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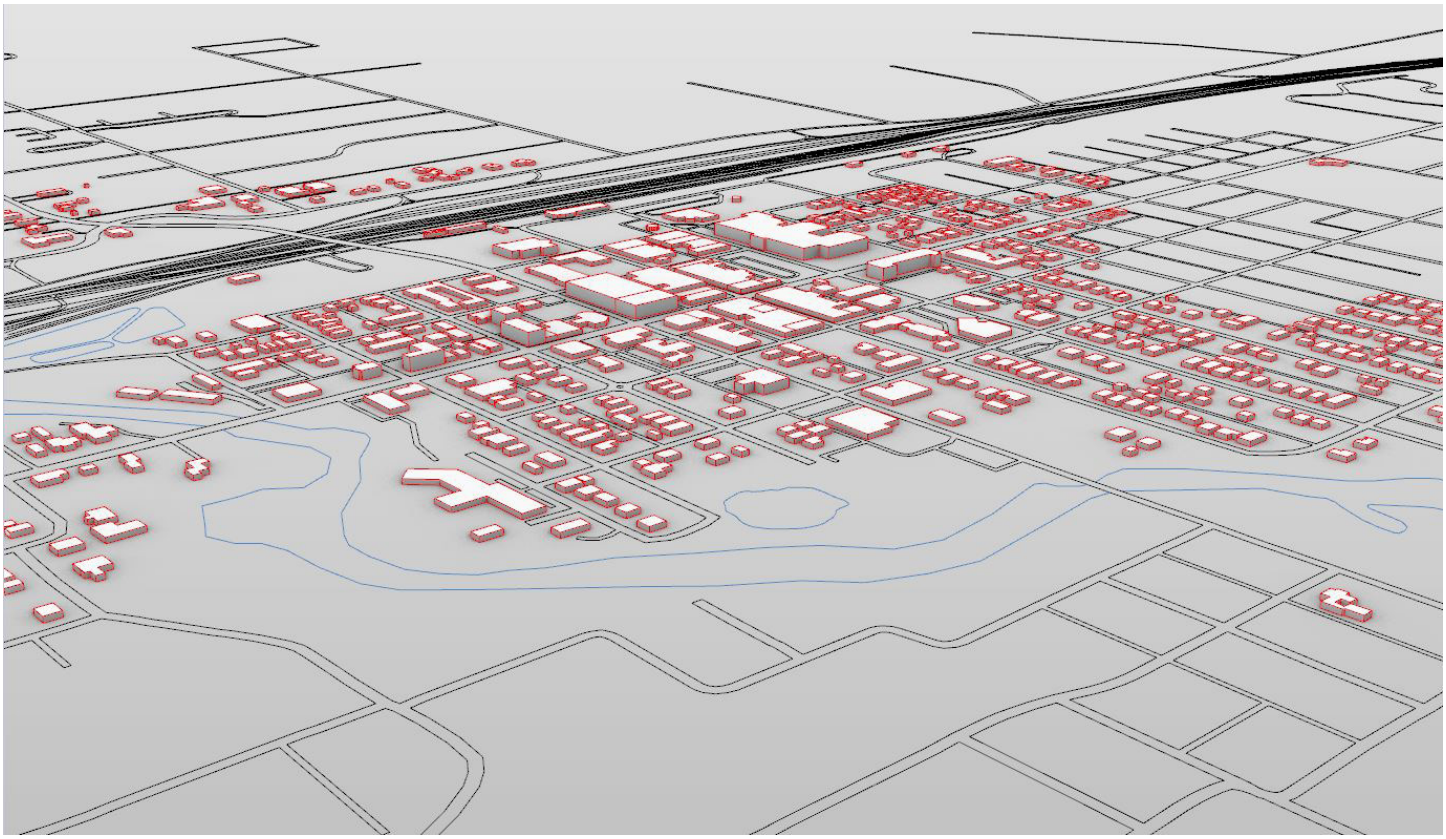
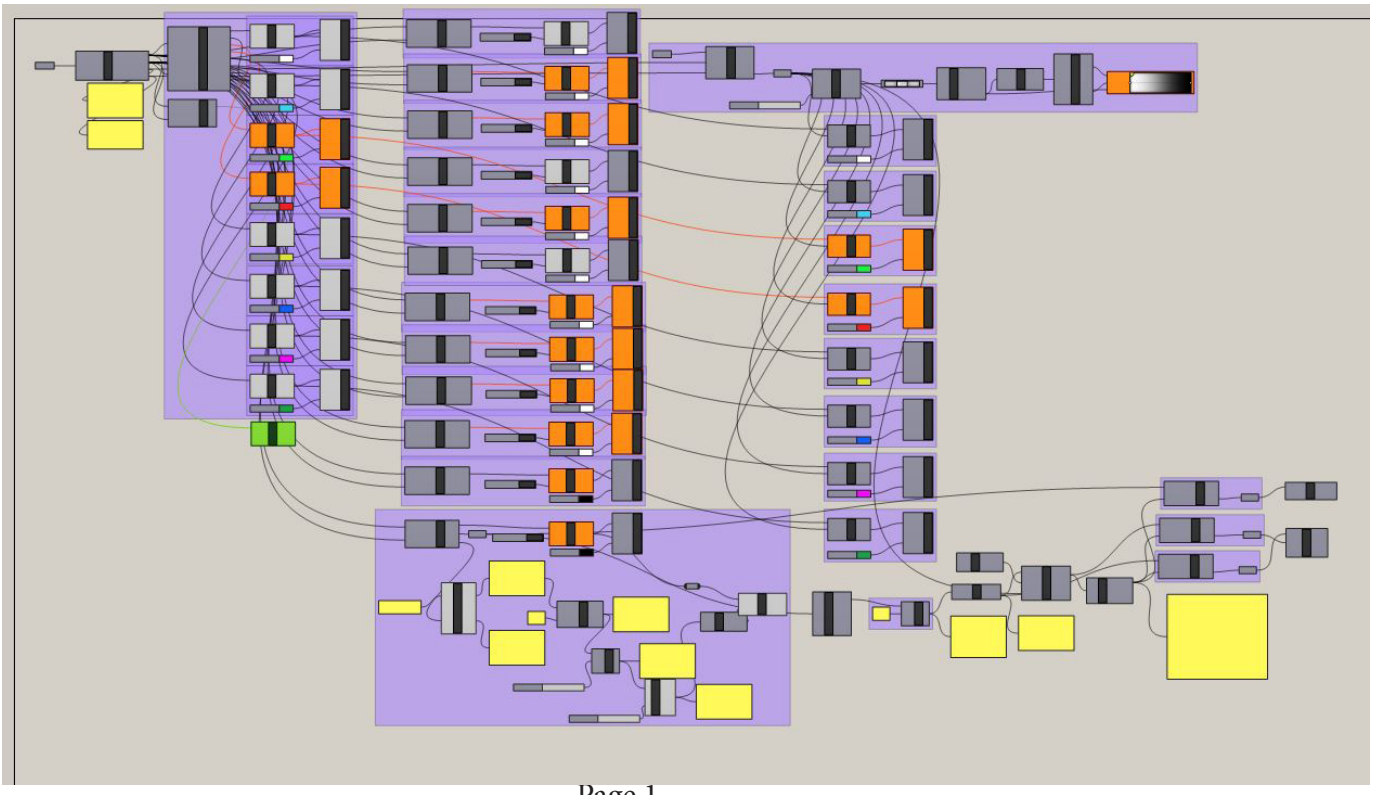
Site Plan from Grasshopper Script



Grasshopper Script: Elk Site Plan



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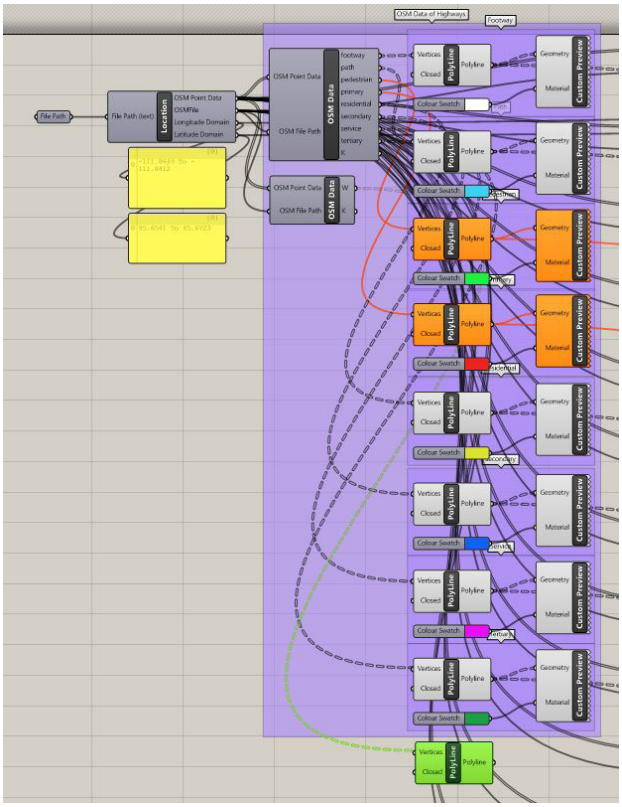
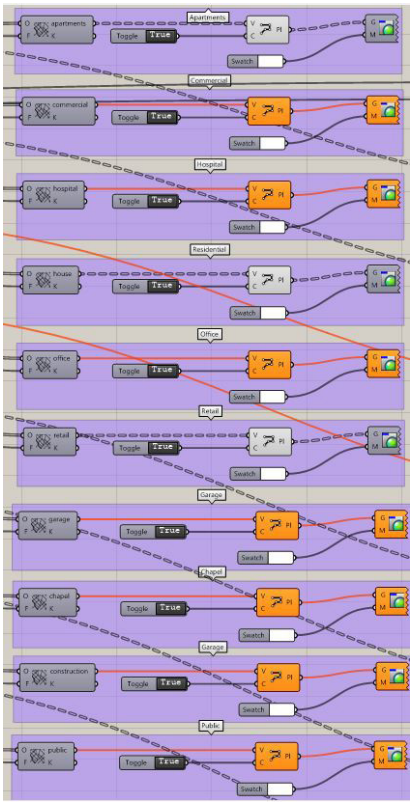
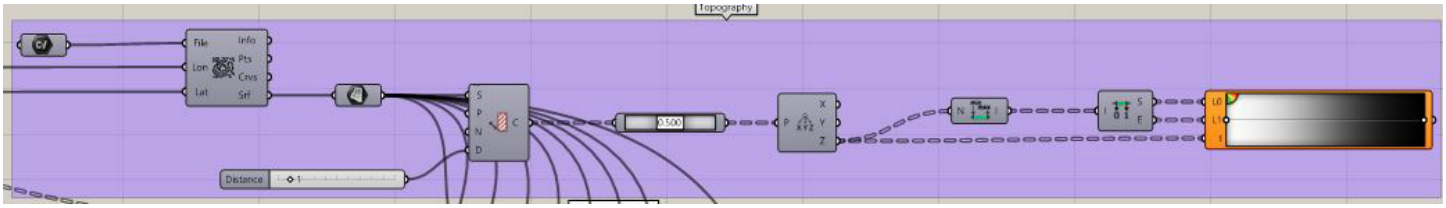
Grasshopper Script: Elk (Roads and Pathways)



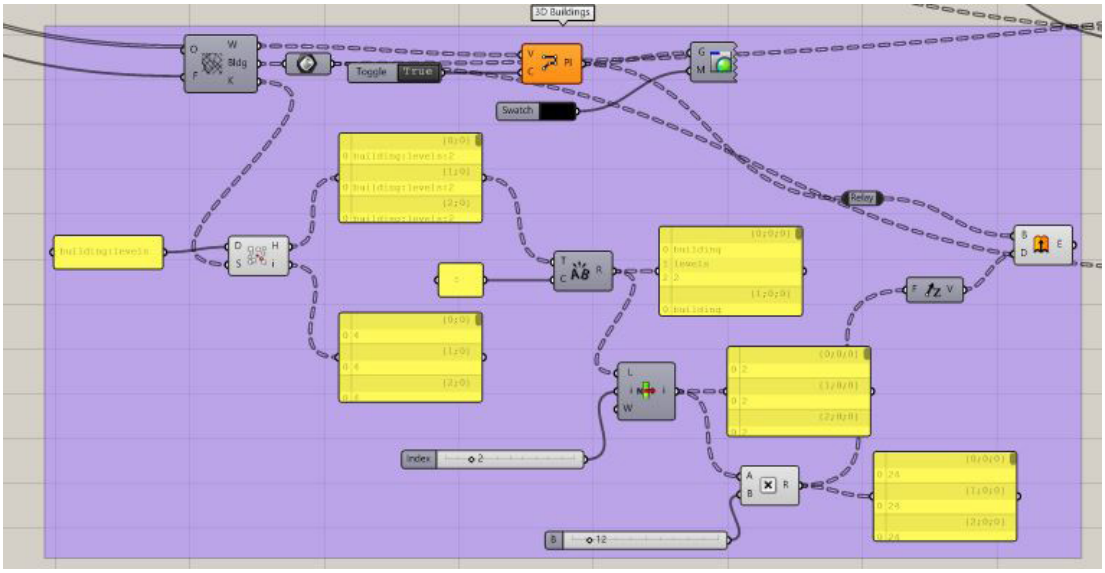
Grasshopper Script: Elk (Building Footprints)



Grasshopper Script: Elk (Topography)



Grasshopper Script: Elk (3D Building Extrusion)



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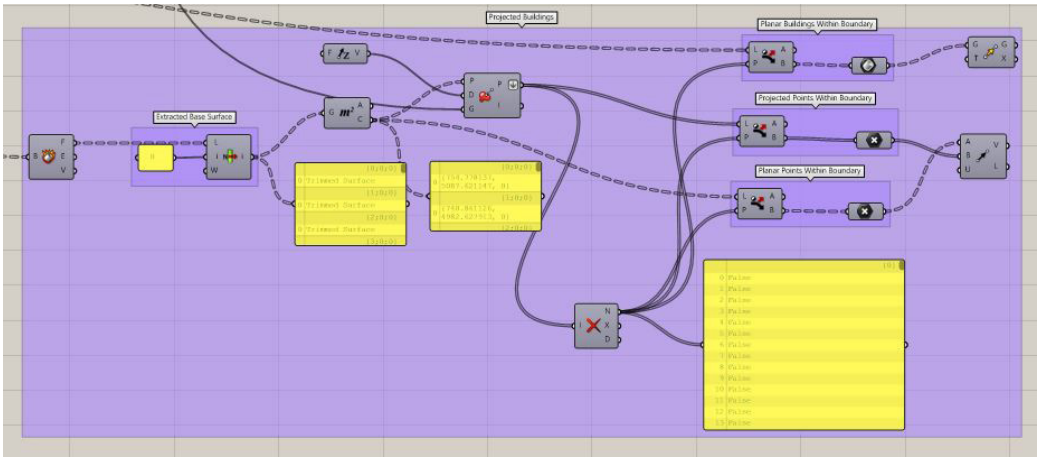
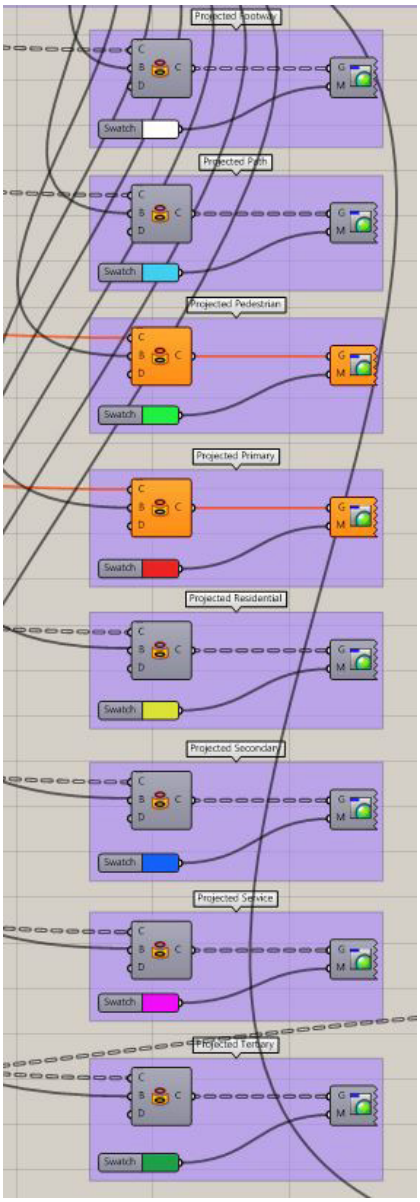
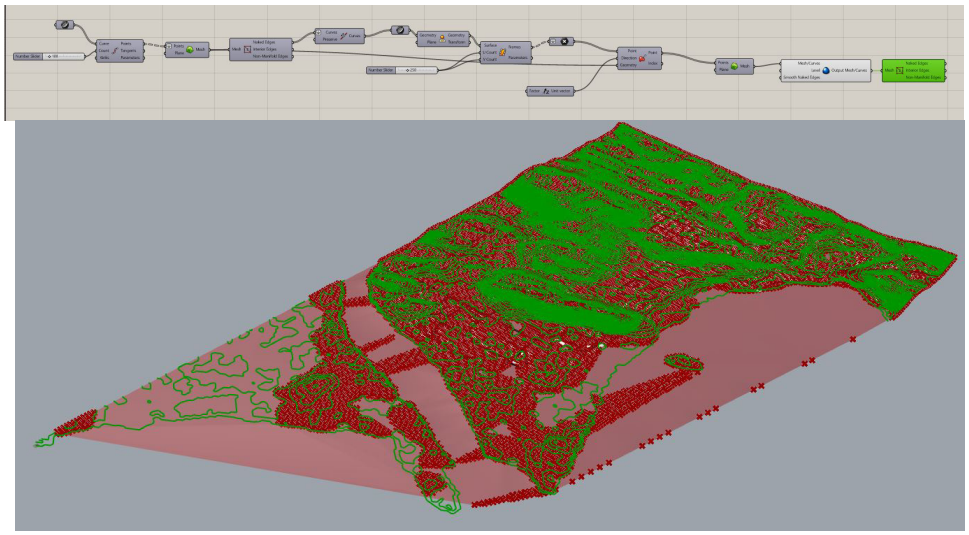
Grasshopper Script: Elk (Projected Buildings to Toposurface)



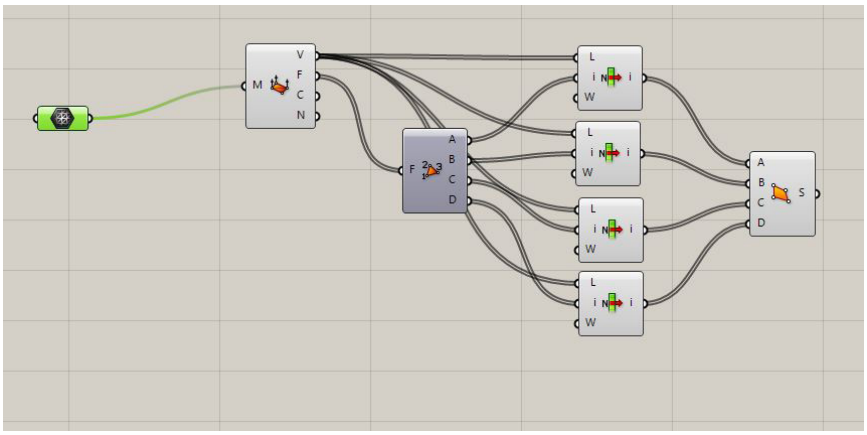
Grasshopper Script: Elk (Projected Roads to Toposurface)



Grasshopper Script: Contours to Site Mesh



Grasshopper Script: Mesh to Surface



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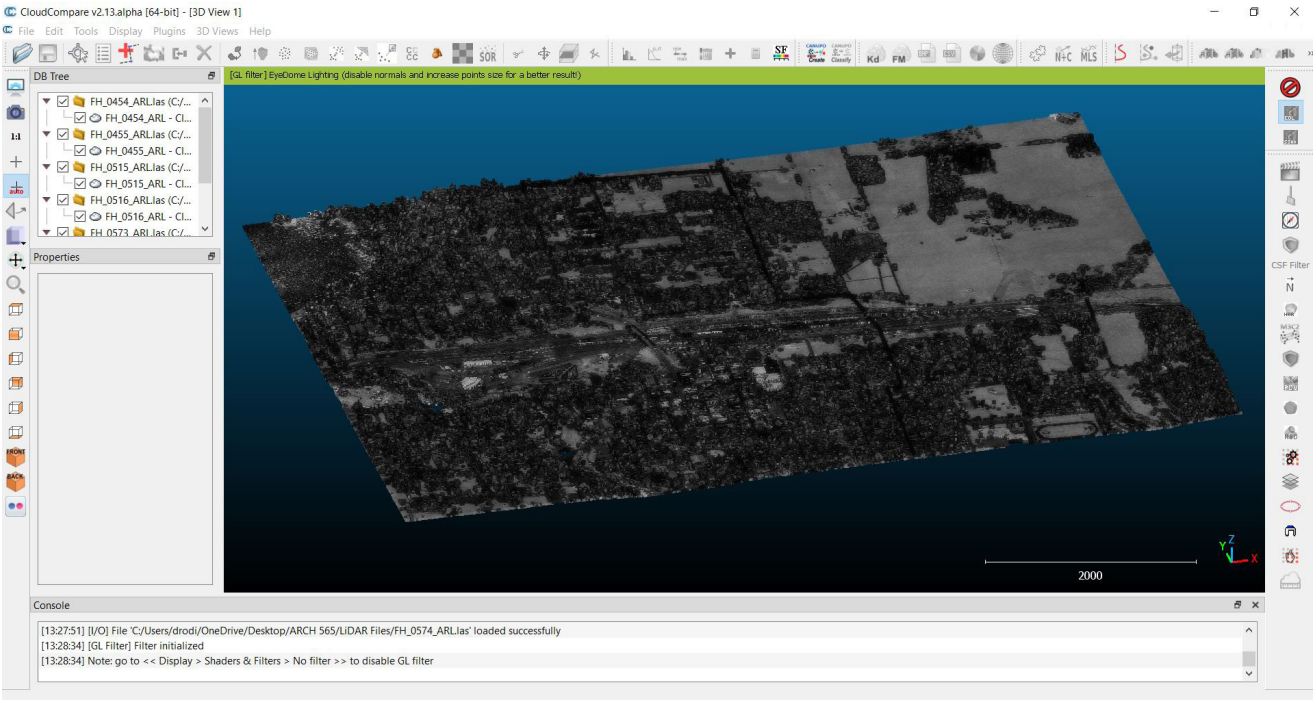
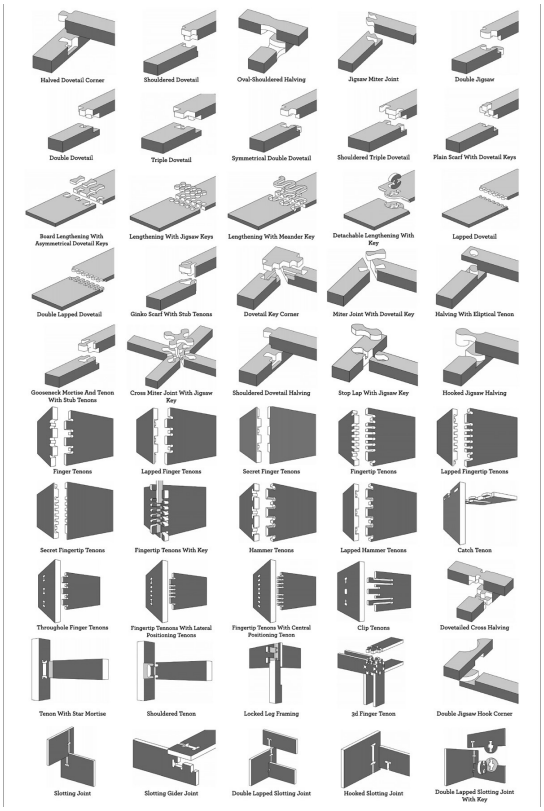
CloudCompare: Whitefish Site for Thesis



Examples of Different Joints for Thesis Project



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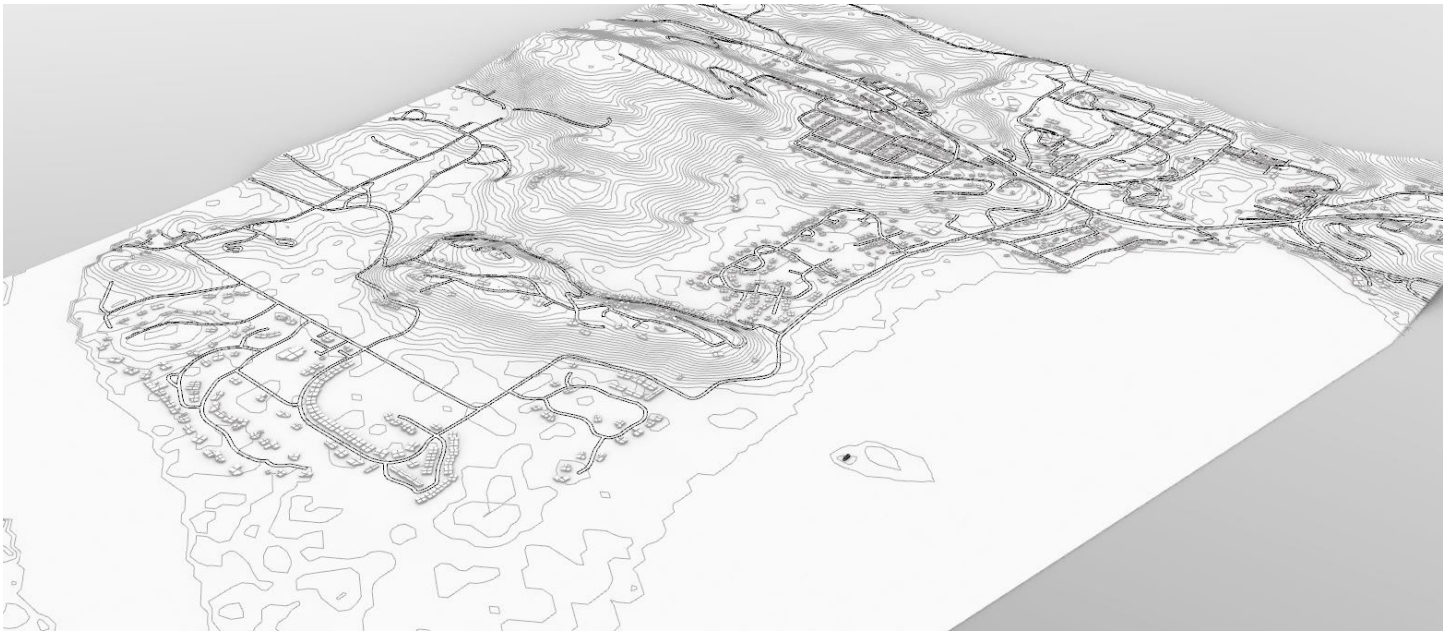
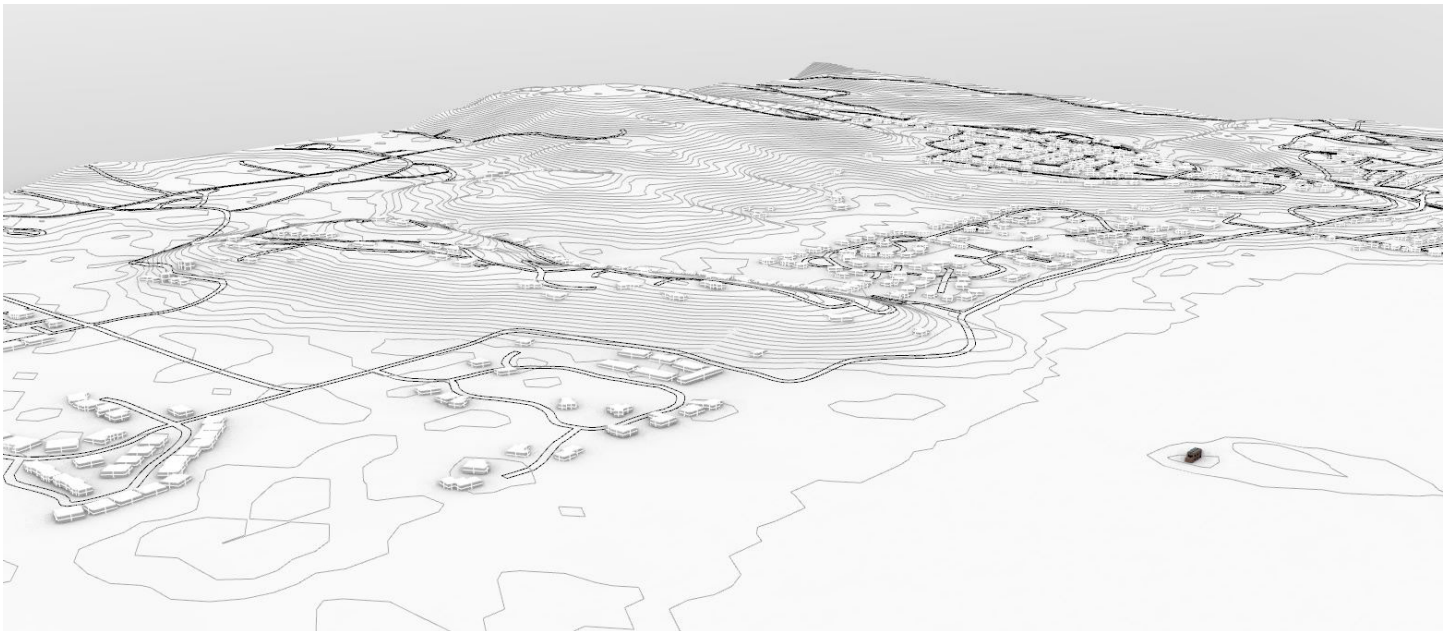
Site Model for ARCH 528 Project: (Contours to Surface Scripts and Elk Script)





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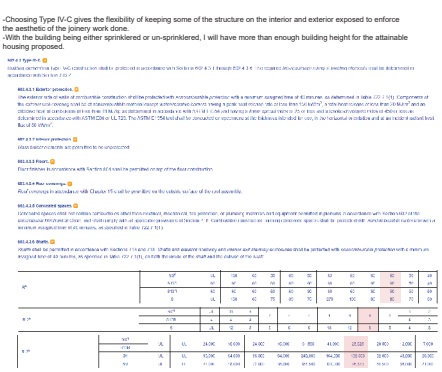
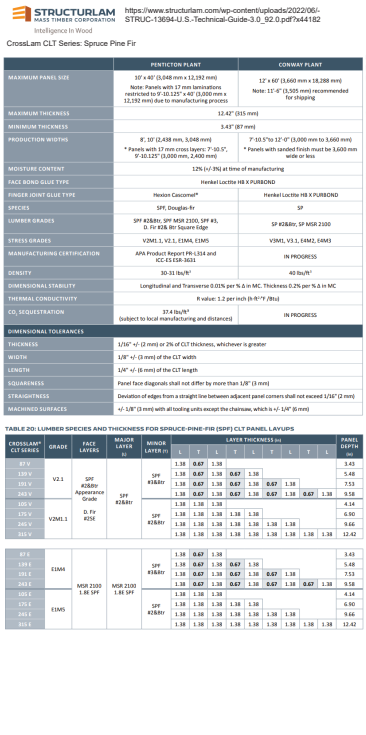
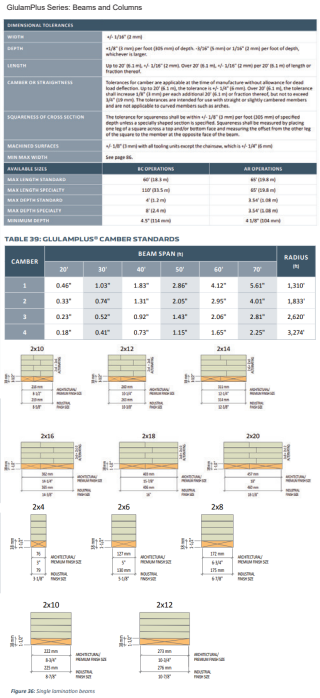
Code and Structural Sizing Research

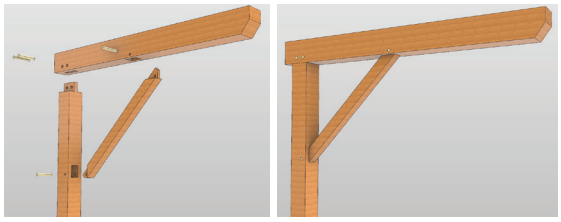




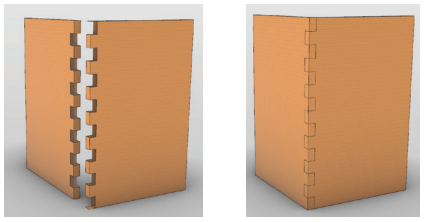


Sample Joint Research and Studies

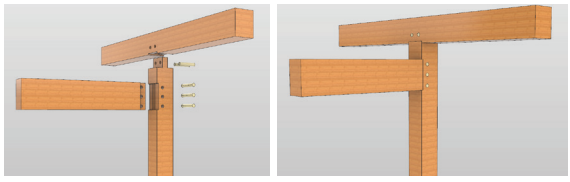
Post and Beam Connection with Knee Brace Joint



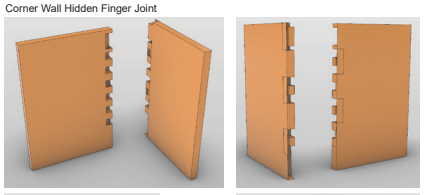
Corner Wall Finger Joint



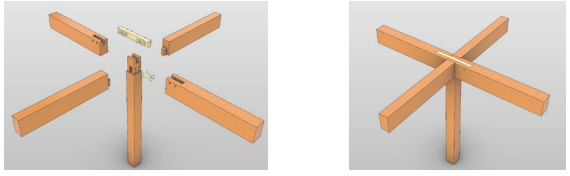
Mortise and Tenon: Beam to Post and Post to Plate



Corner Wall Hidden Finger Joint



4 Point Beam to Girder Joint



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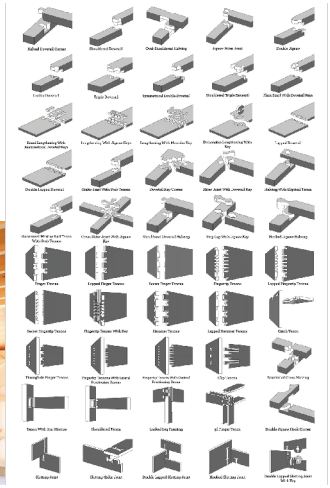
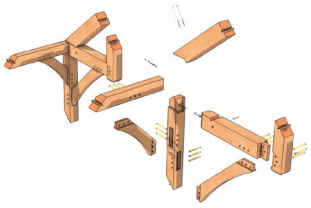
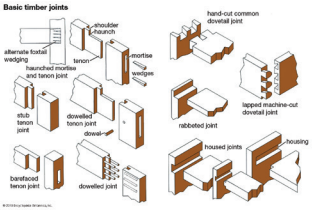
Sample Joint Research and Studies

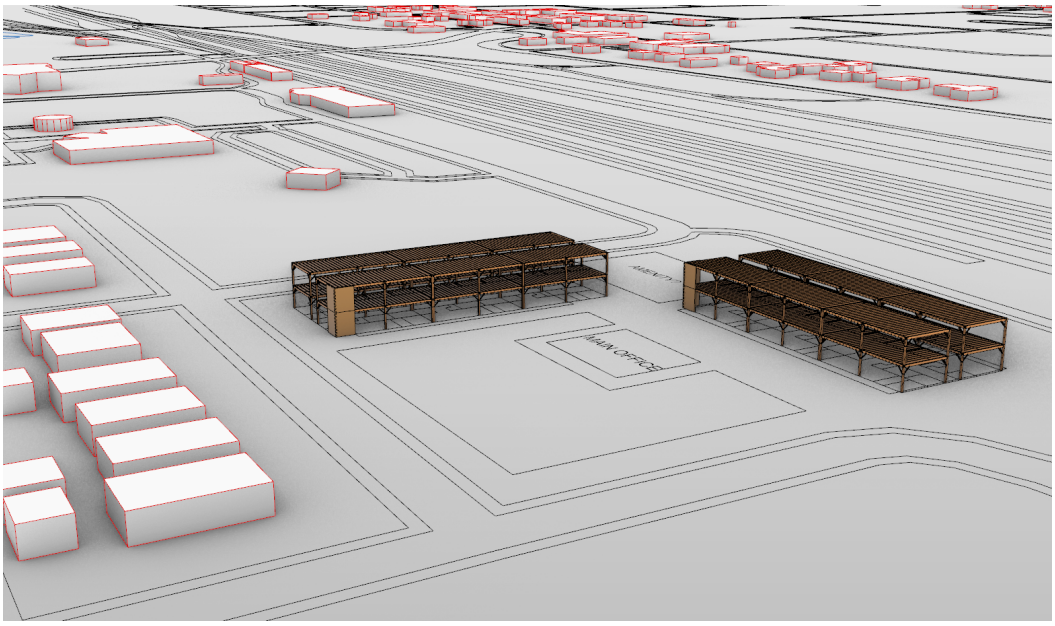
Precedent Analysis

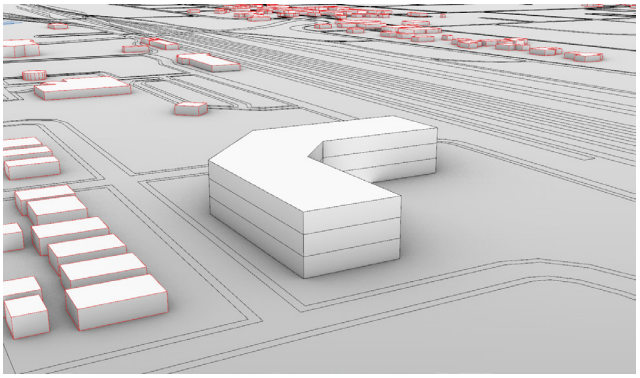


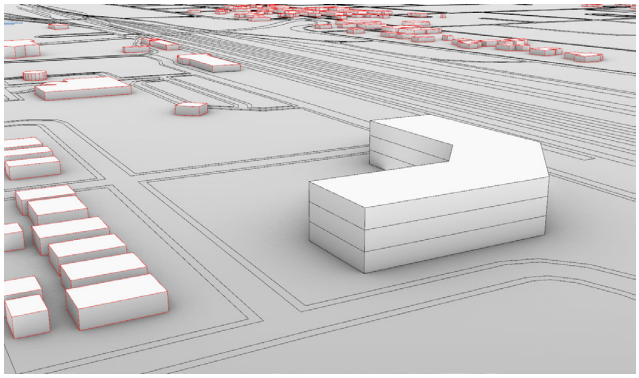




Preliminary Structural Analysis/Massing Models







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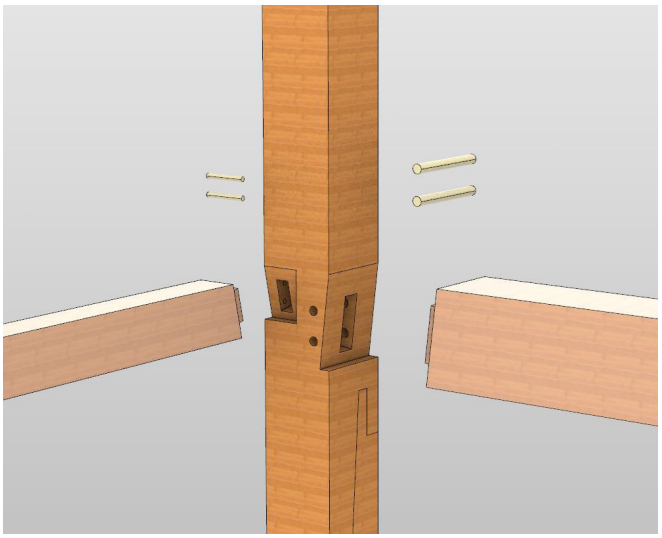

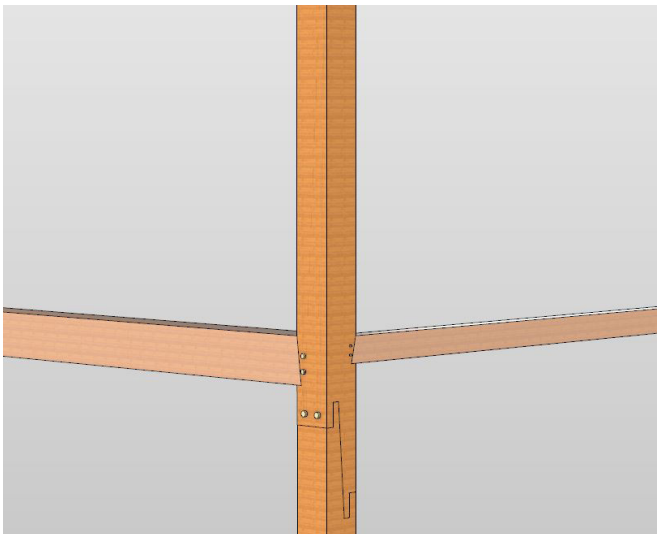

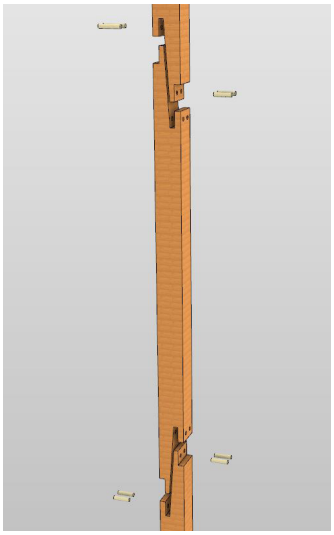

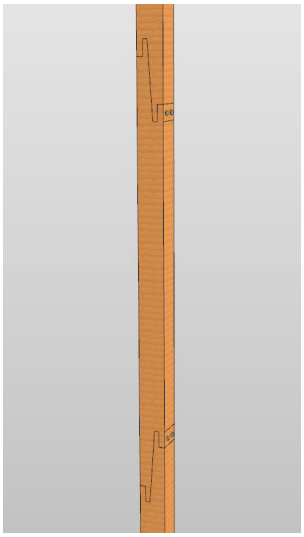

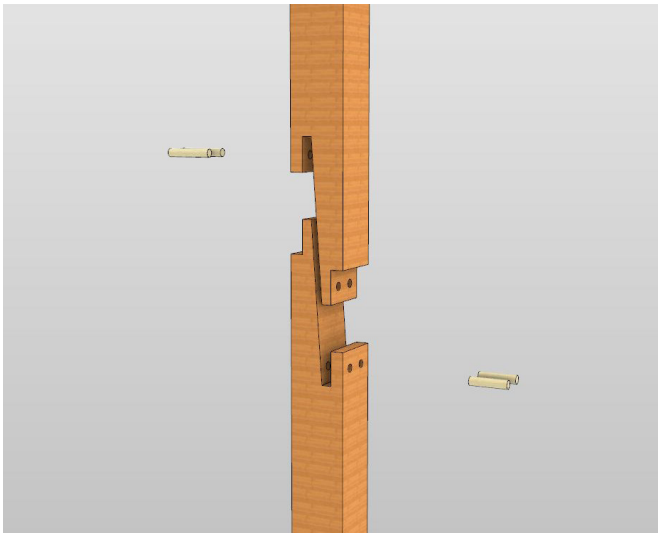

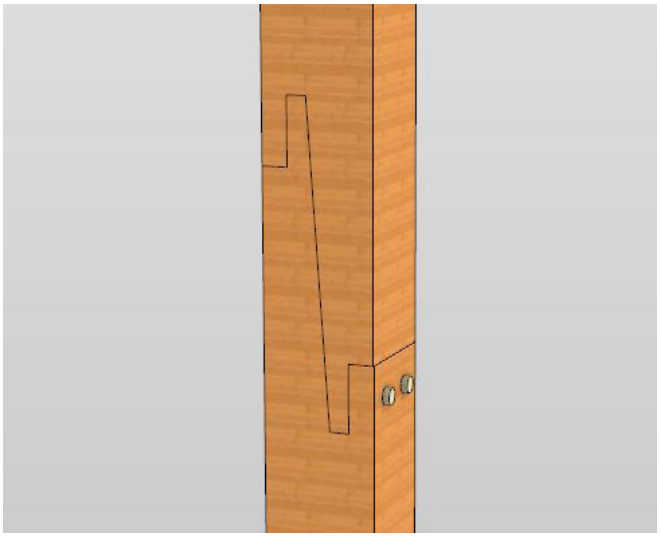

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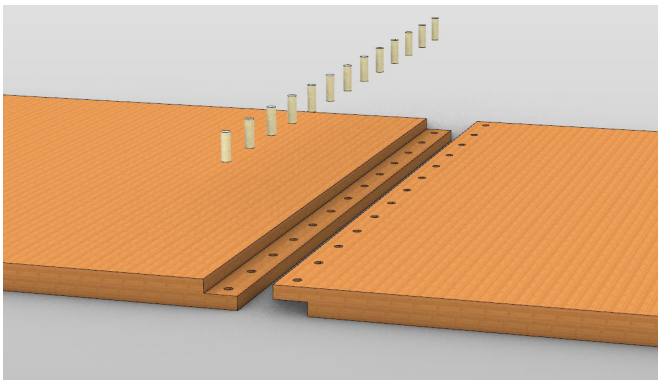

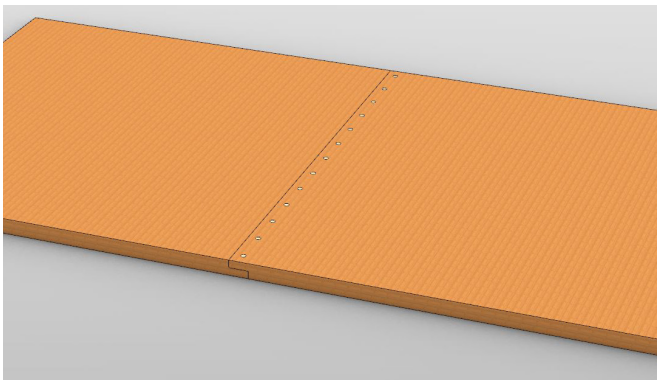

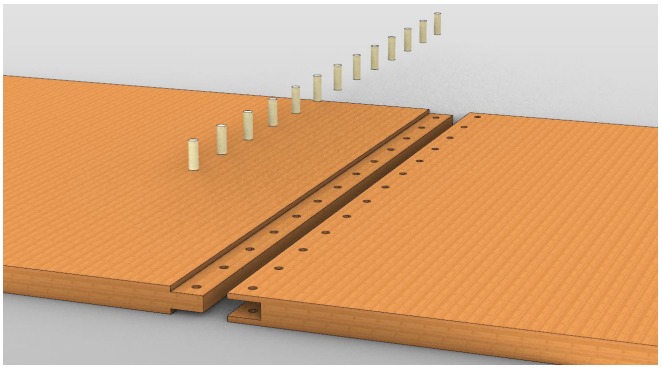

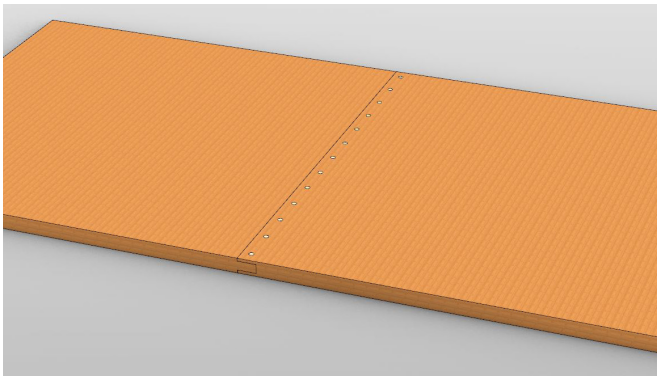

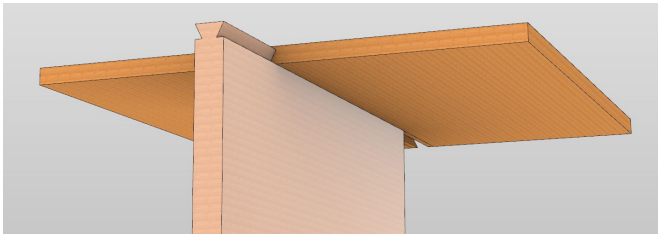

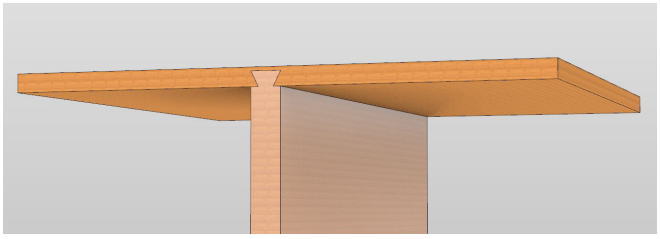

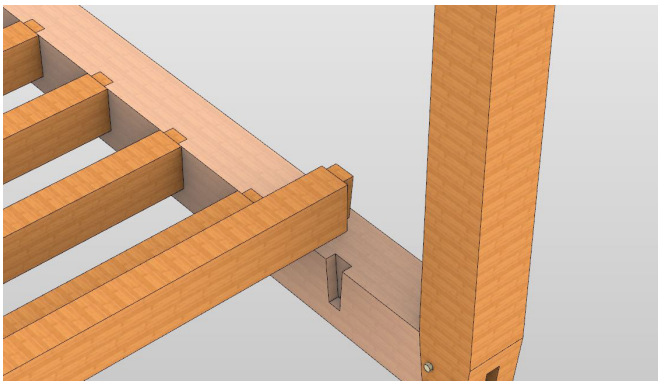

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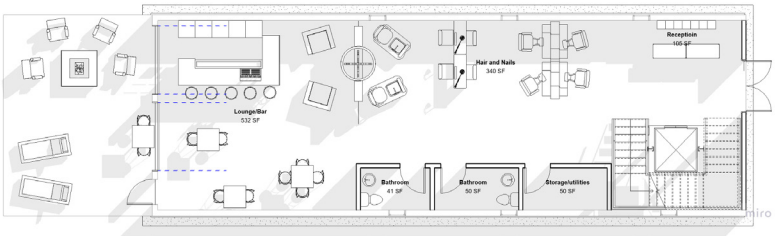

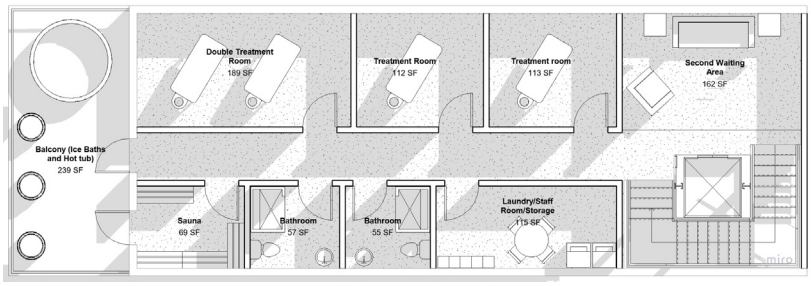

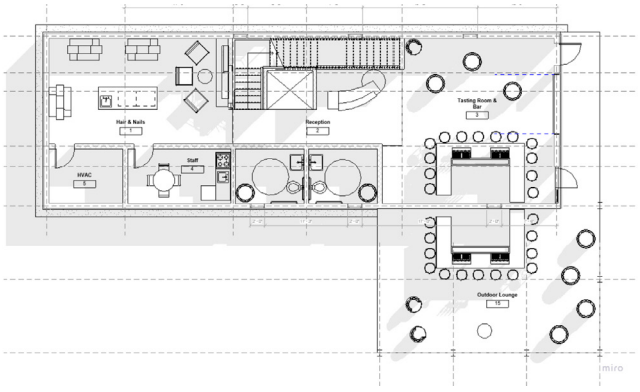

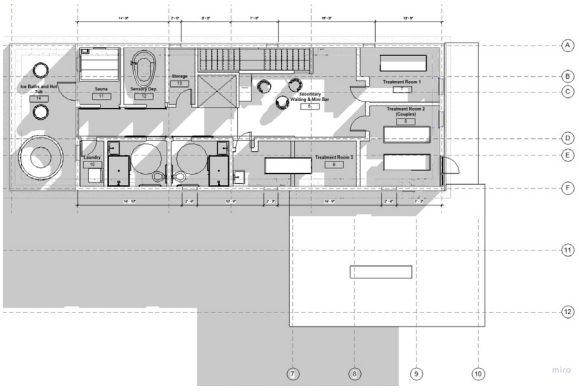

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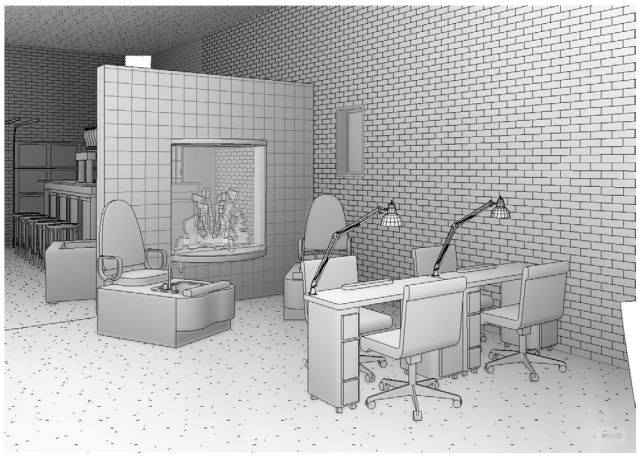

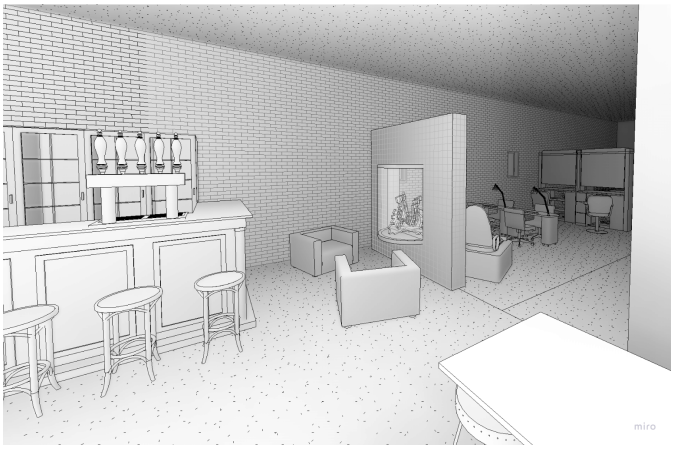

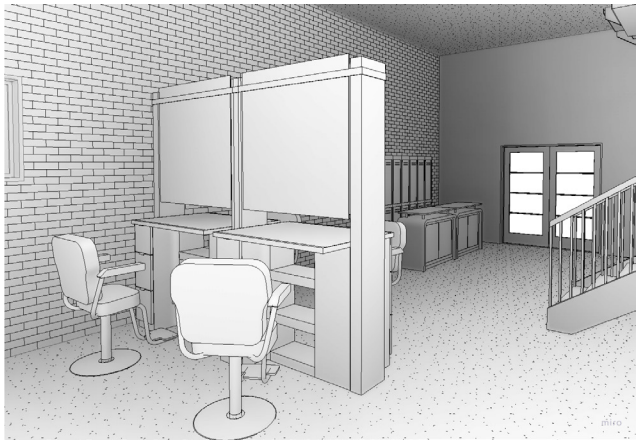

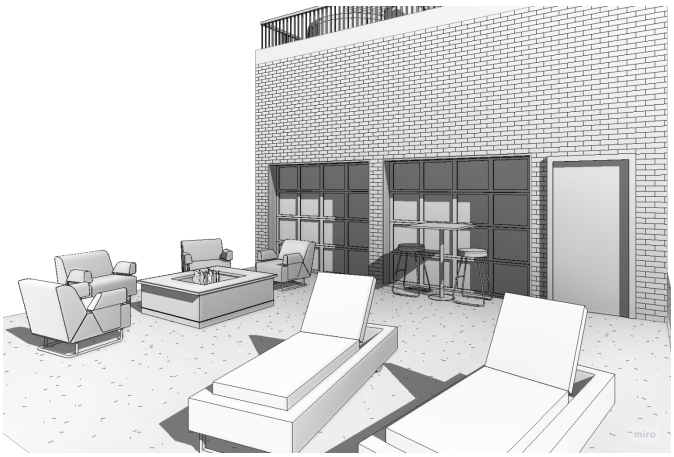

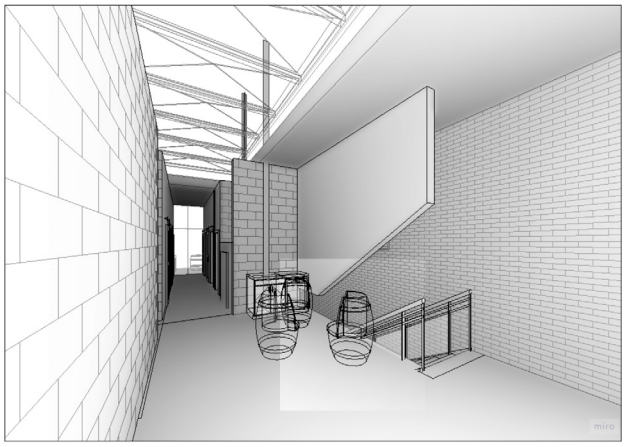

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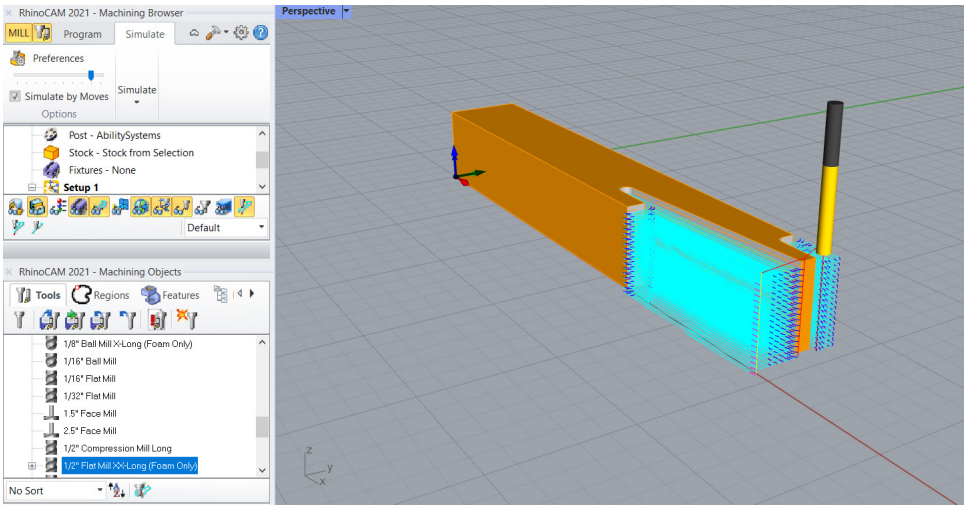

Scarf Joint Horizontal Roughing Tool Path

CNC Mill Work

Final Product

Connection Detail showing Joint and Dowel Connection

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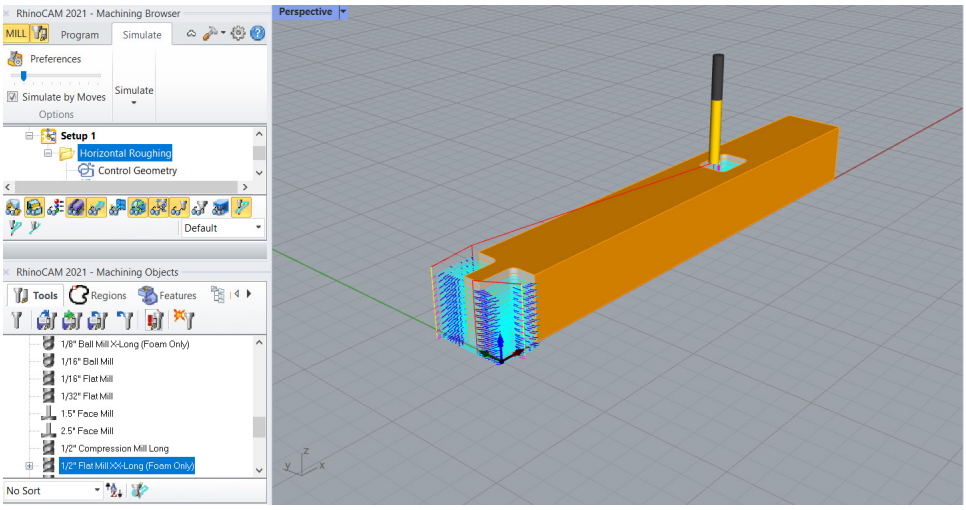

Mortise and Tenon Elbow Joint Column Tool Path

Will have images of Final Product once cut

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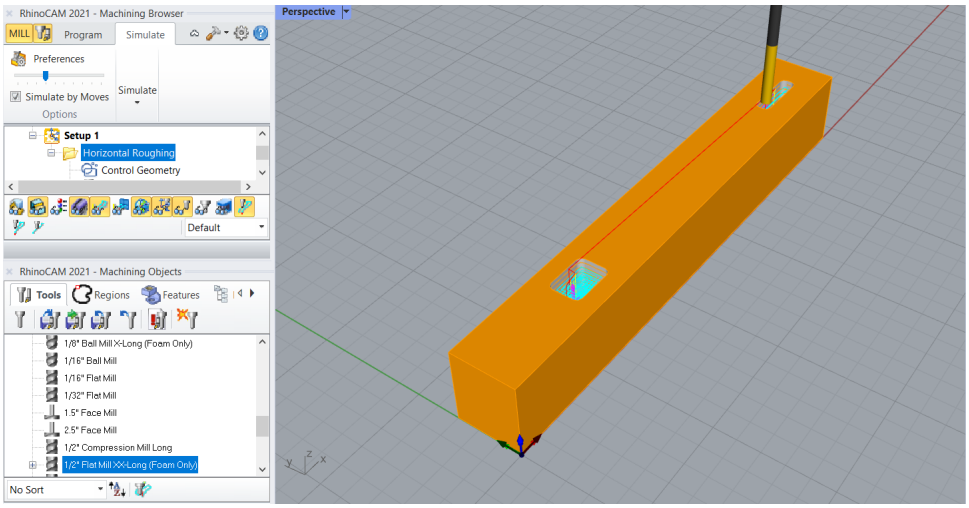

Mortise and Tenon Elbow Joint Beam Tool Path

Will have images of Final Product once cut

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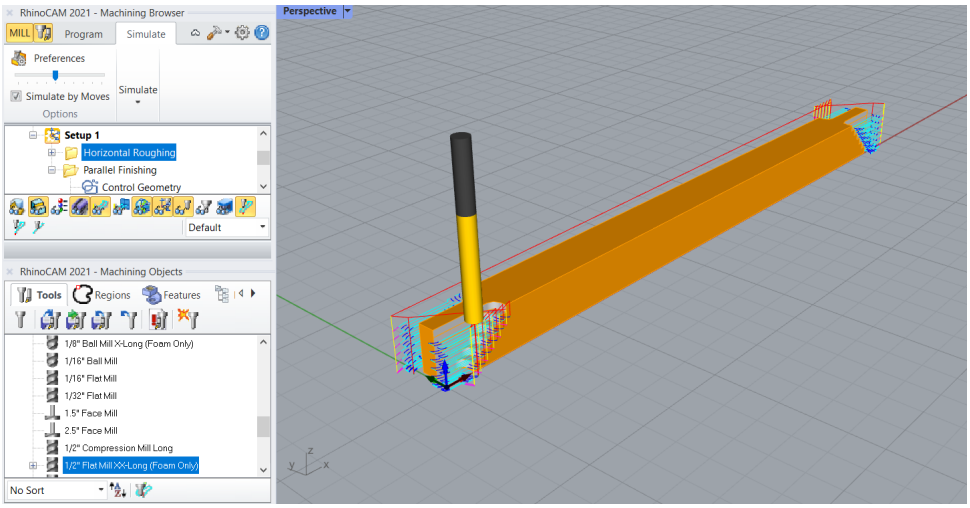

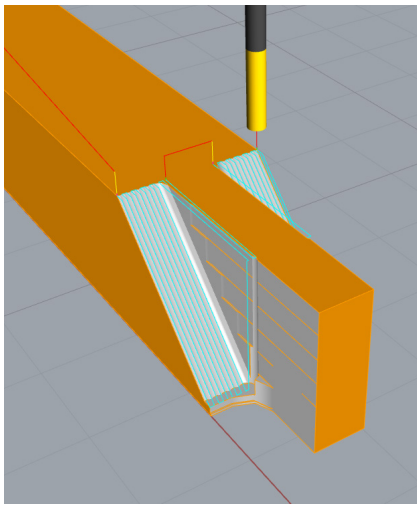

Mortise and Tenon Elbow Joint 45 Degree Bracket Tool Path

Will have images of Final Product once cut

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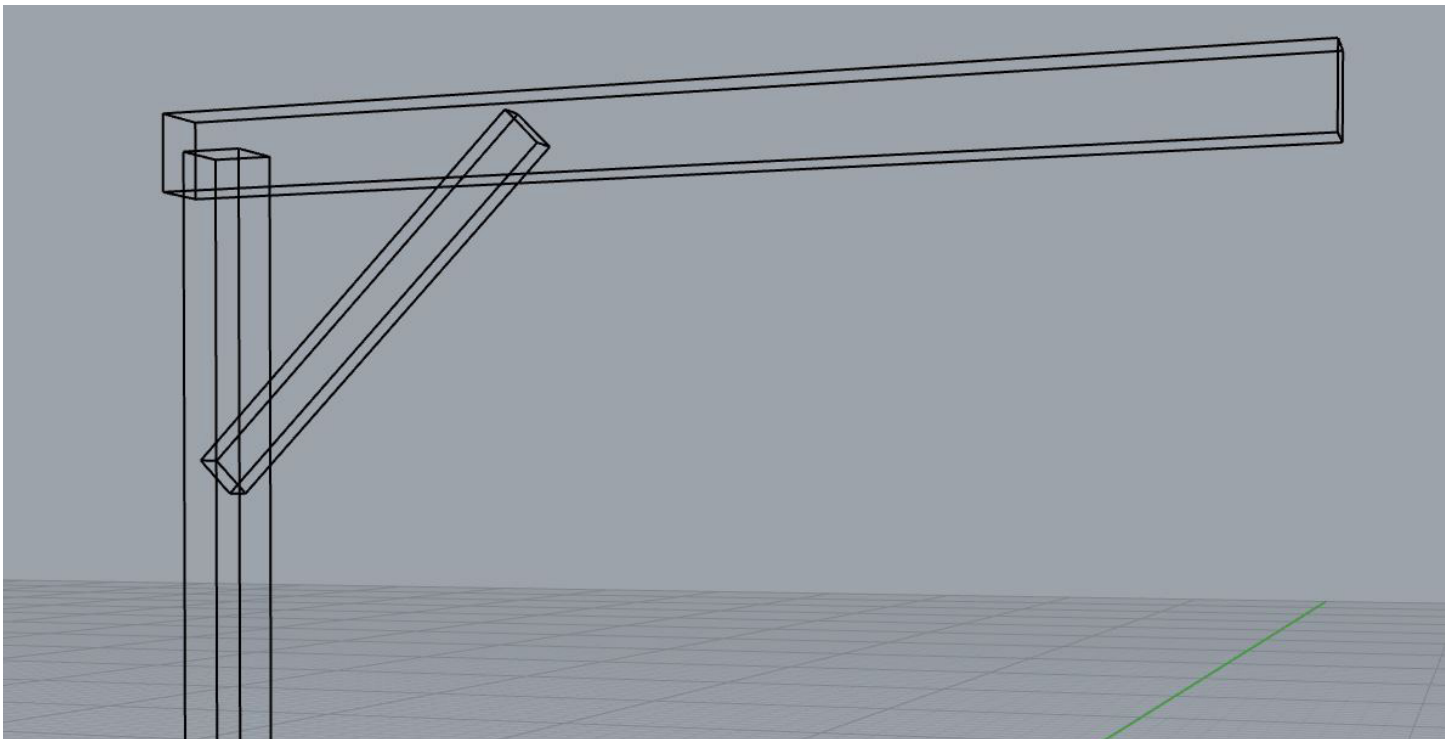
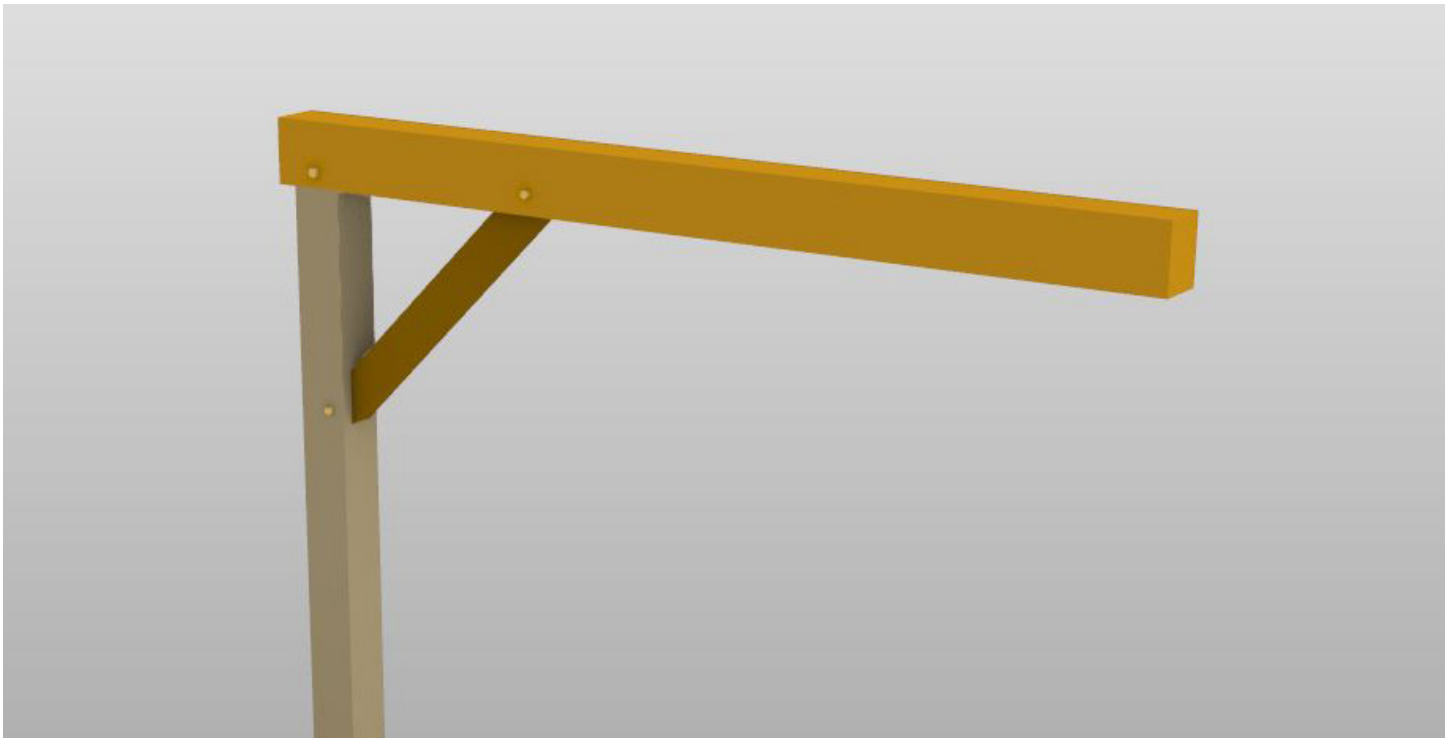


The problem I started with was how to create an elbow joint using wood dowel connections. This is the starting form I was going off of which informed the rest of the design.



This was the final solution created by the grasshopper script to the right.

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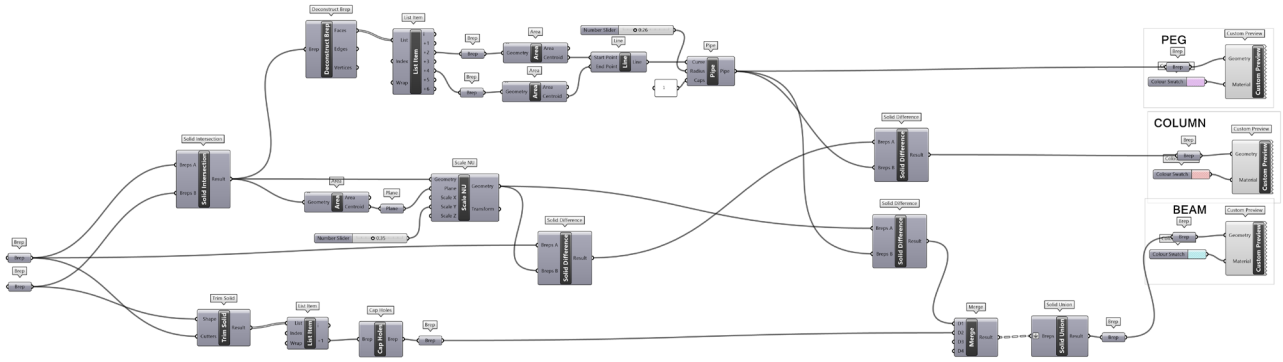
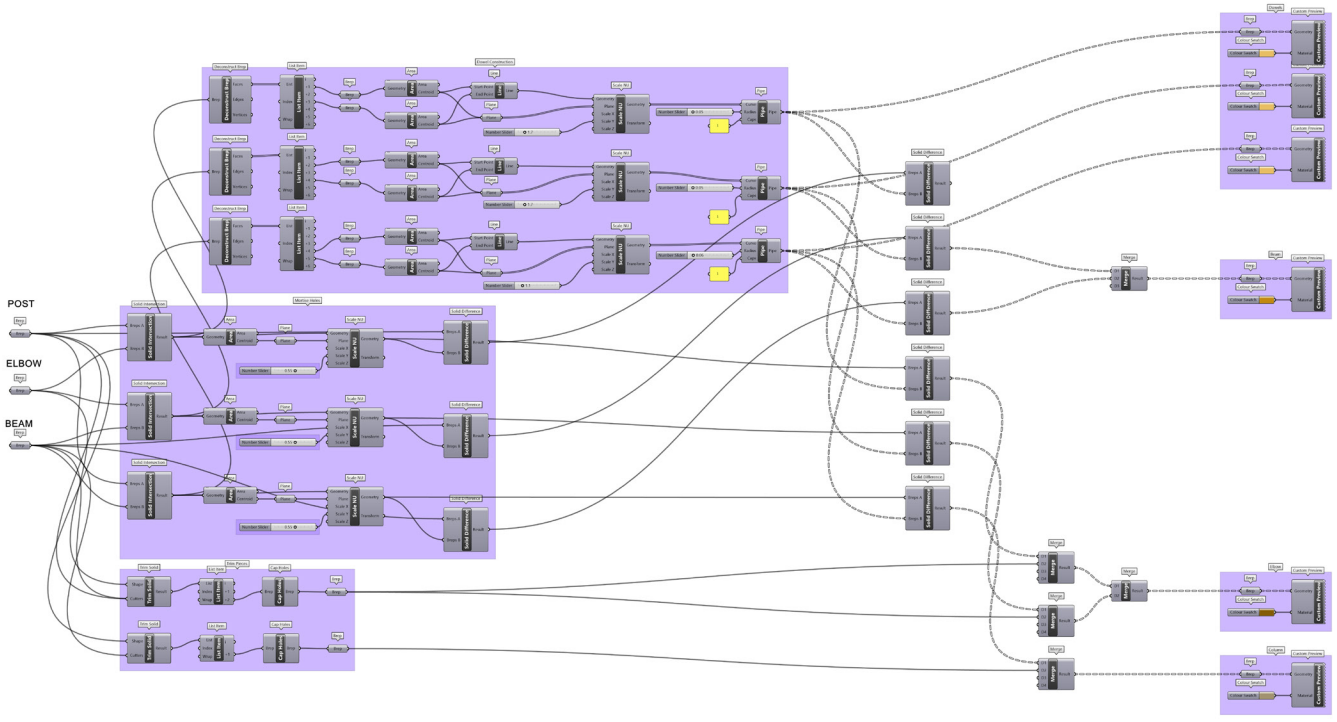
Tennon And Mortice



This was the starting grasshopper script from which I created my own out of. This script was more basic than what I needed and only created a mortise and tenon joint for one connection.



This was the final script I created from the original above. Rather than only using one connection, three connections are made while also extruding the dowels out from the edge conditions and incorporating the elbow joint to the beam.

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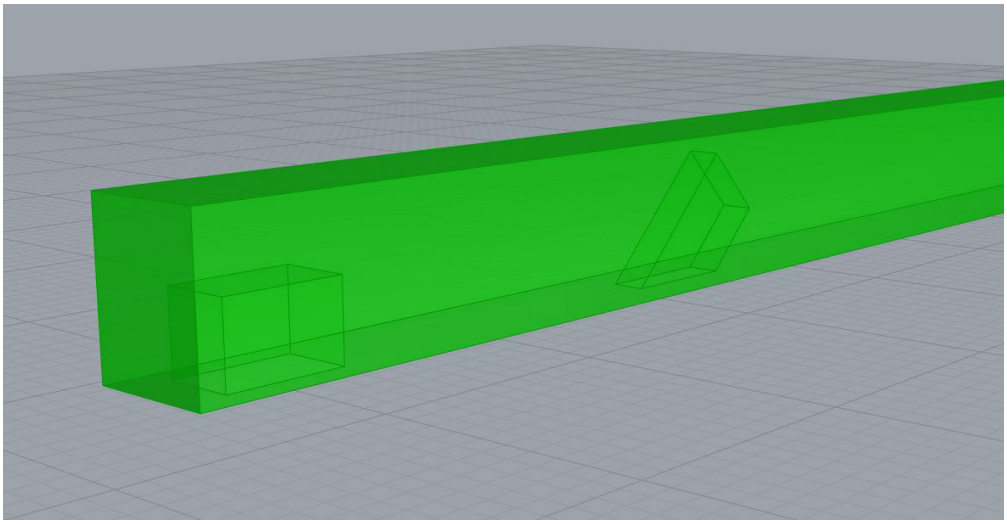
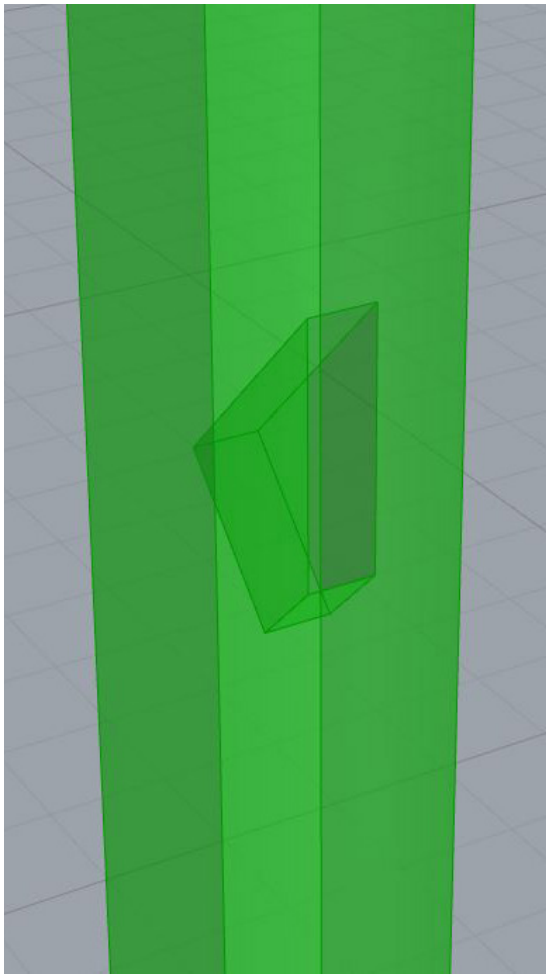
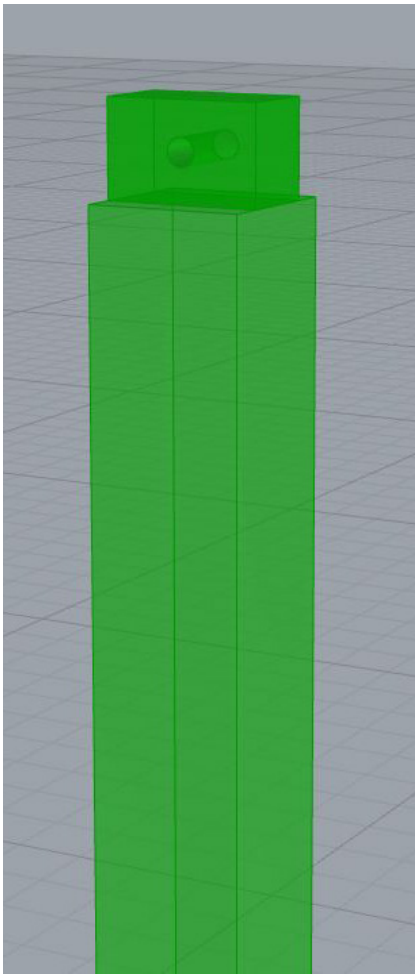


Detail image of beam with both mortise joints from post and elbow

Detail image of post with mortise from elbow and tenon for beam





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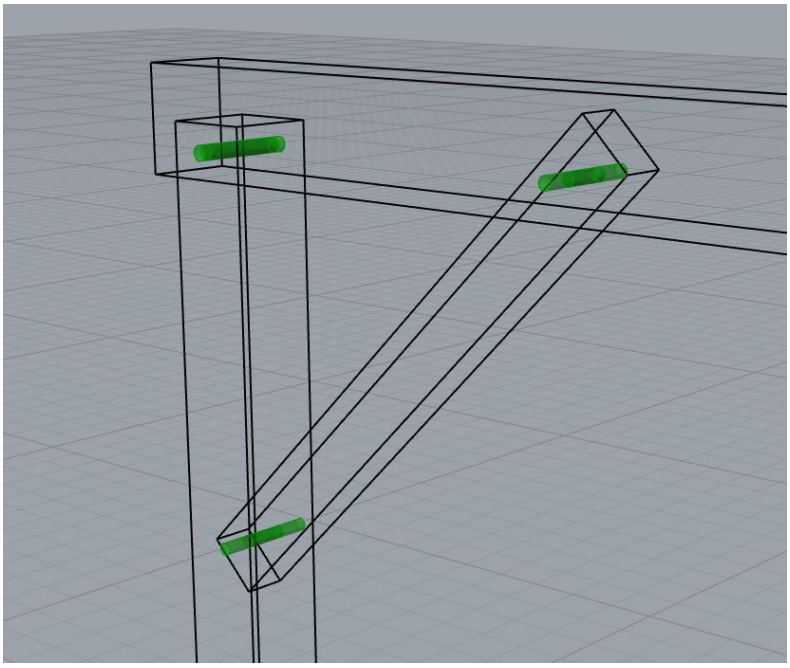
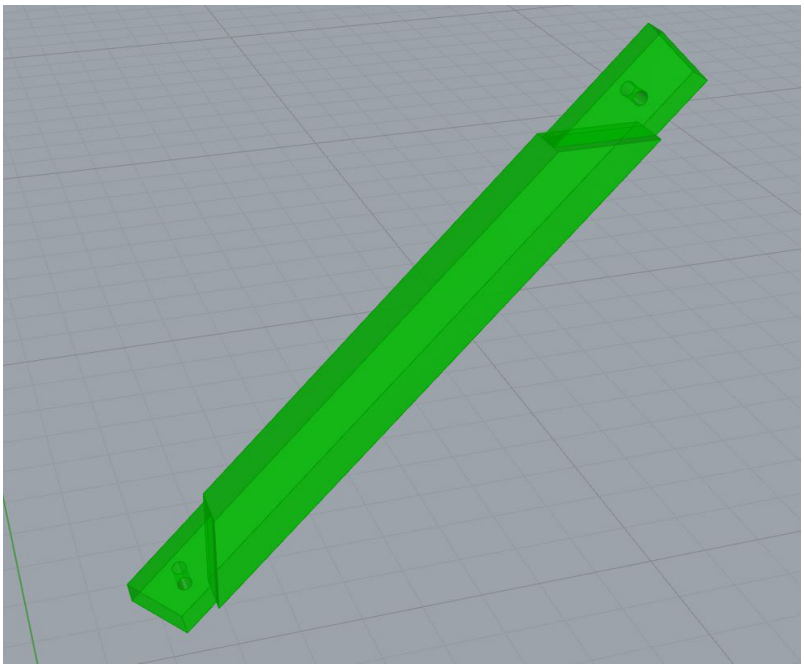
Detail image of dowel connections for beam, post, and elbow. (showing extrusion out from edge of beam and post)





Detail image of elbow joint with both tenons for beam and post

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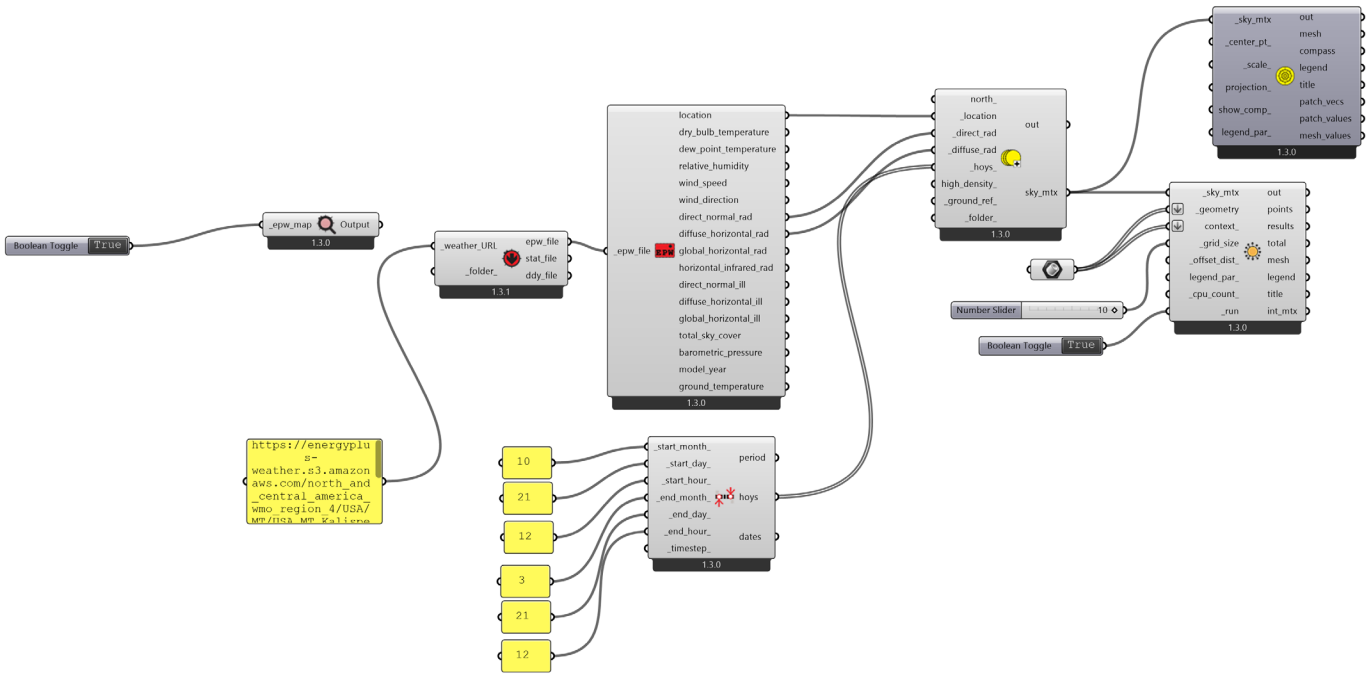
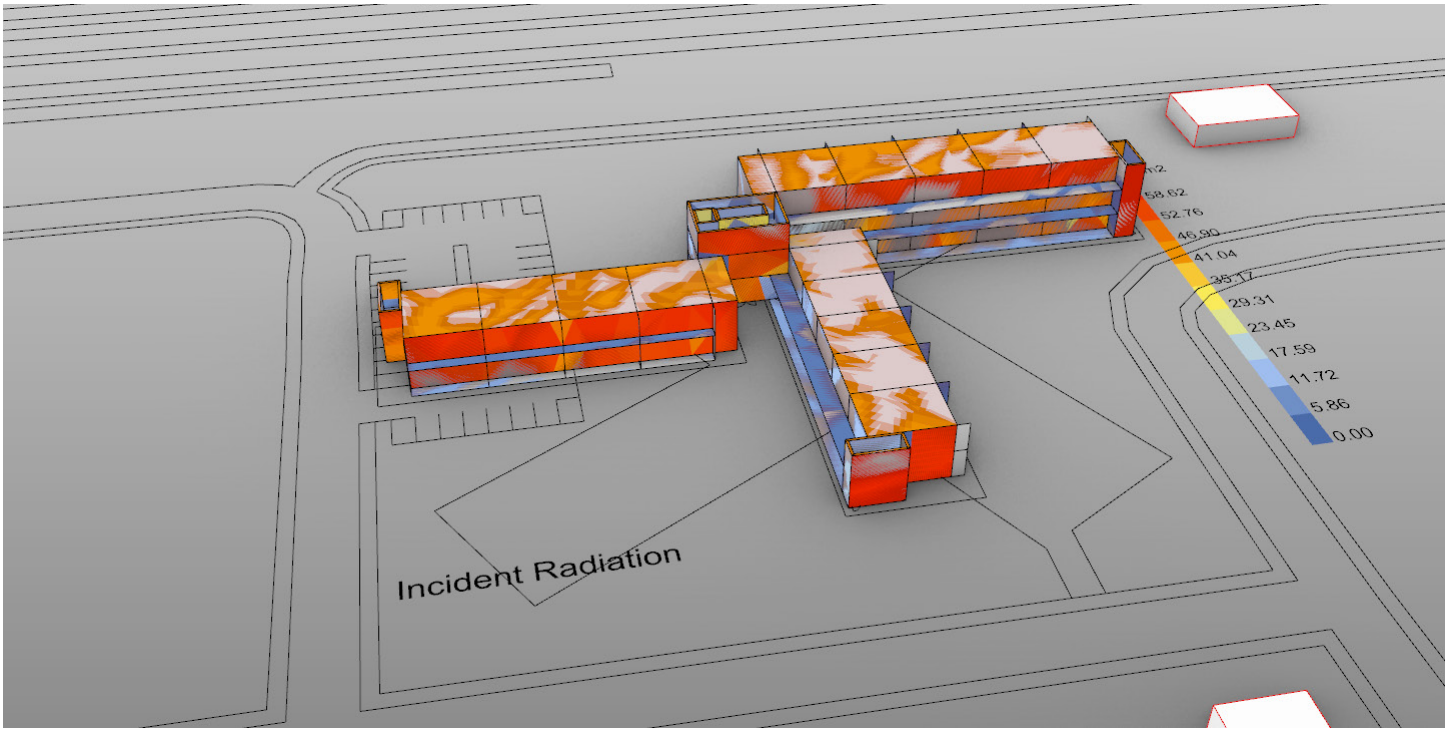


Ladybug Incident Radiation Analysis Script



Building Oriented Vertically North to South

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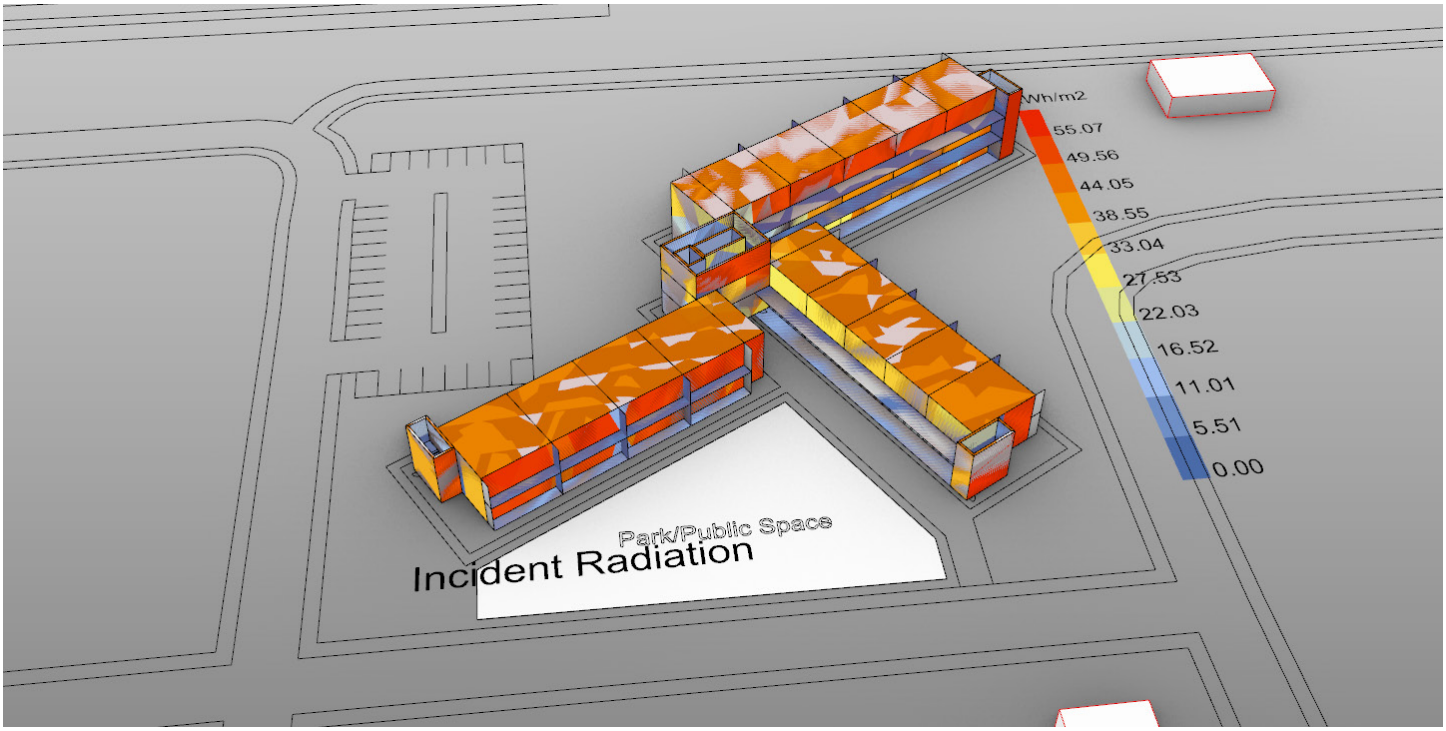
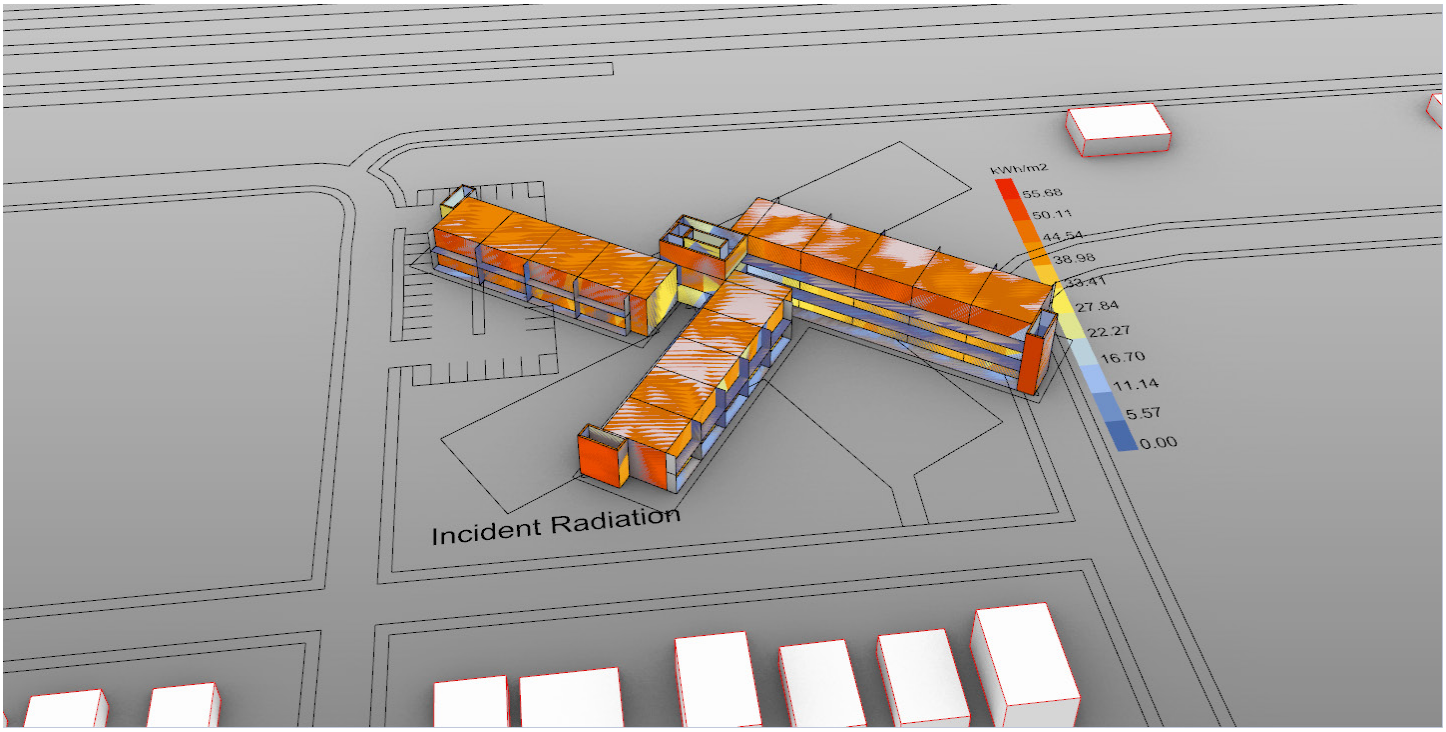


Building Oriented at a 35 Degree Angle Southeast



Building Oriented at a 35 Degree Angle Southwest

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The problem I started with was how to create natural stone foundations in Rhino. This is the technique I am using for foundation work on my studio project because it ties back into traditional foundation work used in Japan and China, a major part of my thesis proposal.

This is the final solution I was able to come up with. The stone would be carved out by a trained stone scribe, the way it has traditionally been done in the past. Another solution I came up with would be to design concrete framework that I would be able to CNC so the product would be faster to manufacture

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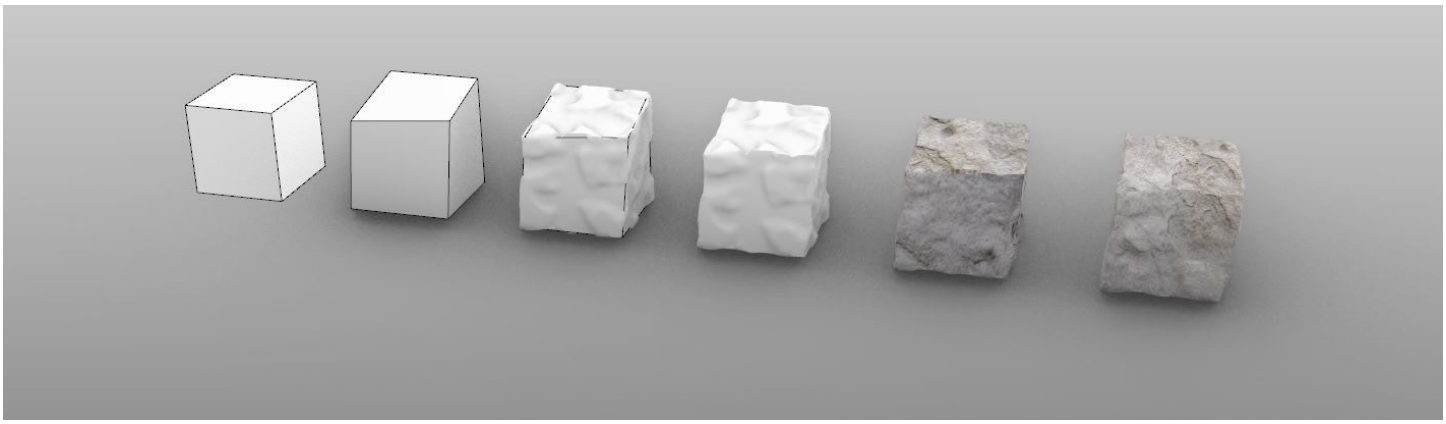
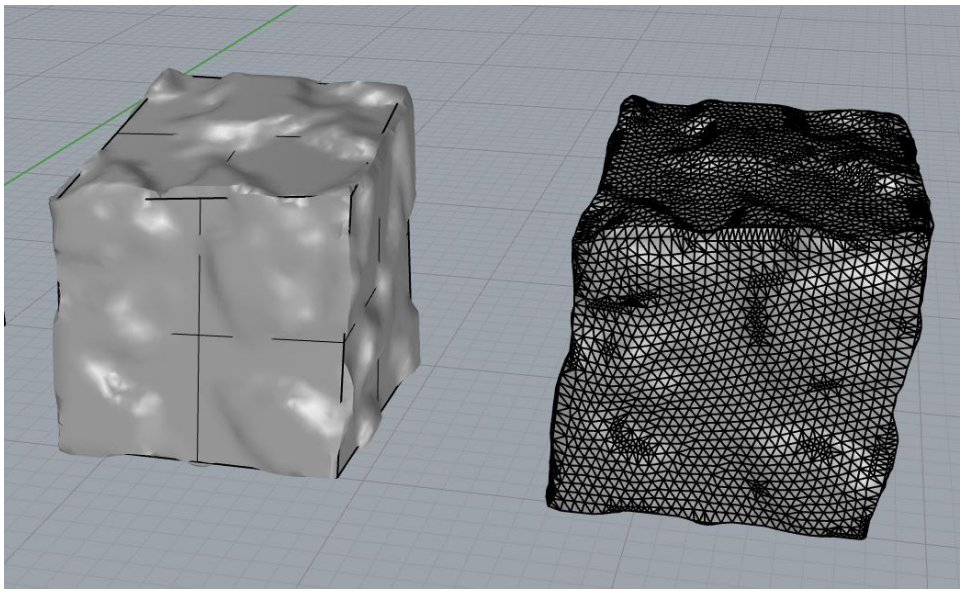


Here is the step by step process I took to create the stone framework:
1. Start with Box in Rhino.
2. Move points to create an more organic shape of a stone.
3. Use Displacement tool to apply a Granite Texture.
4. Use ExtractRenderMesh Tool to create a usable Mesh in Rhino.
5. Apply Stone Texture to the Mesh.
6. Apply Box Mapping onto the Mesh to create more realistic look.
7. Use tool MeshBooleanDifference to create hole for the column to go into



When working on creating this in Rhino, these were the two steps I had trouble with since I did not know these commands yet. Through research, however, I was able to figure out how to use Displacement Mappings and the ExtractRenderMesh tools.

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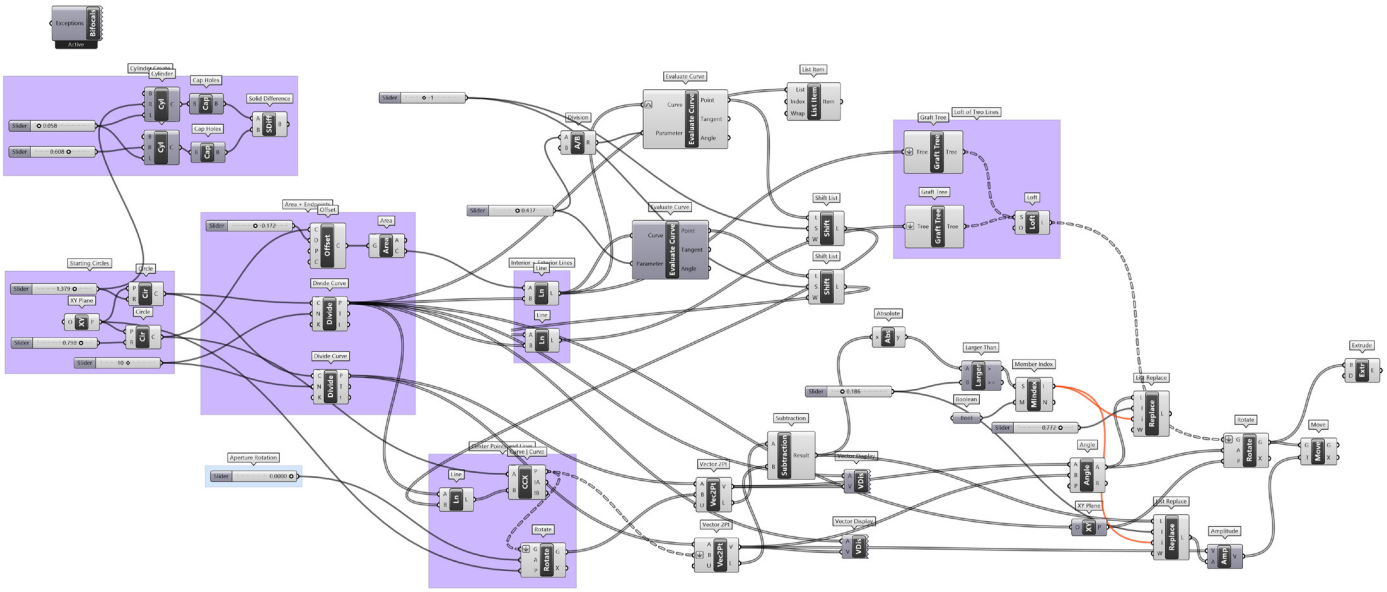
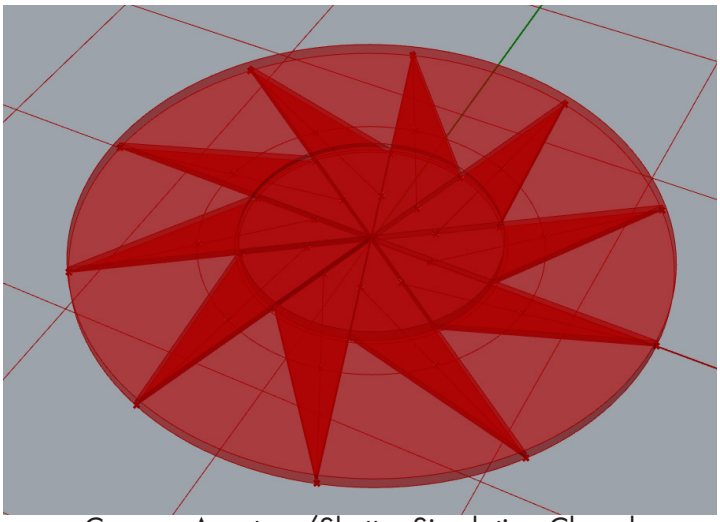
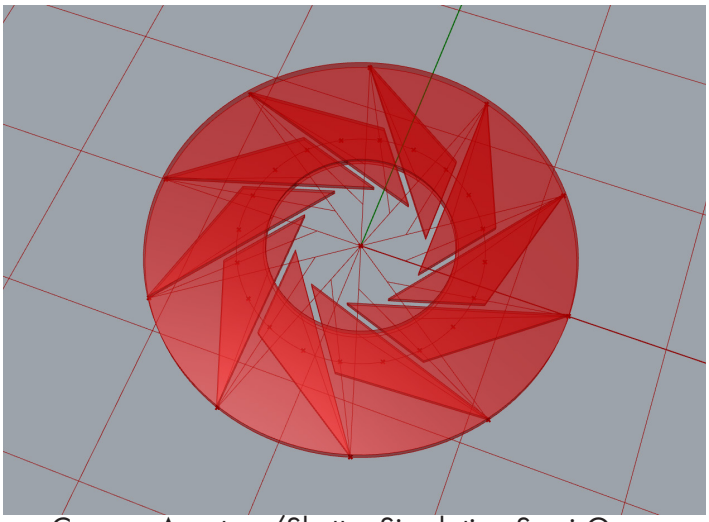
Camera Aperture/Shutter Simulation Grasshopper Script



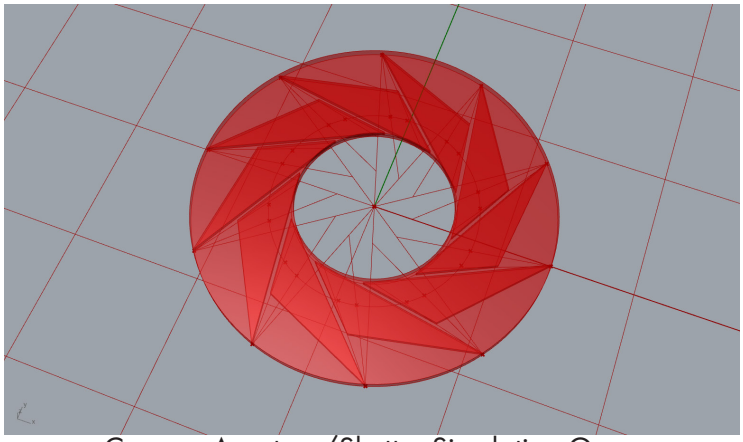
Camera Aperture/Shutter Simulation



Camera Aperture/Shutter Simulation Closed



Camera Aperture/Shutter Simulation Semi-Open



Camera Aperture/Shutter Simulation Open

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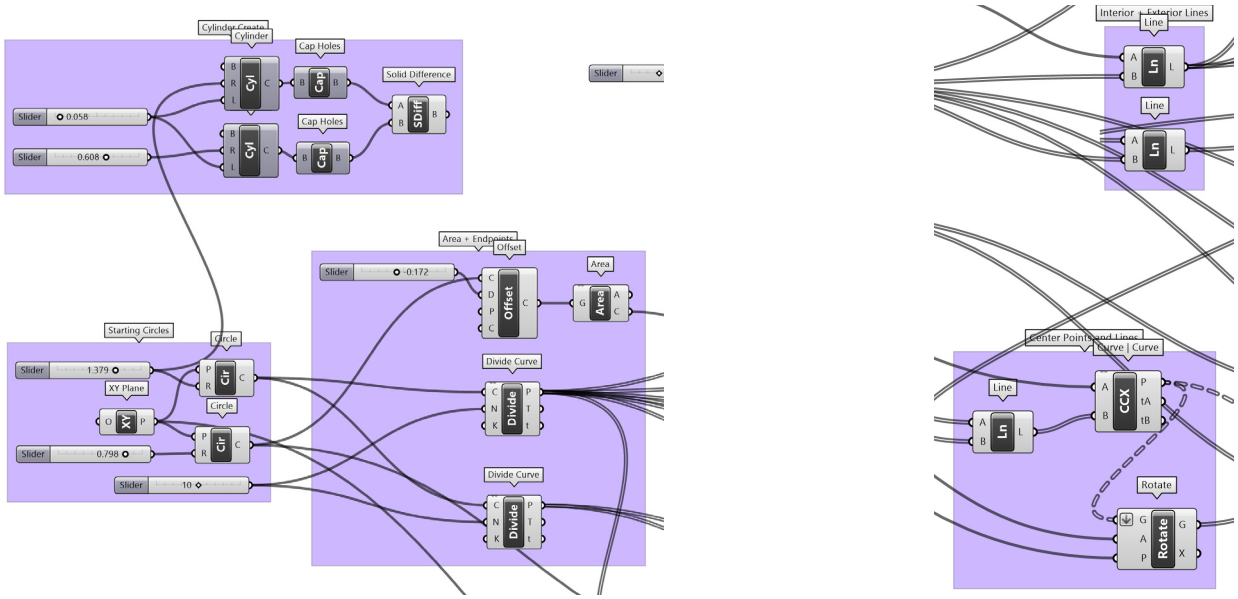
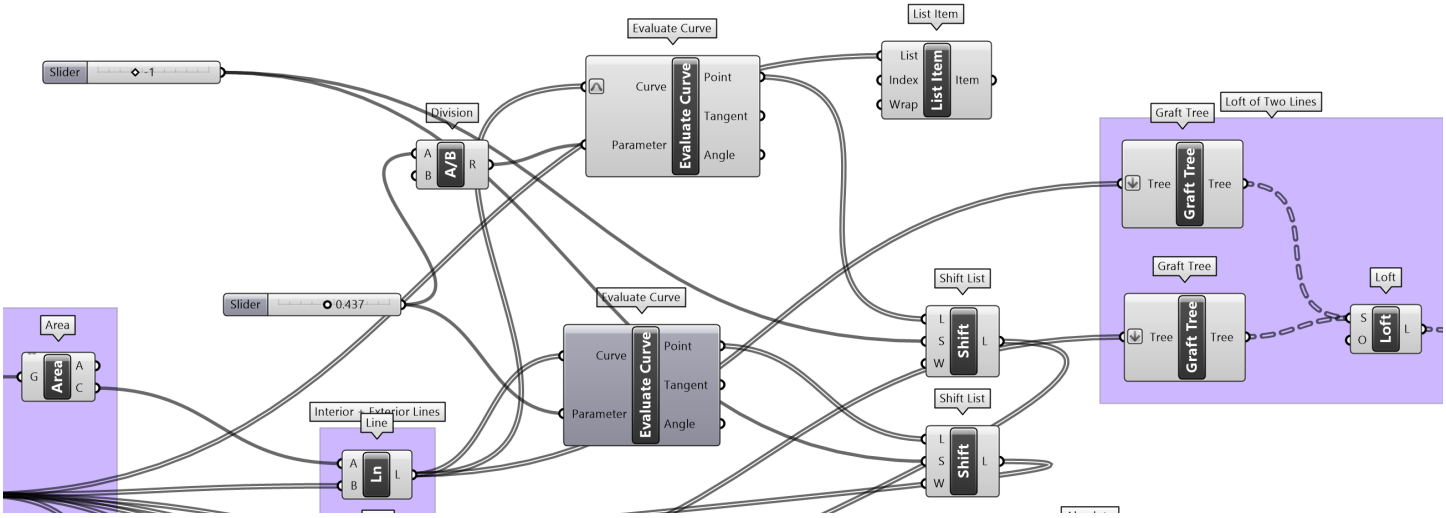
The problem I started with was how to create a simulation of a camera aperature in Grasshopper. The first part of the problem was to create the geometry I would be working with. This included two cylinders and finding the endpoints of each triangle in the shutter of the camera. The next step was to create the lines that would shape the triangles that would be used for the lens.



By creating an offset circle on the interior of the cylinder, I was able to control the centerpoint of each triangle to follow the path of the circle making it so each triangle opens the same distance.



Evaluating both curves that go to the center and the edge of the inner cylinder, I was able to locate where each triangle would be when fully open and halfway open. From this, I could graft both lines and loft them together the get the shape of each of the triangles forming the aperture of the camera lens.

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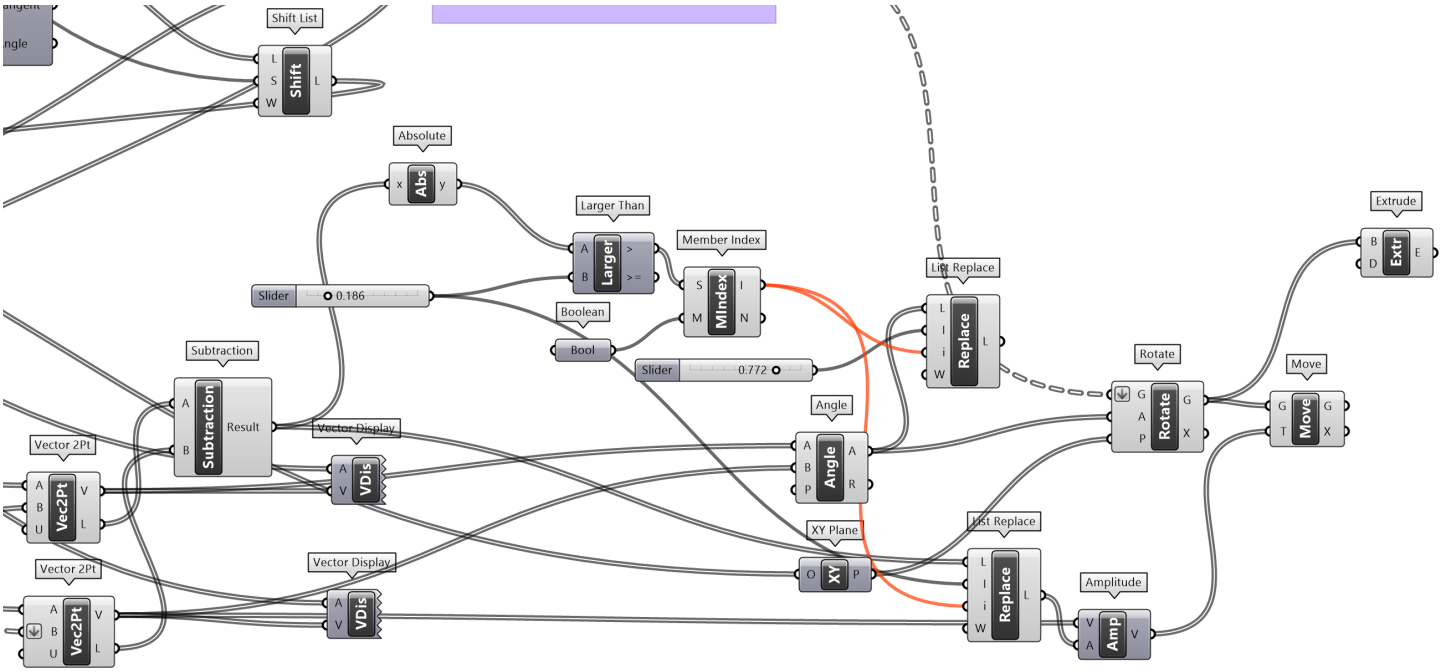
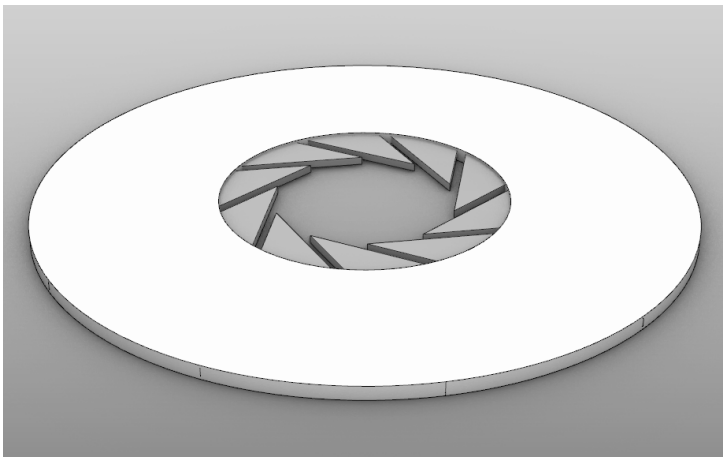
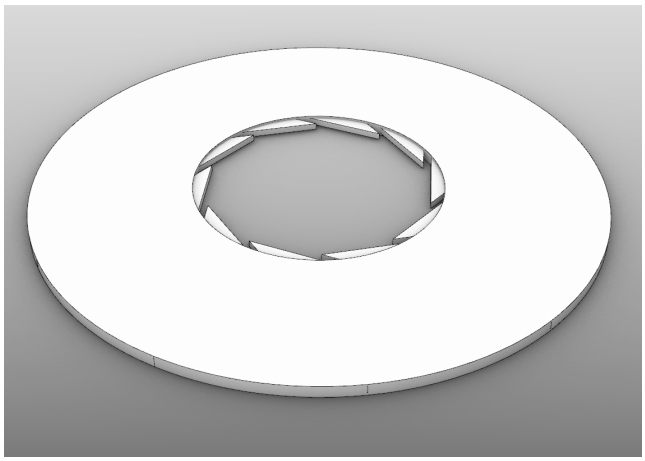


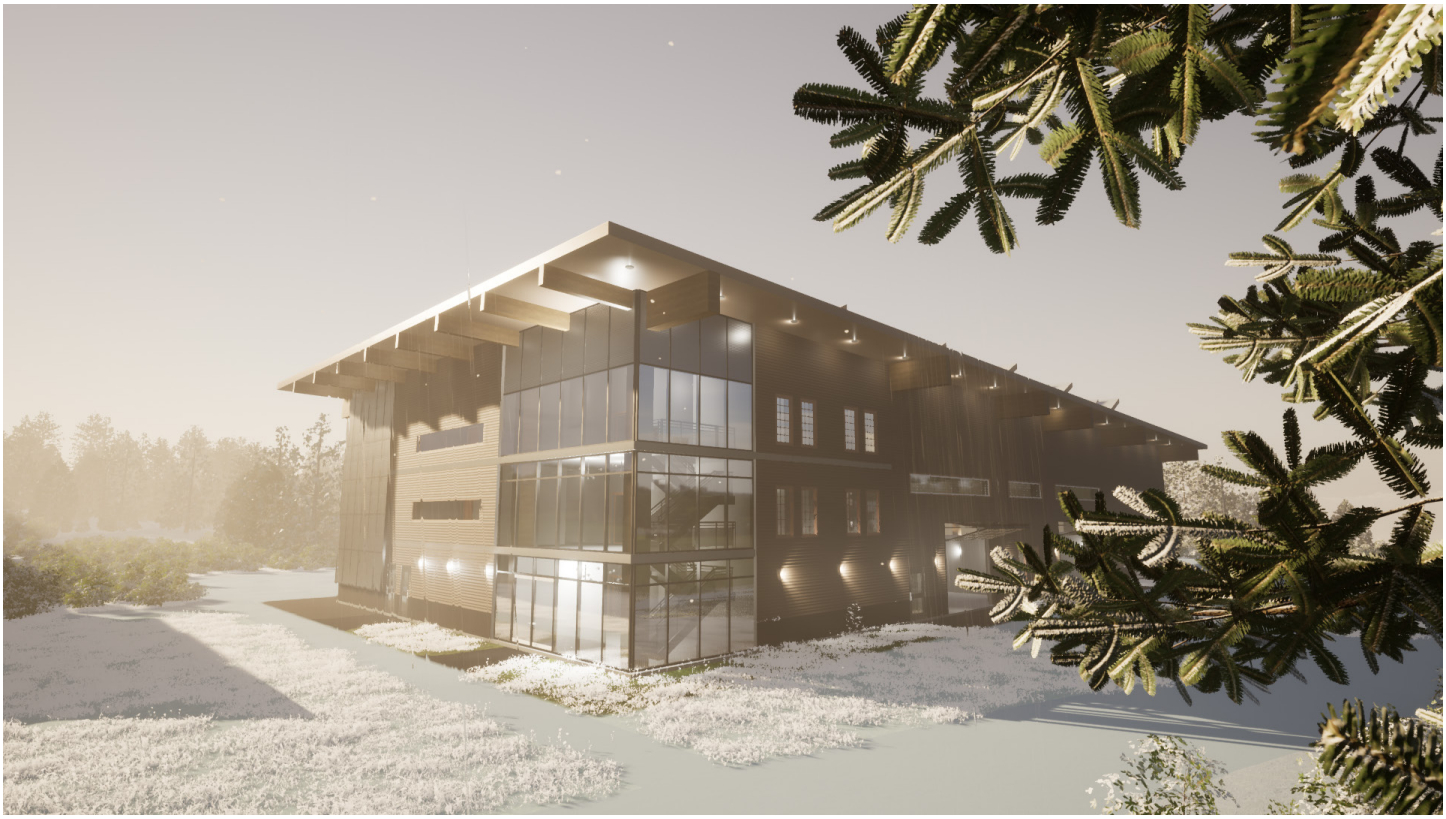
From this point, I needed to do some research and get help on how the triangles moved around the cylinders in a mathematical sense. The rest of the script shows the math behind the rotation of the triangles using the circles and grid lines for guides. From this, the last step was to extrude the triangles to make them match the height of the cylinders.





Finished Product

Starting Rendering from ARCH 558 Project



New Finished Rendering out of Twinmotion

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Starting Render from Twinmotion

This render started to get at the basics of Twinmotion with the addition of trees and vegetation as well as adjusting the materials of the building.

New Render from Twinmotion

Based off the original render I created to figure out the basics of Twinmotion, I started to mess with the sky, exposures, and weather settings to create a more realistic version of how this area would look. In addition, I also added in vehicles and topography of the site to add to the realism of the image.

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With the image on the left of my site Tower Roosevelt in Yellowstone National Park and the inspiration image of the cloudy, winter sunrise, I was able to capture a more realistic render of what my building would actually look like during the winter which is when the building would be used most often throughout the year.

New Render from Twinmotion

This image tries to replicate the existing site topography with trails and roads in Twinmotion as well as landscaping of the trees and brush. In addition, the lighting tries to replicate the inspiration image to give a better feel of how it would look to be here during the winter at sunrise.