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

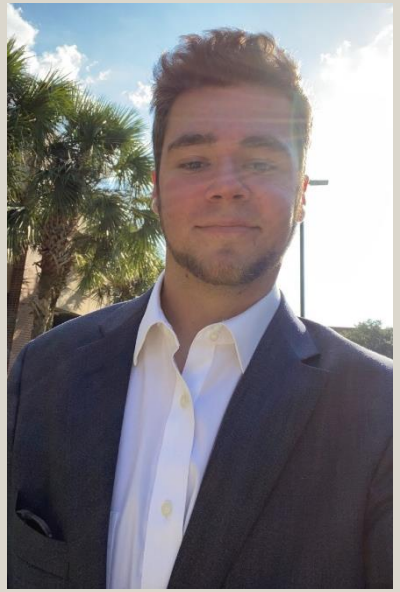
Structural Design Engineer

Taylor M. Larson

Dynamics Engineer

Segundo A. Sanchez

Materials Analysis Engineer



Jared T. White

Facilities and Manufacturing Engineer

Taylor Larson

Sponsors and Advisors

Jeffery Roche

Engineering Mentor

Heavy Duty Project Manager

Jeffery Stott

Engineering Mentor

Equipment Engineering Manager

Eric Hellstrom, Ph.D

Academic Advisor

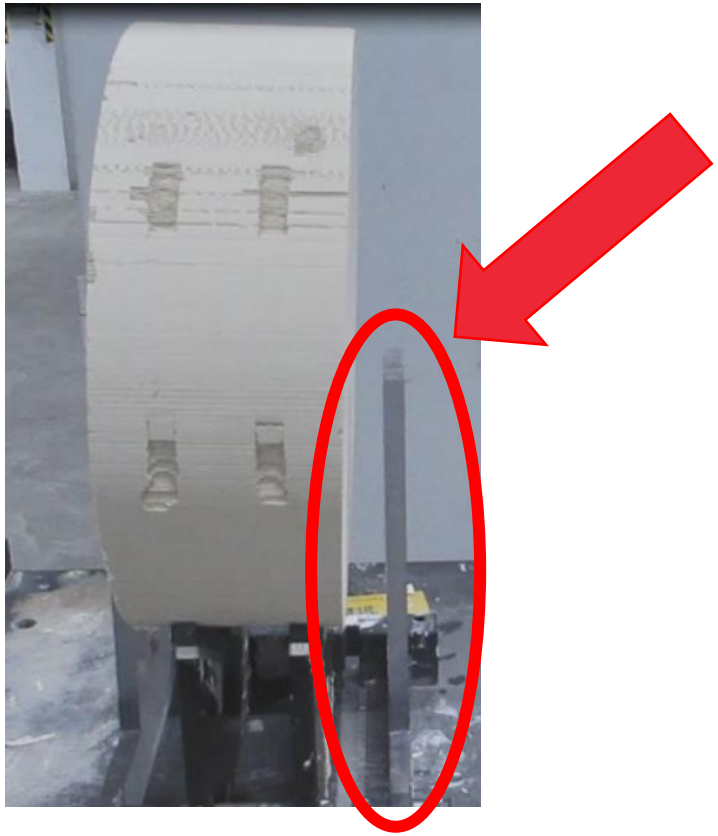
Materials Science Program Director

Taylor Larson

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.

Project Background



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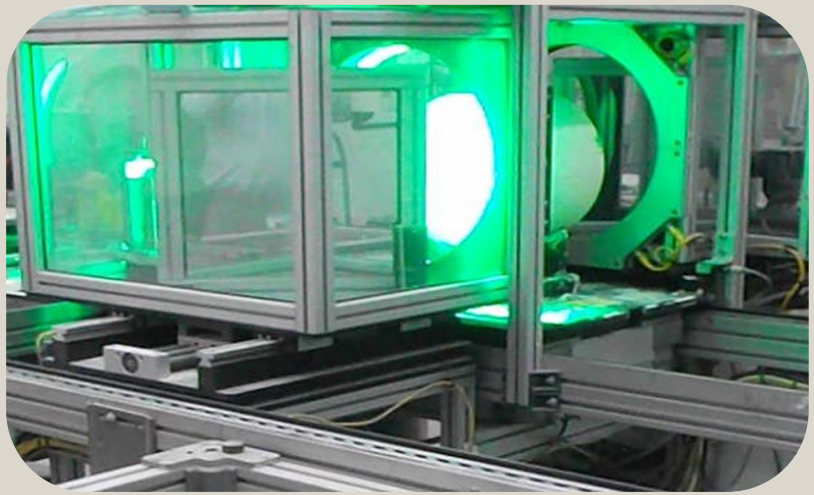
Key Goals

Prevent Damage

Limit Interaction



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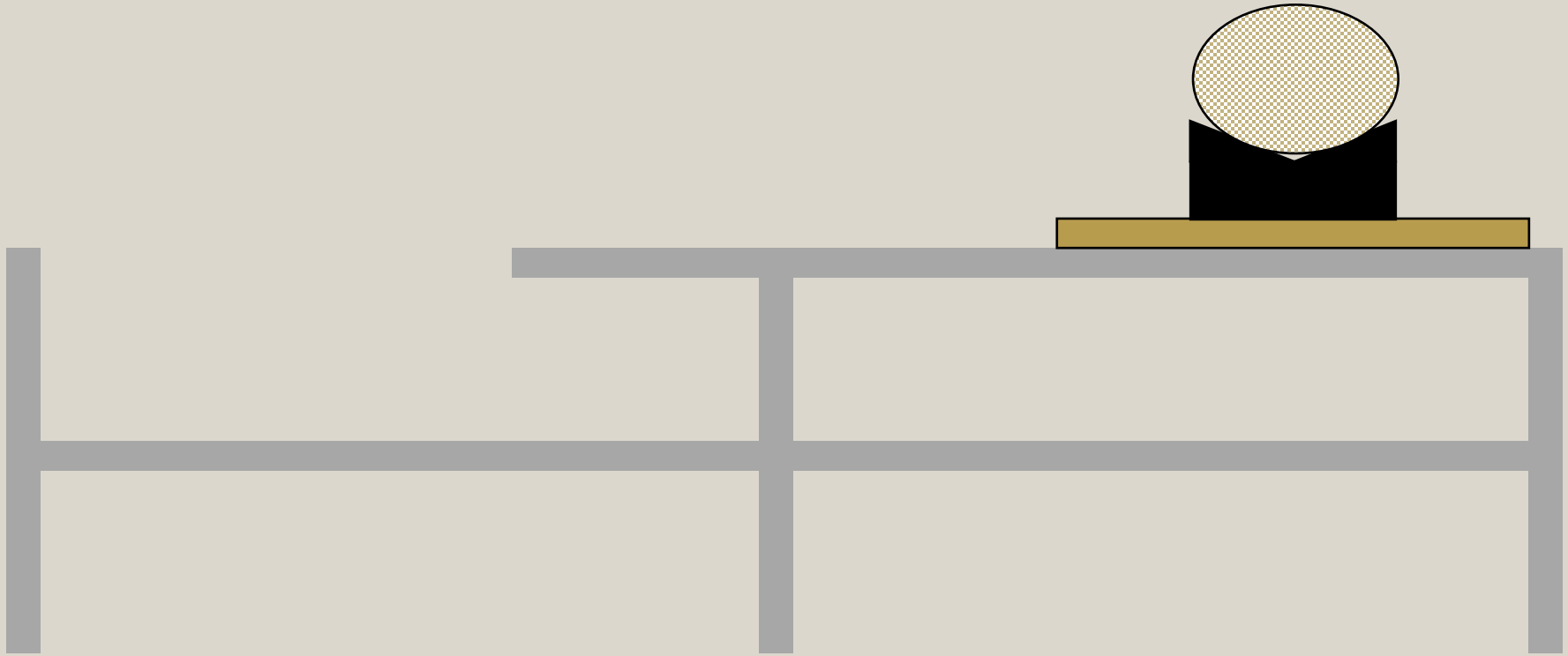
Key Goals

Integrate with conveyor system



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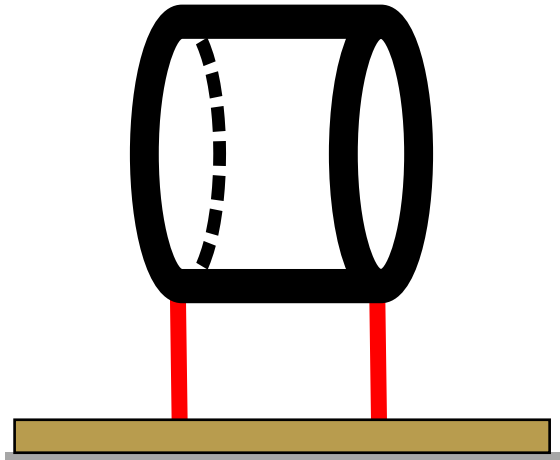
Targets and Metrics

Stabilization

Stabilization Metrics



Secure Ceramic	1 DOF
Prevent Damage of Ceramic	Limit Movement to 0.5 in

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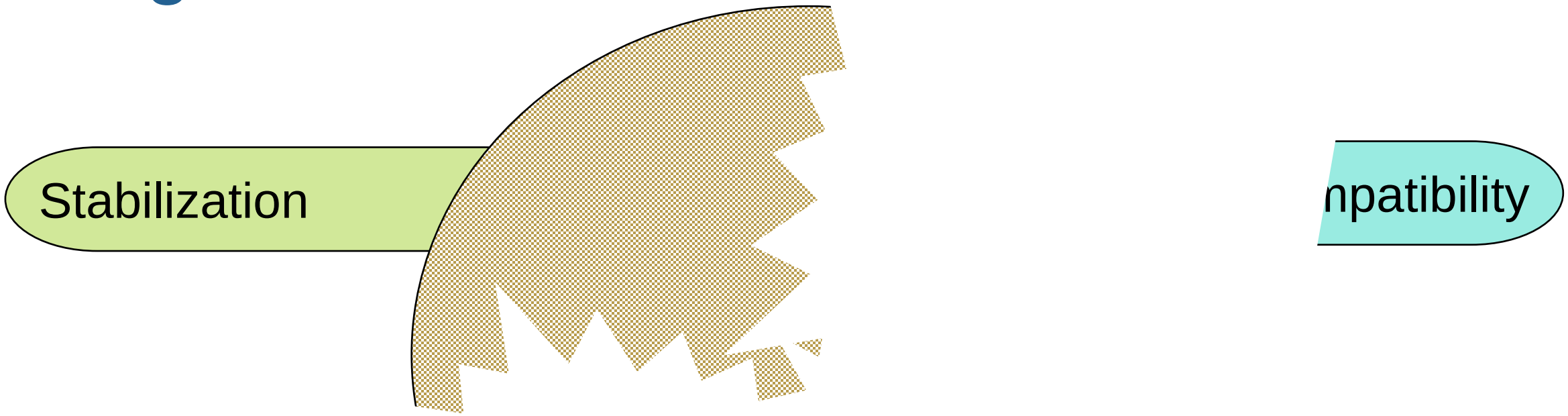
Targets and Metrics



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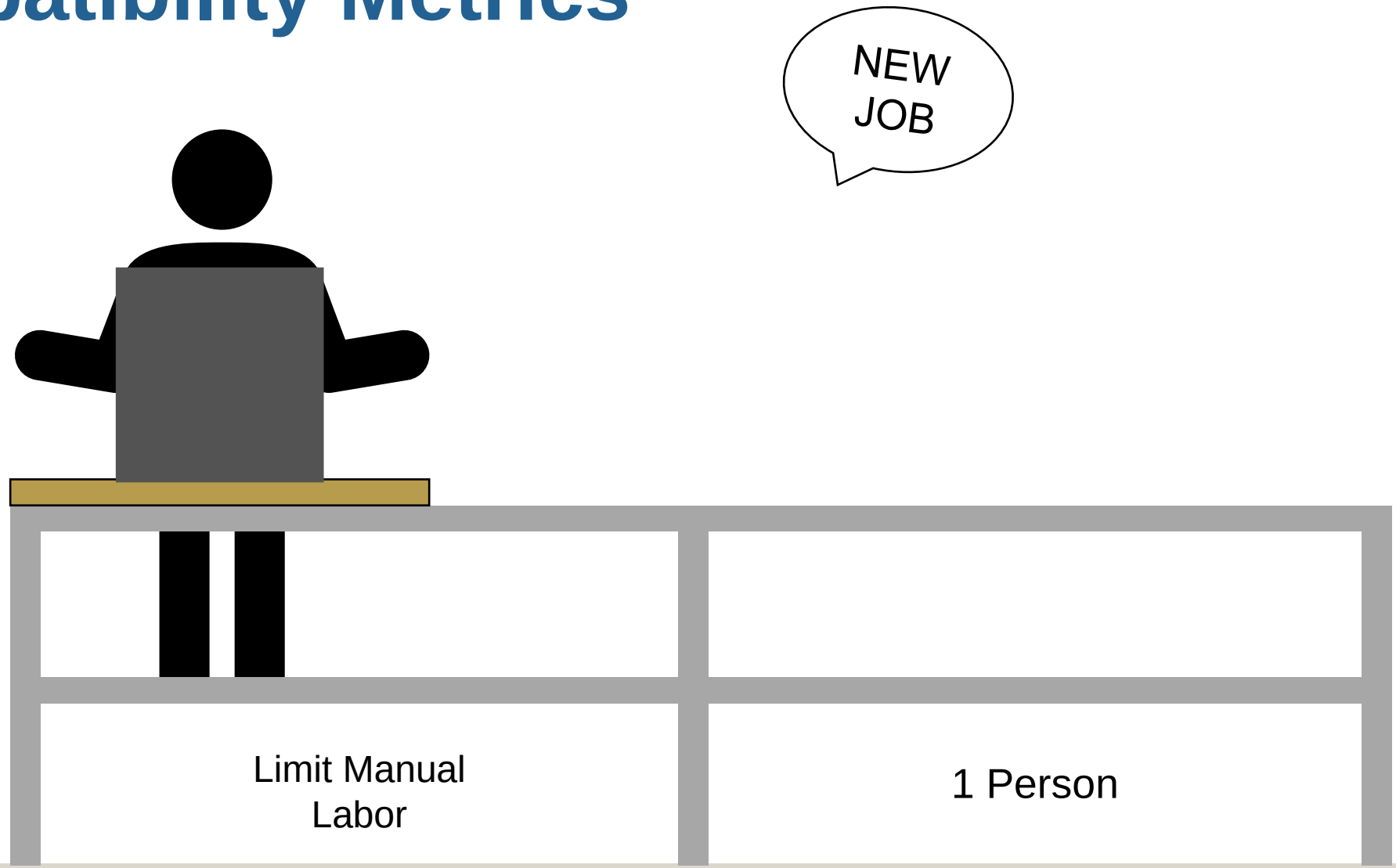
Compatibility Metrics



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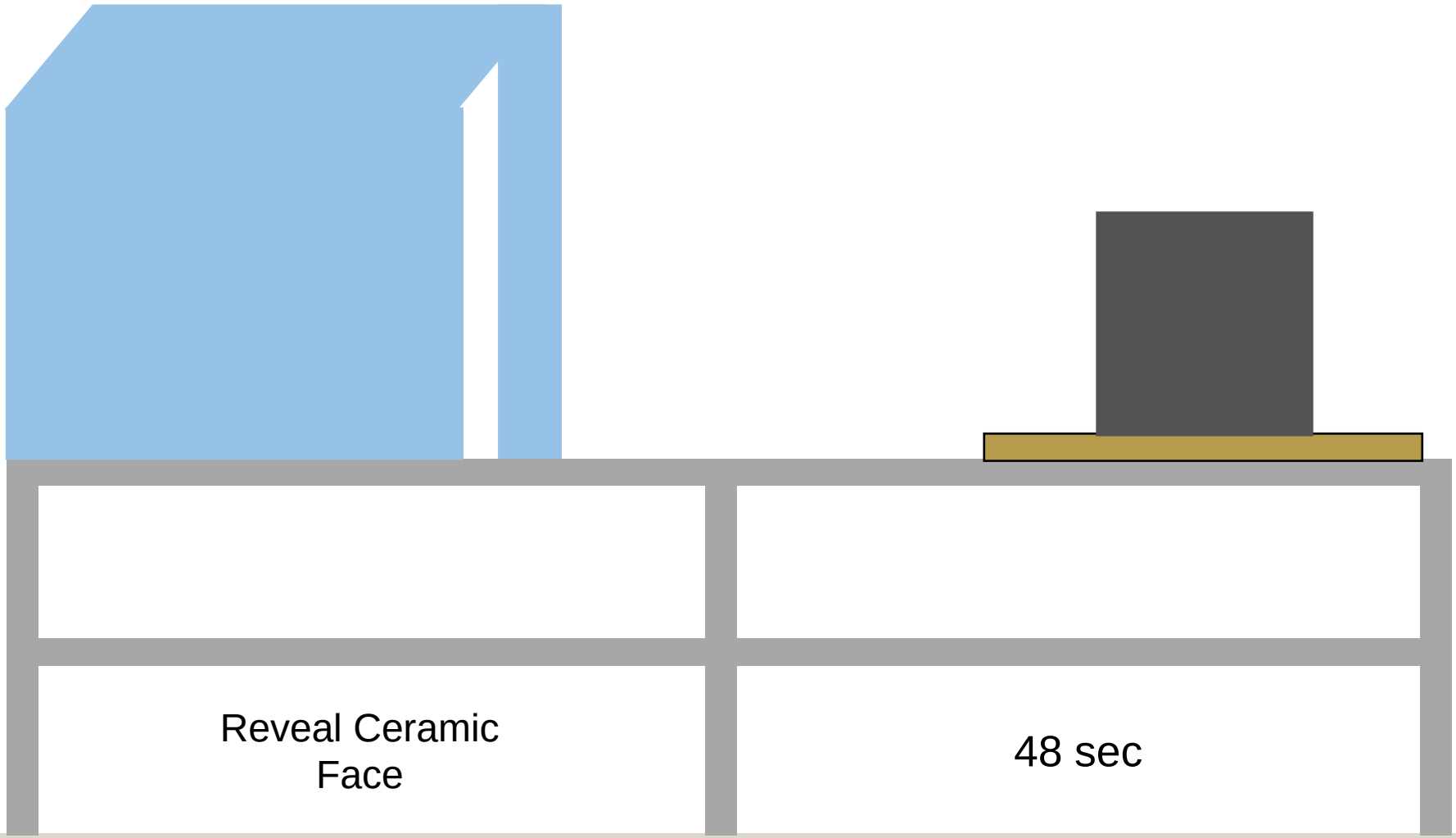
Compatibility Metrics



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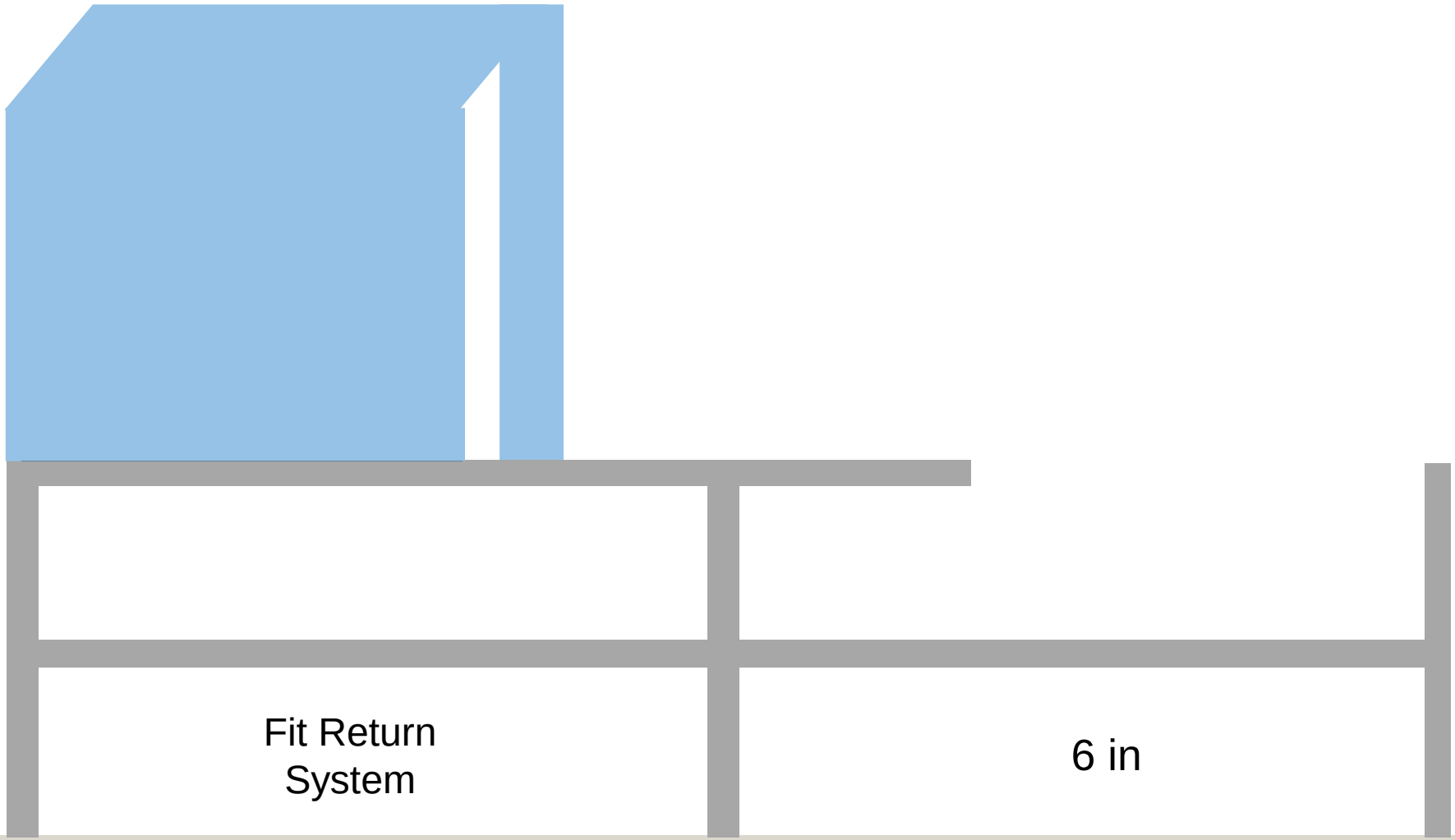
Compatibility Metrics



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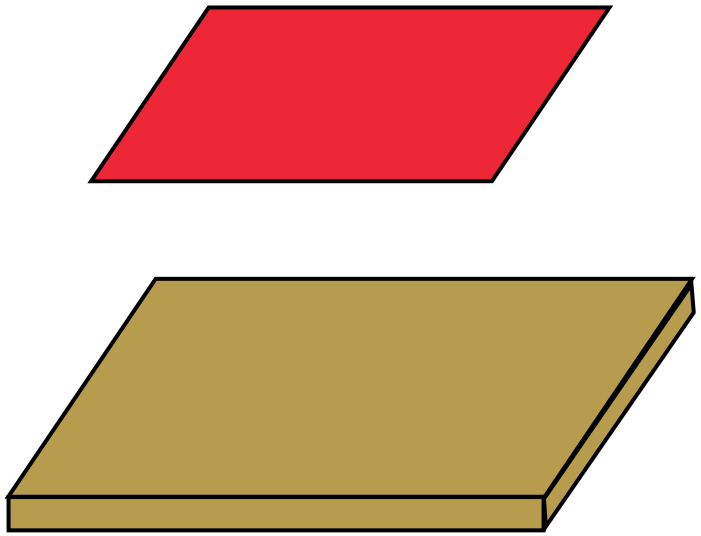
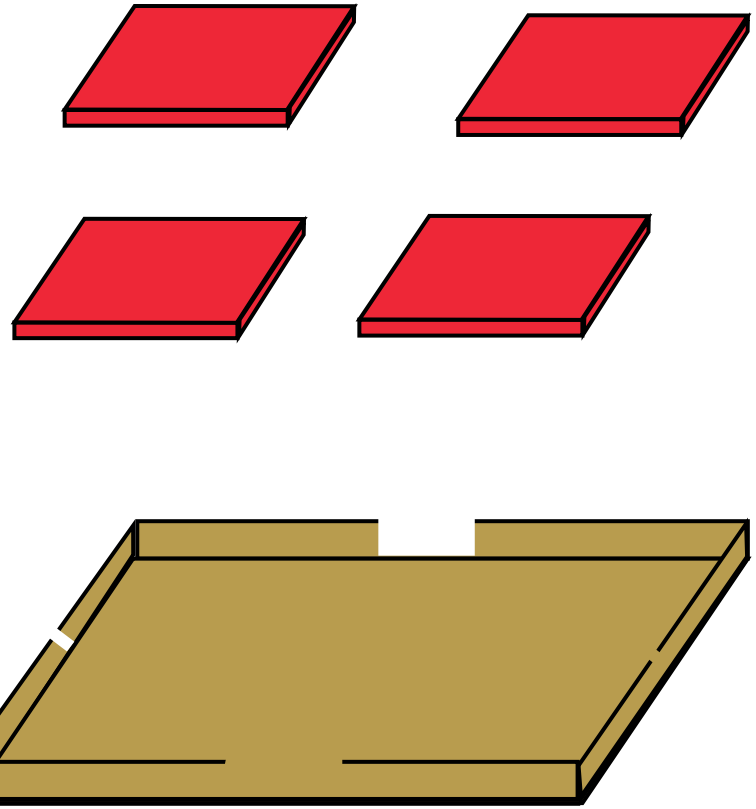
Compatibility Metrics

Integrate with Current Conveyor	297.36 in^2 43.18 in^3 (x4)





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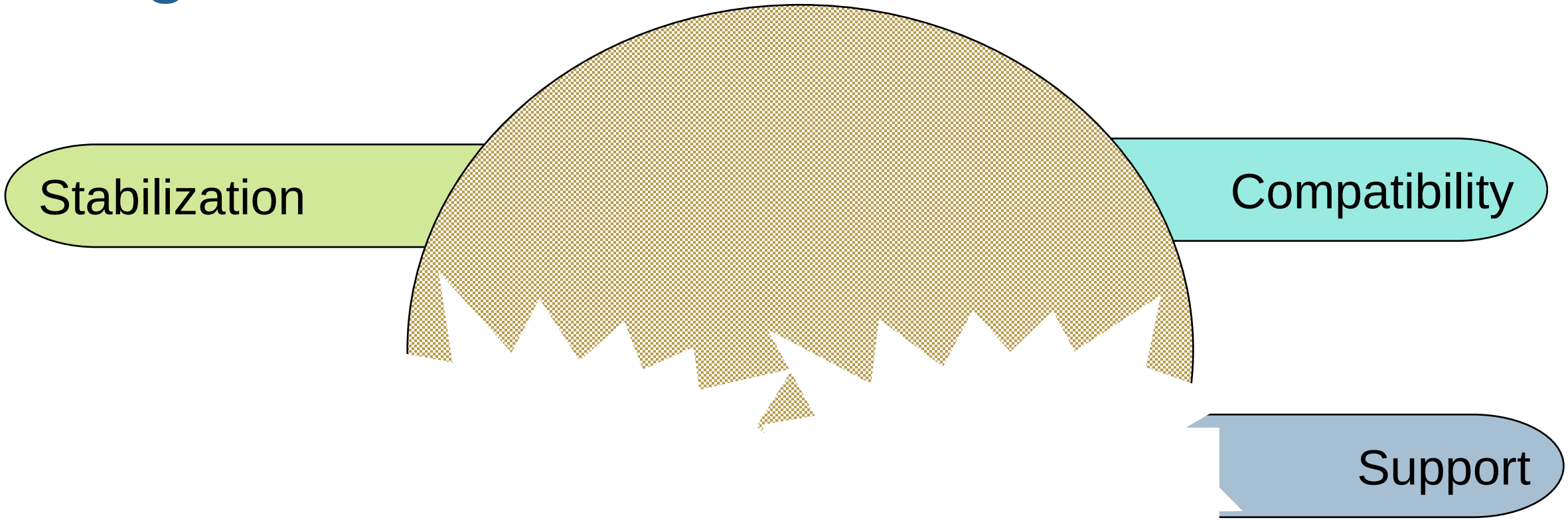
Targets and Metrics



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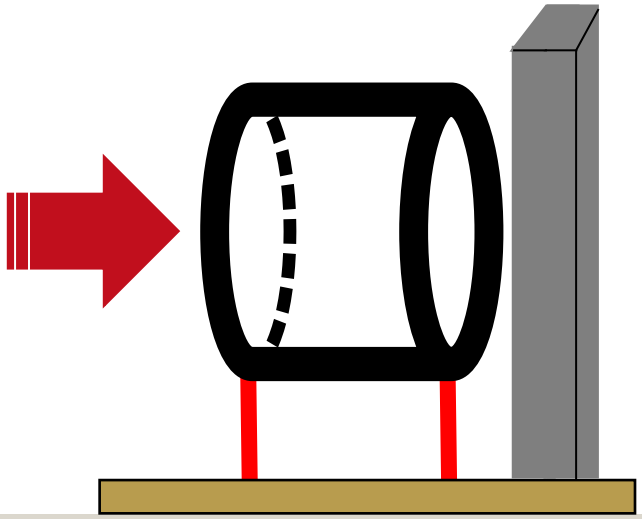
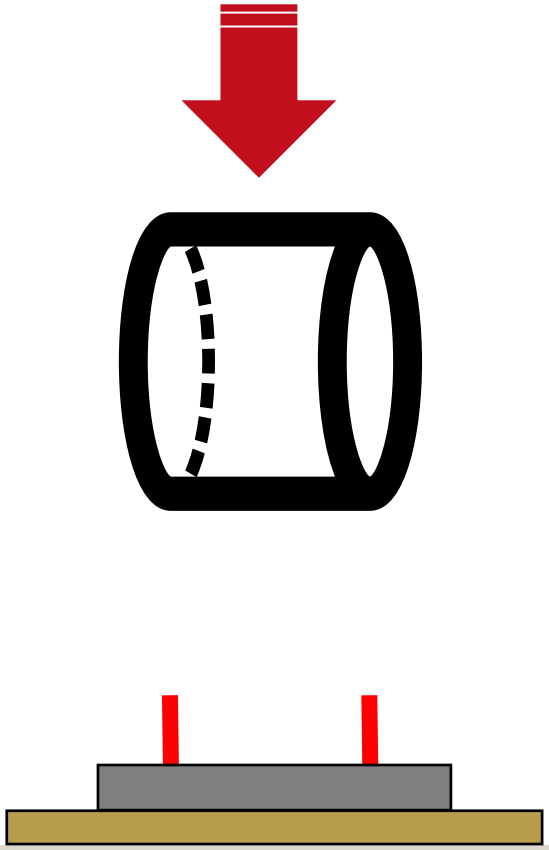
Support Metrics

Withstand Load	8 lbs





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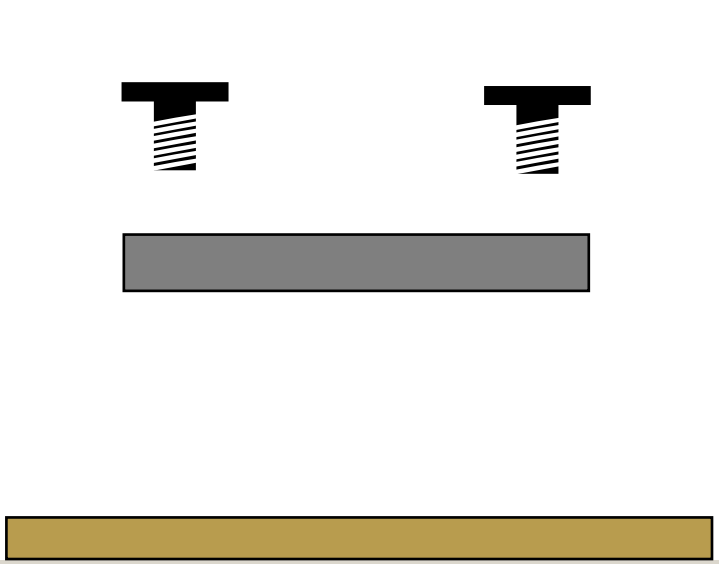
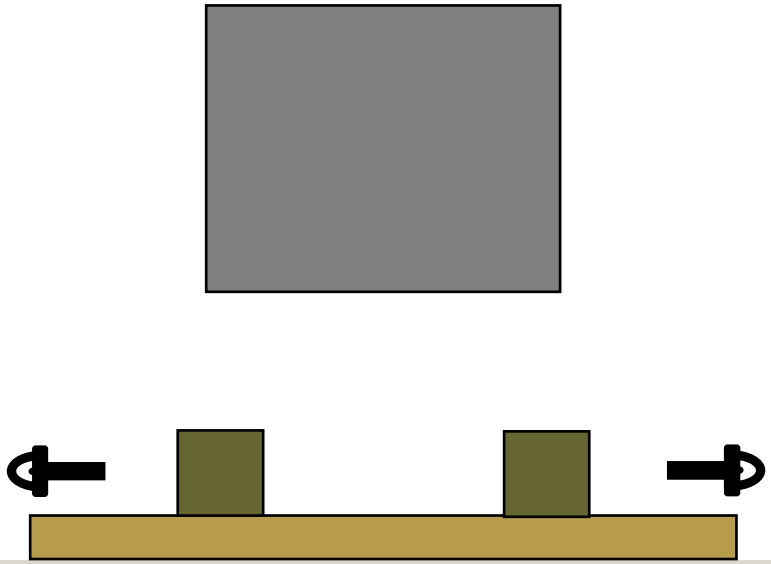
Support Metrics

Secure to Pallet	0 DOF





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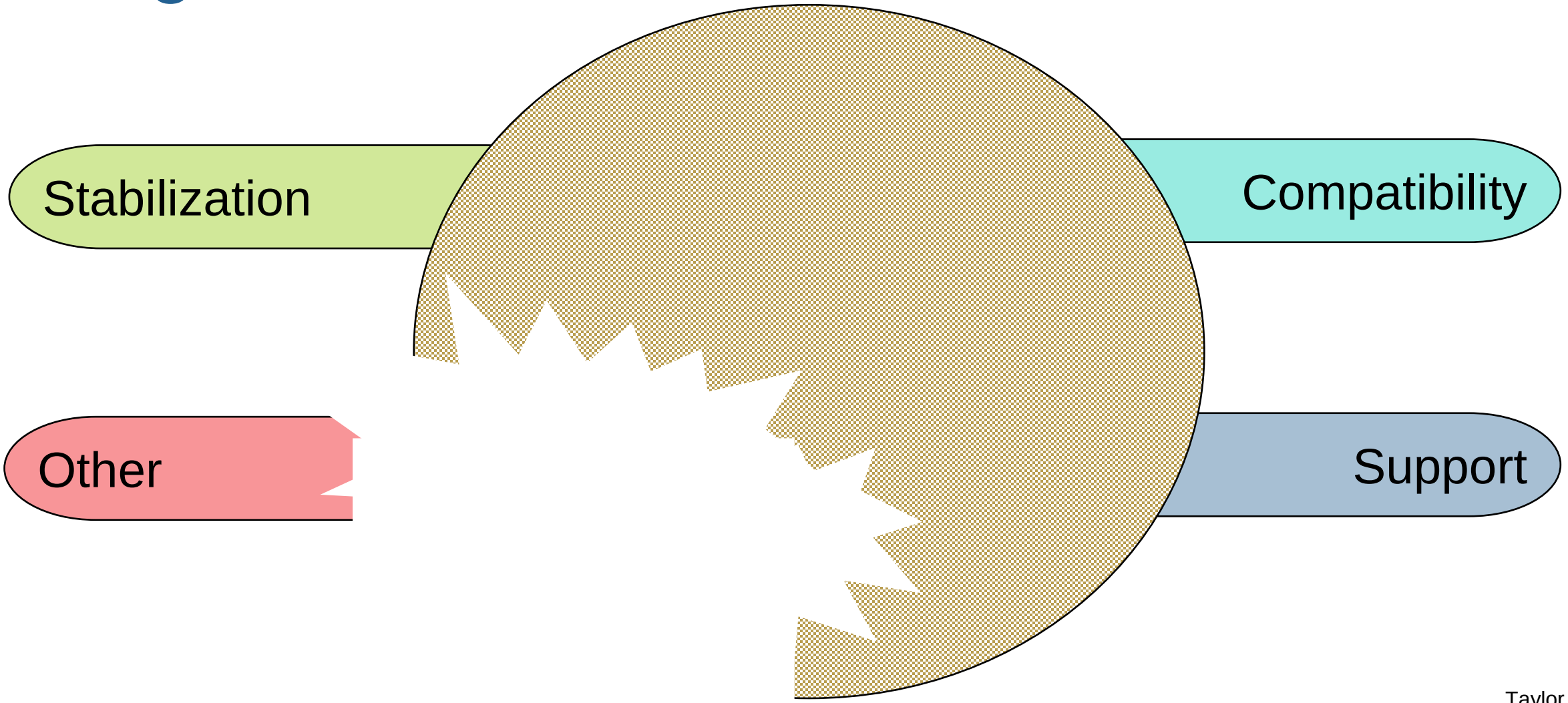
Targets and Metrics



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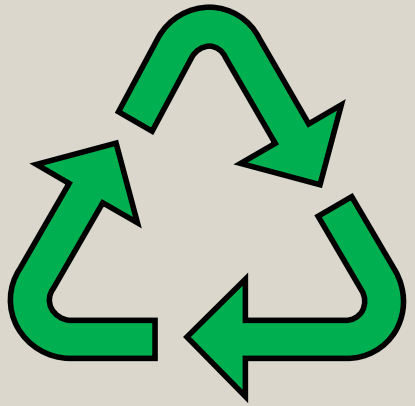
Other Metrics

Device Weight
25 lbs

Assembly Time
30 sec

Recyclable



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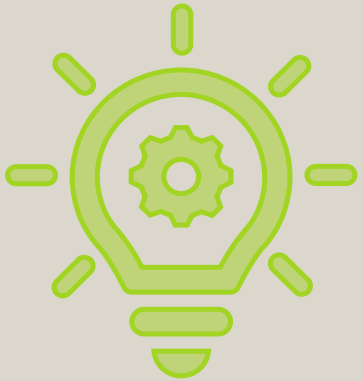
Concept Generation Tools

Biomimicry

Brainstorming



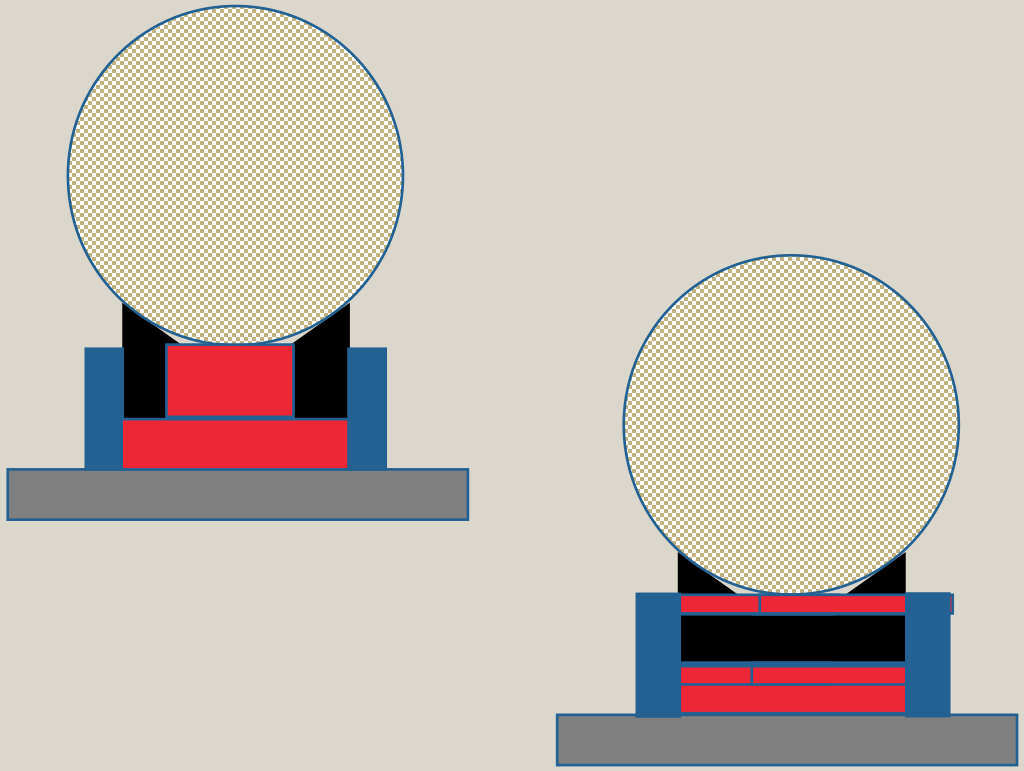
Crapshoot

Pawel Grum

Medium Fidelity Concepts

Self-Nesting T

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



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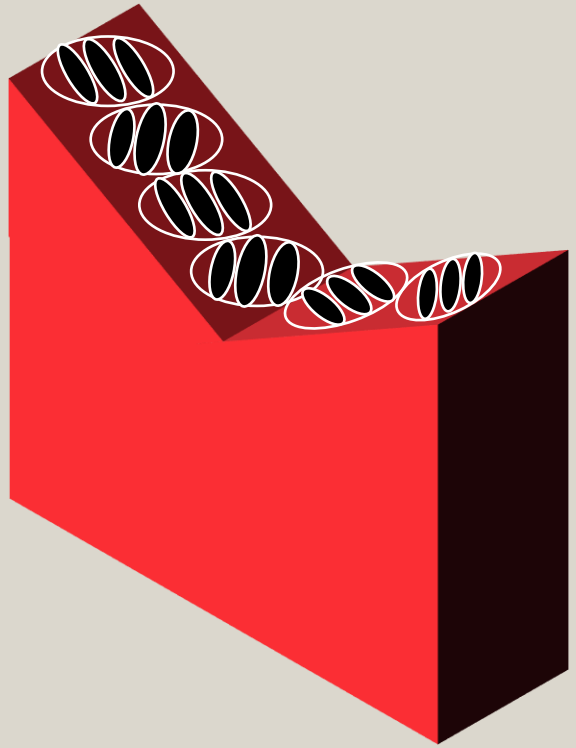
Medium Fidelity Concepts

Swedish Wheels

- Swedish wheels offset at 90°
- Mechanically moving
- Ceramic shifting actuates opposite wheels



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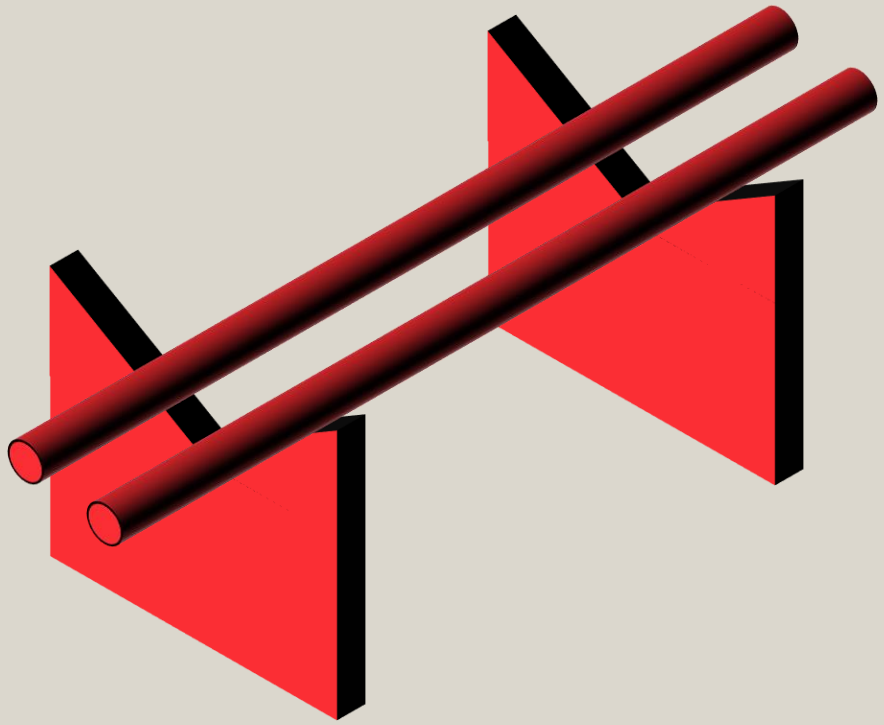
Medium Fidelity Concepts

2 Long Poles

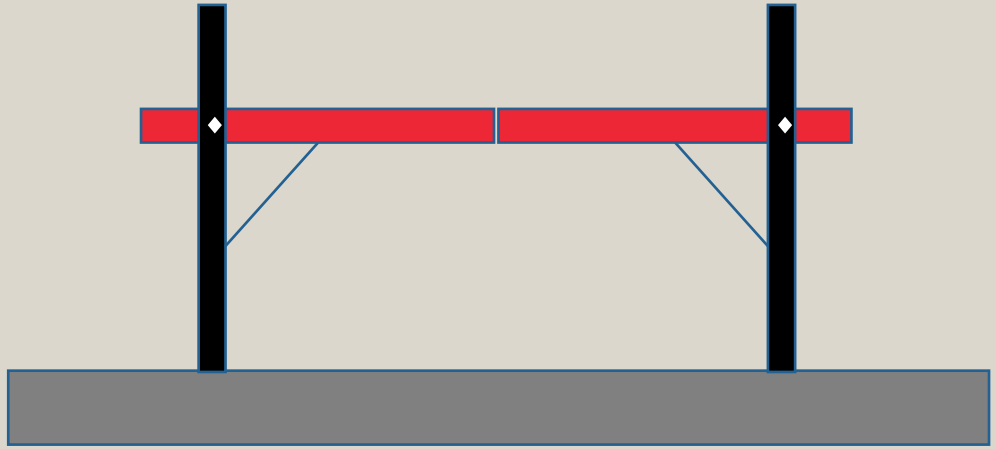
- Connector between Vs to add additional contact points to ceramic
- Extends beyond current V to stabilize front to back



Medium Fidelity Concepts

Pressure Sensor Gate

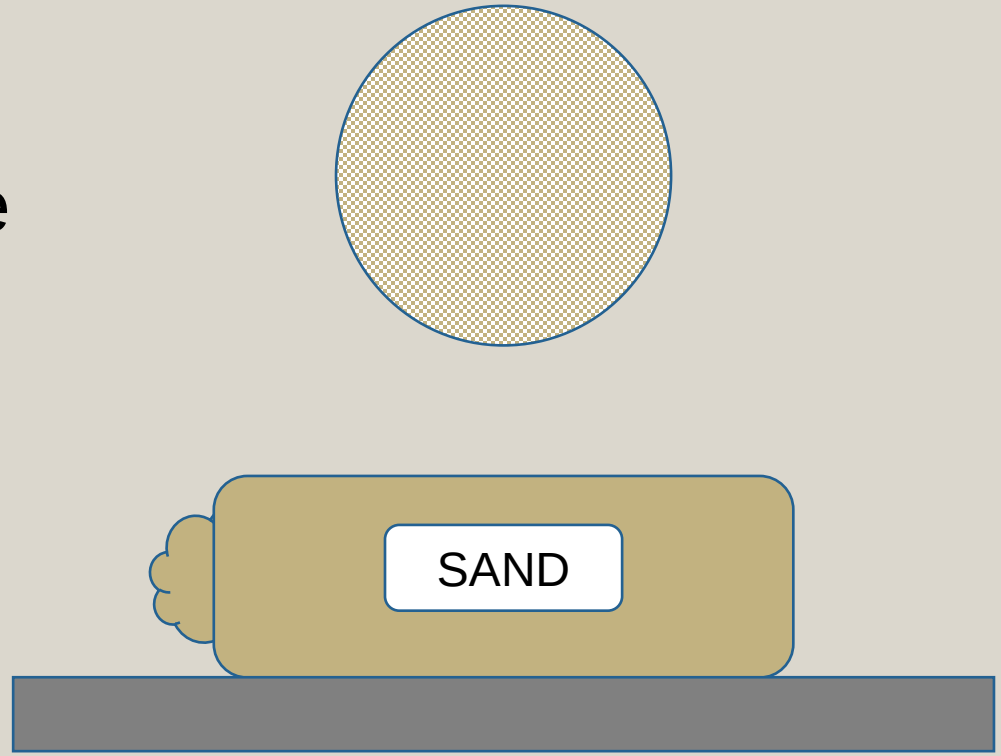
- Spring-loaded gate connecting in-between the Vs
- Robot force actuates the gates
- Self-retracting
- Adds additional points of contact for the ceramic



Medium Fidelity Concepts

Sandbag Weight

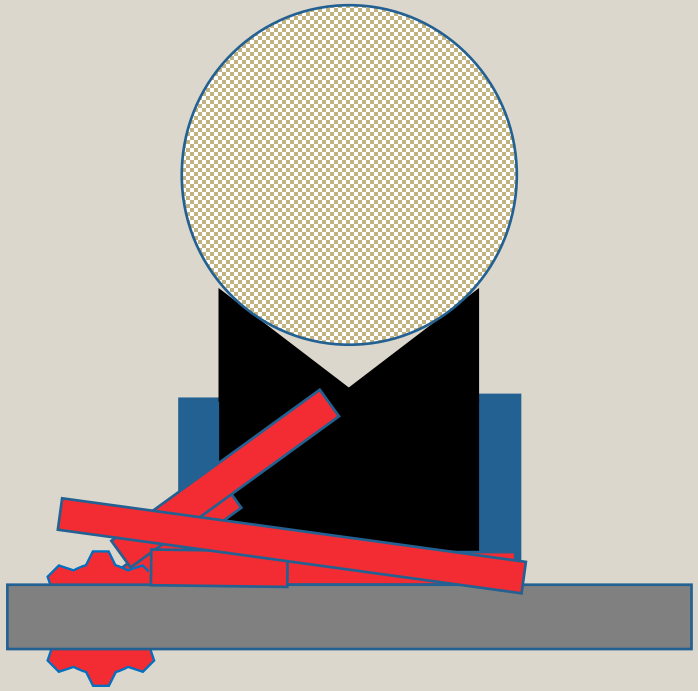
- Adding heavy sandbag to the pallet
- Reduces vibrations
- Ceramic nests inside to prevent damage



High Fidelity Concepts

Four Bar Mechanical System

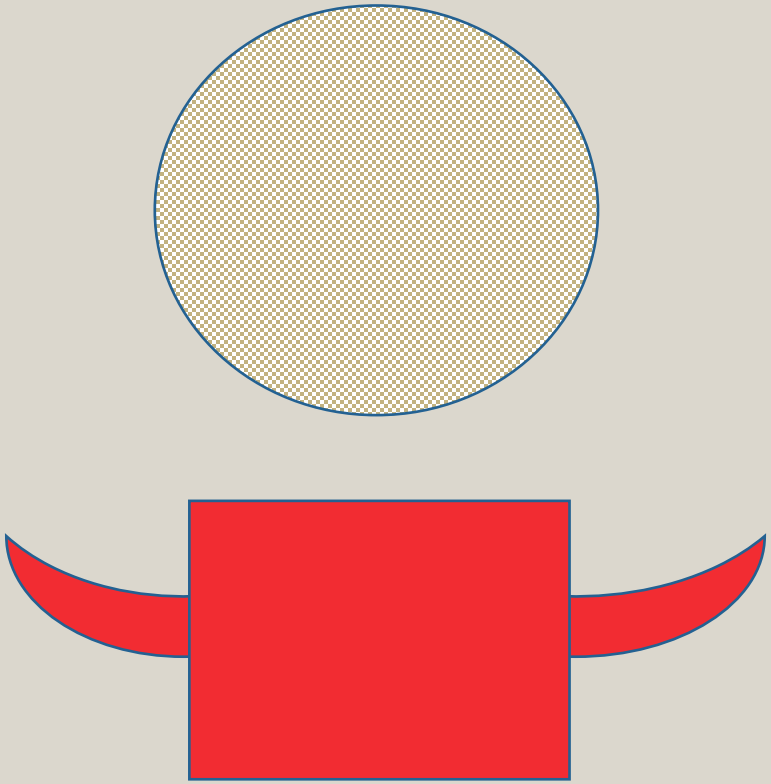
- Four-bar mechanical linkage that utilizes current chucks
- Gear system that moves the crank
- Overhang on conveyor actuates gears



High Fidelity Concepts

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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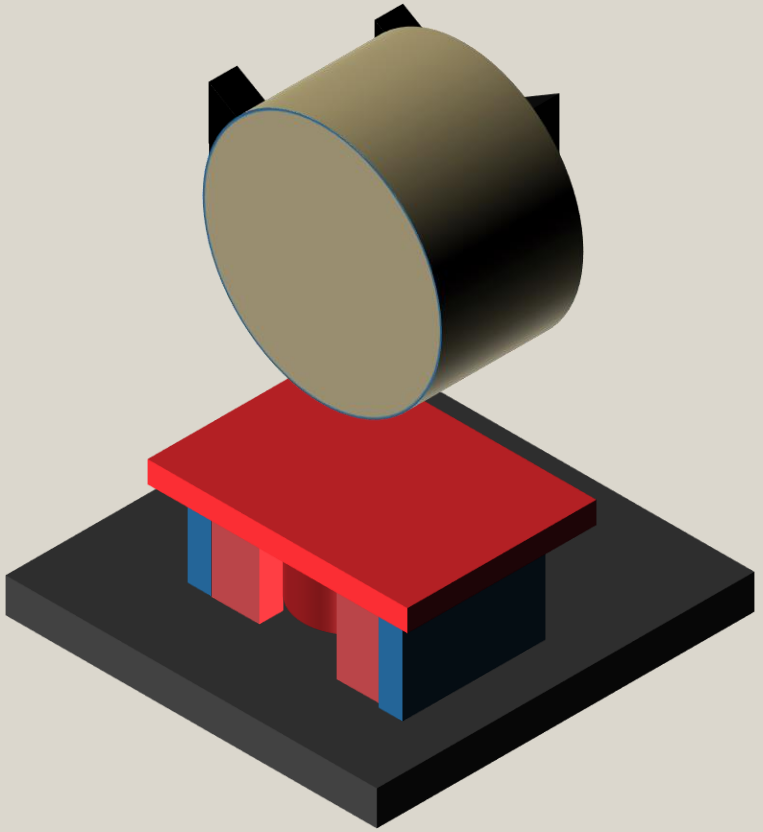
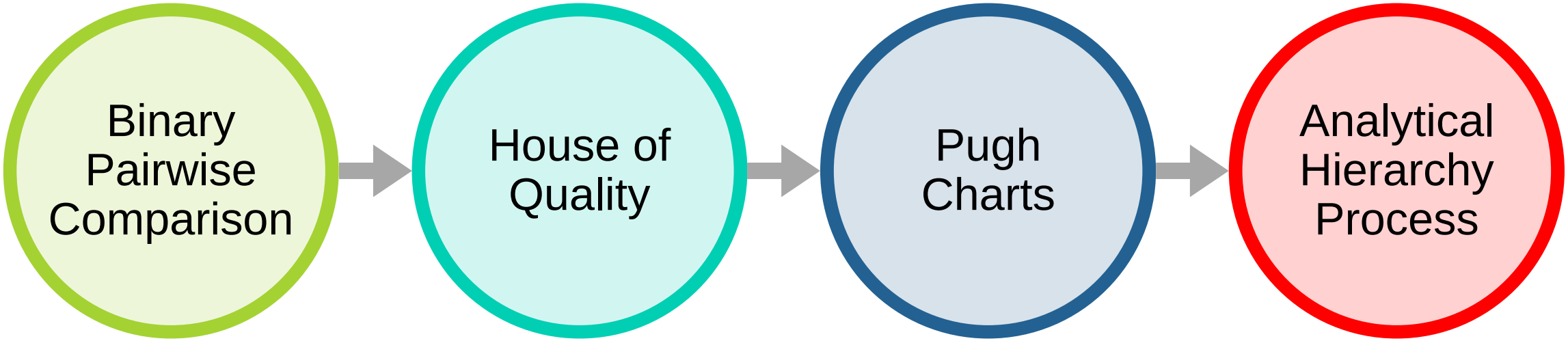
High Fidelity Concepts

Magnetic Locking Swivel

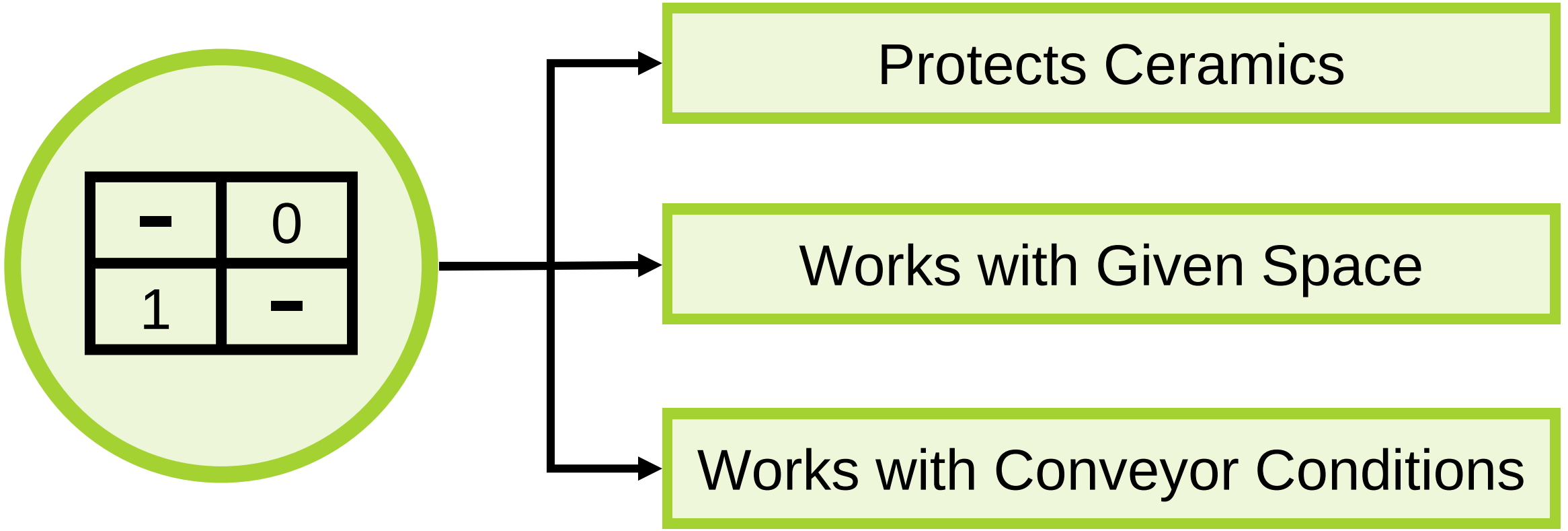
- Swivel that locks using magnets
- Overhang on conveyor will rotate swivel
- Ceramics will never travel face first, eliminating tipping



Concept Selection



Binary Pairwise Comparison



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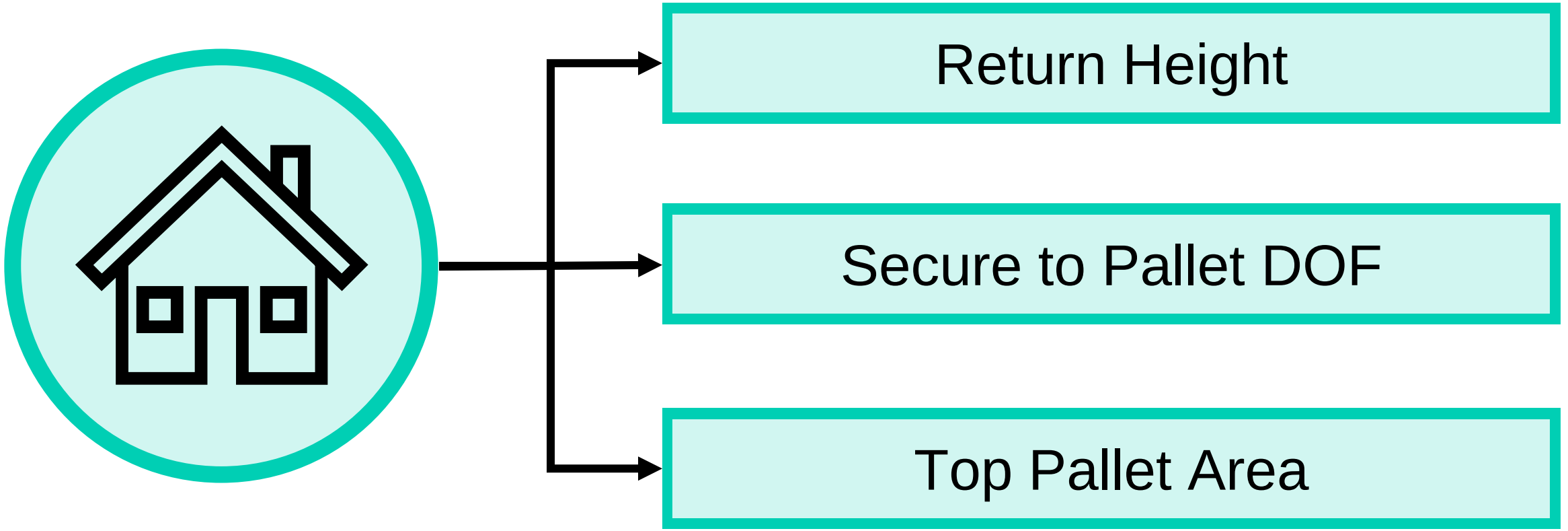
House of Quality



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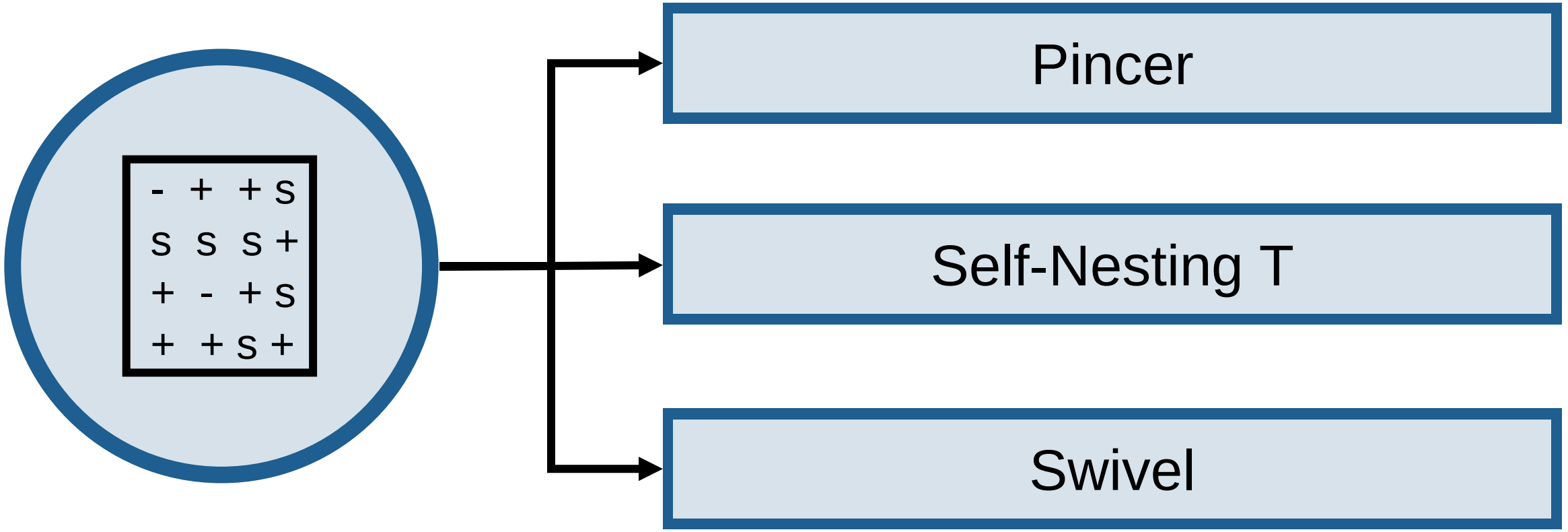
Pugh Charts



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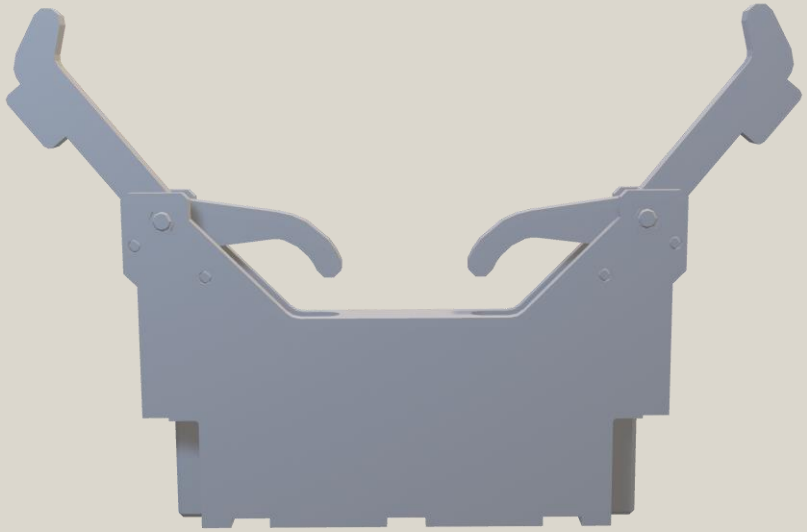
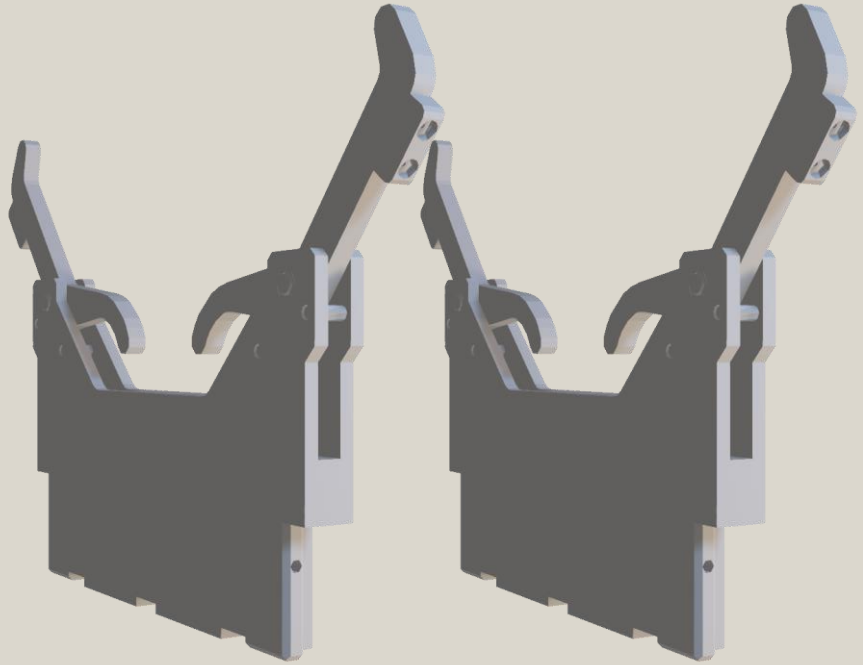
Pugh Charts - Pincer





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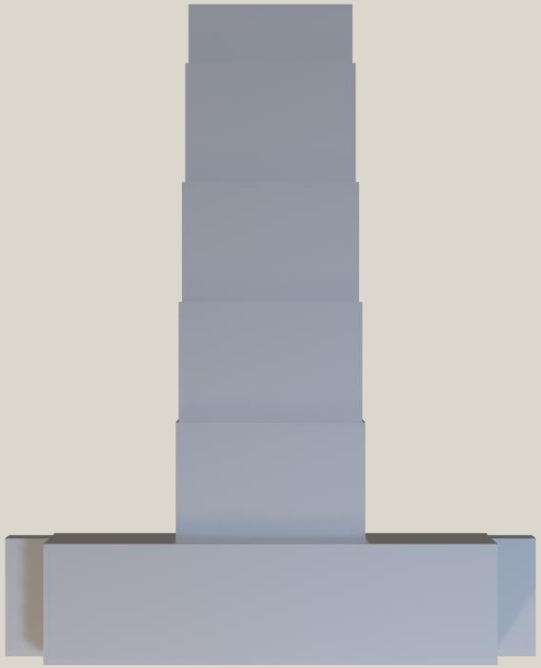
Pugh Charts - Self-Nesting T



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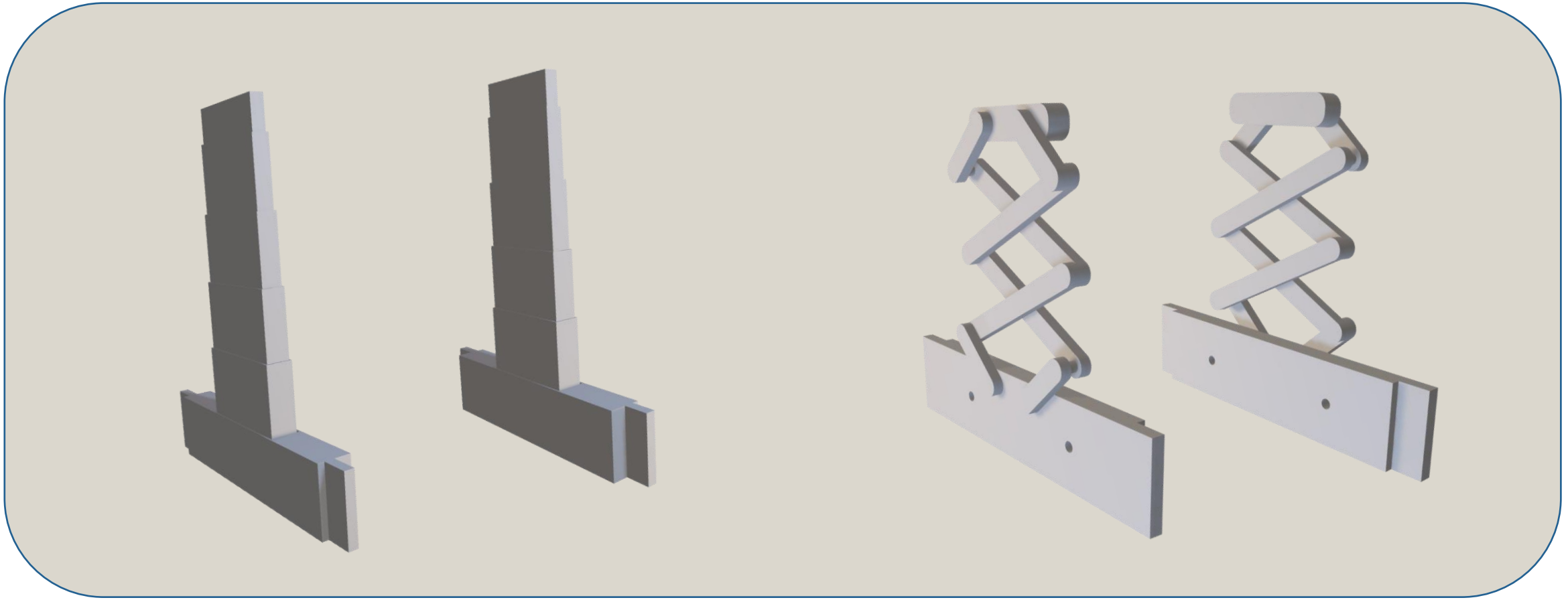
Pugh Charts - Self-Nesting T



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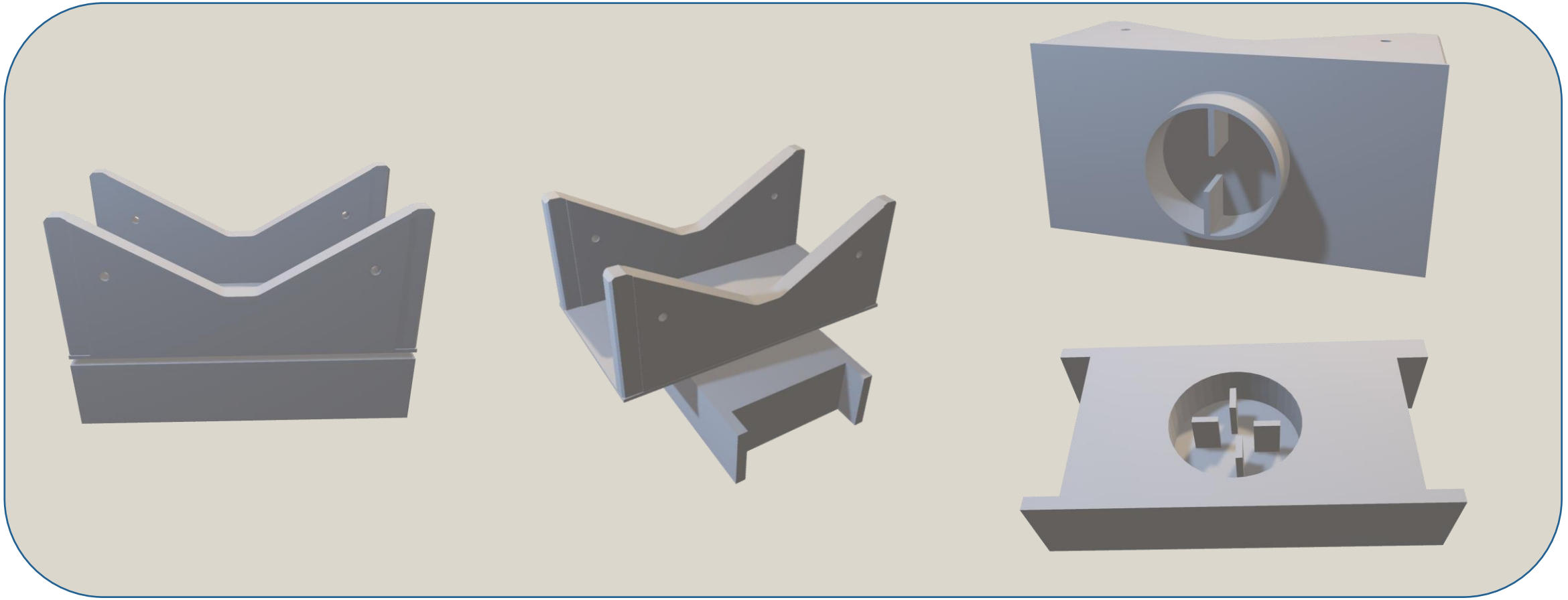
Pugh Charts - Swivel



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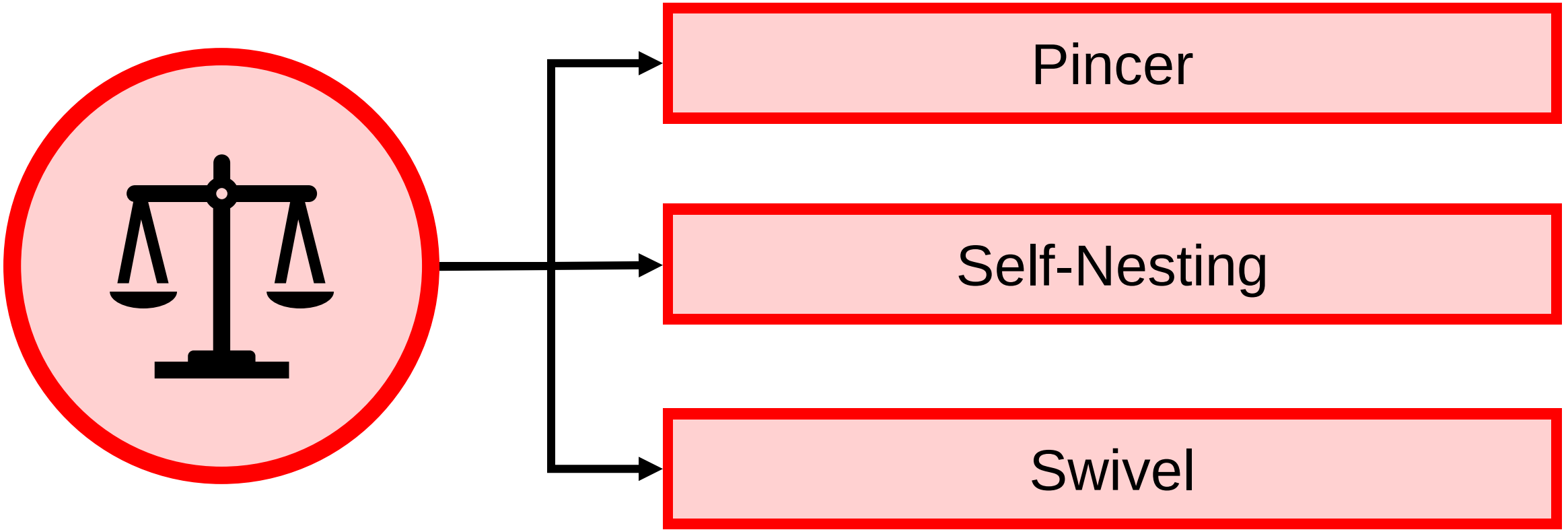
Analytical Hierarchy Process



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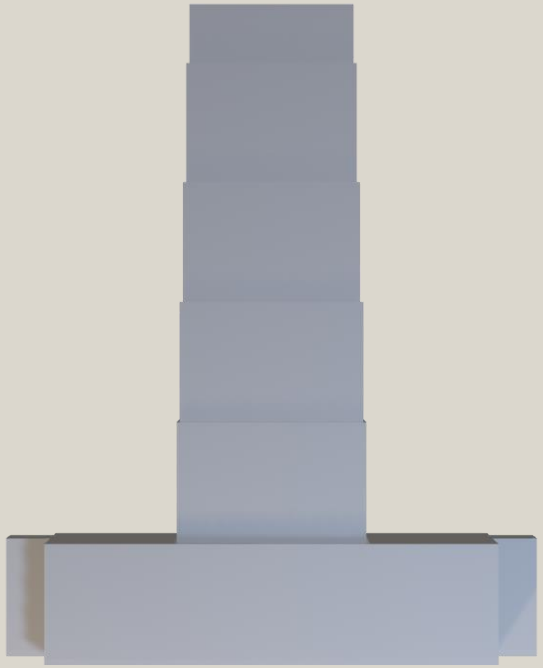
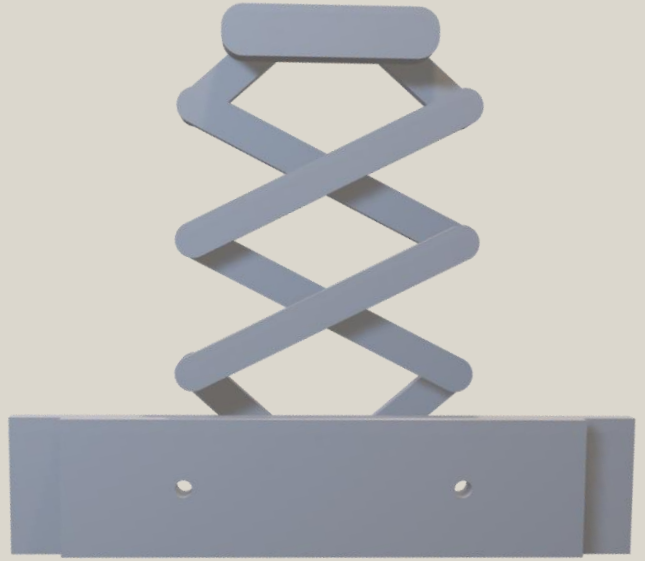
Final Selection

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





Robert Kosmas

Future Work

Risk Assessment

Bill of Materials

Spring Project Plan

Robert Kosmas

Thank you!

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