

Student Instruction Manual

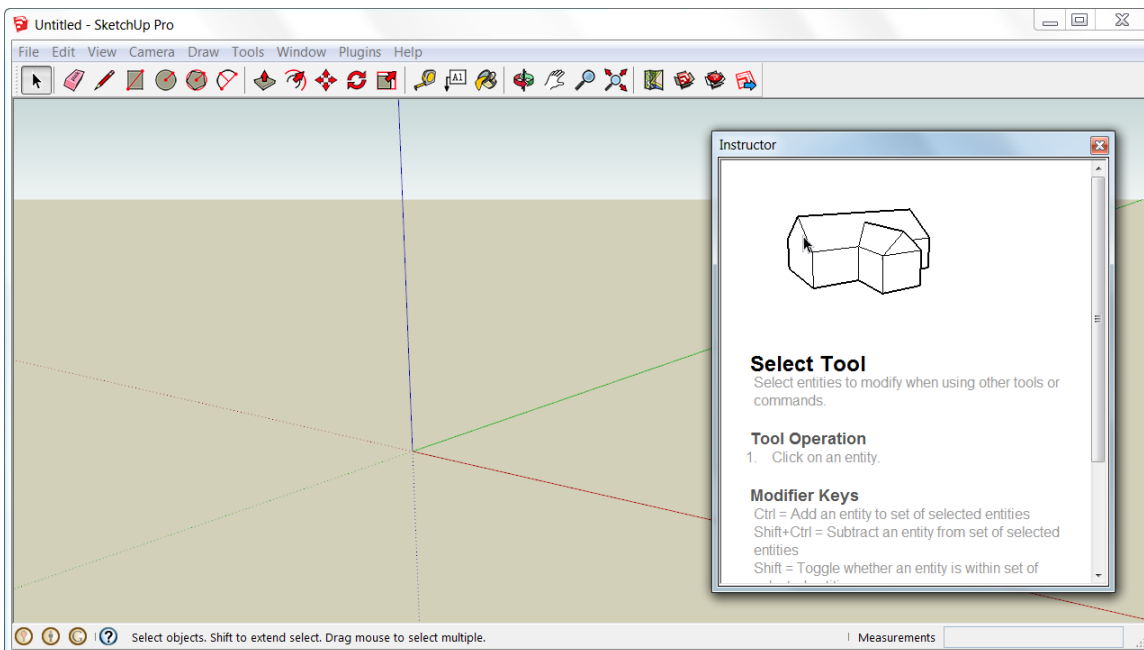
The interactive 3D companion exercises for this book are available in two 3D CAD formats: Trimble SketchUp's **SKP** and Autodesk AutoCAD's **DWG**. Both formats can be imported into a variety of 3D modeling software and these exercises can be completed using those (with some reduction in functionality if SketchUp is not used). However, instructions here will be provided for the **freely available SketchUp (Make and online)** software. You are encouraged to use it for these exercises to get the full benefits of included labels, dimensions and some of the interactive behavior. SketchUp is easy to learn and can be used even by novices.

You can download **SketchUp Make** for free (Windows and Mac versions are available) from here:

<http://sketchup.com/>

These exercises will also work with SketchUp Pro, which can be purchased at a student discount and might already be available in your university's computer labs.

After installing the software and starting it, you should see the following screen (Windows/Pro version shown) and you are ready to start the exercises:



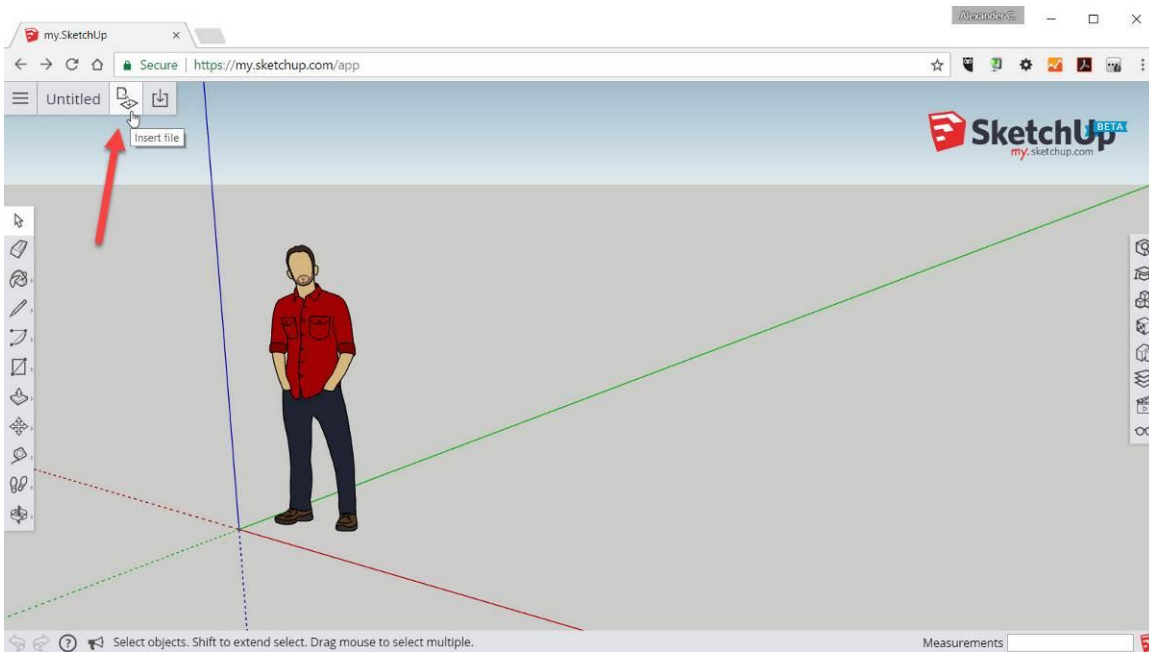
Alternatively, you can use the online, browser-based **my.SketchUp.com** application, which has a similar tool set to SketchUp Make. Sign up for it here:

<https://my.sketchup.com/app>

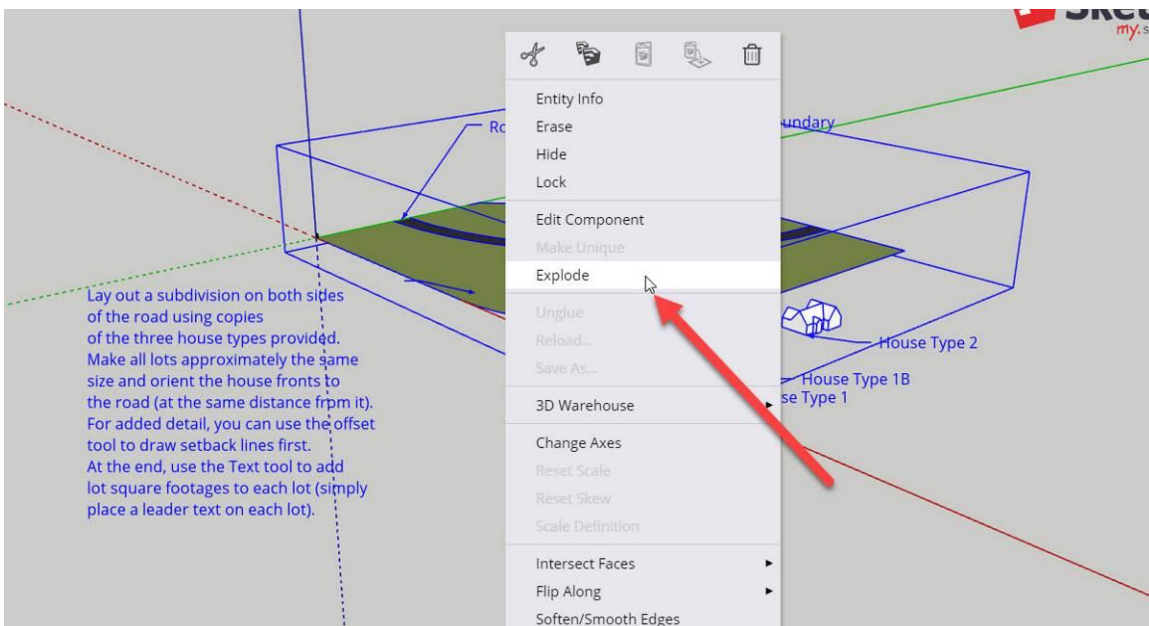
After registering and starting the my.SketchUp.com app, it should appear in the browser window as shown below:

Fundamentals of Residential Construction, 4th Edition

Interactive 3D Exercises – Student Instruction Manual



Use the **Insert File** tool (see red arrow) to insert a (previously downloaded) SketchUp SKP file into the model area. Please note that this file is being inserted as a *Component* (everything in it is grouped). To be able to commence with the exercise, you first need to un-group the inserted model. You do that by right clicking on the inserted model and then selecting **Explode** from the context menu (as shown below). At that point, you are ready to start the exercise.



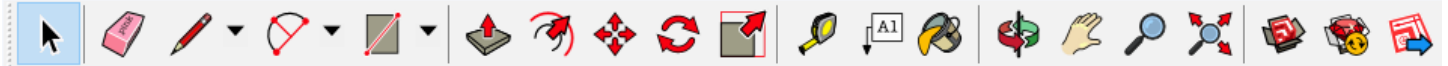
Please note: All SketchUp SKP files are provided in the 2013 file format and can be used in SketchUp version 2013 and newer.

Fundamentals of Residential Construction, 4th Edition

Interactive 3D Exercises – Student Instruction Manual

Tools

Although SketchUp has much more functionality than is shown on this startup screen, you can complete all of the exercises using only the tools that are provided on the Getting Started toolbar. These tools are:



(left to right: Select, Erase, Line, Arc, Rectangle, Push/Pull, Offset, Move/Copy, Rotate/Copy, Scale, Measure, Label, Paint, Orbit, Pan, Zoom, Zoom-Extents, 3D Warehouse, Extension Warehouse, Export to LayOut)

If you are new to SketchUp, make sure the Instructor window is open (as shown above). It is located in the panel on the right side of the work area and provides contextual help for the currently open tool. You can always display this window by going to **Window > Default Tray > Instructor**.

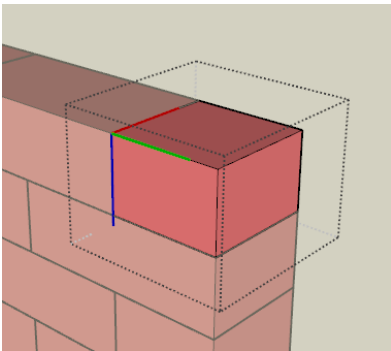
Please note: All of these tools are also available on my.SketchUp.com although icons may look slightly different.

The only tools from this toolbar that you need for these exercises are explained next:

Select

Click select or hit the spacebar to be able to select objects. Single-click objects to select them or draw a selection rectangle around multiple objects (window and crossing selection are available).

Please note: If you double-click an object, you will get into group/component editing mode. It looks like this:



When this happens, click outside of the object into empty space to exit edit mode. You do not need to use this functionality for the exercises.

Erase

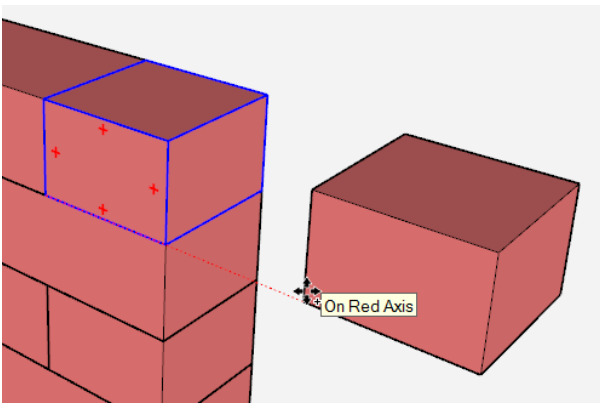
If you need to erase something, start this tool and click an edge of the object you need to erase.

Alternatively, you can select one or multiple objects first and then hit the **delete** key on your keyboard.

Move

You will need to move and copy things a lot in these exercises, therefore get familiar with this tool. To move an object, start the tool and click a convenient point on the object (e.g. a corner or the midpoint of a side). Always use SketchUp's snap functionality to pick this point and the target point. Don't just eye click points and distances – things will not line up in the end.

When you temporarily move an object parallel to one of the main axes (red/green/blue), SketchUp will show you this (see image below) and you just need to type a distance (e.g. 3'2" for three feet and two inches) to move the object by this amount in the shown direction.

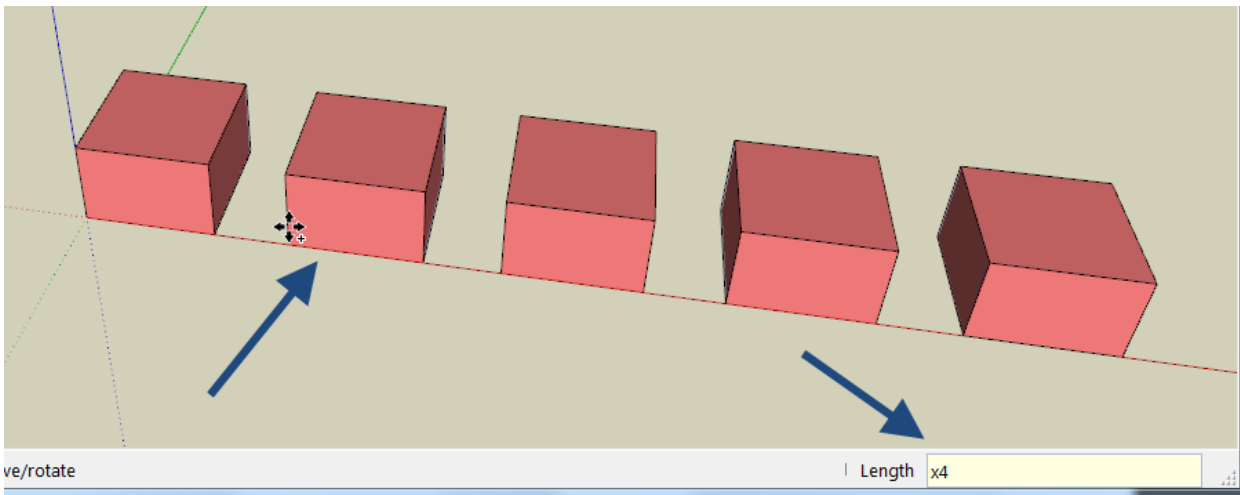


SketchUp has an excellent inference system that allows you to acquire points easily in 3D. Check out its help file to learn more about this.

Copy

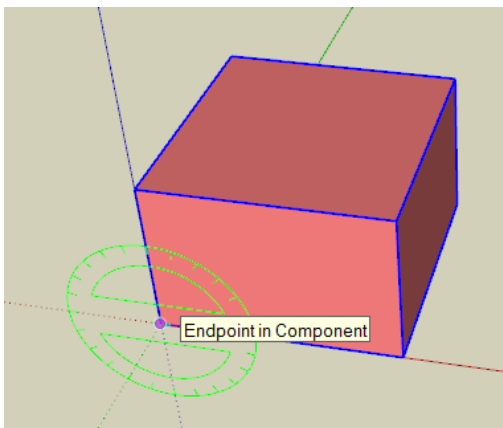
The Copy tool is actually hidden inside the Move tool. To use it, all you need to do is start the Move tool and toggle the copy functionality by clicking the Ctrl key (you don't even have to hold that key, just use it as an on/off switch!). You can then move the copied item and place it where you like it. Remember to use object snapping here, too.

If you need to make multiple, regularly spaced copies (an "array"), place the first copy (left arrow in the image below) and immediately type x4 (or any number you like) to make the remaining copies. This works very well for objects like bricks. Just remember that you need to enter "x4" before you click anything else in the software (you need to still be in the Move/Copy tool).



Rotate

When you start the rotate tool, you get a protractor-like gizmo. Based on what is underneath your cursor, this tool will pick a plane about which it will rotate (also indicated by its color). The point you click then will be the center of rotation.



To select a specific plane to rotate about, hover your mouse where the tool acquires that plane (e.g. above the ground) and then hold the shift key to lock this plane until you pick the center of rotation. This allows you to perform rotations about arbitrary planes.

As with the copy tool, use the snap functionality to acquire endpoints, midpoints etc.

Next you will need to pick a zero line for the rotation. Move the mouse along an object (e.g. the bottom line of the brick shown above) to set this line.

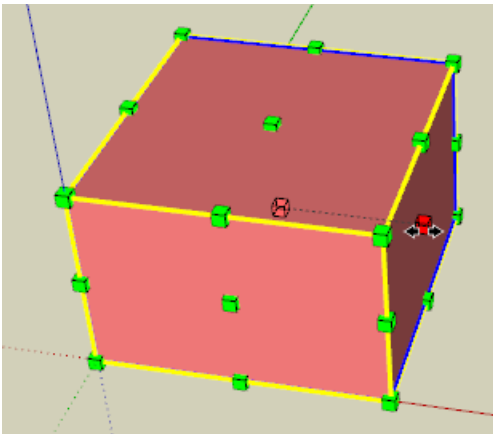
You can then move into the direction of the rotation and either click a point or type in a value for an angle.

By the way: rotational copies and rotational arrays work similar to the Move tool!

Scale

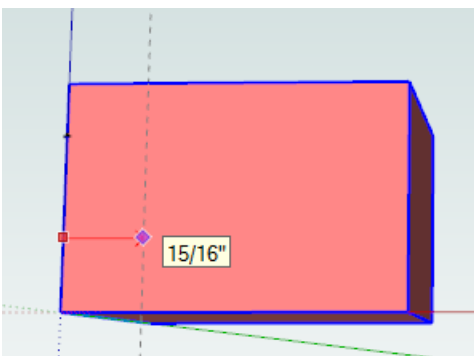
When you need to stretch things, use the Scale tool. Click the appropriate yellow handle to start stretching in a certain direction. Although you can enter a scale factor (e.g. 2 to double the size of an object), It is also possible to start stretching and then acquire a relative point (e.g. the next brick's corner) to stretch to that point.

For these exercises, you typically only need to stretch lengthwise, therefore make sure you select the respective yellow box in the center of a side.



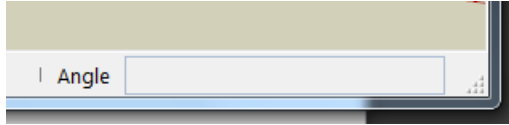
Measure

The Measure tool gives you a means to check your work. In addition, it also lets you place construction points (e.g. on edges) that you can later use e.g. as references for copying. With this tool you can also create offset reference lines (click on a line instead of a point to do that). Enter values for precise distances.



Some General SketchUp Tips

- Never click the Measurements box (shown in the bottom-right corner of your screen):



If you need to enter something (e.g. a distance) , just type on the keyboard and it will appear here.

- Every once in a while you need to “look through” objects to e.g. snap onto hidden points. Turn on X-ray mode to do this (**View > Face style > X-ray**).
- Sometimes it is easier to work in parallel projection instead of perspective mode. You can switch between the two using the **Camera** menu. *Please note:* If you run into clipping problems (parts of the model disappear), click the Zoom-Extents button.
- SketchUp lets you snap in length increments. This is usually 1/16” unless you change the default settings in **Window > Model Info**.
- It’s a good idea to review SketchUp’s object snap and inference documentation here:
<http://help.sketchup.com/en/article/3000083>
- If you want to manipulate many objects at the same time (e.g. move a brick course), then it might be useful to group these objects. Select them and select **Make Group** from the right-click menu.

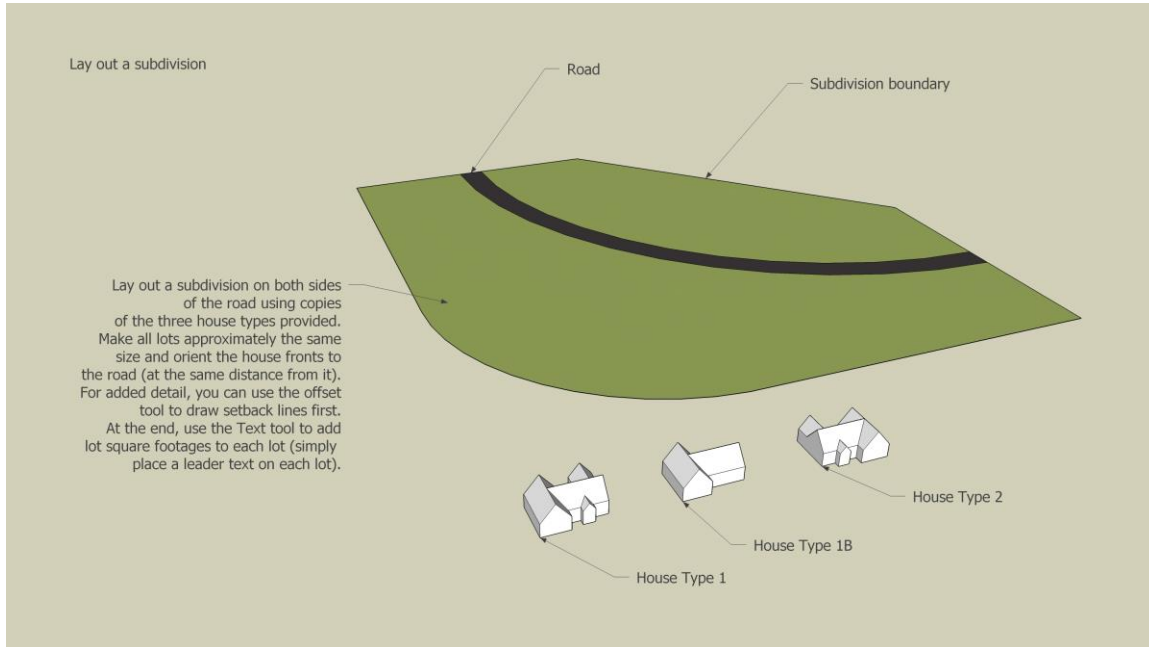
Need More Info?

These pages should get you going quickly with the software. However, if you want to know more about SketchUp, take a look at **Alexander Schreyer’s book “Architectural Design with SketchUp: 3D Modeling, Extensions, BIM, Rendering, Making, and Scripting, 2nd Edition”**:

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-1118978811.html>

Chapter 1

1-19 - Lay out a subdivision

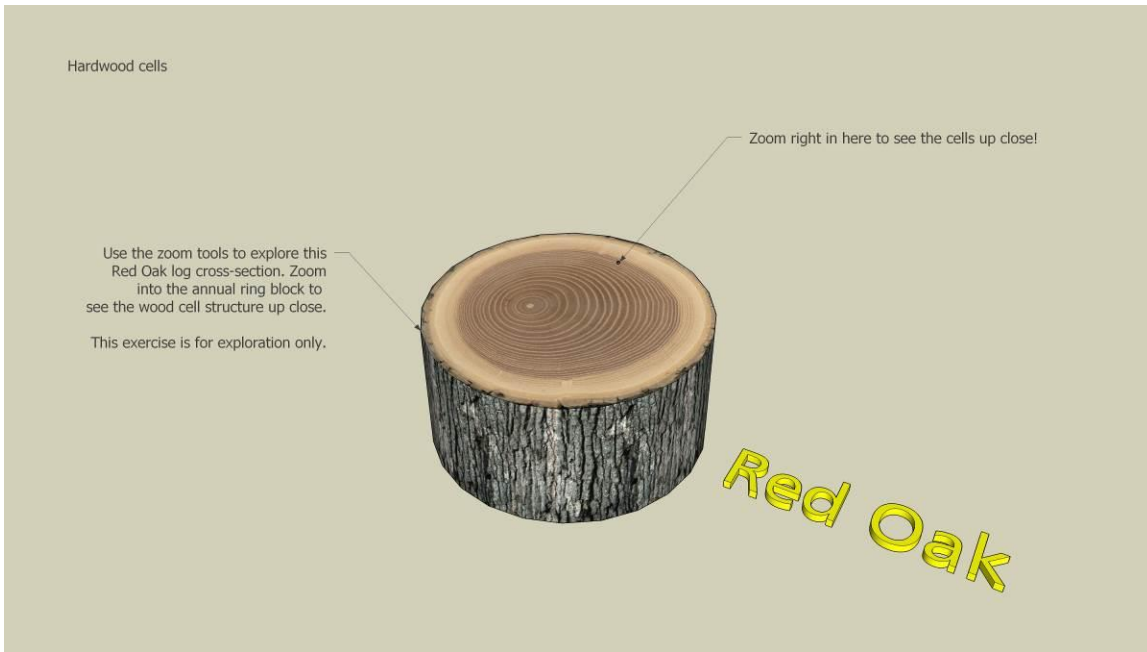


Chapter 5

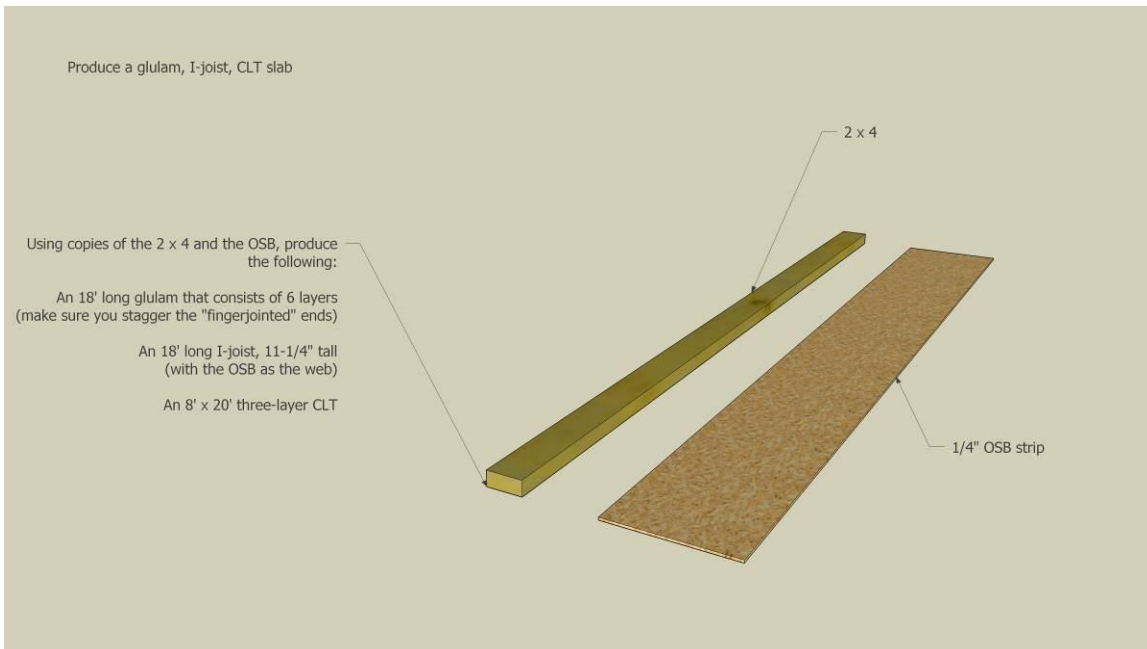
5-2 - Softwood cells



5-3 - Hardwood cells

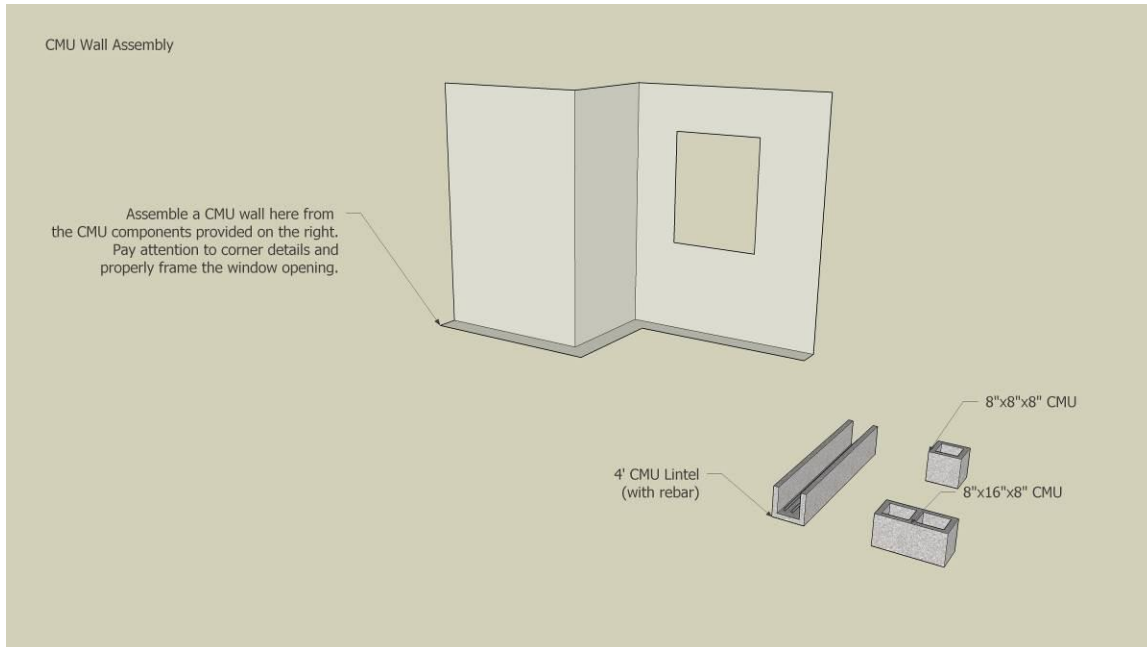


5-21, 5-26, 5-34 - Produce a glulam, I-joist, CLT panel

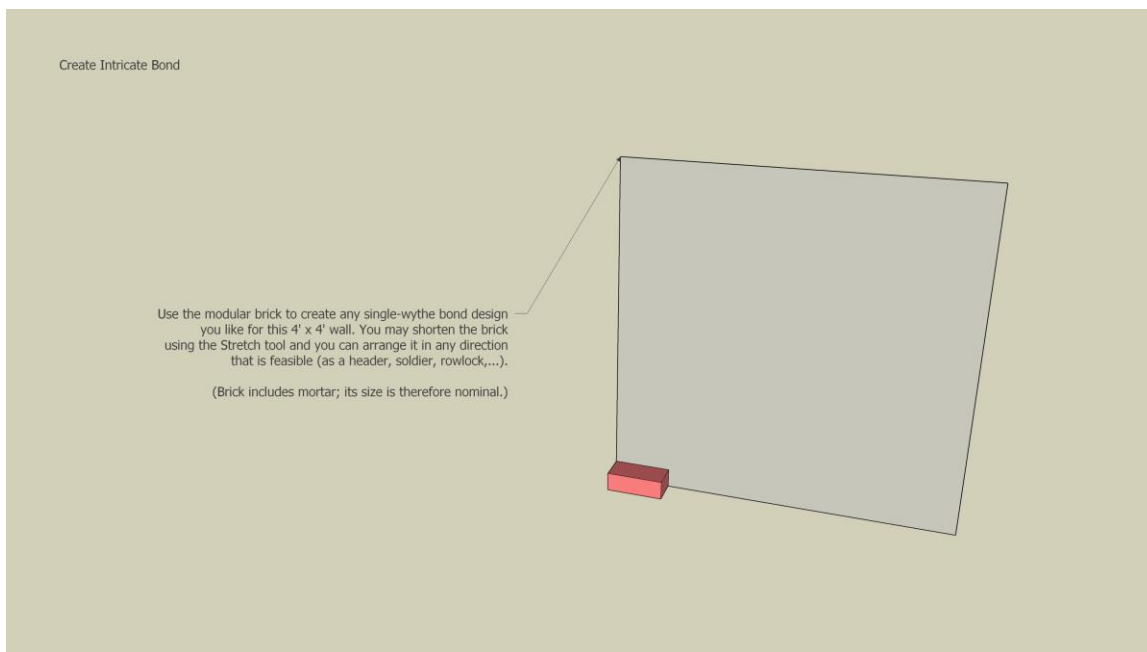


Chapter 6

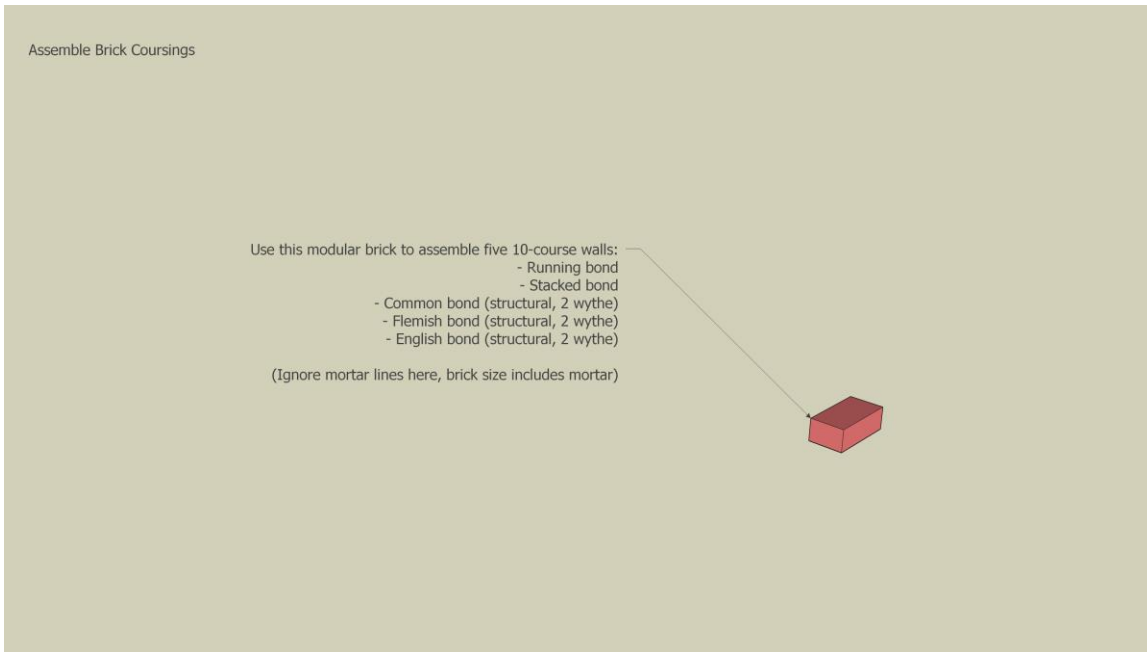
6-10 - Concrete block wall with opening



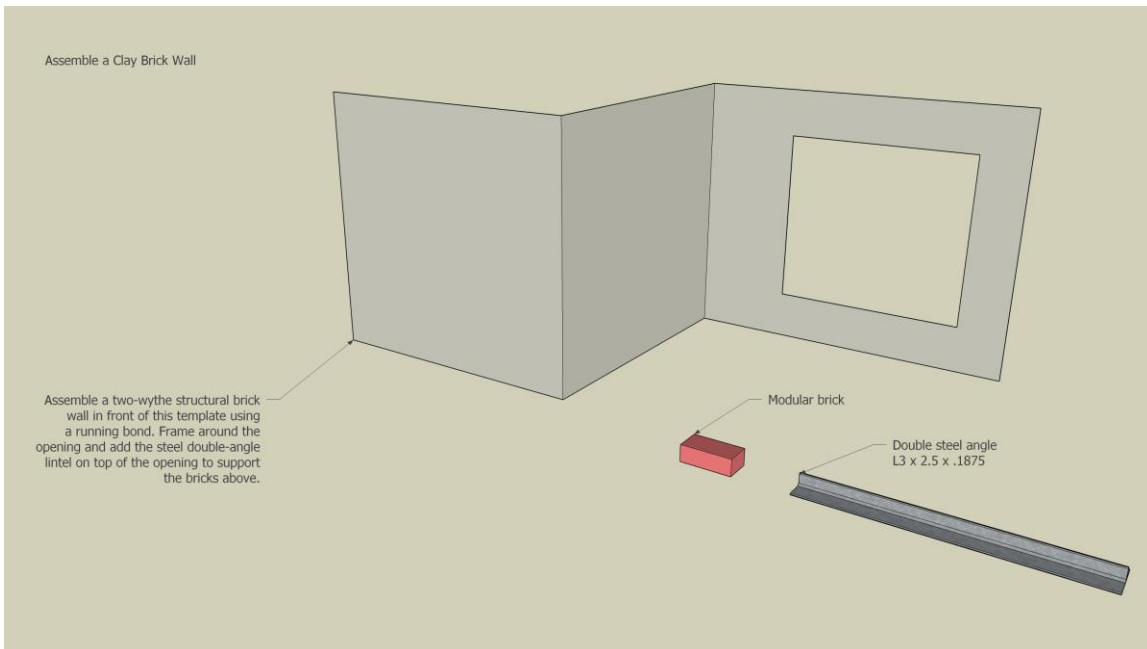
6-27 - Intricate bond using modular bricks



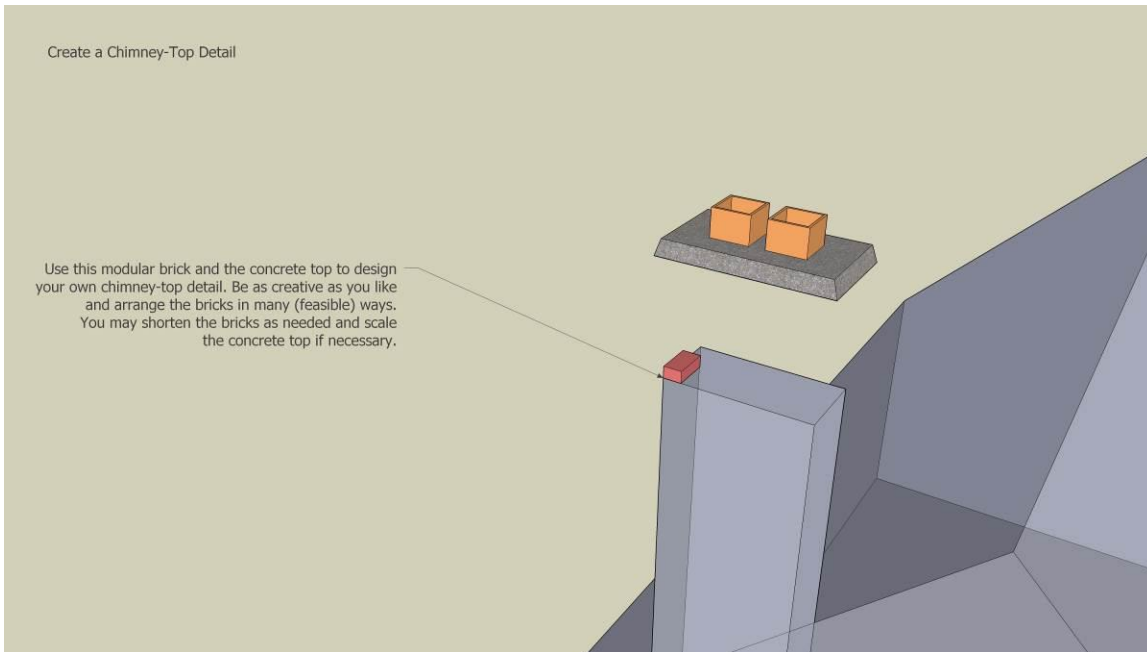
6-27 - Typical bonds using modular bricks



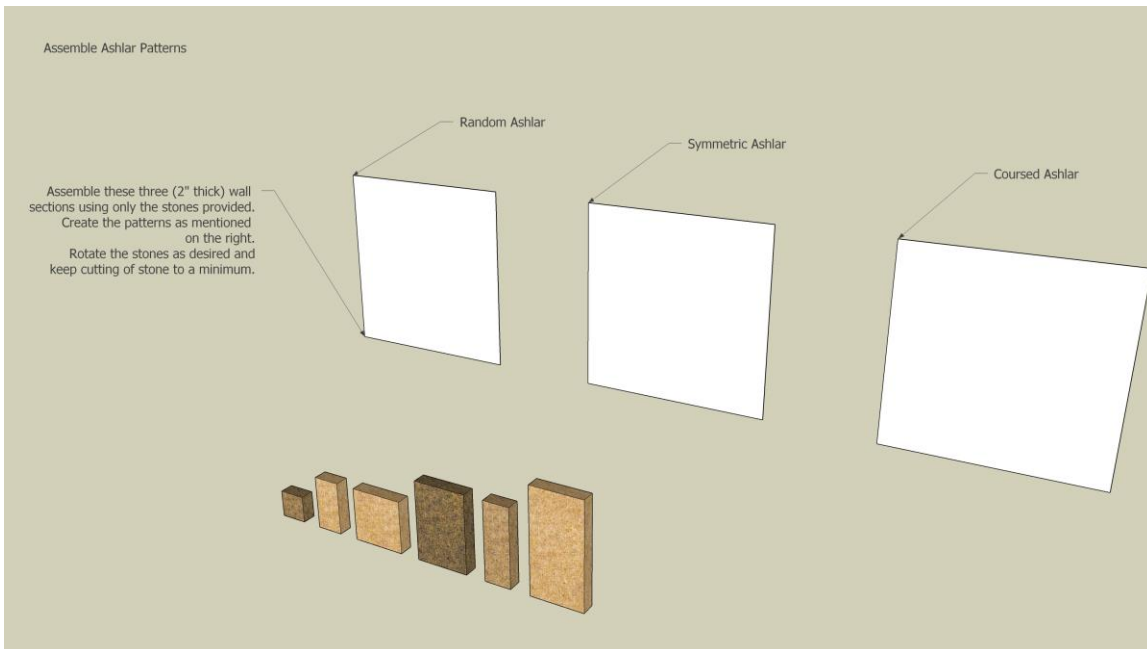
6-30 - Masonry window opening detail



6-36 - Chimney-top detail

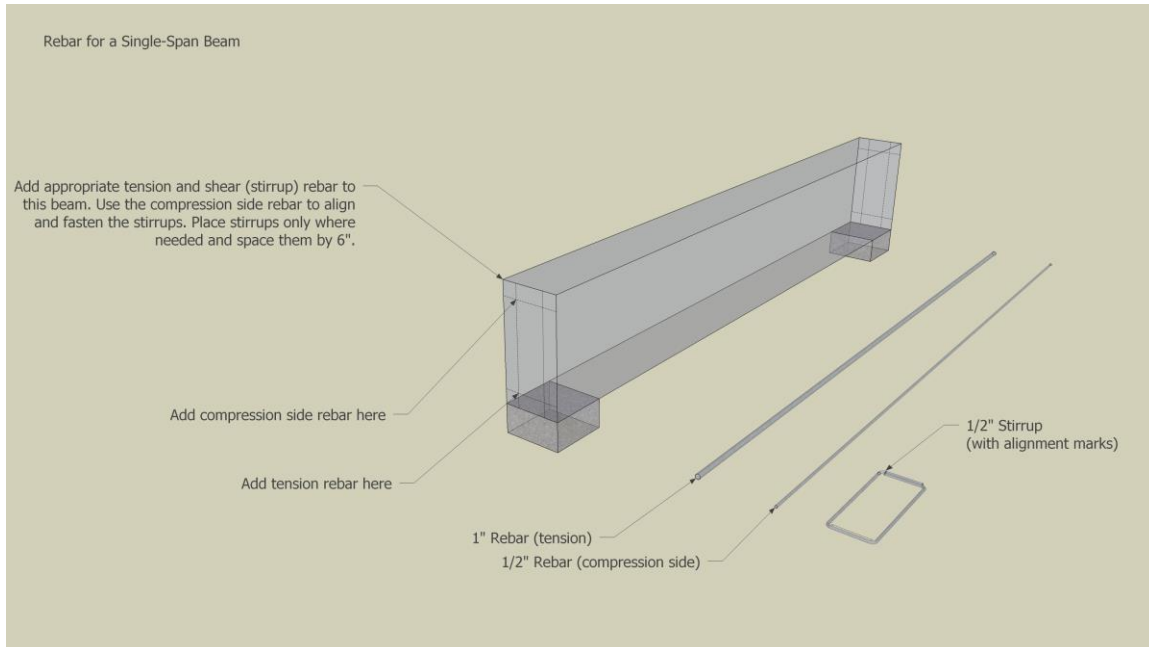


6-42 - Ashlar patterns



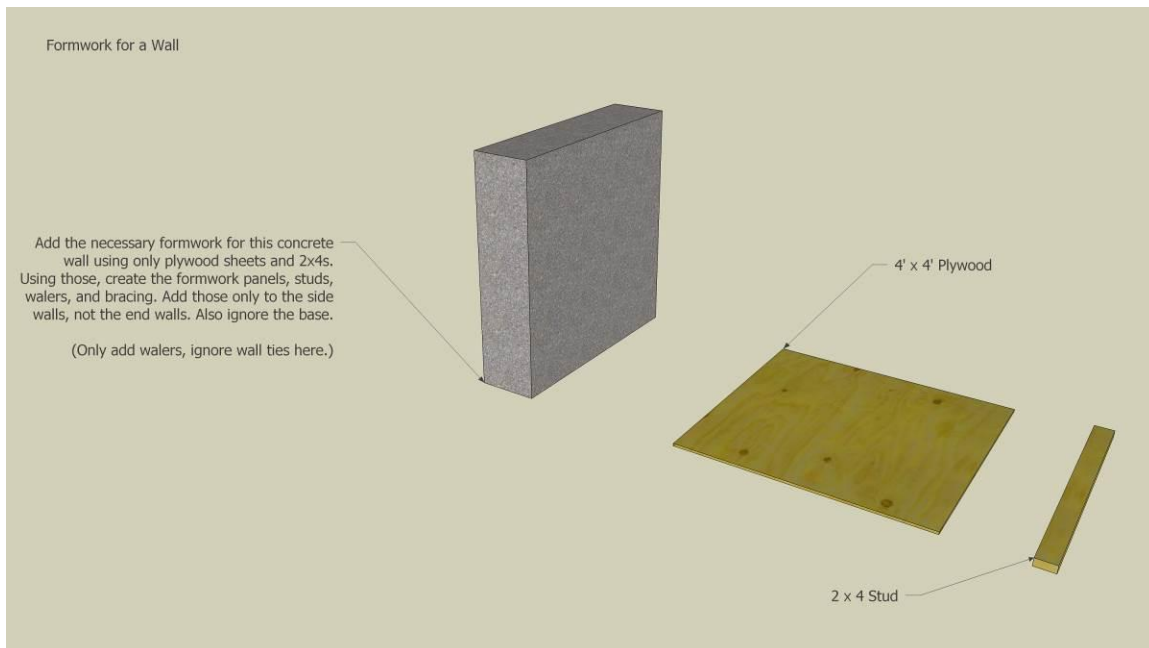
Chapter 7

7-20 - Concrete rebar for a simple beam

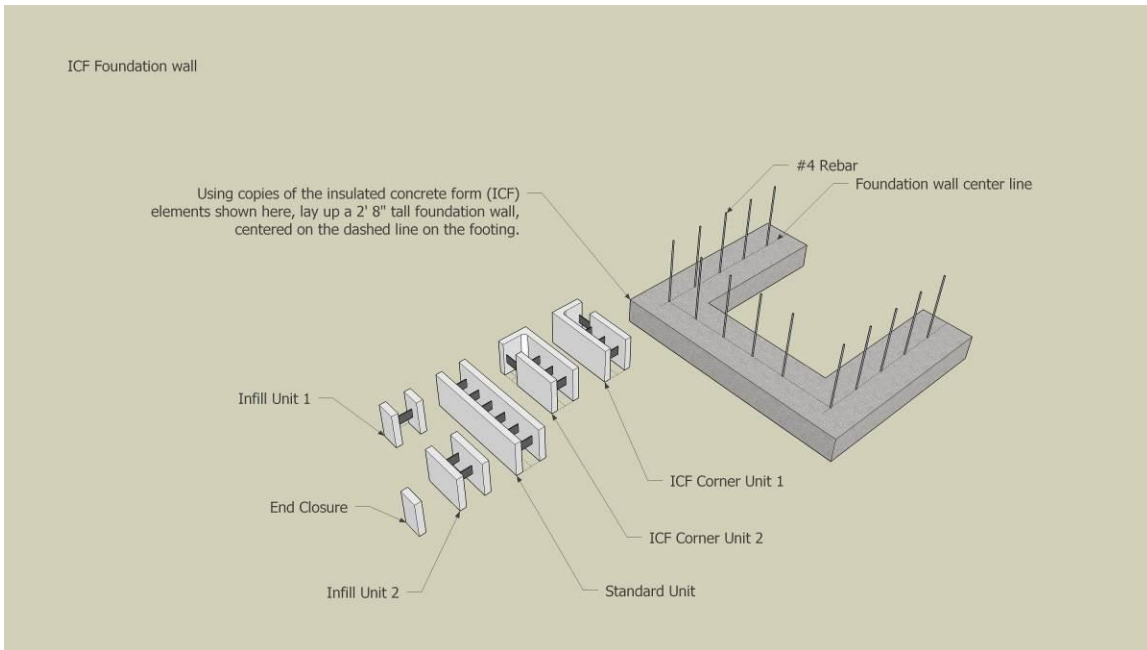


Chapter 9

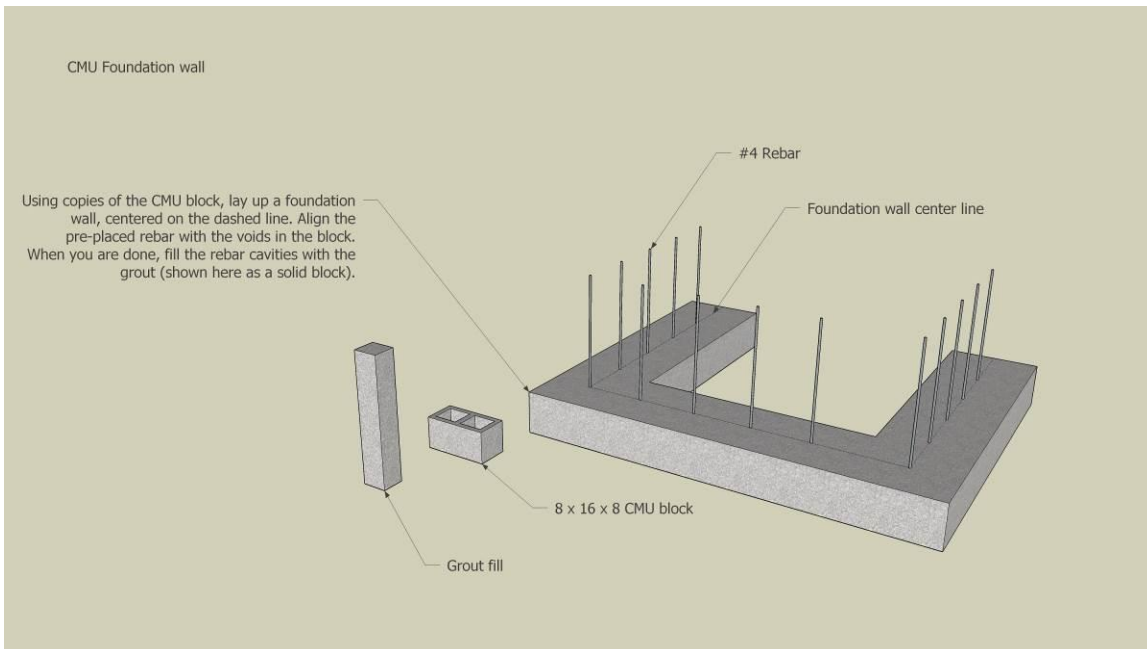
9-15 - Formwork for a wall using wood products



9-20 - ICF Foundation wall

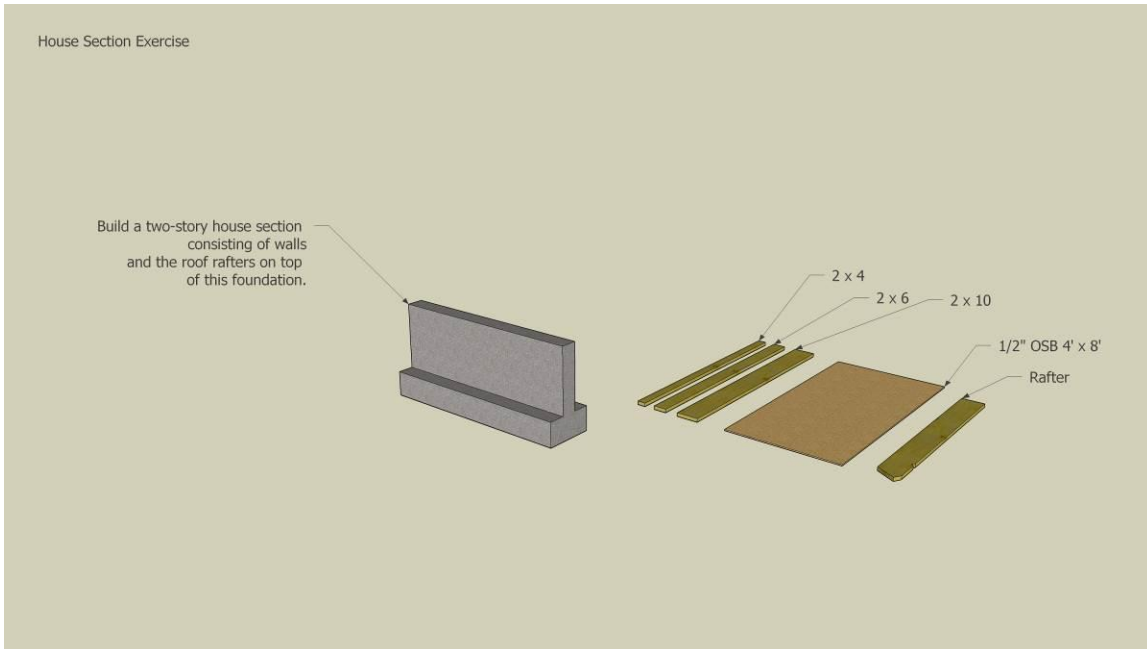


9-23 - CMU Foundation wall

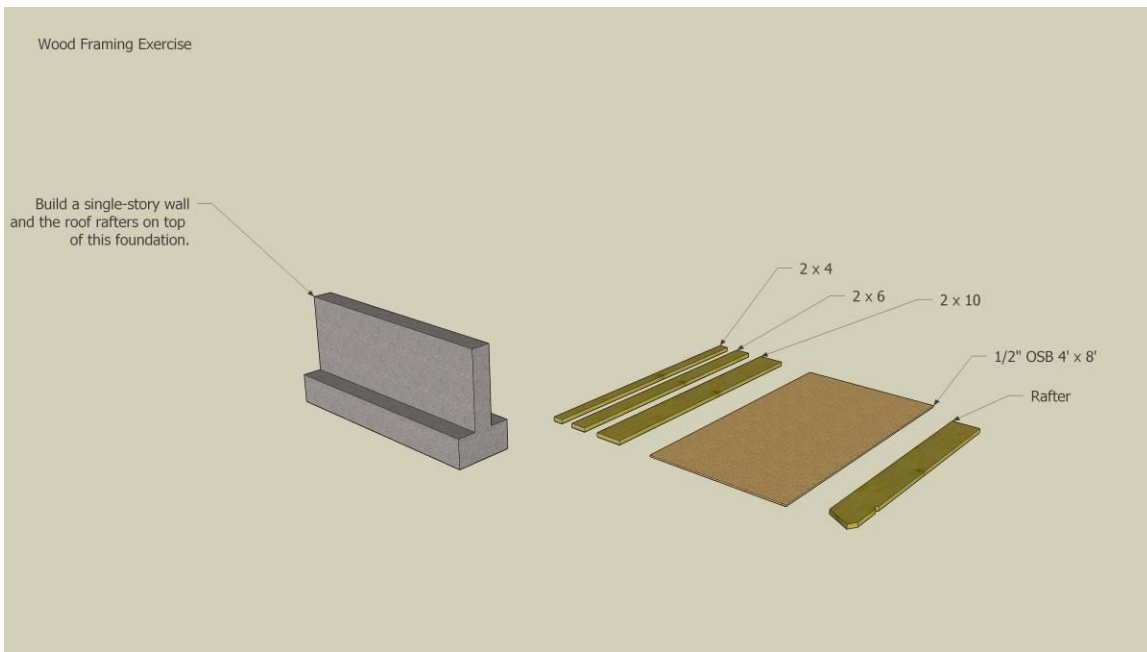


Chapter 10

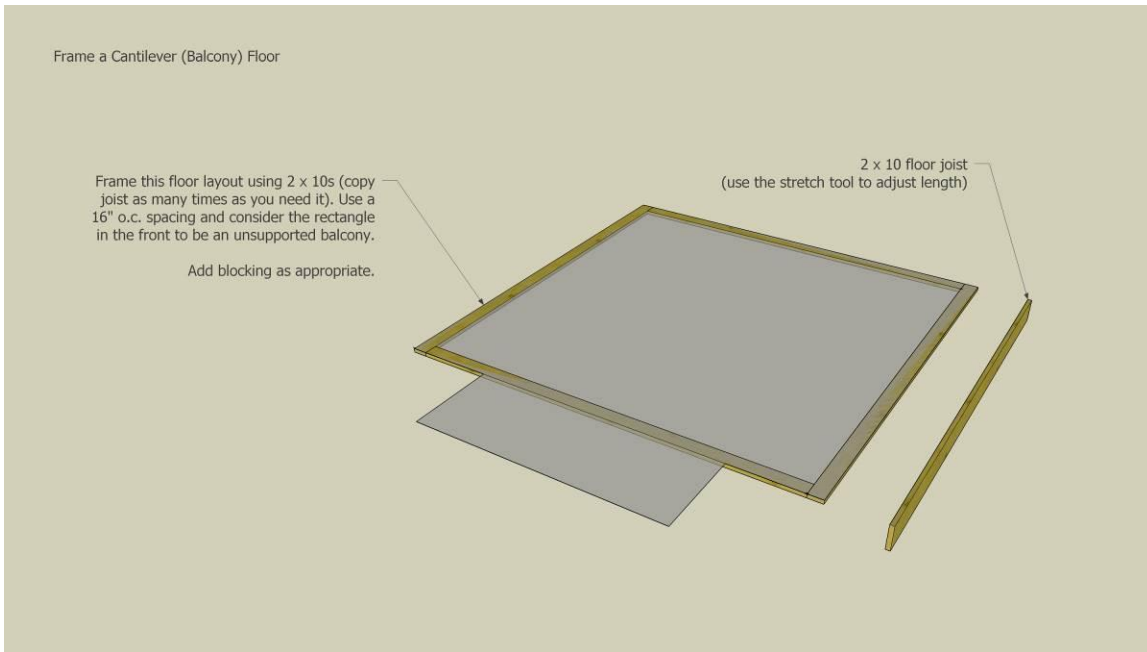
10-2 - House section assembly



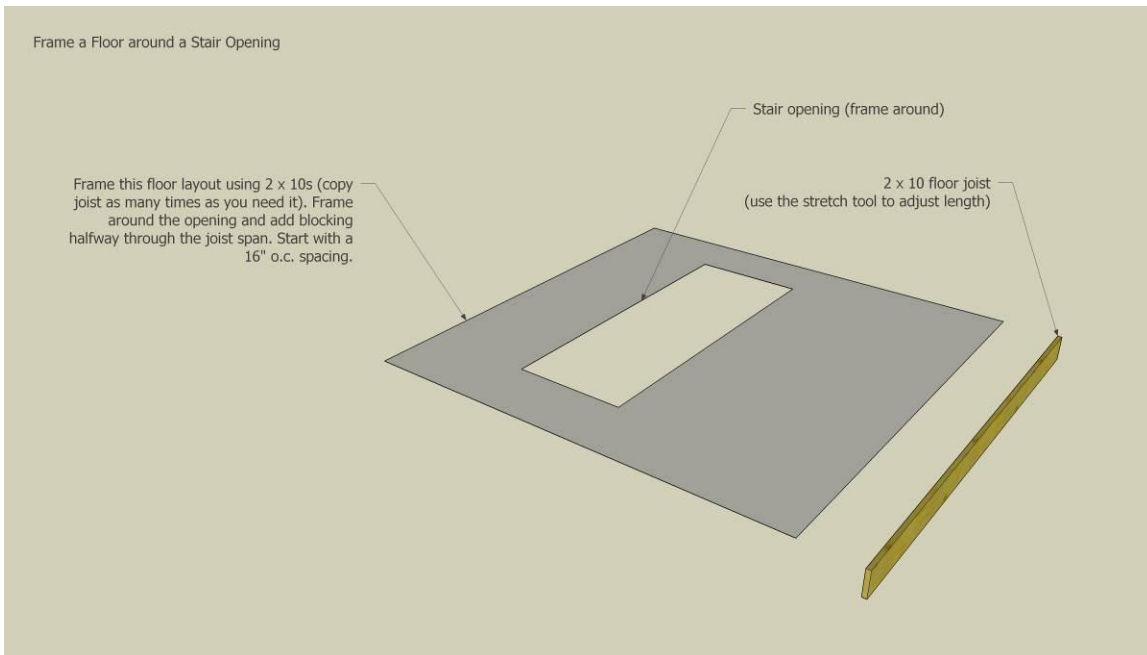
10-2 - Wood framing foundation wall floor



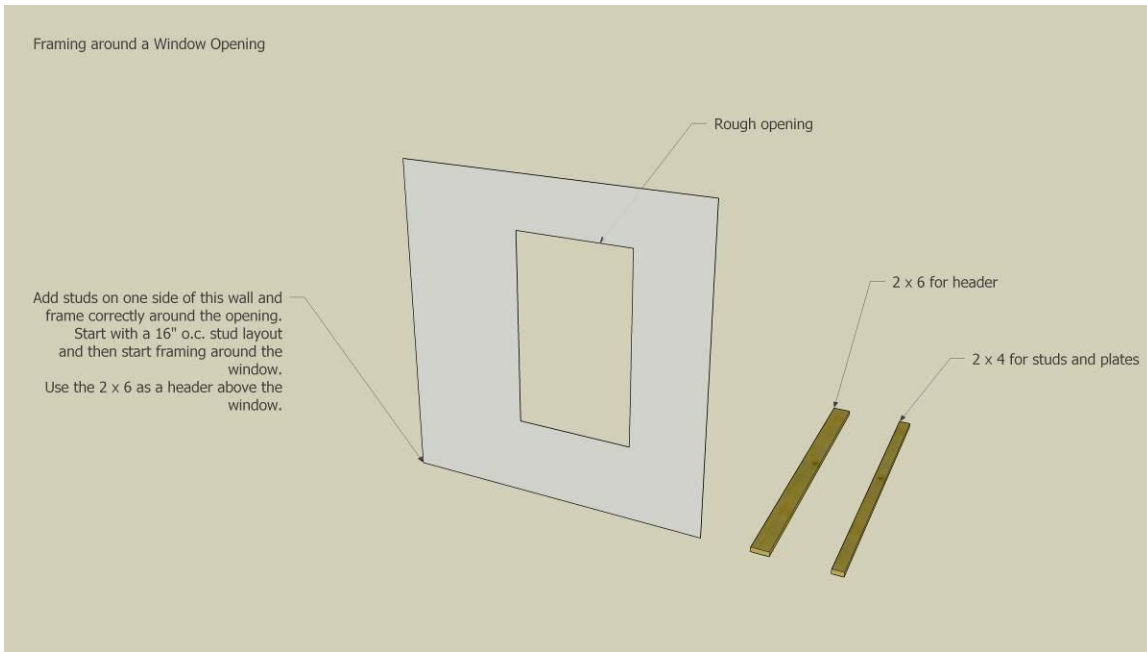
10-7 - Frame a cantilever floor



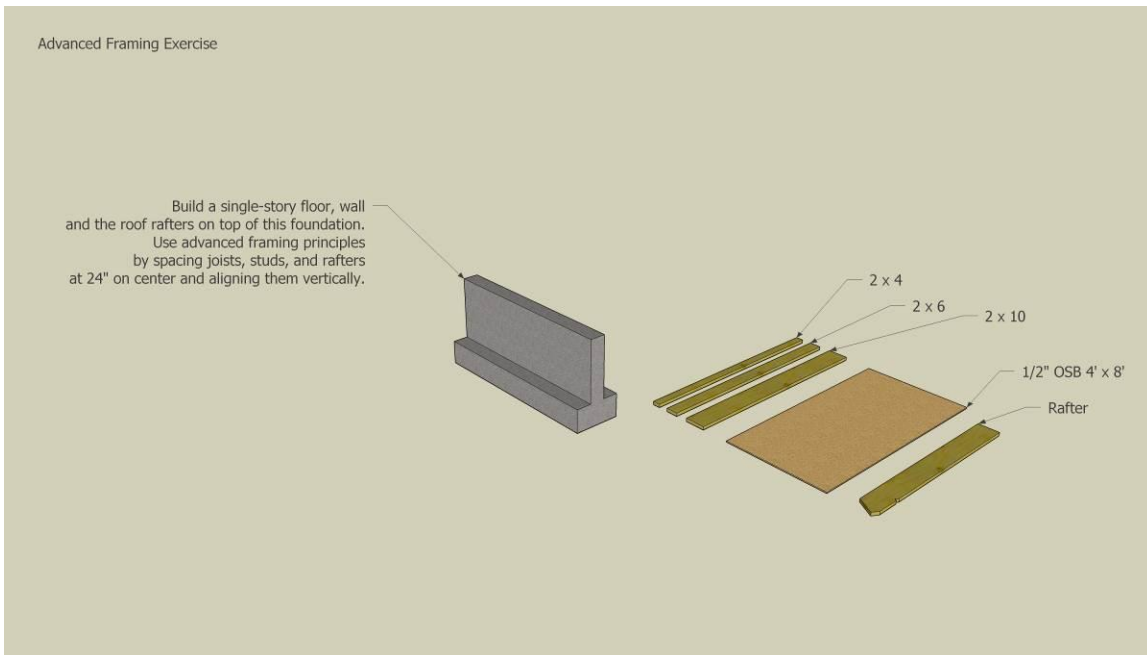
10-16 - Floor with stair opening



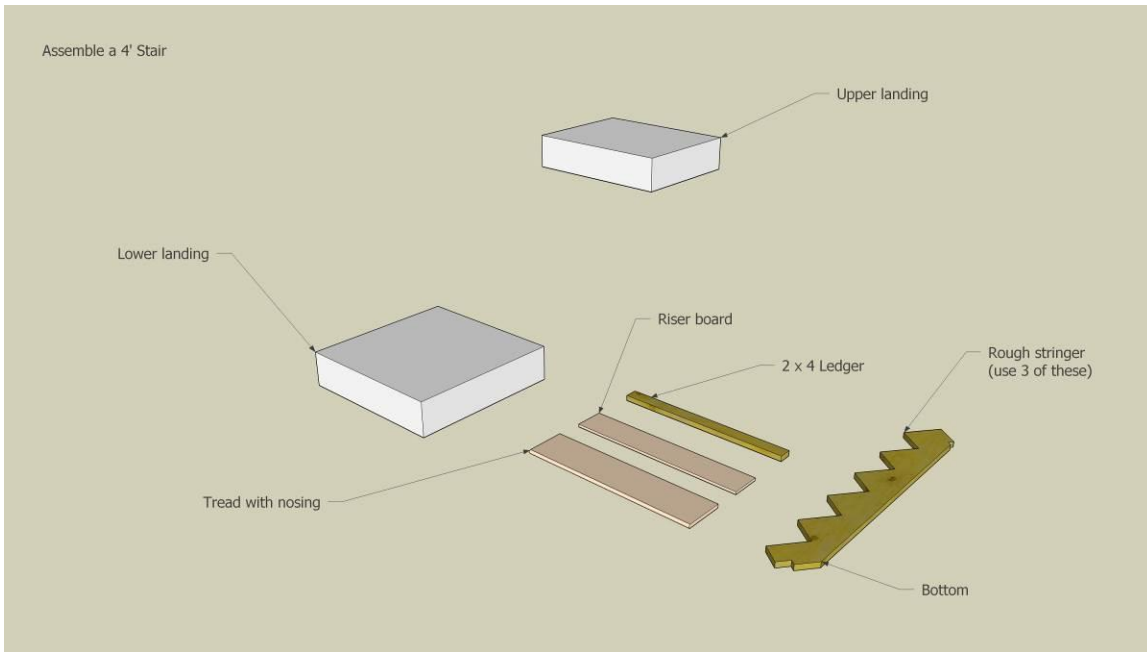
10-30 - Window opening framing



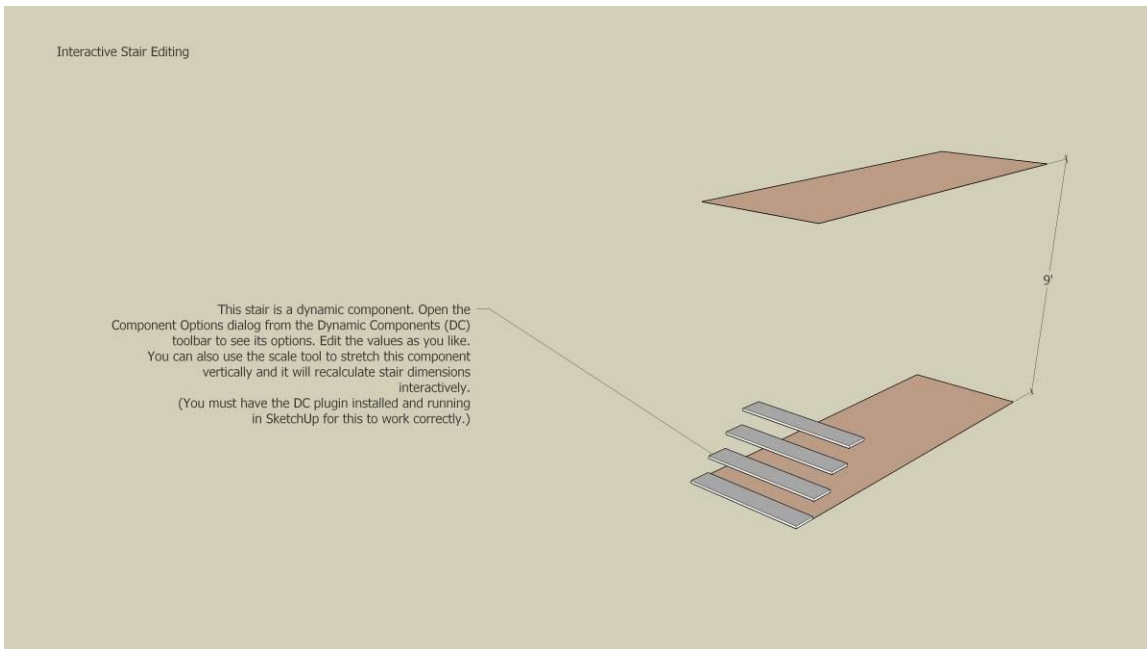
10-33 - Advanced Framing



10-45 – Stair

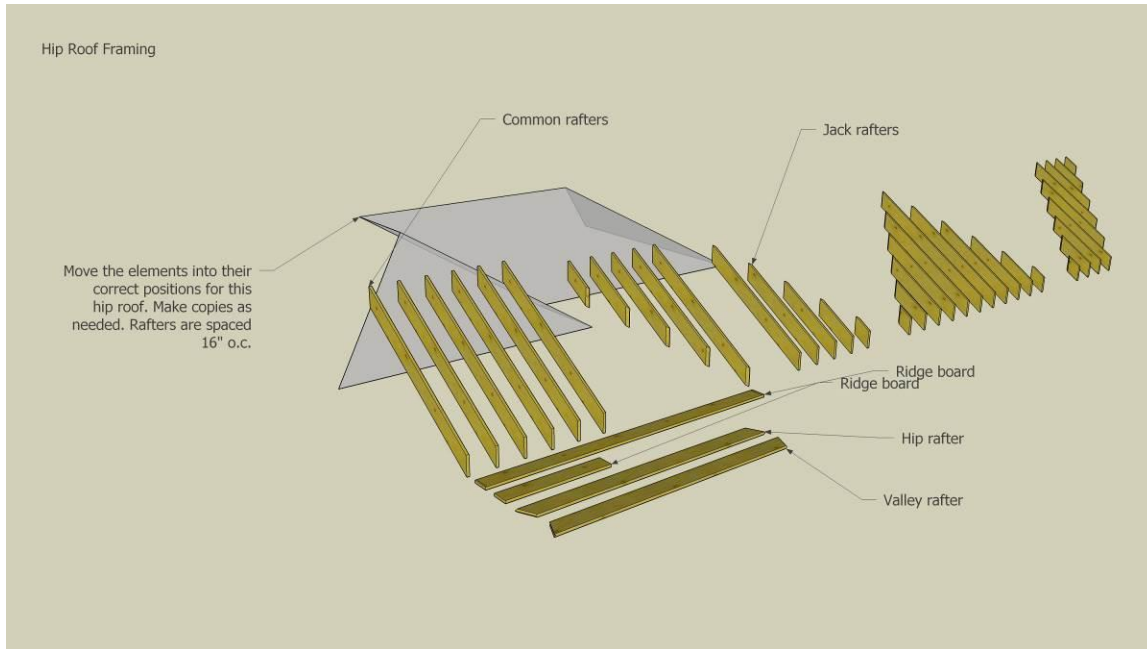


10-48 - Interactive stair sizing

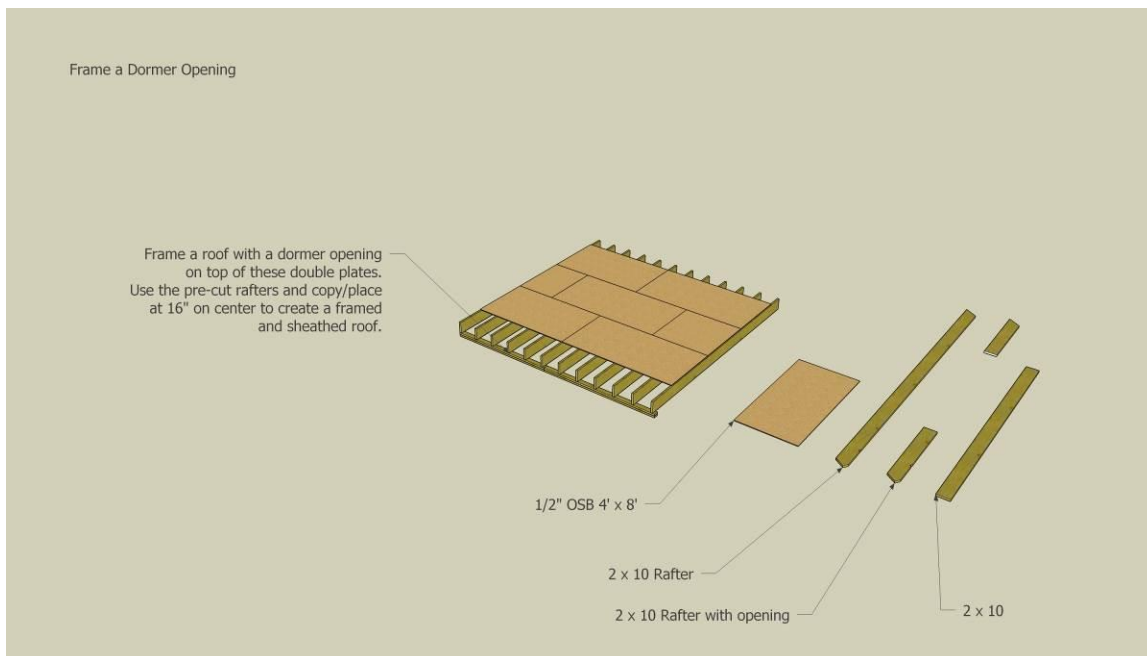


Chapter 11

11-13 - Frame a hip valley roof

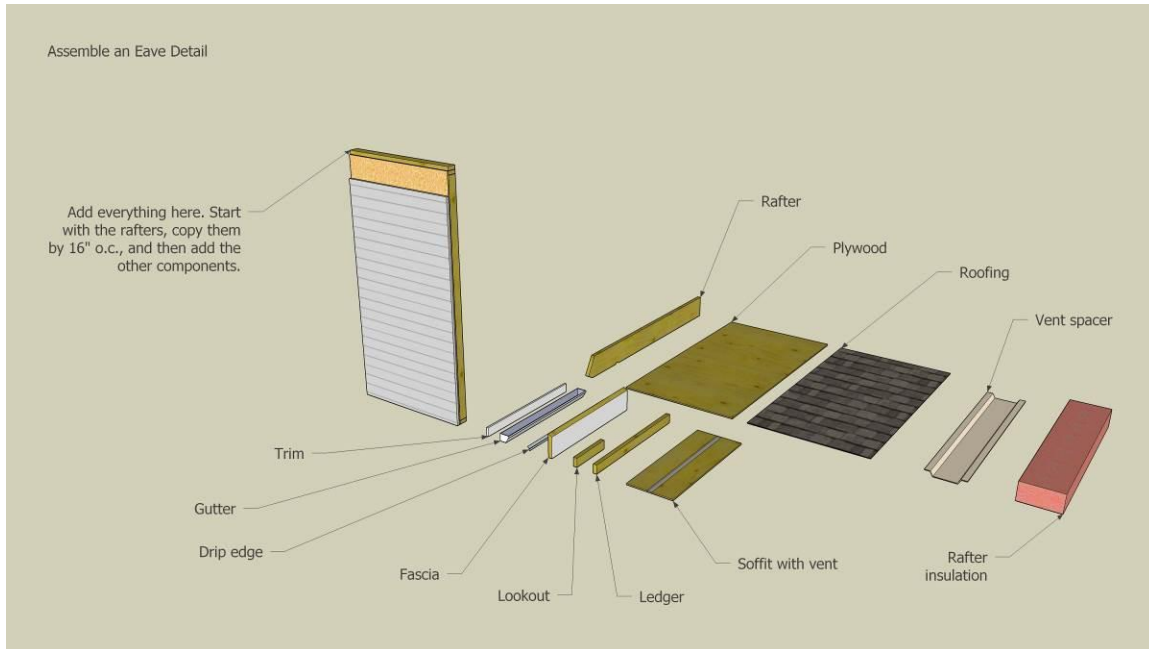


11-29 - Frame a Dormer

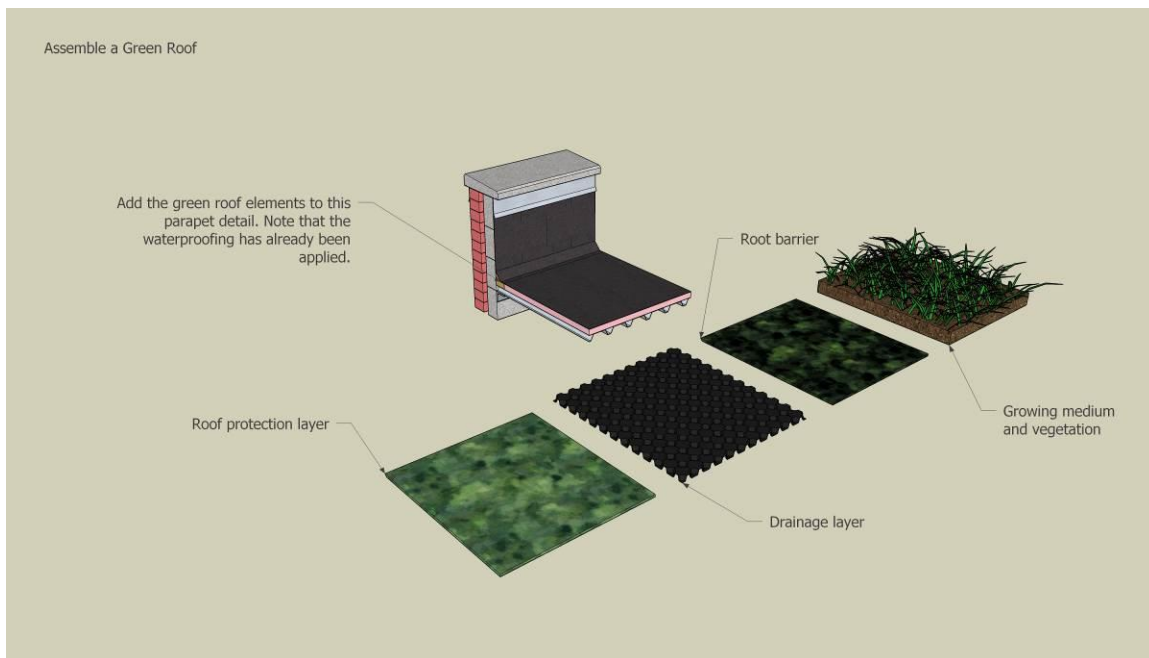


Chapter 12

12-37 - Eave detail

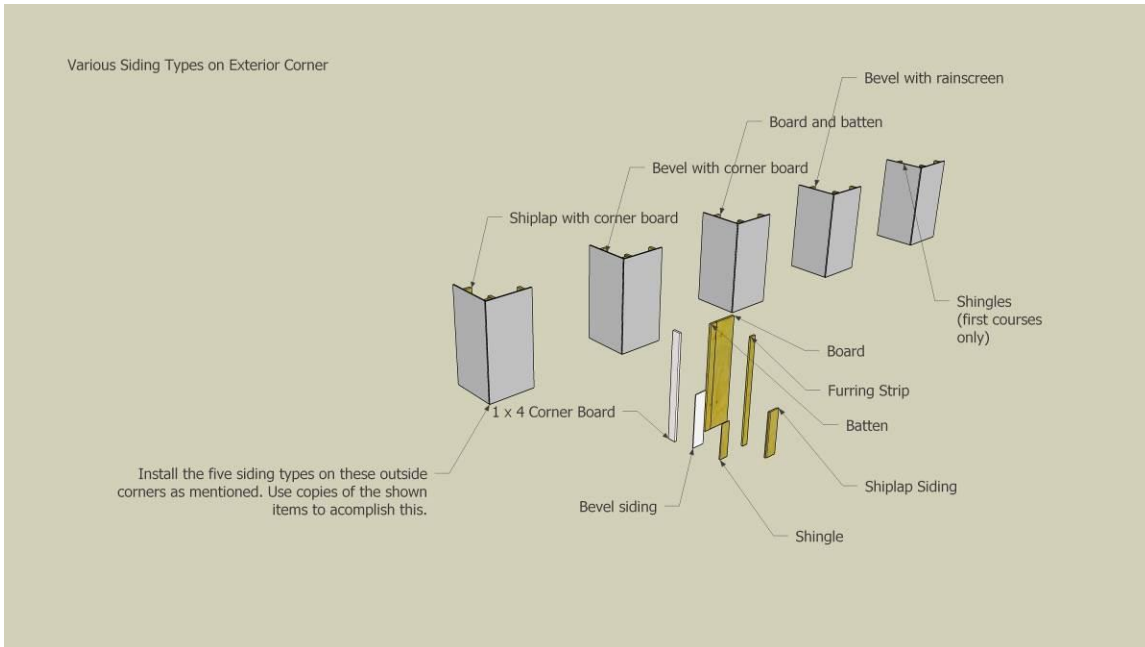


12-47 - Green roof detail

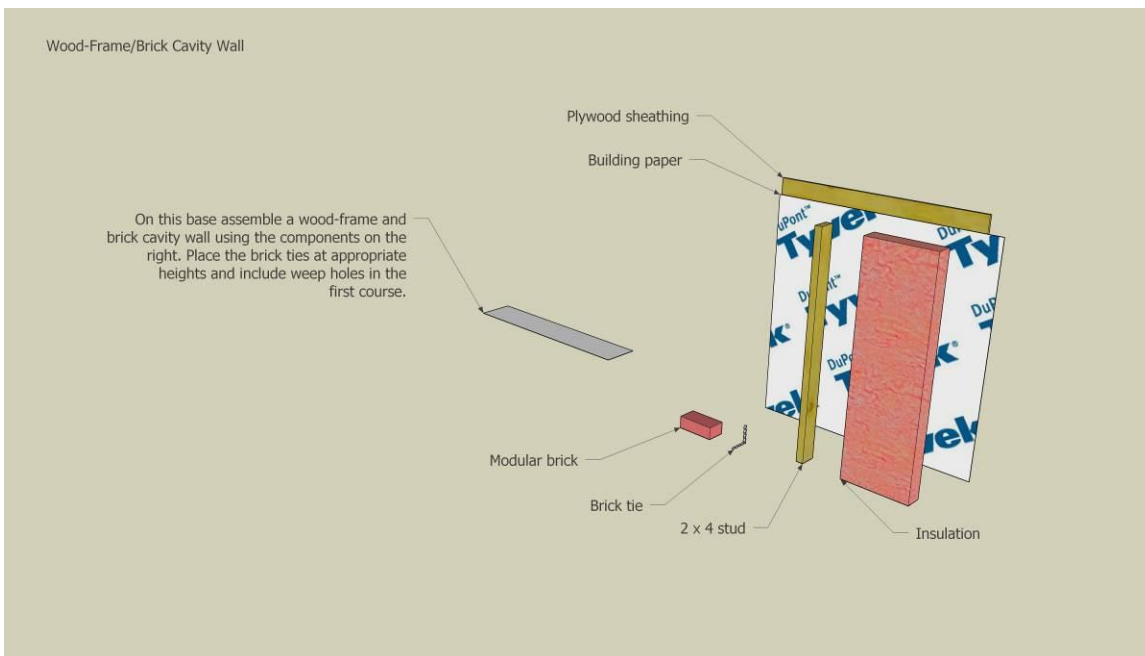


Chapter 14

14-8, 14-18 - Various siding on exterior corner

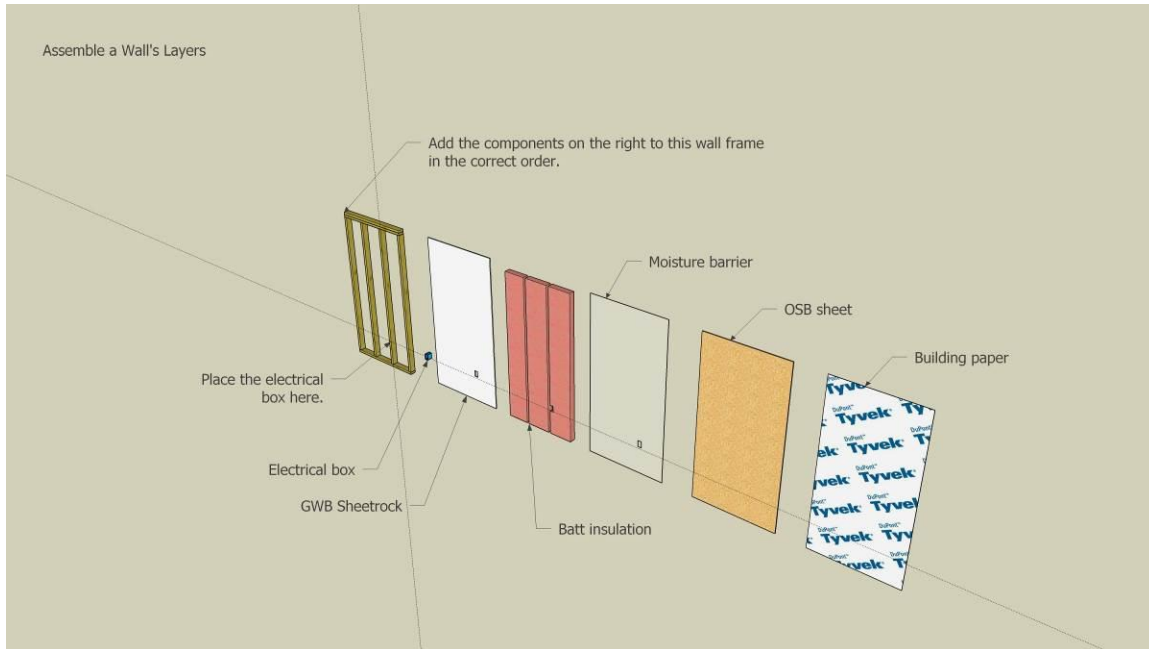


14-27 - Brick siding on wood frame wall



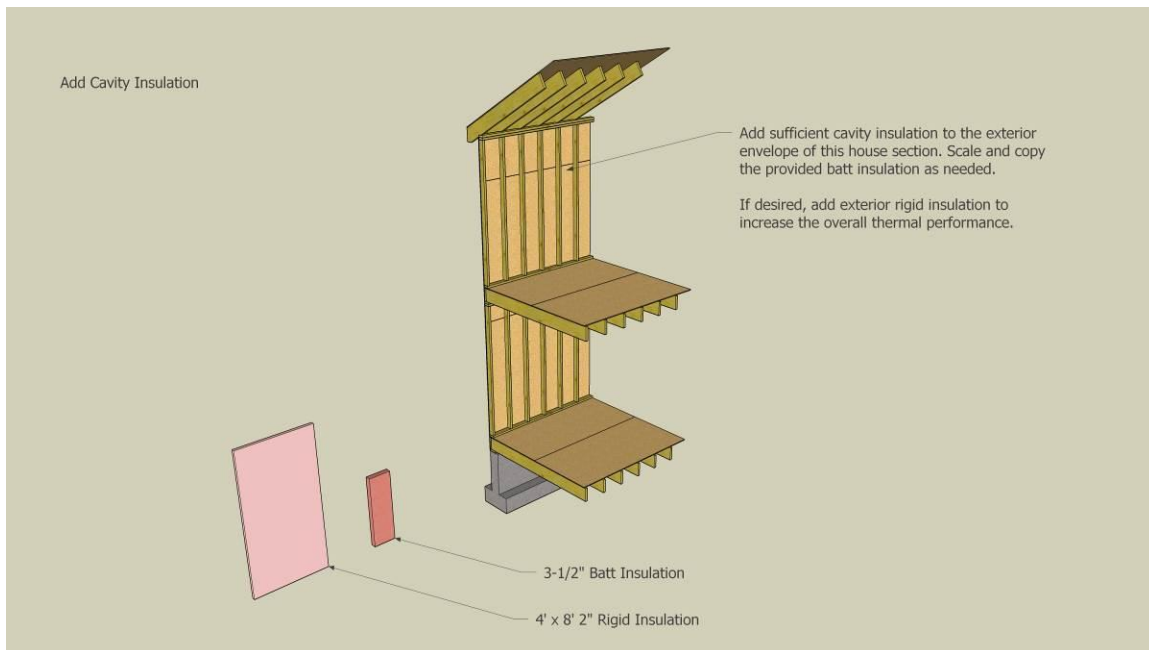
Chapter 18

18-20 - Wall insulation and electrical



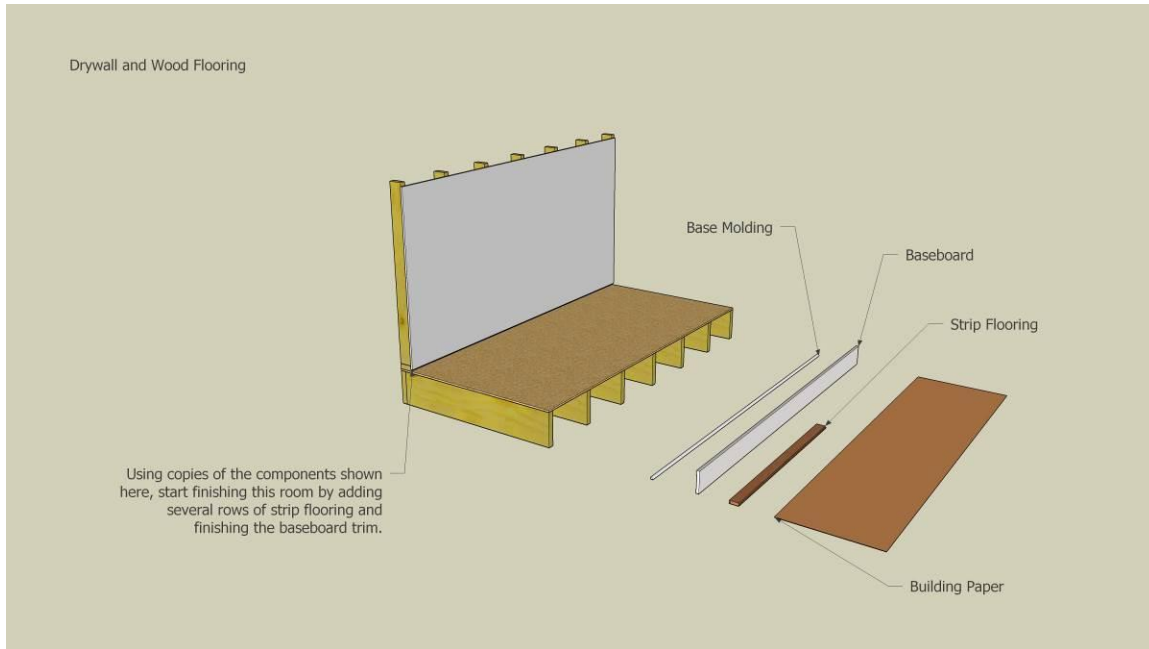
Chapter 19

19-2 Add cavity insulation

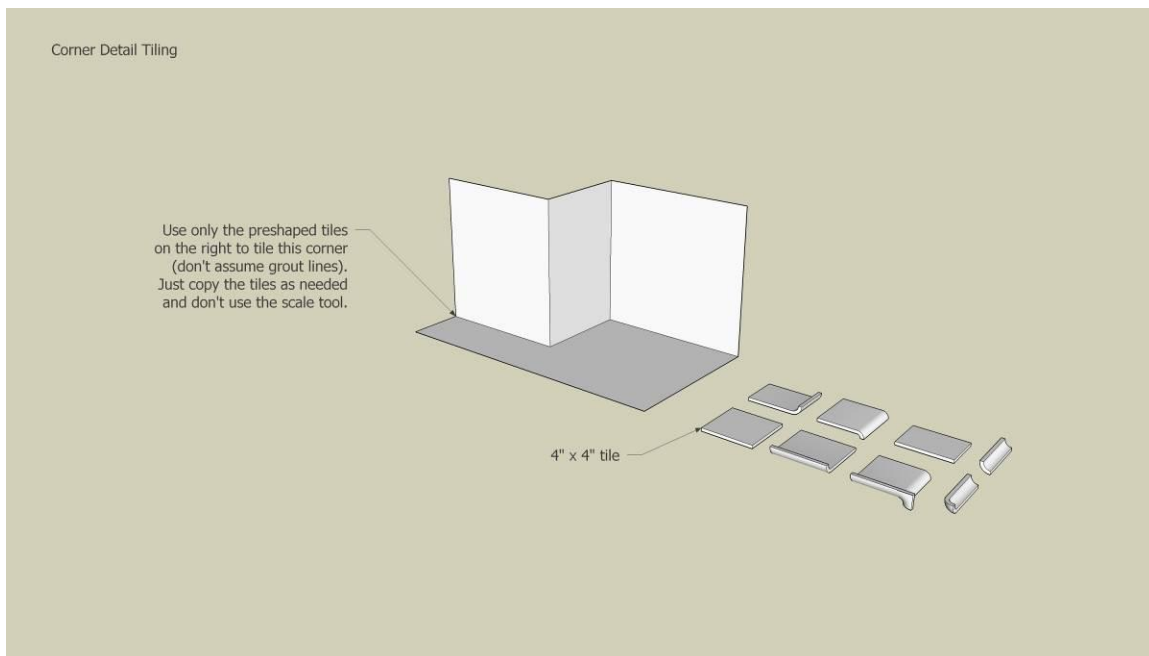


Chapter 20

20-18 - Drywall and wood flooring

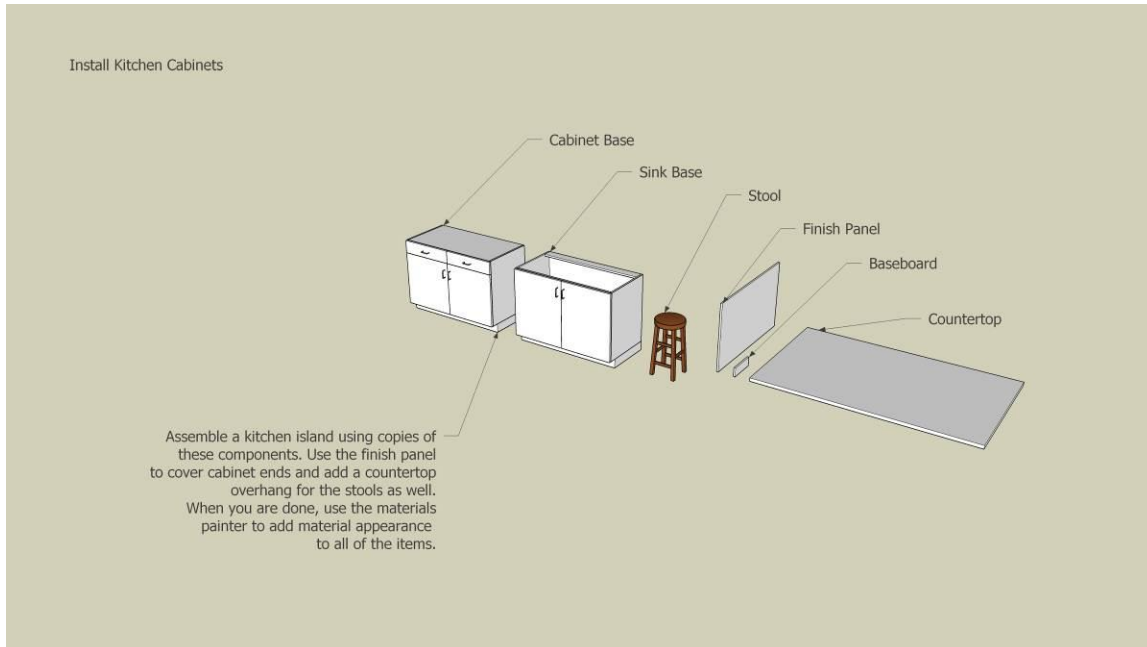


20-30 - Corner tiling detail

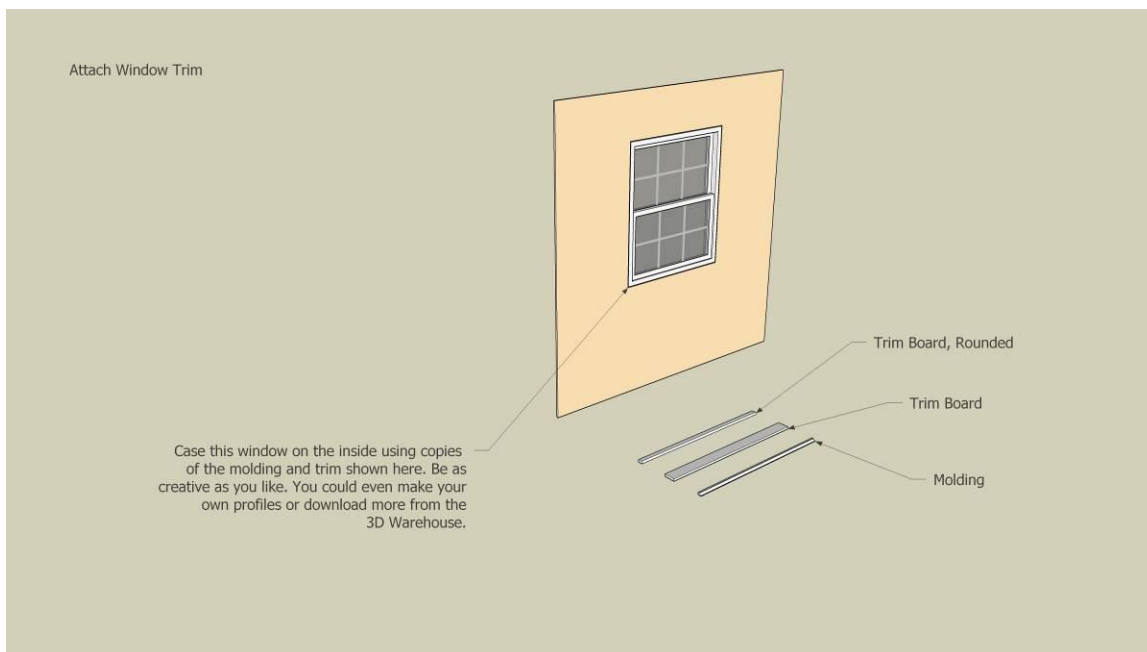


Chapter 21

21-11 Install kitchen cabinets

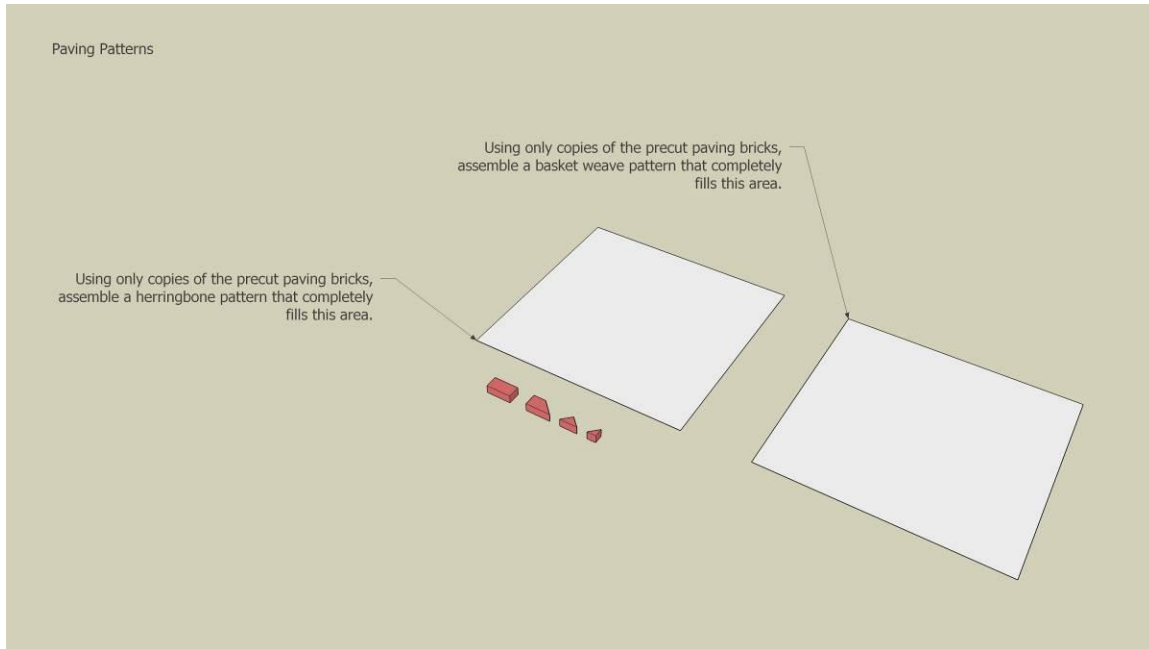


21-24 Attach window trim

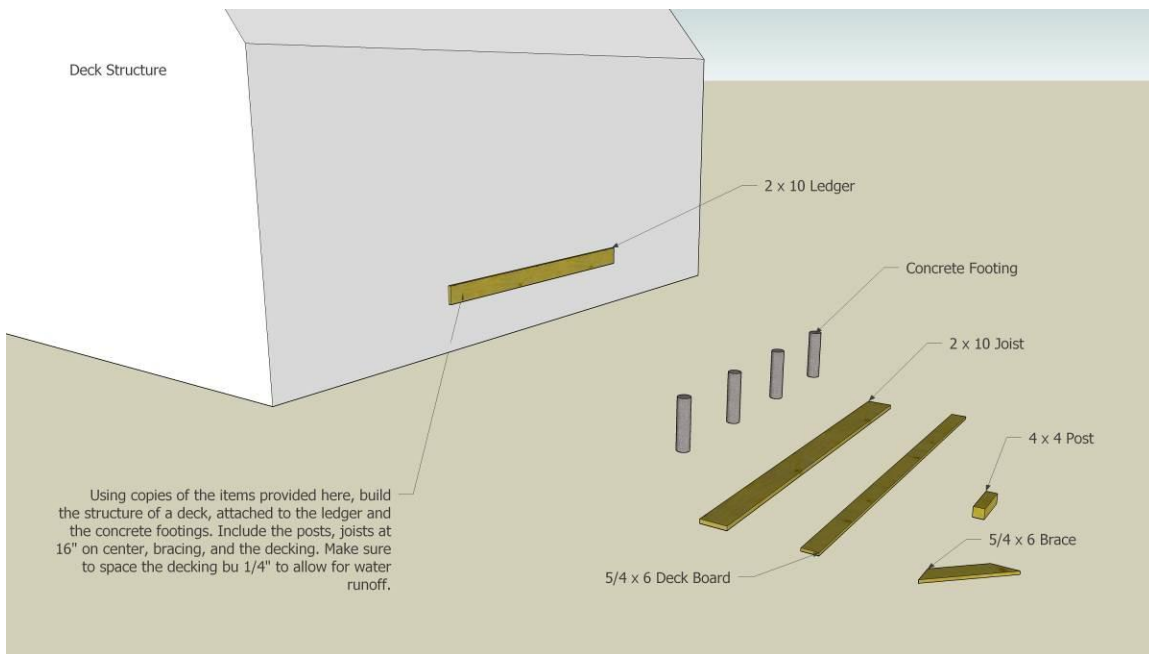


Chapter 22

22-6 - Paving patterns

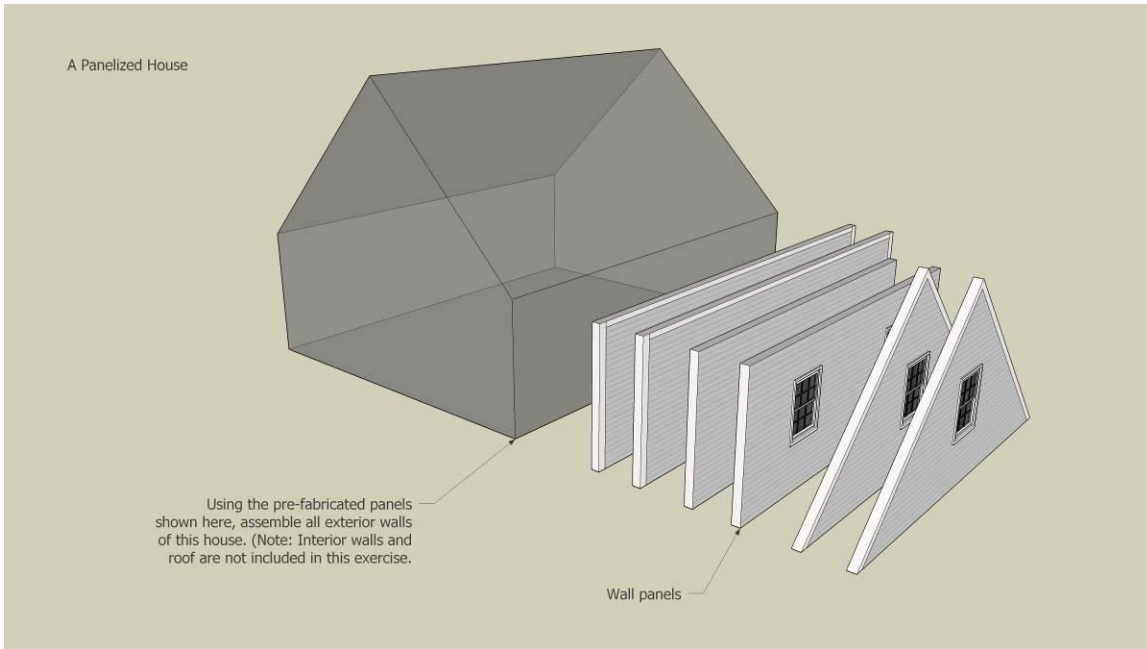


22-19 - Deck construction

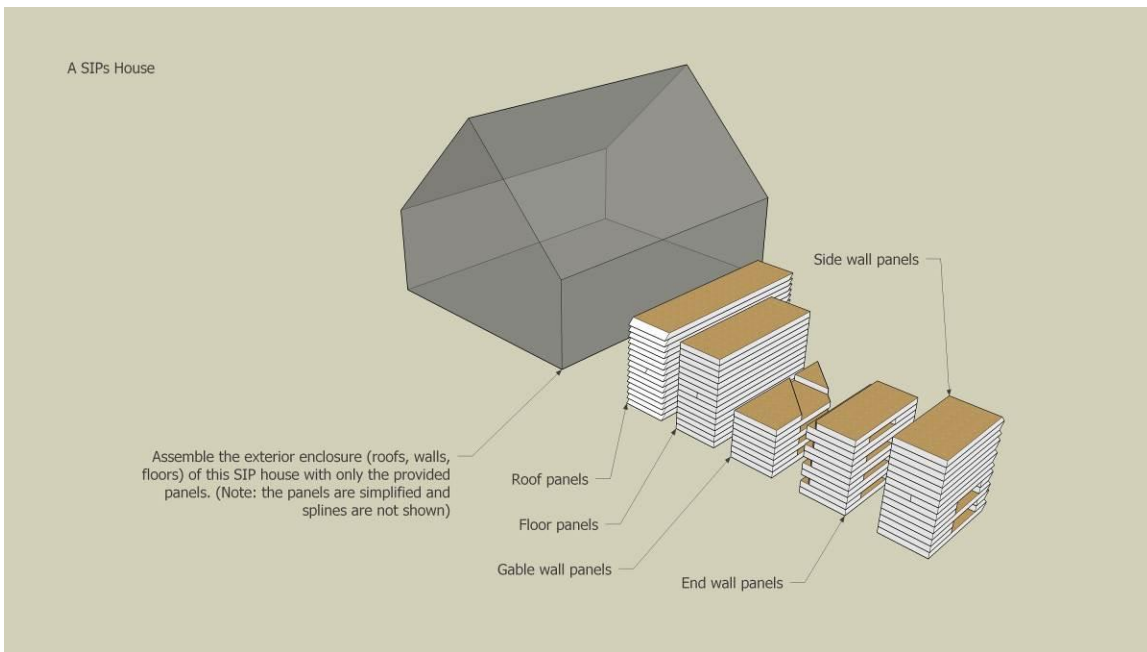


Chapter 23

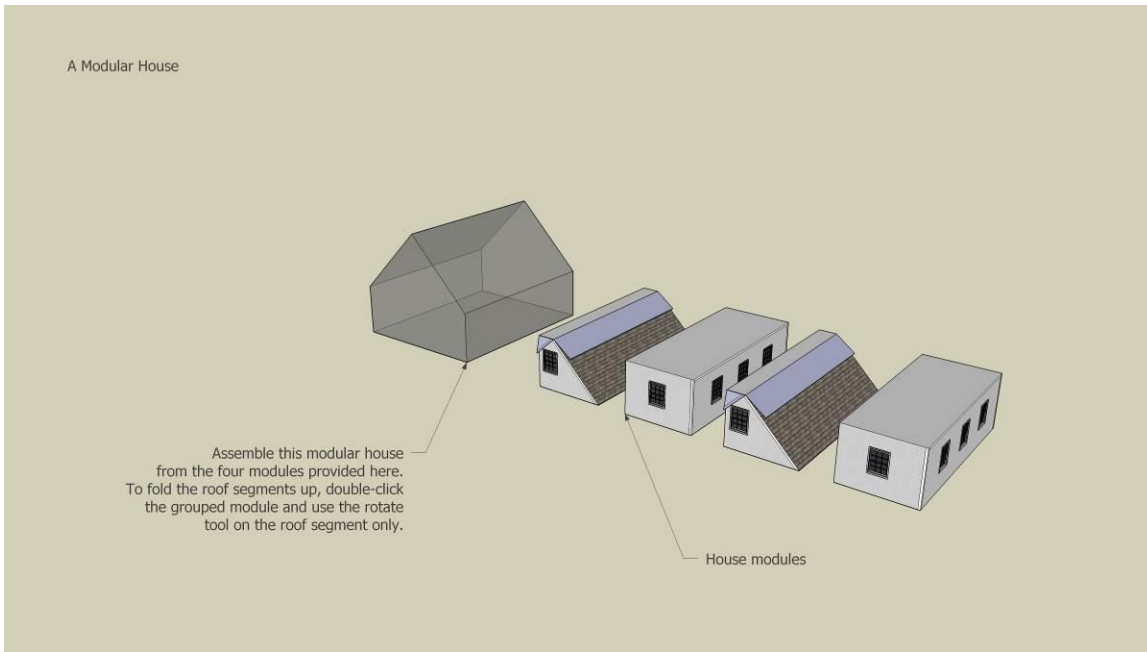
23-8 - A panelized house



23-22 - A SIPs house

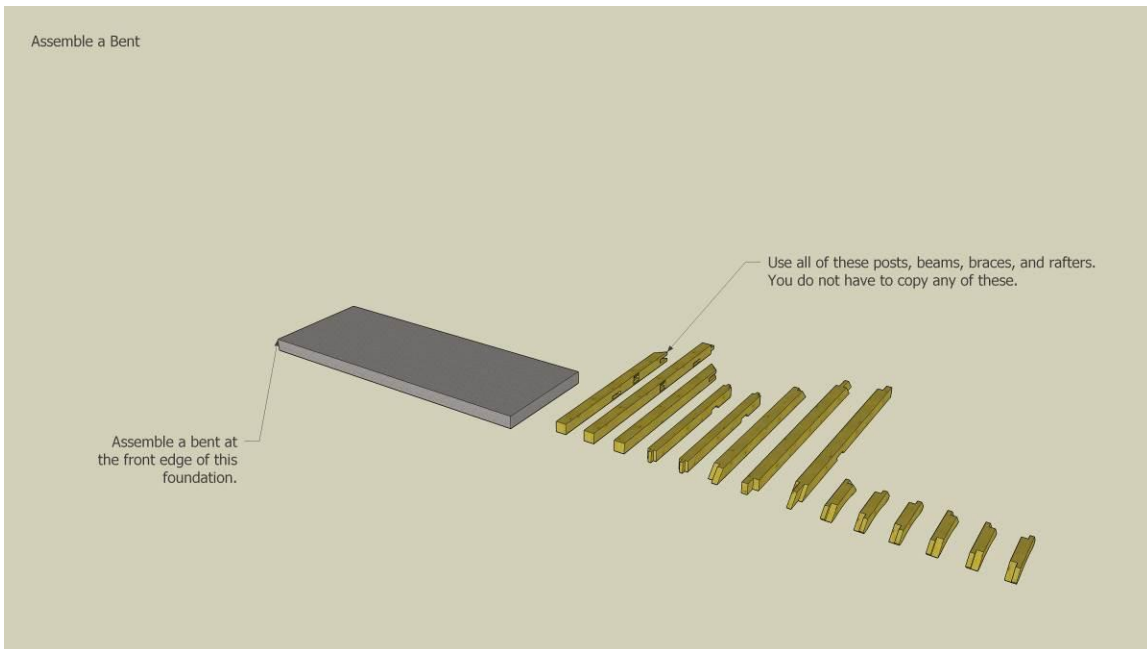


23-39 - A modular house

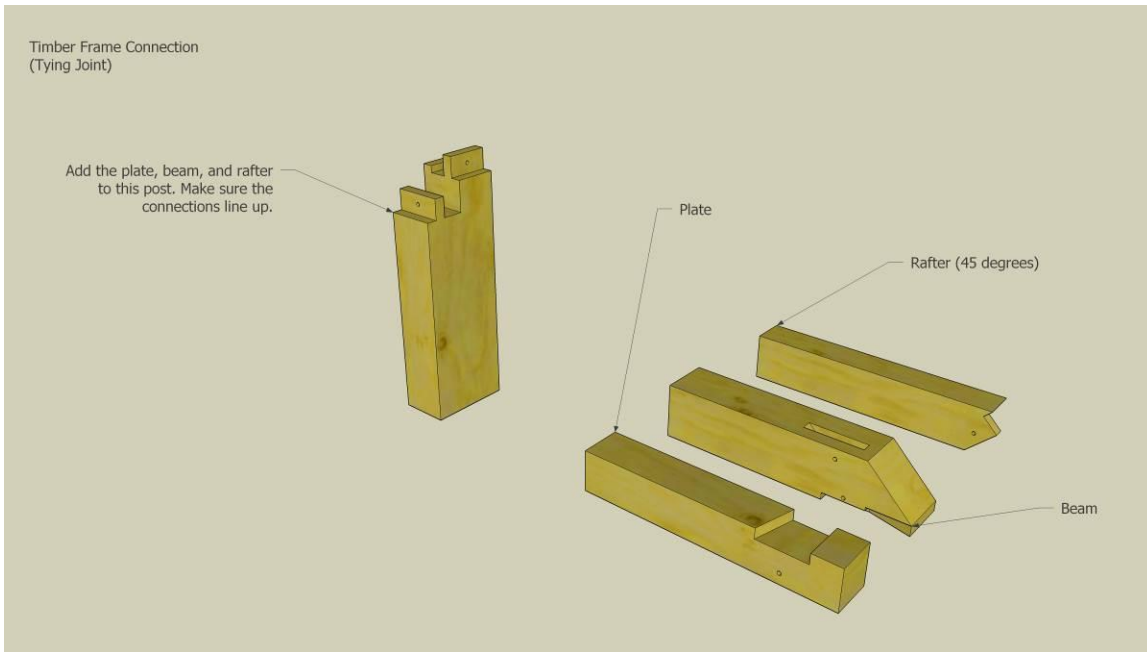


Chapter 24

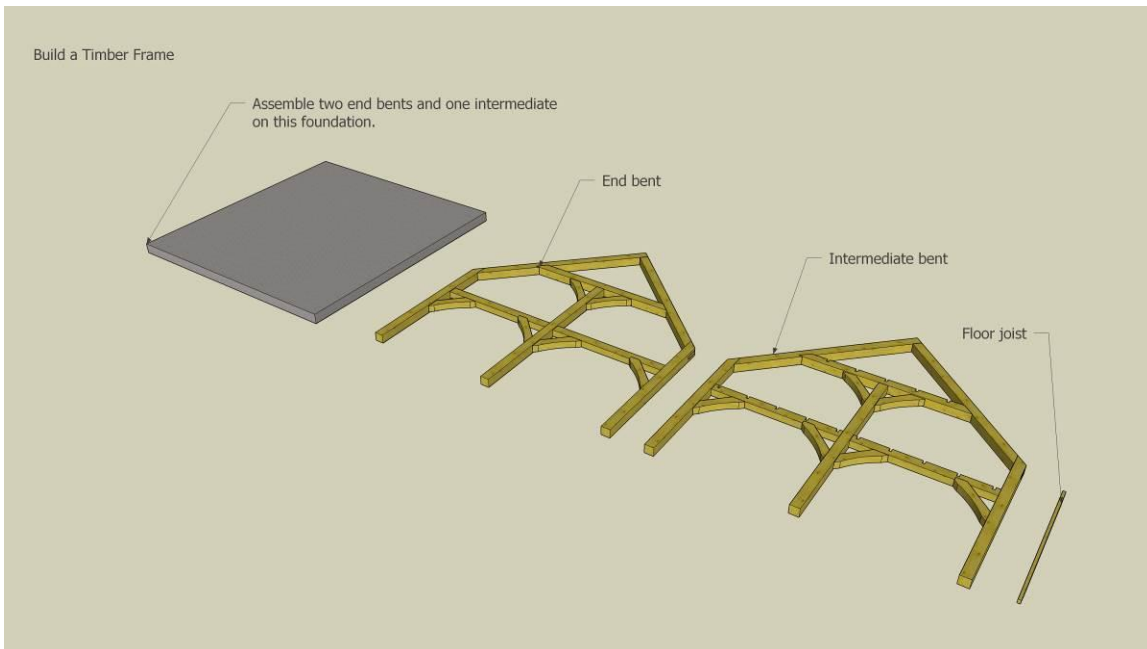
24-4 - Bent assembly



24-10 - Pegged-bracing connection

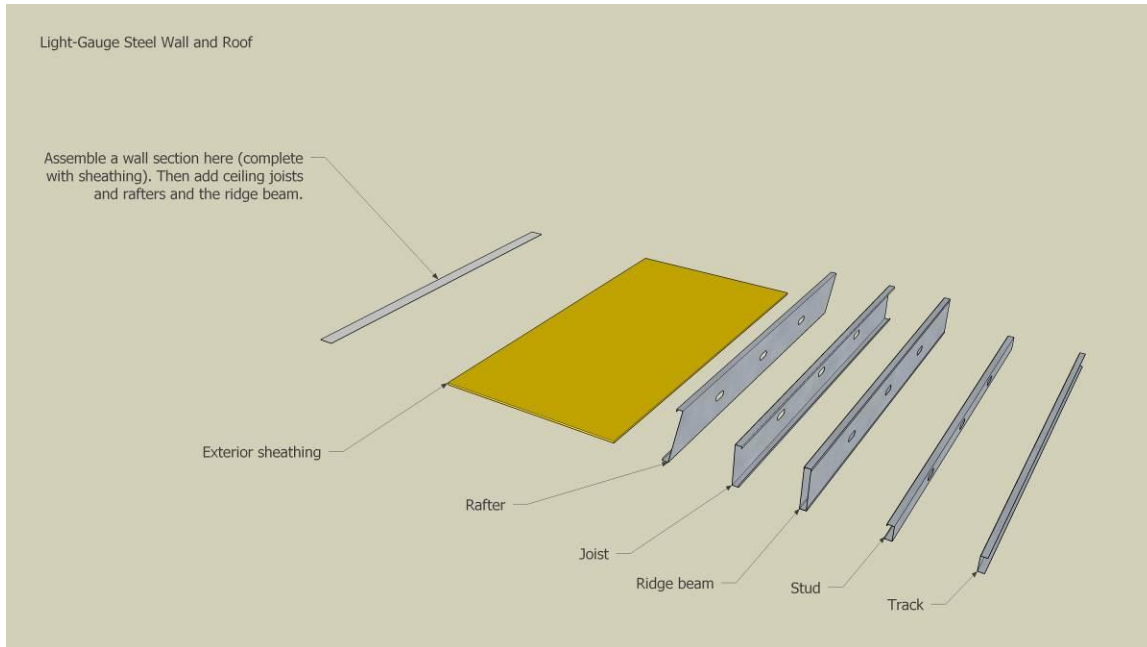


24-13 - Timberframe assembly



Chapter 26

26-4 - Light-gauge foundation floor and wall



26-4 - Light-gauge roof and wall

