



COLLEGE OF FINE ARTS & COMMUNICATION  
**LAMAR UNIVERSITY**  
Department of Art & Design

# **Foundry Policies & Procedures**

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## General Procedures

### General Safety Apparel

All foundry safety apparel will be used only for pouring purposes. All safety apparel will be checked, maintained and inventoried by the professor of note at the beginning and end of each semester. This same procedure will take place each time any safety gear is checked out for any off campus activity.

During non pouring times, i.e., mold making, furnace preparation, clean up, etc... all participants must adhere to the following safety requirements:

- Close woven cotton shirt
- Long pants
- Leather work boots, preferably boots with a steel toe – **No sandals or open toed shoes**
- Safety glasses with side shields. Prescription glasses can be purchased at Texas State Optical. Welding supply stores and most hardware stores stock proper eye ware. **Sun glasses are not proper eye protection**

### Travel

The professor of note must adhere to all travel policies for students set forth by Lamar University when working off campus or participating in professional conferences.

### Guest Artists

All visitors participating or working in the foundry must adhere to all policies and procedures set forth in this document. In addition, all visitors participating or working in the foundry must sign a waiver.

# Iron Furnace

## Description

A cupola furnace and a cupolette furnace both have three main sections; well, wind-box, and stack. Coke and iron is preheated in the stack. Air is introduced at the wind-box through the tuyeres. This area is called the melt zone where the coke (fuel) is burned to melt the iron. The molten iron is collected in the well. When the well is full, a clay plug (bott) is removed from the tap hole, allowing the iron to exit the furnace and fill a ladle. The tap hole is botted, and the melting process continues or repeated.

Iron can be melted proficiently in a cupola or cupolette. A cupola furnace has a tall stack for preheating the coke and iron charges. The charges in the stack function as an impediment to the air flowing into the furnace, keeping the air in contact with the coke fuel so that the fuel combusts completely. This type of furnace is charged continuously and has a slag hole located at the top of the well. Slag and iron eventually will come out of this hole as the level of molten iron rises in the well. This signifies that the well is full and the iron needs to be tapped immediately.

A cupolette furnace has a shorter stack and is equipped with a lid. The lid keeps the oxygen confined in the melt zone to burn the coke efficiently. The stack is charged with coke and iron in batches. The amount of iron charged determines how much iron is in the well. A cupolette can also have a slag hole.

The foundry area at Lamar University utilizes both types of furnaces, with a range of sizes. The type of furnace utilized is determined by the size and quantity of molds for a specific pour.

## Iron Pre-pour Procedures and Requirements

- All iron charges will be completed well in advance of a scheduled pour.
- All mold making will be completed the day before the scheduled pour.
- Furnace preparation will be completed the day before the scheduled pour.
- All student participation will require proper instruction regarding safety gear, furnace operations, and pouring procedures prior to scheduled pour.
- All student participants are required to participate in a practice pour clearly demonstrating all activities that take place during a scheduled pour.
- All student participants must be present during both the orientation session and the scheduled pour unless authorized by the professor of note.
- All participants, number of molds, and estimated weight to be poured must be posted prior to the pour. This will facilitate a safe and organized pour.
- The safety apparel monitor will facilitate safety gear fitting properly and emergency operations.
- The Department of Art & Design will supply drinking water and ice for all participants during a scheduled pour.

Prior to the scheduled pour, participants will be organized into furnace and pouring teams, as well as general areas of responsibilities. Team leaders will be assigned from experienced participants to maintain cohesive order within these smaller groups and direct their operations during the pour.

**If you have been assigned to an operation that you do not feel comfortable performing, speak up in a timely manner.** It is important to everyone's safety that you are comfortable in your own capabilities. Everyone can participate, there are many duties that do not include intimate contact with metal pouring depending on the type of foundry operation; i.e., mold captain to direct the pouring crew, safety apparel monitor, record keeper, someone to ensure that the participants keep adequately hydrated, crowd control, and, at "public demonstrations", someone to inform the observers about the process.

Prior to the actual operation of the furnace there will be an organizational meeting of all participants with the professor of note who will double check proper number of participants and safety attire.

## Pouring Crew and Responsibilities

- While operating the 300# cupola, a pouring crew will consist at minimum of the following participants:
  - ✓ 1 mold captain
  - ✓ 1 crane operator
  - ✓ 4 participants operating the furnace
  - ✓ 3 participants pouring the metal (bull ladle)
  - ✓ 3 participants pouring the metal (small ladle)
  - ✓ 1 safety apparel monitor
  
- While operating the 100# cupola, a pouring crew will consist at minimum of the following participants:
  - ✓ 1 mold captain
  - ✓ 2 participants operating the furnace
  - ✓ 3 participants pouring the metal (small ladle)
  - ✓ 1 safety apparel monitor

## Safety Apparel during Furnace Operation

**A sculpture professor must be present during all furnace operations.**

All safety equipment must be worn in the furnace and mold areas when furnaces are in operation or metal is being poured. All students, professors and guest artists must adhere to the following safety requirements:

- Close woven cotton shirt
- Long, loose fitting denim jeans
- Safety glasses with side shields. Prescription glasses can be purchased at Texas State Optical. Welding supply stores and most hardware stores stock proper eye ware. **Sun glasses are not proper eye protection**
- Cap or hat (not synthetic material) to cover your head and keep your hair tied back. A cotton bandana or scarf will also work.

**The Department of Art will supply the students the following safety apparel in good condition and proper working order for all pouring operations. Duct tape should not be used to alter any safety apparel.**

- Leather or Kevlar gloves
- Foundry Kick-off boots, boots must be in good condition and fit comfortably
- Foundry helmet with face shield
- Leather jacket, cape, or apron
- Leather chaps
- Spats

## **Clean up**

A brief clean up will take place after the pour. This will consist of turning off all gasses and placing all equipment in a safe location. Safety apparel will be stored and inventoried in proper location. A final cleanup will take place the next class period after the pour. This will consist of putting away all tools and equipment in proper location, disposing all mold waste, sweeping floor sand, and cleaning furnace area.

All students who participated in the pour must be present during clean up procedures.

## **Bronze and Aluminum Furnace**

### **Description**

Bronze and Aluminum are melted in a crucible furnace utilizing forced air and natural gas. This furnace is a steel shell, lined with refractory with a crucible to contain the melted metal. The crucible is generally made of silicon carbide, which has a higher melting point than bronze or aluminum. This crucible is somewhat fragile and should be checked before each pour.

Charging metal should never be dropped in the crucible, as the crucible may crack or breach.

The crucible is removed from the furnace when the desired amount of metal has been melted utilizing tongs and placed into the pouring shank. Two participants are need for this operation. Two additional participants are needed for the pouring shank. These participants will place the shank and crucible on pouring stands and the professor of note will skim and set the crucible.

After the metal has been poured, the crucible is placed back into the crucible furnace with a layer of cardboard between the pillow block and crucible to melt more metal. If no more metal is needed, the crucible is removed from the shank and left to cool down.

## **Bronze and Aluminum Pre-pour Procedures and Requirements**

- All student participation will require proper instruction of safety gear, furnace operations, and pouring procedures prior to scheduled pour.
- All student participants are required to participate in a practice pour clearly demonstrating all activities that take place during a scheduled pour.
- All student participants must be present during scheduled pour unless authorized by the professor of note.
- All participants, number of molds, and estimated weight to be poured must be posted prior to the pour. This will facilitate a safe and organized pour.

## **Pouring Crew and Responsibilities**

- While operating the crucible furnace, a pouring crew will consist at minimum of the following participants:
  - ✓ 1 participant operating the furnace (instructor of note)
  - ✓ 3 participants pouring the metal
  - ✓ 1 safety apparel monitor

## **Safety Apparel during Furnace Operation**

**A sculpture professor must be present during all furnace operations.**

All safety equipment must be worn in the furnace and mold areas when furnaces are in operation or metal is being poured. All students, professors and guest artists must adhere to the following safety requirements:

- Close woven cotton shirt
- Long, loose fitting denim jeans
- Safety glasses with side shields. Prescription glasses can be purchased at Texas State Optical. Welding supply stores and most hardware stores stock proper eye ware. **Sun glasses are not proper eye protection**
- Cap or hat (not synthetic material) to cover your head and keep your hair tied back. A cotton bandana or scarf will also work.

**The Department of Art & Design will supply the students the following safety apparel in good condition and proper working order for all pouring operations. Duct tape should not be used to alter any safety apparel.**

- Leather or Kevlar gloves
- Foundry Kick-off boots, boots must be in good condition and fit comfortably
- Foundry helmet with face shield
- Leather jacket, cape, or apron
- Leather chaps
- Spats



## **Clean up**

A brief clean up will take place after the pour. This will consist of turning off all gasses and placing all equipment in a safe location. Safety apparel will be stored and inventoried in proper location. A final clean up will take place the next class period after the pour. This will consist of putting away all tools and equipment in proper location, disposing all mold waste, sweeping floor sand, and cleaning furnace area.

All students who participated in the pour must be present during clean up procedures.