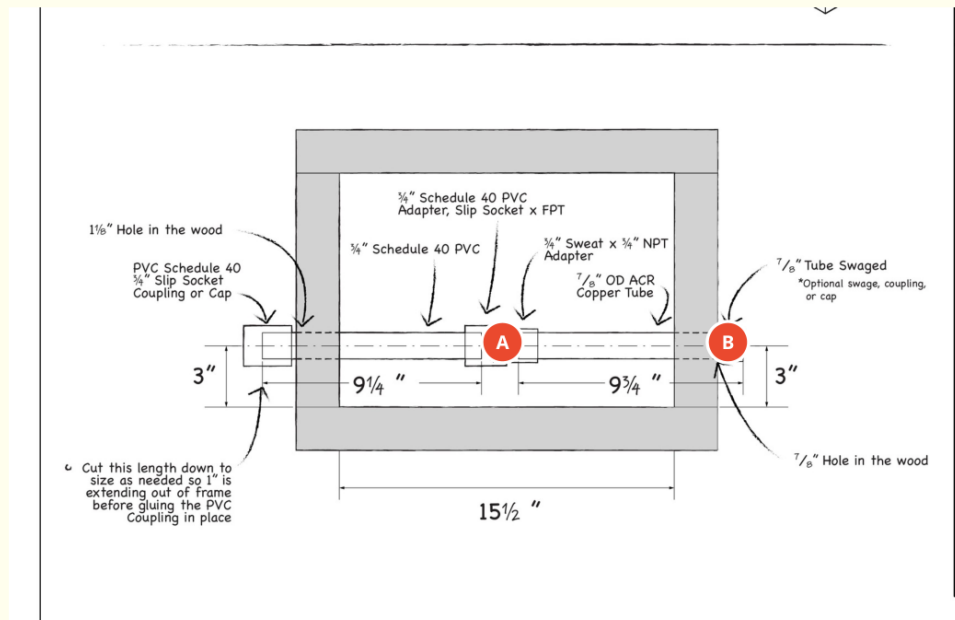


HOST GOAL: CHOOSE ONE COPPER JOINING SYSTEM

Choose a Brazing or Soldering Method



A REQUIRED: 7/8-in ACR INTO SWEAT ADAPTER | B OPTIONAL: COPPER CAP / COUPLING

Choose one copper joining system

for the brazing and pipe fitting module. If offering the optional aluminum module, choose one repair method.



PROPANE / MAP-PRO

SOFT SOLDER + ALUMINUM

Complete trigger torch + cylinder. Built-in ignition: no striker. Hand-tight cylinder: no wrench. Use plumbing solder + matching flux for copper, or the selected aluminum repair product. Does not perform the copper-braze option.

Best fit when the copper joint will be soft-soldered



AIR-ACETYLENE / SWIRL-TIP

FULL MODULE

Complete matched swirl-tip kit - usually TurboTorch. Push-button lighting preferred; striker if manual. Acetylene wrench always. A-8 copper tip; A-3 aluminum tip. Sil-Fos / phos-copper (BCuP) for copper; selected aluminum product for aluminum.

Only one-kit option for soft solder, copper braze + aluminum repair



OXY-ACETYLENE

COPPER BRAZE ONLY

Complete matched two-gas kit. Small manufacturer-approved tip for the 7/8-in joint. Flint striker; correct acetylene wrench always. Use Sil-Fos / phos-copper (BCuP). Do not use oxy-acetylene for aluminum repair.

Copper brazing by mentors already competent with oxy-fuel

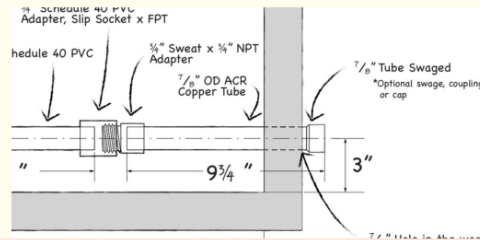
FULL-MODULE CHOICE

Air-acetylene / swirl-tip - usually TurboTorch - is the only one-kit system for soft solder, copper brazing, and aluminum repair. Oxy-acetylene is copper-only; never use it for the aluminum portion.

Choose the copper system first; add aluminum only if offering that module.

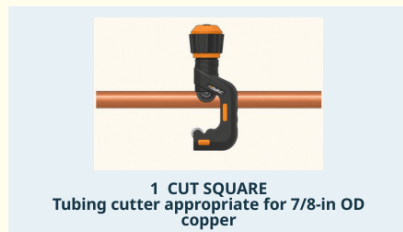
7/8-IN ACR INTO 3/4-IN SWEAT X MALE NPT ADAPTER

Make the copper joint



A = 7/8-in ACR fully seated in the straight sweat cup. Complete this joint before the box backer is installed.

JOINT PREP



SOFT SOLDER - PROPANE OR MAP-PRO

BUY PLAIN LEAD-FREE PLUMBING WIRE SOLDER

- | | | |
|-----------------------------|-----------|------------|
| 1 Silver-bearing / Safe-Flo | 420-460 F | PREFERRED |
| 2 95/5 tin-antimony | 450-464 F | ACCEPTABLE |
| 3 97/3 tin-copper | 440-572 F | ACCEPTABLE |

Use separate plumbing flux; Oatey No. 95 tinning flux is the GRIT default. Do not buy rosin-core, acid-core/general-repair wire, or leaded solder.

- 1 Brush a very thin coat on the cleaned tube OD and inside the straight cup. Seat fully; wipe excess.
- 2 Clamp over firebrick. Heat the tube and fitting around socket depth; keep the flame moving.
- 3 Touch solder opposite the flame. The hot work melts and draws it in; stop at a continuous ring.
- 4 Hold still. Cool naturally. Wipe off flux residue and inspect 360 degrees.

BRAZE - AIR-ACETYLENE OR OXY-ACETYLENE

FILLER = SIL-FOS / PHOS-COPPER (BCuP)

Use Sil-Fos / phos-copper (BCuP) for this copper-to-copper joint. No external flux on clean copper-to-copper.

AIR-ACETYLENE: matched A-8 copper tip in the swirl-tip system, usually TurboTorch.

OXY-ACETYLENE: small approved tip for the 7/8-in copper joint only - never for aluminum repair.

- 1 Dry-fit fully seated and snug. Clamp over firebrick.
- 2 Light with the kit's push button or a flint striker. Oxy-fuel uses a neutral or slightly reducing flame.
- 3 Heat both base metals evenly. Touch rod away from the flame; the hot work melts and draws it in. Judge flow, not color alone.
- 4 Stop when filled. Cool naturally; wipe oxide after the joint sets; inspect 360 degrees.

CATCH THESE FAILURES

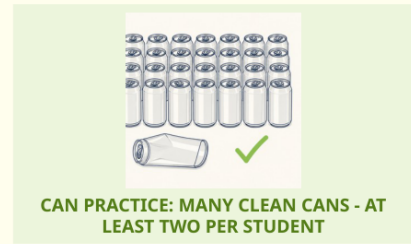
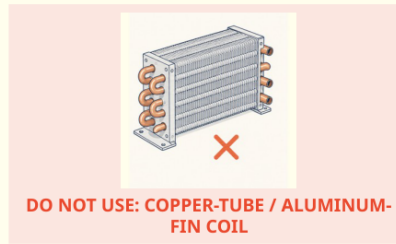
Burr left in | dirty or loose fit | too much/burned flux | flame melts filler instead of the work | moved or quenched before set

If filler beads instead of wetting: stop, cool, reclean, and remake. More filler will not fix preparation or heat control.

Heat the work, feed the joint, stop when it flows, and let it cool naturally.

OPTIONAL MODULE — COIL REPAIR + ALUMINUM CAN REPAIR

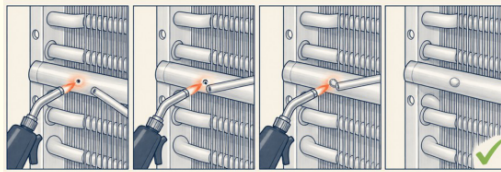
Choose the aluminum repair category



ALUMINUM HEAT: PROPANE/MAP-PRO OR MATCHED AIR-ACETYLENE SWIRL-TIP (USUALLY TURBOTORCH). NEVER OXY-ACETYLENE.
EVERY METHOD: clean/degrease; dedicated stainless brush; keep the exact filler, flux, heat method, and cleanup together.

1 PREFERRED - FLUX-CORED ALUMINUM REPAIR

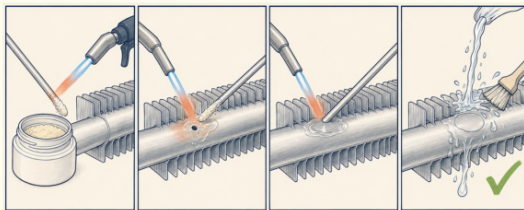
LUCAS-MILHAUPT AL 822 | HARRIS ALUXCOR ZN78/22 (ZN78CW09420POP)
ABOUT 800-900 F | FLUX INSIDE THE ROD | NO EXTERNAL FLUX



- 1 Heat the base with propane/MAP-Pro or the matched A-3 air-acetylene tip; touch the cut rod face to the defect.
- 2 Feed cut face first so the internal flux reaches the repair before the alloy.
- 3 Remove rod and heat as soon as the hole fills. Overheating can enlarge it.
- 4 Follow the product label for residue cleanup.

2 SECOND CHOICE - EXTERNAL POWDER FLUX

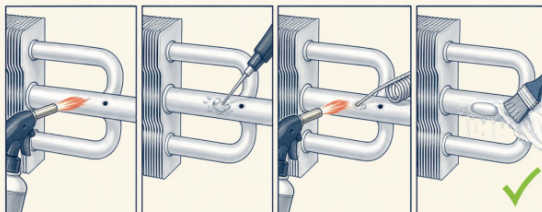
REFERENCE: SOLDERWELD ALLOY-SOL | SEPARATE POWDER FLUX | DIRECT WORK HEAT



- 1 Warm the rod tip and dip it in the named external powder flux.
- 2 Preheat the base metal; melt flux onto the repair until it goes clear.
- 3 Feed while heating the work. Stop as soon as alloy flattens and wets.
- 4 Cool naturally; wash flux residue with water and a brush.

3 ALTERNATE - VERY LOW TEMPERATURE + LIQUID FLUX

UNIWELD UNI-4300 | ABOUT 500 F | SEPARATE LIQUID FLUX | INDIRECT / SIDE HEAT
GENERALLY LESS CAPABLE FOR PATCHING; THE LIQUID FLUX IS EASIER TO BURN



- 1 Gently preheat the sides of the repair; then apply the matching liquid flux.
- 2 Feather side heat. Flux bubbles, goes quiet, and may show a green flash; do not overheat it.
- 3 Touch filler to the hot base metal; the work, not the flame, melts it.
- 4 Cool naturally; remove all residual liquid flux.

PREFERRED: FLUX CORE | NEXT: EXTERNAL POWDER | ALTERNATE: VERY-LOW-TEMP LIQUID FLUX - NEVER MIX SYSTEMS

Keep each aluminum repair rod, matching flux, heat method, and cleanup together.

CAPACITY AND BUY CHECKLIST

Count complete torch kits, not loose equipment

RECOGNIZE THE THREE EQUIPMENT TYPES



PROPANE /
MAP-PRO



AIR-ACETYLENE /
SWIRL-TIP



OXY-
ACETYLENE

Use photos to identify the system; buy the matched torch, tip, cylinder, ignition, valve tool, filler, and flux listed below.

CAPACITY

STUDENTS	ACTIVE PAIRS	COMPLETE TORCH KITS	MENTORS + FLOATER
8	4	4	4 + 1
12	6	6	6 + 1
16	8	8	8 + 1

One lit torch per active pair. One competent mentor per lit torch. A floater supports setup, materials, and transitions.

WHAT EACH COMPLETE TORCH KIT INCLUDES

SYSTEM	COMPLETE KIT	IGNITION	VALVE TOOL
PROPANE / MAP-PRO	Trigger torch + cylinder; plain lead-free plumbing solder; matching plumbing flux + brush	Built-in trigger NO STRIKER	Hand-tight NO WRENCH
AIR- ACETYLENE	Matched swirl-tip kit - usually TurboTorch; A-8 copper / A-3 aluminum; Sil-Fos / phos-copper (BCuP) + selected aluminum product	Push button preferred; striker if manual	ACETYLENE WRENCH REQUIRED
OXY- ACETYLENE	Matched two-gas kit + small approved tip; Sil-Fos / phos-copper (BCuP). COPPER BRAZE ONLY - NOT FOR ALUMINUM	FLINT STRIKER	ACETYLENE WRENCH REQUIRED

FULL MODULE: only a matched air-acetylene swirl-tip kit - usually TurboTorch - covers soft solder, copper brazing, and aluminum repair. OXY-ACETYLENE IS COPPER ONLY - NEVER FOR ALUMINUM. Every acetylene cylinder needs a dedicated tank wrench or correctly fitting refrigeration service wrench.

AT EVERY ACTIVE STATION

- One complete selected torch kit - not loose components borrowed from another station.
- Correct filler and exact matching flux system; plumbing flux brush where used.
- Appropriate copper tubing cutter; red pencil reamer; tube abrasive, fitting brush, tongs, and rags.
- Sturdy work table, clamp/fixture, four firebricks, and a defined hot/cooling area.

SHARED CAMP SUPPORT

- Enough complete kits, spare tips, strikers/igniters, acetylene wrenches, filler, flux, and brushes.
- Enough tables and clamps for every active pair; supply surfaces do not count as work tables.
- Enough compatible cylinders, hoses, handles, and replacement tips to keep each selected station complete.
- If aluminum is offered: exact labeled kit, dedicated stainless brush, and many clean cans - at least two per Student.

MENTOR SEQUENCE

Fit, solder/braze, clean, and inspect the copper assembly before installing the backer. Before a student lights a torch, confirm that station's kit, tip, ignition, wrench, filler, flux, clamp, hot zone, and shutdown.

Count complete stations—not loose torches, tools, or supplies somewhere in the room.