Deliverable H: Prototype III and Customer Feedback

Group 3

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To fulfill the objectives outlined for developing the second prototype and devising a test plan for the third, our team will follow a structured approach:

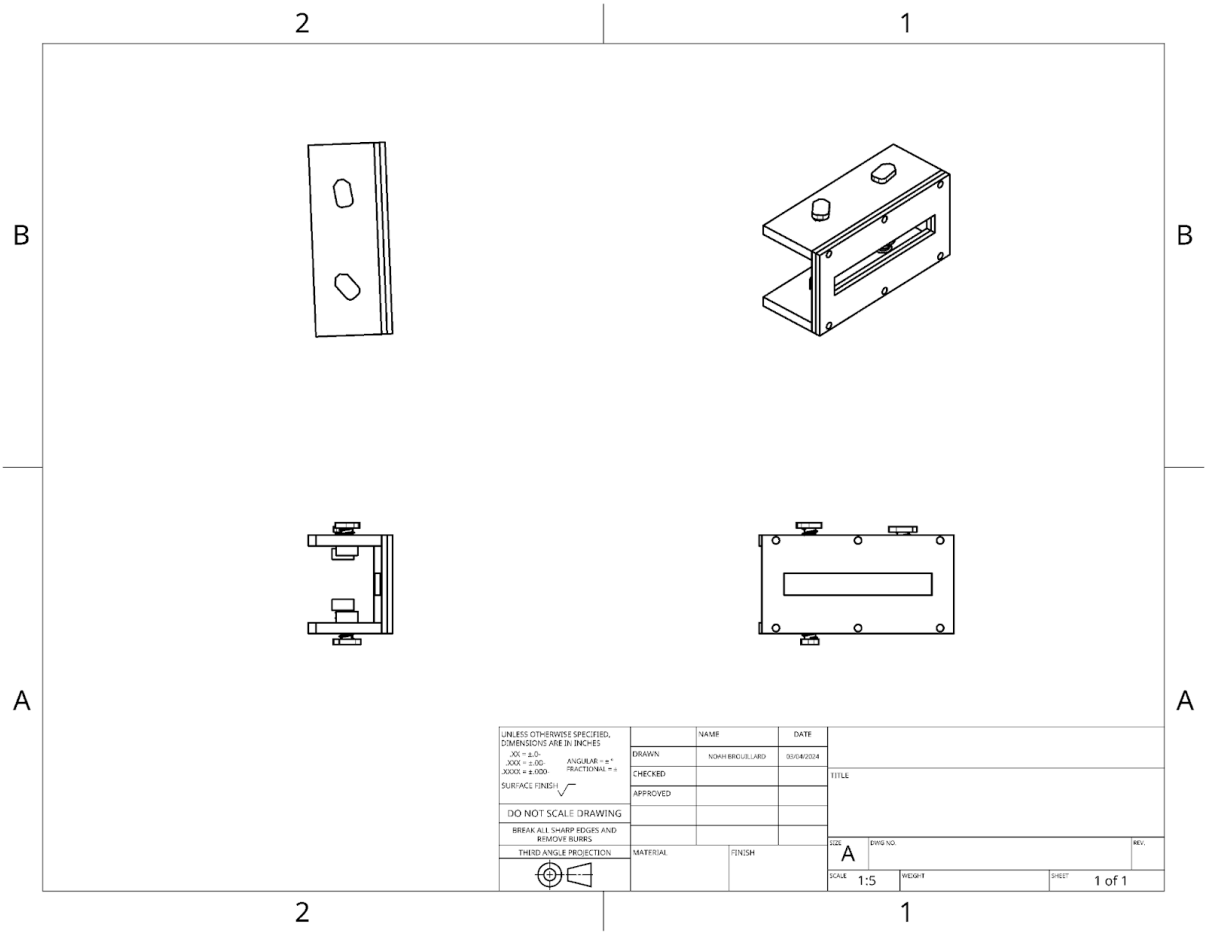
Prototype Development:

The team developed three prototypes over the course of several weeks. Each prototype involves 3D designing components and assembly. After several tests on the second prototype, we decided to decrease the dimension of the helix on the screws, as the precious screws were tightly fitted into the plates, and cannot be functional.

Prototyping Test Plan and Documentation:

Test ID	***Test Objective (Why)***	***Description of Prototype use and of Basic Test Method (What)***	***Description of Results to be Recorded and how these results will be used (How)***	***Estimated Test duration and planned start date (When)***
1	Clamping Strength	We will be determining the strength that the clamping system can withstand prior to shifting or experiencing structural damage.	A horizontal and vertical load will be applied to the jig, therefore replicating the use of a router and a measurement of distance travelled will be used to determine the strength.	This test is not very time-consuming and will be performed after completing the assembly of the jig.
2	Time consumed during the clamping and unclamping process.	We will be clamping the jig to a door and unclamping it to determine how much time is consumed during this process.	recording the time taken for clamping and unclamping.If the time is fast (<30 seconds), adjustments are not necessary. If the time is slow, adjustments are necessary to increase time efficiency	This test can be conducted any time after conducting the clamping test and should take less than three minutes. This test can also be conducted as many times as needed as it is not time-consuming

3	Changing Width	We will be using the bolt/thread system to determine that the jig fits into the specifications of Ambico's doors.	We will be using another frame-like object representative of the door of Ambico. Then a third-party tool will be used to measure the accuracy.	This is also not very time consuming and will be performed after the prior 2 tests. ETA is 3 minutes.



Gathering Customer Feedback:

Prof Majeed suggested finding a better way to produce the plates as printing the full plates would be time-consuming. Since a 3D printer excels at printing smaller parts, the design can be split into sections in which only the mechanism (the most vital component) is 3D printed. The other components would consist of other manufacturing techniques such as Laser-cutting. If the main body is printed by the 3D printer, it is a big challenge to the client's request on the durability and longevity

Ambico suggested refining our initial jig to be more precise, specifically to be accurate within 1/32 of an inch, as before it was accurate to 1/16 of an inch. As such, the threads were edited so that they are accurate as per Ambico's specifications.

Peers recommended using rubber or more malleable plastic for the cover under the cutout frame.

Update and Iteration:

The updates made to this prototype include a slimmer main body plate, using 3D printed bolts instead of screws (where applicable), and smaller screws. The initial prototypes had thicker body plates which is not necessary as the plate can be thin because it will be manufactured out of steel. The reduced thickness of the plate yields a result of less weight, reduced material use, and higher strength when compared with PLA. In the third prototype, we changed all the securing screws to bolts, as the connections do not need to move and are stronger. The initial prototypes did not function efficiently or properly as the screws were slightly too large and required force and lubricant to thread properly. This was changed in our third prototype to provide easy turning of the handles and clamps to decrease further setup time as well as prevent the screws from breaking or causing damage to the side plates. In order to update the accuracy of our jig we made custom screw threads so that each turn moves the screw an increment of ⅛ of an inch totaling ¼ of an inch overall to better adapt to their various door sizes.