

Enclosure Holder

This document is set up in chronological order from bottom to top. We see the ideation and fabrication process of the enclosure holders for both the 8 in. enclosure (for the electronics harness enclosure) and the 3 in. enclosure (for the battery)

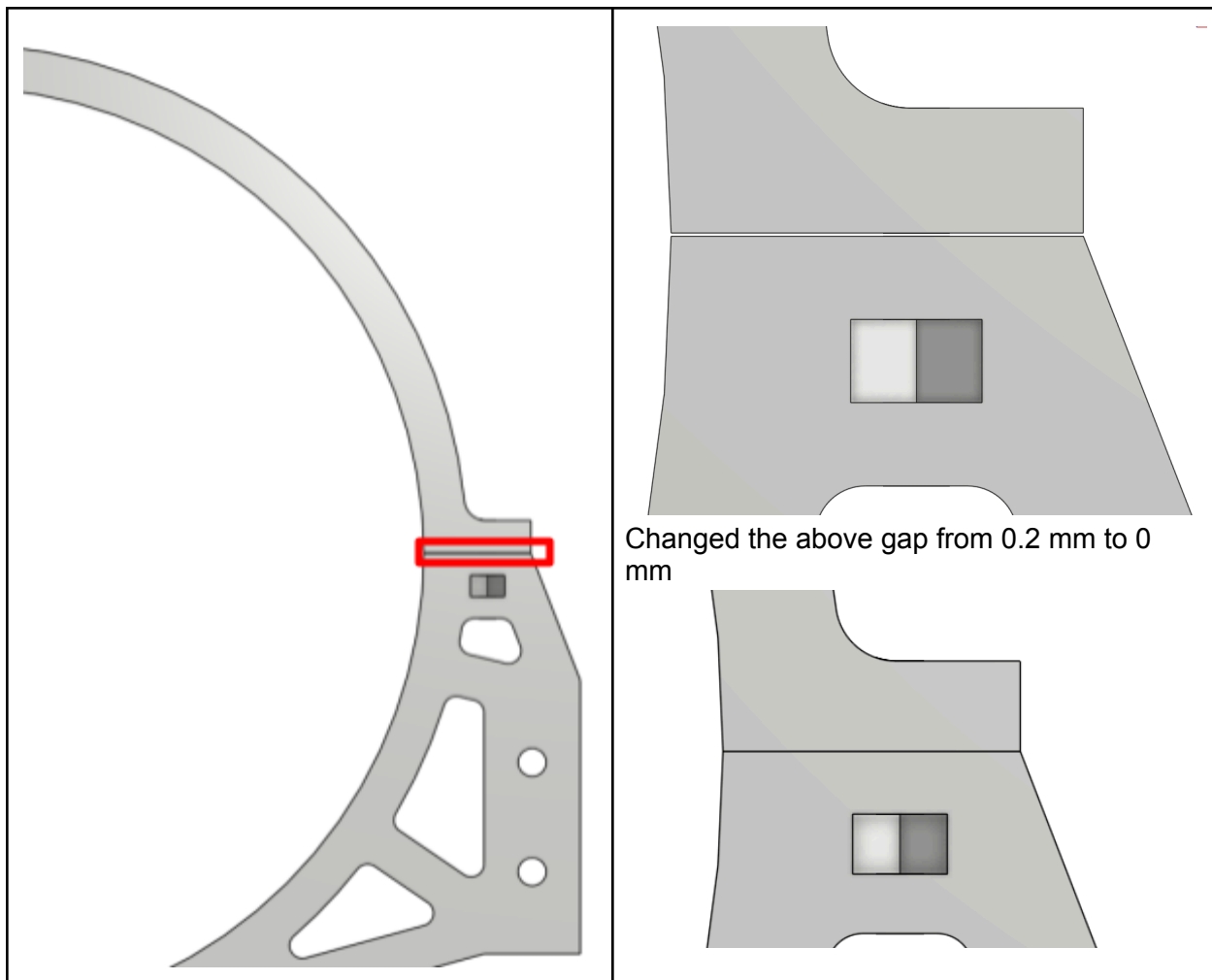
7/17/21 Replacements needed for the 8 in enclosure holder	2
6/26/21 Strain Analysis on the enclosure	2
6/26/21 Strain Analysis on 8in Enclosure Clamps	3
6/26/21 Strain Analysis on 3in Enclosure Clamp	6
6/20/21 Material Failure Documentation	7
6/20/21 Design Revision to 8in Enclosure Clamp Base	8
6/19/21 Editing Tolerances	9
5/22/21 Power Latch Evolution	10
5/21/21 Video Demo of Battery Latch	11
5/16/21 Documentation of Enclosure Clamp integrated onto Hull	12
5/15/21 Assembly of Enclosure Clamps onto Hull	13
5/13/21 Editing Tolerances	15
5/10/21 Assembly of Enclosure Clamps	15
5/9/21 3D Printing Enclosure Clamps	17
5/9/21 Assembly of Battery Enclosure Holder	18
5/8/12 Designing 8in Enclosure Clamps	21
5/8/21 Editing Tolerances of Battery Enclosure Holder	22
5/2/21 Initial Design and Fabrication of Battery Enclosure Clamp	23

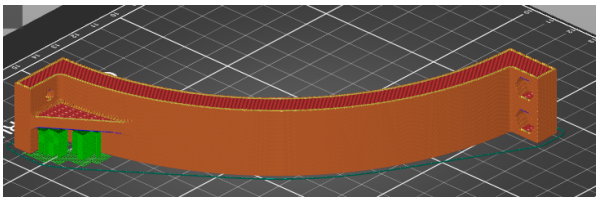
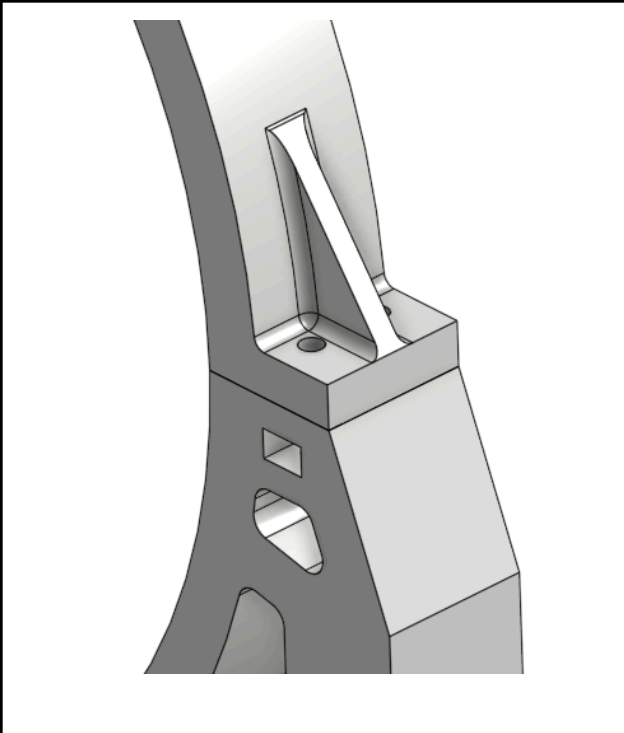
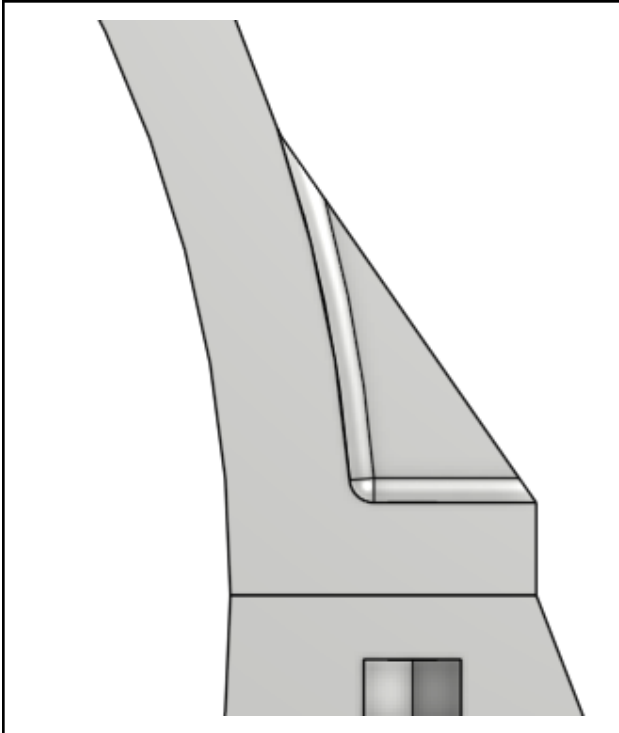
7/17/21 Replacements needed for the 8 in enclosure holder



The enclosure clamps broke at the corner between the mounting face and the curve. The team utilized string to tie down the enclosure to continue to apply pressure through ensuring contact between the enclosure and the dycem(kitchen mat). This allowed the team to continue to perform maneuvers while the replacement parts were printing.

The team increased the diameter that the clamps are clamping from 216.2 to 216.6 mm. This is the outer diameter of the tube + 0.7 mm the thickness of the dycem.

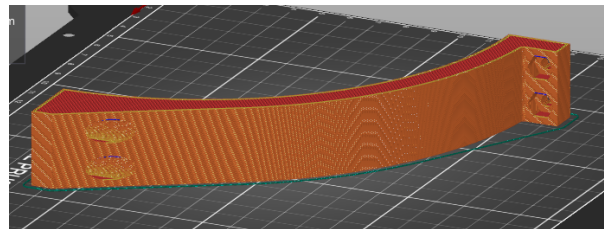




Needs support material the print time with 30% infill and 3 perimeters comes out to 3h41 mins

Sliced Info

Used Filament (m)	12.04
Used Filament (mm ³)	28968.69
Used Filament (g)	35.92
Cost	0.91
Estimated printing time:	
- normal mode	3h40m
- stealth mode	3h41m

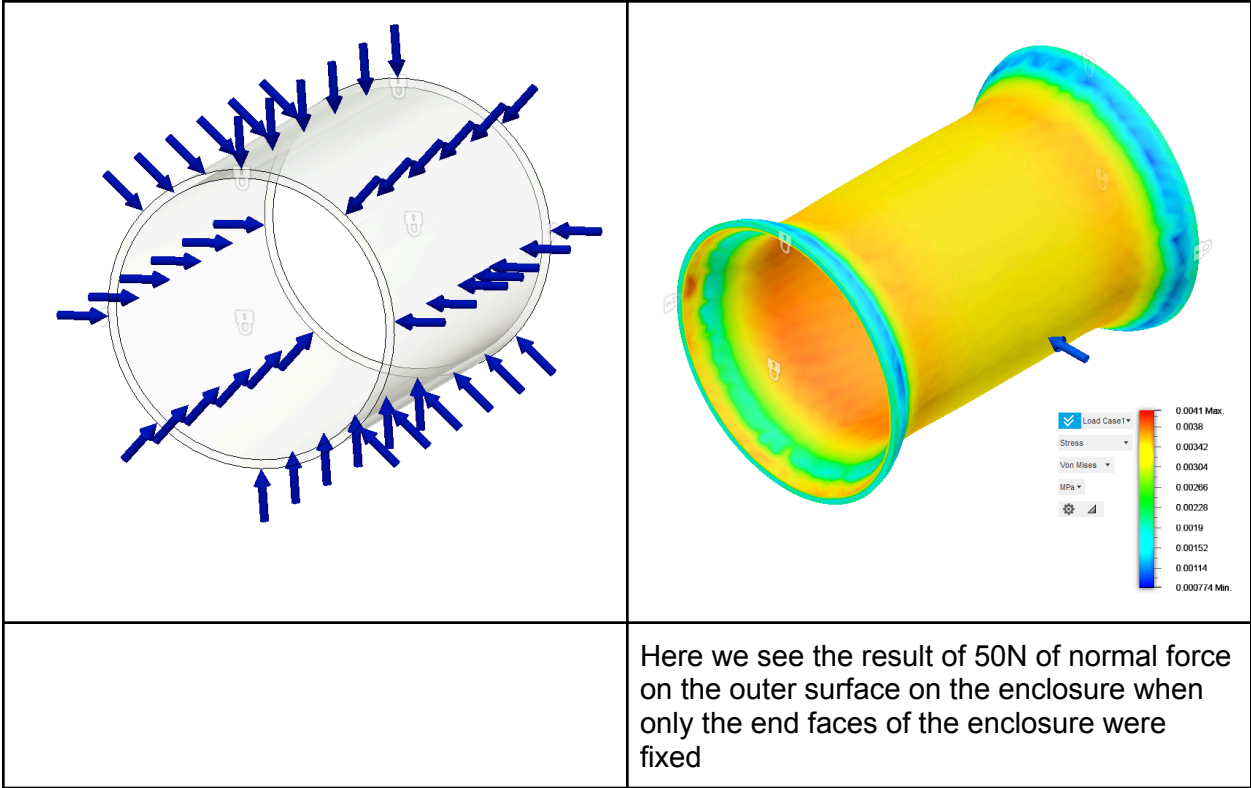


This part would print with the same print settings but take 3H 49 m while taking more filament

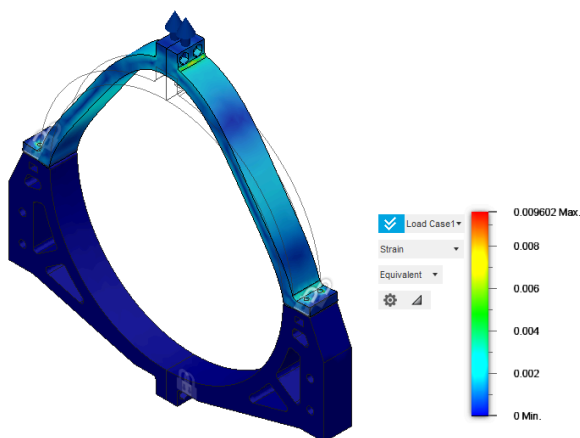
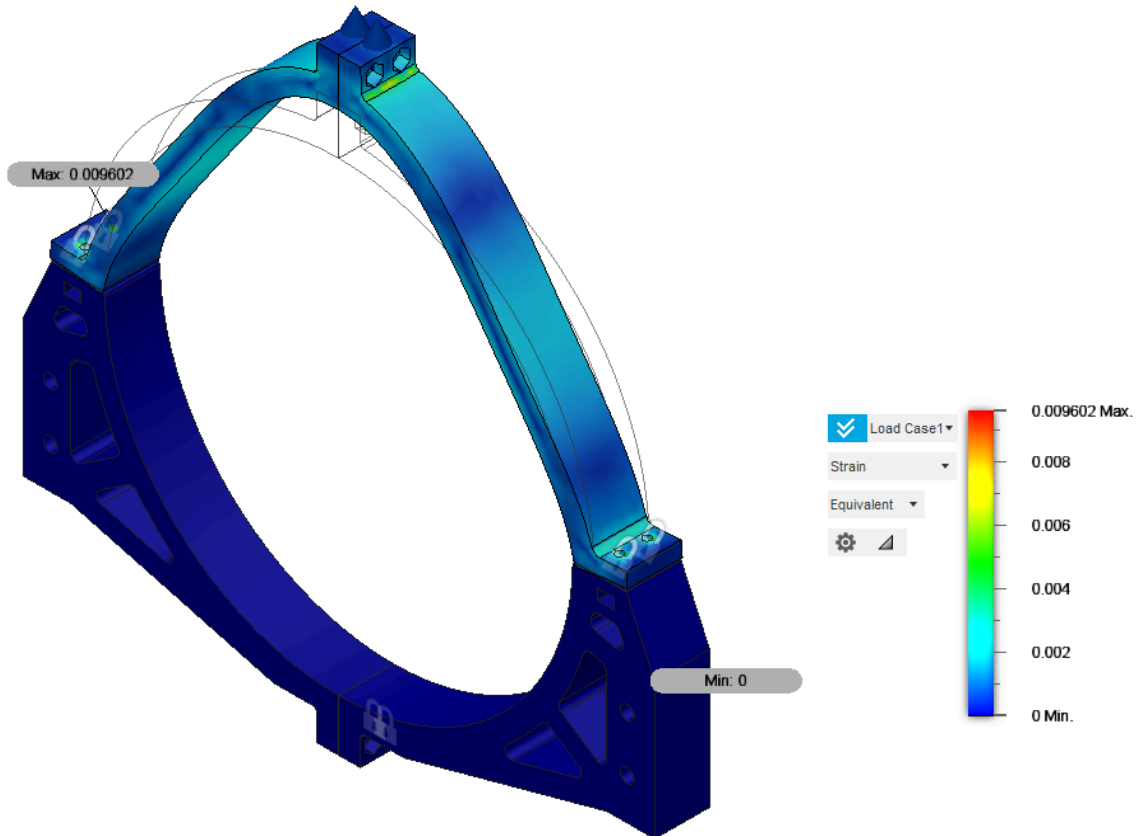
Sliced Info

Used Filament (m)	12.77
Used Filament (mm ³)	30708.31
Used Filament (g)	38.08
Cost	0.97
Estimated printing time:	
- normal mode	3h49m
- stealth mode	3h50m

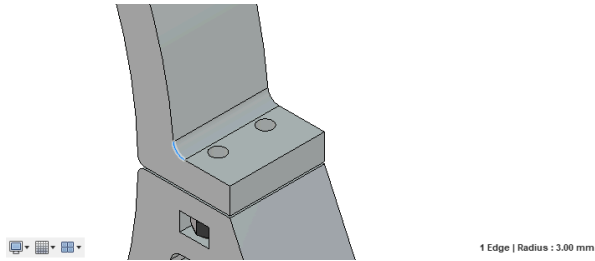
6/26/21 Strain Analysis on the enclosure



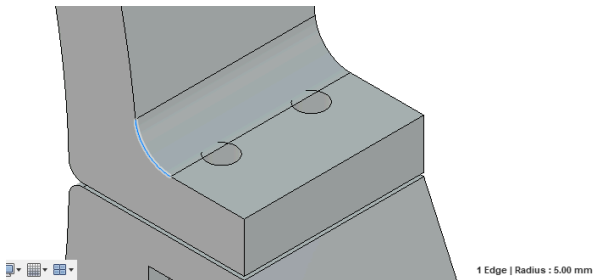
6/26/21 Strain Analysis on 8in Enclosure Clamps



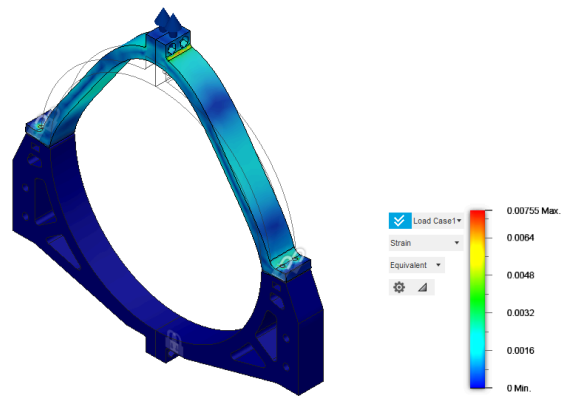
strain analysis when there are 50 N forces pulling up on the clamps. The 50 N was to demonstrate extreme load cases exerted on the piece. This highlights that the areas with the biggest strain were where the corners of intersection between the curves and the extension parts.



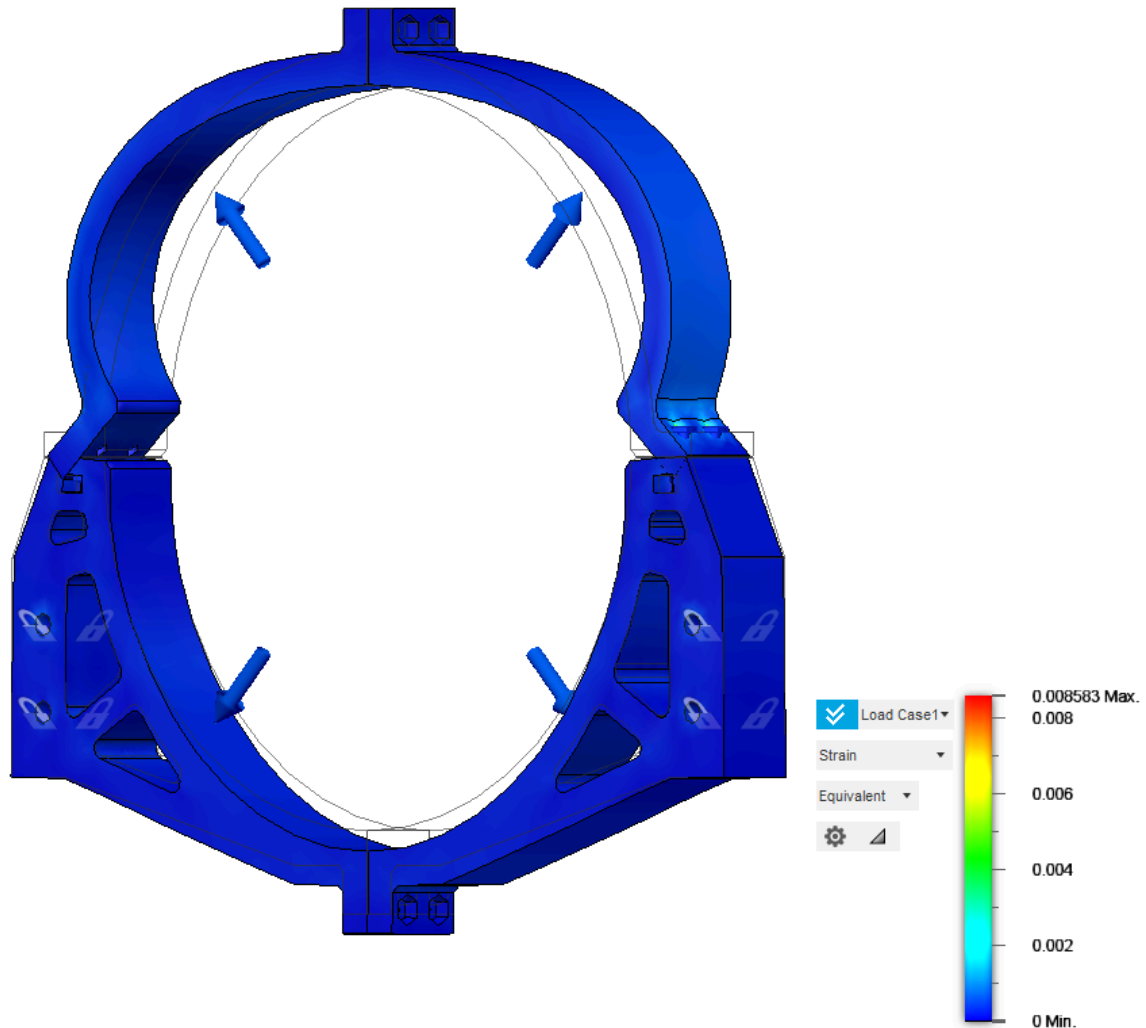
We see that the radius of the fillet at the base of the clamp was only 3 mm in the above design

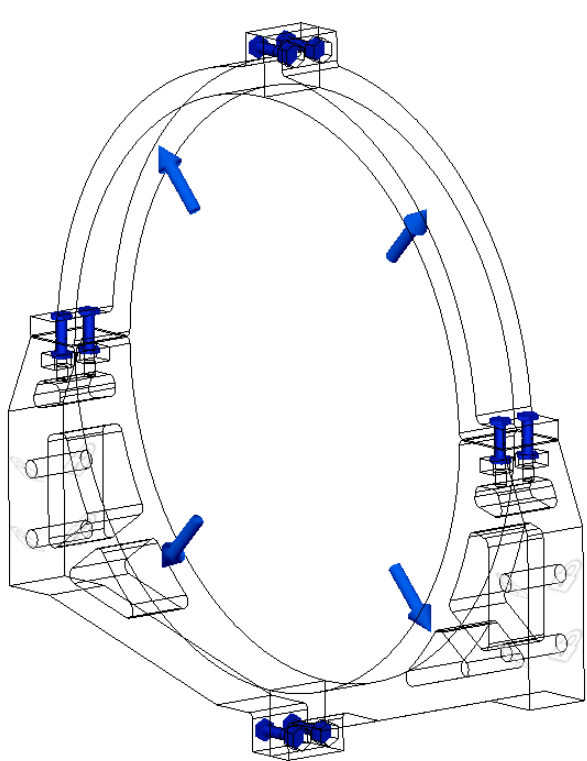


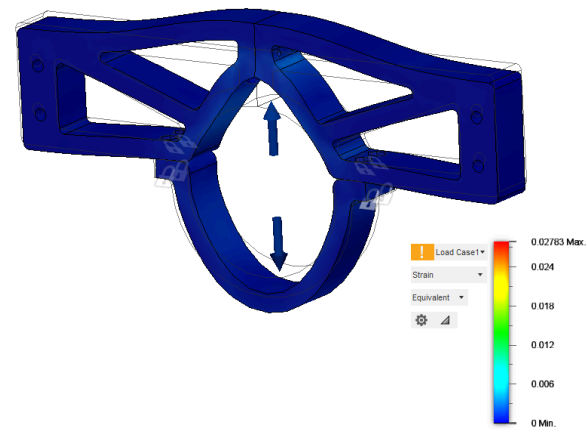
Increasing the radius of the fillet on the bottom of the clamp from 3 mm to 5 mm without change to the top fillet shows that more of the strain is concentrated at the top fillet. However the max strain decreased from 0.009602 N to 0.00755 N

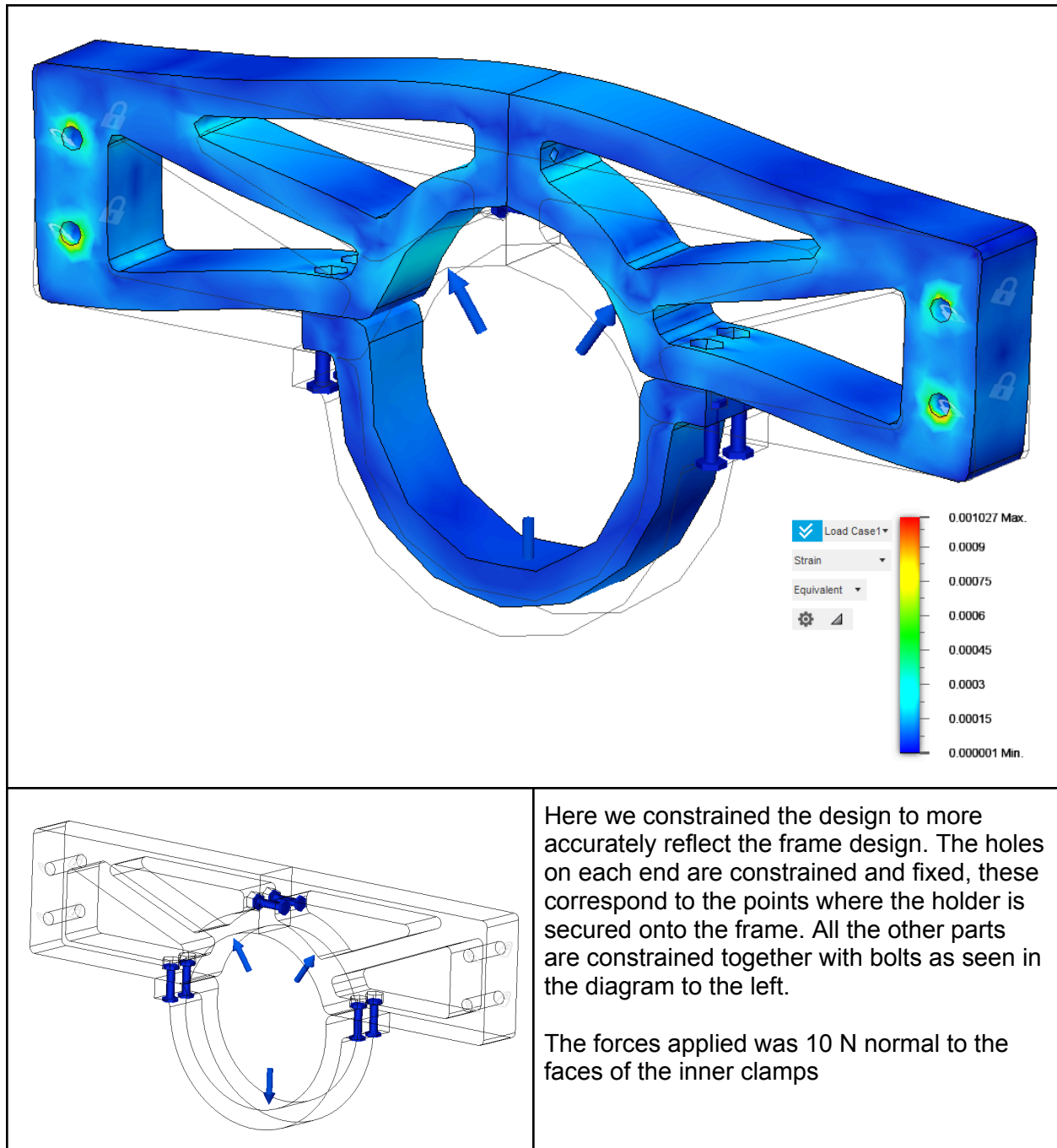


On the base of the clamps we can see there is considerably less strain acting on the parts. Nearly all of the strain that occurs from 50N pulls down on the clamps are found in the bottom two filets.



	We see another simulation set up to the electronics enclosure. There was 10N of force applied to the normal faces of the objects of the clamp. We see that there is a lot more deformation (keep in mind the deformation has been adjusted to be visible) on the latches then the base of the clamp. This is a result of the bottom base of the clamp being fixed, this corresponds to the bottom parts of the clamp being secured onto the frame of the sub.
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6/26/21 Strain Analysis on 3in Enclosure Clamp	
	For the battery enclosure hodler we can see there is menial amount of stress when 50N of force is applied from the hull expanding or if the





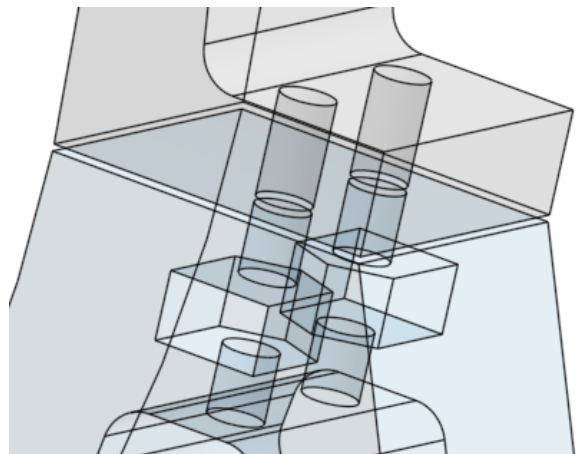
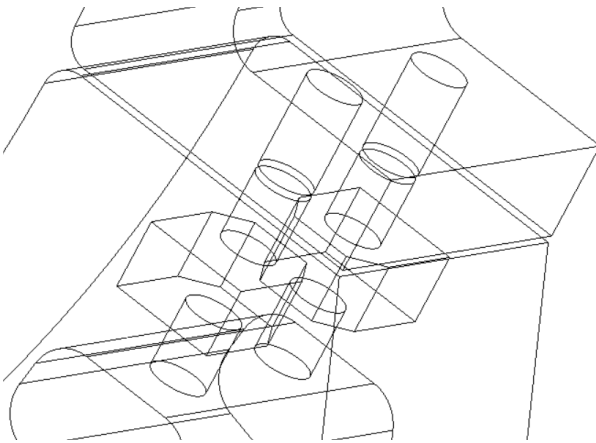
Another clamp broke, and I need to revisit the design.

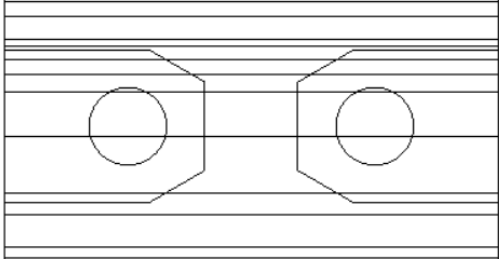
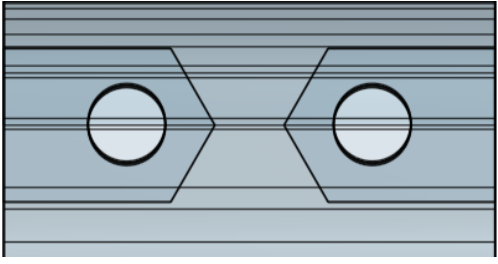
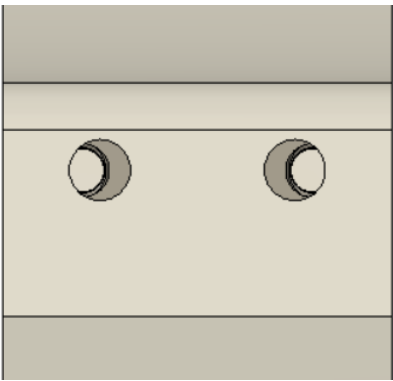
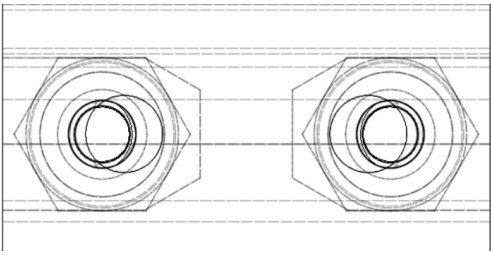
Increasing the fillet size to 5 mm

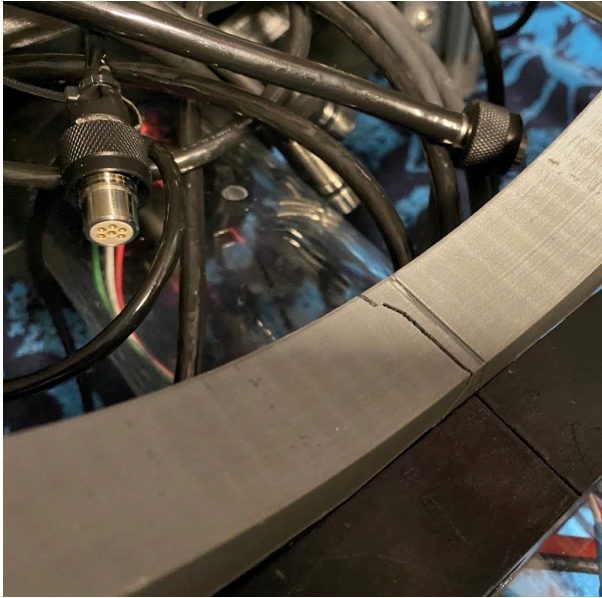
As well as increasing the infill from 15% to 30%

As well as decreasing the distances that the clamp is from the base from 0.5 mm to 0.2 mm

6/20/21 Design Revision to 8in Enclosure Clamp Base

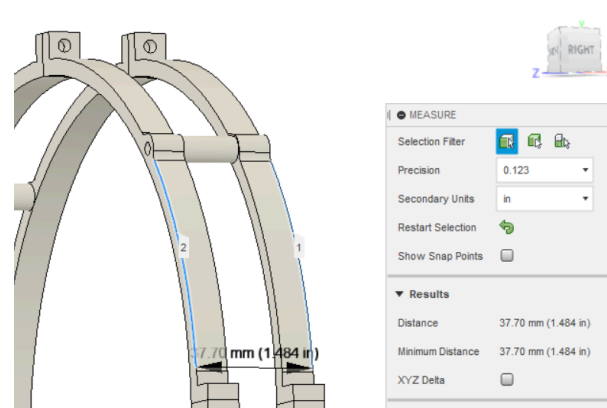


	
There is only one face and edge faces that support the nut. This previous design allowed the nut to slip as the edges were	We can see on the right side we have moved the enclosure clamps onto the onshape. Here we see a different geometry. There are two slides that support the nut.
 From the previous adjustments. Nuts cannot fit within the slot correctly.  As the areas are only 7.9 mm rectangular cutout the nut physically cannot rotate into the correct direction	 The revised clamp (as seen in balck fits with the rest of the clamps in the same position)
6/19/21 Editing Tolerances	
Reducing the tolerances for the enclosure holder	

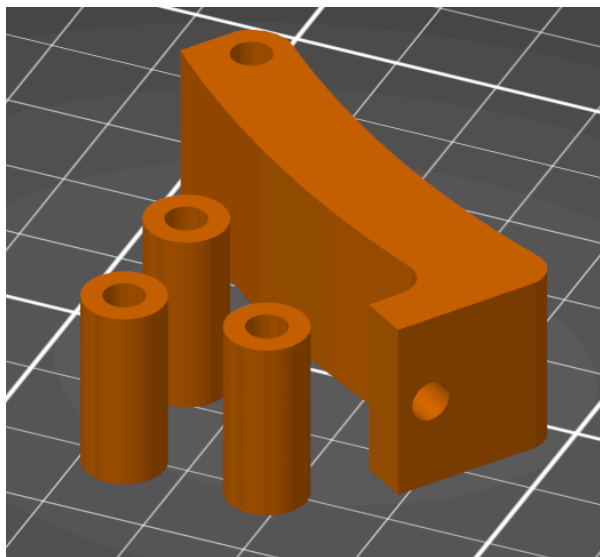


There were cracks that appeared on the enclosure holder, these occurred in the joints of the parts. These original pieces were printed with 15% infill.

5/22/21 Power Latch Evolution



Can use 1.75 inch screws to secure the clamps together which accommodates for a 0.5 inch diameter magnet in the latch



Creating a latch based off of this magnet:

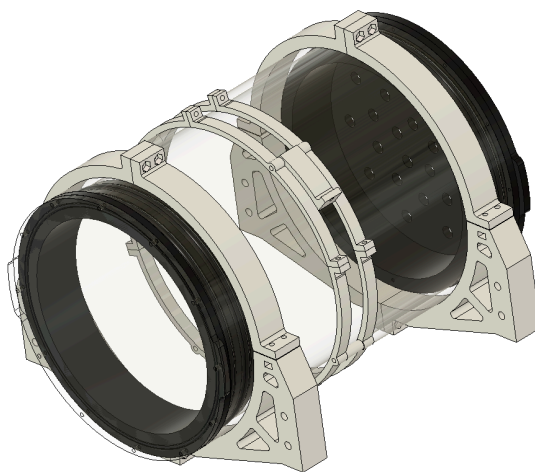


5/21/21 Video Demo of Battery Latch

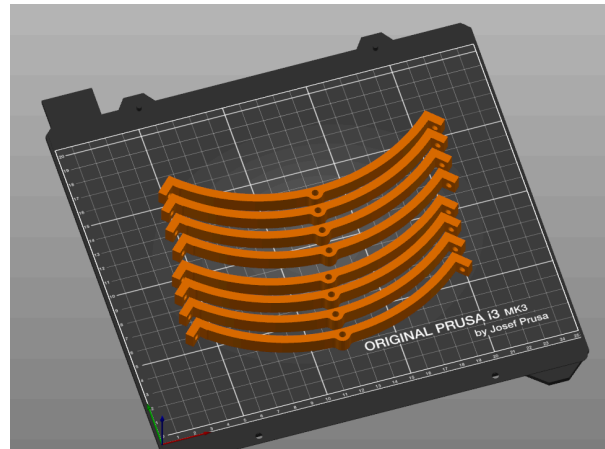
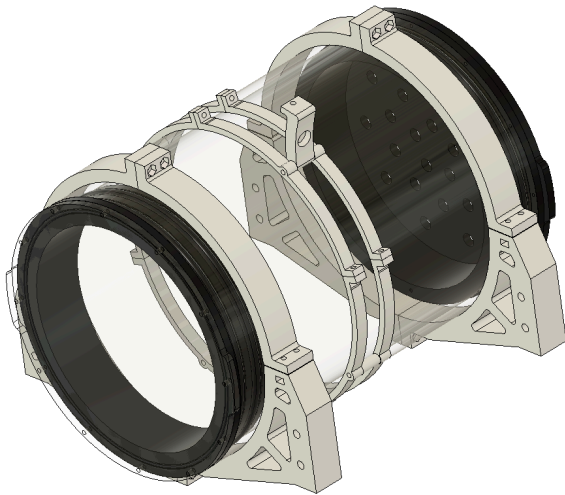


Video Demo

In the closed position



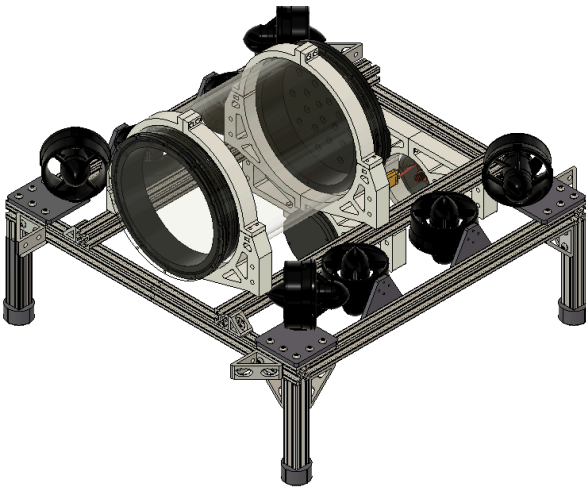
Open position



Made the clamps in 4 pieces to ensure that all clamps could be fit on print bed

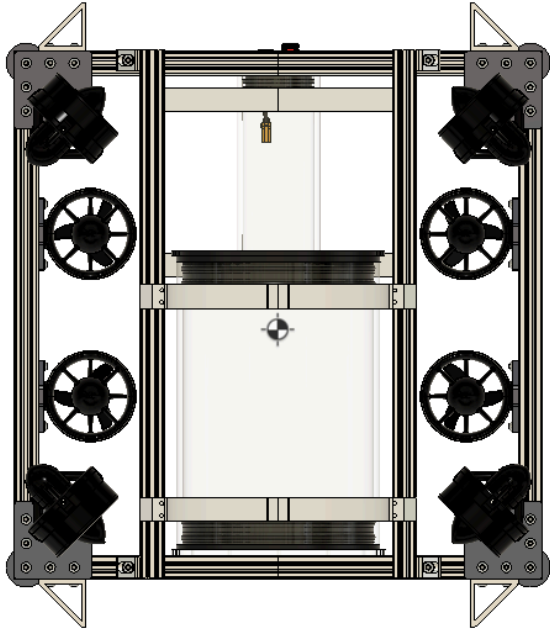
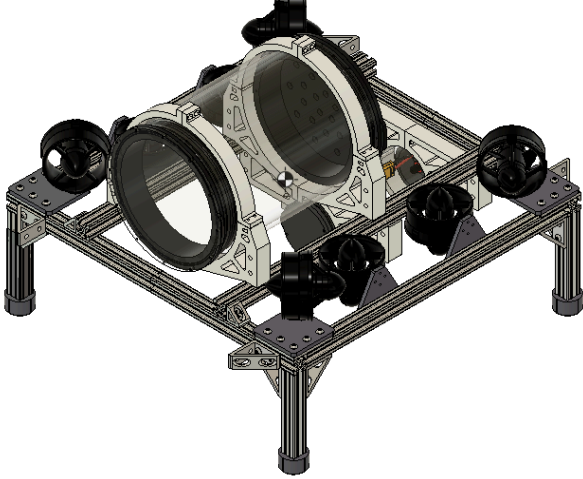
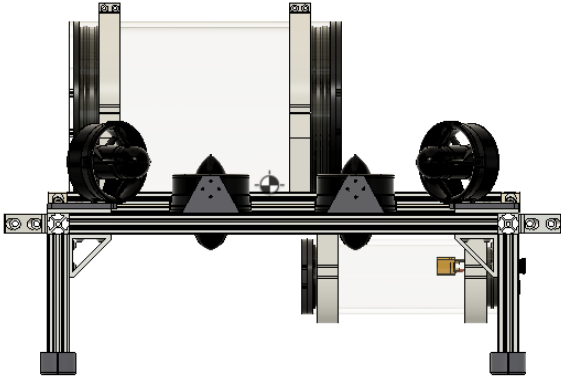
"D:\.....RoboSub 2021\5_21_21 battery latch" location on computer

5/16/21 Documentation of Enclosure Clamp integrated onto Hull



Created model of the current robot configuration

Live link to the robot:
<https://a360.co/3eRbfbV>

	
	Currently without any electronics within the model the center of mass is a bit forward mainly positioned near the frame of the robot
5/15/21 Assembly of Enclosure Clamps onto Hull	



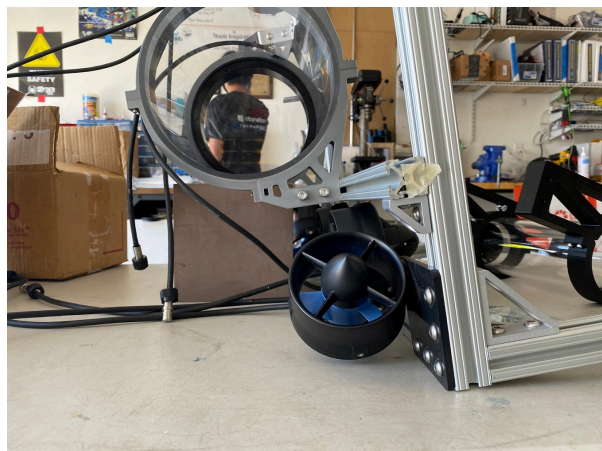
Using a dycem strip to reduce the slippage of the clamp on the enclosure, suggestion to use dycem to go around the whole enclosure to ensure a good fit even when the plastic warps due to heat



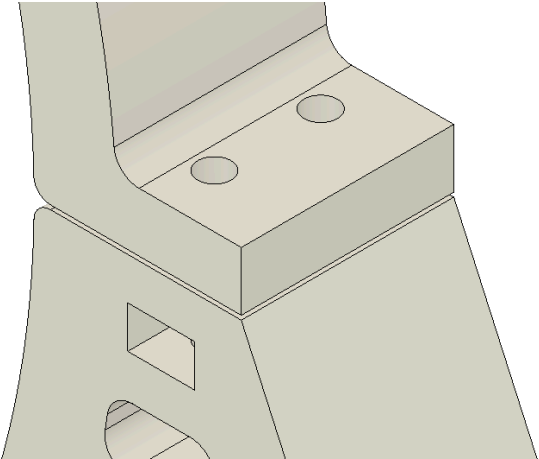
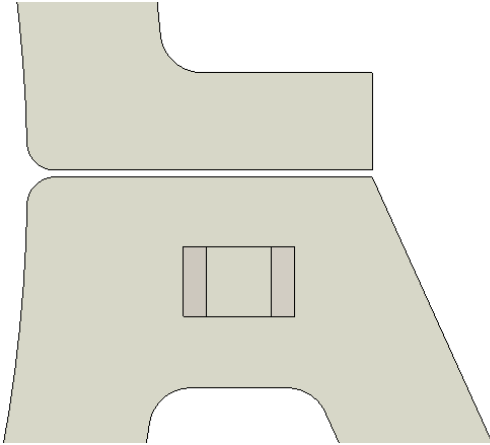
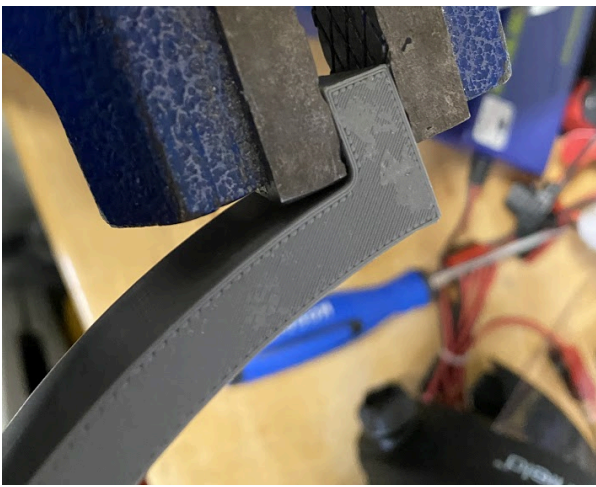
Assembled the batter holder. Can see the nested nuts incorporated into the battery clamp design

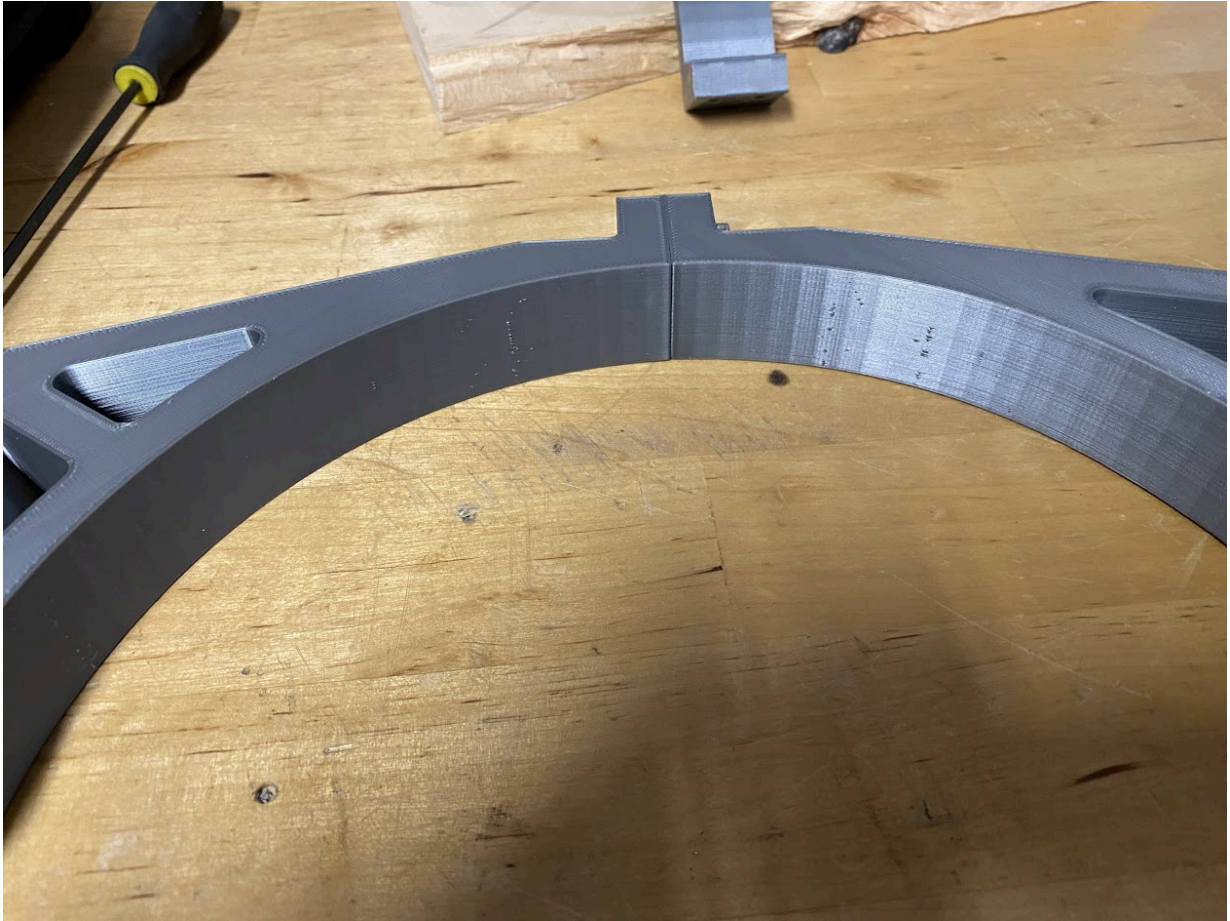


Mounted the battery clamp onto the bottom of

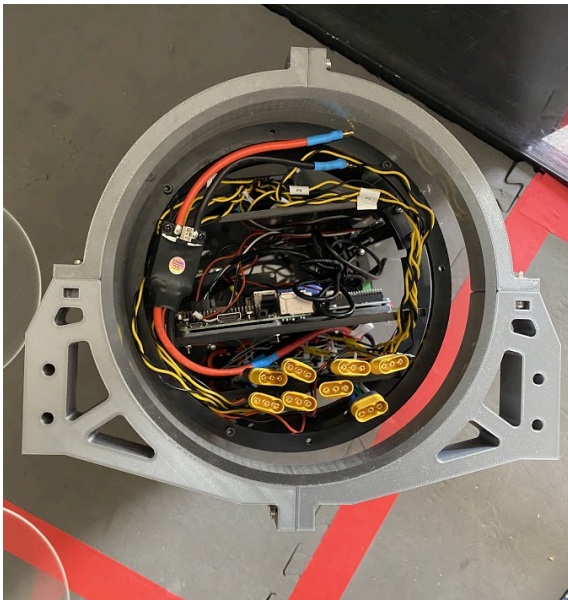


Used a 6in block to prop up the enclosure.

the motor. Ideating how to place the enclosure perpendicular to the length of the robot	There is clearance between the propellers and the table.
5/13/21 Editing Tolerances	
	
Keeping the bottom arc the same radius, introducing a 0.5 mm gap between the top clamp and the bottom clamps to ensure that the enclosure is clamped well	
Stored here: D:\.....RoboSub 2021\5_14_21 smaller clamp	
5/10/21 Assembly of Enclosure Clamps	8 in enclosure holder taking off supports and cleaning up
 Using the clamp to press in the locknuts into the cutouts	 The tolerances of 8 mm in the cad were perfect



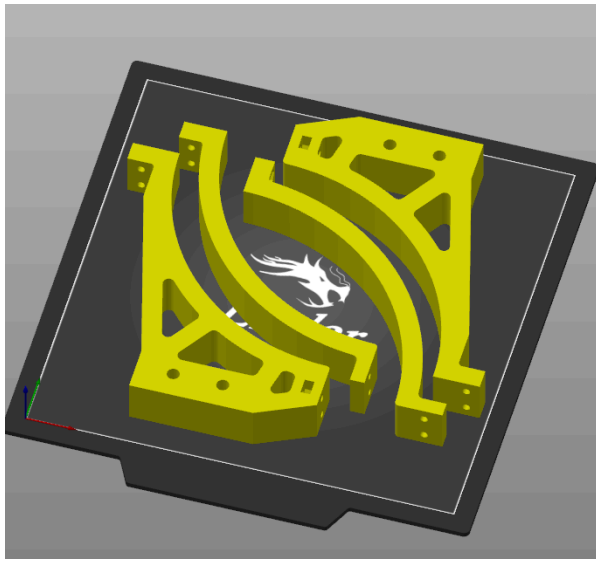
There were some roughness on the insides of the enclosure. Used p100 grit sandpaper to take the roughness out



Perfect fit on the enclosure around the 8 in tube. It is a bit too perfect, the clamps are not clamping down on the enclosure and therefore can slide up and down the enclosure. We can use dycem (kitchen mats) to introduce compressible materials to ensure a clamping motion. We could also reduce the decrease the tolerances for a tighter fit of the clamps and the enclosure

5/9/21 3D Printing Enclosure Clamps

8 in enclosure holder



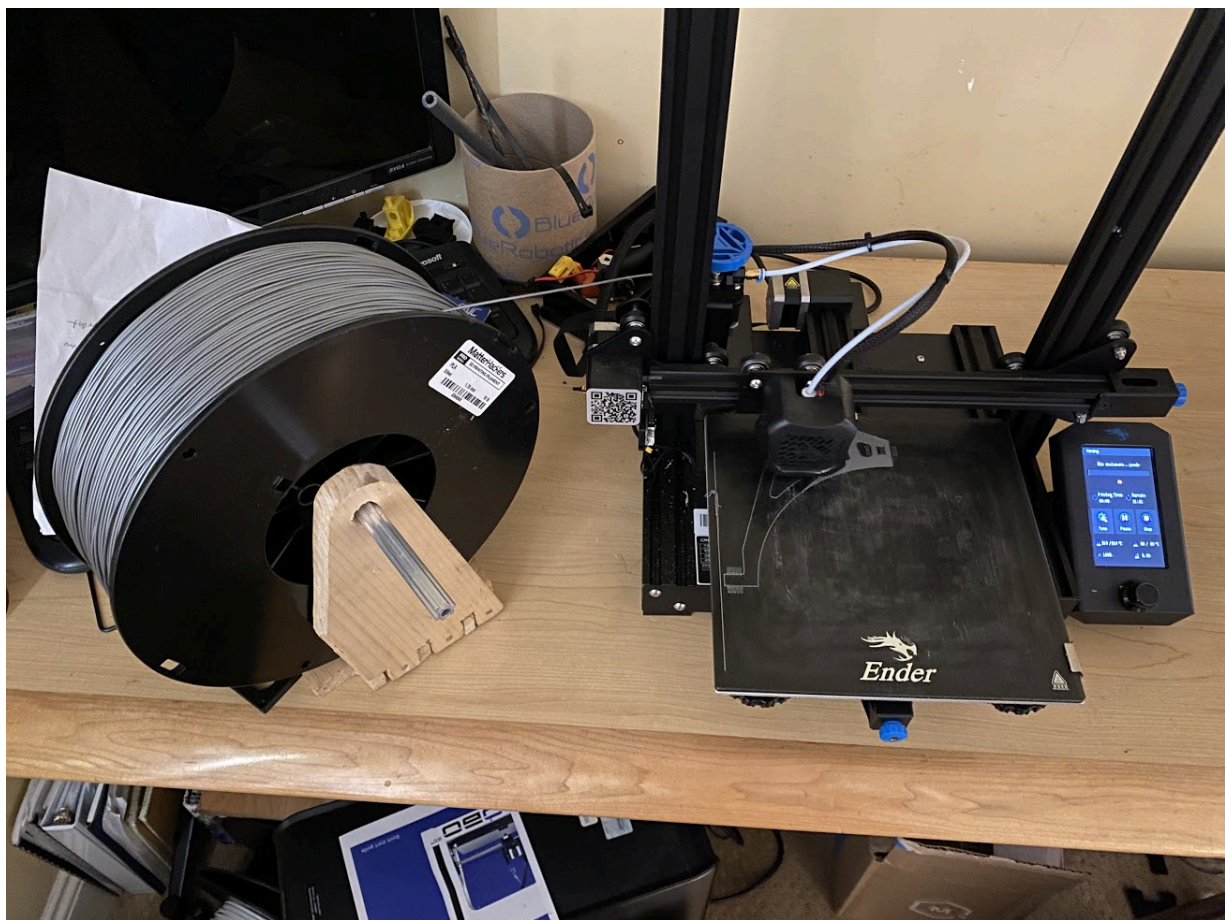
All components can fit in the build plate

☆ User Parameter	thickness	mm	1 in
☆ User Parameter	paddin	mm	10 mm
☆ User Parameter	tubeDiameter	mm	215.90 mm + 0.3 mm

Using the tube diameter _0.3 mm tolerance

In this folder:

"D:\.....RoboSub 2021\5_9_21 enclosure holder\with enclosure tolerance"



Using a bowden tube printer with the 1 kg spool as the stepper motor used to pull the filament is stationary

5/9/21 Assembly of Battery Enclosure Holder

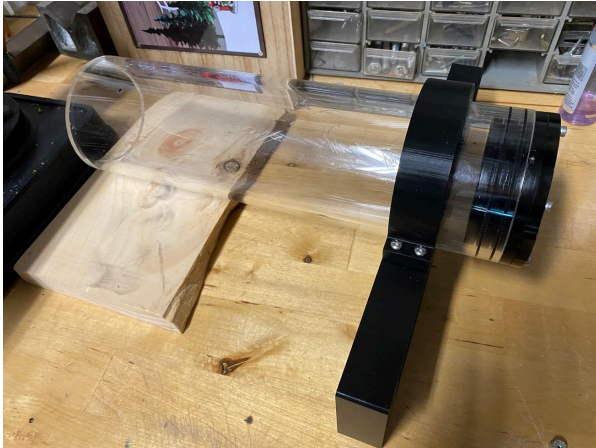
Battery enclosure holder



Observe the difference between the screw styles



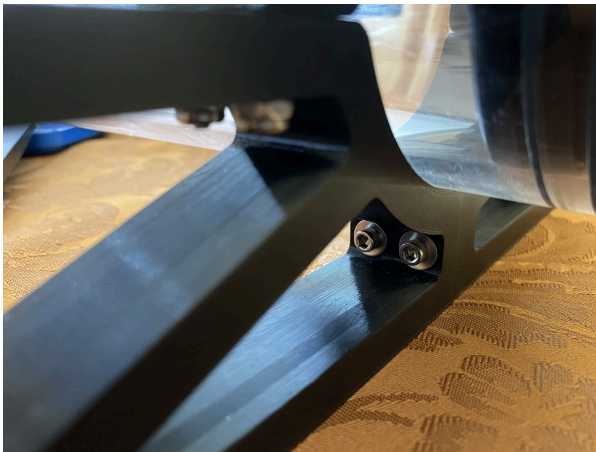
The red circles above show how we need to use the 8mm or 5/16 wrench to hold the nuts before screwing in the screws. For the green circle we can see how we utilized the nested nuts, here we did not need to use the wrench as the nuts were held in with the tight tolerances. For assembly it is better to lightly tighten the screws and nuts to loosely secure the top clamp to the base. Then slide in the enclosure without the end cap into the enclosure.



Using a ~0.5 inch board to support the enclosure while tightening the clamp onto the base.



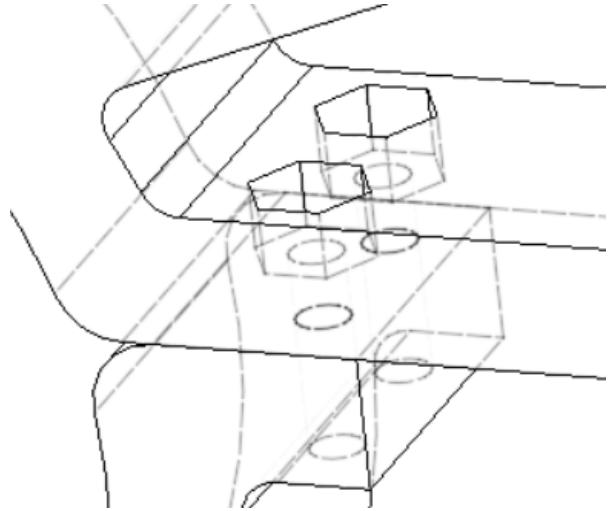
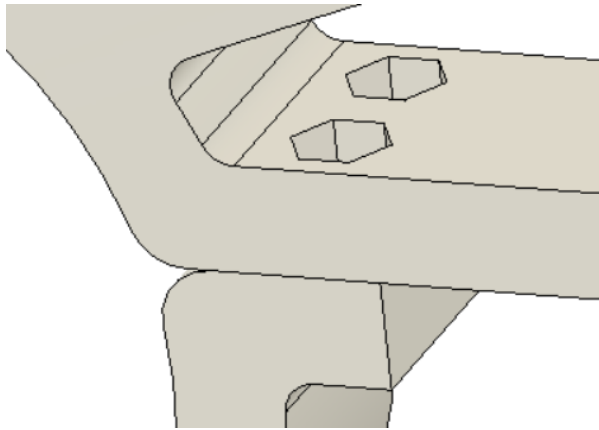
Using 1 inch screws for securing the clamp into the base clamp



Utilizing washers to ensure that the button heads don't dig into the 3d printed base.



No need for the washers for the philips heads which were used on the top clamp as there is a greater surface area of the head.



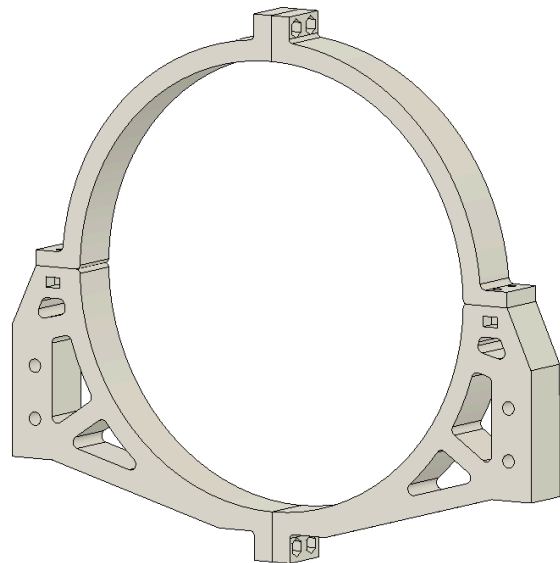
Designing in the spaces for nested nuts for the screws securing the clamp onto the base. This will save the team the trouble of needing to use a wrench when interacting with the clamp

Found in directory: "D:\.....RoboSub 2021\5_9_21 3D printed battery holder nested nut"
On Colin's computer

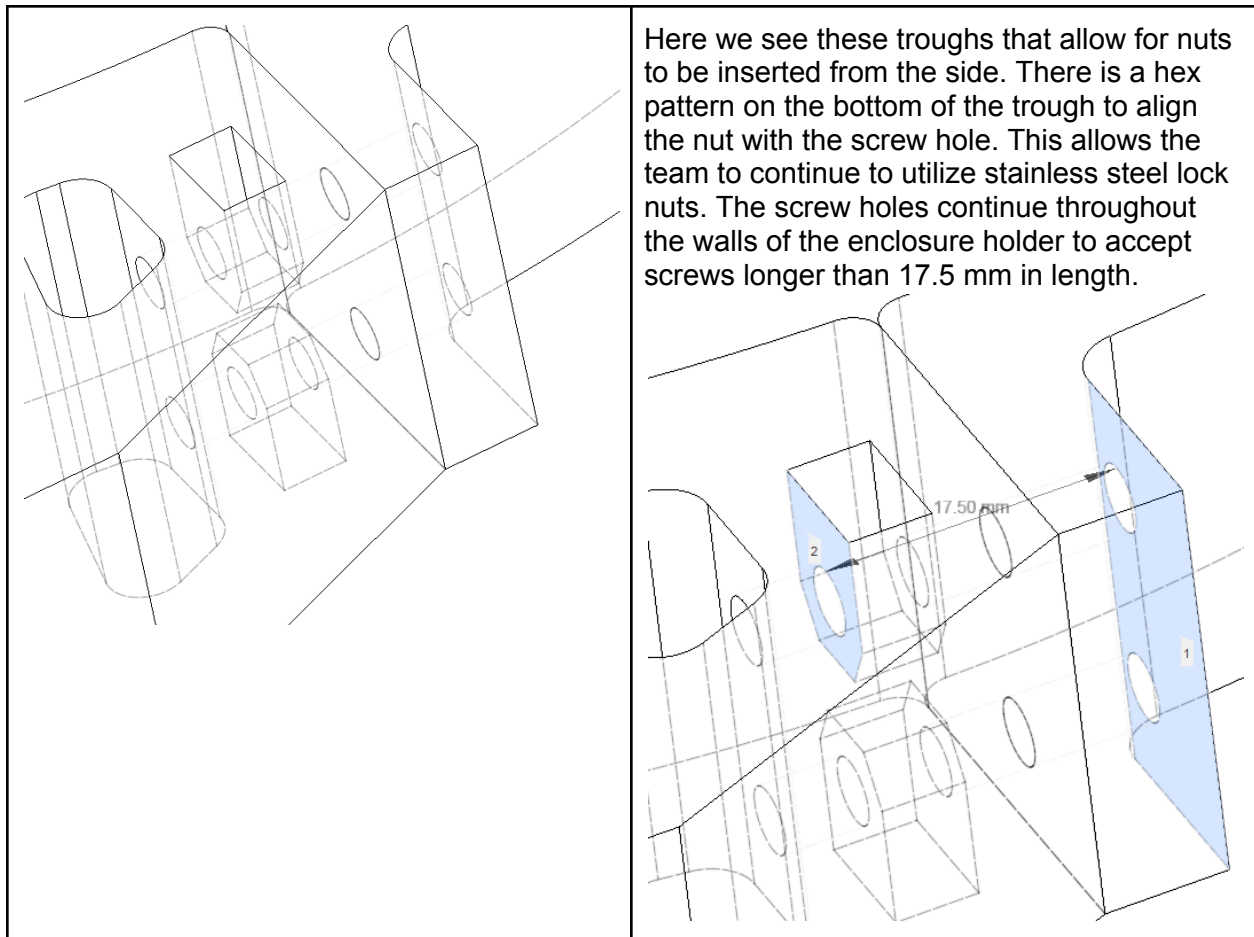
5/8/12 Designing 8in Enclosure Clamps

8 in enclosure holder

Took inspiration from previous geometry as seen [here](#)



Created an enclosure holder that consisted of 4 3d printed pieces. This is to allow for each part to fit within our printer. See files [here](#)



5/8/21 Editing Tolerances of Battery Enclosure Holder

Battery Enclosure Holder

☆ User Parameter	×	thickness	mm	30 mm
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☆ User Parameter		thickness	mm	1 in
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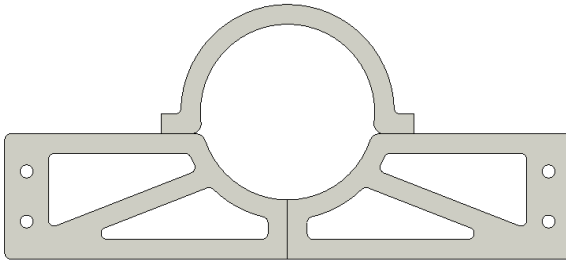
25.40 mm thickness

Decreasing the thickness of the enclosure mount to better it

☆ User Parameter		diameterenclosure	mm	89.06 mm
☆ User Parameter		diameterenclosure	mm	89.06 mm + 0.3 mm

Increasing the tolerance of the clamping portion to ensure that the enclosure can fit.
Tolerances from [Link](#)

5/2/21 Initial Design and Fabrication of Battery Enclosure Clamp



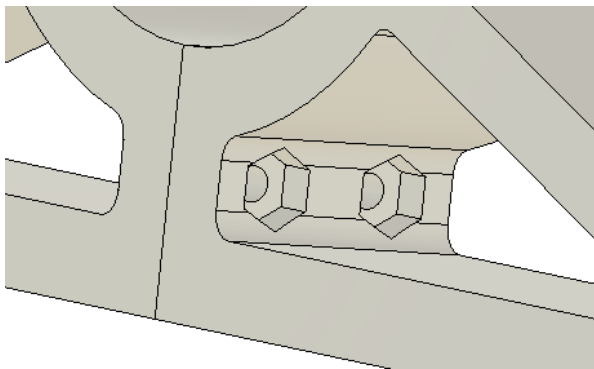
Front view of the design

Notes from today:

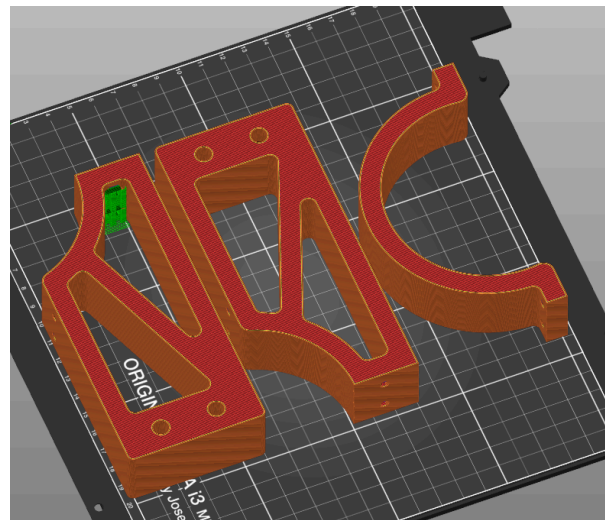
"4101" of 90 angle bracket for sub
89.06 mm diameter of the enclosure

Interactive link of the battery enclosure holder

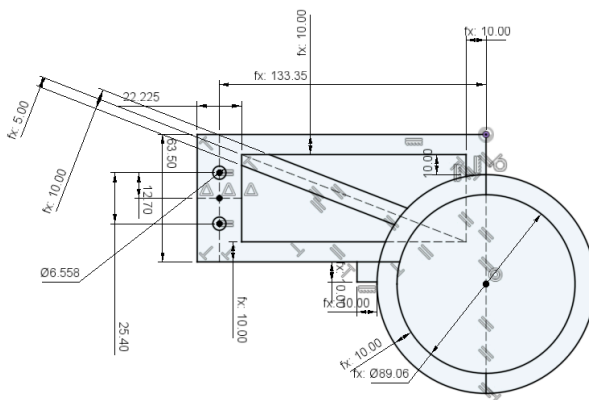
<https://a360.co/3gWe0dp>



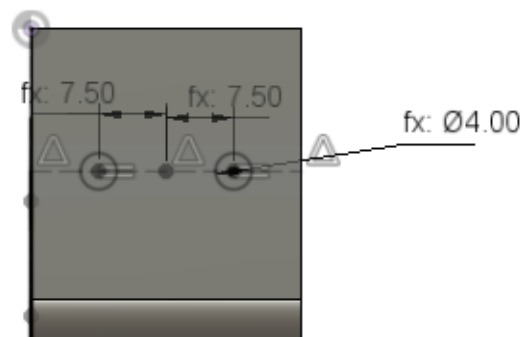
Designed for captive nuts as this is a tight space to fit a wrench to secure the nuts while tightening the screws.



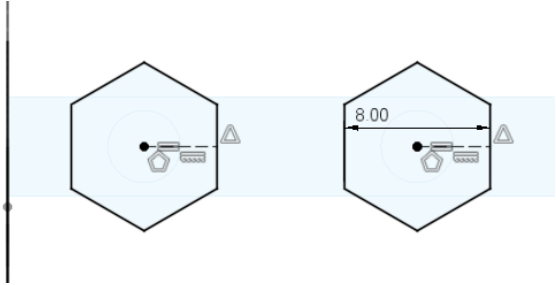
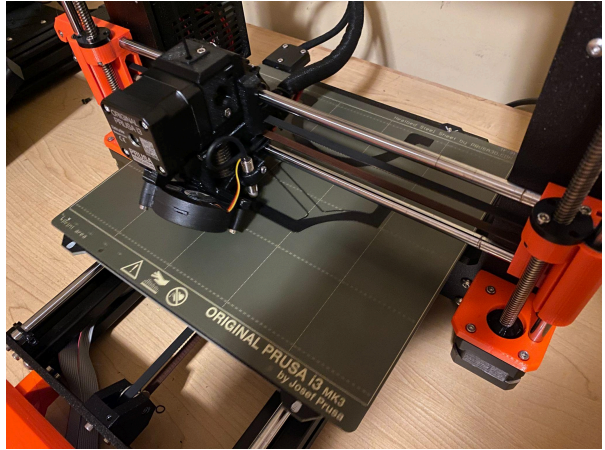
Everything fits on the build plate



Screws of front view if needed to be transferred CAD programs



Holes for securing base to base

 CAD dimensions of the extrusion inware to hold the nutes	 Printing on the prusa i3 mark 3 at the teammates house
If there are breaks in the component then we will increase the amount of shells the part has	Found in this folder on Colin's computer: D:\.....RoboSub 2021\5_2_21 3D prints Enclosure