accidental ingestion of the dust.

Q: How is MSR lumber tested?
A: MSR lumber is tested by a machine. To test a piece of lumber, the piece enters a machine that exerts bending stress in two directions. Electronic load cells measure resistance to bending and send that information to a data processing unit. The data processor analyzes the information and accepts or rejects the piece according to stiffness characteristics. Each piece receives an appropriate stamp.

Q: What grade of board should I use for building a wall?
A: If the wall won’t be carrying any weight above it, you can use a light framing 2x4. The other option is a stud, which can be used for load bearing walls.

Add-on Sales
- Anyone buying treated lumber will need galvanized or stainless steel fasteners.
- Recommend a dust mask, gloves and safety glasses as personal protection when cutting treated lumber.
- Ask customers if they need an extra saw blade, in case the one they are using gets dull.
- Remind customers that even though they are buying treated wood, they should still use a wood preservative for preserving the cut ends of lumber as well as for waterproofing.

Module 4: Boards

Product Knowledge:

Sizing Boards
A board is generally a piece of lumber 1” nominal in thickness (3/4” actual) and any width.

Thickness
- A board is generally a piece of lumber 1” nominal in thickness (3/4” actual).
- Boards thicker than 1” nominal are called 5/4 (five-quarter) or 6/4.
- These are often softwoods in finish grades and use board grading rules.

Width
- Boards are typically 2” and wider.
- With thicker boards, it is common to buy S2S lumber (surfaced on two sides, not on the edges). They are often random widths.

Length
- Typical stock for a store is boards in even foot lengths from 8’ to 16’.

Patterns
- Some boards are precut into standard shapes for uses such as paneling, siding, flooring or shiplap, which is a board with notched edges so adjoining pieces overlap.

Grading
- Boards are graded on their appearance rather than their structural qualities. Their intended use depends on their grade, or how many defects they have. They have low moisture content and are kiln dried.
Select Board

- The select board category consists of boards of various types of species where appearance is most important.
- Selects are graded based on appearance and they are also known as appearance lumber.
- This is the type most commonly carried by lumberyards.
- Idaho white pine and cedar have separate names for the various grades. These are listed here with “IWP” as a prefix.
- B & Better (IWP-Supreme): The ultimate in fine appearance. This is the highest grade of select lumber. Many pieces are absolutely clear of defects.
- C Select (IWP-Choice): May contain a few defects that can be hidden by painting. Recommended for uses where fine appearance is essential. Widely used for high quality interior trim and cabinet work. Frequently blended with B & Better grade and marketed as C & Better Select.
- D Select (IWP-Quality): For finishing requirements less exacting than C Select. It has an unlimited number of defects or blemishes that can be hidden by painting. One restricted cutout is permitted. Many pieces may have a finish appearance on one side. It is between the higher finishing grades and the board grades.

Paneling

- Paneling is another type of board graded on appearance.
- This type of board is used to finish walls, and is usually stained and varnished.
- Select or Finish grade boards are used for paneling. Selected Grade 2 Common or Grade 3 Common is also used for paneling where knots are a part of the final appearance.

Common Board

- Common boards are used for utility and construction.
- This type of board has enough blemishes or defects to make it unsuitable for work where appearance is important.

Here are the typical grades of common boards:

- Grade 1 Common (IWP Colonial): Used where the ultimate in a knotty appearance is desirable. All knots are sound and tight. Often used for paneling and shelving.
- Grade 2 Common (IWP-Sterling): Used for housing and light construction where it will be exposed and where a fine knotty appearance is desired. Often used for paneling and shelving. Allows for larger and more defects than No. 1. No knot holes.
- Grade 3 Common (IWP-Standard): Used where appearance and strength are both important. Often used for paneling, shelving and siding and especially suited for boxes, crating, sheathing and many industrial uses. Occasional knot holes plus larger and more defects than No. 2.
- Grade 4 Common (IWP-Utility): Most widely used grade. Used for general construction purposes such as subfloors, roof and wall sheathing, concrete forms, low-cost fencing, crating and similar types of construction. Allows only three knot holes per 12' length of board.
- Grade 5 Common (IWP-Industrial): Used for economy applications. Allows almost unlimited defects if it holds together during ordinary handling.
Alternate Board

- Alternate boards are not suitable for work where appearance is important.
- The grade of this board is determined from its better face. There are two common grades:
  - Select Merchantable is used for paneling, shelving or where a knotty type of lumber is desirable.
  - Construction is used for let-in bracing, spaced sheathing, fences, boxes, crating and industrial applications.

Frequently Asked Questions

Q: Can I buy more paneling that matches what I already have in my house?
A: If the design is a standard pattern, it has a number and is easy to reorder. We'll check the WWPA's "Standard Product Pattern" booklet.

Q: What does 5/4 mean?
A: Most boards are sold using the quarter (1/4) system, where four 1/4" increments make up an inch. Therefore “4/4 rough” equals 1” thick, 5/4 equals 1-1/4” thick, 8/4 equals 2” thick, etc. These are usually softwoods in finish grades.

Q: What would you recommend for building sides to a drawer?
A: Use boards that are 5/8” or 1/2” thick. These are usually used for building drawer sides and for hobby work.

Q: What board would I use for a stair tread?
A: Use a 5/4 or a 6/4 board. These are thicker than the standard board, which is 1” nominal. These are used for stair treads as well as for making trim and cabinets.

Add-on Items

- Customers purchasing boards will likely need basic measuring and cutting tools. Ask if they have a square, measuring tape, carpenter’s pencil and saw.
- They may also need basic assembly tools, such as a hammer and finish nails.
- Next, ask how the customer will be finishing the wood, and recommend the appropriate paint, stain or polyurethane.
- They will also need brushes and rags for applying the finish.
- Other items you can recommend include sandpaper for preparing the wood’s surface and wood putty for covering nail holes.
- Don’t forget to recommend a dusk mask, gloves and eye protection for working with wood.

Taking it to the Floor:
Module 5: Deck and Fencing

Product Knowledge:

Wooden Deck Board
- Wooden deck board is used for outdoor and garden applications, such as patios, decks, benches, trim and fencing.
- It is also known as patio decking or radius-edged patio decking.
- It is generally made to be installed flat and used for load bearing applications. The maximum span is 16” on center.
- Many of the decks built today use pressure-treated wood because it resists decay, insects and deterioration. However, some treatments can be toxic and corrosive to fasteners. Pine is commonly used for pressure-treated wood.
- Some decks are made from softwoods that are naturally resistant to decay, such as redwood and cedar.
- Both of these types need to be maintained with a stain or wood preservative to maintain their appearance and extend their life.

Grades of Fencing and Decking
- Some mills and distributors mix grades and coin terms such as patio grade, deck grade and garden grade. They attempt to come up with a mix that will be suitable for building a deck or fence, for example, at the lowest price.
- Here are some grades you’ll find for decking:
  - The Patio 1 grade is similar to the No. 2 and Better. It is a common grade of board lumber where a fine knotty appearance is desired. It allows fewer manufacturer defects.
  - The Patio 2 grade is similar in appearance to the No. 3 Common grade of board lumber, which allows for occasional knot holes plus larger and more defects than No. 2 grade.

Grading Redwood
- Unlike dimension lumber and boards, redwood is graded based on whether the wood is all heartwood or contains some sapwood. Here are the general grades. For a more detailed listing of grades, see the appendix.
  - The Clear grade is the highest quality and has few defects.
  - The Construction grade has some defects but is suitable for load carrying.
  - The Merchantable grade has more defects and may be similar to a good grade of utility lumber.

Plastic Deck Board
- Plastic deck board is made from extruded vinyl, usually PVC.
- Some types are hollow, but better types have an open-cell PVC construction.
- Plastic deck board is low maintenance, and doesn’t mold or rot. Some types can be worked like wood.
- It is available in a variety of colors. Some manufactures have boards that closely mimic wood.
Deck Accessories
- In addition to decking boards, the customer will need several other accessories to complete the project. These may be available in both wood and composite decking materials.
- Stair stringers are often precut with the rise and run at standard lengths for an easier install.
- Balusters are part of the railing system and help give the deck a finished appearance. The balusters (vertical pieces) and the rails (horizontal pieces) are usually available in different styles. They may also come with an assembly system that makes them easy to install.
- Lattice can be used as underpinning to close the open space between the deck and the ground. It can also be used trellises or arbors for the garden.

About Fencing
- A fence system includes posts, horizontal rails and vertical slats. It also includes a variety of gate hardware.
- Fences are sometimes sold in preassembled panels. They are simply attached to posts in the ground. Other systems are sold as separate pieces.
- Several styles of decorative fences are available, including solid board, shadowbox, spaced picket, lattice top, stockade, basket weave and post and rail. When choosing a style, homeowners should consider the style of their house and what function they want the fence to serve.

Wood Fencing
- Pressure treated pine is one of the most commonly used woods used for fences. It resists decay and is inexpensive. Make sure the pressure treated lumber you sell has a chemical concentration suitable to the use. Lower concentrations of chemical are for above-ground use and higher concentrations are for below-ground use.
- Cedar and redwood are other popular woods used for fences. They naturally resist decay. They are often graded according to different categories than the pine.
- When looking for wood suitable for a fence, appearance is an important factor. Uniformity will be an important factor to consider. Refer to grading guidelines to see which grades are suitable for use below ground.

PVC Fencing
- PVC fencing is made of vinyl in a variety of styles that mimic wood.
- Several colors are available and this fence needs no painting. On high-quality fences, the color goes all the way through to resist scratching and chipping.
- This type of fencing resists rotting and splintering.
- Styles include ornamental, picket, post and rail and privacy. Accessories like post caps and finials are also available.
- It assembles with screws.
- Each manufacturer of this product will have its own unique set of features. Know the selling points that differentiate the product your store sells from other products on the market.
Frequently Asked Questions

Q: Do I need to stain or paint my cedar fence?
A: Cedar is naturally resistant to decay and when it weathers, it will turn a soft silver gray and even black in some areas. To protect its color and protect from mildew, use a penetrating stain. You can use a transparent stain, a semi-transparent stain or an opaque stain.

Q: What kind of nails should I use for my deck?
A: Use non-corrosive nails, such as stainless steel or hot-dipped galvanized. Ring- or spiral-shanked nails provide better holding capacity.

Q: How deep should I bury the fence posts?
A: A good guide is to bury at least 1/3 the total length of the post in the ground. For posts that are on the end or that will support a gate, bury the post an additional 6”.

Q: How strong is vinyl fence?
A: Farmers use vinyl fence to safely contain cattle and horses. High-quality fences have a better tensile strength than wood.

Q: What can I use to clean my wood fence?
A: Use a product designed for the purpose. Ordinary household cleaners may contain bleach, which breaks down the fibers in the wood and can also damage surrounding greenery.

Q: Do I need to apply a waterproofer on top of the stain?
A: No, that won't give the fence extra protection. The waterproofer must penetrate the wood to work and it can't do that if there is already a coating on the wood.

Q: How do I maintain my redwood deck?
A: Redwood is stronger than other woods, so you can let it weather naturally and it is less likely to warp or split. It will weather to a natural gray color. To enhance the color of the wood and provide additional protection, use a finish that has a water repellent, a mildewcide and UV protection.

Upselling Skills

- Several manufacturers have processes that treat wood without the use of toxic chemicals. The types include a thermally modified lumber, acetylated lumber and a glass-infused lumber. While these types of wood are often more expensive, the advantage is that they are non-toxic, non-corrosive to fasteners, are more dimensionally stable than regular wood, and resist insects and fungi. Some manufacturers even claim their products are fire resistant. Most products carry long warranties.

- Also remind customers of the advantages of composite decking and fencing materials. While these have a higher initial cost than wood, they last longer. Each manufacturer of this product will have its own unique set of features. These features should be your selling points as you show customers their decking options.
Add-on Sales

- Many of these add-on sales will be useful for either a fence or deck installation project.
- Suggest a tape measure, string line and stakes for laying out the area where the fence or deck will be installed.
- Suggest a post-hole digger or auger for digging a hole for the posts. Customers will also need concrete mix for setting the post. Suggest a shovel for filling in dirt after the post has been set.
- Ask if customers need a circular saw for making any necessary cuts to the board or a level for aligning the posts.
- For customers who will be installing a gate, suggest the appropriate gate hardware.
- Customers using composite materials will need a carbide saw blade for making cuts.
- Make sure customers have plenty of galvanized nails and a hammer for installing wooden products, or specialty fasteners recommended by the manufacturer for composite and vinyl products.
- Finally, for customers buying wood materials, remind them to use a stain or sealer to keep the fence or deck well maintained.

Module 6: Hardwood Lumber

Product Knowledge:

Oak
- Oak is one of the most popular hardwoods for both woodworkers and consumers.
- It has a pronounced grain that catches the eye and distinguishes it from other hardwoods. Open-pores mean it has dramatic grain patterns in sawn lumber.
- Some boards may have dark mineral streaks. Occasionally, very small pink pin knots will be present.
- The most common types include red and white oak.
- White oak is typically more fine-grained and has a more gray-brown color.
- Oak is used in a wide variety of applications including flooring, furniture and cabinetry construction.

Birch
- Birch has a fine grain pattern and excellent working properties, which means it is suitable for a variety of projects.
- There is a wide variation between sapwood and heartwood birch. The sapwood has a creamy yellow color and the heartwood has a rich reddish-brown color.
- Some customers may specify all white (sapwood) or all red (heartwood).
- Birch is used in kitchen cabinets and other carpentry for the home and office.

Walnut
- Walnut has a rich brown appearance and typically has numerous knots, tight burls and wavy grains.
- It is a favorite of home workshops and cabinetmakers because it works well with machine and hand tools, and it nails, glues and holds screws well.
- Walnut finishes, turns, sands and carves easily, and can be polished to a high sheen.
- One type, American black walnut, dries very slowly and is suitable for steam bending.
Cherry
- Cherry typically has a reddish-brown color, but freshly cut wood may be lighter. The sapwood can be a creamy white.
- It is moderately durable with medium strength and low stiffness and has a tendency to darken with age or after cutting.
- Cherry works well with hand and power tools.
- It nails, glues and stains well and can produce a smooth finish.
- It also has good bending properties, and is often used for turning and carving.
- Cherry is very popular for use in fine furniture, for flooring, molding, paneling, doors and musical instruments.

Ash
- Ash is straight grained with a coarse, uniform texture.
- The sapwood is light colored, and the heartwood is grayish brown to light brown.
- It machines well, and holds nails, screws and glue well. It is superior for steam bending.
- Ash has good strength qualities compared to its relative light weight, as well as good shock resistance.
- It is used for cabinets, joinery, plywood, oar construction, sporting goods and tool handles.

Maple
- Maple has a straight, close-grained, uniform texture, but sometimes will show curls.
- The sapwood is creamy white with a touch of brown in color, while the heartwood can be light to dark reddish brown.
- It dries slowly and shrinks significantly.
- Maple is good for steam bending. It has a high resistance to abrasion and wear and has good strength properties.
- It machines and glues satisfactorily, but holes should be pre-bored for nails or screws.
- It produces an outstanding finish when stained.
- Maple is a favorite for making baseball bats.

Poplar
- Poplar has a straight, closed grain.
- Sapwood is whitish yellow in color, while the heartwood is straw brown to green.
- Poplar is lightweight with moderate stiffness and good strength.
- It works well with hand and machine tools but has a slight tendency to split when nailed.
- Poplar holds paint well and typically better used with dark stains as the heartwood doesn't absorb stain well.
- It is used for paneling, interior trim, furniture, carving and turning.

Chestnut
- Chestnut resembles oak in color and grain.
- It is light in color and slightly lighter in weight than maple.
- “Wormy” chestnut has tiny pinholes that are the result of pinworm infestation.
- It is a coarse wood, so it doesn’t turn as well as other woods.
- It works easily with hand and power tools, and sands well and responds well to finish.
- Chestnut is often used as a veneer for cabinets, for furniture construction and by antique restorers.
Hickory
- Hickory is a heavy wood known for its strength.
- It has a dense grain with high toughness, stiffness and shock resistance.
- The sapwood is white in color, while the heartwood is tan to brown.
- Hickory is difficult to machine, or cut, and can blunt tools.
- It stains and finishes well.
- Hickory is used to make sporting goods equipment, carvings and veneers on paneling.

Beech
- Beech has a close grain that makes it suitable for turning and carving.
- It is typically white, pale cream or pale brown in color.
- This wood has good steam bending properties, and it glues easily and finishes well. However, it can be difficult to cut or plane.
- Sometimes it is used as a substitute for birch.
- Beech is used for high-end furniture and cabinetry as well as toys, sports equipment and musical instruments.

Lauan
- Lauan is softer than most softwood dimensional lumber.
- It is also known as Philippine mahogany, which is not the same as tropical mahogany.
- Sometimes Lauan is called the poor man's hardwood, as it is usually the least expensive of the popular hardwoods.
- One use is as a veneer on plywood.

Grading Agencies for Hardwood
- The National Hardwood Lumber Association establishes these grades of hardwood lumber. Since hardwoods are rarely used for structural purposes, the main factor in hardwood grading is appearance and the number of clear cuttings possible from a piece.
  - FAS (First and Seconds). The most pieces clear of defects and also the most expensive. Boards are generally 6” and wider and 8’ and longer. Used for fine furniture and cabinetry.
  - Selects. A cost-effective substitute for FAS when only one good facing is required. Boards are 4” and wider, 6’ and longer.
  - #1 Common. A shop or thrift grade where boards are 2/3 clear face cuttings. A good value for where smaller pieces can be used.
  - #2 Common. Boards have 50% clear faces. Generally 3” and wider and 4’ and longer. Used for some paneling and flooring.

Cutting Boards
Boards may vary in price and quality depending on how they are cut at the sawmill. The way a board is cut will affect its appearance and stability. Here are the three main ways boards are cut.

Plain Sawn: In a plain sawn board, boards are cut parallel to the log. It produces the familiar “cathedral” appearance. This is the most efficient way to cut a board and there is minimal waste. The disadvantage is that these boards have a tendency to cup, twist or bow.

Quarter Sawn: A quarter sawn board is first cut in quarters, then cut mostly perpendicular to the grain. This produces a board with mostly straight lines. It is also more stable that a plain sawn board. Since it takes more work to cut this type of board and since it produces more waste, it is more expensive.
Taking it to the Floor:

Frequently Asked Questions

Q: Why does a piece of wood have knots?
A: Knots mark the spot on a tree where there once was a branch, which has since been encased by the growth of the tree.

Q: What's the difference between hardwood and a softwood?
A: The biological answer is that hardwoods produce seeds with some sort of covering, such as a fruit or a nut. Softwoods produce seeds with no covering—they fall to the ground. Hardwoods tend to be more dense, but the hardness or density of the wood is not the means of classification. (Balsa wood, the lightest of all woods, is considered a hardwood). But in the lumberyard, structural lumber is softwood because it is easy to work with and the least expensive. Hardwood is more expensive and is used mainly as a finishing material.

Q: What does it mean if a board is quarter sawn?
A: To quarter saw a piece of wood means cutting the log at a 90º angle to the growth ring. This will produce a uniform or vertical grain pattern. This method of cutting produces fewer boards per log and thus quarter-sawn boards are more expensive. They are usually used for decorative applications and will expand and contract less than boards cut from the log by other methods.

Add-on Sales

• Customers purchasing hardwoods may also be looking for a variety of hand and power tools. You can learn more about those tools in the Basic Training Course in Hardware Retailing. But even for customers who own all of the necessary tools, there are still some items they will need on a regular basis that you can recommend during a sale of hardwood.

• Ask if the customer needs any additional blades for the saws used to cut hardwoods.

• They may also need a carpenter’s pencil for marking lines.

• Next, ask how the customer will be fastening the board together. Woodworkers generally use glue and some type of joinery, such as biscuits or dowels.

• Another important phase of a woodworking project is the finishing phase, so remind your customer to get the proper sandpaper.

• Then, show the customer your selection of paints, stains and finishes, along with brushes and rags.

• Remind your customer to use safety equipment for working with hardwoods, including safety glasses, ear protection and gloves.
## Chapter 2: Selling Lumber

### Module 1: Understanding Board Feet

Selling lumber can be more complex than most of the other products you sell. Some customers will give you a detailed list of each size and quantity they need. Others may come in with a project and ask you to help them figure quantities and sizes. Each module of this chapter will help you make sure the lumber they get is adequate for the task.

While much lumber today is sold by the piece, some lumberyards sell lumber by the board foot. This module will help you understand board feet and how to price and calculate quantities.

### Product Knowledge:

#### Board Feet & Lineal

- A board foot (BF) is 144 cu. in. of lumber. Think of it as a piece of lumber 12” square and 1” thick. It could, for example, be a 2x6 that is 1’ long, or any combination that equals 144 cu. in.
- Lineal feet (LFT) is the equivalent of placing the lumber end to end and just counting the total length. It is sometimes called running feet. For example: 10 pieces of 2x4s that are 10’ long would be 100 LFT.

#### Reading Board Foot Tables

- To read a board foot table, first read the nominal size column to find the lumber size.
- Next read across to the correct column. The numbers have always been rounded up.
- Use the left column to find out how many lineal feet are in a certain number of board feet.
- For example, how many LFT of 2x4s are there in 300 BF of 2x4s? To find the answer, look in the table to find how many LFT there are in one BF of 2x4. The number is 1.5. Multiply 1.5 x 300. The answer is 450 LFT of 2x4 in 300 BF.
- Use the second column to find out how many board feet are in a certain number of lineal feet.
- For example, how many BF are there in 450 LFT of 2x4s? The table tells us there is .6667 BF per LFT in a 2x4. Calculate .6667 x 450 = 300 BF in 450 LFT of 2x4.
- To find how many board feet there are in each piece of lumber, look first under the nominal size column for the size you want, then find the appropriate length.
- For example, a 22’ long, 2x12 board has 44 BF.

#### Board Feet Formula

- You can also calculate board feet without the table.
- Use this formula: NUMBER OF PIECES x THICKNESS (in inches) x WIDTH (in inches) x LENGTH (in feet) = BOARD FEET (divided by) 12.
- Here’s an example. How many BF are in 20 pcs. of 2x6-16’? To find the answer, multiply 20 x 2 x 6 x 16 = 3,840. Then 3,840 / 12 = 320. The result is 320 BF.
- A second formula is: LINEAL FEET x THICKNESS (in inches) x WIDTH (in inches) = BOARD FEET (divided by) 12.
- For example, how many BF are in 500 LFT of 2x10? The answer is 500 x 2 x 10 = 10,000. Then: 10,000 divided by 12 = 833-1/3. 833.34 BF.
Converting Board Feet To Lineal Feet

- Remember, lineal feet is simply how much length of lumber you have. Sometimes you may have to change board feet into lineal feet.
- To do that, first find out how many board feet are in one lineal foot of the given size. Do this either by looking at the chart or using either of the board foot formulas just discussed.
- Second, divide that number into the board feet given.
- Here's an example. How many LFT of 1x3 lumber is there in 1,000 BF? First, use the chart to find that 1 piece of 1x3, 1' long contains .25 BF. Then make the calculation: 1,000 BF divided by .25 = 4,000. Answer is 4,000 LFT.

Converting Board Feet To Number of Pieces

- An estimator in your store may give a builder a price “by the thousand board feet.” The contractor accepted the bid and now it’s time to deliver the materials. You’ll have to convert the board feet to actual pieces.
- To do this, first find out how many board feet there are in one piece of the desired size.
- Next divide that number into the allotted amount.
- Finally, round up or down depending on the situation.
- For example, the bid you were given shows 2,000 BF of 2x8s at a certain price. The customer wants 14' lengths. How many should you deliver?
- Answer: Look on the chart and see that 1 piece of 2x8-14' contains 18.667 BF. 2,000 total BF / 18.667 = 107.14 pieces. You should deliver 107 or 108 pieces.

Pricing Lumber

- Many times, you'll price lumber “by the thousand” board feet, abbreviated MBF. There are several ways you can calculate this and arrive at the same answer.
- The first option is to calculate the price per M, or 1,000 BF.
- First multiply the price per M x the number of BF.
- Next, divide by 1,000. The easiest way is to move the decimal point three places to the left.
- For example, how much does 350 BF of 2x10s cost if the price is $500/M? To find the answer, multiply 350 BF x $500 (which equals 175,000) then divide by 1,000. Price: $175.00
- A second option is to divide BF by 1,000 then multiply by the “per M” price.
- A third option is to divide the price by 1,000 then multiply by BF.

Units

- Lumber comes from your supplier in units, or large bundles.
- When ordering lumber from your supplier, it is helpful to know what quantities make up standard units, as it is usually advantageous to order full units. The price is better, banded units are easier to load and unload and delivery is usually faster because of easier handling.
- The main reason you would change quantities with size is to try to keep all the units approximately the same size to simplify warehousing.
- There are standard lumber unit quantities and sizes. For example, 2x4s commonly come in units of 180, 192 and 294 pieces. See the Appendix for more examples.
- You may also order lumber by the complete truckload or railcar load.
Module 2: Estimating Lumber Coverage

Product Knowledge:

Estimating Lumber Coverage

- Because lumber is sold in board feet and calculated on the nominal size, some people are misled as to how much area lumber will cover. The problem is that a 1x8, for example, is actually 7-1/4” wide, not a full 8”.
- All lumber has this same problem. If you have the right tables available you can easily tell how much to add to make up for the difference in nominal and actual lumber sizes.

Waste

- You can calculate exactly how much lumber to add to make up for the difference between actual and nominal sizes.
- There will always be waste when using lumber. During construction, pieces that are cut off may be too short to be used, or there may be “bad spots” that must be cut off.
- The amount of waste depends on the builder. Typically the waste is 5%, while some builders will calculate 10%. Add this waste to the total amount needed.
- In cases of installing a board diagonally, there will be extra waste. The table we'll use calculates 6% waste for this.

Reading Coverage Tables

- This table will help you calculate how much lumber you need to cover a given amount of space.
- First, select the kind of lumber you plan to use from the two columns on the far left.
- Next, multiply the square feet of area to be covered (length x width) times the multiplier from one of the last two columns, depending on whether you want to include waste.
- The column labeled “If Diag.” is for the extra waste produced when cutting boards diagonally.

Problem #1: How many BF are required to cover a floor 15’ x 20’ if you are using 1x8 S4S boards and want a 5% waste factor?

Answer #1:

- Figure the square footage of the room: 15x20=300 sq. ft.
- Multiply by 1.15 (the multiplier across from 1x8 S4S Boards, in 5% waste column)
- Answer: 345 BF.

Problem #2: How much 1/2x8 bevel siding will cover 8,000 sq. ft. of wall (including 5% waste)?

Answer #2:

- Locate multiplier of 1.33 across from 1/2x8 bevel siding.
- Multiply 1.33x800=1064 (1/2” in lumber is still figured as 1” for finding board feet).
- Answer: 1,064 BF.
Reading Rafter Tables

- Customers may also need you to help them find how long a rafter for a home should be, which will help you decide how much lumber they need to build the rafter.
- There are a few terms you need to know as you read this table.
- The common rafter run is the horizontal, or flat, distance the rafter covers.
- The slope, or pitch, of a roof, is a ratio of the rise and run of a roof. It is determined by the vertical rise, in inches, for every horizontal 12” length, or run.
- For example, if a roof has a 4/12 pitch, then for every 12” of length, the roof rises 4”.
- To find how long a rafter should be, first find the common rafter run including the overhang. After that, find the slope from the rafter table.

Rafter Table Examples

- For example, if the house is 26’ wide and has a 2’ overhang, the common rafter run is 15’. Half of the house width is 13’, since the rafters peak in the middle of the house. After you add 2’ for the overhang, you get 15’.
- Next, you need to find out what the rafter slope should be. For our example, assume the rise and run will be 4/12 (4 in 12). Find 4 in 12 under the “Rise & Run” column in the table and read across to the “Common Rafter” column. That number is 1.054.
- Finally, take the rafter run length (15’) and multiply times the common rafter column number (1.054) to find the actual rafter length. You’ll need to use 16’ stock lumber.
- Another type of rafter run is one for a hip/valley rafter. To find this type of rafter run for the same roof, multiply the rafter run by the multiplier in the far right column (“Hip/Valley Multiplier”). The final answer will be 21.8’, or 22’ stock.

Reading Rafter Tables Problem

| Problem: Assume a building has a 5/12 rise/run and a 2’ overhang. Find rafter runs for buildings 22’, 28’ and 32’ wide. |
| Answer: |
| • 22’ wide building: 14.08’ (22’ ÷ by 2 =11’. Add a 2’ overhang, and length = 13’. 13’ x 1.083= 14.08’). |
| • 28’ wide building: 17.33’. |
| • 32’ wide building: 19.49’. |
Module 3 Reading Span Tables

Reading span tables may be the most technical part of selling lumber. But builders and remodelers are high-volume customers and they may look to you for technical advice.

Product Knowledge:

Span Tables
• Span is the building width in a roof. It is also the distance from one support to the next.
• Structural members are what carry the weight in a building. It is a series of bearing walls, joists, rafters and trusses.
• The amount of weight each structural member can carry depends on its strength, its species and grade (how many defects it has), lumber size (whether it’s a 2x4, a 2x10, etc.), what it is being used for (joist, rafter, etc.) and whether or not it is used by itself or with a group of other members.
• Span tables provide an easy reference to determine the size of lumber for a specific purpose. They help answer questions that pertain to building codes such as: “What size floor joist should I be using?” or “What size lumber do I need for the window header I’m building?”

A Word of Caution
• Remember, the information provided here is to give you a basic understanding of span tables. Never guess at or offer to design structural members. Refer the question to a qualified engineer.
• Never recommend structural members that are not specifically stated in the Span Table you are using. Be aware there is a high liability of risk if you guess at what size of board your customer should be using.
• Always refer to local codes first. The tables provided here are legitimate, but are only guides to help you understand the span tables that may be in effect in your area.
• For example, how many board feet are there in 450 lineal feet of 2x4s? The table tells us there is .6667 BF per LFT in a 2x4. Calculate .6667 x 450 = 300 BF in 450 LFT of 2x4.
• To find how many BF there are in each piece of lumber, look first under the nominal size column for the size you want, then find the appropriate length.
• For example, a 22’ long, 2x12 board has 44 BF.

Codes
• In most areas, builders and remodelers must follow certain building codes that specify, among other things, what type of lumber and what size they can use for specific applications.
• Various grading agencies publish information for the species of lumber they grade, so there may be several different sources for span tables.
• This course will use the span tables from the “International Residential Code (IRC) for One- and Two-Family Dwellings.” It is best suited for an introduction to span tables and for a nationwide course such as this.
• Be aware that the building code you are under is determined by your locale, which may impose variations on this code. Also know that some areas are under no building codes, but it is a good practice to always recommend construction that follows the minimums found in the codes.
• The tables represented in this course are just a sample of the many available for different configurations. Consult the “IRC for One- and Two-Family Dwellings” and your local building code officials for tables applicable to your area.
Load
• The structural system of the house is made to resist the loads placed against it.
• Dead loads are the weight of the building materials and objects installed in or on the structure. There are standard calculations for dead loads and two are included on our sample span tables. 10 psf (per square foot) is standard. 20 psf is common if the structure is supporting more weight than normal such as a grout bed for tile.
• Live loads are weights that come from use (like furniture and people), wind and snow. This load is impossible to calculate accurately because it changes. There are estimated live loads based on use of the building and geographic location. For example, a load of 30 psf is common for sleeping rooms.
• Total load is dead load and live load combined and is usually represented on span tables. Check with your local building code to determine if the specific situation you are dealing with matches what is described in the tables.
• The types of stress a structural member can endure also affect the size of lumber and span.

Lumber Stress Types
• An understanding of stress types in lumber will expand and supplement your knowledge of span tables.
• Rafters and joists must endure a variety of stresses. A rafter or a floor joist has to be designed not to break or even bend under the load it is carrying.
• Span tables are set up with an understanding of the stress limitations of each size and grade of lumber. They will not recommend a use for a piece of lumber that would cause it to break.
• Understanding the types of stresses a piece of lumber must endure will help understand the limitations span tables place on lumber.

Common Stress Types
Here is a brief definition of the common stress types on lumber. Please see the appendix for a more detailed explanation.

Extreme Fiber Stress In Bending
• Abbreviated Fb.
• Usually the limiting factor in rafter design.
• Live and dead loads on a structural member cause them to bend. This creates stress on the wood fibers.
• The most extreme stress occurs along the very top edge and bottom edge of the lumber.
• As stress is placed on the lumber, the top edge has a tendency to get shorter, or to compress.
• As the top portion is compressed, the bottom portion wants to lengthen or pull apart. This is called tension.
• The closer to the middle of the piece, the less stress there is. There is a point at the center of the piece of lumber where there is no bending stress. This is called the neutral axis.

Modulus of Elasticity
• Abbreviated E.
• Usually the limiting factor for floor and ceiling joists.
• Elasticity is how much a piece of lumber will sag or deflect in relation to the load placed on it.
• In ceiling joists this is a problem because a sagging ceiling joist means the drywall attached to it will develop nail pops. Or, a floor joist that sags will cause any walls attached to it to sag and also cause nail pops.
• The building code will set a limit on how much a piece of lumber is allowed to deflect. These are reflected in the span tables.
Compression Parallel to Grain
• Abbreviated FC.
• A normal stress on a post, column, stud, etc.
• Typical stress where the load is supported on the end of the piece.
• The fibers in the wood are uniformly stressed. Stress is parallel to and along the full length of the wood.
• This is rarely a problem in home construction as most lumber is very strong.

Compression Perpendicular to Grain
• Also abbreviated FC.
• The stress when a floor joist, ceiling joist or beam rests on a support. The load tends to crush, or compress, the fibers at the bearing point.
• The bearing area has to be large enough so that the load doesn't crush the fibers at the side grain.
• Building codes set minimum bearings for lumber.

Horizontal Shear
• Stress when wood fibers slide over themselves horizontally right at the top to bottom mid-point of the member.
• The only time when this stress is a problem is in short, heavily loaded beams that are deep.
• The solution is to increase beam cross section.

Taking it to the Floor:

Frequently Asked Questions

Q: Who publishes the building codes?
A: There are three major building codes that have evolved as model building codes. The International Code Council is a cooperation of these three. In an effort to standardize building codes, they cooperate as the International Code Council and publish the “International Residential Code (IRC) for One- and Two-Family Dwellings.”

Q: May I use these span tables for engineered lumber?
A: The span tables for engineered lumber and standard lumber products will be different. The suppliers of these products design them and their uses are brand specific. To use them, refer to information specific to each manufacturer’s product.

Q: Does everyone use the same building code?
A: No, as the building code you are under is determined by your locale, which may impose variations on the international code. Some areas are under no building codes, but it is a good practice to always use construction methods that follow the minimums found in the codes.

Q: Why is it important to use span tables?
A: Span tables assure that you have the proper spacing of supports under rafters and joists. A rafter or a floor joist has to be designed not to break or even bend under the load it is carrying. Span tables will recommend the proper uses for a piece of lumber so that it will not break.
Module 4: Reading Span Tables

Product Knowledge:

Joists & Rafters

- Joists are supporting members of a house that support a ceiling or floor. They rest on walls, the foundation or on beams.
- A rafter is a sloped structural member designed to support the roof deck. It rests on a wall plate.
- To correctly determine the size of lumber needed for a joist or rafter, first locate the correct span table. There is a separate table for each type of structural member.

Using a Floor Joist Span Table

- Find the live load. Make sure the live load rating matches the type of room you are considering.
- Find the dead load. Determine whether you will be basing your calculations on a dead load of 10 psf or 20 psf. For most purposes, you will use 10 psf, and that’s what we’ll use here.
- Determine the structure’s width. Ask the customer how wide the house is and how wide is the span between members. As an example, consider a 28’ wide house with a bearing wall in the center. That means each span will be 14’.
- Determine joist spacing. Next ask about the joist spacing, sometimes referred to as the “On Center” measurement. For our example, use 16”.
- Determine the species and grade of wood. For this example, use Douglas Fir-Larch, No. 2 and Btr. Note: This includes grades No. 1 and Select, and more than likely your store has a mixture in stock. Since your mix of lumber may include a mix of grades SS, #1 or #2, always use the design values for the lowest grade of lumber possible in the mix. In our example, it is #2 Doug Fir-Larch.
- Find a span value. For this example, find a span value that is at least 14’. The closest we can find on the table is a span value of 15’-5”.
- Find the correct size of lumber. The size of lumber the table directs us to use is a 2x10. That size of lumber will support the load placed on it for a span of up to 15’-5”, enough for a span of 14’.

Headers

- When an opening is cut in a wall for a door or window, some of the supporting members (usually wall studs) must be cut-off to make space for the opening. The weight, then, that normally would have been carried by those members must be transferred to another member. Header is the term given to supporting members that transfer the loads.
- The size of the header depends on several factors, including how much weight it is expected to carry, where it is located and the strength of the wood.
- Headers are generally designed on the job site out of standard dimensional lumber. They are usually made by nailing two or more pieces of 2x lumber together.
- To know what lumber you’ll need to sell your customer for the header he will be designing, you’ll need to know how to read girder and header span tables. These tables are also provided by the IRC for One- and Two-Family Dwellings.
Non Load-Bearing Headers

- Some headers won't carry a significant load. These are essentially non-load bearing.
- To create these headers, you can use a 2x4 turned flat. The purpose here is just to frame an opening for the window.
- One example is a window placed on the gable end of a one-story house. The main purpose of the studs is to provide nailing and backing for exterior sheathing and siding and for interior wall finish.
- Another example is for interior walls on the top floor of a trussed roof building. The truss carries the weight of the roof to the outside walls. Studs for interior walls don't have to carry any load.

Load-Bearing Headers

- When the header must carry a load, it must be designed according to the specifications outlined by the IRC.
- Some builders will tell you exactly what size they want, so all you have to do is price it for them. Other times, you may need to help someone figure out what size they should be using. Remember, never design a structural member or try to guess what size someone needs. If the tables don’t answer your questions exactly, then consult a qualified engineer.
- The header must be supported by studs, and the more weight the header must carry, the more studs there need to be to support it.
- These studs are called jack studs and how many of them are needed is specified in the IRC Girder Span and Header span table.

Using the Header Table

A header span table can help you find the appropriate size of lumber for the span your customer desires. Here are the steps you should take to help a customer find the right header for a window in a house.

- Determine the width of the house. In this case, the customer says the house is 28' wide.
- Determine the snow load. Know the snow load for your area and choose the appropriate column on the table. For this example we'll use 30 psf.
- Determine the species. Note that it specifies the species covered by these specifications are douglas fir-larch, southern pine and spruce-pine-fir. A footnote tells us that the assumed grade is #2. So the values on the table are valid for a mix of lumber #2 & Btr.
- Determine what the header is supporting. In our example, we are looking for a window. The only weight the header will be supporting is a roof and ceiling.
- Determine the windows rough opening. The customer says the window will need a rough opening (RO) of 8'; so the header must cover a span of at least 8'.
- Find the closest allowable span. Using the header span table, we can see that the closest span that allows at least 8' is 8'-5". From there, we can look under the "size" column to determine we need two 2x12 pieces of lumber.
- Determine if jack studs are needed. In the adjoining column labeled "NJ" (number of jack studs), we find we need two jack studs to support that header.

Note that this example could also be used if we were figuring a header for a door or window on the second floor of a two-story building. You only have to figure the weight for the structure above the header.
Girder
- You may also need to use the span table to find the length of a girder, which is also a beam that carries building loads, often a floor joist.
- This is usually a piece of engineered lumber, but also may be made by nailing pieces of lumber (usually three pieces) together.
- Instead of jack studs, girders generally rest on top of a wall or post.

Example #1:
- We'll work in the opposite direction of the table as we did for the header problem. We want to use three 2x10s to make the girder. How far apart should we place the posts that support this girder?
- Since the girder will be supporting an interior wall, use the table labeled “Girder Spans and Header Spans for Interior Bearing Walls.”
- First, our example house is 28’ wide with one story and a truss roof.
- To support one floor, if we are going to use three 2x10 pieces of lumber nailed together, we would need at least a 7'-7” span between supporting posts.

Example #2:
- Your customer wants to build a girder for a 32’-wide, two-story house. He asks, “If I’m going to use three 2x10s to make up the girder, what is the maximum spacing of the basement posts?
- To find the answer, use the table Girder Spans and Header Spans for Interior Bearing Walls.
- Since there is no column for 32’, use the next highest, 36’
- Use the row labeled “Two Floors” and find the row for 3-2x10.
- The posts will need to be 4’-10” apart.

Taking it to the Floor:

Q: What is the “on center” measurement?
A: This is how much space there is, for example, between two floor joists. You may see this abbreviated as OC. If two framing members are 16” on center, then they are 16” inches apart, measured from the center of one member to another.

Q: What kind of header do I need for a window on the gable end of a house?
A: If the window is on the gable end of one-story house, you can likely use a non load-bearing header. To create this header, you can use a 2x4 turned flat. The purpose here is just to frame an opening for the window. You’re also providing nailing and backing for exterior sheathing and siding and for interior wall finish.

Q: How do I create a header?
A: Headers are generally designed on the job site out of standard dimensional lumber. They are usually made by nailing two or more pieces of “2 by” lumber together.

Q: How do I figure a header for the second floor of a two-story building?
A: Figure it the same way you would for a one story building. You only have to figure the weight for the structure above the header.
### Board Feet Table

<table>
<thead>
<tr>
<th>LINEAL FEET PER BOARD FOOT</th>
<th>BOARD FEET PER LINEAL FOOT</th>
<th>LENGTH NOM. SIZE</th>
<th>8'</th>
<th>10'</th>
<th>12'</th>
<th>14'</th>
<th>16'</th>
<th>18'</th>
<th>20'</th>
<th>22'</th>
<th>24'</th>
<th>26'</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>0.1667</td>
<td>1 x 2</td>
<td>1.34</td>
<td>1.67</td>
<td>2</td>
<td>2.34</td>
<td>2.67</td>
<td>3</td>
<td>3.34</td>
<td>3.67</td>
<td>4</td>
<td>4.34</td>
</tr>
<tr>
<td>4.0</td>
<td>0.25</td>
<td>1 x 3</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5.5</td>
<td>6</td>
<td>6.5</td>
</tr>
<tr>
<td>3.0</td>
<td>0.3334</td>
<td>1 x 4 2 x 2</td>
<td>2.67</td>
<td>3.34</td>
<td>4</td>
<td>4.67</td>
<td>5.34</td>
<td>6</td>
<td>6.67</td>
<td>7.34</td>
<td>8</td>
<td>8.67</td>
</tr>
<tr>
<td>2.0</td>
<td>.50</td>
<td>1 x 6 2 x 3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>1.5</td>
<td>.6667</td>
<td>1 x 8 2 x 4</td>
<td>5.34</td>
<td>6.67</td>
<td>8</td>
<td>9.34</td>
<td>10.67</td>
<td>12</td>
<td>13.34</td>
<td>14.67</td>
<td>16</td>
<td>17.34</td>
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<tr>
<td>1.2</td>
<td>.8334</td>
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<td>15</td>
<td>16.67</td>
<td>18.34</td>
<td>20</td>
<td>21.67</td>
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<tr>
<td>1.0</td>
<td>1.0</td>
<td>1 x 12 2 x 6</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>20</td>
<td>22</td>
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<tr>
<td>.75</td>
<td>1.3334</td>
<td>2 x 8 4 x 4</td>
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<td>20</td>
<td>24</td>
<td>28</td>
<td>32</td>
<td>36</td>
<td>40</td>
<td>44</td>
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<td>30</td>
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<td>48</td>
<td>54</td>
<td>60</td>
<td>66</td>
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### Estimating Lumber Coverage Table

<table>
<thead>
<tr>
<th>Lumber Type</th>
<th>Nominal Size</th>
<th>Actual width</th>
<th>Board feet required per Sqft of surface no waste</th>
<th>Board feet required per Sqft of surface 5% waste</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Overall</td>
<td>Face</td>
<td>If Diag.</td>
</tr>
<tr>
<td>S45 Boards</td>
<td>1 x 4</td>
<td>3-1/2&quot;</td>
<td>3-1/2&quot;</td>
<td>1.14</td>
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<tr>
<td></td>
<td>1 x 6</td>
<td>5-1/2&quot;</td>
<td>5-1/2&quot;</td>
<td>1.09</td>
</tr>
<tr>
<td></td>
<td>1 x 8</td>
<td>7-1/4&quot;</td>
<td>7-1/4&quot;</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>1 x 10</td>
<td>9-1/4&quot;</td>
<td>9-1/4&quot;</td>
<td>1.08</td>
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<tr>
<td></td>
<td>1 x 12</td>
<td>11-1/4&quot;</td>
<td>11-1/4&quot;</td>
<td>1.07</td>
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<tr>
<td>Shiplap</td>
<td>1 x 8</td>
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<td>6-7/8&quot;</td>
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<tr>
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<td>1 x 10</td>
<td>9-1/4&quot;</td>
<td>8-7/8&quot;</td>
<td>1.13</td>
</tr>
<tr>
<td>Tongue &amp; Groove</td>
<td>1 x 4</td>
<td>3-3/8&quot;</td>
<td>3-1/8&quot;</td>
<td>1.28</td>
</tr>
<tr>
<td></td>
<td>1 x 6</td>
<td>5-3/8&quot;</td>
<td>5-1/8&quot;</td>
<td>1.17</td>
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<tr>
<td></td>
<td>1 x 8</td>
<td>7-1/8&quot;</td>
<td>6-7/8&quot;</td>
<td>1.16</td>
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<tr>
<td>Bevel siding 1&quot; lap</td>
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<tr>
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<td>7-1/4&quot;</td>
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<td>Drop siding</td>
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<td>1 x 8</td>
<td>7-1/8&quot;</td>
<td>6-7/8&quot;</td>
<td>1.16</td>
</tr>
</tbody>
</table>
# Rafter Length Table

**TO FIND RAFTER LENGTHS**

Multiply common rafter run x multiplier.

<table>
<thead>
<tr>
<th>Roof Pitch</th>
<th>Rise &amp; Run</th>
<th>Multiplier Common Rafter</th>
<th>Multiplier Hip/Valley Rafter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/12</td>
<td>2 in 12</td>
<td>1.014</td>
<td>1.424</td>
</tr>
<tr>
<td>1/8</td>
<td>3 in 12</td>
<td>1.031</td>
<td>1.436</td>
</tr>
<tr>
<td>1/6</td>
<td>4 in 12</td>
<td>1.054</td>
<td>1.453</td>
</tr>
<tr>
<td>5/24</td>
<td>5 in 12</td>
<td>1.083</td>
<td>1.474</td>
</tr>
<tr>
<td>1/4</td>
<td>6 in 12</td>
<td>1.118</td>
<td>1.500</td>
</tr>
<tr>
<td>7/24</td>
<td>7 in 12</td>
<td>1.158</td>
<td>1.530</td>
</tr>
<tr>
<td>3/8</td>
<td>9 in 12</td>
<td>1.250</td>
<td>1.601</td>
</tr>
<tr>
<td>JOIST SPACING (inches)</td>
<td>SPECIE AND GRADE</td>
<td>( (\text{R} - \text{in.}) )</td>
<td>2x6</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-----</td>
</tr>
<tr>
<td>12</td>
<td>Douglas fir-larch</td>
<td>10-4</td>
<td>0-4</td>
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<tr>
<td></td>
<td>Douglas fir-larch</td>
<td>9-11</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Douglas fir-larch</td>
<td>6-9</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>Hem-fir</td>
<td>9-9</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Hem-fir</td>
<td>9-6</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Southern pine</td>
<td>10-2</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>Southern pine</td>
<td>9-11</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>Southern pine</td>
<td>9-6</td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>Spruce-pine-fir</td>
<td>8-9</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Spruce-pine-fir</td>
<td>0-9</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Spruce-pine-fir</td>
<td>8-1</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Spruce-pine-fir</td>
<td>0-0</td>
<td>0-6</td>
</tr>
</tbody>
</table>

Check sources for availability of lumber in lengths greater than 20 feet.

For ST: 1 in = 25.4 mm, 1 ft = 0.3048 m, 1 pound per square foot = 0.0479 kN/m.
a. End bearing length shall be increased to 2 inches.
<table>
<thead>
<tr>
<th>GIRDER SPANS* AND HEADER SPANS* FOR EXTERIOR BEARING WALLS (Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce-pine-fir** and required number of jack studs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIRDERS AND HEADERS SUPPORTING</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Roof and ceiling</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
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</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Roof, ceiling and one center-bearing floor</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td>Roof, ceiling and one clear span floor</td>
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</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Roof, ceiling and two center-bearing floors</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

## Table R802.5.1(1)

### Rafter Spans for Common Lumber Species

<table>
<thead>
<tr>
<th>Species and Grade</th>
<th>2x4</th>
<th>2x6</th>
<th>2x8</th>
<th>2x10</th>
<th>2x12</th>
<th>2x16</th>
<th>2x18</th>
<th>2x20</th>
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<td></td>
<td>Feet</td>
<td>Feet</td>
<td>Feet</td>
<td>Feet</td>
<td>Feet</td>
<td>Feet</td>
<td>Feet</td>
<td>Feet</td>
</tr>
<tr>
<td>Douglas fir-larch S5</td>
<td>11-6</td>
<td>18-0</td>
<td>23-9</td>
<td>Note b</td>
<td>Note b</td>
<td>11-6</td>
<td>18-0</td>
<td>23-5</td>
</tr>
<tr>
<td>Douglas fir-larch #1</td>
<td>11-1</td>
<td>17-4</td>
<td>22-5</td>
<td>Note b</td>
<td>Note b</td>
<td>10-6</td>
<td>15-4</td>
<td>19-5</td>
</tr>
<tr>
<td>Douglas fir-larch #2</td>
<td>10-10</td>
<td>16-7</td>
<td>21-0</td>
<td>25-8</td>
<td>Note b</td>
<td>9-10</td>
<td>14-4</td>
<td>18-2</td>
</tr>
<tr>
<td>Douglas fir-larch #3</td>
<td>8-7</td>
<td>12-6</td>
<td>15-10</td>
<td>19-5</td>
<td>22-6</td>
<td>7-5</td>
<td>10-10</td>
<td>13-9</td>
</tr>
<tr>
<td>Hem-fir S5</td>
<td>10-10</td>
<td>17-0</td>
<td>22-5</td>
<td>Note b</td>
<td>Note b</td>
<td>10-6</td>
<td>15-0</td>
<td>19-5</td>
</tr>
<tr>
<td>Hem-fir #1</td>
<td>10-7</td>
<td>16-8</td>
<td>21-10</td>
<td>Note b</td>
<td>Note b</td>
<td>10-3</td>
<td>14-11</td>
<td>18-11</td>
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<td>Hem-fir #3</td>
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<td>12-6</td>
<td>15-10</td>
<td>19-5</td>
<td>22-6</td>
<td>7-5</td>
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<td>17-8</td>
<td>23-4</td>
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<td>Note b</td>
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<td>17-8</td>
<td>23-4</td>
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<td>17-4</td>
<td>22-11</td>
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<td>Note b</td>
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<td>17-3</td>
<td>21-9</td>
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<td>22-5</td>
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<td>Note b</td>
<td>10-6</td>
<td>15-9</td>
<td>19-5</td>
</tr>
<tr>
<td>Southern pine #3</td>
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<td>20-3</td>
<td>26-1</td>
<td>7-11</td>
<td>13-11</td>
<td>18-10</td>
</tr>
<tr>
<td>Spruce-pine-fir S5</td>
<td>10-7</td>
<td>16-8</td>
<td>21-11</td>
<td>Note b</td>
<td>Note b</td>
<td>10-7</td>
<td>16-8</td>
<td>21-11</td>
</tr>
<tr>
<td>Spruce-pine-fir #1</td>
<td>10-4</td>
<td>15-3</td>
<td>21-0</td>
<td>25-8</td>
<td>Note b</td>
<td>9-10</td>
<td>14-4</td>
<td>18-2</td>
</tr>
<tr>
<td>Spruce-pine-fir #2</td>
<td>10-4</td>
<td>16-3</td>
<td>21-0</td>
<td>25-8</td>
<td>Note b</td>
<td>9-10</td>
<td>14-4</td>
<td>18-2</td>
</tr>
<tr>
<td>Spruce-pine-fir #3</td>
<td>8-7</td>
<td>12-6</td>
<td>15-10</td>
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<td>22-6</td>
<td>7-5</td>
<td>10-10</td>
<td>13-9</td>
</tr>
</tbody>
</table>

### International Residential Code 2003, Copyright 2003. Falls Church, Virginia: International Code Council, Inc. Reproduced with permission. All rights reserved.
<table>
<thead>
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One floor only

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Two floors