



TSD 6208 B

PLANT STANDARD BHOPAL

BP 064 02 99

Rev. No. 04

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SUPERSEDES
BP 064 02 99 (Rev. 03)

STRESS-RELIEVING OF MILD STEEL FABRICATION - OTHER THAN QUENCHED AND TEMPERED STEELS - 580 - 620°C.

1.0 GENERAL:

This standard details the process of stress-relieving in the temperature range 580 - 620°C, of mild steel fabricated structures made from plates, rolled sections, shafts etc. which have had any one or more of the following operations carried out on them : rough machining, fabrication welding, major repair welding, flame cutting, cold bending.

2.0 APPROVAL OF FURNACES :

The furnace used for the heat treatment shall be approved by BHEL, Bhopal. Recorded checks shall be made at intervals not exceeding 6 months to ensure that temperature control and distribution are maintained at the required standard. Rechecking shall also be done after any repairs that could affect temperature distribution.

3.0 COMPLIANCE WITH STANDARDS :

There is no Indian Standard Covering Stress Relieving of Mild Steel Fabrication. However this standard is based on GEC Spec. 302/0205.

4.0 LOADING OF THE FURNACE :

The fabrication(s) shall be loaded into the furnace at a temperature not exceeding 200°C. The load shall be distributed in the furnace so that:-

- 4.1 The load/Item is supported on suitable spacers/sections/ (e.g. H Iron)/platform/packers, to maintain a minimum height of 230 mm above the furnace hearth unless otherwise agreed, and in such a way as to prevent any distortion during the stress relieving cycle. When items are stacked upon one another they shall be separated from each other by suitable spacers or sections.

A minimum clearance of 300 mm shall be maintained whenever possible between the load and the inside furnace walls, and the door of furnace, in order to minimise the effect of flame impingement on the load.

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4.0 LOADING OF THE FURNACE: (Contd...)

4.2 In a gas-fired furnace there is no direct flame impingement on the load and the free circulation of hot gases is not impeded..

4.3 In an electric furnace there is no undue radiant heat directly on the load and the free circulation of heat by convection is not impeded.

5.0 RECORDING OF TEMPERATURE:

5.1 Thermo Couples :

Sufficient thermocouples (minimum of 4) shall be placed in metallic contact with the load in such a manner that they will give an indication of the maximum temperature differentials within the load. Typical positions which are likely to show a variation in temperature from the average temperature are near to the door, the hearth, the roof, the heating elements or ports and the heaviest and lightest sections of the load.

If advice is required on the number and positions of thermocouples Metallurgy Department, TSD shall be consulted.

5.2 Recorders:

Thermocouples which measure furnace temperature or load temperature, shall be connected to a chart recording instrument.

While cooling, the recording of the temperature need not be carried out below 300°C.

All thermocouples and recorders shall be properly maintained and calibrated periodically as per WMI 0802.

Calibration records shall be maintained and made available for verification any time.

6.0 HEAT TREATMENT:

6.1 Heating Cycle:

6.1.1 Heating Rate :

Once the heat treatment cycle has been started, door shall not be opened until the stress relieving treatment has been completed.

The heating rate of the load shall be 100°C/hour maximum.



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6.0 HEAT TREATMENT : (Contd...)

6.1.1 Heating rate: (Contd...)

Between room temperature and 300°C it may prove difficult to comply with the above heating rate in some gas-fired furnaces due to the furnace design and/or the size and distribution of the furnace load. In these instances the heating rate may exceed 100°C/hour up to 300°C provided the requirements of clause 6.1.2 are met.

6.1.2 Temperature differentials:

Temperatures	Max.Temp. differential throughout the load
Room temp. - 250°C	100°C
250°C - 500°C	75°C
500°C - Soak temp. during soaking	50°C Within soaking temp.range

If a temperature differential greater than these, quoted in the above table, occurs in the load, the heating cycle shall be stopped and the load held at a convenient temperature until the temperature differential falls within the appropriate range.

6.2 Soaking temperatures

The soaking temperature of the load shall be between 580-620°C.

6.3 Soaking time:

The minimum soaking time of the load shall be 1 hour/25mm of the thickest section in the load with a minimum time of 3 hours. For thickness above 150 mm, Metallurgical Section of TSD, should be consulted.

6.4 Cooling cycle:

6.4.1 Cooling Rate :

The cooling rate of the load shall be 100°C/hour maximum in a closed furnace to a temperature below 300°C. The door may be opened at a temperature below 300°C provided that subsequent furnace cooling is in still air.



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7.0 INSPECTION AT BHEL

QCX-FBM shall ensure compliance to the various requirements of this specification by checking and clearing at the following stages:

QCX Check Points

Check List

Clearance for S/R

- Ensure all previous operations have been carried out satisfactorily.

Furnace Loading

- Charge details

After S/R

- Prepare records as per clause 5.
- Check compliance and approve.
- Normal Heat Treatment charges are to be cleared by concerned QC. In case of deviations, the complete records shall be sent to Metallurgy Group, TSD for final decision.

8.0 HEAT TREATMENT RECORDS:

8.1 Documents

Each stress relieving treatment shall be covered by the following documents.

8.1.1 Furnace Loading Document

This document shall give full particulars of the load (see 8.1.3 below).

8.1.2 Temperature Recorder Chart (s)

Each copy of the temperature recorder chart shall give charge no., chart speed, start and finish dates and times of stress relieving treatment, and the start and finish of soaking period.



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8.1.3 Identification of Load

For identification purpose, the following particulars of the load shall be written on each furnace loading document and temperature chart.

Name (s) or Title (s) in the load

Quantity of each item

Drawing number (s) of each item(s)

M.C. Number(s)

Charge number

Load-Total weight

Spec.No. (Specification of the material used for fabrication).

9.0 INSPECTION AT SUPPLIERS OR SUBCONTRACTORS WORKS:

The BHEL's representative shall have all reasonable facilities afforded him at any time by the Supplier or Subcontractor to inspect the heat treatment facilities and to satisfy himself that the fabrication (s) are being Heat treated in accordance with this Standard.

10. PROTECTION:

Where there are threads or specially prepared surfaces on the fabrication these shall be protected with clay or other suitable compound to avoid excessive scaling during the stress-relief.

11. CONTINGENCY PLAN:

Consult Metallurgy Section, TSD, whenever the above process has not been followed, for contingencies/reasons beyond control e.g. power failure etc.