Making a Wood Box Joint TCJ10, 20

Construction Technology

Making a Wood Box Joint

Introduction

Course Code: TCJ2O
Broad base Technology: Construction Technology
Destination: Open
Grade Level: 9 and/or 10
Prerequisite (if applicable) None
Resource/Project Name: Making a Wood Joint Box

Description:

This project focuses on the trades of cabinetmaking and carpentry. In both fields, basic level apprenticeship training requires the development of proficient hand tool techniques. This project focuses solely on hand tools in order to learn about and layout and cut four different wood joints

Go through Checklist:

Go through Checklist to understand the appropriate order of operations for this project.

Checklist

Safety:

- ☐ Use personal protective equipment
- ☐ Practice safe work habits.
- ☐ Practice good housekeeping.

Tools:

- ☐ Select and use hand tools
- ☐ Select and operate portable power tools
- ☐ Select and operate stationary power tools and equipment
- ☐ Sand pieces with sandpaper or sanding machines.
- ☐ Used the following tools:
  - Hand saw
  - Pencil
  - Square
  - Chisel
  - Hammer

Procedure:

- ☐ Read and interpret technical drawings/plans/sketches
- ☐ Apply trade-related written and spoken information
- ☐ Perform trade-related calculations
- ☐ Use wood glue or other adhesives
- ☐ Select and use nails or screws
- ☐ Prepare the project for applying finishes, which includes but is not limited to sanding, filing, etc.
- ☐ Select, apply and polish finish material.

Written Instructions

Steps:

Part 1: Rough Cuts

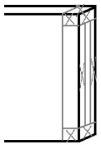
1. Look over the provided drawing.
2. Write a cutting list of your cuts. Look at the notes on each drawing to help determine the lengths of the cuts.
3. Layout the rough cuts on your given lumber. Use a tape measure, and break an inch for accuracy. Use the tri square to square your mark on all four sides.
4. Tip: write an X on all offcut pieces.
5. Use a vice to hold your piece while you cut. Use your saw, and ensure that you can sight the square pencil mark on two sides while you cut. This will ensure that you can keep your cuts straight.
6. Once your pieces have been cut to their rough length, start laying out your joints, based on the drawings provided by your teacher.

Part 2: Wood Joints

Mortise and tenon

1. On the tenon, measure the distance indicated from the end of your stock. Note: the distance between the shoulder of your mortise and the shoulder of your box joint should be exactly 8 ¾" long, while the distance between the shoulder of your mortise and the shoulder of your dovetail should be 5". Ensure the shoulder-to-shoulder measurement is exact, as this will create assembly problems in the future. If the tenon or box joints are longer than ½" or ¾", they can be cut down accordingly. Note: Box joints can be assembled with pins longer than ¾" and can be planed or sanded down to size after assembly. Tenons will need to be 1/16" shorter than the mortise prior to assembly.
2. Use a trisquare to mark the length of your tenon (½").
3. From the top and bottom edge, measure up and down ¾". Use your scribe or combination square to mark this around the face and edge.
    a. Note:

How to mark it:



4. Use your hand saw to cut out the tenon.

5. Mark out the mortise.
6. Use a hammer and ¼" chisel to go the required depth. Make sure you are chiseling down on the top and bottom ends of the mortise first to break the grain before chiseling the channel. Continue chiseling until your required depth of 9/16".

Dovetail

1. Mark out the length of the dovetails using a tape measure. Note: the distance between the shoulder of your dovetail pins and the shoulder of your rabbit or mortise joint should be exactly 8 ½" long. Similarly, the shoulder of your dovetail tails and the shoulder of your tenon should be exactly 5". Ensure the shoulder-to-shoulder measurement is exact, as this will create assembly problems in the future. If your tails or pins are longer than ¾" that is not bad, and can actually be good for having nice dovetails after assembly. They can be cut or sanded after the joint has been assembled. Ideally, mark out ¾" plus 1/16" - ⅛".
2. Starting with the tails, measure the indicated distances along the end of your back piece. Use a tri square to square them across the end of the wood.
3. Advice: put an X on the parts you wish to remove, so you do not accidentally remove the wrong parts.
4. Set your sliding t-bevel to 1:6. To do this, you can measure on a known square piece of wood (or workspace, or other) 1" across and 6" down. Set your sliding T-bevel along your marks to create a roughly 80.5° angle.
5. Alternating the direction of the T-bevel, draw in your tails on both sides of your piece of wood.
6. Measure back from the end ¾" and square off your mark on all sides of your piece.
7. Put your piece in a vice and use a saw to cut the tail marks.
8. Use a sharp chisel to cut out between the tails, along your ¾" mark. Tip: chisel straight down, perpendicular to the direction of the grain, to break the grain. Do this on both sides. Then chisel from the end toward your chisel marks, only going the depth of your initial strikes. Repeat until the tails are all cleaned out.

    Note: if you are not precise with the shoulder cuts (the chisel cuts perpendicular to the grain between the two tails, or the hand saw cuts at both ends), you will see gaps after assembly. Be very careful to be precise with your cuts and chiseling!

9. For your pins, mark your end with the measurements provided.
10. Use your pre-set sliding T-bevel to mark out the appropriate angles.
11. Before cutting, and after marking out the pins on the end of your piece, put your cut out tails along your marks. See if they line up. Adjust as necessary to create a tight joint.
12. Once you have adjusted your pencil marks on the end of your piece, use a tri-square to square your marks down along the face, parallel to the grain.
13. From the end, measure down, in the same direction, ¾". Use your square to square off that mark.
14. Because the pins are angled on the end, rather than on the side with the tails, cut along the end with your hand saw.
15. Set your piece on the table, so that the shorter side of the pins are facing up. Be delicate when chiseling out between your pins. Break the grain on both sides, but do the majority of your chiseling with the shorter side facing up. This will prevent major tear out on the other side.

Box Joint

1. Mark out the length of the box joints using a tape measure. Note: the distance between the shoulder of your box joints and the end of your rabbit should be exactly 5 ¼" long. Similarly, the shoulder of your box joint and the shoulder of your mortise should be exactly 8 ¾". Ensure the shoulder-to-shoulder measurement is exact, as this will create assembly problems in the future. If your pins are longer than ¾", that is not bad, they can be cut or sanded after the joint has been assembled. Ideally, mark out ¾" plus 1/16" - ⅛".
2. Measure the given distances along the end of your piece.
3. Use a tri square to square off your marks.
4. Use a tri square to transfer your lines along both faces.
5. Measure from the end in, along your face ¾". Use a square to transfer this line around all faces and edges.
6. Advice: put an X on the parts you wish to remove, so you do not accidentally remove the wrong parts.
7. Use your saw to cut down your pencil marks, along the grain. You can cut across the grain for the end mark that needs to be removed.
8. Use a sharp chisel to cut out between the marks, along your ¾" mark. Tip: chisel straight down, perpendicular to the direction of the grain, to break the grain. Do this on both sides. Then chisel from the end toward your chisel marks, only going the depth of your initial strikes. Repeat until the area is all cleaned out.

   Note: if you are not precise with the shoulder cuts, you will see gaps after assembly. Be very careful to be precise with your cuts and chiseling!

9. Repeat with the other piece, ensuring that you are keeping or getting rid of the opposite parts.

Rabbet and Dado Joint

1. First, start by laying out the rabbet joint on the front piece.
2. From the left edge, measure back ¼".
3. Using a tri square, square your mark on the face and two sides.
4. Along the top and bottom edge, measure back from either face ⅜" so that the thickness is split in half.
5. Repeat step 4 along the entire end.
6. Using a handsaw, cut out the rabbet joint.
7. On the left side piece, measure in from the end ¼", then ⅜" on the side that will face inward of the box.
8. Along the top and bottom edges, measure back from the marked face ¼".
9. Using a handsaw to cut the lengths of your dad cut, cut down ¼" depth on the left and right of your dado cut. Ensure your saw is on the inside of each line.
10. Use your ¼" wide chisel to remove the material inside your dado cut. This will leave a ¼" deep and ⅜" wide dado for your rabbet to fit into.

Base

1. On each of the four side pieces, measure up from the bottom ⅜", then again 1 ⅛". Use a scribe or combination square to transfer the line parallel to the edge of your piece.
2. Continue and transfer the line across both ends.
3. On each end, measure down ¼" from your pencil marks.
4. Use a hand saw to cut your pencil marks to a depth of ¼".
5. Use the ¾" wide chisel to chisel out your dado.
6. Your base piece should fit perfectly into the dado cuts of all four sides.

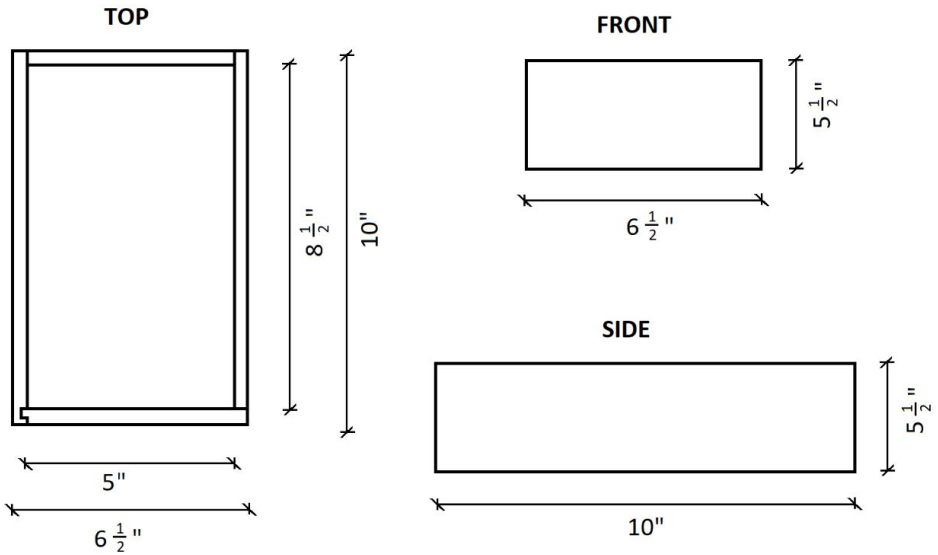
Part 3: Assembly:

1. Before gluing, do a dry test of all your joints and adjust by filing, cutting, sanding or chiseling any joint that is not fitting properly.
2. Put glue along all areas of your wood joints that will be making contact, right before assembling that joint.
3. Start by inserting your base into one of the sides. Assemble the two joints on either side of your first piece.
4. Finish with the last piece.
5. Your joints should be very tight. If they are not, you may need to use clamps to secure your pieces together while they dry. Do not forget to use squish blocks if you are using metal clamps!

Part 4: Finish:

1. After the glue has dried (approximately one hour), you can start sanding your finish piece.
2. Begin by delicately scraping excess glue. Remember to try not to gouge your wood.
3. Start sanding using a sand block, starting with grit 60, 80, 100, 120, 150, and then 220.
4. Your teacher will give you options for finishes. Follow all instructions your teacher provides, as is outlined on the container and/or on the MSDS sheets.

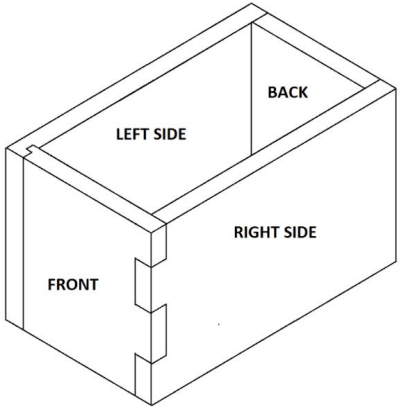
BOX OUTER DIMENSIONS



Notes:

*Individual joint details are provided below and are not indicated on the above front and side views.

*No hidden lines are indicated above.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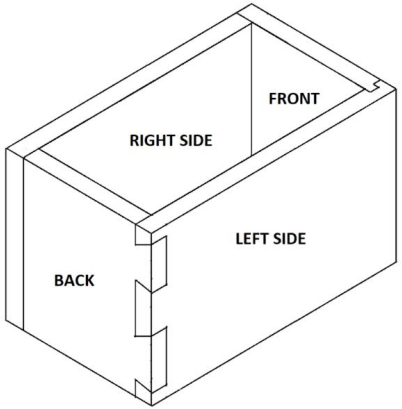
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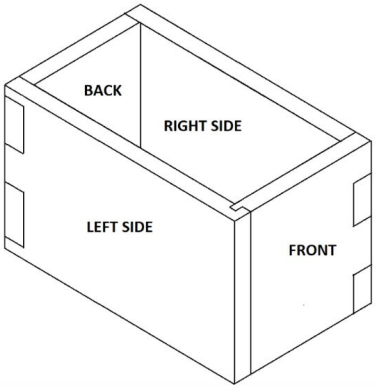
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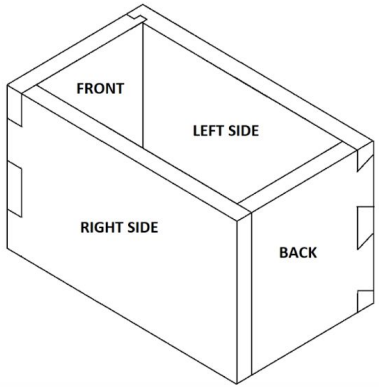
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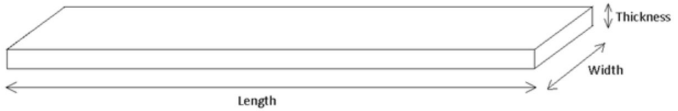
Rough Cutlist Assignment

Use the following chart to fill-out your cutlist form.

Name: _____ Date: _____

ROUGH CUT CUTTING LIST ASSIGNMENT



Write your list as:

2 @ 2" x 4" x 8' means that you need two 8 foot long lengths of 2x4 material.

Fill in the following chart:

In the chart below, put the rough lengths that you will be cutting your four sides, and the bottom piece. Use the information from each joint to determine the final lengths.

Piece	QTY @ thickness (*t*) x width (*w*) x length (*l*)	Check Off When Cut
Front	_____ @ _____ x _____ x _____	
Back	_____ @ _____ x _____ x _____	
Right Side	_____ @ _____ x _____ x _____	
Left Side	_____ @ _____ x _____ x _____	
Bottom	_____ @ _____ x _____ x _____	

Post Assignment Questions:

1. How many new skills did you develop doing this project? Compare the number of checks you put above compared to the start of the project.

1. Which skills do you feel are your strengths? Explain.

1. Which skills did you find difficult to perform? Explain.

1. What did you enjoy in doing this project? Explain.

1. What did you not enjoy? Explain.

Post Assignment Questions:

1. Which of the following applies to you?
   a. I am interested in beginning an apprenticeship
   b. I am considering doing an apprenticeship
   c. I plan on doing some trade-related projects or jobs, but not as a career path
   d. I plan on doing some hobby projects
   e. I do not intend to do trade-related projects ever again.

1. The apprenticeship training standards for Carpenter, Cabinetmaker, Construction Craft Worker and Native Residential Construction Worker were all included in this assignment. Are you surprised to see how this project aligns with apprenticeship standards? Do you think this may give you a head start? Explain.

Please find the lesson plan with materials, instructions, and handouts HERE