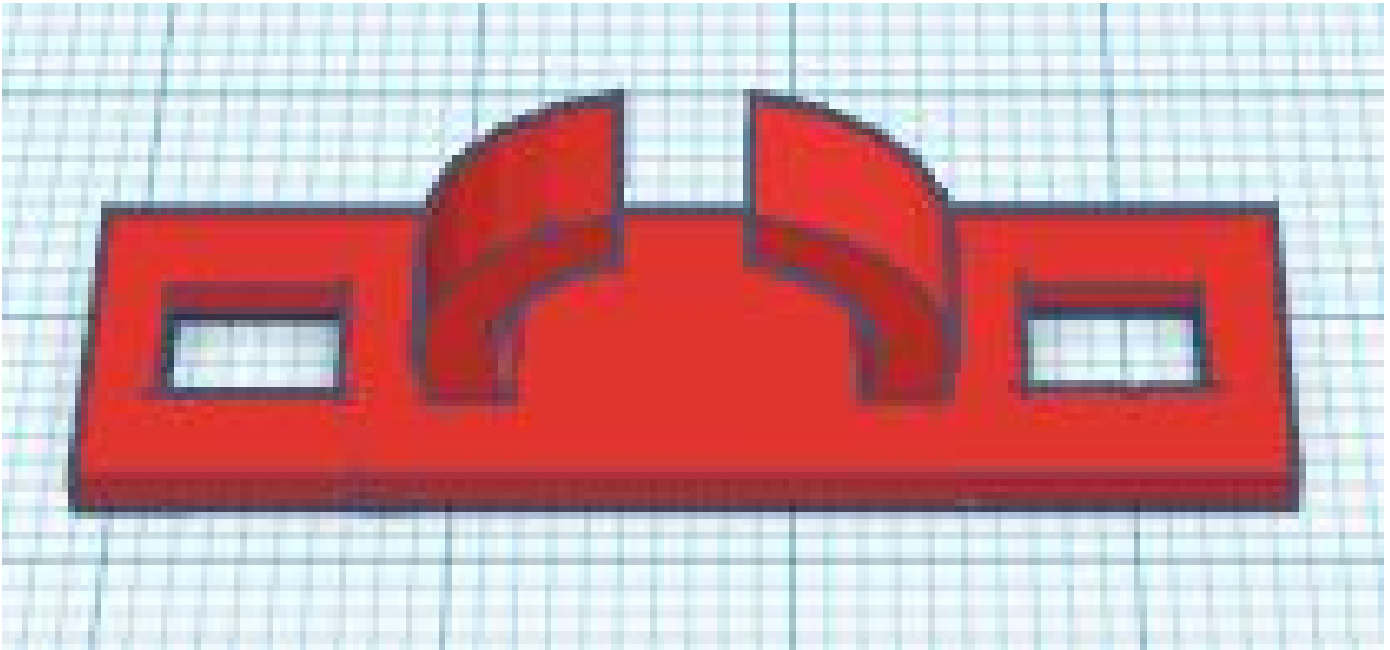


Rubber Band Hooks

RoboVulcans #90707A



- **Problem:**

- In VEX, there are many instances when the robot needs rubber bands. Rubber bands have a spring-like property that makes them usable for latches, triggers, and return mechanisms. Rubber bands can also add tension which is helpful in robotics. However, there is one consistent problem with this approach, how to keep them on the robot? The only answer we got when we asked this was zipties. However as we began to use zip ties, we found that they had many problems. Not only did you need to use an excessive amount of zip ties to attach the rubber bands, but zip ties also break extremely easily, which can result in your robot breaking apart during a competition. We also figured out that zip ties could be harmful while building due to sharp edges, and even disrupt the robot while it's moving. Our solution, the rubber band hook, will help solve all of these problems, and make using rubber bands safe, convenient, and efficient.

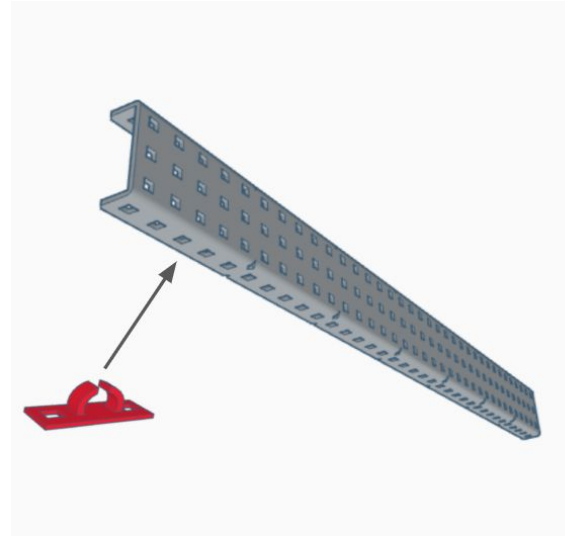
- **Our Solution**

- We decided to make a rubber band hook so that zip ties aren't required. Rubber band hooks can hold multiple rubber bands and unlike zip ties, can be reused repeatedly. Additionally, there are no sharp edges in our design, which helps avoid getting scratched because of it. The design also uses hooks, which makes sure that all of the

rubber bands don't fall off before or during the competition. The hook has two holes for mounting the piece on the robot, and a hook-like mechanism used attaches the rubber bands.

- **How Our piece works**

- To use Rubber Band hooks you will need two rubber band hooks, for each side of the rubber band(s). First you will need to figure out how far the rubber bands need to go and correctly place the hooks on the bars, aligning the holes with the vex bar. Because the hole is in the center, both sides of the hook can be used for the rubber bands so you don't have to worry about the orientation. After that you secure the hook down with screws and nuts. Now, the rubber band hook is ready to attach rubber bands.



- **How did we use Tinkercad?**

- We used tinkercad to design our project. At first, we were leaning towards using Autodesk Fusion 360 as it was a more professional software, however looking at our design we found it easier to use Tinkercad since it was a more simple software and took less time to make. Tinkercad was also a better software for our team because many of our teammates had used this software before and it allowed multiple people to edit at the same time. Because our design wasn't difficult we were able to use basic shapes, such as rectangular prisms, cylinders, and rings to build our design.

- **What did we learn from this project?**

- We learned a lot of things from this project, including the journey of the design process. We learned about brainstorming, prototyping and revising. We also learned that sometimes it's hard to choose from many designs without putting them into work first. For that reason we created another design apart from Rubber Band hooks on autodesk fusion because it was a little more harder. Overall, we learned about how to design and use multiple softwares to create a project that can be used in real life.

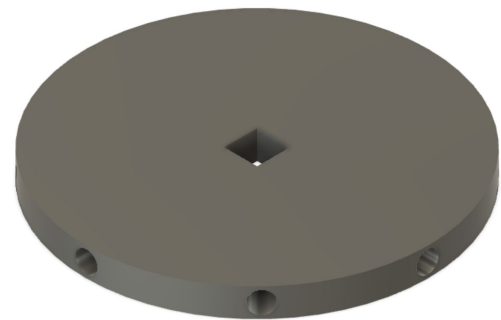
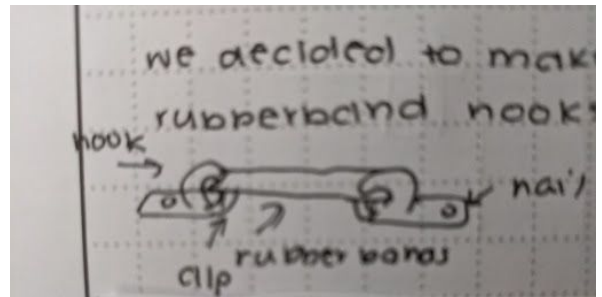
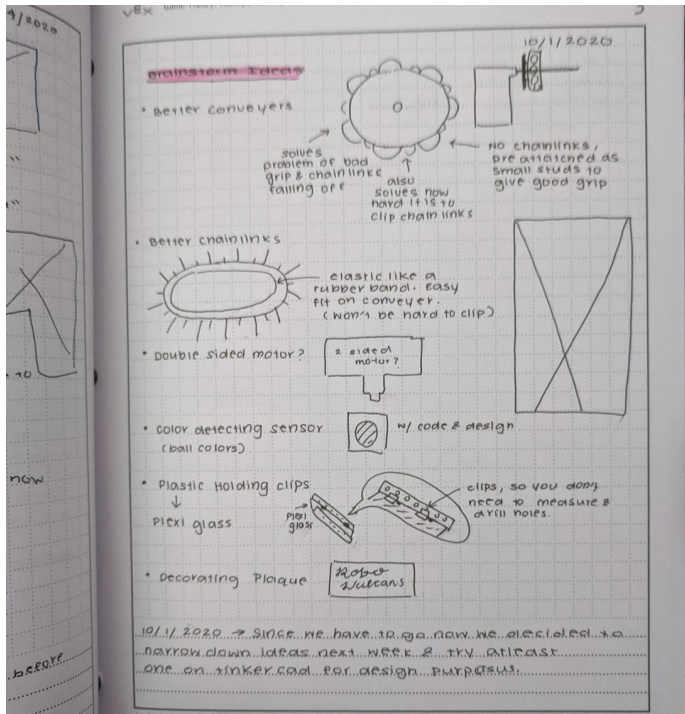
- **Will you use 3D designing in the future? How does this software help in a competitive robotics team, and/or in your career path?**

We will definitely use 3D designing in the future, to make more accurate models of designs we may think of and to help us move forward with robotics. 3D designing is very helpful for visualizing our ideas and looking at them from a new perspective. For this reason 3D designing can help in a competitive robotics team. We can brainstorm our ideas for the robot and 3D model them to see if they will really be useful or not.

Pictures and Animation

Brainstorm Process

We brainstormed by thinking of problems that we encountered during the VEX Robotics Tower Takeover competition. We came up with 1) a gear and peg system that would replace a conveyor belt with flaps and 2) a rubber band clip or hook. We worked on designing both, but ended up prototyping only the rubber band hook due to time constraints.

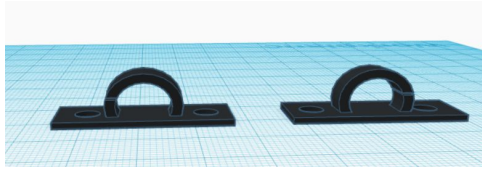


Design #1 → Autodesk Fusion



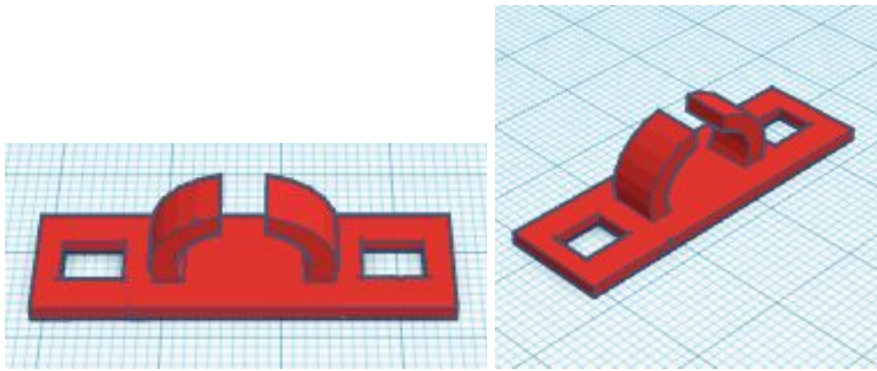
We did not use this design because we thought that the cylinder shape of the hook didn't fit the style that we wanted.

Design #2 → Tinkercad



This was going to be our final design, but when we were 3D printing this design, we realized that our hook holes were too small and our measurements were slightly off.

Final Design



The hole is in the center because it was harder to 3D print the hole on the side. Also with the hole in the center, we will be able to hook on the rubberband from both sides.

3D Print attempts

We used an Ender 3 Pro with PLA filament to print a prototype of our part. For our first 3D print, we realized that our hole was too small so the printer wasn't printing it. For our second print, because the hole was off to the side, the printer couldn't print the flat top correctly due to its being horizontal with no support. So the opening was moved to the center to avoid the flat top, and we tried adding supports for the 3rd print. The supports looked painful to remove, so they were eliminated. The 4th, 5th, 6th, 7th, 8th, and 9th prints were close, but our measurements for the holes size and/or placement were off, so the screws couldn't fit in.



Finally, for our last print, after adjusting the hole widths and placements, the measurements fit and we got it to work! As shown below, we were able to attach our rubber band hook to an official VEX C-channel bar.

