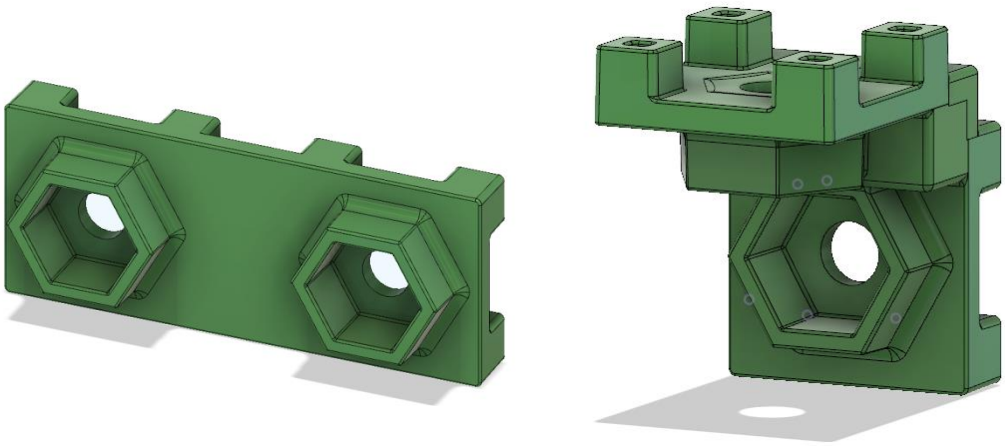


8-Post Hex Nut Retainer Kit

Evan Huang

Team 2915F

Lynfield College

New Zealand

2021-2022 VRC Middle School

“Make It Real” CAD Engineering Online Challenge

January 2022

Table of Contents

Chapter 1: Introduction

During our VEX Robotics Competition experiences, we found it difficult to connect two C-Channels in the ways we wanted. I developed the 8-Post Hex Nut Retainer Kit to overcome this existing problem in this project. The kit has two components: The 8-Post Hex Nut Retainer and the 8-Post Hex Nut Retainer Corner Connector (referred to as the Corner Connector for the rest of this document). Autodesk® Fusion 360™ is used to design and create the new robot components.

Currently, the 4-Post Hex Nut Retainer can connect two pieces of structural metal components as shown, but it has limited uses.

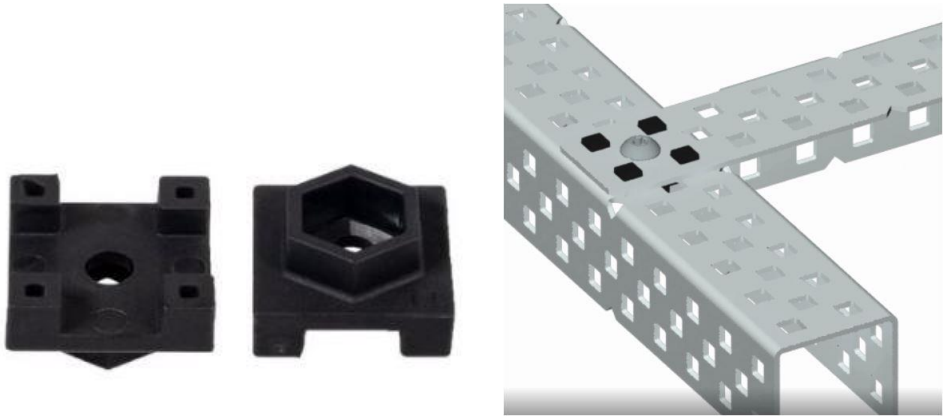


Figure 1.1 Left: 4-Post Hex Nut Retainer, Right: Channels Connection

Chapter 2: Design of the 8-Post Hex Nut Retainer

The 8-Post Hex Nut Retainer is two 4-Post Hex Nut Retainers combined with added stability.

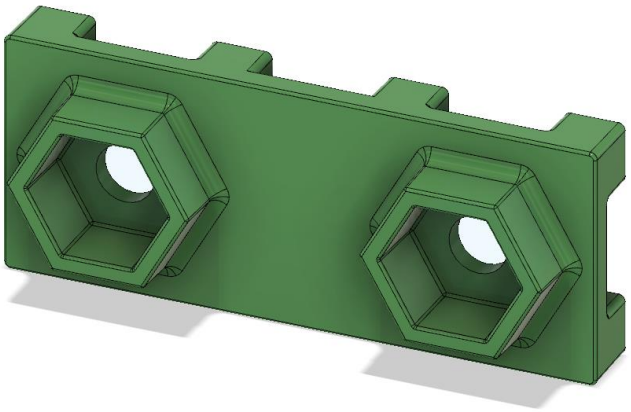


Figure 2.1: Front view

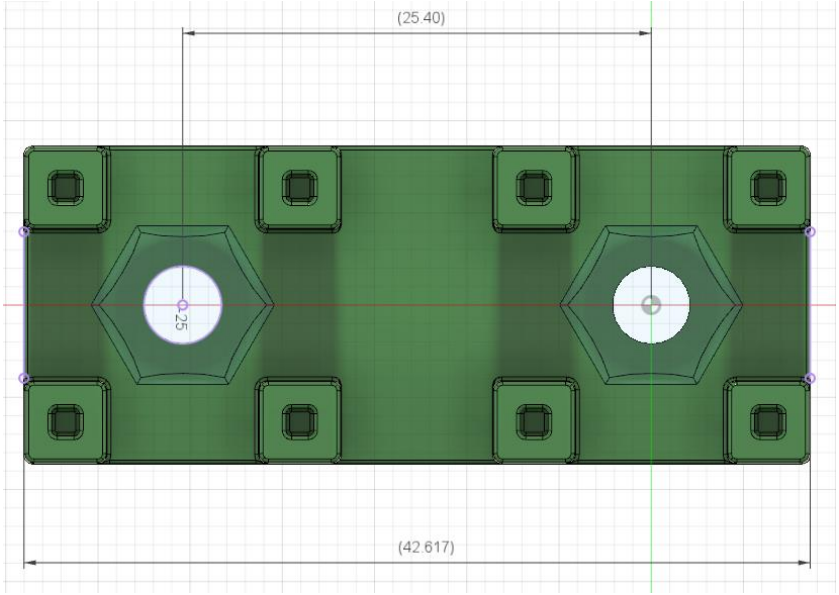
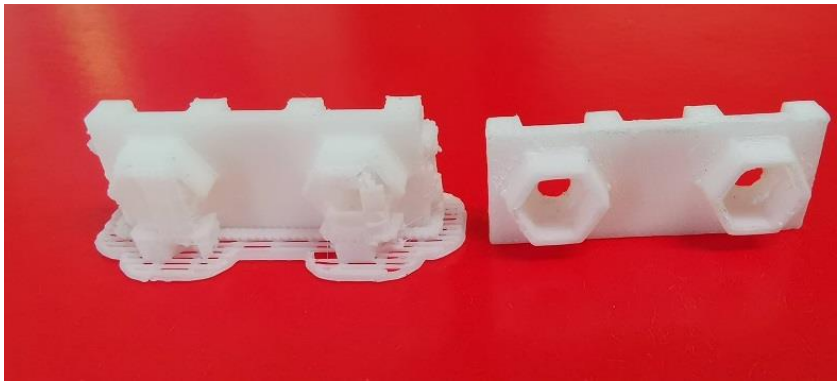
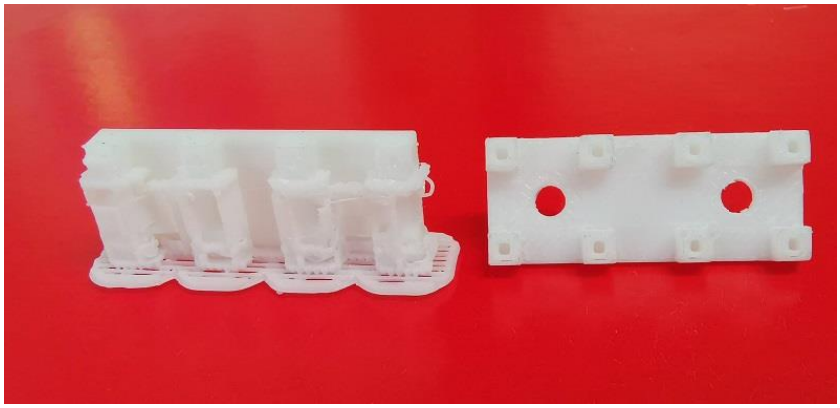


Figure 2.2: Back view

The below figures show the 3D printing results. The left piece is with support; the right piece is the final result.





I used an Up Plus 3D printer to print my parts.

Chapter 3: Design of the Corner Connector

The Corner Connector is two perpendicular 4-Post Hex Nut Retainers combined with added stability.

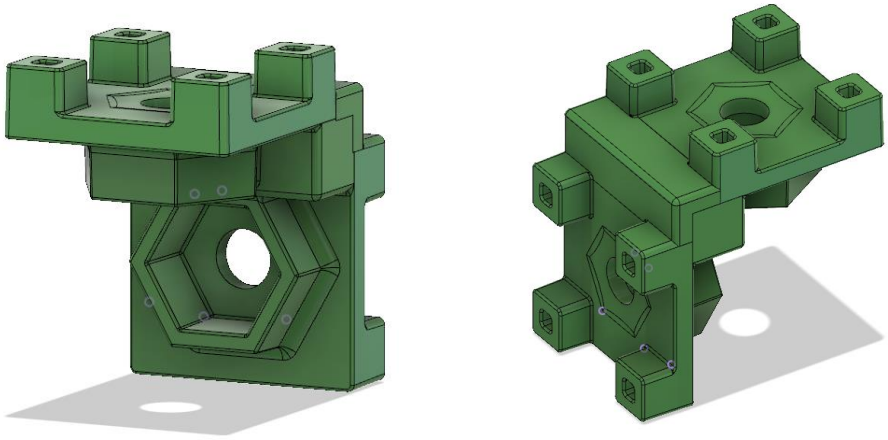
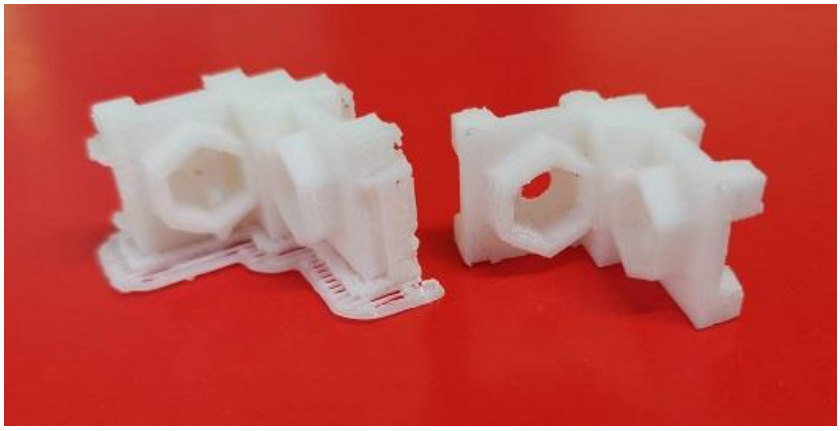
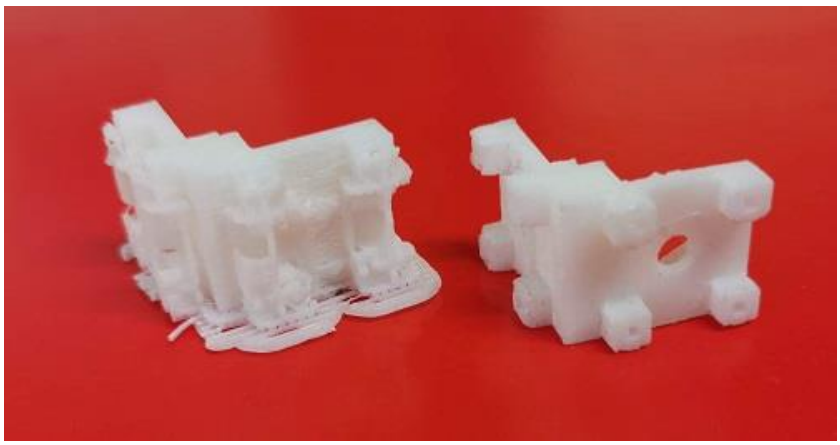


Figure 3.1: Left: Front View; Right: Back view

The below figures show the 3D printing results. The left piece is with support; the right piece is the final result.





Chapter 4: Using the 8-Post Hex Nut Retainer

The 8-Post Hex Nut Retainer provides 10 points of contact for connecting two pieces of structural metal using two screws and two nuts. The retainer contains eight posts which are sized and shaped to securely fit into the square hole of a structural component. It is sized to securely fit two hex nuts, allowing a #8-32 screw to be tightened without the need for a wrench to hold the nut.

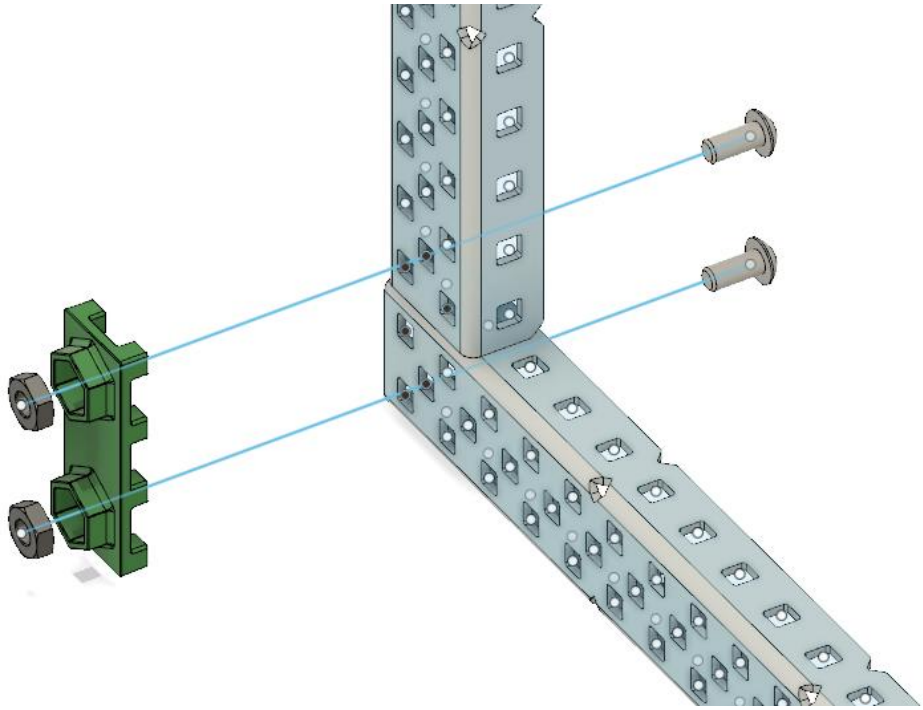


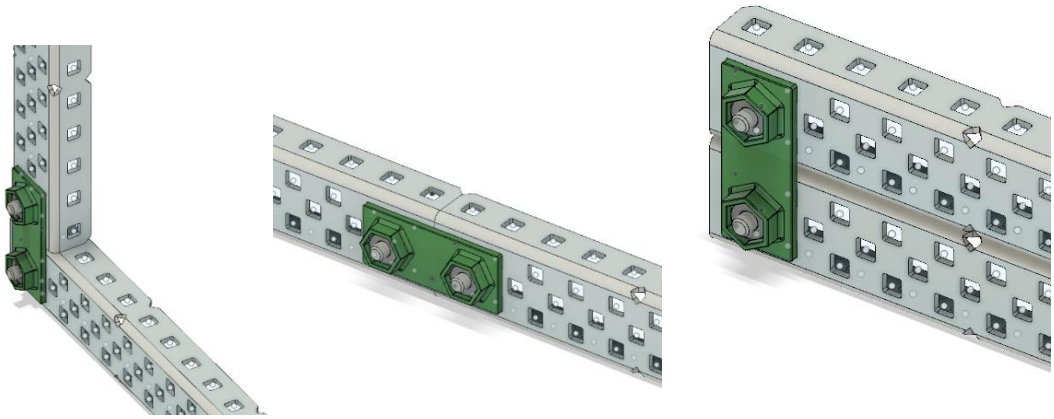
Figure 4.1 Assembly of the 8-Post Hex Nut Retainer

How to assemble the retainer:

1. Put two channels next to each other in some way (in the case of the diagram above, perpendicular).
2. Insert the 8-Post Hex Nut Retainer such that four square posts fit in both pieces of structural metal.
3. Insert a #8-32 Hex Nut into the centre slots (or one at a time).
4. Insert a #8-32 X 3/8" Screw through the square holes in both pieces of metal.
5. Spin the screw to the right in order to thread it into the nut and tighten it.

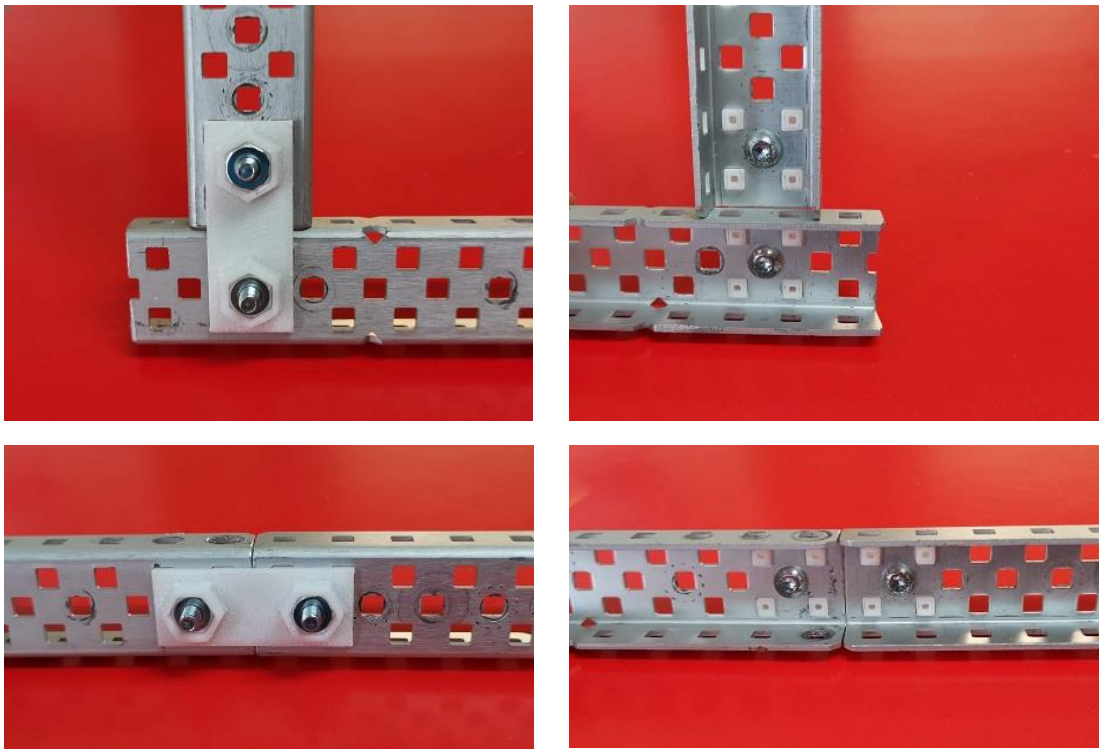
Uses

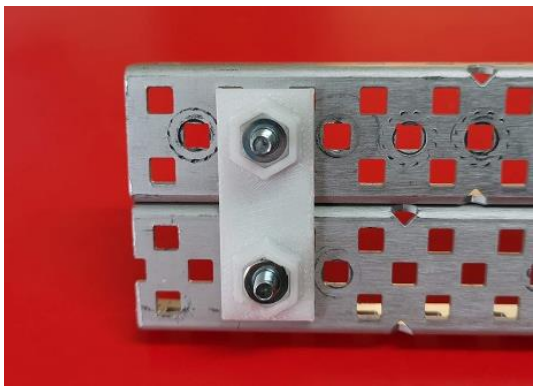
The below figures show three uses of the 8-Post Hex Nut Retainer in Fusion 360.

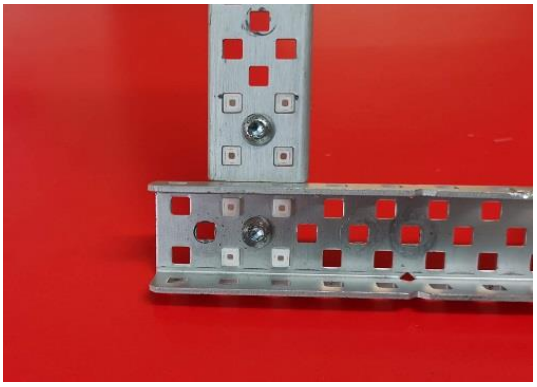


Real Uses

The below figures show six real uses of the 8-Post Hex Nut Retainer. In each case, the left side shows the front view, and the right side shows the back view.







Chapter 5: Using the Corner Connector

The Corner Connector can connect at 90 degree angles. The retainer contains eight posts, which are sized and shaped to securely fit into the square hole of a structural component. It is sized to securely fit two hex nuts, allowing a #8-32 screw to be tightened without the need for a wrench to hold the nut.

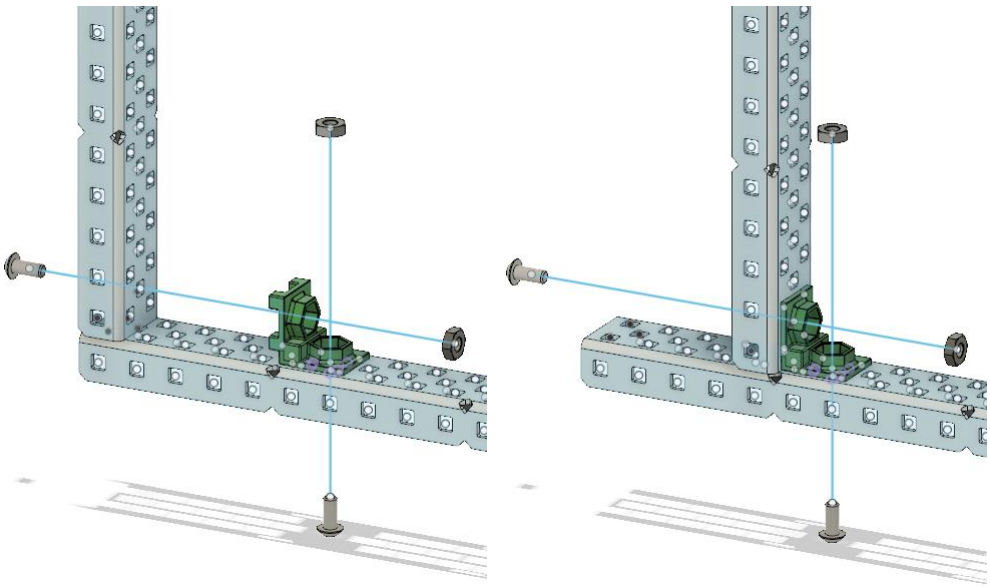


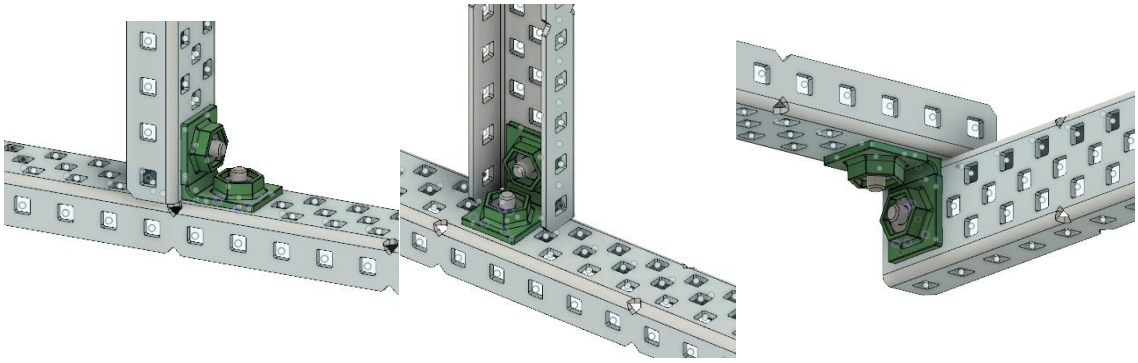
Figure 5.1: Assembly of the Corner Connector

How to assemble the retainer:

1. Insert the Corner Connector such that four square posts fit in the piece of structural metal.
2. Attach another piece of structural metal such that the remaining four square posts fit securely.
3. Insert a #8-32 Hex Nut into one of the centre slots.
4. Insert a #8-32 X 3/8" Screw through the square hole.
5. Spin the screw to the right in order to thread it into the nut and tighten it.
6. Repeat steps 3-5 for the other centre slot.

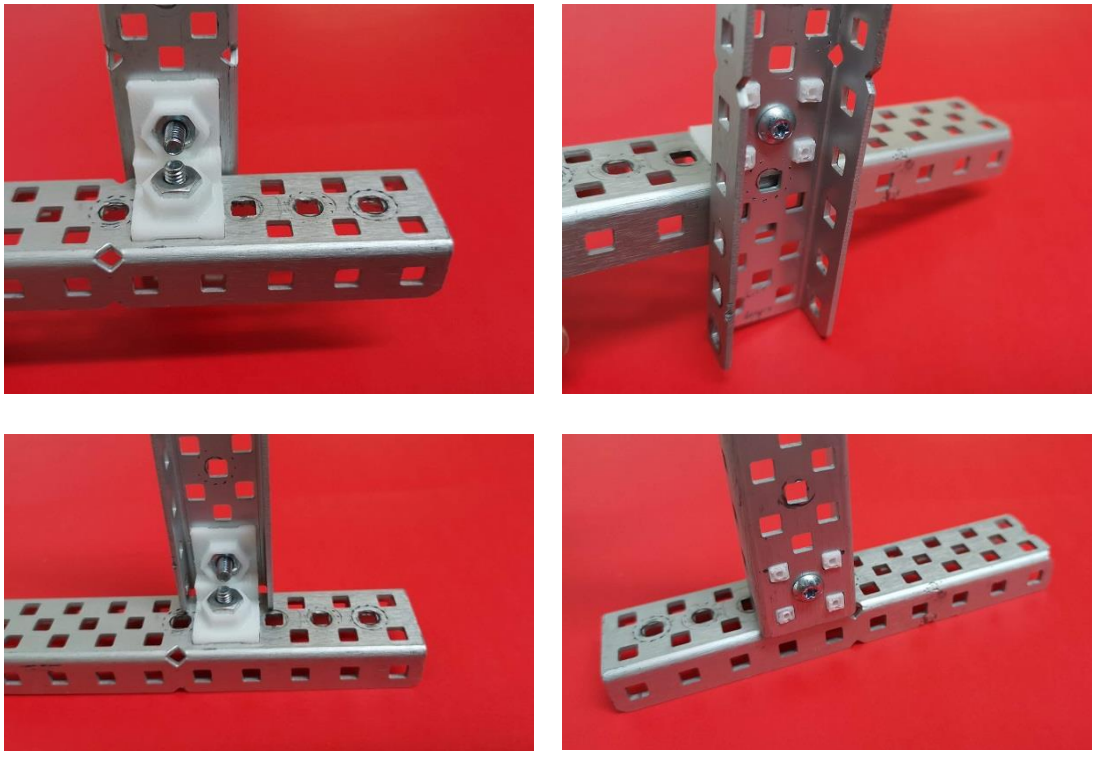
Uses

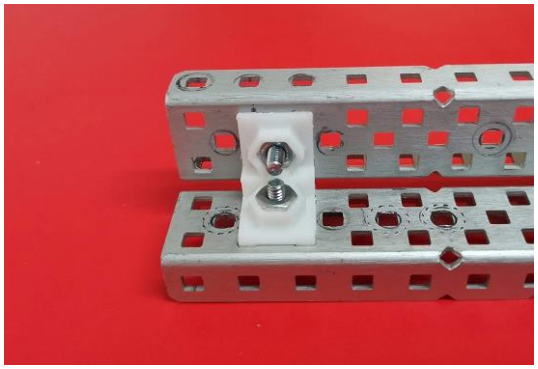
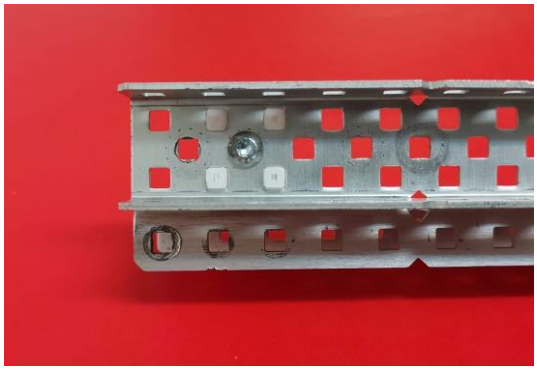
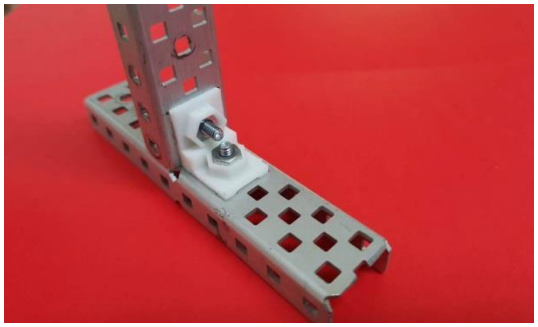
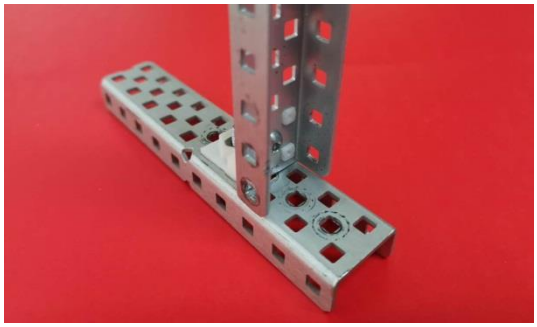
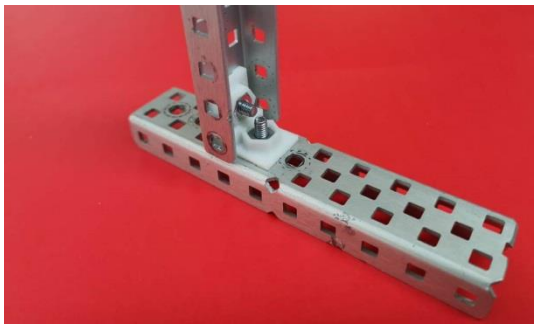
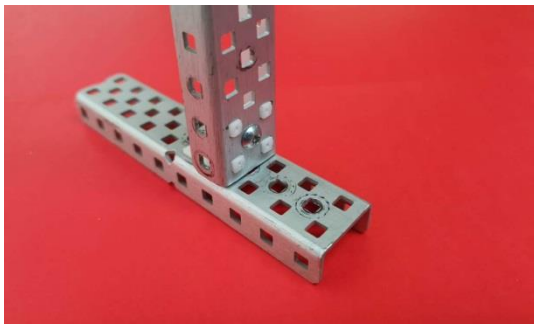
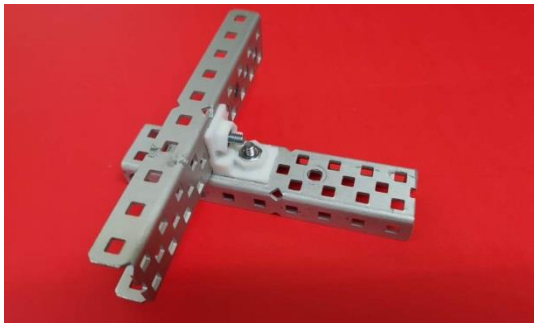
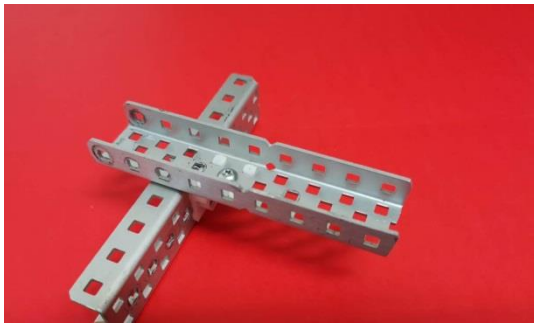
The below figures show three uses of the Corner Connector in Fusion 360.



Real Uses

The below figures show six real uses of the Corner Connector. In each case, the left side shows the front view, and the right side shows the back view.



Chapter 6: CAD Experience

The CAD software used in this challenge:

Autodesk® Fusion 360™
Version 2.0.11894
Active Plan: Fusion 360, Student

The design process and animation make up this project. In the design process, the features used are:

- Solid - Create Box, Extrude
- Modify – Fillet, Combine, Split Body, Move
- Create Sketch – Line, Extend
- Construct
- Assemble – New Component, Joint
- Tools – 3D Printing

The process to generate an animation:

1. Create an animation
2. Explode the assembly
3. Edit the timeline
4. Duplicate the storyboard and reverse it
5. Download the animation

Chapter 7: Conclusion

In this project, I learned how to use Autodesk® Fusion 360™ to design parts and animate products. I also learnt how to turn the design into real-life using 3D printing. The result was satisfying as the pieces worked well.

In the next VEX season, I plan to assemble a VEX robot using Fusion 360. I will create a research project that uses CAD software to create a robotic arm for the disabled. I want to develop real robots to change the world.