GNG 2101

# Design Project User and Product Manual

## Portable Shower Seat


Submitted by:

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# 1 Introduction

For the disabled and elderly crowd, taking a bath is a very tough thing. In this project, the client, Darcy, has suggested the use of 3D printing, pins, screws, and soft cushioning to develop the physical shower seat. As such, the team developed Portable Shower Seat, an integrated shower seat that will allow users to take a convenient bath. The Portable Shower Seat is a simple device that, together with a foldable system, simplifies and assists users to enjoy a high-quality bath. The purpose of this deliverable is to outline the user guide of the application, so that anyone may use, further develop, or replicate the seat. Also, the document will cover errors or precautions when using the shower seat. This User and Product Manual (UPM) provides the information necessary for the disabled and elderly groups to effectively use the foldable mechanism and for prototype documentation.

# 2 Overview

After the first client meeting, our client, Darcy, indicated that he needs a shower seat when having a shower. And because his legs are unavailable to stand in the tub, so a shower seat is really important for him. Thus, our project is to design a shower seat that can be portable and can be folded into suitcase. Also, it must can afford certain weights and should be light enough to carry.

The key aspect that differentiates our product with others is the height adjustable system, it allows user to adjust seat's height to a comfortable range when sitting on it.

## Final product:

## Height adjustable system:

It contains 2 main functions: folding system that allows seat to fold into cushion and height-adjustable system that allows seat to adjust its height. The folding function is controlled by the 4 connectors on the legs, when folding the seat, first loosen the screws in the connector then fold the legs together. And the heigh-adjustable system consists of 5 silicones in legs, height can be adjusted 5 levels with them.

# 3 Getting started

## 3.1 Configuration Considerations

All items that are required are provided, therefore there are no need for any equipment other than the screwdriver. However, if one were to replace a connector part (yellow part) he could use provided .STL file and and a 3D printer to reproduce.

## 3.2 User Access Considerations

Possible users for the system are seniors and handicapped people. There are no restrictions placed on system accessibility for each user.

## 3.3 Accessing/setting-up the System

Firstly, align the hole in the yellow connector piece with the hole in the leg. And secondly, insert the pin. Repeat three more times.

**Figure 1: Step 1, Holes are aligned**

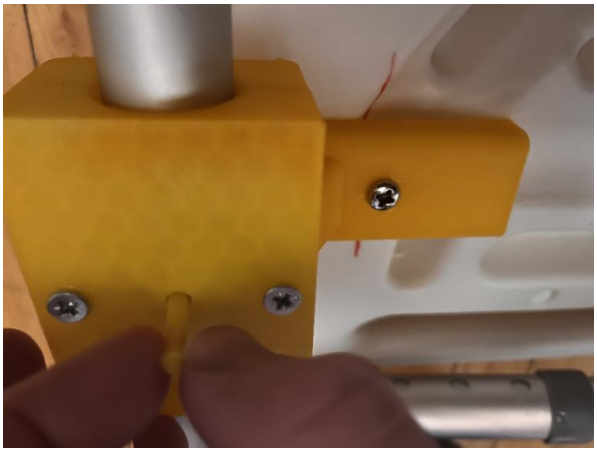


**Figure 2: Step 2, Insert the pin**

**Figure 3: Step 3, Adjust Height**

## 3.4 System Organization & Navigation

### 3.4.1 Legs

Legs are inserted into the connector part and screws are used to constraint the movement of the leg. Afterwards, when chair is required to be used pins are used to constraint the rotation of the legs. Legs are made of Aluminum.

### 3.4.2 Seat

Legs are attached to the seat using the connectors parts with a screwdriver. It is made of HDPE

### 3.4.3 Connector Part

Connector Part connects legs and the seat. Requires 3 screws to work. It is made of PLA as it was 3D printed.

### 3.4.4 Pins

Pins are inserted inside the connectors to constraint the rotation of the legs. They go inside the connector and also the leg. They are made of PLA as they were 3D printed.

## 3.5 Exiting the System

Remove all four pins and fold the legs.

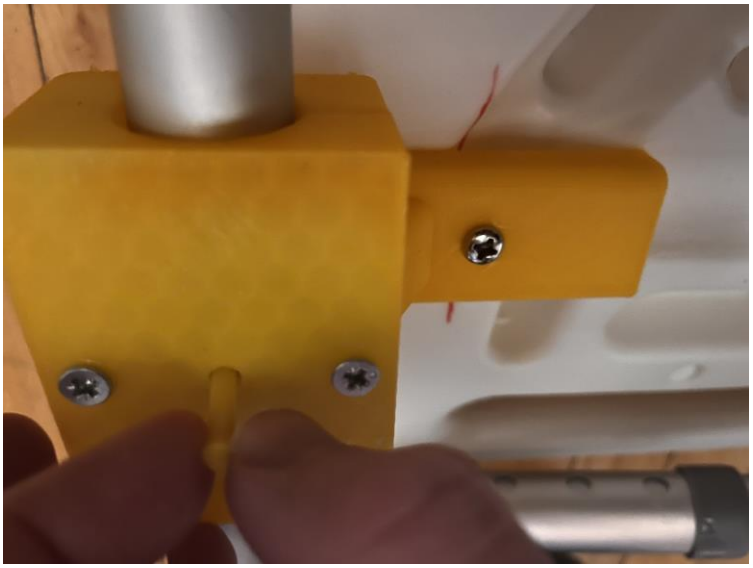


**Figure 4: Step 1, Remove the pin**

**Figure 5: Step 2, Fold the legs**

# 4 Using the System

The following sub-sections provide detailed, step-by-step instructions on how to use the various functions or features of the <>.

## 4.1 <Given Function/Feature>

### 4.1.1 <Adjust the height>

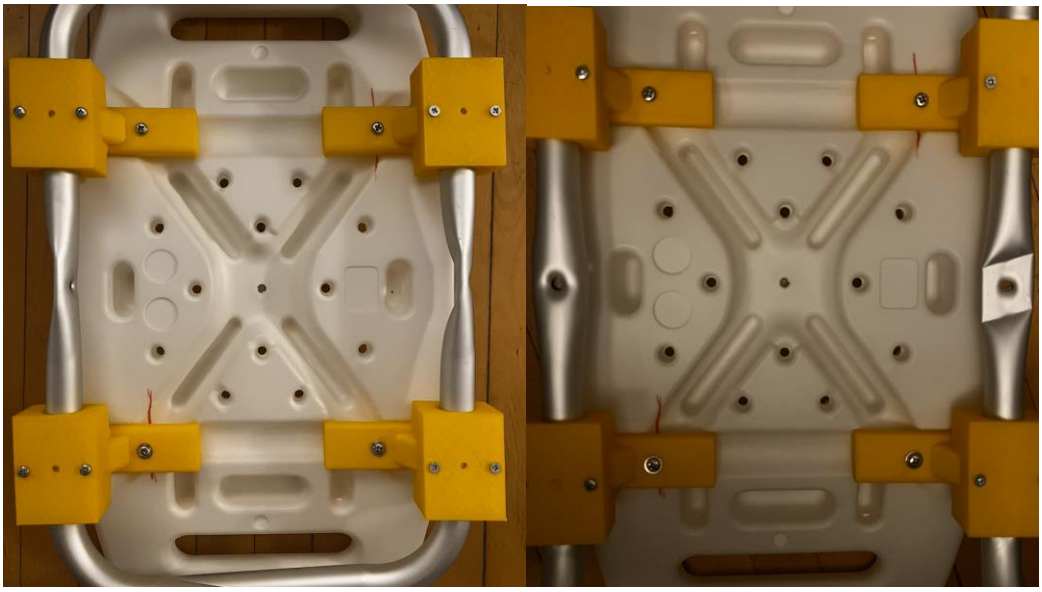
You can use the spring lock pin by rotating it to reach the desired height.

### 4.1.2 <Flod the legs>

To fold the legs, you need to take the pins on the stable squares out and rotate the legs inward.

### 4.1.3 <Expand the legs>

To expand the legs, you need to rotate the legs outward, insert the lock pins into the small holes on the stable squares.



# 5 Troubleshooting & Support

## 5.1 Error Messages or Behaviors

- Users may lose the small lock pins for the stable square
- Users may break the stable of the legs if they sit too hard, because the weight of the chair is mainly supported by the small lock pins.
- Make sure that the spring lock pin pops out after adjusting the height

## 5.2 Special Considerations

Since users may lose or break the lock pins for the stable squares, we highly recommend having an extra spare of pins.

## 5.3 Maintenance

- For safety issues, please check the resistance of abrasion of the durable feet based on your usage frequency, recommend checking per two months.
- For safety issues, please check the resistance of abrasion of the small lock pins of the stable square based on your usage frequency, recommend checking per month.

## 5.4 Support

- For any discount or free gifts when purchasing, please contact the sellers.
- For any technique issues, please contact the main responsible person Fred Xu rxu101@uottawa.ca
- For any production support, please contact the manufacturer

# 6 Product Documentation

## 6.1 <Subsystem 1 of prototype>

### 6.1.1 BOM (Bill of Materials)

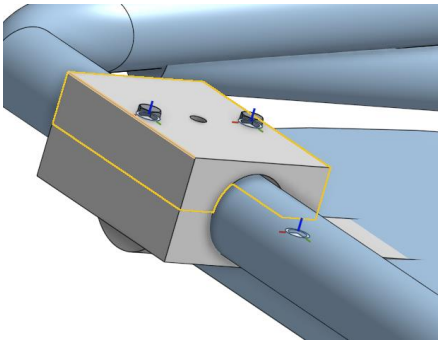
| Item Number | Part Name | Description | Quantity | Unit Cost | Extended Cost |
|---|---|---|---|---|---|
| 1 | Filament | PLA, 1.75mm, 1 kg | 1 | $ 32 | $ 32 |
| 2 | Screw | Stainless Steel | 12 | $ 0.1 | $ 1.2 |
| 3 | Legs | Aluminum | 1 | $25 | 25$ |
| 4 | Seat | HDPE | 1 | $25 | 25$ |

### 6.1.2 Equipment list

- 3D Printer
- Drill, Jacob’s chuck, and drill bit
- Screwdriver

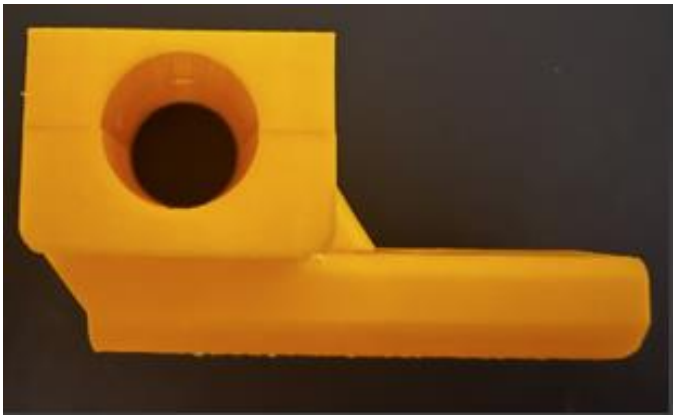
### 6.1.3 Instructions

#### 6.1.3.1 Step 1 Download the .STL file



It will be used to attach the leg and the seat.

#### 6.1.3.2 Step 2 Print the Connector Piece



Standard settings can be used for printing.

#### 6.1.3.3 Step 3 Screws

Use screwdriver to screw the screw in to 12 shown locations.

#### 6.1.3.4 Step 4 Print Pins

Standard settings can be used for printing.

## 6.2 Testing & Validation

This chair is tested with the weight of someone weighing 98 kg and therefore, applying 1000N of force to the chair. An FEA analysis done on Solidworks showed only a very conservative amount of Von mises stress.

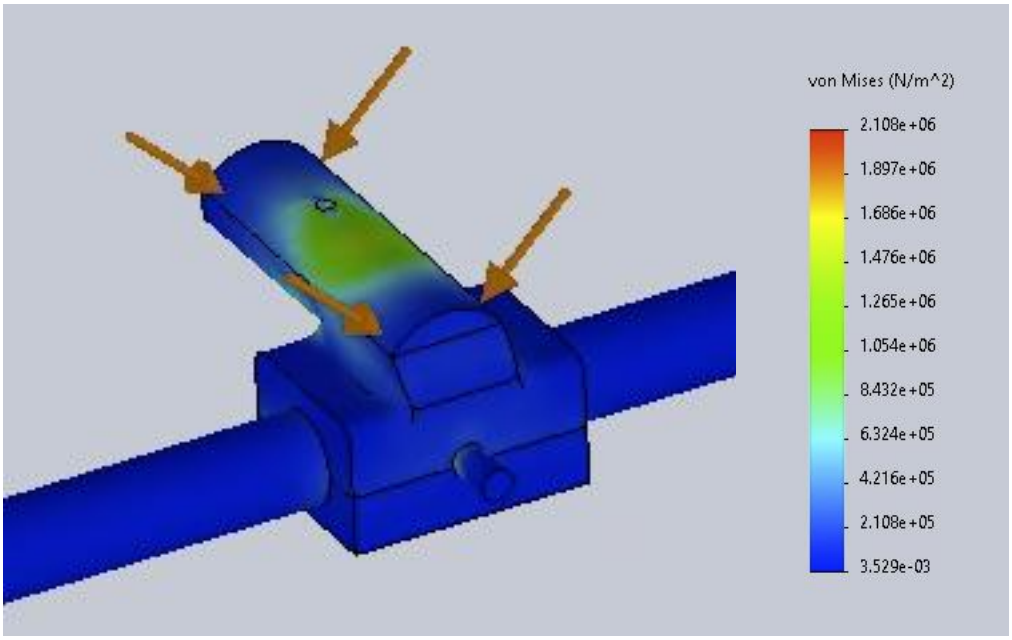



**Figure 6: FEA Analysis**

# 7 Conclusions and Recommendations for Future Work

Throughout the whole project, we learned a lot from processes doing the product. Communication is the most important thing to improve the project. It helps team members to share useful information and keep in track of the project. A team cannot succeed without good communication. Also, benchmarking is necessary to generate ideas can concepts. For future works, we'll keep improving the final products to add more functions on it. We'll share the link of our product in Makerepo and share all the files needed online so that others can promote our products based on work we did.

Because of the tight schedule in this semester, our team compress the project works. We abandoned building the whole product from the ground. Instead, we decided to make some updates on the existing product in the market because it's too time-consuming. Thus, we would like to build

the whole product all by our own if we were given more time. We may add more functions on the seat and make the seat more perfect if we can build the seat by ourselves.

# APPENDICES

# 8 APPENDIX I: Design Files

https://makerepo.com/AidanMountain/1382.gng2101-b32-infinity55

**Table 1. Referenced Documents**

| Document Name | Document Location and/or URL | Issuance Date |
|---|---|---|
| | | |
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# 9 APPENDIX II: Other Appendices