Lesson Plan

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Central Valley High School

SPIE Internship 2012 **Sprinkler Stand**

Agricultural Standards Met:

5.0 Problem Solving and Critical Thinking

Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques:
5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
5.2 Understand the systematic problem-solving models that incorporate input, process, outcome, and feedback components.
5.3 Use critical thinking skills to make informed decisions and solve problems.

6.0 Health and Safety

Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials:
6.1 Know policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
6.2 Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
6.3 Understand how to locate important information on a material safety data sheet.
6.4 Maintain safe and healthful working conditions.
6.5 Use tools and machines safely and appropriately.
B1.0 Students understand personal and group safety:
B1.1 Practice the rules for personal and group safety while working in an agricultural mechanics environment.
B1.2 Know the relationship between accepted shop management procedures and a safe working environment.

B4.0 Students understand plumbing system practices commonly used in agriculture:
B4.1 Know basic plumbing fitting skills with a variety of materials, such as copper, PVC (polyvinyl chloride), steel, polyethylene, and ABS (acrylonitrile butadiene styrene).
B4.2 Understand the environmental influences on plumbing system choices (e.g., filter systems, water disposal).

B4.3 Know how various plumbing and irrigation systems are used in agriculture. B4.4 Complete a plumbing project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, joining, and testing.

Objectives:

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

Read a plan to determine layout dimensions.
Select correct pipe and fittings to be used in this sprinkler stand.
Differentiate SXSXS Tee, SXSXT Tee, Cap, SXT Coupling, Male Adapter.
Use problem solving and critical thinking skills to successfully complete this project.

Anticipatory Set:
(Phone rings; pretend the conversation with the principal about an emergency on campus.) Class, that was the principal on the phone. Apparently someone drover their 4x4 on the campus lawn last night and broke the sprinkler system. Due to the poor economy our school cannot afford a plumber to fix the damage. So the principal wants the Ag Mech Class to make 30, Super Duper Power Soaker 3000, sprinklers to keep the grass from drying out. (Place model on table).

We have already learned how to identify different pipes and pipe fittings. We are now going to learn how to join the various pipes and fittings together to make a water tight system.

Issue Parts
-Teacher will issue parts to students as described on bill of materials sheet.
-Teacher will pass out Sprinkler Stand Plan and Grading Sheet to students.

Inventory Check
-Teacher will review with class all parts issued to students
- Teacher will lead class discussion on where each part is used on project.

Demonstration:
Galvinized pipe: Teacher will demonstrate how to:
-Secure pipe with chain vise.
-Measure pipe to 8" using a tape measure and pencil.
-Proper use of pipe cutter.
-Proper use of pipe reamer.
-Proper use of pipe die , die stock, cutting oil to make threads.
-How to apply Teflon tape by stretching tape over threads, wrap tape in opposite direction of threads so tape does not ---unravel when threading fitting onto pipe.
-Proper use of pipe wrench- always pull wrench towards you.

PVC pipe: Teacher will demonstrate how to:
-Measure pipe to 4" using a tape measure and pencil.
-Proper use of PVC pipe cutter
-How to apply primer, and PVC cement, without being messy.
-Join pipe and fitting by shoving together and apply ¼ turn.

Sweating copper joints: Teacher will demonstrate how to:
-Clean copper surfaces with wire brush and emery cloth. –important to remove impurities.
-Apply flux- to fuse solder to copper
-Use of propane torch. Apply heat to thicker fitting (male adapter), then sweat in solder.

-Use machinist vise to hold male adapter, but instruct students clamp on nut of male adapter, not the threads.

Assembly: Teacher will demonstrate assembly sequence:

1. Cement 4" PVC pipe to caps
2. Cement PVC SXSXS Tee to 4" PVC pipe with caps.
3. Cement PVC SXSXS Tee to 4" PVC pipe without cap.
4. Cement SXSXT Tee to to the assemble above. Use a tri square to position SXSXT in the vertical position.
5. Use pipe wrench and Teflon tape to join galv. Pipe to PVC SXT coupling.
6. Cement PVC coupling (that has galv. Pipe threaded into it) onto 4" PVC pipe that is coming out of the SXSXT fitting.
7. Using Teflon tape and open end wrench, thread copper male adapter into PVC SXSXT fitting.

Class Management:

-Class will be divided into 3 groups:

-Galvanized pipe station
-PVC station
-Copper station

-Students may move to the either of the other stations when finished with 1st assigned station.

Pressure test:

When students complete assemble the instructor will pressure test the sprinkler.

- Issue students a galvanized cap or threaded PVC cap and have them install cap on copper riser male adapter.
- (Ahead of time) install a Schrader valve on to galvanized cap.
- TEST- pump 35 psi into sprinkler stand.
- Place sprinkler stand under water in water tank.
- No bubbles Pass !
- Bubbles present- Fail.

Completion:

-Upon successful completion of sprinkler stand, teacher will issue students sprinkler head to install in riser, thus completing project.

- Students will turn in project with grading sheet.

Assessment

After pressure test, project will be assessed using grading rubric.

Sprinkler Stand

Name_____
Period_____

Materials;

6”- ½” copper tubing
8” – ½” Galvanized iron pipe
16”- Schedule 40 , ½” PVC pipe
2- ½” PVC Caps
1- ½” PVC SxSxS Tee
1- ½” PVC SxTxS Tee
1-1/2” PVC SxT coupling
2- ½” Copper male adapter
1- 15’ Radius sprinkler head

Cut List:

Quantity	Size	Material
4	½” x 4”	PVC
1	½” x 8”	Galv Pipe
1	½” x 6”	Copper tubing

Tools -10pts

PVC pipe cutter or hack saw
PVC primer
PVC cement
Pipe cutter
Chain vise
Pipe die & die stock
Cutting oil
Soldering torch
Solder
Pipe reamer
Tape measure or Ruler

Procedure: / 15pts

PVC

1. _____/ 5pts. Measure and mark the 4 lengths of PVC Pipe. DO NOT CUT until checked by instructor.
2. Cut PVC using PVC pipe cutter.
3.

Galvanized Pipe

1. _____/ 5pts. Measure and mark 8” of galv. pipe. DO NOT CUT until checked by instructor.
2. Cut galv pipe using pipe cutter and chain vise.
3. Ream both ends of pipe using pipe cutter and chain vise
4. _____/5pts. Thread both ends of galv pipe using pipe thread die and die stock, cutting oil, and chain vise. Cut 1” of threads on each end. Have instructor check threads before assembly.

Copper

1. Ream both ends of cooper tube using reamer on tubing cutter..
2. Clean both ends of copper tube and inside of male adapter with wire brush.
3. Apply soldering flux to copper tubing and male adapter.
4. Sweat copper tubing to male adapters. (DO NOT clamp threads in vise.)

Name_____

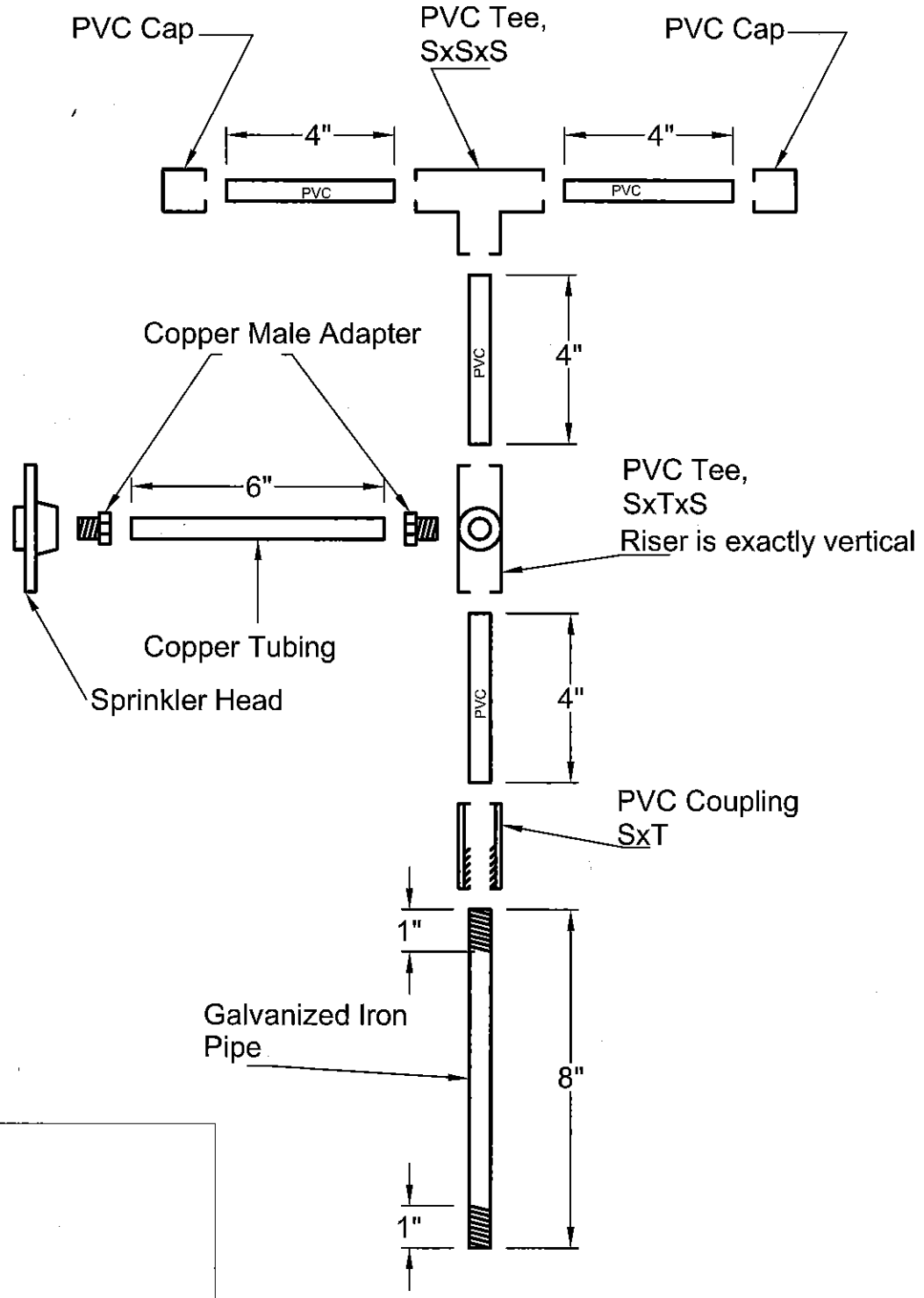
Assembly

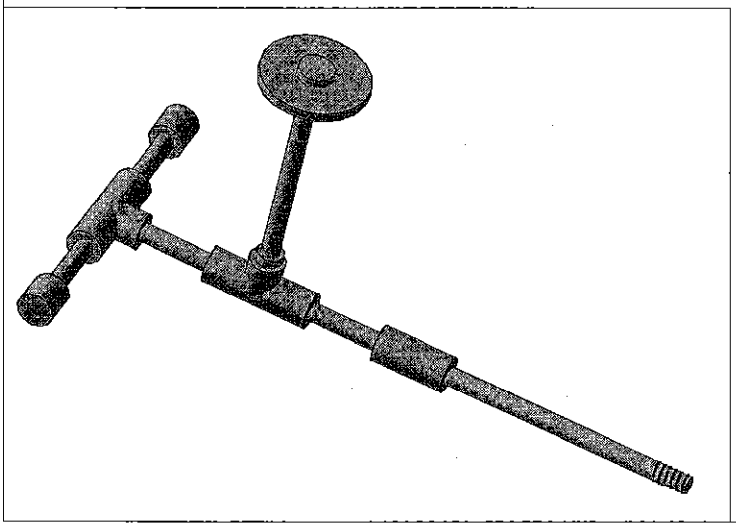
1.Prime the exterior of the PVC pipes and interior of the fittings prior to assembly. (do step by step, not all at once.) Assemble PVC parts using PVC cement. Be sure to be neat. Be sure riser is exactly vertical.

2. Use a pipe wrench and Teflon tape on all threaded fittings.

Sprinkler Stand Grading Rubric

Critical Tolerance +/- 1/4”	possible	score
Overall Length 16-1/4”	10	
Overall Width 7”	5	
Riser is vertical- 1/8” off of plumb tolerance	5	
Craftsmanship- neat, no smearing of PVC cement on exterior of project.	5	
Pressure test- Pass/ Fail	25	
Total	50	





SPRINKLER STAND		
SCALE 1:4	DRAWN BY: MR. TRAINI	7-24-12