
Weldability of metals

Objective: At the end of this lesson you shall be able to

- **explain the effects of weldable quality on ferrous and non-ferrous metals.**
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Weldability:

- The ferrite and Marten site structure on carbon steels are not suitable for welding. But, the crystal fine structure enables brazing.
- Austenitic steels are suitable for welding. In present days all types of steels are welded using inert gas shielded arc process.

Weldability of cast Iron:

Cast Iron is welded after performing preheating to a temperature of 200°C-210°C. On completion of first layer of welding, the same preheating is repeated to maintain the reinforcement of weld. Next, the whole job is evenly heated. This is called post-heating.

The job is cooled slowly, by covering under a heap of lime or ash or dry sand.

Weldability of copper:

99.9% pure copper with 0.01 to 0.08% oxygen in the form of cuprous oxide is known as electrolyte copper and this is not weldable.

A small quantity of phosphorous added to electrolyte copper to de-oxidise, so as to make it weldable.

The surface of the base metal is preheated to a fairly high temperature resulting in peacock neck blue colour; before the actual welding started.

Once the metal is cooled after welding, to reduce the grain size and locked up stresses, the pressuring is done.

Importance of preheating, post-heating and maintenance of inter-pass temperature

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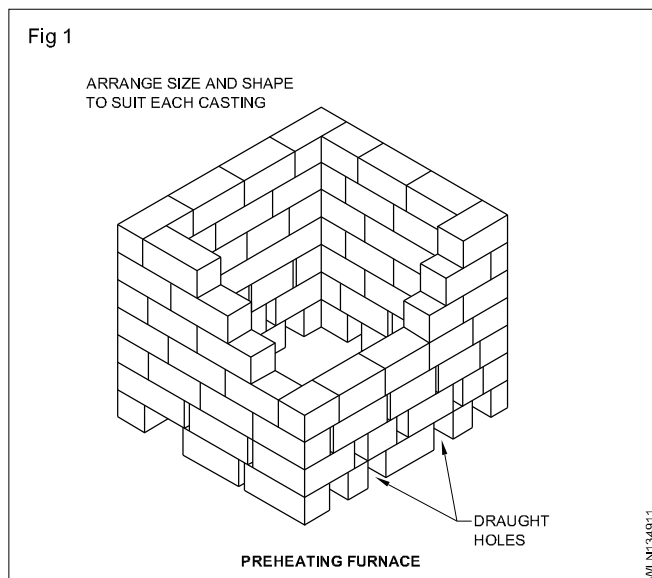
- state the purpose of preheating
- explain the method of preheating
- describe the types of preheating
- explain the purpose of post-heating a bigger job
- describe the maintenance of inter-pass temperature.

Preheating: Heating the job before welding operation is known as 'preheating'. The purpose of preheating of the cast iron job is to reduce cracking due to distortion. The rate of cooling, and gas consumption etc. are also reduced.

Small casting jobs may be preheated by the application of a blowpipe flame. But larger jobs should be preheated in a 'gas-furnace' or by means of a temporary charcoal furnace.

Methods of preheating

Preheating methods depend upon the size of the job and the technique used for welding. Preheating can be done in a temporarily built gas or charcoal furnace (Fig 1) blacksmith's forge and even by the oxy-acetylene flame. Heavy jobs can be preheated from the furnace and small jobs by a flame from a blowpipe or from the forge.



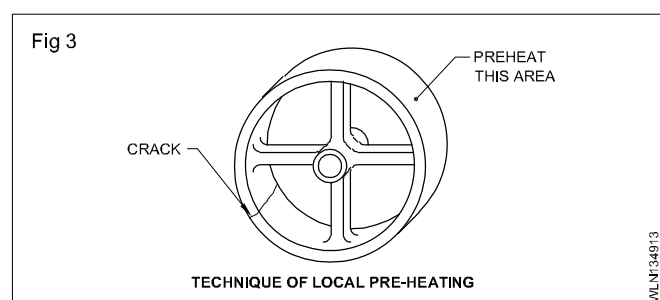
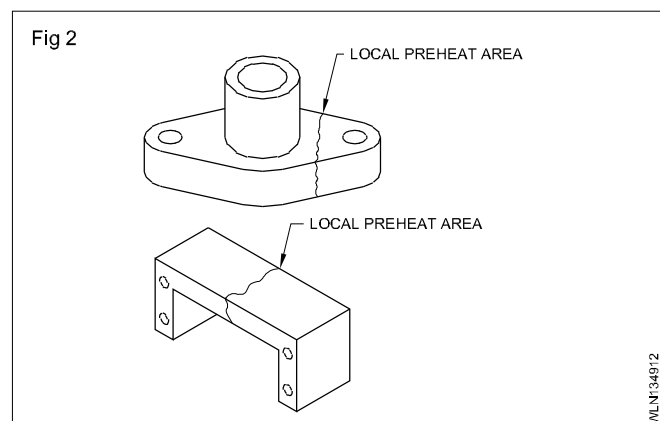
Types of preheating

The type of preheating depends on the size and nature of the job. There are three types of preheating.

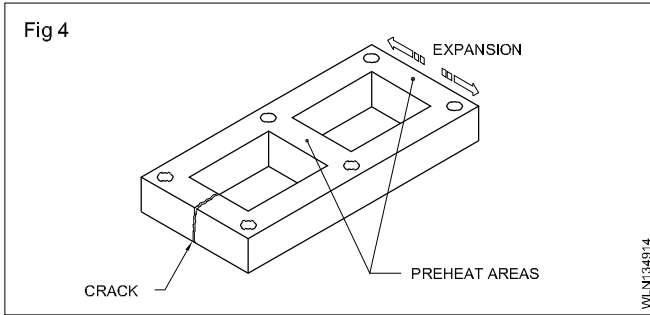
- Full preheating
- Local preheating
- Indirect preheating

Full preheating: The process of heating the entire job before commencing the welding operation is known as full preheating. This is usually done in a furnace for heavy jobs. In this type of preheating the heat of the job will be retained during welding, and also it will cool down at a uniform rate.

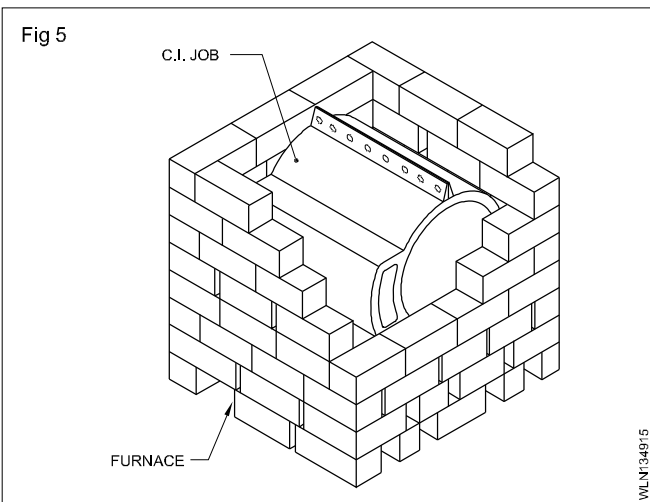
Local preheating: In this type, the preheating is done only at the portion to be welded. This is usually done by playing the blowpipe flame just before starting the welding. (Fig 2) In case of welding a cracked cast iron wheel, preheat the area opposite to the area crack. (Fig 3)



Indirect preheating: In this type, the preheating is being done on the area which may be affected by the uneven expansion and contracting due to the welding heat but not on the portion to be welded. This also can be done by the application of a blowpipe flame before commencing the weld. (Fig 4)



Purpose of post heating: If it is a bigger job, the welded job should be post heated in the same preheating furnace and allowed to cool slowly in the furnace itself so as to avoid any crack or any other distortion due to rapid cooling. (Fig 5)



The slag and oxide on the surface of the finished weld can be removed by scraping and brushing with a wire-brush after cooling. The weld should not be hammered as cast iron is brittle.

Maintenance of inter-pass temperature: The temperature of the preheated job can be checked by wax crayons. Marks are made on the cold job pieces by these crayons before preheating and after the job pieces reach the preheating temperature the marks will disappear.

This indicates that the job has been heated to the required preheating temperature. Different wax crayons are available for checking different temperatures. The temperature which is checked by the crayon will be marked on it.