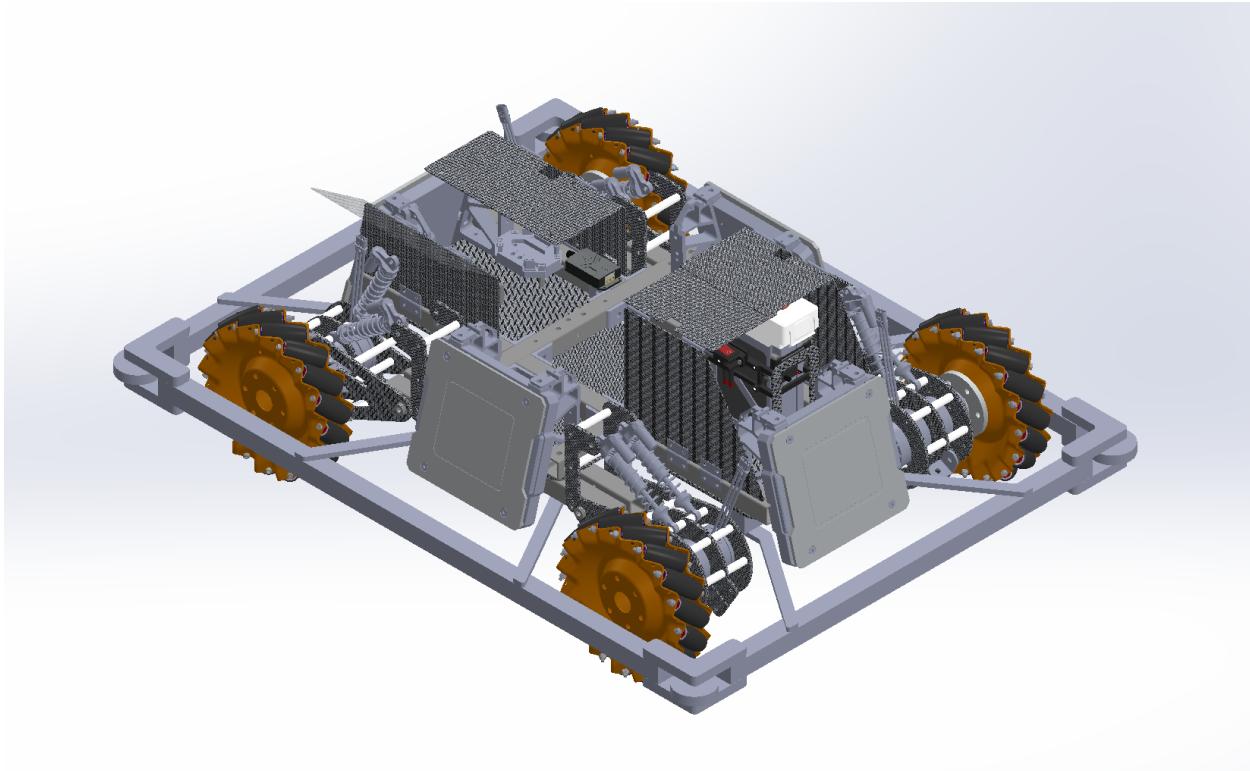
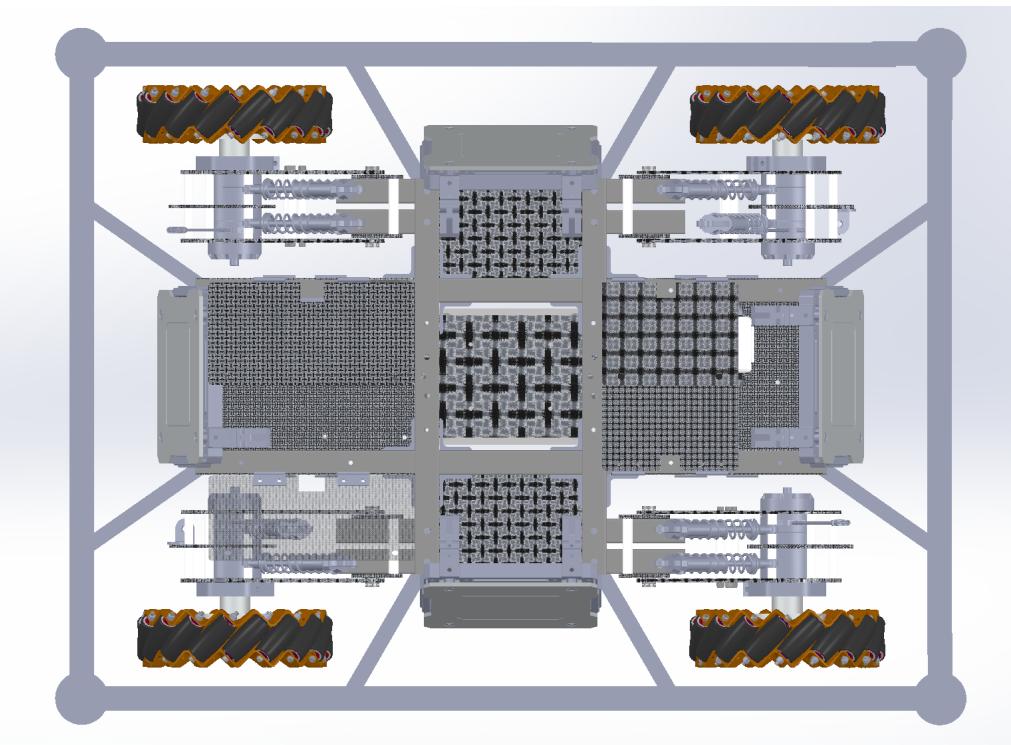


Infantry Protector Design v1

Written By: Roger Nguyen



(isometric view)



(top view and bottom views)

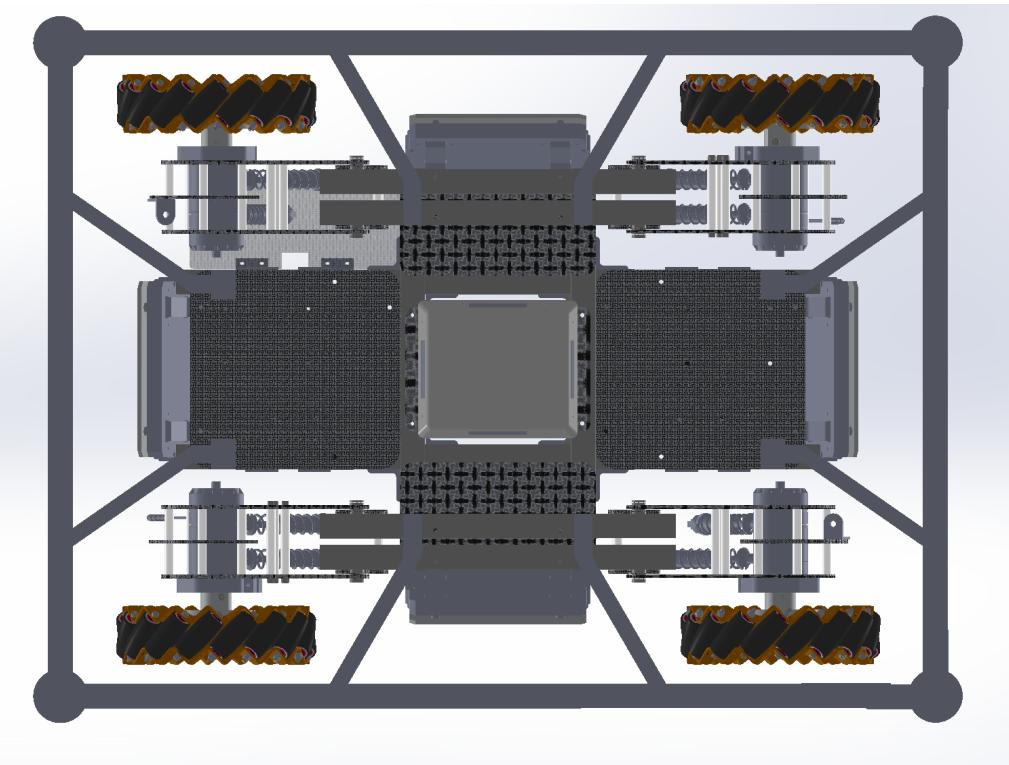


Table of Contents

[1] Abstract	4
[2] Parts	4
[2.1] Mounting Brackets	4
[2.2] Mounting Block	7
[2.2.1] Material Used For Mounting Block	8
[2.3] Square Tubing	9
[2.4] Roller Mounting Bracket	12
[3] Other Details	15
[3.1] Holes	15
[3.2] Roller	17
[3.3] Screws	18
[4] Re-Design Considerations for Protector	18
[4.1] Size	18
[4.2] Trapezoidal Bracket Shape	20
[4.3] More Rollers	22
[5] Re-Design Considerations for Chassis	22
[5.1] Size	22
[6] References	23

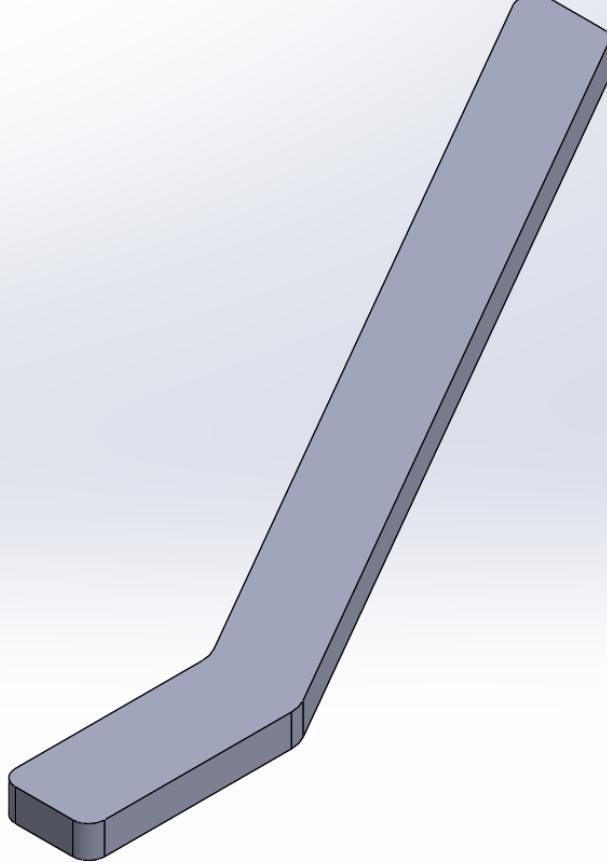
[1] Abstract

This is the initial design that was made for the Infantry Protector. The role of the protector is to protect the infantry and the field from collisions. The materials used for the initial design will be acrylic which is used for the mounting brackets, aluminum square tubing which is used for the protector itself and mounting block, and roller which will be at the corners.

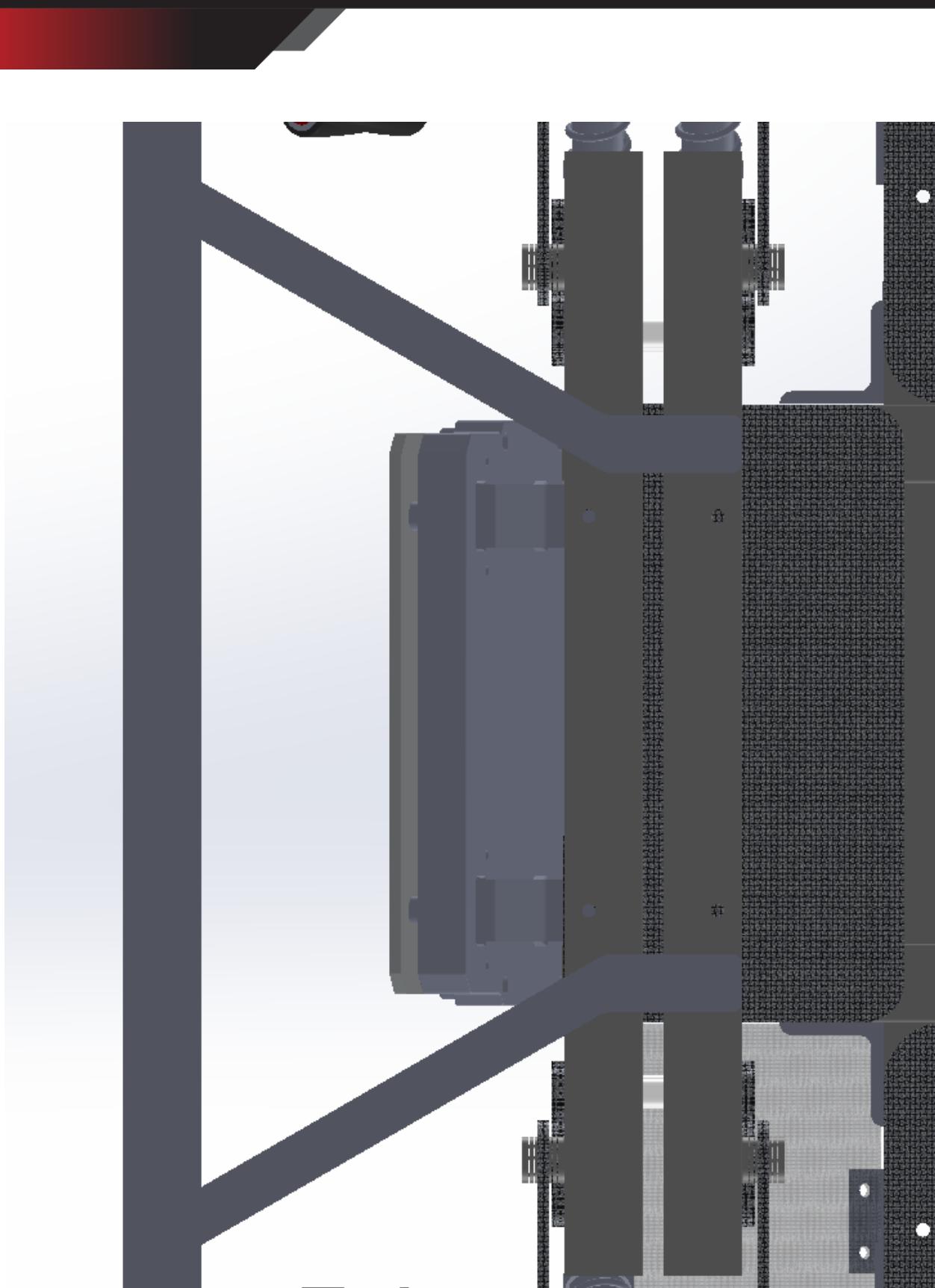
[2] Parts

The parts do not yet include holes and most of the dimensions are not intentional; this is just an initial design.

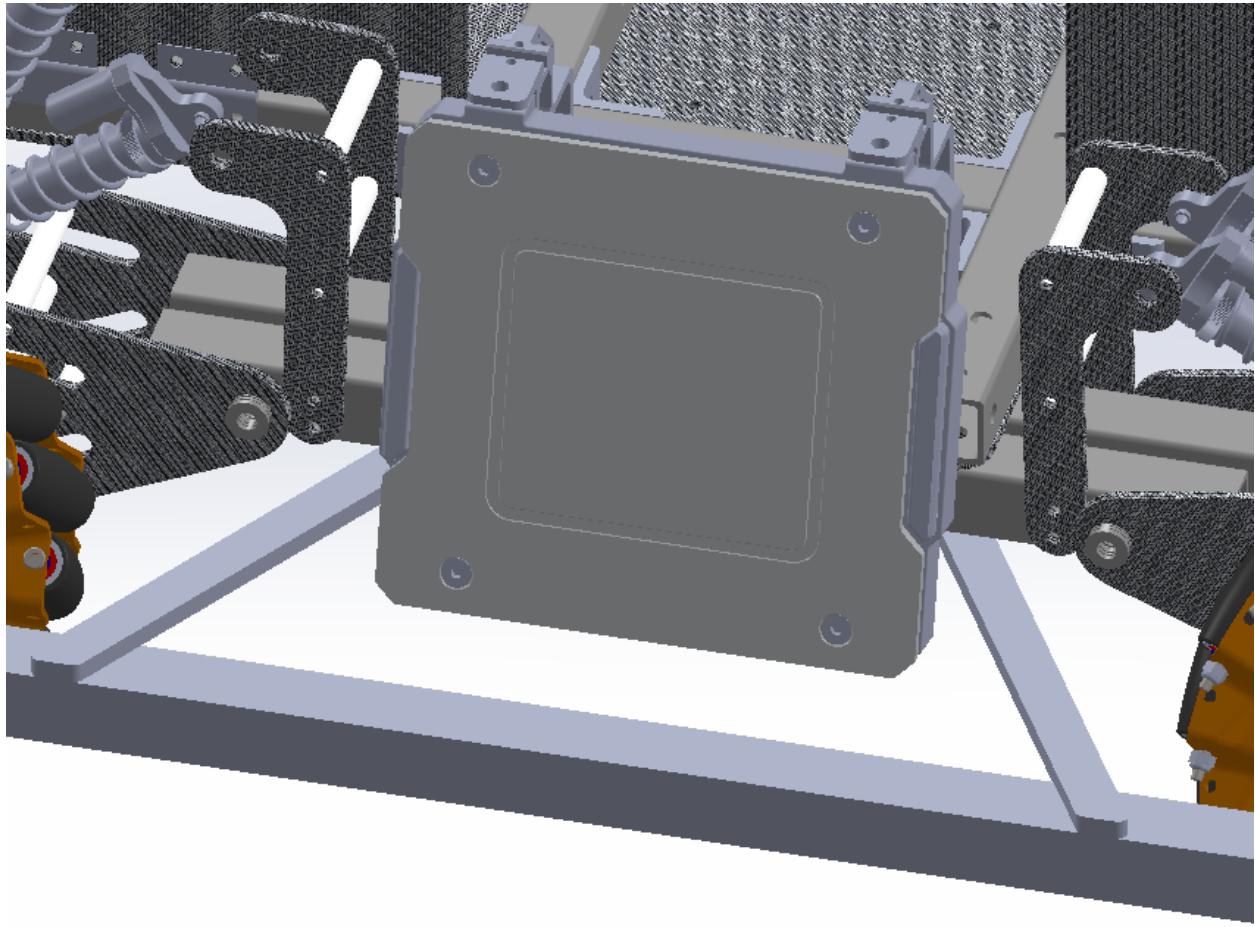
[2.1] Mounting Brackets



- This is the mounting bracket in an isometric view. There are two different configurations: one for the rear and one for the front and back of the chassis.

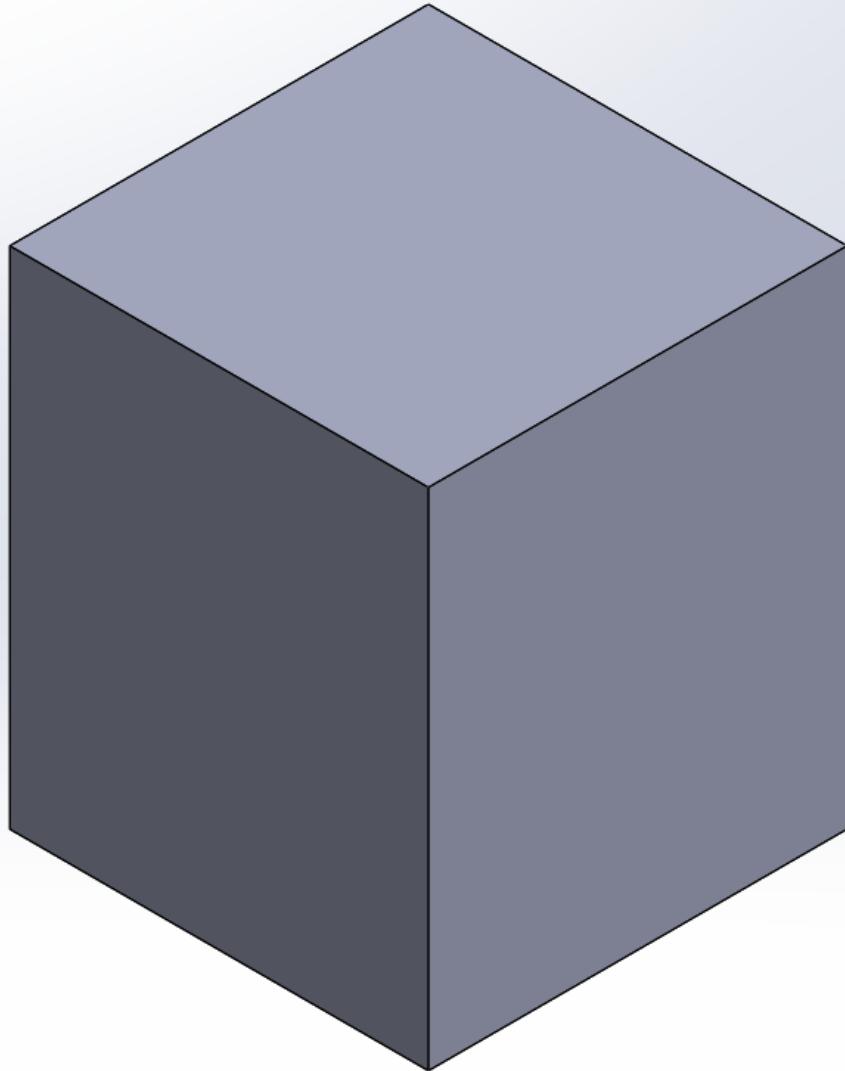


- The mounting bracket will be connected to the underside of the square tubing that mounts the small armor module.

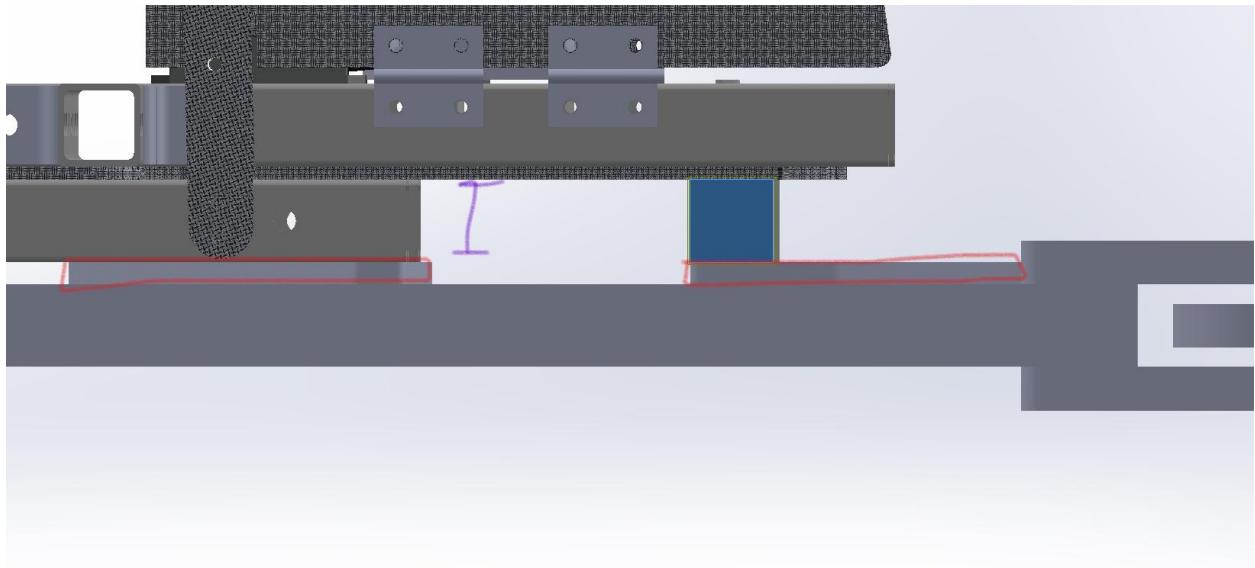


- The mounting bracket will connect to the top of the square tubing.

[2.2] Mounting Block



- The mounting block is used because otherwise the mounting brackets would be at different heights.



- On the rear sides of the chassis, there is square tubing underneath to support the suspension. The absence of this square tubing in the front and the back cause an uneven level for the mounting brackets to attach to the chassis (the purple dimension). The inclusion of the mounting block (highlighted in blue) allows the mounting brackets to be on the same level (red).

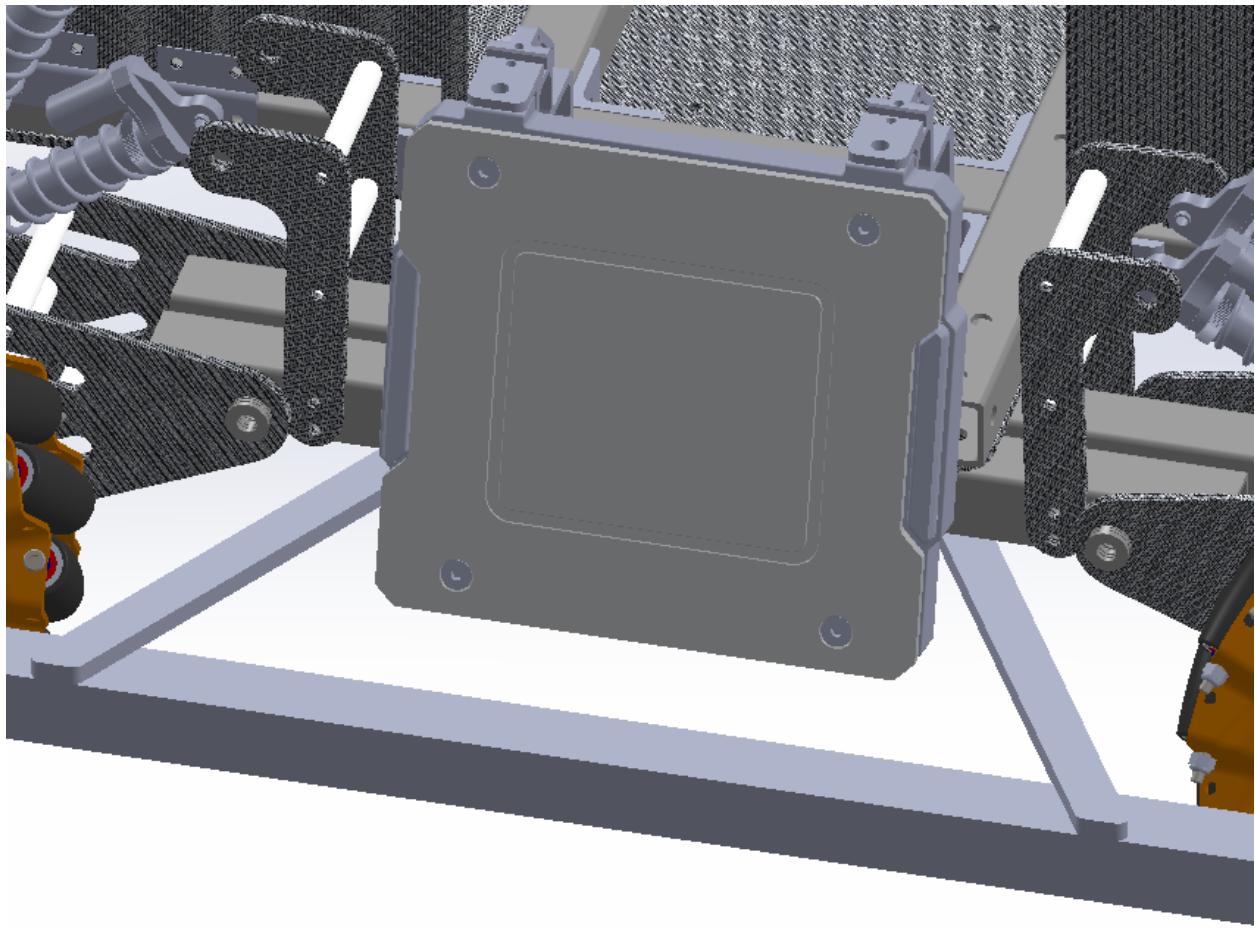
[2.2.1] Material Used For Mounting Block

- The block height is 19.05 mm, which is the distance needed for the brackets to be on the same plane. This is the exact height of the square tubing that will be used; it's the same square tubing used in the chassis. I'm specifying this section because the CAD model of the block does not look like square tubing.

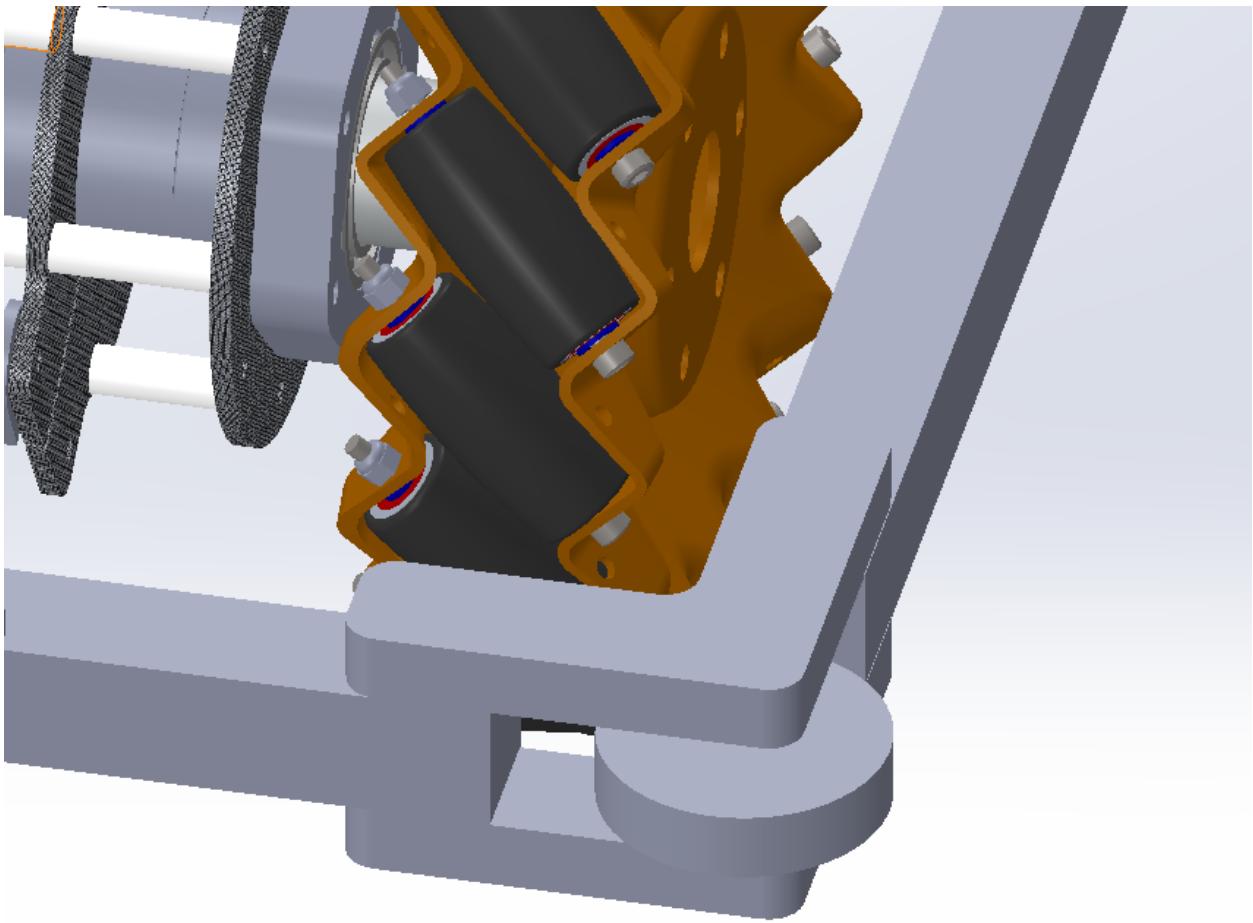
[2.3] Square Tubing



- The square tubing used will be the same used in the chassis, which is 3/4" in side length.

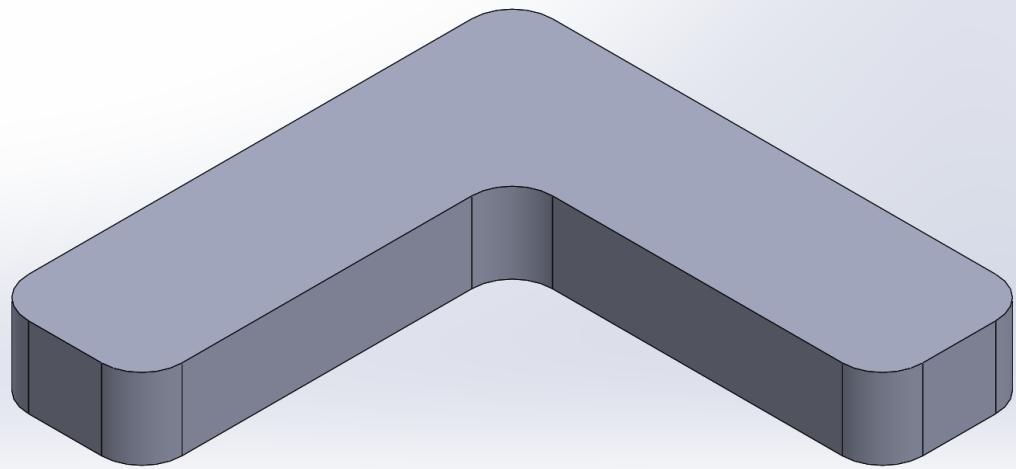


- As mentioned above, the square tubing will be attached to the mounting bracket.

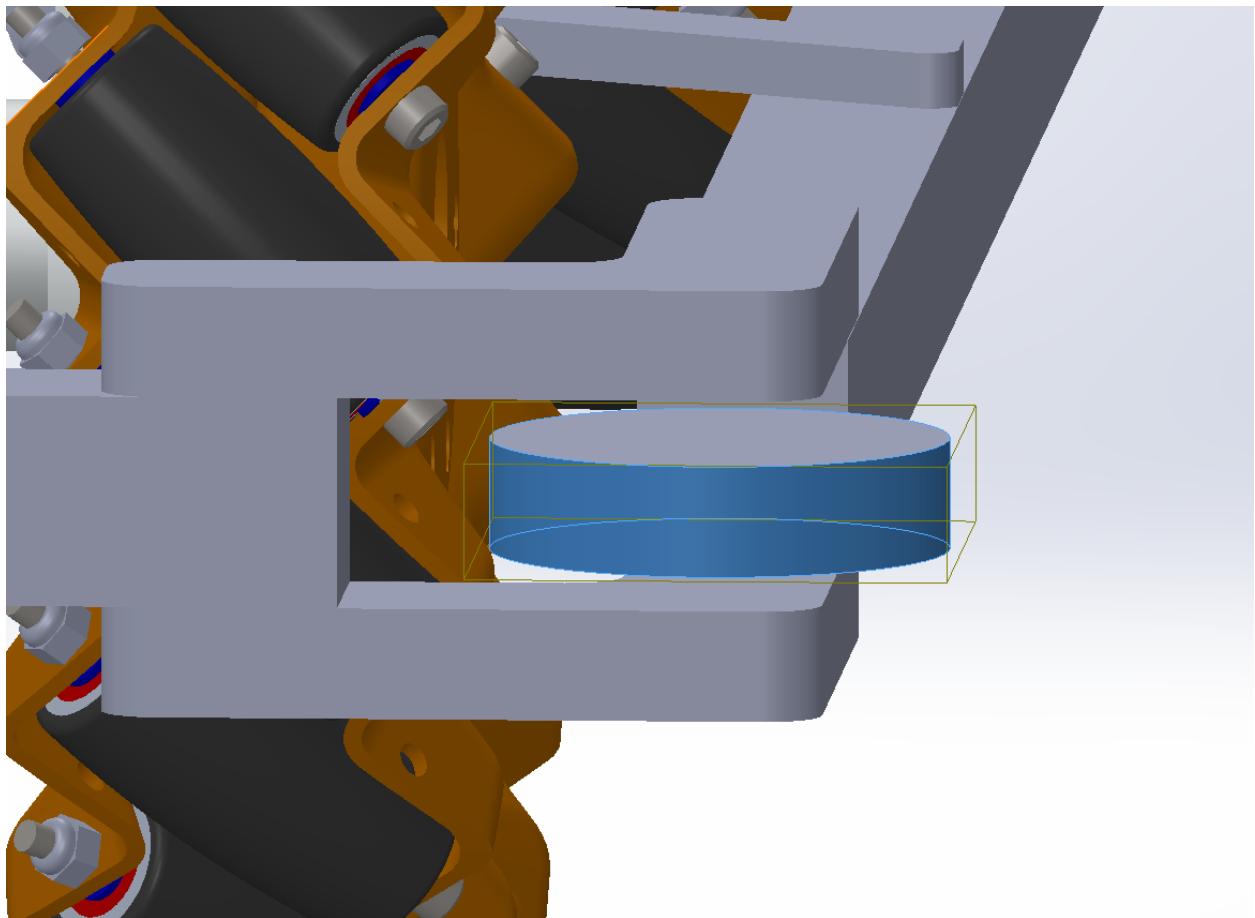


- At the corners, the square tubing will be attached to the roller mounting brackets that will hold the roller

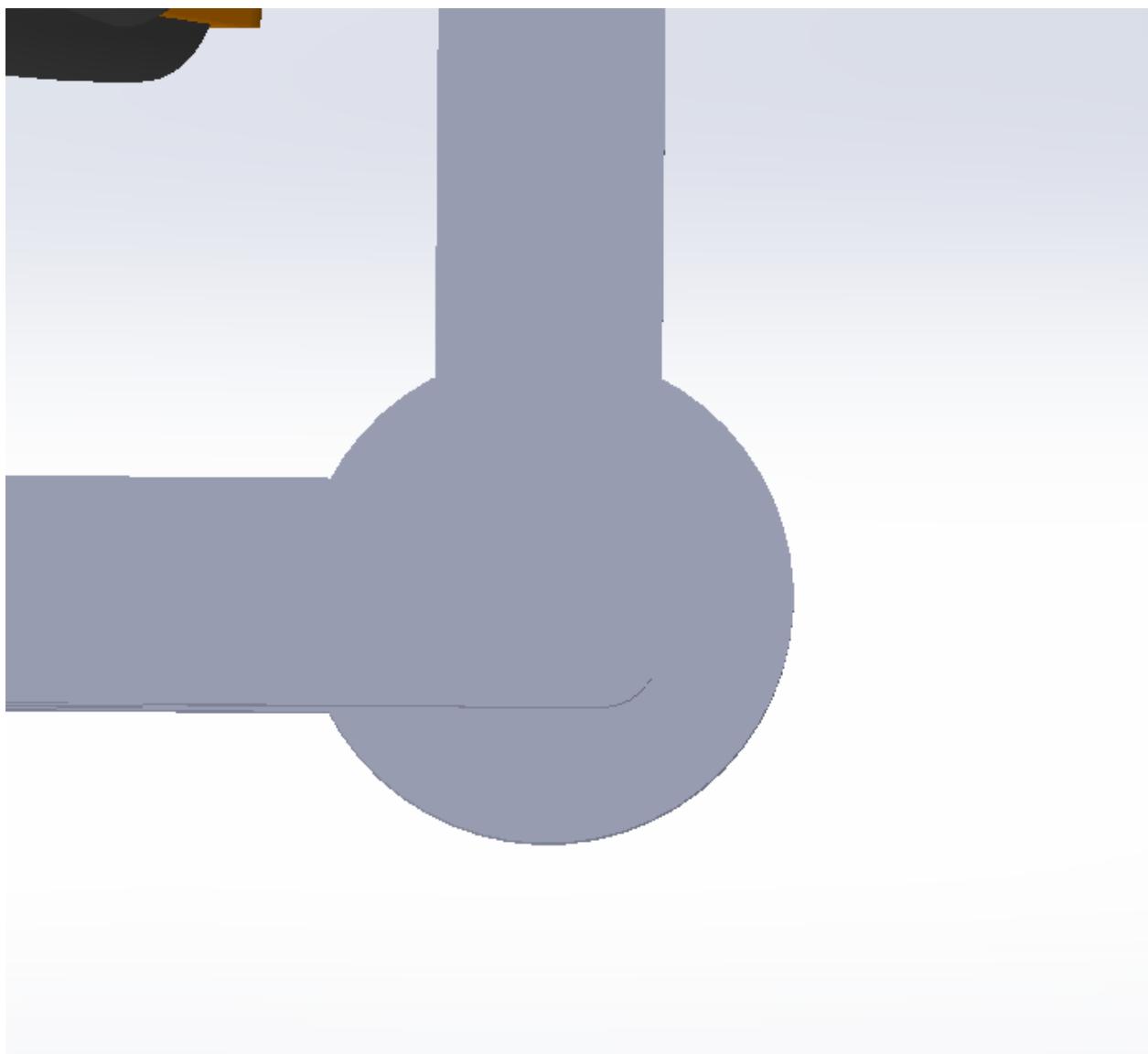
[2.4] Roller Mounting Bracket



- The roller mounting bracket—as mentioned above—will be used to attach the rollers to the protector.



- The roller (highlighted in blue) will be connected to the bracket via a screw that will be through both brackets

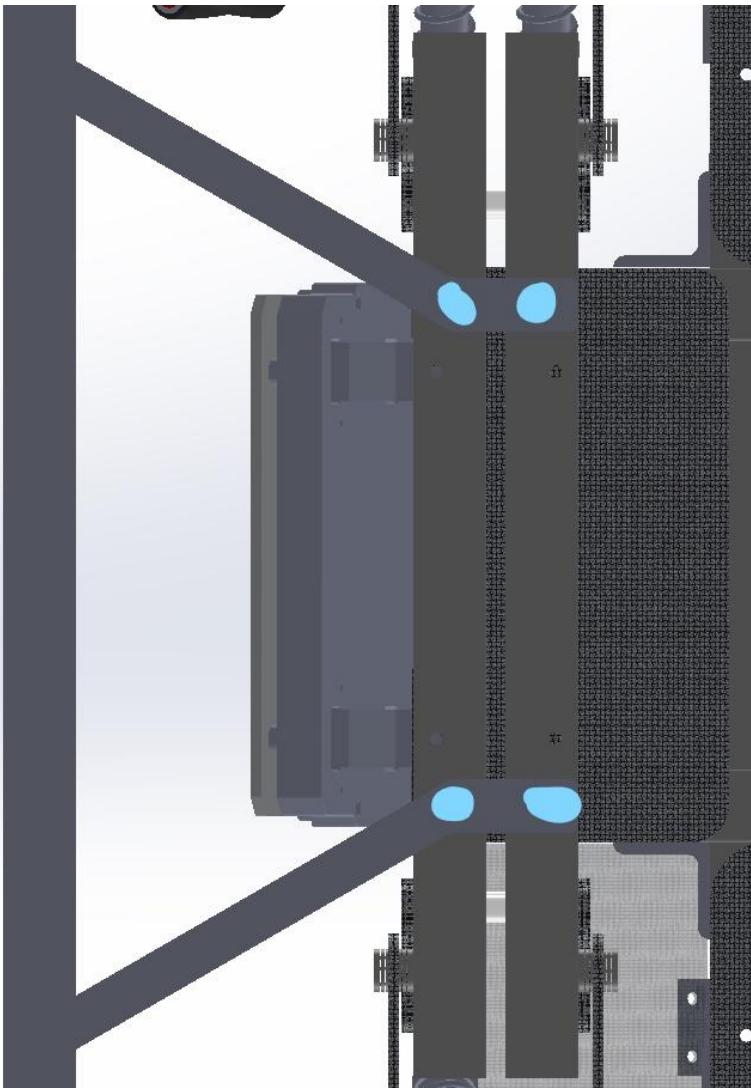


[3] Other Details

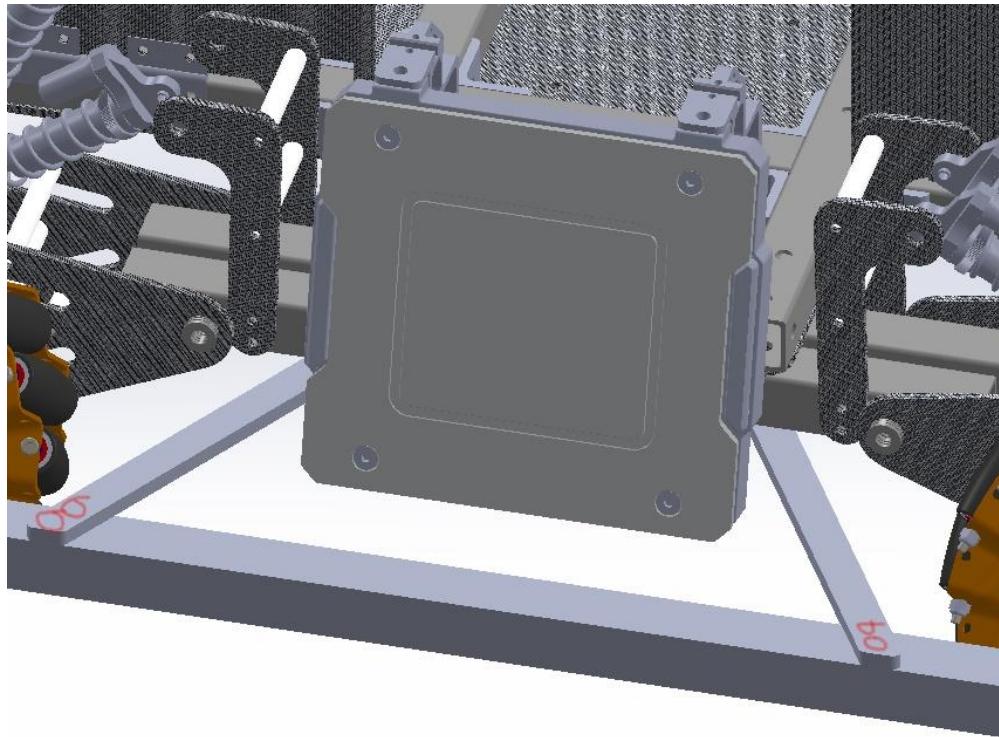
All the details that haven't been mentioned but have been considered by me will be in this section

[3.1] Holes

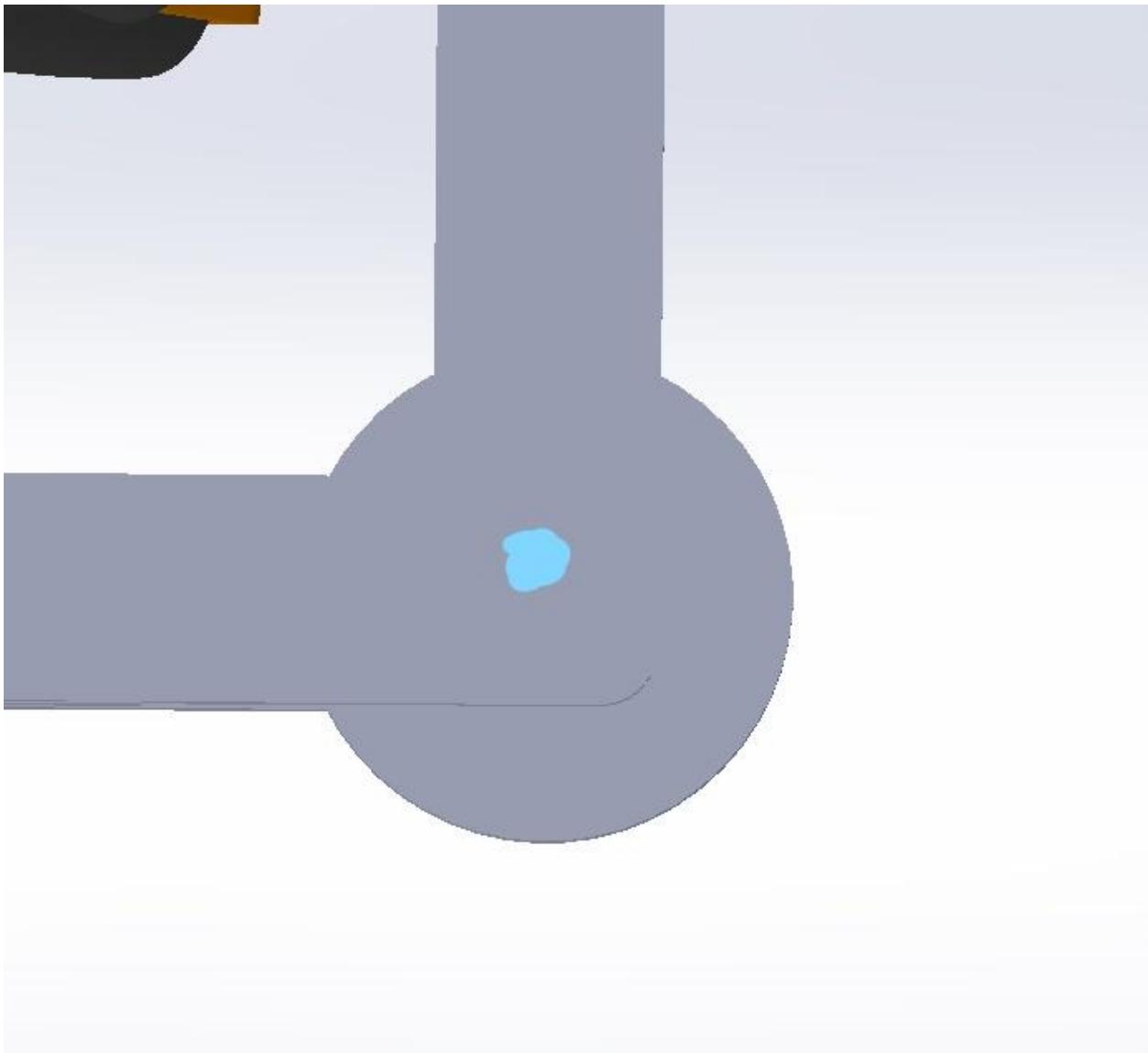
- What I'm considering for the mounting bracket and the square tubing is M5 in these locations



- For the mounting bracket, the holes (marked in blue) are already there. We will just need to use a longer screw.



- The holes (marked in red) seem a bit unstable. What could be done is to make the two brackets into a trapezoidal shape to add more stability and then more holes will be involved.



- The hole for the roller mounting bracket depends on the inner diameter of the roller purchased.

[3.2] Roller

- I have not looked at any sites to find a roller, but I've been inspired by those on the benches and seats at the gym RIMAC, so I'm considering ones that look like these.





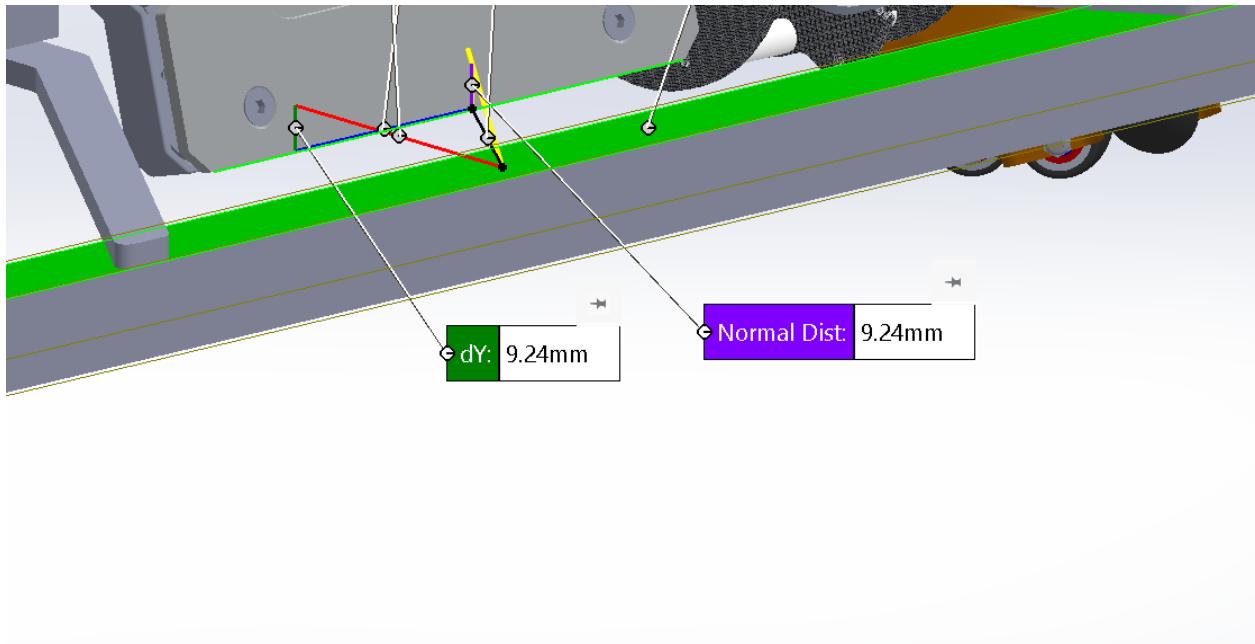
[3.3] Screws

- For the mounting bracket and block, I'm not making new holes on pre-existing parts. I'm using pre-existing holes that will be used to connect the bracket and block to the chassis. I have not checked if we have a screw length of length X, X being the length needed. Me not knowing the dimensions should tell you that I haven't considered it before I made this document and that we probably need some long screws.

[4] Re-Design Considerations for Protector

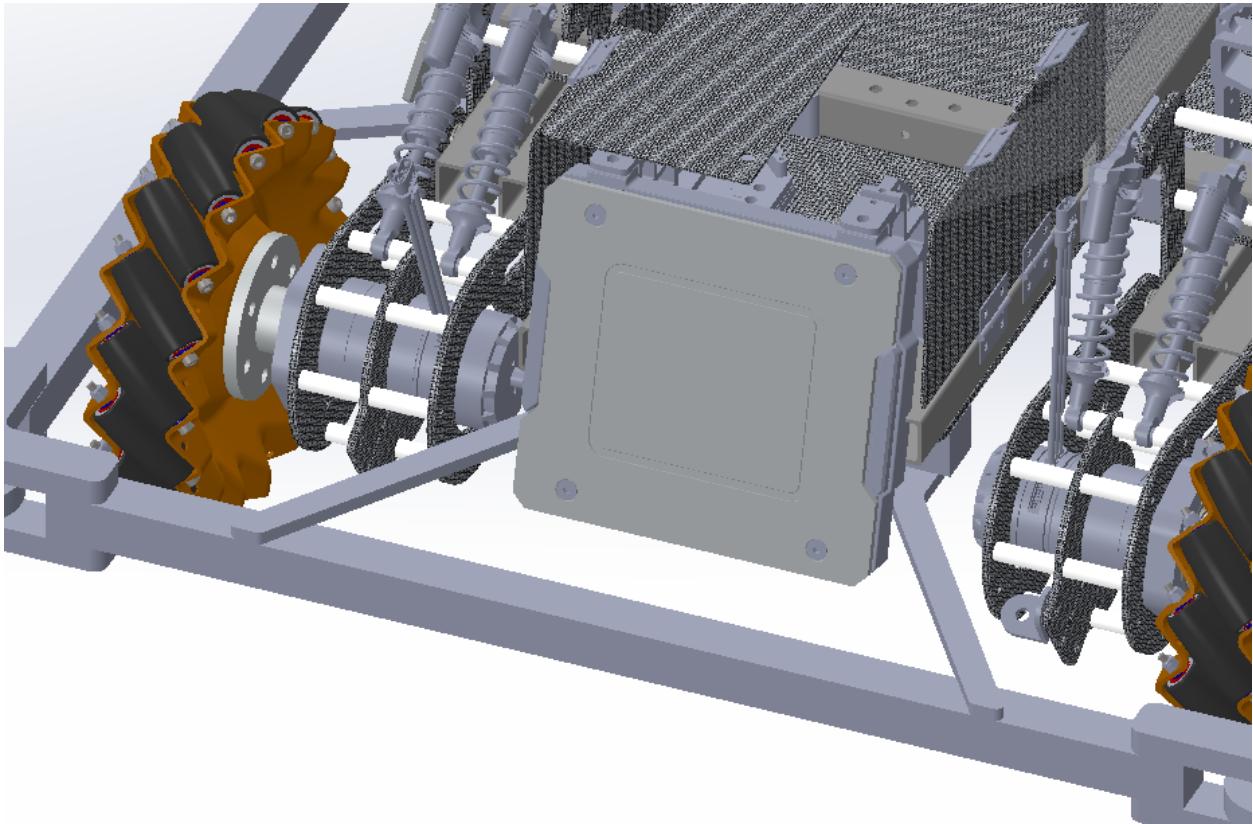
[4.1] Size

- The current infantry design with the protector is over the LWH constraint of 600mm*500mm*800mm (the units will not be included in the rest of the commentary). The current dimensions are 707*541*H, where H is still undetermined because the turret CAD is not fully complete. Without the protector, the dimensions are 580*435*H. With the current chassis model, this gives the protector a length of 20 mm and width of 60 mm to work with. **Since the protector is designed with the plan of using 19.05 mm square tubing, either the chassis will need to be re-designed to be smaller or the protector will have to be significantly smaller to account for the extra space taken up by the rollers.**

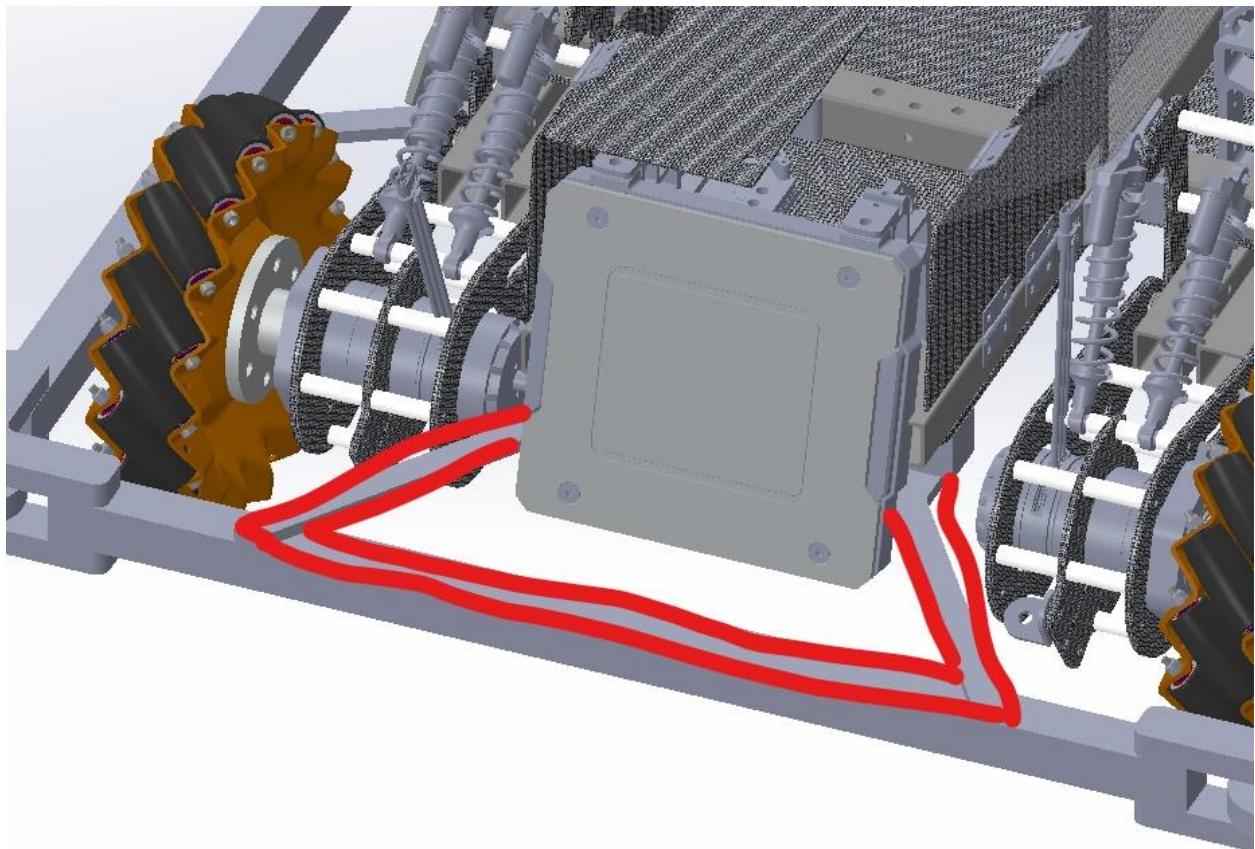


- Currently, the square tubing is above the bottom-most point of the small armor module. Either the square tubing will need to be lowered, the armor module will need to be moved up, or most likely, the section of square tubing in front of the armor module will need to be removed and the mounting bracket will need to be further supported.

[4.2] Trapezoidal Bracket Shape

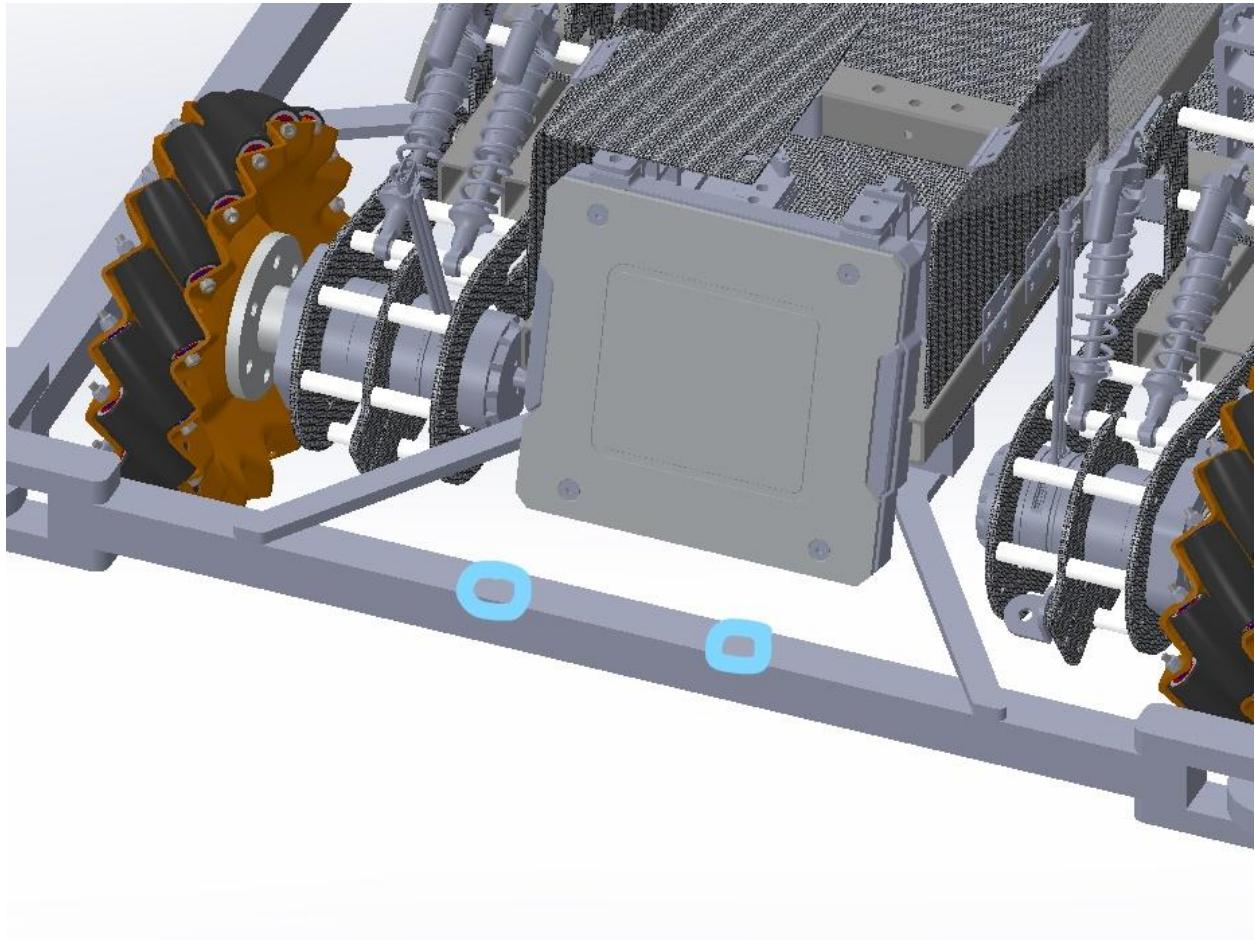


- The prototype will be using acrylic and with this current design most likely will yield during collisions. In the final design, carbon fiber will be used.



- A design consideration for the mounting bracket is to make the brackets into a trapezoidal shape to make it less prone to yielding during collisions.

[4.3] More Rollers



- In order to further protect the chassis, extra rollers could be added to the front, back, and rear sides of the protector (the blue circles indicate where the rollers could potentially be).

[5] Re-Design Considerations for Chassis

[5.1] Size

- As I mentioned in section 4.1, the dimensions of the chassis without the protector are 580*435*H. With the current chassis model, this gives the protector a length of 20 mm and width of 60 mm to work with. Realistically, changing the size of the chassis will be better for the protector because the length constraint is an issue.
- The armor module needs to be moved higher (refer to section 4.1). Currently, the square tubing is above the lowest part of the armor module. With 0.125 inch thickness, the acrylic mounting bracket (which will be used for prototype) and the square tubing will block the armor module.

[6] References

- 2020 Shanghai Jiatong University Infantry