

GNG 2101

Design Project User and Product Manual

Portable Step: Step on it!

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July 24th 2022

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List of Acronyms and Glossary

Table 1. Acronyms

Acronym	Definition
USB	Universal Serial Bus
USB-A	Type A is the port on the computer (the host)
USB-C	USB-C is a 24-pin USB connector system with a rotationally symmetrical connector.
DC Port	It is an electrical connector for supplying direct current (DC) power.

Table 2. Glossary

Term	Acronym	Definition
Water Displacement, 40th formula	WD-40	Removes gunk and grease from the paint on the portable step

1 Introduction

This User and Product Manual (UPM) provides the information necessary for any person with or without a disability to effectively use the portable step and for prototype documentation. The team of student engineers that worked on this product measured, calculated and went through various prototypes and usability testing to come up with this final product. Some assumptions rose along the way of building this product as the core objective was to build it for a 10-year-old girl who has a disability (e.g. width and height of the step, substep, platform size, etc..). The number one goal was to make it portable and easy to use for anyone and that goal was achieved. This document will analyze and go through various aspects of how to use the portable step as well as how the product was built. The document is organized in the following manner:

1. Overview of the product and important things to know for the user to use it.
2. How did the project start and what was taken into consideration in building it.
3. Tools and Equipment used to build the product.
4. Using the product the correct way
5. Troubleshooting & Support
6. Product Documentation
7. Recommendations for Future Work for the team (Step on it!)

The intended audience for this document is wide so anyone with an interest in purchasing something as portable and efficient could read this document and learn about why it was built as well as how effective it is for the average person. The first priority for this product was the client but we have made the step so flexible for any person to use as it has a substep and handles over 350 + pounds.

There is no security or privacy associated with this user manual and product manual. This is a public document that anyone could access and read more about our product.

2 Overview

There is a need for a portable step that could allow a person with difficulty reaching high stepping areas to use it in different places and ensure the safety of each user by making sure it can handle different surfaces as well as a variety of capacities. This problem is important as it could help millions of people with or without disabilities to reach high areas. The step is portable, safe and easy to use for any person regardless of their weight capacity as this step could handle up to 350 + pounds of weight load.

This step was specifically designed for a child who has a disability and is unable to reach areas such as (getting in a van, reaching the top of their closet or even reaching the sink). The needs of the user were the most important aspect of this design:

1. Portability.
2. Being a 3-inch thick step.
3. Easy to use (2-button operation)
4. Handles 120 + pounds
5. Anti-slip platform
6. Reaches most heights (3-16 inches)
7. The pink color

This step was able to achieve all the above user needs and has gone above and beyond for weight load.

Many things differentiate our product from others, one major difference is the portability of the product. Users could take our product with them on the go. You could fit it in your closet, put it in your bag, carry it, or even put it in the trunk of your car to travel with you.

Our Product	Other Products
Suitcase design - portability	Not Portable
Small and minimalistic	Big and Chunky
2 button operation	Confusing buttons on the step itself
Anti-Slip platform for safety	No Anti Slip material
Handles 350+ Pounds	Only handles 90-lbs

Table - 3: Our Product vs. other products

As stated in the above table, our product outperforms a lot of other products on the market and will help users achieve their goals when using our product. Therefore, our product is overall better and safer to use with a wide variety of users.



Figure 1: Image of Final product

The key features of the product are its simplicity and ease of use. With a 2-button remote to bring the user up and down, as well as take you up to 16-inches of height. Once the user is back down, attach the remote back on the velcro and it's as easy as picking up an item off the floor. The user grabs the handle and rolls the step with them to wherever they're going just like they roll a suitcase when traveling. The weight is about 15 pounds so it's easy for the average person to carry it around or place it somewhere they feel comfortable placing it.

The architecture/construction of the system was well thought out and was well-accomplished for this product. Starting from the bottom to the top as seen below:

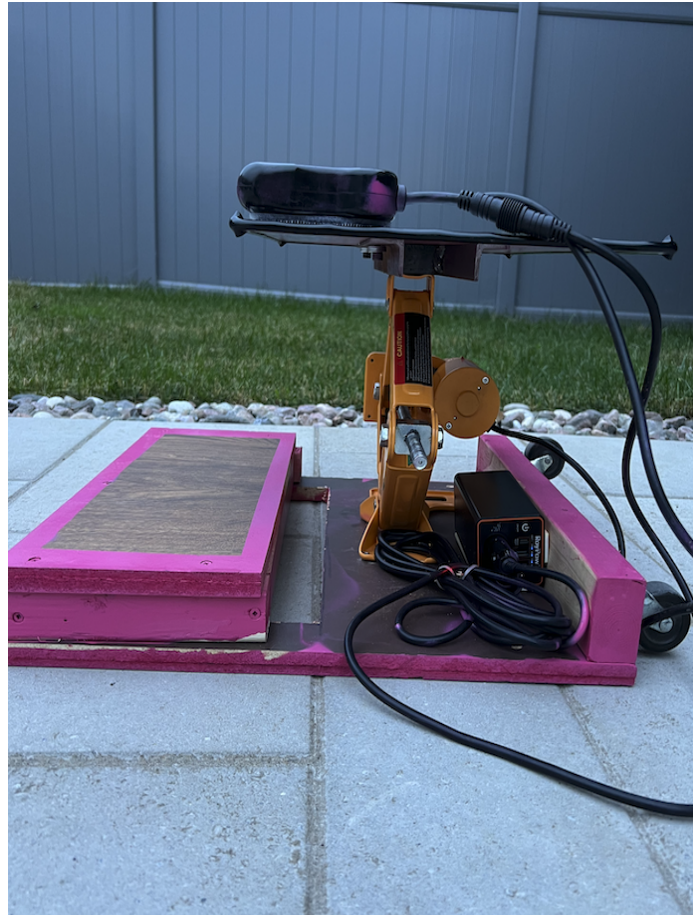


Figure 2: Architecture/construction of the overall product

- Base - made of wood and attached to it is a substep of 3 inches thick with 2 wheels on the other end. Lastly, one handle to roll the step around.
- The scissor jack mechanism which is a car jack with a remote and a motor.
- Attached to the base is a 24 amp battery that will deliver power to the jack.
- Attached to the top of the jack is a 12"x 18" steel checkered plate that is surrounded by rubber tubing for the safety of the user.
- 3 steel bars are in between the platform and the jack, they are welded into position to keep the platform in place.
- Lastly, a velcro holder is added for the remote to be in place. The remote contains 2 buttons for the user to press up and down once they are on the platform.

Overall, the product is made of all environmentally friendly material that is recyclable and could be used over and over again.

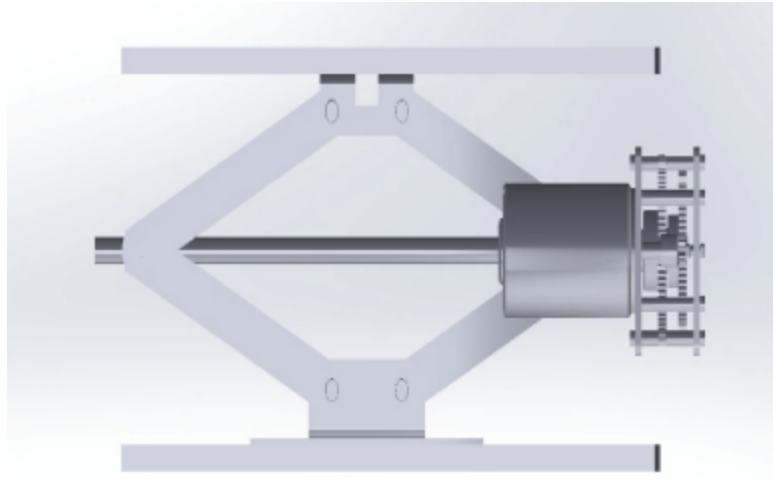


Figure 3: Block diagram for in-depth architecture

2.1 Conventions

Action #1 - Every user should make sure that the cigarette plug is connected to the battery the correct way. Please ensure that the light on the remote and the light from the battery are turned on. Once they're on, the user could step on the step and press either of the two buttons for operation.

Action #2 - Every user should make sure that the step is at the bottom. You can do that by turning on the step and pressing the down arrow for the step to decrease in height.

2.2 Cautions & Warnings

Warning #1 - Once the user steps on the platform and starts pressing the up arrow, make sure there is something near the step to grab onto as the step is a little unstable once the weight is distributed from one side to the other.

Warning #2 - Even though there is rubber tubing around the edges of the platform. Please be careful stepping on especially if children are using the product.

Caution #1 - Please ensure that the battery is charged, there is a charger that comes with the product for charging.

3 Getting started

3.1 Configuration Considerations

To begin, the system consists of a wooden base with a substep, an electric car jack that has a steel platform on top and is attached to the wooden base. There is a battery under the carjack which is secured by screws and zip ties for cable management. A remote is also there which should be attached to the velcro on the platform. There are also wheels on the bottom and a handle to make ease of use in moving it. The battery consists of a cigarette lighter 12V connection, two USB ports to charge anything external and a USB Type C to charge the battery itself. The electric jack is constantly plugged into the battery, if not, make sure it is plugged into the cigarette lighter part of the battery (the biggest input). In order to make sure the battery is on, double check to see if the blue light appears. This means the battery is on. If it is off, simply click the power button once to turn it on. If it is on, and you would like to power it off, then simply hold the power button until the blue light disappears.

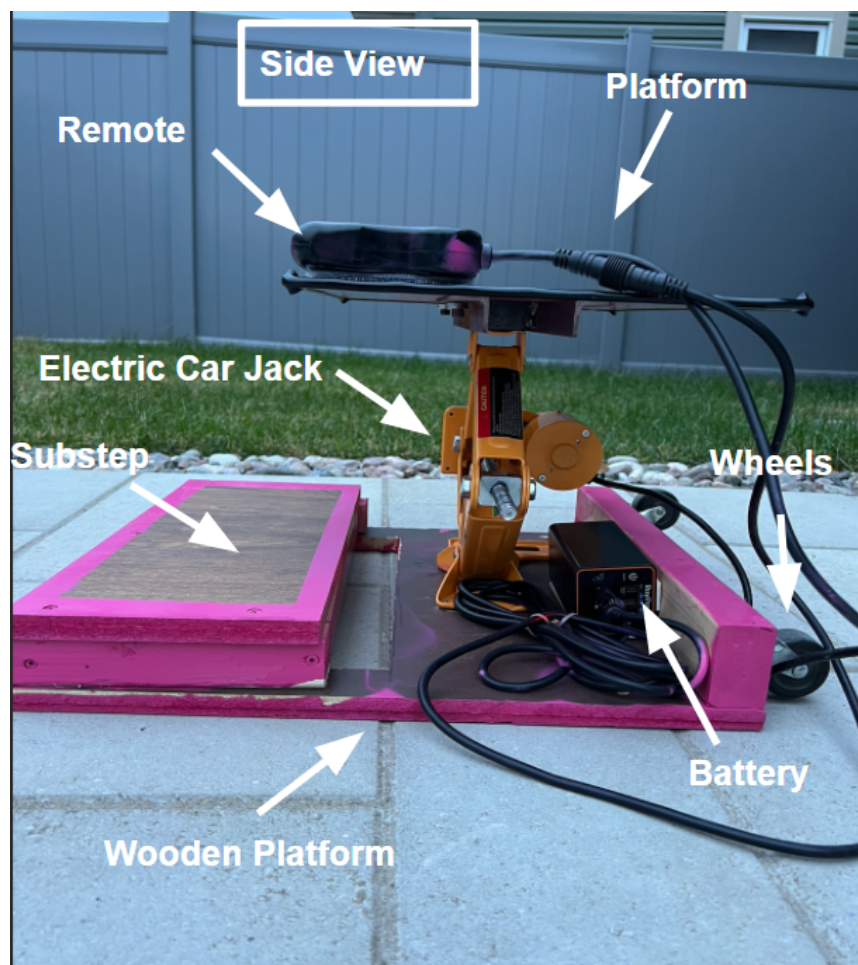


Figure 4: Side view of the portable step with it being raised to 12 inches

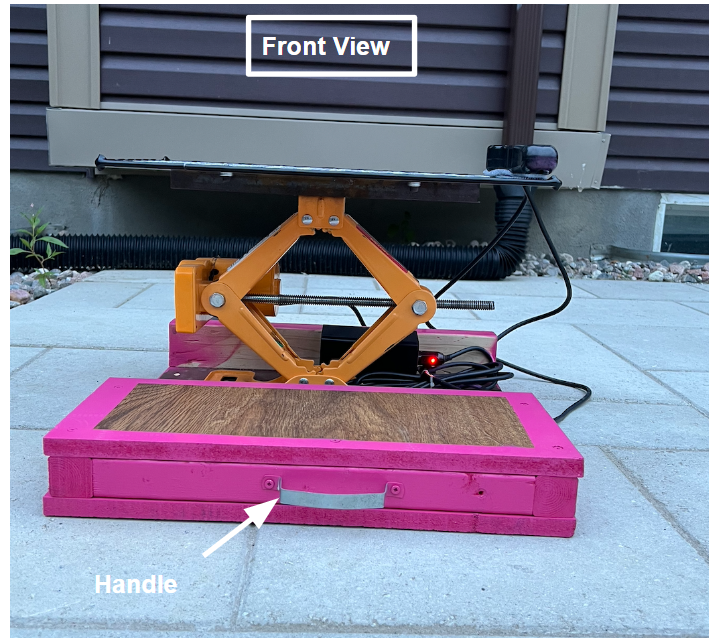


Figure 5: Front view of the portable step with it be raised to 12 inches



Figure 6: Making sure the cigarette lighter output is connected to the battery, the power button is the top right button.

3.2 User Access Considerations

A group of users that could be using the product are people with limb issues who struggle with bending down. A restriction placed on the system accessibility for these users is them

having to turn on the battery if it is not already on. This can be an issue because the battery is tucked in underneath the scissor jack. It is best practice to keep the battery on the entire day then power it off at night to recharge it. Another problem for these types of people is to also bend down to make sure the scissor jack is plugged into the battery. The input to the battery can be loose and thus cause the scissor jack not to work which could be an issue for these users. Another group of users that could be using this product is people with balance issues. When using the portable step, there is some balance required to keep yourself up right. This is a restriction on the use of the step but can be countered by holding onto something nearby such as a car if the user is entering a car.

3.3 Accessing/setting up the System

For operating the portable step, at first, it has to be put in the desired place where the elevation is required. The part with the subset should be facing the user when the portable step is set up on the ground. The user or anyone nearby has to ensure that the jack system is connected to the portable battery. After it's placed properly and proper electrical connection has been assured, the user steps on the elevating portion of the step by using the substep. To get the portable step to function, the user needs to grab the remote from the velcro strap and press the button (▲) which would cause the step to elevate. After reaching the required height, the user can press the button (▼) to put the elevated step back to its original position.

3.4 System Organization & Navigation

- 1) Step on the substep, then step on the steel platform
- 2) Once fully standing on the center of the platform, the button (▲) is pressed on the wired remote. The motor engages and smoothly raises the platform
- 3) Let go of the button when desired height is reached. The maximum lifting height is 16 inches.
- 4) Step off the portable step when it is stopped.
- 5) To leave, step on the step and hold on the button (▼) to move downwards
- 6) Clip the wired remote back onto the platform.
- 7) Return the step to its storage location (trunk, garage etc.)

3.5 Exiting the System

When the platform reaches the desired height. Step off the step and get into a car or the place the client wants to reach. Once the lift is complete, using the wired remote, position the platform to the normal height based on the preference of the primary user, and return it to its storage location. Make sure the battery is off when it is unused.

4 Using the System

4.1 Raising Platform Upwards

In order to raise the platform, make sure the previously mentioned getting started instructions have been read. The platform first of all must be placed with the metal platform next to the intended location you want to step on. Once that is complete, simply take the remote and orient it with the two cables pointing upwards. Step onto the sub step, then onto the metal platform. It is recommended to hold onto something to balance yourself. Then hold onto the ^ symbol. At this point, the platform will be moving upwards and you can let go of the button at any time to stop ascending. If the button is not released, then it will automatically stop at the maximum height of 16 inches. Once the desired height is reached, release the hold off the button. The platform will then stop and you may step off the platform onto your intended area.



Figure 7: Standing on the step with the metal platform next to the intended target (the car)

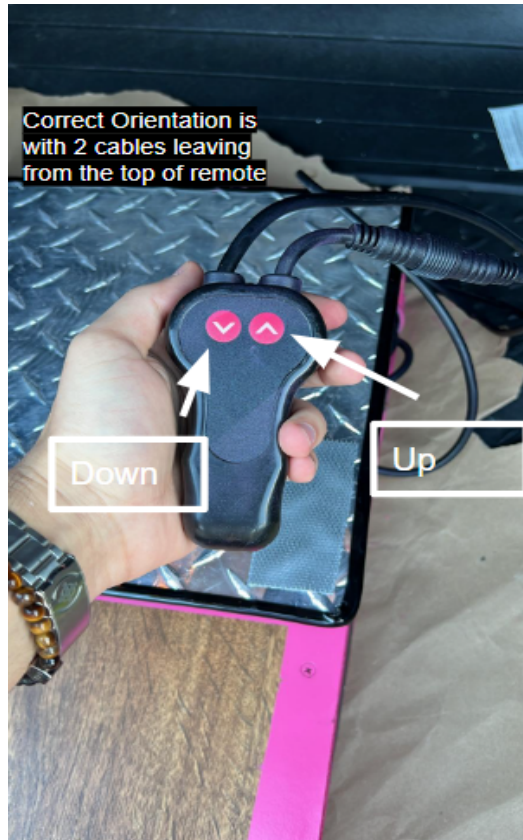


Figure 8: Correct orientation of the remote. Hold remote with the two cables on top of the remote

4.1.1 Standing Lift:

The step provides users a method to be lifted while standing, to a safe level maximum 16 inches from the floor. This application can assist the user onto a bed that may be the perfect height to get up from. This function can also assist where single or dual step level changes may need to be overcome in the home or office.

4.1.2 Small Footprint and Easy Portability:

The FTS is a portable lift that is rolled around on wheels like a suitcase. The small footprint allows it to be positioned in many places other lifts simply cannot go. The step can go just about anywhere including most small bathrooms and hallways.



Figure 9: Portability - Wheels are attached with the step

4.1.3 Wired Remote:

The wired remote has a more than 1m retractable cord, allowing the user or a helper to operate the lift. The wired remote has physical, easy-to-operate button controls, and graphics that indicate the up and down functionality. Raising or lowering the platform takes approximately 75 seconds. The wired remote is stored on the platform.

4.1.4 Rechargeable Battery:

The step comes standard with a rechargeable Lithium-Ion battery pack and charging unit. C86 battery pack has high compatibility. 4 kinds of charging port (USB-A, USB-C, DC Port, Cigarette Lighter Port) can charge most of your devices, such as laptop, phone, tablet, Inflator, Pump, Car Refrigerator, router, 12V speaker. A full charge takes about three to four hours.



Figure 10: Multiple Charging Ports of the battery

4.2 Descending the Platform

In order to lower the platform, the opposite must be done. Once the transfer proceeds, repeat the steps of how to raise the platform but hold onto the up ▼ button instead of holding the down ▲ button. It is recommended to find support and balance when standing from the platform. At this point, the platform will be moving downwards and you can stop lowering the platform by releasing the button. If the button is not released, then it will automatically stop at the lowest height. Once the desired height is reached, release the hold off the button. The platform will be stopped and you may step on the substep to leave the platform.

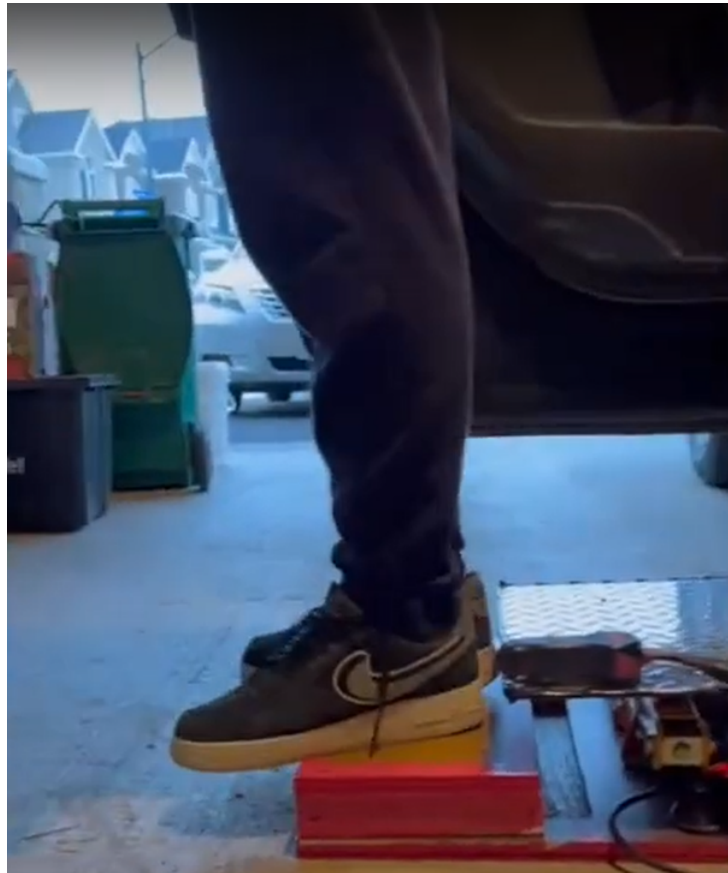


Figure 11: Standing on the substep after leaving the metal platform

5 Troubleshooting & Support

5.1 Error Messages or Behaviors

- 1) Ensure the cigarette lighter is plugged into the portable battery, otherwise the step will not be able to operate.
- 2) The top platform of the step is a bit wobbly so when standing on it don't jump or stand more to one side or the other. This will increase the chance of the step breaking or malfunctioning.
- 3) When using the remote control to move the step up or down the buttons on the remote need to be held not pressed once and then again to stop.

5.2 Special Considerations

1. The wire connecting the jack to the battery got cut off or the attachments came too loose which would stop the step from functioning.
2. The battery is not being turned on before operating the step.
3. The portable battery does not have enough charge to operate. This might cause the step to stop halfway or not even operate
4. The main screw of the scissor jack system is getting rusted or breaking. Due to usage of the step in inclement conditions and not taking proper care of the product, this might occur. This would result in the step operating at a slower pace than usual and in the worst-case scenario, break and not function at all.

5.3 Maintenance

In terms of regular maintenance, the first thing is to make sure the battery is charged. You must use a USB Type C to charge the battery which comes with the product. Simply plug one end into the battery and the other end into an electricity supply such as a wall charger. It takes up to 3-4 hours to charge the battery.

More maintenance must also be done on the electric car jack. Make sure to grab WD-40 lubricant. It usually comes in a spray bottle and must be bought separately. It does not come with the portable step. The long horizontal screw attached to the jack must be given WD-40 once a week. Spray approximately 5-10 seconds worth of WD-40 all across the screw in order to keep it lubricated.

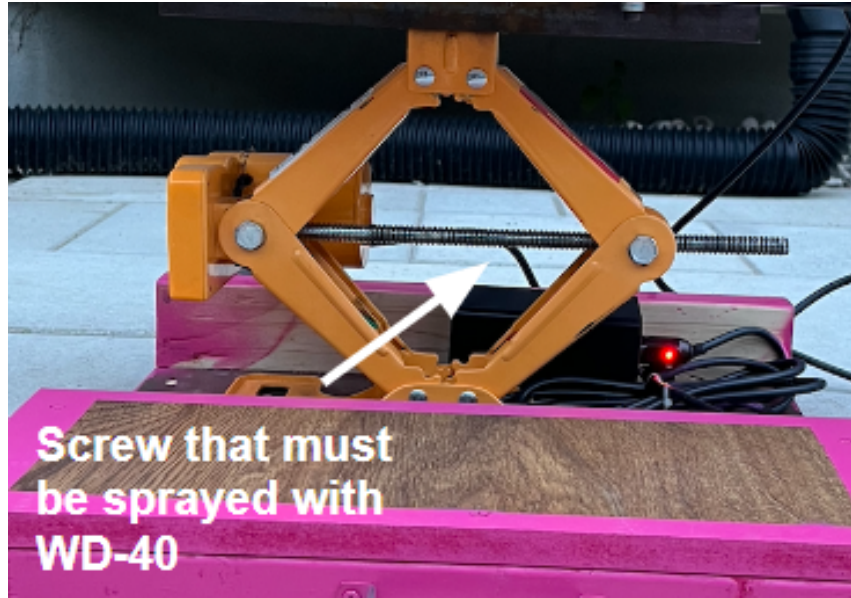


Figure 12: The shown screw must be sprayed with WD-40 once a week

Finally, it is also recommended but not needed to clean the portable step every week to maintain its looks. Or else it will start to have stains and not look as aesthetically pleasing.

5.4 Support

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6 Product Documentation

6.1 Mechanical

6.1.1 BOM (Bill of Materials)

Table 4: The Bill of Materials for everything that was used within the project

#	Part Name	Description	Quantity	Unit Cost (\$)	Extending Cost (\$)	Web Link
1	Electric Car Jack	Used to raise cars up	1	163.84	163.84	Electric Jack
2	Portable Battery	Used to power the jack	1	101.69	101.69	Battery Link
3	Pink Spray Paint	To spray paint the portable step	1	14.67	14.67	
4	Velcro Holder	To hold the remote on the platform	1	5.65	5.65	
5	Safety Rubber Tube	Cover the edges of sharp platform for safety	1	24.85	24.85	
6	Wood	Used as a substep and as a base for the product	1	0.00	0.00	
7	Handle	Handle used to carry the step or drag it	1	0.00	0.00	
8	Wheels	To drag the portable step on the wheels	2	0.00	0.00	
9	Aluminum Platform	For the user to stand on	1	0.00	0.00	
10	Zip Ties	Cable management for battery wires	2	0.00	0.00	
11	Screws	To keep everything together	20	0.00	0.00	
12	Metal frames	Welded on jack to	1	0.00	0.00	

		provide base for aluminum platform				
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6.1.2 Equipment list

Table 5: Equipment list for everything that was used to build/put together the portable step

#	Equipment Name	Description	Used for	Link to Image
1	Jigsaw Table Machine	Used to cut materials	Cutting all the wood and the aluminum platform	Click
2	Circular Saw	Used to cut materials with more freedom	Hollowing out the wooden base for weight reduction	Click
3	Drill	Used to drill holes and screw in screws	Drilling holes in multiple areas and screwing in screws	Click
4	Electric Weld	Used to weld metals together	Welding metal frames under platform to the electric jack	Click
5	Angled Grinder	To flatten out metal and remove paint	Removing paint off the top of scissor jack	Click

6.1.3 Instructions

1. Cut a 0.875" inch thick piece of wood to a 18"x18" inch square.

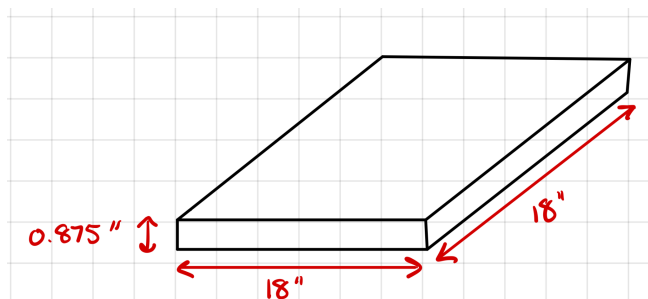


Figure 13: Dimensions of the base step

- Cut another 18"x 6" inch piece from the 0.875" inch thick piece of wood.

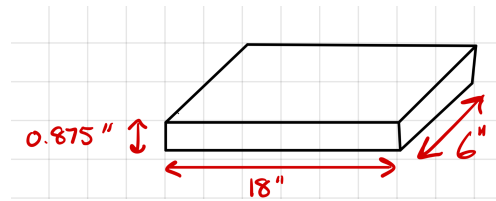


Figure 14: Dimensions of the top of the substep

- Cut a 1"x 1" inch prism piece of wood to be 18" inches long, and 2 others to be 5 inches long.

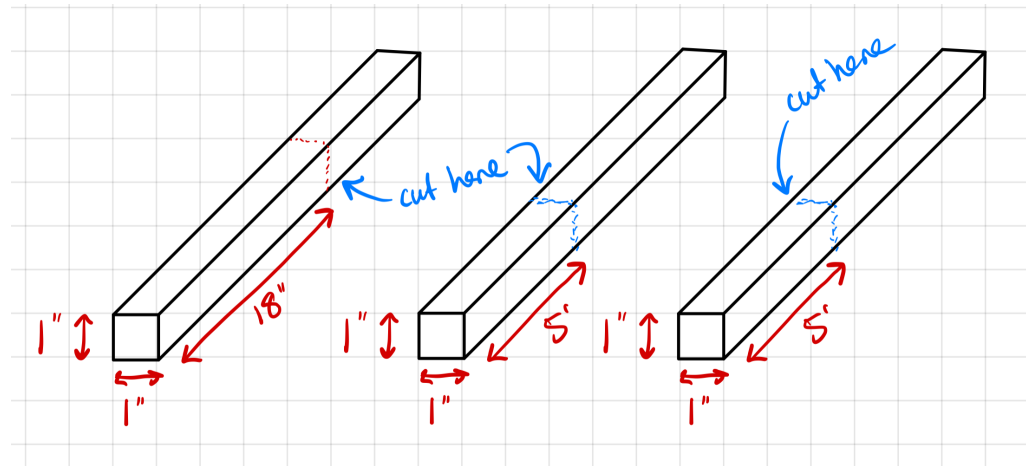


Figure 15: Lengths of the bars

- Place the 1" inch pieces in a U-shape at one end of the 18"x18" inch square and screw them in.

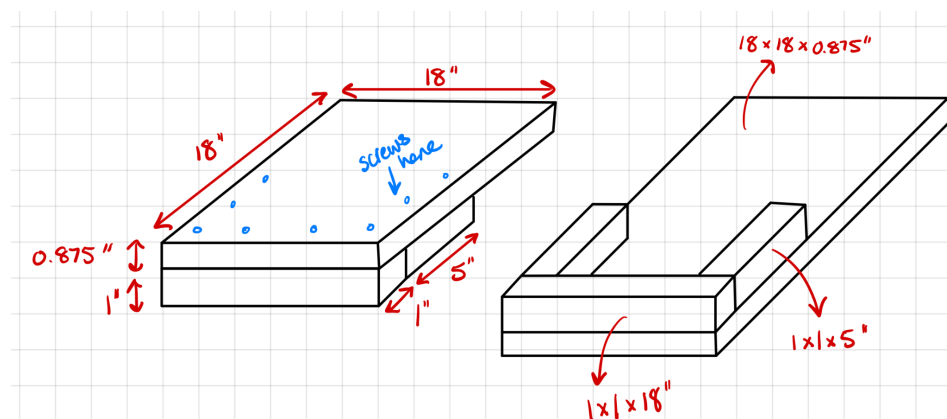


Figure 16: How to place the bars onto the bottom platform

- Place the 18"x 6" inch piece of wood on top of the U-shape and screw that piece in as well.

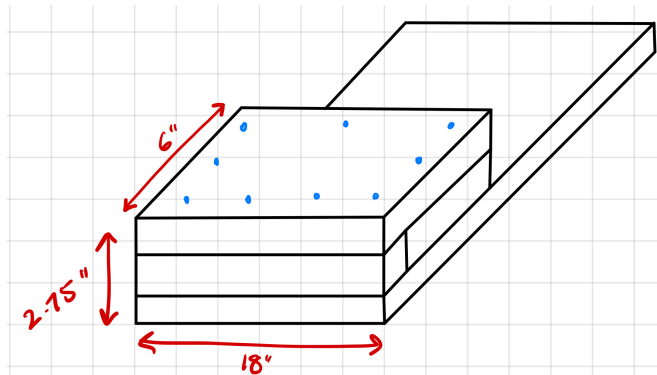


Figure 17: How to assemble the substep

- Screw a handle to the middle of the 18"x 1"x 1" inch piece of wood.

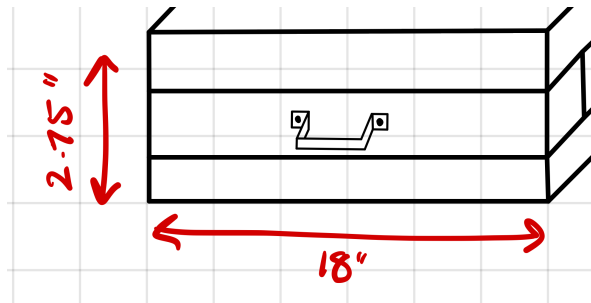


Figure 18: Handle placement

- Cut a 1"x 2.5" inch prism of wood to be 18 inches long. Screw that to the opposite end of where the U-shape pieces of wood were screwed.

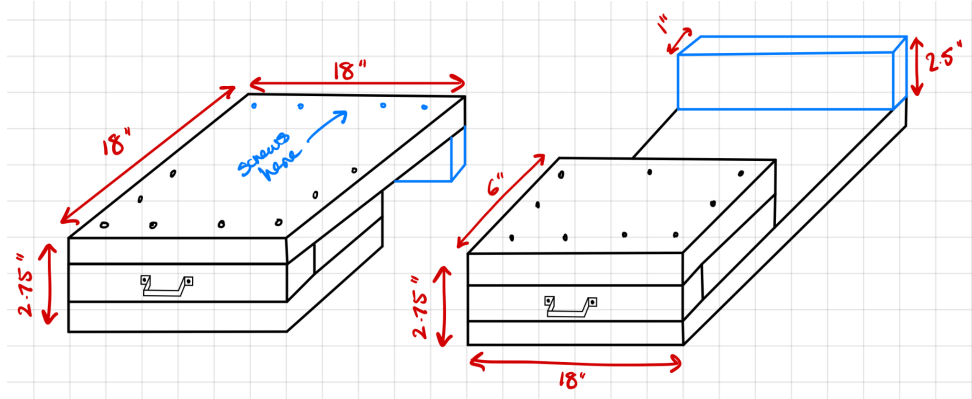


Figure 19: Placement of the back piece of wood

8. Take two pieces of wheels and screw them to each end of the 2.5" inch piece of wood. This is now the base of the step.

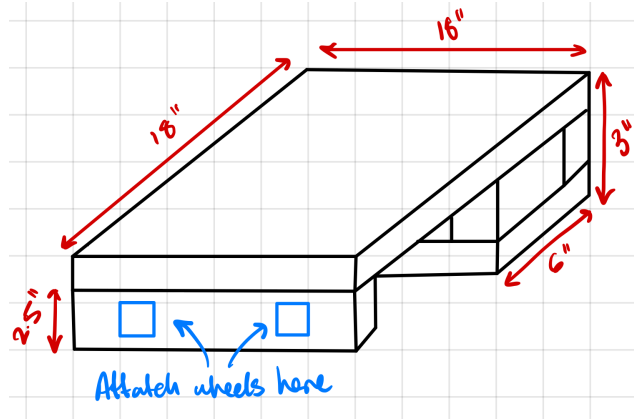


Figure 20: Placement of the wheels

9. Next, cut an angled bar into two 14" inch long pieces and two 6" inch long pieces.

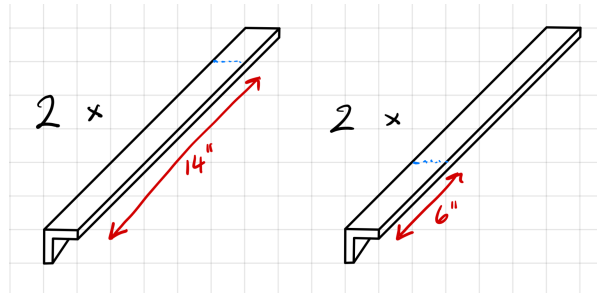


Figure 21: Lengths of the angled bars

10. Weld the 4 bars into the shape shown in the following image making sure the width of the square is slightly (about 1mm) longer than the diameter of the top of the jack.

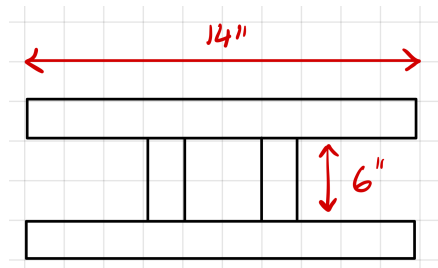


Figure 22: Placement of the angled bars

11. Use an angled grinder (shown in the following image) to scrape the paint off the top of the jack, and weld the angled bars onto the jack.
12. Drill 4 holes (2 on each 14" inch long piece) in a rectangular formation and thread the holes.



Figure 23: Placement of the holes

13. Finally, take a 0.2" inch checked metal plate and cut it to be 12"x 18".

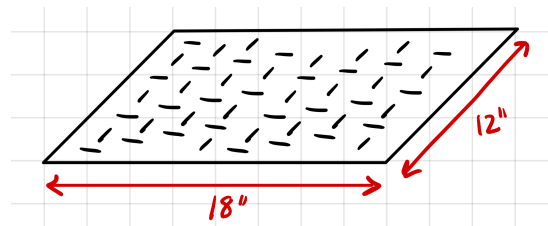


Figure 24: Dimensions of the top platform

14. Line the plate up to the center of the jack and mark down where the holes of the angled bars land on the checked metal plate using an acupuncture.
15. Drill 4 holes into the metal checkered plate and thread the holes.

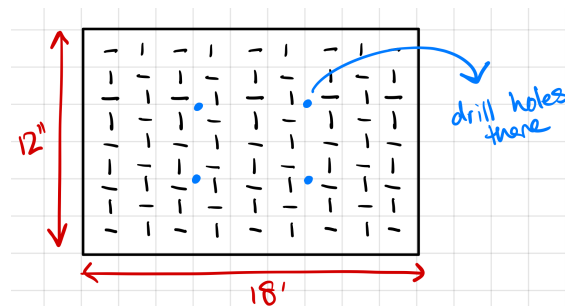


Figure 25: Placement of the holes in the top platform

16. Place the metal checkered plate on top of the welded angled bars.

17. Using bolts and washers screw the welded bars and checkered metal plate together. Make sure to screw the bolts in starting from the angled bars (bottom) and use enough washers that the bolts end at the surface of the checked metal platform.

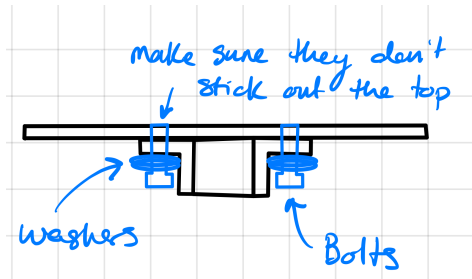


Figure 26: How to secure the top platform to the angled bars

18. Screw the bottom of the jack to the base of the step
19. Add rubber around the edges of the metal platform, and add velcro to the bottom left corner of the step.

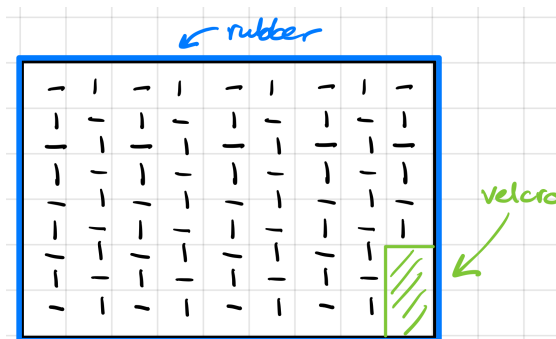


Figure 27: Placement of the rubber and velcro on the top platform of the step

20. Insert the cigarette lighter of the jack into the portable battery.
21. Hold the wire of the jack in place using tie-wraps and secure the wires to the base of the step using a screw



Figure 28: Wire management placement

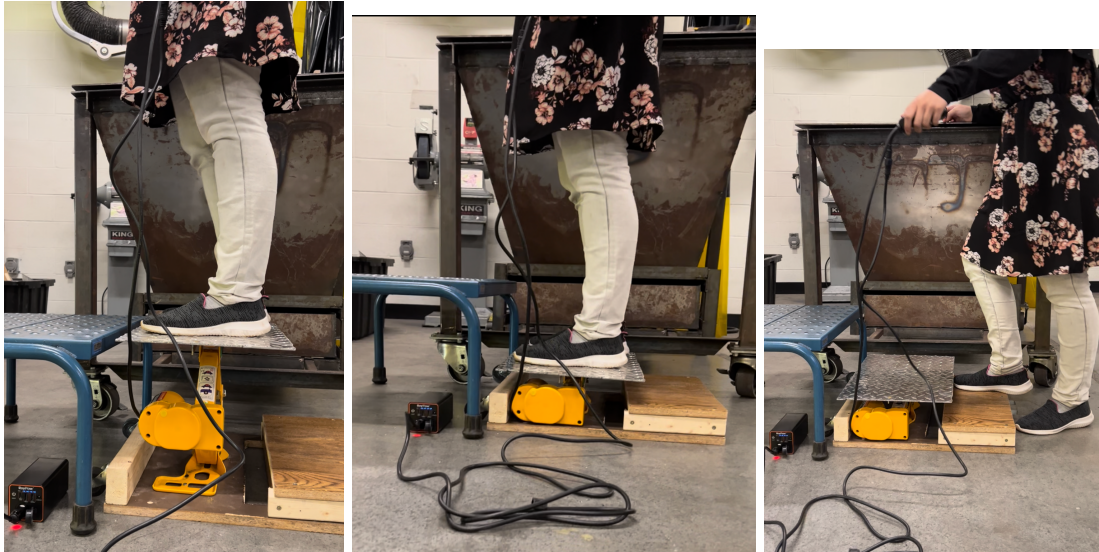
22. To finish it off, paint the base of the jack pink.

6.2 Testing & Validation

To make sure the portable step would function properly in real-world conditions, the product has gone through various types of testing over the course of its completion. The notable testing is as follows:

- Testing for bending of elevating step: When we first designed the step, the elevating portion was suggested to be wood as it would make it lightweight and working on it would be easy. Later on, in the testing phase, it was found out that the wood would be too much of a brittle material to use as it almost broke off from the main hub at one point of testing. After further analyzing the problem, we decided to use aluminum instead of wood and strengthen the hub by making an H-shape weld, which also increased rigidity. During testing, The issue was solved and the step was strong enough to withstand the body weight of 180 Lbs (which exceeds the criteria of the step to be able to accommodate 120 lbs).
- Stability of the step when at an elevated position: The step, although being fairly rigid after switching the material choice from wood to aluminum, started suffering problems

with stability. It would often tip on one side or the screw would loosen up just after 2-3 times of use. After further investigation, we figured out the problem was happening because of using the same type of screws that we were implementing for the wooden platform. As the wood platform was less thick, we opted to use 6 mm screws. So we switched them all out and use 1/4-20 x 1" flat head socket cap screws with washers for better connection of welding with the platform. The results as can be seen from the figure below were promising. The step was much more stable when at the elevated position and the user can also stand on one side of the step and not tip over.



Figures 29 - 31: Stability test. The user steps on the step and moves around the step when elevated to check for stability and overall rigidity

7 Conclusions and Recommendations for Future Work

The top platform of our final prototype was a bit wobbly and the whole step itself was a little heavy. So one of the most useful work for the future could be to lighten the base of the step. This includes cutting out any extra wood or even finding a lighter (yet still strong or stronger) material than the wood currently being used. Another way to lighten the step would be to reduce the amount of excess wire by redoing the wiring of the jack to the remote.

The other most useful work would be to make the second main lifting part of the step more stable. This could be done in multiple ways such as by adding extending stabilizing bars to each corner of the top platform. Or the harder way (that we abandoned due to lack of time and other reasons) would be to build/manufacture (or if possible buy) an X-cross scissor jack, shown below, with a motor and a remote.



Figure 32: X-Cross Scissor Jack

This way, you could control the initial stepping height which could remove the need of a substep plus reduce the weight and increase the weight capacity for more users, and also make the top (moving) platform more stable since it would already be supported at all 4 corners instead of at a single point like the electric scissor jack we used.



Figure 33: Electric Scissor Jack used in our product

Making the step more stable using the second method would be basically changing the design of the step to be similar to our original design (in Deliverable D), which we decided not to implement since we couldn't find a motorized scissor-jack in the shape of an X cross.

Overall the lessons learned were that for a mechanical project like this, teamwork is key and it's best to start physical prototyping from the beginning. Our only physical prototype was the final prototype, and I can't help but wonder if we could have avoided the wobbliness and weight problems with our final prototype if we had made a physical prototype right from the start.

8 Bibliography

https://www.amazon.ca/gp/product/B07SQ4TZBX/ref=ppx_yo_dt_b_asin_title_o05_s00?ie=UTF8&psc=1

https://www.amazon.ca/Extreme-Max-5001-5044-Motorcycle-Scissors/dp/B0196PAZ1S/ref=sr_1_5?keywords=motorcycle+scissor+jack&qid=1658711493&s=automotive&sr=1-5

https://www.amazon.ca/gp/product/B08R33NTFX/ref=ppx_yo_dt_b_asin_title_o03_s00?ie=UTF8&psc=1

APPENDICES

9 APPENDIX I: Design Files

Table 3. Referenced Documents

Document Name	Document Location and/or URL	Issuance Date
MakerRepo	https://makerepo.com/alikhreis/1217.gn-g2101z12step-on-it#&gid=1&pid=2	07/13/2022