

REVERSE HYPEREXTENSION DEVICE

Pittsburg State University

Senior Project WF16/SP17





Group members

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- Customer
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Background Information

- A Reverse Hyperextension device, sometimes called Reverse Hyper or RHD is generally designed to help those with lower back problems who can no longer do squats because of the strain that comes from them.
- The RHD presents the option to work out the same muscles that squats focus on, without having the added force of gravity acting upon the person's back.



Design Inputs

Reverse Hyperextension Device		
Input	Nominal Value	Rationale
Collapsible	3' x 10' x 7'	Size of usable storage space
Width	3'	Size of usable storage space
Length	10'	Size of usable storage space
Height	7'	Size of usable storage space
Assembled Footprint Dimensions	5' x 5.5' x 5.5'	Size of functioning space
Width	5'	Size of functioning space
Length	5.5'	Size of functioning space
Height	5.5'	Size of functioning space
Movable by one person	70 lb	Max weight for UPS package to be lifted safely/individually
Stability	Present	Utilize Solidworks Stability study
Time to assemble or disassemble	10 min.	Requirement for use; time between classes
Tools needed for assembly	3	Requirement for use; device function
Weight Device can support user	300 lb Person	Customer Requirement, user safety

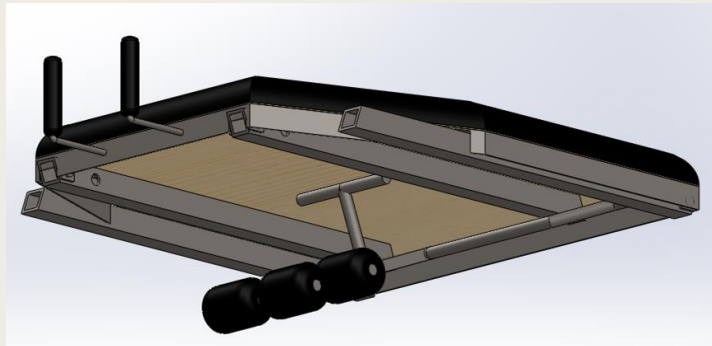
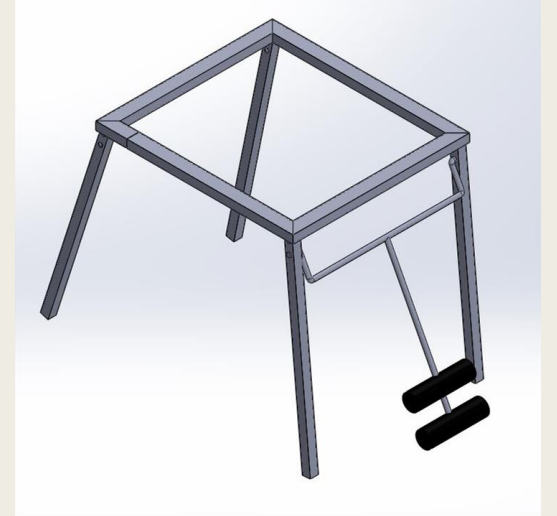
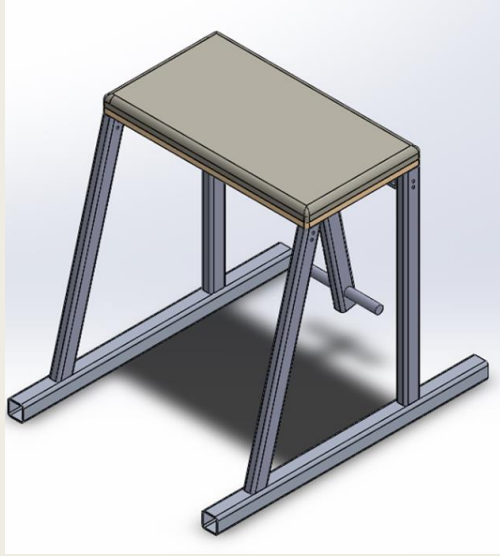
Design Inputs

Weight Device can support plate weight	250 lb Plates	Customer Requirement, user safety
Size range of user	4'-10" - 6'5"	5th percentile female - Specified by customer
Pendulum range of motion (0° is at resting point)	90° extension	Customer Requirement
	30° flexion	Customer Requirement
Cleanable Surfaces with alcohol	Present	Customer Requirement; 70% Isopropyl Alcohol
Angular position readout	Present	Customer Requirement, for data analysis
Scratch Resistant Feet	Present	Design team requirement
How-to-Use Manual	Present	Customer Requirement, user safety
Paint	Present	Design team requirement
Clean weld beads	Present	Design team requirement
Safety		
No sharp points	Present	User Safety
Minimize or label pinch points	Present	User Safety

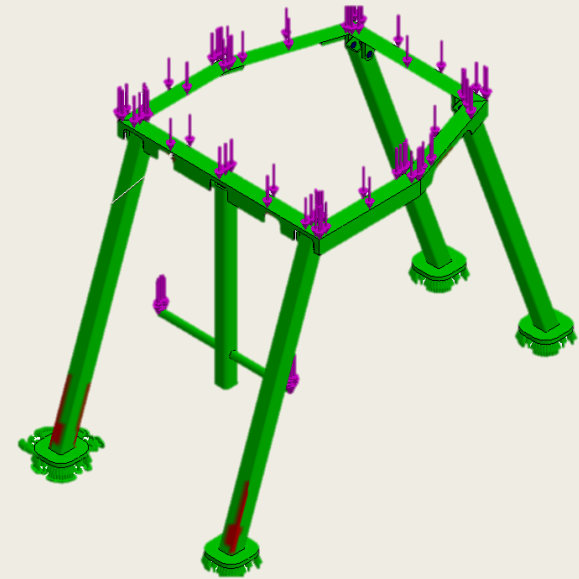
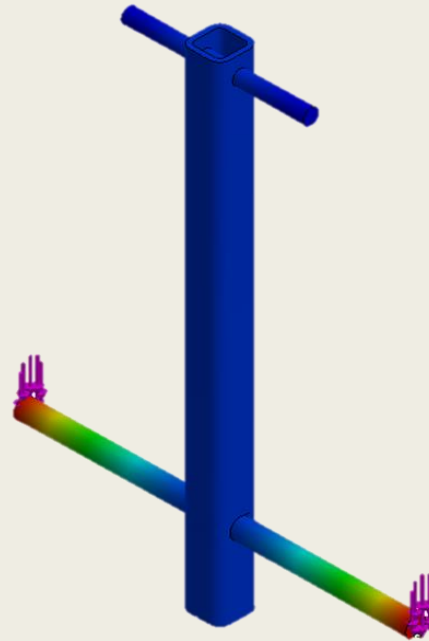
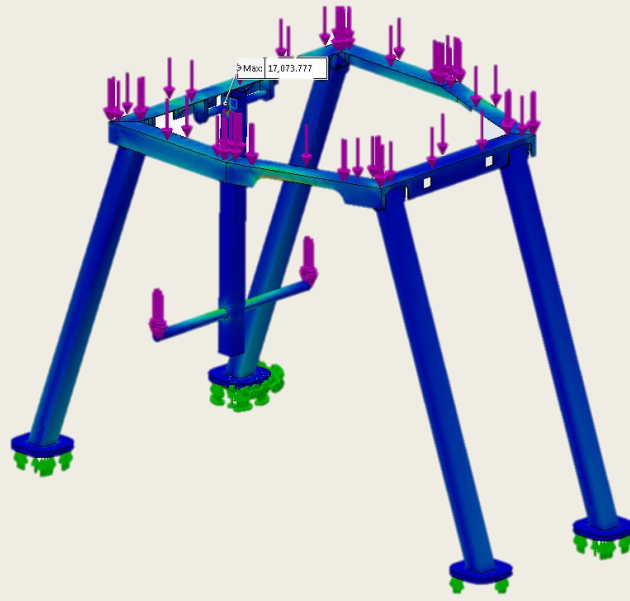
Original Budget

Material	Description	Qty.	Cost	Supplier
Aluminum Sq. Tubing	2" x 2"x.125"	15'	\$ 180.00	Metal By The Foot
Steel Angle	2" x 2"x.125"	12'	\$ 50.90	Metal By The Foot
Round Stock	.875" DIA 6061 Aluminum Rod	4'	\$ 15.60	Metal By The Foot
	.75" DIA Steel Rod	1'	\$ 2.23	Metal By The Foot
Square Stock	1.5" x 1.5" Steel Stock	25"	\$ 38.02	Metal By The Foot
Cushion	Fabricated by Custom Upholestry	1	\$ 200.00	Custom Upholestry and Draperies
Handle Grips	7/8" x 8" Closed end PVC grip	2	\$ 8.40	Full Circle Padding
Velcro Rivet Straps	Velcro Rivet Straps	1	\$ 50.00	Neobits
Casters	Gladiator Casters	2	\$ 50.00	McMaster-Carr
Embroidered SplitFace	Offical SplitFace Logo of Pittstate	1	\$ 20.00	Rigid Designs
Bearings	Permanently Lubricated Ball Bearing	2	\$ 49.20	McMaster-Carr
Powder Coating	Krylon Supermaxx Class	4	\$ 26.16	Walmart
Leg Strap	Reverse Hyper Strap	1	\$ 50.00	Rouge Fitness
Spring-Loaded Pins	Spring Plunger for Handles	2	\$ 6.98	McMaster-Carr
Miscellaneous	-	-	\$ 100.00	
10% Contingency	-	-	\$ 74.75	
Total			\$ 922.24	

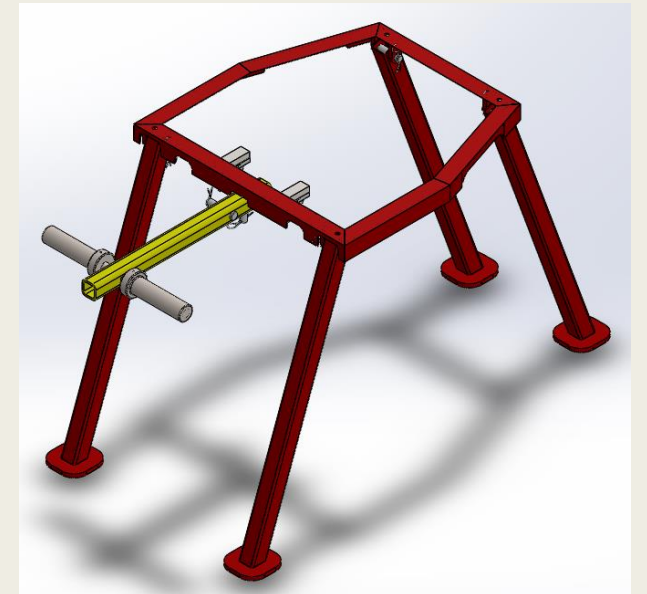
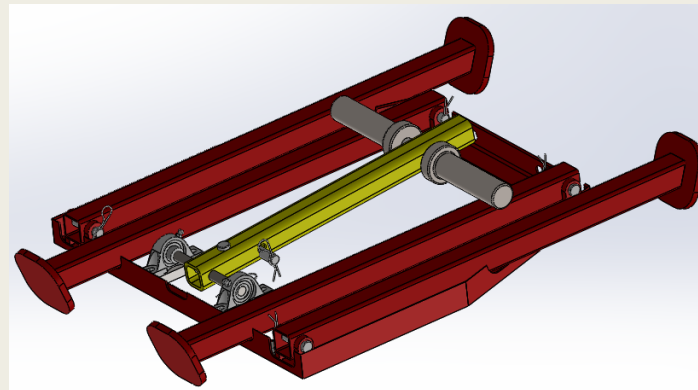
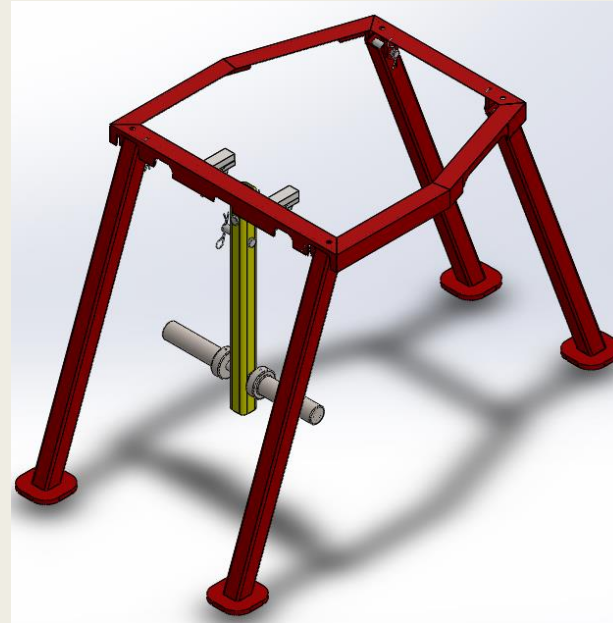
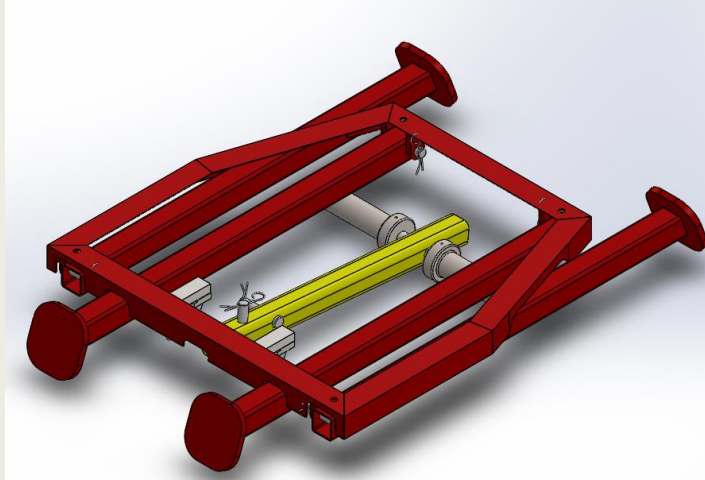
Initial Ideas



FEAs



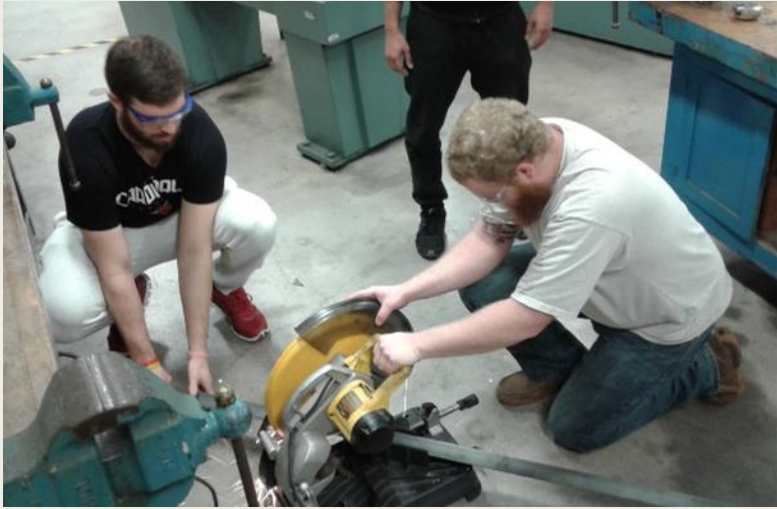
Final Frame Design



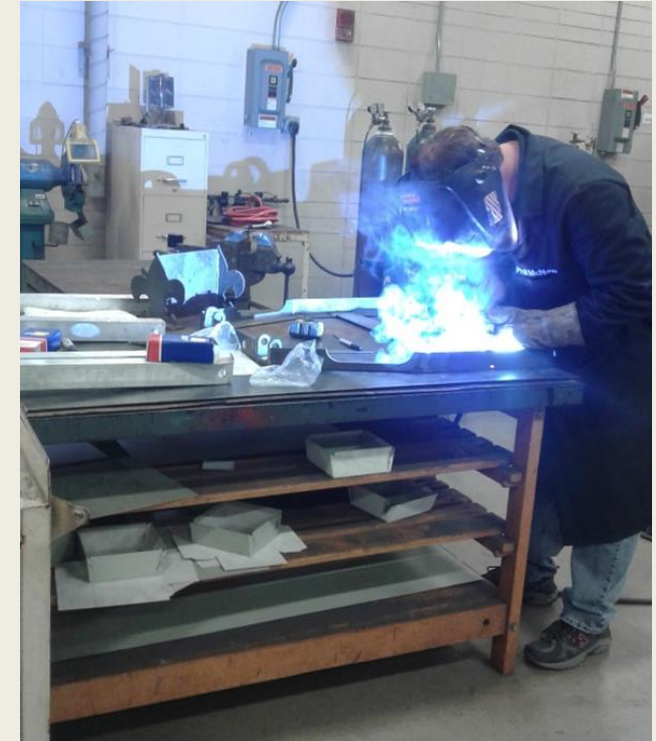
Budget

Date:	Vendor:	Desc.	Date Received:	Cost:
1/23/2017	Metal By the Foot	Frame, legs and pendulum materials	1/30/2017	\$ 231.43
2/15/2017	Metal By the Foot	Round tube replacment, leg tab material	2/20/2017	\$ 22.51
2/16/2017	Spud Inc.	Reverse Hyper Strap	2/23/2017	\$ 54.99
2/16/2017	McMaster-Carr	Pillow Block, Pins, Spring Loaded Pin	2/17/2017	\$ 124.96
2/17/2017	Amazon	Velcro Strap	2/21/2017	\$ 13.87
2/17/2017	Amazon	Olympic Collar	2/21/2017	\$ 12.37
2/17/2017	Amazon	Handle Grips	2/21/2017	\$ 17.98
2/17/2017	Amazon	Olympic Sleeve	2/21/2017	\$ 75.38
2/17/2017	Amazon	Amazon Tax	n/a	\$ 6.98
3/6/2017	Airgas	Nozzle	3/6/2017	\$ 15.10
2/27/17	Custom Upholstery	Pad	3/9/2017	\$ 201.80
3/7/2017	Boyd Metal	Remaking legs (20 ft. Al square tubing)	3/7/2017	\$ 65.57
3/8/2017	Home Deopt	Home Depot	3/8/2017	\$ 47.07
4/19/2017	McMaster-Carr	Clevis Pin, Vinyl Caps, T-Handle Pin		\$ 22.90
			Total:	\$ 912.91
			Remaining Budget:	\$ 87.09

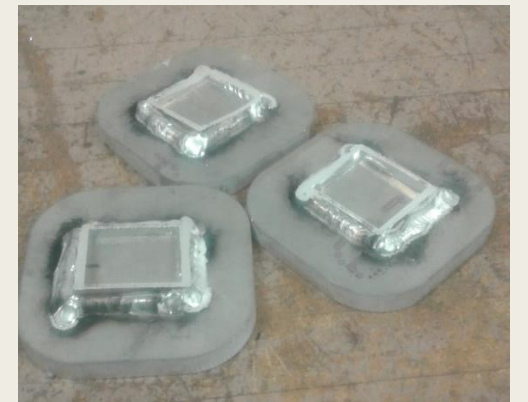
Manufacturing Process



Manufacturing Process



Manufacturing Process



Manufacturing Processes



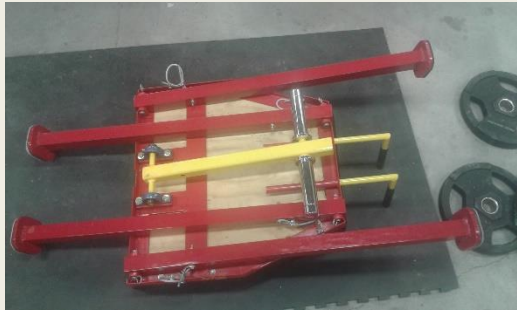
Testing Stage



Safety



Final Prototype



A thick red vertical bar is positioned on the left side of the slide, extending from the top to the bottom.

Questions?