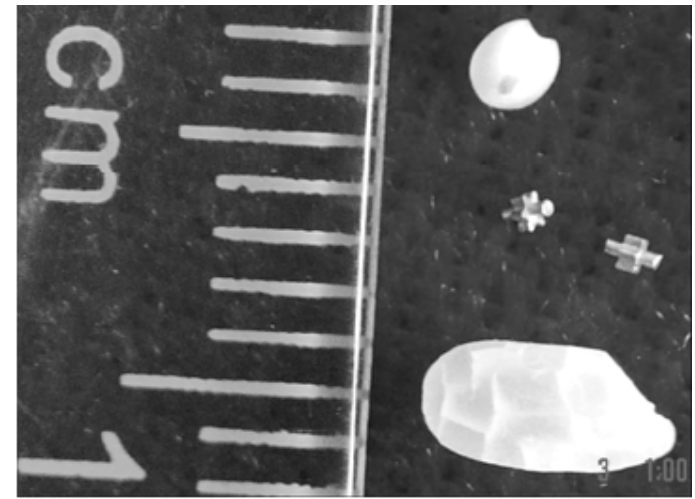
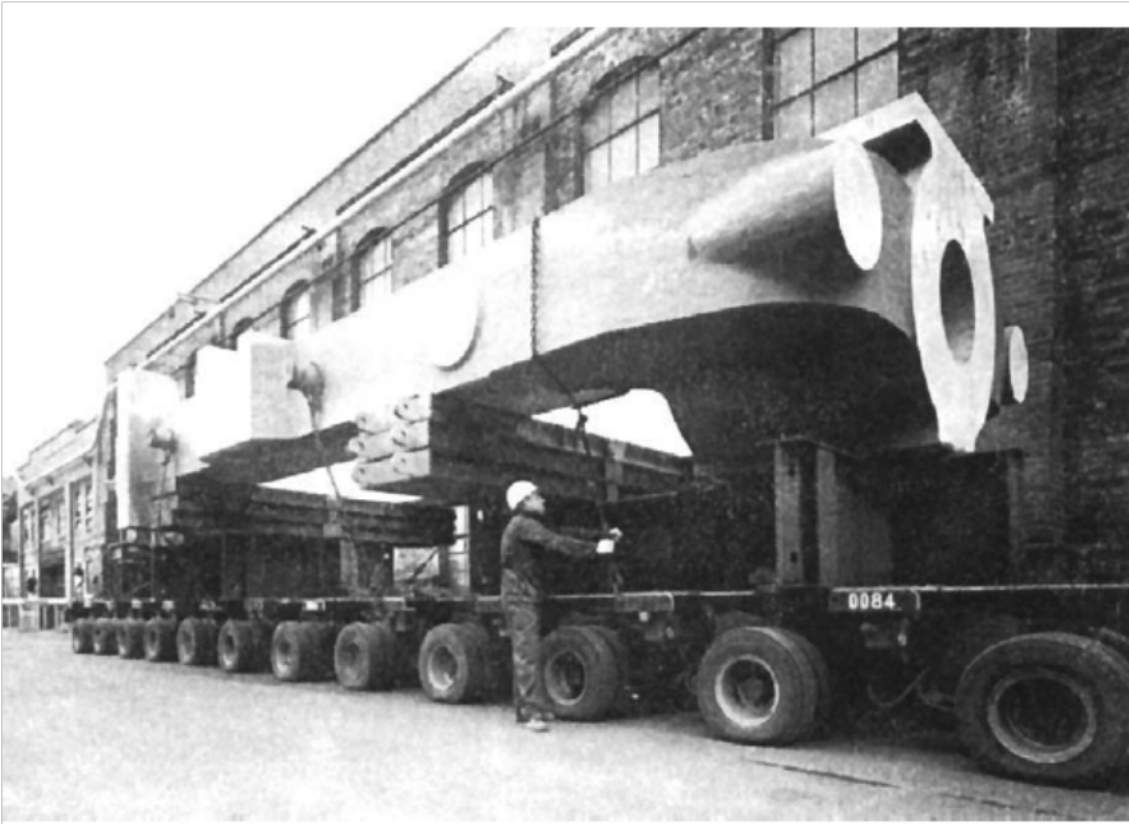


- 5000-3000 BC – First casting
- Bronze age, iron age
- Rapid Production
- Wide range of shapes and sizes
- Complex/intricate shapes

- The most common materials cast are gray iron, ductile iron, aluminum alloys, and copper alloys
- 35% of the market is in automotive and light truck manufacturing
- Castings are used in applications ranging from agriculture to railroad equipment and heating and refrigeration

- No Weight limitation



Outer diameter; 580 micron

Figure 0.1 Cast steel mill housing: delivered weight 280 tonnes, poured weight 467 tonnes (courtesy of River Don Castings, now part of Sheffield Forgemasters Engineering Ltd.)

CASTING

- Process involves melting and pouring of liquid metal into a cavity (mold or mould) of desired shape and size.

Important steps in a casting process are :

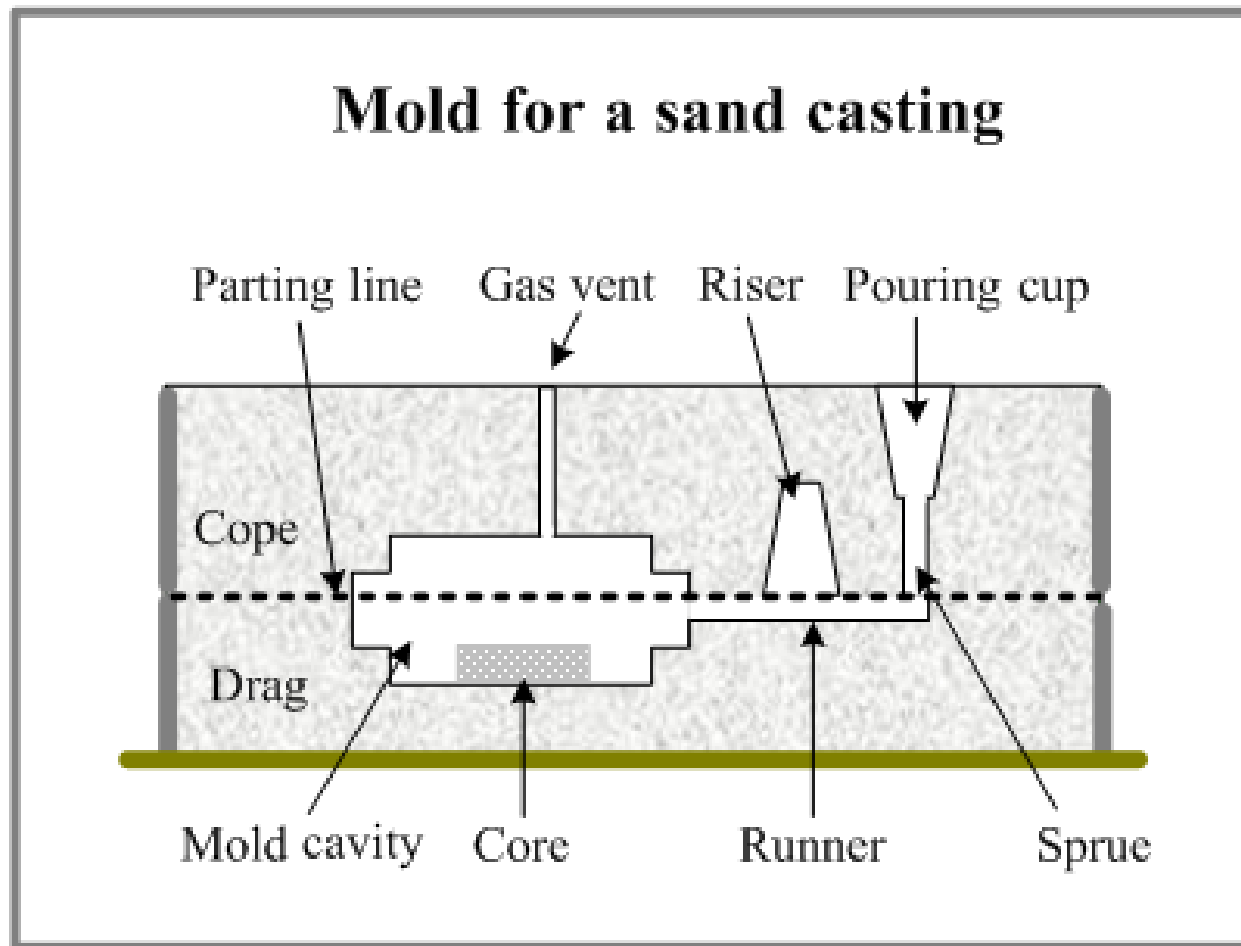
- Preparation of pattern and mould
- Melting and pouring of liquid metal
- Cooling and solidification of liquid metal
- Defects, inspection and testing

CASTING

Important casting processes:

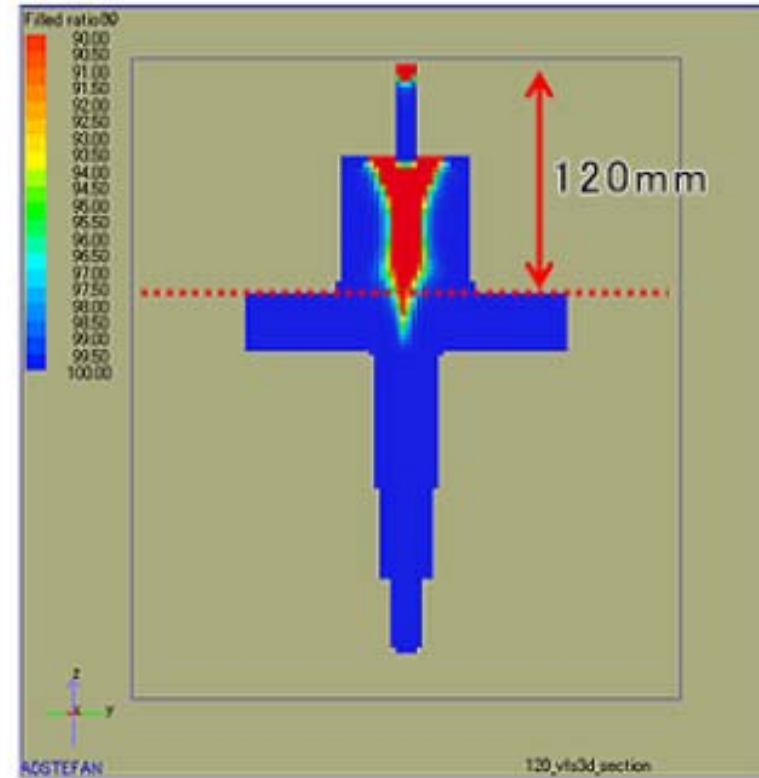
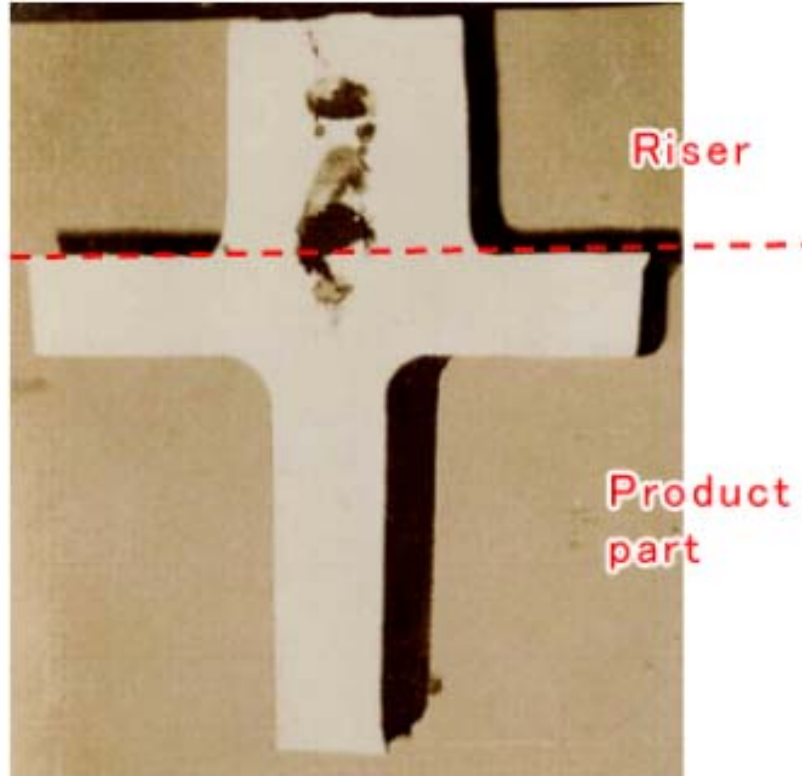
- Sand casting
- Pressure Die casting
- Investment casting
- Centrifugal casting

Sand Casting

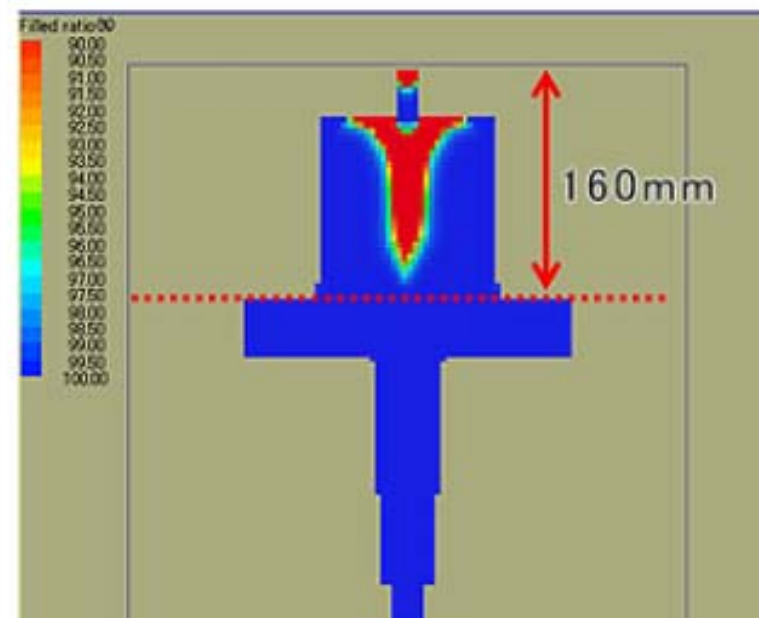
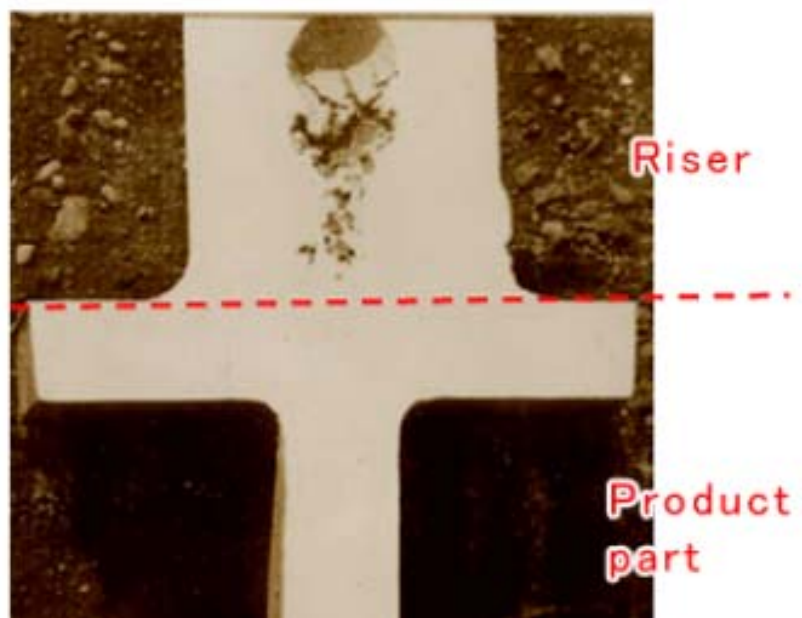


Sand Casting Process

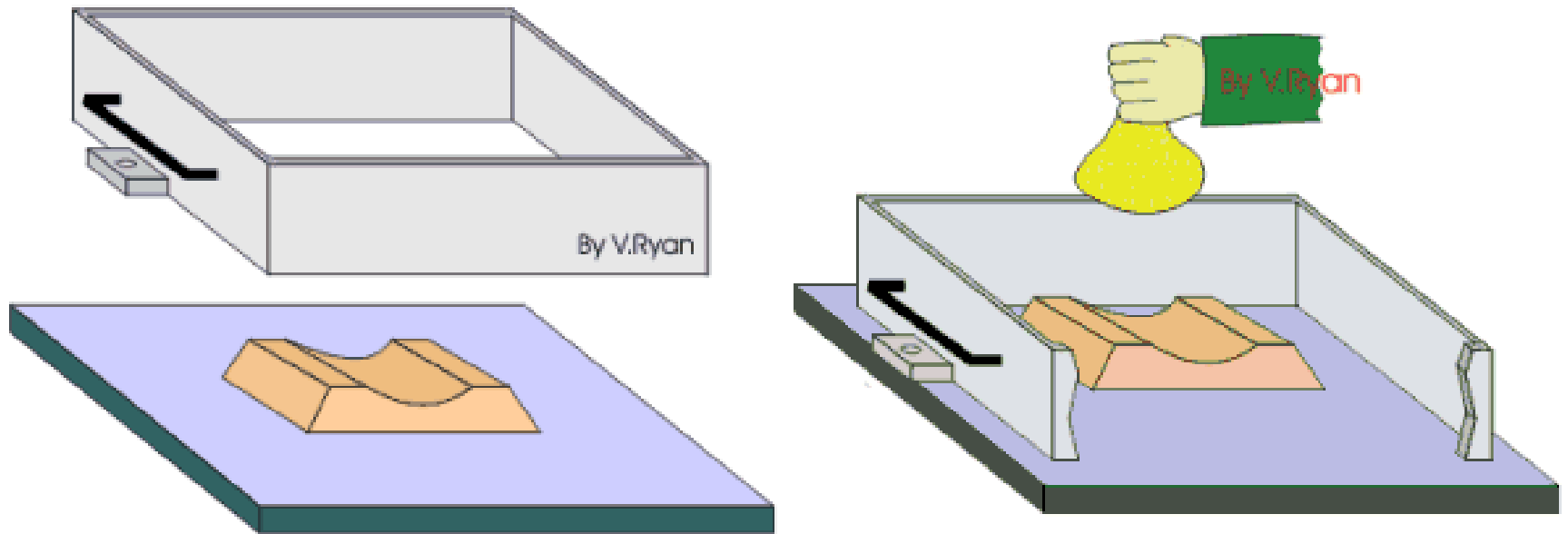
Riser 120mm



Riser 160mm

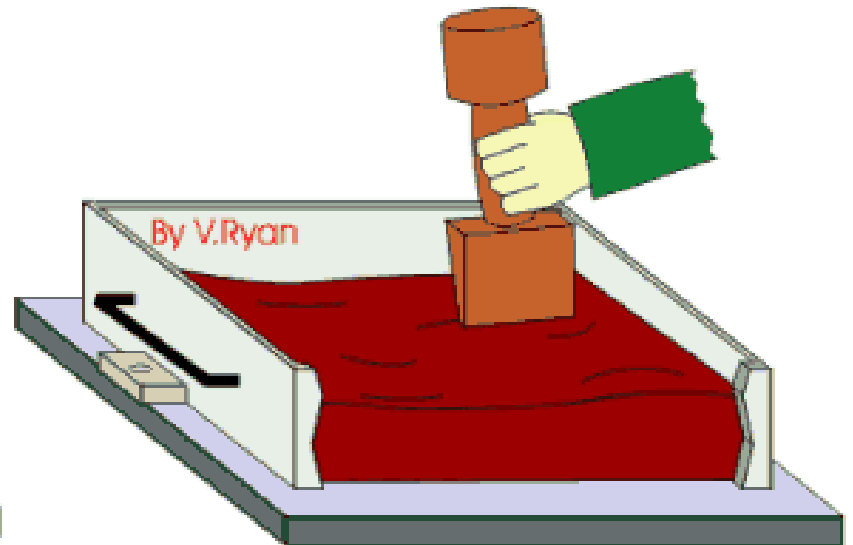
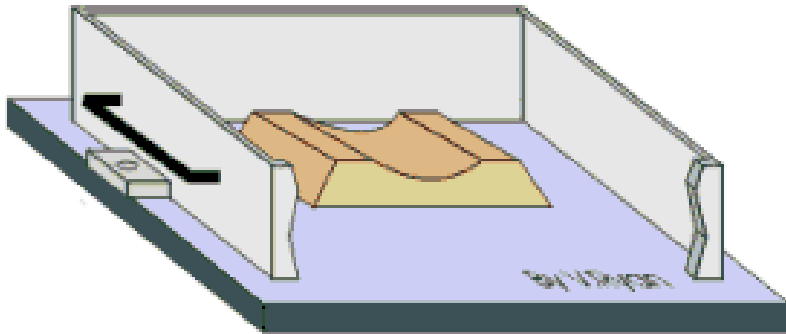
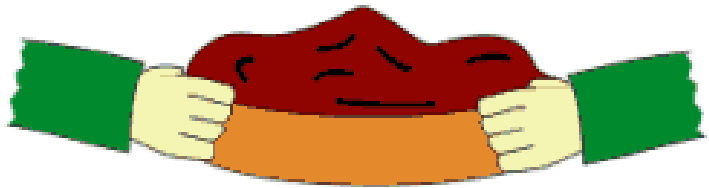


Sand Casting



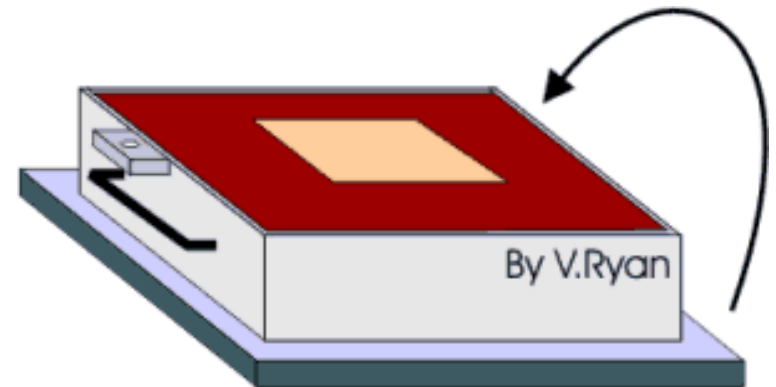
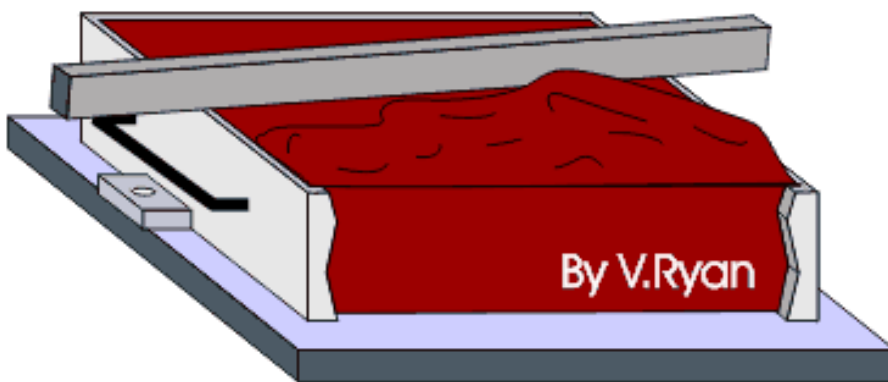
Sand Casting Process

Sand Casting



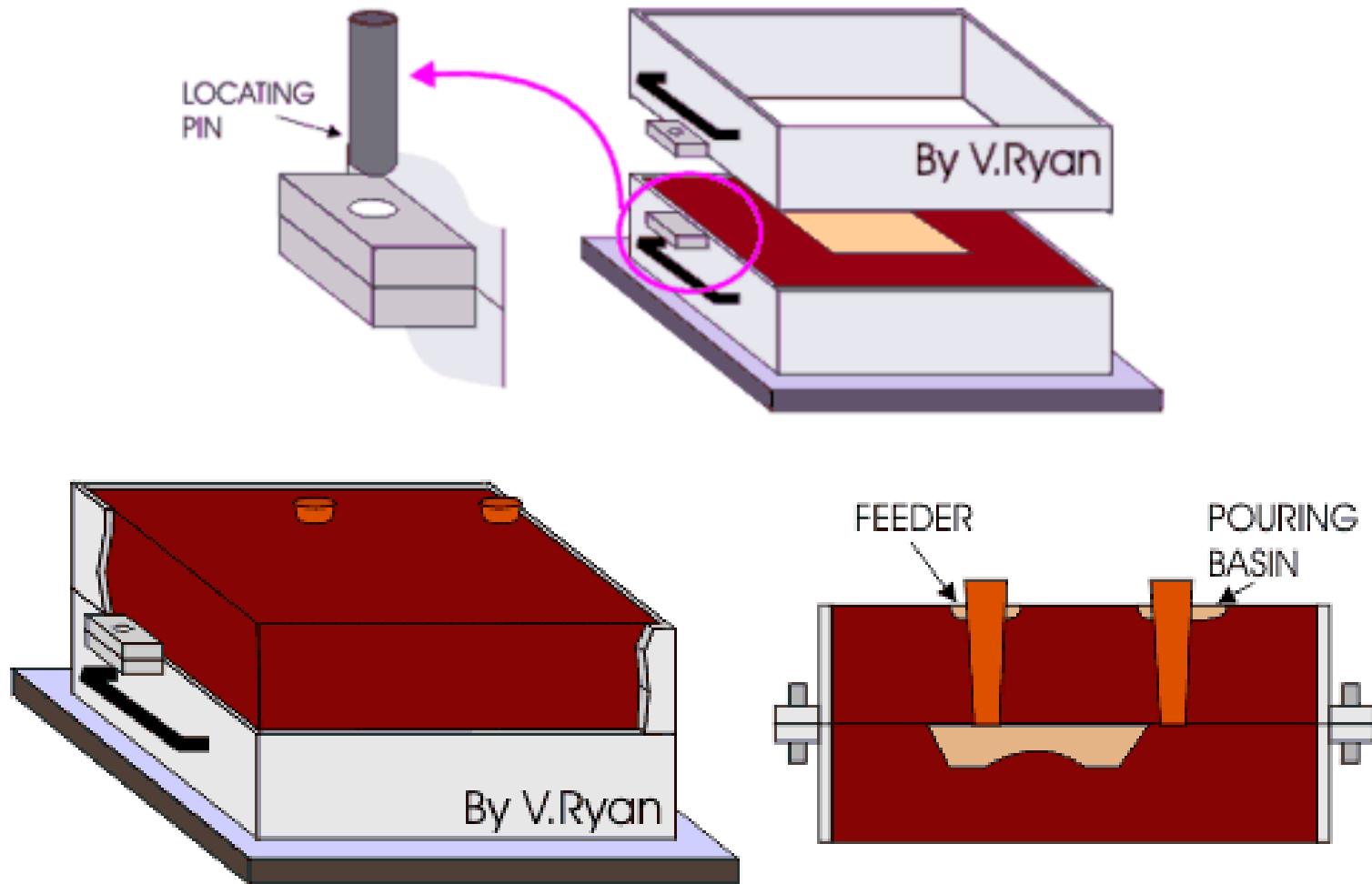
Sand Casting Process

Sand Casting



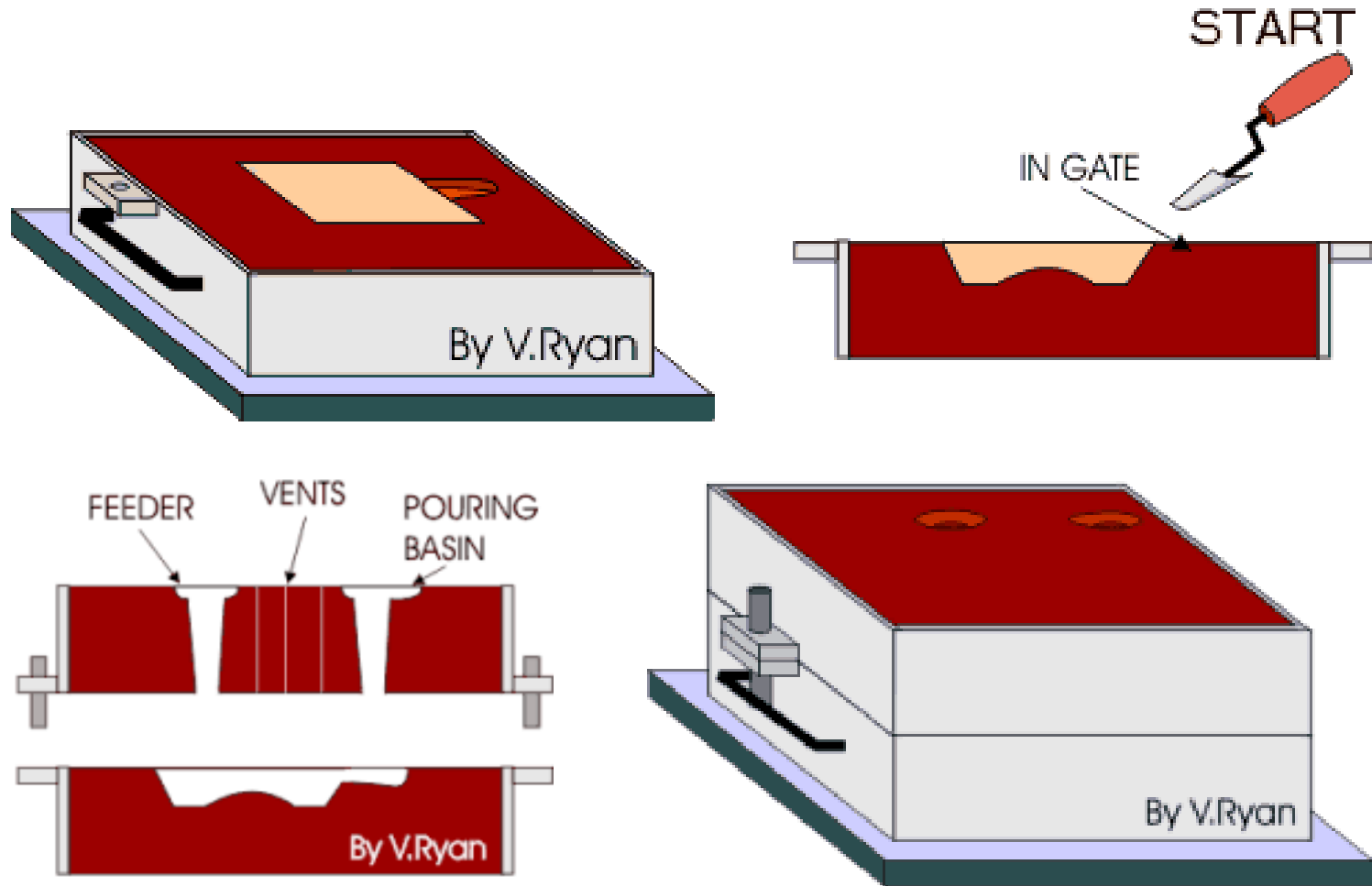
Sand Casting Process

Sand Casting



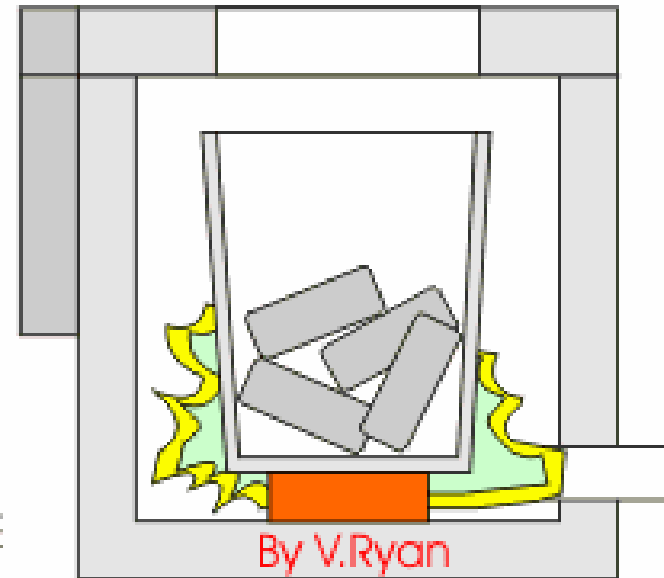
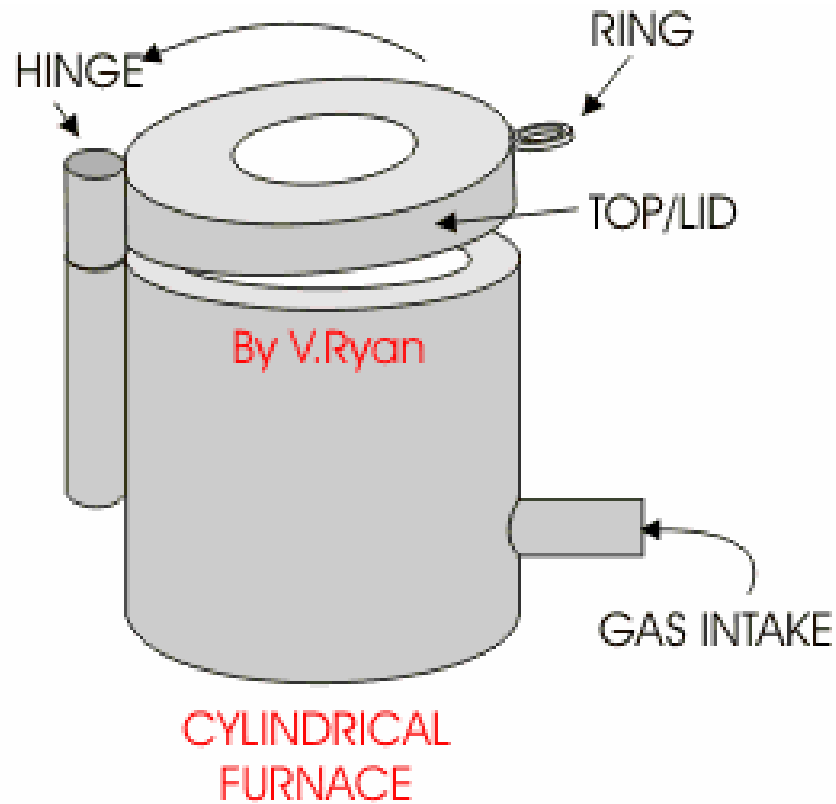
Sand Casting Process

Sand Casting



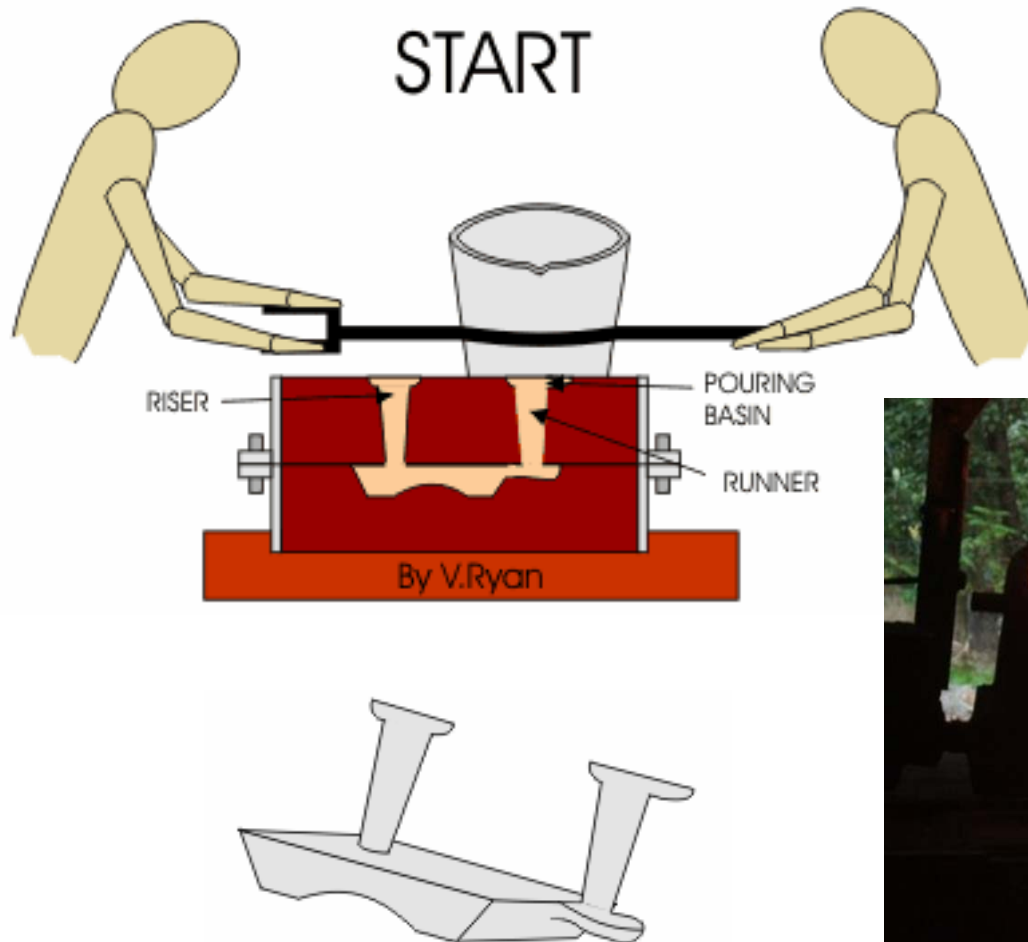
Sand Casting Process

Sand Casting



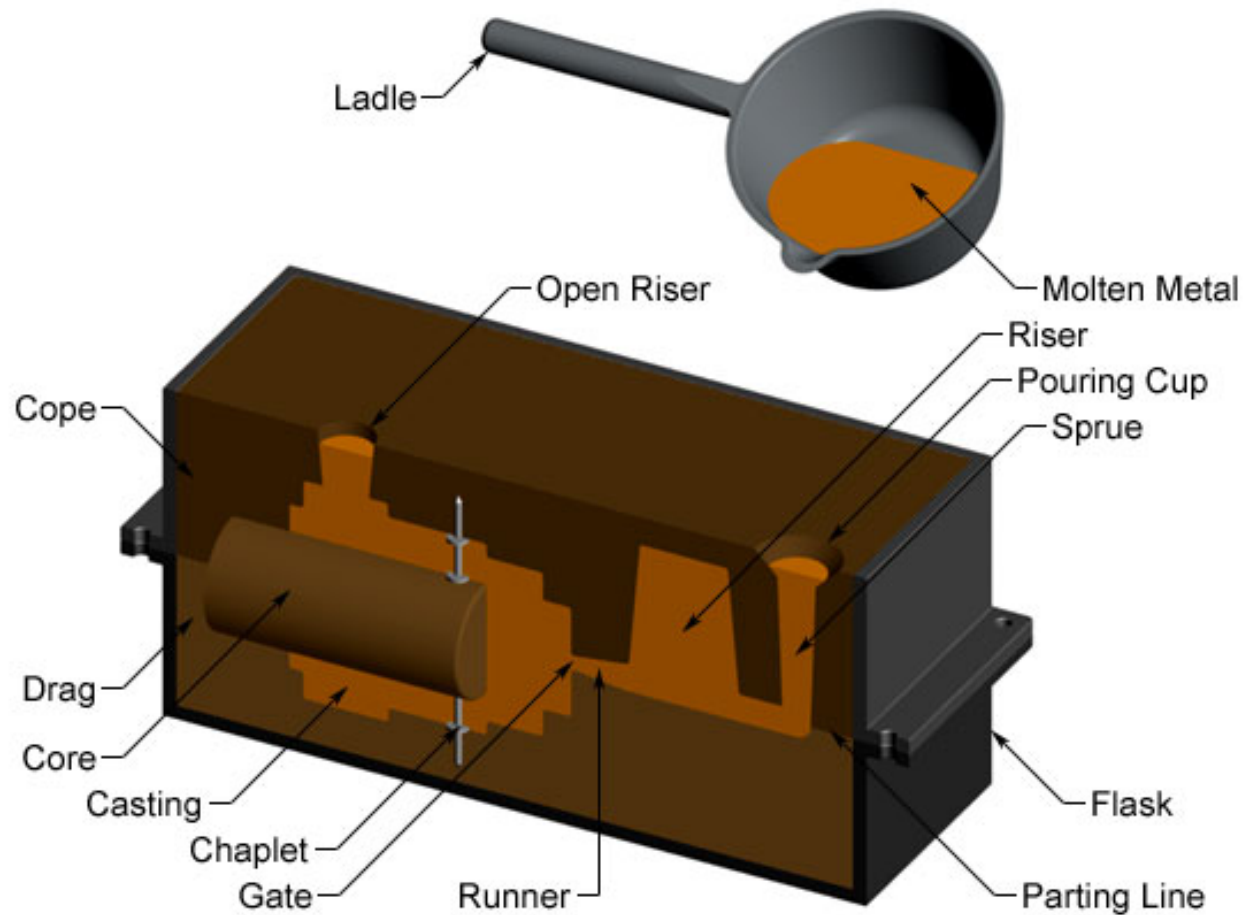
Sand Casting Process

Sand Casting



Sand Casting Process

Sand Casting



Sand Casting Process

Solidified casting



Applications



• Six basic steps of casting

Mold cavity is produced having the desired shape and size of the part

- Takes shrinkage into account
- Single-use or permanent mold

Melting process

- Provides molten material at the proper temperature

Pouring technique

- Molten metal is poured into the mold at a proper rate to ensure that erosion and or defects are minimized

Solidification process

Controlled solidification allows the product to have desired properties

Mold should be designed so that shrinkage is controlled

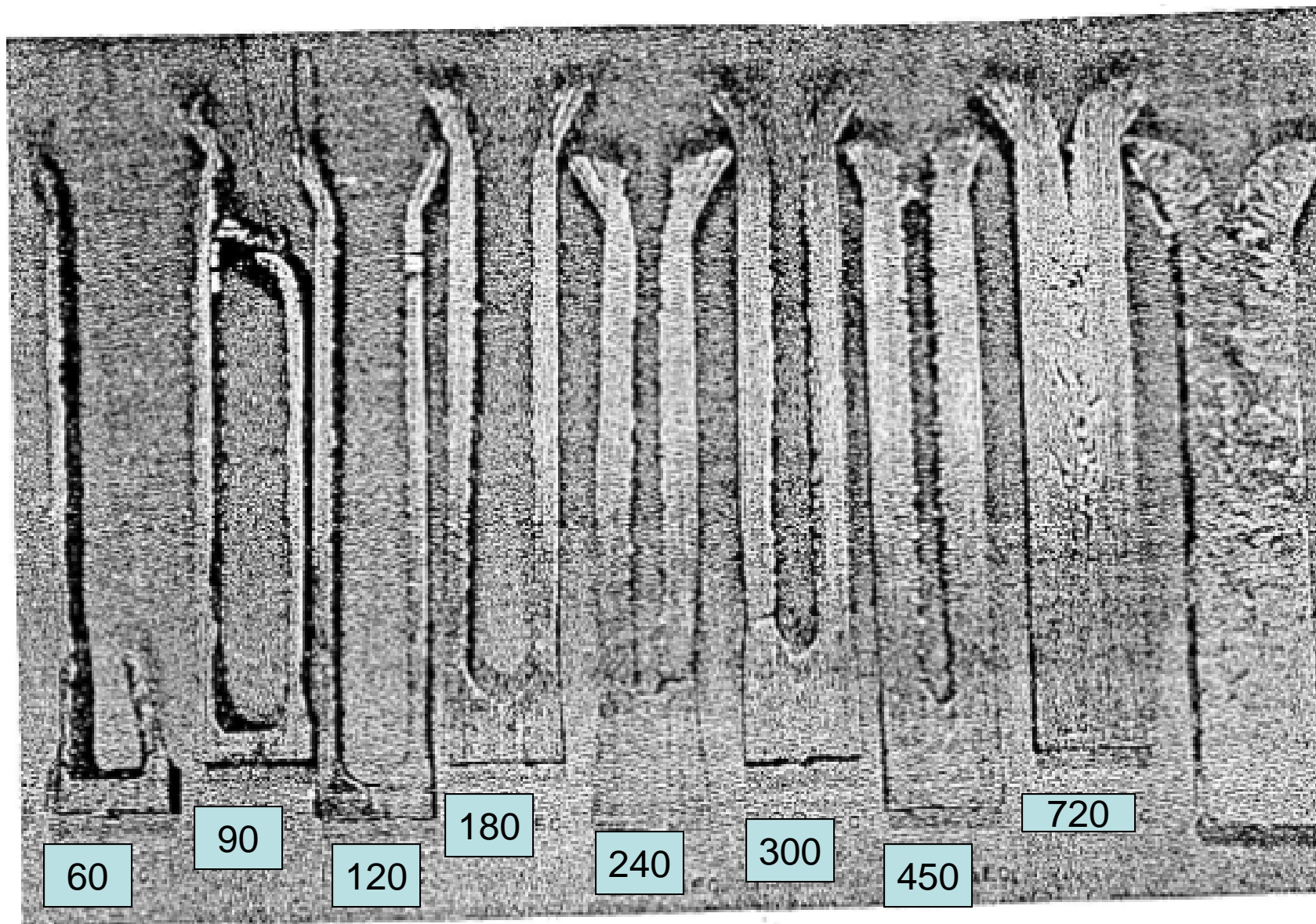
Mold removal

The casting is removed from the mold

- Single-use molds are broken away from the casting
- Permanent molds must be designed so that removal does not damage the part

Cleaning, finishing, and inspection operations

Excess material along parting lines may have to be machined



60

90

120

180

240

300

450

720

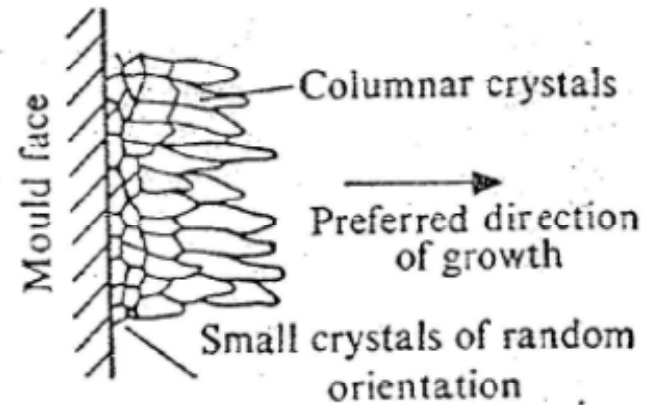
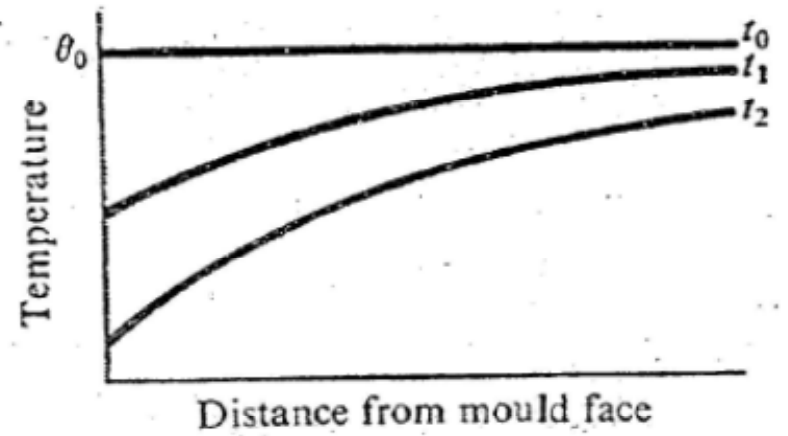
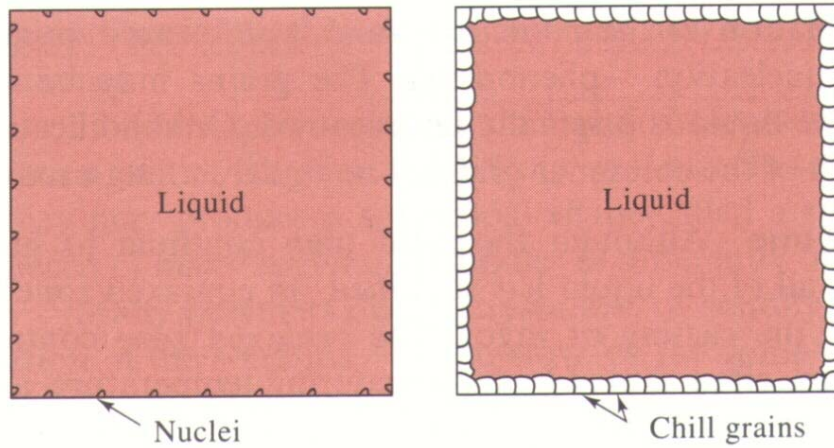
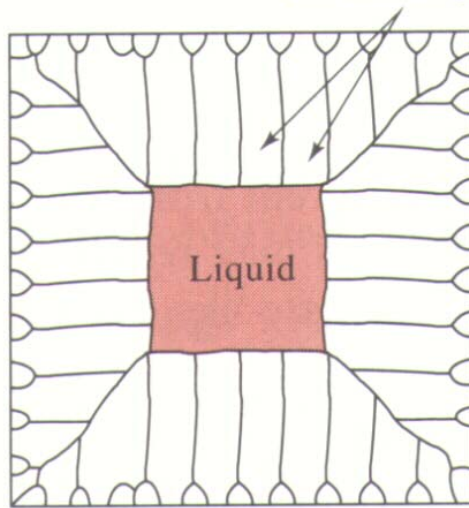
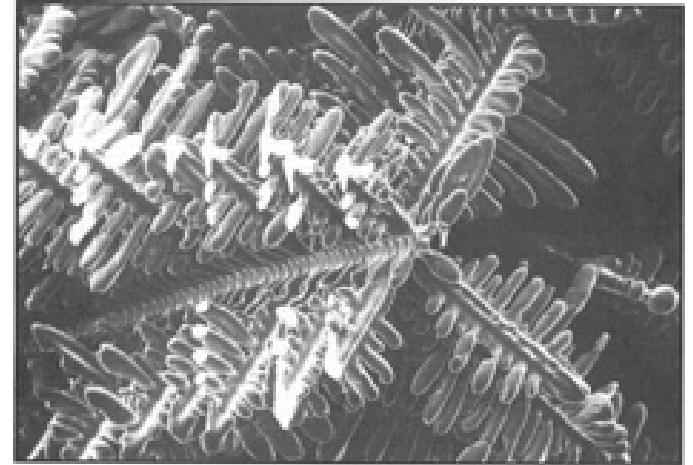
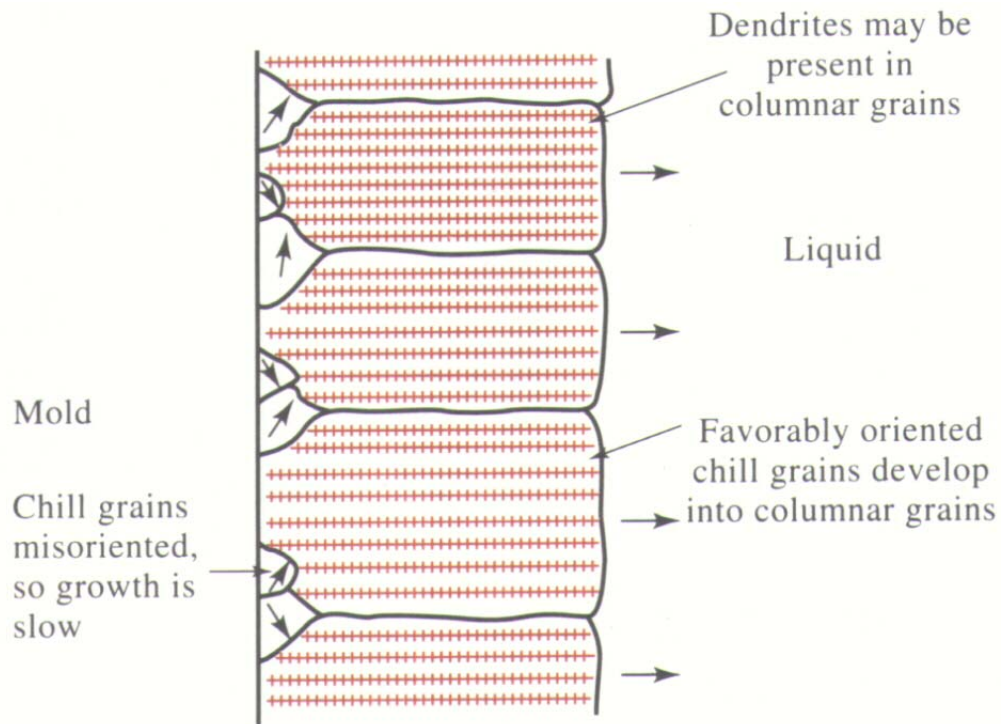
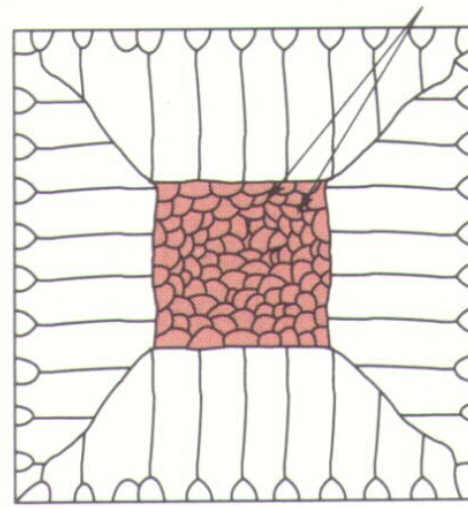


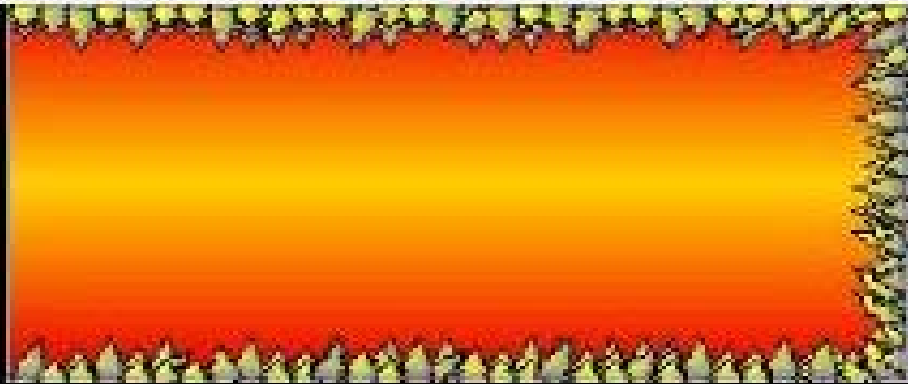
Fig. 2.14 Development of columnar crystals.

Columnar grains

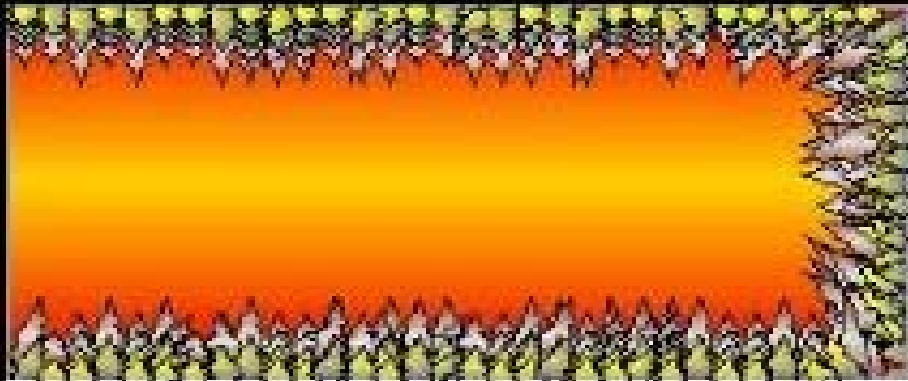


Equiaxed grains



A

A. A thin layer cools and solidifies where the metal touches the mold surface.

B

B. Heat is sucked out of the metal anywhere it is touching the mold, and crystal dendrites form along the surface layer.

C

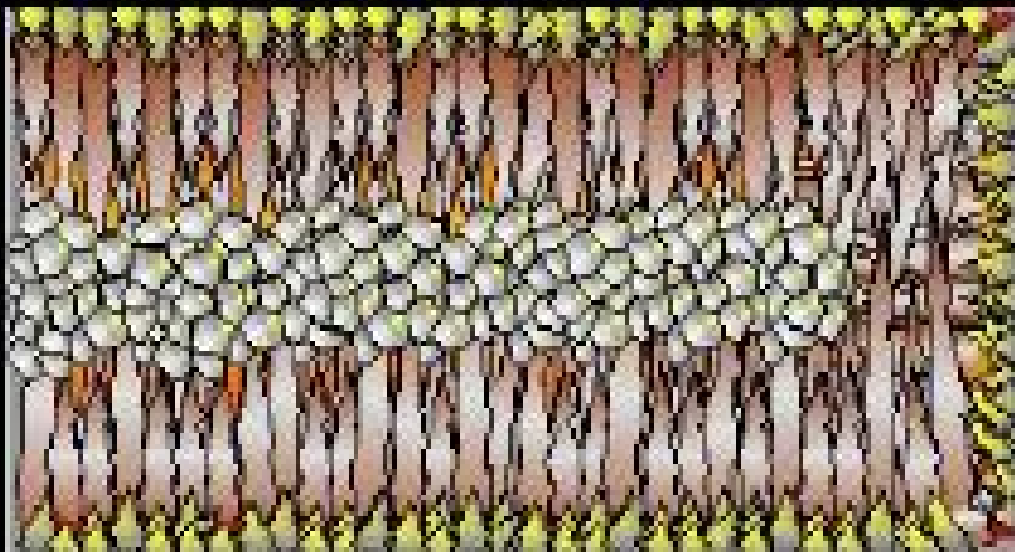
C. As heat continues to leave via the metal/mold interface, the dendrites grow.

D



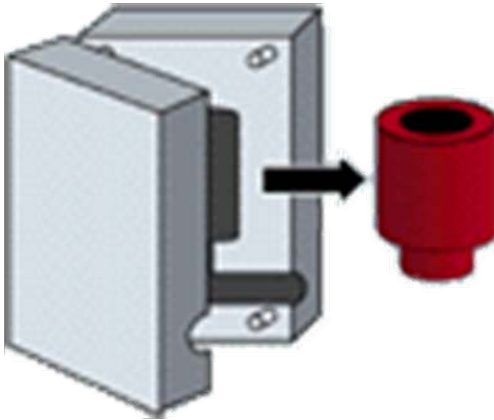
D. Metal in the center finally cools enough to start to crystallize. Small seed crystals form.

E



E. These seed crystals multiply and grow until the casting is solid.

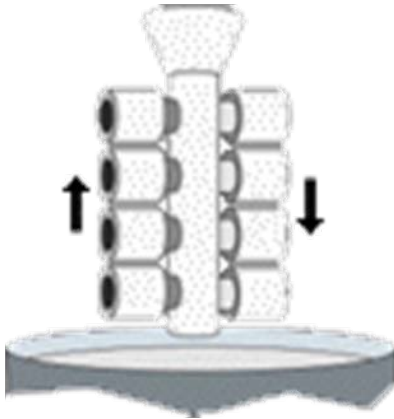
Investment Casting



Wax Pattern



Pattern Assembly



Shell Building



DeWax

Investment Casting



Casting



Knock Out



Cut Off



Finished Part

Applications

