

M2.5 - City of Kyle: Sign Design

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 City of Kyle: Public Works



Problem Statement

The City of Kyle Public Works department has asked for assistance in the completion of an ongoing public sign project. This project asks for the design of a rotational sign that portrays the letters "KYLE", and is functional at the highest level of safety.

Location

The sign will be installed for display at the roundabout intersection of Burleson St. and Marketplace Ave in Kyle, Texas.



Objective

Design and fabricate a rotating sign that ensures the highest level of safety.

Safety Factors Considered:

- Weight & Durability
- Speed & Torque
- Vehicular & Human Obstruction
- Natural Weather

Acknowledgments

We would like to acknowledge and thank Harper Wilder and his team at the City of Kyle Public Works department for their continuous support during this project. As their constant innovative critiques have driven us to the design of our proposed design. We would also like to thank Dr. Austin Talley and Mr. John Ivey for their guidance and assistance throughout the design process thus far.

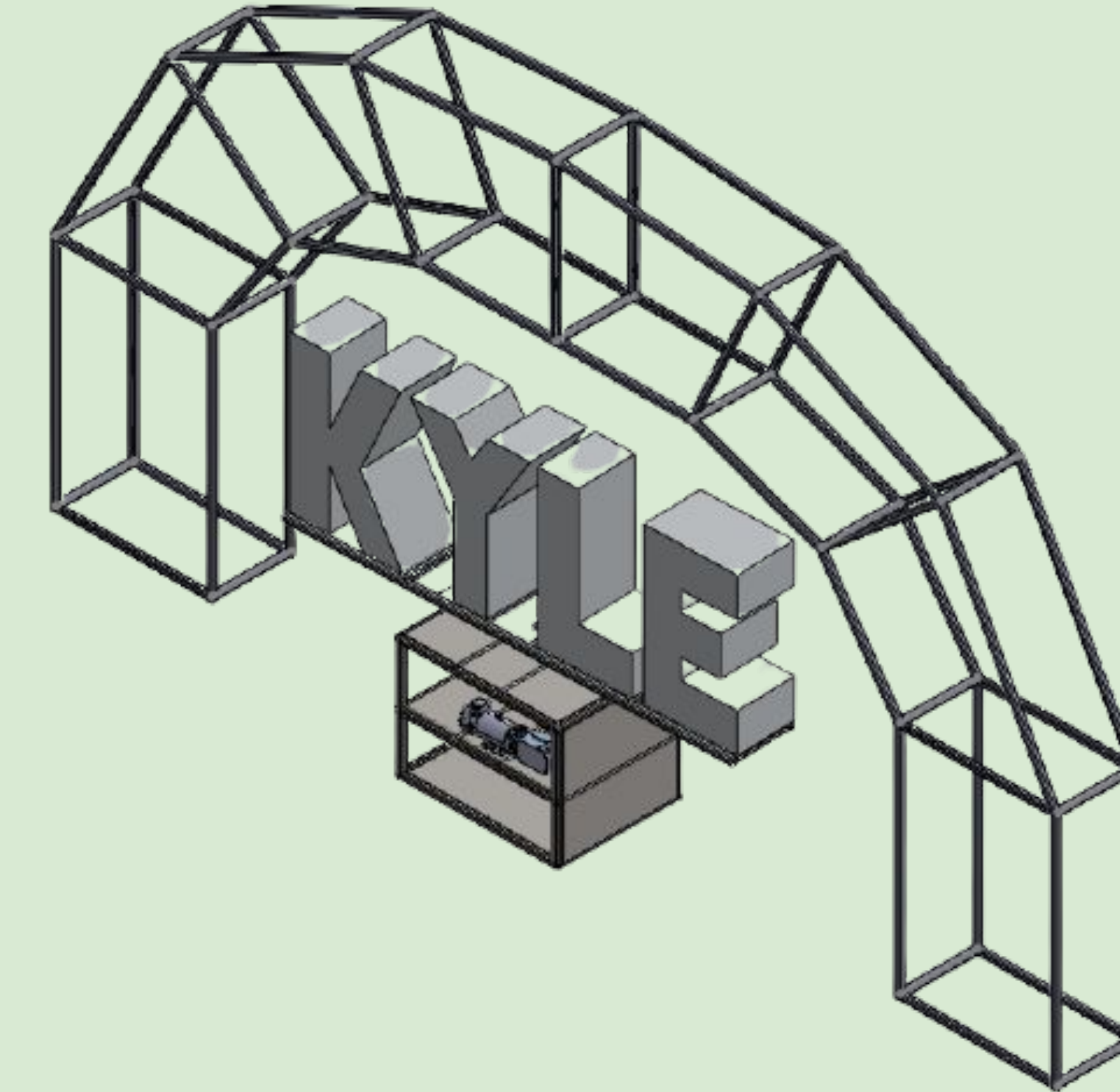
Overall Design

Old Design

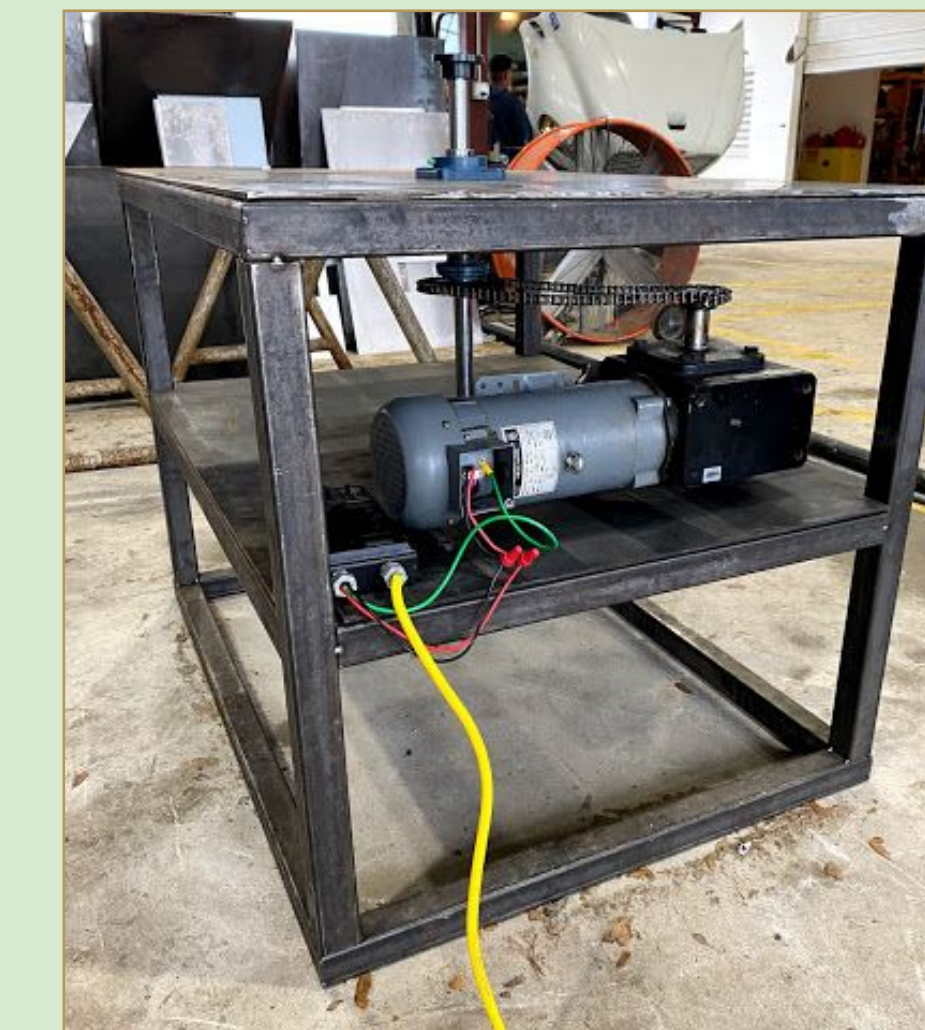
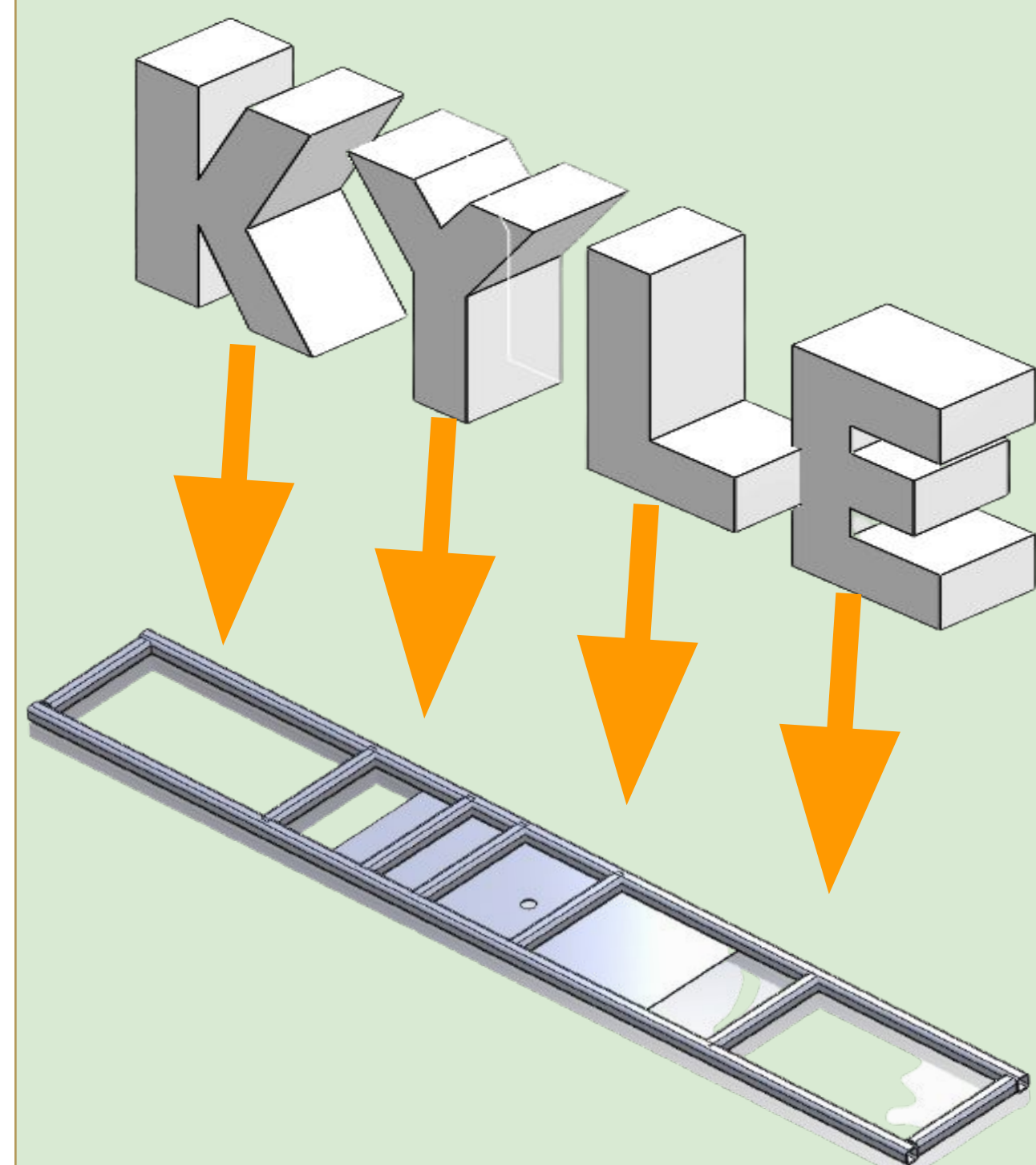
- Letters: **Net weight of 1,707 lbs.**
- Frame: **Net weight of 498 lbs.**
- **Total weight = 2,205lbs**
- **Calculated torque = 85.28 ft-lb**

New Design

- Aluminum Letters and Frame: **Estimated Total Weight = 400lbs**
- **Calculated Torque = 4.15 ft-lb \approx 50 in-lb**



Design Fabrication & Assembly



- 4' x 18" redesigned letters fabricated out of 5052 sheet aluminum. Estimated net weight of 200lbs.
- 11' tall, 25' wide structural arch for "cage like" safety implementations and aesthetic factor.
- Redesigned letter frame with measurements of 11' long x 18" wide. Estimated net weight of 200lbs.

*(Assuming total weight is correct & 1 rpm is achieved)

Material Selection

Reduction of weight is paramount for improvement for overall safety and functionality of the sign.

- Aluminum 5052 Plates 4' x 10' x 0.08" (New letters)
- Aluminum 6063 square tubing 2" x 2" x 1/8" (Arch structure)
- Aluminum 6063 square tubing 2" x 2" x 1/8" (Letters Frame)

Key Mechanical Components



- Permanent Magnet DC Motor
- ◆ 1800 RPM



- Gear Worm Reducer
- ◆ 60:1 ratio
- ◆ Speed Reduction



- Variable Speed DC Controller
- ◆ Motor Speed Controller



- 4-Bolt Flange Bearing with Ball Bearing Insert
- ◆ Shaft Support
- ◆ Load Support



- Adjustable Torque Limiter
- ◆ Range of 50-75 in-lb
- ◆ Overload Protection



- Flange Bearing
- ◆ Additional Load Support



- Detachable Bushing