

## **Team 687D: VEX Robotics Engineering CAD Challenge**

Once every other match, either our team or our alliance encountered difficulties with wires becoming unplugged or tangled. Many times those unfortunate problems hindered us from advancing further in the tournament. Through a series of brainstorming sessions, we thought of ways to combat the uncooperative wires and to find an effective solution to replace zip ties. Together, we thought of many ideas including using different localized brains, which would reduce the amount of wires going to the centralized brain. Also, we thought of a way to reduce the possibility of wires becoming unplugged, but that would only resolve half of the solution. Finally, we came up with a solution similar to a preexisting VEX part that would both replace the zip tie and ensure that the wires are not unplugged during matches. The part is based on a plus gusset, but has two opposite square pieces cut off. It's placed where there's a cluster of wires; from there, wires can be tied down. We called this adaptation the Wire Gusset.

After the brainstorming session, we decided to use a decision matrix to finalize our selection based on which solution fully answered both of our problems and would be the most effective. It turned out that the most efficient solution, according to the matrix, was the Wire Gusset. The Wire Gusset can easily be incorporated into the robot as it can be tied down into virtually any hole on a C-Channel. Keps nuts and screws would not be needed because the wires alone would be able to hold the Wire Gusset into place. When using the Wire Gusset, the user aligns the holes on the C-Channel with the holes on our new part. Then, the user would thread the wires through both holes three times. Our Wire Gusset enables wires to remain stationary, reduces the possibility of tangling, and guarantees that wires do not become unplugged.

After finalizing our design, we utilized Autodesk Inventor to turn our 2D vision into a 3D reality. Using the dimensions taken from the plus gusset, we made a rough sketch of what the

Wire Gusset would look like. A few adjustments were made to the sketch to ensure accuracy. After extruding the sketch, we used the assembly feature to constrain the Wire Gusset to various places on the preexisting model of our robot. The next step was to make an isometric drawing of both the Wire Gusset and the robot using the drawing function on Inventor. With our virtual prototype completed, we performed a visual analysis. The Wire Gusset will be a great addition to our robots in future years and will reduce the risk of tangled and unplugged wires.

## DESIGN PROCESS

VEX Robotics Engineering CAD Challenge

Issues with current Vex parts

- C-channels are not appropriate size for some cases
- rubber bands technically not VEX parts
- Wires tangled up and easily become tangled

Design Process


Problem  
The wires in our robot are tangled up. This causes the motors to not work, messes up the motion of the robot, and is difficult to untangle.

Brainstorm

- Wire organizers.
- Small brains that will connect to the main brain.
- Zip ties

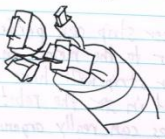
Research and Generate Ideas

Wire Snake Cable Organizers



The wire snake cable organizers are spirals that can wrap around cords and cables to create tidy bundles. However, these don't help us in VEX because there's no place to put it and might be complicated to get them out.

Hosa Cable Organizer



The hosa cable organizer takes a whole mess of cords and compiles them into one strand. However, this doesn't help us in VEX because it can't fit all the wires in one, we might get two of these things, but more than one of the cable organizers can get in the way for our robot.

Identify Criteria and Constraints

Solutions:

- 1.5" x .5" 2 wire organizer strip (3 holes)
- 1" x 1" 2 wire drop
- 1" x 1" 2 wire
- Circumference cord

Solutions	Cost	Safety	Motors	Organize	Simplicity	TOTAL
* 1.5" x .5" 2 wire organizer strip (3 holes)	+	+	+	+	+	5
1" x 1" 2 wire drop	+	+	0	+	0	3
Circumference cord	-	+	-	0	0	-1

Key: + = 1  
0 = 0  
- = -1

Explore Possibilities

The 1.5" x .5" 2 wire organizer strip can perfectly be attached next to or near to the motors and/or the brain. The wire organizer strip will have 3 holes that can be attached/screwed in the robot. 2 or 3 of these organizer strips can really organize the wires, the motors, the brain, and the robot.

Alternative Ideas: 1" x 1" 2 wire drop

- Can be attached to the robot; however, not easy to take it out.
- Can organize the whole robot with no problems.

Circumference Cord

- Can be attached to the robot, but it's not easy to attach and detach from the robot.

Select an Approach

Result in decision matrix:

- 1.5" x .5" 2 wire organizer	TOTAL=5
- 1" x 1" 2 wire drop	TOTAL=3
- Circumference Cord	TOTAL=1

**FINAL IDEA**

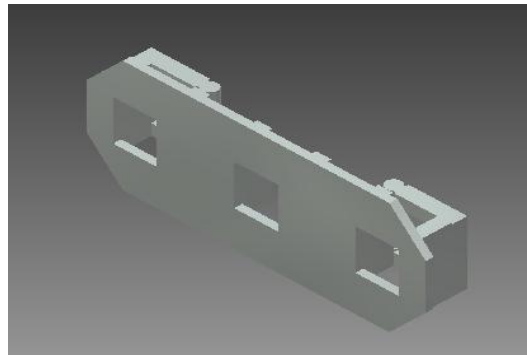
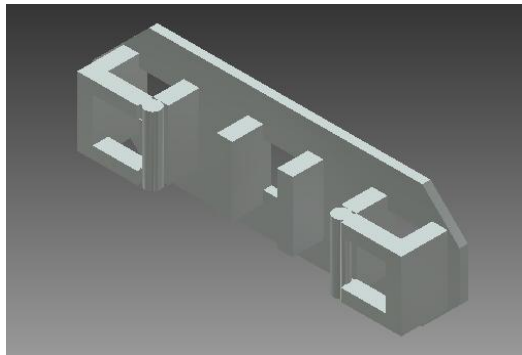
1.5" x .5" 2 wire organizer

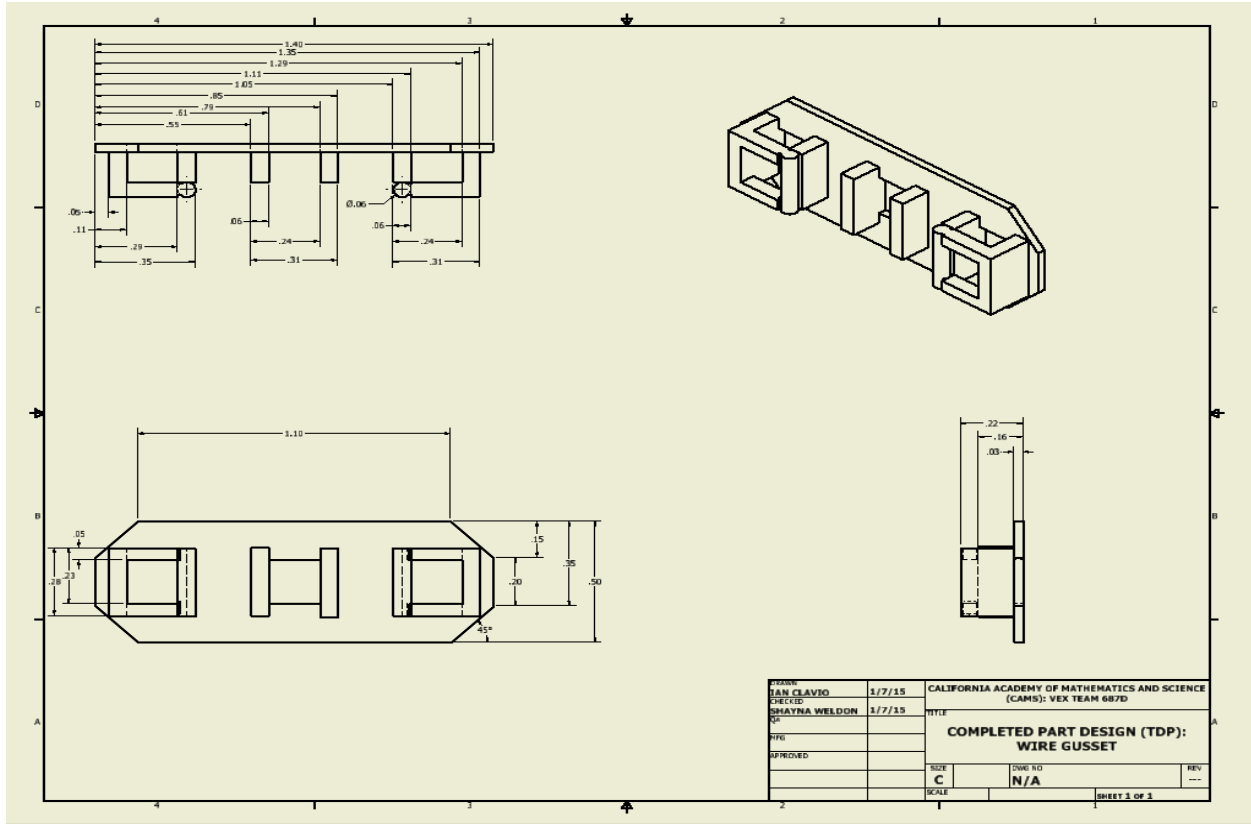
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Develop a Design Proposal

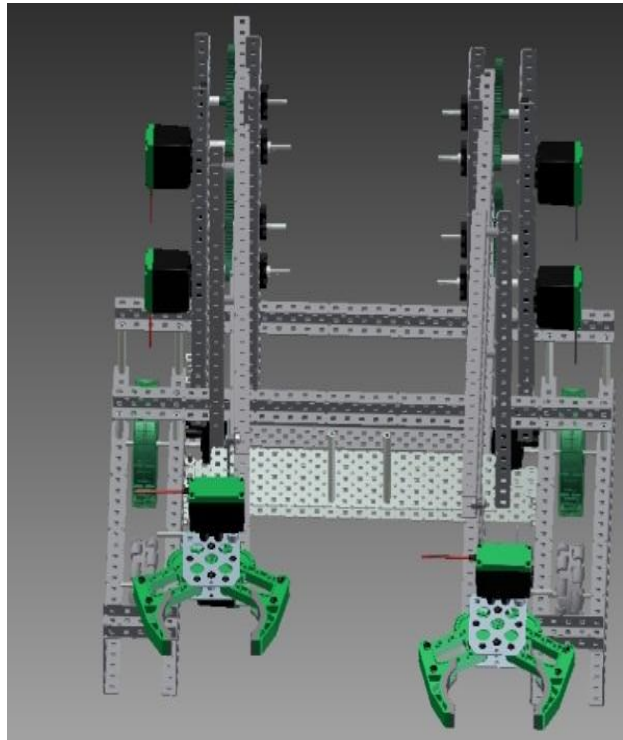
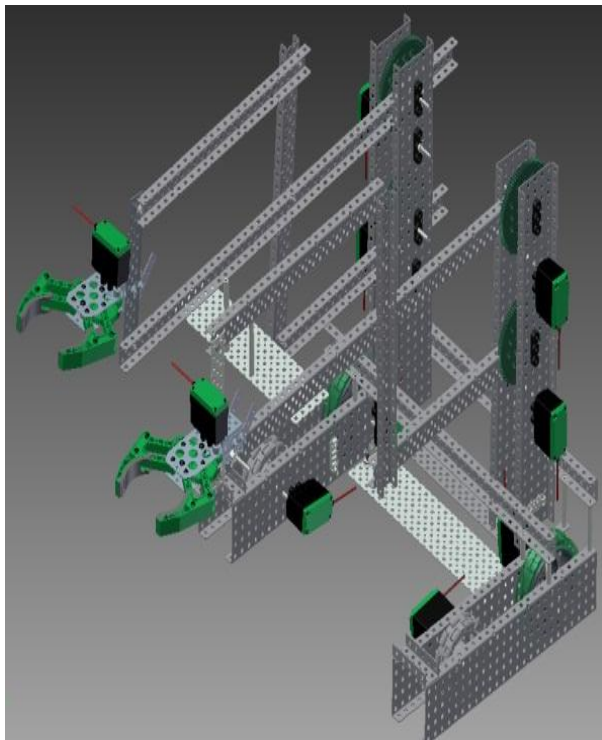
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**COMPLETED PART DESIGN (CAD and TDP): WIRE GUSSET**





## COMPLETED ROBOT DESIGN (CAD)



## ASSEMBLIES (CAD)

