JIG JACKPOT

Group 10

AGENDA

RAY

INTRODUCTION	EMPATHIZE	DEFINE	IDEATE	PROTOTYPE + TEST	FINAL DESIGN
	First Client meeting	Need Statements	Brainstorming process	Prototype "0" and client meet 2	Justification
	Interpreted need statements	Problem Definition	Top designs	Prototype 1 and client meet 3	Next steps
		Technical Benchmarking	Comparison Matrix	Prototype 2 and feedback	
				Prototype 3 and feedback	

INTRODUCTION

RAY

Our team:

- Ray Li
- Amrou Eldeabis
- Sam Delisle
- Samantha Cookson
- Abbygail Martin
- Rachel Ade

Our Values:

- Collaboration
- Commitment
- Efficiency
- Communication

We approached this project with an emphasis on developing unique ideas as individuals, and then bringing together the best elements of each member's designs and ideas

EMPATHIZE

AMROU

1st Client Meeting: What they said vs. Interpreted needs

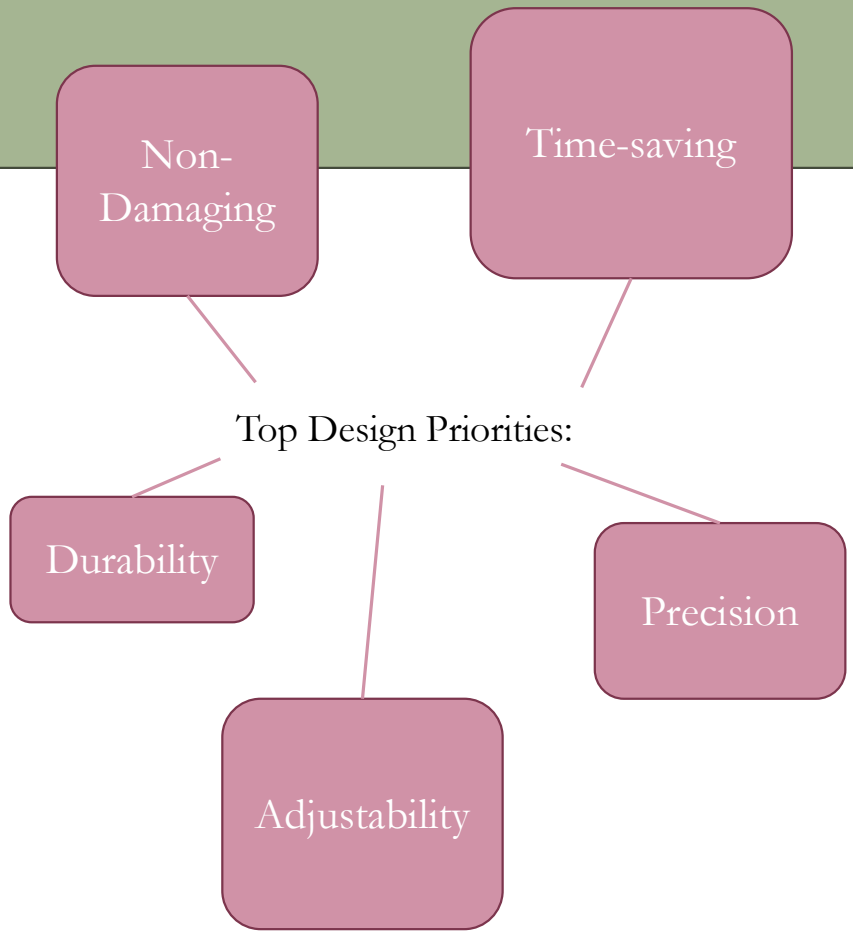
Client Statement	Interpreted Need
The client uses the jig that ensures the doors remain undamaged during its use	Jig needs to be non-destructive
The client is seeking a jig that is simple to assemble and user friendly	Jig should be easy to use, self-explanatory
Client uses many thicknesses of doors between 1-3/4in to 2-3/4in , in ¼ " increments	Jig should be adjustable in this size range
Client current flush-bolt cut-out time 30 minutes	Jig needs to be time efficient and reduce the current time
The client doesn't like that the currently used jig doesn't clamp	Jig needs to clamp or fasten to the door

DEFINE

Need statements, groups and priorities

AMROU

Group	Need	Priority (1-5)
Ease of use	Simple design, non-clunky	4
	Easy to use, self-explanatory.	4
	Attaches to the door; does not need to be held in place.	4
Functionality	Adjustable to fit many door thicknesses and thus back sets	5
	Exact to the 1/32 inch.	4
	Holds up in a dusty environment.	4
	Does not damage the wood door.	5
	Measures to allow flush bolt to be inserted 12" from top/bottom of the door	4
Appeals to the buyer financially	Reduces time required for flush bolt cut-out.	5
	Stays within $100 budget.	3
	Durable	4



DEFINE

Problem statement

AMROU

A need exists for technicians at AMBICO to precisely route a flush bolt cut-out in a wood door with an adjustable jig that is easy to use, does not damage the door and reduces time in the cut-out process.

DEFINE

Technical Benchmarking

AMROU

Company / Specifications	Norfield	N/A	Trend
Cost (excl. tax)	$901.30 (CAD)	$39.12 (CAD)	$178.90 (CAD)
Material	Aluminum	Plastic	Laminate
Door Thickness Range	1-3/8” to 2-1/4”	1.38” to 1.73”	1.18” to 3.15”
Horizontal Adjustability System	4 screws with turning knobs	2 sliding clamps	2 clamps and screws (screwdriver needed)
Vertical Adjustability	none (must be placed at end of door)	movable	movable
Thickness Centering Mechanism	none	none	Has ruler for centering
Router Template	for flush bolt	for door lock	for lock face
Image			

IDEATE

Brainstorming Process – subsystem definition

SAM

Our Subsystems:

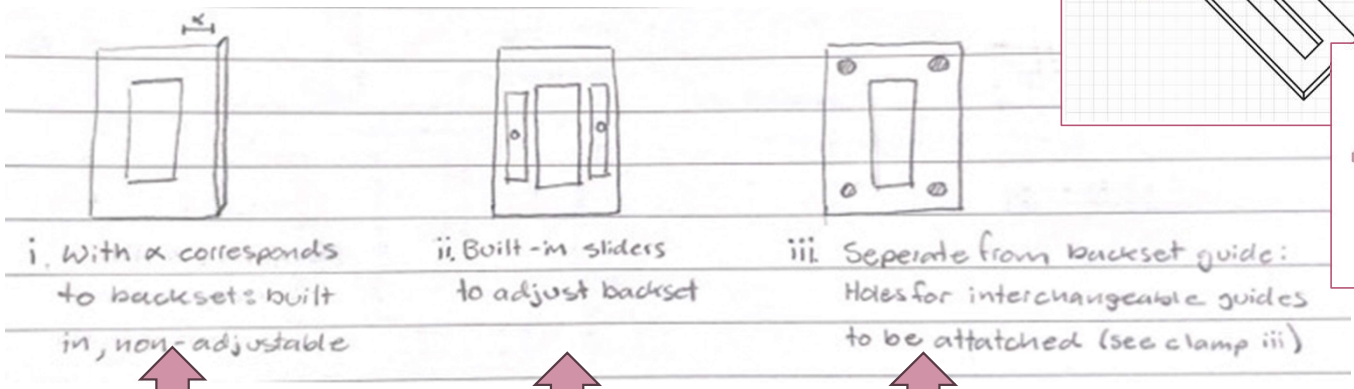
- BASEPLATE: Includes the hole which the router must cut into the door
- CLAMP: Fixes the jig to the door to hold it in place in the routing process
- GUIDE: Brings the center of the flush-bolt cutout to 12” or 24” from the end of the door

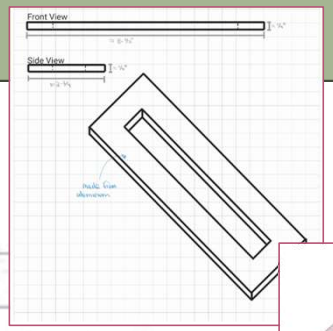
IDEATE

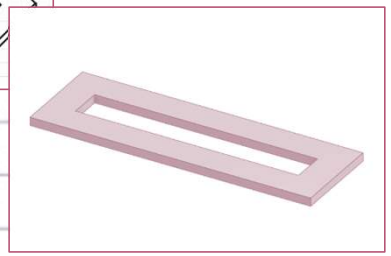
Brainstorming Process – individual brainstorming

SAM

BASEPLATE







Baseplate with Non-adjustable backset built in

Baseplate with "sliders" built in to adjust backset

Baseplate separate from backset guides

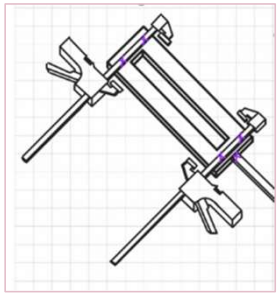
IDEATE

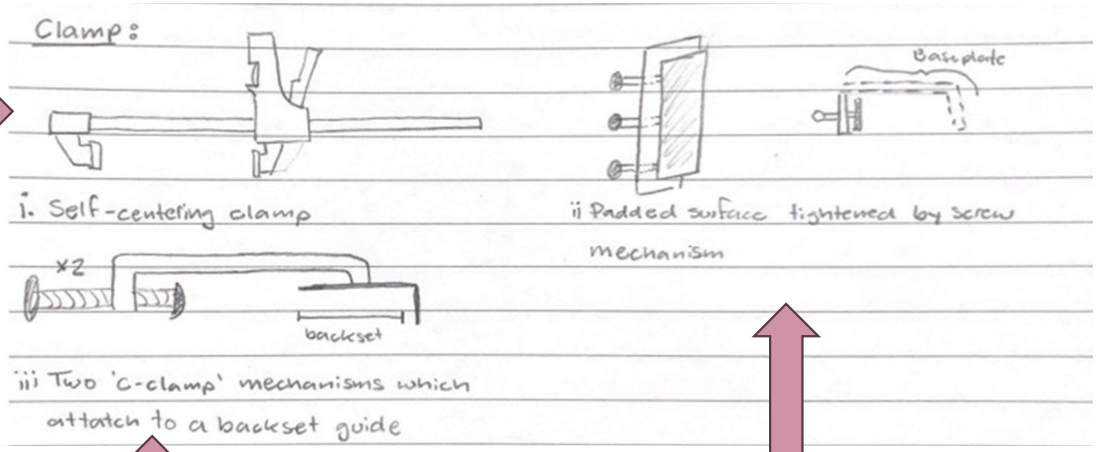
Brainstorming Process – individual brainstorming

SAM

CLAMP

External self – centering clamp





Screw-tightened padded surface

"C-clamp" style clamps with a built-in backset guide

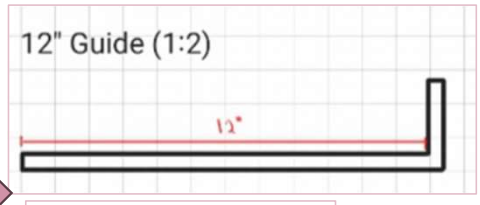
IDEATE

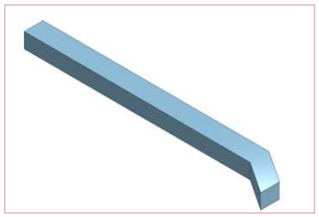
Brainstorming Process – individual brainstorming

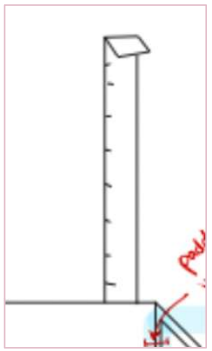
SAM

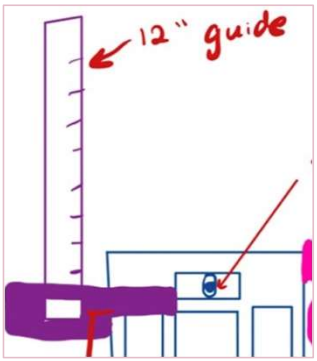
GUIDE

Fixed 12” guide



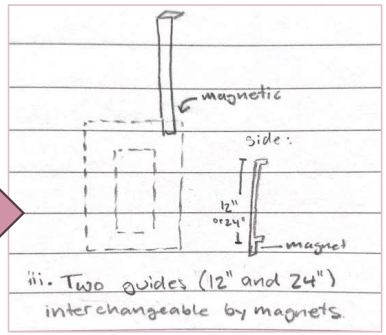






Ruler-style adjustable guide

Magnetically detachable guide



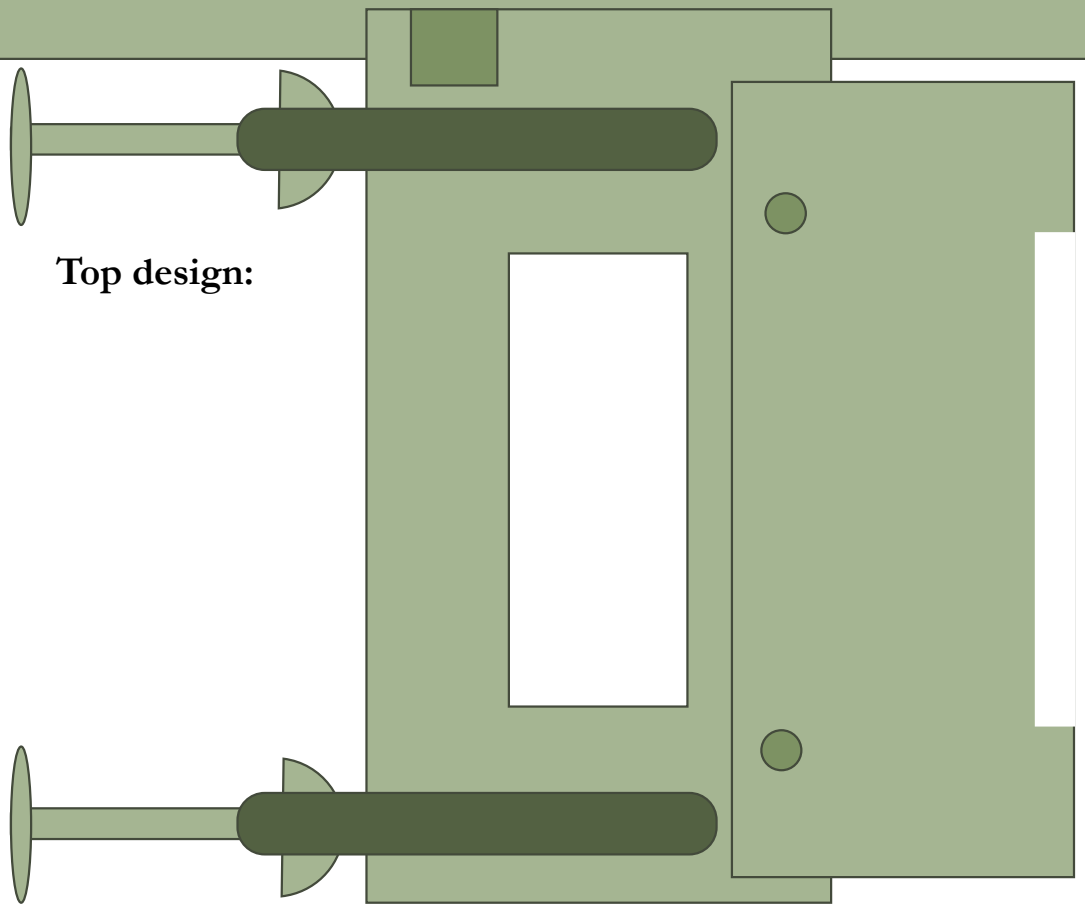
IDEATE

Selection of top design

SAM

- Decision matrix for all subsystems
- Creation of top three complete designs
- Decision matrix between the three top designs

Top design:

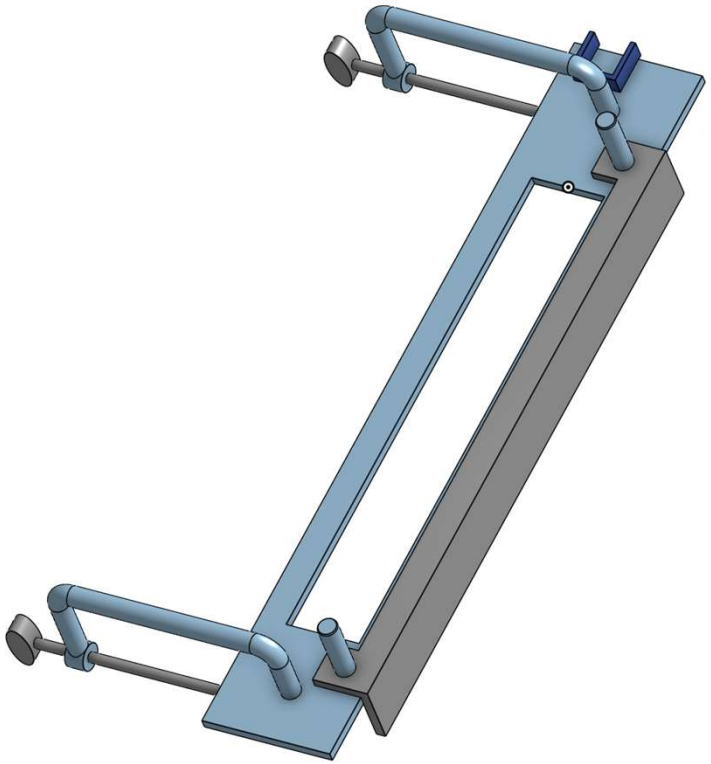


- Baseplate separate from backset guide, with pegs to interchange between sizes
- C-clamps welded to the baseplate to fix to the door
- Magnet for interchangeable 12” or 24” guide

PROTOTYPE + TEST

SAM

Prototype "zero" and client meet 2



Feedback from client:

Positive	Flaws
○ Our focus on using the backset distance for centering seems reliable ○ The minimal number of pieces/moving parts is advantageous ○ Rounded clamp pads and rubber/vinyl lining is good for protecting the door	○ Additional clearance needed for router ○ Magnet shouldn't be attached to the jig during routing ○ Should accommodate the 86.5-degree bevel in the doors

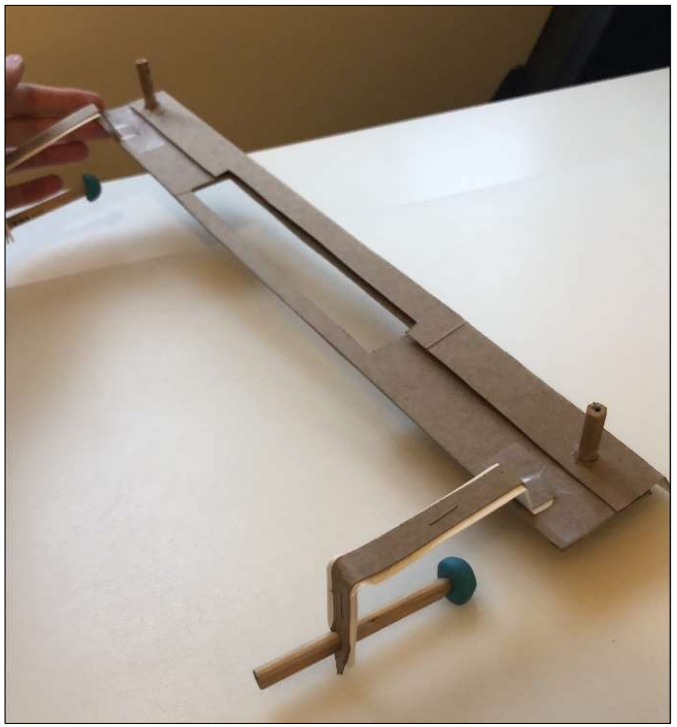
PROTOTYPE + TEST

Prototype I and Client meet 3

SAMANTHA

Main objectives:

- First physical prototype of the jig
- All three subsystems work together cohesively



PROTOTYPE + TEST

SAMANTHA

Prototype I and Client meet 3

Test Results:

- Hard to determine if backset system was fully functional and easy to use, due to recycled materials which were not durable and delicate
- There was sufficient space around the face of the jig so the jig will not affect router path
- Due to materials, it was hard to determine if self-centering system was fully functional

PROTOTYPE + TEST

SAMANTHA

Prototype I and Client meet 3

Client feedback:

- There was not much time to converse with the client, because of the group setting of the final meeting we were unable to get in depth feedback
- However, we were able to discuss our design with a member of the previous semester's winning team. They liked the simplicity and sleekness of our Jig design, as well as its adjustability. To improve, they recommended reducing the size of the clamp holders.

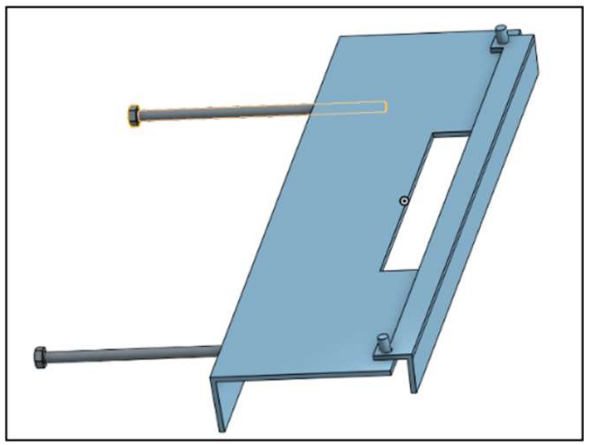
PROTOTYPE + TEST

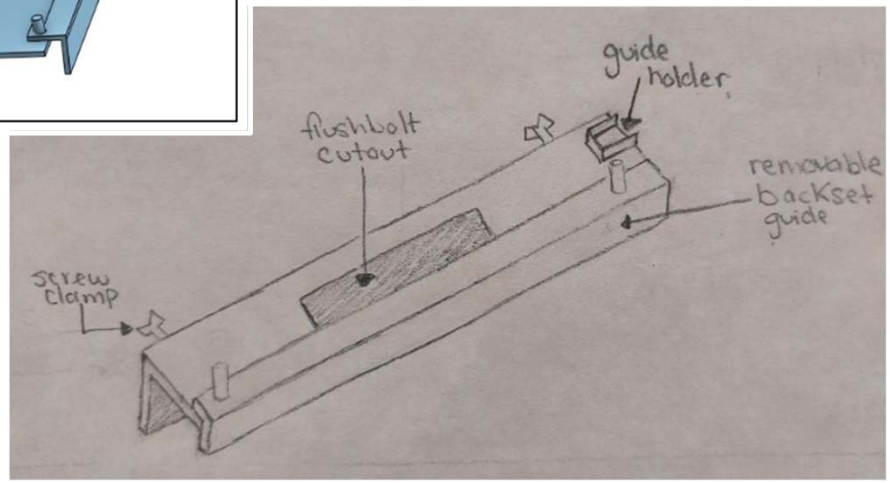
Prototype II

ABBYGAIL

Main Objectives:

- Clamps integrated into the baseplate subsystem, rather than purchased and attached externally
- Have the clamp extend sideways, rather than be fixed on the face of the baseplate





PROTOTYPE + TEST

Prototype II

ABBYGAIL

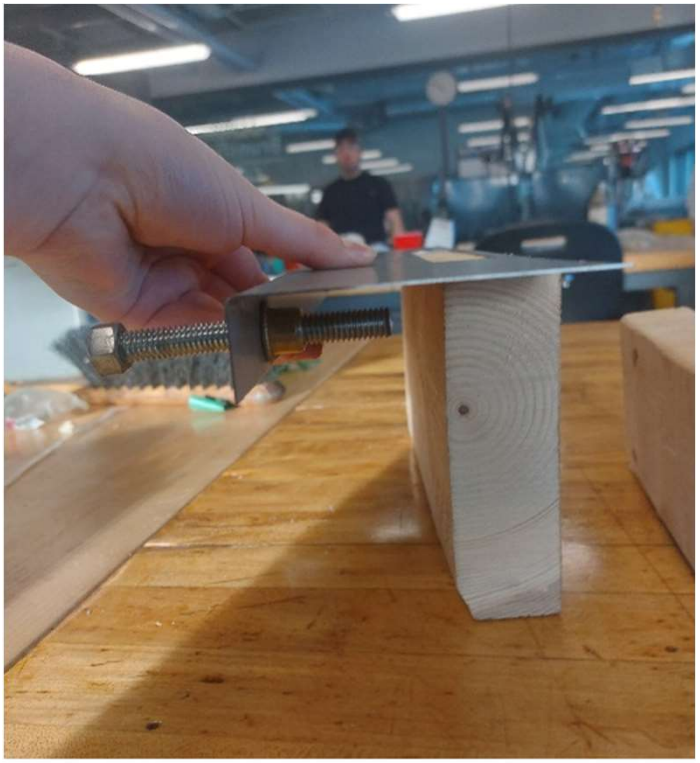
Item	Cost
Steel sheet	$10
3/8 x 6-in Bolt (×2)	$0
3/8-in Threaded Rivet Nut (×2)	$0
3/8-16-in Nut (×2)	$0
Total:	**$10**

PROTOTYPE + TEST

Prototype II

ABBYGAIL

Results:



PROTOTYPE + TEST

ABBYGAIL

Prototype II - Testing

Test Results:

- Dimensions of the backset guides and baseplate were consistent
- Measurements of baseplate matched the original design
- The clamping system was able to secure all of the different widths of wood and held them in place
- If overtightened the wood would be damaged, so a better material against the door is needed

PROTOTYPE + TEST

ABBYGAIL

Prototype II - Feedback

Feedback from Jason Demers and the CEED team:

- Change the design to one backset with multiple holes to accommodate the varying cut out sizes
- Thicker metal for the final product, could withstand the 86 degree angle in the backset guide better
- It is difficult to weld cylindrical pegs

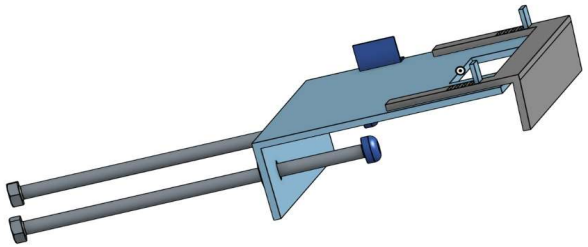
PROTOTYPE + TEST

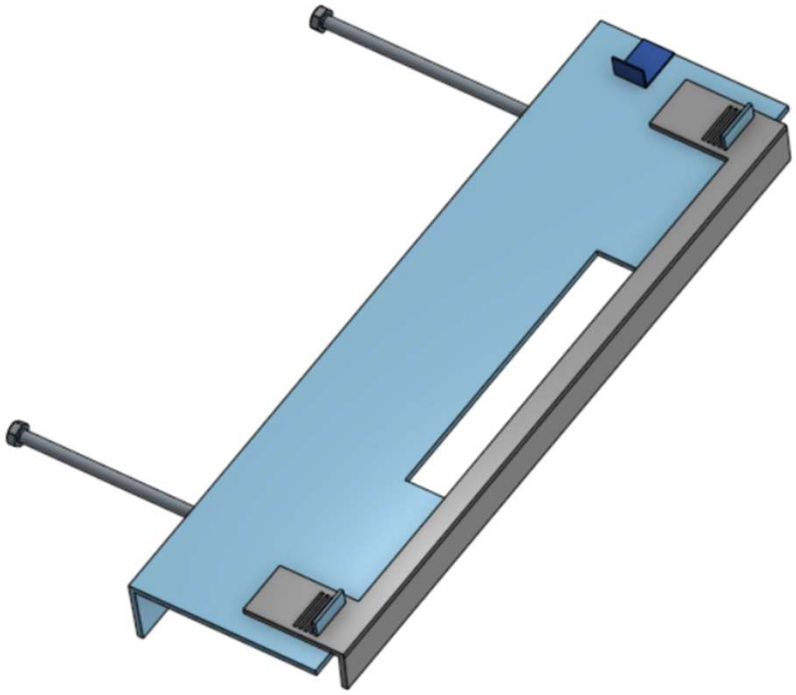
Prototype III

RACHEL

Main Objectives:

- 1 backset guide instead of 5
- All components fit well together
- Jig is functional and accurate





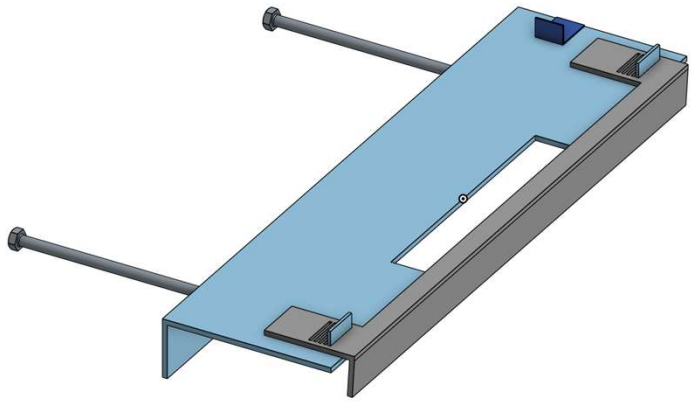
PROTOTYPE + TEST

Prototype III

RACHEL

Item	Cost
Steel sheet	$0 (already purchased for prototype II)
3/8 x 6-inch Bolt (×2)	$0
Hand knob (×2)	$5.26 (for 2)
3/8 Threaded Rivet Nut (×2)	$0
Magnet	$0
Vinyl fabric	$0
Super Glue 3g	$1.25
Total (incl. Tax)	**$7.34**

< $50!



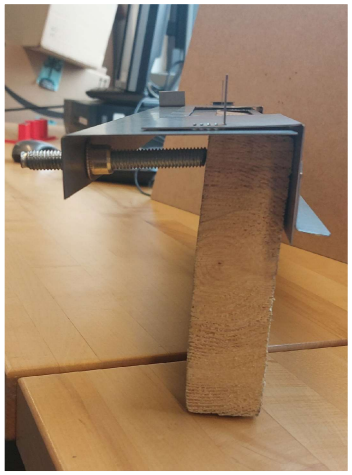
PROTOTYPE + TEST

Prototype III

RACHEL

Test Results:

- Components fit together nicely
- Jig could be easily adjusted to fit different door widths
- Super glue was a successful adhesive for the Vinyl
- With Vinyl the jig did not damage door
- 12" backset was too far back and did not hook onto the end of the door



PROTOTYPE + TEST

Prototype III

RACHEL

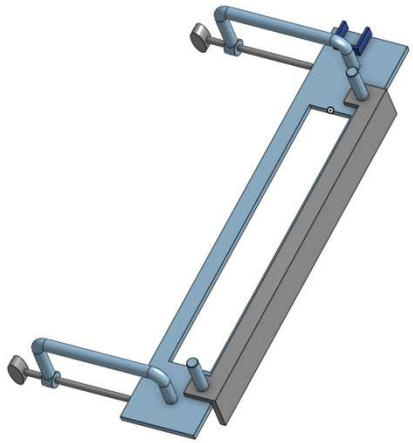
Feedback:

While making our prototype we were able to get feedback from Alexander Vendette (a CEED worker). Alexander suggested we:

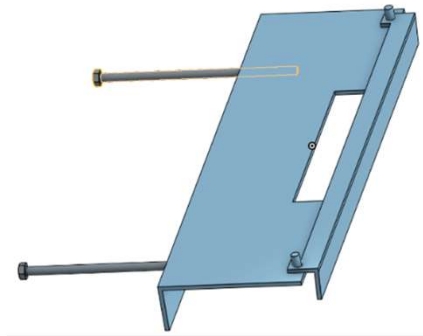
- Add some sort of additional raised guide for the router (e.g., wooden or metal "bumpers" around the cutout)
- Add an additional bend in the backset guide for stability.

PROTOTYPE + TEST
Summary

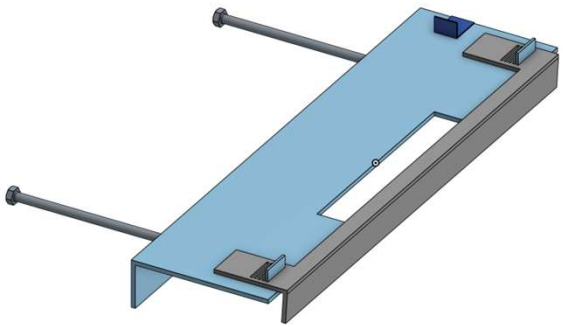
RACHEL



Good...



Better...



Best!

FINAL DESIGN

SAMANTHA

Changes we made to our final conceptual design:

- 1/8” sheet metal (as opposed to 1/32”) – this is the thickest that AMBICO’s laser cutter can handle
- Use a metal laser cutter for more accurate cuts (Ambico can do this)
- Move 12” guide an inch to the right

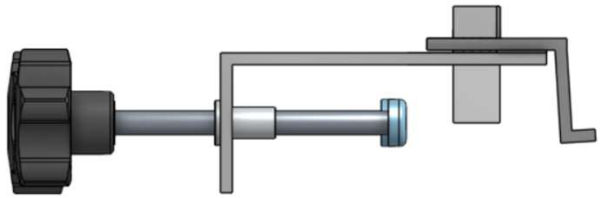
FINAL DESIGN

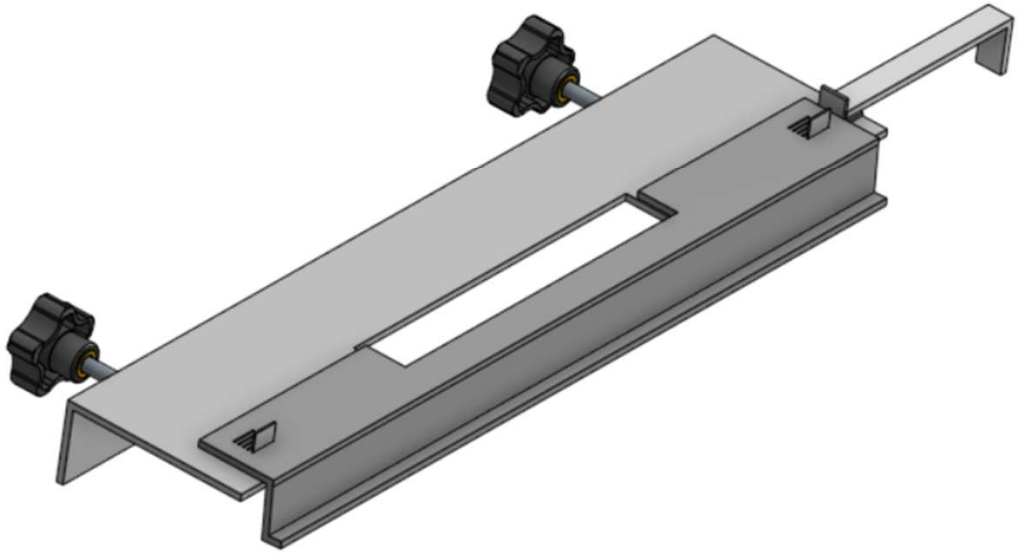
Justification

SAMANTHA

Unique Features:

- Removable 12-inch guide
- Minimal pieces (can be stored as one)
- Intuitive to use
- Made from steel
- Vinyl-lined
- Can be made in-house at AMBICO
- < $50





FINAL DESIGN

SAMANTHA

Bill of Materials					
Item #	**Item Description**	**Product Link**	**Quantity**	**Unit Price**	**Amount**
1	12 x 16-inch 16 Gauge Steel Sheet	12x24-inch 16 Gauge Steel Sheet | The Home Depot Canada	1	$25.38	$25.38
2	3/8 x 6-inch Carriage Bolt (16 UNC)	3/8x6-inch Bolt | The Home Depot Canada	2	$1.95	$3.90
3	3/8-inch Wing Nut (16 UNC)	3/8-inch-16 Steel Wing Nut | The Home Depot Canada	2	$0.76	$1.52
4	3/8” Rivet Nut (16 UNC)	Rivet Nut | Amazon	2	$0.85	$1.70
5	10mm x 3mm Refrigerator Magnet	Refrigerator Magnet | Amazon	1	$0.41	$0.41
6	20" x 30" x 5mm, White Foam Board	White Foam Board | Dollarama	1	$1.50	$1.50
7	Super Glue 3g	Super glue | Dollarama	1	$1.25	$1.25
				Sub Total	$35.66
				HST	$4.64
				Total	**$40.30**

FINAL DESIGN

Next Steps

SAMANTHA

- Try to find local suppliers for all materials –to be more environmentally conscious
- Create a User Manual for Client

Questions?

Q: How much would shipping cost?
A: Home Depot: $0 (free over $35) Amazon: ~$4.70 (without membership)

Q: How can the jig accommodate the router?
A: The use of thicker metal on the baseplate or plastic/wooden “bumpers” around the cutout

Q: Can this jig be manufactured in house?
A: Yes! The jig is made of sheet metal and standard components, so AMBICO's laser cutter and factory environment is perfect for construction.