

# **Team 506: Corning Plugger Pallet Short Part Stabilization**

Pawel J. Grum | Robert C. Kosmas | Taylor M. Larson | Segundo A. Sanchez | Jared T. White

# Team Members



**Pawel J.  
Grum**

*Mechanical Test  
Engineer*



**Robert C.  
Kosmas**

*Structural Design  
Engineer*



**Taylor M.  
Larson**

*Dynamics  
Engineer*



**Segundo A.  
Sanchez**

*Materials Analysis  
Engineer*



**Jared T.  
White**

*Manufacturing Engineer*

Segundo Sanchez

# Sponsors and Advisors

Jeffery Roche



Engineering Mentor

*Heavy Duty Project  
Manager*

Jeffery Stott



Engineering Mentor

*Equipment Engineering  
Manager*

Eric Hellstrom, Ph.D



Academic Advisor

*Materials Science  
Program Director*

Segundo Sanchez

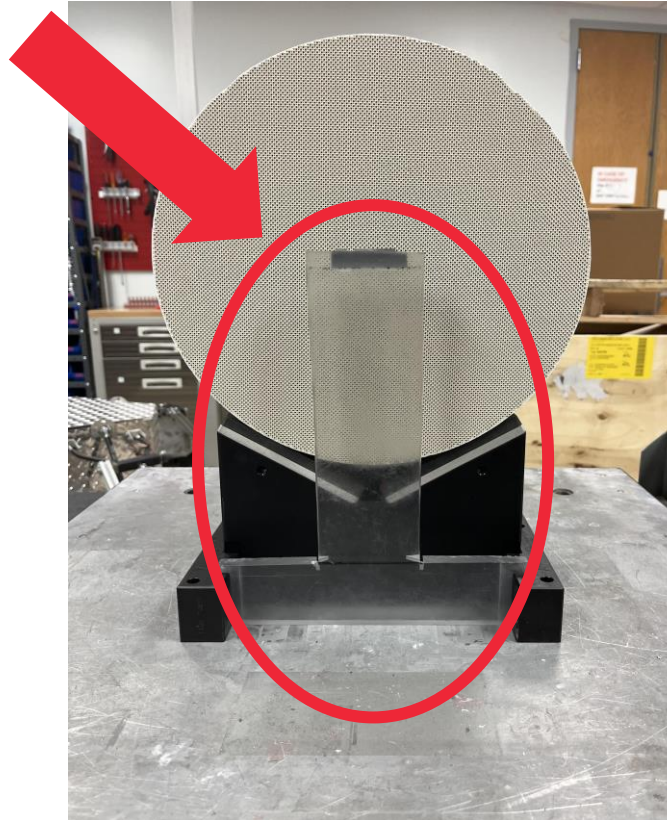
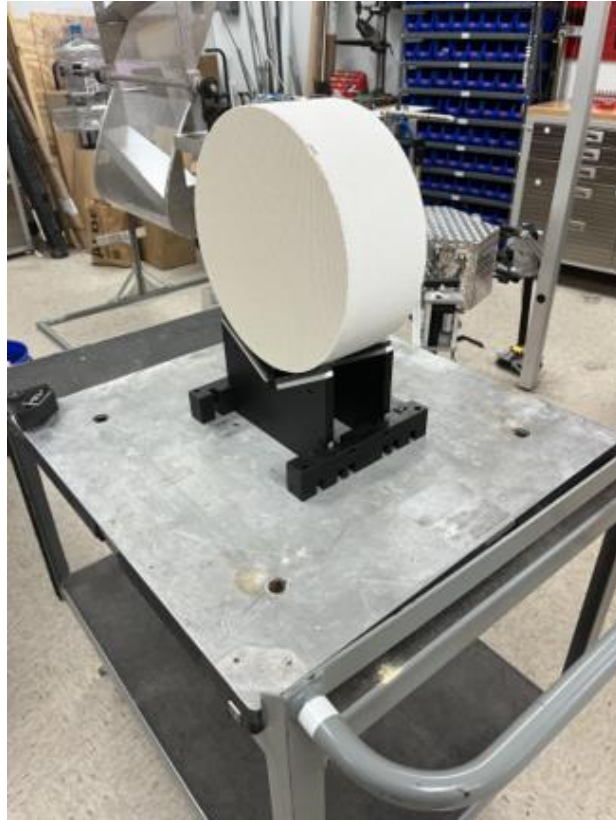


# Project Objective

The objective of this project is to produce a stabilization system to protect ceramics on Corning's conveyor while reducing the required manual labor.

Segundo Sanchez

# Project Background



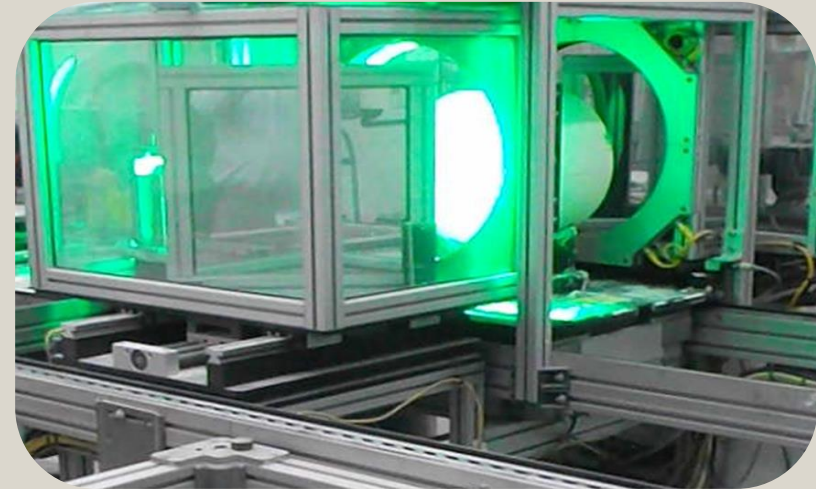
Segundo Sanchez

# Key Goals

## Prevent Damage



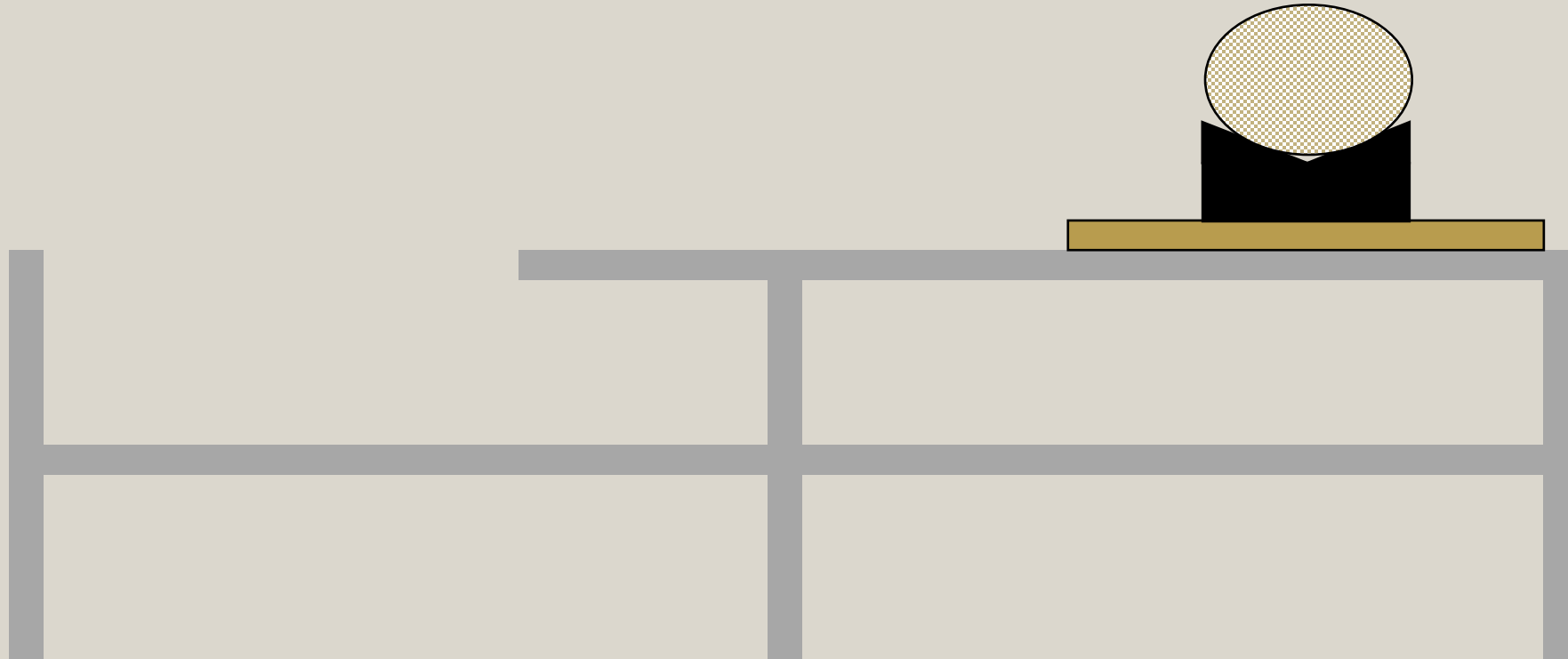
## Limit Interaction



Segundo Sanchez

# Key Goals

Integrate with conveyor system



Segundo Sanchez

# Targets and Metrics

Stabilization

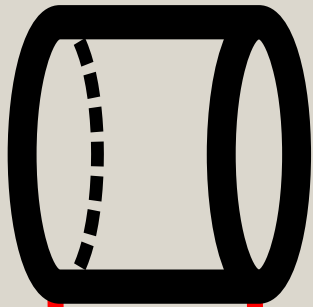
Segundo Sanchez



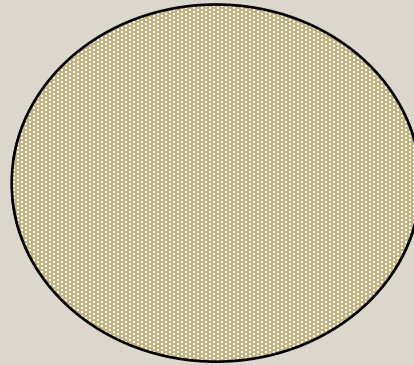


# Stabilization Metrics

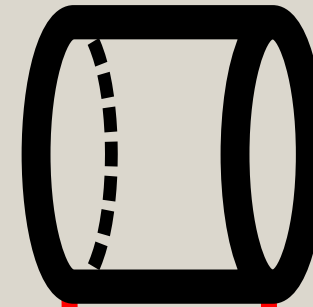
Secure Ceramic  
1 DOF



Prevent Damage  
0%

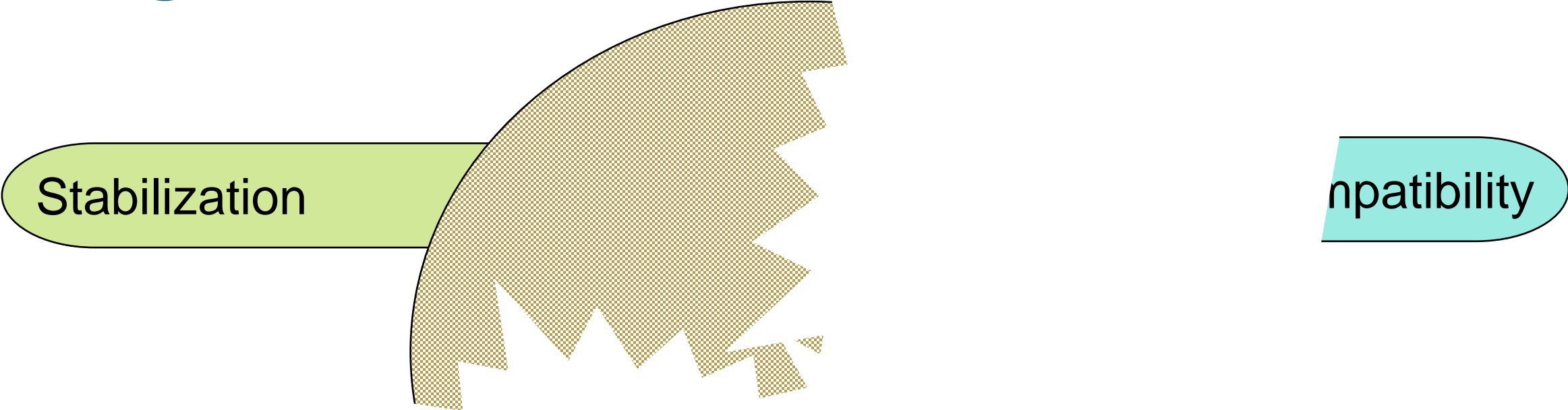


Limit Movement  
0.6 in



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# Targets and Metrics



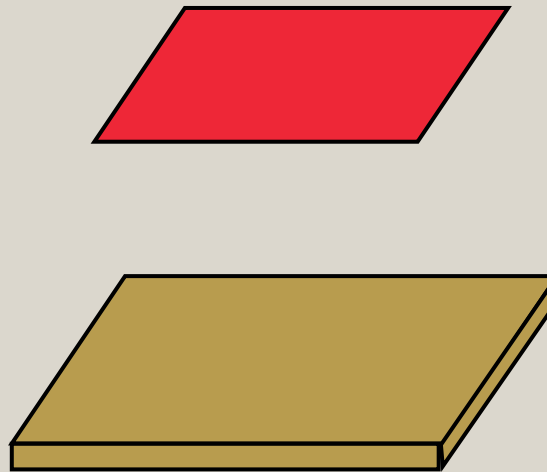
Segundo Sanchez

# Compatibility Metrics

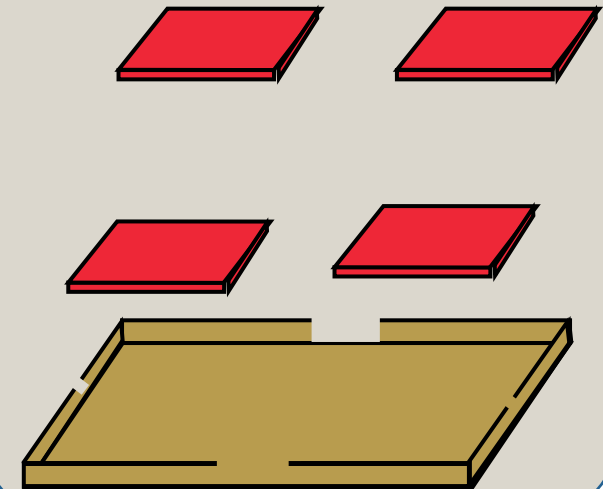
Limit Manual  
Labor  
1 Person



Integrate with  
Pallet  
297 in<sup>2</sup>



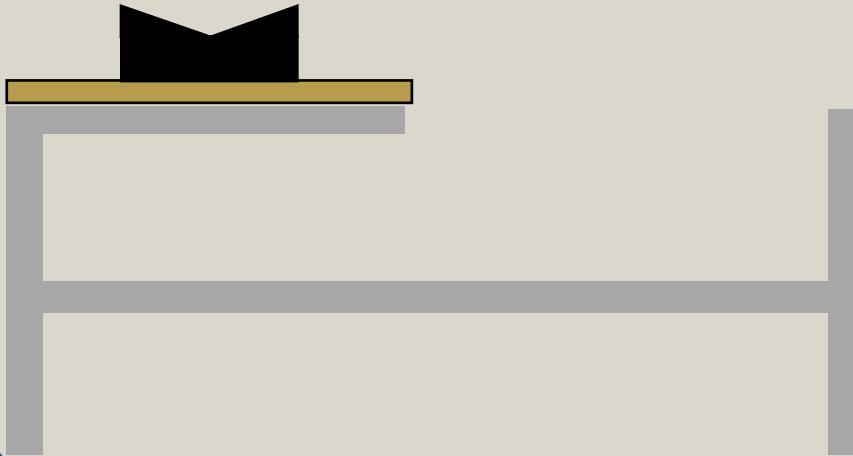
Integrate with  
Pallet  
43 in<sup>3</sup> (x4)



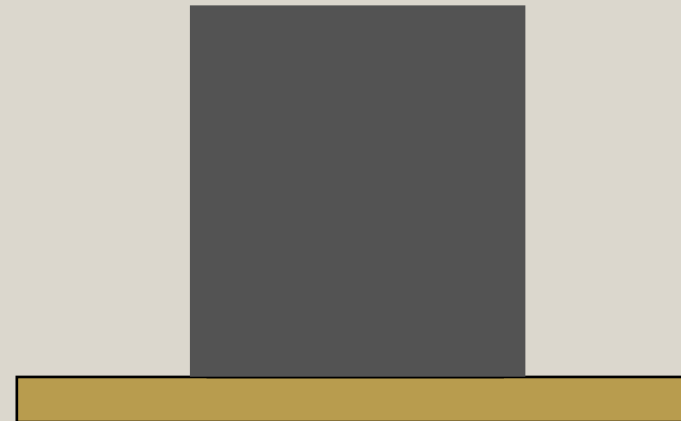
Segundo Sanchez

# Compatibility Metrics

Fit Return System  
6 in

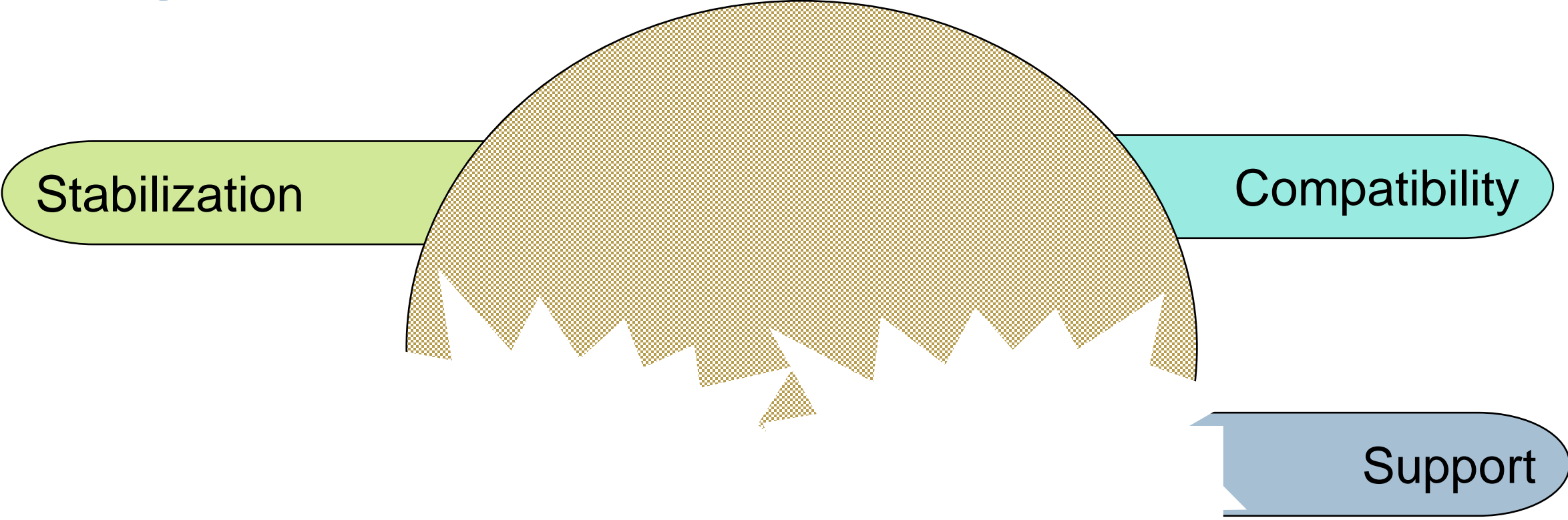


Reveal Ceramic Face  
48 sec



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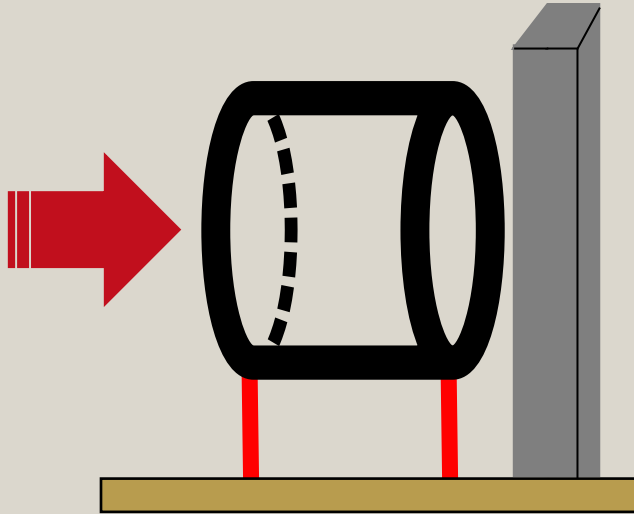
# Targets and Metrics



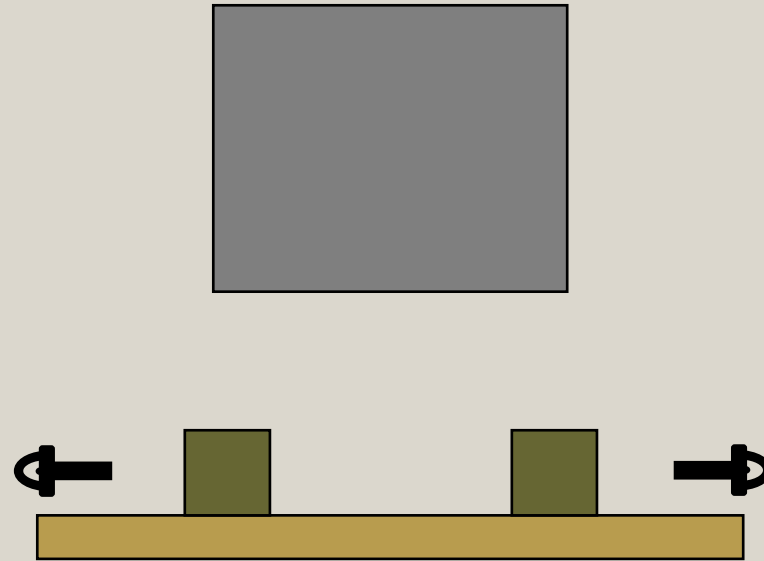
Segundo Sanchez

# Support Metrics

Withstand Load  
8 lbs

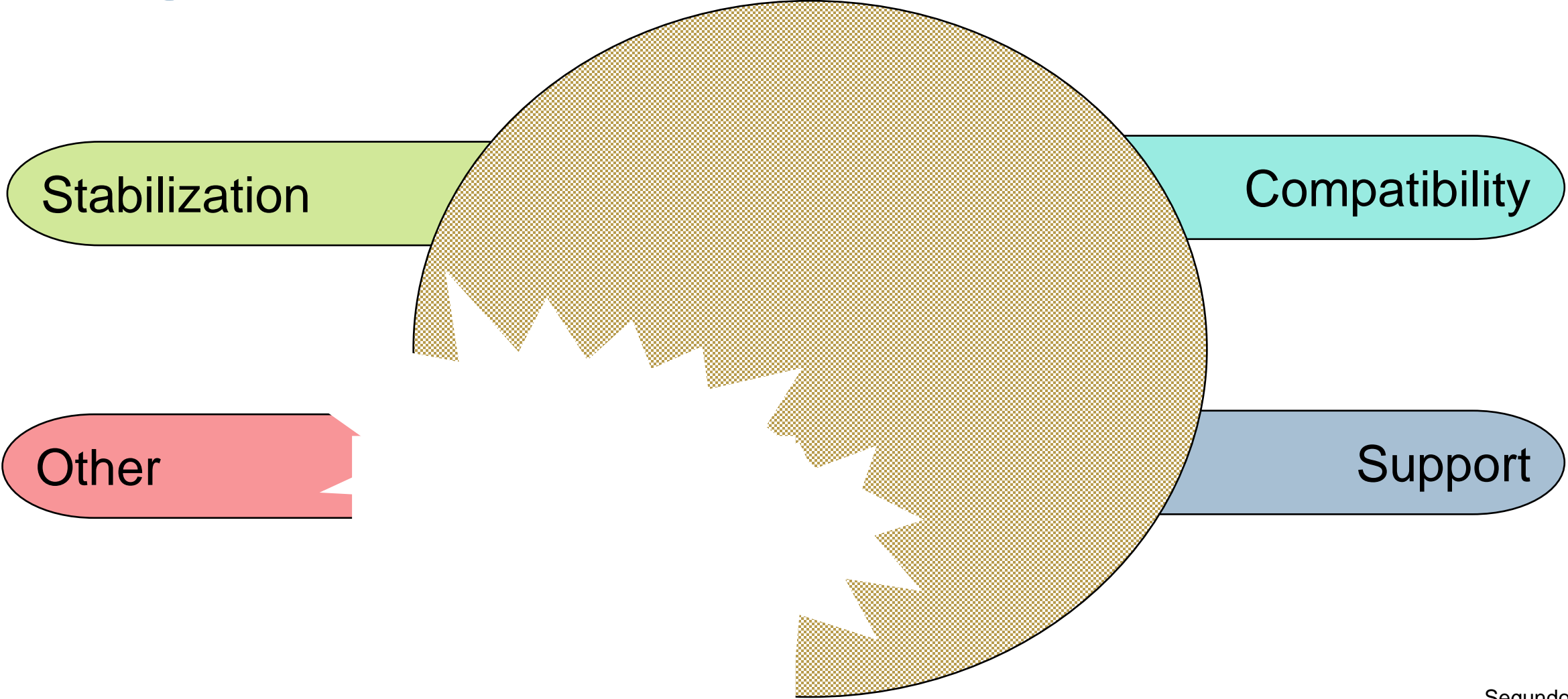


Secure to Pallet  
0 DOF



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# Targets and Metrics



Segundo Sanchez

# Other Metrics

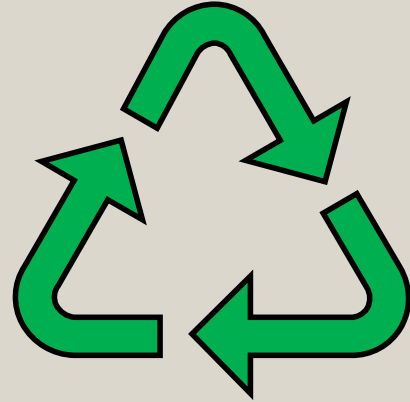
Device Weight  
25 lbs



Assembly Time  
30 sec



Recyclable



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# Concept Generation Tools

Biomimicry



Brainstorming



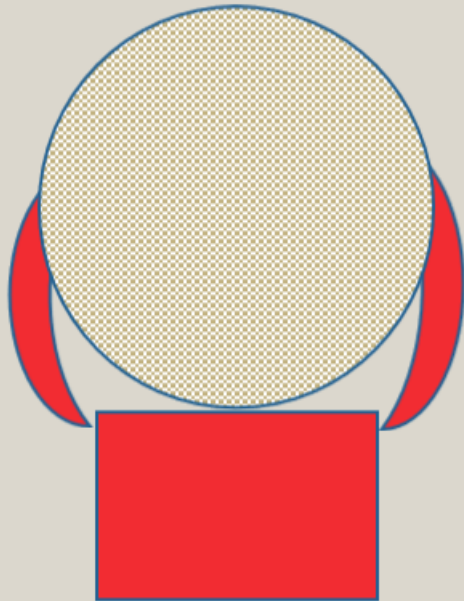
Crapshoot



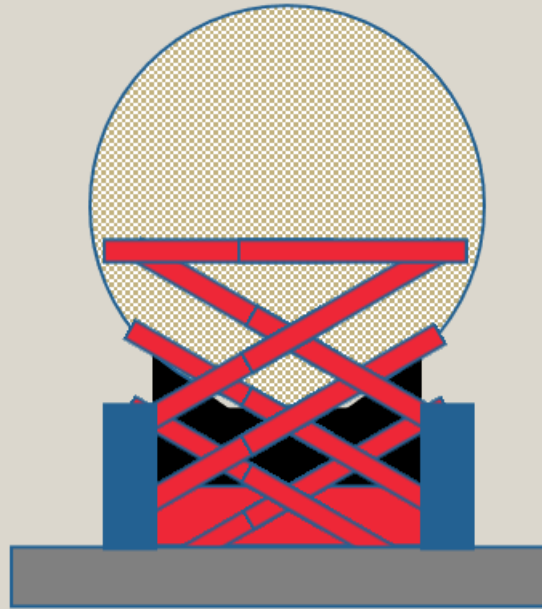
Segundo Sanchez

# Top 3 Concepts Generated

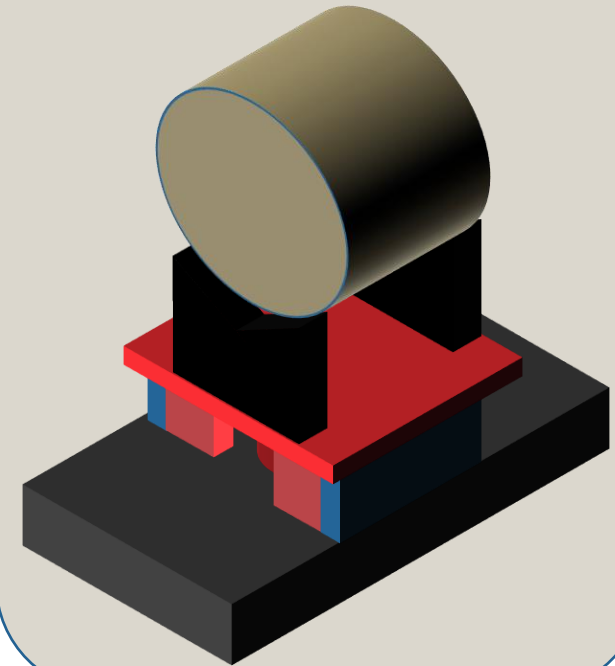
Pincer



Self-Nesting T



Swivel

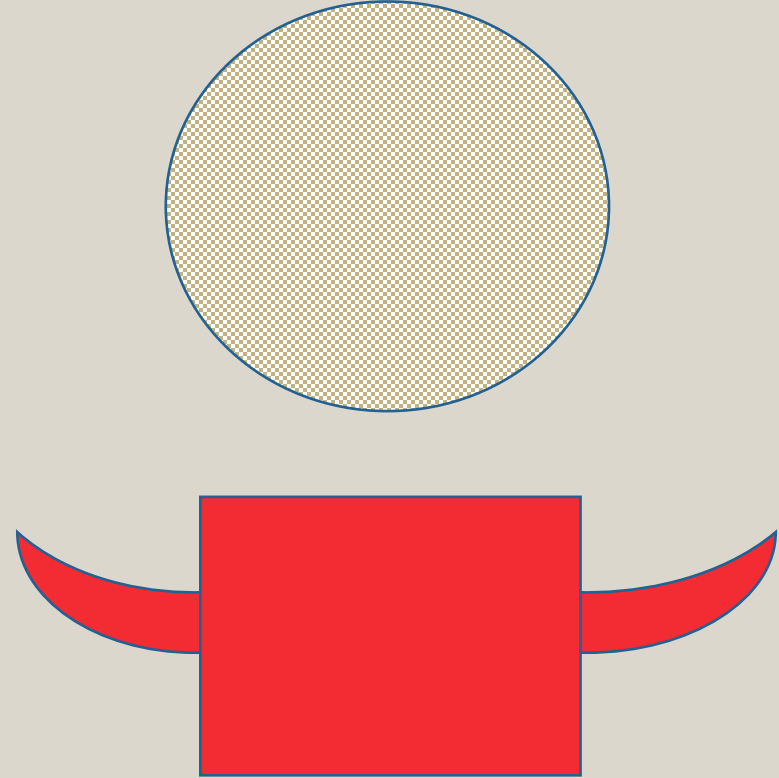


Segundo Sanchez

# Top 3 Concepts Generated

## Weight Activated Pincers

- Based on Corning's previous attempt
- When ceramic is placed on pincer, weight activates arms to hold ceramic in place
- Usable for any size ceramic

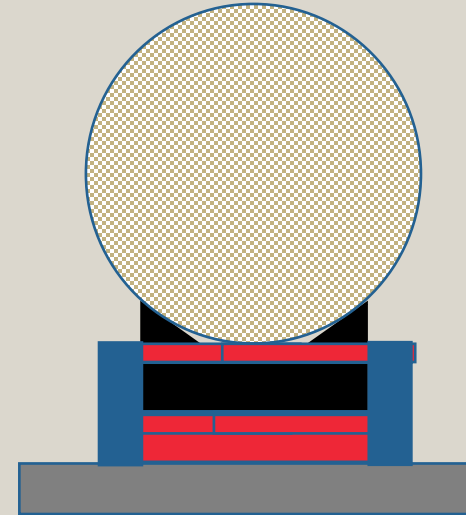


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# Top 3 Concepts Generated

## Self-Nesting T

- Device has similar shape to Corning's current method
- Trigger activated and collapsible
- Uses mechanism on conveyor to activate

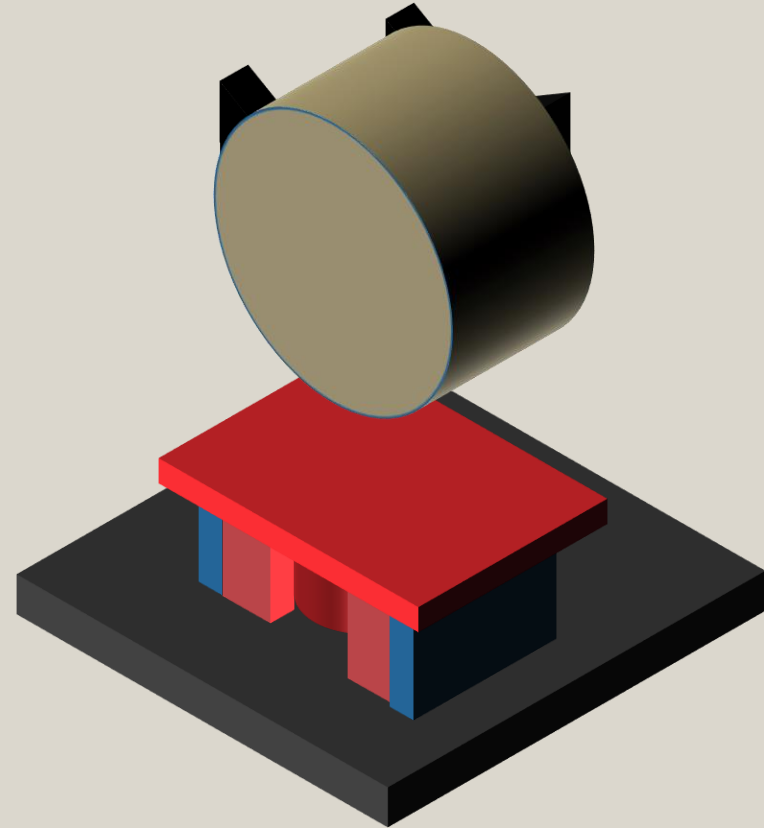


Segundo Sanchez

# Top 3 Concepts Generated

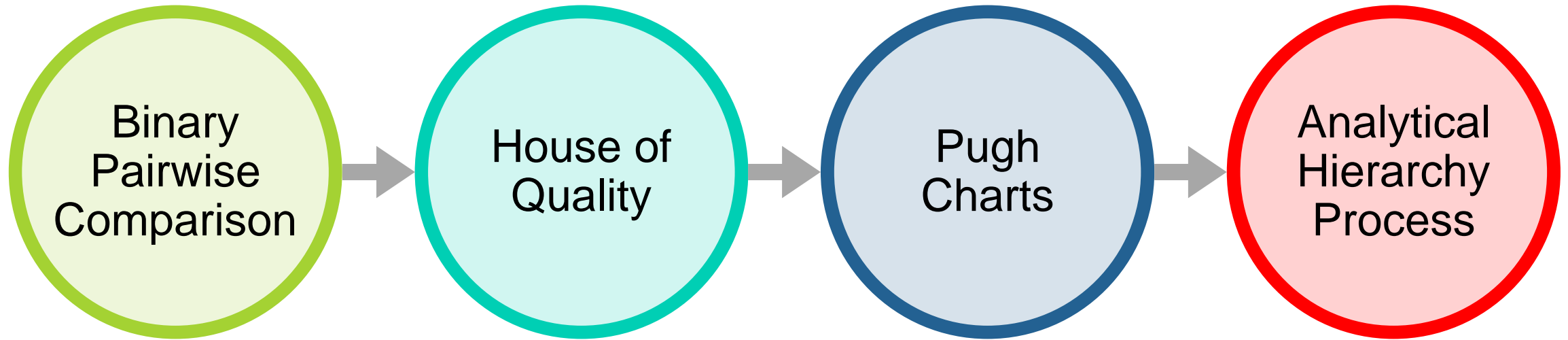
## Magnetic Locking Swivel

- Swivel that locks using magnets
- Overhang on conveyor will rotate swivel
- Ceramics will never travel face first, eliminating tipping



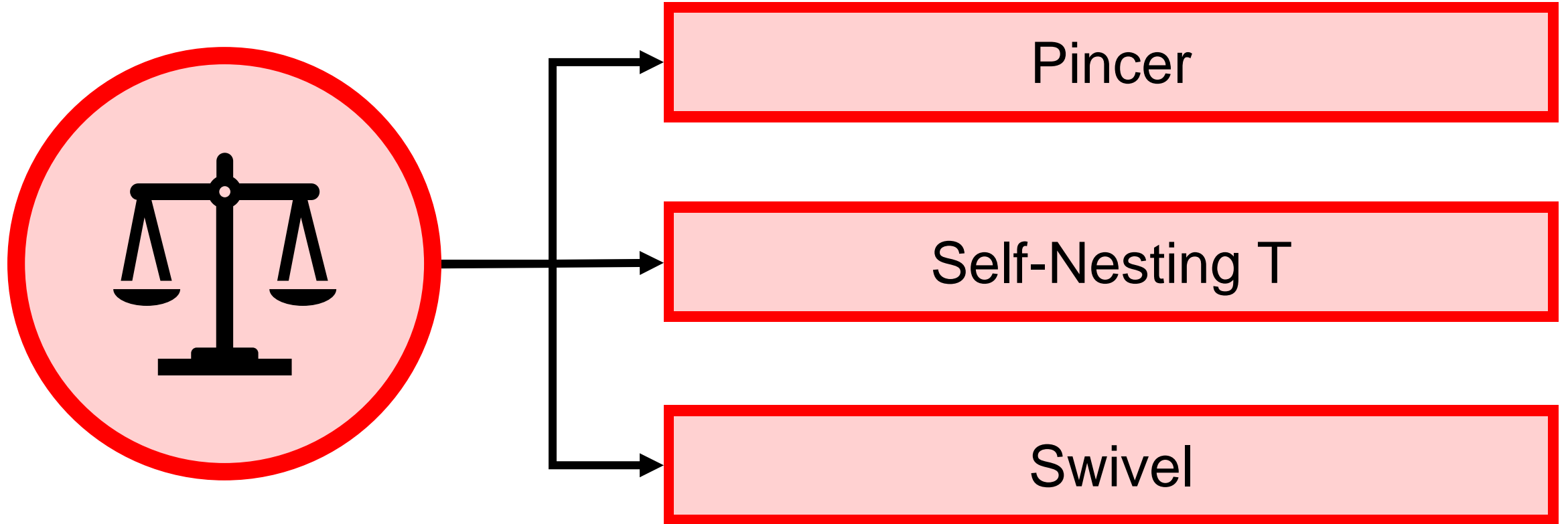
Segundo Sanchez

# Concept Selection



Segundo Sanchez

# Analytical Hierarchy Process



Segundo Sanchez

# Final Selection

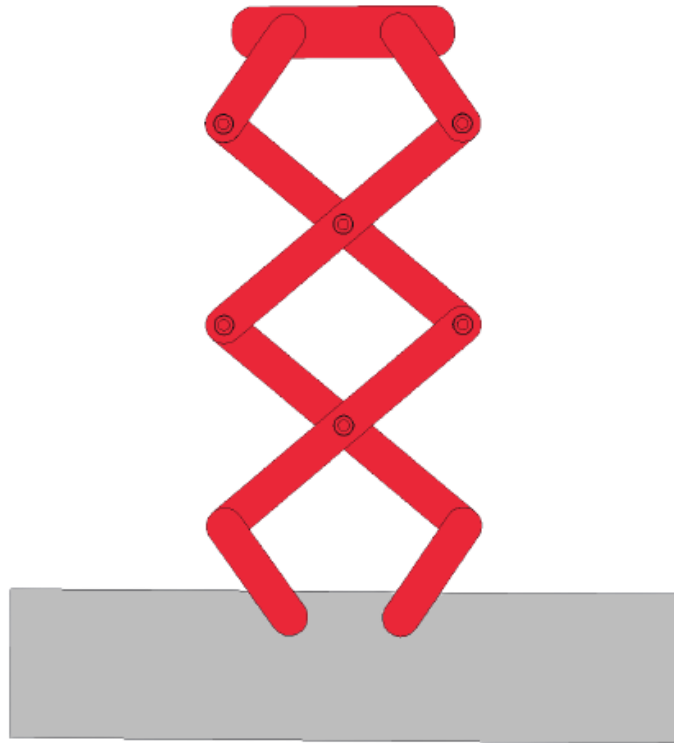
- Similar to working design
- Trigger activated and collapsible
- Uses mechanism on conveyor to activate



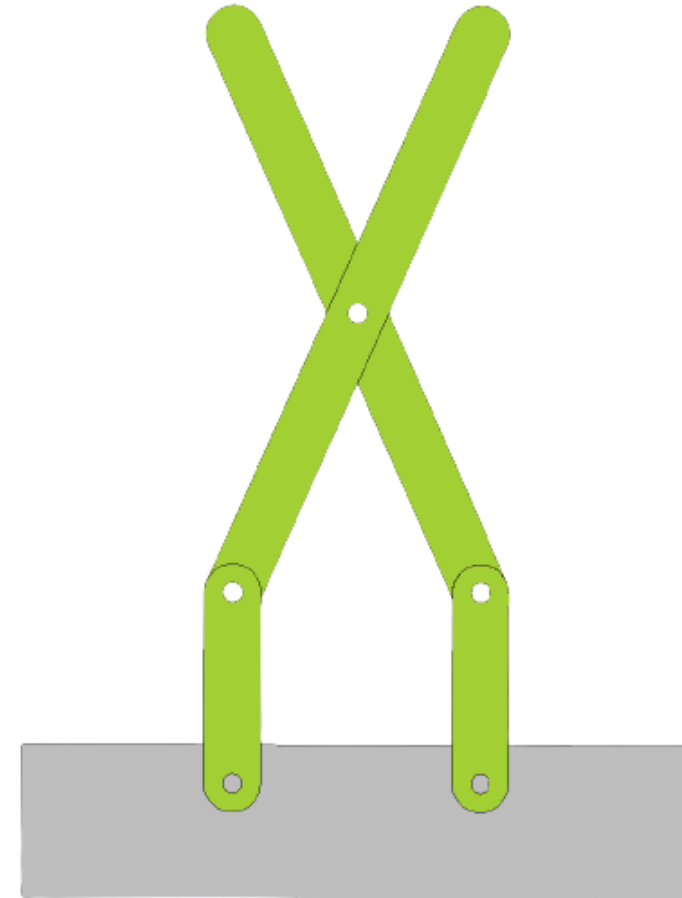
Segundo Sanchez



# Design Update



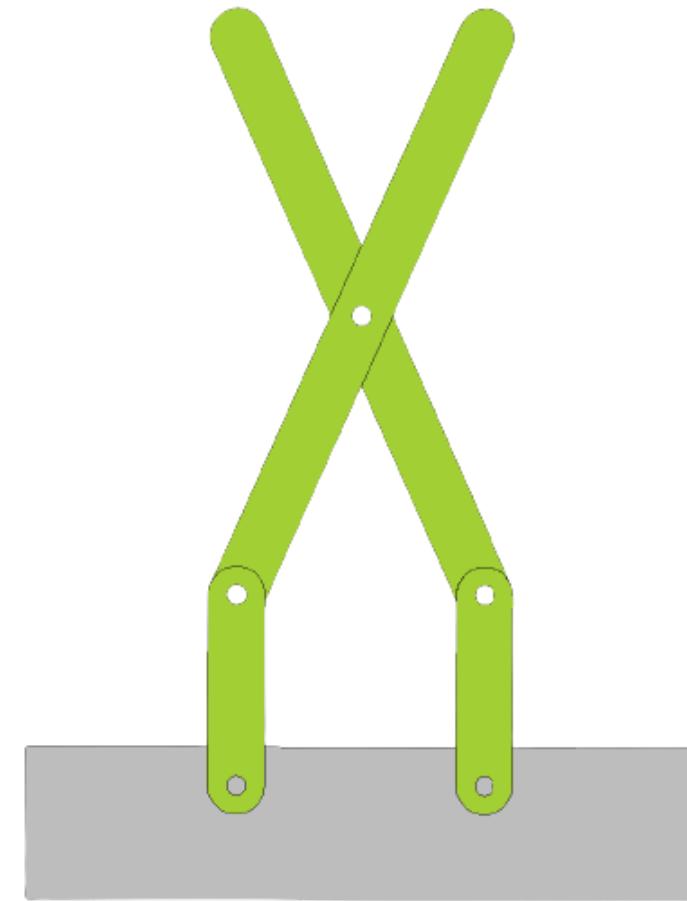
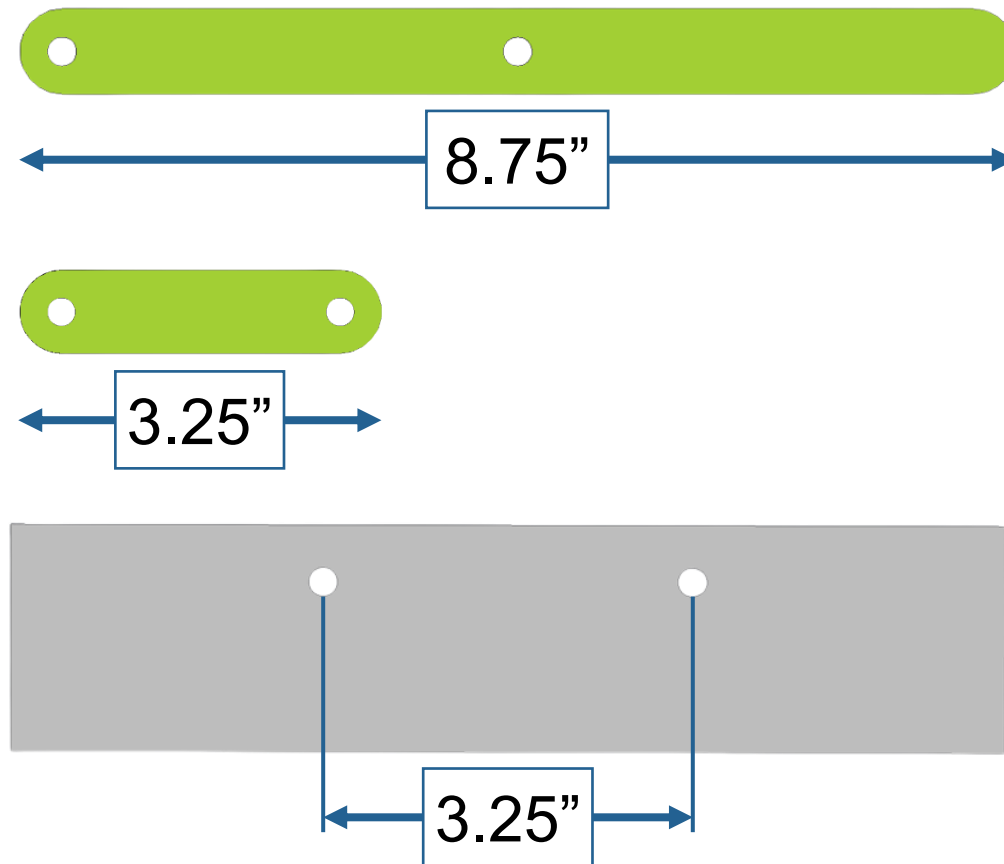
Old Design



New Design

Robert Kosmas

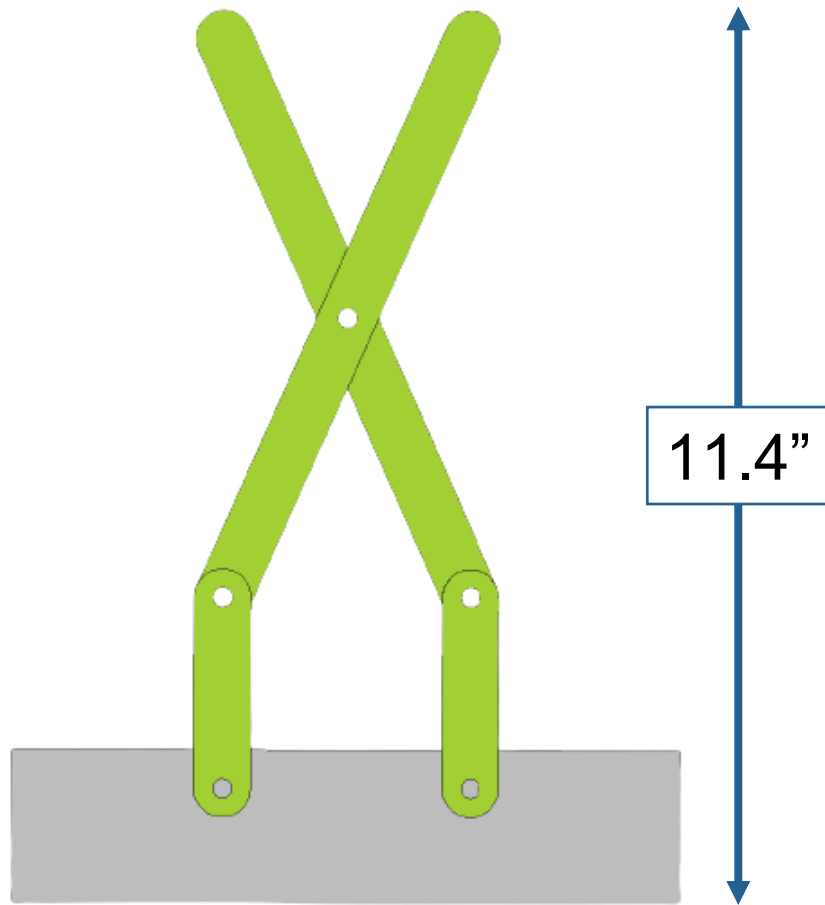
# Dimensions



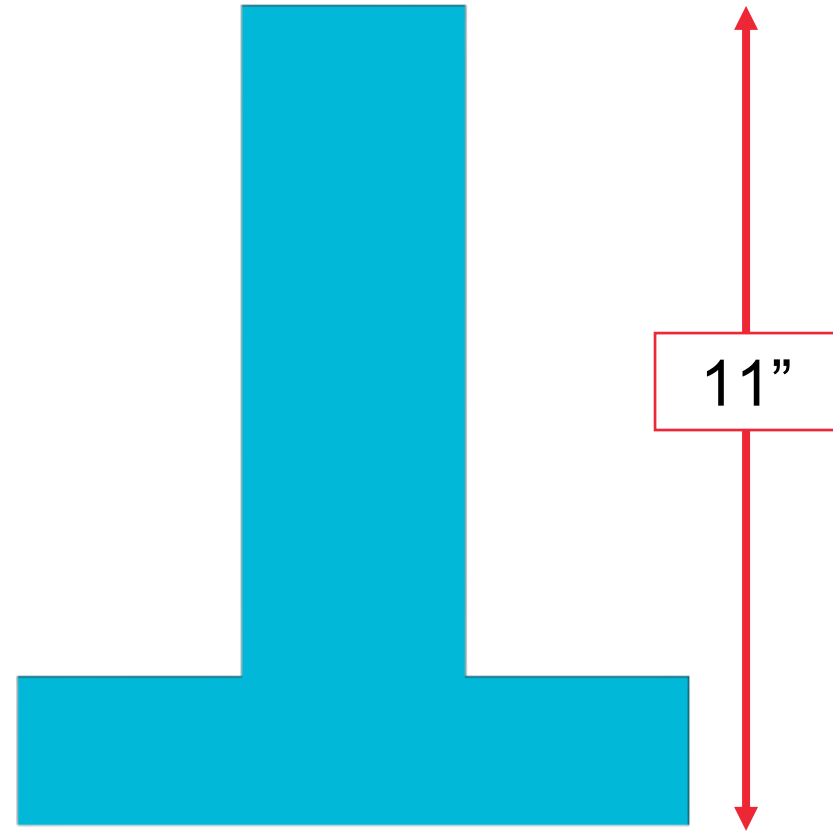
Full Model

Robert Kosmas

# Dimensions



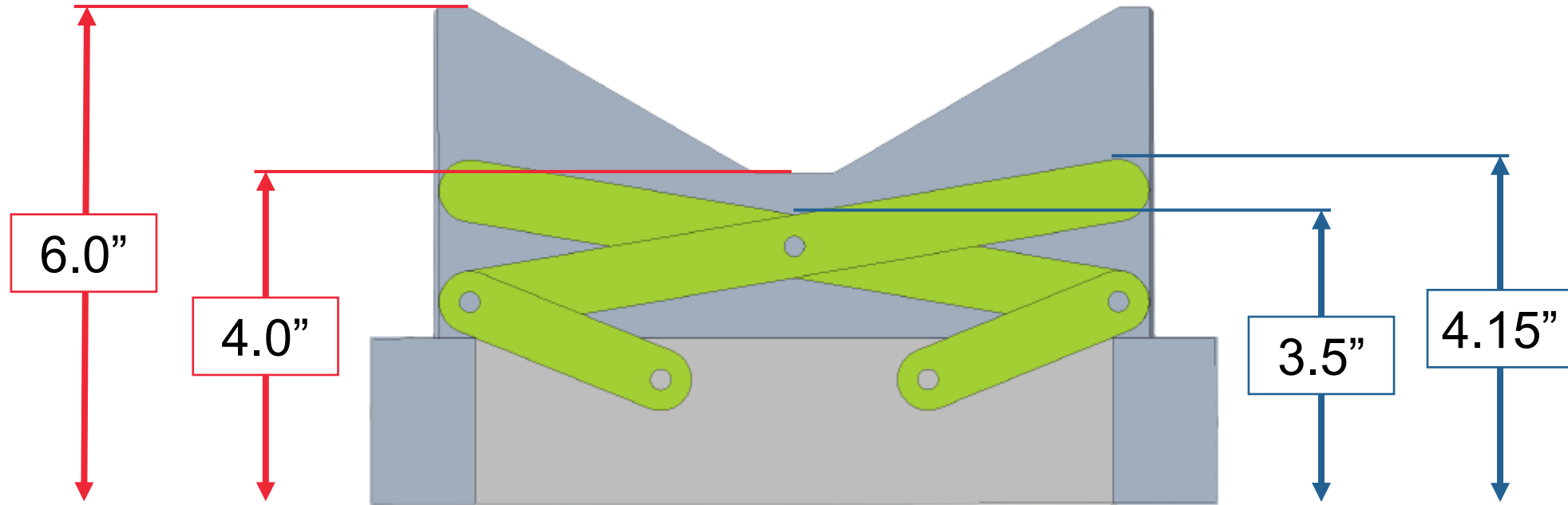
Full Model



Plexi-Glass T

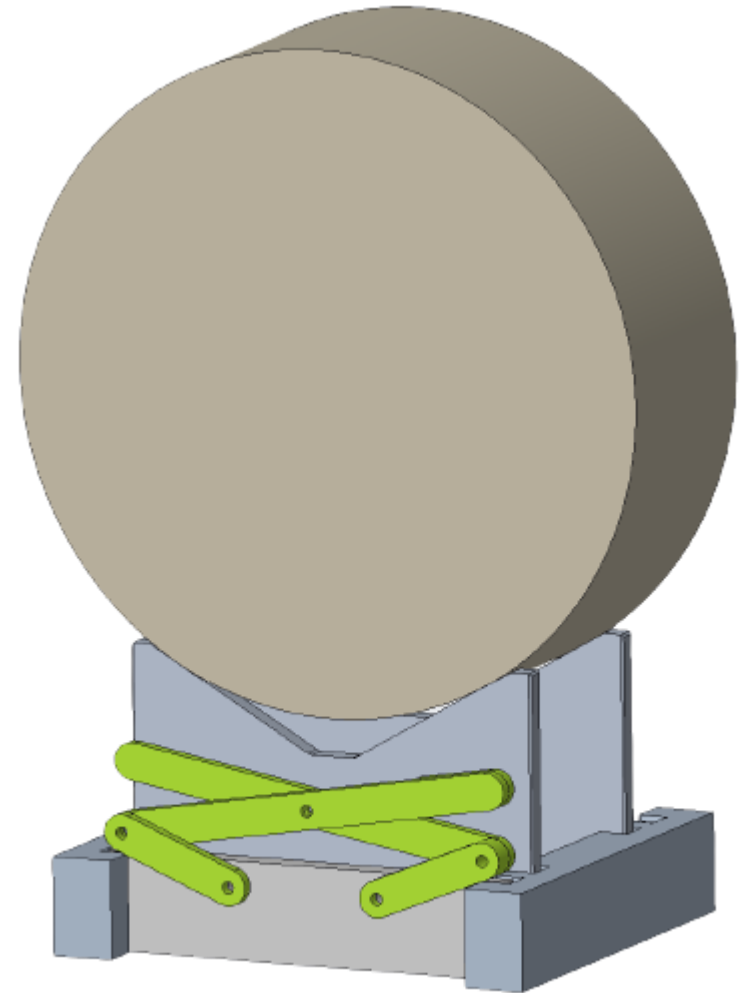
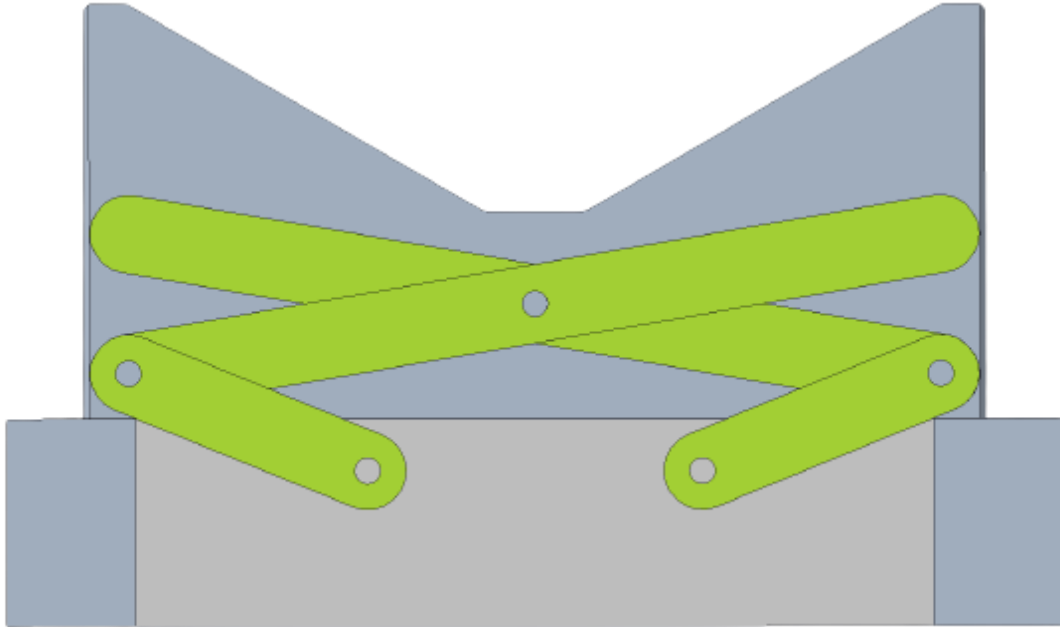
Robert Kosmas

# Vertical Retraction



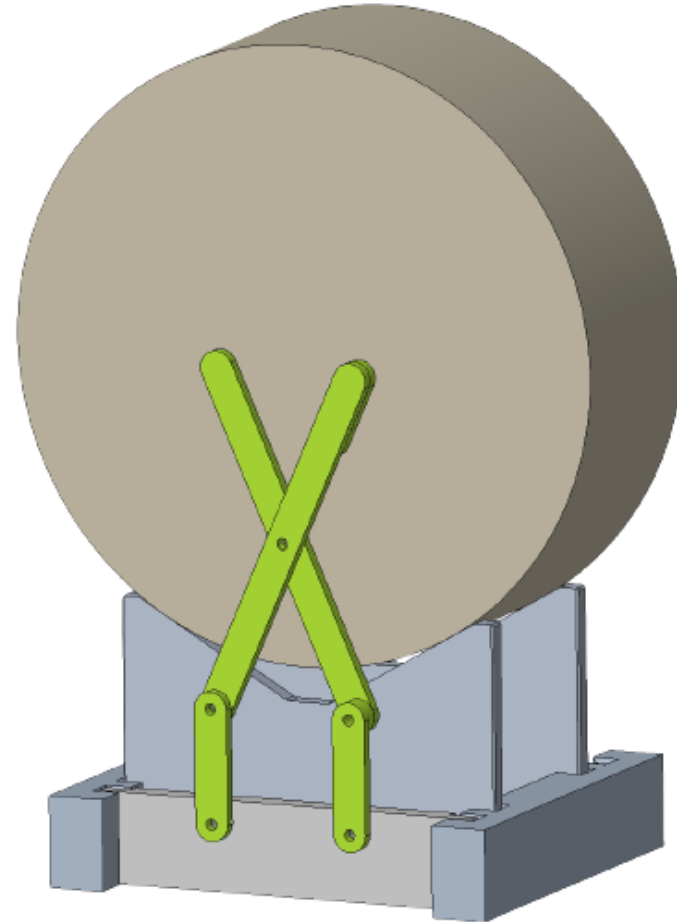
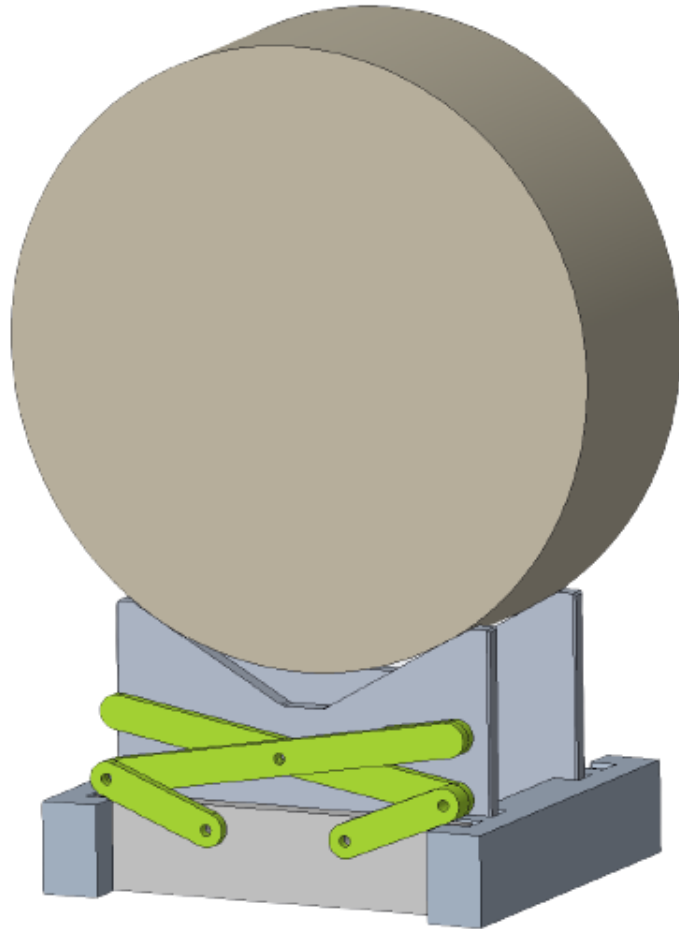
Robert Kosmas

# Vertical Retraction



Robert Kosmas

# Vertical Retraction and Expansion

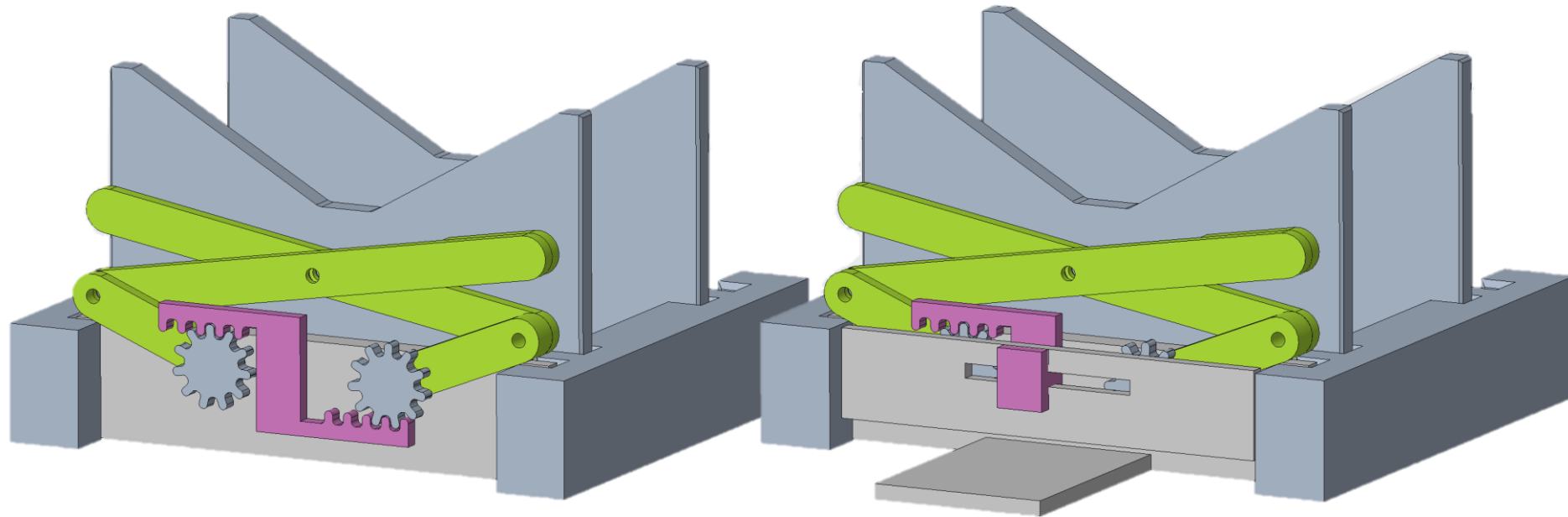


Robert Kosmas

# Vertical Retraction and Expansion

## Gear and Rack Slider

- “Z” shaped rack allows simultaneous rotation
- Will slide using a slot on the outer wall
- The outer wall will be raised for particle flow

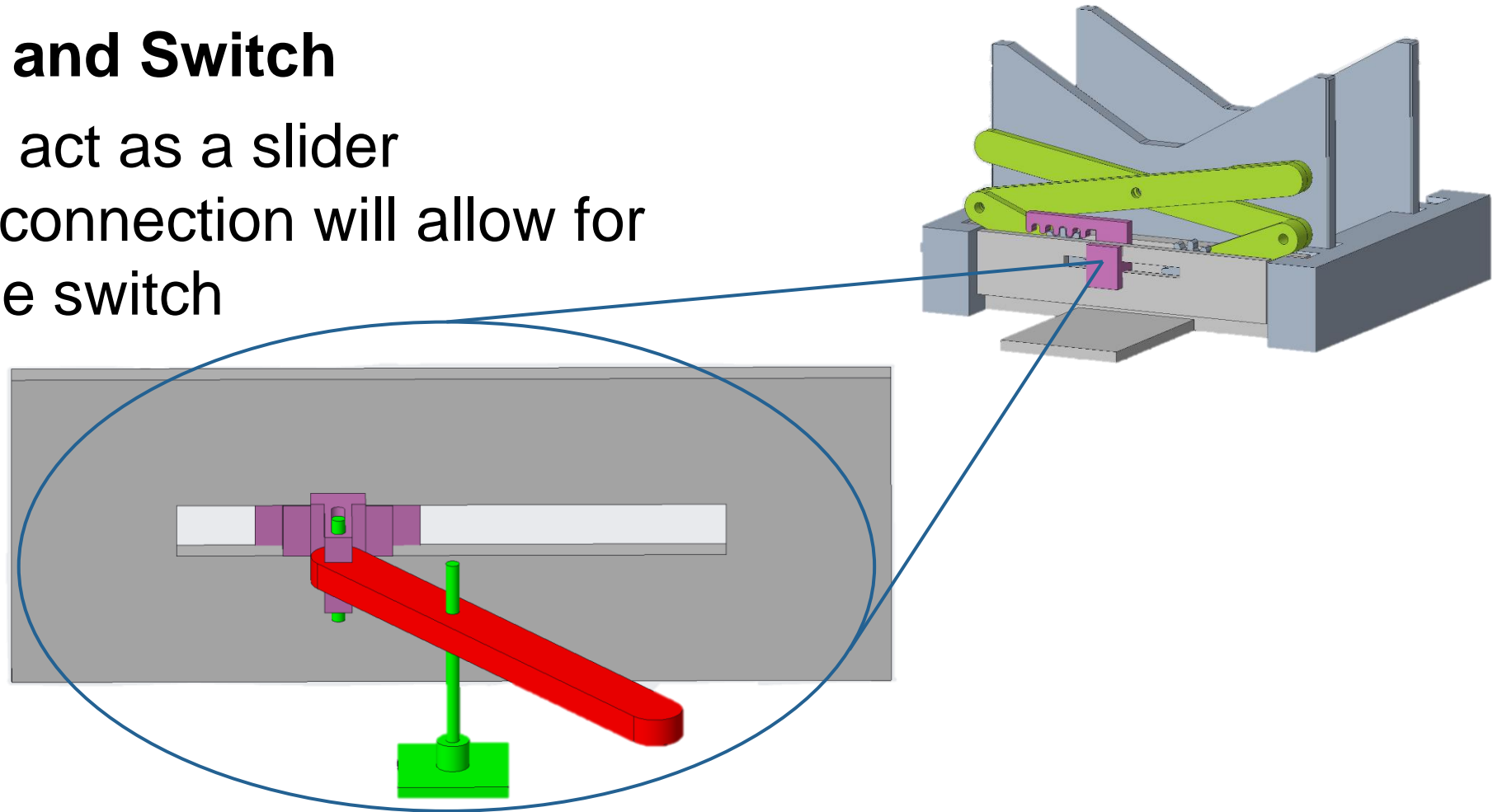


Robert Kosmas

# Vertical Retraction and Expansion

## Slider Joint and Switch

- The rack will act as a slider
- Slotted joint connection will allow for rotation of the switch



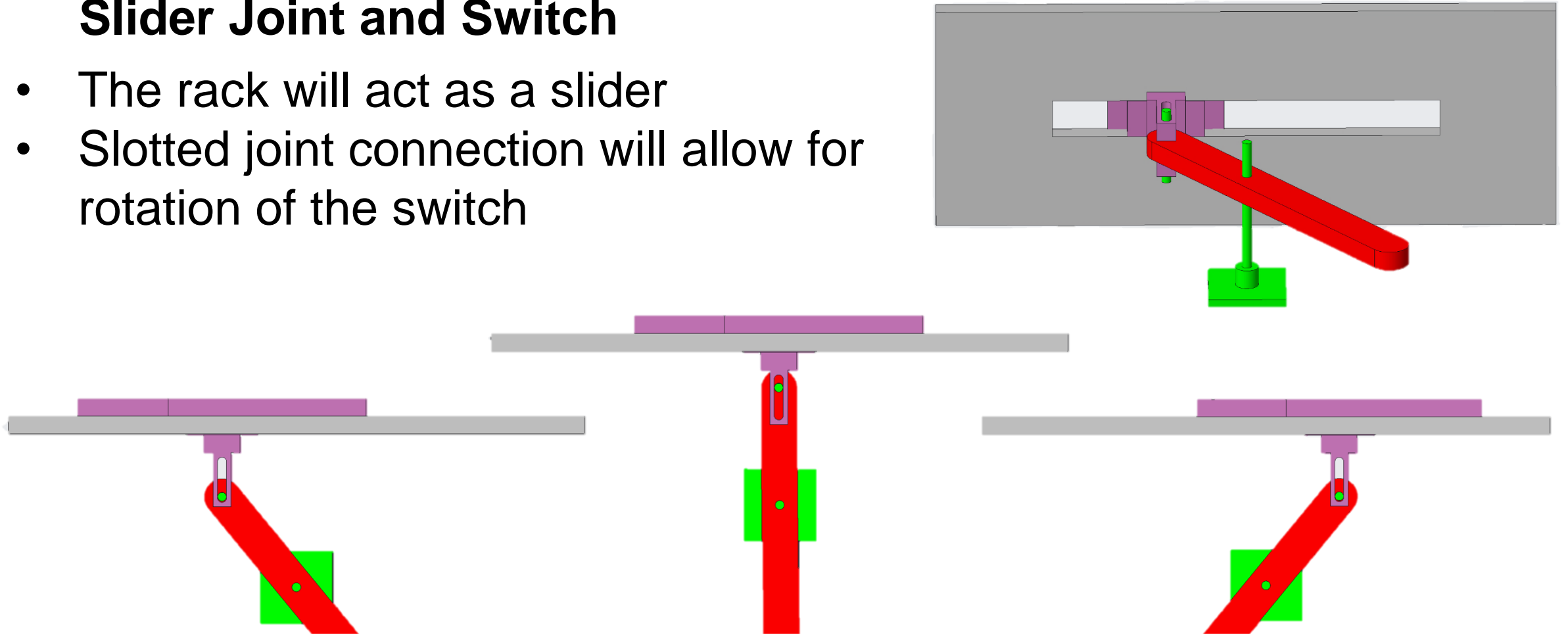
Robert Kosmas



# Vertical Retraction and Expansion

## Slider Joint and Switch

- The rack will act as a slider
- Slotted joint connection will allow for rotation of the switch



Robert Kosmas

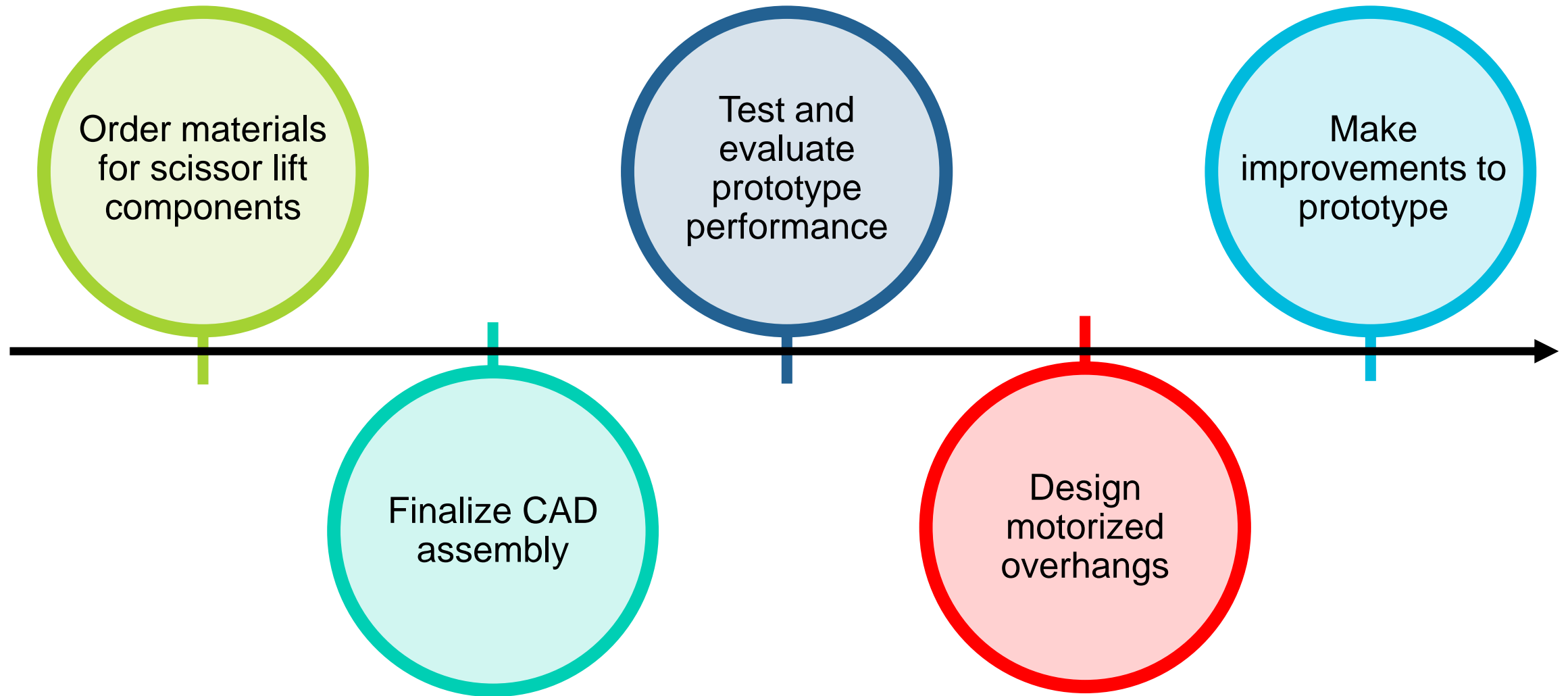
# Current Challenges

- Finalize connection from slide to switch bar
  - ❑ Merge CAD's, correct positioning, check on the machinability of the connection
- Finalize self-nesting T CAD
  - ❑ Adjust tolerances, add hardware, communicate with machine shop for final adjustments
- Developing motorized overhangs
  - ❑ Determine positioning, type of motors, and forces needed
- Test mechanisms durability
  - ❑ Mobility during harsh conditions, impact resistance, material resistance

Robert Kosmas



# Future Work



Robert Kosmas

# Thank you!

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