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Design Project User and Product Manual

Door Hinge Jig

Submitted by:

GROUP 7

Amelie Zietak, 300360976

Nicole Moszkowicz, 300287553

Rameen Rana, 300360323

Dima AlQaruoti, 300379269

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University of Ottawa

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List of Acronyms and Glossary

Table 1. Acronyms

| Acronym | Definition |
|----------------|-------------------|
| Mig | Metal Inert Gas |

Table 2. Glossary

| Term | Definition |
|-------------|--|
| Bandsaw | An infinite saw made of wheels and a steel band with a serrated edge |
| C-Clamp | Clamp device in a shape of a C. |
| Jig | A tool holder that directs the tools being used on a piece of work. |
| Prototype | An initial version of a product, model, or sample created to test an idea or procedure |

1. Introduction

This User and Product Manual (UPM) provides the information necessary for users to effectively use the Door Hinge Jig and for prototype documentation. The purpose of this door hinge jig is to make the process of creating the holes for a door hinge, easier. This document is set up in a fashion that would make it easy for users to understand and follow. The purpose of this document is to aid users in understanding how to use the jig and how the jig was designed and created.

2. Overview

AMBICO has asked our team to design a jig to make the installation of wooden door hinges easier; they have provided detailed information about the project allowing us to create a plan that focuses on affordability, efficiency, accuracy, and durability. Our product is extremely quick and easy to use with extreme accuracy.



Figure 1.1



Figure 1.2

This prototype was created out of a 16 gauge hot-rolled piece of sheet metal steel. This specific steel was chosen, since it was thick enough to not need additional bearings and would be durable for the labourer. The use of bearings was deemed unnecessary as we were informed the labourers at AMBICO were very precise in drilling and the steel would be thick enough to resist deformation of an accidental drilling into it. The holes were also created to be slightly oversized to account for this. The stability system for the jig relies completely on the c-clamps purchased from amazon. These clamps are also weldable and were able to be attached to the jig so it can remain stable to the door by being clamped to the top.

2.1. Cautions & Warnings

Before using the prototype be cautious to secure the clamps tightly around the door to make sure the jig does not move around the work piece or cause harm.

3. Getting started

The door hinge jig has a few simple steps to follow when installing it. Loosen the clamps, fit into routed out part of door and tighten clamps. After installing the jig is when you would have to follow your own steps in drilling and tapping the holes. After finishing creating the holes in the door loosen the clamps and remove the jig of door and neatly put jig away.

3.1. Configuration Considerations

For the use of the jig, a drill would be needed. The idea is for the jig to be a template for drilling and tapping the holes for the installation of a door hinge.

3.2. User Access Considerations

Our door hinge jig was created for the company AMBICO, but due to the easy nature of installing our jig, anyone above the age of 16 can use it. The jig is fairly simple and safe to use so it would be safe for at home use.

3.3. Accessing/setting up the System

To set up the door hinge jig loosen the C clamps enough to fit on the door, fit the backset into the routed out part of the door and then tighten the clamps tightly enough to fit on the door and be stable. Use the nut as a double locking method to prevent the clamps from clamping to tightly and ruining the finish on the door.

3.4. System Organization & Navigation

3.4.1 Backset

The main component of the jig is the 4 inch backset with 4 holes for precise drilling of the door hinge.

3.4.2 C-Clamps

There are two C clamps welded on to the jig to provide stability.

3.5. Exiting the System

Place or hang the jig by the clamps in a cool dry area to properly store the device.

4. Using the System

This door hinge jig is extremely simple and easy to use, therefore there is 2 simple features, C-Clamps and the backset.

4.1. C-Clamps

The C-clamps are simple to use all that is needed is for the clamps to be placed on the door and then tightened using the bolts.

4.1.1. Nuts

The nuts on the c-clamp are in place as a double locking method and they provide a less tight grip on the door, for keeping the finish of the door untouched. So if preferred tighten the clamps by tightening the nuts.

4.2. Backset

The backset just simply needs to be placed into the routed out part of the door. No setup is required to use the backset.

5. Troubleshooting & Support

The door hinge jig does not have any troubleshooting messages due to the fact it is at physical prototype. Therefor any issues that may be encountered, contact the support team.

5.1. Error Messages or Behaviours

In rare occasions the C-clamps may break off the main backset component. If this happens contact the team for support.

5.2. Special Considerations

In a special circumstance, the jig may have sharp edges. Contact the team for support if applicable.

5.3. Maintenance

To avoid failure simple steps in regular maintenance is required. The jig should be stored in a dry area to avoid the jig from getting rusted.

5.4. Support

If jig fails and support is needed contact one of the following:

Amelie Zietak: aziet081@uottawa.ca

Nicole Moszkowicz: nmosz058@uottawa.ca

Rameen Rana: rrana029@uottawa.ca

Dima Alqaruoti: dalqa074@uottawa.ca

6. Product Documentation

To build the final prototype lots of testing and changes were done to our first design.

6.0.1 Mechanical

The prototype was made using a bandsaw and a Mig welding machine.

6.0.2 Software

The prototype was first created on CAD software.

Step 1

Mark the 16 gauge steel sheet to the specific dimensions. Mark out the backset and the four drilling holes.

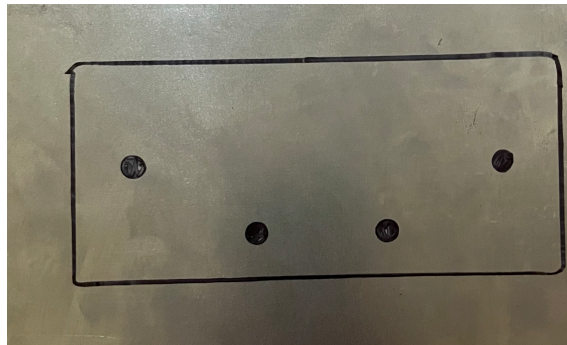


Figure 1.3

Step 2

Cut out the backset with a bandsaw and use a file to make the edges not sharp.



Figure 1.4



Figure 1.5

Step 3

Use a drill press with the 7/32" drill bit to drill out the holes on the backset. Then use a file to get rid of the burrs.



Figure 1.6



Figure 1.7

Step 4

Cut the C-clamps on the bandsaw in a diagonal and cut the bottom L of the clamp in half.



Figure 1.8



Figure 1.9

Step 5

Use a Mig welding machine to weld the C-clamps to the backset.



Figure 2.0

6.1. Clamps

6.1.1. BOM (Bill of Materials)

\$6.74 6”x 18” 16 gauge stock metal - Steel

<https://www.homedepot.ca/product/paulin-6-x-18-inch-16-gauge-steel-sheet/1000861865>

\$18.37 C Clamps

https://www.amazon.ca/dp/B09MTGVJBR?ref=ppx_yo2ov_dt_b_product_details&th=1rking-C-clamp-Openings/dp/B08LBBTWVS

6.1.2. Equipment list

1. Mig welding machine
2. Bandsaw
3. Drill press
4. Files

6.1.3. Instructions

The clamp subsystem was bought online by a manufacturer for the prototype.

6.2. Testing & Validation

6.2.1 List of Tests

1. Record the maximum pressure the jig can withstand before deformation or failure. This data will determine the structural integrity
2. Record any deviations in hole placement. Evaluate the jig’s ability to consistently produce accurate hinge hole alignments.
3. Record user feedback, including any challenges faced during operation. Evaluate the prototypes usability based on user input.
4. Record any issues or modifications needed to fit various door sizes. Evaluate the jig’s adaptability and compatibility.
5. Record and imperfections or roughness in the holes. Evaluate the jigs ability to produce clean and precise holes.
6. Record the time taken and any difficulties encountered during assembly. Evaluate the prototype’s ease of assembly based on user feedback.

6.2.2 Summary of tests

When using this test plan to test our jig, we were able to confirm it met all the necessary requirements for this project. Since it was made of a flat sheet of steel, it is extremely structurally stable and did not reach a point of seeing deformation even at 25lbs. Based on user input we also confirmed that the jig was easy to use and assemble as it only involved the manual adjustment of the clamps which are a simple mechanism and once doing that the jig remained stable on the door throughout the drilling process. The holes on the door came out well as the holes on the jig were oversized and did not chip or leave any residue on the door itself. The drilling of the holes itself took approximately 10 minutes, even with the addition of the time needed to tap the holes, this time should still remain under the 30 minute goal mark. One issue we encountered with the jig was not being able to make it adjustable for different backset. Due to timing and not having all the correct dimensions we were not able to include the sliding bottom. However, the jig we have created could be replicated with the 5 inch hinge dimensions to solve this problem.

7. Conclusions and Recommendations for Future Work

Our door hinge installation jig is not just a tool – it's a solution to a long-standing problem. With a focus on durability, simplicity, adjustability, and affordability, our product is poised to revolutionize the way door hinges are installed. Looking ahead, we plan to introduce a sliding backset for 5-inch hinges, further expanding our product's versatility.

8. Bibliography

<https://www.amazon.com/Bosch-83038-Deluxe-Hinge-Template/product-reviews/B0000224KW>

<https://www.amazon.com/Bosch-83038-Deluxe-Hinge-Template/product-reviews/B0000224KW>

<https://milescraft.com/product-category/door-installation/mortise-kits/>

APPENDICES

9. APPENDIX I: Design Files

To create our design, CAD and MakeRepo were used.

Table 3. Referenced Documents

| Document Name | Document Location and/or URL | Issuance Date |
|--------------------------------|---|----------------------|
| Deliverable G: Prototype II | https://cad.onshape.com/documents/7f9fe514b09dcea5ff9ba134/w/6ff8835c2d8eb28469dc7977/e/bd23a11760d6af60f2cf9d1d | November 2023 |
| GNG1103-Group 7 | https://makerepo.com/rrrameen/1800.gng1103-group-7 | November 16, 2023 |