

# **Craniacs**

## *Walker*

### *Loading B2.2*

#### ***Members:***

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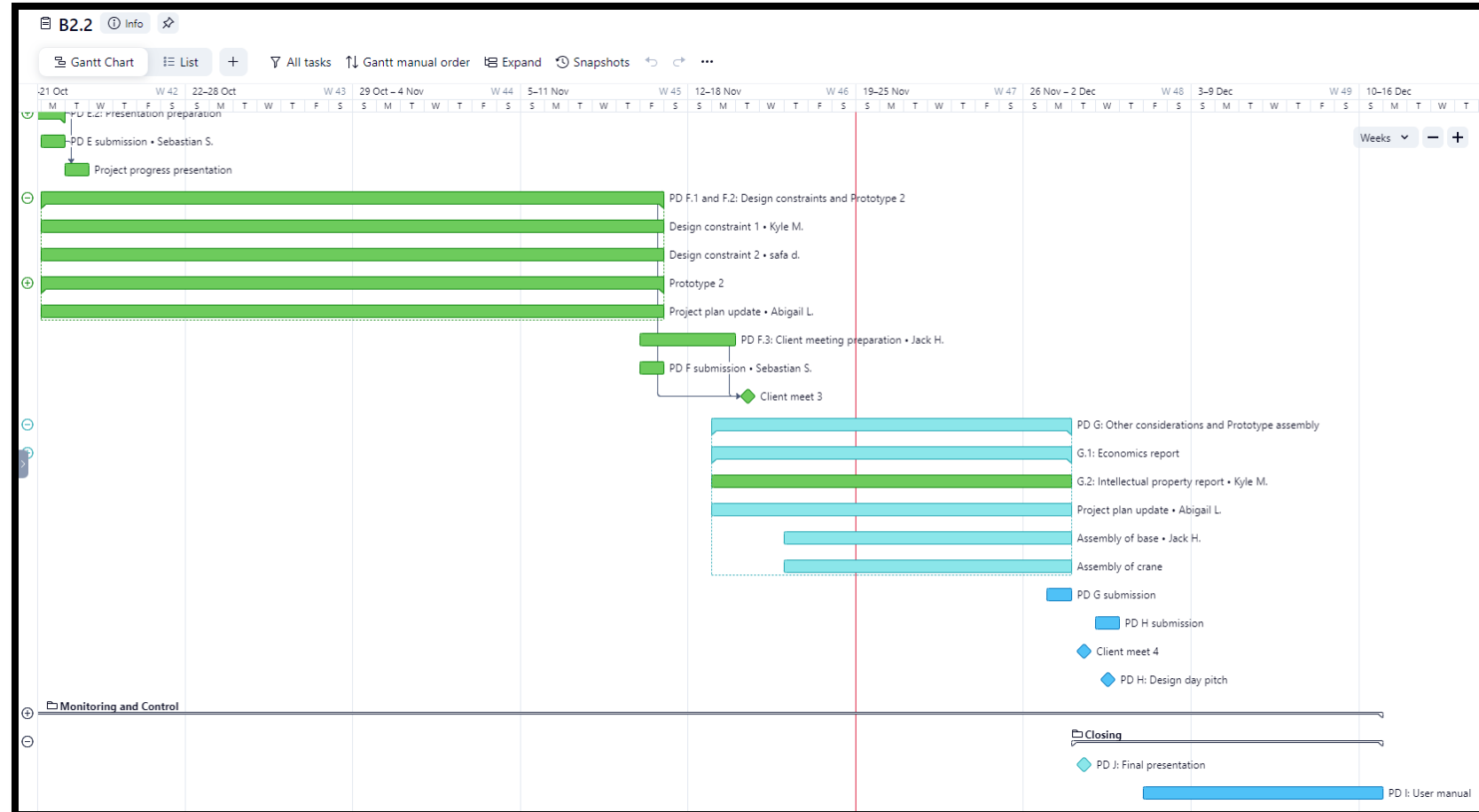
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# Problem Definition

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Design a weatherproof, safe, durable and adaptable system to lift a walker in and lower it out of the trunk of a vehicle. It is to be used independently by an individual who uses a walking aid without causing damage to the car or to the walker.

# Project Plan



# Customer Needs and DFX

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## *Design for:*

- Adaptability
- Reliability
- Usability
- Sustainability
- Cost

#	Need	Importance
1	The loading system operates normally in various weather conditions	5
2	The loading system is adaptable to different vehicle types	3
3	The loading system can lift various folded walker models	1
4	The loading system preserves the quality of the car	4
5	The loading system is easy to install	3
6	The loading system is affordable and within budget	3
7	The loading system lasts a long time	5
8	The loading system is safe to operate	5
9	The loading system allows for easy maintenance	3
10	The loading system does not take up all the trunk's capacity	2
11	The loading system preserves quality of the walker	5
12	The loading system does not require a high degree of mobility to operate	5

# Technical Benchmarking

Metric #	Need #	Metric	Unit	Exterior Hitch Carrier	Hitch-Mounted Lift	Trunk-Mounted Arm/ Hoist	Ramp
		Company	-	Steady Carriers	Viking Solutions	MillerCare	Ganggend
1	6	Price (CAD)	\$	399.00	355.99	Unknown (Requires a Quote)	159.99
2	10	Dimensions Length x Width x Height	in	Length from hitch 12 x 19 - 26	60 x 36.5 x 52	N/A (Inquired)	36 (closed position) – 60 (open position) x 7.4
3	4,11	Exterior Storage of Walker	Y/N	Yes	No	No	No
4	2	Exterior-Mounted Device	Y/N	Yes	Yes	No	Only in Use
5	12	Degree of Mobility Required	level	High	Moderate	Low	High
6	8	Load Capacity	lbs	Unknown	300	176.4 – 220.5	600
7	1,7	Materials	list	Steel Tubing and Stainless-Steel Hardware	Steel Tubing and Stainless-Steel Hardware	Unknown	Aluminum Alloy with plastic non-slip portions
8	9	Degree of Recyclability (of Materials)	level	High	High	N/A	Moderate
9	8	Weight of Unit	lbs	< 9	54	Unknown	12.71
10	5	Ease of Use	level	Moderately Easy	Moderately Easy	Easy	Easy



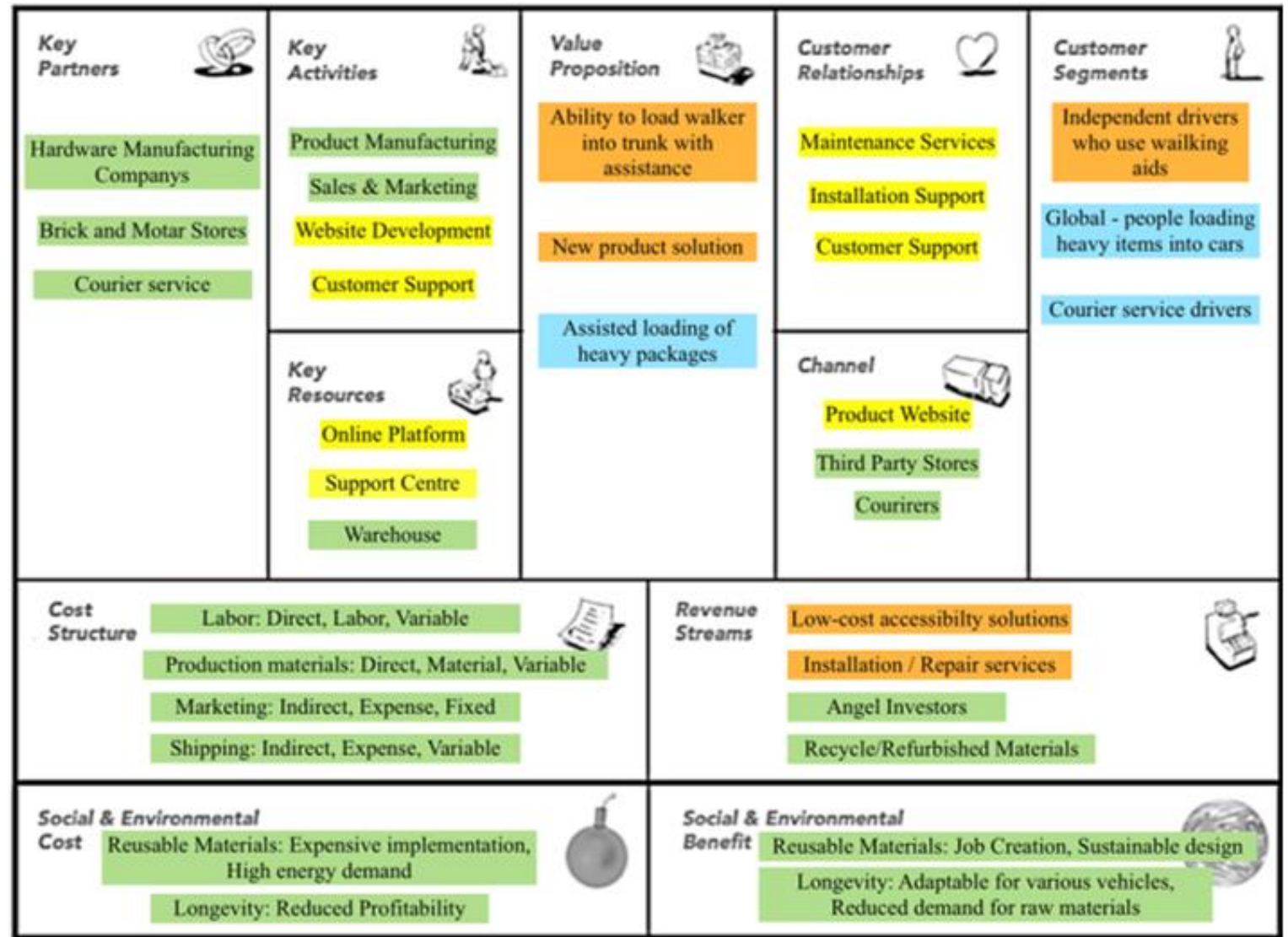
# Target Specifications (Interpreted Needs)

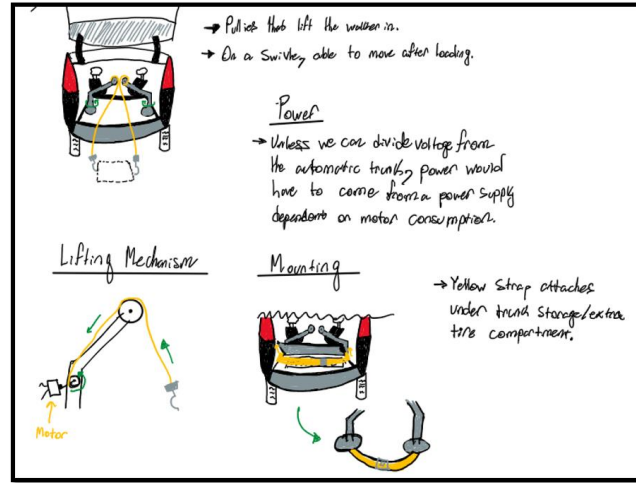
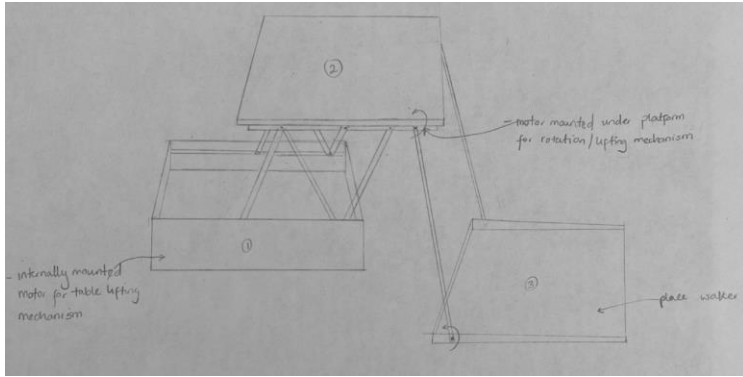
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Metric	Unit	Value
1	Price (CAD)	\$ 100
2	Dimensions: Length x Width x Height	in < 37.8 x 43.3 x 35.4
3	Exterior Storage of Walker	Y/N No
4	Exterior-Mounted Device	Y/N No
5	Degree of Mobility Required	level Low
6	Load capacity	lbs 26.5 <
7	Material	list N/A
8	Degree of Recyclability (of Materials)	level High
9	Weight of Unit	lbs 16
10	Ease of Use	level Easy

# Business Model

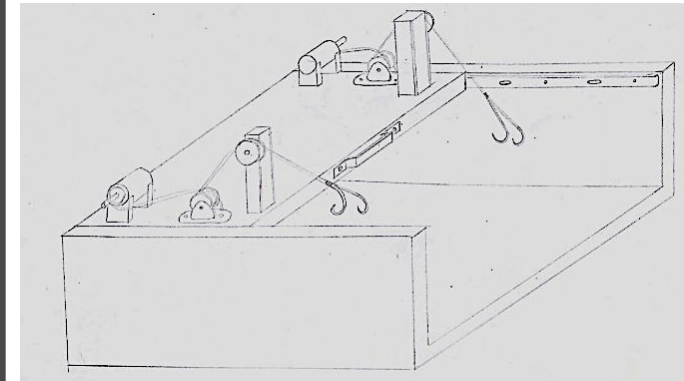




# Concepts Development

Selected Criteria	Weight	Concept 1	Concept 2	Concept 3
Ease of use	0.20	4	2	3
Cost	0.15	3	3	5
Dimensions	0.10	2	2	1
Load capacity	0.10	6	4	4
Degree of Mobility Required	0.15	6	3	2
Lifespan	0.10	4	2	3
Maintenance requirements	0.10	3	5	4
Safety	0.20	5	4	4
Total	1.0	4.45	3.20	3.25
Rank		1	3	2

\*Rating 1-6 (1 being worst, 6 being best)



**Global Concept**

Precious



# Critical Assumptions and Design Constraints

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## Critical Assumptions:

### **Trunk Size/ Car Model**

Assumed Honda CRV and trunk size of 30in x 30in (LxWxH)

### **Power for Electronics**

12V cigarette lighter was assumed for power (later determined not enough power)

### **Mounting**

Assuming tie down hooks available in trunk

## Design Constraints:

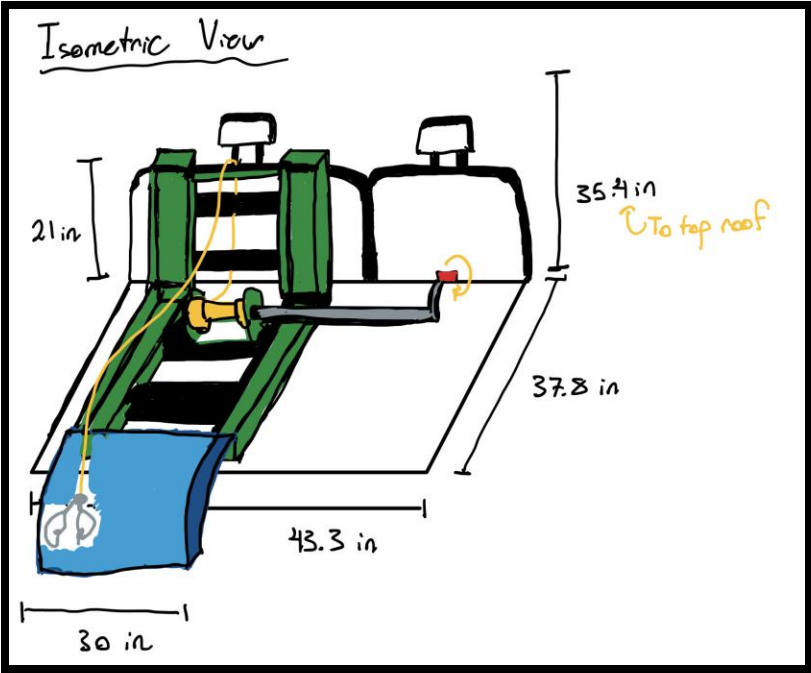
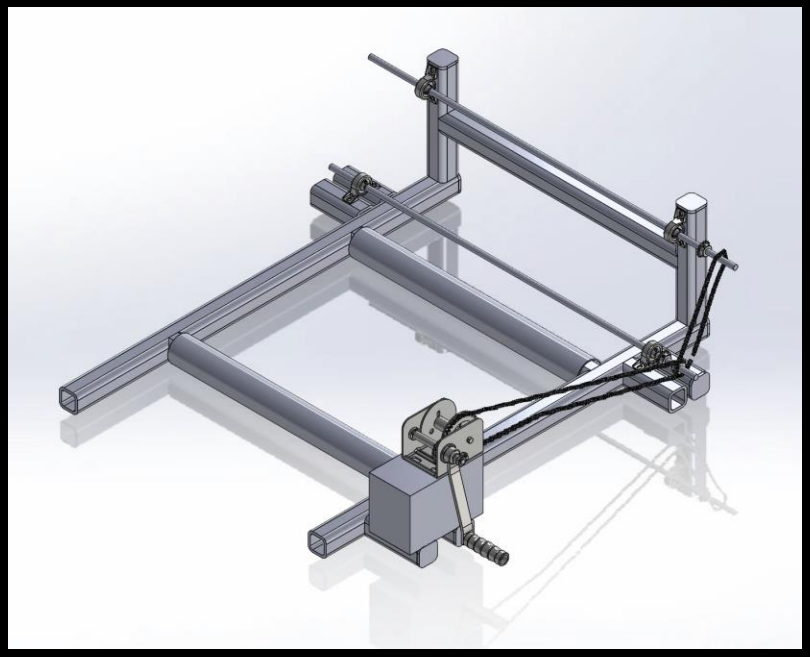
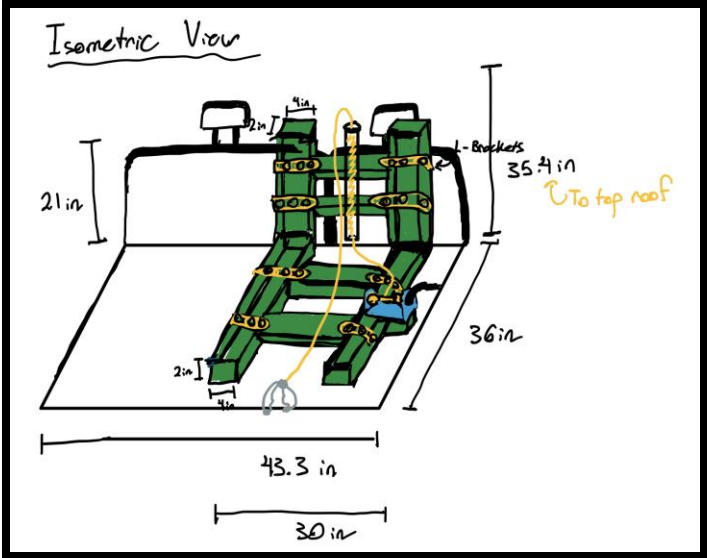
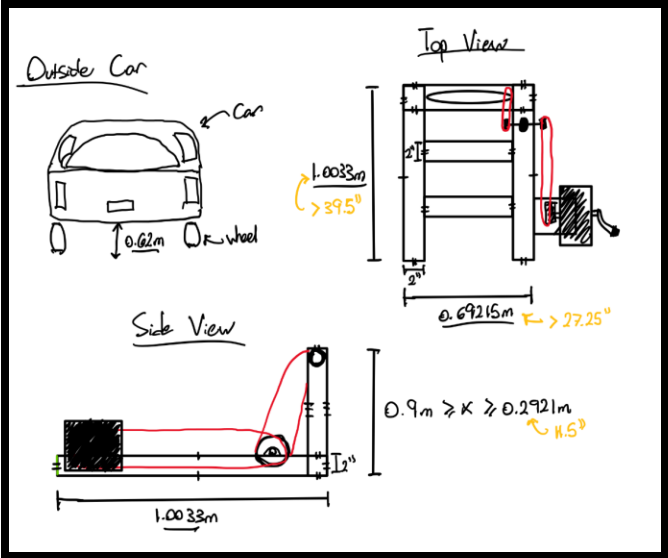
### **Weight of the Load**

Min. 30 pounds for walker

### **Footprint of Loader**

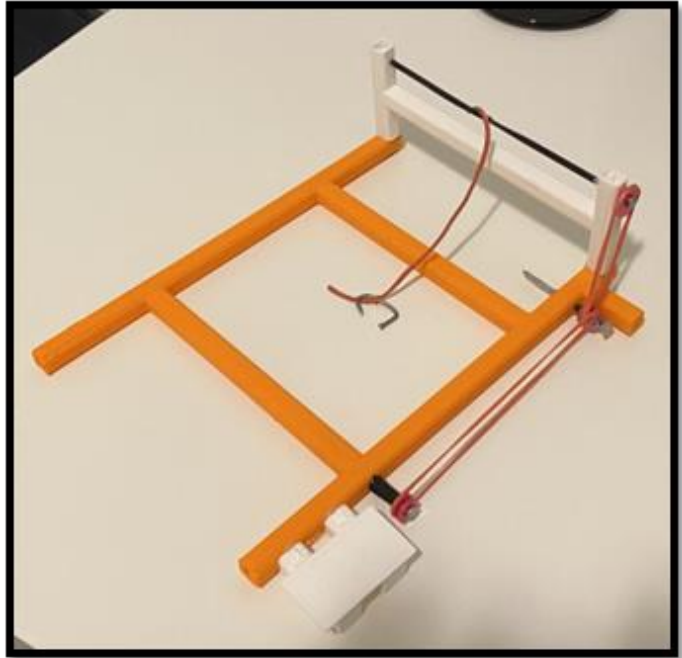
30in x 30in x 24in (LxWxH)

# Decision Made



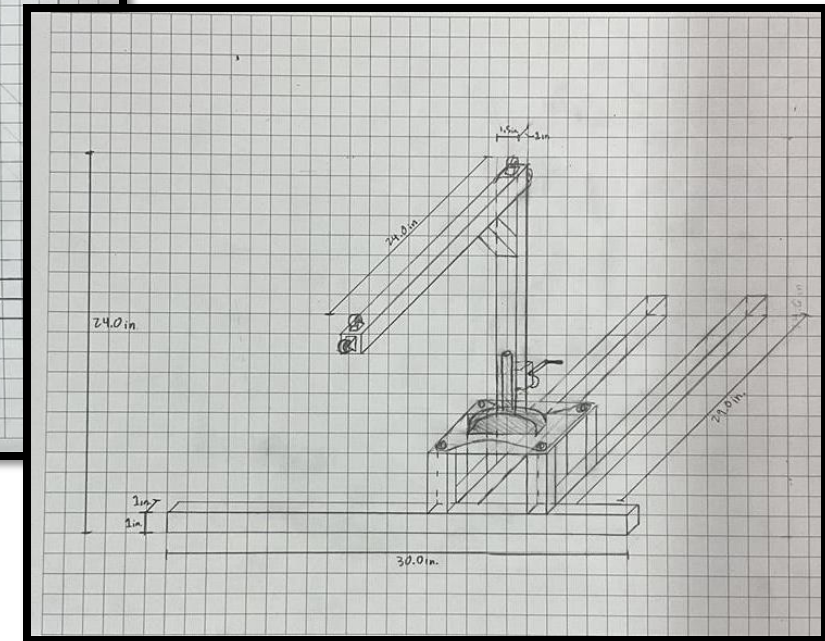
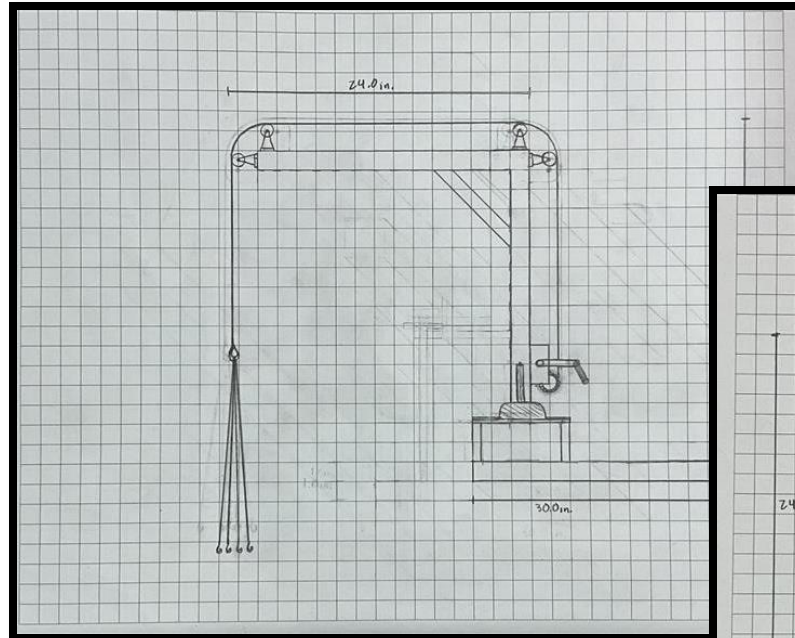
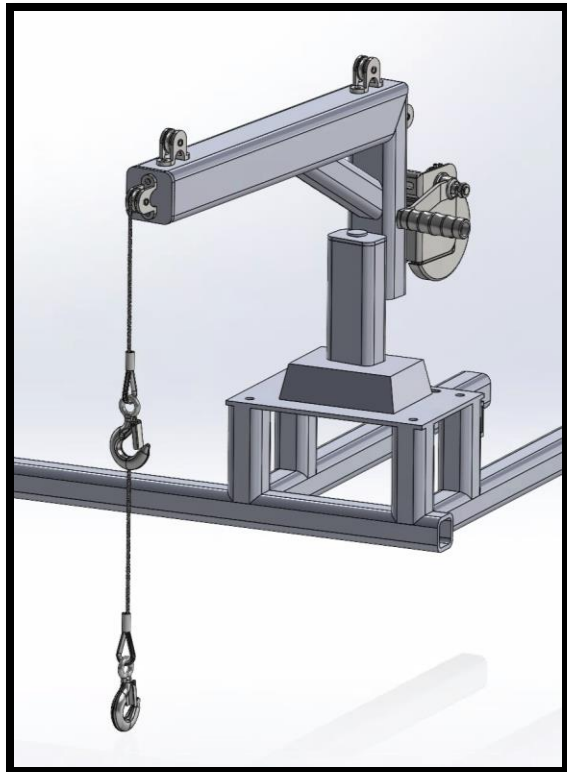
# Prototypes (Trials and Tribulations)

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# Chosen Concept and Detailed Design

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# Prototype Demonstration and BOM

BOM				
Item	Price/ Unit (\$)	Quantity (#)	Price (\$ + 0.13%)	Hyperlinks
Makerstore (Brunsfeld Metal)	5	1	5	<a href="#">Hyperlink</a>
Steel Tubing (1.5in x 1.5in x 0.065in) for horizontal crane	10	1	10	<a href="#">Hyperlink</a>
Steel Tubing (1in x 1in x 0.065in) for base (recycled)	0	0	0	
Used Office Chair (recycled) for swivel	0	1	0	
600lbs Hand Crank	32.99	1	37.99	<a href="#">Hyperlink</a>
Block Pulleys	29.99	1	33.8887	<a href="#">Hyperlink</a>
Carabiner	11.99	1	13.5487	<a href="#">Hyperlink</a>
Metal Sheet (can utilize scrap)	0	1	0	<a href="#">Hyperlink</a>
Ratchet Straps for Tie Down	14.99	1	16.9387	<a href="#">Hyperlink</a>
Hardware (from brunsfeld)	0	0	0	
Total			117.3661	

# Sustainability Report

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- Environmental impacts
  - Decrease involvement in creating waste products which creates a chain effect on pollution
  - Respect of environmental guidelines
- Social impacts
  - Create job opportunities with fair wages: “recycling creates on average nine times more jobs than trash”
- Economic impacts
  - Attracts clients that are eco-friendly, new customers

# Lessons Learned

- New technical skills
- Changing your design many times is acceptable
- Making compromises with the client needs
- A simple design is more advantageous in short term projects
- Staying under budget while prototyping can be difficult

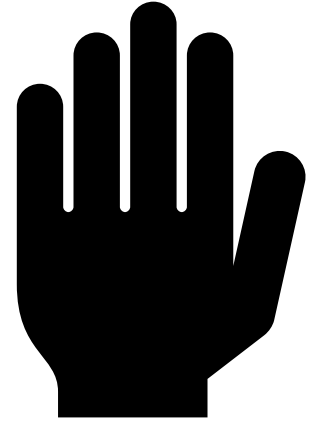
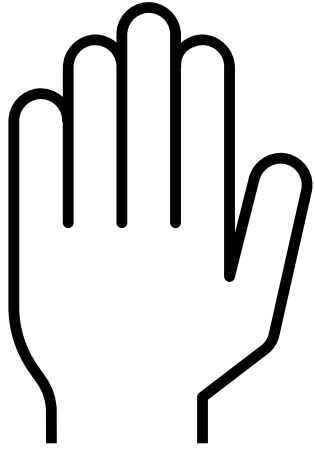
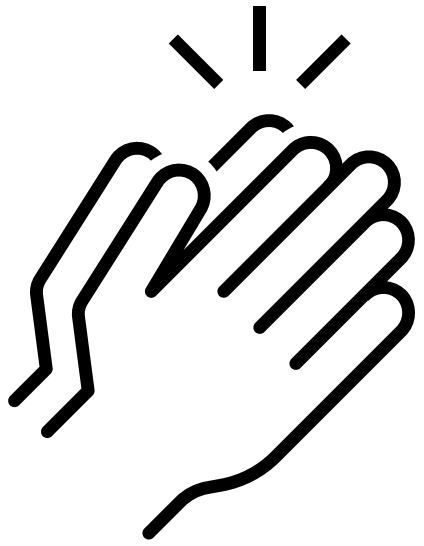
# Future Work

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- No counterweight
- Adjustable T support
- Lock to prevent rotation of loader







Questions