

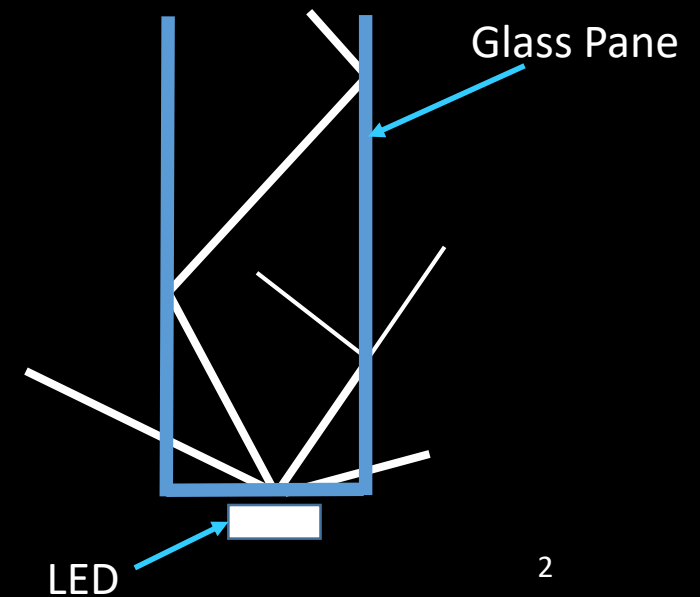
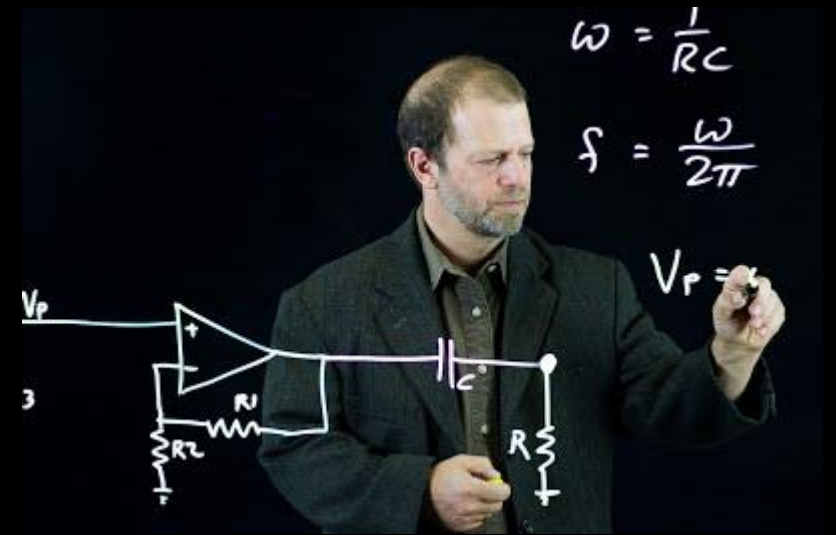


# Buzz Lightboard

Talal Aldoussari, Jake Jermyn, Nate Sherwood, Taylor Spence

# Overview

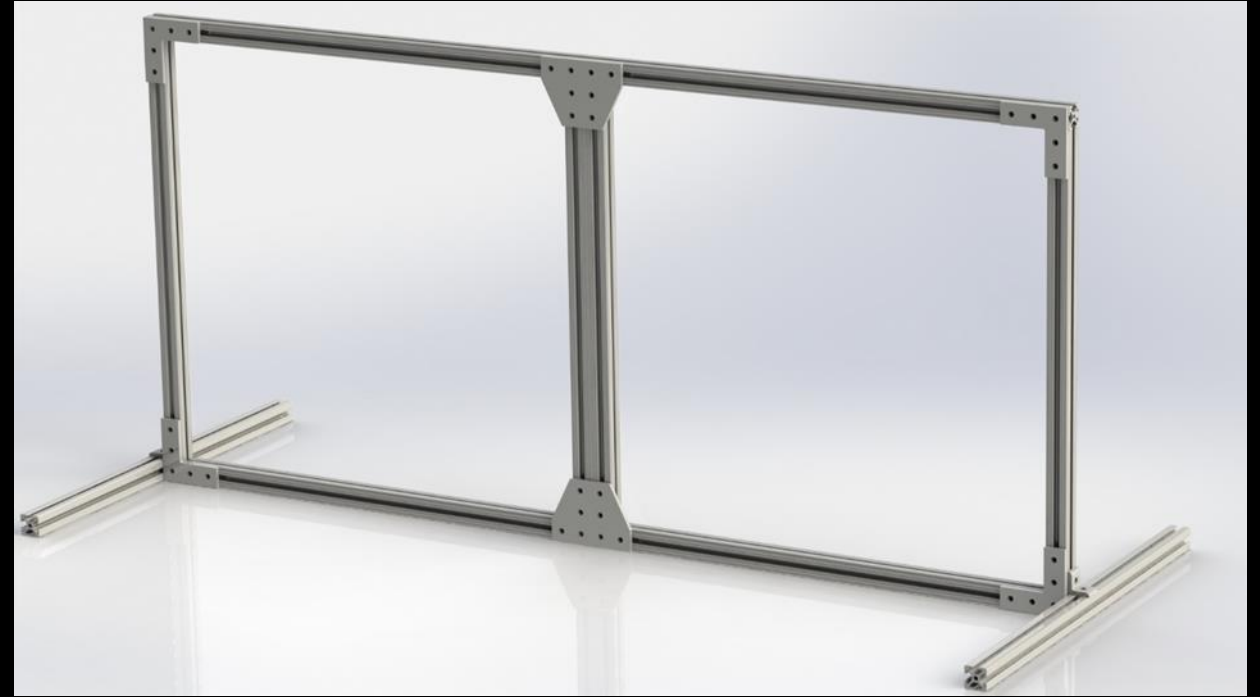
- What is a lightboard?
  - A see through whiteboard that is an effective online teaching tool
- How does it work?
  - Total internal reflection
  - Frustrated total internal reflection to illuminate the ink in contact with the glass
- Why is it useful?
  - Provides a more engaging and personal experience to the typical online class
  - Stimulates the viewer and engages learning in new ways



# Problem Statement

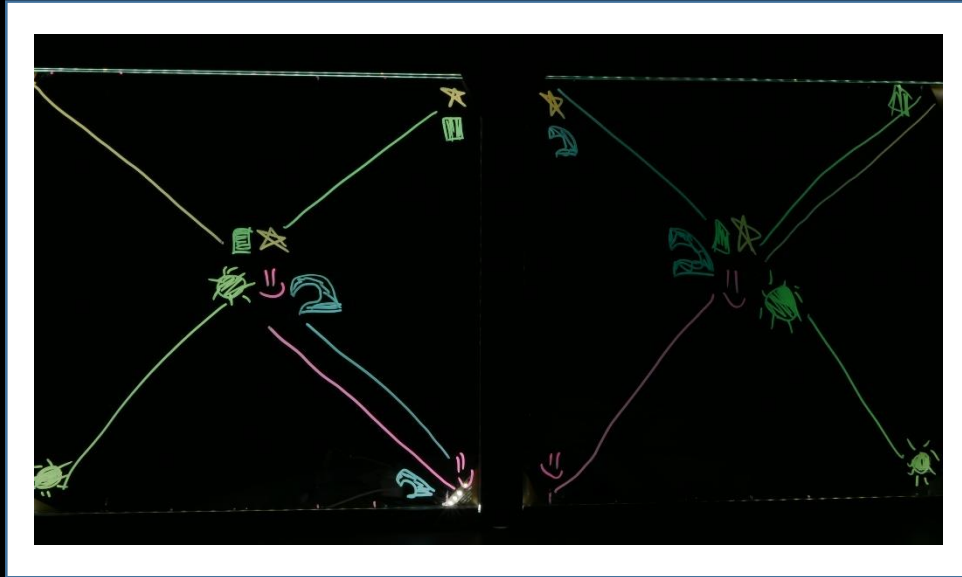
- The Center for Excellence in Teaching and Learning (CETL) at the University of Idaho requested we manufacture a low cost lightboard.
- MSRP ≈\$3000
- Our Budget \$2000
  
- Goal: create a financially palatable lightboard that will be specially designed to gain faculty buy-in/interest via portability and user convenience.

# Glass Problem



- Regular Plate Glass
  - Window Glass
  - Cheaper ( $\approx \$4/\text{ft}^2$ )
  - Poor Light Penetration
- Starphire Glass
  - Low Iron Glass
  - Expensive ( $\approx \$12/\text{ft}^2$ )
  - Better Light Penetration

# Glass Decision



360° Lighting Scheme



Single Sided Light Test (Lighted from top)

The left side in both photos (Starphire Glass) has a more consistent color and light penetration, where the right side on both photos (Window Glass) fades to green as the writing travels away from the light.

DECISION: Starphire Glass

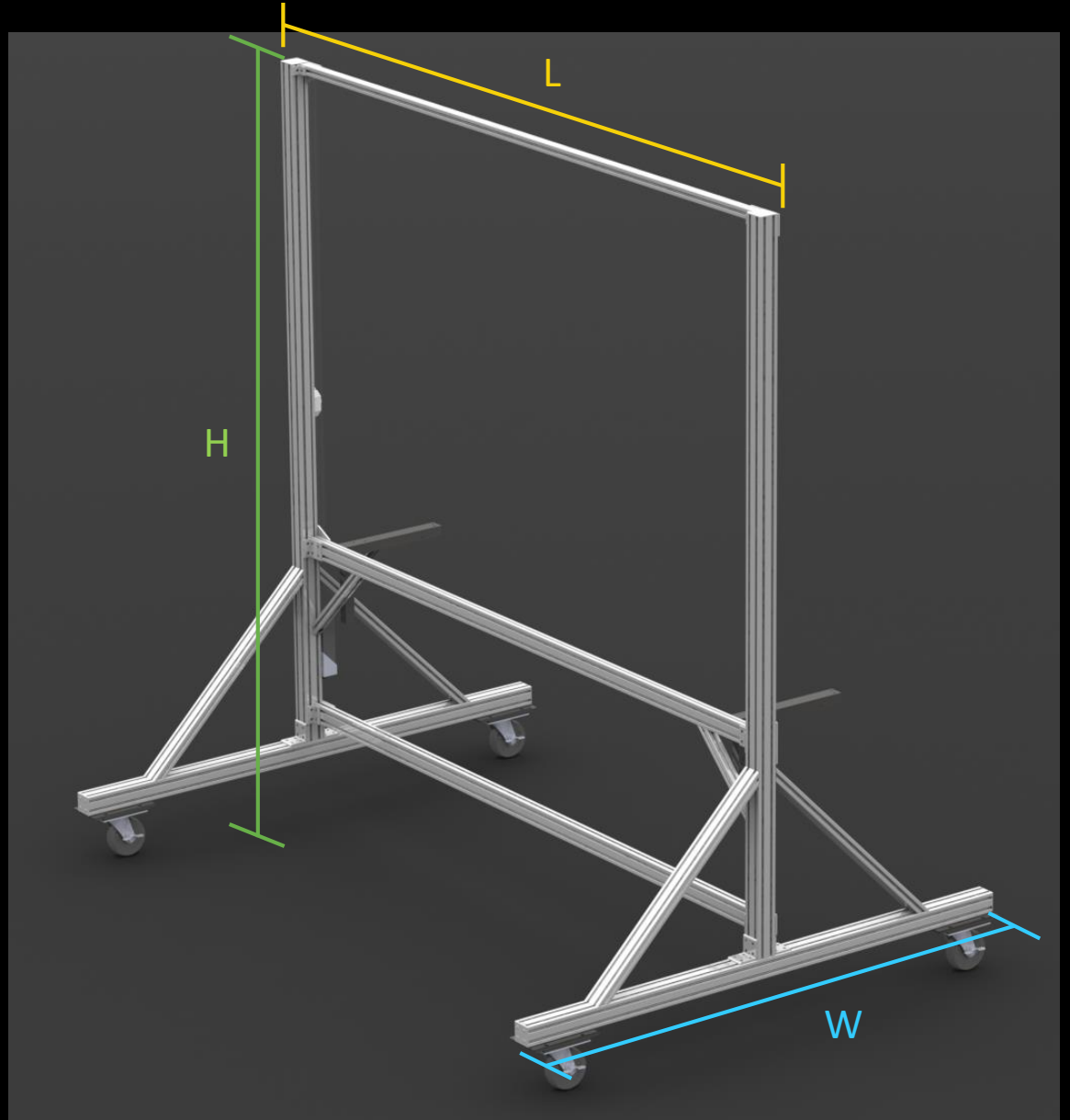
# Final Design

- Portable
  - Fits through doorways
  - Locking caster wheels
- Easy to Use
  - Simple plug and play
  - Easy adjust lighting
  - Adjustable shelf
- Accommodating
  - Ergonomic for users



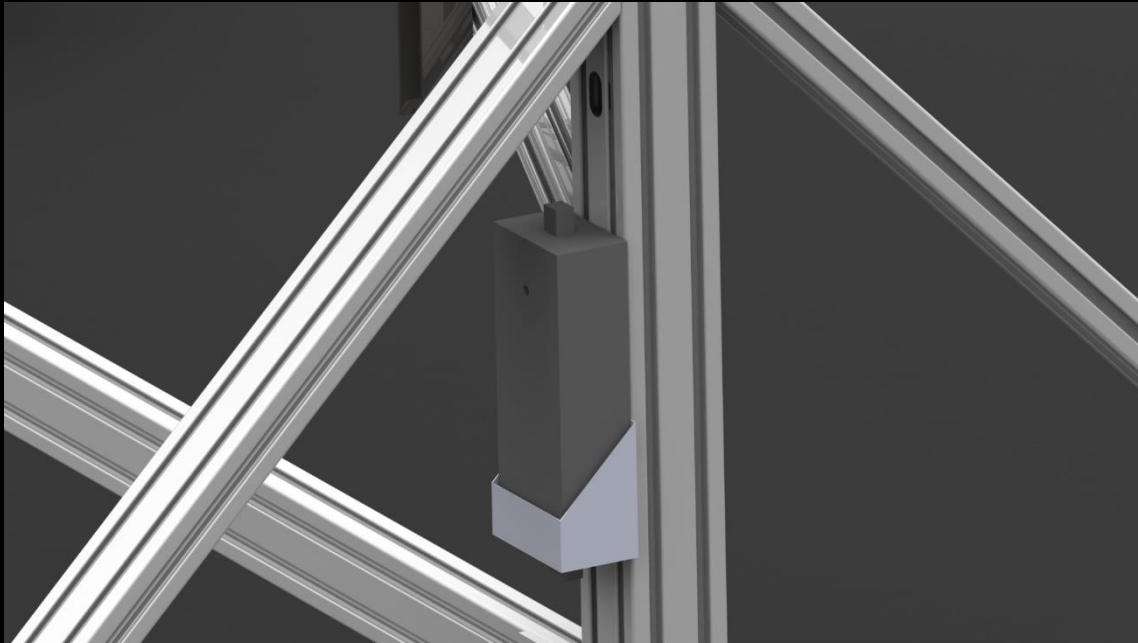
# Final Design Details

- Height: 6' 5.65"
- Width: 4' 6"
- Length: 6' 5.7"
- Weight: 146 lb
- Frame Matl.: Aluminum T-Slot
- Glass Sheet: 4' x 6'

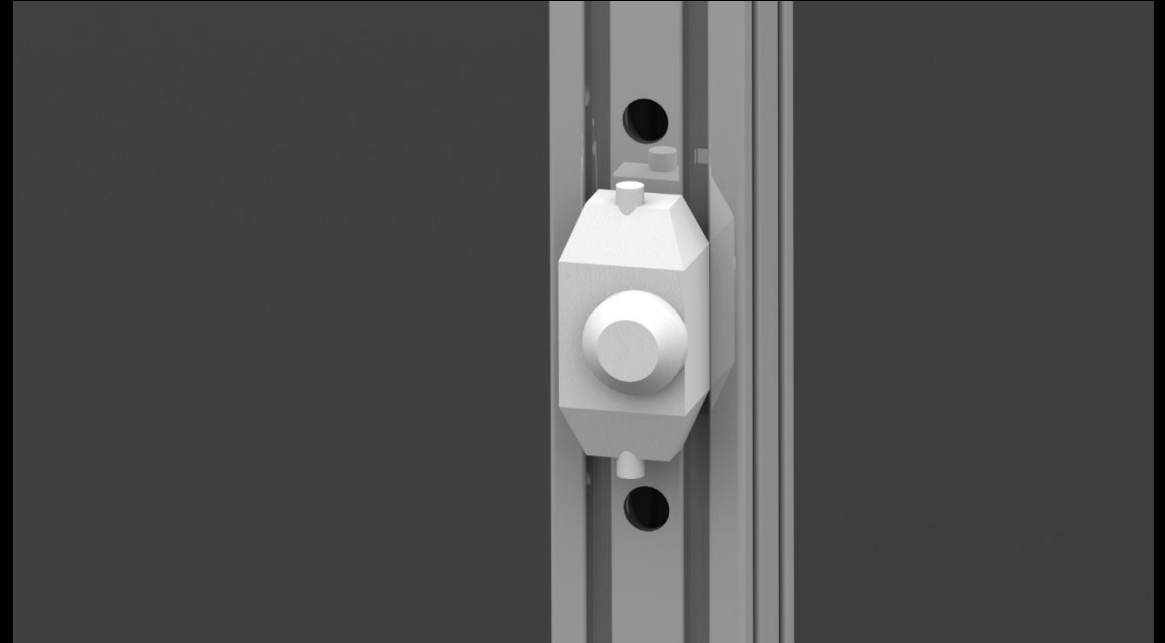


# Final Design Details

- Power Brick Holder



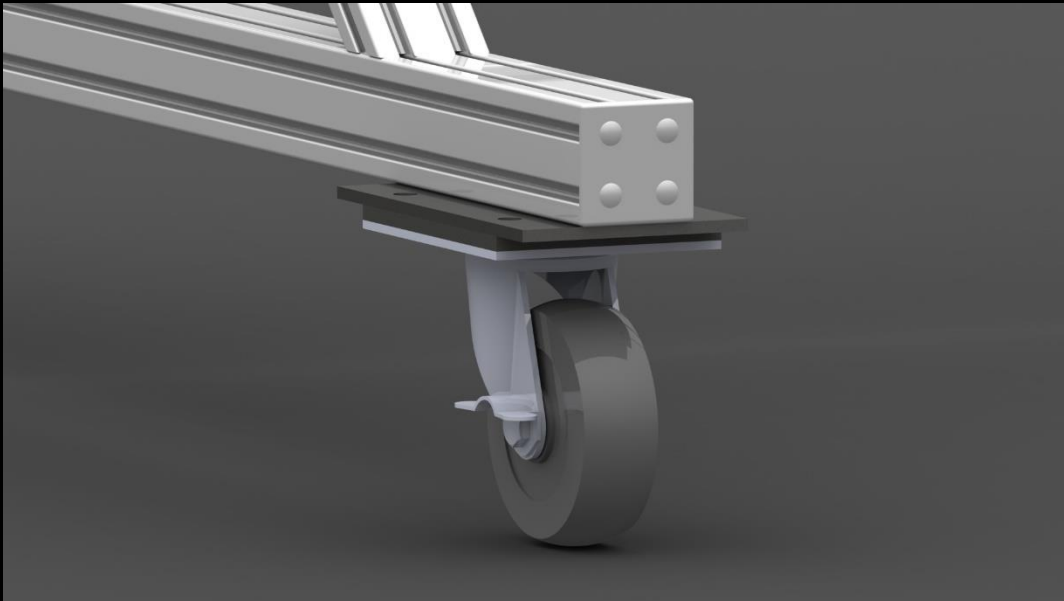
- Light Dimmer



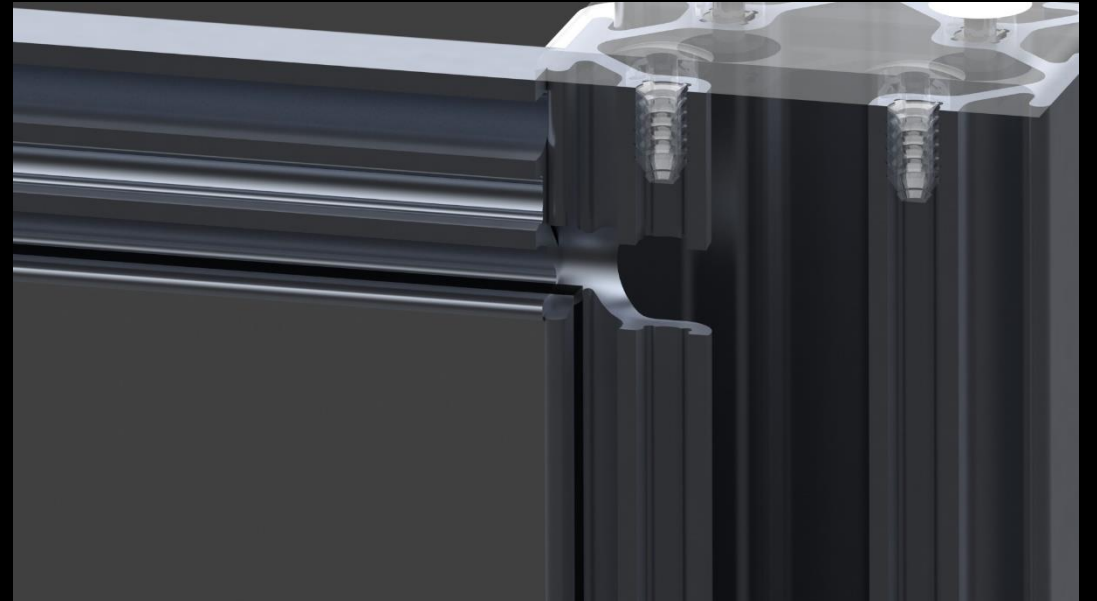


# Final Design Details

- Rubber Wheel Dampers



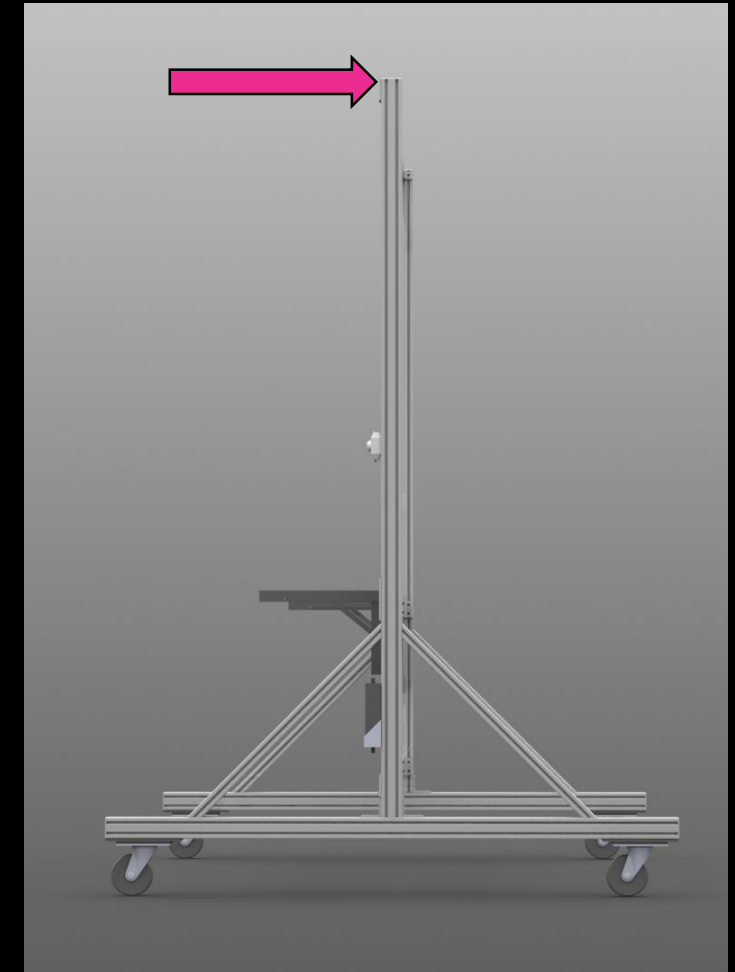
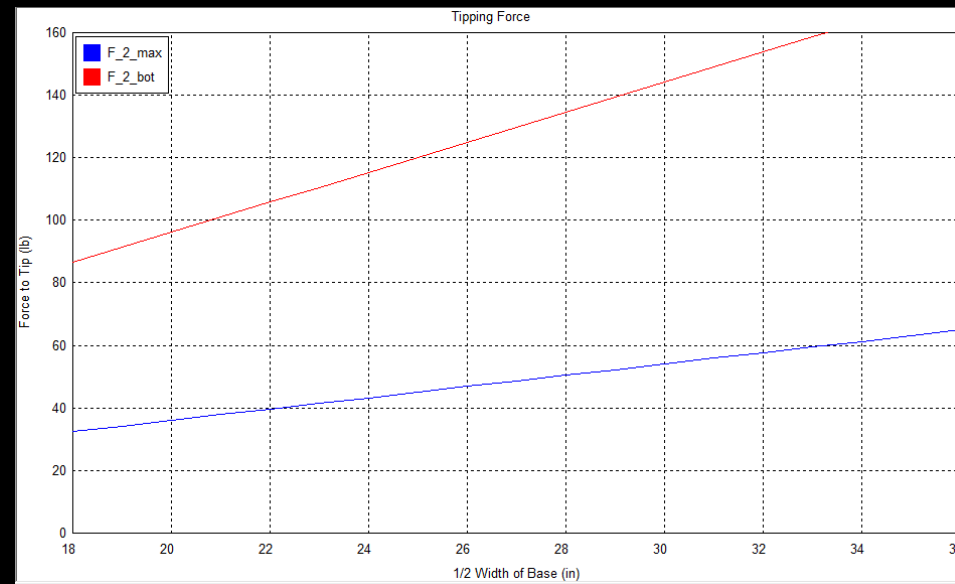
- LED/Glass Fit



# Safety Calculations

- Tipping
  - Can withstand 42.26 lb force at top before tipping at current width.

Status	Input	Name	Output	Unit
	140	F_1		
L	23.44	width		
	77.65	h_max		
	29.12	h_bot		
L		F_2_bot	112.692308	
L		F_2_max	42.2614295	

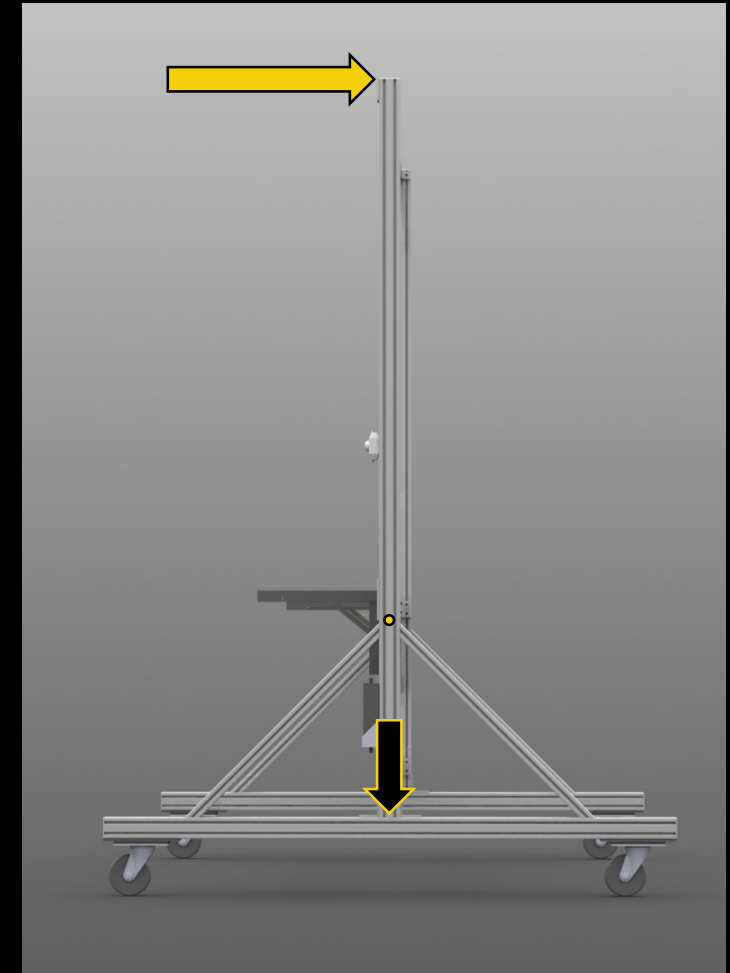
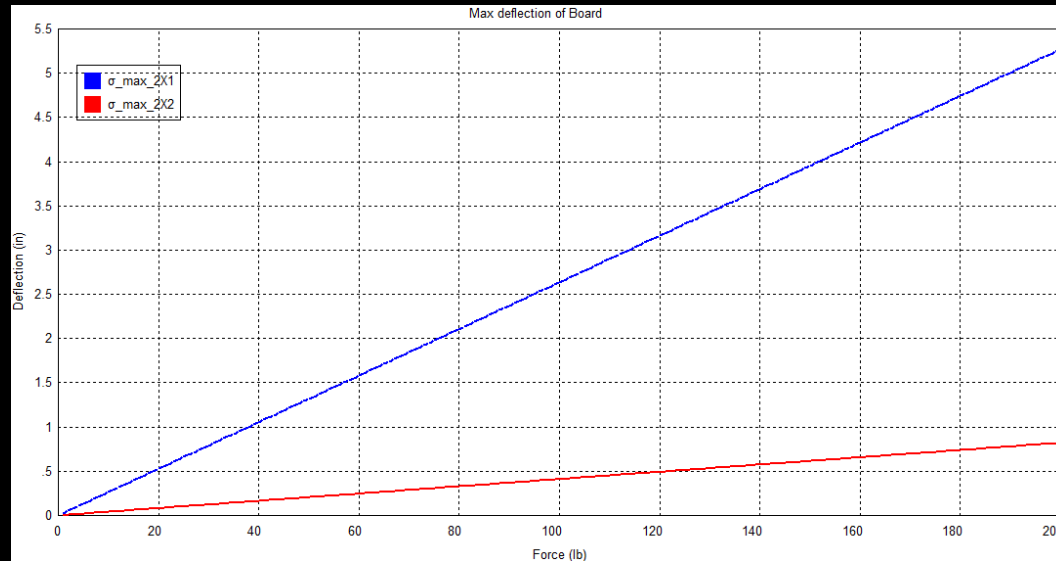


# Safety Calculations

- Bending

- Support leg beam deflects 0.1292 in from a 215 lb load
- Deflection of vertical beam is 0.205 in from 50 lb force

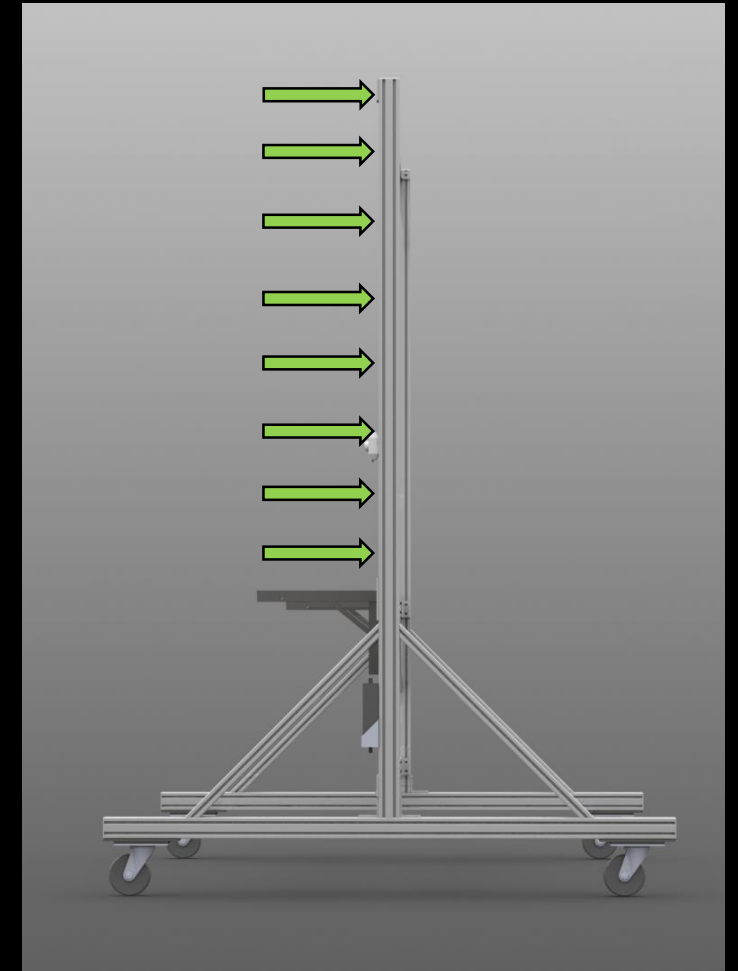
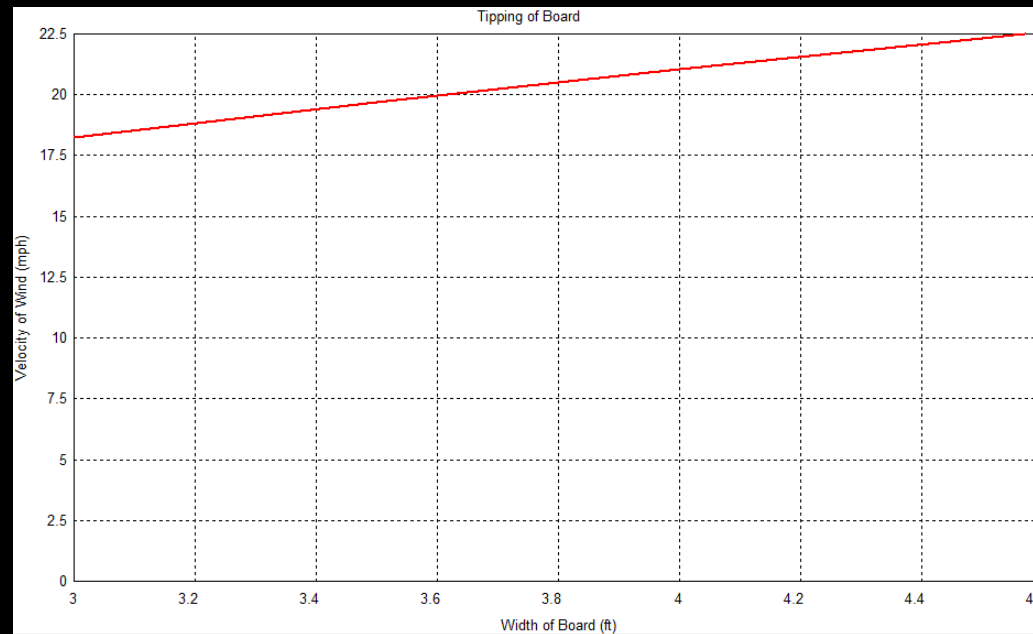
Status	Input	Name	Output	Unit	Comment
L	50	F		lb	Force at the very top of the board
	51.82	L		in	Length of unsupported beam
	10200000	E		lb/in <sup>2</sup>	modulus of Elasticity
	.5545	I		in <sup>4</sup>	Moment of Inertia
L	$\sigma_{max\_2}$		1.31734647	in	Max deflection with a 2x1 support beam
	? .0863	I_2X1		in <sup>4</sup>	
L	$\sigma_{max\_2}$		.205026151	in	Max deflection with a 2X2 support beam
	.5545	I_2X2		in <sup>4</sup>	



# Safety Calculations

- Wind Force
  - Can withstand 20.81 mph wind before tipping at current width

Status	Input	Name	Output	Unit
	2	C_D		
		A	26.3530625	
	.00237	p		
L		V	30.5180856	
	4.1775	h		
	6.30833333	b		
	4.36541667	h_c		
	130	W		
L	1.95333333	width		
L		F_D	58.1693233	
	0	M		
L		V_mph	20.8077856	
L		width_tot	3.90666667	



# Black Anodized Option

- Regular 80/20



- Black Anodized





# Schedule

LightBoard Schdule																						Color	Key		
																							Purchase Items		
																							SNAPSHOT Days		
																							In Progress		
																							Future Due Dates		
																							Completed		
Project:		LightBoard																							
Last Updated:		9/28/2018																							
Task Description	Duration	Assign	Aug				Sept					Oct					Nov				Dec				
		Month	8/6	8/13	8/20	8/27	9/3	9/10	9/17	9/24	9/28	10/4	10/9	10/16	10/23	10/30	11/6	11/13	11/20	11/27	12/4	12/7	12/14	12/21	12/28
<b>Final Build</b>																									
Finalize Solidworks Model	15hr	Taylor																							
DDR Presentation Prep																									
Detailed Design Review		Team																							
Work on Problems Revealed from DDR																									
Create dFMEA																									
Create Final BOM																									
LogBook Check #3		Team																							
Create Detailed Engineering Drawings																									
Order Glass	2hr	Taylor																							
Order Frame Components																									
SNAPSHOT #3		Team																							
Lightboard Video		Team																							
Machining Parts																									
Lightboard Construction																									
Wiki Site Review																									
LogBook Check#4	-----																								
Team Citizenship Grade																									
Finalized Prototype (Hardware/Software)																									
Testing Lightboard																									
Modifications Based on Tests																									
Poster Development																									
Print Poster																									
Final Report (Portfolio)																									
LogBook Final Review	-----																								
Complete Lightboard (SNAPSHOT)																									
Work Area Check-out																									
Project Files																									

Questions?