



Midterm Presentation

Bandsaw Guide UX Design

Laguna Tools

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- Our team's goal is to design a new bandsaw guide for Laguna Tools
 - The current lower guide design requires the user to position their hands in tight spaces to adjust the guide. With the tilt on the table for intricate cuts, access becomes even more difficult to adjust
- Seeking to improve the mechanical design of the bandsaw guide provided to us by Laguna Tools
- Plan to create a design that improves the user's experience when adjusting the bandsaw blade guides for maintenance and when changing blades

LAGUNA



Figure 1: Laguna Tools 14|12 Bandsaw

- Laguna Tools 14|12 bandsaw blade guides have 3 important aspects of their design that can be improved
 - 1) The guides can be difficult to adjust, especially the bottom guide that sits under the cutting table
 - 2) The guide's rear support, made of ceramic, tends to wear down rapidly and produces sparks when making contact with the saw
 - 3) Ceramic parts are difficult to replace

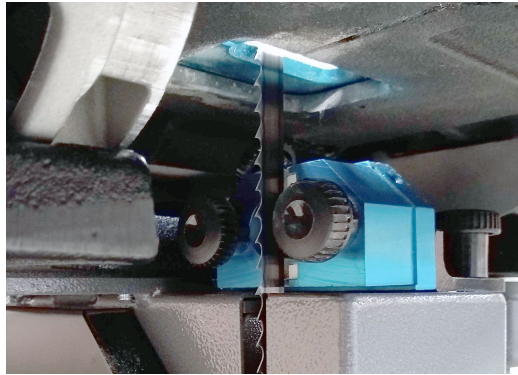


Figure 2: Current Lower Guide

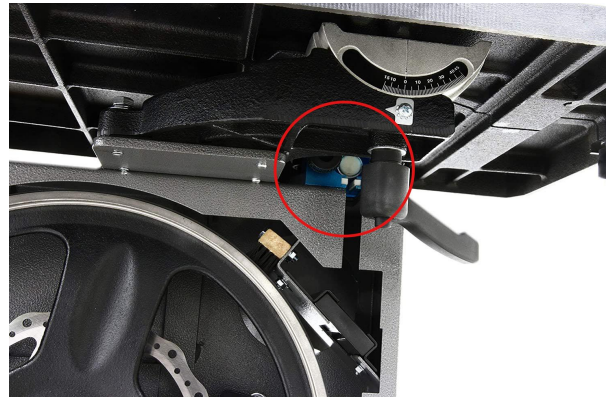


Figure 3: Limited space to adjust the lower guide

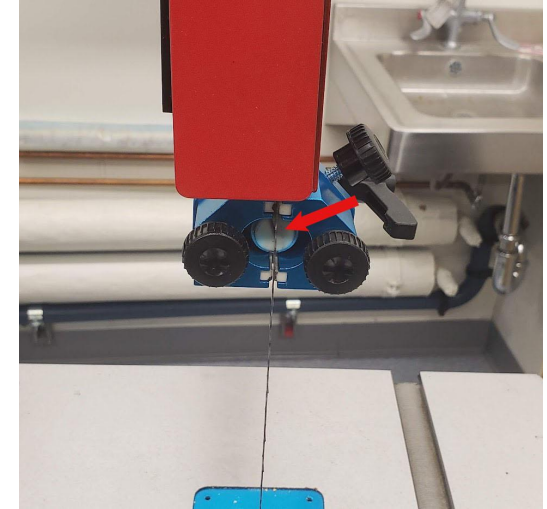


Figure 4: Current Thrust bearing (rear support)

Objectives

- Accurate and precise adjustment the guide
- Ease of adjustability
- Quick to change replacement parts such as ceramics and bearing
- Quick to adjust guide to fit blade
- Easy access to adjustment knobs for lower guide
- Ease of manufacturing
- Safety

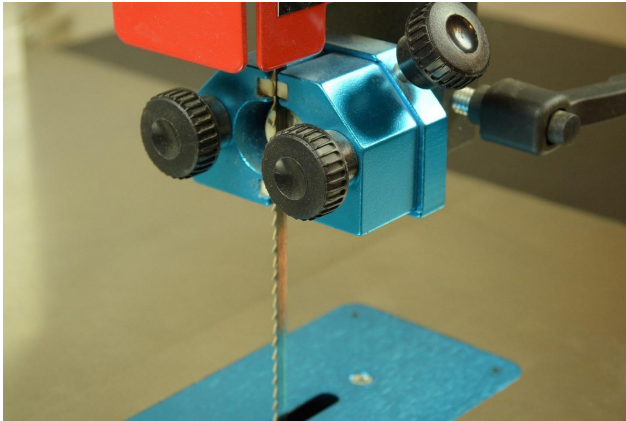


Figure 5: Current upper guide



Figure 6: 14|12 Bandsaw

Design Attributes Table

Attribute	Objective	Constraint	Function	Means
More precise and accurate methods of adjustment	X			
Easy adjustability	X			
Quick to change ceramics replacement	X			
Quick to change blades	X			
Safety	X			
Guides are easily incorporated to current bandsaw				
Stabilize blade when cutting			X	
Table needs to be able to tilt			X	
Cost		X		
Size		X		
Durability	X			
Use bearing to support back side of blade				X

Design Requirements

Requirements	Nominal	Ideal
Easy access to adjustability	10 sec to adjust guides	Reduce time by 30%
Side guide block's lateral movement	5 mm in each direction	5 mm
Time to replace guide's component (ceramics, bearings)	~30 min	~1 min
Bottom guide's location	50 mm from table pivot	10 mm from table pivot
Table tilt	45 deg up/ 7 deg down	45 deg up/ 7 deg down
Cost	Current part \$25	<200% of current cost
Max usable cutting height	13 in	13 in

Detailed Design for Thrust Bearing

- Both designs replace the ceramic to a ball bearing to reduce friction and eliminate sparks
- Design 1 features a slide and lock mechanism
- Design 2 features both macro and micro adjustments at a higher cost to manufacture

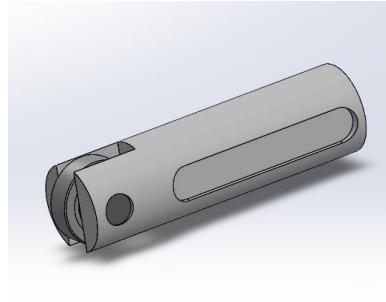


Figure 8: Thrust Bearing Design 1

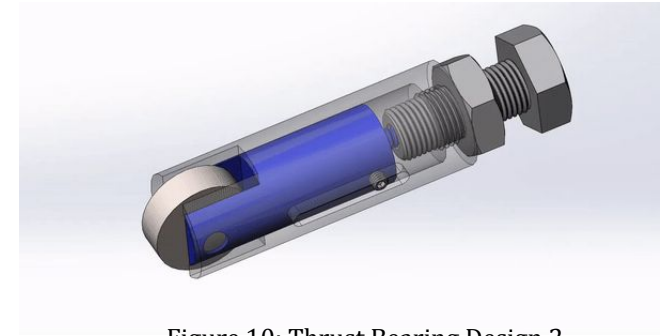


Figure 10: Thrust Bearing Design 2



Figure 7: Thrust Bearing 1
Prototype

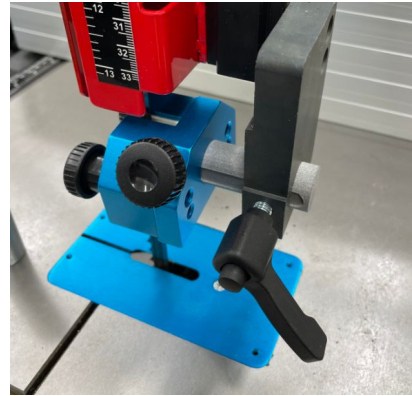


Figure 9: Test Fit of Thrust
Bearing 1 Prototype



Figure 11: Thrust Bearing 2
Prototype

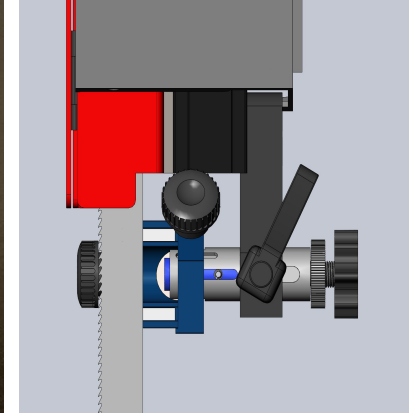


Figure 12: CAD Assembly of
Thrust Bearing 2

Side Guide Preliminary Concepts

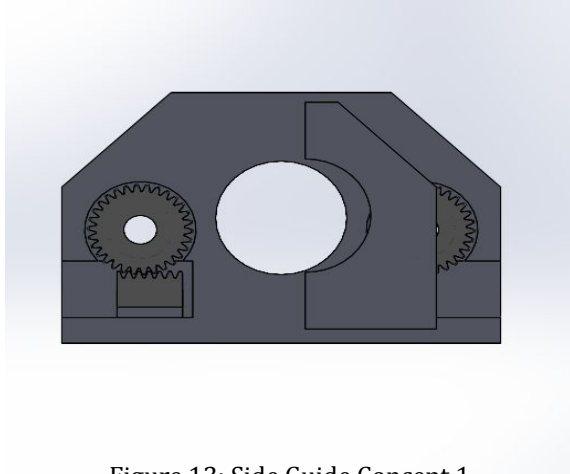


Figure 13: Side Guide Concept 1

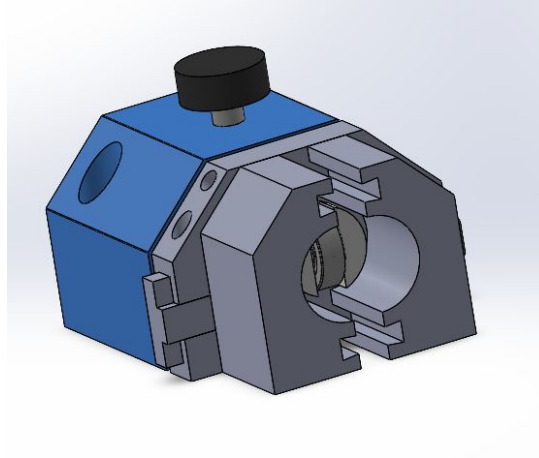


Figure 14: Side Guide Concept 2

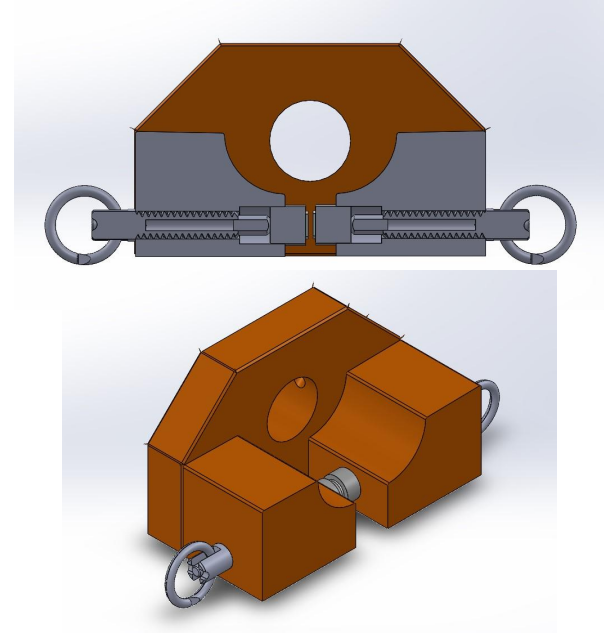


Figure 15: Side Guide Concept 3

Side Guide Preliminary Concepts

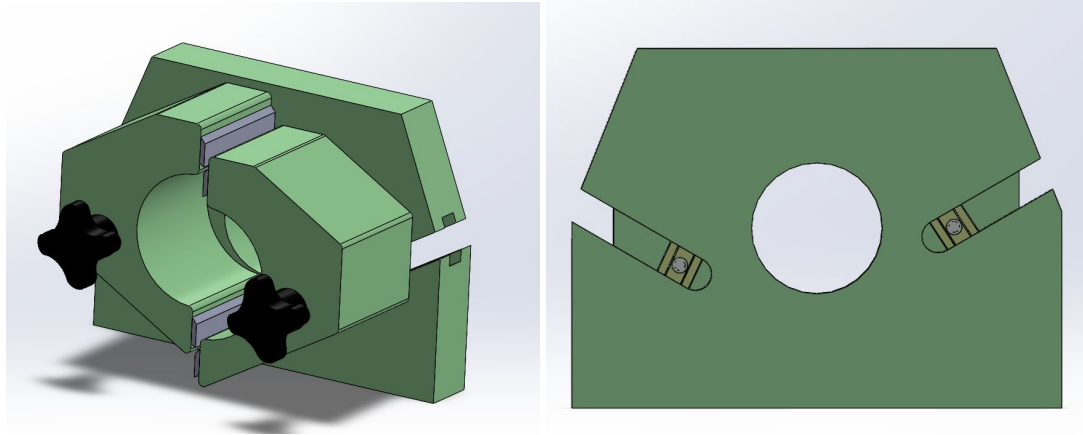


Figure 16: Side Guide Concept 4

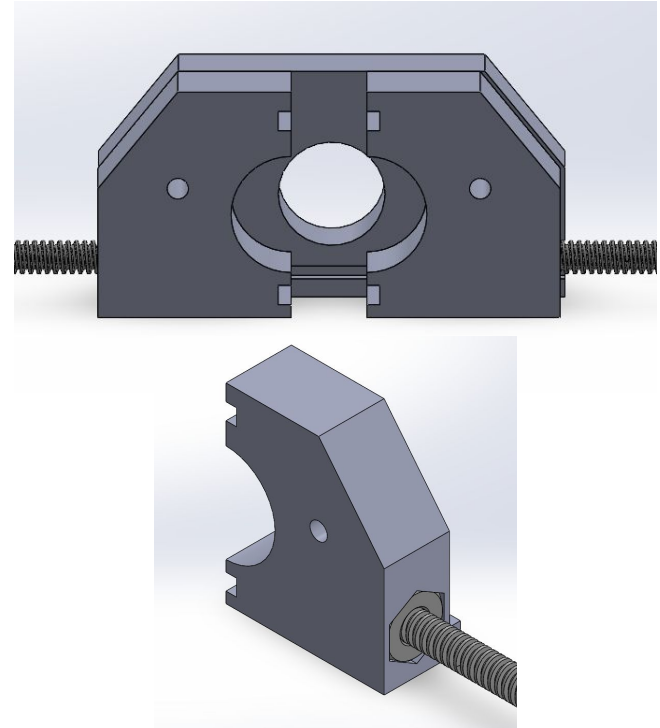


Figure 17: Side Guide Concept 5

Side and Bottom Guide:

- This concept uses a lead screw that nut is connected to the side guides powered by the worm gear
 - For the gears: there will be a cover that protects them from wood pieces and dust
 - Plans for the nut to be a self cleaning style to prevent issues with the lead screw
 - Cable arm allows for users to easily adjust the guides without reaching their hand in a tight spot, connected to worm gear



Figure 18: Cable Arm

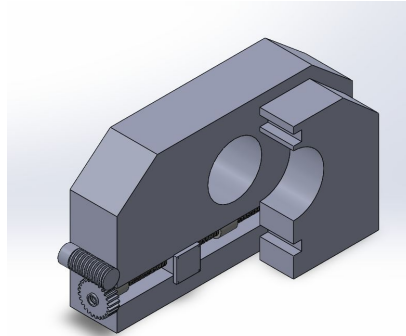


Figure 19: Isometric angle of Side Guide

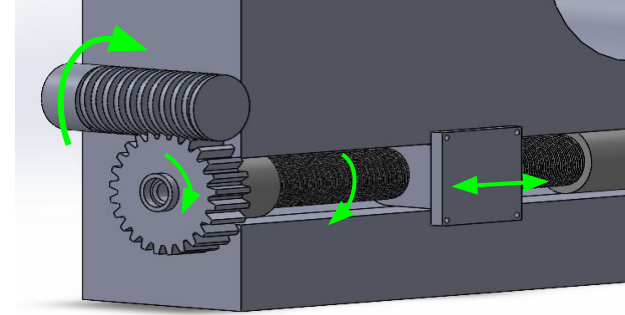


Figure 20: Movements of Gears

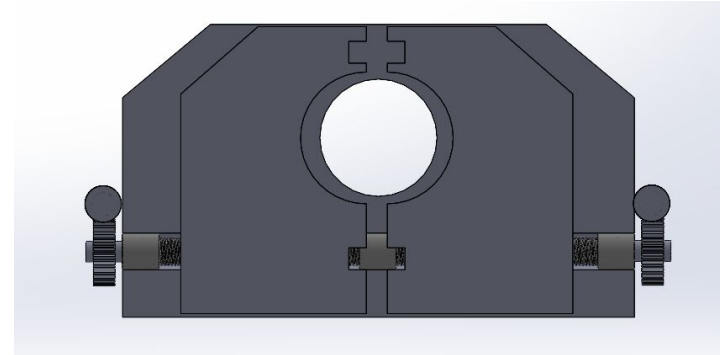


Figure 21: Front view of CAD

SWOT Analysis for Bottom Guide:

Strengths

- Easy access to adjustment
- Has a self locking mechanism with the worm gear
- Can be integrated into the current model

Weaknesses

- Cost of manufacturing and locating parts

Opportunities

- Can have potential upgrades in the future for customers

Threats

- Gear parts will need greasing

Compliance Table

Compliance Table for Bottom Guide:

	Requirement	Compliance
1	Uses more precise and accurate methods of adjustment	Yes, using a lead screw attached to the nut, users can make precise adjustments
2	Users have easy to access adjustability	Yes, with the flexible slow motion cable (or something similar)
3	Guide blocks x-axis movement	Yes, lead screws allow movement 2.5 meters both ways on each side = 5mm
4	Time needed to replace bandsaw guide components (ceramics, bearings)	No, looking at combining additional concepts to side guides
5	Blade movement/vibration/wobble	Needs to be tested with model
6	Ability to withstand heat	Yes, made of the same material and side guides as current guides to dissipate heat
7	Cost	No, need to find parts/ manufacturers who can provide parts or look into manufacturing costs
8	Durability	No, need to calculate lifespan of parts and under conditions of dust and wood shavings

Guide Insert Preliminary Concepts

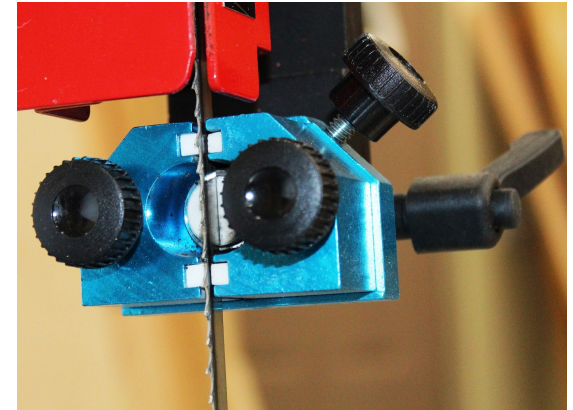
Ceramic Inserts:

- Current guides utilize high strength, highly heat resistant glue
 - This makes it challenging and messy to make replacements
- Considering Utilizing set screws to keep inserts in place
 - This will allow for implementing functionality for both the regular and mini guides

Figure 22: Existing Mini Guide



Figure 23: Current regular guide



Ceramic and Mini Guide Inserts:

- This concept utilizes set screws and a spacer to hold the ceramic blocks in place
 - Metal or rubber spacer will be used to reduce stress on ceramic blocks
- The Guides will allow for easy swapping of ceramics and substitution for graphite mini guide inserts

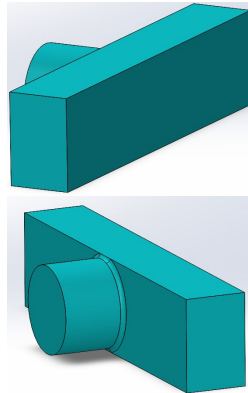


Figure 24: Spacer For Ceramic Blocks

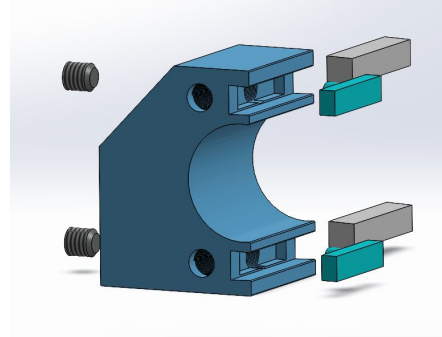


Figure 25: Animation of Ceramic Block Assembly

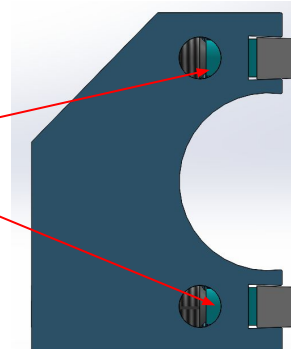


Figure 26: Side Guide with Ceramic Blocks

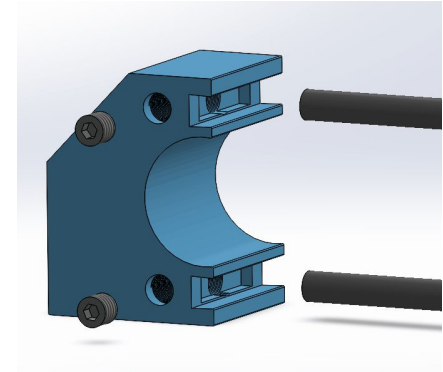


Figure 27: Animation of Mini Block Assembly

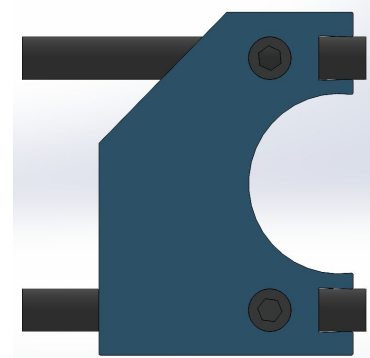


Figure 28: Side Guide with Mini Guide Blocks

SWOT Analysis for Guide Inserts:

Strengths

- Will allow for an easy method of changing guide blocks

Weaknesses

- There will be more moving and loose parts than the existing design

Opportunities

- Guides can have the functionality of 2 different products
- Can be implemented onto existing guide design

Threats

- Ceramics are brittle and may fracture under load
- Tolerances need to be extremely small

Prototype Plan and Schedule

3D Printing:

- Reprint of thrust bearing prototype
- Side guide concept
- Ceramic and mini guide insert

Manufacturing to be able to test on the Bandsaw:

- Thrust guides
- Looking at ordering and outsourcing for parts for side guide

Week 6:

- Go into finalized design phase for side guides
- Reprinting 3D part for thrust bearing prototype

Week 7:

- 3D printing for side guide
- Find parts online to order for side guide prototype

Week 8:

- Testing 3D printed side guide prototype and move into the detailed design phase
- Find a machinist for the thrust guide

Week 9:

- Find a machinist for the side guide

Week 10:

- Final Presentation and Final Report

Plans

- Plan on prototyping the side/ bottom guide by 3D printing and finding parts
- Looking to manufacture/ find a machinist that allows us to be able to test parts on the bandsaw by the end of the quarter

Concerns

- Time to prototype and manufacture parts for testing
- UCI is currently ordering new lathes so we are unable to use them in making changes to our prototypes



Thank you for listening!
Questions?

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