Canadian Tire Lift Assist Design Update

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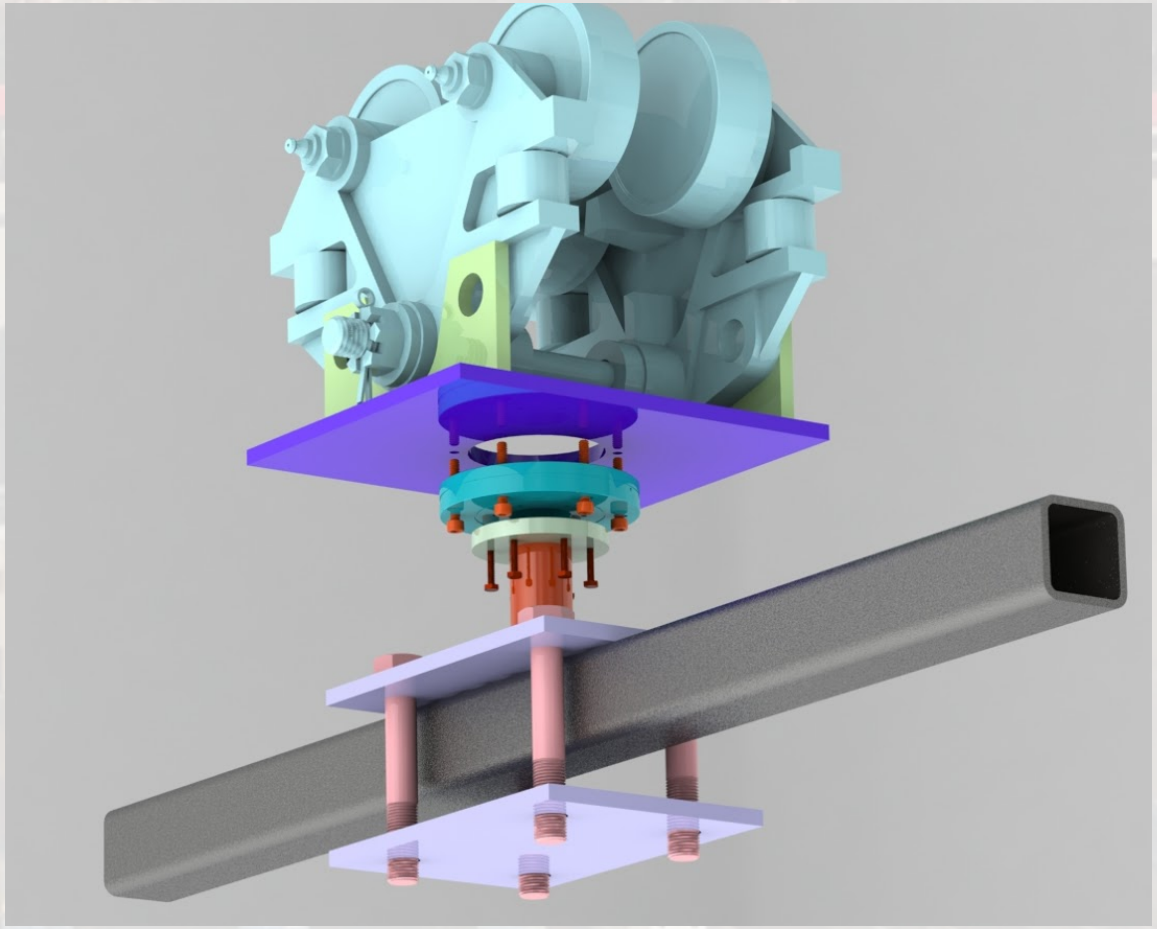
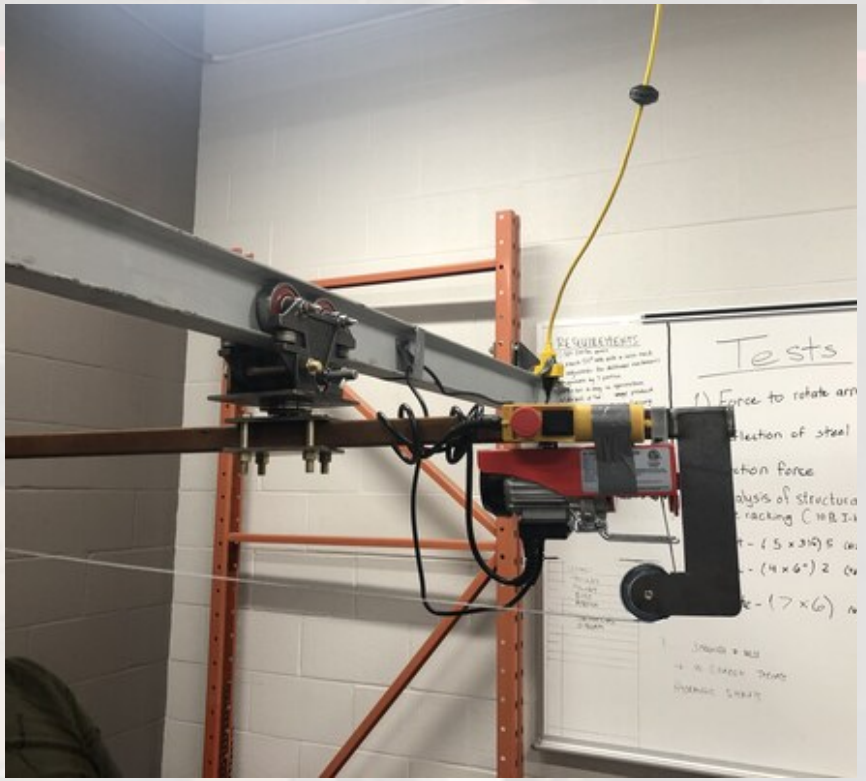
Final Design

Our goal: assembly of a safe and functional track mounted arm able to house recommended vacuum lift system



Project Status

- Main components assembled
- After assembly, arm rotation test was deemed unnecessary
- Other design issues found upon assembly

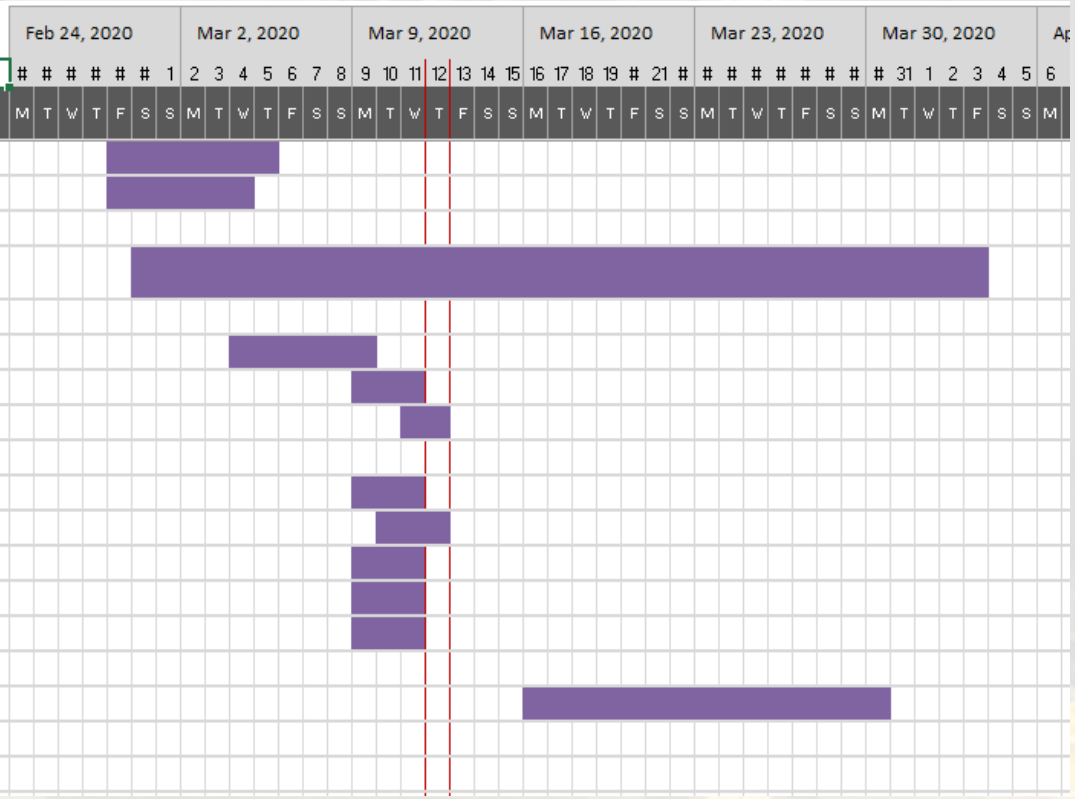


Project Status

- A number of design modifications to implement
- Minimal procurement left

Display Week: 18

TASK	ASSIGNED TO	START	END
3.3.2. Trolley Stabilizer Designed	EPF	2/28/20	3/5/20
3.3.3. Vacuum Design	RF, RU, PK	2/28/20	3/4/20
4. Detailed Design Review		2/29/20	4/3/20
4.1. Detailed Design Review Report	All		
4.1.1. Create DDR	All	3/4/20	3/9/20
4.1.2. Create DDR Presentation	EPF	3/9/20	3/11/20
4.1.3. Update Client	PK	3/11/20	3/12/20
4.2. Final Modifications to Design			
4.2.1. Design Limit Switch Modification		3/9/20	3/11/20
4.2.2. Build Trolley Stabilizer		3/10/20	3/12/20
4.2.2. Vacuum Hand Design		3/9/20	3/11/20
4.2.3. Arm Lock Design		3/9/20	3/11/20
4.2.4. Trolley Lock Design		3/9/20	3/11/20
4.3. Prototype Release			
4.3.1. Final Detailed Design		3/16/20	3/30/20
4.3.2.			
4.3.1. Operational Prototype			



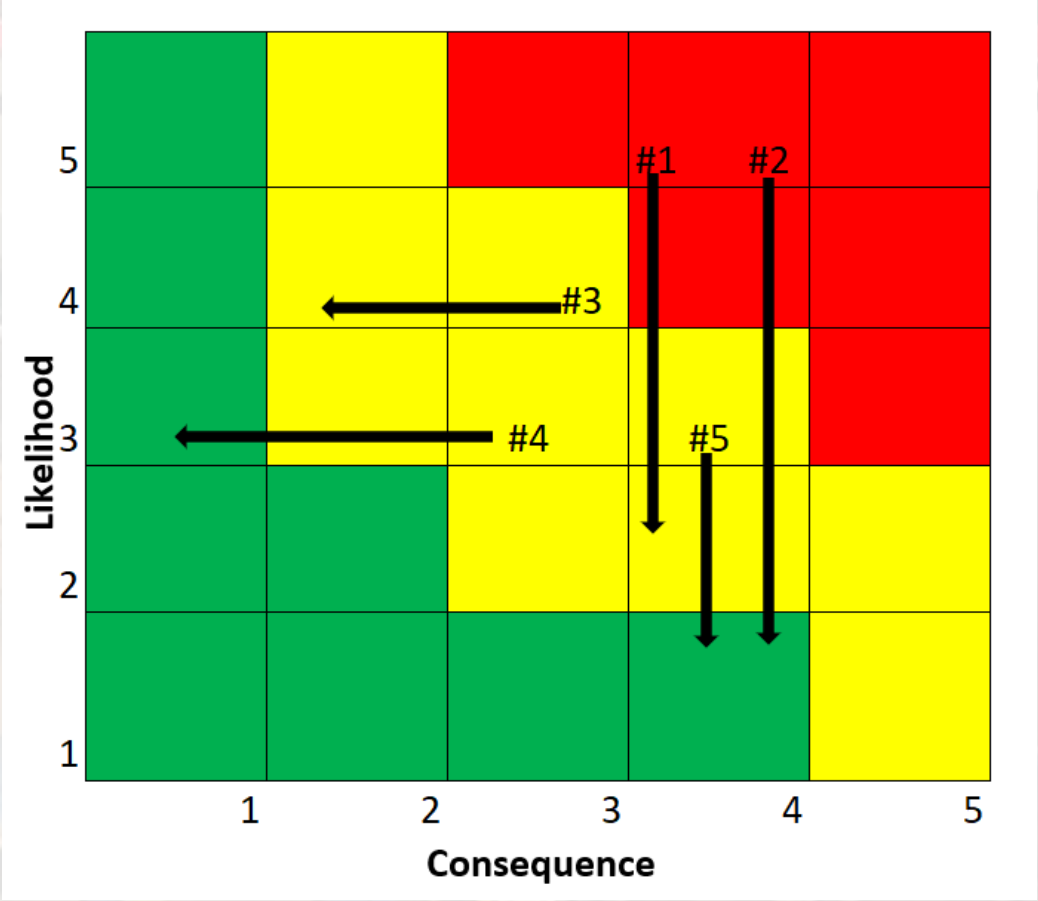
Project Status

While budget was unspecified, goal was below $5,000

Track, Trolley, and Arm	$775.57
Pivot Point	$426.97
Hardware	$218.97
Suction	$228.01
Total	**$1,649.52**

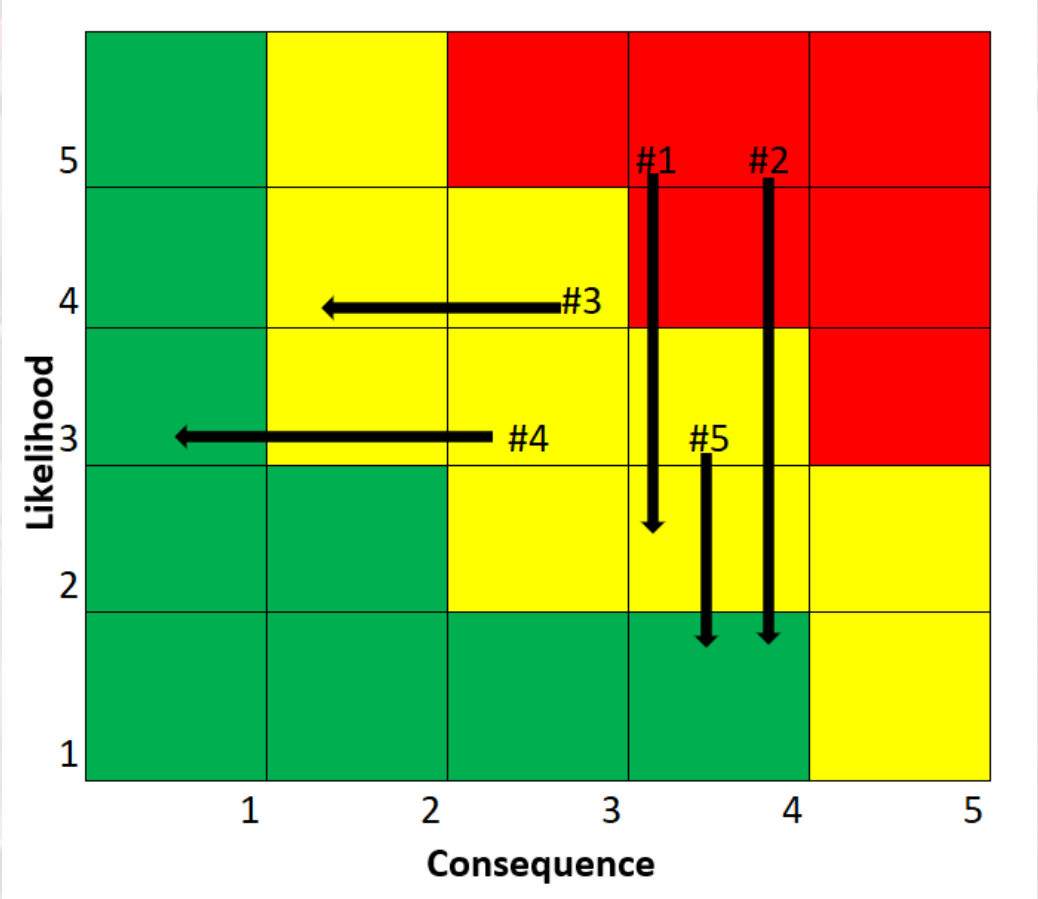
Risk Management

- *Risk 1:* Excessive beam deflection
  - Solution: ran Solidworks simulations using various materials
- *Risk 2:* Extreme shear forces on turntable
  - Solution: implemented heavy duty slew bearing rated higher than necessary
- *Risk 3:* Pinch points
  - Solution: protective casing and locks on movable parts



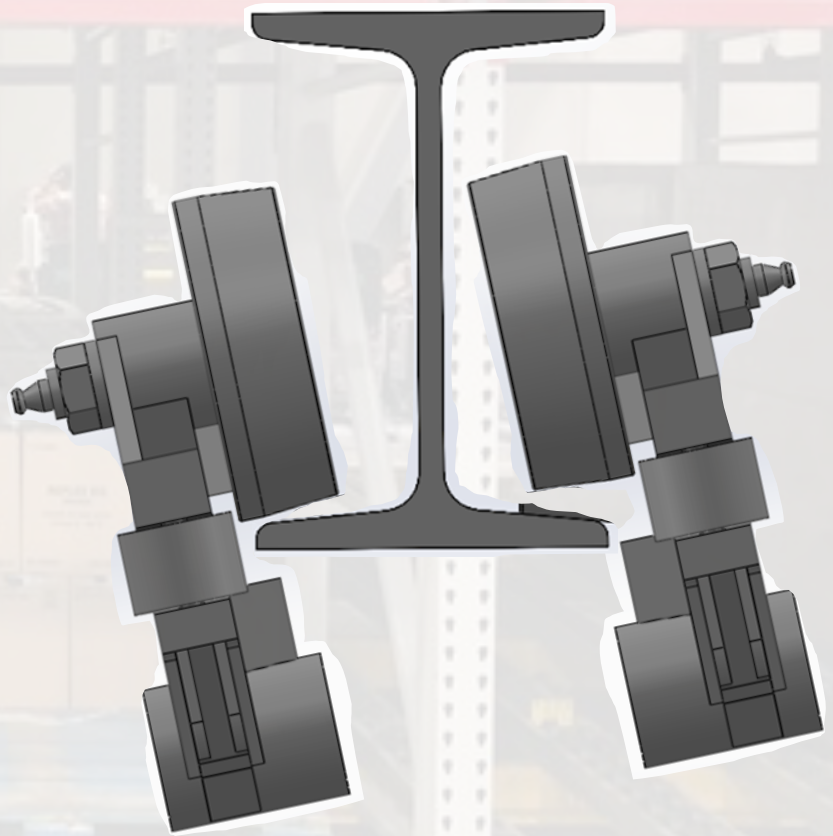
Risk Management

- *Risk 4:* Uneven distribution of vacuum head weight
  - Solution: position cups on secure frame
- *Risk 5:* Lack of suction while picking up items
  - Solution: adequate force applied to suction cups with weight of frame and correct pressure



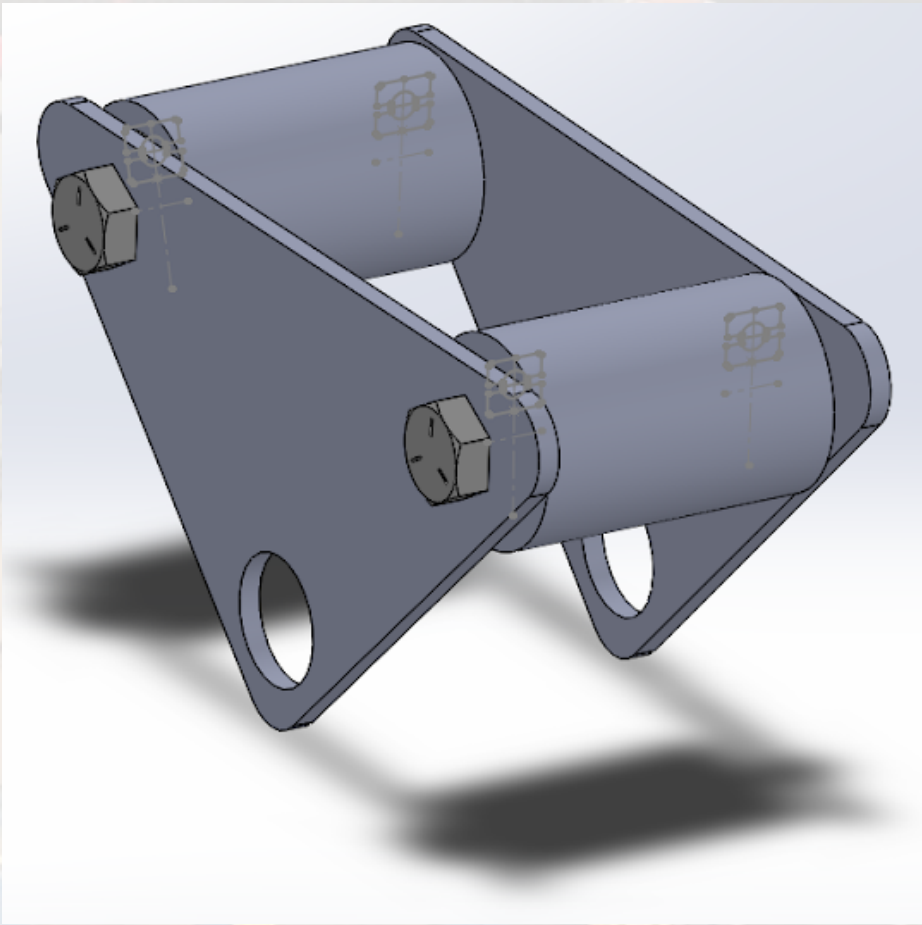
Final Design Additions – Trolley Stabilization

- Upon testing, it was noticed the trolley tilted as a result of an off centred load
- Not unsafe but appeared awkward



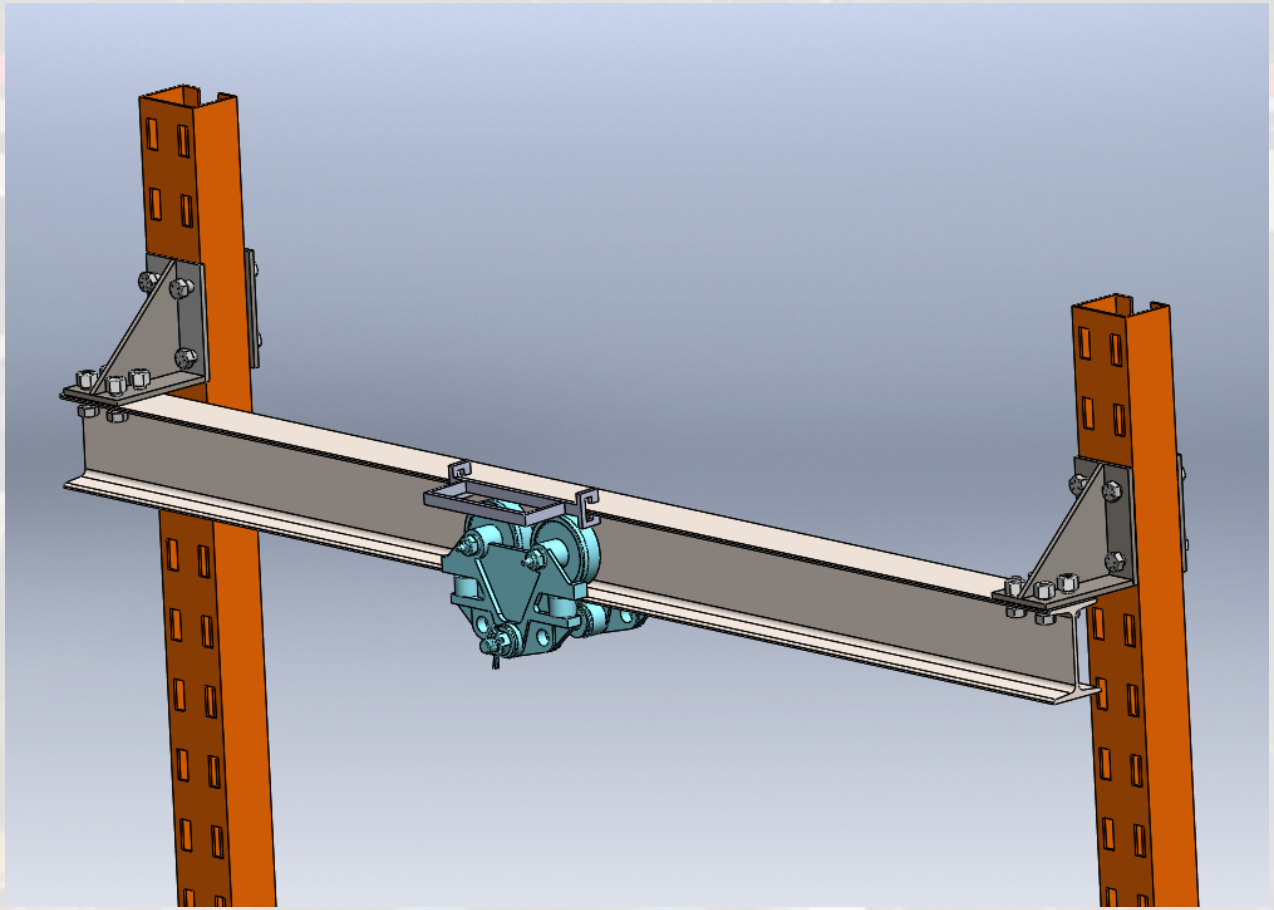
Final Design Additions – Trolley Stabilization

- A stabilizer piece was designed
- Two rollers pressed lightly against the bottom of the beam to support trolley without limiting movement



Final Design Additions – Safety Locks

- A lock for the trolley will be installed to prevent unintentional sliding
- A lock for the arm will be installed to prevent unintentional swinging

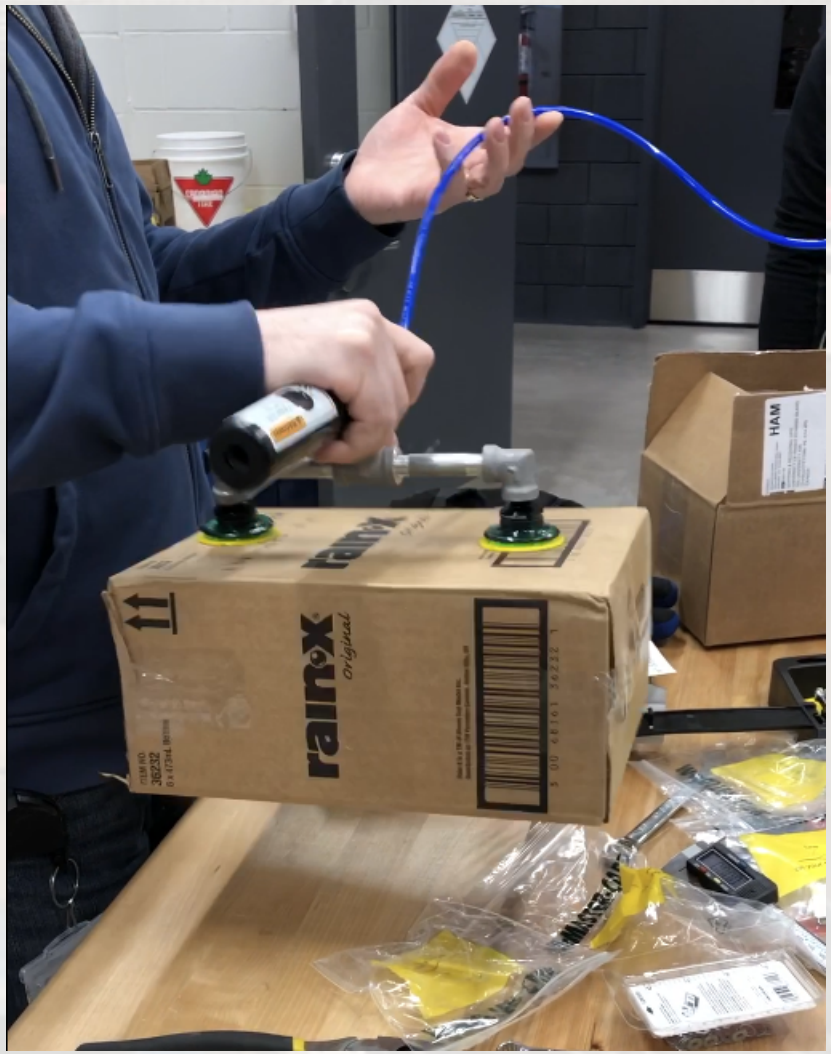


Prototype Testing – Vacuum Suction

- Air flow from single pump split into two suction cups
- Vacuum tested on cardboard (with and without tape) and pails

Final Design Recommendations

- An optimized suction system will be determined based on testing conducted
- Our recommendation: An optimized version of our testing or an off-the-shelf vacuum automation system




Thank you!