

Separation Connector Improvement



Final Design Review

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Overview

- Problem Statement
- What is a separation connector?
- Constraints/Specifications
- Final Design
- Design Analysis
 - Stress
 - Static
 - Dynamic
- Material Analysis
- Timeline

Problem Statement

- The goal for this project is to design and prototype a perfectly reliable, inexpensive, and easily manufacturable separation connector

What is a Separation Connector?



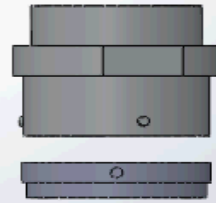
Constraints

- No greater than 25% larger than current design
- Weigh less than or equal to the current design
- Material cannot out-gas in a vacuum
- Must not de-mate prematurely
- Male end of the connector must remain unchanged

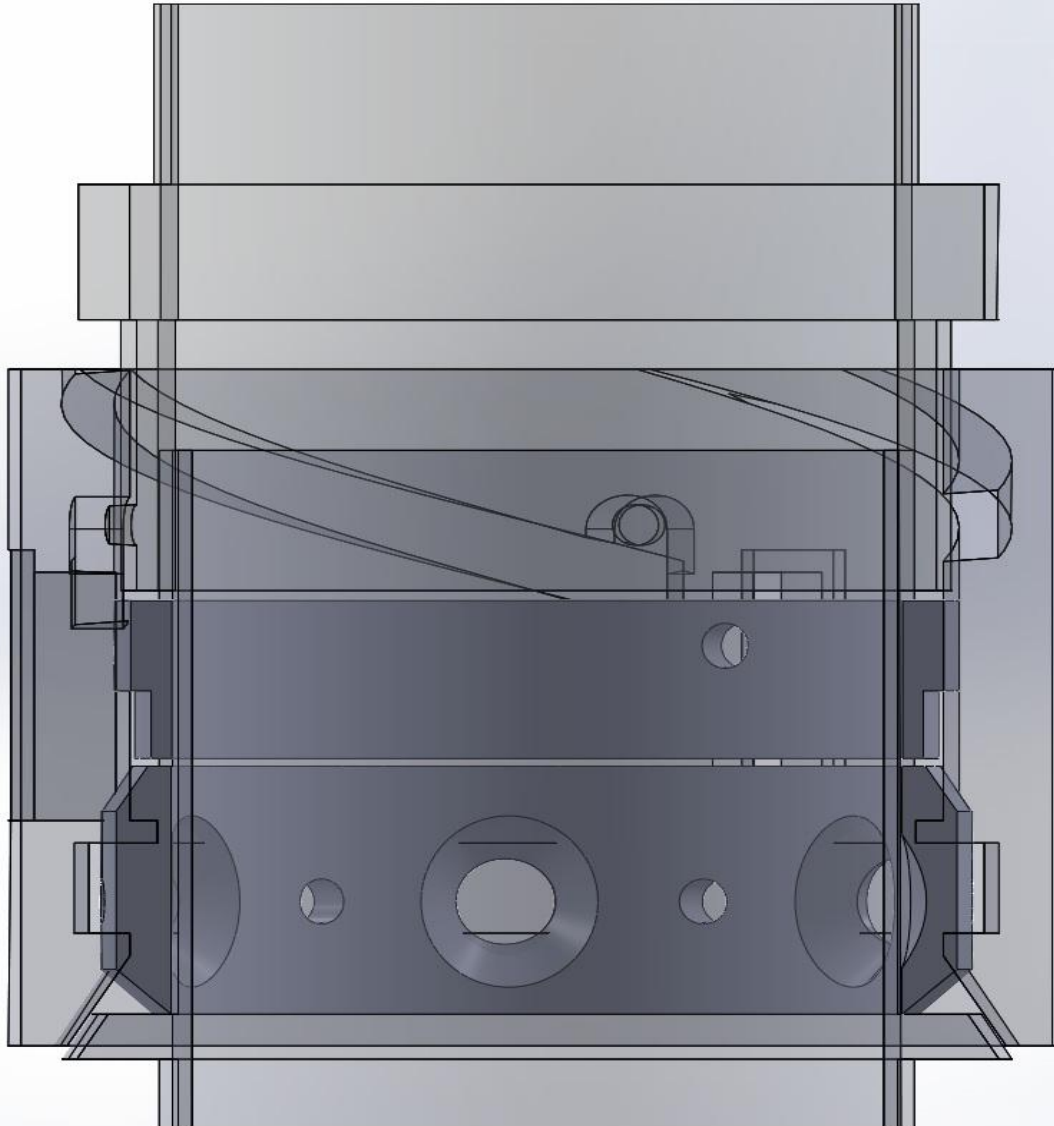
Specifications

- 10-30 lbf Static de-mate
- 200 lbf Dynamic de-mate
- Survive in a temperature gradient of $-34^{\circ}\text{C} - 71^{\circ}\text{C}$
- Withstand a static acceleration of 15 G-Force
- Drop test
- Vibration test

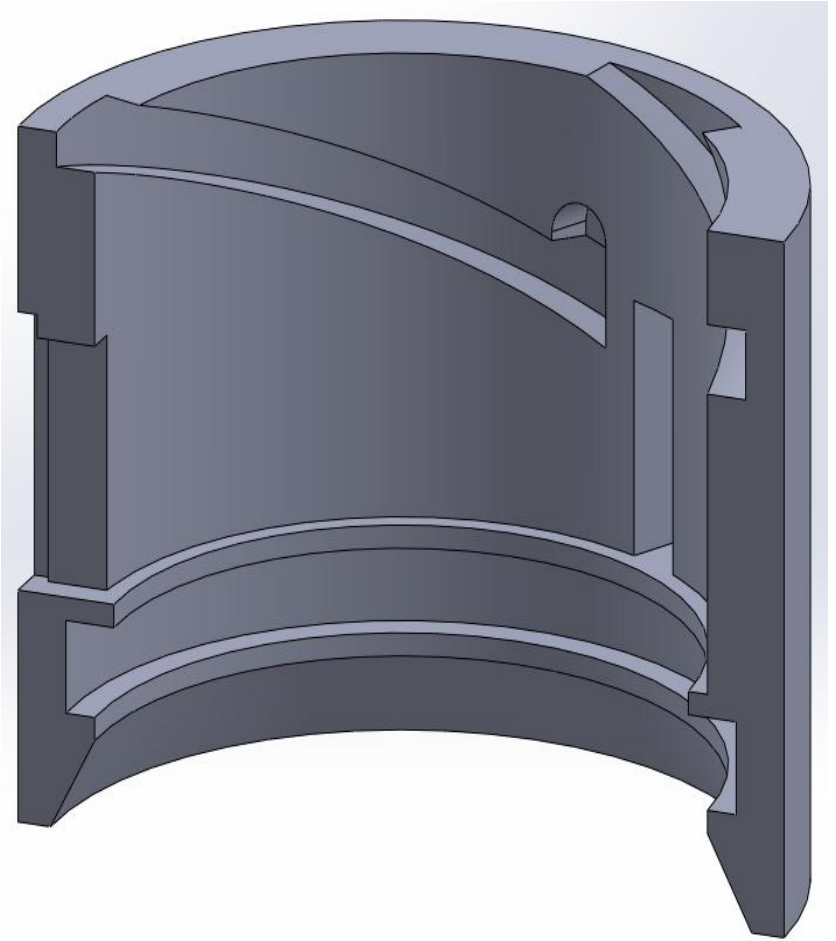
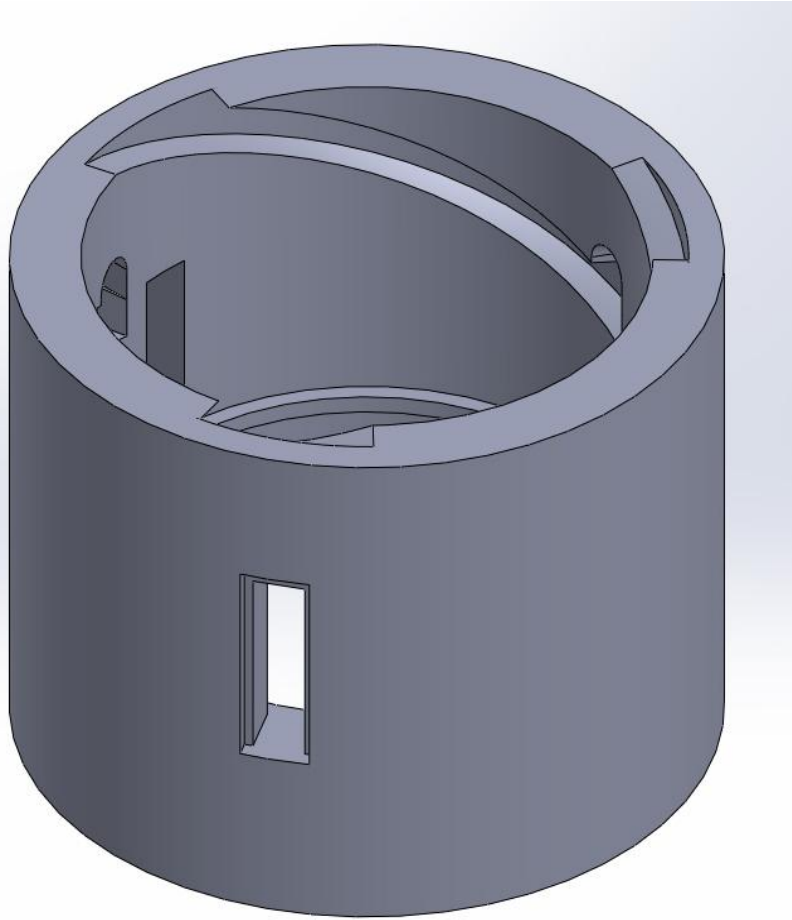
Final Design



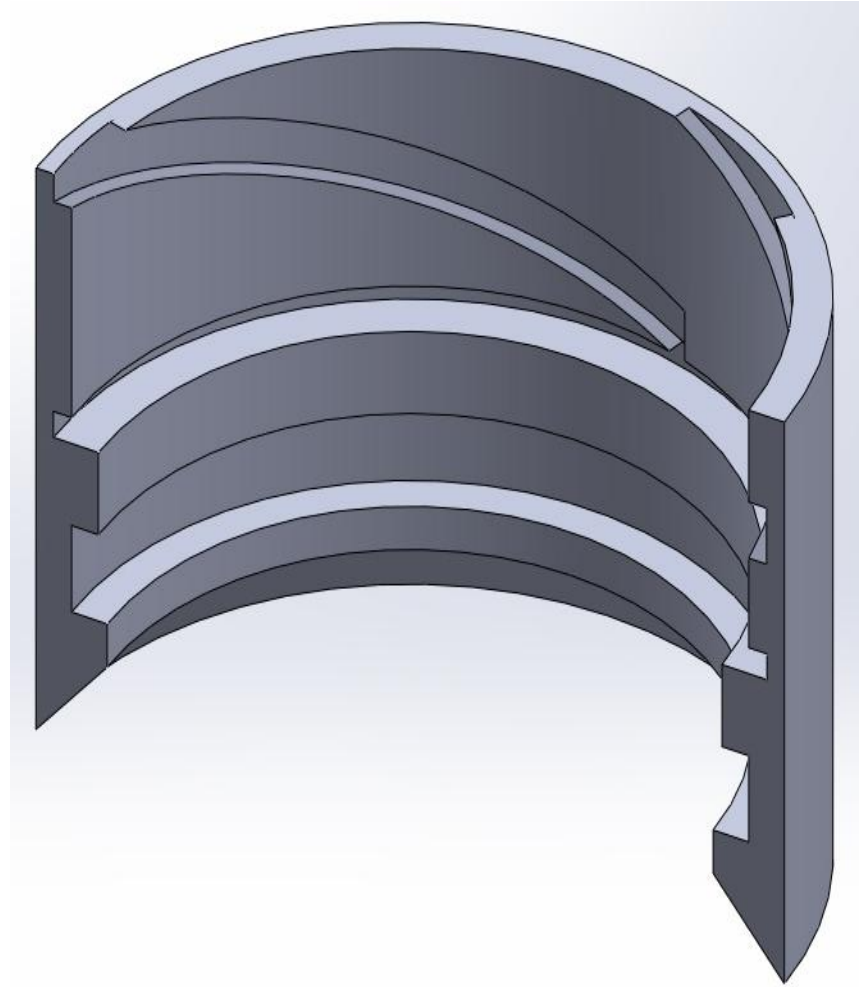
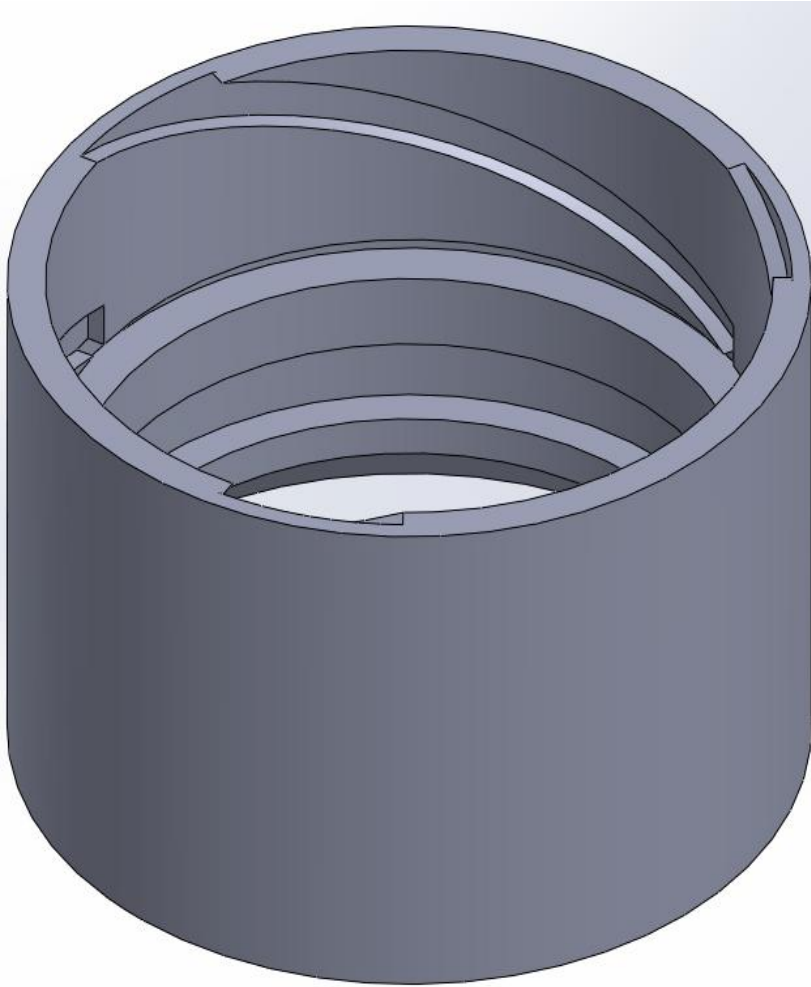
Final Design



Coupling Solution #1



Coupling Solution #2

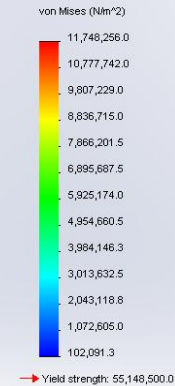
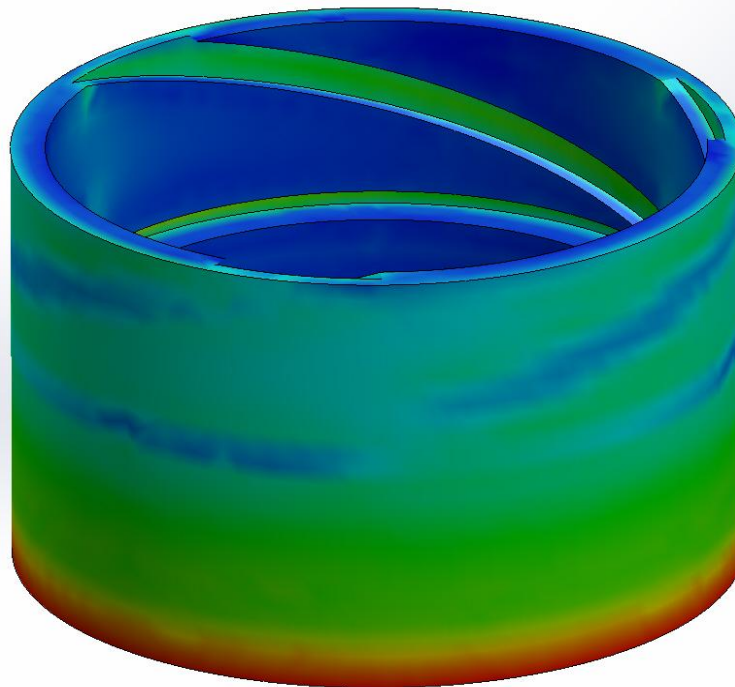


Parts List for Analysis

- Ball Bearing Design
 - Springs for Ball Bearings
 - Male End
 - Inner Female Mate
 - Outer Shell
 - Ball Bearings
 - Plate
 - Spring for plate

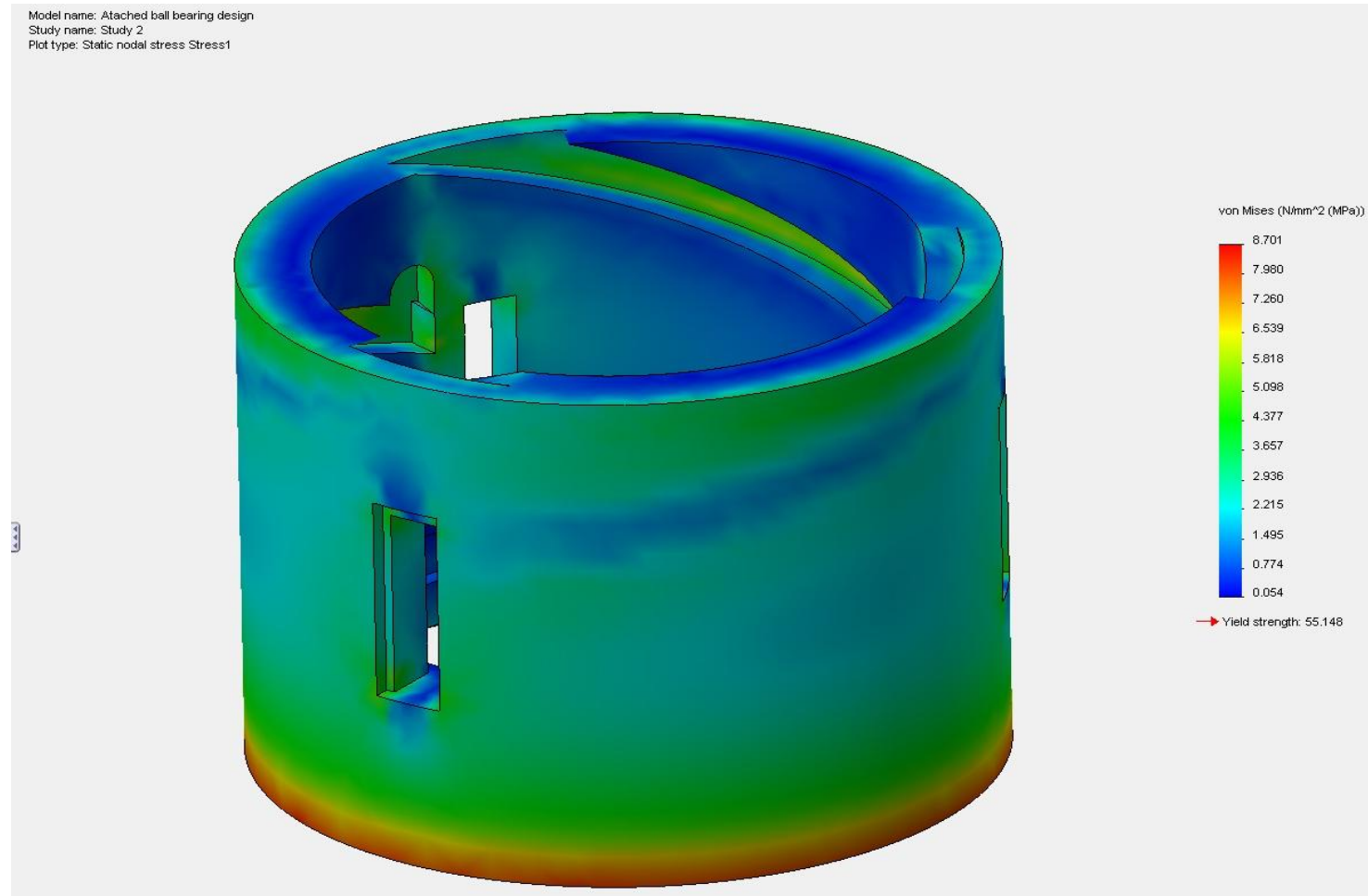
Stress Analysis - Design #1

Model name: Attached ball bearing design 2
Study name: Study 1
Plot type: Static nodal stress Stress1



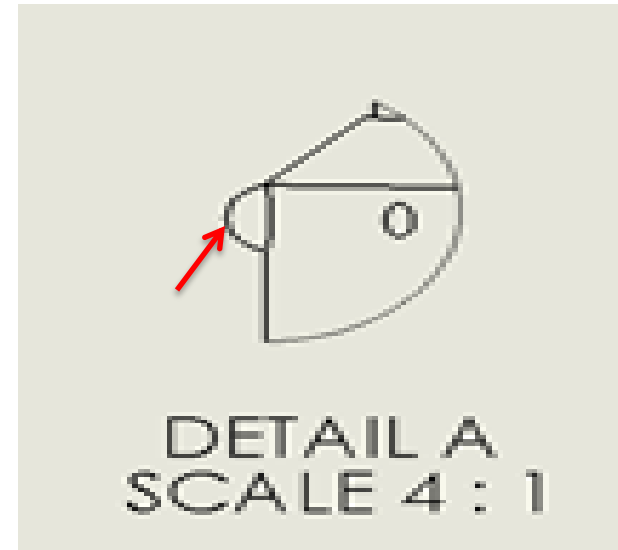
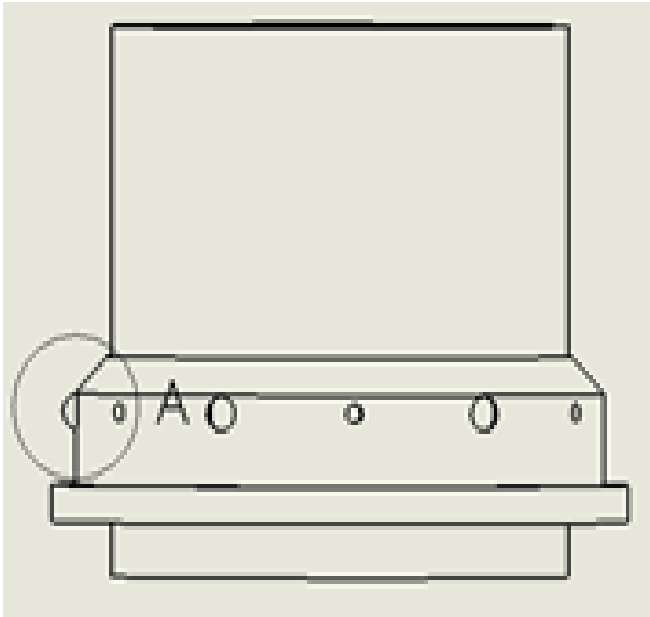
Educational Version. For Instructional Use Only

Stress Analysis - Design #2



Static Analysis

- Six Ball Bearings Spaced Evenly
- Force in the X-Direction is 16.67 lbf.
- Force in the Y-Direction is 5 lbf



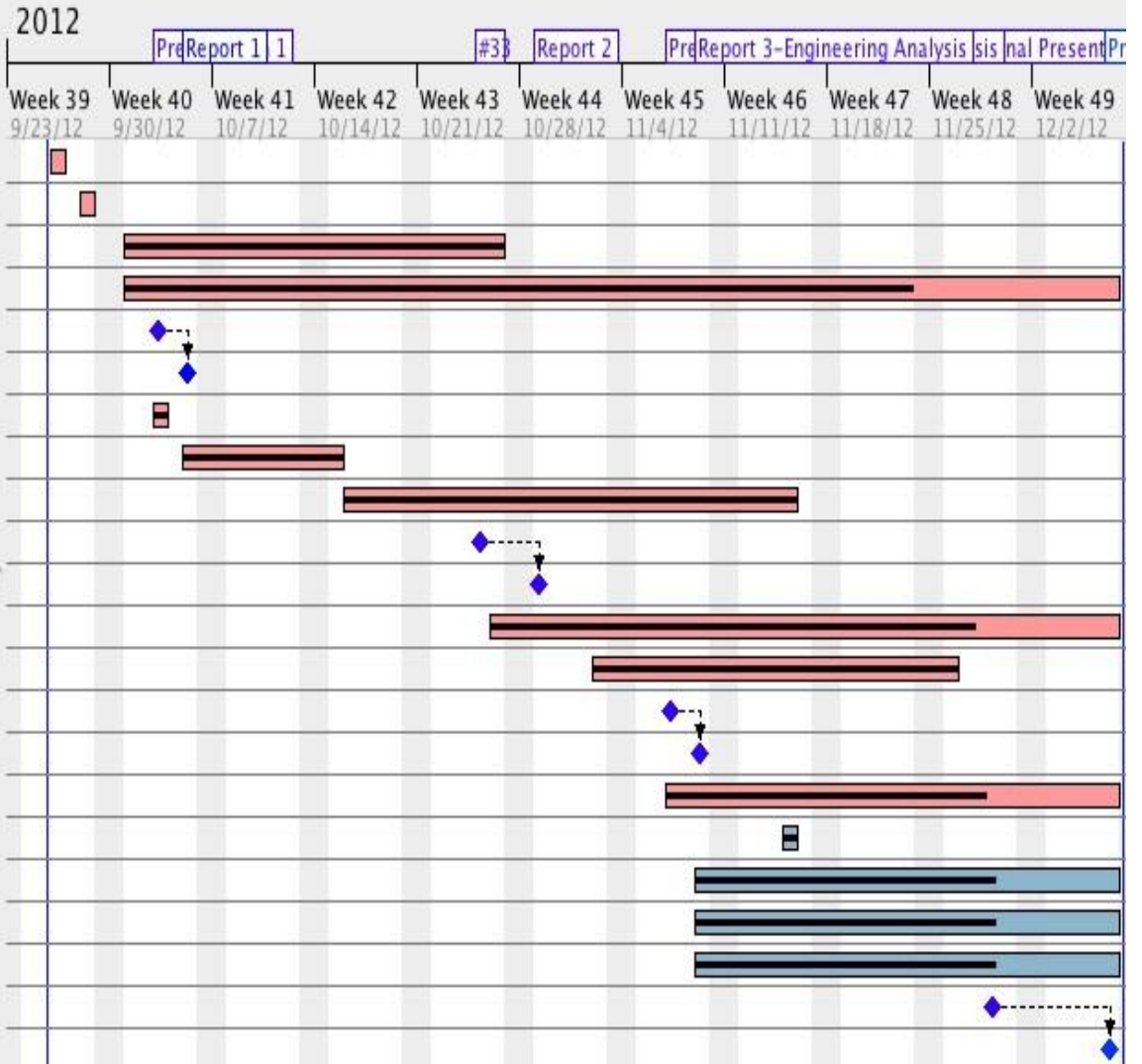
Material Analysis

	Stainless Steel	Aluminum 6061	Aluminum 7075	Abs plastic
Tensile Yield Strength (kpsi)	31.2	40	73	6.1
Fatigue Strength (kpsi)	35	14	23	11
Brinell Hardness	123	95	150	X
Modulus of Elasticity (kpsi)	28000	10000	10400	310

Schedule Update



- ame
- Contact Mary Roger (Client)
- Meet with client
- Sample Design CAD Drawing
- Work on and update Website
- Presentation 1
- Report 1
- Meet with Client-sample design
- Brainstorm Designs
- Select Design
- Presentation 2 Concept Generation & Selection
- Report 2
- Analyze Design
- Client review of design analysis
- Presentation 3- Engineering Analysis
- Report 3-Engineering Analysis
- Speak w/professor for aid in calculations
- Choose/Discuss Final design with Client
- Update CAD drawing/Finalize Dimensions
- Client review of finalization
- Final Design Review/Project Proposal
- Final Presentation
- Project Proposal



Conclusion

- Defined Constraints and Specifications
- Final Design
- Two Solutions for Coupling Design
- Effects of Loads on Connector
- Calculated Forces on Springs and Ball Bearings
- Material Analysis
- Timeline

References

- "Amphenol Tri-Start Subminiature Cylindrical Connectors." *Powell Electronics*. Powell Electronics, n.d. Web. 4 Oct 2012.
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- Richard G Budynas and J. Keinth Nisbett (2011). *Shigley's Mechanical Engineering Design*. 9th ed. New York: McGraw-Hill.
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Questions?