- Gated Pattern - postiion - small fork

- Loose Piece Pattern - loose pieces in it, can be seen under

- Swept Pattern - to make symmetrical nodes

- Skeleton

- Follow board to follow all allowances

- Shell Pattern - hollow pattern

- Pattern allowances
  - Sprueing Allowing - control of casting - big board - (shrink) change of phase
    - Remedy - dimensions of mould
  - Distortion Allowing - shape distortion on cooling - due to diff in metal struge at diff pts
Additives • Wood Flour • Iron Powder
  • Backing Sand • Particles
  (moulding sand source)

Moulding Sand Prep
  • Permeability - escape gas/steam
    Controlled by shape & size of sand
  • Flowability - able to flow inside box
  • Cohesiveness/Strength - Adhesiveness - wall & bed
  • Refractoriness - withstand hightemp
  • Collapse - after solid, collapse itself, allow free contract

Casting Shapes:
  • Random
  • Rounded

Moulding Tools & Equipment
  • Shovel • Trowel • Riddle • Moulding Bar
  • Rammer • Strike off Bar
  • Drawforth • Vent Rod
  • Swab
Layer of charge - Metal coke
- Well - Molten metal collected
- Combustion zone - (1500 - 1800°C)
  \[ \text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \Delta \]
  \[ \text{Mn} + \text{O}_2 \rightarrow \text{MnO}_2 + \Delta \]
  \[ \text{Si} + \text{O}_2 \rightarrow \text{SiO}_2 + \Delta \]
- Red Zone - (1200°C)
  \[ \text{CO}_2 + \text{C} \rightarrow 2\text{CO} - \Delta \]
  Gases protect metal from oxidising - (1600°C)
  \[ 3\text{Fe} + \text{CO} \rightarrow \text{Fe}_3\text{C} + \Delta + \text{CO}_2 \] (Cementite)
- Preheat Zone - Contains charge (1)
- Stack Zone

Diagram:
- Charging dock
- Charging block
- Wind Box
- T宇
- Slag Spout
- Tapping Spout
- Stack Zone
- Preheat
- Red Zone
- Well
- Other ops - cutting, drilling, stretching, sheeling, bending, forming with hammer (after heat)

- Extrusion process - hydraulic

- Aluminum - pressurized tool

- Can be in hot or cold work according to shape

- Forces of metal through shaped die

- Rolling - forge metal into desired shape by passing through rolls

- Also known as: hot-rolled steel

- forging

- Two high mill -

- Three high mill -

- Four high mill -
Advantages: smooth finish, no fluxing
Disadvantages: separate filler rod, tungsten can contaminate, not faster as MIG, higher costs.
Applications: non-ferrous metals, thick sections

Resistance welding:
- by applying pressure, material is heated to be current, this raises temp. (\(H = \frac{I^2RT}{P}\))
- Pressure applied to complete process

Types:
- Butt Welding:
  - Offset
  - Clamped edge to solid contact
- Spot Welding: for overlapping sheets, strip
- High current - VPA desired to resist
- Pressure forced metal to weld.
- Welding defects:
  - Cracks
  - Porosity
  - Overlapping weld bead
  - Poor penetration
  - Slag inclusion