SAM HOUSTON
Agricultural Sciences

VATAT 2019

Agricultural Mechanics 101: Beginning Shop Projects for New Teachers

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Birdhouse

Name: _____
Date: _____

Description:

Students will build a traditional cedar birdhouse using a layout, wood, hammer, glue, and wood dowel. Agriculture mechanic shop tools such as a miter saw, table saw, drill press, measuring tape, and combination square will be used by students to construct pieces of the birdhouse.

Objectives:

By properly completing this project, students will be able to:

- Read and implement project layout directions.
- Efficiently use wood cutting machine to make accurate wood cuts.
- Efficiently use drill machine to make accurate hole size.
- Implement placement and sanding for workmanship.

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural and technical system skills in agricultural applications. The student is expected to:

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(D) Identify building materials and fasteners; and

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(3) The student follows operating instructions for tools and equipment to perform a given task. The student is expected to:

(A) Select, use, maintain, and store appropriate hand tools to perform a given task;

(B) Select, use, maintain, and store appropriate power equipment such as tools powered by electric, pneumatic, and internal combustion engines; and

(C) Select and use measuring and marking devices.

(7) The student performs carpentry skills. The student is expected to:

(A) Identify materials used in agricultural construction;

(B) Identify elements of a cost estimate and prepare a bid package for a planned project;

(C) Demonstrate basic carpentry skills; and

(D) Paint and protect a project with coatings.

Materials:

1”x 6” Cedar Fence Board
1 1/4” Drywall Screws
3/8” Diameter Wood Dowel
Sandpaper (120 grit)

Tools:

Table Saw
Power Miter Saw
Claw Hammer
Drill Press
Combination Square
1/8” Diameter Drill Bit
3/8” Diameter Drill Bit
1 ½” Diameter Drill Bit (Forstner or spade)
Measuring Tape
Pencil

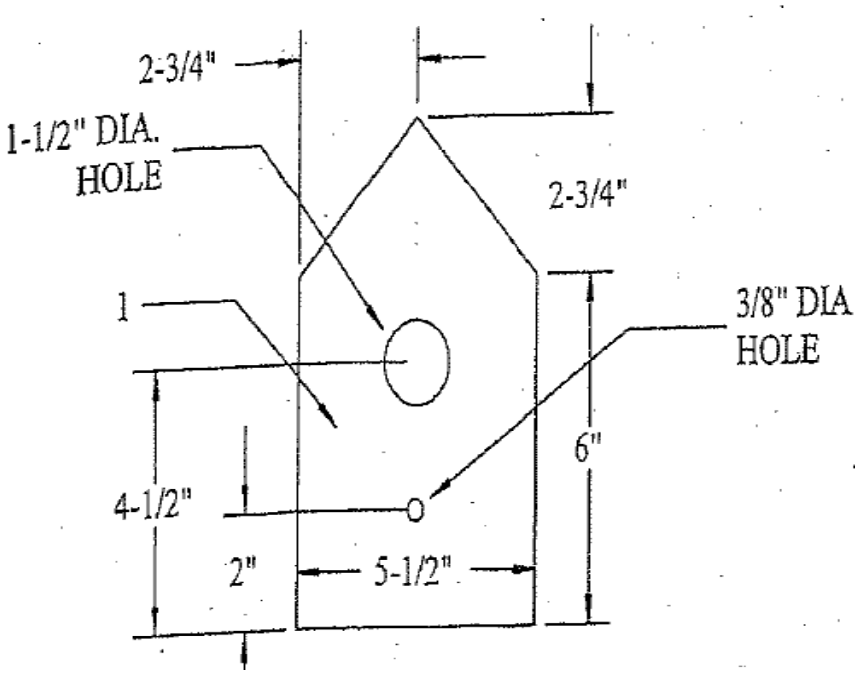
Procedure:

1. Measure two side panels (5 ½” by 6”) as shown in the plan. Cut out the side panels using a miter saw.

2. Measure the front panel (5 ½” by 8 3/4”) and mark cuttings. Cut front wall panel (5 ½” by 8 3/4”) with miter saw. Then measure up 6” and mark. Use a combination square to

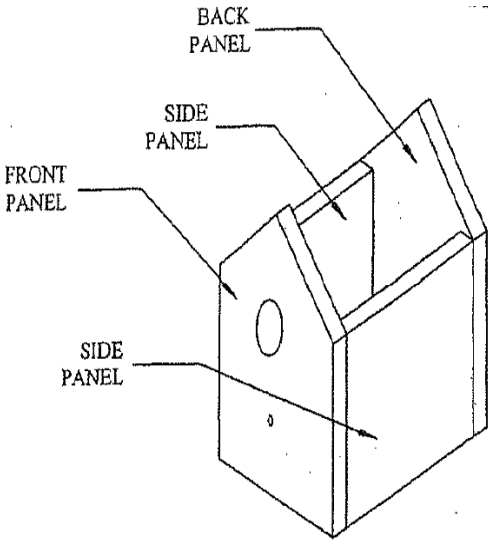
draw out the 45-degree angle at the top of the panel. Cut the 45-degree angles using the miter saw.

3. Measure the center of the holes on front panel. The large hole is 4 1/2” up and 2 ¾” over. The small dowel hole is 2” up and 2 ¾” over. Then cut out the holes using the correct size bit and the drill press. The large hole needs a 1-1/2” diameter bit and the small hole needs a 3/8” diameter bit for the front panel.



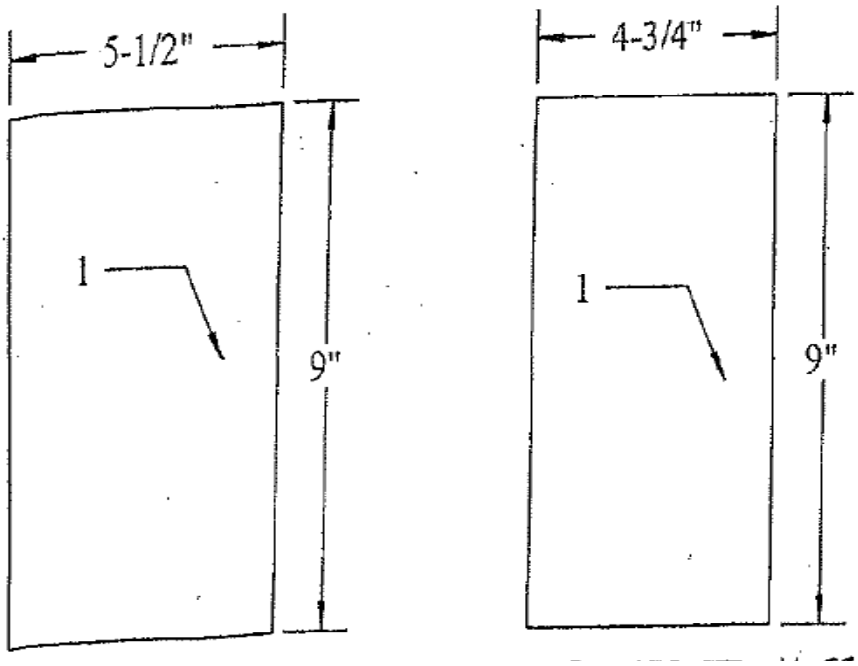
4. Measure and cut (1) back wall panel by using the front panel as a template for back panel, to ensure both panels are identical. Do NOT drill holes into the back panel.

5. Assemble (2) sides, front, and back panels as shown in the figure below. Screw together (2 screws per joint) each joint by using the 1/8” drill bit to drill the pilot holes where the screws will go. Use a Philips driver bit to drive in 2 screws.

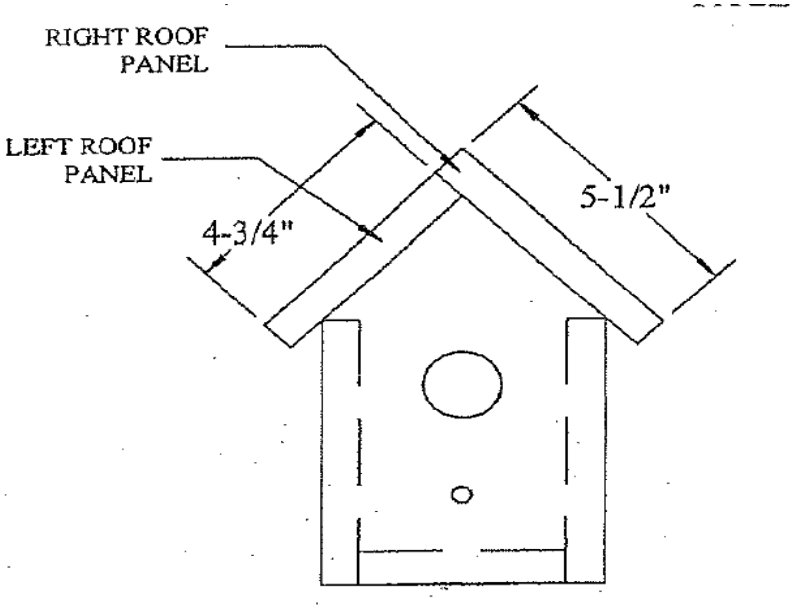


6. Measure and cut (1) bottom panel 5 ½” x 7”. Install bottom panel by using the 1/8” drill bit to drill pilot holes and using a Philips head screwdriver to drive in 2 screws.

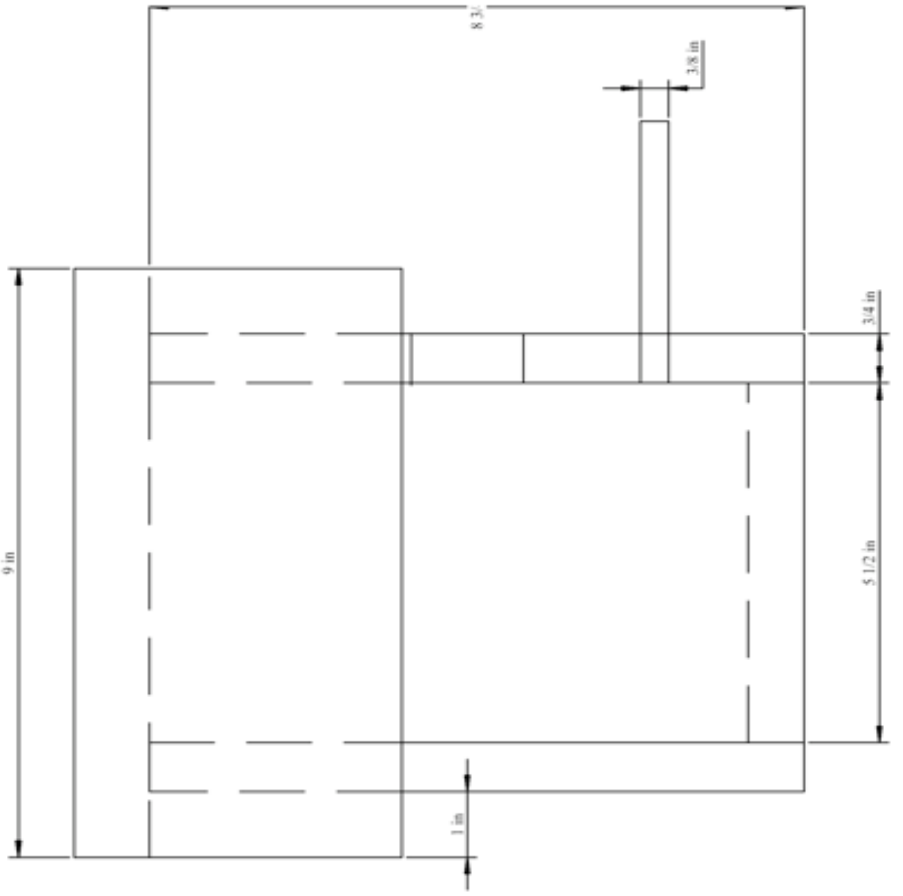
7. Measure and cut (1) right roof panel and (1) left roof panel on the miter saw. One panel with be 5 ½" by 9", while the other will need to be ripped to be 4 3/8" by 9". Use the table saw to rip the roof panel.

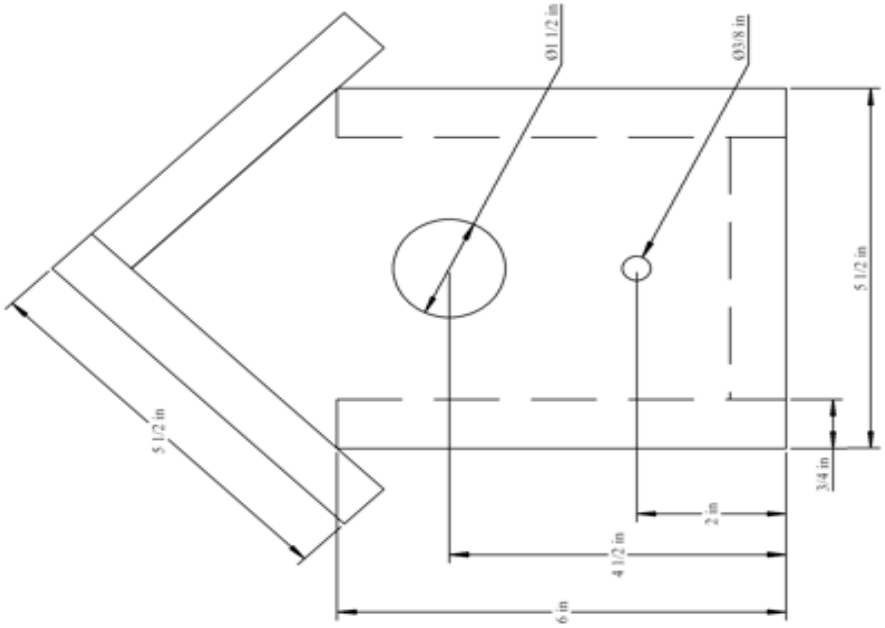


8. Install roof panels on house walls. Drill pilot holes and attach (2 screws per end and 3 screws along ridge) roof panels. Shown below.



9. Cut a 4" long piece of 3/8" diameter wood dowel using the miter saw. Glue and insert dowel into 3/8" diameter hole previously cut out into front panel of birdhouse.


8 3/
3/8 in
9 in
3/4 in
5 1/2 in
1 in


Ø1 1/2 in
Ø3/8 in
5 1/2 in
5 1/2 in
3/4 in
2 in
4 1/2 in
6 in

Bill of Materials:

Size	Material	Quantity	Cost
1” x 6” x 10’	Cedar Fence Board	1	2.48
3/8”	Wood Dowel	1	0.98
1 ¼”	Drywall Screws	1 Box	2.98

Cut List:

Quantity	Material
2	5 ½” x 8 ¾” for ends
2	5 ½” x 6” for walls
1	5 ½” x 7” for bottom
1	4 ½” x 9” for roof
1	5 ½” x 9” for roof
1	4” - 3/8” wood dowel

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Project layout (accurate measurements)	15	
Project cutout (accuracy and quality cuts)	15	
Holes drilled (size and location)	15	
Project finish (corners square, minimal scratches)	15	
Overall appearance of the project (workmanship)	15	
Safety	25	
TOTAL	100	

Pictures:

Boot Scraper

Name: _____
Date: _____

Description:

This project will utilize cold metal cutting with either a hydraulic ironworker/ cold saw/ or chop saw. Shielded Metal Arc welding or Gas Metal Arc welding can be used to construct this project. Once the boot scraper is completely constructed, it can be set in concrete or screwed to the base material for ease of use.

Objectives:

By properly completing this project, students will be able to:

- Read a plan to determine and layout dimensions.
- Cut mild steel with the hydraulic shear/ cold saw/ chop saw
- Properly round the top of the leg (3/4" radius) with a bench grinder.
- Properly set an arc-welding machine.
- Choose the correct electrode/wire for the job.
- Properly assemble the boot scraper.

Agricultural Standards Met:

TEKS:

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(9) The student performs appropriate cold and hot metal techniques. The student is expected to:

(A) Identify types of metal;

(B) Cut, file, shape, and drill metal;

(C) Select and operate oxy-fuel welding and cutting equipment to meet standards;

(D) Select and operate electric-arc welding equipment to meet standards; and

(E) Perform specialty welding and cutting techniques to meet standards.

Materials:

1 ½" x ¼" mild steel flat bar

Tools:

Hydraulic Shear/ Cold Saw/ Chop Saw
Arc/ MIG Welder
E 7018/ 0.035 Wire
Chipping Hammer
Wire Brush
Locking Pliers
Bench grinder
Drill press
Center Punch
Pencil

Procedure:

1. Cut a 1 1/2" x 1/4" piece of flat bar 8" long with the hydraulic shear.

2. Cut two pieces of 1 1/2"x 1/4" flat bar 3 1/2" long with the hydraulic shear.

3. Cut two pieces of 1 1/2" x ¼" flat bar 4 3/4" long with the hydraulic shear.

4. Mark a 3/4" radius at the top of both the 4 3/4" pieces. Reference the drawing.

5. Notch out both corners above the radius making sure your mark is still visible.

6. Use a course bench grinder to round out the corners of the uprights.

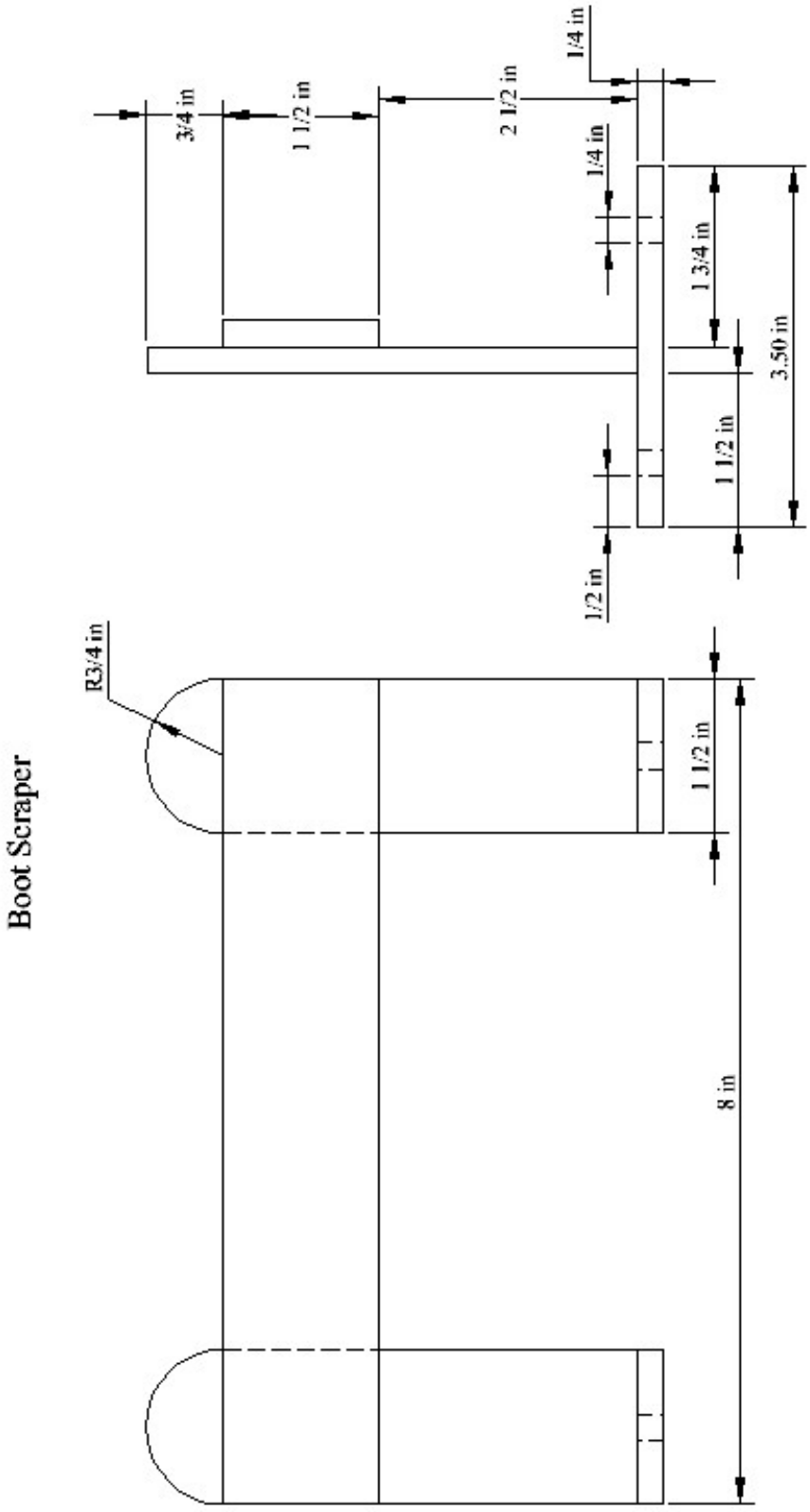
7. Use a drill press and drill out the four holes as specified on the drawing. Be sure to mark where the center on the hole will be.

8. Use Shield Metal Arc welding or Gas Metal Arc Welder MIG machine to weld the pieces together, using E7018/0.035 wire.

    a. Tack then weld the top scraper flat bar (8" piece) to the legs (4 3/4") at a 90 degree with the rounded radius at the top. Reference drawing.

    b. Weld the legs 1 3/4" back on the feet from the front at a 90-degree angle. Reference drawing. Weld fillet welds on both sides of the legs.

9. Clean-up all welds with a chipping hammer and **cool it off** in a bucket of water before you turn it in.


Boot Scraper
3/4 in
1 1/2 in
2 1/2 in
1/4 in
1/4 in
1 3/4 in
3.50 in
1 1/2 in
1/2 in
R3/4 in
1 1/2 in
8 in

Bill of Materials:

Size	Material	Quantity	Cost
1 ½” x 1/4" x 20’	Flat Bar	1	0.99 ft

Cut List:

Quantity	Material
1	2” x 1/4" x 8”
2	2” x 1/4" x 3 1/2”
2	2” x 1/4" x 4 3/4”

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Proper Assembly (As shown in drawing and Square)	15	
Correct pieces cut	15	
Weld Quality Fillet Welds - 4 (On legs)	15	
Weld Quality- Lap Welds – 4 (top)	15	
Workmanship	15	
Safety	25	
Total Score	**100**	

Pictures:

Electric Motor Project

Name:_____
Date: _____

Description:

Students will learn how to properly install and wire by constructing an electric motor.

Objectives:

By properly completing this project, students will be able to:

- Identify wire colors
- Can properly wire a circuit.
- Understand basic principles of electric motors
- Demonstrate how to properly wire an electrical device.

Agricultural Standards Met:

TEKS:

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(4) The student identifies and performs electric wiring skills. The student is expected to:

(A) Identify principles of electricity and wiring terminology;

(C) Maintain electric motors.

130.27. Agricultural Structures Design and Fabrication

(c) Knowledge and skills.

(4) The student explores the different types of power systems used in agricultural structures. The student is expected to:

(A) Define the terms and principles of electricity;

(B) Estimate electrical needs and loads;

(E) Select circuit wiring materials and supplies;

Materials*:

2 1/2" L Brackets (not galvanized)
6 volt battery
14 gauge wire
Disk Magnets
Voltage test leads

Tools:

Screwdriver
Needle Nose Pliers
Wire cutter/stripper
Tape Measure
Pencil

Procedure:

1. Coil the wire around a round object several times (d-cell battery works great). Remove the coil and wrap the ends around two sides of the coil to hold it in place. Leave 3 inches of wire on both sides. Make sure the wire is bare.

2. Hold the coil vertically and coat one-half of the lead with a permanent marker. Apply a second coat. (The ink coat will allow a break in the magnetic field to keep the coil spinning)

3. Cut out a scrap piece of wood measuring 10” x 10”. This will be the base for the project to sit on.

4. Place both disk magnets onto the board.

5. Space (2) L-brackets 3 inches apart and screw down to the board.

6. Connect one end of each test lead to an L-bracket.

7. Balance the coil using the top hole in the L-bracket just so it clears the magnets.

8. Screw down a L-bracket on both sides of the battery and attach the other ends of the wire under the screws.

9. Give the coil a gentle spin using a pen or pencil.

10. Adjust the balance of the coil and experiment with the configuration until you have a working motor

For best results drill a 3/32 hole either in the L-bracket or in another piece of material that the coil sits in so that the coil will not jump around when spinning

Bill of Materials:

Size	Material	Quantity	Cost
14 gauge	wire	3 ft.	--
6 Volt	Battery	1	9.99
2 ½"	L- Brackets	4	5.68
--	Disk Magnets	1 pack	1.97
--	Voltage Test Leads	1	2.99

Grading Rubric:

CRITERIA	POSSIBLE	Problem 1
Proper device location	20	
Workmanship(no nicks, clockwise loops, neat)	20	
Correct circuit (works)	20	
Safety	40	
TOTAL	100	

Pictures:


GAME WINNER™
Sealed Lead Acid Rechargeable Battery
6V 4Ah*
Constant Voltage Charge
CAUTION
DO NOT SHORT CIRCUIT
Sealed lead acid battery must be
Recycled or disposed of properly
NON-SPILLABLE

Feed Scoop Project

Name: _____
Date:_____

Description:

Students will properly measure, layout, cut and bend sheet metal to construct a feed scoop. Then they will properly cut wood and attach the handle to successfully finish the project.

Objectives:

By properly completing this project, students will be able to:

- Read a plan and layout dimensions.
- Cut Sheet Metal
- Bend Sheet Metal
- Cut Wood
- Measure Wood and Sheet Metal

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural, and technical system skills in agricultural applications. The student is expected to:

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems.

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

3) The student follows operating instructions for tools and equipment to perform a given task. The student is expected to:

(A) Select, use, maintain, and store appropriate hand tools to perform a given task;

(B) Select, use, maintain, and store appropriate power equipment such as tools powered by electric, pneumatic, and internal combustion engines; and

(C) Select and use measuring and marking devices.

(7) The student performs carpentry skills. The student is expected to:

(A) Identify materials used in agricultural construction;

(B) Identify elements of a cost estimate and prepare a bid package for a planned project;

(C) Demonstrate basic carpentry skills

Materials:

1” x 4” common board
1” wood dowel
26 Gauge sheet metal
Wood glue
½” pan headed screw

Tools:
Miter Saw
Drill Press
Tin Snips/ Plasma Cutter
Sheet metal brake
Scribe
1” forstner bit
1/8” drill bit
Portable drill
Pencil
Tape measure

Procedure:

Wood Handle

1. Measure 6 inches on the 1” x 4” x 8’ and cut with a miter saw.

2. Measure a 1” dowel 5 ½ inches long and cut with a miter saw. Hold carefully.

3. Measure out and mark the center to layout the hole.

4. Using the wood drill press and a 1” forstner bit, drill a hole half way into the wood where you marked the center of the board.

5. Drill a hole using 1/8” drill bit through center of the hole created with drill press with a portable drill.

6. Glue dowel into 1” hole on wood base.

7. Make a washer using a small piece of scrap sheet metal (about 1” square). Mark the center with a center punch. Carefully drill a 1/8 inch hole through the metal using the metal drill press.

8. Using the portable drill insert a 1 1/4" screw into the piece of wood on the base (using the scrap sheet metal as a washer) in order to hold the handle in place.

Sheet Metal Scoop

1. Cut a piece sheet metal 11” x 15”.

2. Using the plan, layout the cut and fold lines on the sheet metal.

3. Use a speed square to layout the straight lines.

4. Use the dividers to scribe the arc.

5. Review your cut lines (compare with the plan).

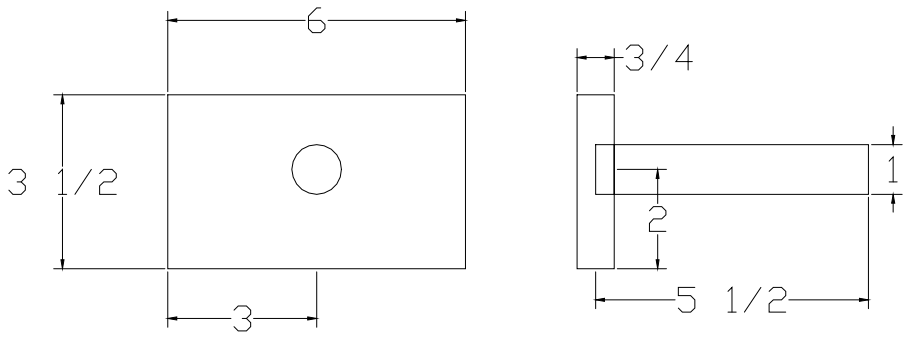
6. Cut out the project using snips.

7. Using the sheet metal brake, bend the 1/2" sides all the way over on both sides. (WATCH OUT FOR THE TABS)

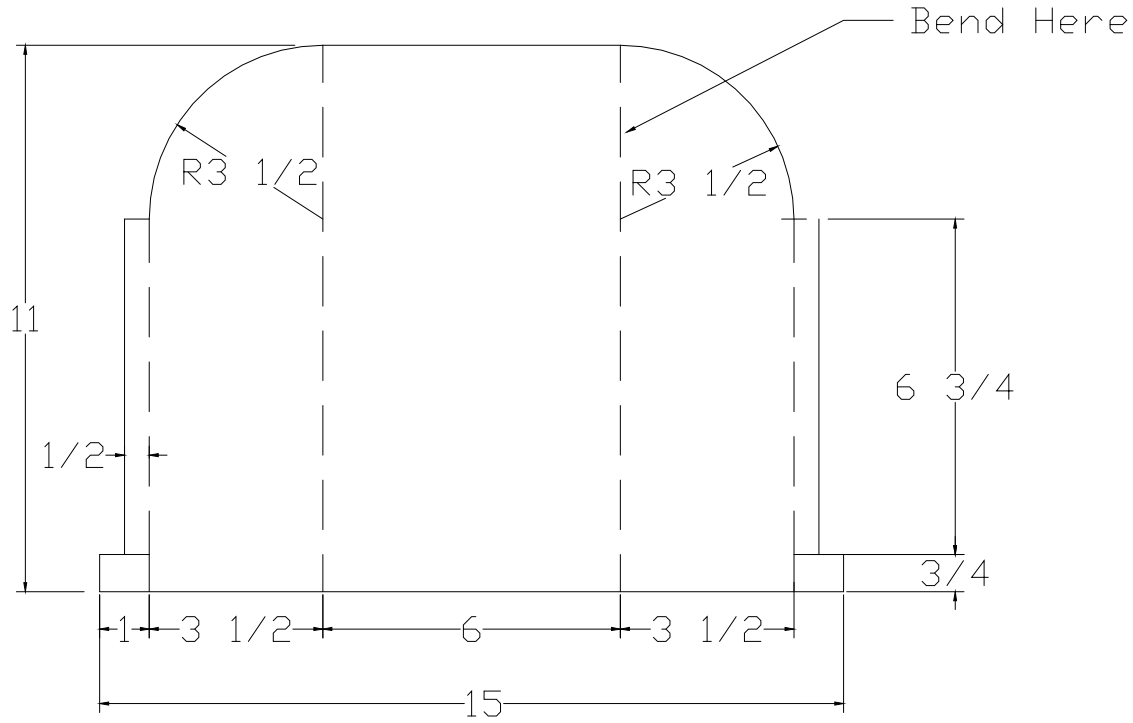
8. Bend the 3 ½ inch line 90° on both sides using the brake.

9. Fit the metal to the wood folding the tabs over the wood. Trim the tabs so no sharp corners hang over the wood. Be sure to install the wood right side up.

10. Attach the sheet metal scoop to the wood using nails. (Start on the bottom) There should be 3 nails on the bottom, 2 on each side and, 2 on top.



Handle Detail
Materials: 3/4" pine, 1" dowel



Feed Scoop Sheetmetal Layout
Materials: 24-26 ga. steel

Feed Scoop
Drawn by: M. Spiess
Date: 09/04/98
Materials: Sheet metal and wood.

Bill of Materials:

Size	Material	Quantity	Cost
1” x 4”x 8’	Common board	1	2.32
1”	Wooden dowel	1	3.98
26 gauge	Sheet metal	1	49.95
#8 ½”	Pan headed screws	1	6.84

Cut List:

Quantity	Material
1	1” x 5 ½” wood dowel
1	11” x 15” 26 gauge sheet metal
1	3 ½” x 6” common board

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Length	5	
Width	5	
Quality of the bends	5	
Fit of metal to wood	5	
Handle installation and placement	5	
Workmanship (cuts, finish, no sharp edges, etc)	5	
Worksheet	10	
Total	30	

Pictures:

Marshmallow Launcher Project

Name: _____
Date: _____

Description:

Use basic plumbing skills and common plumbing materials to create a marshmallow launcher.

Objectives:

By properly completing this project, students will be able to:

- Read a plan and determine layout dimensions.
- Demonstrate proper PVC plumbing techniques.

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural and technical system skills in agricultural applications. The student is expected to:

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(D) Identify building materials and fasteners; and

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems.

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(5) The student performs plumbing skills. The student is expected to:

(A) Identify and use plumbing tools; and

(B) Identify plumbing fixtures.

Materials:

½" x 10' Schedule 40 PVC Pipe
½" PVC Cap
½" PVC 90° Elbow
½" PVC Slip x Slip x Slip (SSS) Tee
PVC primer and cement

Tools:

PVC cutter
Tape Measure
Pencil

Procedure:

1. Using a PVC cutter, cut pipe sections (4) to 6 inches in length, (1) to 8 inches in length, (1) to 24 inches in length, and (1) to 4 inches in length. Layout pipe sections with the proper fittings. Do NOT assemble tightly in to PVC fittings as they can get stuck. Double check that you have the tees, elbows, and caps in the correct locations.

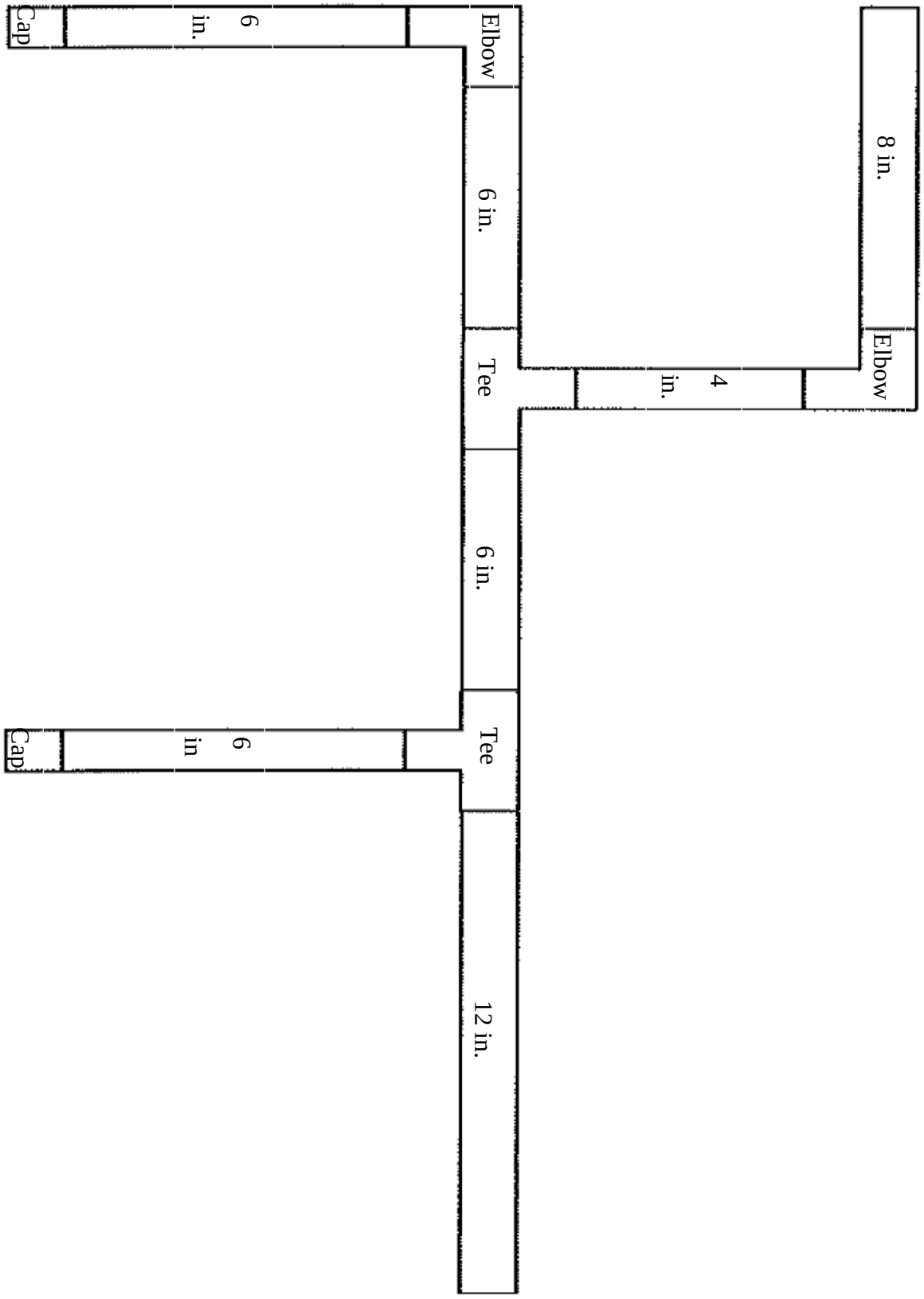
2. Assemble the mouthpiece using the (1) 8 inch section, (1) 90° elbow, and (1) 4 inch section. Use primer and cement. Be sure to give the fitting a ½-inch twist as you assemble with the cement and hold for 30 seconds to insure that the pipe does not slide out of the fitting. **Refer to the draft as needed.**

3. Next use the primer and cement to attach (1) tee to the 4 inch section and (2) 6 inch sections on either sides of the tee. **Refer to the draft as needed.**

4. Using primer and cement, attach (1) 90° elbow to one end of (1) 6 inch section and (1) cap to the other end. Attach to the 6 inch section in line with the mouthpiece. **Refer to the draft as needed.**

5. Assemble (1) tee, (1) 6 inch section, and (1) cap using primer and cement.

6. Next attach (1) 12 inch section onto the right side of the tee and the left side onto the open 6 inch section. **Refer to the draft as needed.**


Cap
6 in.
Elbow
6 in.
Tee
6 in.
Tee
12 in.
8 in.
Elbow
4 in.
Cap
6 in

Bill of Materials:

Size	Material	Quantity	Cost
½ inch	Schedule 40 PVC Pipe 10’	1	2.20
½ inch	PVC Cap	2	0.49
½ inch	PVC SSS Tee	2	0.42
½ inch	PVC 90° Elbow	2	0.46

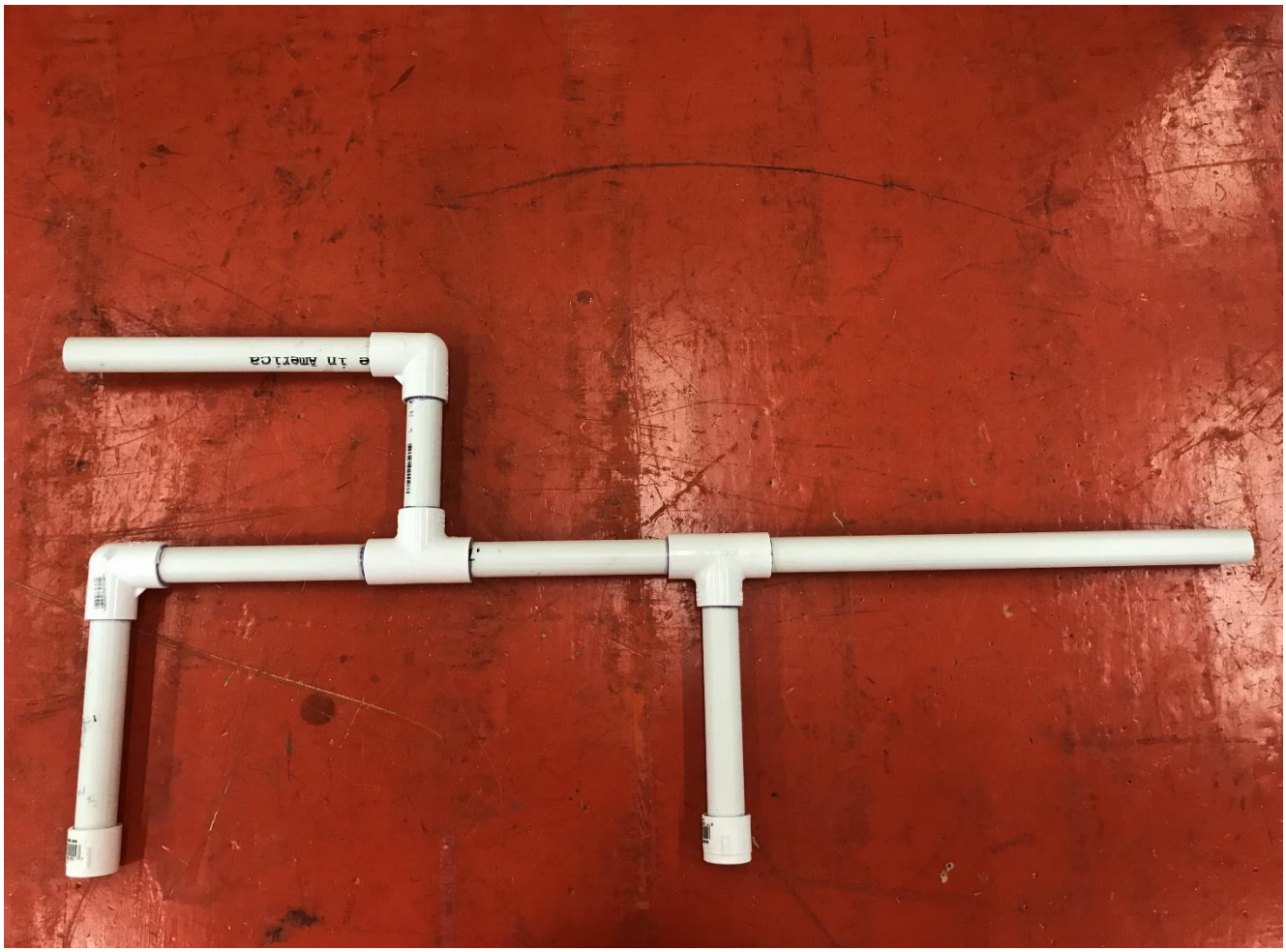
Cut List:

Quantity	Material
1	1/2” x 4” Schedule 40 PVC Pipe
4	1/2” x 6” Schedule 40 PVC Pipe
1	1/2” x 8” Schedule 40 PVC Pipe
1	1/2” x 12” Schedule 40 PVC Pipe
2	1/2" PVC Caps
2	1/2" PVC SSS Tee
2	1/2" PVC 90° Elbows

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Correct pieces cut	15	
Correct final dimensions	15	
Assembly (project is flat)	15	
Workmanship (no excess primer or cement)	15	
Functionality	15	
Safety	25	
TOTAL	100	

Picture:



Paper Towel Holder Project

Name: _____
Date: _____

Description:

Construction of the towel holder utilizes scrap lumber to make a useful project. Workmanship is a key part of the project. In Building this project you will use common woodworking tools and learn to identify common woods.

Objectives:

By properly completing this project, students will be able to:

- Use various power tools saw to work wood.
- Layout a project

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural and technical system skills in agricultural applications. The student is expected to:

(A) Identify major areas of power, structural, and technical systems;

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(D) Identify building materials and fasteners; and

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems.

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(3) The student follows operating instructions for tools and equipment to perform a given task. The student is expected to:

(A) Select, use, maintain, and store appropriate hand tools to perform a given task;

(B) Select, use, maintain, and store appropriate power equipment such as tools powered by electric, pneumatic, and internal combustion engines; and

(C) Select and use measuring and marking devices.

(7) The student performs carpentry skills. The student is expected to:

(A) Identify materials used in agricultural construction;

(B) Identify elements of a cost estimate and prepare a bid package for a planned project;

(C) Demonstrate basic carpentry skills; and

(D) Paint and protect a project with coatings.

Materials:

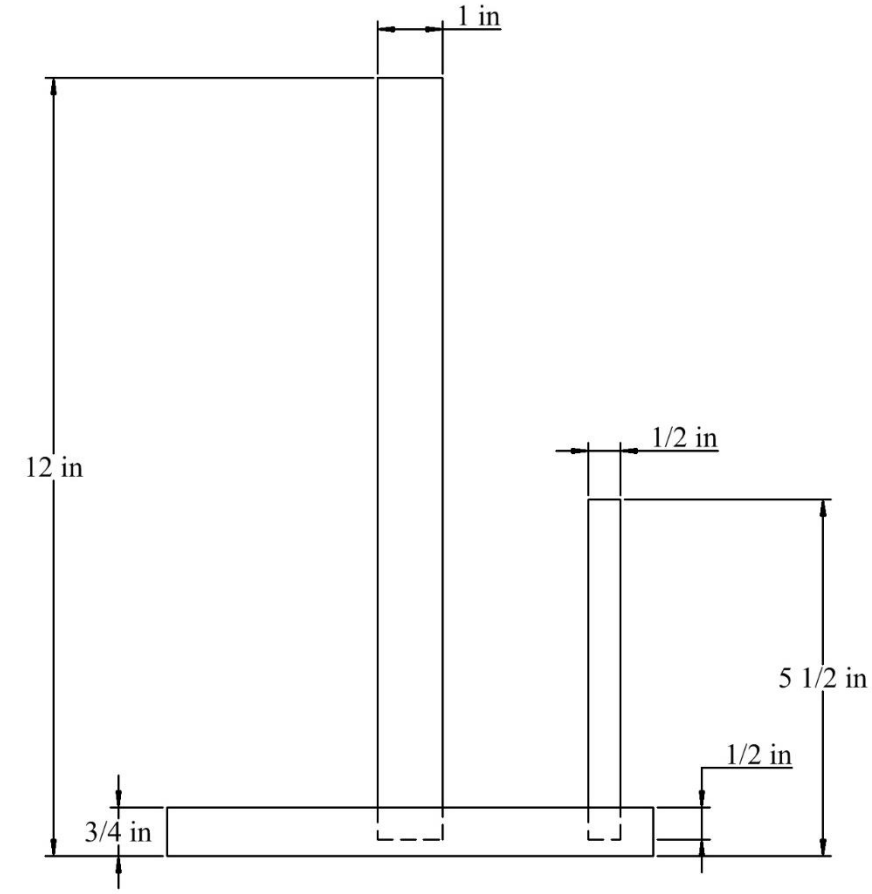
Wood glue
Sand paper (120 grit)
1" dowel
½" dowel
1"x 8" x 6' or Scarp hardwood or cutting board (3/4"x8"x8")
Latex gloves
Stain
Paintbrush

Tools:

Compass
Measuring Tape
½" & 1" Forstner Bits
Drill Press
Miter Saw
Band Saw or Jig Saw
¼" round router bit
Pencil
Palm Sander

Procedure:

1. Draw a 7 ½" diameter circle using a compass on the wood.
2. Cut the circle with the band saw or jig saw.
3. Sand the edge to make it smooth.
4. Route the edge to round (top only)
5. Layout the two holes and drill (1/2" deep).
6. Sand the surface.
7. Cut the 1" dowel to 11 3/8" long and the ½" dowel to 5 1/8" long. Lightly sand and round the top edges. **Important: If using a miter saw to cut the dowels, they must be securely held to avoid spinning.**
8. Glue dowels in place and let dry.
9. Apply stain to finish.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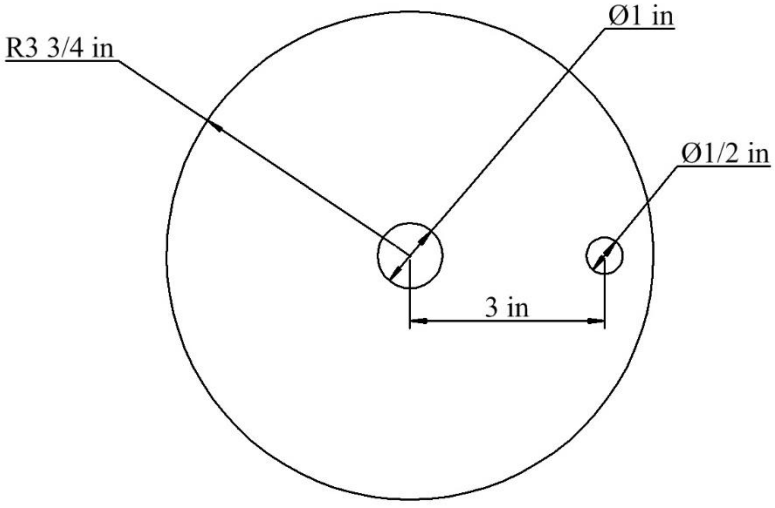
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3 in

Bill of Materials:

Size	Material	Quantity	Cost
1”	Wood Dowel	1	3.98
½”	Wood dowel	1	1.72
1” x 8” x 6’	Common board	1	8.67

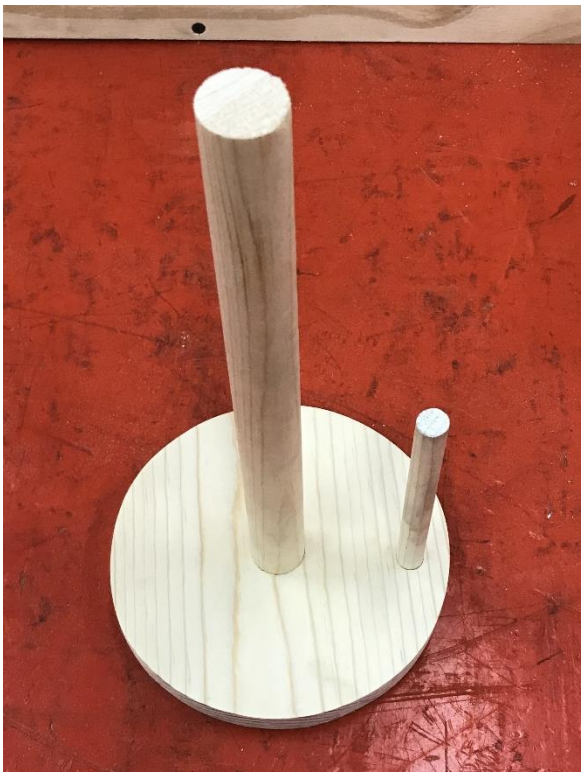
Cut List:

Quantity	Material
1	1” x 11 3/8” wood dowel
1	½” x 5 1/8” wood dowel
1	1” x 8” x 8” common board

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Project layout	15	
Project cutout	15	
Holes drilled (correct size and location)	15	
Finish (surface, edges)	15	
Workmanship (sanding)	15	
Safety	25	
TOTAL	100	

Pictures:



Receiver Hitch and Pin

Description:

The hitch is used with a standard 2" receiver hitch commonly found on trucks and SUVs. It can be fitted with any size ball. It may be mounted up or down depending on the desired height.

Objectives:

By properly completing this project, students will be able to:

- Read a plan and determine layout dimensions
- Cut mild steel with a cold saw/ chop saw
- Properly set an arc- welding machine
- Choose the correct electrode/ wire for the job
- Heat and bend metal using a rose bud

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural and technical system skills in agricultural applications. The student is expected to:

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems.

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(9) The student performs appropriate cold and hot metal techniques. The student is expected to:

(A) Identify types of metal;

(B) Cut, file, shape, and drill metal;

(C) Select and operate oxy-fuel welding and cutting equipment to meet standards;

(D) Select and operate electric-arc welding equipment to meet standards; and

(E) Perform specialty welding and cutting techniques to meet standards.

Materials:

2” x 2” x ” Steel Tubing
3/4" x 2” Hot Rolled Flat Bar
5/8” Cold Rolled Round Stock

Tools Required:

Chop saw/ cold saw
Bench grinder or angle grinder
Arc Welder
E 70183.
Blacksmith or engineer’s hammer
Oxy-Acetylene Cutting Torch with rosebud tip.
Drill Press
5/32” drill bit
1” drill bit
5/8” drill bit
Protractor
Tape Measure
Pencil

Procedure:

1. Set the chop saw/ cold saw to 65^{o} and cut the 2” square tubing to 8 1/2”.

2. Cut the flat bar to 7 1/2” and the round stock to 5 1/2".

3. Layout the 1” hole in the flat bar by measuring 1 1/2" back, and 1 1/4" down. Using a center punch, make a mark to begin drilling a pilot hole using a 5/32” drill bit. Complete the hole using a 1” drill bit.

4. Layout the 5/32” hole on the 5/8” round stock by making a center line and measuring back 1/2”. Using a center punch, make a mark and begin drilling the 5/32” hole in round stock.

5. Layout and drill the 5/8” hole in the square tubing. Measure 3” from the back and 1” down. Using a center punch, make a mark and begin drilling the 5/8” hole in the square tubing. This is a critical dimension, as the hole must match the receiver hitch. You may wish to drill a pilot hole first to insure proper placement.

6. Using a course bench grinder or angle grinder, round the edges of the pin and the flat bar.

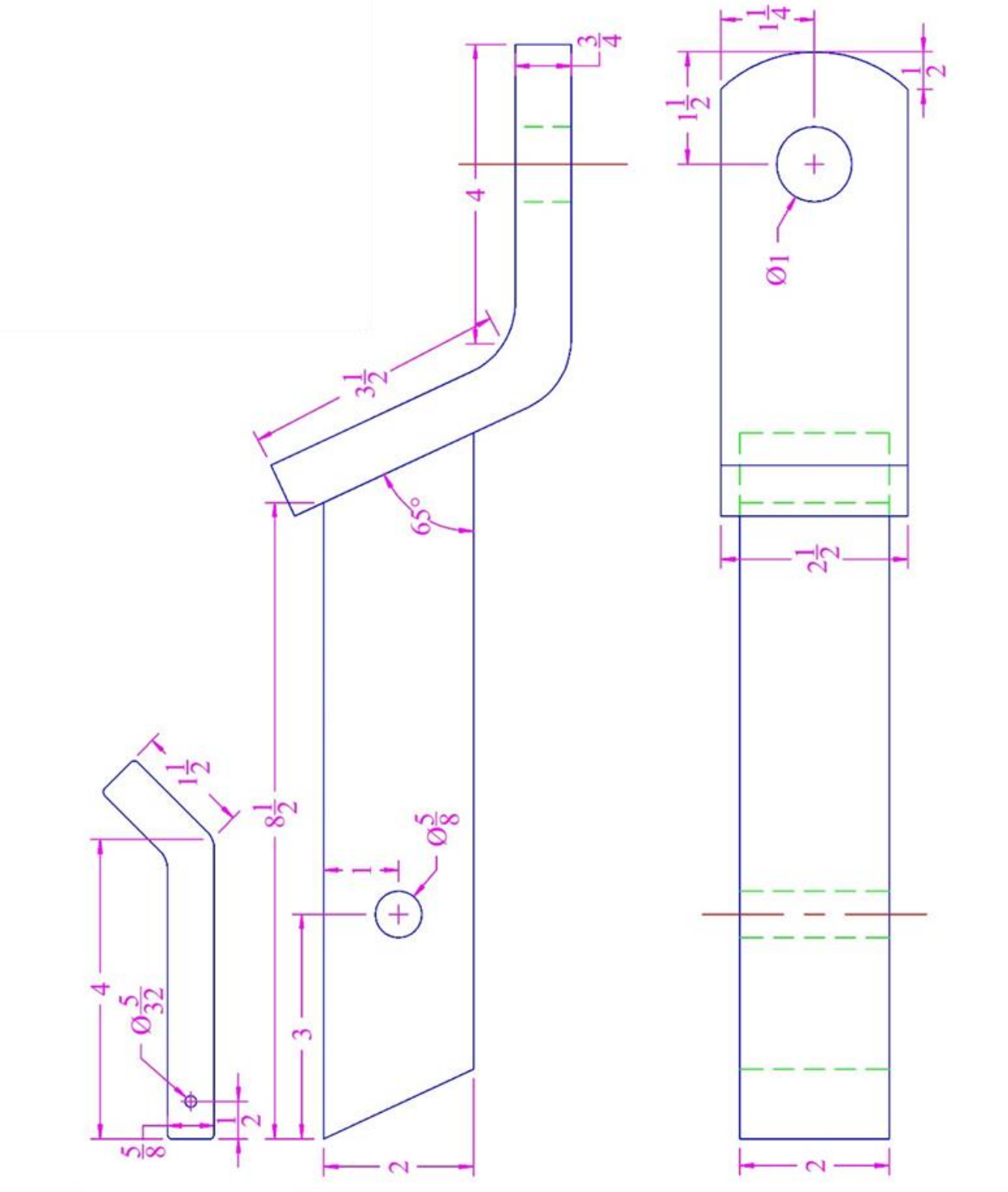
7. Using an arc welder, weld the flat bar to the square tubing as shown in the plans.

8. Place the welded hitch in a vise and heat the flat stock at the bend until it is red hot. Using a large adjustable wrench or a hammer bend the flat stock as shown in the plan. Be careful not to heat the vise.

9. Place the round stock in a vise and heat the bend. Bend as shown in the plan.

10. Clean up any sharp edges on the project. Test the project in a hitch and make any needed adjustments.

11. Paint as desired.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Bill of Materials:

Size	Material	Quantity	Cost
2” x 2” x ¼”	Square Tubing	1	3.49 ft
2 ½” x ¾”	Flat Bar	1	3.70 ft
5/8”	Round Stock	1	0.69 ft

Cut List:

Quantity	Material
1	2” x 2” x ¼” Square Tubing 8 ½” long
1	2 ½” x ¾” Flat Bar 7 ½” long
1	5/8” Round Stock 5 ½” long

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Correct hole placement	15	
Correct final dimensions	15	
Assembly (project is flat and angle of riser is 90°)	15	
Workmanship (no excess primer or cement)	15	
Weld Quality	15	
Safety	25	
TOTAL	100	

Pictures:

Sprinkler Project

Name: _____
Date: _____

Description:

Use basic plumbing skills and common plumbing materials to create a sprinkler.

Objectives:

By properly completing this project, students will be able to:

- Read a plan and determine layout dimensions.
- Demonstrate proper PVC plumbing techniques.

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural and technical system skills in agricultural applications. The student is expected to:

(A) Identify major areas of power, structural, and technical systems;

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(D) Identify building materials and fasteners; and

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems.

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(5) The student performs plumbing skills. The student is expected to:

(A) Identify and use plumbing tools; and

(B) Identify plumbing fixtures.

Materials:

½" x 4" Schedule 40 PVC Pipe
½" x 2" Schedule 40 PVC Pipe
½" PVC Cap
½" PVC Slip x Threaded x Slip (STS) Tee
½" PVC Slip x Slip x Slip (SSS) Tee
½" PVC Slip x Slip x Slip x Slip (SSSS) Cross
½" Slip x ¾" PVC threaded fitting
4" Sprinkler Riser
15' Radius Sprinkler Nozzle
Teflon tape
PVC primer and cement

Tools:

PVC cutter
Tape Measure
Pencil

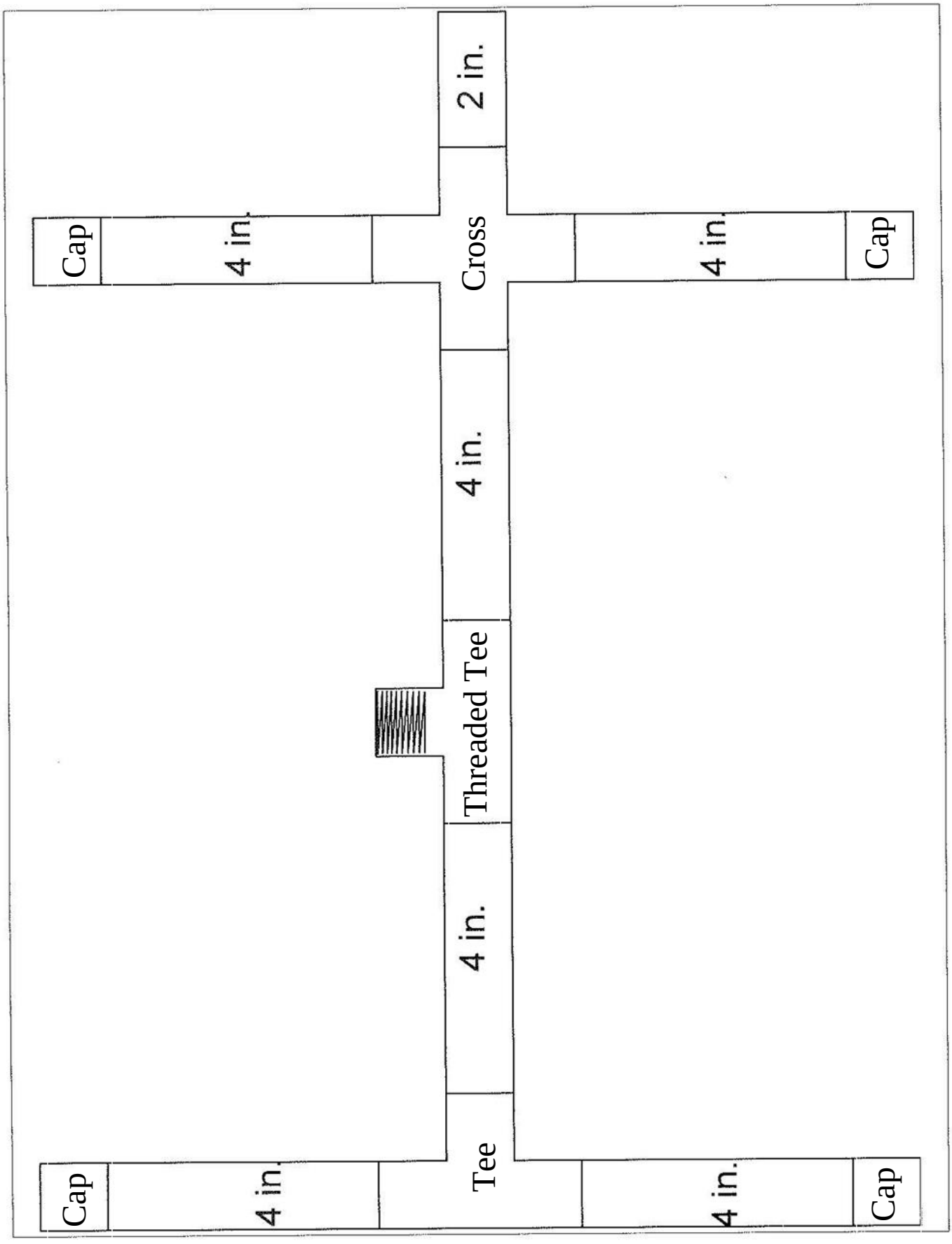
Procedure:

1. Using a PVC cutter, cut pipe sections (6) to 4 inches in length and (1) to 2 inches in length. Layout pipe sections with the proper fittings. Do NOT assemble tightly in to PVC fittings as they can get stuck. Double check that you have the tees in the correct locations.

2. Assemble the four legs using (4) caps, (4) 4 inch sections, (1) SSS tee and (1) SSSS cross. Also assemble the middle section using (1) STS tee, Use primer and cement. Be sure to give the fitting a ½-inch twist as you assemble with the cement and hold for 30 seconds to insure that the pipe does not slide out of the fitting.

3. Assemble the (1) 2 inch section onto the cross and the (1) ½" slip x ¾" threaded fitting onto the other end of the 2 inch section.

4. Using Teflon tape, wrap both ends of the (1) 4 inch riser the opposite direction that the riser will be tightened onto the STS tee and the sprinkler nozzle.


2 in.
Cap
4 in.
Cross
4 in.
Cap
4 in.
Threaded Tee
4 in.
Cap
4 in.
Tee
4 in.
Cap

Bill of Materials:

Size	Material	Quantity	Cost
½ inch	Schedule 40 PVC Pipe 20’	1	4.59
½ inch	PVC Cap	4	0.49
½ inch	PVC STS Tee	1	0.65
½ inch	PVC SSS Tee	1	0.42
½ inch	PVC SSSS Cross	1	1.44
½ inch	½” slip x ¾” PVC Threaded Fitting	1	1.70
½ inch	4” Sprinkler Riser	1	0.58
½ inch	15’ Radius Sprinkler Nozzle	1	2.97

Cut List:

Quantity	Material
6	1/2” x 4” Schedule 40 PVC Pipe
1	1/2” x 2” Schedule 40 PVC Pipe
4	1/2" PVC Caps
1	1/2" PVC STS Tee
1	1/2" PVC SSS Tee
1	PVC SSSS Cross
1	1/2” slip x 3/4” PVC Threaded Fitting
1	1/2” x 4” Sprinkler Riser
1	15’ Radius Sprinkler Nozzle

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Correct pieces cut	15	
Correct final dimensions	15	
Assembly (project is flat and angle of riser is 90°)	15	
Workmanship (no excess primer or cement)	15	
Functionality	15	
Safety	25	
TOTAL	100	

Picture:

Tool Box Project

Name: _____
Date: _____

Description:

This project consists of building a small toolbox. General skills used to build this project include drawing, measuring, laying out the project, cutting and sanding the materials. Nails and screws will also be used to fasten different pieces together.

Objectives:

By properly completing this project, students will be able to:

- Read a plan and implement layout dimensions.
- Fasten all components together using screws.
- Select kinds, grades, and quantity of lumber for a given task.
- Demonstrate proper use of common woodworking power tools.

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural, and technical system skills in agricultural applications. The student is expected to:

(A) Identify major areas of power, structural, and technical systems;

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(D) Identify building materials and fasteners; and

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems.

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(3) The student follows operating instructions for tools and equipment to perform a given task. The student is expected to:

(A) Select, use, maintain, and store appropriate hand tools to perform a given task;

(B) Select, use, maintain, and store appropriate power equipment such as tools powered by electric, pneumatic, and internal combustion engines; and

(C) Select and use measuring and marking devices.

(7) The student performs carpentry skills. The student is expected to:

(A) Identify materials used in agricultural construction;

(B) Identify elements of a cost estimate and prepare a bid package for a planned project;

(C) Demonstrate basic carpentry skills; and

(D) Paint and protect a project with coatings.

Materials:

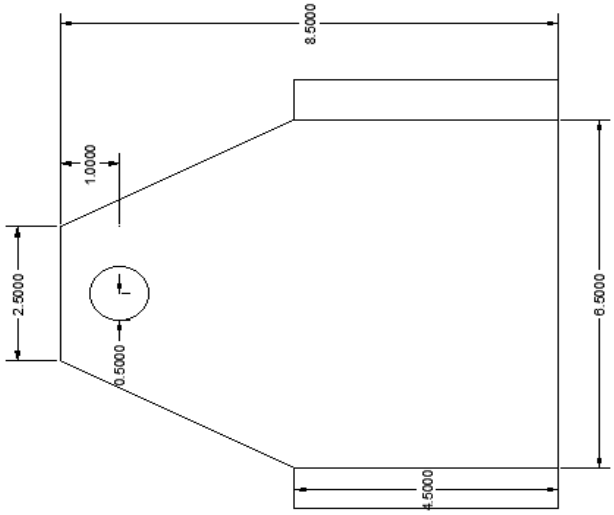
1" x 8" x 12’ pine
1” hardwood dowel
120 grit sand paper
1 ¼” drywall screws
1/8” drill bit

Tools:

Table Saw
Miter Saw
Jig Saw
Palm Sander
Portable Drill with Phillips driver
#6 Countersink bit
Drill Press
1” forstner bit
Combination square
Tape Measure
Pencil

Procedure:

1. Rip lumber to 4 ½” and 6 ½” width using the table saw.
2. Cut (2) 6 1/2" x 8 1/2"pieces for the ends and (1) 6 1/2" x 16” piece for the bottom.
3. Layout the angles and center of the handle hole.
4. Cut the angles using a jigsaw.
5. Drill the holes for the handle using the drill press and 1” forstner bit.
6. Cut the dowel to length. **Hint: cut 1/16” long to insure a good fit.**
7. Cut (2) 4 1/2” x 17 1/2" pieces for the sides.
8. Install the handle in the ends (Do not glue so that it can be replaced if needed). Use a short screw or nail to secure the handle.
9.
10. “Dry fit” all the parts to be sure you have a good fit.
11. Using the 4 1/2" x 17 1/2" boards, mark the boards 3/8” from the edges. The marks will be where you drill your pilot holes.
12. Using a 1/8” drill bit, drill 4 pilot holes where your marks were laid out. Re-drill each pilot hole using a countersink bit to allow the head of the screw to be flush with the board when tightened.
13. Assemble the bottom to the sides and end using the same steps above. Be sure to use the countersink to prevent splitting.
14. Sand and paint if desired.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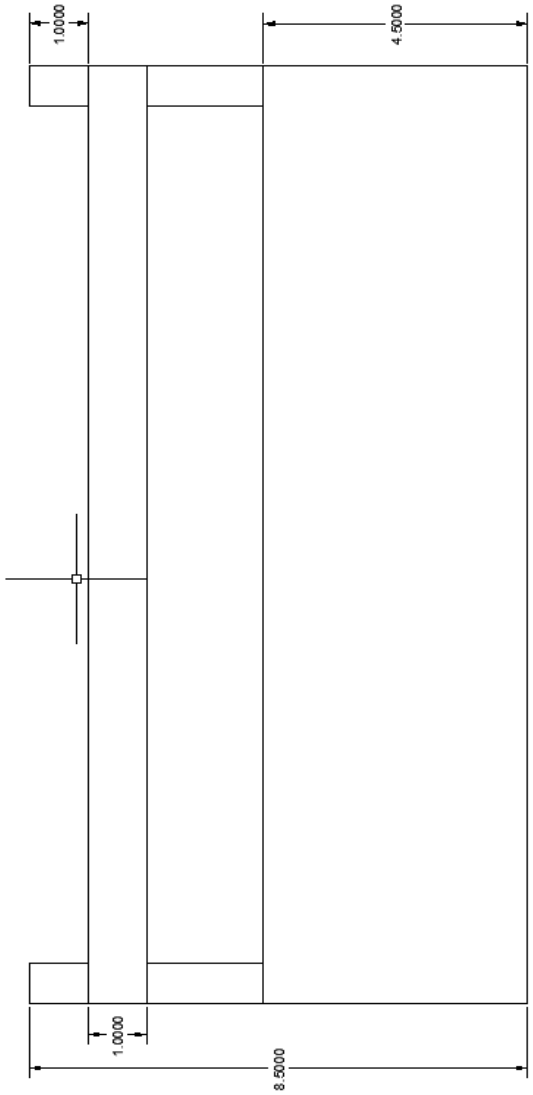
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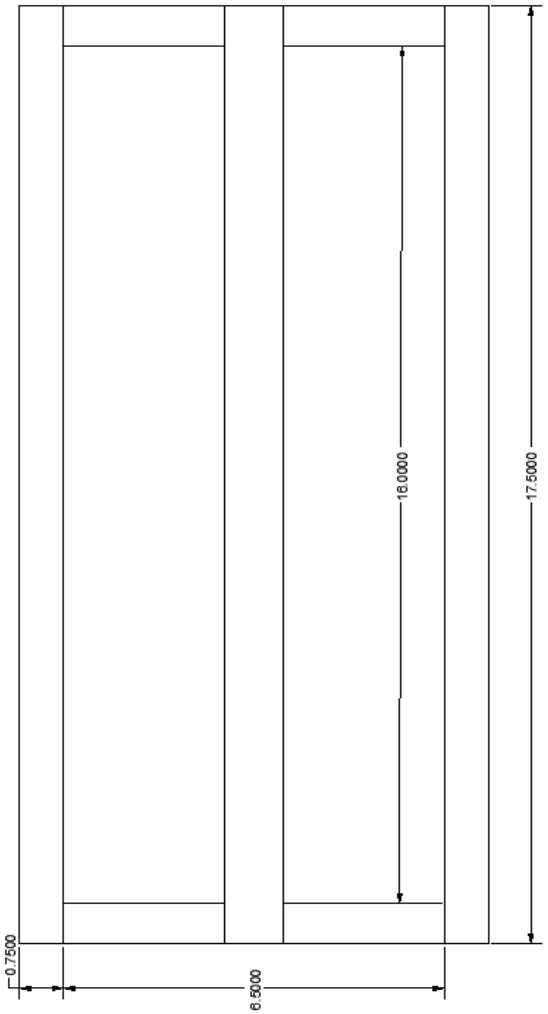
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Bill of Materials:

Size	Material	Quantity	Cost
1” x 12” x 12’	Common Board	1	15.12
1”	Wood Dowel	1	3.98
1 ¼”	Drywall Screws	1 box	2.98

Cutting List:

Quantity	Material
2	1” x 6 ½” x 8 ½” for ends
2	1” x 4 ½” x 17 ½” for sides
1	1” x 6 ½” x 16” for bottom
1	1” x 17 9/16” dowel for handle

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Project layout	15	
Project cutout	15	
Holes drilled (correct size and location)	15	
Project Finish (screws counter-sunk, corners square)	15	
Workmanship (fit, cuts, sanding)	15	
Safety	25	
TOTAL	100	

Pictures:

Tool Cabinet Project

Name: _____
Date: _____

Description:

Students will layout and construct a tool cabinet using basic carpentry skills and common woodworking tools such as a miter saw, table saw, and cordless drill.

Objectives:

By properly completing this project, students will be able to:

- Read a plan and determine layout dimensions
- Demonstrate proper use of common woodworking tools
- Fasten components using screws

Agricultural Standards Met:

TEKS:

130.2. Principles of Agriculture, Food, and Natural Resources

(c) Knowledge and skills.

(14) The student safely performs basic power, structural and technical system skills in agricultural applications. The student is expected to:

(B) Use safe and appropriate laboratory procedures and policies;

(C) Create proposals that include bill of materials, budget, schedule, drawings, and technical skills developed for basic power, structural, and technical system projects or structures;

(D) Identify building materials and fasteners; and

(E) Use tools, equipment, and personal protective equipment common to power, structural, and technical systems.

130.26. Agricultural Mechanics and Metal Technologies

(c) Knowledge and skills.

(3) The student follows operating instructions for tools and equipment to perform a given task. The student is expected to:

(A) Select, use, maintain, and store appropriate hand tools to perform a given task;

(B) Select, use, maintain, and store appropriate power equipment such as tools powered by electric, pneumatic, and internal combustion engines; and

(C) Select and use measuring and marking devices.

(7) The student performs carpentry skills. The student is expected to:

(A) Identify materials used in agricultural construction;

(C) Demonstrate basic carpentry skills; and

(D) Paint and protect a project with coatings.

Materials:

1/4" x 48” x 72” Plywood
1” x 8” x 12’ Yellow Pine
2” Butt Hinges
3 1/2" Hasp
1 1/4” Drywall Screws
1/8” Drill Bit

Tools:

Panel Saw and/or Table Saw
Miter Saw
Cordless Drill
Speed Square
Tape Measure
Pencil

Procedure:

1. Cut plywood into two 36” x 48” pieces.

2. Using the table saw, rip both 1” x 8” x 12’ to 5” wide. This will be used to make the sides for the cabinet. The leftover piece, which should measure 2 1/4”, will be used for the sides of both doors.

3. Using the boards that now measure 5” wide, layout and cut (2) pieces measuring 36” which will be for the two sides and (2) pieces measuring 46 1/2" using a miter saw. These pieces will be for the top and bottom. These 4 pieces will make the frame for the cabinet.

4. Using the remaining piece from ripping the 1” x 8” x 12’, which will measure 2 1/4" wide, layout and cut (4) pieces measuring 36” which will be for the sides and (4) pieces measuring 22 1/2" using a miter saw. These 8 pieces will make the frame for both doors.

5. Assemble the frame for the back cabinet using (2) 1” x 5” x 36” pieces and (2) 1” x 5” x 46 1/2" pieces. Use a speed square to make sure all corners are square.

6. On the (2) 1” x 5” x 36” (**side boards**) measure and mark the boards 3/8” from the edges. The marks will be where you drill your pilot holes.

7. Using a 1/8” drill bit, drill 4 pilot holes where your marks are laid out. Re-drill each pilot hole using a countersink bit to allow the head of the screw to be flush with the board when tightened.

8. Using a portable drill and a Philips drive bit, attach the side each side with (2) 1 1/4" drywall screws.

9. Once the frame is assembled, attach (1) 1/4" x 36” x 48” piece of plywood to the back of the frame. Space screws evenly apart.

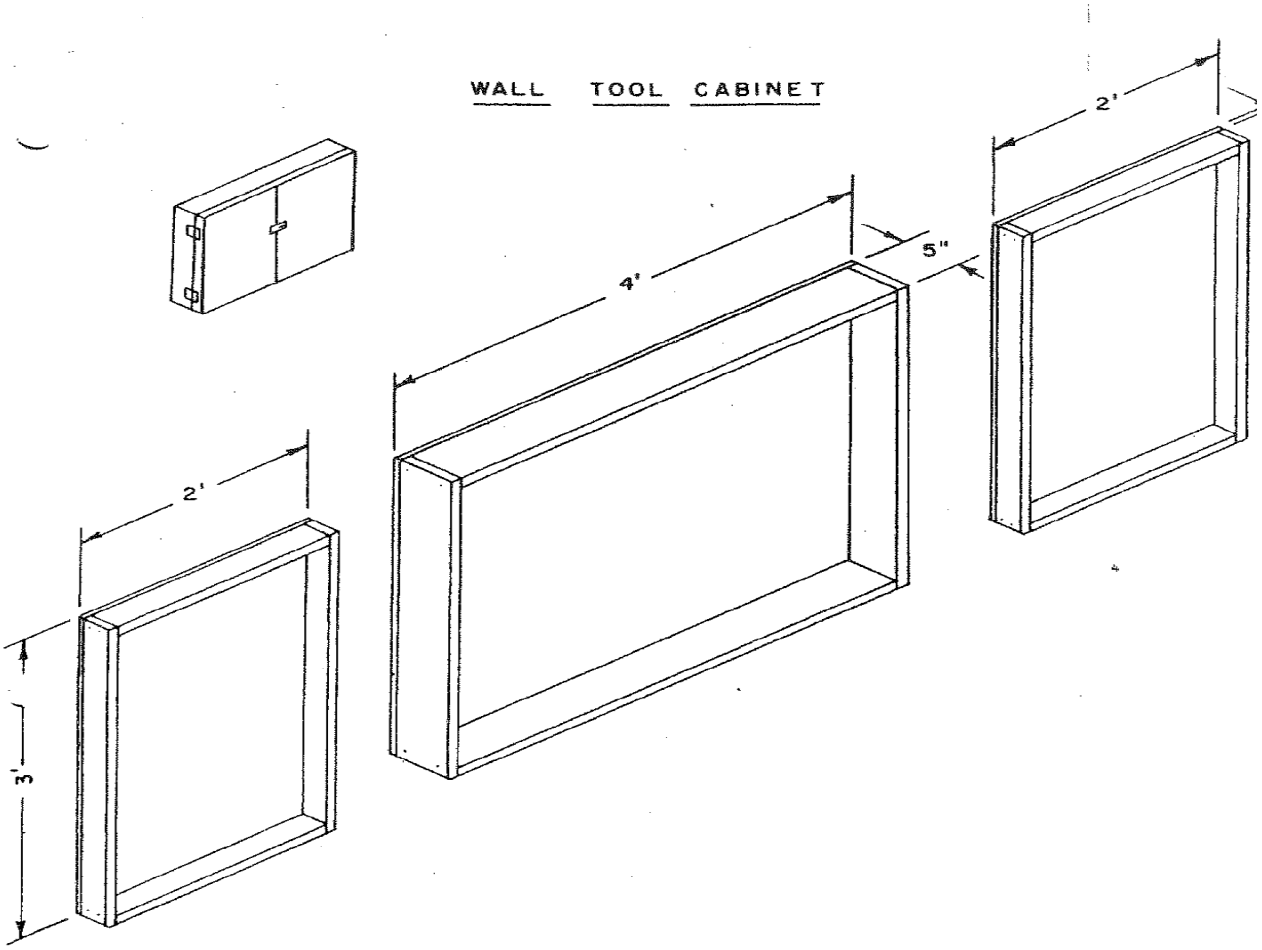
10. Assemble the doors using (2) 2 1/4” x 36” pieces and (2) 2 1/4" x 22 1/2" pieces each.

11. Repeat steps 7-9 to construct the two doors.

12. Once the two door frames are assembled, cut the remaining 1/4" x 36”x 48” piece of plywood in half and attach to the frames of the doors. Space screws evenly apart.

13. Center (1) 2” hinge at 6” and (1) 2” hinge at 30” on each door and fasten to the cabinet frame.

14. Attach hasp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5"
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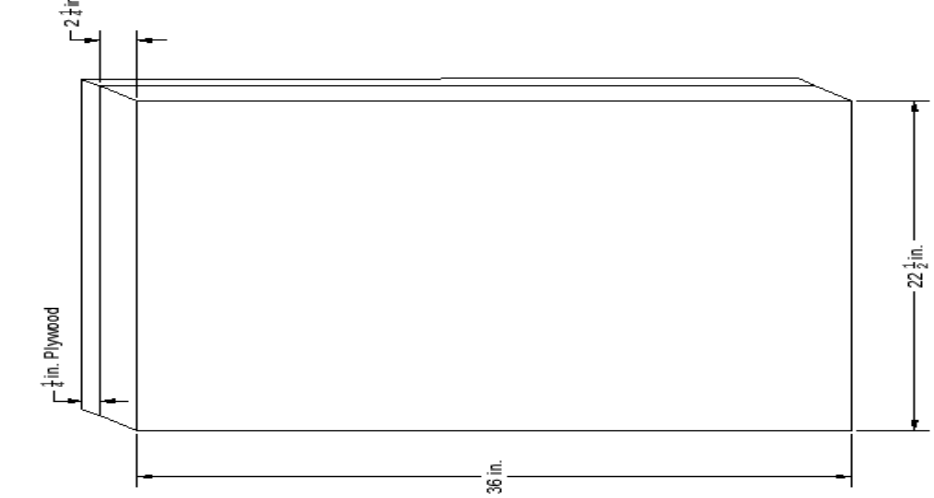
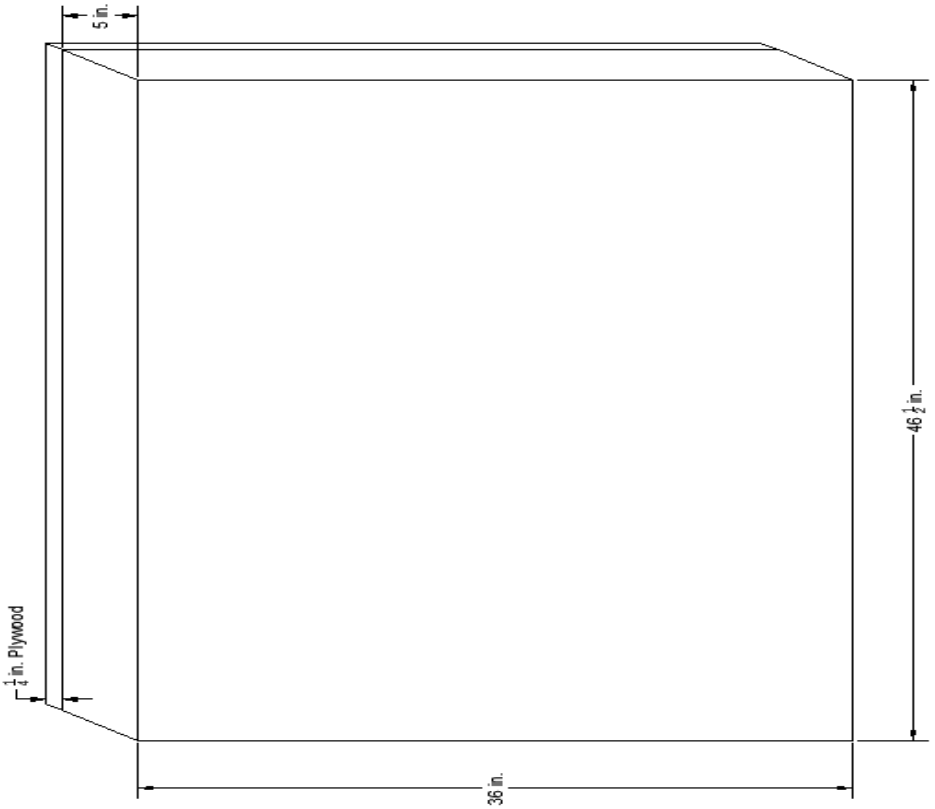
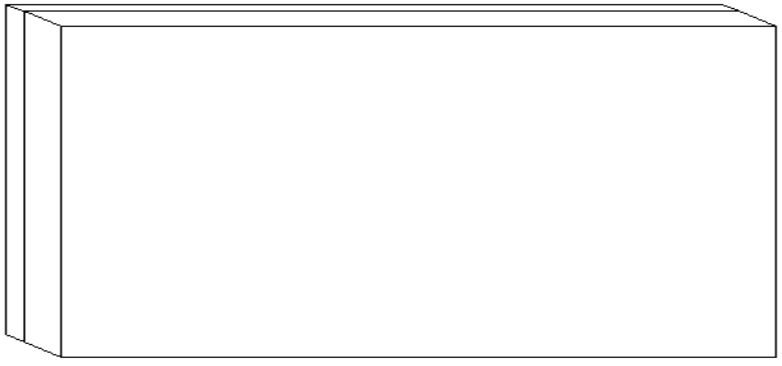

2 1/4 in.
22 1/2 in.
1/4 in. Plywood
36 in.


5 in.
46 1/2 in.
1/4 in. Plywood
36 in.



Bill of Materials:

Size	Material	Quantity	Cost
3 ½”	Hasp	1	4.72
2”	Hinge	4	2.17
1” x 8” x 12’	White Pine	2	15.12
½” x 48” x72”	Plywood	1	24.98

Cut List:

Quantity	Material
1	1/4” x 36” x 48” Plywood
2	1/4" x 36” x 24” Plywood
2	1” 5” x 36”
2	1” x 5” x 46 1/2"
4	1” x 2 1/4" x 36”
4	1” 2 1/4" x 22 1/2”

Grading Rubric:

CRITERIA	POSSIBLE	SCORE
Correct pieces cut	15	
Correct final dimensions	15	
Assembly (correct fastener placement)	15	
Workmanship (is it square)	15	
Functionality	15	
Safety	25	
TOTAL	100	

Picture:


Georgia-Pacific
APA
RATED SHEATHING
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