

ME, ECE, BE Capstone Design Programs

Adviser: A.J. McPhate

Team 10: Alternative Playground Equipment

Sponsor: Elissa McKenzie

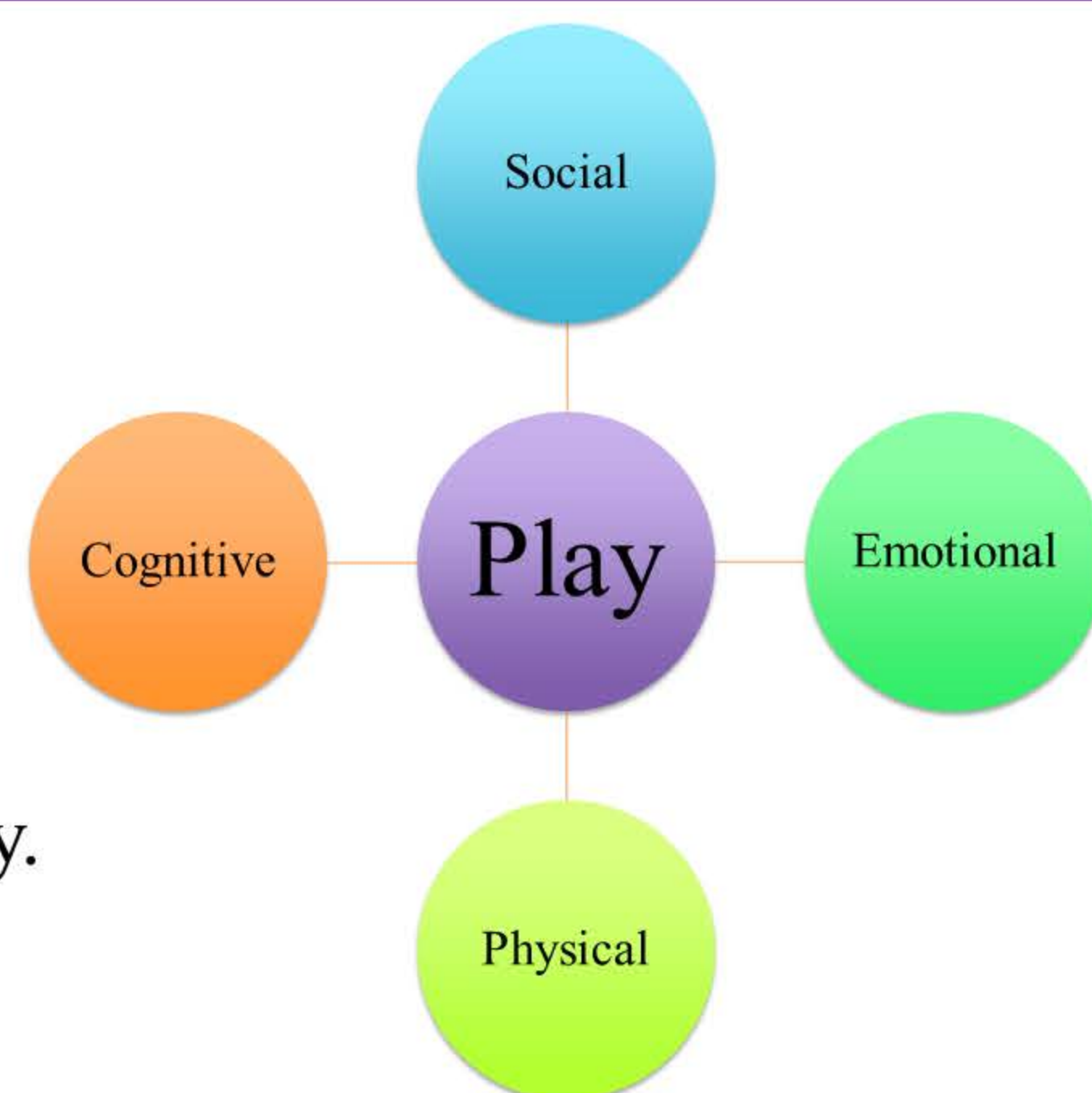
Objective

To design and construct safe outdoor playground equipment that is accessible and entertaining to children at St. Lillian Academy.

Background

St. Lillian Academy is a special needs school that caters to:

- Down Syndrome
- Cerebral Palsy
- Developmental Delays
- Autism
- Paraplegia



All children have four areas of play. Special needs children focus on cognitive and physical.

Product Overview

- 4 Handlebar Inputs
- 2 Mechanical Elevators
- Randomization System
- Pinball-like Bumpers
- Enclosed in Polycarbonate
- Vented Roof and Floor
- Acrylic/PVC Ball Maze
- Galvanized Steel Support Poles

Analysis

Component	FBD	Analysis	Value
Handlebars		Bending Stress	7111.1 psi
		Shear Stress	7653.1 psi
		Principle Stress	12 ksi
		Max Shear Stress	8.4 ksi
Panel		Velocity Pressure	21.1 lbs/ft ²
		Wind Pressure	0.13 psi
		Wind Load	436.2 lbf
Pole		Bending Moment	12649.8 lbf-in
		Bending Stress	9182.53 psi
		FOS	5.4

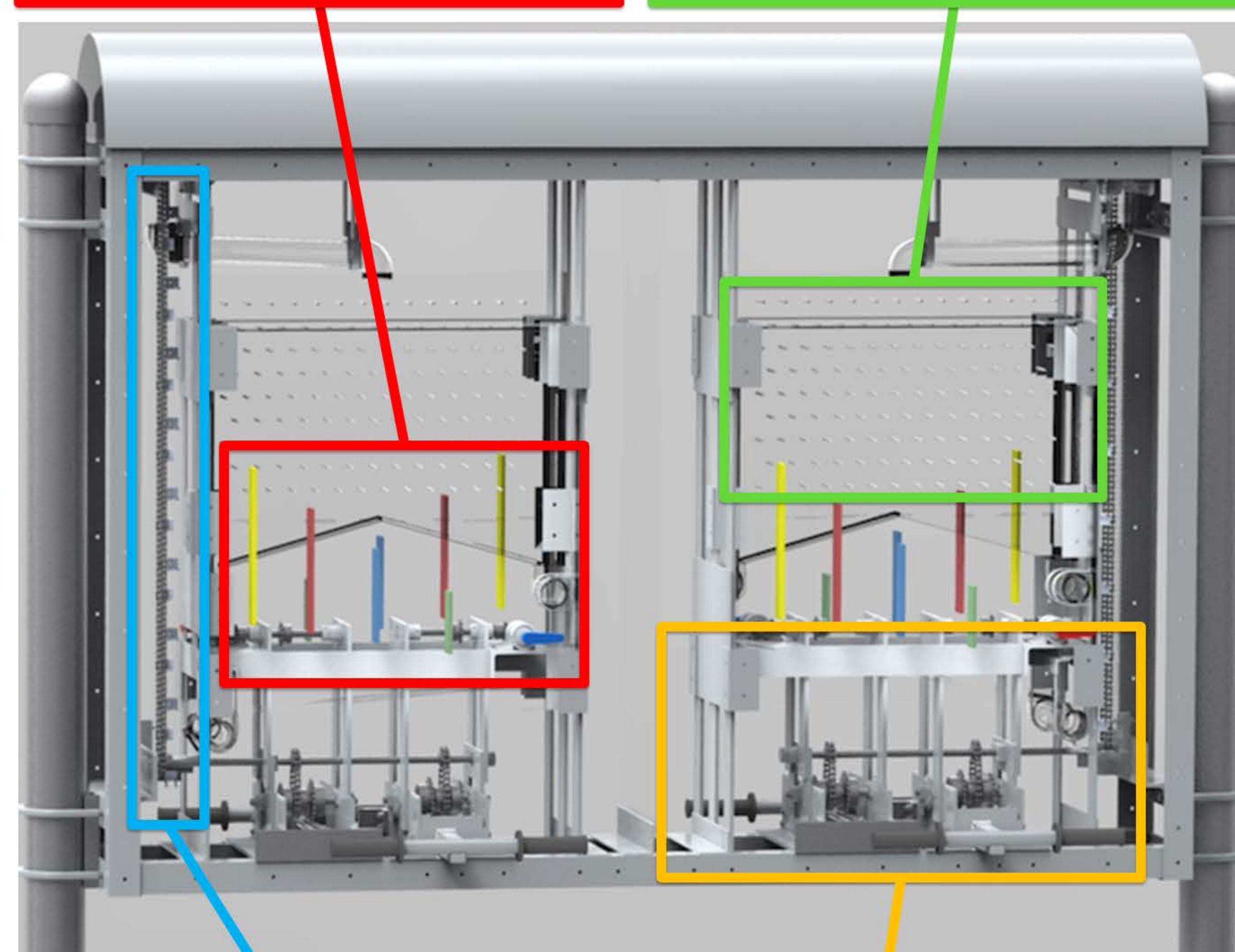
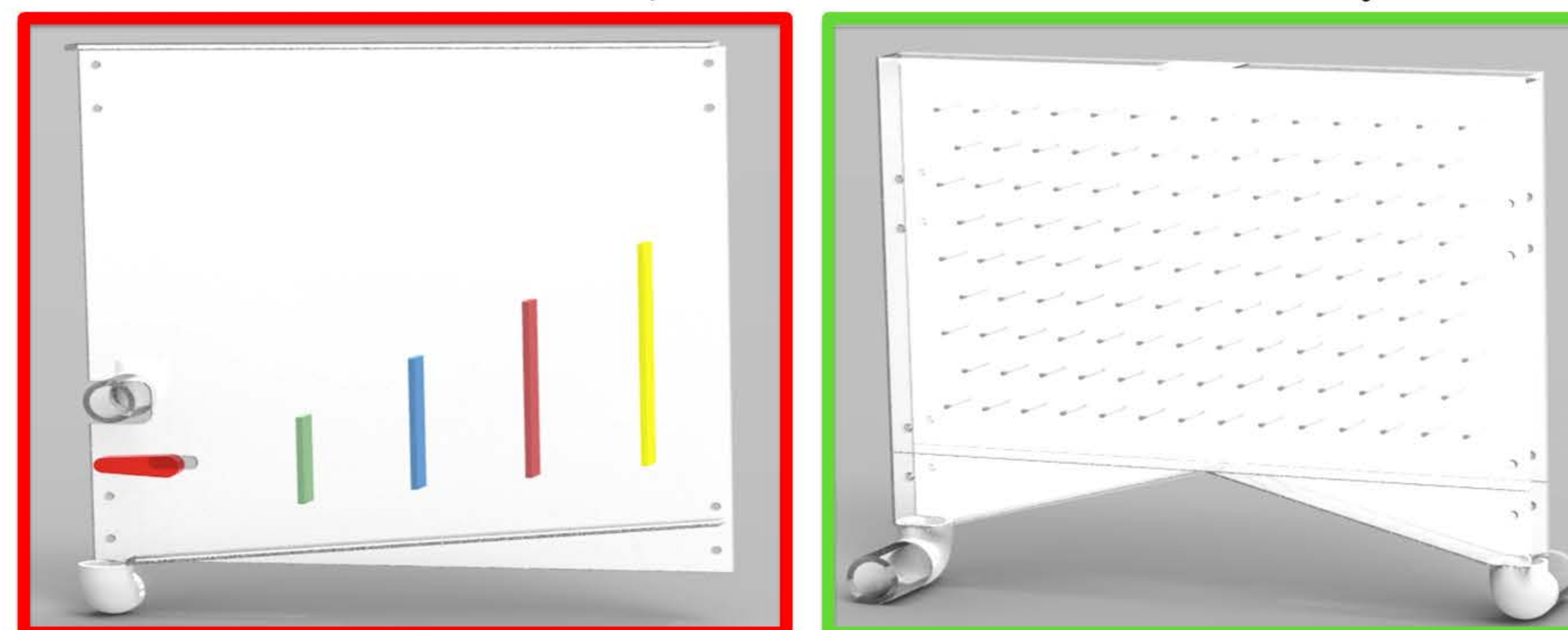
Jordon Biagas, Megan Delatte,
Michelle Fox, John Fricke

Product Architecture

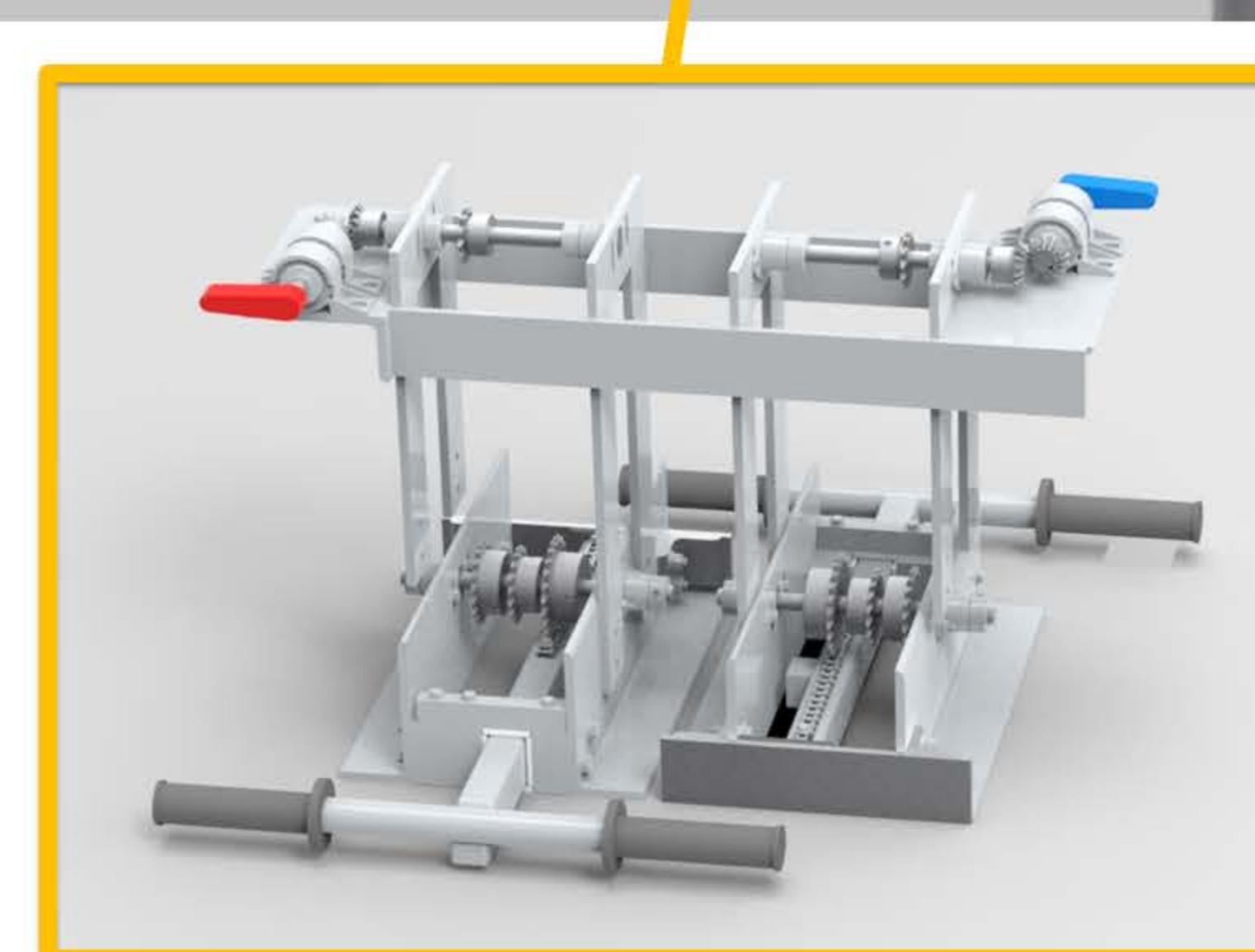
“Pushy-Pulley-Poppy”

Game Sub-Assembly

Randomization System



Elevator Sub-Assembly



Input and Bumpers Sub-Assembly

Engineering Specifications

Requirement:	Engineering Specifications:	Target:	Result:
Safety	Factor of Safety of components	≥ 5	5.5
	Number of exposed moving parts	≤ 8	4
Durability	Yield Strength of critical components	≥ 20 ksi	36 ksi
Fun	Time of maintained user interest	≥ 10 min	--
	Number of users accommodated	≥ 4	4
Economical	Equipment Initial cost	≤ \$10,000	\$6,724
Accessibility	User interaction height	2.58–2.75 ft	2.75 ft
	Interaction force	≤ 4 lbf	3.4 lbf
	User interaction displacement	≤ 4 in.	3.75 in.
Variability	Possible outcomes from one input	≥ 5	∞

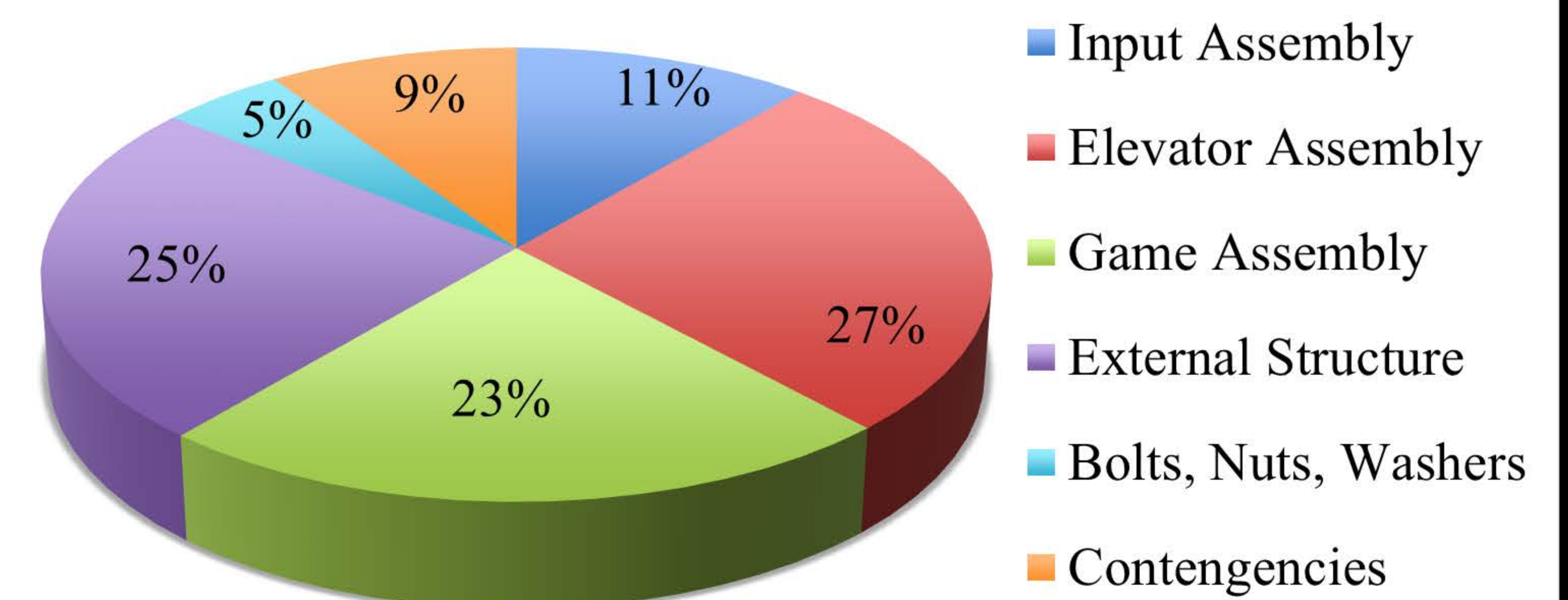
Safety

For safety, the listed ASTM F1487-11 codes were followed:

- 6.2 Sharp Points/Sharp Edges
- 6.3 Protrusions
- 6.5 Crush/Shear Point
- 9.2 Stationary Equipment

Project Management

Total Budget \$6,723.49



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