

3.0 CAST IRON

Cast iron is the refined form of pig iron. The pig iron is melted and refined in cupola furnace. Then it is poured into the moulds.

The term cast iron refers to those iron carbon silicon alloys which contain 1.8 % – 4 carbon (C) and usually 0.5 % – 3 % silicon (Si). Cast iron is an important engineering material with a number of advantages, mainly good castability and machinability and moderate mechanical properties.

Types of Cast Iron

- 1) **White Cast Iron.**
- 2) **Grey Cast Iron.**
- 3) **Ductile Cast Iron. ...**
- 4) **Malleable Cast Iron.**

White Cast Iron

White cast iron contains 1.8 % -3.6 % C, 0.5 % -1.9 % Si and 1 % – 2 % manganese (Mn). White cast irons are so called because when broken, the fracture surface is white. This is unlike the grey fracture surface normally associated with other cast irons which contain graphite.

While not as common as grey cast iron, white cast iron is another type worth mentioning. It receives its namesake from its off-white colour, which is the result of iron compounds known as cementite. Like grey cast iron, white cast iron features many small fractures. The difference is that white cast iron features cementite below its surface, whereas grey cast iron features graphite below its surface. The graphite creates the appearance of a grey colour, while the cementite creates the appearance of a white colour. White cast iron is hard and offers excellent resistance against abrasions.



Fig 3.1 White cast iron

Grey Cast Iron

Gray cast iron is a broad term used for a number of cast irons whose microstructure is characterized by the presence of flake graphite in the ferrous matrix. Such castings often contain 2.5%–4% carbon, 1%–3% silicon, and some additions of manganese ranging from 0.1% to 1.2%.

The most common type, grey cast iron features a graphite microstructure consisting of many small fractures. It's called "grey cast iron" because the presence of these small fractures creates the appearance of a grey colour. When grey cast iron is produced, the fractures open up to reveal the grey-coloured graphite underneath the surface. Grey cast iron isn't as strong as steel, nor is it able to absorb the same shock as steel. With that said, grey cast iron offers similar compressive strength as steel. As a result, it's become a popular choice of metal for applications involving compressive strength.

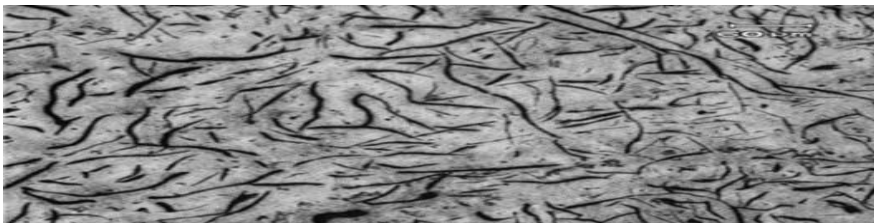


Fig 3.2 Grey cast iron

Ductile Cast Iron

Ductile iron—also referred to as spheroidal or nodular iron—is actually a group of irons that exhibit high strength, flexibility, durability, and elasticity due to their unique microstructure. Cast ductile iron normally contains over 3 percent carbon; it can be bent, twisted, or deformed without fracturing. Its mechanical properties are similar to steel, and far exceed those of standard cast irons.

Also known as nodular cast iron, ductile cast iron is a type of soft, ductile iron alloy with a high carbon content. It's typically made with trace amounts of other compounds, including magnesium and cerium. When added, these trace compounds inhibit the speed at which graphite grows, thereby keeping the metal soft and ductile. Ductile cast iron was invented in the early to mid-1940s.

Malleable Cast Iron

Malleable cast iron also contains sometimes small amounts of chromium (0.01 % to 0.03 %), boron (0.0020 %), copper (up to 1.0 %), nickel (0.5 % to 0.8 %), and molybdenum (0.35 % to 0.5 %).

Malleable cast iron that easily “workable.” It’s typically created using heat treatment processes on white cast iron. The white cast iron is heated treated for up to two days, after which it’s cooled. When finished, malleable cast iron can be bent and manipulated to achieve unique shapes and sizes.

Applications of cast iron

- It is used in making **pipes**, to carry suitable fluids.
- It is used in making different machines.
- It is used in making automotive parts.
- It is used in making pots pans and utensils.
- It is used in making anchor for ships.

