

# **METALS 200 Series - Using the torches at the Jewelry and Metal Craft Shop**

Metals 201

Metals 202

Metals 203

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# **METALS 201**

## **Using Single Fuel Torches and Certification**

### **Welcome**

#### **Attendance / Intros**

**Prerequisite:** Metals 100, 101

**Required for:** Metals 202 and some techniques classes

### **GOALS:**

1. Identify and understand the purpose of the tools and equipment at the soldering station
2. Review the Acetylene Torch and Silver Soldering Safety handout
3. Practice: Hands-on set up, lighting and shutting down gas: Butane, MAPP/Propane, Acetylene-Air
4. Understand the basic relationship between the fuel, the flame, the amount of heat, and the temperature of the work piece
5. Identify popular techniques requiring the torch that metalsmiths use
6. Stow the equipment - shut down the station
7. Practice with the annealing, soldering process, complete the sampler or project and the certification checklist

## Introduction

### Safety Review

- Eye protection: Impact, UV and IR (heat) Didymium lens
- Skin: Extreme heat, Pickle and irritant exposure
- Apparel
- Fumes and ventilation
- First Aid
- Fire extinguishers
- Gas tanks and regulator

### TM Environment

- Unidentified “stuff” accumulates. Clear it off if it is not identified or being used
- Locate what you need, it may or may not be where you last saw it
- Clean up area. Do something extra
- Notify captain if any equipment is not functioning or if tanks are empty
- Turn off gas and pickle pot if no one is using them
- Cover solder brick if cool to touch. If not, leave a note that bricks are HOT

Use of single fuel torches at the Jewelry and Metal Craft Shop vs. other torches around TinkerMill.

- Glass flame work, Welding in back bay
- Appropriate uses
  - Non ferrous metals
  - Examples of processes: Warming, Annealing, Soldering, Brazing, Balling wire, Enameling, Reticulation, Heat patina, Metal Clay Sintering, Forming, Chasing/ Repousse, Texturing
- Inappropriate uses
  - Don't use this shop to work with ferrous metals (e.g.: steel, iron)
  - No torch-cutting
  - No bon-fires at the station, please

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1. Identify and understand the purpose of the tools and equipment at the soldering station

- Tanks
- Regulator system
- Torch hand piece and hose
- Station equipment and utensils
  - Flint lighter/sparker
  - Fire brick and cover
  - Pickle pot
  - Quench pot
  - Flux
  - Solder
  - Cleaning supplies
  - Solder pick, tweezers, hemostat, 3rd-hand, pins, paper towels, water

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2. Review the entire Acetylene Torch and Silver Soldering Safety handout

- Demonstration and explanation

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3. Practice: Hands-on set up, turning gas on, lighting/extinguishing the torch, and shutting gas off.

- **Butane**
  - Small hand-held torch with canister filled with butane
  - Turn gas on by rotating knob on top counter-clockwise (left) until you hear gas escaping. Press the igniter button to light the flame.
  - Turn gas off by rotating knob on top clockwise (right) until it is snug and flame completely disappears.
  - The butane torch body can be refilled from a full can of butane. Invert the torch body and locate the filling nipple on the bottom. Invert the can of butane and fit the tip over the nipple and press straight down toward the torch body. When the body is full, butane will start to spray out around the connection. Stop filling. The overflow will quickly evaporate.
- **MAP-Pro (MAPP) gas**
  - Portable gas canister (yellow usually) with a hose connecting it to a torch hand piece
  - Check for leaks. Turn gas on and use soapy water on all connection points. If you see bubbles forming, there is a leak. Turn off gas and tighten connection. Recheck.
  - Turn gas on by rotating knob on top of canister counter-clockwise (left) until you hear the fuel escaping. It may take several full turns.
  - Squeeze and hold the igniter trigger switch on the hand piece to light the flame. You should hear the gas escaping and the flame should light after a few tries. To lock the flame on, use the rectangular push button located at the front end of the handle near the trigger. Press this lock button in once the flame is lit and while you still are

squeezing the trigger switch. Then you can release at the trigger switch. To release the lock and extinguish the flame, squeeze the trigger switch and release.

- This gas is hotter than Propane and is good for heating larger areas especially for annealing copper sheet.
- **Propane**
  - Portable gas canister (blue usually) may or may not have the torch directly connected to the tank. Open the valve until you can hear gas escaping. Light using a sparking flint. Never a flame. If there is a hose and hand piece, use the same lighting procedure as for MAPP gas.
- **Acetylene**
  - Red tank is Acetylene and is connected to a torch hand piece that mixes it with ambient air -
  - **Acetylene fueled flames reach over 2000 degrees F.**
  - Follow the “Operation” section in the attached handout: *Acetylene Torch & Silver Soldering Safety* to pressurize the system and light the torch using the flint sparker.
  - Follow the “Operation” section in the attached handout to shut down the system and bleed the hose.
- **Oxygen**
  - There is an oxygen tank and a second Acetylene tank that make up the Oxy-Acetylene torch setup. The oxygen tank is not used with single fuel torches and that system is not covered in the 201 class.

#### 4. Understand the basic relationship between the fuel, the flame, the amount of heat, and the temperature of the work piece

- Anatomy of the flame
- Tips have different hole sizes to adjust the **amount** of heat possible, larger flame, larger area can be heated
- Fuel flow is adjustable. Different fuels burn at different temperatures
- The amount of heat raises the temperature of the work piece until solder liquifies and makes the solder joint
- Solder comes in 4 alloys that melt at different temperatures to facilitate consecutive soldering steps (Hard, Medium, Easy, Extra Easy)

#### 5. Identify some of the torch heat processes useful to metal-smiths

- Annealing is used for softening metal to allow it to be manipulated. E.g., Fold forming, Raising, Shaping, Chasing/Repousse, and Texturing
- Soldering - melting a silver alloy (solder) to join metal together at molecular level
- Casting uses molten metal to fill a mold
- Special techniques include: Balling wire, Enameling, Heat patina, Metal Clay

## 6. Stow the equipment - shut down the station

- **Unplug pickle pot** and make sure the lid is on.
  - Cover and stow the quench pot
  - When firebrick is no longer hot, cover with wooden lid. If you must leave before it is cool enough, place a sign on or near the firebrick to indicate it is still hot
  - Return utensils to jar or bin under the soldering deck
  - Close the flux jar and stow it
  - Complete the shutdown procedure for gas tanks
  - Shut off lights and ventilation unless others are using the space
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## 7. Practice with the startup/shutdown, annealing, soldering process and complete the sampler or project and the certification checklist.

- Sampler/project requirements: (not judging quality, just knowledge of best practice and evidence of the safe attempt)
  - Make an appointment with the instructor to complete this step
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### **Sampler:**

- Anneal a copper sheet (24g) approximately 3x4". Work-harden it and re-anneal.
  - Sweat-solder (tin) two pieces of metal together.
  - Solder a jump ring together.
  - Make a solder seam to connect the edges of two or more pieces. Pickle and rinse.
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### **Project:**

Create a design (or find an existing design) that uses the annealing and soldering processes. Discuss with instructor. Set up a time with the instructor to execute the design.

**Certification checklist**

|   |  |  |  |  |   |  |  |
|---|--|--|--|--|---|--|--|
| Demonstrate the use of the tools or processes below (required). |  |  |  |  |   |  |  |
|   | <i>Gas Torches:<br/>Acetylene, Butane<br/>MAPP, Propane</i>  |  | <i>Annealing</i>   |  | <i>Soldering</i>                            |  | <i>Soldering<br/>station<br/>equipment</i> |
|   | <b>Tank setup and shut down process</b>                      |  | <b>Successfully annealing copper or brass sheet and wire</b> |  | <b>Workpiece preparation essentials</b>     |  | <b>Setting up</b>                          |
|   | <b>Lighting and adjusting the flame. Extinguishing flame</b> |  | <b>Proper use of rolling mill</b>                            |  | <b>Soldering prep essentials</b>            |  | <b>Stowing equipment and cleanup</b>       |
|   | <b>Changing tip (acetylene only)</b>                         |  | <b>Proper use of steel dapping block/punch</b>               |  | <b>Flame adjustment and heating process</b> |  |  |
|   | <b>Check equipment for safe operation</b>                    |  | <b>Proper use of disc cutter</b>                             |  | <b>Quench, pickle, rinse, dry</b>           |  |  |

|   |   |
|---|---|
| <b>Answer the following (may be done orally):</b> |   |
|   | Name three hazards involved in using the torch and safe practices to mitigate them. |
|   | What is meant by “work-hardening”? Name three ways that work-hardening happens.     |
|   | Name three tools that can be damaged by working metal that is too hard.             |
|   | Name three things to check before you leave the soldering station.                  |
|   | Where is the nearest fire extinguisher? Where is the nearest exit?                  |

8. Review with instructor your checklist and sampler/project for completion of requirements. Sign the certification log.

## References and Resources

- Eye protection discussion at Ganoksin; Jim Binnion, master metalsmith, says ...Gas flames do produce some UV, how much depends on the temperature and what things are being heated, i.e. metal, brick, flux etc. As an example an Oxy-Propane torch used to heat borosilicate glass will produce significant amounts of UV but the same torch used to solder silver on a charcoal block does not produce very much...
- *Silver Soldering Techniques and Tips* from the University of Vermont: <http://www.uvm.edu/safety/art/silver-soldering>
- *Complete Metalsmith* by Tim McCreight
- Wiki: [wiki.tinkermill.org](http://wiki.tinkermill.org) - Jewelry and Metal Craft Shop
- Slack channel: <https://tinkermill.slack.com/messages/metal-craft/details/>
- Instructor: [lynne.davis@tinkermill.org](mailto:lynne.davis@tinkermill.org)
- Open Studio: Sundays 12:30-2:30

