

CASTING DEFECTS

The following are the major defects, which are likely to occur in sand castings:

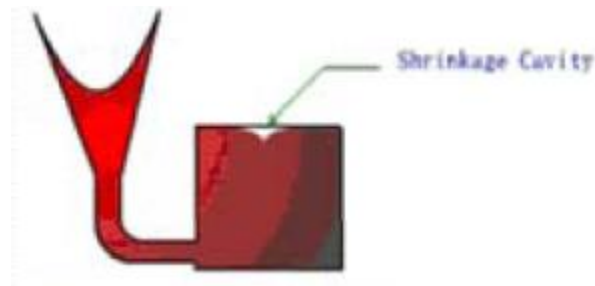
- Gas defects
- Shrinkage cavities
- Molding material defects
- Pouring metal defects
- Mold shift

Gas Defects

- A condition existing in a casting caused by the trapping of gas in the molten metal or by mold gases evolved during the pouring of the casting.
- The defects in this category can be classified into blowholes and pinhole porosity.
- Blowholes are spherical or elongated cavities present in the casting on the surface or inside the casting.
- Pinhole porosity occurs due to the dissolution of hydrogen gas, which gets entrapped during heating of molten metal.

Shrinkage Cavities

- These are caused by liquid shrinkage occurring during the solidification of the casting.
- To compensate for this, proper feeding of liquid metal is required. For this reason risers are placed at the appropriate places in the mold.
- Sprues may be too thin, too long or not attached in the proper location, causing shrinkage cavities.
- It is recommended to use thick sprues to avoid shrinkage cavities.

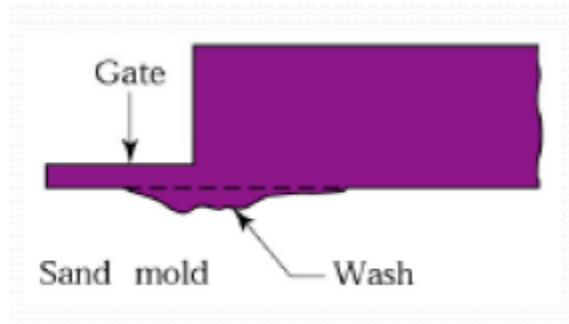


Molding Material Defects

- Cuts and washes,
- Scab
- Metal penetration,
- Fusion, and
- Swell

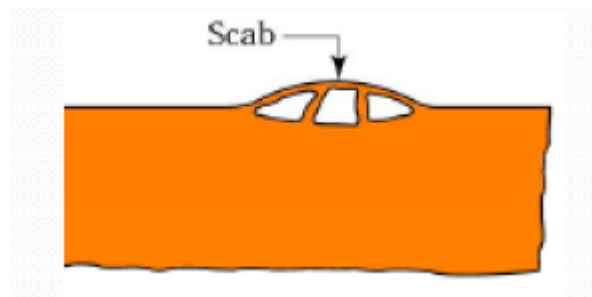
Cut and washes

- These appear as rough spots and areas of excess metal, and are caused by erosion of molding sand by the flowing metal.
- This is caused by the molding sand not having enough strength and the molten metal flowing at high velocity.
- The former can be taken care of by the proper choice of molding sand and the latter can be overcome by the proper design of the gating system.



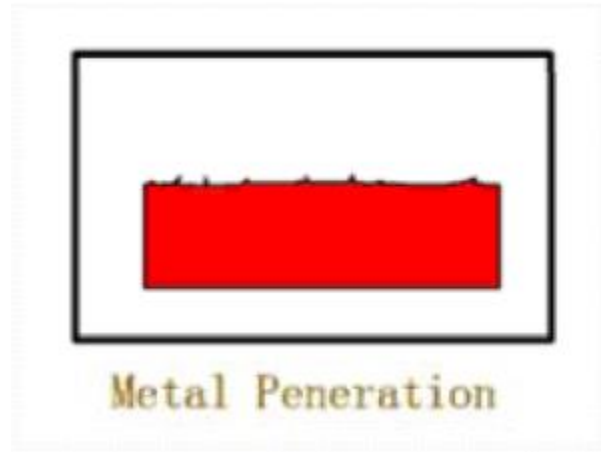
Scab

- This defect occurs when a portion of the face of a mould lifts or breaks down and the recess thus made is filled by metal.
- When the metal is poured into the cavity, gas may be disengaged with such violence as to break up the sand, which is then washed away and the resulting cavity filled with metal.
- The reasons can be: - too fine sand, low permeability of sand, high moisture content of sand and uneven mould ramming



Metal penetration

- When molten metal enters into the gaps between sand grains, the result is a rough casting surface.
- This occurs because the sand is coarse or no mold wash was applied on the surface of the mold. The coarser the sand grains more the metal penetration.



Fusion

- This is caused by the fusion of the sand grains with the molten metal, giving a brittle, glassy appearance on the casting surface.
- The main reason for this is that the clay or the sand particles are of lower refractoriness or that the pouring temperature is too high.

Swell

Under the influence of metallostatic forces, the mold wall may move back causing a swell in the dimension of the casting. A proper ramming of the mold will correct this defect.

Inclusions

Particles of slag, refractory materials sand or deoxidation products are trapped in the casting during pouring solidification. The provision of choke in the gating system and the pouring basin at the top of the mold can prevent this defect.

Pouring Metal Defects

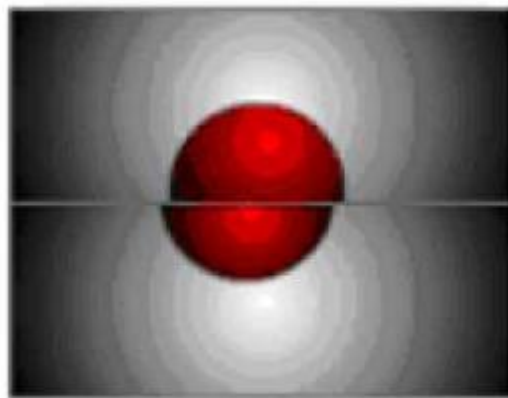
The likely defects in this category are

- Mis-runs and
- Cold shuts
- A **mis-run** is caused when the metal is unable to fill the mold cavity completely and thus leaves unfilled cavities.
- A **cold shut** is caused when two streams while meeting in the mold cavity, do not fuse together properly thus forming a discontinuity in the casting.
- The mis-run and cold shut defects are caused either by a lower fluidity of the mold or when the section thickness of the casting is very small. Fluidity can be improved by changing the composition of the metal and by increasing the pouring temperature of the metal.



Mold Shift

The mold shift defect occurs when cope and drag or molding boxes have not been properly aligned.



Mismatch

Metallurgical defects

- **Hot tears or hot cracking**, cause of this defect is that stresses and strains built up during solidification are too high compared to the actual strength of the semisolid material. This type of defects occurs in the lower part of the solidification range, close to the solidus, when the alloy has a wide solidification temperature range and a small amount of liquid, when the solid fraction is more than 0.9, the hot tearing is easy to occur. Proper mould design prevents this type of defect.
- **Hot spots** are areas on the surface of casting that become very hard because they cooled more quickly than the surrounding material.