

# Pipe Trades Workshop

## LESSON PLANS

### Lesson One – 7 hour session

**Goal: Students will understand the difference between the pipe trades, experience work that is common to both, and apply math, measuring and print reading skills.**

#### I. Pipe trades overview

- Overview of work performed
- What's the difference
- How do you apply
- Math for hands-on activities

Hand-outs: plumbers' math, what's the difference chart, apprenticeship announcements.

#### II. Hands-on Projects

**Divide class into three groups and rotate through the following stations**

##### A. Material handling (1 ½ hours)

- Demonstrate proper lifting techniques, students will lift and carry 5' to 10' lengths of case iron pipe.
- Students will build hangers and set approximately 8' from the ground.
- Students will then lift 4' case iron pipe into the hangars and use a torpedo level to adjust the length until even.
- Discuss new physical strength requirements for the plumbers – allow them to attempt lifting 75lbs above their heads using weights and milk crates with proper technique.

**Hand-outs: Hanger project drawing**

**Tools: 3/8" treaded rod, 4" hangers, 3/8" nuts, torpedo levels, crescent wrenches**

##### B. Pipe wrenches project (1 ½ hours)

- Understand how leverage works in this situation
- Practice safe use of tools
- Show relationship between posted diagram (of assembled project) and demonstration models
- Use 2 pipe wrenches in unison to dismantle demonstration models
- Students then use their knowledge of printreading and pipe wrenches to re-assemble models in accordance with posted diagram



**Hand-out:** Diagram of finished set-up

**Tools and Materials:** 12" pipe wrenches (2 per station), models, dope/Teflon paste

##### C. Soldering (2 hours)

- Introduction, including uses, vocabulary and safety.
- Offer student choice of projects.

- Based on diagram, create cut list and determine fittings required.
- Measure (using stick rule)  $\frac{3}{4}$ " copper pipe.
- Use tubing cutter to cut copper to length.
- Ream, sand, flux & assemble project according to diagram.
- Solder joints.
- Carry finished piece (using channellocks) to water bucket; dip; cool; remove
- Place projects in jig to test accuracy.

**Hand-out:** Soldering and Brazing, project drawings, copper fittings chart, and copper soldering project worksheet

**Tools and Materials:** Tripod with chain vice, 20lb propane tank with turbo torch,  $\frac{3}{4}$ " copper pipe (about 1 foot per student), tubing cutters (8 or more) and extra cutter wheels **check wheels**, folding/stick rules (6-8), sandcloth less than 4" per student (one 25' roll), plumbing flux for 95/5, solder (4-6 small containers, couplings (1 per student + spares), propane soldering torches (1 per station + extras) **check tips**, vices (1 per station attached to table), strikers (1 per station), channellocks (1 per station), rags, 5 gallon buckets, hose, brown jersey gloves.

## Lesson Two – 2 1/2 hour session

### I. Introduction to plumbing (15 minutes)

- Water system
- Work performed

Hand-outs: "How Water Gets to You", Plumbers' Tools, Drains and Sewers, Back to back bathroom plans

### II. Hands on activities

Divide students into as many groups as there are structures, pulling one group at a time from toilet installation for the cast iron demonstration.

#### A. Water closet Installation (1 hour and 45 minutes)

- Introduction – using cross section display of toilet and bathroom mock up, provide basic instruction on how these fixtures work and how the pipes carry water to and from them.
- Demonstrate and assist students in installing toilets into existing structures completed during carpentry week.

**Tools and Materials:** water closets, plumbers' putty, 12" crescent wrenches, wax ring, bisected toilet and sink cabinet, jig saws, closet collars and bolts.

#### B. Cast Iron Pipe cutting demonstration (30 minutes)

- Introduction, including uses, vocabulary and safety
- Practice safe use of the ratchet snappers to cut pieces of cast iron

#### C. Lead/Oakum Joints (as time allows)

- Set piece of cast iron into hub, use yarning iron to pack with oakum, ladle in molten lead, let cool

**Tools and Materials:** Ratchet snappers, lengths of cast iron drain pipe (stand (4-6 pieces), 5 pound lead (pig iron) ingot, melting pot & ladle, propane torch & striker or melting furnace, oakum, brown (1 roll), 2 ½” curved yarning iron/tool

### Lesson Three – 2 1/2 hour session

#### I. Overview of Pipefitting

##### A. Safety

- Review of personal protective equipment (PPE),
- Hot
- Firewatch – review location of fire extinguishers.

##### B. Overview of cutting and welding

Divide class is half – one group begins with cutting, the other with welding – there can be as many stations as is possible for each group.

#### II. Practical One: Cutting

##### A. Layout

- Measure twice, cut once
- Mark w/ soapstone and combination square

##### B. Neutral Flame

- See handout

##### C. How to use the torch

- Steady against something fixed
- Pre-heat and oxy-lever

##### D. Cut two coupons

##### E. Switch partners

##### F. Bonus activity: Cut bolt holes

##### G. Bonus activity: Clean tips

##### H. Clean-up

- Shut off bottles
- Wind hoses
- Sweep, etc.

#### I. Practical Two: Welding

##### A. Striking an arc

- Equals success!

##### B. Running a bead

##### C. Bonus activity: Tee Joint

##### D. Clean-up

- Shut off machines
- Wind cables
- Sweep, etc.

#### II. Closing

##### A. Questions?



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