

# CASTING

**CASTING:** is a [manufacturing](#) process in which a liquid material is usually poured into a [mold](#), which contains a hollow cavity of the desired shape, and then allowed to solidify. The solidified part is also known as a casting, which is ejected or broken out of the mold to complete the process.

## CASTING MATERIALS

Casting materials are usually metals or various time setting materials that [cure](#) after mixing two or more components together; examples are:

- [1. Epoxy](#)
- [2. Concrete](#)
- [3. Plaster](#)
- [4. Clay](#)

# PRINCIPLE OF CASTING

In order to have a casting of any form, the following are the basic steps which one must follow:

- Patternmaking
- Core making
- Molding
- Melting and pouring
- Finishing
- Patternmaking

## PATTERNMAKING

To create a casting mold, a manufacturer must first design a physical model. The process of fabricating this model is called patternmaking. Using computer-assisted design (CAD) systems, the manufacturer designs dimensions and geometry of a mold, and then packs an aggregate material, such as sand, concrete or plastic, around the pattern. Once the pattern is removed, the mold cavity in the sand can be filled.

## COREMAKING

Cores are solid materials placed inside the mold cavity to create interior surfaces of a casting. For example, a metal pipefitting will require a cylindrical core inside the mold cavity to create the hollow construction of the components interior.

## **MOLDING**

At this point, the manufacturer can create the casting mold. A material such as sand, plaster or wax is used in expendable mold casting, whereas metal and other durable materials are used in non-expendable mold casting techniques. The material fills the casting mold model and is allowed to harden, at which point the manufacturer removes it from the cavity and the casting of the component can now begin.

## **MELTING AND POURING**

Metal must be properly melted prior to being placed in the mold. Typically, this is done by using what is known as a crucible. Crucibles are containers made of porcelain or another melt-resistance substance in which a manufacturer can heat a metal beyond its melting point. Once properly melted, the molten metal is poured into the casting mold to cool and harden.

## **FINISHING**

Because metal can sometimes fill in cracks in a casting mold or sprues, the pouring channel for the mold, manufacturers must often finish the metal following casting. This can be accomplished through a variety of finishing techniques, including sanding, grinding and buffing. Once proper appearance and surface texture has been achieved, further post-treatment processes such as painting or electroplating may be necessary for some applications.

## **IMPORTANCE OF CASTING**

The modern world functions because we have metal castings. Metal castings are essential to these industries: Automotive, Agriculture, Aerospace, Oil and gas (energy sector), Mining, Railroad etc. Municipal/water infrastructure, Transportation, Health care etc.

However, our industry has valuable expertise, capability and capacity to continue to provide key American-made castings such as:

- Engine blocks
- Turbine housings
- Pumps
- Water meters
- Manhole covers
- Fire hydrants
- Drainage grates

- Compressors
- Couplings
- Valves and seals
- Bushings, support castings and brackets
- Flow meter housings
- Blanks and billets for seamless refinery pipes
- Sewer and water pipes
- Key parts in the energy grid
- Medical equipment

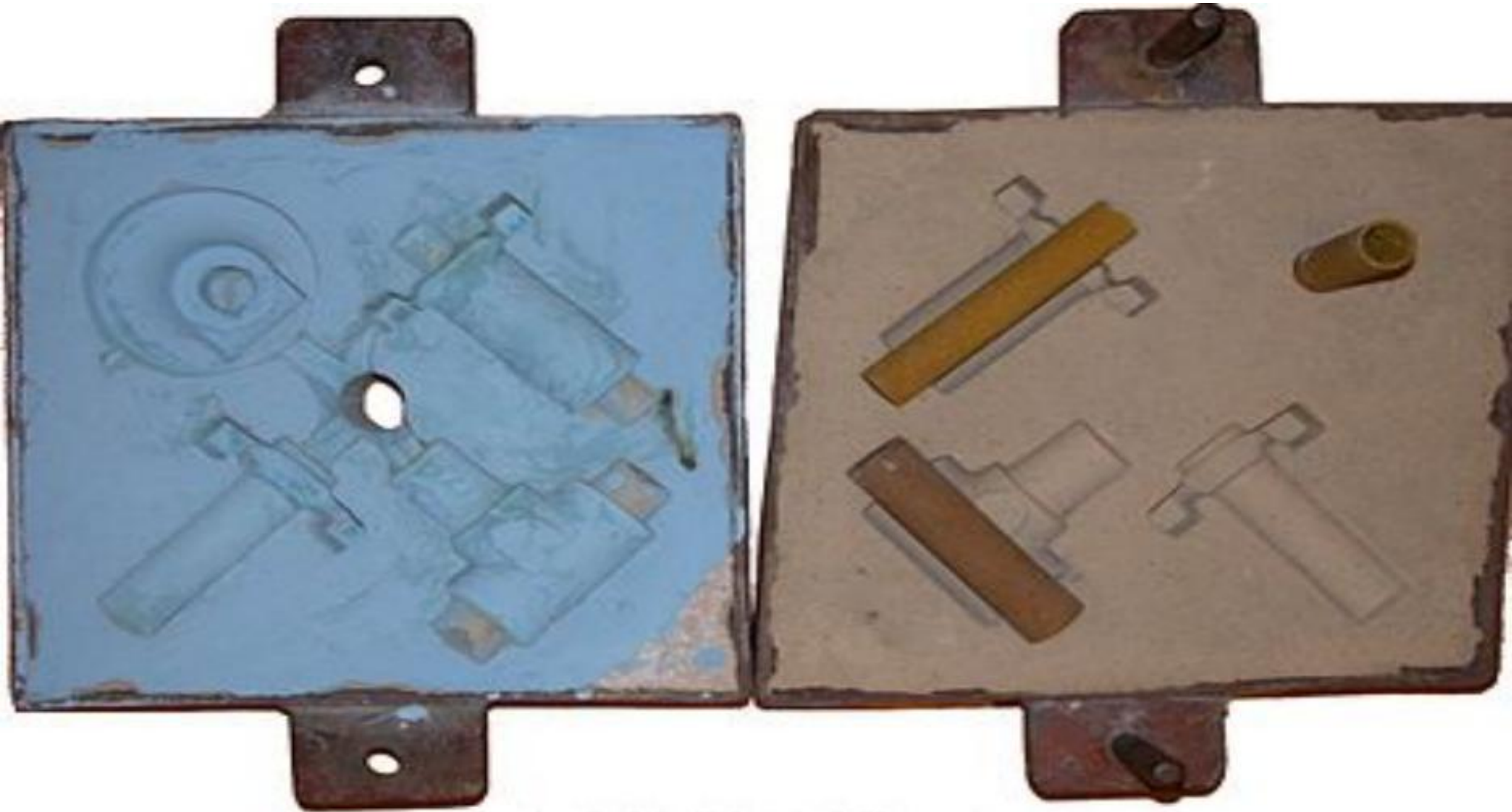
# METHOD OF CASTING

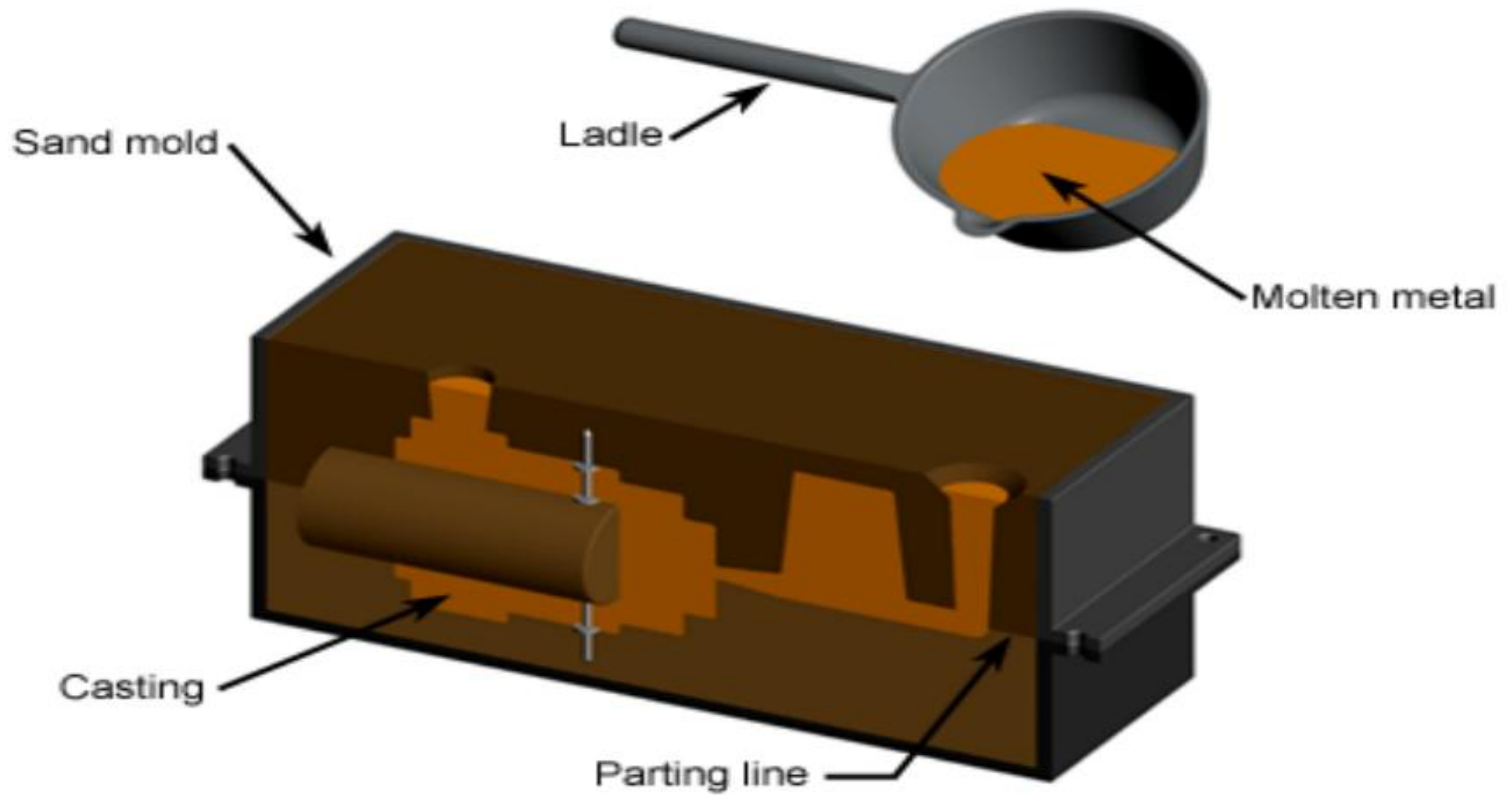
- Sand mould casting
- Plaster mould casting
- Die mould casting
- Shell mould casting

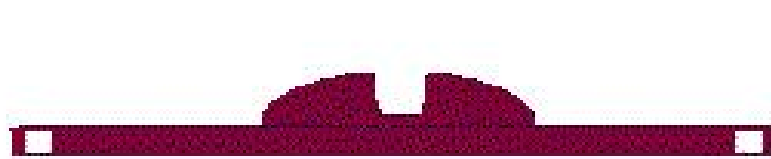
**SAND CASTING**: this is also known as **sand molded casting**, is a metal casting process characterized by using sand as the mold material. The term "sand casting" can also refer to an object produced via the sand casting process.

To make the sand castings, sand is mixed with clay, water and sometimes other substances. The process here is a lot different than die casting because the hard sand that forms the mold is broken away and dispensed with afterward.

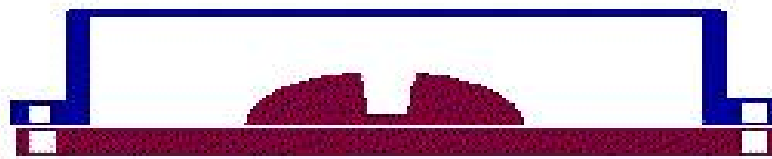




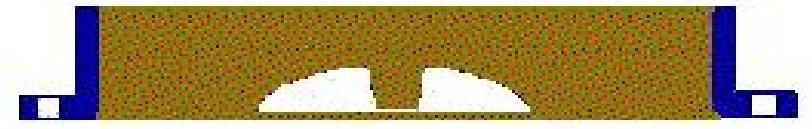




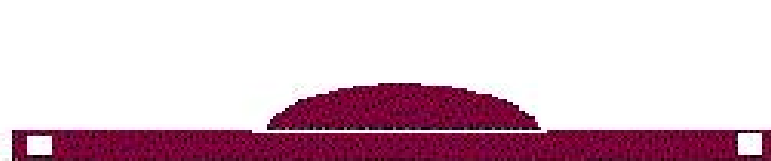
**One half of the pattern**



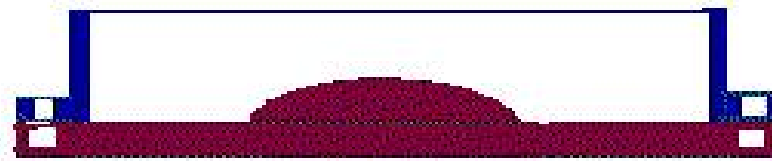
**Flask placed over  
the first pattern**



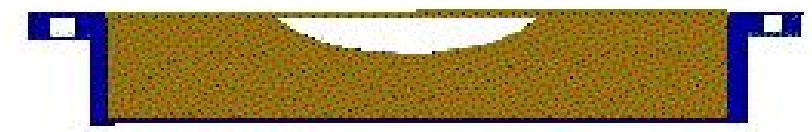
**One half the mould  
(cope)**



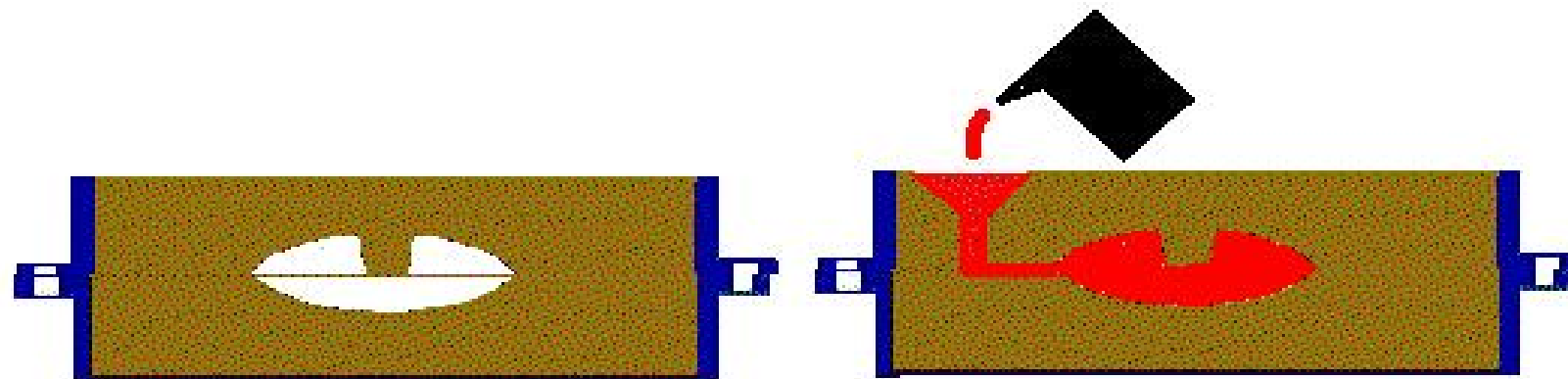
**Other half of the pattern**



**Flask placed over  
the second pattern**



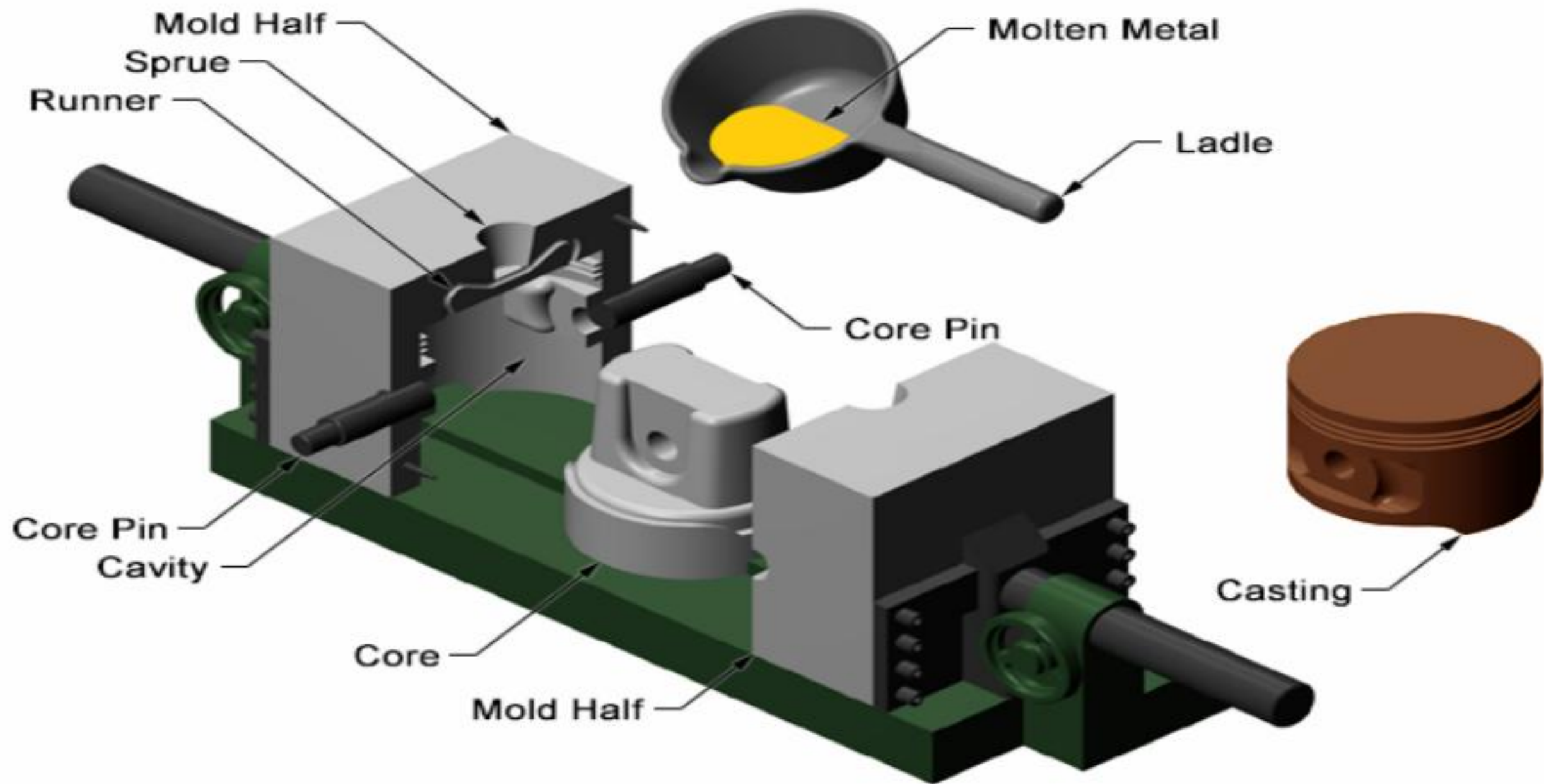
**Other half the mould  
(drag)**

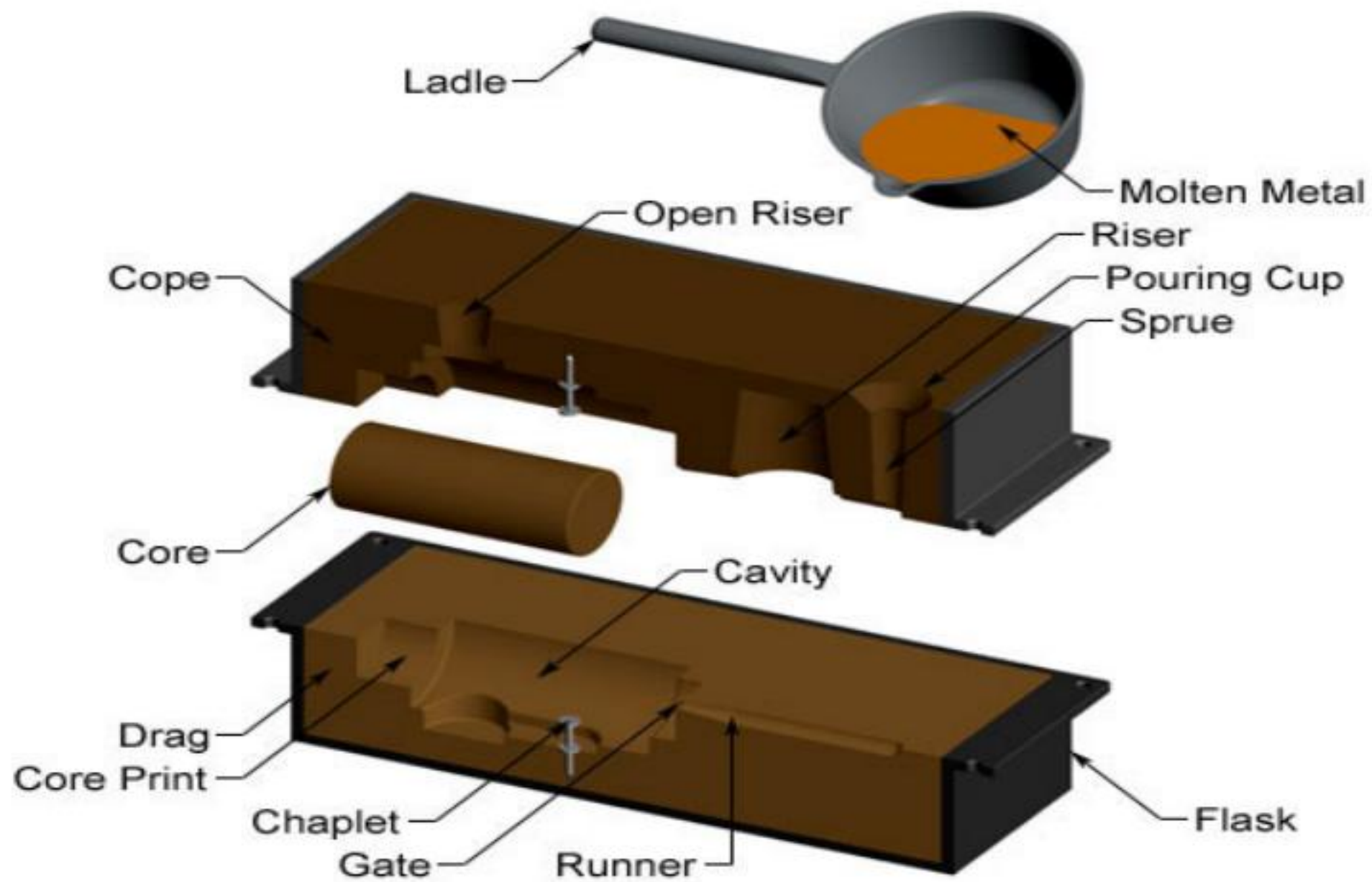


**Assembled molds**

**Casting through the gating  
system**

**The solidified  
casting**







**PLASTER MOLD CASTING:** is similar to sand casting. Generally, the form takes less than a week to prepare, after which a production rate of 1–10 units/hr-mold is achieved.

**SHELL MOLDING:** is similar to sand casting, but the molding cavity is formed by a hardened "shell" of sand instead of a flask filled with sand. The sand used is finer than sand casting sand and is mixed with a resin so that it can be heated by the pattern and hardened into a shell around the pattern. Because of the resin and finer sand, it gives a much finer surface finish.

**DIE CASTING:** is a method of molding materials under high pressure and usually involves non-ferrous metals and alloys, [such as zinc](#), tin, copper, and aluminium.

# PATTERN MAKING

**A PATTERN MAKING:** is an art. It is the art of manipulating and shaping a flat piece of fabric to conform to one or more model from which a copy is made.

## TYPES OF PATTERN

- Simple piece
- Split
- Flat back

**CORE MAKING:** A **core** is a device used in [casting](#) and [moulding](#) processes to produce internal cavities and [re-entrant](#) angles (an interior angle that is greater than  $180^\circ$ ). The core is normally a disposable item that is destroyed to get it out of the piece. They are most commonly used in [sand casting](#), but are also used in [die casting](#) and [injection moulding](#).

- The core is a chemically bonded sand shape that creates the interior surfaces of an iron casting. A core box is the tooling used to create the core.







# CASTING DEFECTS

## CASTING DEFECTS:

### TYPES OF DEFECTS

- Blown air
- Holes
- Complete run out
- Cold
- Short
- Core fault