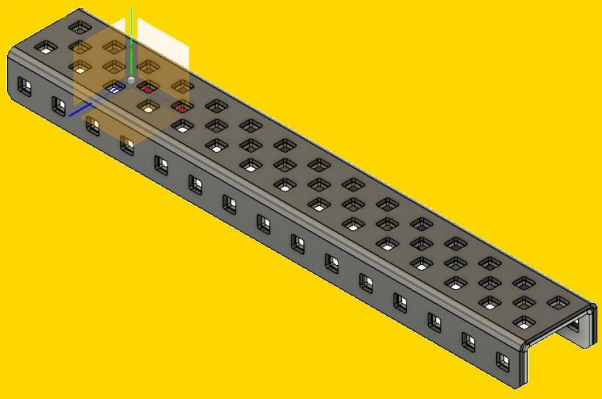
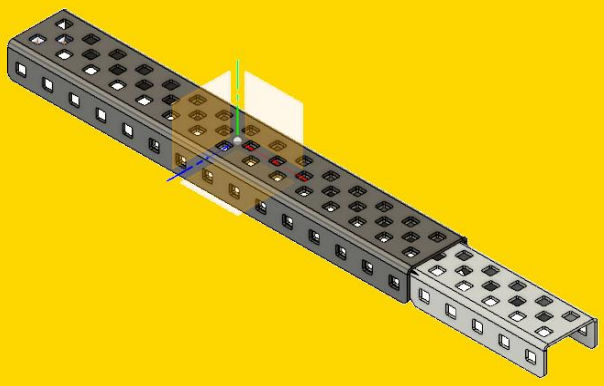
Miraleste Intermediate School Robotics

MEME Team 7035M

Miraleste Intermediate School STEM Program

(Rancho Palos Verdes, CA)





VEX Adjustable C-Channel

2019 Make It Real CAD Engineering Challenge

MEME Team 7035M
Miraleste Intermediate School (Rancho Palos Verdes, CA)
Middle School Division

VEX ADJUSTABLE C-CHANNEL

The Challenge:

One major challenge that teams face when building their robots is cutting their C-Channels to the required size. Making straight, clean cuts and sanding them down is time consuming and the process creates a lot of scrap metal which is expensive. It also creates a lot of waste as the season progresses and the robot design changes. We do try to recycle and salvage the cut pieces, but at the end, there are always some wasted. During the cutting, C-Channels can also bend and lose their straight angle edges, creating uneven or non-square bases, which results in problems when the robot is running, especially during autonomous program. This problem is costly both for the robotic teams and for the environment since the production of aluminum and steel uses an incredible amount of energy. This does not need to be the case and it is why our team set out to find a solution.

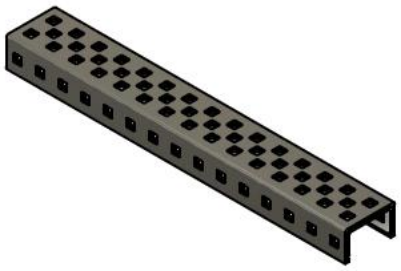
The Solution:

The **VEX Adjustable C-Channel [ACC]** is a simple design that can efficiently save time, money, and the environment. Built using partly the existing C-Channels, it makes the molding for manufacturing and production easier. The two C-Channels would slide over each other and get fastened together at the desired length by screws, eliminating any need for cutting or sanding. To readjust the size, the screws need to be opened, the channels stretched or contracted to their new length and screwed back in. The **ACC** comes in 2 different sizes, covering ranges from 7.5” to 12” and 12.5” to 22”, leaving some overlap of the two channels for better stability. The unevenness caused by the thickness of the outer C-Channels can easily be compensated by a washer with the thickness of the outer C-Channel.

The Software:

Our team chose Fusion-360 to create the **VEX Adjustable C-Channel [ACC]**. We used 2018 Autodesk Fusion 360 (Education License), version 2.0. This year was our first year competing and our learning curve for using the software was steep. After brainstorming on different ideas on how to improve some of the problems we had faced during our season, we came up with the idea of **VEX ACC.** We drew the sketch of our idea on a graph paper to find out the correct measurements and the feasibility of our design. In Fusion 360, we first used an existing 15-hole steel C-Channel as our inner part. Then, we made a sketch of another C-Channel around the first one using a sheet metal, and an increase in the width dimensions by 0.047 inches. For the 25-hole C-Channel, the model was an aluminum C-Channel with the width of 0.062 inches, so we used this thickness for our design. The biggest challenge in making the C-Channel was making the holes. First, we tried using project command which was inefficient and tedious work. After doing more research for finding a more efficient way to work, we found out how to use the pattern command, making the task of design much faster. Finally, we designed two washers with widths of 0.062 and 0.047 inches to be used with the **ACC**.

In our original brainstorm design, we had added a small ledge to the outer C-Channel to help with the guiding and sliding of the C-Channels over each other. After designing the part in Autodesk Fusion 360, we realized that for manufacturing purposes, it would be difficult to grip and bend a metal at 90-degree angle with a thickness of about 0.05 inches. Making a mold for it would make the ledge possible but the production becomes too expensive. Since the two parts are going to be screwed together, the ledge is unnecessary, and we redesigned and eliminated it.



The main lesson we learned from our experience was how to use Fusion 360. We also learned that there are a lot of steps involved in taking an idea from a sketch into a real 3-D, workable model. However, once learned, a software such as CAD allows the user to design and weed through the problems without the cost of molding and prototyping. It makes coming up with new, functional designs much faster and cost efficient.

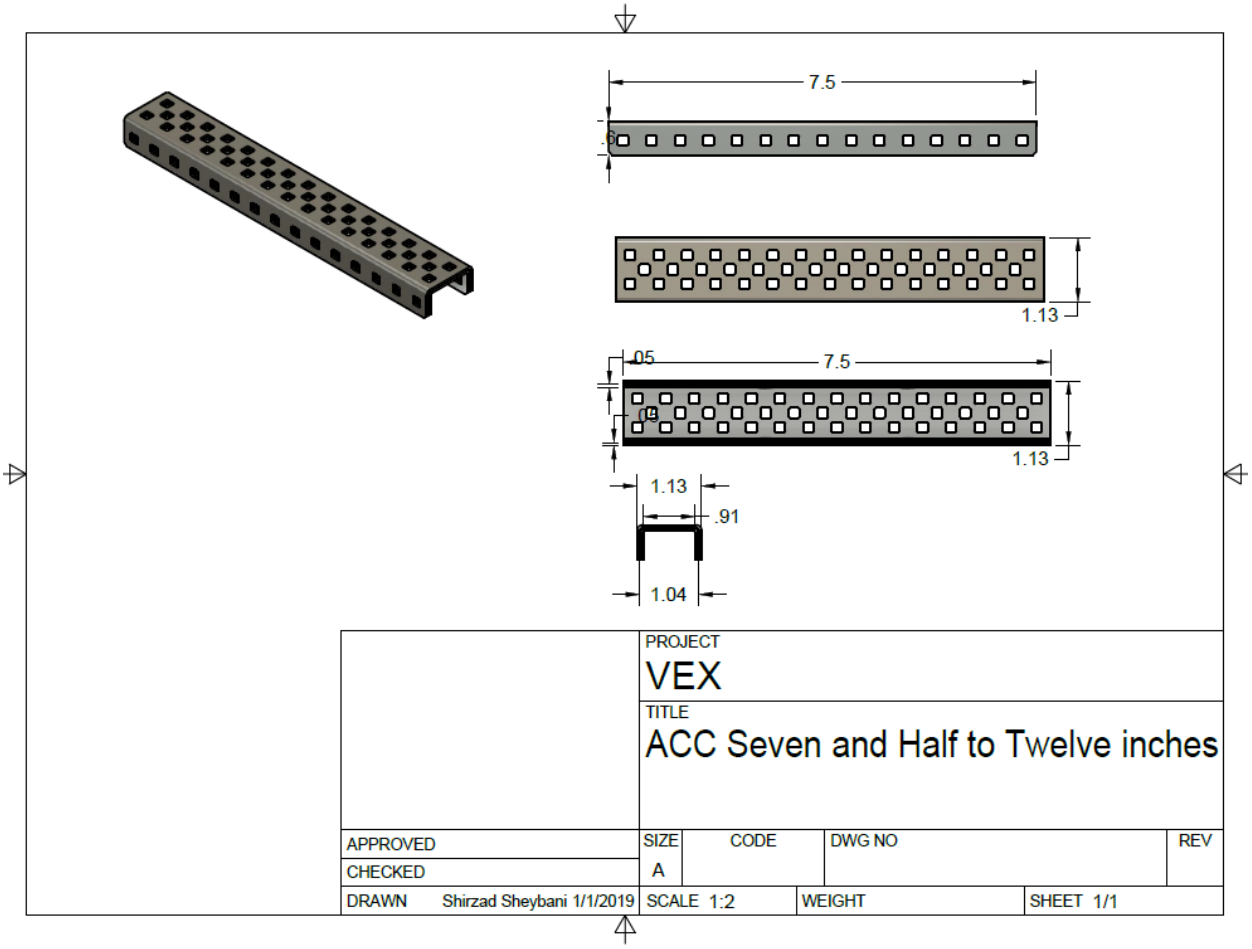
Reflection:

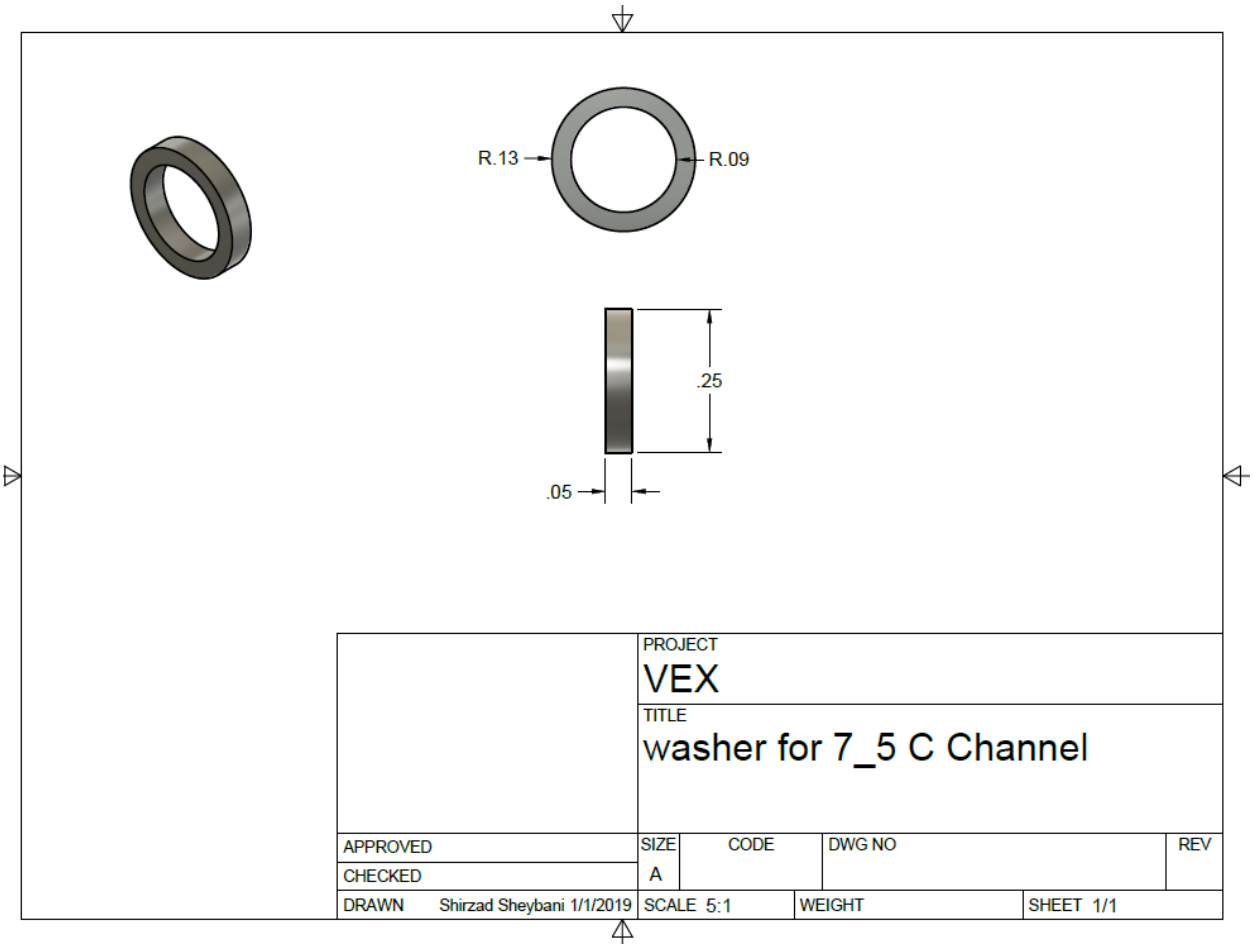
We hope that the **VEX ACC** would make building robots easier and more efficient. This challenge has taught us how to use the amazing software of Fusion 360. Drawing the robot in a 3D software would make it easier and more accurate to build and eliminates many of the errors that is harder to see in the hand drawn design.

Our team plans to use this software in all our future designs. In the past we made each section of the design based on the functionality of the subsystem. However, when we tried to put these sections together, the parts did not always fit on the robot or meet a specific requirement. With Fusion 360, we can test and put together our subsystems before building it and adjust our designs according to our specifications.

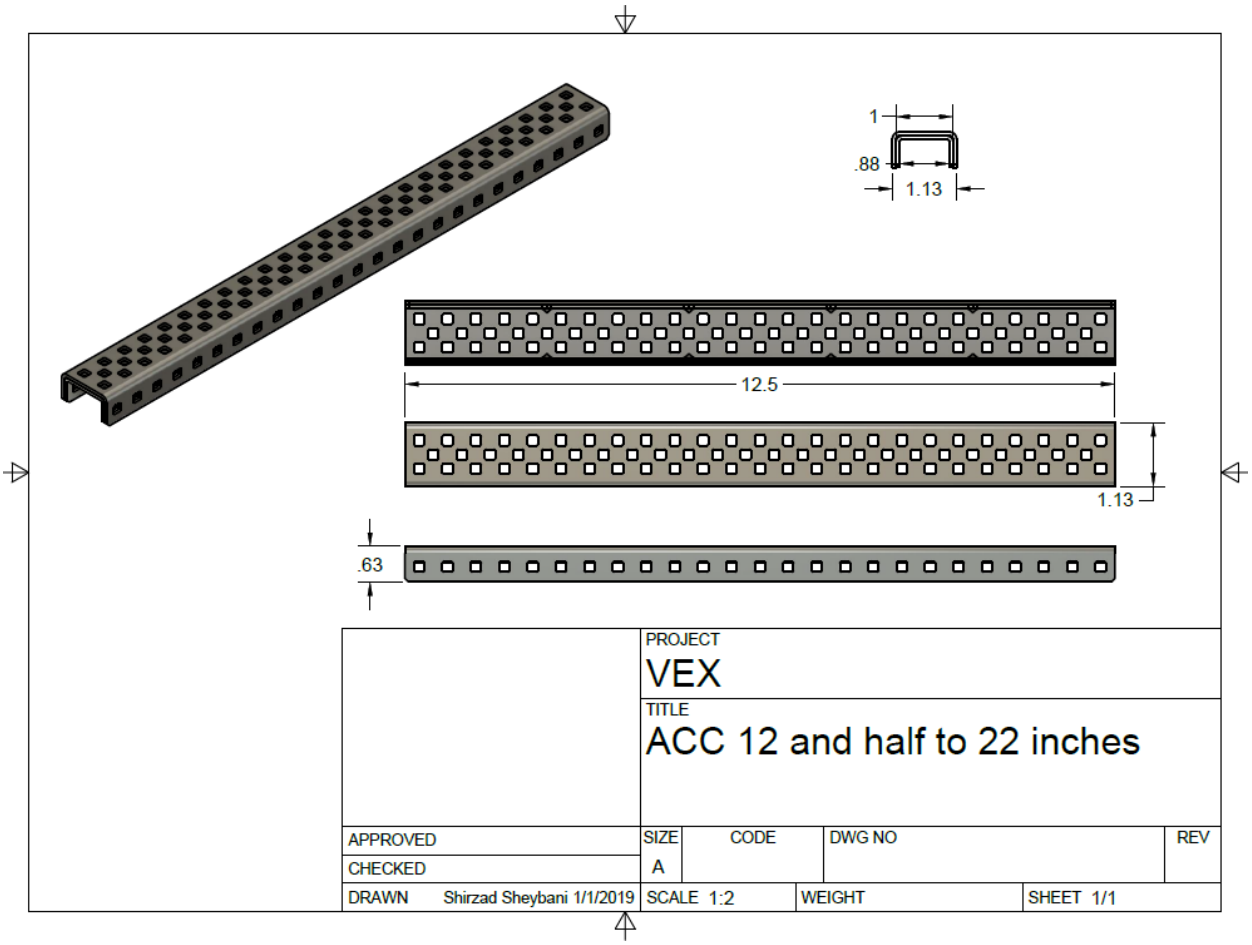
Mastering Fusion 360 will also be very beneficial for our future career. In many fields of engineering, CAD modeling is used for making prototypes and debugging designs. Now that we have learned the basics of the software through this challenge, we have the foundation to advance and make much more complicated designs in the future. Fortunately, there are many great tutorials on the Autodesk website under explore and learn which can help us advance our learning. We hope our design helps all future teams and contributes a little to saving our planet.

Fusion 360 Designs:





	PROJECT VEX			
	TITLE washer for 7_5 C Channel			
APPROVED	SIZE	CODE	DWG NO	REV
CHECKED	A			
DRAWN Shirzad Sheybani 1/1/2019	SCALE 5:1	WEIGHT	SHEET 1/1	


1
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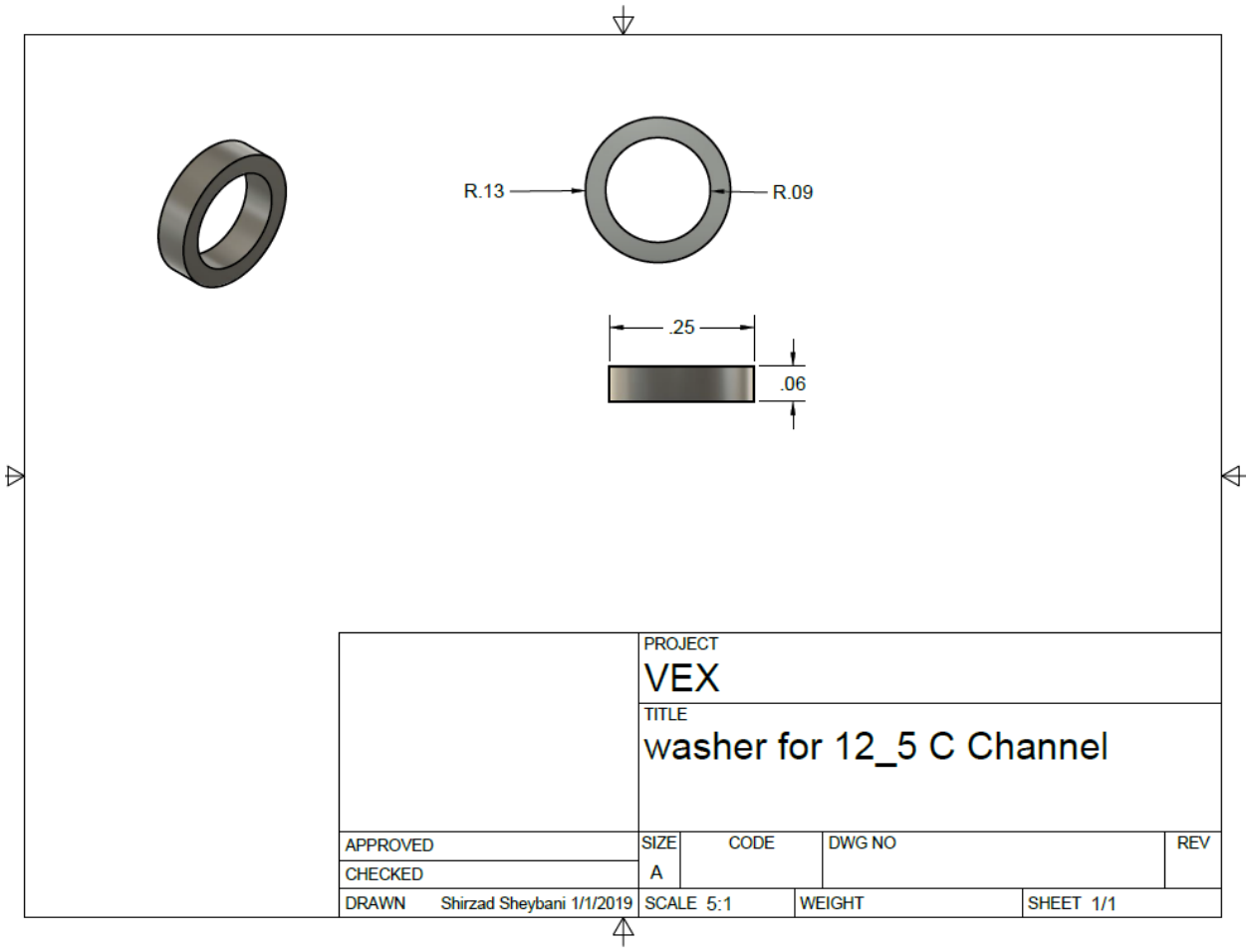
1.13
12.5
1.13
.63
PROJECT
VEX
TITLE
ACC 12 and half to 22 inches
APPROVED
CHECKED
DRAWN Shirzad Sheybani 1/1/2019
SIZE
A
CODE
DWG NO
REV
SCALE 1:2
WEIGHT
SHEET 1/1


R.13
R.09
.25
.06
PROJECT
VEX
TITLE
washer for 12_5 C Channel
APPROVED
CHECKED
DRAWN Shirzad Sheybani 1/1/2019
SIZE
A
CODE
DWG NO
REV
SCALE 5:1
WEIGHT
SHEET 1/1

3D Printed Prototype of 7.5 inch ACC:

ISOMETRIC VIEW	TOP VIEW
	
SIDE VIEW	FRONT VIEW
	
BACK VIEW	BOTTOM VIEW