

Table of Contents

Chapter 1: Introduction

How this Book Came About	1
How this Book is Set Up	1
Google SketchUp 6: Basic Exercises	1
Google SketchUp 6: Advanced Exercises	2
About the Author	2
About the Cover	2

Chapter 2: The Basics

Google SketchUp Screen	3
Viewing Tools	4
Shortcut Keys	5
Drawing Tools	5
Line	5
Rectangle	11
Square and Golden Section	13
Push/Pull	14
Circle and Polygon	18
Arc	24
Freehand	29
Manipulation Tools	31
Select	31
Taking Off Quantities Using Select and Entity Info	34
Eraser	35
Tape Measure	38
Protractor	43
Move and Copy	47
Move	47
Copy	49
Autofold	51
Autofold with Curved Faces	53
Using Move to Resize Curves and Curved Surfaces	54
Rotate and Copy	57
Rotate	57
Rotate - Copy	60
Defining the Rotation Axis	61
Using Rotate to Twist	64
Scale	65
Scaling with the Axis Tool	67
Offset	68
Axes	69
Displaying and Smoothing Edges	71

Chapter 3: Intersect and Follow Me

Follow Me	77
Basic Follow Me	77
Follow Me with Components	83
Round Objects	85
Intersect with Model	87
Cutting and Embossing	87
Intersecting Arches	89
Arch Cutouts Using Groups	91
Intersect with Context and Selected	93
Combining Follow Me and Intersect with Model	96
Creating a Wall Niche	96
Intersecting Moldings	98

Chapter 4: Making Multiple Copies

Basic Move and Copy	101
Multiple Linear Copies	103
Orthogonal Copies	103
Sloped Copies	107
Multiple Rotated Copies	110

Chapter 5: Working with Roofs

Using Offset for Roofs	117
Simple Roof and Dormers	119
Resolving Sloping Roofs	125
Set Slope and Double Constraints	127
Delete and Recreate	134
Roofing with Follow Me	137
Overhangs	139
Overhangs by Moving Faces	143

Chapter 6: Groups and Components

Components Versus Groups	145
Introduction to Groups	145
Breaking Connected Faces	146
Disconnecting from Other Objects	147
Using Groups for Cutting	148
Unsticking Objects from a Group	151
Introduction to Components	152
Component Files	152
Components Window	153
Inserting and Editing Predefined Components	155
Where to Find More Components	161
Creating and Saving Components in the Library	161
Component Source Files and Reloading	167

Resizing Components (and Groups)	171
Tips for Efficiency with Components	173

Chapter 7: Painting, Materials, and Textures

Overview of Materials	175
Materials Window: Windows	175
Materials Window: Mac	178
Colors	179
Textures and Materials	180
Importing Images	180
Where to Find More Materials	181
Applying Materials	182
Using Shift and Ctrl/Option Keys	189
Creating and Saving Materials in the Library	190
Material Transparency	194
Double-Sided Faces	201
Materials of Groups and Components	203
Overview of Materials and Groups	204
Using Groups to Separate Materials	205
Materials of Components	207
Default Component Materials	211
Wrapping Images	213
Planar Faces	213
Curved Faces	215
Tips for Efficiency with Materials	219

Chapter 8: Adding Text and Dimensions

Text	221
Dimensions	226
Creating Dimensions	226
Dimension Display and Properties	234
Dimensioning Using the Text Tool	238
Using the Axis Tool with Dimensions	239
3D Text	240

Chapter 9: Using Exact Dimensions

Creating Exact Geometry	245
Entity Info	251
Exact Moving and Copying	252
Exact Rotated Copies	257
Symmetry	262
Measuring Length and Area	264
Scaling in 3D	267

Chapter 10: Miscellaneous Basic Exercises

Healing a Divided Line	269
Finding the Center of an Arc	269
Domed Apse	270
Smoothing Faces of Rotate-Copied Curved Objects	274
Hyperbolic Parabola (Saddle Shape)	276
Curvy Things	277

Chapter 11: Google SketchUp and Google Earth

Placing a Model in Google Earth	283
Finding the Model's Location	283
Changing and Relocating the Model	286
Saving Google Earth Files and Models	291
3D Warehouse	295

Chapter 12: Program Settings

Stacking Windows	299
Model Display	300
Edge Settings	301
Face Settings	304
Background Settings	308
Watermarks Settings	308
Modeling Settings	309
Perspective and Parallel Views	310
Model Info	310
Model Info > Animation	310
Model Info > Components	311
Model Info > Dimensions	311
Model Info > File	313
Model Info > Location	313
Model Info > Statistics	314
Model Info > Text	315
Model Info > Units	315
Preferences	316
Preferences > Compatibility	316
Preferences > Drawing	316
Preferences > Extensions	317
Preferences > Files	317
Preferences > General	317
Preferences > OpenGL	318
Preferences > Shortcuts	319
Shortcuts for UI Windows, Toolbars	319
Shortcuts for Render Settings	320
Preferences > Template	320
Toolbars / Tool Palettes	320
Export and Import	321
Exporting	321

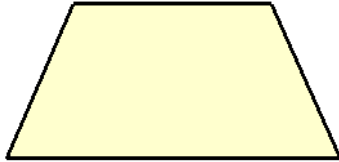
File / Export / 3D Model	321
File / Export / 2D Graphic	321
File / Export / Section Slice	322
File / Export / Animation	322
Importing	322
File / Import	322

Push/Pull

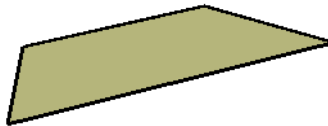
While not exactly a 2D drawing tool, **Push/Pull** it is so crucial to working in Google SketchUp that it's important to cover it before moving on to other tools.

Push/Pull is what makes Google SketchUp so unique and easy to use. Simply put, it takes a face and makes a 3D assembly of faces. In CAD terms, it's basically an extrude tool but much more flexible and intuitive.

1. Start in top view, and use **Line** to make a trapezoid.



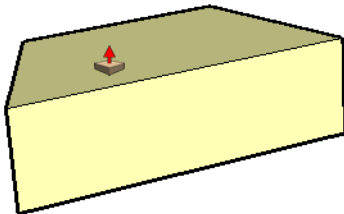
2. Orbit to an isometric view.



3. Click **Push/Pull** (or select **Tools / Push/Pull**).



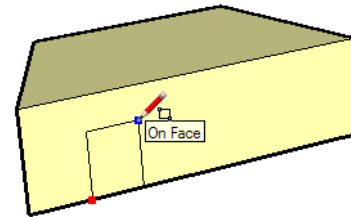
4. To use this tool, you can click on the face and drag the face up or down. But a better way is click-move-click: first click the face, then click the point (above or below the face) to set the height. Either way, the face updates dynamically while you move the mouse.



NOTE: For the **Push/Pull** cursor, the tip of the red arrow is where you select or highlight.

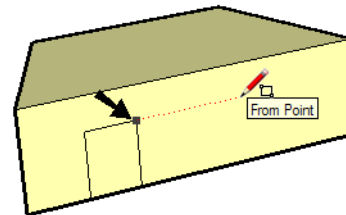
Push/Pull always pushes or pulls a face in a direction *perpendicular to the face*. It also creates a prismatic form - the start and end faces are the same size.

5. Use **Rectangle** (or **Line**) to draw a rectangle from the bottom edge of the front face.

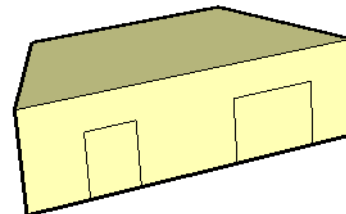


When you use a 2D drawing tool on a face, the object automatically aligns to that face.

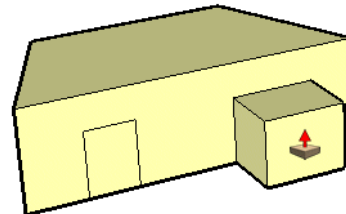
6. We want another rectangle on this face that has the same height. Hover over the corner point shown and move the cursor to the right to place the first corner point.



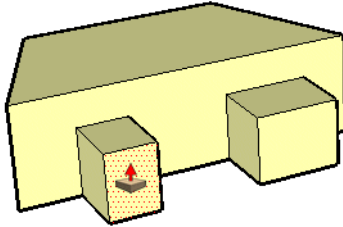
7. Click along the bottom edge to complete this rectangle.



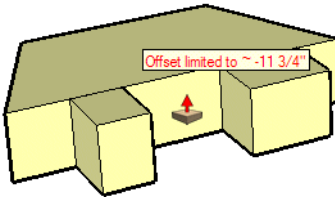
8. Use **Push/Pull** to pull out one of the rectangles.



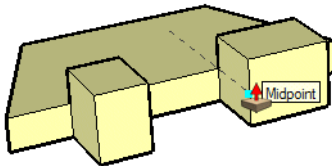
9. Double-click on the other rectangle - this pulls it out by the same distance you just used.



10. Now push the top of the trapezoid down. You can only go as far as the top of the box forms.

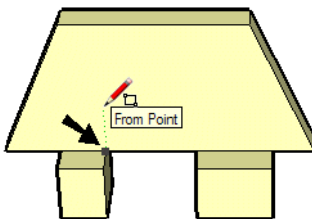


11. Use another **Push/Pull** to continue pushing this face past the boxes. You can use inferences while using **Push/Pull** - stop at the midpoint of the edge shown (or any similar edge).

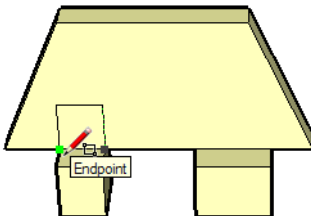


NOTE: This is one example in which click-move-click is easier than dragging.

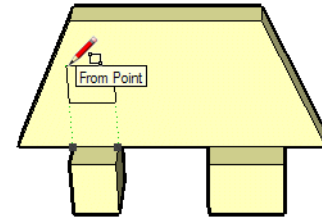
12. We will now draw two rectangles on the top of the trapezoid. Click to place the first corner in the green direction from the corner shown.



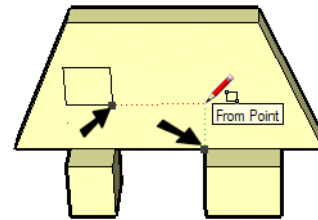
13. Hover over the other corner . . .



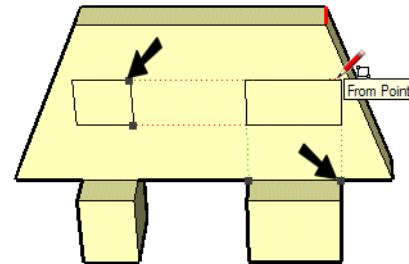
14. . . . and place the second corner point.



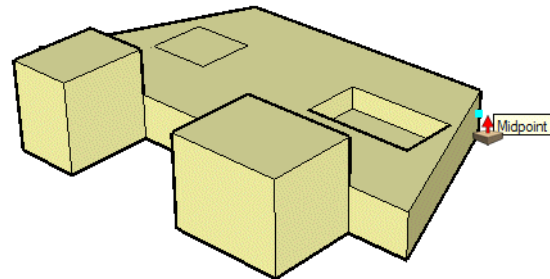
15. The second rectangle will use inferences from two existing lines. Hover over the two points shown, and click at their intersection.



16. Hover over the two points indicated to get inference lines for the second corner point of the rectangle.



17. Use **Push/Pull** to push in one of the rectangles.



To push the other rectangle in by the same distance, you could double-click it. But this can only be done when you want to use the distance of the last **Push/Pull**. If you used **Push/Pull** somewhere else, then came back to the second rectangle, the distance you want is no longer stored.

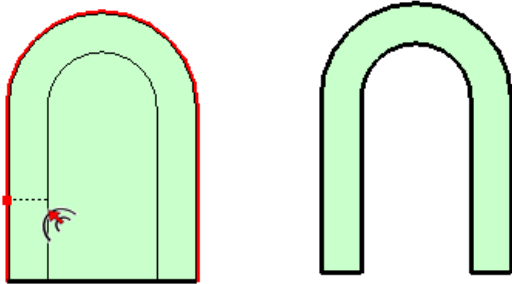
Intersecting Arches

This exercise is pretty straightforward - intersecting two arches that meet at a 90-degree angle.

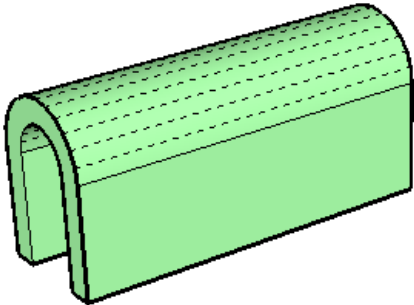
1. Start in a new file in **Front** view.



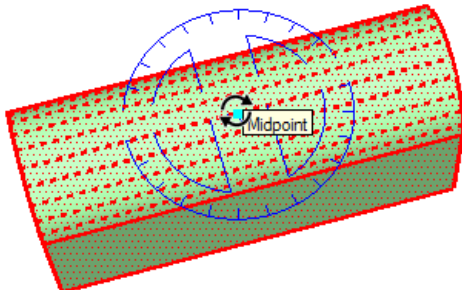
2. Use **Rectangle** and **Arc** to draw an arch. Select all edges except for the bottom one, and use **Offset** to create an inner arc. Then erase the bottom edge.



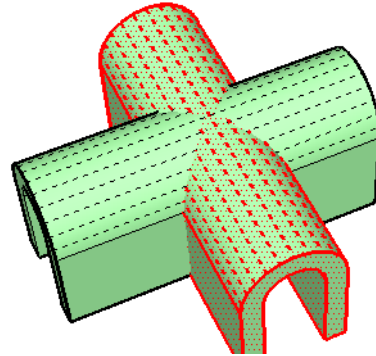
3. **Push/Pull** it out and display the hidden edges (**View / Hidden Geometry**). This is so that we will have a reference for copying and rotating.



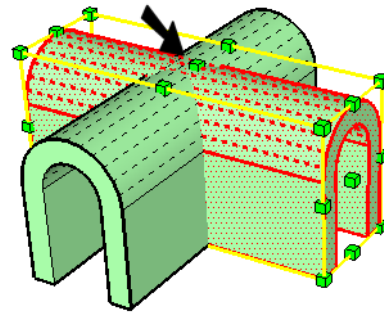
4. Select the arch and activate **Rotate**. Shift-lock the protractor to the red-green plane and place it at the midpoint of the top (hidden) edge of the arch.



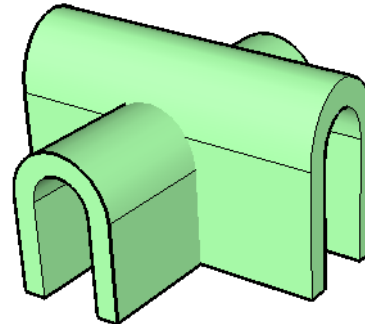
5. Press **Ctrl/Option** for copying, and set the rotation axis anywhere. Enter, or snap to, a 90-degree angle.



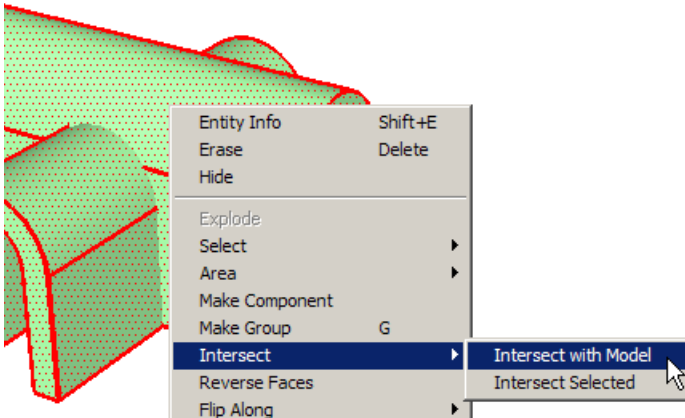
6. With the copied arch still selected, activate **Scale**. Drag the top center handle upward to create a higher arch.



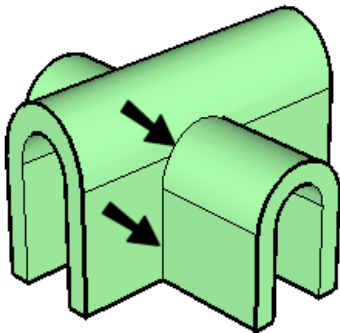
7. Deselect everything and hide the hidden edges. We want to cut the arch openings, but first we need the intersection edges.



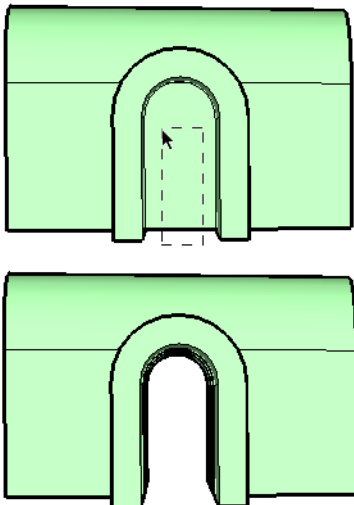
8. Select both arches, and right-click and select **Intersect with Model**.



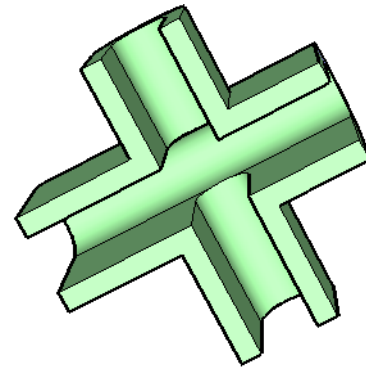
This creates edges where one object intersects with another.



9. To cut the openings, switch to a front or side view and use a right-to-left window to select and delete everything inside the shorter arch.



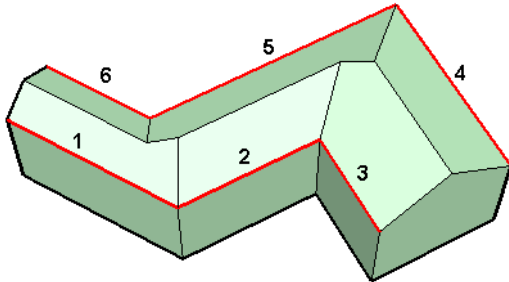
10. Do the same for the higher arch. This is how the model should look from the bottom (some cleanup may be needed).



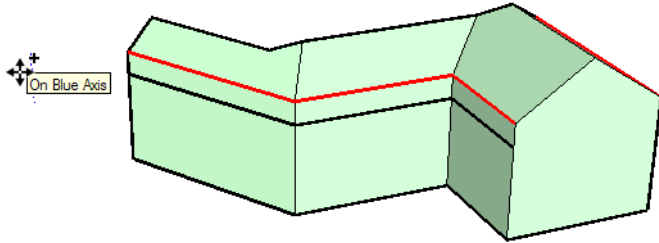
Overhangs by Moving Faces

Here's an easier and faster way to achieve similar results. This method works when all slopes are uniform.

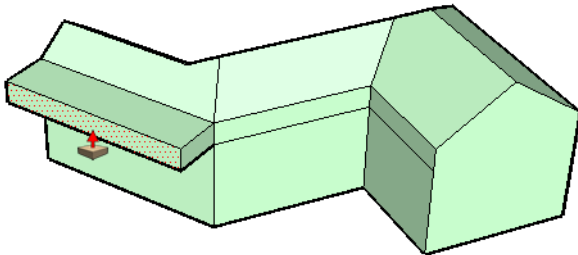
1. Open the saved file "RoofIntersections.skp." Select all six roof edges.



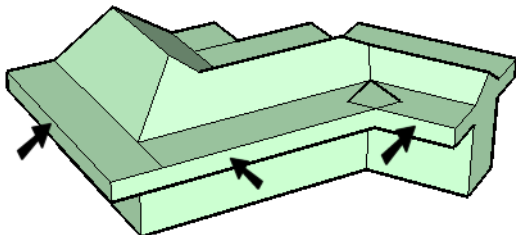
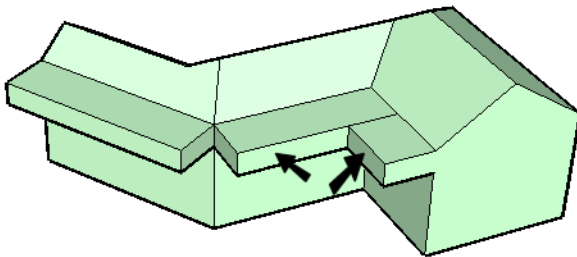
2. Copy the six lines down slightly.



3. **Push/Pull** one of the new faces outward.

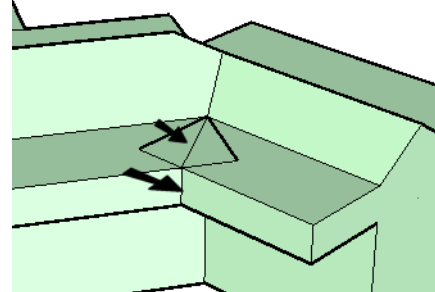


4. In **Push/Pull**, double-click the other five faces to pull them out the same distance.

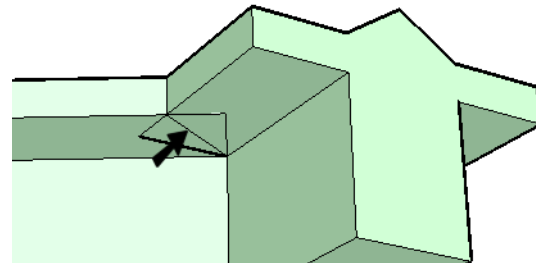


The 90-degree corners don't need to be fixed, but the diagonal ones do. We can either fix the corners now or later, so let's fix one now. Look at the inside corner - the one that overlaps.

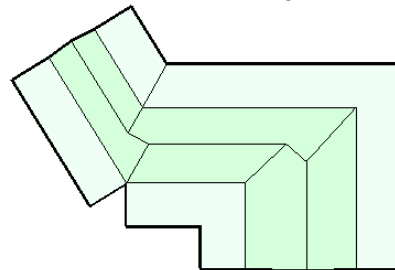
5. Draw two intersection lines on the top . . .



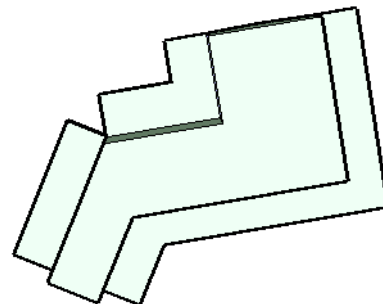
6. . . and one on the underside.



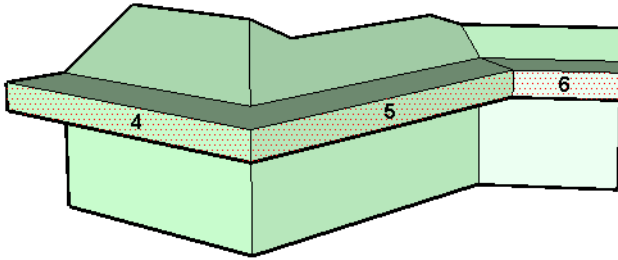
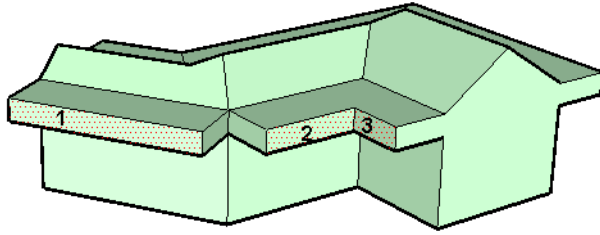
7. Switch to **Top** view and erase all extra lines. If a face is deleted, redraw one of its edges to recreate it.



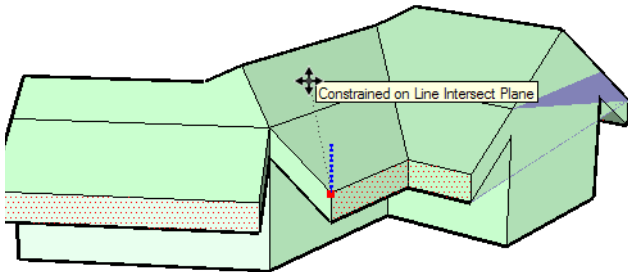
8. Erase extra lines on the underside as well. (Or switch to **X-Ray** mode so that you can see all extra lines without switching views.)



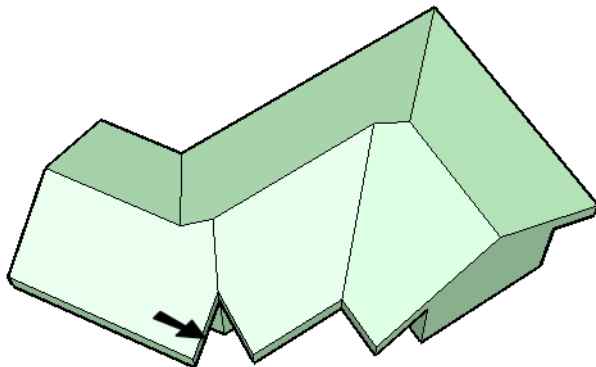
9. Now select the six vertical fascias.



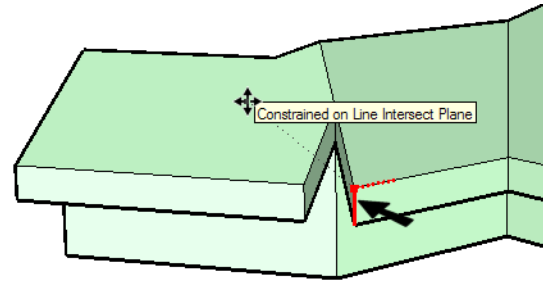
10. Activate **Move**, and click any point along the top edge of one of the fascias. Move the fascias in the blue direction, pressing Shift or the Up arrow key to lock them, and constrain them to the slope of the adjacent roof face.



11. Erase the extra lines on the now-continuous roof. There is only one corner left to be fixed

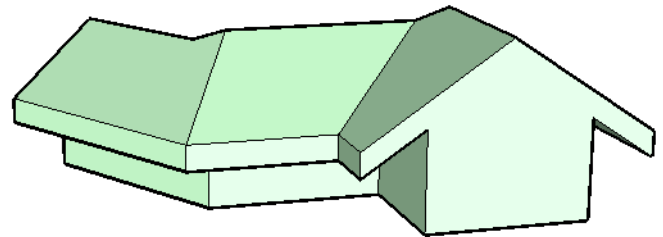


12. Select the edge shown and activate **Move**. Drag any point of this edge along the axis, and press Shift. Then constraint the point to the adjacent roof face.



13. Move the other edge of this corner to meet the corrected edge.

Here's the whole house - fixed corner and all.



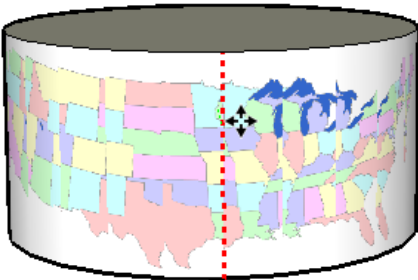
You have now created a continuous overhanging roof using a pretty small number of steps. The difference with the result here is that the fascias are all vertical; in the previous exercise the fascias are at right angles to the roof planes.

Curved Faces

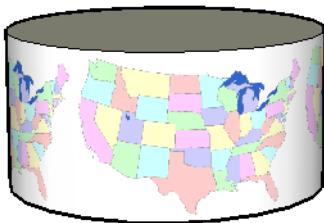
1. Continue in the same file. Draw a cylinder and apply the picture to it. (Use the thumbnail from the **In Model** tab of the **Materials** window, not the sampled skewed texture from the cube.) The image wraps smoothly.



2. Use **Move** to resize the cylinder. Now the image is no longer smooth. This is because the image is actually applied to each planar segment separately.

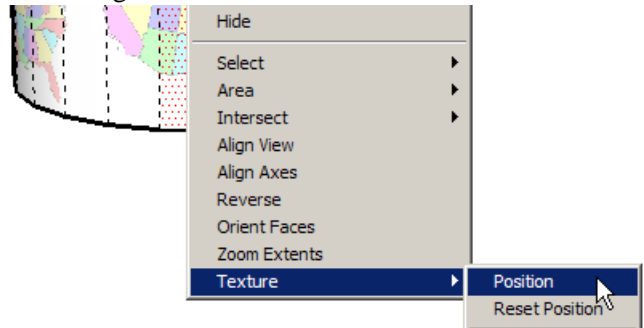


3. It's easy to fix this - just remove the image by painting the cylinder with the Default paint, then reapply the image.

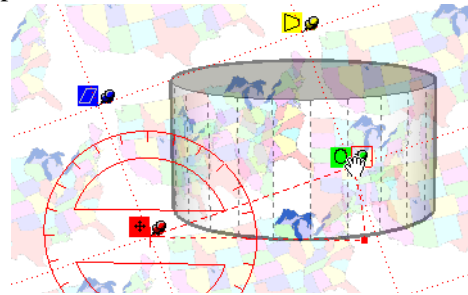


The picture wraps smoothly, but you cannot right-click on the face to access texture positioning.

4. To change the orientation or scale of the image on a curved face, first display hidden edges (**View / Hidden Geometry**). Then right-click on any of the face segments and select **Texture / Position**.

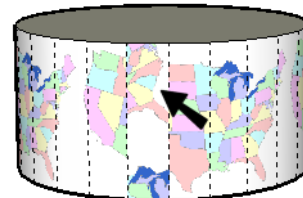


5. You should see four pins, each with a different color (this is **Fixed pin** mode). If you are in **Free pin** mode (four yellow pins), switch modes by right-clicking and selecting **Fixed pins**. Drag the green pin to rotate the picture.



NOTE: *Texture positioning is covered in-depth in Google SketchUp 6: Advanced Exercises.*

Right-click and select **Done**. Only the edited segment has the rotated picture.



6. Sample the rotated image, and turn off the hidden lines. Then apply the texture to the cylinder - the rotated picture wraps around the whole cylinder.

