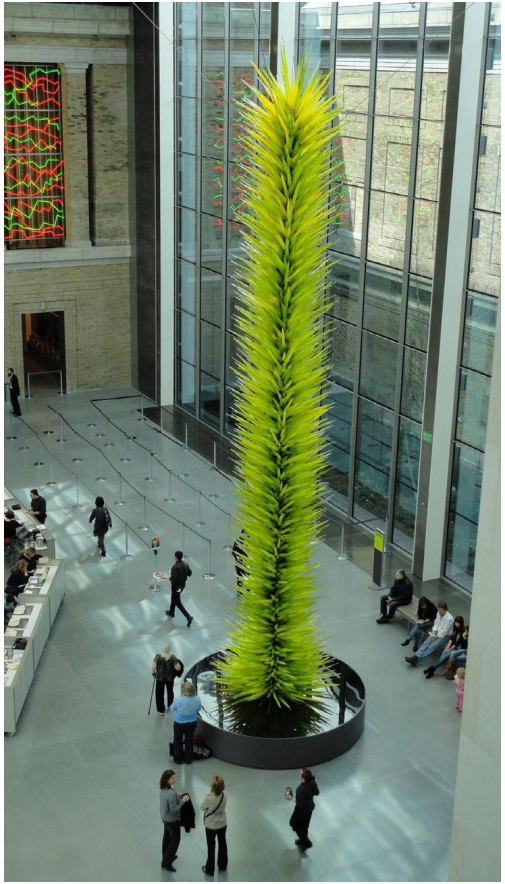
Mockup Review

Pink

Pallet Dampener

Pink



Design Concept

A portable shock absorber set for large item deliveries on pallets **to minimize the amount of damaged items.**

Goal:

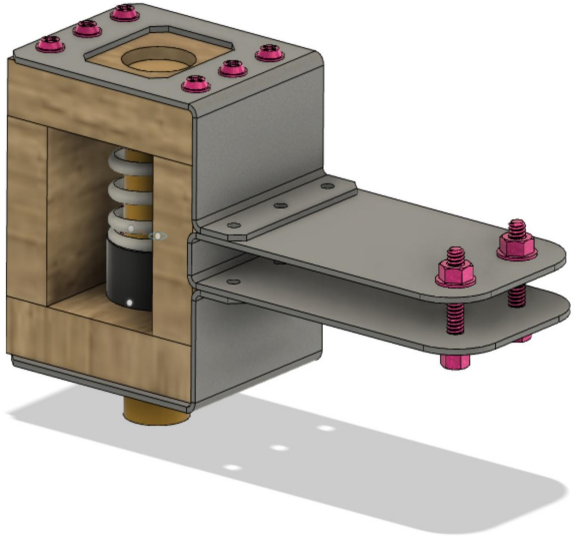
- Significantly reduce the amount of items broken during delivery.
- 21% of people had a large item they purchased **arrive damaged**.

Market:

- More than **1000 large-item shipping companies** in Massachusetts.

Target Audience:

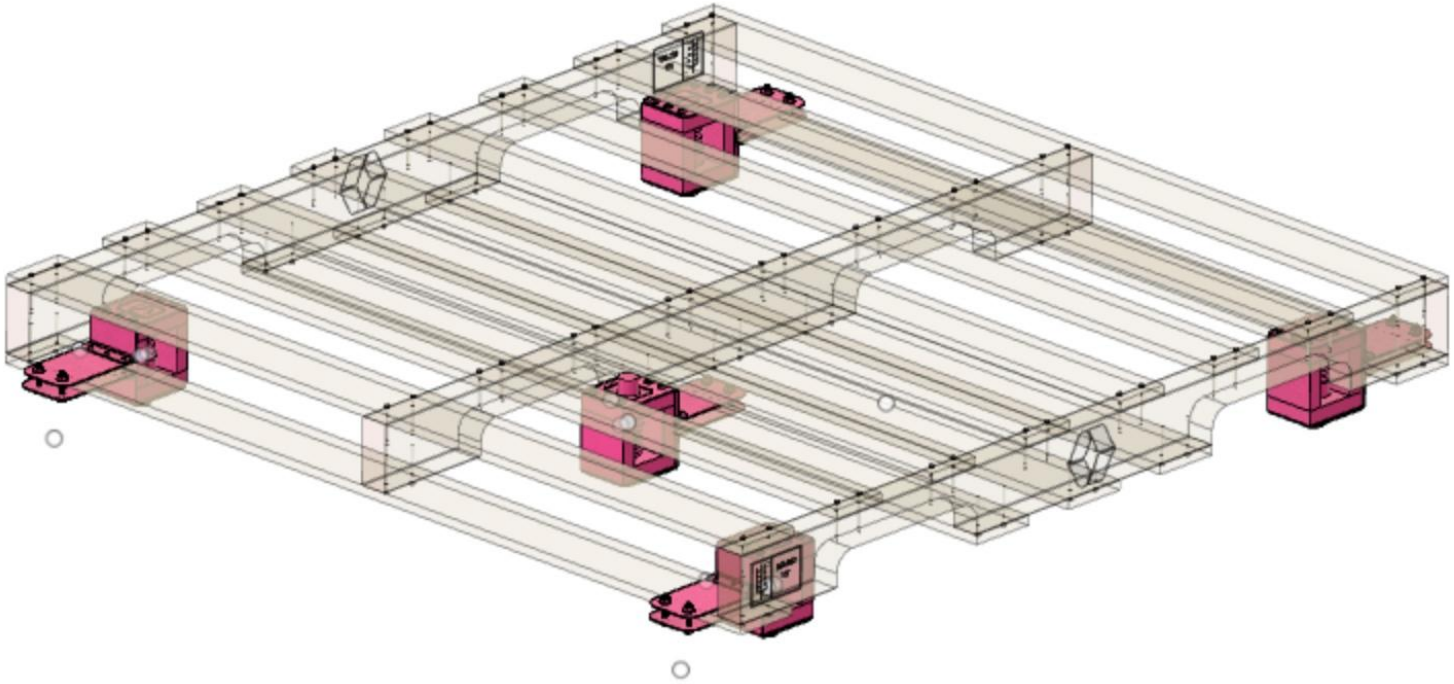
- Art Movers in Boston
- Appliance Dealers
- Large-item shipping company



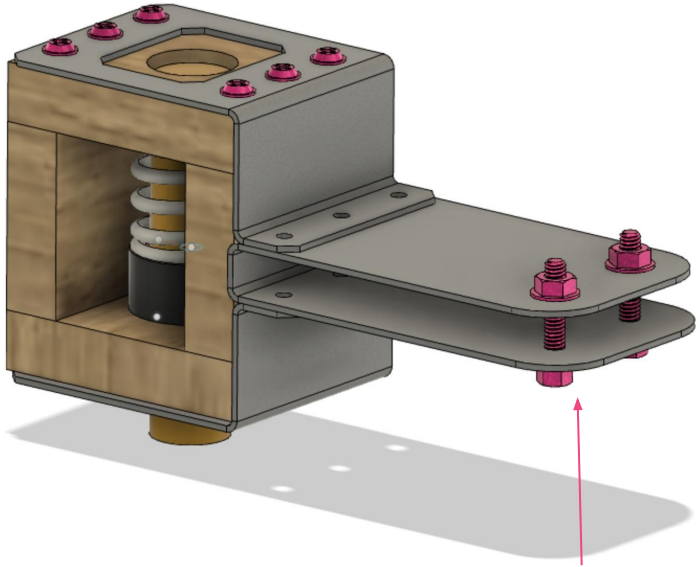
Critical Questions

Clamping Mechanism	Dampening System
Can it be easily attached and removed?	Is the damping force enough to handle large loads?

Implementation

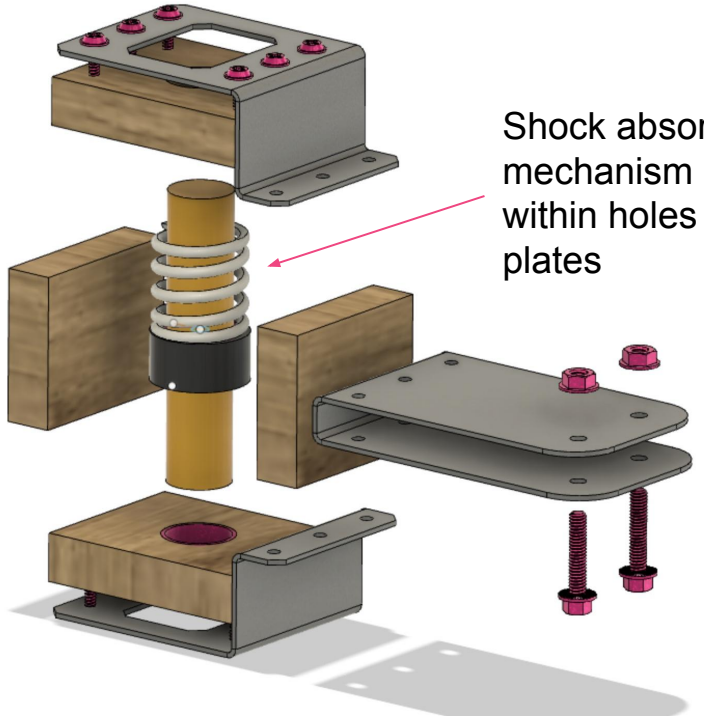


Non-Exploded



Clamping Mechanism

Exploded



Shock absorber mechanism slides within holes in plates

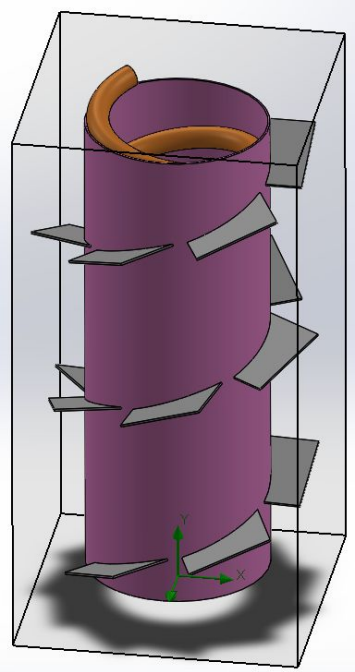
Remaining Concerns

- What damping force is necessary?
  - Is it solved? Is it still a concern?
- How does it scale?
  - Is it repeatable? What happens if one fails?
- Can it fit all standard pallets?
- Is moving the clamp to above the assembly necessary?
- Can we make it easier to clamp on without losing functionality?

Sea Turtle Incubator

Design Concept

- An incubator deployed on the beach that **cools sea turtle nests**



Goal:

- **Rectify the sex ratio imbalance** caused by rising global temperatures

Market:

- 10% of sea turtle conservation grants in the US = **$1.5 million annually**

Key Features:

- **Easy Deployment**: flange attachments and handle
- **Cooling Method**: (1) passive cooling: reflective cover
  (2) active cooling: water pump, heat exchanger

Critical Questions

Cooling Methods	Deployment in Sand	Energy Consumption	Power Concerns
Can we combine **passive/active** cooling methods?	Can we utilize the cylindrical shape for **screw structure** to achieve easier deployment?	Can we build **simulation model** to calculate **power** and **energy consumption**?	How should we **power the system**?

Cooling Methods

Can we combine **passive/active** cooling methods?

Passive Cooling

Definition:
using **design choices**
to reduce heat gain
and increase heat loss

Reflective Cover

- Avoid direct sunlight
- Create shade
- Previous research shows shading can cool 1-1.9 °C

Active Cooling

Definition:
a **heat-reducing mechanism** that ensures proper heat transfer and circulation from within

Replace cooler

- Keep water pump
- Exploring possibility of heat exchanger and refrigeration system

Deployment in Sand

Can we utilize the cylindrical shape for **screw structure**?

Easier Deployment

Handle

- Easy to rotate
- Better grip

Flange Screwing Mechanism

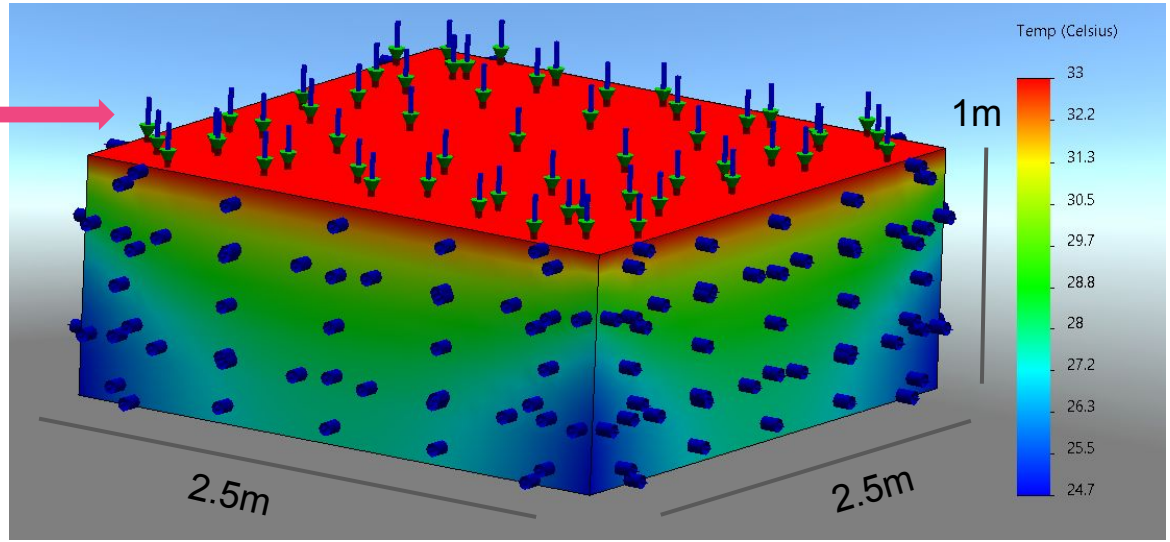
- Inspired by beach umbrellas
- Average Force exerted 83.5 N required to submerge 13” into sand

Energy Consumption

Can we build simulation model to **calculate heat transfer** and **energy consumption**?

Temperature gradient

- Convection from 33°C ambient air
- Better understanding of thermal properties of sand
- Refine the model to fit different solutions

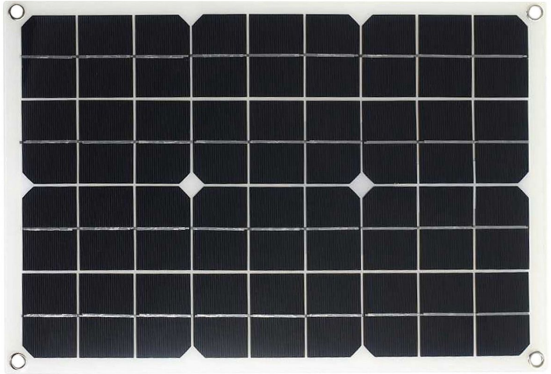


Power Concerns

How should we **power the system**?

Power Requirement

- 18 W
- Reasonable for solar panels
- Implement in reflective roof



Calculations

$$q_s = \frac{k(T_s - T_0)}{(\pi \alpha t)^{1/2}}$$

$$q_s = 18 \frac{W}{m^2}$$

$$A = \pi D L$$

$$A = 1\, m^2$$

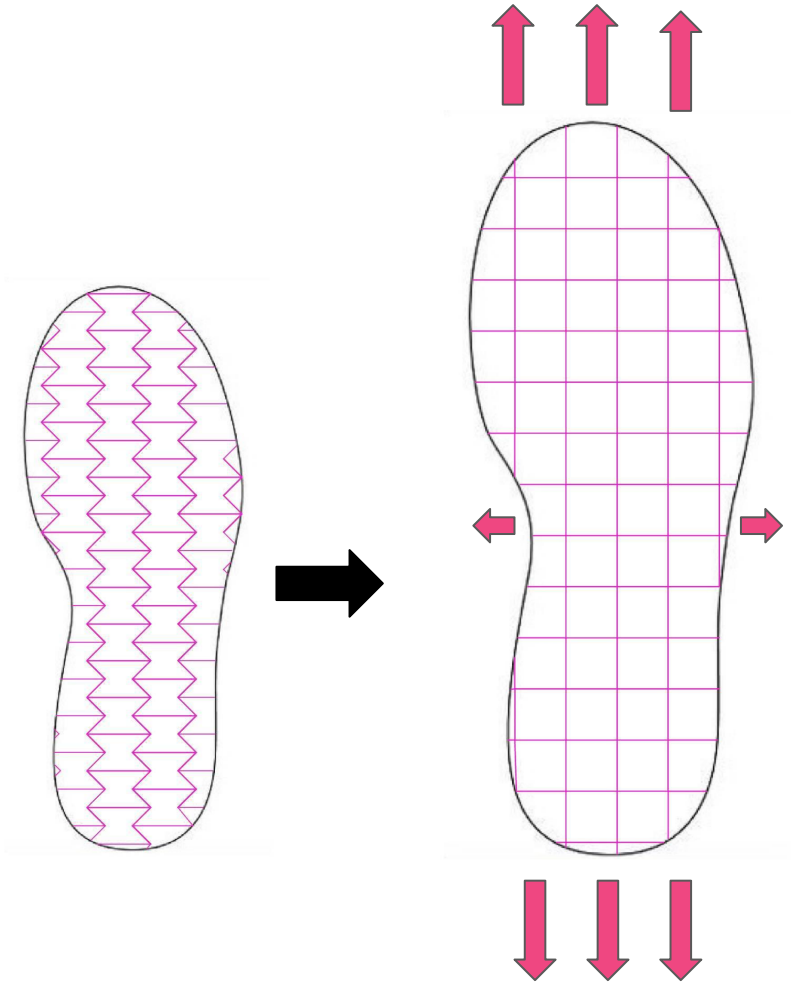
Remaining Concerns

Powering Active Cooling

- Heat exchanger
- Water pump

Expandable Shoe

Product Vision



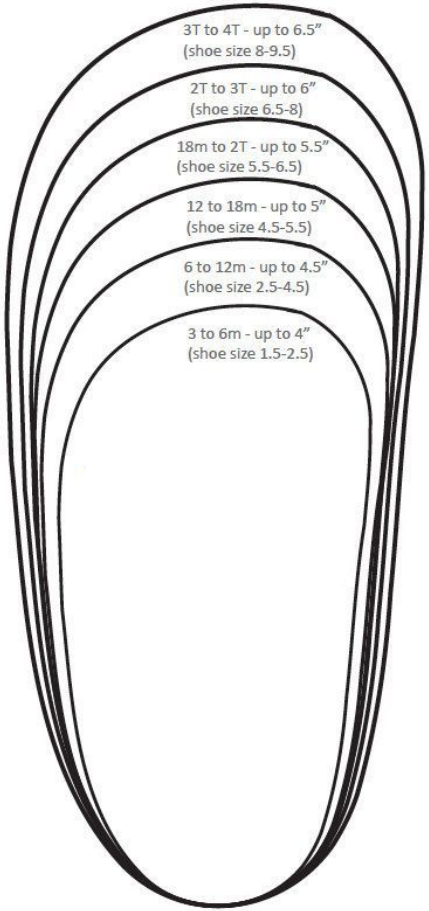
Critical Questions: Shoe Standards

What shoe size for ages 1-5?

- Expand from US children's shoe size 5 to 11
- Expand 2-5 times a year

How do we benefit foot/walking development?

- Toe must be flexible
- Flat sole, no arch
- Lightweight

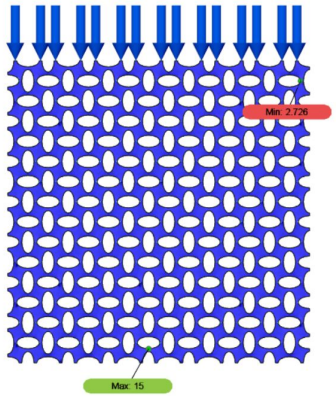


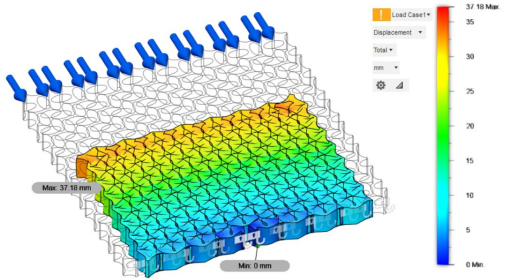
Critical Design Questions

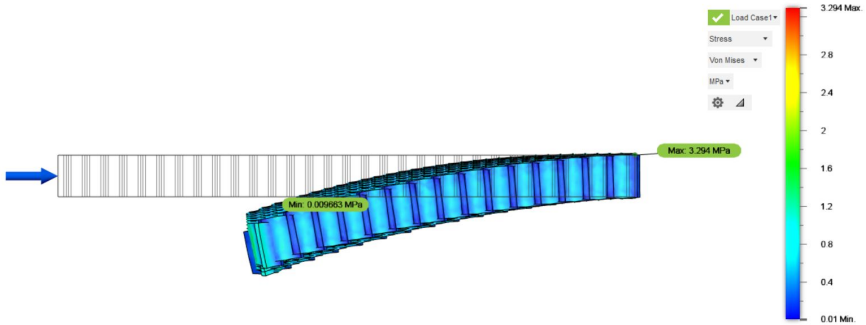
- How do we expand/ contract the sole?
- How do parents/ manipulate the shoe?
- How do we make the shoe weatherproof?
- How do we make the shoe durable?

Key Findings

- The **aspect ratio** and **shape** of the **auxetics** can be adjusted to manipulate how the sole expands and contracts
- **Velcro + stiff fabric** provides adjustable structure
- A **mechanical advantage** in our **winching system** of at least 1.5 is necessary to accomplish contraction of the structure without strenuous user input
    - may change with varying material and auxetic selection







Remaining concerns

- Material & Auxetic Shape selection
- Testing
  - Fatigue
  - Durability
  - Hydrostatic load
- Component Integration