

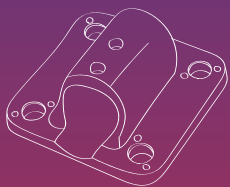
DREAM. BUILD. BECOME.

ACE METAL
FOUNDATIONS

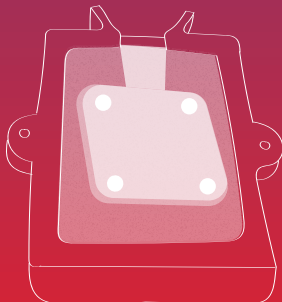
By IACMI

Molding and Casting

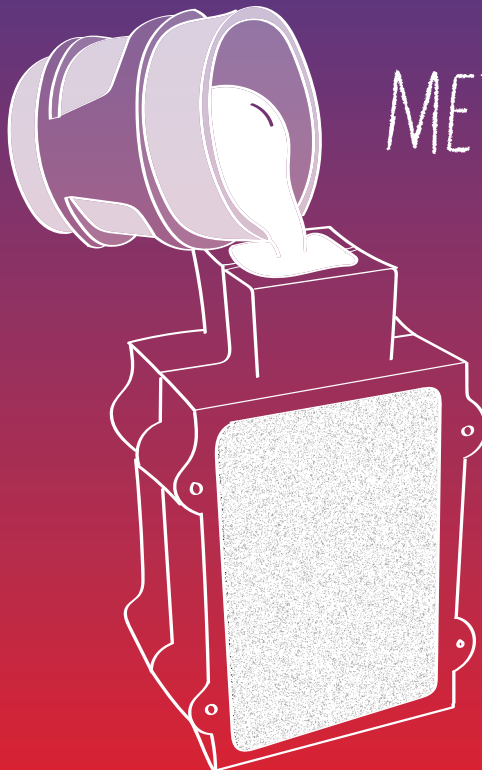
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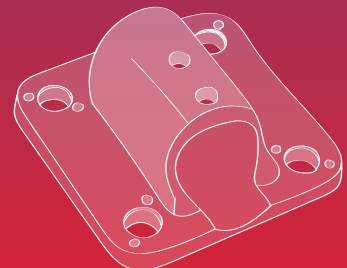
MOLD



METAL CASTING



METAL CASTED
PART



Molding and Casting



Prior Knowledge

Before starting this activity, students should understand that pressing an object into a soft material (like clay, sand, or dough) creates a shape or imprint.

Students should also be familiar with the idea that materials can change shape when force is applied and that some materials can harden or hold their shape over time.

It is helpful if students have basic experience working with soft materials such as clay or dough and understand how to handle them carefully without distorting shapes.

Molding and Casting

Lesson Overview

In this two-part activity, students first create a two-part mold using clay and a small object. In the second part of the activity, students use the mold to cast a new object using play dough.

Students observe how molds allow the same object to be produced multiple times. They also examine how alignment, pressure, and filling affect the final result. Through this process, students explore ideas related to manufacturing, repeatability, and quality control.

Vocabulary

Mold: A shape that helps you make another object.

Casting: Making a new object by filling a mold.

Impression: The shape left behind when you press something into a soft material.

Quality Control: Checking to see if something was made the right way.



Figure 1: Molten metal being casted into a sand mold.



Figure 2: A METAL bootcamp participant obtaining molten metal from a furnace to pour into a mold.

Molding and Casting

The Foundations of Mold Forming and Casting

Sometimes, people need to make the same object over and over again, like parts for cars, toys, or tools. One way they do this is by using something called a mold.

A mold is a special shape that you can fill to make a copy of something. First, an object is pressed into a soft material to create the mold. This captures its shape.

Then, a new material is pressed or poured into that mold. When it sets or dries, it becomes a copy of the original object.

Many molds are made in two pieces so you can open them up and take the finished object out.

Using molds helps people make lots of objects that all look the same. After making them, engineers check to make sure each one is the right shape and size.

In this activity, you will make your own mold and use it to create several copies of the same object.

Materials

Materials Supplied in Kit

Per Student

- 2 mailing tube lids
- 1 cotton ball
- 1 checker piece

Shared

- Air-dry clay (enough to fill two mailing tube lids)
- Five 3 oz. cans of play dough
- Cornstarch

Materials Supplied by Teacher

- 1 pencil



Molding and Casting

Activity Directions

Day 1

Step 1: Prepare a mold

- Students should write their name on the backs of each of their mailing tube lids since this is a multi-day activity
- Pack each (2) mailing tube lid to its top with air dry clay
- Use a pencil to roll over the lip of each lid to smooth down any excess air-dry clay



Step 2: Prepare the mold for an impression

- Dab a cotton ball in the cornstarch
- Dab the corn starched cotton ball lightly over the surface of the air-dry clay in each mailing tube lid. This will prevent the checker piece from sticking to the clay mold. A light coating will do the job.



Molding and Casting

Activity Directions Continued

Step 3: Finish the mold

- Firmly press a checker piece roughly halfway into the clay in one mailing tube lid



- Carefully place the second lid on top of the first lid, as if it were a sandwich. Press straight down so both lids meet evenly



- Leave the mold undisturbed for a few minutes before carefully pulling the lids apart
- Carefully remove the checker piece without disturbing the clay
- Allow the mold to dry over the course of the remainder of the school day



Molding and Casting

Activity Directions Continued

Day 2

Step 1: Prepare the casting

- Roll a small amount of play dough into a ball. Only enough foam clay should be used to fill the mold without overflowing (industry calls this overflow 'flash')
- Place a small piece of play dough into one half of the mold, slightly overfilling it.



Step 2: Cast the foam clay



- Press the mold halves gently, but firmly together for several seconds
- Open up the mold halves and gently remove the foam clay casting

Step 3: Quality Check

- Examine the cast and compare it to the original checker

Discussion Prompts or Reflection

- How does the cast compare to the original checker?
- Do all casts look the same?
- What happened when the mold halves did not line up perfectly?
- How did pressure or filling affect the final shape?
- Why might manufacturers check parts during production?

Molding and Casting

Variations and Enrichment

- Students may create several casts and compare them to see how consistent the parts are.
- Students may analyze how alignment, pressure, or under-filling the mold affects the final shape.
- Any object small enough to fit inside the lids can be cast using this method. Some objects work better than others, as the foam clay can only fill the voids made by the mold. Encourage the students to experiment with casting different objects if resources are available.
- Create a classroom checkerboard to play checkers with the casted pieces.

Foundation Exploration

- **Metal casting workers** use molds to shape melted metal into parts for cars, tools, and machines. They use the same mold many times to make parts that match in shape and size.
- **Composite Manufacturing Technicians** use molds to form strong materials made from plastics and fibers. These molded parts are used in things like sports equipment, airplanes, and wind turbine blades.
- **Manufacturing Engineers** design molds and processes that help factories make thousands of identical parts. They think about alignment, pressure, and materials to make parts turn out correctly.
- **Quality Control Inspectors** check finished parts to see if they match the original design. They look for missing details, uneven edges, or differences between parts and help fix problems.



Figure 3: A METAL bootcamp participant stirring molten metal in a furnace.