



# BUILDING INDUSTRY TECHNOLOGY ACADEMY

A program promoted by the  
California Homebuilding Foundation



## UNIT TEN: PROJECT #2

## **YEAR ONE**

### **UNIT TEN: PROJECT #2 TOOLBOX**

# **Table of Contents**

**Lesson 1:** Blueprint Reading/Bill of Materials

**Lesson 2:** Types of Wood Joints

**Lesson 3:** Project #2 (10 Day project)

### Lesson #1: Blue Print Reading/Bill of Materials

#### Objectives

**Students will be able to...**

- Obtain the information they need from a working drawing.
- Develop a bill-of-materials.

#### Common Core Standards

LS 11-12.6

RSIT 11-12.2

RLST 11-12.2

Health and Safety 6.2, 6.3, 6.4, 6.5, 6.6

Leadership and Teamwork 9.1, 9.7

Technical Knowledge and Skills 10.1, 10.5

Demonstration and Application 11.1

Cabinetmaking and Wood Products Pathway A1.4, A1.7, A3.1, A4.1, A4.3, A4.4, A4.7A4.1, A4.4, A6.1

Residential and Commercial Pathway D2.1, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7

#### Materials

Tool Box Working Drawing

Tool Box Instructions

Bill of Materials

#### Lesson Sequence

- Introduce a working drawing to the class. Explain that a working drawing is also considered a text. Show that the working drawing connections and represents the finished project.
- Pass out copies of the *Toolbox Working Drawing, Toolbox Instructions, And The Bill-Of-Materials*.
- Have students identify all the parts of the project so they have an idea of how many items will be listed on their bill of materials list. Work together to complete the bill of materials. (50 minutes)

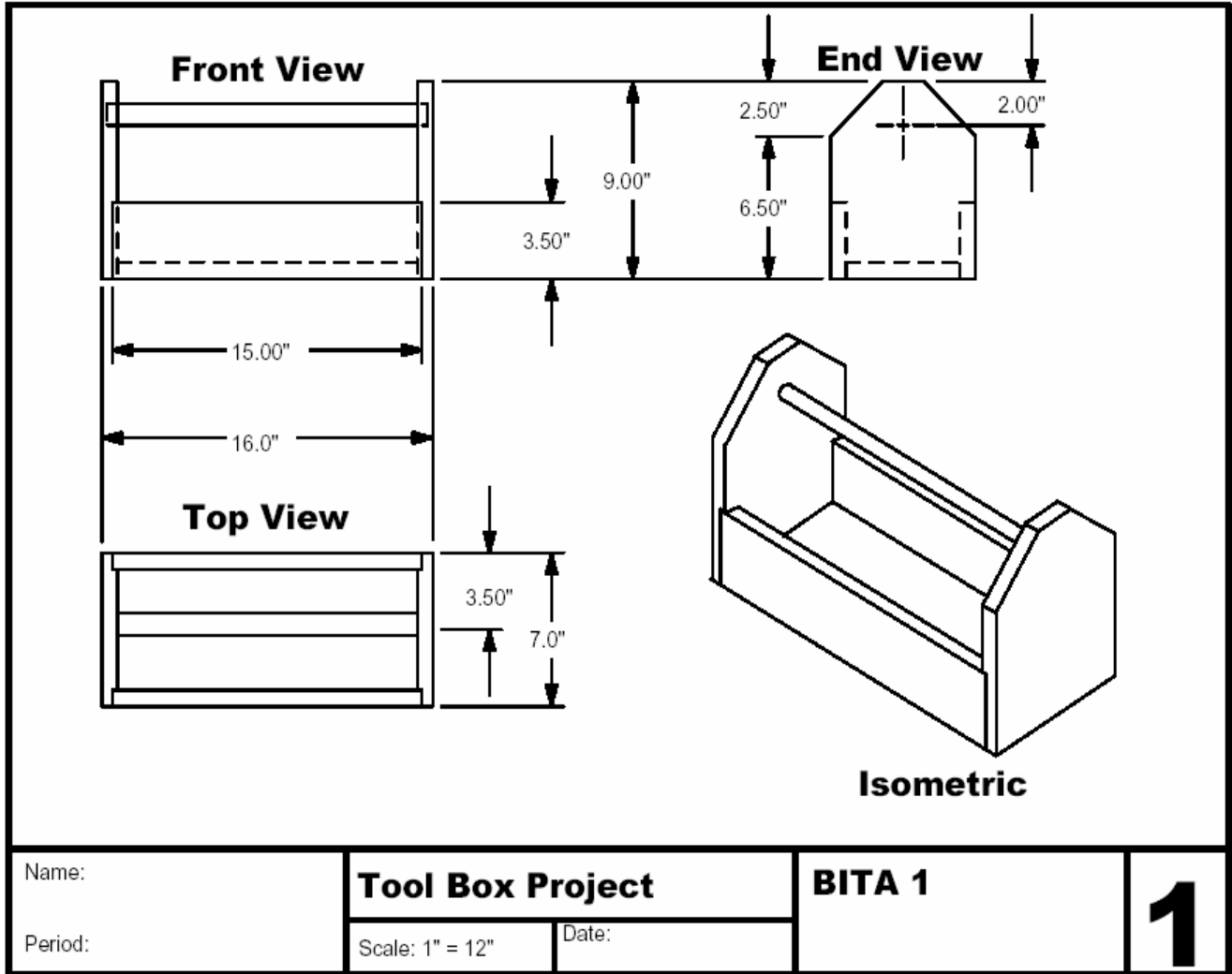
**Assessment**

Check for understanding. Monitor Student learning through questioning.

**Accommodations/Modifications**

Check for Understanding  
Additional Visuals  
Support One on One

**Toolbox Working Drawing**



## Toolbox Instructions

### Layout

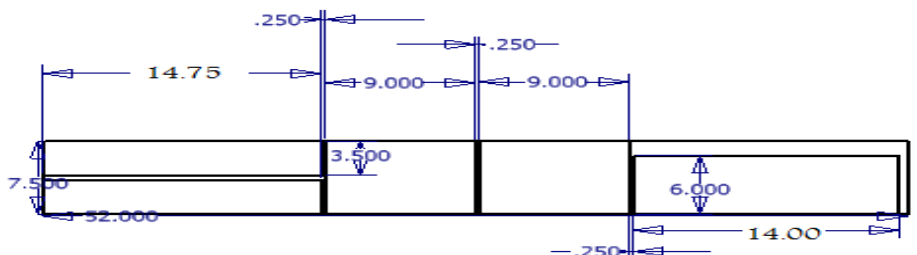
1. Layout angled lines by measuring up 3 ½ inches on each side of the end pieces and make a mark, measure across the top 2 5/8 inches on both sides. Draw a diagonal line connecting the marks on each side. This will make the angled lines on the ends of the tools box.
2. Place the first end piece into a vice, or clamp to a workbench.
3. Using a handsaw cut along the lines you just marked.
4. Using a sharp hand plane, straighten and smooth the newly cut sides.
5. Repeat steps 1 – 4 for the other end piece of the toolbox.
6. Measure ¾ of an inch in on each side of the end piece; draw a straight line up into the angled cut.
7. Using a handsaw, make a shoulder cut for the rabbit on the line you just made, 3/8" deep. This will be the edge of the rabbit. Do this on both edges of the end piece.
8. Using a chisel, chisel out a groove 3/8" deep next to the saw kerf that was just made.
9. Repeat steps 6 – 8 on the other end piece of the toolbox.
10. Measure down 1 ½" from the top of the edge piece and make a mark, now find the centerline of the edge piece and make a line. Where the two lines intersect is where the hole for the handle will be drilled.
11. Using a brace and 3/4" bit, drill a hole at the intersection of the two marks that where just made.
12. Repeat steps 10 and 11 on the other end piece of the toolbox.

### Assembly

1. Receive two (2) side pieces and one bottom piece from your instructor.
2. Without glue, dry assemble all pieces to insure a proper fit, adjust non-fitting pieces now.
3. Assemble all five (5) pieces at once using glue, clamps and nails.
4. Drive two finish nails into each joint.
5. Receive ¾" dowel from instructor, insert into holes at the top of the toolbox with approximately ¼" protruding from each end, secure with glue.

### Bill of Materials per Student

- (1) 1" x 8" x 48" cut as shown
- (1) ¾" dia. Dowel 18" long





### Bill of Materials

Part #	Description	Material Type	Dimensions (calculate footage)		Footage (bd/ft, lin/ft, sq/ft)	Quantity Of Parts	Unit Cost	Total Cost
				=				\$-
				=				-
				=				-
				=				-
				=				-
				=				-
				=				-
				=				-
				=				-
				=				-
Cost:								\$-



### Lesson #2: Types of Wood Joints

#### Objectives

**Students will be able to...**

- Understand the different between wood joints.
- Develop and understanding of how to cut a rabbet joint using hand tools.

#### Common Core Standards

LS 11-12.6

RSIT 11-12.2

RLST 11-12.2

Health and Safety 6.2, 6.3, 6.4, 6.5, 6.6

Leadership and Teamwork 9.1, 9.7

Technical Knowledge and Skills 10.1, 10.5

Demonstration and Application 11.1

Cabinetmaking and Wood Products Pathway A1.4, A1.7, A3.1, A4.1, A4.3, A4.4, A4.7A4.1, A4.4, A6.1

Residential and Commercial Pathway D2.1, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7

#### Materials

Common Wood Joints and Clamping Power Point

<https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Afee56a00-ffd7-4ace-b3bc-405ccd5b20b5>

Cloze Notes worksheet on Wood Joints and Clamping

YouTube Video <https://www.youtube.com/watch?v=mYqwsRRTwxI>

#### Lesson Sequence

- Using the *power point lesson* instruct students on common joints. Pass out the *cloze notes worksheet* and have students fill in the blanks on their notes by using the material from the power point. Answer any questions students may have (30 minutes).
- Watch the *YouTube video* <https://www.youtube.com/watch?v=mYqwsRRTwxI> and answer any questions students may have (10 minutes)
- Have students write an exit ticket about how to cut a rabbet join using hand tools.



**Assessment**

Use exit ticket data to gather information on student understanding of how to cut a rabbit joint using hand tools. May need to reteach as needed.

**Accommodations/Modifications**

Check for Understanding  
One on One Support  
Visuals  
Partner Support for Cloze Notes

## Cloze Notes Worksheet on Wood Joints and Clamping

Directions: As you watch the Power Point on common wood joints fill in the missing information.

**Joinery** is a part of woodworking that involves joining together pieces of timber or lumber, to produce more complex items. Every place that two separate pieces of wood meet each other is considered to be a joint.

**Joints** is a term used to describe the close securing or \_\_\_\_\_ of two or more smooth, even surfaces. Most joints are permanently fastened together with glue and sometimes screws or nails.

The joint selected for each kind of construction depends to some extent on the need for:

- ✓ The strength
- ✓ The appearance
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_

Therefore, different joinery techniques are used to meet differing requirements. You can build a project with countless different joinery methods. The most basic involves two boards butted together and connected with a fastener like a screw. Or, as you advance your skills, you can test out the more complex, traditional methods like a dovetail or mortise and tenon.

Nine basic wood joints

1. Edge
2. Butt
3. Rabbet
4. Dado
5. Miter
6. Lap
7. Mortise and Tenon
8. Dovetail
9. Finger

## **1. Edge-to-edge Joint**

This joint is used when laminating boards together edge-to-edge to obtain a \_\_\_\_\_ piece of wood. It is used for tabletops, desktops and cabinet sides.

## **2. Butt Joint**

A butt joint is a technique in which two pieces of wood are joined by simply placing their ends together without any special shaping. The butt joint is the \_\_\_\_\_ to make since it merely involves cutting the wood to the appropriate length and butting them together. It is used for simple boxes, cases, cheap drawers, frames and chairs. It is a \_\_\_\_\_ joint.

## **3. Rabbet Joint**

To make this joint you need to make a cut or groove along or near the edge of a piece of wood that allows another piece to fit into it to form a joint. It is an \_\_\_\_\_ cut across the edge or end of one piece. It is used for joining cabinets or for making boxes where two edges need to fit together tightly.

## **4. Dado Joint**

The dado joint is a \_\_\_\_\_ the grain. It is typically used in making bookshelves, drawers, steps, and bookcases. This is a \_\_\_\_\_ joint. In very old furniture, a dovetail dado joint is a real work of art because of the time the cabinetmaker had to spend to cut it.

## **5. Miter Joint**

When you make this joint you are joining pieces that are cut at a \_\_\_\_\_ angle and joined to form a \_\_\_\_\_. They are very weak and are often reinforced with dowels, spline, or mechanical fasteners. Miters are used for decorative molding and for frames.

## **6. Lap Joints**

These are really a large group of joints in which one side laps over the other. A cross-lap joint joins two pieces with flush faces, the pieces may \_\_\_\_\_. You need to cut dadoes of equal width and depth on the two pieces so that the face surfaces are \_\_\_\_\_ when they are assembled to make the joint. This joint is strong. These joints are used for legs of furniture, doors, furniture frames and braces.

## **7. Mortise and Tenon Joint**

One of the most common joints used for joining the \_\_\_\_\_ of tables, chairs, and other type of furniture is the Mortise and Tenon joint.

The tenon is the part that \_\_\_\_\_ and glue is applied before the joint is pushed together. Clamps are then used to hold the joint firmly together, usually for twenty-four hours.

The *Plain Mortise and Tenon* joint is very common and is widely used for the joints of tables. Although it is quite strong, if enough force is placed on the joint it will eventually break or come lose.

The *Wedged Mortise and Tenon* joint is extremely strong because the tenon passes all the way through the mortise and is wedged at the other side. However, the Wedged Mortise and Tenon is more difficult to mark out and cut and requires much more technical skill. This is used as a joint on chairs and other pieces of furniture so that the joints do not break apart when extra weight is applied.

## **8. Dovetail Joint**

This is very strong joint because of the way the tails and pins are shaped. This makes it difficult to pull the joint apart and virtually impossible when glue is added. This type of joint is used in \_\_\_\_\_ such as draws, jewelry boxes, cabinets and other pieces of furniture where \_\_\_\_\_ is required. There are different types of dovetail joints and when cut accurately they are very impressive and attractive.

## **9. Finger Joints**

This joint is ideal for box constructions and is suitable for use with natural woods such as pine and mahogany or even man-made boards such as plywood and MDF. The joint is strong especially when used with good quality glue.

### Lesson #3: Project #2 (10 Day project)

#### Objectives

##### Students will be able to...

- Build a three-dimensional object based on two dimensional drawings.
- Estimate the cost of a given project, based on a shop drawing.

#### Common Core Standards

LS 11-12.6  
 RSIT 11-12.2  
 RLST 11-12.2  
 Health and Safety 6.2, 6.3, 6.4, 6.5, 6.6  
 Leadership and Teamwork 9.1, 9.7  
 Technical Knowledge and Skills 10.1, 10.5  
 Demonstration and Application 11.1  
 Cabinetmaking and Wood Products Pathway A1.4, A1.7, A3.1, A4.1, A4.3, A4.4, A4.7A4.1, A4.4, A6.1  
 Residential and Commercial Pathway D2.1, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7

#### Materials

Clean up job volunteers list/sign-up sheet  
 Tool Box Instructions/working drawings  
 Bill of Materials  
 Project Progress Self-evaluation (Day 6)  
 Project Self-Evaluation (Day 10)

#### Lesson Sequence

##### Day 1-5

- Have students find their "building buddy."
- Review *the clean-up job descriptions* and ask for volunteers to sign up for extra credit.
- Remind students of the clean-up procedures and machine and safety rules for while in

the shop.

- Review and answer any questions regarding the *toolbox instructions*.
- When each student gets their board, they may begin their project.

**Day 6**

- Have students complete the *project progress self-evaluation form*. Then students may continue to work on their project.

**Day 10**

- Have students put their final projects out and students roam around the classroom looking at each other's final project. Students may ask each other questions about their project. Have students fill out *the project self-evaluation form* about their experience with the project.

**Assessment**

- Monitor student's progress each day by observation and asking questions. Clarify any misconceptions as needed.
- Use student's toolkit papers/drawings, final product and student self-evaluation for student's final grade.

**Accommodations/Modifications**

One on One Support  
Check for Understanding  
Extra Time  
Specific Partnering

**Project # 2 Progress Self-Evaluation**

1. What I have learned from this project so far...

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2. What I would still like to learn from this project is.....

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3. Safety practices that I have been observing...

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4. What I have learned that I should be doing, from this point on, to ensure an excellent outcome of this project...

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## Project #2 Self-Evaluation

1. What I have learned from this project...

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2. Safety practices that I observed on this project...

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3. What I like and don't like about the structure/appearance of my project...

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4. What I could have done differently during this project...

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5. Skills I learned from this project...

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6. How much time did you put into this project?

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7. If you had to make five of these projects, how you manage your time differently?

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8. The grade that I would give myself on this project is a(n) \_\_\_\_\_.

## **Clean-up Jobs and Job Descriptions**

**Shop foremen (2):** Makes sure that everyone is helping and that those with specific jobs are doing them. Reports to Instructor before class is released.

**Safety glasses (2):** Counts safety glasses before going into shop, makes sure same number is back in case before final bell, reports any missing, or broken pairs to foremen and/or instructor.

**Tools (2):** Makes sure all tools that are out, get back into the tool room.

**Tool Room (2):** Makes sure that all tools brought into the tool room are put away in the correct place. Makes sure all tools are accounted for, and cleans/straightens tool room if necessary. Reports any discrepancies or problems to foremen and/or teacher.

**Machinery (2):** Makes sure machines are cleaned off, and cleaned out if necessary. Reports anything that is not right (broken, out of adjustment, etc.) to foremen and/or instructor.

**Work benches (2):** Makes sure all tools, materials, etc. are cleaned off of benches. Then sweeps them down.

**Floor (sweeping) (2-4):** Makes sure the entire shop is swept, and all sawdust is picked up and place in the trash or proper receptacle.

**Shop Volunteers – Sign Ups**

<b>Job:</b>	<b>Student #1</b>	<b>Student #2</b>
Shop foreman		
Safety glasses		
Tools		
Tool room		
Machinery		
Work benches		
Floor sweeping		
Floor Sweeping		