

Advance Tank & Construction Vertical Welding Buggy



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Presentation Overview

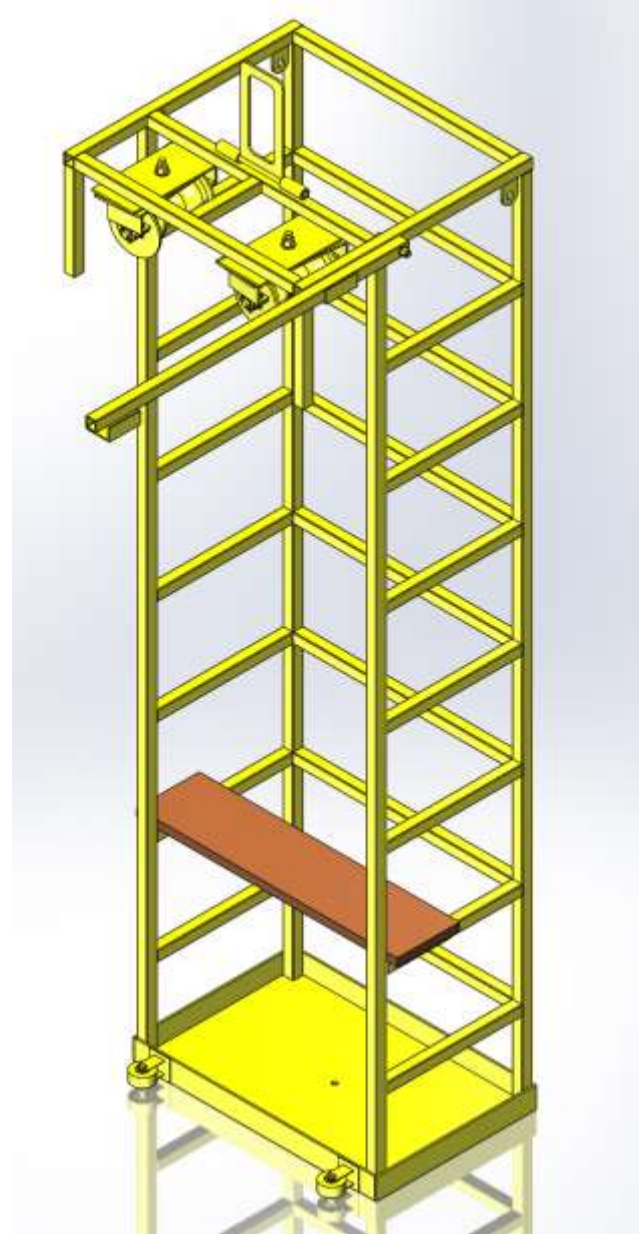
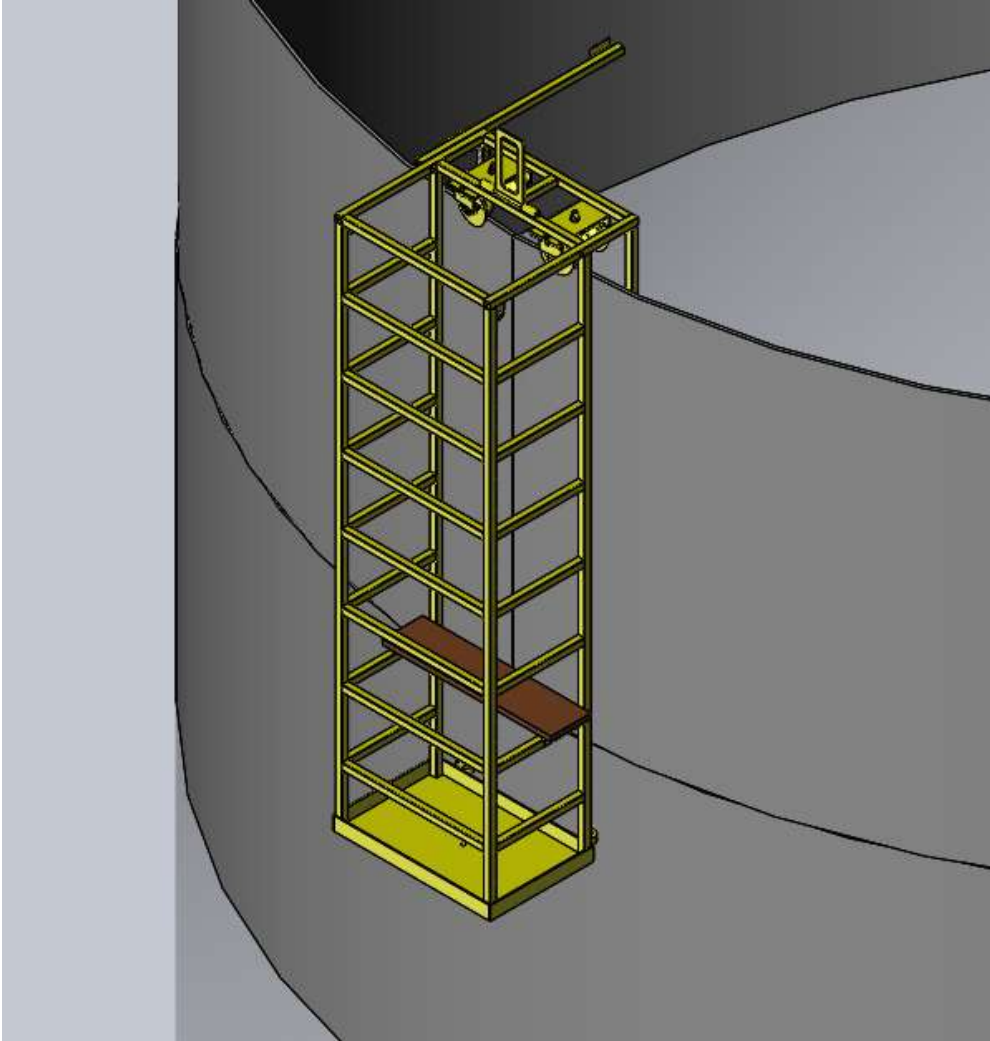
- Advance Tank and Construction (ATC) Background
- Project Motivation
- Production Objectives
- Safety Objectives
- Design Iterations
- Project Deliverables
- Questions

Advance Tank & Construction / Project Background

- Industrial storage tank manufacturer (crude oil, water, chemicals, etc.)
- Office and machine shop location: Wellington, Colorado
- Bottleneck of tank construction is the welding of vertical seams (vertical seam circled in red)



Current Advance Tank Buggy



Production Objectives for the Structure

- Compatible with welding machine
- Increases efficiency compared to current methods
- User friendly product
- Short set-up and take-down time
- Reliable and dependent

Production Objective: Welding Machine Compatibility

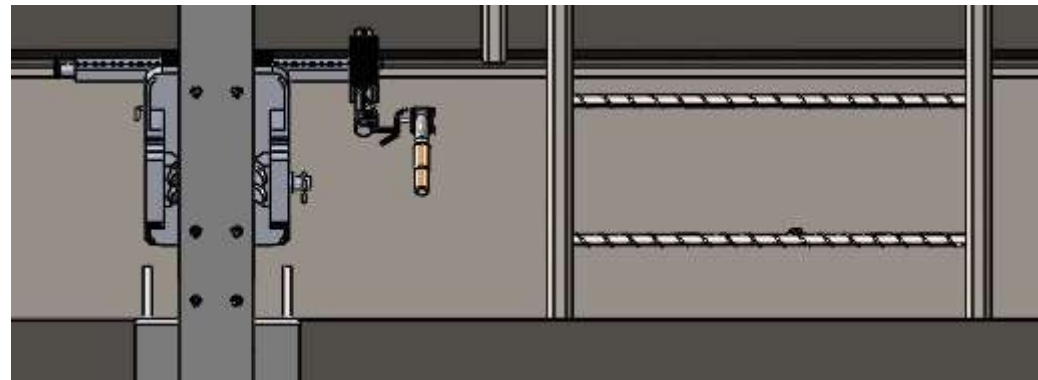
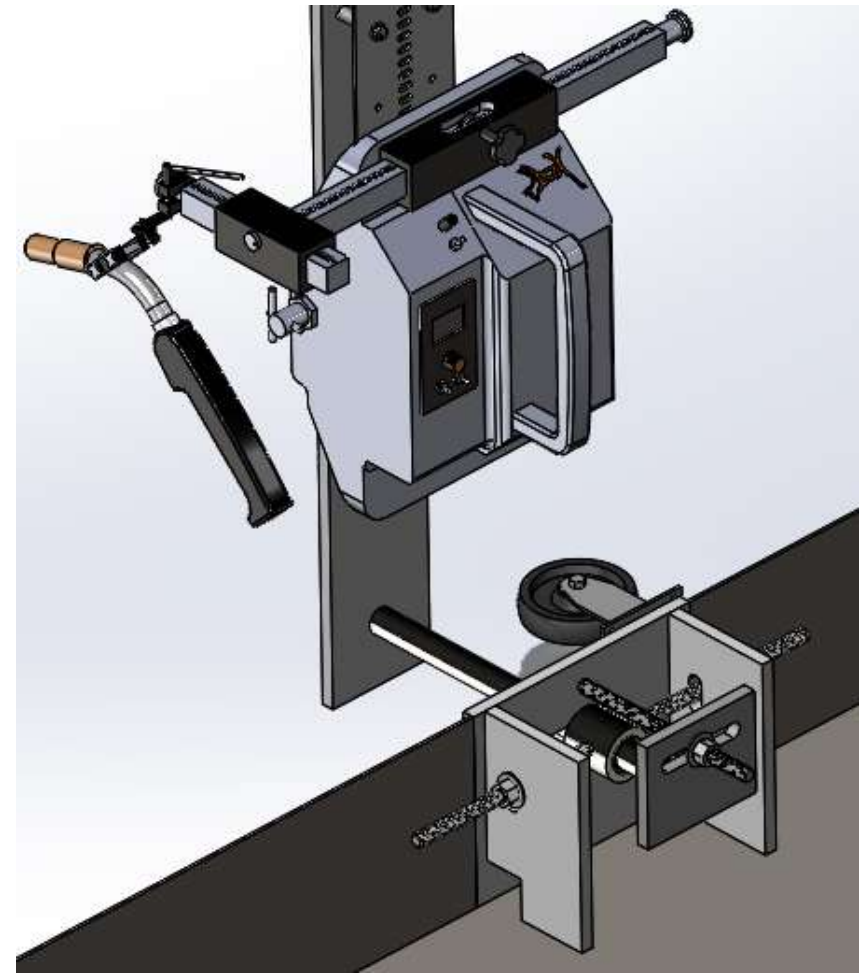
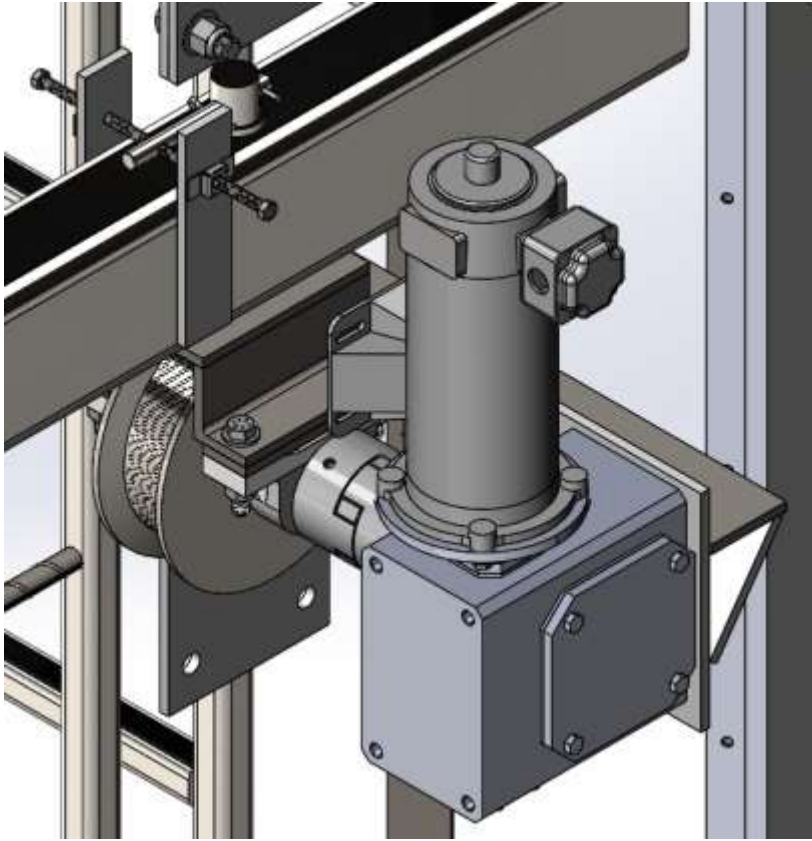


Working Dimensions

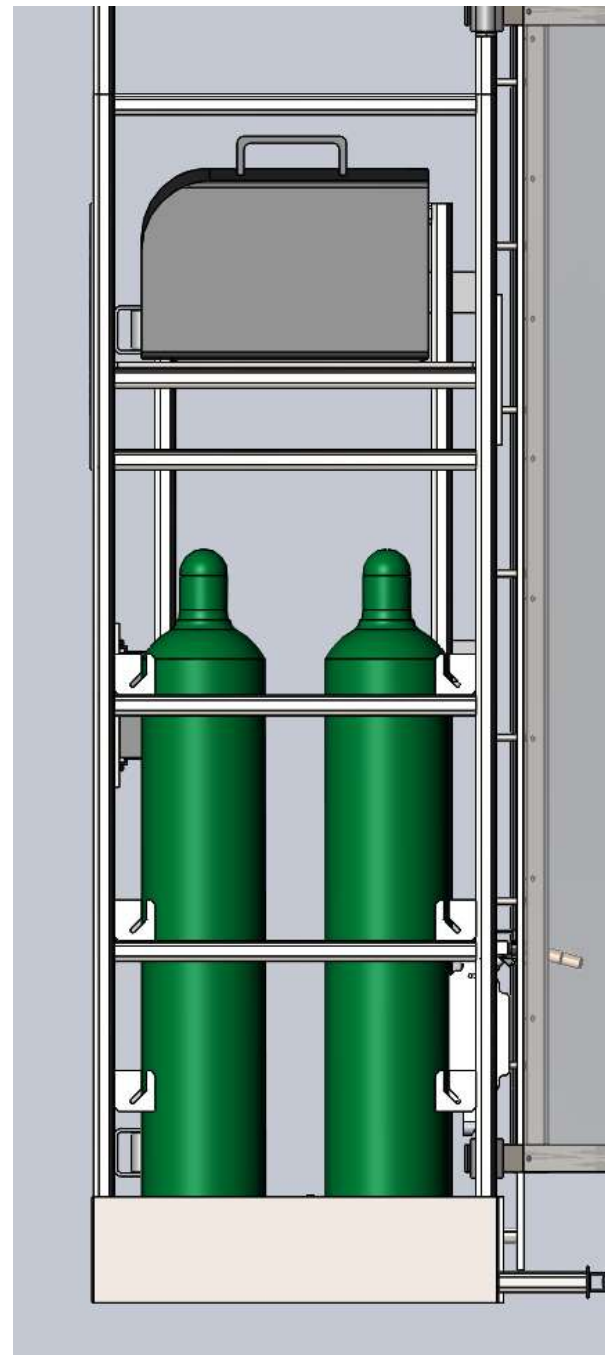
Height	15.2 feet
Width	5.8 feet
Depth	2.2 feet



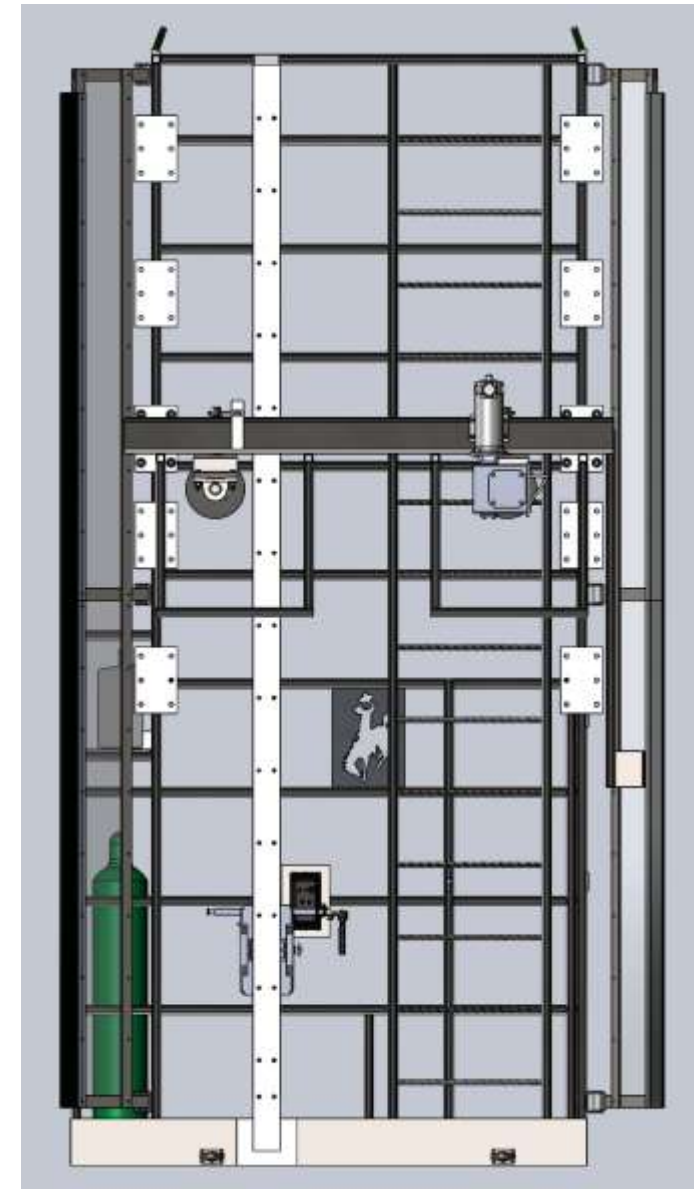
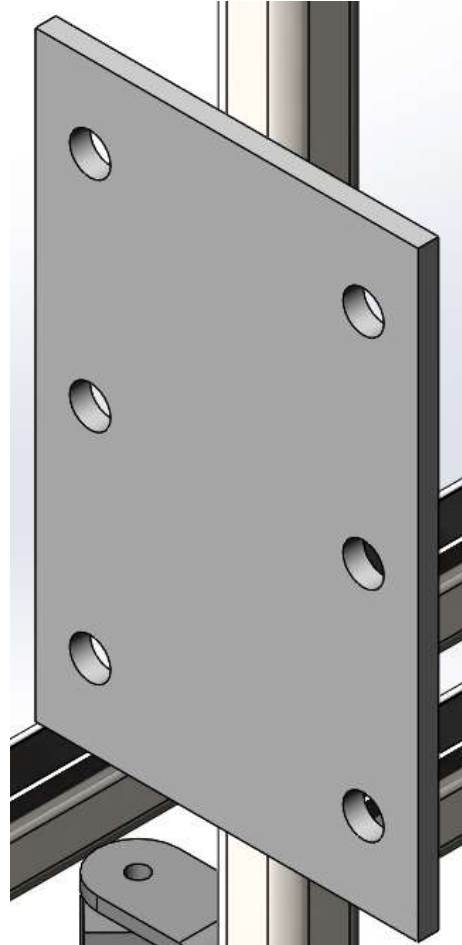
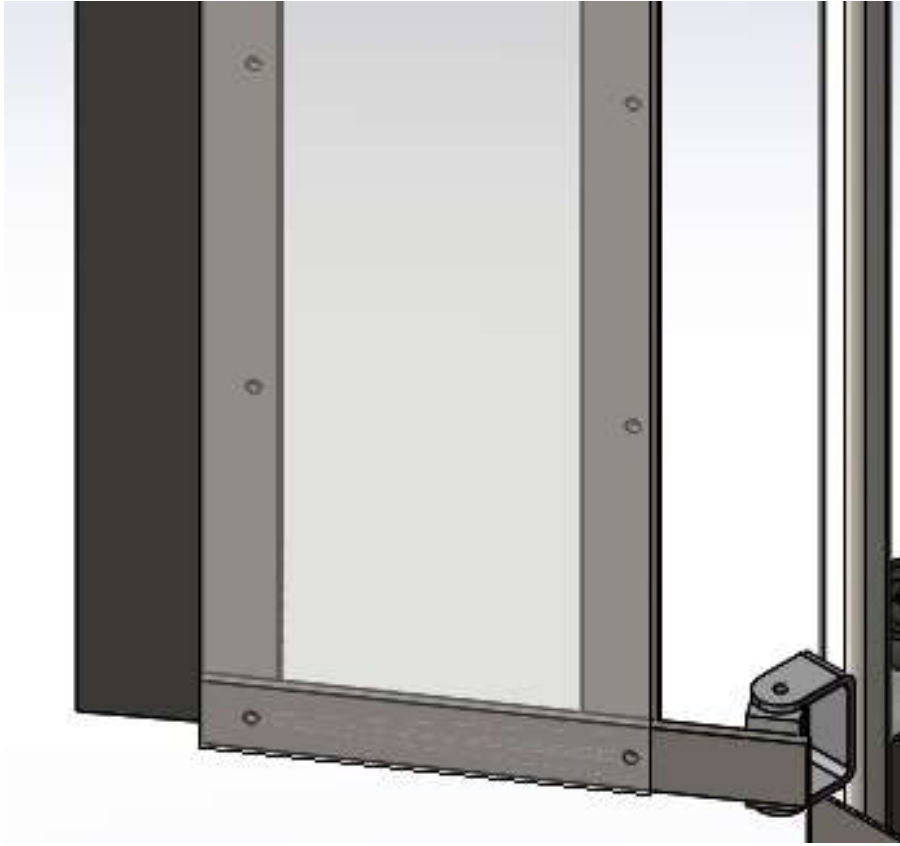
Production Objective: Increase Efficiency



Production Objective: User Friendly Design



Production Objection: Short Set-Up and Take-Down Time



Production Objective: Reliable and Dependent

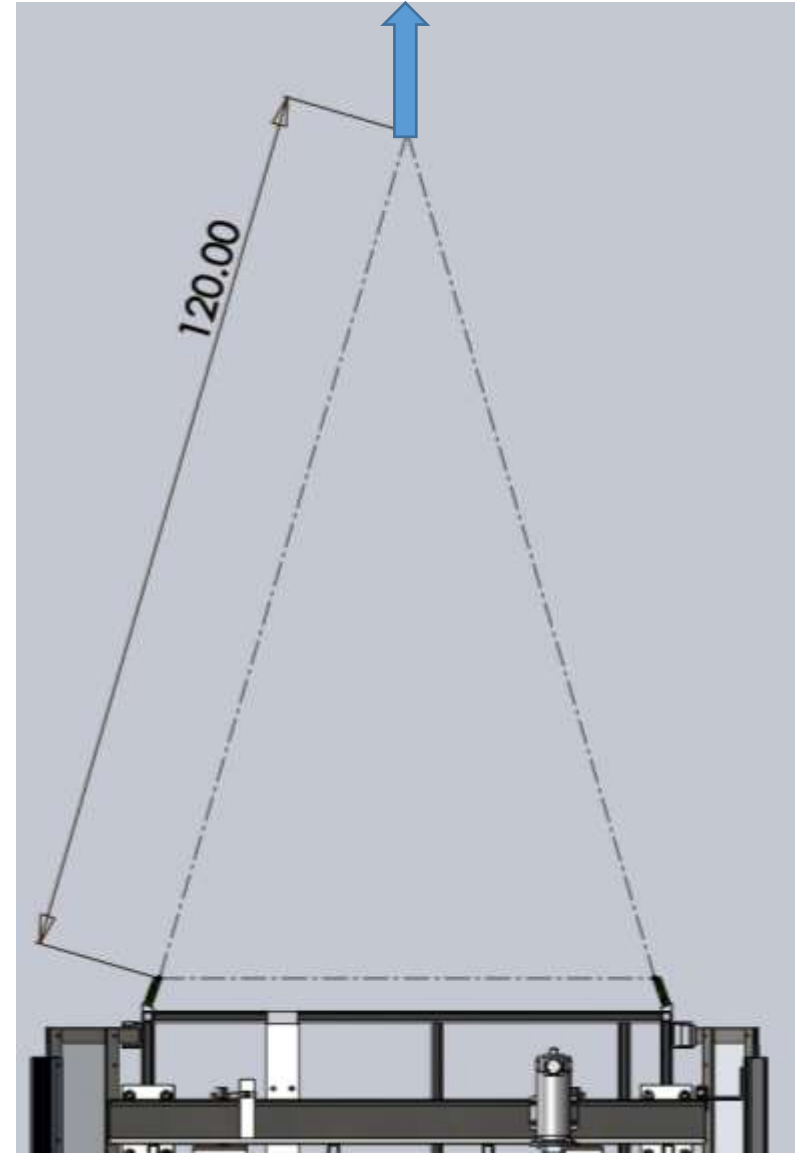
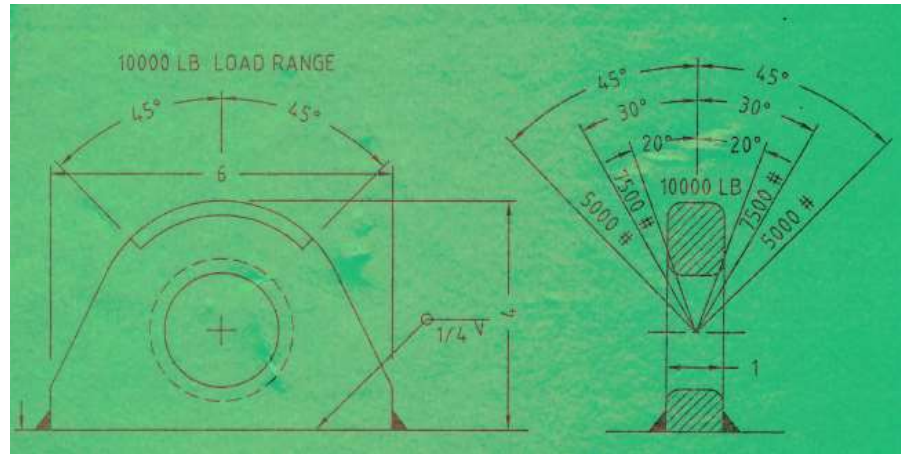
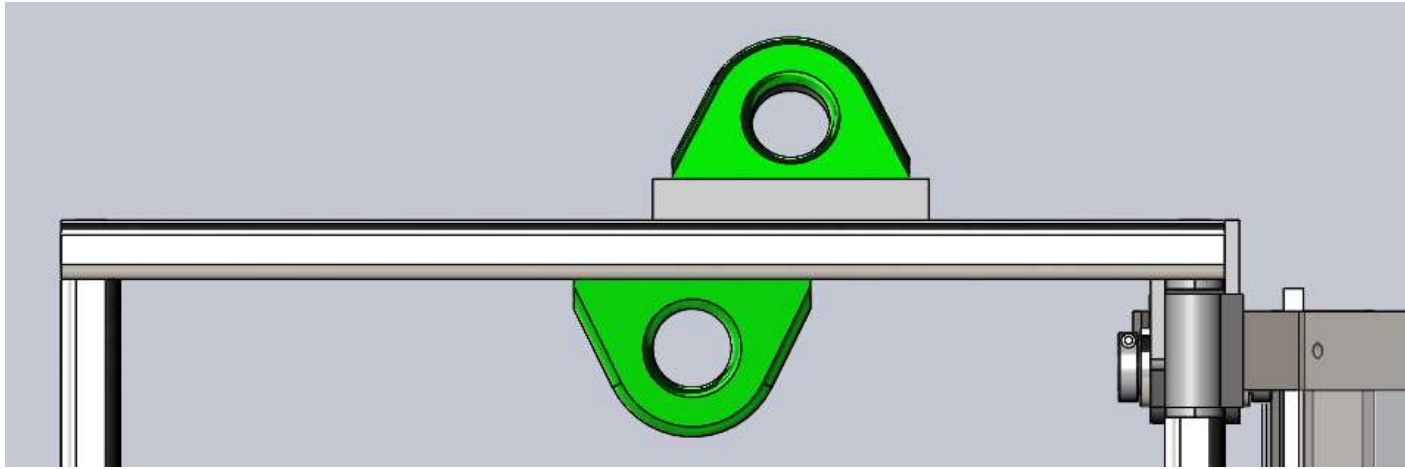


Safety Objectives

- FMEA
- Tie-off & crane pick points
- Catch system if rollers fail
- Meets all OSHA requirements for an elevated working platform

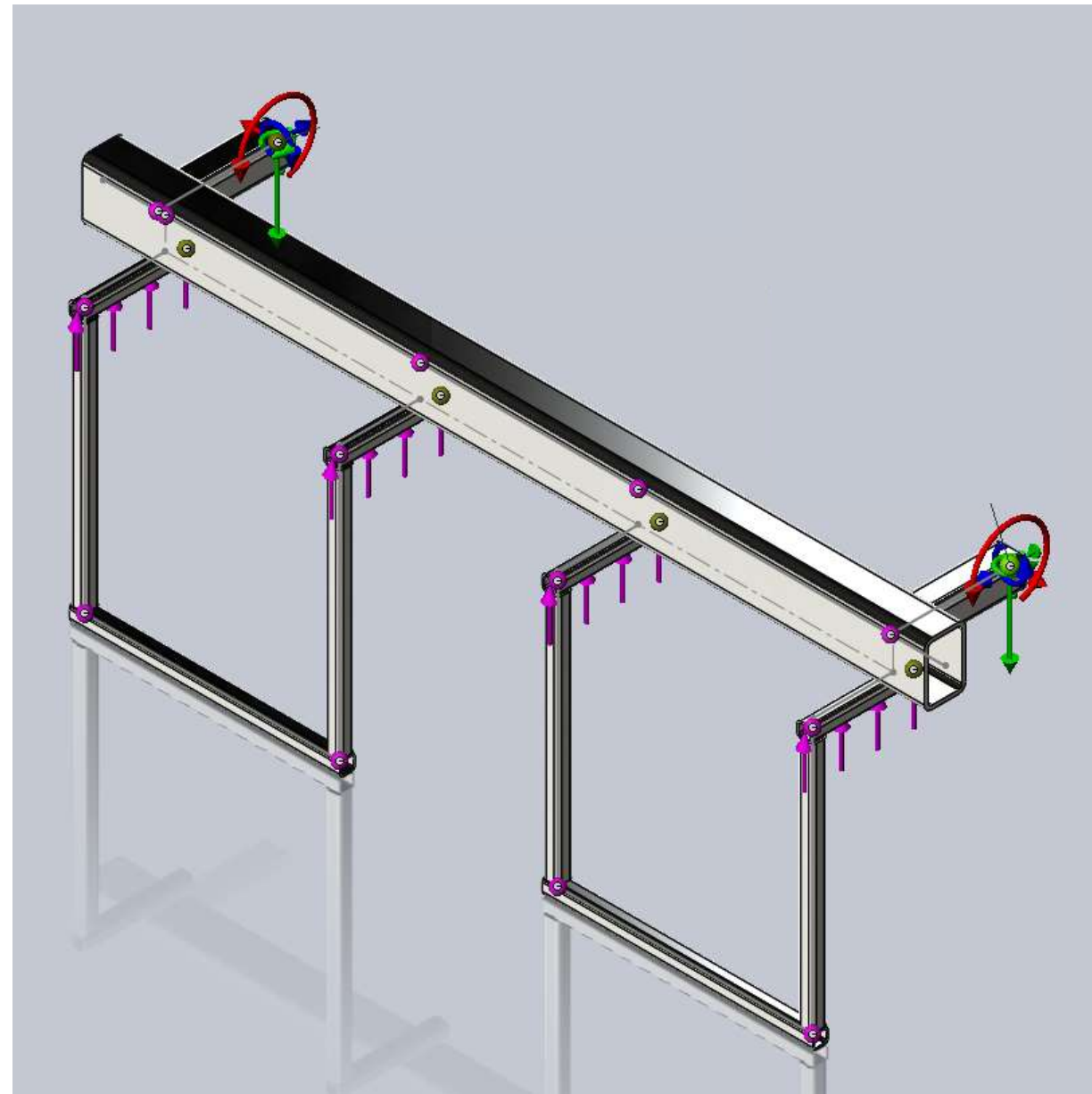
Process	Potential Failure Mode	Potential Failure Effects	Severity	Potential Causes	Occurrence	Process Controls
Movement and Placement of Buggy	Pick Point Failure	Machine Damage / Workman Health	H	Inadequate design / welds without full penetration	L	Tested welds
	Fall off shell	Machine Damage / Workman Health	H	Design failure of primary track and fall prevention system	L	Tested welds, catch system installed on buggy
	Motor failure	Motor continues running w/o operator	H	Workman falls from structure while in motion	L	Deadman switch on motor control
Welding vertical seam	Operator fall	Workman injury/death	H	Unnatural ergonomics / workman error	L	Sufficient fall protection, ergonomics considered
	Fall protection failure	Workman injury/death	H	Tie-off lugs not properly welded	L	Tested welds
	Exposure to gas byproduct of weld	Workman illness	H	Design limits working space	L	Structure of sufficient size
	Fire	Machine damage, workman injury/death	H	Weld malfunction, electrical spark	L	Fire extinguisher on site
	Pinched/cut wires	Electrical spark/ gas leak	H	Structure design flaw/workplace accident	L	Designed wire & hose location

Safety Objective: Tie-Off & Crane Pick Points



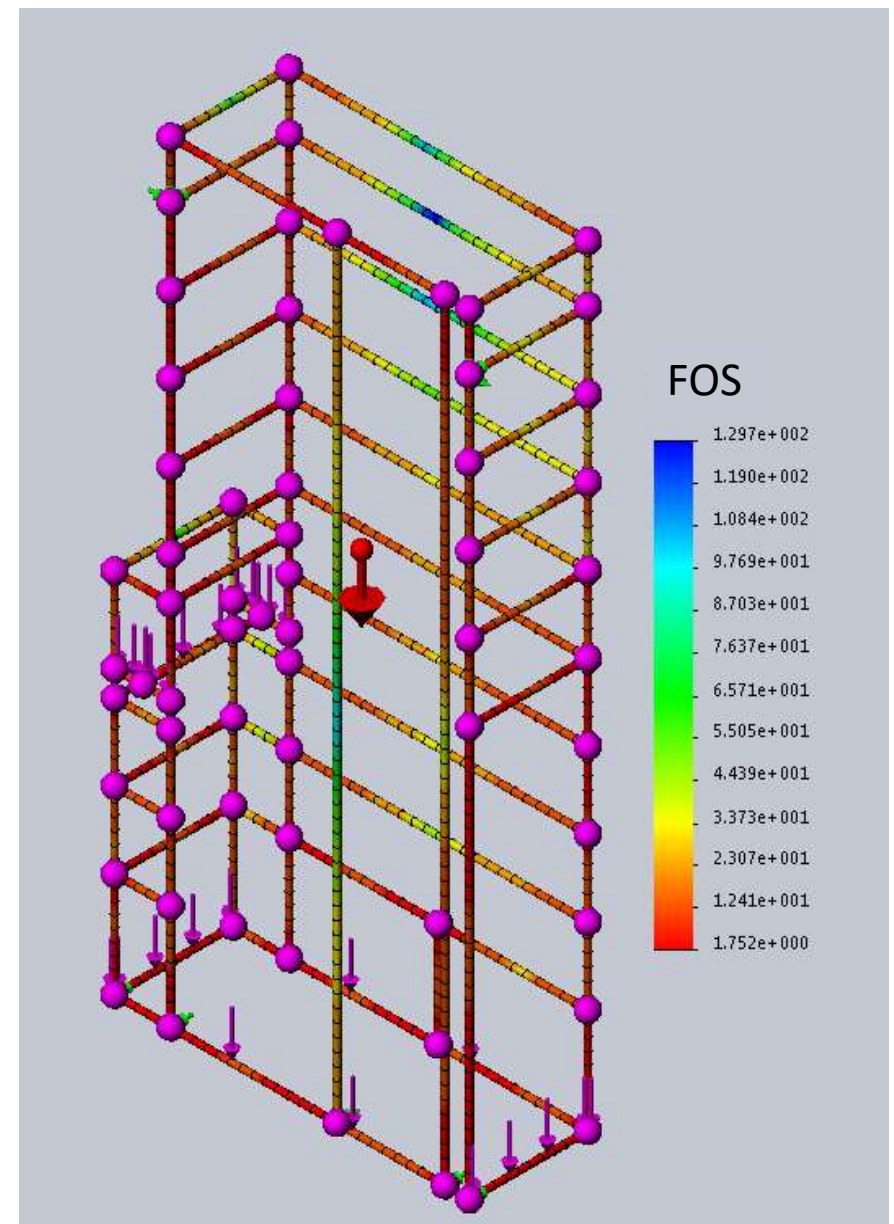
Safety Objective: Safety Catches

- Resultant moment on weld:
 $128 \cdot 10^3 \text{ lbf} \cdot \text{in}$
 - Resultant force on weld:
 $9.31 \cdot 10^3 \text{ lbf}$
 - Produces:
 - Bending stress of:
 14.26 ksi
 - Shear stress of:
 2.07 ksi
- Result: $FOS_{vM} = 3.1$

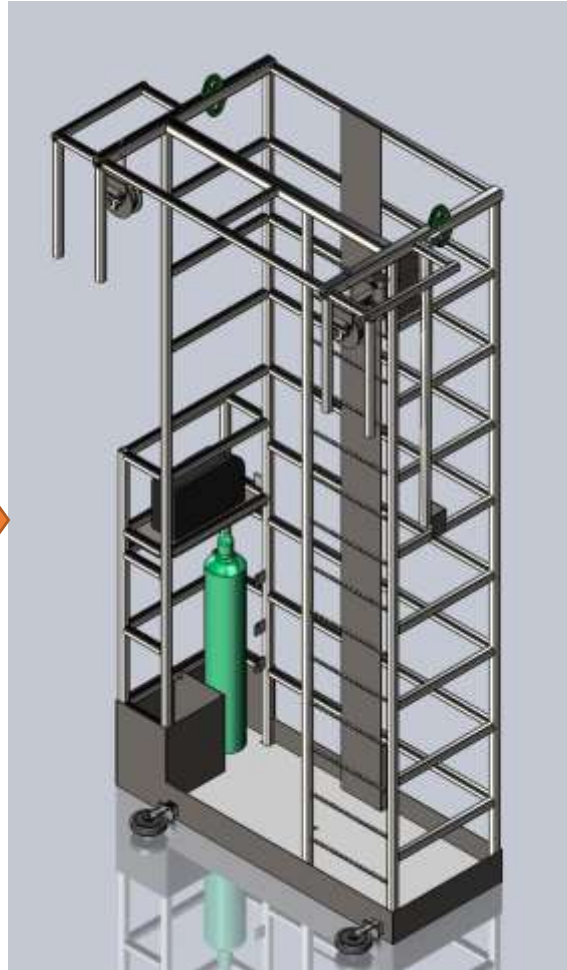
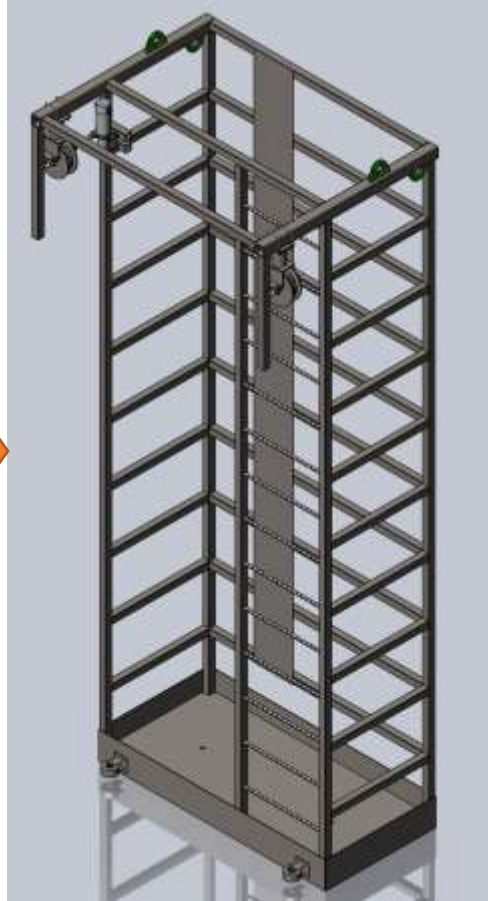
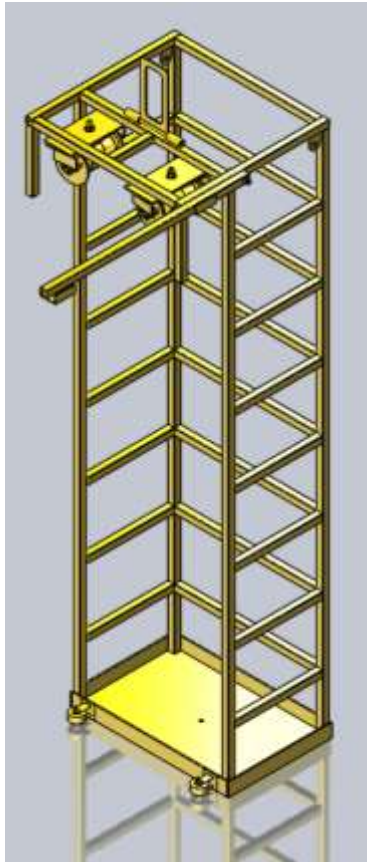


Safety Objective: OSHA Requirements

- Material: ASTM A500 Grade B
- 4x live load
 - Four 350 lb men
 - Eight full argon bottles
 - etc...
- Resulting in $FOS = 1.75$



Design Iterations



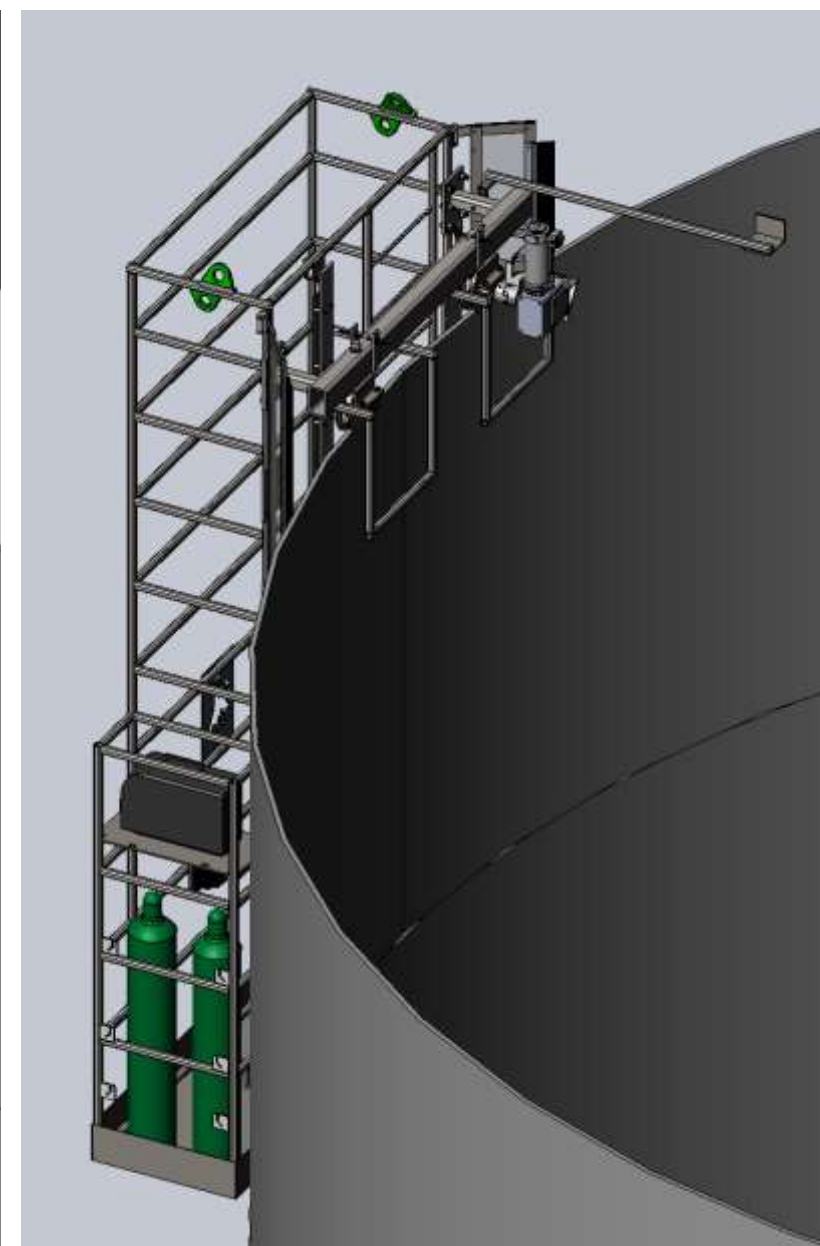
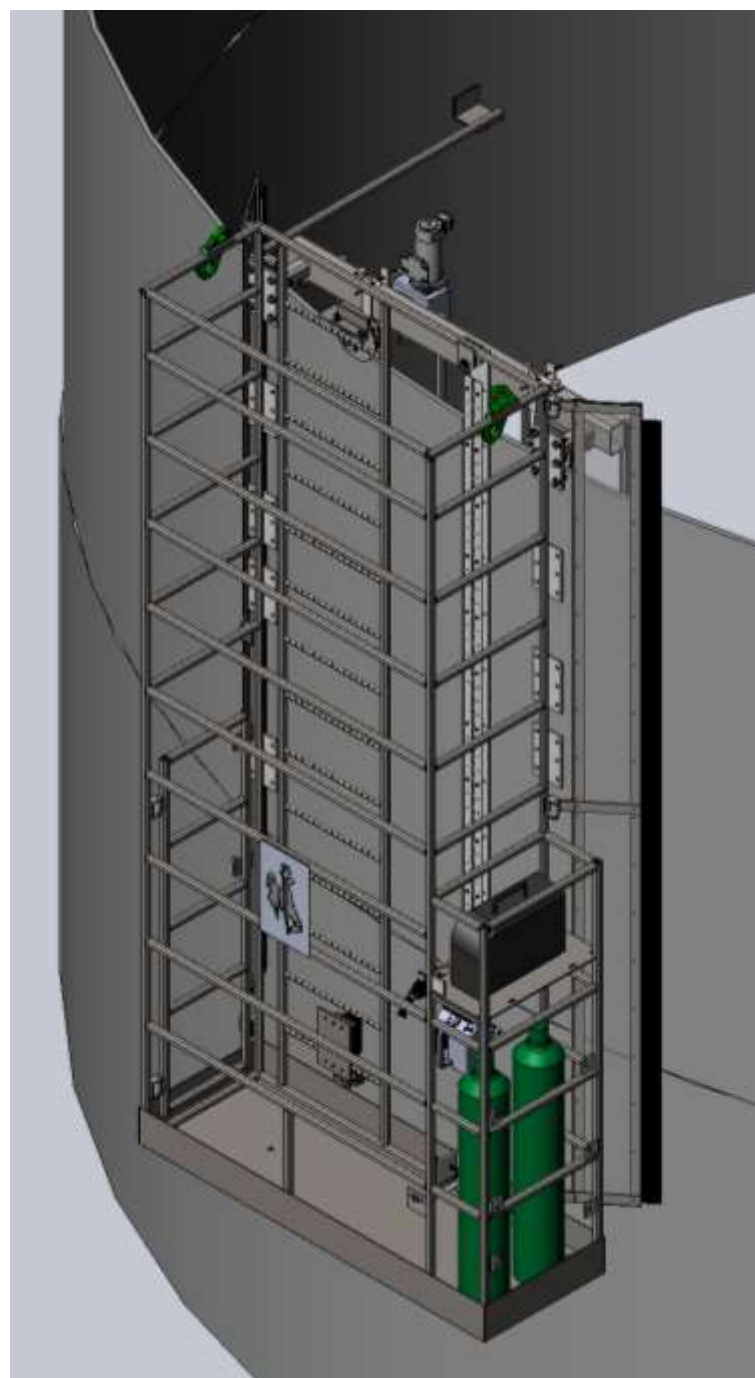
Project Deliverables

- Finalized project objectives document
- Bill of Materials
- Drawings for every part associated with buggy
- 3-D Model of final buggy

Final Design: Economics

Cost to Build	\$16,000
Cost to Buy	\$25,000
Savings	\$9,000

- 25% increased efficiency



Thank You and Questions

