

## Curb Climbing Wheelchair

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Figure 12. Prototype of Curb Climbing Wheelchair

### INTRODUCTION

The curb climbing wheelchair serves as a solution to a common problem that many wheelchair users face on a daily basis. The device allows a user to traverse a curb in the absence of a handicap accessible ramp. The mechanism is capable of both climbing and descending a curb in a safe and fluid manner. Since the climbing system is supplementary to the wheelchair's primary function, the weight of the additional system is kept to a minimum. Safety is clearly paramount to our design considerations. Due to this consideration, the design keeps the angle of the chair approximately parallel to the ground throughout the process. The main challenge is to control the center of gravity of the system, thus avoiding any tipping and ensuring that the forces are distributed correctly. Ultimately, the design provides an inexpensive and elegant solution to traverse a curb, and consequently gives wheelchair users greater freedom, safety and peace of mind.

### SUMMARY OF IMPACT

The curb climbing wheelchair can have a large impact on the market that we are targeting it at. During the market research and user needs analysis, we found that wheelchair users who did not possess the strength to ascend and descend a curb without assistance felt intimidated by the possibility of encountering curbs without a ramp. The only device on the market is far too expensive for average wheelchair users. If the design could go into production, it would have a serious impact on society because its design is simple and affordable. Moreover, one of the key objectives of this project was to add a simple, light and safe retrofit device onto a wheelchair, thus giving the user peace of mind that they did not need to search for a ramp if one was not readily available. This goal has been achieved.

### TECHNICAL DESCRIPTION

The user will activate the device through a three way switch fixed on the wheelchair, and the lifting process will be run on a DC battery. The driving force of the system comes from a linear actuator. Its power is transferred to lift and lower the wheelchair through the use of linkages, chains, sprockets and gears. The lifting process takes roughly 14 seconds and is able to lift the user in a safe and controlled manner while keeping the user horizontal. For the drive system, the user will be able to continue using the big wheels on the wheelchair even when they are off the ground to move forward or backward to get either over the curb or away from it. After the wheels get to their desired orientation with the curb, the user reverses the actuator and the wheelchair is lowered down. After that, the wheelchair is able to continue on its way.

To make sure everything was safe for the user, the materials were carefully selected to ensure that they were both light and strong enough for the application. We used a combination of 4130 aircraft steel for shafts that dealt with high forces and 6061-T6 aluminum for the other components where the forces are not that great. We used an assortment of bushings and bearings to ensure that all the parts were moving smoothly and easily to prevent material breakdown.

The cost of the parts and supplies for this project was \$1200.

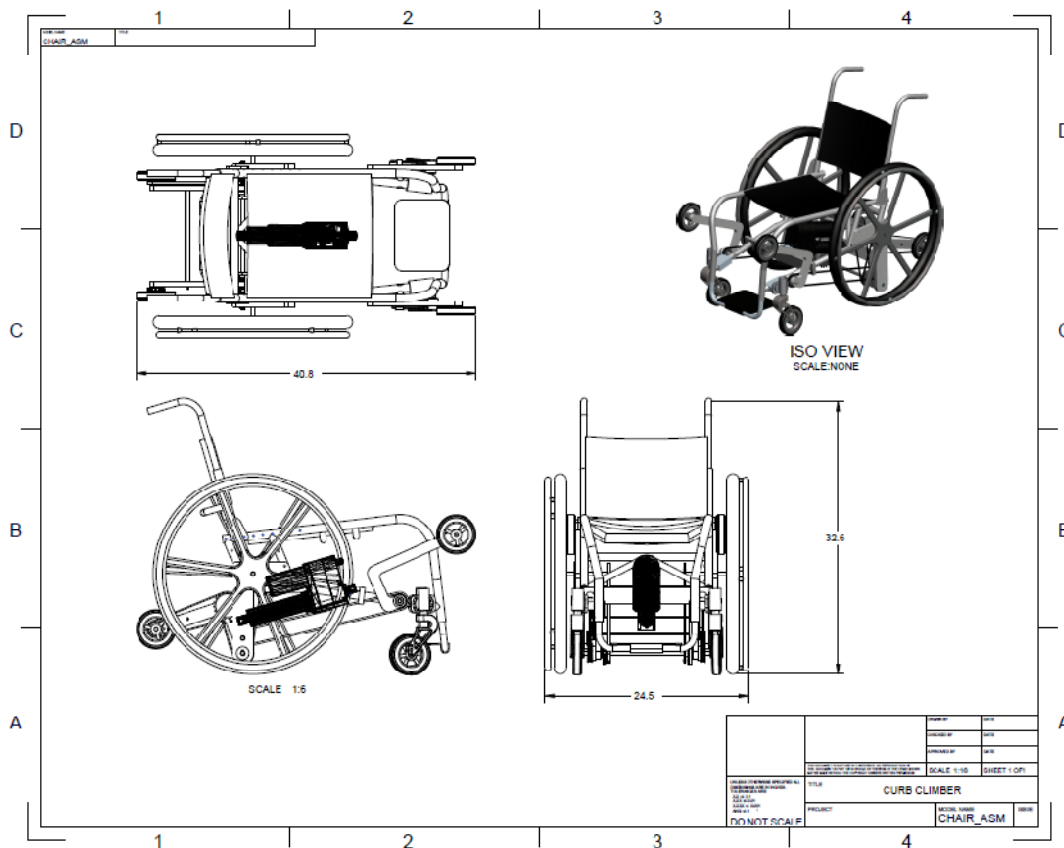


Figure 13. Design of Curb Climbing Wheelchair