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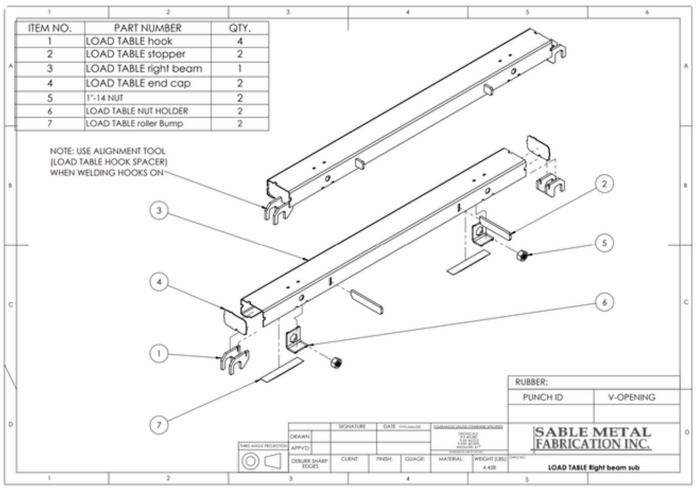
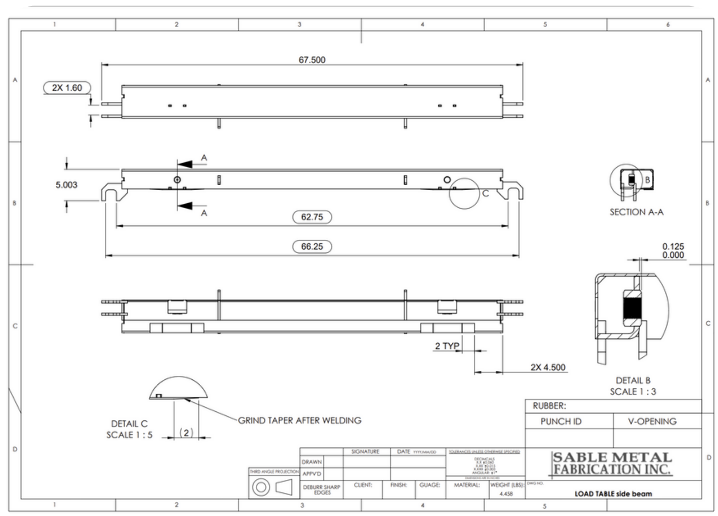
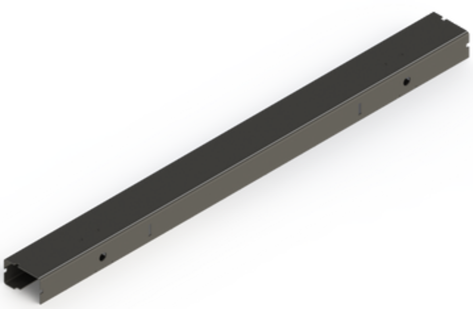
LASER LOAD TABLE

SABLE







Goals

- Modify existing laser cutter **loading table** design to ensure proper fit of the table in the automated loading station
- Enable production of multiple tables **without** the need for post-fabrication adjustments by **grinding/welding**

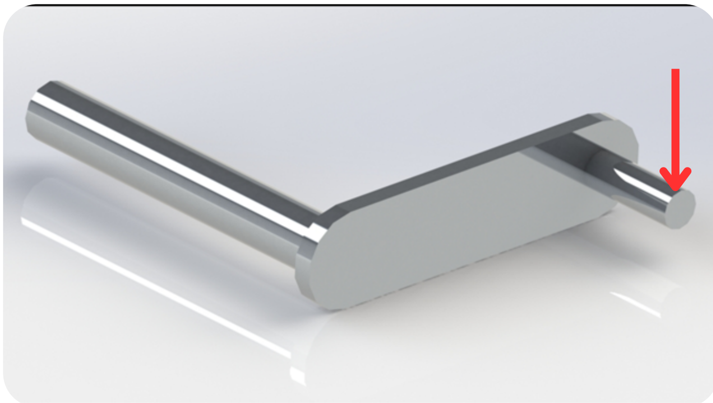
Methods

- Used **SolidWorks** to ensure all the parts fit together without any interferences
- **Vernier calipers** were used to compare dimensions with factory built loading tables and make changes to drawings where necessary
- Communicated with welders about **critical dimensions** to be taken care while welding

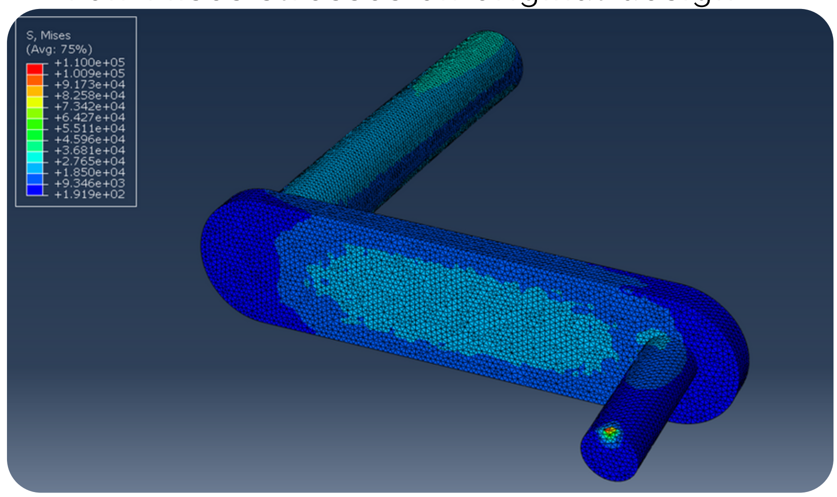
Results

- The loading table worked perfectly with a proper fit in the automatic loading station with **greater ease** of movement within the system compared to previous build
- This design provides a foundation design which can be used to manufacture **multiple tables** at once

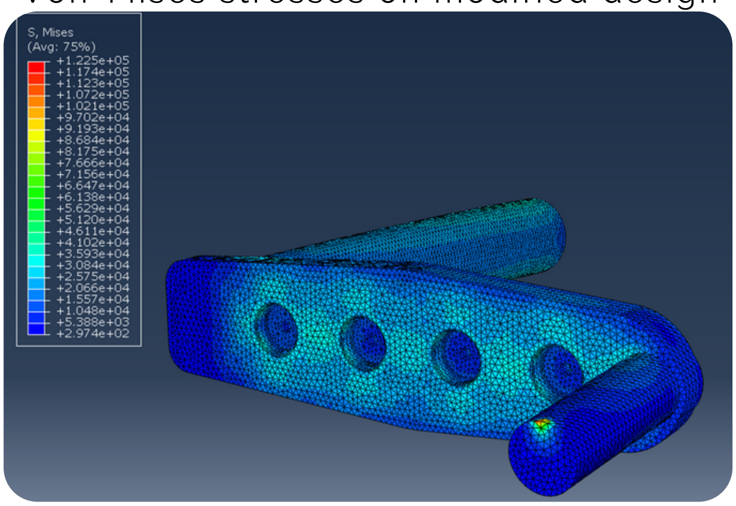
CRANK OPTIMIZATION



Von-Mises stresses on original design



Von-Mises stresses on modified design



Goals

- Find the **maximum point load** that can be applied on the Aluminum crank (red arrow) with the long rod considered to be fixed
- Optimize the design to **reduce** the **mass** without changing its load carrying capacity

Methods

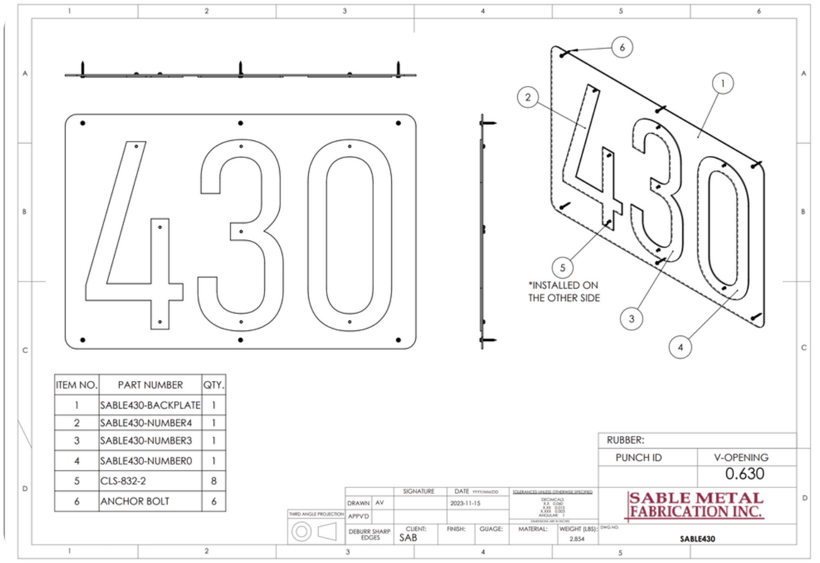
- Used **SolidWorks** to model the crank
- Used **Abaqus** to mesh the model, create the load and boundary conditions and visualize the results
- Increasing loads were applied until a certain area observed **von-mises** stresses **greater** than the **yielding** stress
- Careful reduction in material was done in areas with **lesser von-mises** stresses

Results

- The maximum force was found to be **208lb**
- A **11%** reduction in overall mass was achieved by creating a triangular top and bottom, and holes with a depth of half the thickness

BUILDING NUMBER SIGN

SABLE



Goals

- Design and manufacture a building number sign that needs to be mounted on the outside wall
- Needs to be clear enough to be seen from the road

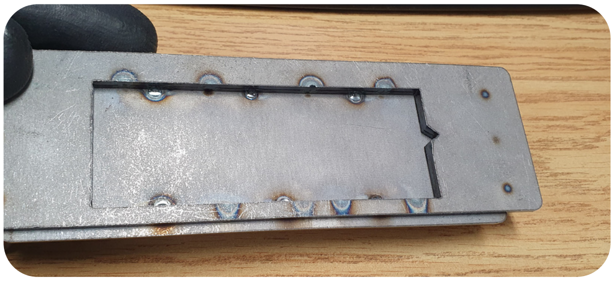
Methods

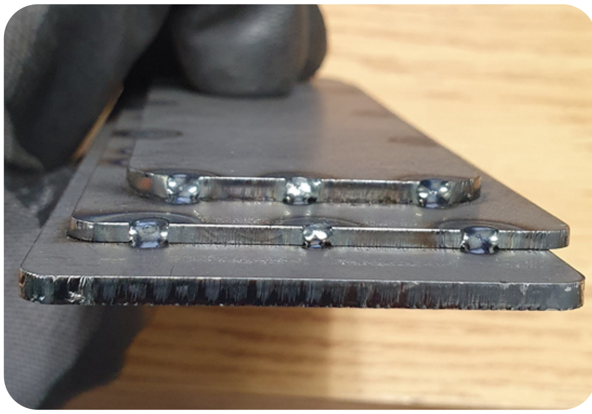
- Used **SolidWorks** to create separate numbers with a **legible font** in sheet metal
- The numbers are then mounted onto a backplate using **PEM flush head studs** for sheet metal
- The backplate is placed onto the wall using **anchor bolts**

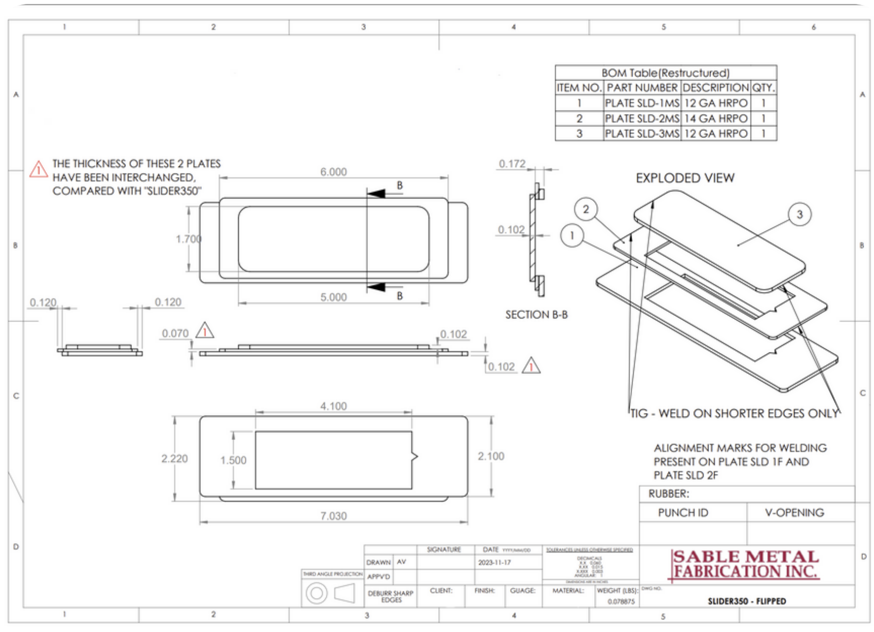
Results

- The building sign was a success due to its ease of installation and stylistic design

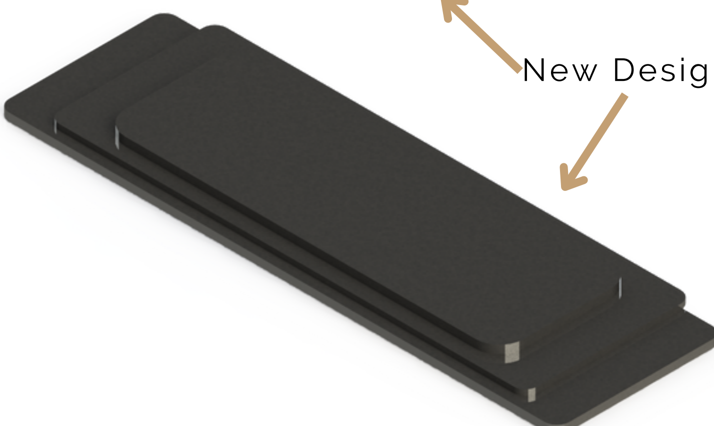
DOOR CLOSER - INTERNAL COMPONENT



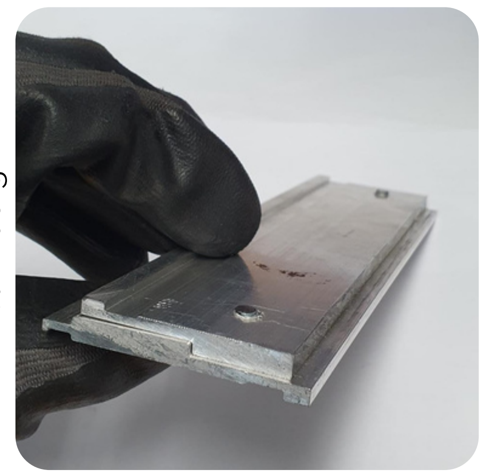




New Design



Old Design



Goals

- Redesign an existing **internal component** of a door closer to be manufactured using sheet metal
- Ensure the part can **slide** through the aluminum extrusion
- Fabricate a **prototype** to show proof of concept

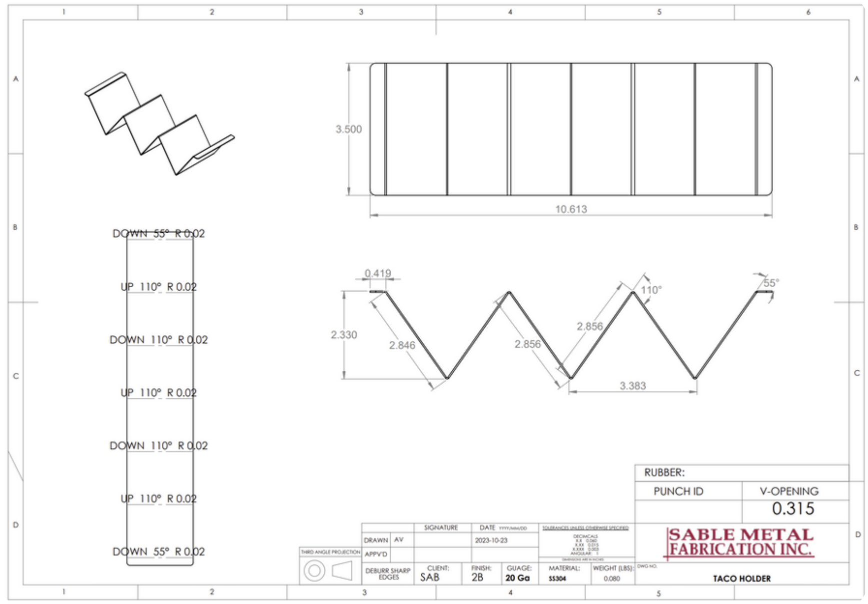
Methods

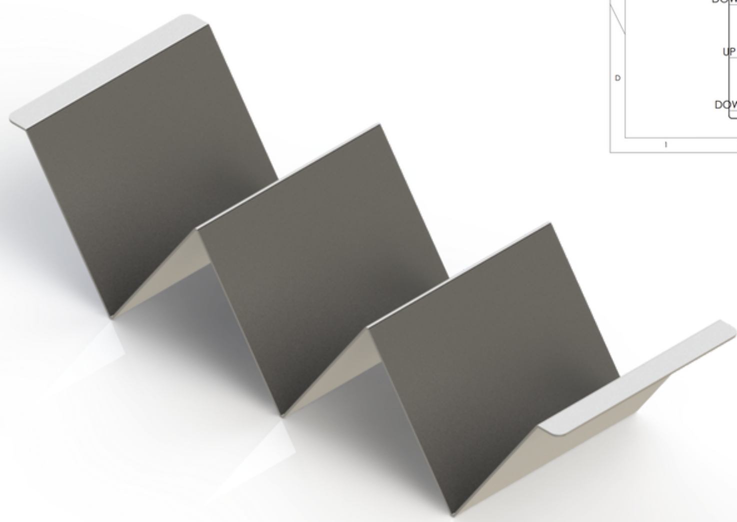
- Used **SolidWorks** sheet metal to design 3 separate mild steel plates with **specfic thickness** to ensure the part fits in the slots of the extrusion
- The 3 plates are **TIG welded** on the shorted edges and in the inside cavity
- The weld was performed by carefully ensuring that the plates **do not bend** during welding, which can severely effect the sliding motion

Results

- The prototype was able to perform the sliding motion as intended with **sufficient friction** between it and the extrusion, to prevent the part from sliding on its own
- Incorporation of **welding consideration** in the design of the parts such as laser engravings for alignment, tab cutout for more accurate alignment made welding easier and more accurate

TACO HOLDER





Goals

- To model and manufacture a taco holder from a picture of an existing one
- Must be able to hold **3 tacos**
- **Safe** for children to handle

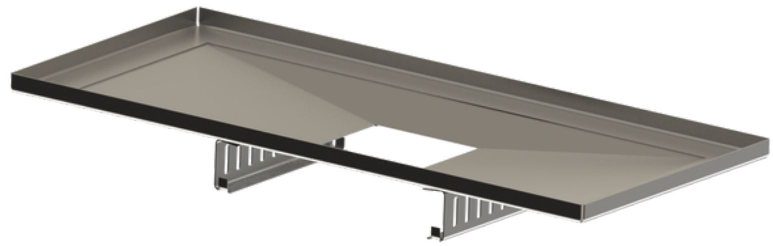
Methods

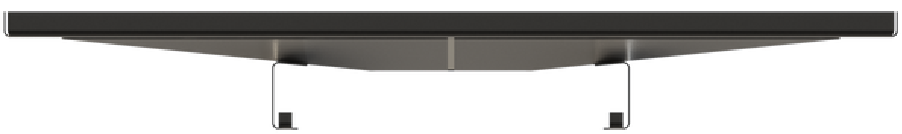
- Designed the part in **SolidWorks** by calculating required **bend angles** using geometry from known angles
- Manufactured in-house

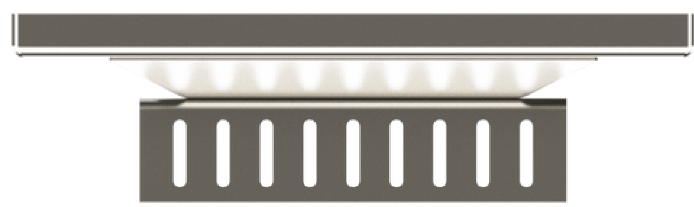
Results

- The taco holder was able to be **fabricated easily** without any problems with the multiple bends and met all necessary requirements

BARBECUE GREASE TRAY







Goals

- Design a barbecue grease tray using sheet metal by **reverese engineering** an old rusted grease tray
- **Minimize** the number of separate parts that need to be welded

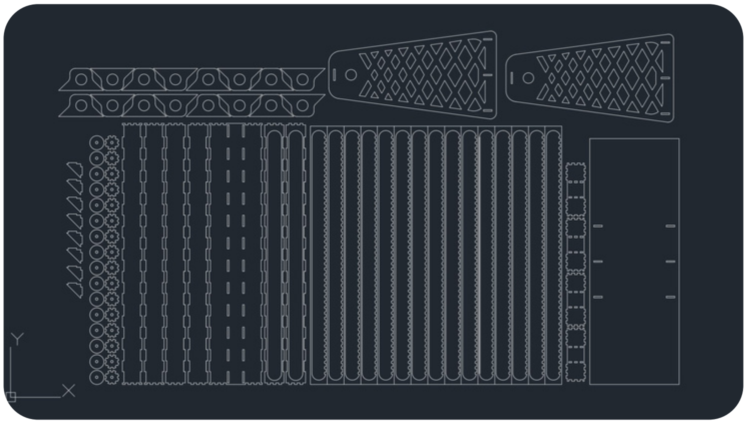
Methods

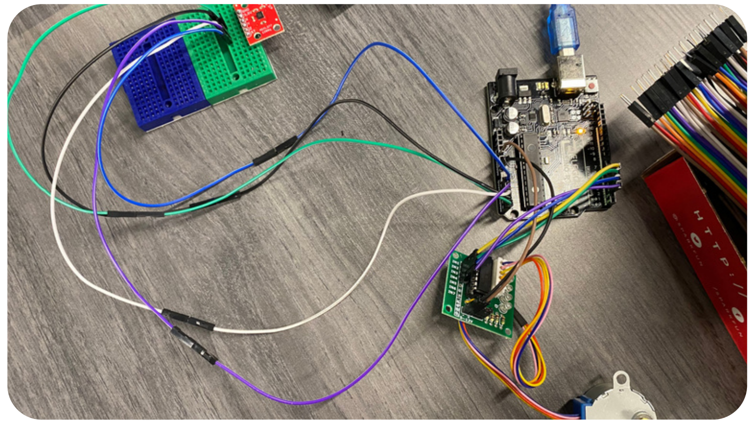
- Used **SolidWorks** sheet metal to design **4 separate parts**: Tray, Frame and two Sliding Racks
- Took accurate measurements of old grease tray using **vernier caliper** and **protractor**

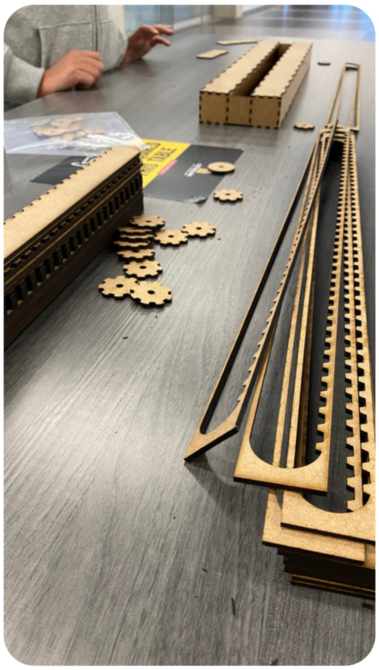
Results

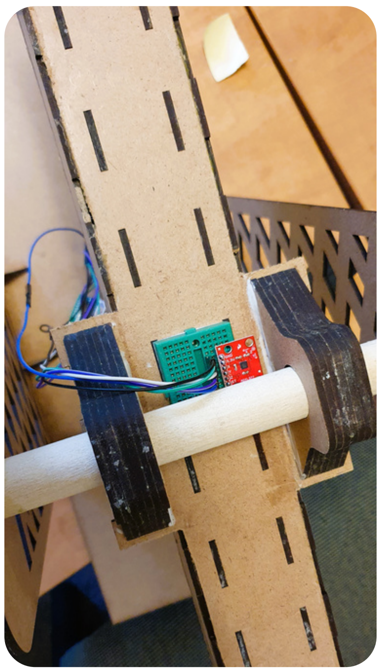
- The design met all expectations and the reduced number of parts needing welding, **decreased risks** of problems with fitting

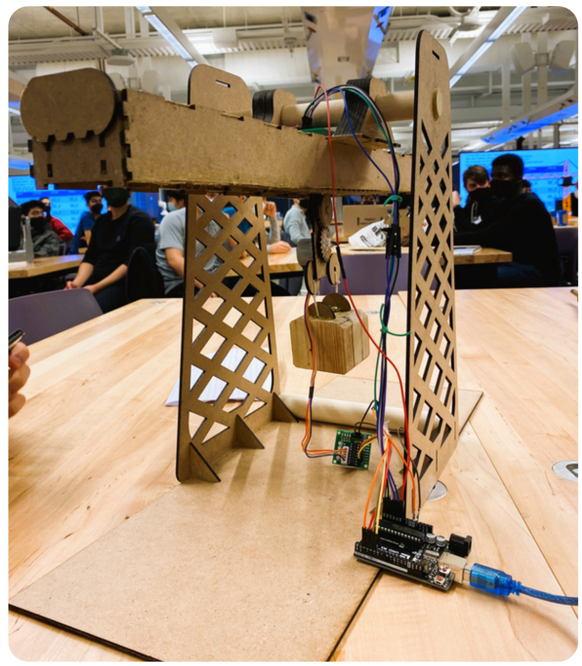
BALANCE MONKEY TOY











Goals

- Design and prototype a toy whose main goal is to balance the beam by using pieces of wood, while the monkey moves and unbalances it
- Primarily responsible for all the electronics used in this project
- Designed few of the CAD drawings
- Was one of two members who was tasked with assembling the different components and final refinements

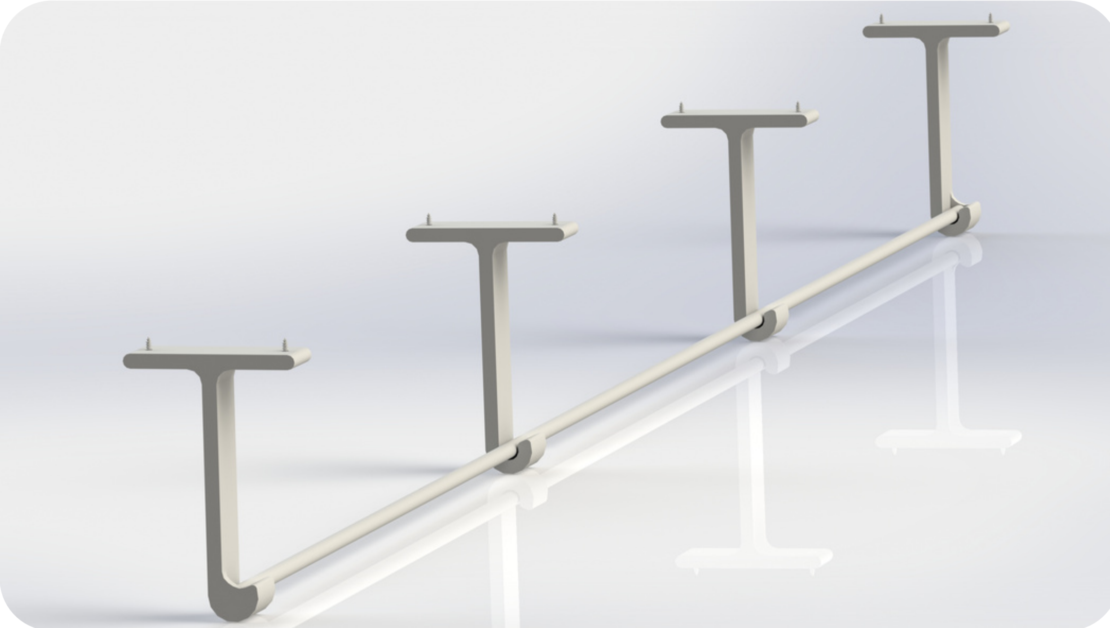
Methods

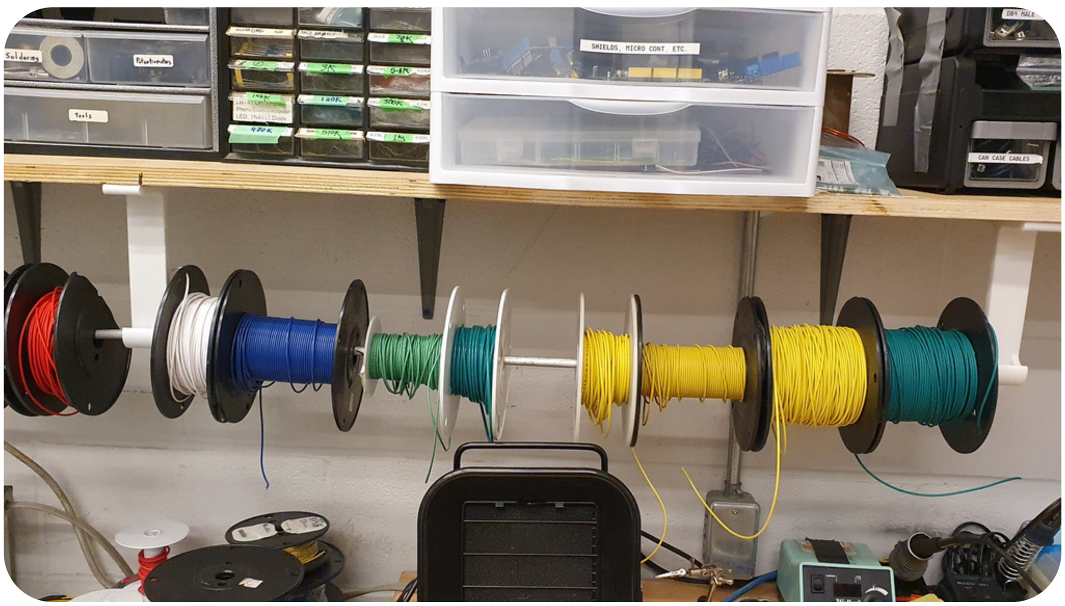
- Used **AutoCAD** to design the side supports which were then laser cutted
- Used **Arduino** to control stepper motors and an accelerometer to check balance
- The monkey (woodblock) moves by a rack and pinion system

Results

- The toy was a success resulting in our team being one of the few teams having a successfully completed prototype
- It can be further improved by implementing better cable management, using more powerful DC motors

WIRE SPOOL RACK UWAFT





Goals

- Design a new wire spool rack for the UWAFT Vehicle Garage that enables easier access and replacement of spools when needed

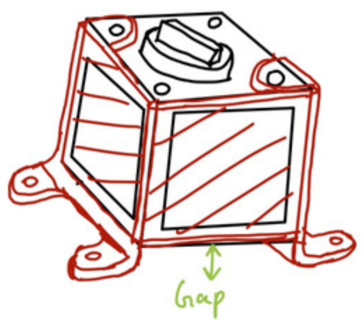
Methods

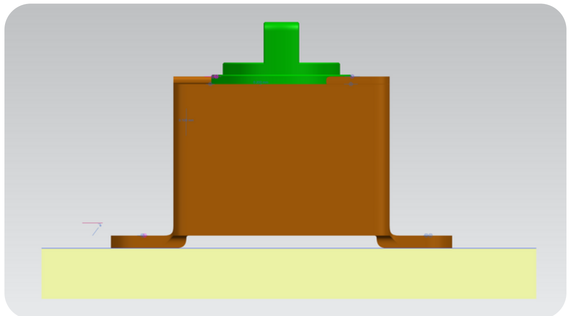
- Used **SolidWorks** to model the individual hooks for the rack
- A SolidWorks Assembly was made to check the fit of all the components
- Hooks were 3D printed in PLA using an in-house Ender 3 printer
- Aluminum rod was passed through the spools to hold it in place

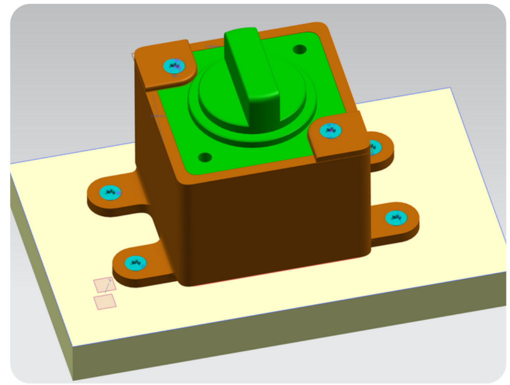
Results

- This design allows the Aluminum rod to be lifted from the support hooks easily when the spools need to be replaced
- Spools can be spun about the rod when wire needs to be taken for use
- Storing wire spools in such a way keeps them organized

SWITCH MOUNT UWAFT







Goals

- Being a University of Waterloo EcoCAR Team (UWAFT) member, I was asked to design a mount for a switch as part of a CAD challenge
- The mount must enclose the open panels
- Should be able to manufacture it in a cost efficient way.

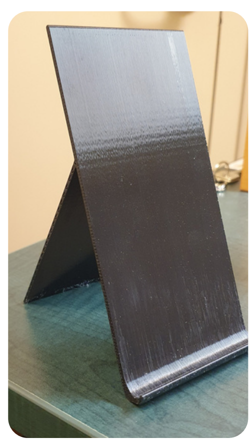
Methods

- Used **Siemens NX** to model the mount
- Suggested **3D printing** as the best way to manufacture this enclosure

Results

- Provided a solution that offered good structural support while at the same time minimized screw usage
- The design was able to accomodate cable management and heating issues with the help of a unique spacing between the switch and the wall

CELL PHONE STAND



Goals

- Design and 3D print a cell phone stand with minimising material usage as top priority

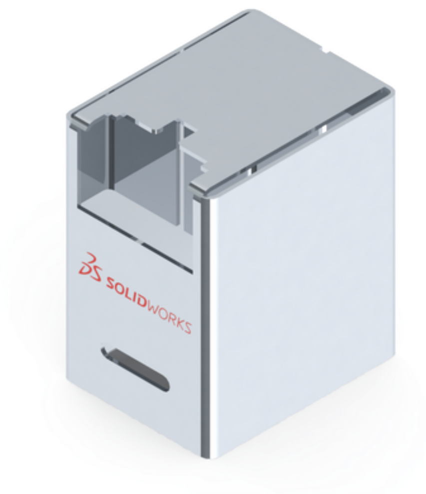
Methods

- Used **SolidWorks** to design the stand which was then **3D printed** in ABS
- Used **GrabCAD Print** to calculate expected model and support material

Results

- Reduced material usage by orienting the stand such that it reduces the amount of support material needed while printing
- Adding another support structure would reduce deterioration of the support joint from continuous loading

MODULAR JACK SHIELDING



Goals

- Design a RJ45 and USB-C modular jack shielding to improve sheet metal knowledge

Methods

- Used **SolidWorks** to design the sheet metal through a combination of edge flanges, unfolds, cut extrudes and folds
- **Photoview 360** was utilized to produce photo-realisitc renders of the part

Results

- Design closely resembles the actual modular jack shielding
- Flattened form of the sheet metal part shows how it would look before folding
- The file was successfully exported into DXF format which can now be sent for punching/laser cutting
- Expanded the understanding about various functions available to create sheet metal designs