Prototype II and Customer Feedback

The Doors

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Abstract

This document outlines the customer feedback from prototype I and uses it to outline the plan for creating the second prototype. It explains how prototype II will be used to test critical subsystems of the design, and summarizes the results of the design review. Also included is the test plan for prototype 3.

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Client Feedback

Although we were unable to receive direct feedback from the client due to a lack of time, through our own prototype testing and brainstorming we were able to come up with ways to improve our first prototype. The most significant feedback we received through product testing was that it was difficult to tighten both screws at once to secure the jig into place. Using this feedback, we changed the design so that the jig had a plate on the bottom as opposed to the screw fastener. This plate would rest on the underside of the door, and by using the top screw fastener to tighten the jig in place, everything would remain secure and stable. The initial prototype was made out of items found around the home (ex. Cardboard and screws), simply to test the basic functioning of the product. For the second prototype, we are choosing to 3D print the model, providing a more accurate representation of what the final product will be like, and also allowing us to complete further product testing before developing the final prototype that will be presented to the clients.

Analytical Model

Below is an analytical model of the second prototype. It breaks the prototype down into its individual components which are then analyzed by parts, and purpose.

Figure 1

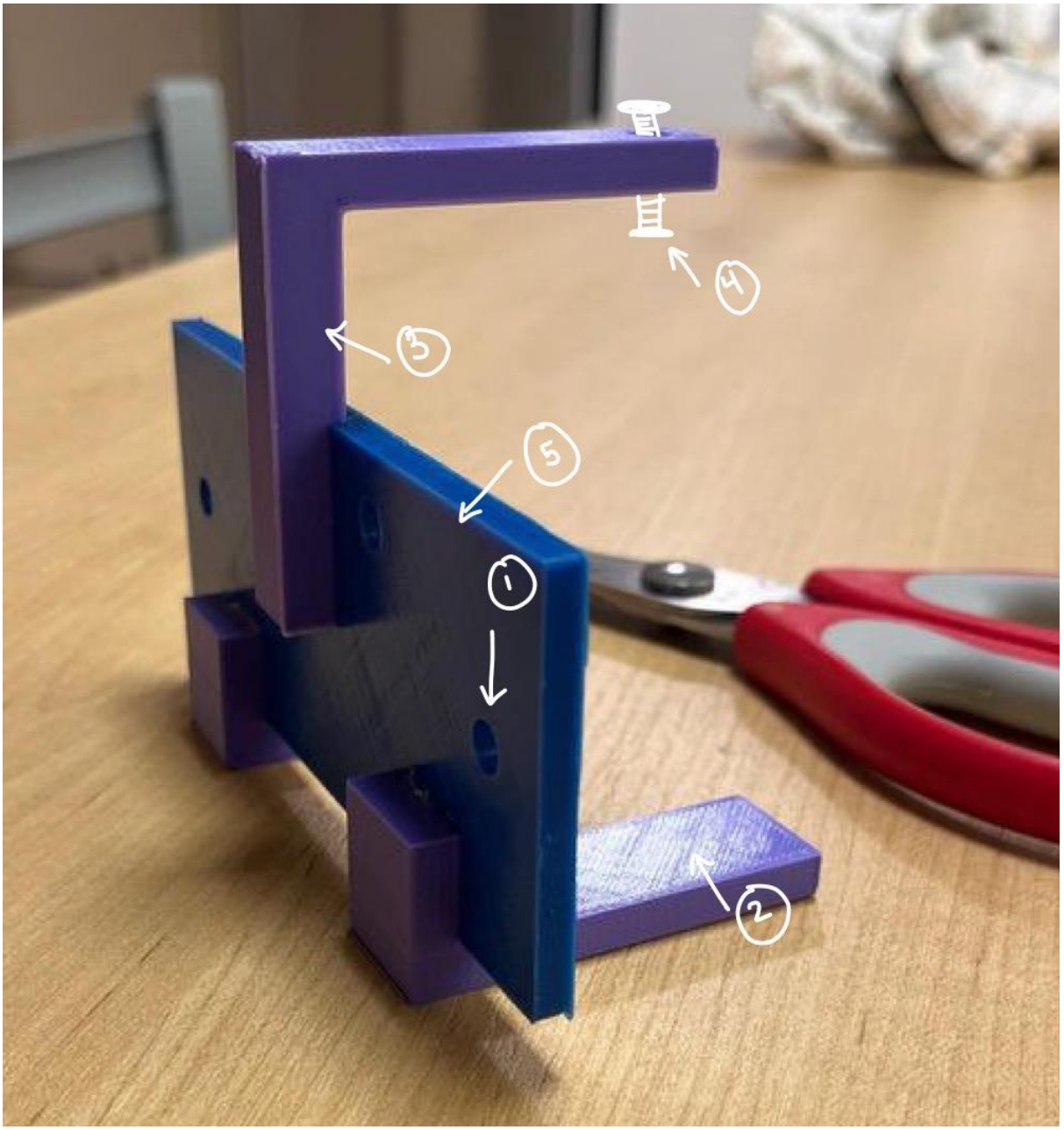


Table 1- Analytical Model

Component number (as seen in above photo)	Component name	Parts that compose it	Purpose of component
1	Guide holes	N/A	Allows the user to drill the holes for the hinge without having to measure
2	Lower stabilizer	Two lower bars that attach to the main body of the jig	Applies counter pressure to the underside of the door, increasing stability
3	Upper stabilizers	A single upper bar that attaches to the main body of the jig and has a hole at the top for the stabilizing screw	Provides a frame for the stabilizing screw to attach to
4	Stabilizing screw	A single screw and a bottom rubber plate to rest against the door	Provides counter pressure to the top of the door, increasing stability
5	Main body	A plate of metal with guiding holes	Fits directly into the pre-made cutout and provides the guiding holes for the user to drill through.

Test Result

Stability test

Objective: To test if the structure (clamp connecting to plate) can stabilize itself on the door

Description: Place the prototype on the side of a desk, and simulate a door placed horizontally/ hang some weight on the prototype and it needs to remain stable on the table

Result: can go up to 10 lbs of weights, excess deflection determined on the clamp with bolt

Structure consolidation test

Objective: To test if the structure (whole structure) is fragile or not

Description: Drop the prototype on the floor/ increase the height after each drop/ check if there is a broken part after each drop/ Stop after reaching 2m

Results: Success

Size and shape test

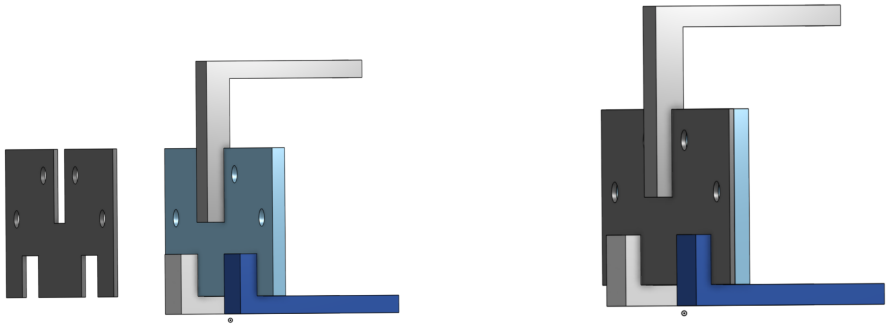
Objective: To test if the placement of holes is correct and if the driller can fit into the tube

Description: Compare the holes with the actual hinge/ try to fit the driller into the tube

Result: The hole fits the hinge and the driller fits in the tube

Updated Design

Figure 2 & 3



In order to accommodate for our clients feedback where they explained they would like the jig to be of metal construction we have altered our design to include a sheet metal plate that will attach to the main body of our jig which will provide increased strength and durability.

The other change to our design is that we will alter the top bracket in order to decrease deflection when under a load. To do this we will increase the thickness of the part and increase the infill density from 20% to 40%.

Bill of Materials

Table 2- Client Bill

Item Name	Item Description	Unit	Quantity	Unit Cost	Extended Cost	Item Link
Home Pak, Hex bolts 2 pack	M6 x 30 mm hex head bolt	CAD	1	2.29	2.29	https://www.home k-m6-x-30mm-88- x-bolts/p/2128010
ABS	40.0g of Filament	CAD	2	$0.13/ g	$10.40	ca/shop/ols/prod
K&A Round Brass	¼” x 1’ Brass Tube	CAD	1	$13.85	$13.85	w.amazo ISION- 8131-Ro

Tube						/dp/B002
Permatex Plastic Welder (epoxy)	Epoxy	CAD	1	10.99	10.99	iantire.ca/en/pdp lastic-welder-epo p.0383850.html QjwtJKqBhCaA Xv8MF8BoQpQ bmF6CErbag6iy JaAvDGEALw_ s#store=174
Pauilin sheet metal	6”x18” 16 gauge steel sheet	cad	1	11.97	11.97	
Total (Without shipping or tax)					$49.5	
Total (With shipping and tax)					$56	

Table 3- Actual Bill

Item Name	**Item Description**	**Unit**	**Quantity**	**Unit Cost**	**Extended Cost**	**Item Link**
Home Pak, Hex bolts 2 pack	M6 x 30 mm hex head bolt	CAD	1	2.29	2.29	https://www.home k-m6-x-30mm-88- ex-bolts/p/2128010
K&A Round Brass Tube	¼” x 1’ Brass Tube	CAD	1	$13.85	$13.85	w.amazo CISION- 8131-Ro /dp/B002
Permatex Plastic Welder (epoxy)	Epoxy	CAD	1	10.99	10.99	iantire.ca/en/pdp lastic-welder-epo p.0383850.html QjwtJKqBhCaA Xv8MF8BoQpQ bmF6CErbag6iy JaAvDGEALw_ s#store=174
Total (Without shipping or tax)					$27.13	
Total (With shipping and tax)					$30.66	

Prototype 3 Test Plan

Table 4

Test ID	Test Objective	Description of Prototype used and of basic test method	Description of results to be recorded and how these results will be used	Estimated test duration and planned start date
1	Test clamping force	Entire unit will be used and will be tested with increasing increments of force until failure	Maximum weight until failure will be recorded. Improvements to clamp will be made if target strength is not met	Each increment will be done in intervals of 2 minutes. Nov 18th
2	Test structural strength of components	Entire unit will be used. Force will be applied to specific areas that are expected to be weakest	Reflection distance both attached and detached will be measured along with the corresponding force applied. Depending on pass or fail according to target force, failed components will be edited to increase strength	Each increment will be done in intervals of 2 minutes. Nov 18th
3	Efficiency	Entire unit will be used. Peers will be asked to attach jig to various surfaces	Time to install and feedback will be recorded. Adjustments to design will be made accordingly	Each increment will be done in intervals of 2 minutes. Nov 19th
4	Test strength of glued joints	Fabricated parts to replicate joints of actual prototype. Force will be applied in increasing increments.	Force will be added until failure of joint and recorded. Adjustments to joint connection method may be done depending on results	Each increment will be done in intervals of 2 minutes. Nov 18th

Conclusion

Prototype 2 has met the majority of target specifications and it is expected that once the changes detailed in this document are applied to prototype 3 all target specifications will have been met and the product will be ready for design day.