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” threaded 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) ¾" 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, ¾" 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 – 21/2 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 – 21/2 hour session

I. Overview of Pipefitting
   A. Safety
      o Review of personal protective equipment (PPE),
      o Hot
      o Firewatch – review location of fire extinguishers.

II. 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.

II. 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?