Hingineers

Group 17

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Abstract

Within this deliverable you will see how our group is thinking of splitting up our budget of $50 and if we're going to stay within that budget or not. This deliverable is to show the reader how we plan to spend our money and what we plan to spend it on as well as what parts that we buy will be for what prototype. You will also get a sense of the risks associated with us selecting certain materials and the risks that come with our design if any. At the end of this document, you will have a brief understanding of what is to come in our following deliverables consisting of what we plan to prototype and how it will all come together in the end.

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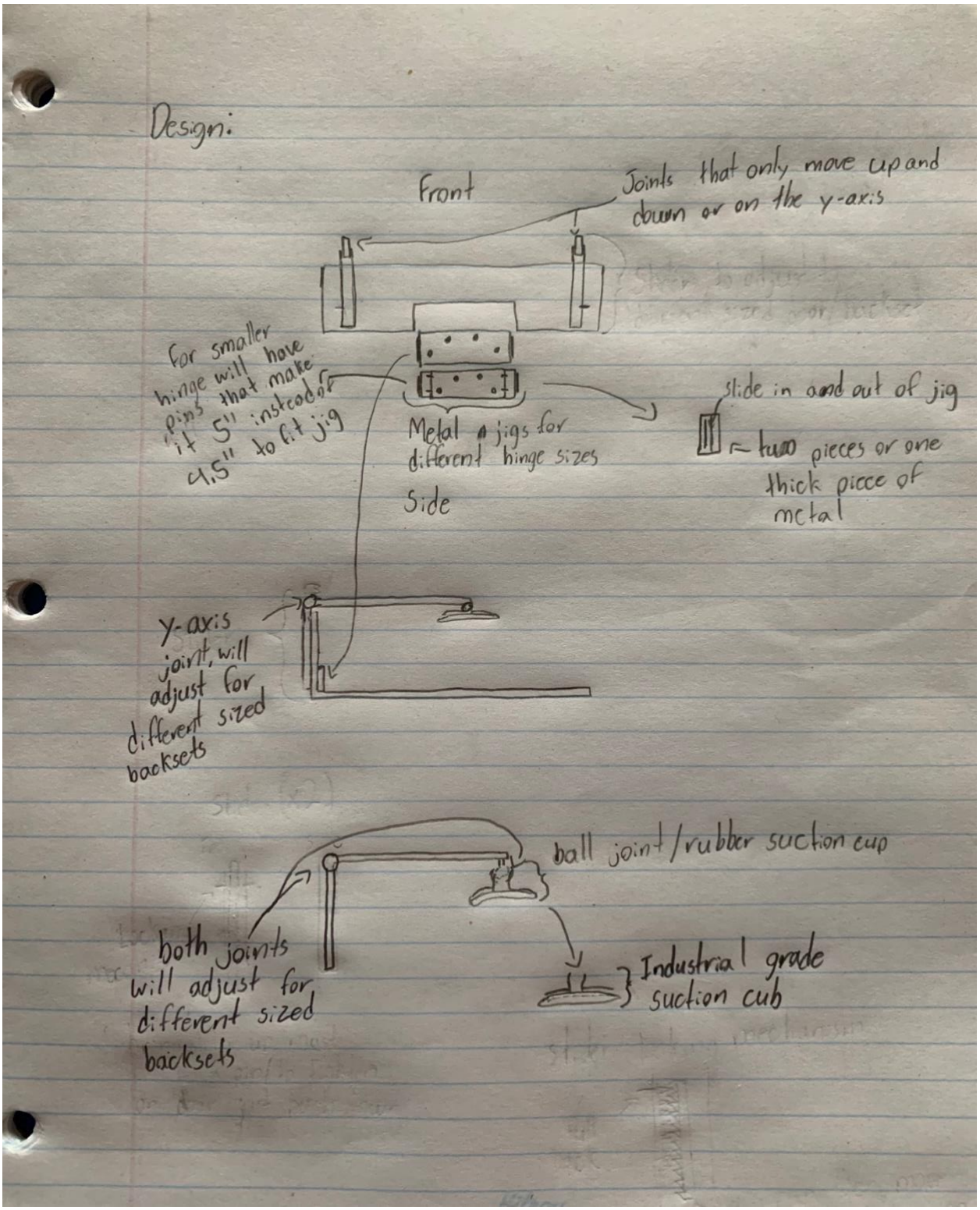
1. The Design

Figure 1: Our Final Design



2. Budget

Table 1 - Bill of Materials

Item name	description	quantity	cost (cad)	extended cost (tax)
Aluminum Vacuum Heavy Duty Suction Cup	Is a suction that is used for glass but in the reviews, we found one being used on a finish used on the doors at AMBICO. (2 Pack).	1	$32.99	$37.94
Ball and Socket Joint	Is the joint that will be used at the end of the metal rod to connect the suction cup to the rod. (2 Pack).	1-2	$1.91	$2.20-$4.39
Steel	One of our group members has left over steel that we are able to use so that will be for the rods going to the suction cups as well as for the hinge jig that has the holes for different size hinges. Also be used for the locking mechanism of the steel hinge plate.	Depends on the size of pieces.	Free	Free
Tee Connector Fitting	Will be used to let the rods that have the suction cups on them move accordingly to the different sized backsets on the door.	2	$2.30	$2.64
			Total after tax:	$42.78-$44.97
			Budget:	$50

3. Equipment

Table 2 - List of Equipment

Item Name	Description	Type / Material	Prototype Num.	Source
Aluminum Vacuum Heavy Duty Suction Cup	Is a suction that is used for glass but in the reviews, we found one being used on a finish used on the doors at AMBICO. (2 Pack).	Aluminum	1	https://www.amazon.ca/SOLUDE-Aluminium-Suction-Granite-Gripper/dp/B09FSRQV5G/ref=sr_1_7?crid=8CJXKLKN2Q5C&keywords=suction%2Bcups%2Bwith%2Blevers&qid=1698422977&sprefix=suction%2Bcups%2Bwith%2Blvers%2Caps%2C188&sr=8-7&th=1

Ball and Socket Joint	Is the joint that will be used at the end of the metal rod to connect the suction cup to the rod. (2 Pack).	Spring Steel	2	https://www.aliexpress.com/item/4000409344564.html?src=google&src=google&albch=shopping&acnt=708-803-3821&slnk=&plac=&mtctp=&albbt=Google_7_shopping&albagn=888888&isSmbAutoCall=false&needSmbHouyi=false&albcp=19108228023&albag=&trgt=&crea=en4000409344564&netw=x&device=c&albpg=&albpd=en4000409344564&gad_source=1&gclid=Cj0KCQjw4vKpBhCZARIsAOKHoWTaCDOLTsVePLlsNl1B-2zJii3qfs0GPgjKHTEGgevL9Bi6X-SVLuwaAhZaEALw_wcB&gclsrc=aw.ds&aff_fcid=5fcfa88fa7aa4df188a2bca458a7aea7-1698503839674-09380-UneMJZVf&aff_fsk=UneMJZVf&aff_platform=aaf&sk=UneMJZVf&aff_trace_key=5fcfa88fa7aa4df188a2bca458a7aea7-1698503839674-09380-UneMJZVf&terminal_id=0bff09d8cdc945d395cb28e6d86c966d&afSmartRedirect=y
Left Over Steel	One of our group members has left over steel that we are able to use so that will be for the rods going to the suction cups as well as for the hinge jig that has the holes for different size hinges. Also be used for the locking mechanism of the steel hinge plate.	Steel/Scrap Metal	All	Zigman's Scrap Metals
Tube Tee Connector Fitting	Will be used to let the rods that have the suction cups on them move accordingly to the different sized backsets on the door. This part will be heavily modified as we are not using tubes so we will make it flat on the connection side and leave the circle so that it can still move up and down.	Metal/Could be Aluminum	2	https://tinktube.com/shop/t-connector/?utm_term=&utm_campaign=Shopping:Product+feed:Mixed:+-+Shopping+-+US+-+EN+-+-+TINAW0029&utm_source=adwords&utm_medium=ppc&hsa_acc=6419365433&hsa_cam=12601477867&hsa_grp=121466524922&hsa_ad=508679508185&hsa_src=g&hsa_tgt=pla-293946777986&hsa_kw=&hsa_mt=&hsa_net=adwords&hsa_ver=3&gad_source=1&gclid=Cj0KCQjw4vKpBhCZARIsAOKHoWRDWOmOCAQ2laLn1R354cxl0dbYqKkCgRyVyfGBg0_WbUGdi4gm6qcaAoVXEALw_wcB

Welder	This will be used to join all our components together as most of them are metal and joining metal pieces together is easiest with a welder as it gives it the most security and strength.	Tig Welder	All	In one of the STEM workshops.
Metal Saw	This will be used to cut out the spot for our hinge metal plate going into the jig. We also need it to cut the lengths of the connecting rods to the suction cups.	Metal Saw	All	In one of the STEM workshops.
Possibly 3D-Printer	This may or may not be used as most of our prototype will be made of metal and some other parts with no room for plastic	3D-Printer	Depends	In the MakerLab.

4. Project Risk

Table 3 – Project Risks

Risk	Severity	Likelihood	Mitigation/Contingency
Suction cup leaves marks on vanier	Medium	low	If the labourer frequently cleans the suction cups then there should be no marks left on the vanier.
Saw dust affects the seal of the suction cups	High	Low	If the labourer frequently cleans the suction cups then the seal from the suction cup should consistently be good.
Operator drops jig and damages clamping mechanims	Medium	Medium	If any part of the clamping mechanism is damaged then the broken piece can be replaced instead of replacing the whole jig

Dust gets into the articulating joints	low	High	If dust gets into the joints it may make the movement feel stiff but the jig should still function. If the movement gets bad then the operator can clean the joints using high pressure air or water.
Dust gets into the rails that the hinge molds slide into	Low	High	If a lot of dust builds up in the rails then the mold won't be seated properly in the jig. If this occurs then the operator can clean the dust out with the high pressure air or water.

5. Prototyping Test Plan

5.1 Prototype 1

For the first prototype, we must first verify whether the jig properly fits on all doors it is to be used on. This requires its suction cups to be firm and airtight to prevent sliding while the jig is used, a perfect fit of the piece that holds the jig in place on the opposite side of the door and overall verifying if the jig is stable and secure while latched onto the door. If the door can withstand a variety of external movements/forces caused intentionally or unintentionally without moving from its place, it is deemed stable enough for use.

5.2 Prototype 2

In the next prototype, it is important that we verify that the jig is properly aligned relative to the door as well as the mold used to measure does not move in place. This means the frame of the jig that holds the mold remains perfectly parallel to the edge of the door that is being drilled/tapped. Additionally, the mold inserted into the jig must be secured in place so that it cannot be displaced by the drilling/tapping tools and inadvertently drill in the wrong place or damage the door. If all measurements made by the mold are consistently accurate and aligned properly throughout the measuring process, the jig should then be good for use.

5.3 Prototype 3

For the final prototype, we must verify that the jig is usable within its intended environment and is durable to avoid damage in some accidental event. This would mean evaluating its performance in a dusty work environment – having it covered in dusty and seeing whether it is still functional or not – and simulating its use to make sure it does its tasks properly while also simulating common errors that may damage the jig to see if the jig can still function despite that damage. Once the jig works exactly as intended after making the appropriate corrections, it should be ready for actual use.

6. Conclusion

To conclude we have agreed on a simple design that relies on suction cups to hold the jig to the door instead of a clamping mechanism. We may make changes to our design if we find flaws as we test our prototypes. The simplicity of our design allows us to be under budget which is important because it gives us a small safety

net if we want to make changes or of we need to replace a part. We will be able to manufacture the jig using the tools available to us in the STEM facility.