

Manufacturing Technology

Coffee Table Directions

This activity is designed to provide students with an opportunity to work with a different hardwood species (oak), learn how to create a mortise and tenon joint, and how to use a sled jig to create shaker style legs.



ITEM NO.	PART	DESCRIPTION	QTY.
1	Leg	Poplar	4
2	Short Side Apron	Poplar	2
3	Long Side Apron	Poplar	2
4	Top	Oak	1
5	Metal Clip	Steel	4

Exploded View

Assembly

Technical Drawing

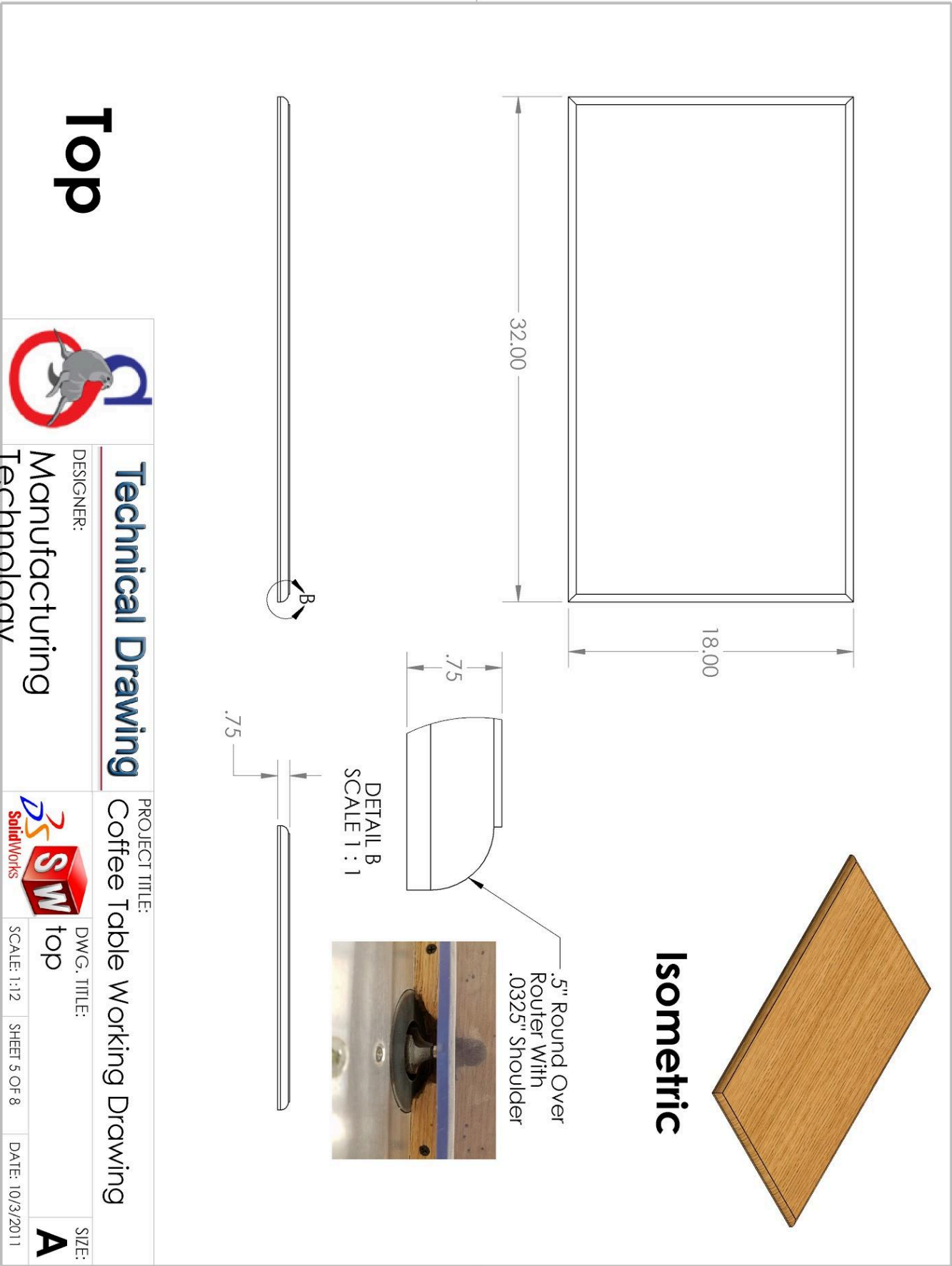
DESIGNER:
Manufacturing
Technology

PROJECT TITLE:
Coffee Table Working Drawing

DWG. TITLE:
Coffee Table Assembly

SCALE: 1:12 SHEET 1 OF 10 DATE: 10/3/2011

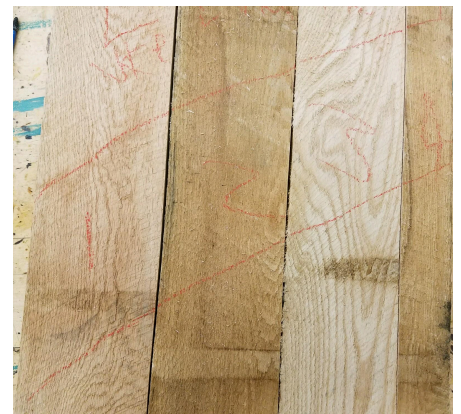
Top:
Gluing, Cutting, & Routing The Top



Top:

Gluing The Top

1. Get a few oak boards from the loft.
2. Use the **up cut saw** to cut the rough lumber to **33.5"** long.
3. Using a Tape Measure and the **table saw**, cut the 33.5" long boards into **1 stack of 19"-20" wide**.
 - a. No piece can be smaller than 1.5" wide and no bigger than 6" wide.
4. Use a **lumber crayon** to mark the end grain pattern of each board as either a **"mountain"** or **"valley"**.
5. Rotate the boards so that the **pattern alternates between "mountains" and "valleys"**.
6. Use a **lumber crayon** to mark one side of each set with your name, period, and group number.
7. Flip the entire stack of boards upside down.
8. **Plane** the boards one time at **1"**.
9. **Edge joint** the boards where they touch one another within each set.
10. Place **two pipe clamps about 1.5' apart** on the glue table.
11. Place the smooth side of the boards down on top of the clamps **with the jointed edges facing one another**.
12. Spread **wood glue** down the entire jointed edge of one of the boards.
13. Work the glue into the wood by **moving the boards back and forth** against one another.
14. Place another **pipe clamp** across the top of the boards.
15. Follow the below tightening order to make sure things stay flush:
 - a. Middle clamp just a little.
 - b. Clamp closest to the flush end just a little.
 - c. Clamp at the opposite end just a little.
 - d. All starting with the middle clamp.
16. Use the **back of the glue brush** to scrape up as much glue as possible.
17. Use a **wet paper towel** to remove the rest of the glue.
18. Flip the entire thing over so that the other side is faced up, and do the same process to remove the glue.
19. Use a **lumber crayon** to **write your name, period, and group number on the boards**.
20. Place the clamped boards to the side for them to dry.



Cutting & Routing The Top

1. Use a **scraper** to remove as much of the glue as possible.
2. Use the **planer** to plane the board down to 0.80". This can be difficult to do.
If your boards aren't flat, ask your teacher for help before doing this.

- a. Plane the rough side at 1.000"
- b. Plane the other side at .900"
- c. Plane the worst side to .850"
- d. Plane the worst side to .800"

3. Use a **lumber crayon** to mark up both sides of all of the board.
4. Use the **wide belt sander** to sand both sides of all boards until the measurement reads **.75"**.

- a. Note: **Only take off .01" on each round of sanding.**
- b. Sanding Measurements:

- | | |
|--------|--------|
| 1) .80 | 4) .77 |
| 2) .79 | 5) .76 |
| 3) .78 | 6) .75 |

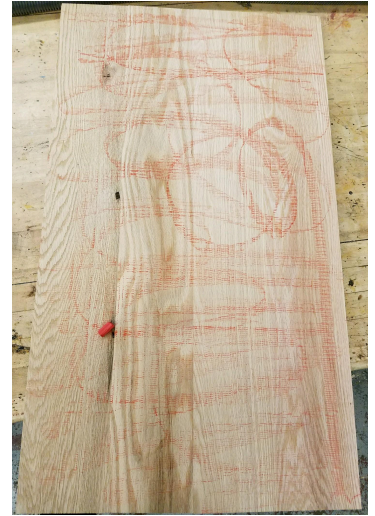
5. Use the **jointer** to make one edge of the board perfectly flat.

6. Using the **table saw**, cut the board (**with the grain**) to **18"**.

7. Locate the **cross cut jig** and carefully attach it to the table saw.
8. Work with your teacher to cut one of the end grain edges straight.
9. Remove the cross cut jig from the table saw.

10. Rotate the board **180 degrees** and cross cut it again to **32"**.

11. Use the **router** with the round over bit to route **all 4 edges on one side**.
 - a. Open the dust collector gate.
 - b. Turn the router on.
 - c. Firmly hold the board down and back against the fence.
 - d. Pull the board across the router bit from **right to left**.



Note: When routing the **end grain**, the router will make a deeper noise than usual. If it seems like the machine is slowing down, back up and let the machine catch back up to speed before starting again.

Finishing The Top

Sanding:

1. Using a **sander** and a **sanding profile**, sand both sides and the edges of the top starting with **80 grit** moving up to **180 grit sandpaper**.
2. Use a **black sharpie marker** to write your name on the bottom (all flat side) of the table top.

Staining:

1. Use a **rag to stain** the bottom of the table top first.
2. Flip the top over and place it on a pin board.
3. Stain the top of the table top.
4. Place it on the shelf to dry.

Polyurethaning:

1. Use a **polyurethane brush to apply polyurethane** to your glued table base and top **2 times**.

Legs:

Gluing & Squaring The Legs

19.00

1.875 or 1 7/8"

*Thickness of the boards will vary between 1"-1.125".

Use a push pad and a push stick to face joint 1 side of each board.

Glue 2 boards together face to face.

Leg Rough Cut

	Technical Drawing	PROJECT TITLE: Coffee Table Working Drawing	
	DESIGNER: Manufacturing Technology	DWG. TITLE: Leg Rough Cut	SIZE: A
		SCALE: 1:8	SHEET 2 OF 10
		DATE: 4/10/2017	

17.25

1 & 5/8th" or 1.625

1 & 5/8th" or 1.625

Use a push pad and push stick to joint 2 adjacent sides of each leg until they are perfectly flat. That means 1 side with the glue and one side with no glue.

Leg Final Cut

	Technical Drawing	PROJECT TITLE: Coffee Table Working Drawing	
	DESIGNER: Manufacturing Technology	DWG. TITLE: Final Cut Leg Assembly	SIZE: A
		SCALE: 1:8	SHEET 3 OF 10
		DATE: 4/24/2017	

Legs:

Gluing The Legs

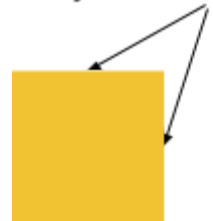
1. Use the **up cut saw** to cut rough lumber to **19"** long.
2. Use the **jointer** to make one edge of the board perfectly flat.
3. Use the **table saw** to cut a total of **8 boards per person at 2"**.
 - a. *Note: Jointed side goes up against the fence.*
 - b. *Make an extra 2 boards for every group of 2, extra 4 boards for a group of 3 or 4.*
4. Use the **jointer, a push pad, and a push stick** to make **one face (not edge)** of each board perfectly flat.
5. Use the **pipe clamps and wood glue** to glue the jointed faces of 2 boards together, making a total of 4 glued legs.
6. Use a **lumber crayon** to write your name, period, and group number on the side of the boards.
7. Place the clamped boards to the side for them to dry.



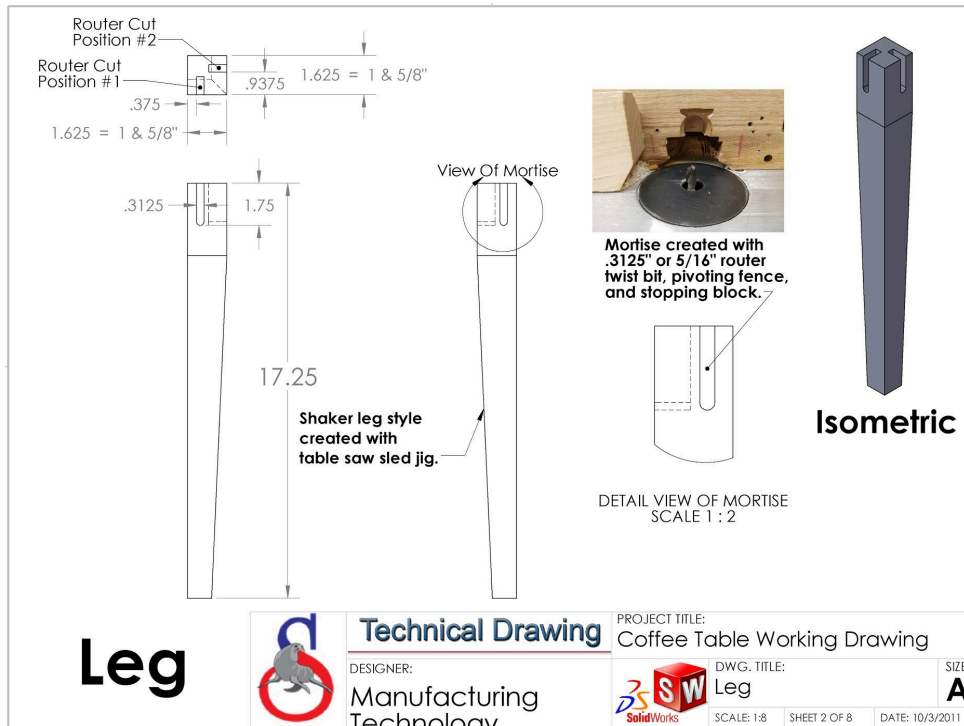
Squaring The Legs

1. Use the **jointer** to **flatten 2 adjacent sides** of each glued leg resulting in 2 sides being a perfect 90 degrees from one another.
2. Place 1 jointed side up against the table saw fence and the other jointed side down on the table, use the **table saw** to cut the rough side down to **1 and 5/8"**.
 - a. *Note: This will make the entire leg into a perfect square.*
3. Rotate the leg so that the remaining rough side is also cut to **1 and 5/8th"** on the **table saw**.
4. Use the **compound miter saw** to cut the legs to a total length of **17 and 1/4th"**.
 - a. Remember to cut a little bit off of one end to square it up, and then slide it over before cutting it to the total length.

Adjacent Sides



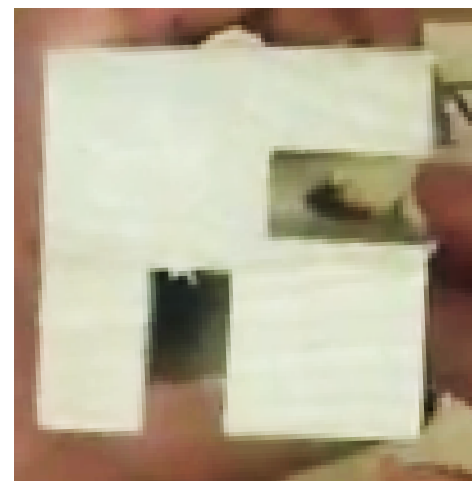
Creating The Mortise & Shaker Part Of The Leg



Stage 3 Steps:

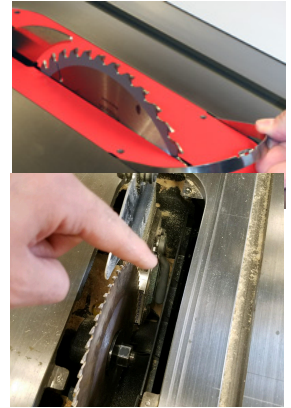
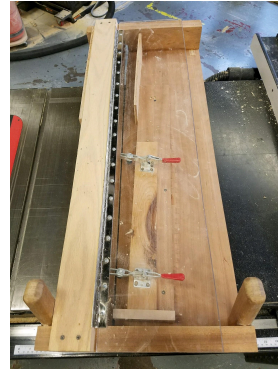
Creating The Mortises On The Leg

1. Use **router** _____ to cut a mortise into **each leg** at **setting #1**.
 - a. Open the dust collector gate.
 - b. Turn the router on.
 - c. Firmly hold the board down and back against the fence.
 - d. Push the **end grain of the leg** into the router bit until you **hit the stopping block**.
 - e. Pull the leg back along the fence, until it is clear of the router bit.
2. **Loosen the black knob behind the fence on the right.**
3. Slide the fence back / tighten the knob at **router setting #2**.
4. **Rotate your leg so that the previously cut mortise is facing in against the fence.**
5. Cut the second mortise into **each leg** at **setting #2**.
 - a. *Note: Make sure the second mortise is at the same end of the leg as the previously cut one!*

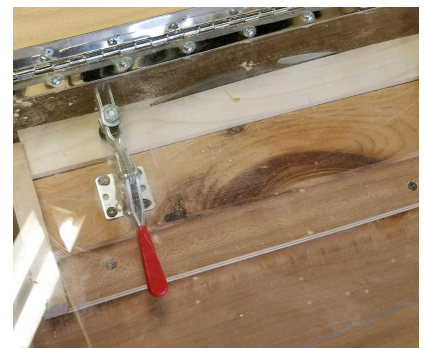


Creating The Shaker Part Of The Leg

1. Locate the **table saw sled jig** that cuts the inside of the legs at a slight taper.
 - a. *Note: The taper makes the legs "shaker" style legs.*
2. Remove the **throat plate** of the table saw.
3. Put up the **grey lever** to release the clamp.
4. Remove the **blade guard and hose**. Place it to the side.
5. Put the chrome **thriving knife** into the clamp, and lock the handle back down.
 - a. *Note: The thriving knife looks like a shark's fin.*
6. Place the throat plate back on.
7. **Carefully place the jig onto the table saw, so that the thriving knife and blade slide through the crack in the jig.**
8. Pull the jig back so that the table saw blade is even or behind the vertical piece of wood that is to the right of the blade.

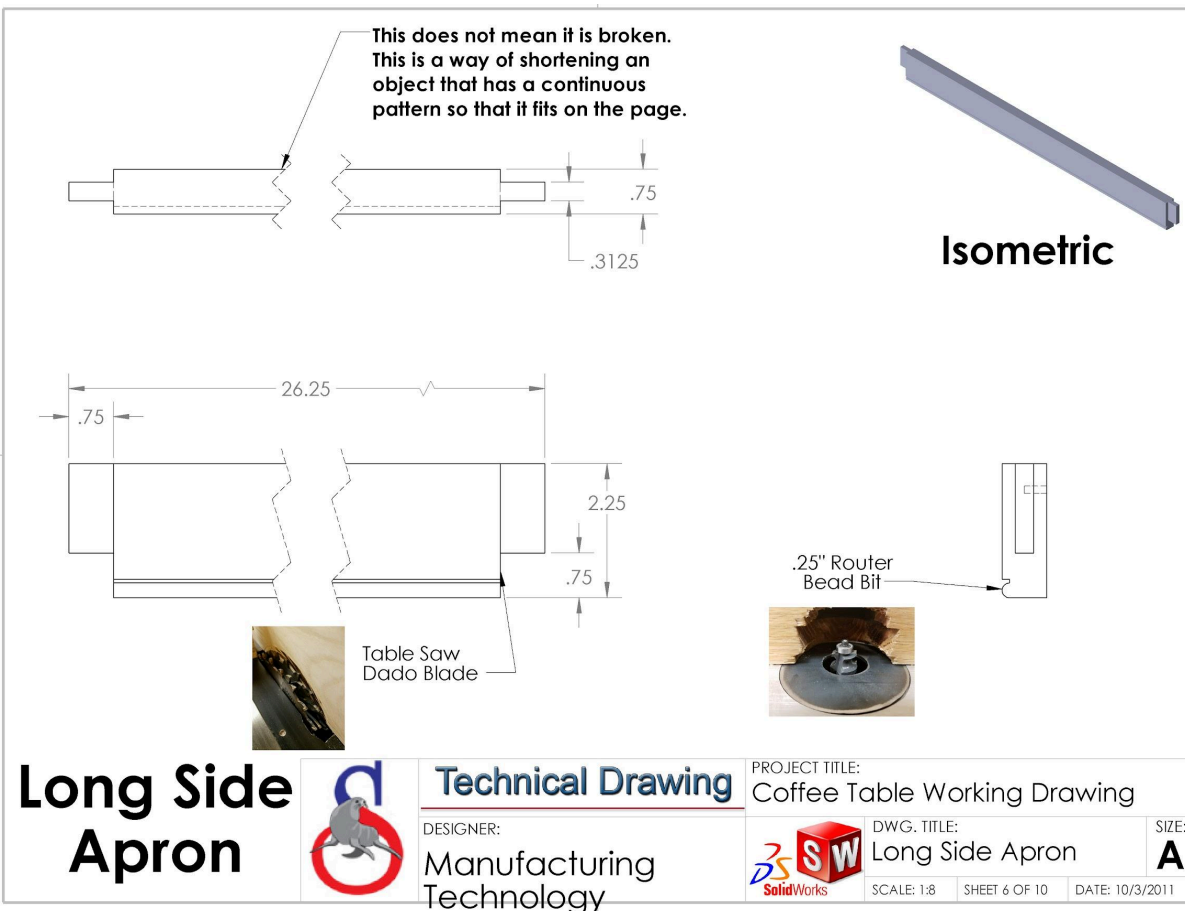
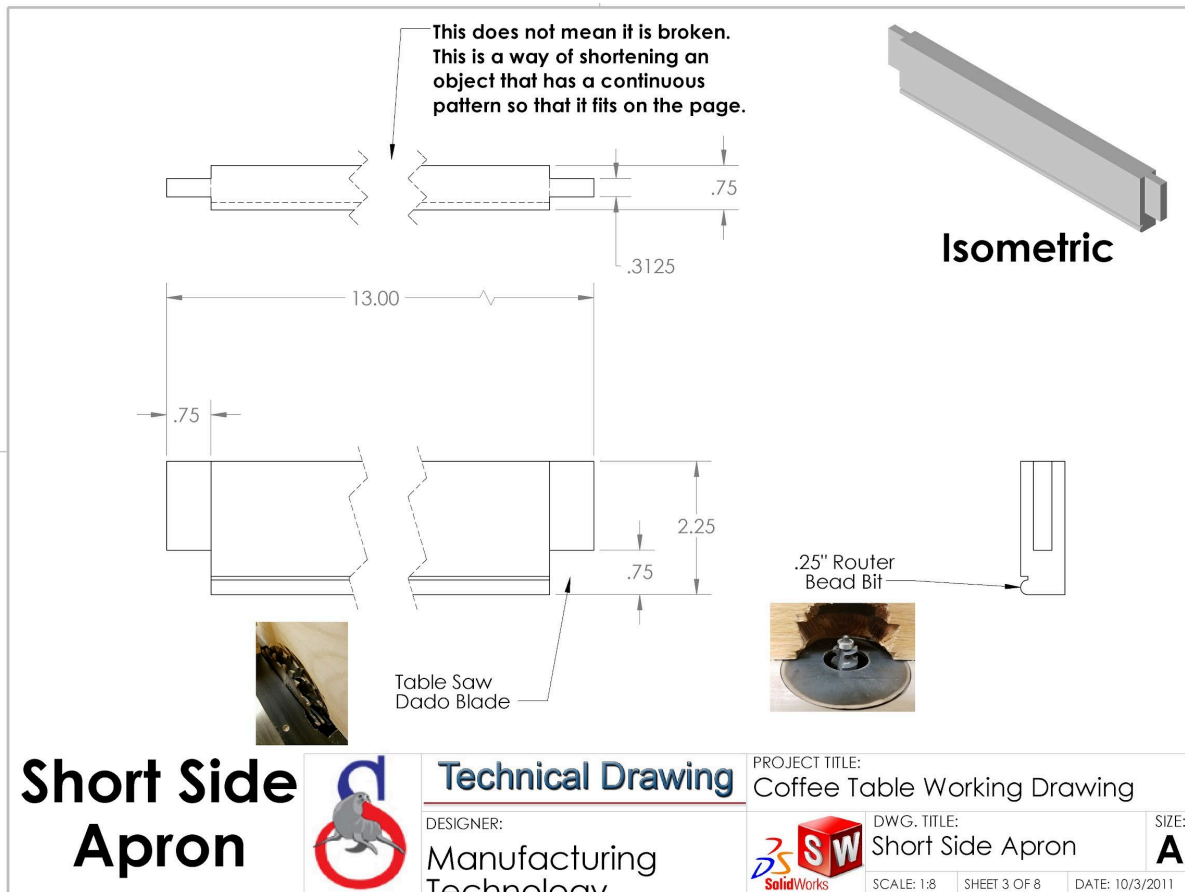


9. Rotate the plexiglass back and pull the clamps up.
10. Place a leg into the jig with **one mortise faced down, the other facing the table saw, and the leg pushed up against the stopping blocks.**
11. Clamp the leg into place so that it doesn't move.
12. Rotate the plexiglass back down.
13. With your hands on the handles and the table saw turned on, push the sled jig forward until the blade cuts through the entire leg.
14. With the saw still running, pull the sled back to its starting position.
15. Turn the saw off.
16. Rotate the plexiglass back and pull the clamps up.
17. **Rotate the leg so that the second mortise is now facing the blade, the mortised side that was already cut is now faced up, and the leg pushed up against the stopping blocks.**
18. Place the **small angled scrap piece** that was just cut back on top of where it was cut from, and clamp the leg into place so that it doesn't move.
19. Rotate the plexiglass back down.
20. With your hands on the handles and the table saw turned on, push the sled jig forward until the blade cuts through the entire leg.
21. With the saw still running, pull the sled back to its starting position.
22. Turn the saw off.
23. Rotate the plexiglass back and pull up on the clamps.
24. **Remove the leg.**
25. Repeat this process until all of your legs are finished.



26. Use a **sander** to sand the legs up to **180 grit**.
27. Use the **letter punches to punch your initials into the bottom of each leg.**
28. **Tape** your legs together.
29. Use a **lumber crayon** to **write your name, period, and group number** on them.
30. Put them away for now.

Aprons:



Aprons:

Cutting the Aprons

Short Aprons: Each person individually needs 2 short aprons!

1. Search through the **poplar scraps** first for any boards that will work for you.
 - a. Bigger than 14" long
 - b. Bigger than 3" wide
 - i. Note: A board that is 6" or wider, it will make both boards!
2. If no scraps are long enough, bring a **poplar board down**.
3. Use the **up cut saw** to cut the poplar board(s) to 14" long.

Long Aprons: Each person individually needs 2 long aprons!

4. Search through the **poplar scraps** first for any boards that will work for you.
 - a. Bigger than 28" long
 - b. Bigger than 3" wide
 - i. Note: A board that is 6" or wider, it will make both boards!
5. If no scraps are long enough, bring a **poplar board down**.
6. Use the **up cut saw** to cut the poplar board(s) to 28" long.
7. Use the **planer** to plane each board down to 0.800".
 - a. Plane the rough side at 1.000"
 - b. Plane the other side at .900"
 - c. Plane the worst side to .850"
 - d. Plane the worst side to .800"
8. Use a **lumber crayon** to mark up both sides of all of the boards.
9. **Wide belt sand** all boards down to 3/4" (.75") removing .01" each time through.
 - a. Note: **Only take off .01" on each round of sanding.**

<i>Sand one side at .80"</i>	<i>Sand the worse side at .77"</i>
<i>Sand the other side at .79"</i>	<i>Sand the worst side at .76"</i>
<i>Sand the other side to .78"</i>	<i>Sand the worst side to .75"</i>

10. Use the **jointer** to make one edge of the board perfectly flat.

11. Use the **table saw** to cut the all boards to 2 and 1/4" wide.

12. Use the **compound miter saw** to cut your **short aprons to 13"**.

13. Use the **compound miter saw** to cut your **long aprons to 26.25"**.

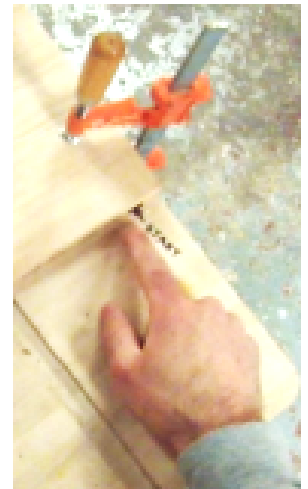


Sanding the Aprons

1. Use a **sander** to sand the **face and edge grain**, **NOT THE END GRAIN** up to 180 grit.

Creating the Tenons On the Aprons

1. Locate **router** with the **tenon sled** that will be used to create the tenons on the ends of the aprons that will fit into the mortises on the legs.
2. Place an apron into upright into the sled jig standing straight up.
3. Close the clamp so that the apron is firmly held in place.
4. Adjust the bar clamp and fence so that the edge is lined up with the starting line.
5. Turn the router on.
6. Slide the sled back and forth across the router 1 time.
7. Unclamp and remove the apron.
8. Rotate the apron so that the routed side is now facing you, yet still down in the jig.
9. Close the clamp and repeat the cutting method.
10. Unclamp and remove the apron.
11. See if the tenon fits snugly into the mortise in the table leg.
12. If it doesn't, then loosen the bar clamp and move the fence back one mark.
 - a. *Note: This causes the router to remove more material.*
13. Repeat the cutting and fence adjustment process until the tenon fits snugly into the mortise in the leg.
14. Once the correct fence setting is found, use that setting to create tenons on **both ends of all 4 aprons (Long and Short).**



Routing the Aprons

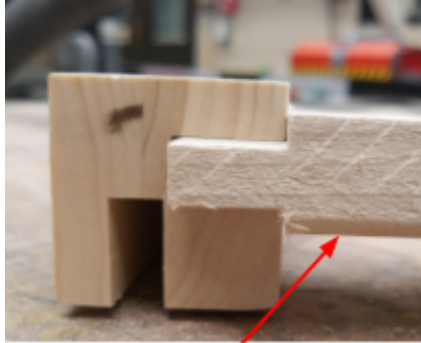
1. Locate the **router** with the **round slotting bit** (as seen to the right) and a **push stick** to apply a detailed edge to all four aprons.
 - a. Open the dust collector gate.
 - b. Turn the router on.
 - c. Place the best face of the board up against the fence and the edge grain of the board flat on the table.
 - d. Pull the board across the router bit from **right to left**.



Assembly Part 1:

Cutting the Tenons On the Short Aprons To Fit In the Mortis

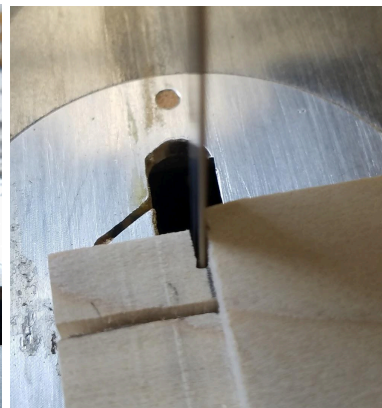
1. Place two legs on the table with the **mortises facing each other and down towards the table.**
2. Rotate a short apron so the round bead (routed part) is at the top and faced down towards the table.
3. Insert it into the mortis.
4. Use a **pencil or pen to trace** the part of the tenon that sticks out of the mortis.



Round bead (routed part)

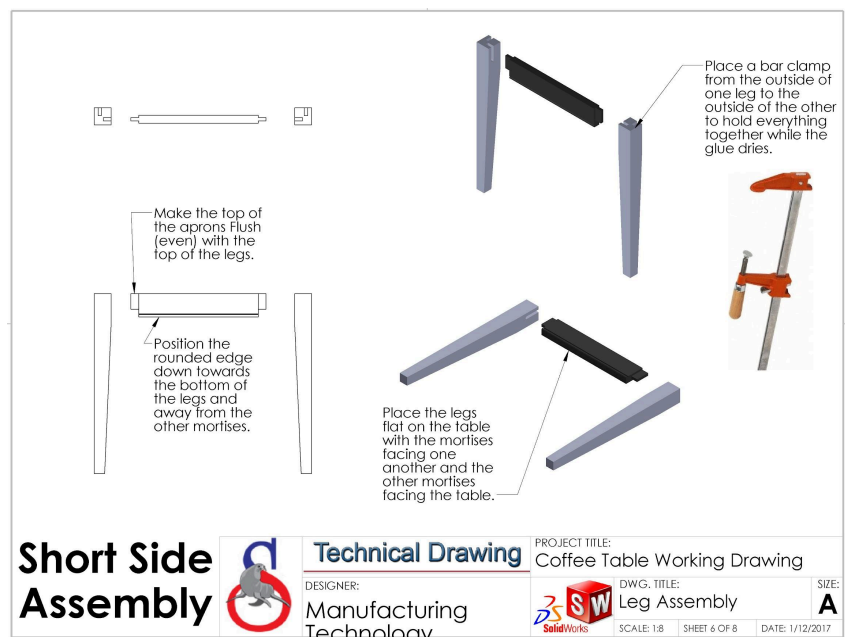


5. Remove the apron from the legs.
6. Use the **bandsaw** to carefully cut the small rectangular corner you traced off of the tenon.
7. Repeat this process with the other short apron.



Short Aprons and Legs Assembly

1. Gather the following materials:
 - a. Bottle of wood glue
 - b. 2 bar clamps
 - c. 2 pipe clamps
 - d. Mallet
 - e. Several wet paper towels



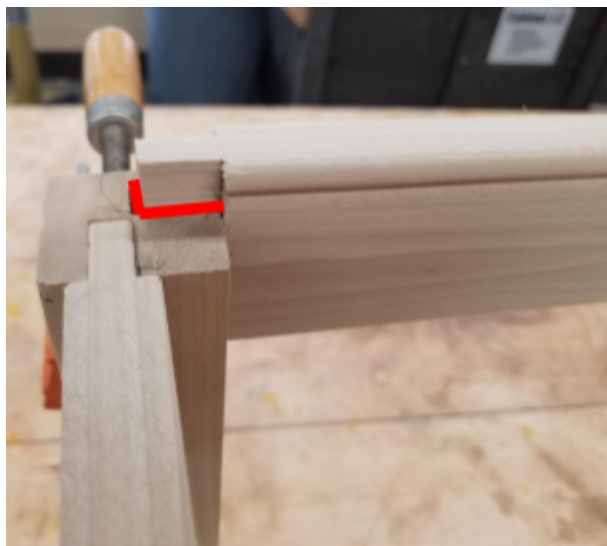
2. Place **2 table legs** on the table with **one mortise faced down, and the other mortises facing the other table leg.**
3. Use a **glue bottle** to put glue inside the mortises that are facing one another and on both sides of one of the small apron's tenons.
4. Rotate the apron so that the **round routed edge is facing up and closest to the smaller end of the legs.**
5. Place the tenon into the mortise of both legs.
 - a. *Use the mallet if needed.*
6. With the **top of the apron flush with the top of the leg**, place / tighten a **bar clamp** spanning across the outside of both legs.
7. Use the wet paper towel to clean off any glue.
8. Repeat this process with the other set of legs.
9. **Allow for 5 minutes of dry time!**



Cutting the Tenons On the Long Aprons To Fit In the Mortis

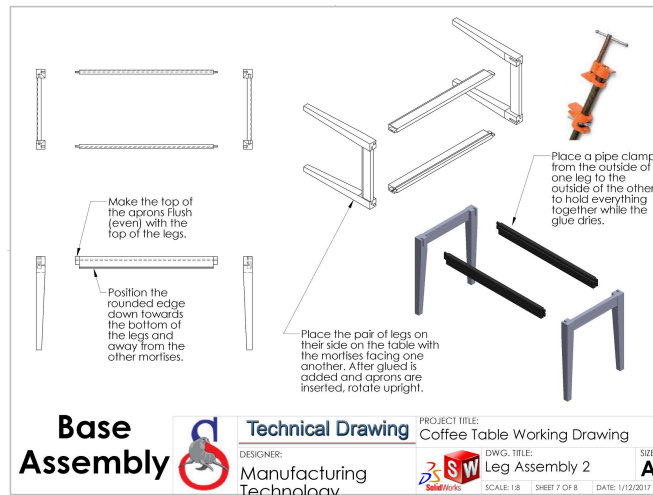
Keep the short aprons clamped up while doing the below steps!

1. Rotate the pairs of legs so that they match the picture to the right.
 - a. Legs on the table with the **mortises facing up.**
2. Work with a partner to stand the legs up and place the long aprons into the mortises with the round bead (routed part) is at the top and faced inwards.
3. Use a **pencil or pen to trace** the part of the tenon that sticks out of the mortis on **all sides of the tenon (inside and outside).**
 - a. You will need the markings on both sides because the apron is too big to rotate it and cut it on the bandsaw without flipping it over!



4. Remove the long aprons from the legs.
5. Use the **bandsaw** to carefully cut the small rectangular corner you traced off of the tenon.

Long Aprons and Legs Assembly



1. Rotate the pairs of legs so that they match the picture to the right.
2. Use a **glue bottle** to put glue inside the mortises of the legs and on both sides of one of the large apron's tenons.
3. Rotate the large aprons so that the round routed edge is facing out.
4. Place the large apron's tenon into the mortise of the legs with the round routed edge is facing out.
 - a. Use the mallet if needed.
5. **Work with a partner** to rotate the legs and aprons upright so that the legs sit on the table correctly.
6. With the top of the aprons **flush with the top of the legs**, place / tighten the **pipe clamps** spanning across the outside of one pair of legs to the other.
 - a. *Note: The pipe clamp should be over top of the large aprons.*
7. Use the wet paper towel to clean off any glue.
8. Use a **lumber crayon** to write your name and period on the outside of the apron.
9. Use the **metal letter punches** and a **hammer** to punch your name on the top of one of the aprons.

Finishing the Base:

Painting:

1. Using a **palm sander**, sand all glue residue flat with **180 grit sandpaper**.
2. Place the table on its side.
3. Use an **impact drill** and a **#2 square driver** to put a 1.25" screw part way into the bottom of each leg.
4. Use a **paint brush** to paint the entire glued table.
 - a. Recommended colors are:
 - i. Black
 - ii. Grey
 - iii. Brown

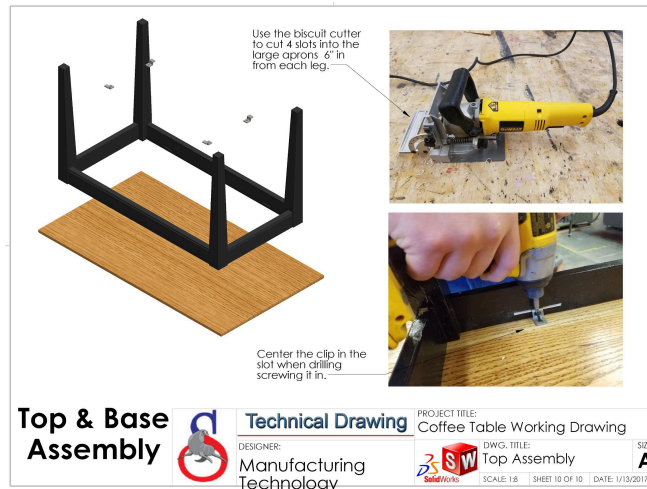
Polyurethaning:

1. Use a **polyurethane brush** to apply **polyurethane** to your glued table base and top **2 times**.

Final Assembly:

Top & Base Assembly

1. Gather the following materials:
 - a. Carpet
 - b. 4 Clips
 - c. 4 .5" Black Screws
 - d. Square or Tape Measure
 - e. Pencil
 - f. Cordless Impact Driver
 - g. #2 Square Drive
 - h. Biscuit Cutter



2. Use a **square / tape measure and pencil** to measure and mark **6"** in from the outside edge of the legs on the large aprons only.
3. Place the **biscuit cutter** on top of the apron, lining the **red line up with your pencil mark**.
4. Hold the table base firmly, pull the trigger, and push in towards the apron.
5. Repeat this step for all 4 spots.
6. Put the **carpet** on a table.
7. Put your top on the carpet with the **routed side down, flat side up**.
8. Place your **leg and apron assembly** on the table.
9. **Center the leg and apron assembly** on the table the best that you can.
10. Place the **clip** into the biscuit cut.
11. Hold the legs & aprons firmly **using a cordless drill to drive a screw into the table top**.
12. Repeat this process for all four clips.
13. Return all material when you are finished.



Final Check (Grading):

1. Turn in the project for grading!

The **final check** will analyze the level of proficiency demonstrated of each step taken throughout the project.