SAE Mini Baja

Frame Team

Conceptual Design Generation

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SAE®

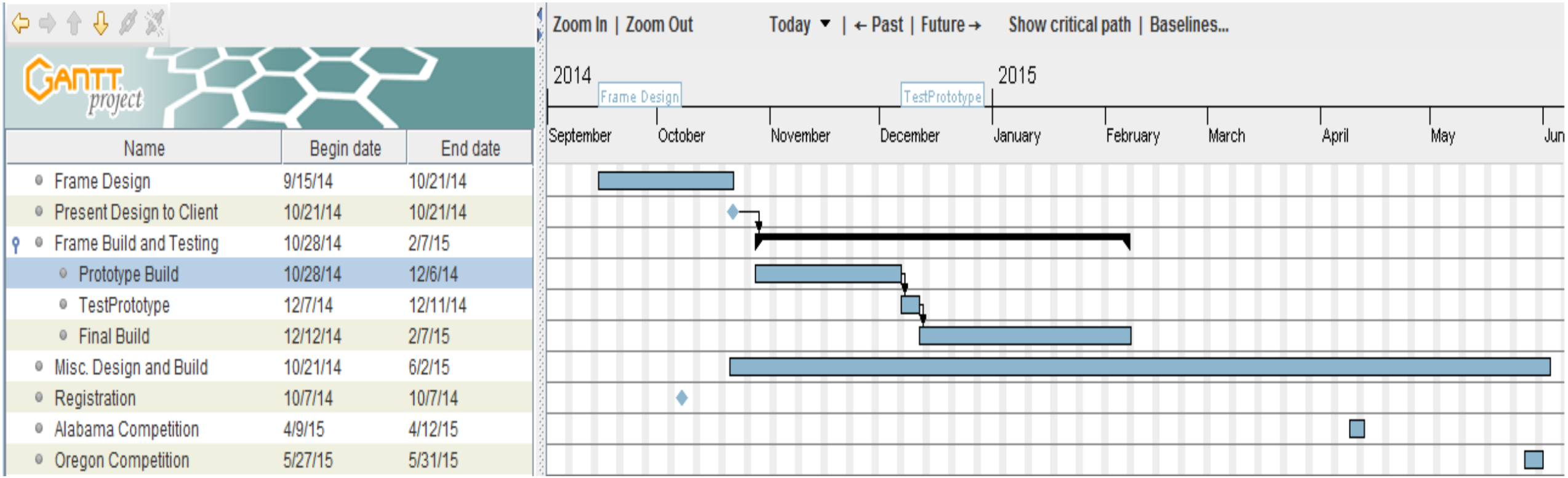
Overview

- Introduction
- Updated Timeline
- Design Concepts
  - Truck, Buggy, Front Supported, Rear Supported, Compact 1 & 2
- Decision Matrix
- Chosen Designs
- References

Introduction

- Competing in the SAE Mini Baja Competition
- Design a manufacturable frame that will last through the SAE Competition Dynamic events
- Frame needs to be lighter and smaller
- Frame must aid in outperforming last year’s baja vehicle
- The roll cage should be finished by Nov. 21st for testing

Updated Timeline



Name	Begin date	End date
Frame Design	9/15/14	10/21/14
Present Design to Client	10/21/14	10/21/14
Frame Build and Testing	10/28/14	2/7/15
Prototype Build	10/28/14	12/6/14
TestPrototype	12/7/14	12/11/14
Final Build	12/12/14	2/7/15
Misc. Design and Build	10/21/14	6/2/15
Registration	10/7/14	10/7/14
Alabama Competition	4/9/15	4/12/15
Oregon Competition	5/27/15	5/31/15

Gehr

Compact Frame Design 1

Description:

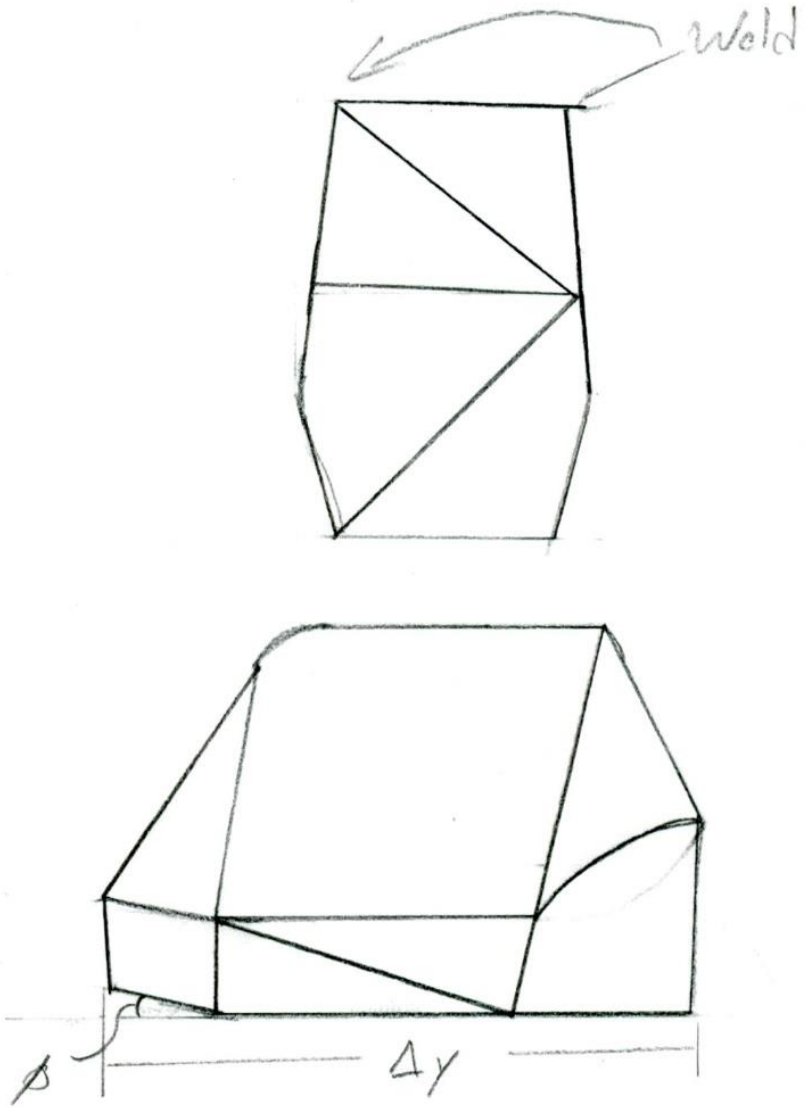
This design is a rear supported frame with the smallest dimension Δy while keeping it within the rule's constraints.

Advantages:

- Simple design
- Light weight
- Cheap

Disadvantages:

- Strength



Compact Frame Design 2

Description:

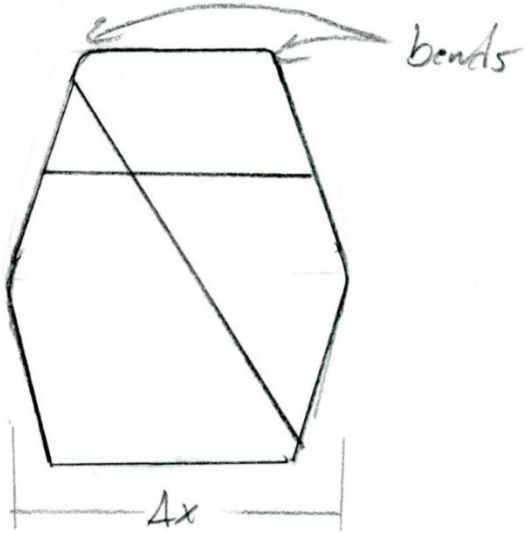
This design is a front supported frame with the smallest dimensions for Δx and Δz while keeping it within the rule's constraints.

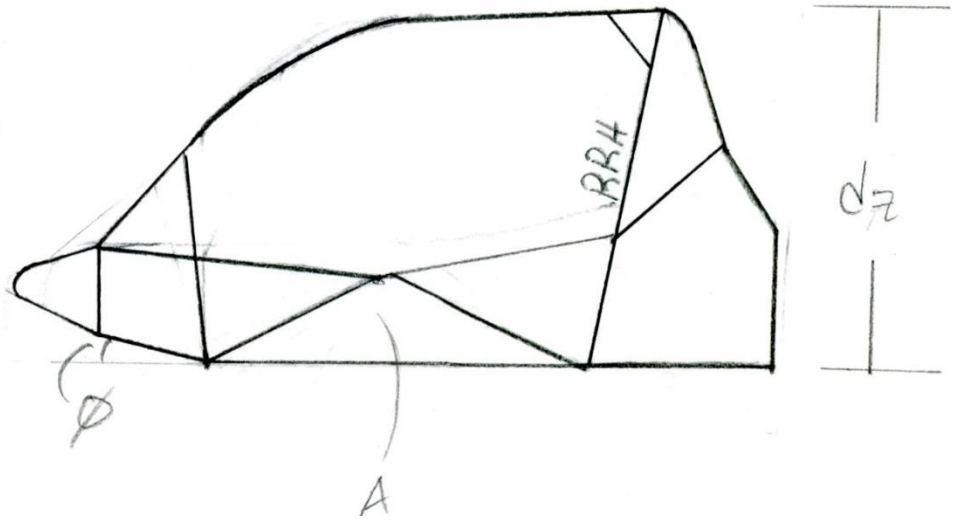
Advantages:

- Weight distribution
- Lower center of gravity

Disadvantages:

- More complex design



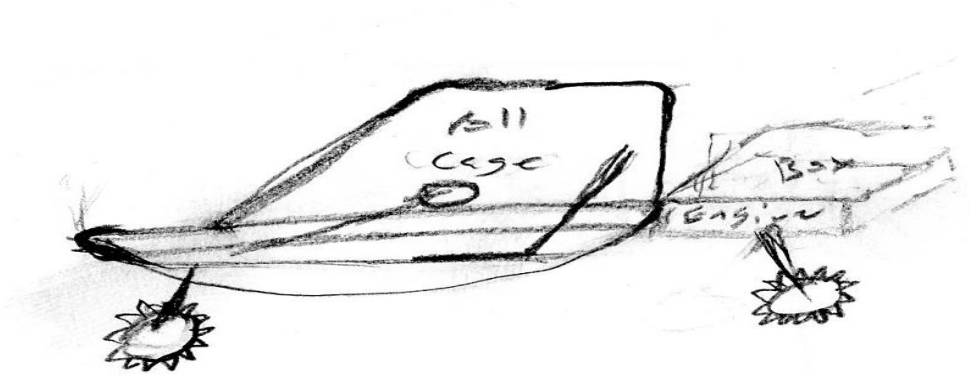


Gehr

Truck Frame Design

Description:

A truck frame design that is built with toe and chamber off road racing suspension.



Reasons for Selection:

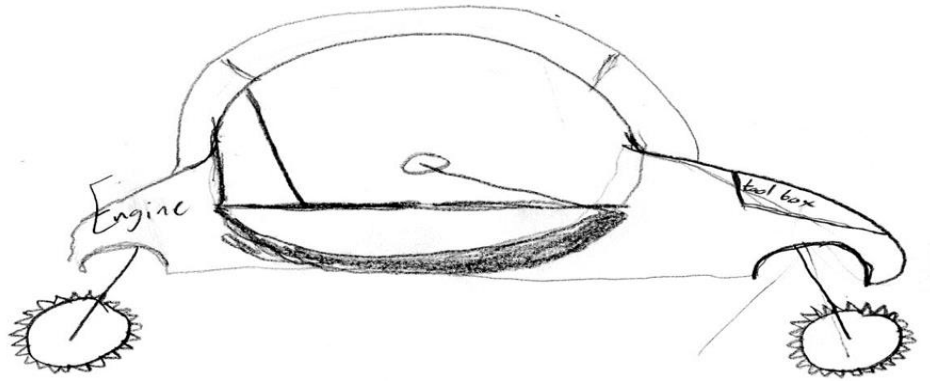
- Light Weight
- Unique Design of Baja Vehicle
- Reliable on off road

[1]

Old Volkswagen Design

Description:

A baja vehicle frame that has the same concept of an old Volkswagen Buggy frame, but with toe and chamber off road racing suspension.

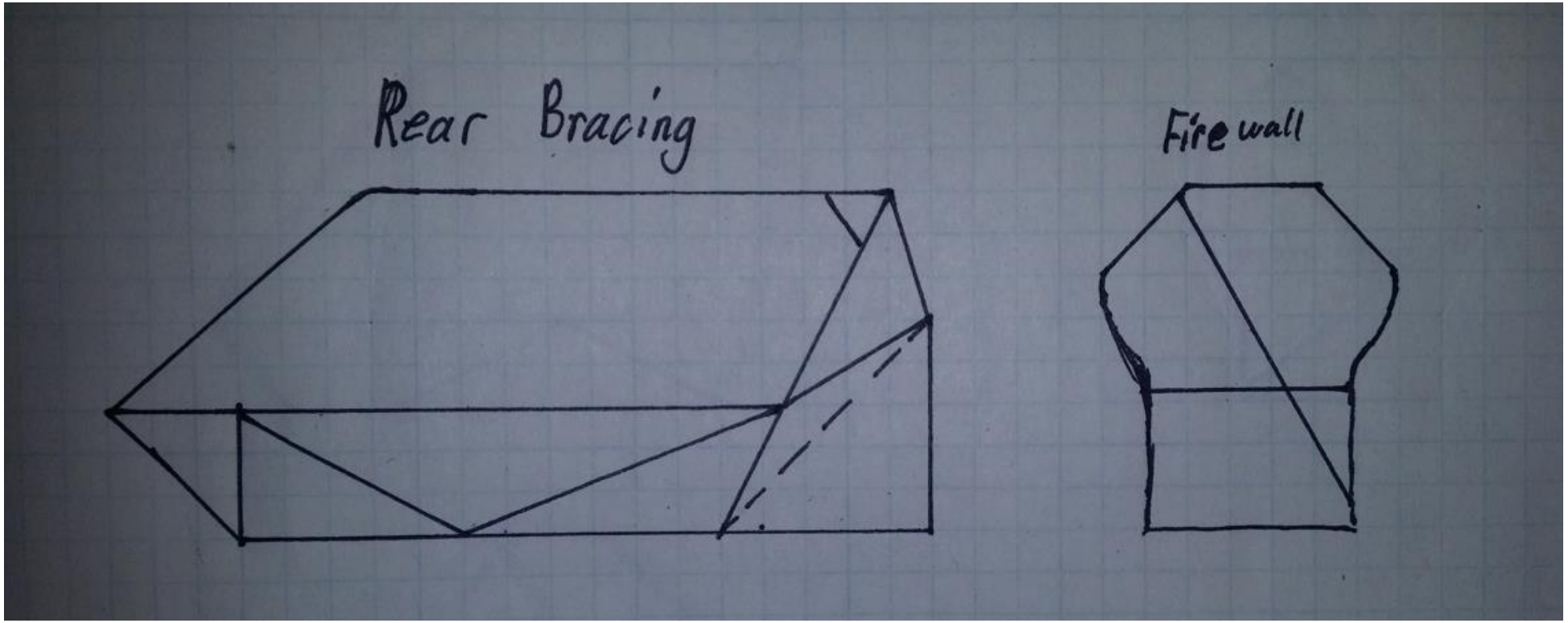


Reasons for Selection:

- Attractive frame design for an off-roading Baja vehicle
- Small size vehicle → Less weight
- Simple frame design → Less cost
- Designed for obstacle clearance
- Frame can be equipped with a tool box

[2]

Rear Bracing Concept



Description:

- A rear brace design with a structural triangle made of main member tubing.

Advantage:

- This allows for a more simple firewall bracing design for the roll cage loop.
- Optional position of bottom member leaves room for alteration to incorporate the subgroup's material

Disadvantage:

- Negative impact on weight ratio

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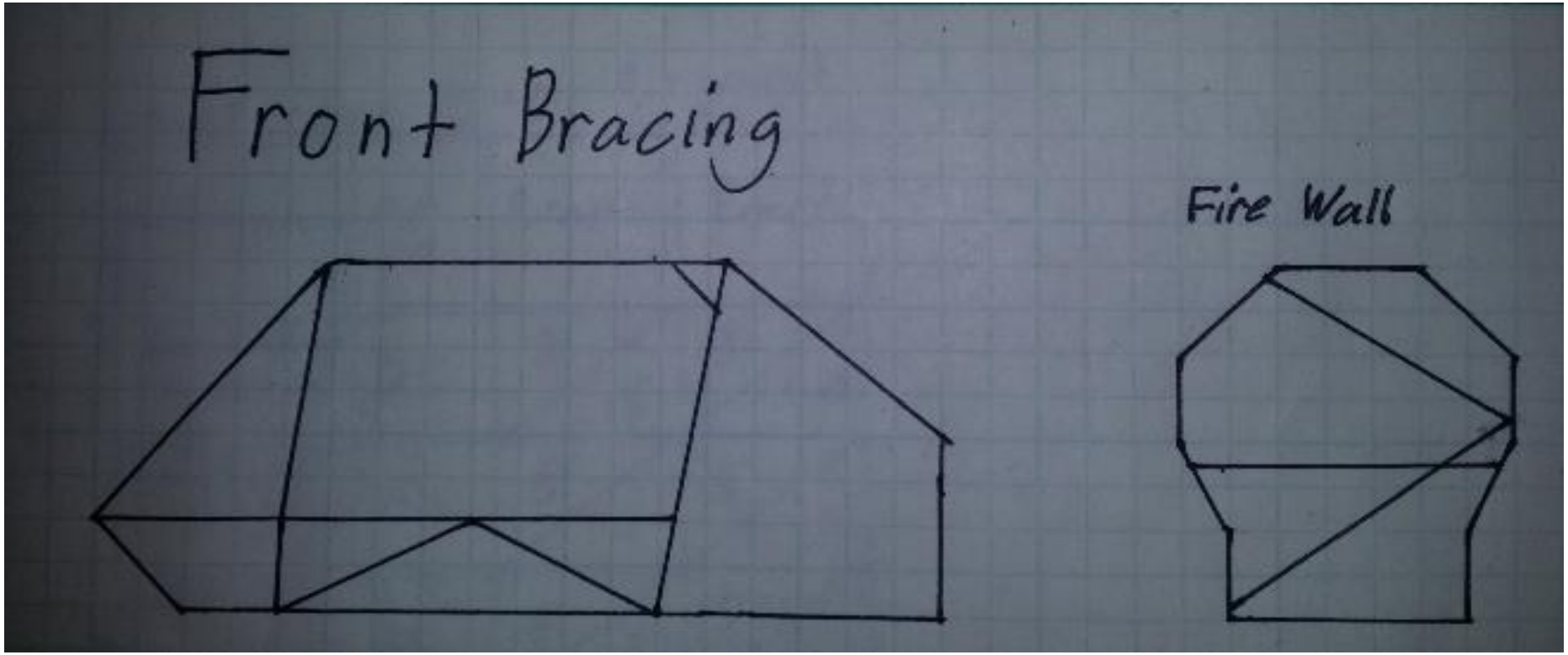
Front Bracing Design



Description:

- A front bracing design with a structural support in the front made with main member tubing.

Advantage:

- This allows for pure customization of the rear of the vehicle for sub group installations.
- Positive impact on weight ratio

Disadvantage:

- Visibility loss for driver

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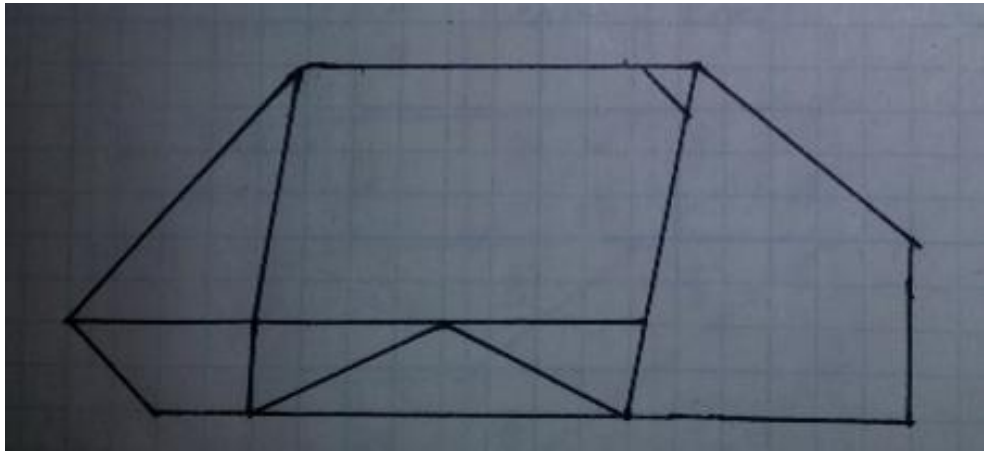
Decision Matrix

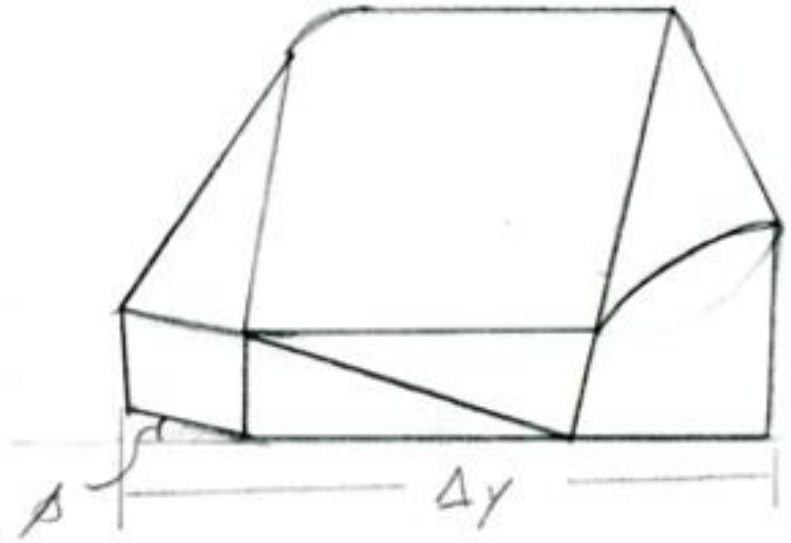
Group Matrix	**Criteria (Rating System: 1-5)**							
Design	Overall Weight	Driver Accessibility	Strength	Simplicity	Room for Modifications	Cost	Ability to Install Accessories	Total Score
Truck Frame Design	2.67	3.67	3.33	3.33	3.00	3.00	3.33	3.12
Volkswagen Buggy Frame Design	3.00	3.67	4.33	2.67	2.33	3.33	3.67	3.30
Rear Brace	4.67	4.33	4.00	3.67	4.00	4.33	3.67	4.17
Front Brace	4.67	4.33	4.33	3.67	4.33	4.00	3.67	4.21
Compact Design 1	4.67	4.33	4.00	4.33	4.00	4.33	3.67	4.23
Compact Design 2	4.33	4.33	4.67	3.00	4.00	4.33	3.67	4.15
Scale	0.2	0.09	0.18	0.1	0.14	0.2	0.09	

Chosen Designs

Front Bracing Design



Compact Frame Design 1



These final concepts are:

- Similar in appearance
- Easily modifiable
- Light weight
- Simple to build

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Conclusion

- Pushed back prototype finish date
- Presented six concept designs: Compact Frame 1&2, Truck, Old Volkswagon, Front Bracing, Rear Bracing
- Front Bracing Design and Compact Frame Design 1 were chosen from decision matrix

Legg

References

[1]. http://www.superatv.com/Polaris-Ranger-XP-900-6-Lift-Kit-P8182.aspx, access 2014.

[2]. http://socalbajas.com/, access 2014.

Questions?