

The Birdcage Lamp

Libby Hillock

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The image features a title card for a 'Project Brief'. The background is composed of three overlapping geometric shapes: a light teal triangle on the left, a dark blue triangle on the right, and a light grey triangle at the top. The text 'Project Brief' is centered in a black, sans-serif font.

Project Brief

Project Summary

I thought the two inspirational images would look cool together, which led me to my lamp design. My first design was similar to my final design, but the main difference was that the lamp's middle's base was wider since I couldn't fit the entire part in the 3D printer and at the time, I still didn't want to use any glue in my project, meaning I didn't want to break the part up into smaller individual parts like I ended up doing. Another difference was the base. I didn't know how I would've done angled legs, so I had to modify it and make the legs straight.

The hardest part while designing the lamp in Inventor was the lesser lamp neck part, mainly because of its generally awkward shape. However, what surprisingly did work was the middle column parts, which fit pretty well into the middle lamp bases.

The materials I used for the project were $\frac{1}{8}$ inch and $\frac{1}{2}$ inch plywood, as well as $\frac{1}{8}$ inch diameter and $\frac{1}{4}$ inch diameter wooden dowel rods.

All of the parts of the lamp are either glued together or incredibly difficult to get unstuck (mainly the dowel rods) except for the lower lamp neck and the lamp base in order to be able to easily replace the lightbulb.

The lamp is designed for generic living room use. It has no particular audience.

Inspiration

Top Image: <https://tinyurl.com/362az6rp>

Bottom Image: <https://tinyurl.com/btpyr8tx>



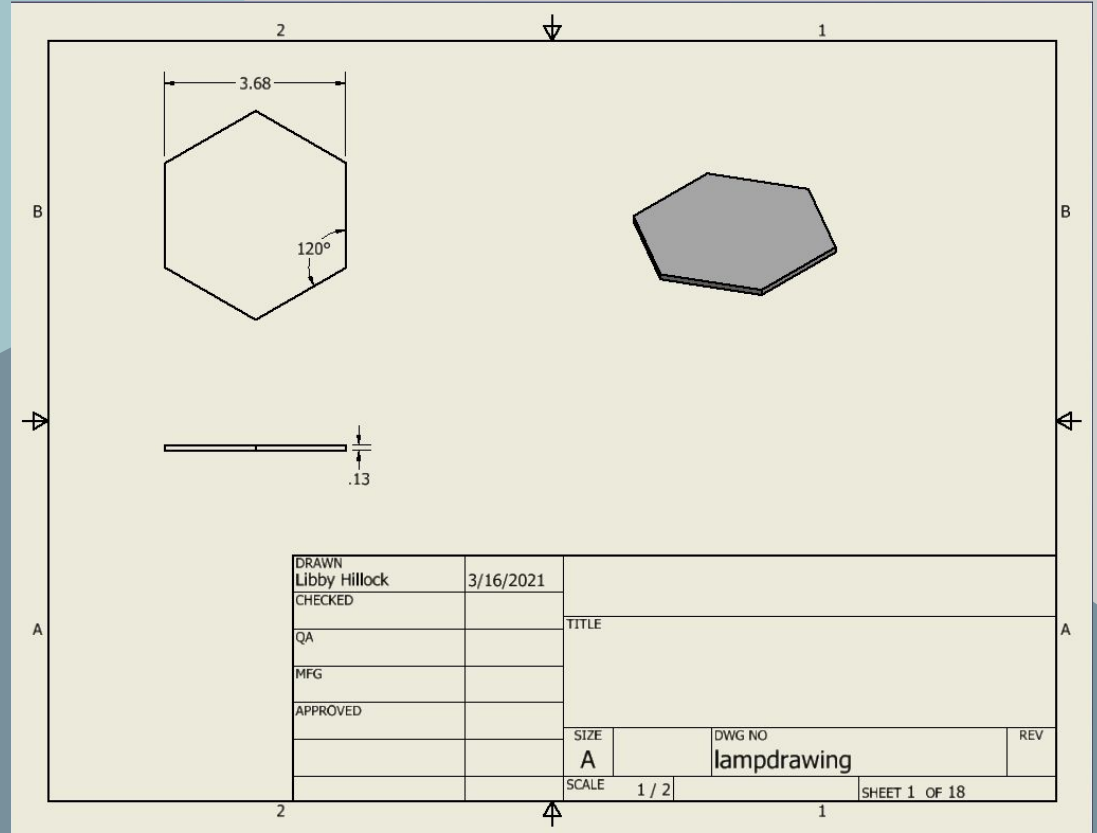
CAD Drawings

Lamp Base 1

Material:

<https://tinyurl.com/2h77ee4a>

Material Dimensions: $\frac{1}{8}$ in
x 4 ft x 8 ft

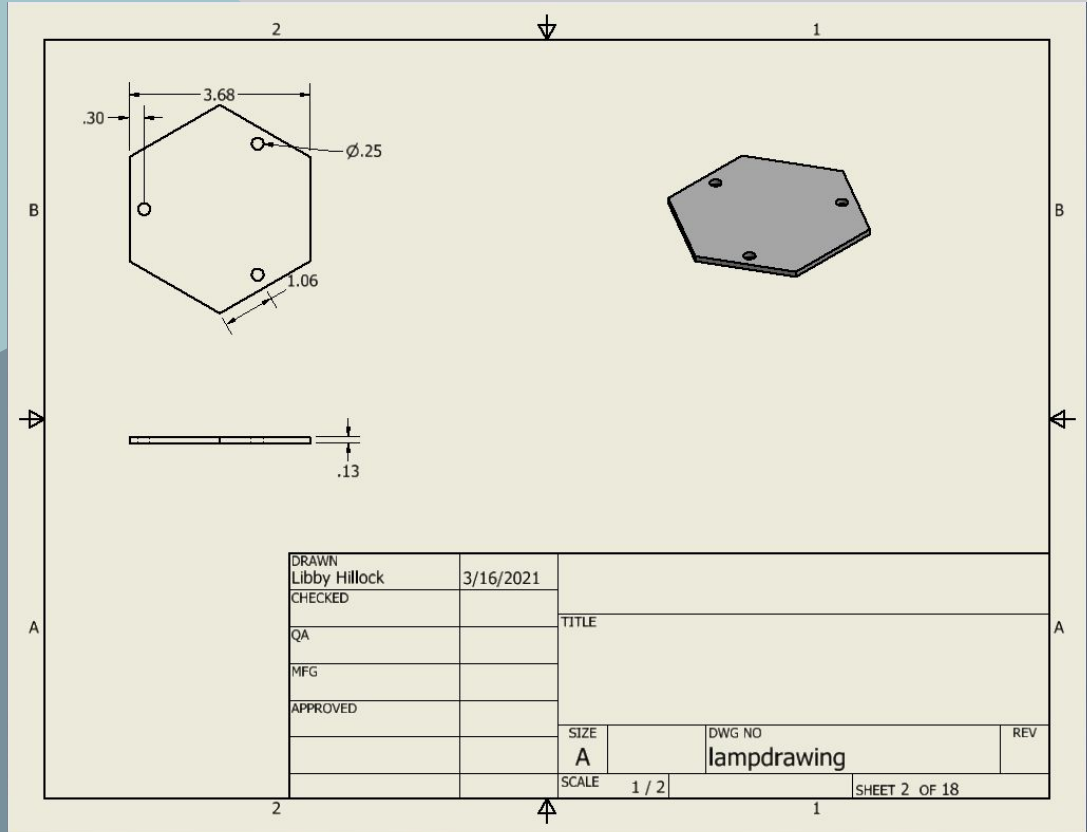


Lamp Base 2

Material:

<https://tinyurl.com/2h77ee4a>

Material Dimensions: $\frac{1}{8}$ in
x 4 ft x 8 ft



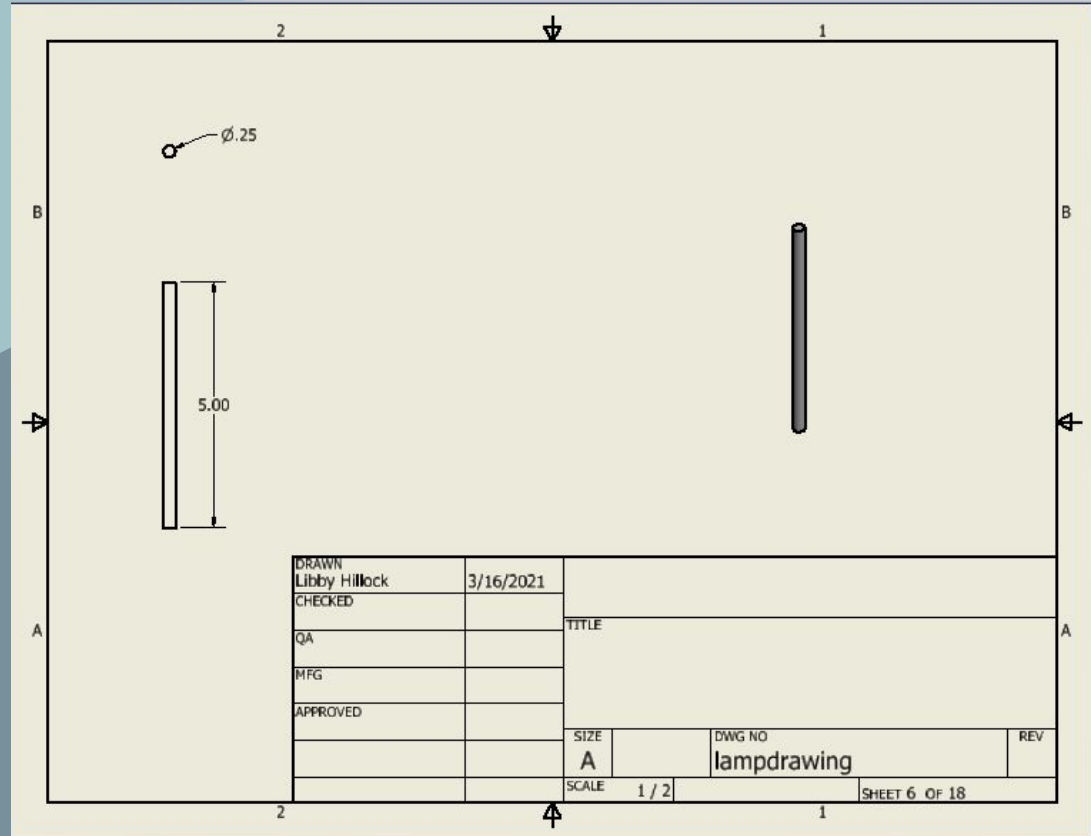
Lamp Base Column

Material:

<https://tinyurl.com/5cz4wz>

C

Material Dimensions: ¼ in
x 3 ft

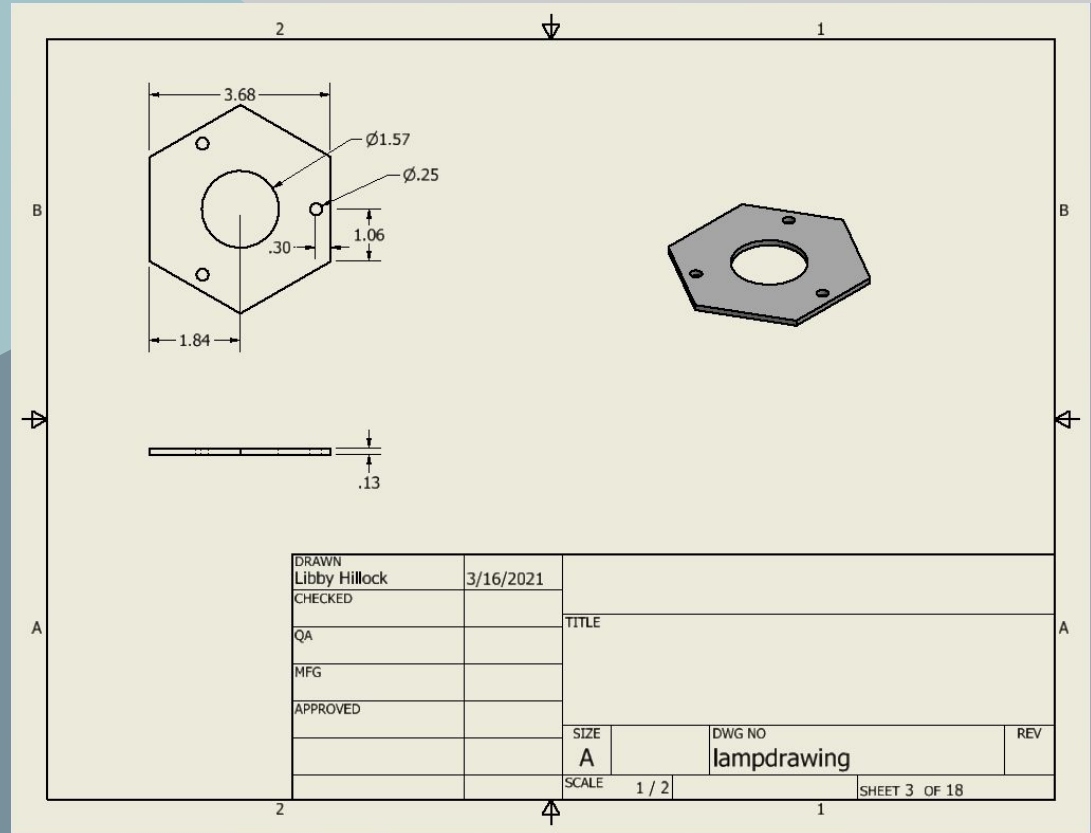


Lamp Base 3

Material:

<https://tinyurl.com/2h77ee>
4a

Material Dimensions: 1/8 in
x 4 ft x 8 ft

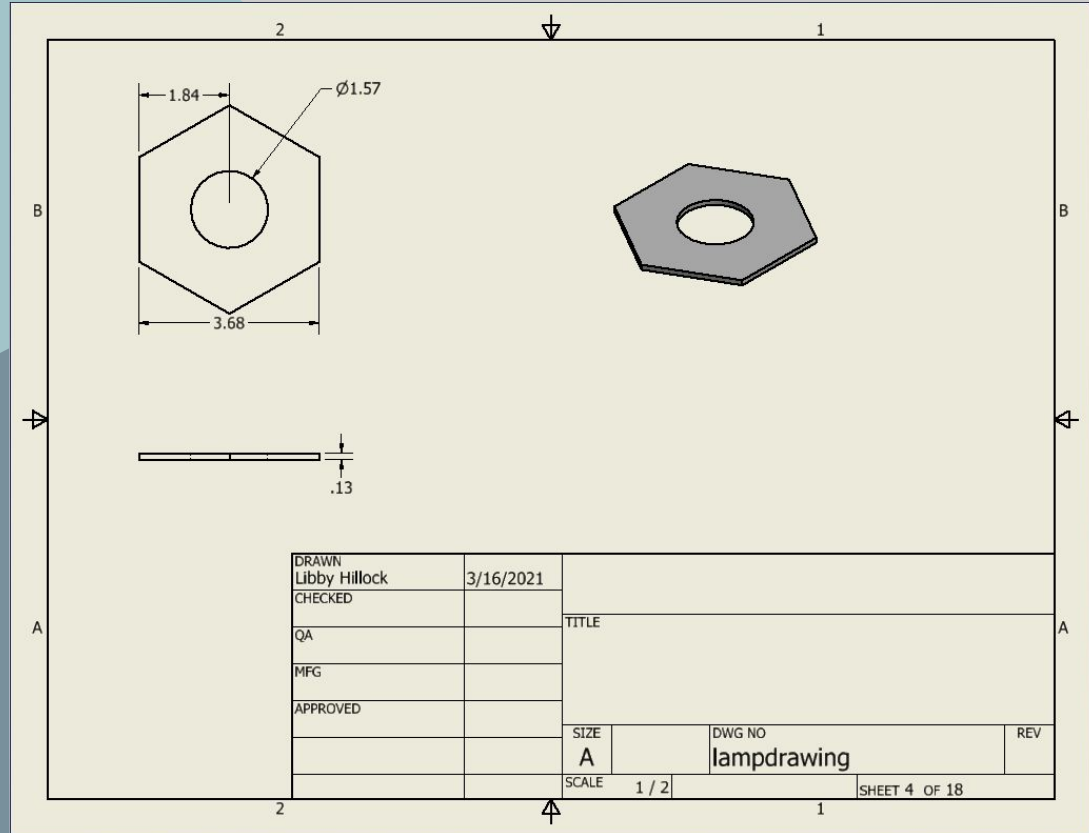


Lamp Base 4

Material:

<https://tinyurl.com/2h77ee4a>

Material Dimensions: 1/8 in x 4 ft x 8 ft

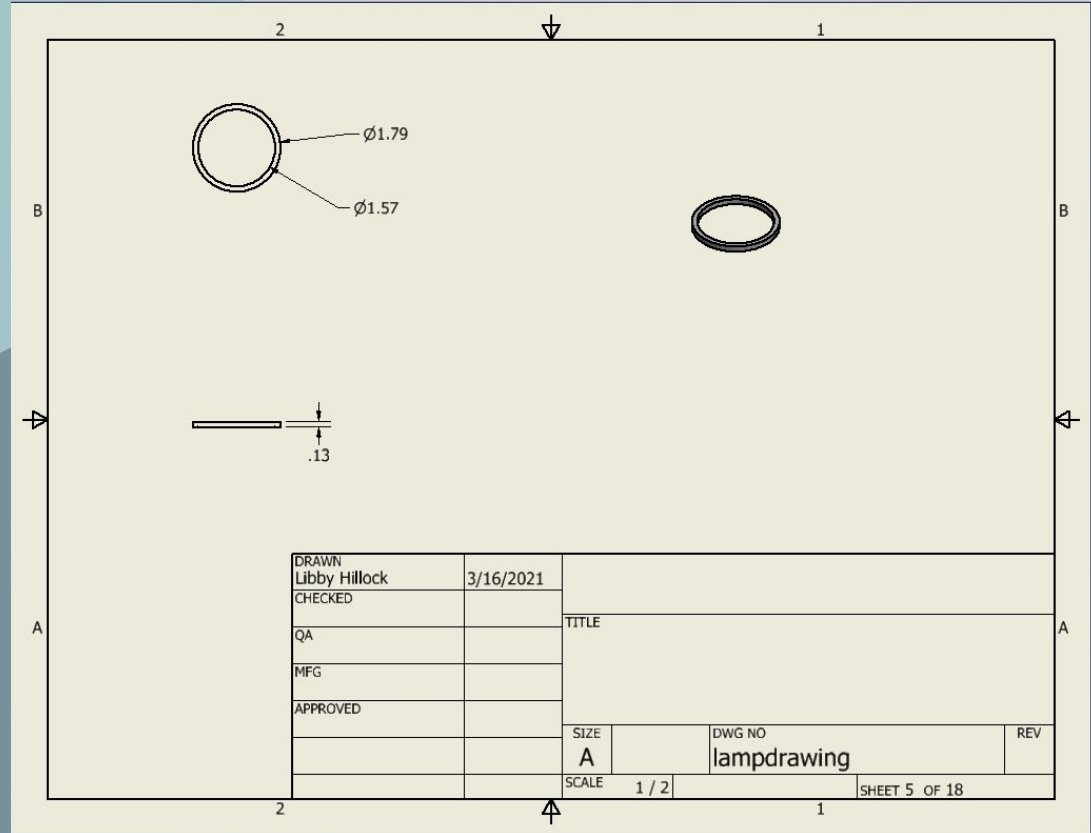


Lamp Base 4 Ring

Material:

<https://tinyurl.com/2h77ee4a>

Material Dimensions: $\frac{1}{8}$ in
x 4 ft x 8 ft



DRAWN Libby Hillock	3/16/2021		
CHECKED		TITLE	
QA			
MFG			
APPROVED			
		SIZE A	DWG NO lampdrawing
		SCALE 1 / 2	REV
		SHEET 5 OF 18	

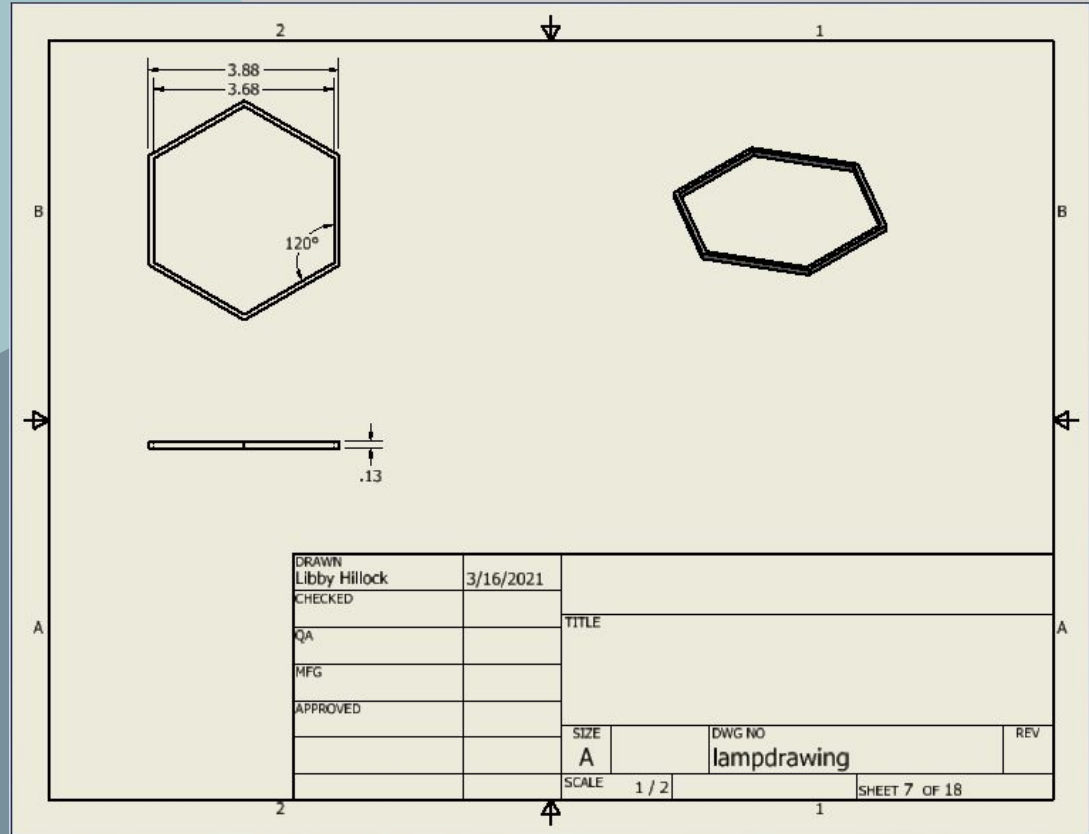
Lower Lamp Neck Base

Material:

<https://tinyurl.com/2h77ee>

4a

Material Dimensions: $\frac{1}{8}$ in
x 4 ft x 8 ft



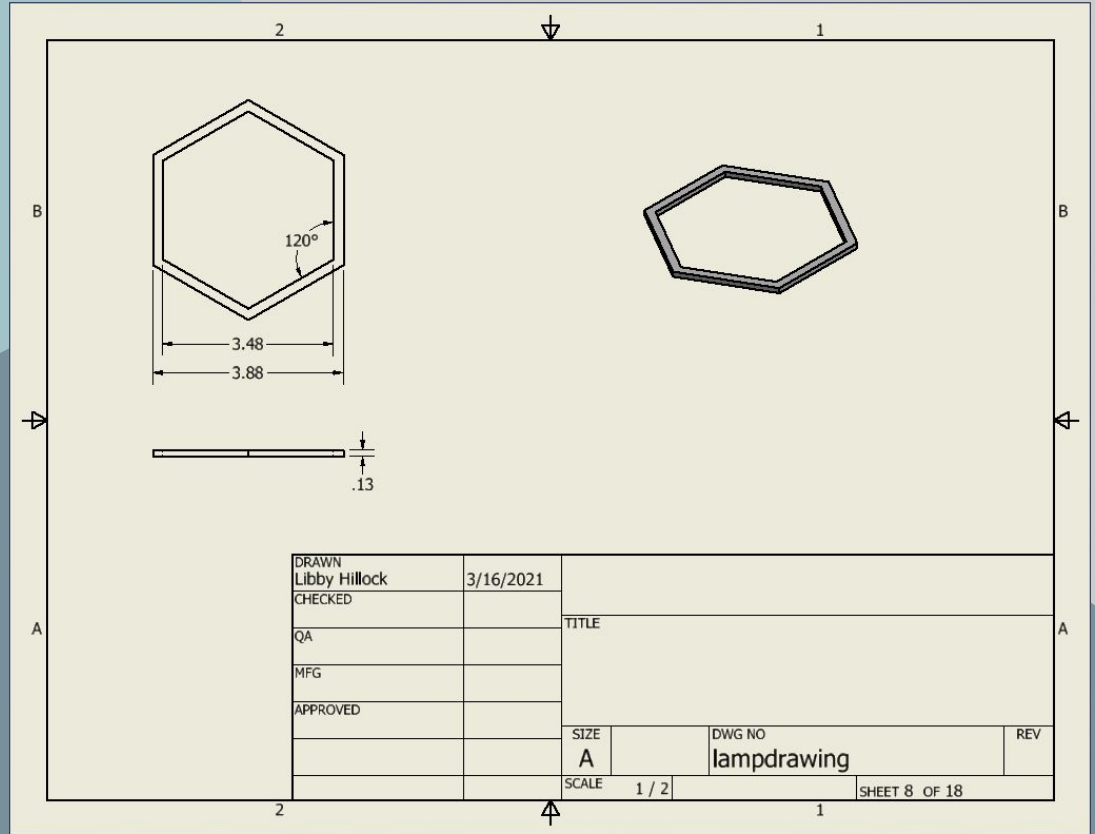
Upper Lamp Neck Base

Material:

<https://tinyurl.com/2h77ee>

4a

Material Dimensions: 1/8 in
x 4 ft x 8 ft

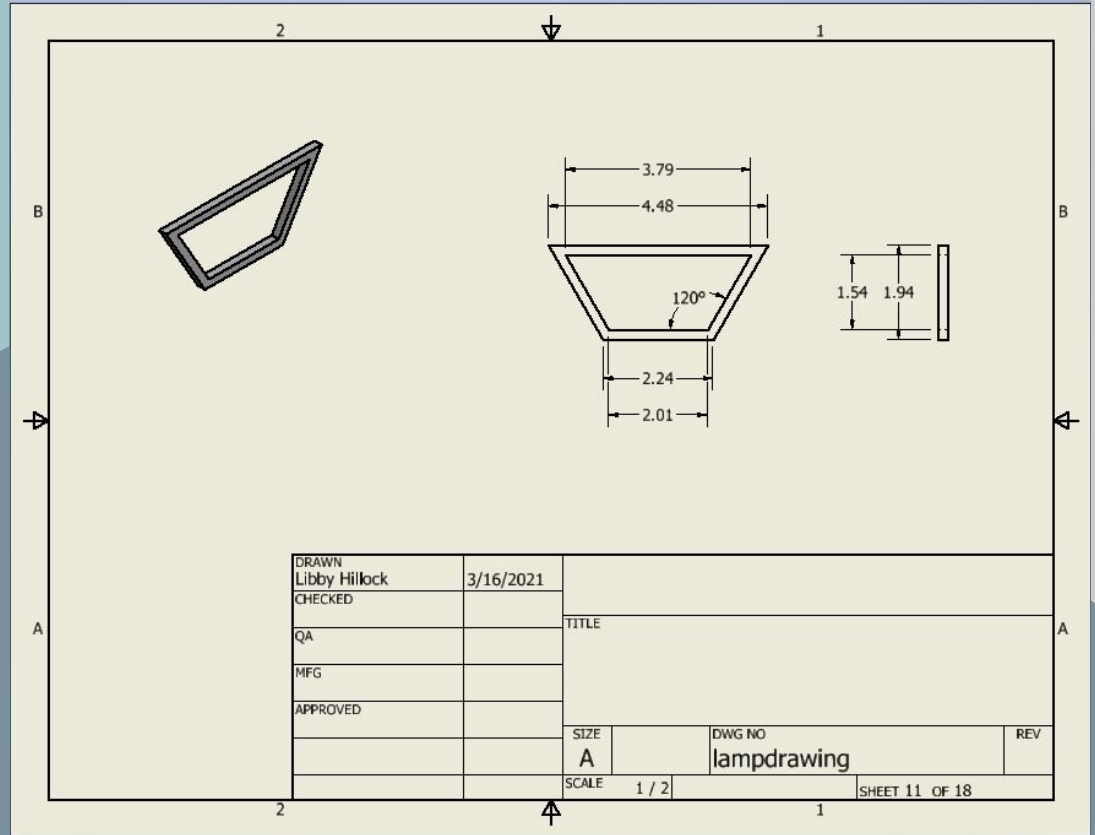


Greater Lamp Neck

Material:

<https://tinyurl.com/yawvd7hm>

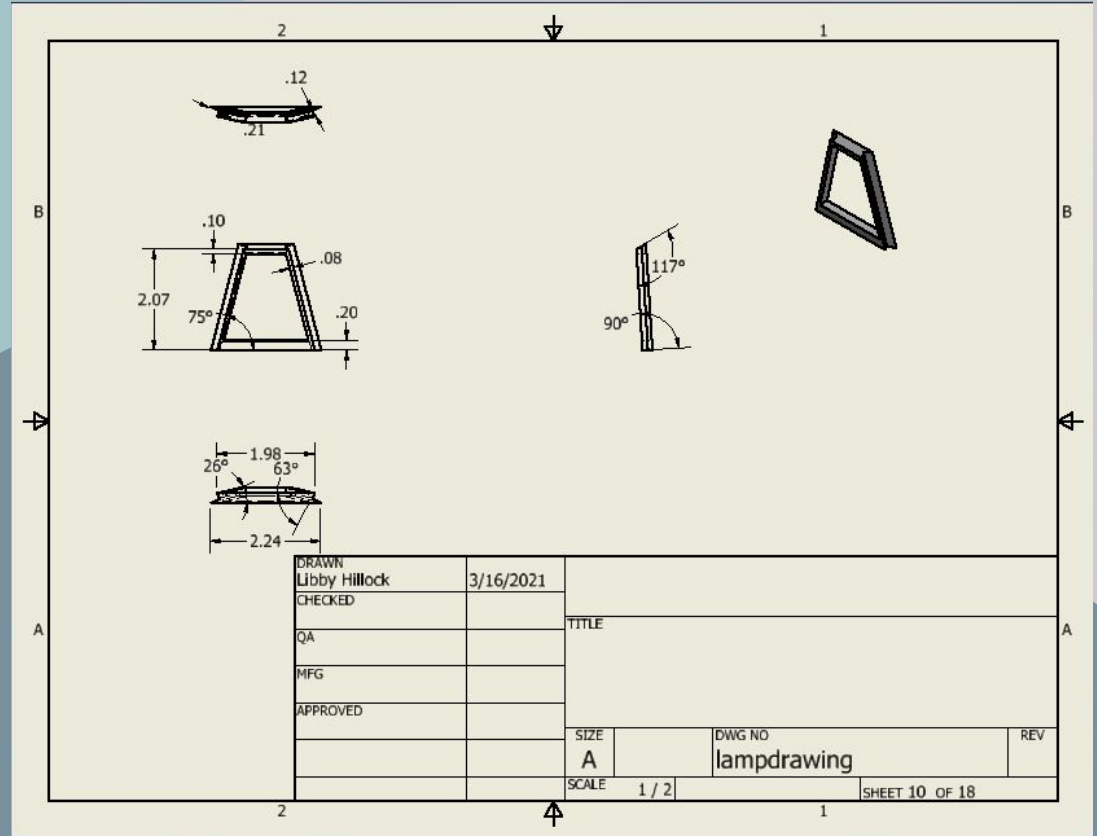
Material Dimensions: 1/8 in x 4 ft x 8 ft



DRAWN Libby Hillock	3/16/2021			
CHECKED		TITLE		
QA				
MFG				
APPROVED				
		SIZE A	DWG NO lampdrawing	REV
		SCALE 1 / 2	SHEET 11 OF 18	

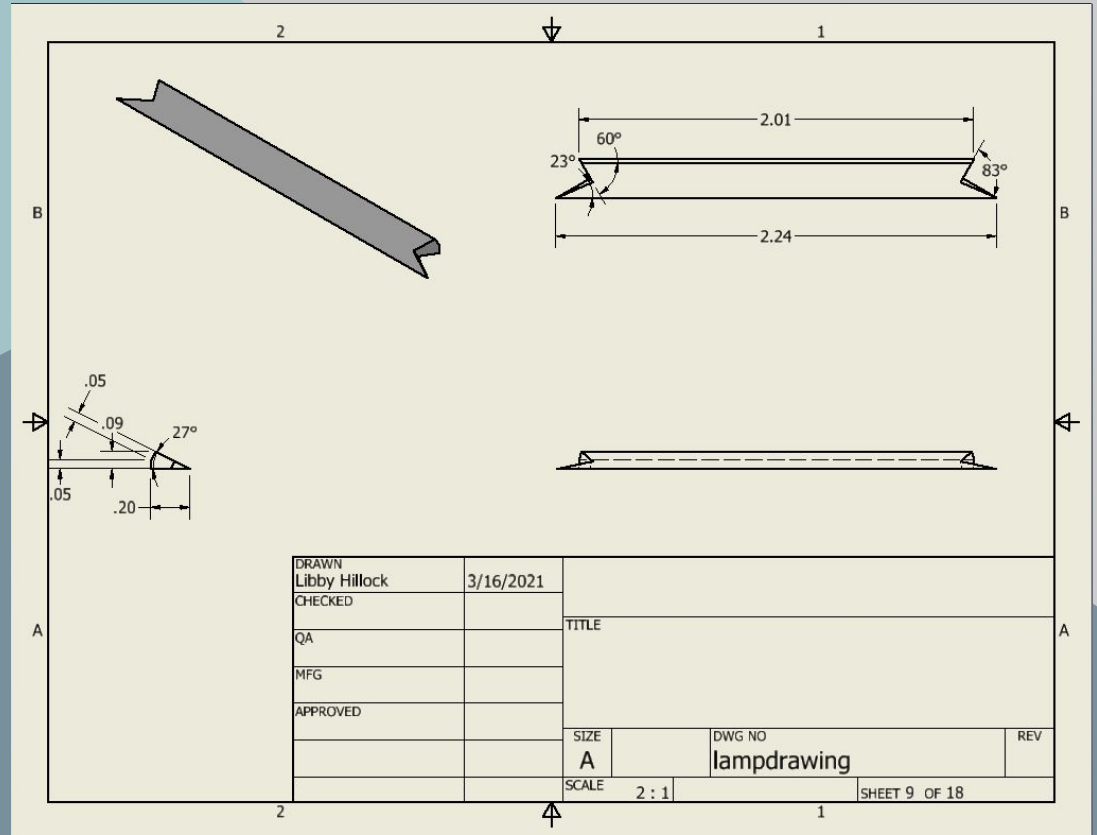
Lesser Lamp Neck

3D Printing Material



Lesser Lamp Neck Base

3D Printing Material

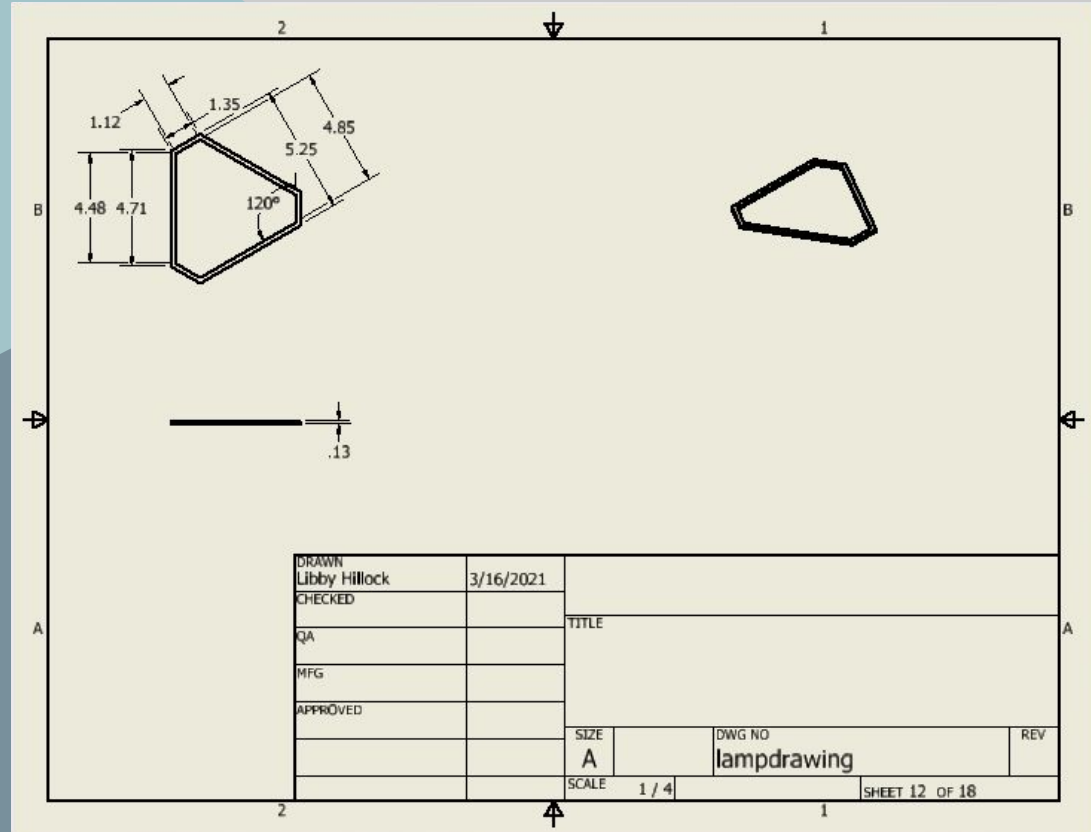


Lower Lamp Middle Base

Material:

<https://tinyurl.com/2h77ee4a>

Material Dimensions: $\frac{1}{8}$ in
x 4 ft x 8 ft

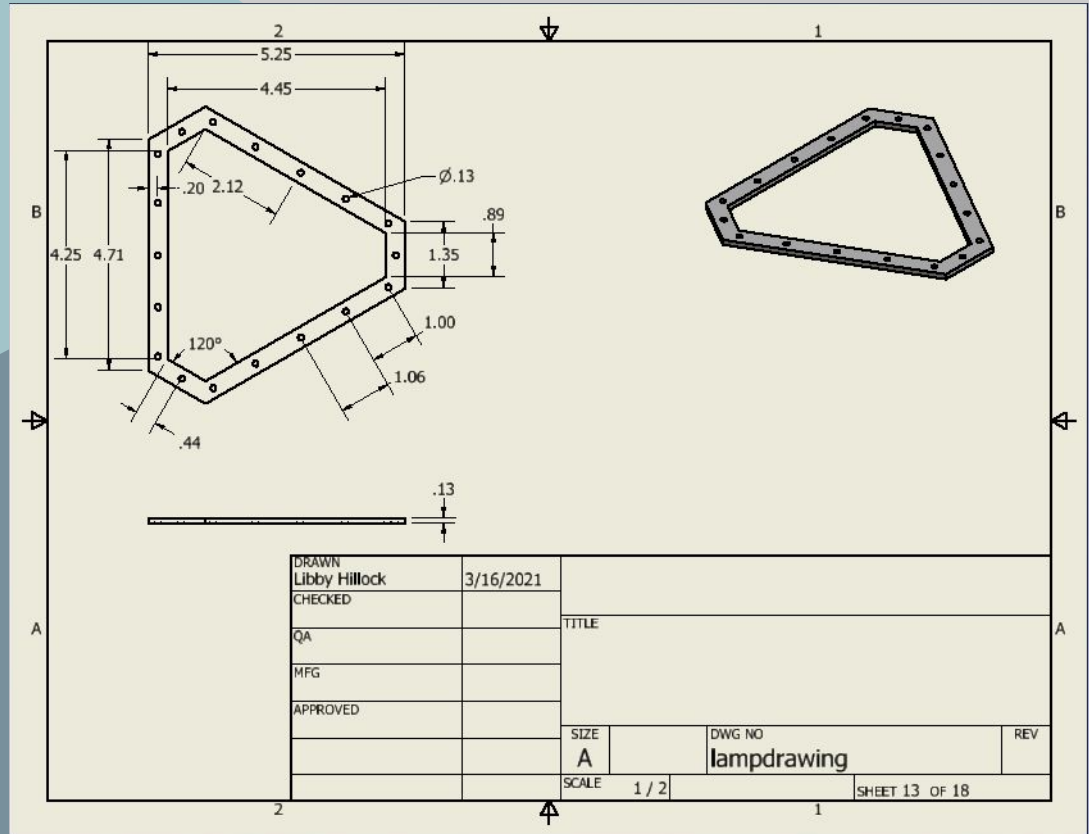


Upper Lamp Middle Base

Material:

<https://tinyurl.com/2h77ee4a>

Material Dimensions: 1/8 in x 4 ft x 8 ft



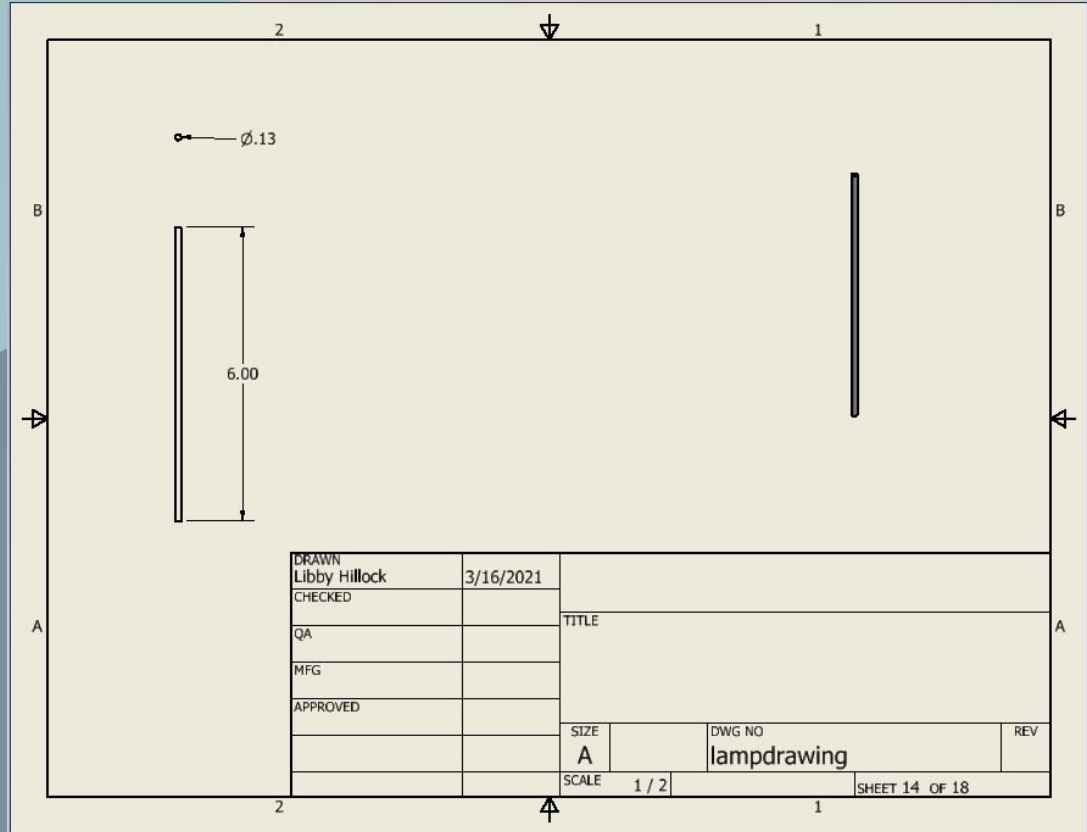
Lamp Middle Column

Material:

<https://tinyurl.com/5cz4wz>

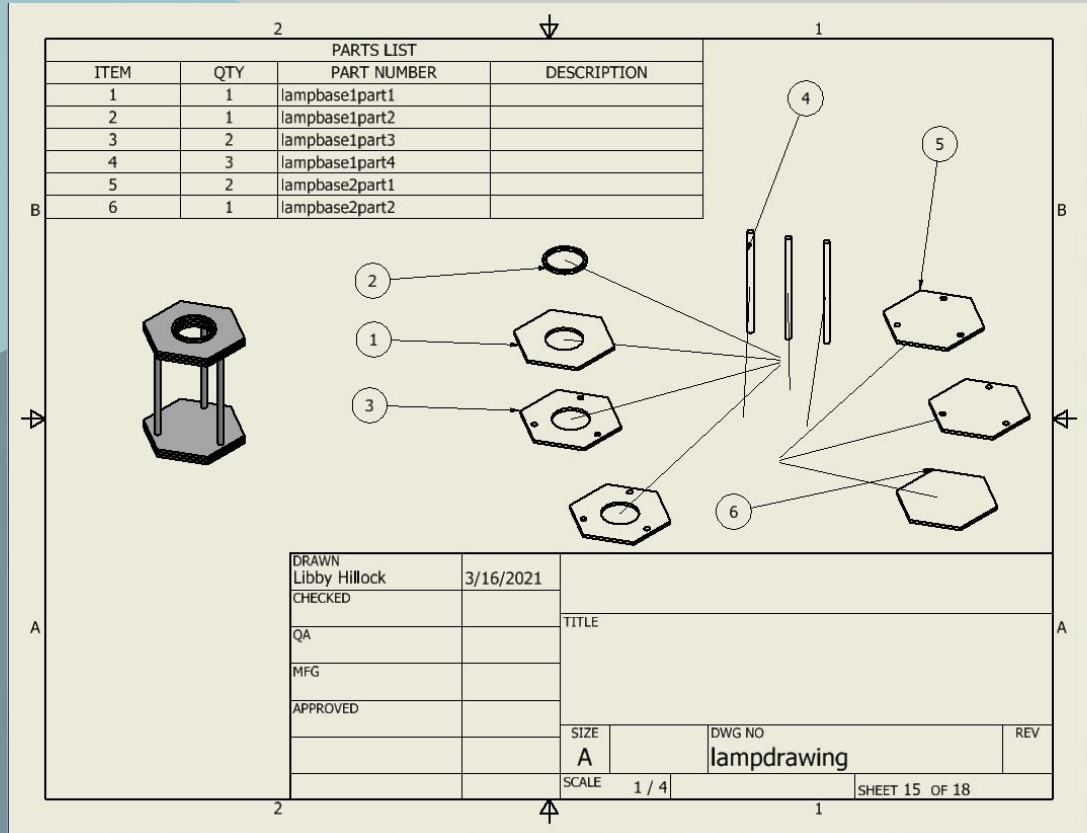
C

Material Dimensions: 1/8 in
x 3 ft



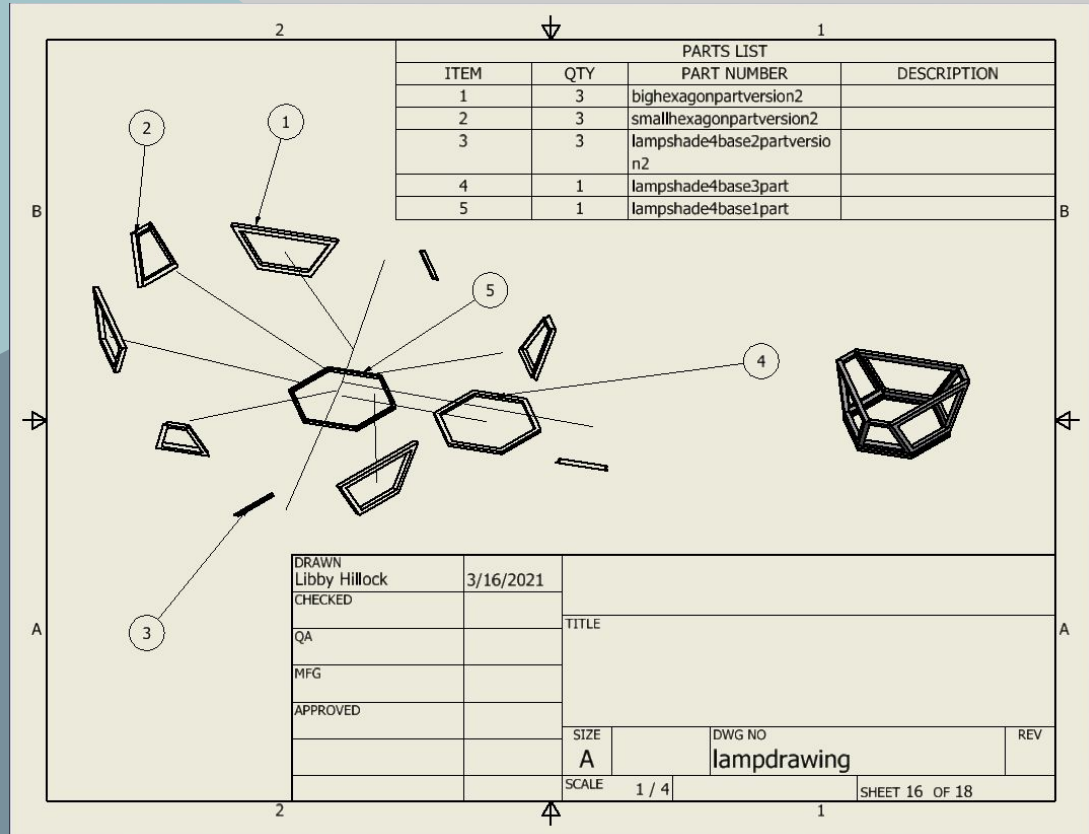
Lamp Base Assembly

Parts: Lamp Base 1-4,
Lamp Base Column, Lamp
Base 4 Ring



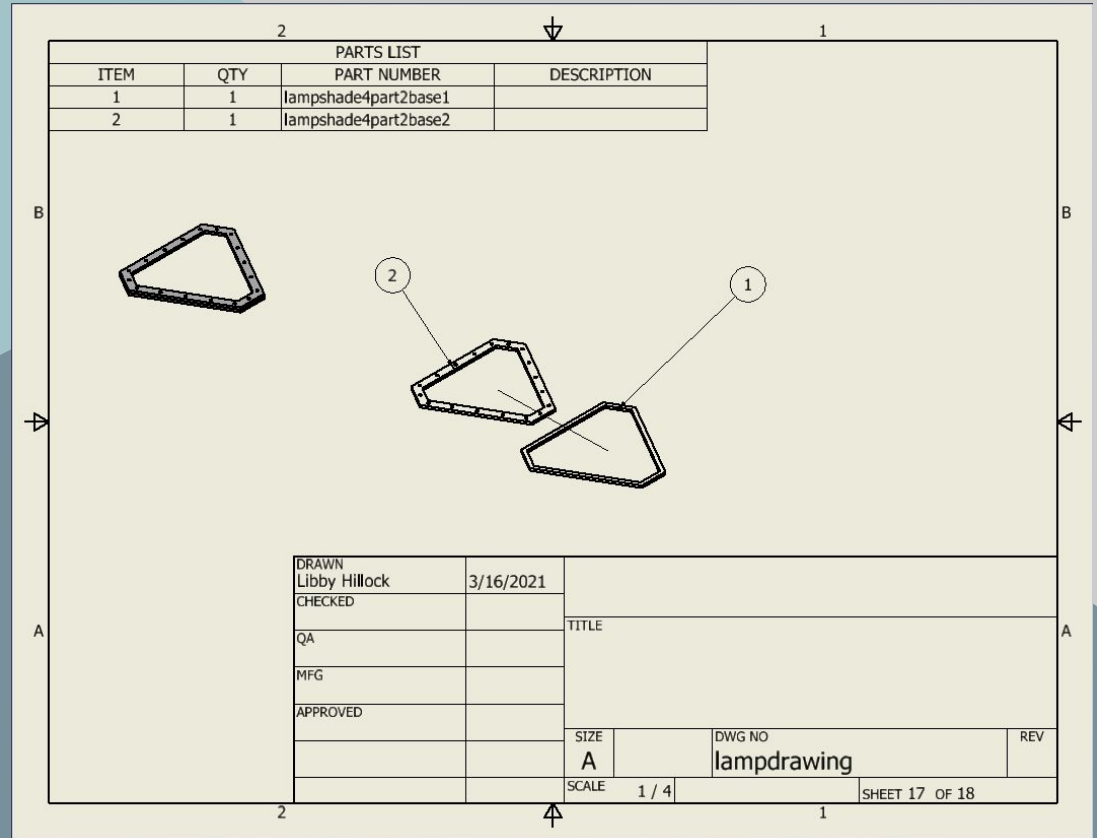
Lamp Neck Assembly

Parts: Lower/Upper Lamp Neck Base, Greater/Lesser Lamp Neck, Lesser Lamp Neck Base



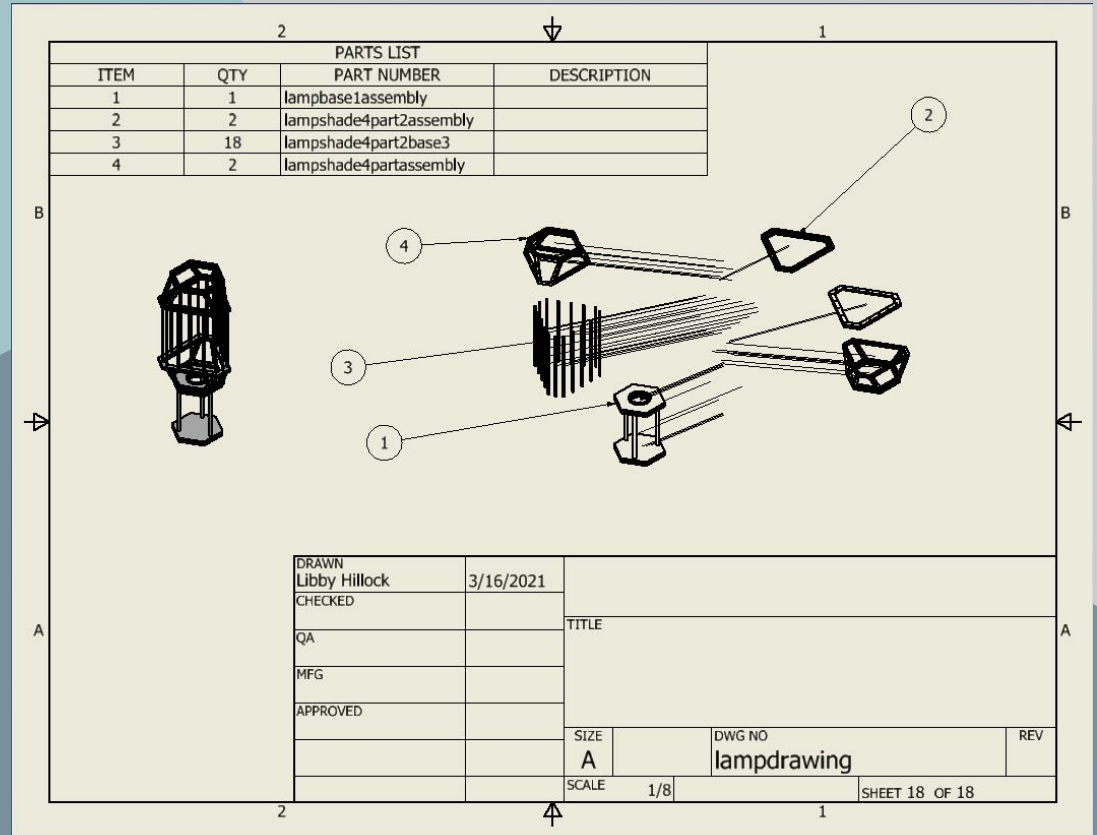
Lamp Middle Assembly

Parts: Upper/Lower Lamp
Middle Base

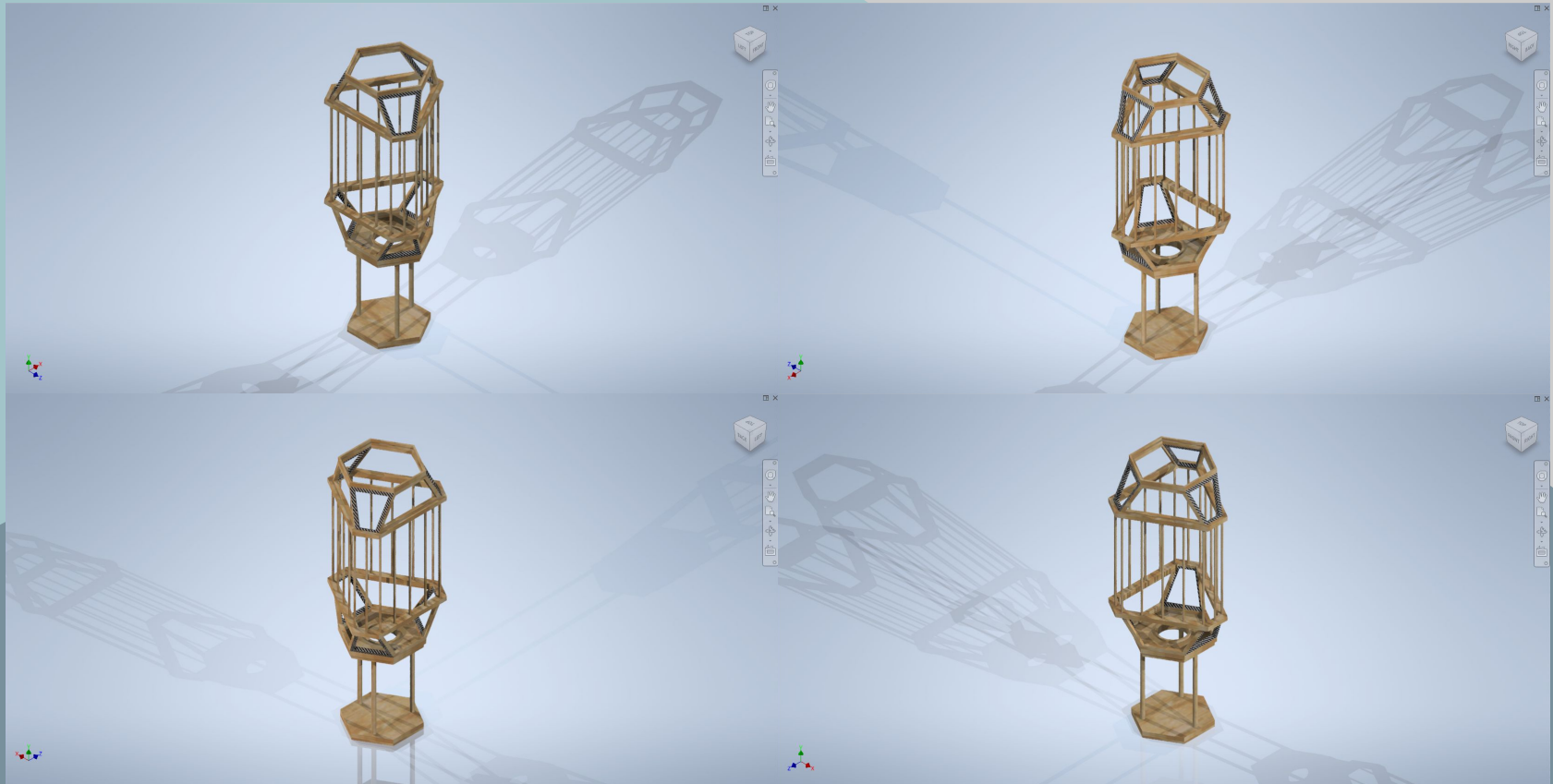


Lamp Assembly

Parts: Lamp Base, Lamp Neck, Lamp Middle, Lamp Middle Column

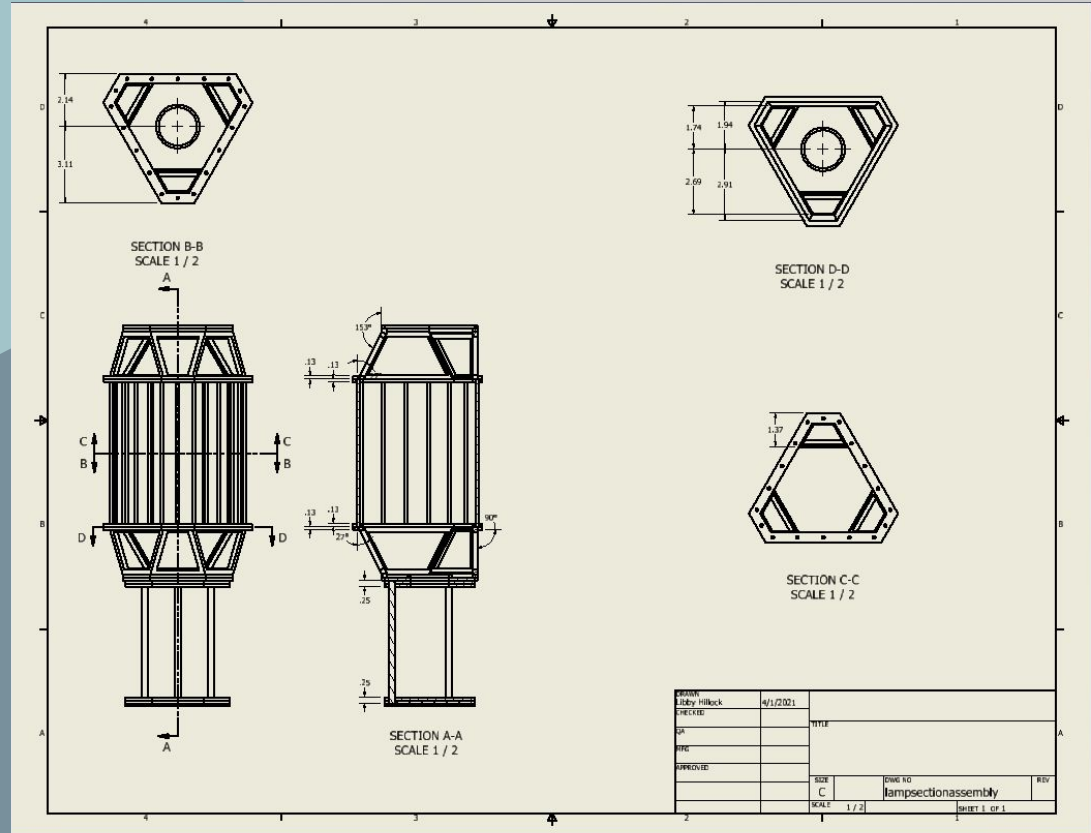


Renderings



Section Views

Views: Top, Bottom, Side

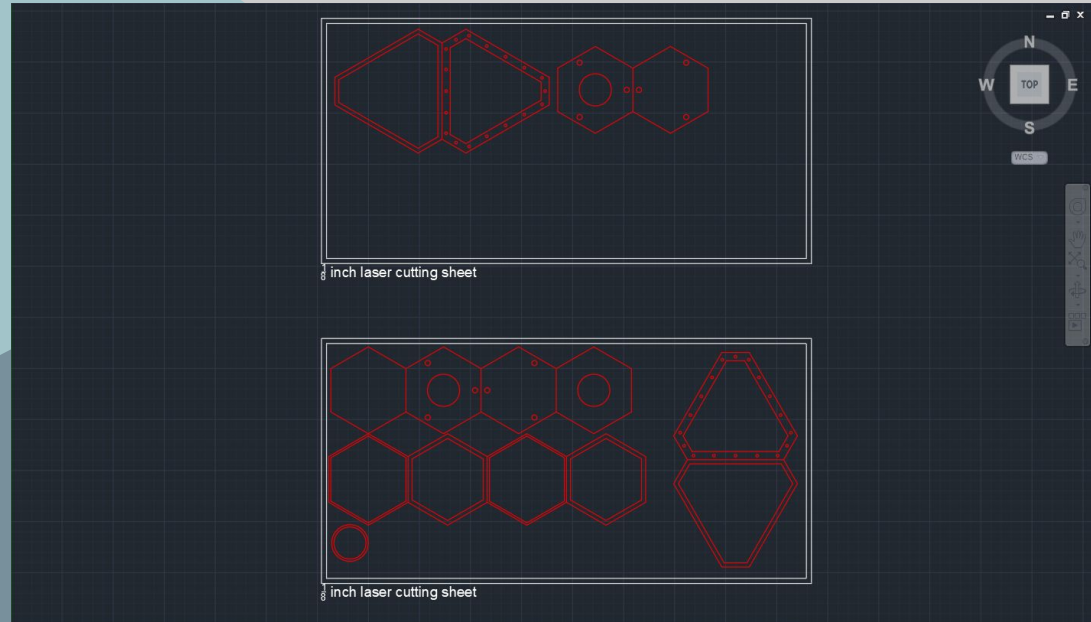




Creation Files

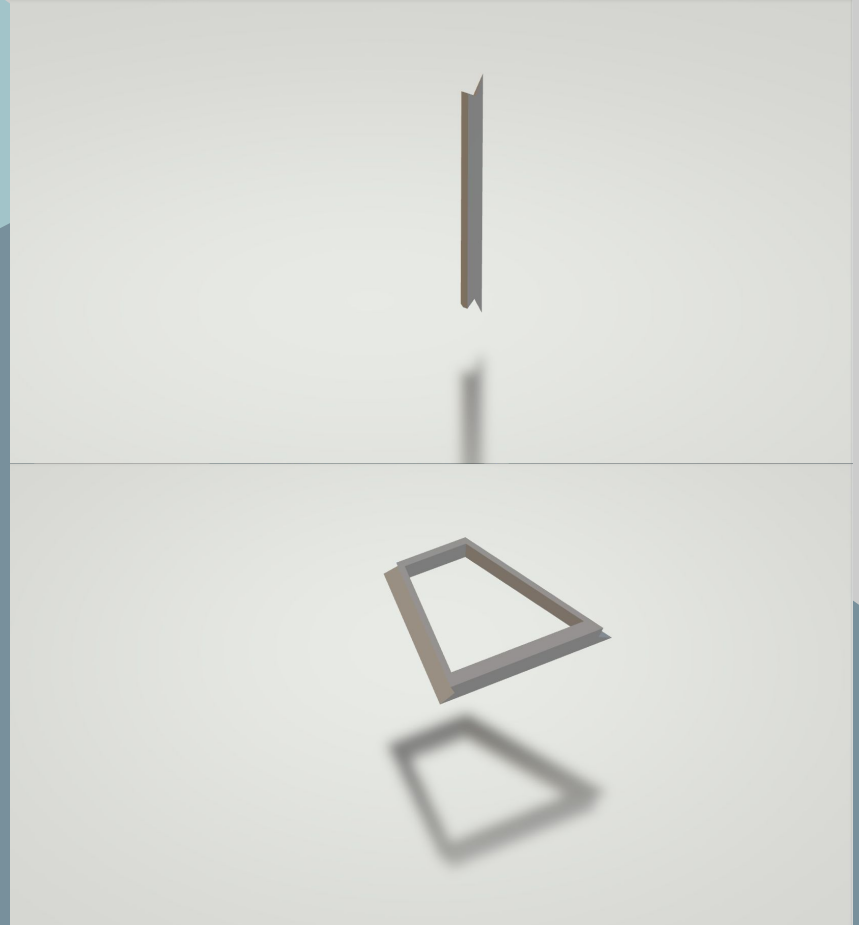
Laser Cutting Files

Final Product Report: files turned out fine, albeit a bit smelly



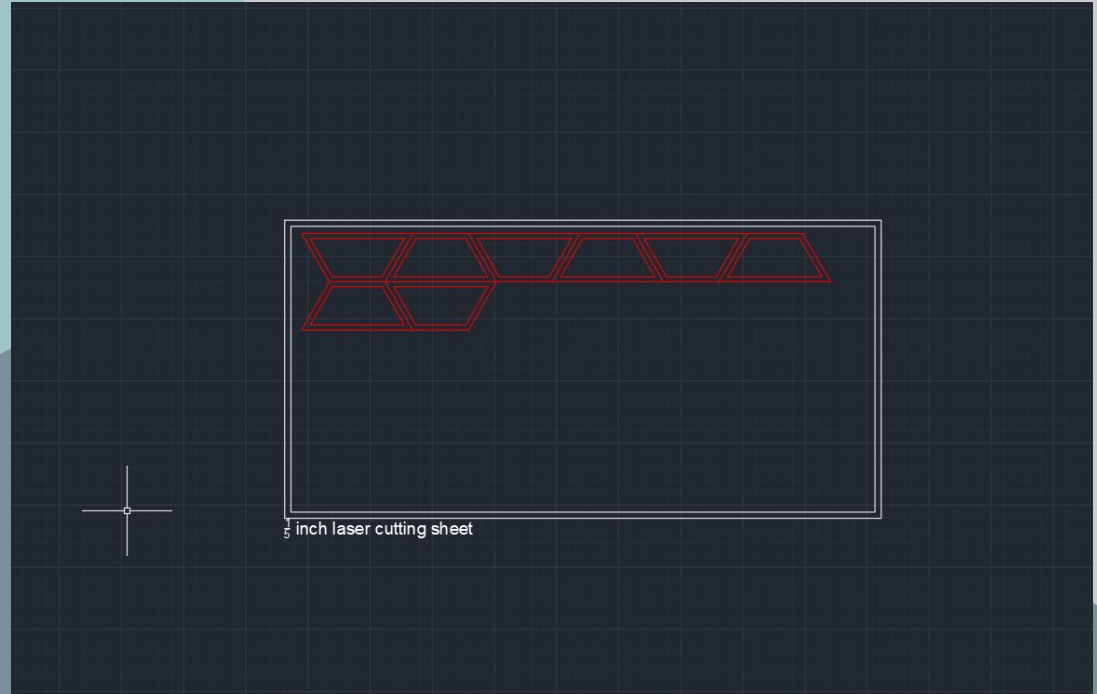
3D Printing Files

Final Product Report: files turned out fine



CNC Files

Final Product Report: files turned out fine except for the rounded inner acute corners, but that didn't affect the final lamp at all.

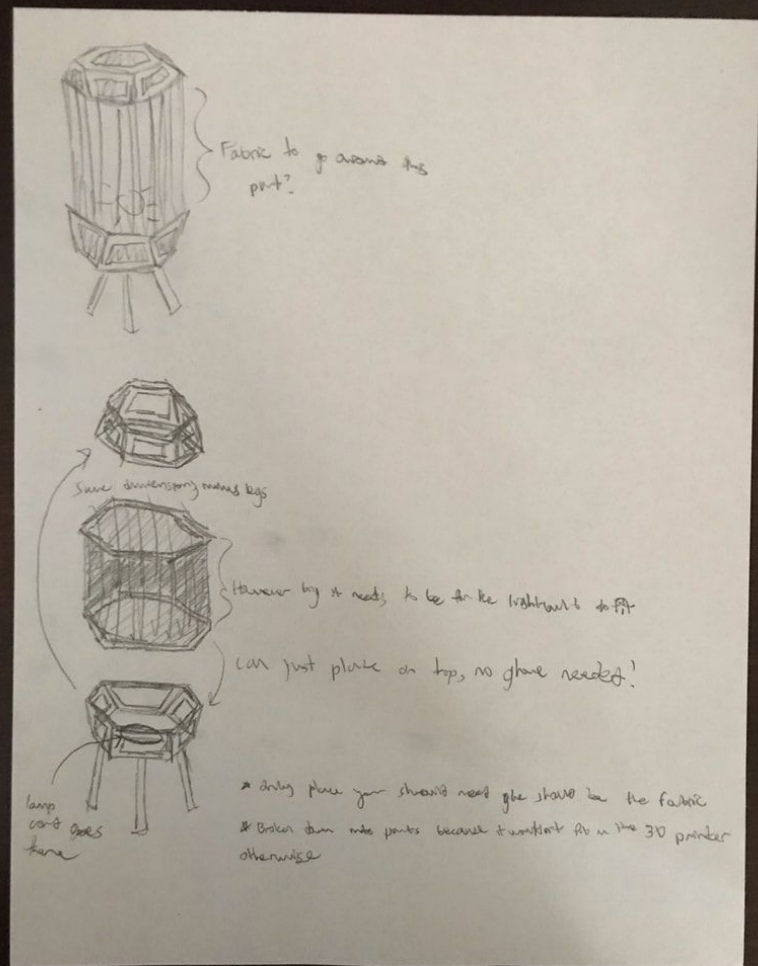




Process

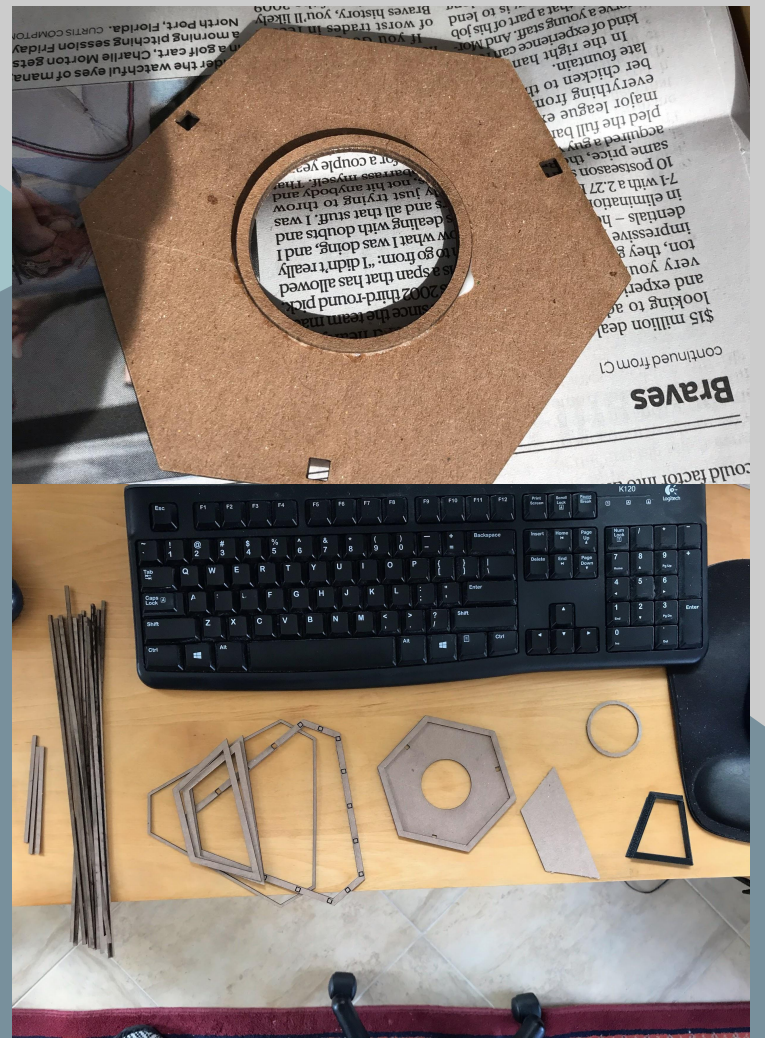
Sketches

My original sketch was a lot like my final product, but the main difference was that the greater lamp neck part of the lamp neck was at an angle to the lamp neck base instead of being perpendicular to it. Another difference between the sketch and the final product was that the sketch didn't have a part to hold the bottom of the lamp base columns - which were angular to the floor at the time - together, but the final product - whose columns are perpendicular to the floor - did.



Study Model

I didn't actually construct my study model (I didn't feel like I needed it, so I didn't bother), I only glued together the two parts in the top image to the right, but the main things I quickly found out after opening the package the study model parts came in were that I needed to use dowels for the columns instead of laser cutting them out, making the lamp middle bases thicker, and adding more bases to the top and bottom of the lamp base column to hold it together better.





Final Model

Creation

Once I got all of my parts, I started gluing parts together, starting with the bases of all of the parts.



Creation

I used an Exacto-Knife to cut the dowel rods. The cuts weren't exact, but the unevenness was basically unnoticeable. The hardest part with the columns was getting the tops into the bases after the bottoms were already put into the bases.

The Hemma lamp cord was difficult to get into the base hole, which made me realize that adding the extra bases to the lamp base were unnecessary.



Creation

While making the lamp neck, I unfortunately didn't actually use the lesser lamp neck parts since when I glued down the greater lamp neck parts, I was so worried they would easily fall over while the glue was drying that I didn't think about also fitting in the lesser lamp neck parts while they were drying. I thought that I would be able to fit them in after the other parts were done gluing, but I wasn't able to fit them in, rendering them useless.



Creation

After the glue on greater lamp neck parts was done drying, they turned out to actually be held done pretty strongly.

After cutting all of the dowel rods and fitting the lamp middle column parts into the lamp middle bases, I ended up with a blister on my thumb, but other than that, the lamp middle turned out fine.

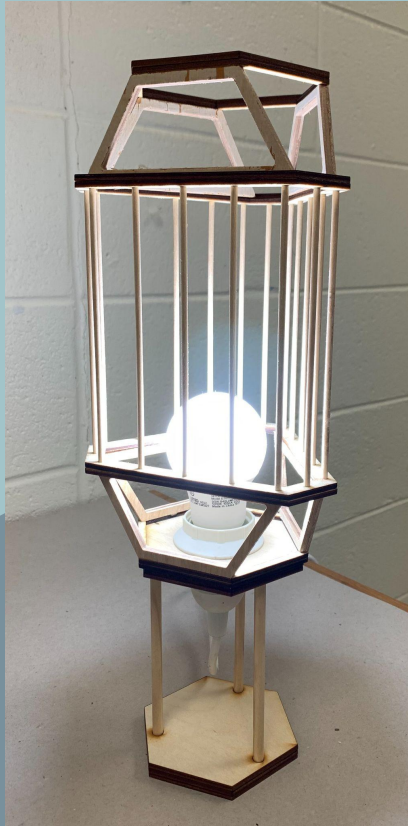


Creation

I glued all of the parts except the columns - which were held in place by the fact that they just about fit into their corresponding holes - and the base/neck - which couldn't be glued together because then it would be nearly impossible to replace the lightbulb - together with regular Elmer's Glue, which worked very well, despite the long time it took to dry.



Final Product





Documentation

Material/Hardware List

- 1/8 in x 4 ft x 8 ft plywood (Quantity - 1): <https://tinyurl.com/2h77ee4a>
 - Total Price: \$11.42
- 1/5 in x 4 ft x 8 ft plywood (Quantity - 1): <https://tinyurl.com/yawvd7hm>
 - Total Price: \$13.98
- 1/8 in x 3 ft dowel rod (Quantity - 3): <https://tinyurl.com/5cz4wzc>
 - Total Price: \$1.47
- 1/4 in x 3 ft dowel rods (Quantity - 1): <https://tinyurl.com/5cz4wzc>
 - Total Price: \$0.79
- Elmer's Liquid School Glue (Quantity - 1): <https://tinyurl.com/9zckbf94>
 - Total Price: \$2.09
- Exacto-Knife (Quantity - 1): <https://tinyurl.com/3nn4594y>
 - Total Price: \$5.80
- CNC Time: 0.25 hrs
 - Total Price: \$8.75
- Laser Cutting Time: 1.75 hrs
 - Total Price: \$54.89
- Total Material/Hardware Cost: \$99.19

Labor Time Estimates

- Sketching/Design: 0.5 hrs
- CAD: 30 hrs
- Material Planning/Testing: 5 hrs
- CNC Time: 0.25 hrs
- Laser Cutting Time: 1.75 hrs
- Assembly: 9.25 hrs
- Documentation Preparation: 42 hrs
- Total Labor Time: 88.75 hrs

Design Price

- Total Material/Hardware Price: \$99.19
- Total Labor Cost (\$40/hr + 40% profit): \$4,970
- Total Cost: \$5,069.19

Reflection

While designing the project, the most challenging part was designing the greater lamp neck part, mainly due to its awkward shape and hard-to-get-exact dimensions, while the most enjoyable part was the physical creation of the final lamp, since I got to see all of the hours of work I put into it finally pay off in real time.

A surprising benefit that came from the aforementioned difficulty from designing the greater lamp neck part was that it helped me learn the Inventor software a lot better than I had previously known it, like how to create angled planes or resolve errors in the model.

The most surprising event in the creation of my lamp was simply the fact that, other than a few mishaps here and there, it largely went easily and smoothly, which, with this long of a project, I simply wasn't expecting. However, with regards to the few aforementioned mishaps, the biggest things I would do differently if I were able to do this project again would be to choose a design I actually liked (I didn't look more into other possible designs because I didn't have time) and to actually plan out my process ahead of time by more than a day or two.