Car Rotisserie for the Lubbock Fire Department

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ME 4371
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Problem

Car accidents typically result in the car coming to rest in one of three primary orientations; all four wheels on the ground, on one side, on its roof (rollovers)
Each orientation presents its own difficulties and warrants a separate response.
Cars that land on their side or roof are especially dangerous for many reasons. The passengers most likely suffered head, neck, and/or spine injuries, are hanging to one side or upside down from their seat belts, and the vehicle may be unstable and difficult to maneuver around.
Training for flipped cars is also incredibly difficult for various reasons;
It can be unsafe and difficult to flip a vehicle, the training is typically a single-use operation, training does not always happen on site.

Design

Partnering with the Lubbock Fire Department we worked to design a device that is able to life, rotate, and pitch a car for fire fighters to practice rapid vehicle extraction.
Some of our design constraints are that the device must be

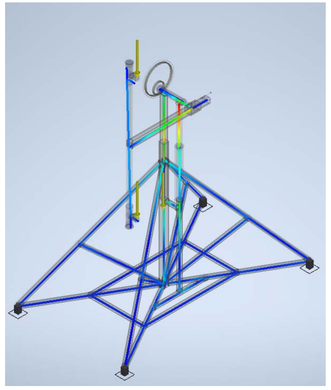
- completely manual with no electrical or gas components involved
- must be able to rest all four wheels on the ground without interference
- must require a minimal amount of people to operate.

Lifting devices used are manual hydraulics and jack screws, the hydraulics will do most of the lifting while the jack screws will be used to adjust the device so that its on the COG of the car. Rotational mechanism involves two chain hoists, one will be fully intact while the other has been modified to utilize the coffing.

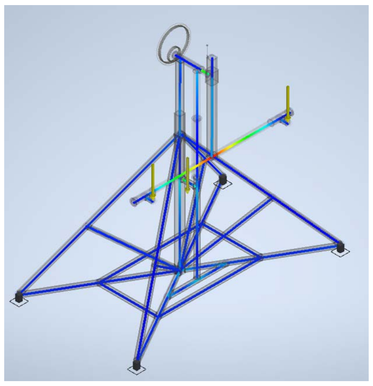
Manufacturing Process

- Banded saw - used to cut square tubing and pipes
- Plasma Torch - used for cutting for complex cuts
- Hand Grinder - used to clean up cuts and prep for smoother attachment
- Welding - used to attach all components together

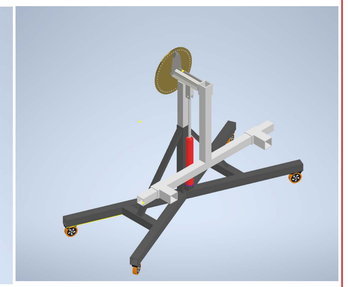
Stress Analysis



At 90 degrees
Maximum Normal Stress is 36.8 ksi
Maximum Shear Stress is 1.524 ksi
At 0 degrees
Maximum Normal Stress is 28.86 ksi
At 180 degrees
Maximum Normal Stress is 28.86 ksi



Prototypes



Final Design