

Lesson #2: Introduction to Wall Framing (5 Days)

Objectives

Students will be able to...

- Describe the four major types of wood house framing that have been used in America since colonial times.
- Find and identify at least three codes in the IRC that govern the construction of stick-framed walls made of wood.
- Identify and describe the name and purpose of the members involved in the construction of stick framed walls.
- Interpret a floor plan.
- Assemble wall framing using the correct materials in the correct order.
- Assess scale model wall framing; adherence to code, cleanliness, squareness, and accuracy. (compared to the prints and to scale)

Common Core Standards

RSIT 11-12.2

RLST 11-12.2

Health and Safety 6.0, 6.2, 6.3, 6.4, 6.5, 6.6

Technical Knowledge and Skills 10.0, 10.1, 10.2, 10.3, 10.4

Demonstration and Application 11.1

Cabinetmaking and Wood Products Pathway A4.1, A4.4, A6.1

Residential and Commercial Pathway D2.1, D2.3, D3.1, D3.2, D 3.3, D5.2, D6.3, D6.5, D6.6, D6.7, D6.8, D6.9

Materials

History of Wood Framing in America Hand out

History of Wood Framing PowerPoint

<https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Ad62b771b-28ca-4929-b71c-913ef9410cce>

Using the Code Book: Wall Framing Worksheet

Wall Framing Vocabulary Worksheet

Floor Plan Handout (Attached PDF)

<https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Aef6af132->

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Bill of Materials

Lesson Sequence

- Introduce the history of wood framing in America by reading the *History of Wood Framing in America Handout* and highlighting important information. Also, discuss the *History of Wood Framing PowerPoint* with students.
- Pass out *The Using the Code Book: Wall Framing Worksheet*. Have students find the answers in the IRC hard copy book or online. Review answers as a class.
- Pass out the *Wall Framing Vocabulary Worksheet*. Review the vocabulary definitions as a class. Have students write down definitions. Answer any questions students may have.
- Hand out copies of the *Floor Plan* and *Bill of Materials*. Demonstrate how to snap plate and detail. Cut and construct wall sub-assemblies such as channels, outside corners, header/rough-sill and cripple packages. Construct a demonstration wall that includes all sub-assemblies, studs, blocks, etc.
- Have teams fill out their *Bill of Materials*. Review as a class.
- Students may build their walls to be placed on their model floors frames together. Support as needed.

Assessment

Informal Observations Throughout Lesson
Check for Understanding Through Questioning
Final Products

Accommodations/Modifications

Visual Supports
Strategic Partners
One on One Support
Extra Time If Needed

History of Wood Framing in America Hand out

Throughout American history, four basic types of wooden home construction/framing were developed and utilized. They are (in succession) log construction, timber framing, balloon framing, and platform framing.

Balloon and platform are also known as stick framing, because instead of using whole logs, or large timbers to support the weight of the structure, they rely on small dimension lumber (lumber that is milled to specific standard dimensions) that when assembled in a certain manner, provide adequate support for the structure.

Log construction

Even though the origin of this building method is uncertain, it is believed that they were first constructed in northern Europe sometime during the Bronze age; approximately 5,500 years ago.

Basically, the only machining necessary was that the ends of the logs needed to be notched. There were several types of notches used to lock the logs together at the corners of the structure. The most popular were the dovetail and the interlocking saddle notches.

Probably the most famous individual to be born and raised in a log cabin was Abraham Lincoln, the 16th President of the United States.

A little-known type of framing that overlaps both log construction and timber frame construction is referred to (among other names) as plank-wall framing.

Methods of assembling a plank framed home varied, but there were several general types of assembly. An example of these methods includes stacking hewn or split planks of approximate six inch thickness one on top of the other. They were then fixed with log-type corner joinery. This joinery included dovetails and interlocking saddle notches where two walls met.

Timber framing

Timber frame construction, like log construction, utilized heavy timbers for the load bearing members of a given structure. Unlike log construction though, the heavy timbers used to construct timber framed buildings were hewn, sawn, or milled into framing members of square cross section, some as thick as 12 inches by 12 inches.

The timbers were not held together with notches aided by their own girth, instead, timber frames used joinery methods such as mortise and tenon and scarf joinery.

These methods would later come to be known as half-timbered construction in the late 1700's. This name was derived from the look of the in-filled spaces between the members of the structural timber skeleton. The in-fill left a portion of the timber exposed on both the inside and outside of the structure

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prompting the name. Traditional in-fill methods used brick, rubble, or wattle and daub (think lath and plaster) that was then plastered over to achieve a sealed, finished wall.

Even though a timber framed structure was first built on American soil almost 400 years ago, the history of this type of framing predates that event by almost 1,600 years!

Another interesting feature of timber frame construction is known as Jettying. An upper story that extends (cantilevers) out beyond the first-floor walls of a timber framed structure is known as a jetty. This was a very expensive and time-consuming feature to add to a structure. So why did people do it? The answer is simple, money. Money in the form of taxes that is!

It's the same in that it has to do with taxes when remodeling your home. Have you ever noticed that sometimes people will tear an existing house down to the ground, but they will leave one solitary wall standing? That seems a little silly doesn't it? If you are going to demolish the house and essentially start over again, why not tear down all the walls? The answer is taxes. For the same reason people would go to the expense of jettying the upper floors of their medieval homes, so too people will leave one wall standing in a total teardown and rebuild. California law states that if you include at least one original wall in the rebuild house then it is not a new house, it is a remodel! And, you guessed it, remodels are taxed based on the improved part of the house determined by the value of the original house. If you tear that one remaining wall down, then your remodel becomes new construction and your new home will be taxed according to current values in its entirety! This can make thousands of dollars of difference in your annual property taxes.

Noggin-pieces

Have you heard the word "noggin"? What were they referring to? (their/someone's head). Well, Noggin-pieces are the horizontal members that form the top and bottom of the frame for in-fill. In certain types of timber frame, the top member is right about at "noggin" height. One has to wonder if early carpenters didn't smack their head on these boards so much while constructing a timber frame structure, that eventually the boards became known as "noggin pieces. Today, these would be like a header and rough sill above and below a window.

Dragon beam

A dragon beam is a beam that is installed diagonally from the bottom of one corner to the top of another. It is supported by the corner post from the floor below, and in turn supports the corner post of the floor above. Because it is installed diagonally, it works similarly to a modern let-in brace, helping the structure resist lateral shear forces.

Balloon framing

For 175 years, the accepted history of balloon framing has stated that this method of construction suddenly appeared in Chicago in either 1832 or 1833. And, depending on who you talk to, this incredible lead forward in construction technology was either the brainchild of George Washington Snow or Augustine Deodat Taylor,

It is a method of framing that used lightweight two by members of dimensional lumber (such as studs and joists, among others) in place of traditional posts and beams as the load-bearing members of a structure.

Eliminating the difficult joinery required by timber framing effectively eliminated the highly skilled craftsmen (who were in short supply in the west at that time) needed to join and assembly a structure's frame. Herein lies one of the true beauties of balloon framing; anyone with general do-it-yourself (DIY) carpentry skills could assemble a balloon framed structure. It was this "anyone can do it" characteristic of balloon framing that allowed for the amazingly rapid expansion of towns in the American West.

Balloon framing was a style that used studs that would begin at the foundation and ride all the way up to the second floor. This attributed to the two main factors of its non-compliance to modern day code books. If they ride from the bottom to top then they would catch fire like a matchbox and the expense of shipping such long studs would cost a fortune, let alone being able to locate such lengthy trees.

Platform/Western framing

Balloon framing pioneered what has come to be known as "light frame construction"., or in the vernacular of the construction trades, stick framing.

Platform framing has been the official answer to balloon framing's faults. Platform framing required merely 8 to 12-foot studs since a new platform would be built to achieve a second floor, this would drastically reduce the pricing of lumber and solve the inventory issue of lengthy trees. The second platform would also stall the speed of fire spread as well as nearly eliminate the need of scaffolding, saving time and money.

Platform framing is our modern-day traditional style of framing in the west. Platform framing is what we are going to learn in this lesson of wall framing!

Using the Code Book - Wall Framing Worksheet

Directions: Using the *IRC for One- and Two-Family Dwellings* or online resources find the answers to the following questions.

1. What chapter and section numbers do you find the codes governing wall framing?

Chapter: _____

Section numbers: _____

2. What are the 3 minimum stud grades that can be used to frame a wall?

3. How far apart (in feet) must joints in the top plates be?

4. Under what section number will you find the code addressing the bottom or sole plate?

5. According to Table R602.3(1) what size nails and how many of those nails must be used to end nail studs to the top and bottom plate?

Quantity: _____

Size: _____

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6. Using the appropriate tables in section 602.3(5) find the maximum on-center spacing of 2x4 studs when supporting one floor, roof, and ceiling. Please state your answer in inches.

7. According to Figure R602.3(1), what section will you find the provisions for drilling and notching studs?

8. According to Figure R602.3(1), what do we call a wall that carries a load from above?

9. According to Table R602.3.1, what is the maximum allowed height of a 2x6 stud when spaced at 16" OC and supporting only a roof? (state you answer in feet).

10. Using the figures R602.6(1) and (2), what **percentage** of a stud's width can be bored out to allow for plumbing, electrical, etc.?

11. Using the maps at the front of the book, what **letter** represents the highest "Seismic Design Category" located in Southern California?

12. When notching top plates to allow for plumbing vents, (a) what does the code require you install? **(b) What size nails** should you install and (c) with and **how many** of those nails do you need to use?
 - a. _____
 - b. _____
 - c. _____

Wall Framing Vocabulary Worksheet

1. Bottom plate:

2. Stud:

3. Cripple:

4. Rough sill:

5. Trimmer:

6. King stud:

7. Header:

8. Top plate:

9. Double top plate:

10. Stud-block-stud:

11. Channel:

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12. Let-in brace:

13. Fire blocks:

14. Platform framing:

15. Shear panel:
