

Mobile Loading Crane

Mechanical Engineering

Students: Mia Bentzien, Miguel Lopez, Abdulrahman Monaqil, Garrett Walker
 Advisors: Dr. Banerjee

FRESNO STATE

Lyles College of Engineering

Abstract

- The goal of this project is to design and fabricate a crane system capable of lifting a 300-500 lb load into a typical full-size, consumer class pickup truck.
- The project is designed for flexibility. This is achieved by making the crane mobile, collapsible, and user friendly.
- It collapses into an easily moveable unit with a floor footprint approximately the size of a lawn mower, while expanding to a nearly 8 ft tall by 8 ft long reach.

Equipment

Components	Quantity
5" Tubing (A36 mild Steel)	2
6" Tubing (A36 mild Steel)	2
2" Tubing (A36 mild Steel)	1
Hydraulic cylinders	2
Sleeve Bearings	4
Casters (2-swivel, 2-fixed)	4
Shaft Material	6
Plastic Pads	16

Design

Tower and Boom: These two portions form the core of the system and are designed to be completely identical. It functions as a hydraulically actuated, telescoping extension system.

The system is able to telescope by using the base segment as a ground, the top segment as the powered section.

Base: The base is made from 2in tubing for two reasons: strength and weight.

The goal is to minimize the need for dedicated counterweights to provide the needed weight.

Mechanism

- The mechanism used for this design is hydraulic system.
- The hydraulic will be attached through the two tubes.
- This way, when extending the hydraulic, the top (powered) tube will be extended or retracted.

Design Layout



Simulations

- Simulations were carried out using SolidWorks at 300lb and 500lb force loads
- The Boom of the mechanism met the required factor of safety at 500lbs
- Boom was capable of holding the 500lb maximum load.

Testing Procedures

- Different loads applied to the boom and tower tubes up to 300-500 lb which is the required load
- Hydraulic test is attaching the hydraulics to the tube and test the mechanism (extend-retract)
- Crane test is the final test of the design which is applying the required loads to the final assembly of the design

Testing Results

- Boom and tower tubes loads:** The results shows that the materials are strong enough to handle 300-500 lb
- Hydraulic system:** The extension and retraction of the mechanism worked perfect. The upper tube of the boom and tower are the powered tubes.
- Crane Load:** Final testing of the design exceeded the expectation. This test approved the purpose of the design

Sponsors/Conclusion

Cencal CNC