PORTABLE INTEGRATED CLOSETS Inc.

PBM²

Perfectly Balanced Manufacturing & Marketing

Phil, Bill, Matt, Mary Beth

Northeastern University

Museum of Science

CAPSULE Capstone Unique Learning Experience

NSF

FOCUS On Children Boston Public Schools

PROJECT MISSION

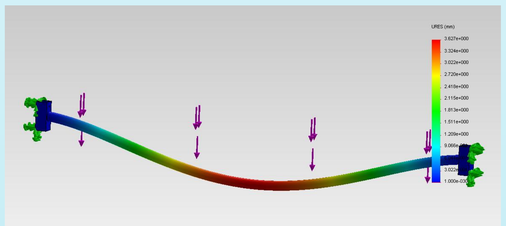
To develop a low-cost, lightweight, environmentally friendly, aesthetically pleasing, portable closet for college students

PROJECT GOALS

- 4' W x 6' H
- Stable and safe
- Collapsible
- Strong shelves and hang bar, with safety factor calculations
- Weight < 80 lbs.
- Cost < $100
- Sustainable design

PROJECT EVALUATION

- Run Stress Analysis on design
- Run Cost Analysis on design
- Run Sustainability calculations

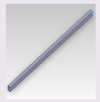
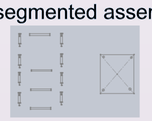


PROJECT PLAN

- Research current products on the market
- Brainstorm design ideas & materials individually and in groups
- Group - decide final structural design based on tradeoffs
- Produce parts
- Assemble parts
- Research material costs and properties
- Group - decide final materials based on tradeoffs
- Run Stress Analysis on shelves and hanging rod
- Complete volume and sustainability calculations on final assembly
- Create project poster
- Create presentation slideshow

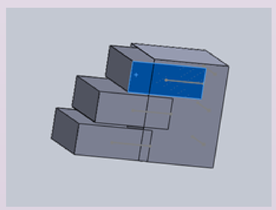
POSSIBLE SOLUTIONS

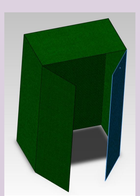
The group discussed a variety of designs and materials.

Option		Tradeoffs
1. # posts:		
4 corners 	2 centered posts 	stability material cost weight material used (sustainability) design time
2. Post cross-section:		
square 	circle 	stability material cost material used ease of cross-bracing
3. Post design:		
single piece 	segmented assembly 	collapsibility manufacturing ease
4. Materials:		
Posts: aluminum vs. steel		weight cost
Covering: burlap vs. vinyl-coated fabric 		sustainability strength
Shelves/drawers: aluminum vs. wood (bamboo or pine)		sustainability weight cost

FINAL SOLUTION

- 6' H x 4'W x 28" D collapsible closet
- 2 aluminum square posts with square aluminum hanging rod
- FR Burlap covering
- 3 grated Aluminum shelves, grated aluminum bottom
- Stackable clothing drawers
- Hook and eye to close fabric doors top center, open on sides





LESSONS LEARNED

- Understanding and application of Engineering Design Process (EDP)
  - Identify need
  - Research
  - Develop Possible Solutions
  - Select Best Solution
  - Construct Prototype
  - Test & Evaluate
  - Redesign
  - Communicate
- Teamwork
  - Team members have different strengths and areas of expertise
  - Members have different design approaches
- Communication
  - Respectful listening skills
  - Practice in positive group interactions
- CAD skills
  - Parts construction
  - Assemblies
  - Drawings
  - Analysis

TAKE AWAYS

- Professional support and materials for the application of CAD in the classroom
- Use of Capstone projects for long-term classroom projects
- Understanding of potential student frustration when introducing new material
- Project time constraints may present a challenge