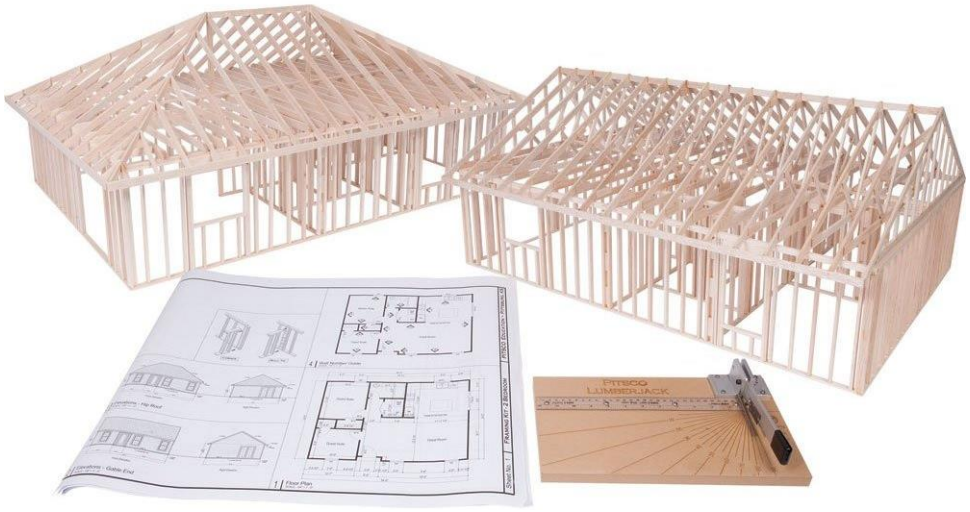
Construction Module



This module is based on the blueprints in the PITSCO Framing Kit.

Activity 1: Learning To Measure

The construction industry mostly uses the Imperial system of measure (not metric). Wood is measured in Feet, inches, and fraction of an inch.

1 foot = 12 inches

- Symbol for 1 foot: 1’
- Symbol for 1 inch: 1”

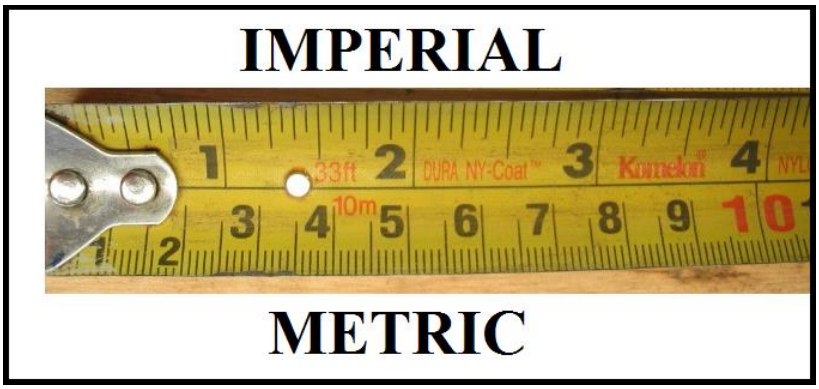
Inches are divided into fractions of usually 16 increments (**1/16”**) but sometimes 32 increments (**1/32”** – more accurate)

Assignment 1:

Watch the video at grandmanan.org listed under Activity 1!

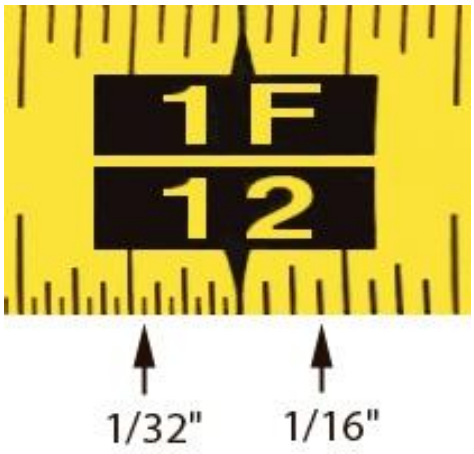
Reading a Tape Measure

1. Check the units:

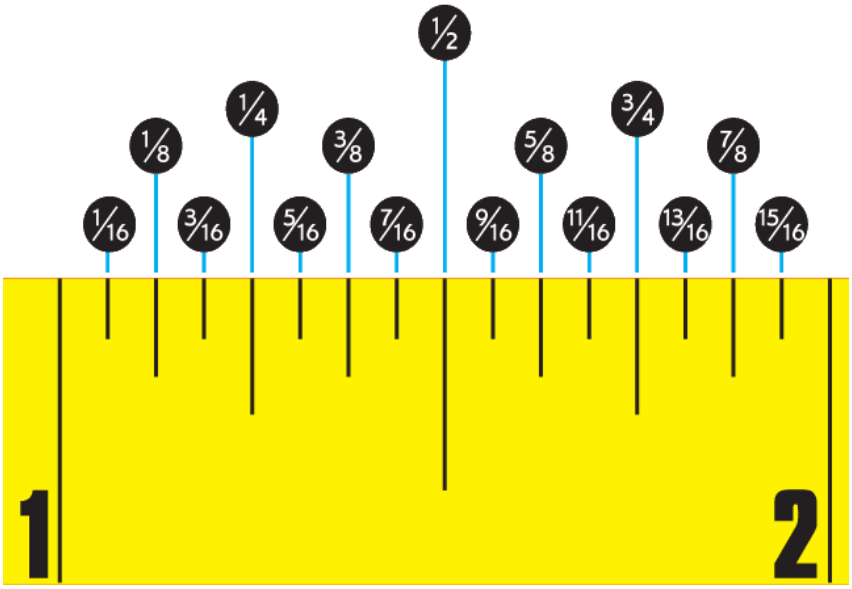


- **Imperial:** Inches/Feet,
- **Metric:** meters/cm/mm
- **Both** Imperial and Metric

2. Check increments between inches
   - 1/16”
   - 1/32”
   - 1/32” for the first foot and then 1/16”



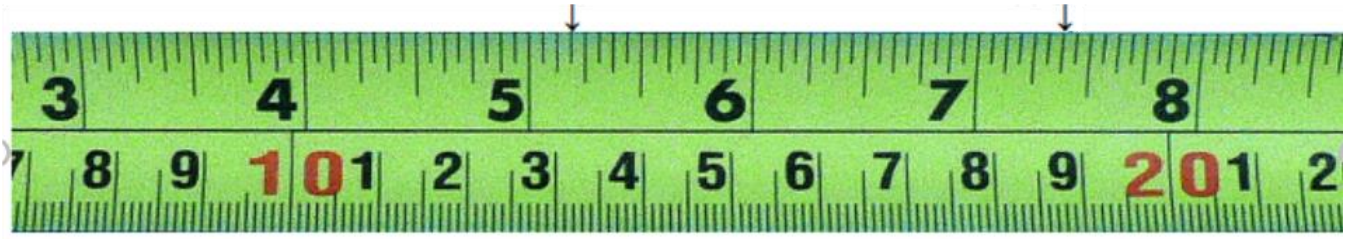
3. If the increments are 1/16”, this is how they are read as “**lowest terms**”



4. **Lowest Terms:** (what number will divide evenly into the numerator and denominator)

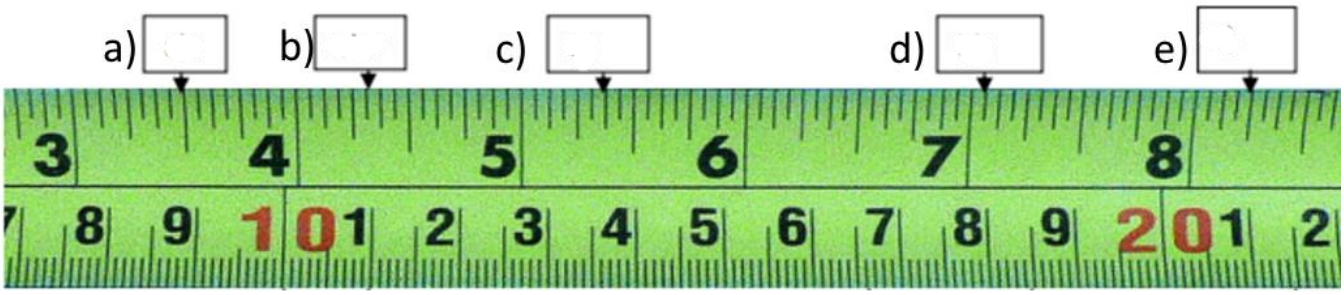
   Example: 4/16" (the largest number that will divide into both numerator and denominator is 4). **Lowest Terms would be 1/16".**

5. **Test Yourself:** Read the two points on the measuring tape (don't forget to put the symbol that represents inches)



Go to the next page and see if you wrote the answer exactly as shown.

6. **Assignment:**
   If you answered the last question (#4) correctly, then complete this assignment on your answers worksheet.



7. **Assignment:**
   Mark the ruler on your answer page showing each measurement

   3 ¾” 4 7/8” 6 1/8” 7 ¼” 7 5/8”

8. **Check Your Work:** Have your instructor mark your answers. Then, if you're ready, ask your instructor to send it to you on Teams.

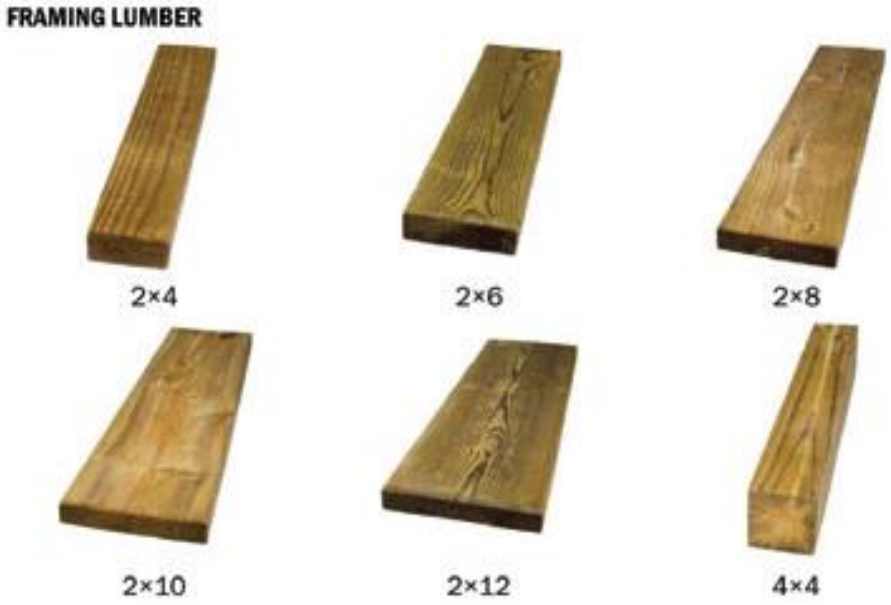
9. **Assignment (on Teams):** There are two bags of wood. Measure the blocks in each and put the answers on Teams. Be careful to answer in the format indicated.

Measuring Tape Answer Key:
(from previous page)

5 3/16” **7 3/8”**

Activity 2: Building Materials

Regular wood is planed down from it's original dimensions. (It is small in size than the name says).



Here are some common materials used in home construction.

Exterior walls (outside walls) are predominantly made from **2x4**s in very old houses, while **2x6**s make better exterior walls in newer houses because they leave more space for insulation.

Interior Walls (inside walls)**:** are usually made of 2X4s.

Ceilings are usually 8 feet high (and that determines how long we have to cut **stud** lumber).

Assignment:
Ask your teacher for the sample lumber. Measure the boards and provide the actual measurements. Put your answers on the answers worksheet.

- A 2x4 is really about _____" by _____".
- A 2x6 is really about _____" by _____".
- A 4x4 is really about _____" by _____".
- A 2x8 is really about _____" by _____".
- A 2x10 is really about _____" by _____".

(There might only be samples for some sizes but not all – no worries)

There are a few other questions on the answers worksheet from the information in the lesson.

Activity 3: Building to Scale

Let's build a miniature house. We can't fit a real house in the classroom, so we built to scale It will be **1:8 scale**, meaning the model will be 1 foot for every 8 feet in real life.

Assignment:

1. Find the special **1:8 scale ruler**
2. Find the **Master Blueprint** (the one that shows the whole house)
3. Ask the teacher which wall you should build, then find the **specific blueprint** for that wall.

Picture Source:
http://www.customsmarthomes.net/assets/images/Custom%20plans%20photo.jpg

Building From Blueprints

Residential framing involves creating a strong skeleton for your house based on proven building codes. A blueprint is an architect's instructions for the builder. It is like a cook's recipe.

You will need to know how to read the blueprint before you start building. Take a look at the specific blueprint for your wall. What does it all mean?

Side View Blueprint:

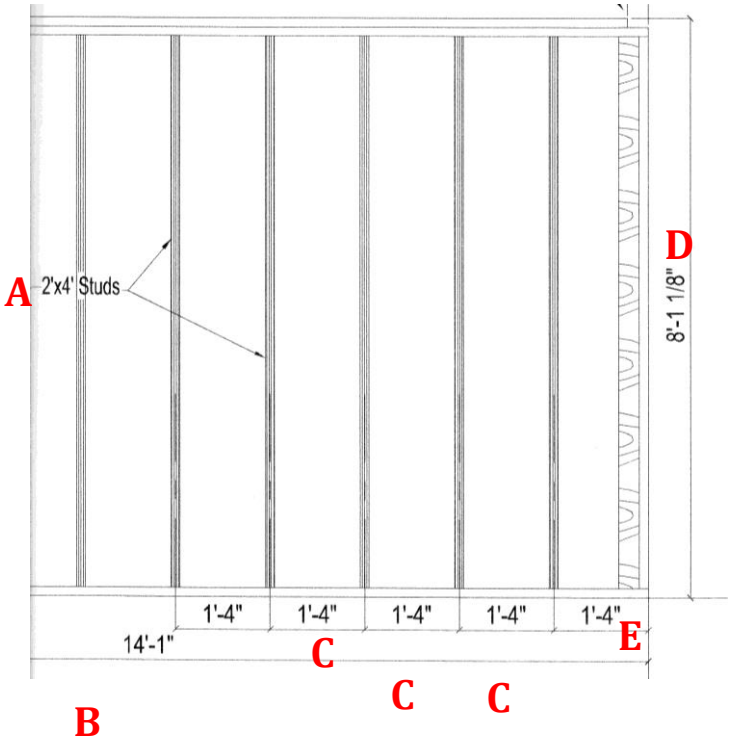
A – You are going to use 2X4s to construct this wall

B – The wall will be 14’ 1” long

C – The Studs will be 16” (1’ 4”) on center (from the center of one, to the center of the next)

D – the walls will be 8’ 1/8” high

E – The wavy line indicate that an interior wall runs parallel and touch on this wall



Top View Blueprint:

A – These are Studs and they are located 16” (1’ 4”) on center (from the center of one, to the center of the next)

B – A window starts at 1’ 11 ½” from the corner

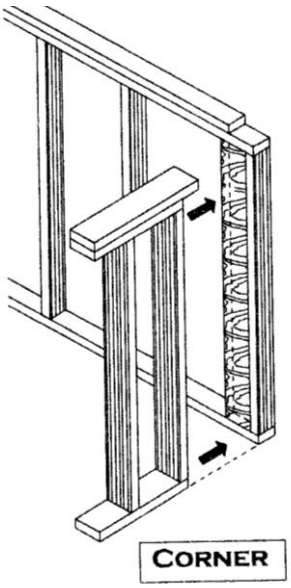
C – The window is 3’ long

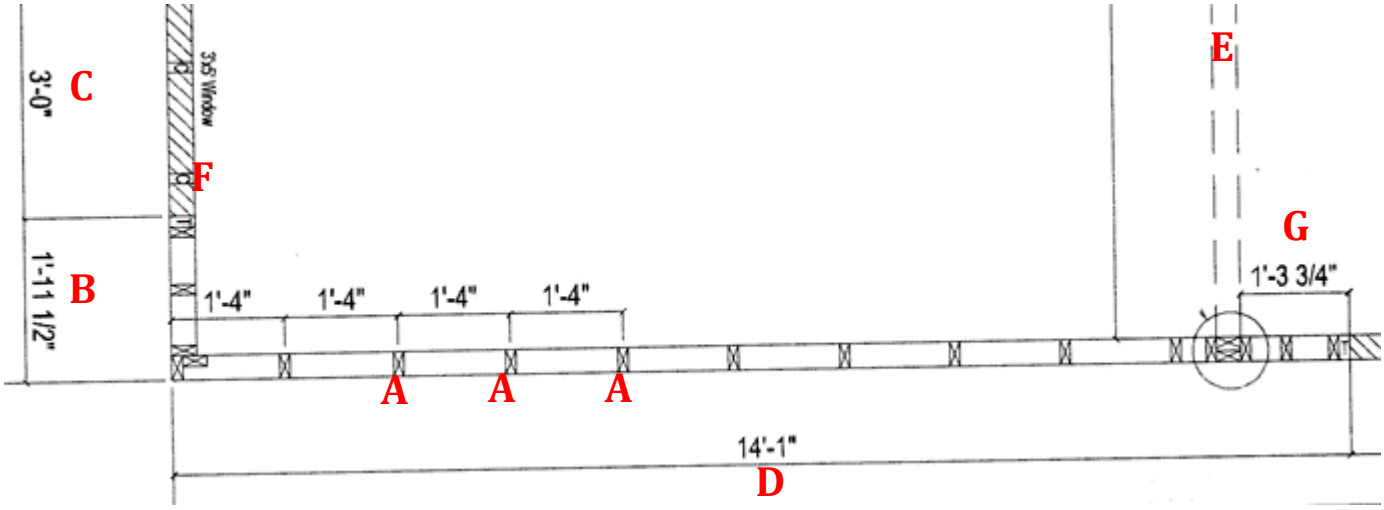
D – The wall is 14’ 1” from the corner to the start of the window.

E – An interior wall

F – The lined area is a window

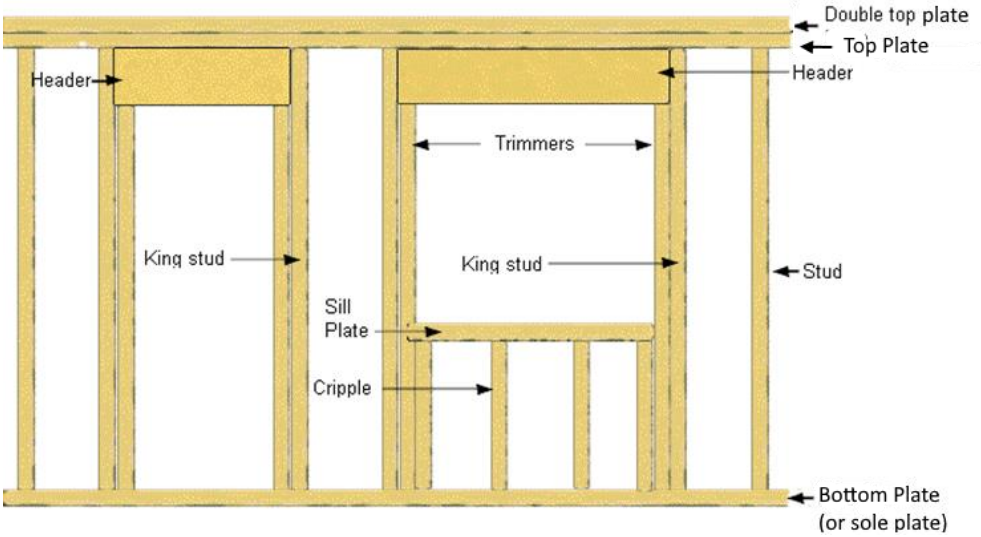
G – The window starts 1’ 3 ¾” from the interior wall



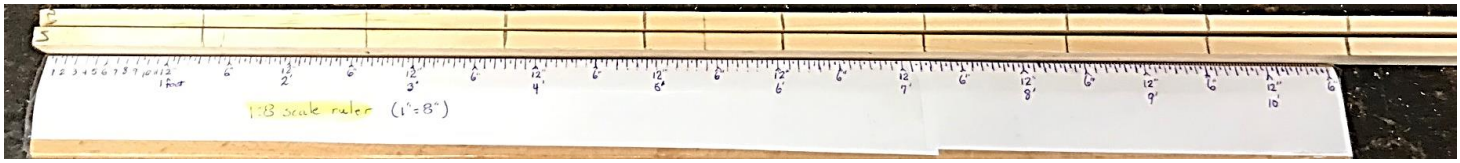


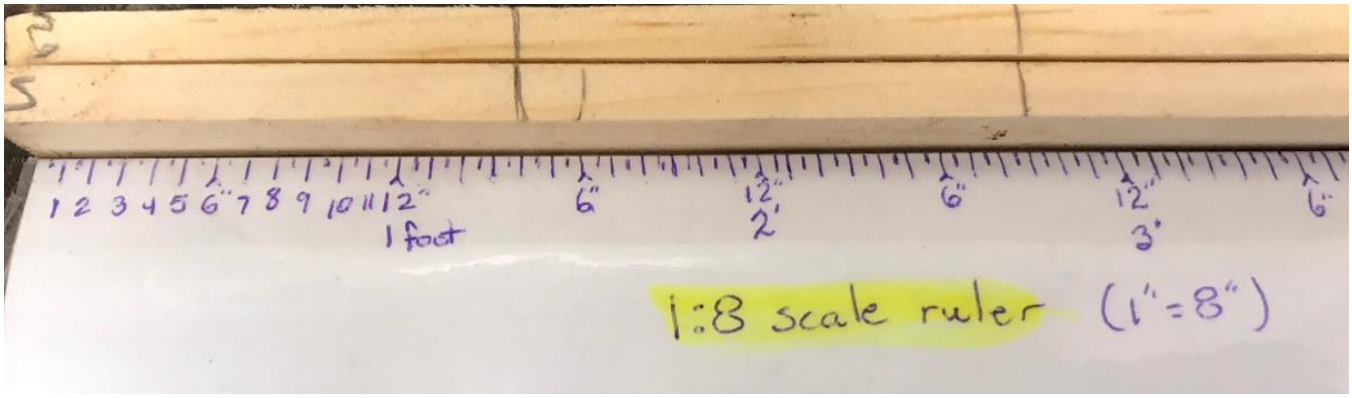
Assignment: Let's start building!

1. Find out from your blueprint how **long** the wall will be.
2. We will build the **Top Plate** and the **Bottom Plate** (sometimes called sole plate)



- Take two pieces of scaled 2X4s and put them together as illustrated below. Put an **S** (for Start) on the left end
- Starting on the left side, measure 16" (1' 4") and put a mark across both boards (use the scaled ruler – notice each mark is ½")



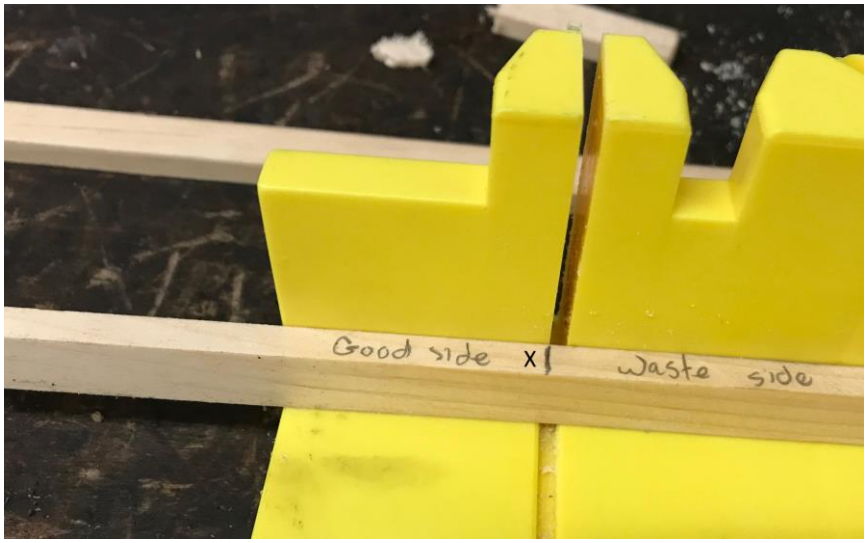


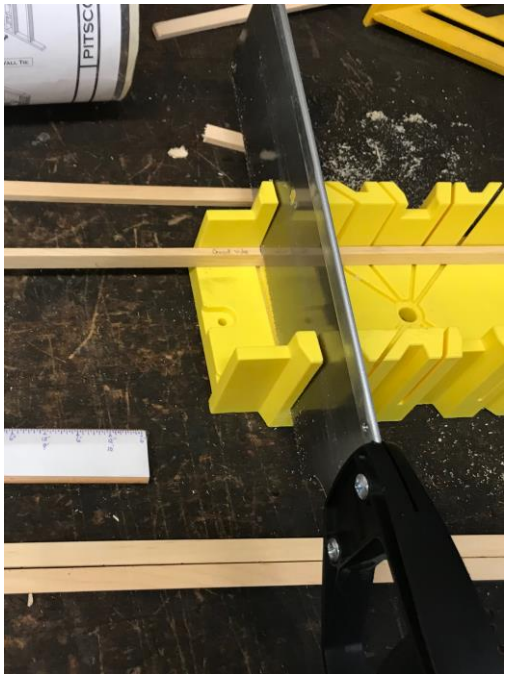
- Keep marking every 16" (1' 4") until you get to the end

Assignment: Cutting the studs

Studs are the vertical boards in your wall. They are 92 5/8" long (we will use 92 ½" to make measuring easier). They can be purchased that exact size so you don't have to cut them (just as for stud length at the hardware store)

- Measure a 2X4 board to stud length (92 ½"). Mark an **X** on the "good side" which is the board you want to use.
- You have to put your saw blade on the line so it doesn't touch the good side.





- Cut a stud for each mark you made on the top and bottom plate, plus 2 extra (one for each end). We careful to make them **exactly** the right length.

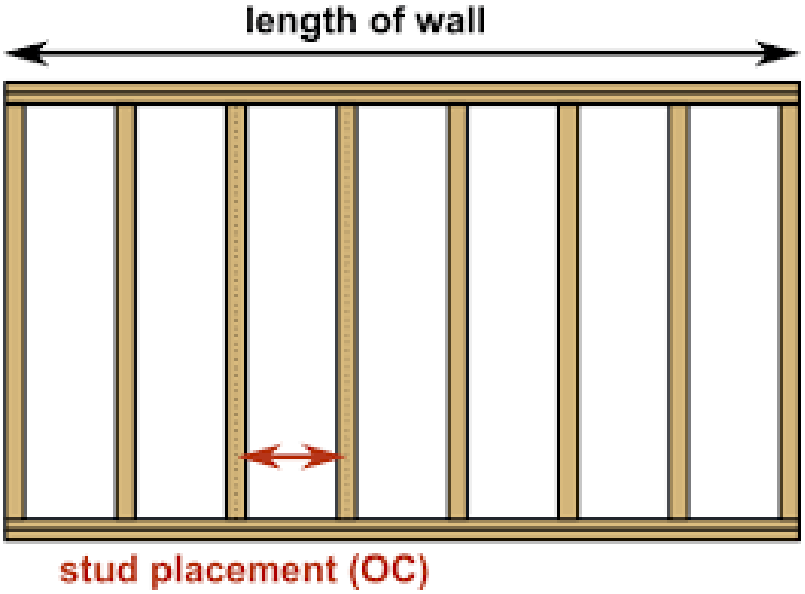
- You don't need to cut a stud if the **side view** blueprint shows a window or door where a stud should go (we'll look after these later).

Activity 4: Nailing the Studs

You are ready to put together the walls with nails.

- Nail the studs to the top place. Make sure the stud is exactly centered on the line.
- Use the nails provided by the teacher
- Don't put a stud if the **side view** of the blueprint shows a stud going through a door or window.

Sample! See the real blueprint of the wall that you are going to construct!



Assignment: Build 2 external walls with the "tiny" wood provided using a blueprint (talk to your teacher about which blueprint).

Activity 4: Nail Gun Safety

Nail guns have made construction a lot faster and more efficient. The problem is, the tool can be dangerous.

Assignment:

- Watch the 2 videos – (on the BBT website)
- Answer the questions

Questions:

1. How can knots in wood affect the nail and what do you do to protect yourself from this.
2. What are all the basic safety rules in the videos?
3. Complete this sentence as heard in the video: "You're a pro… "

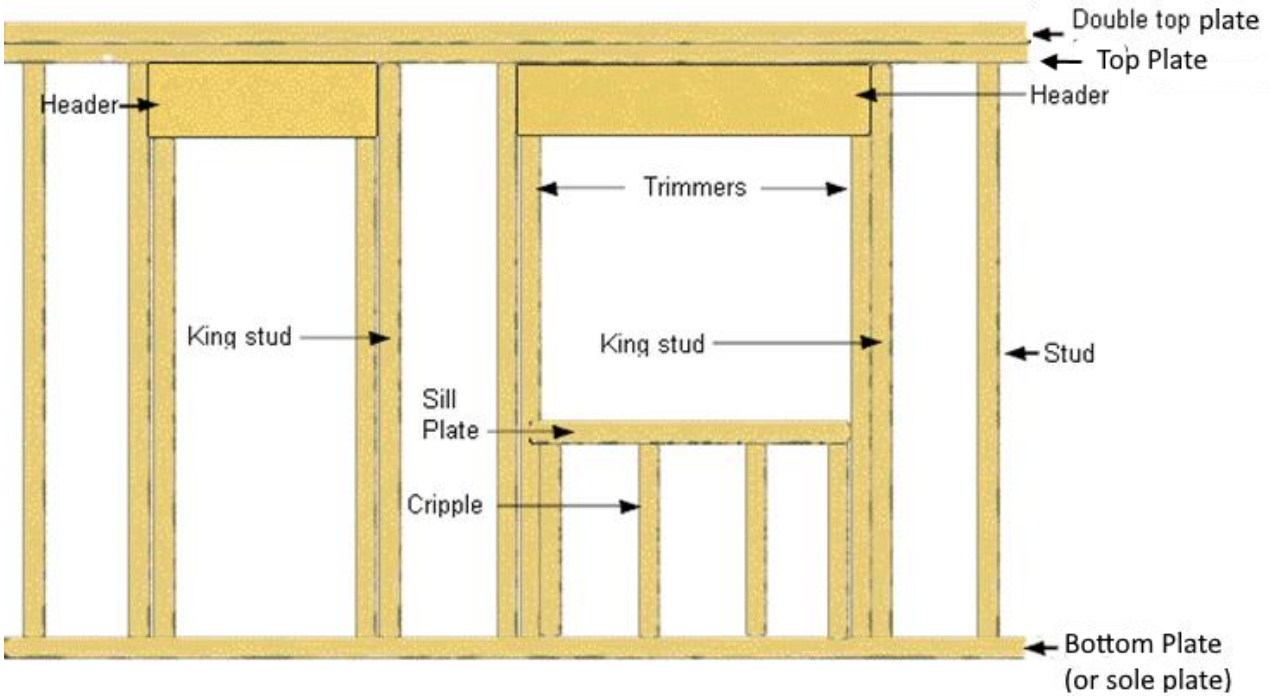
Photo Credit:
http://ilab.engr.utk.edu/cirpc/images/tipslider/18-nailgun.jpeg

Video 1:
http://www.youtube.com/watch?v=qY0-5oU4POE

Video 2: http://www.youtube.com/watch?v=SOZIBZGsjsk

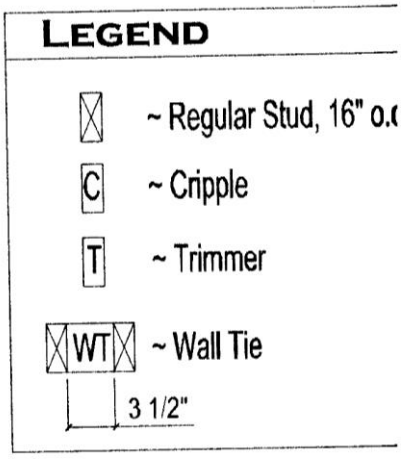
Activity 5: King Studs, Trimmers, and Cripples

Studs always go on 16” centers. Then you have to fill in the other components.



Measure and cut out the door and window components.

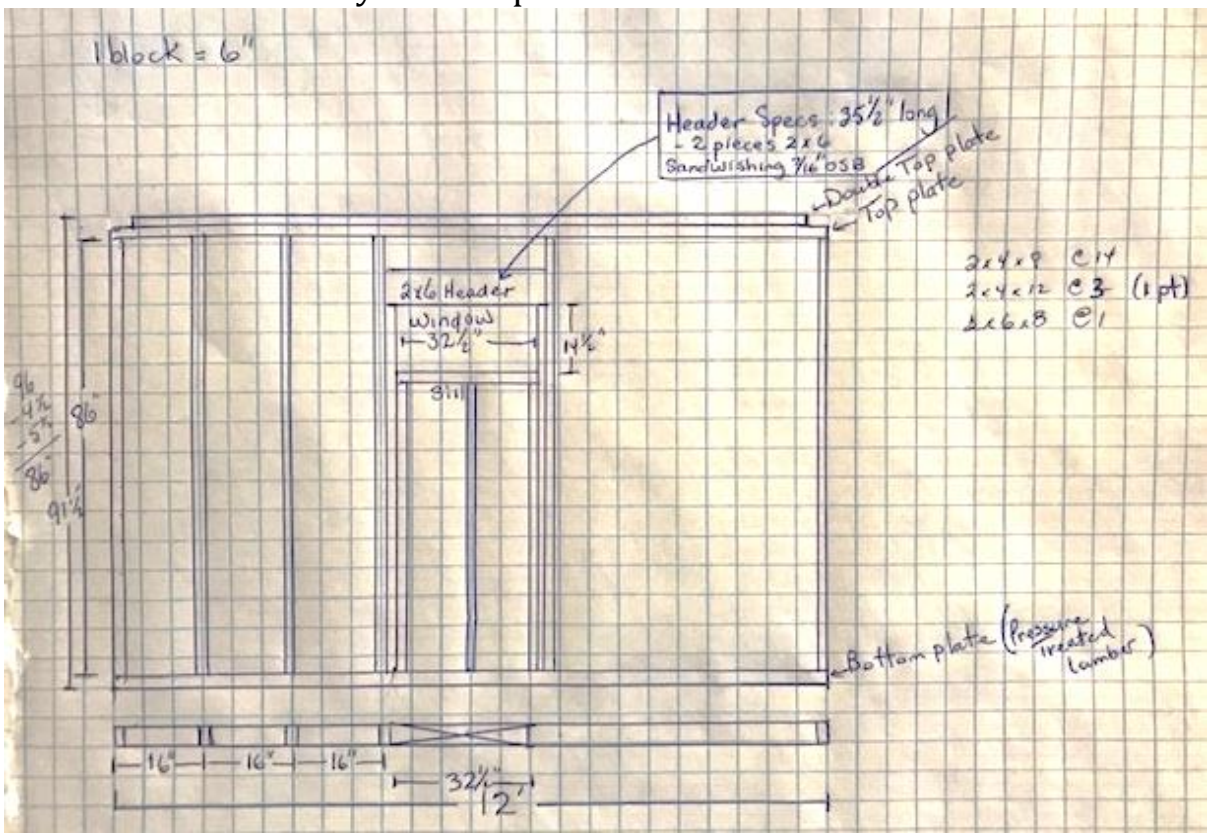
- Notice that a **Header** (Doubled up 2X6 or 2X8 with an OSB spacer) always goes on top for strength
- Notice that a **Trimmer** always goes up to the Header (supports it)
- **Cripples have** to go where you marked the studs on the bottom plate.

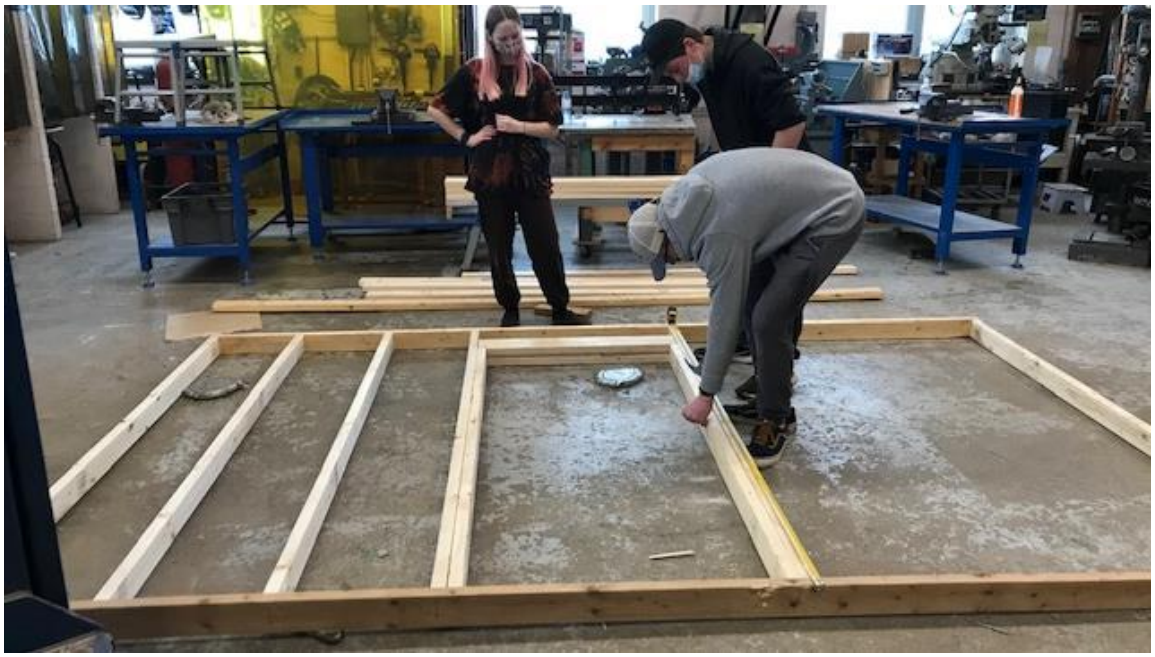


Assignment:

Check your **side view** blueprint and cut the wood needed for a door or window. Nail it based on the dimensions in the blueprint. Then show it to your teacher.

Once approved by the teacher, complete the other windows and doors in the wall as shown by the blueprint.





Activity 6: Future Framing Techniques

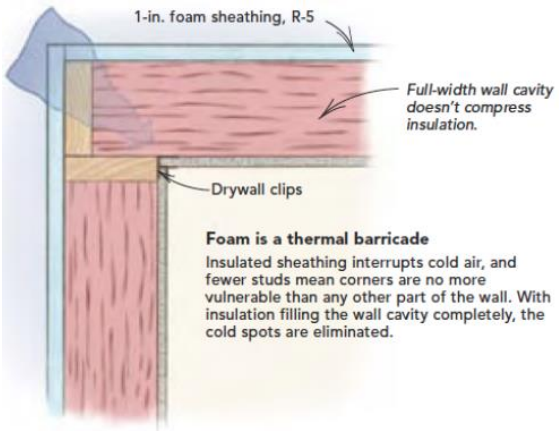
A house isn't just wood and nails anymore. Advances in building technology haven't eliminated the need for good old sawn lumber, but a move to more efficiency is making other engineered materials very popular. Engineered lumber is generally more costly than traditional lumber but overall there are many advantages.

It's not so much that engineered wood is stronger, although in many cases it is, but that it is more consistent and predictable. When steel is combined with wood in the form of joist hangers, rafter ties, and steel connectors, wood can support more weight with less thickness.

Click on the link and read the article, "The Future of Home Framing Is Here".

From the information in this section and in the article, answer these questions:

1. Is engineered lumber stronger than traditional lumber or are there other benefits?
2. What other materials make traditional lumber stronger while needed less of it?
3. Why do we need to start to listen to recommendations that make building more efficient?
4. What is a "Net Zero" house?
5. What is the focus to actually create a "Net Zero" house? Explain!



6. OVE (Optimal Value Engineering) cut the cost of houses by eliminating unnecessary lumber. Name three things that they suggested.
7. Look at the two illustration of a corner (looking down at it) on page 52. What is the issue with the top one?
8. Look at the second insulation illustration on p. 52, and indicate **three** ways that insulation was improved.
9. What are the two most noticeable differences between the two identical walls shown on page 53?
10. "R-value" is the way we rate insulation. The higher the number the better. Compare the R-Value between the "Standard Wall Framing" on p.53 with the "Smart Wall Framing" on p. 53.
11. The framing photo on page 54 of the article shows 12 ways to build more efficiently. List them in your own words (if you don't understand a term, then ask).

This video reinforces the ideas in the article. Link

Activity 7: National Building Codes

National Building Codes are in place in Canada to protect Canadians from unsafe conditions. Just because you are building a house for yourself today, someone else may own it 25 years from now, and it is important that is structurally safe.

We're going to take a quick look at the National Building Code so you can get a taste of what you will do if you become a licensed carpenter.

The latest version of the Construction Building Codes is 1245 pages and costs nearly $300 but if you're in the industry, you might as well get used to using it. If you don't build to code, then the Building Inspector in your area will have you tear everything out and start again. (Yes, s/he will!!)

Even if you own your structure now, it still has to be constructed so it's safe 50 years from now when someone else owns it.

Assignment 7:

Use the National Building Code book to answer each question:

1. Use the index in the front to find what part/section relates to Fire Projection.

   Answer: _____

2. Go down through the index and name the section that relates to Fire Alarm and Detection Systems. (Example: Section 3.1.1)

   Answer: _____

3. Go to the indicated page(s) and find out if you are required to put in a fire alarm system (this is not just a smoke detector but a whole system) for:
    a. A building that has a sprinkler system Answer: _____
    b. A residential occupancy with sleeping accommodations for more than 10 people Answer: _____
    c. A dwelling of not more than 3 stories Answer: _____
4. In that same part of the book (continue along in that section)… what is the section number for Fire Detectors? (Example: Section 3.1.1.2)

    Answer: _____
5. If a fire alarm system is installed, do you have to put smoke detectors in the sleeping rooms?

    Answer: _____
6. Continuing with the situation in question #5, do you also have to put a smoke detector in the hallway/corridor?

    Answer: _____
7. It looked like we were in the right section to find out where you need a smoke detector in your residence but did you see anything in that section about residences/houses?

    Answer: _____
8. Lets' go to the section on Housing and Small Buildings. Look in the index to part 9. What section refers to Smoke Alarms? (hint: you might have to turn the page) (Example: Section 3.1.1)

    Answer: _____
9. In the section, that refers to "Smoke Alarms", determine if we need smoke alarms for each of these situations:
    a. There has to be a smoke alarm on every floor including the ...

        Answer: _____
    b. Each bedroom is protected by having a smoke alarm either inside the bedroom or within _____ meters

        Answer: _____
    c. What kind of a power supply must a smoke detector have?

        Answer: _____

Activity 8: Careers

At one time, just about anyone could do construction work., now, you need to a certified plumber to work on plumbing; a certified electrician to do electrical work; and soon you will need to be a certified carpenter to work on structures such as residential houses.

To become a certified trades person (a journeyman), in most cases, you can choose one of two paths:

1. Work with a certified trades person as an apprentice and write tests (Blocks) as you reach a certain number of hours of work. This usually takes 5 years of full time work to get all your hours depending on the trade.
2. Spend a year or more at Community College, and this time is subtracted from the time you spend as an apprentice.