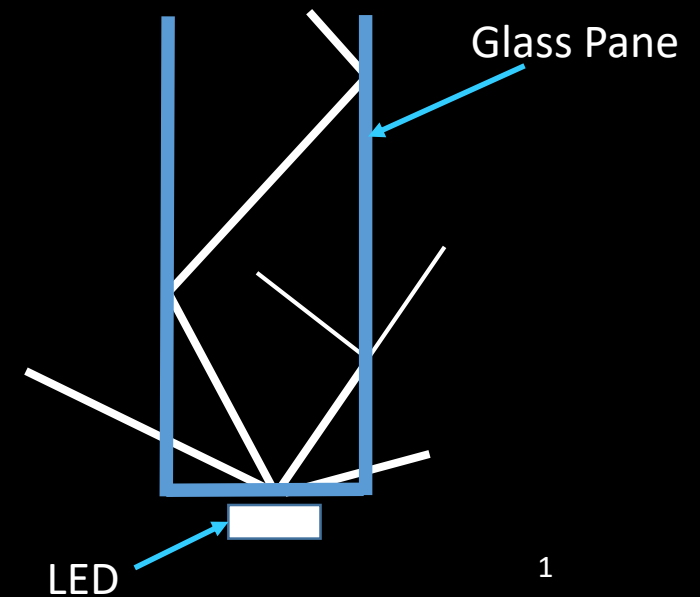
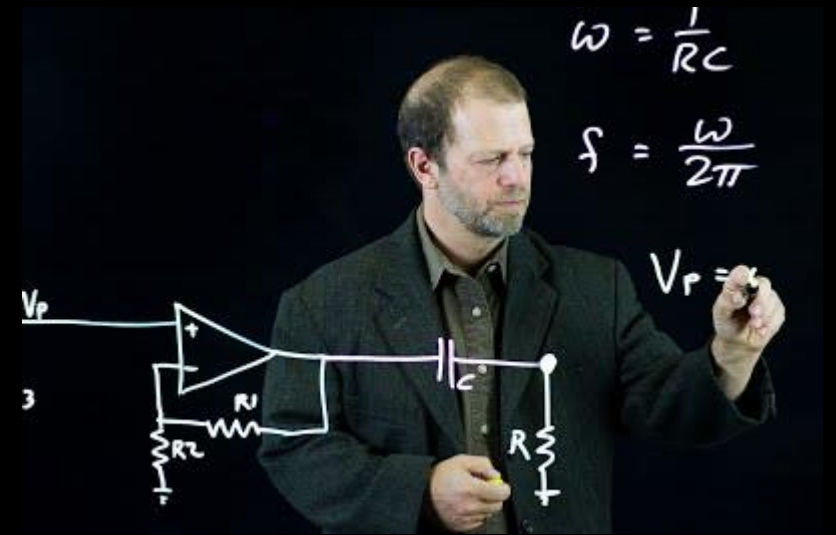


Overview

- 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

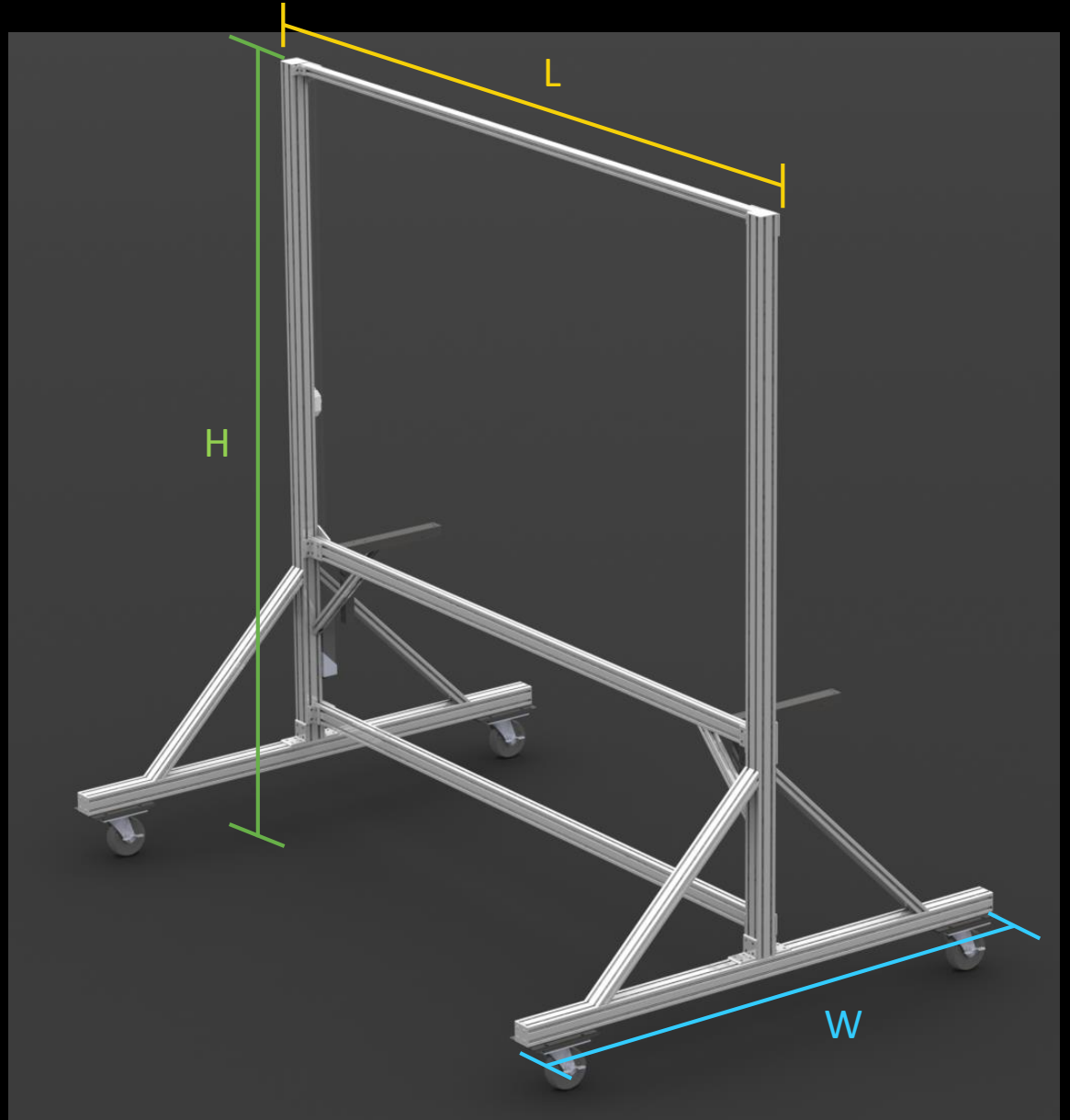
Final Design

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



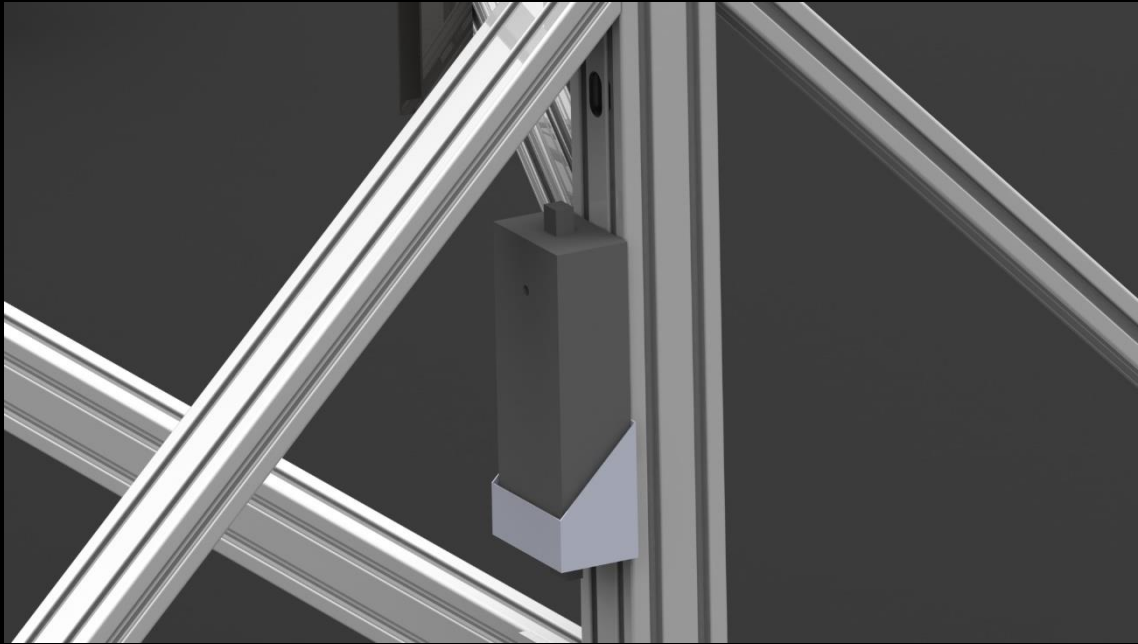
Final Design Details

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

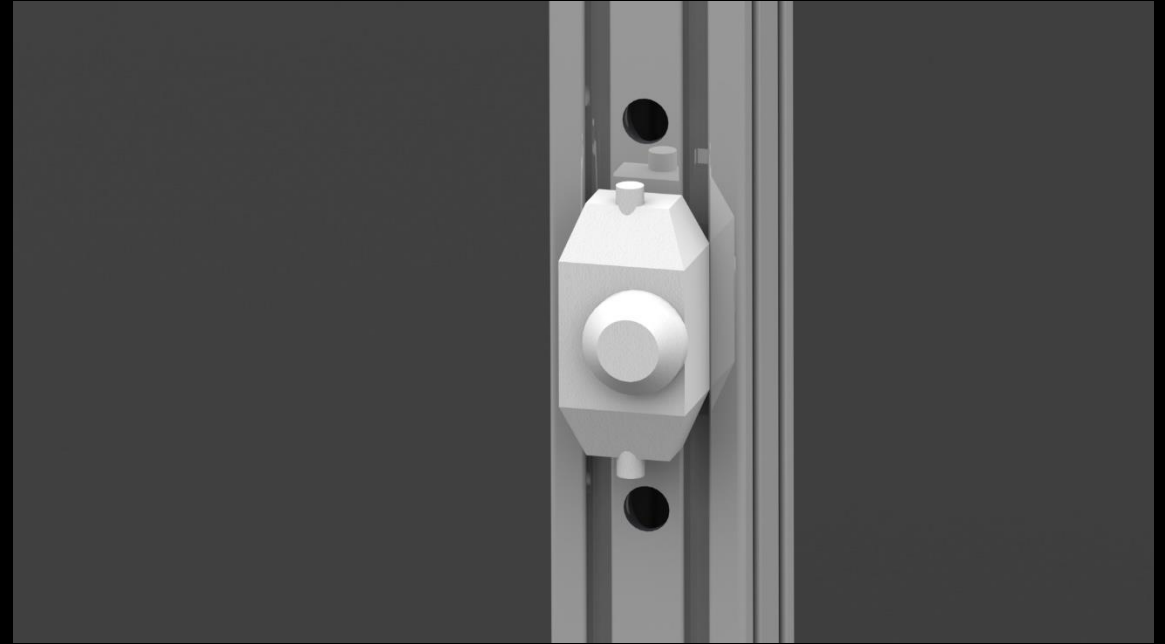


Final Design Details

- Power Brick Holder

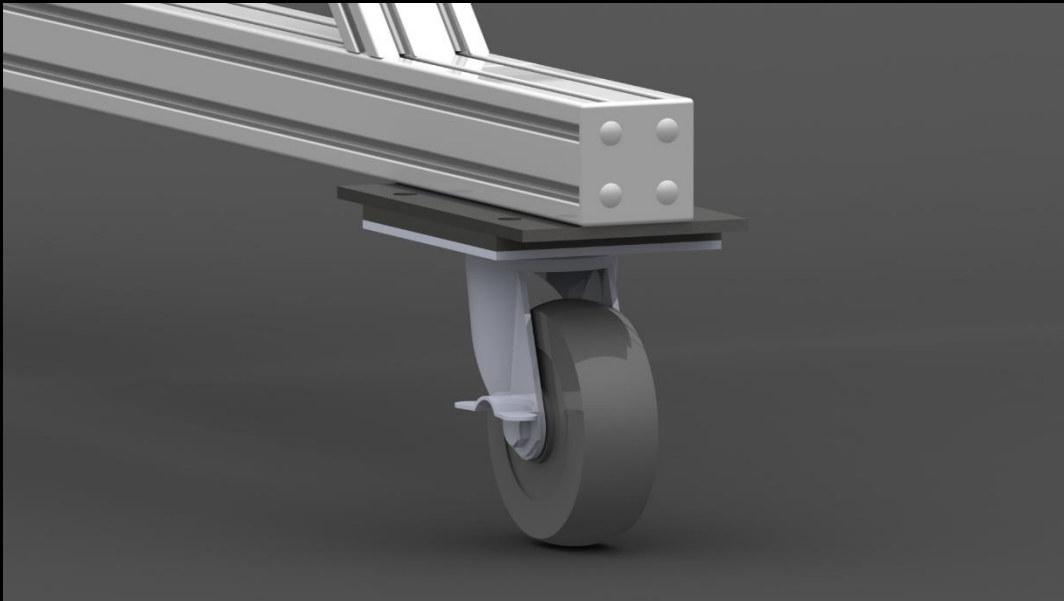


- Light Dimmer

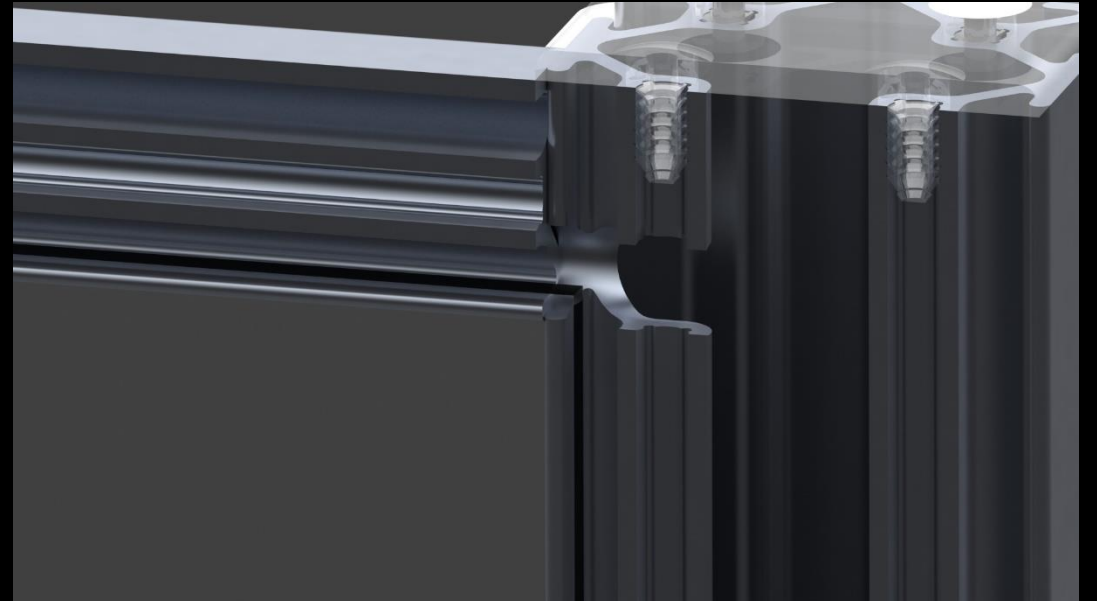


Final Design Details

- Rubber Wheel Dampers



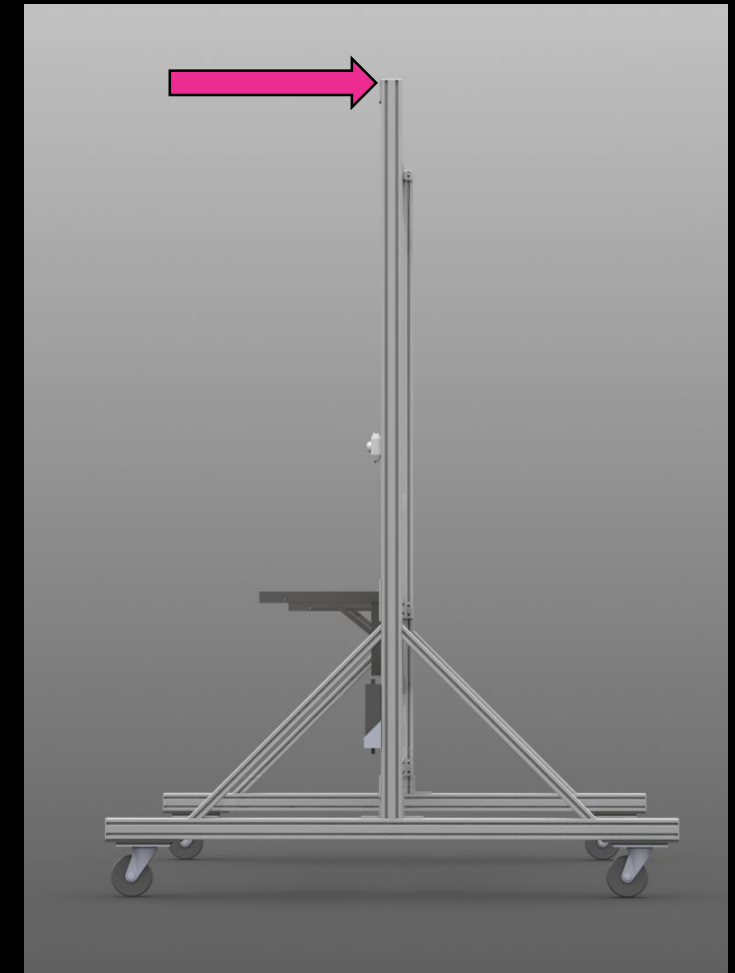
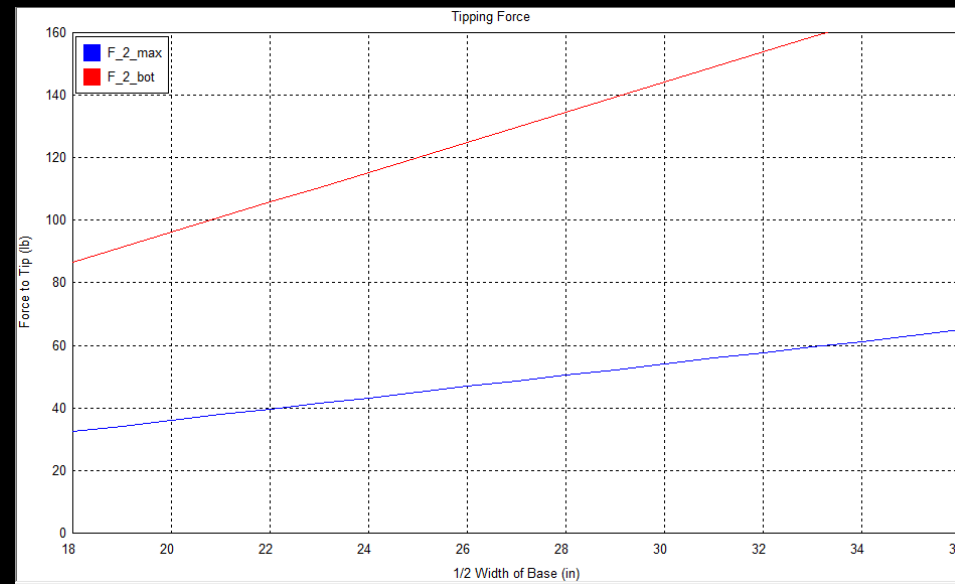
- LED/Glass Fit



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	

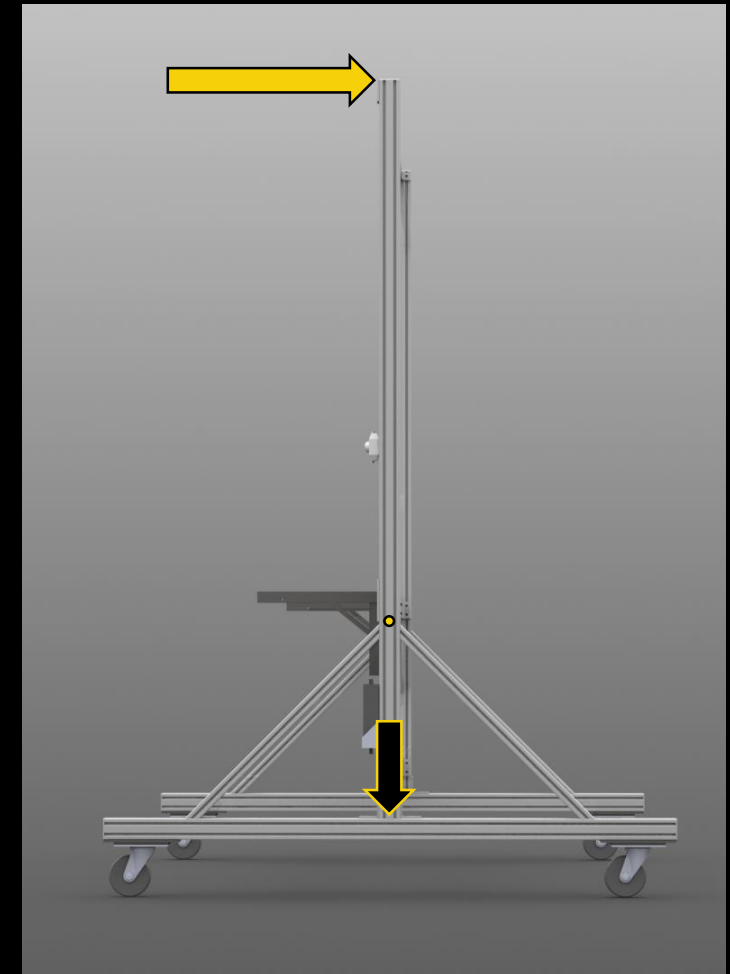
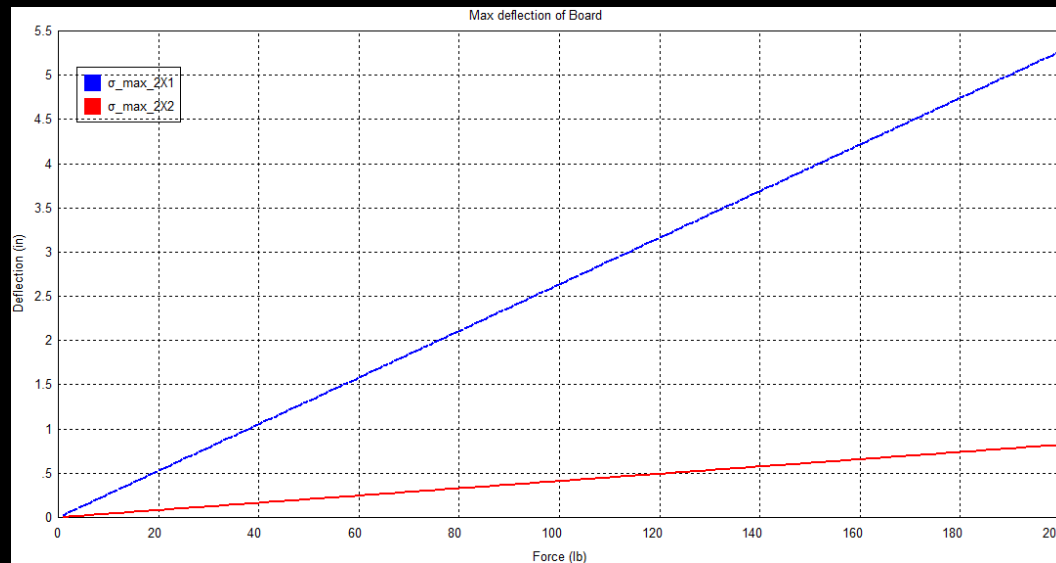


Safety Calculations

- 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 ²	modulus of Elasticity
	.5545	I		in ⁴	Moment of Inertia
L	σ_{max_2}		1.31734647	in	Max deflection with a 2x1 support beam
	? .0863	I_2X1		in ⁴	
L	σ_{max_2}		.205026151	in	Max deflection with a 2X2 support beam
	.5545	I_2X2		in ⁴	



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	

