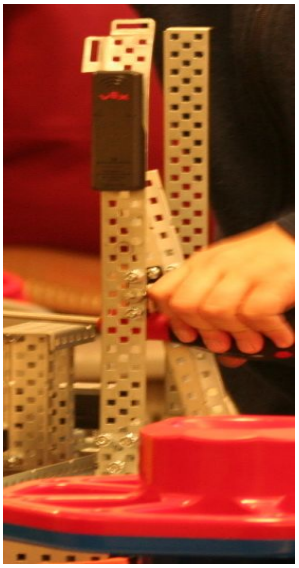
The Problem:



In the fall, my team was facing a problem which was we had two rails that were not supported, as shown right. We had a motor on the two rails and every time we moved the motor, the whole freestanding structure would shake. Being concerned, we were trying to figure out a way to make the freestanding structure more secure while maintaining the same design with the two rails and that is why I set out to make some kind of support system for freestanding structures in robots.

The Solution:

I wanted to use a C Channel to be able to support the rails because the C Channel wouldn't bend under a little bit of pressure. Being new to VEX Robotics, I learned there wasn't a strong brace for supporting freestanding objects and it was almost impossible to make a C Channel bend in different ways. I decided that there should be some kind of multi-angle adapter that would be able to go on a C Channel and change the angle of the C Channel, as shown in the video, to be able to support the freestanding object.

As I thought about this idea, I realized that this is needed in VEX because it incorporates different types of triangles, which happen to be the strongest shape. In Vex, there aren't too many triangles that you can use for building the structure of a robot and it causes robots to be weaker. I have effectively been able to create a way to incorporate triangles into VEX and support freestanding structures. The example that I used was the freestanding rails with a motor that would flip things. Due to no support, there was an exceptional amount of backlash and it caused our parts to bend and get loose. Some other hypothetical example could be something that is very powerful like lifting heavy objects with a chainbar. The chainbar would be unsupported and just the two rails alone wouldn't be able to support the chainbar and the additional weight.

The problem I was trying to solve was being able to use a C Channel at any angle to support a freestanding object. The way that the new part would fit into a complete robot design is that one side would be connected to the freestanding object, and the other side would be connected to the robot, just like a support beam that can have any angle. This can be observed in the renders where the diagonal piece is the C Channel that will be supporting one side fo the freestanding object. Being able to support freestanding structures is awesome because it means that there will a lot more reinforcement in the robot's design and that it wouldn't fall apart in competition and that you can have more freestanding structures without being worried that the structures will fail or break. This will open up new ways to design robots and ways to make robots more structurally stable.

The way that I used Fusion 360 to make my design is that I first imported .f3d files for C Channels, screws, and nuts. Then I added sketches on top of C Channels to make a basic cover for the C Channel. Then I added holes so that screws and nuts could connect the cover and C Channel. Then I made the base using another C Channel and added some holes. Then I created a connector that would connect the cover and the base. Then I extruded a hole in the middle for enough space for a screw to go in and lock the system in place.

The Software:

I chose Fusion 360 to create the **VEX Z Brace.** The version of Fusion 360 that I used was Autodesk, Inc. - Fusion 360 2.0.5119.

This is my first year competing in the VEX Make it Real Challenge and I chose Fusion 360 because I found it easier to use and create a part. When I came up with the idea for this design, I wanted to save time by not creating VEX parts. Since there is a VEX parts folder that can be downloaded, I used that and was able to save a lot more time and not have my dimensions be wrong. I also love the sketch environment in Fusion 360 because you can create any kind of shape and that was just something that I couldn't really find in any other software, except maybe Autodesk, Inc. - Inventor.

Reflection:

I learned that I can use Fusion 360 to make animations and to render out pictures. I wasn't aware of this beforehand, and once I learned about, I fell in love with it. I am planning on using Fusion 360 in the future to create new 3D designs and I have used it in the past to create some parts for use in my own life. Fusion 360 would probably be the only serious CAD that I would use because I find it very simple to use and it is very versatile. I think the way that this software would help me if I am on a competitive robotics team is that I can use this tool to create parts for our bot and solve problems in our bot. Another way I could imagine this software being is to create backup parts and stronger parts than the ones that we are provided. I feel that this software will help me in my career path because I plan to be a Robotics Engineer and having past experience with CAD will help me in the future to design more interesting parts for Robots.

Thank you for taking the time to read this report,
-Rahul Gupta, on the behalf of Team #99567C