PROCEDURE FOR LOCAL POST WELD HEAT TREATMENT

1. PURPOSE: To establish a general procedure for stress relieving Carbon and Low Alloy Steel which is undergo a Heat Treatment Cycle as per client or code requirements.

2. SCOPE: This procedure describes the methodology being adopted by M/s Raysonic NDT Services for carrying out post weld heat treatment components in accordance with client or code requirements.

3. REFERENCES:
   - ASME VIII Div.1 Rules for Construction of Pressure Vessels.
   - ASME/ANSI B 31.1 Power Piping.
   - ASME/ANSI B 31.3 Process Piping.
   - BS 5500 Unfired Fusion Welded Pressure Vessel.
   - WRC Bulletin 452 Recommended Practice for Local Heating of Welds in Pressure Vessels.

4. HEAT SOURCES AND METHODOLOGY:
   - Blanket type electrical elements shall be used to heat treat components.
   - For local heat treatment a minimum, the soak band shall contain the weld, heat affected zone and a portion of the base metal adjacent to the weld being heat treated. The minimum heating band width shall be 5 and minimum insulated width shall be 10. Where R = Inside Radius in mm, t = Wall thickness in mm.

5. GENERAL REQUIREMENTS: The following information shall be provided by the customer. Heat Treatment Cycle Request a) Identification of the Component. b) Size of the Component c) Drawing Number d) Material

6. THE FOLLOWING EQUIPMENT AND CONSUMABLES WILL BE USED:
   - Panel for Power Supply-Automated Programmer (PID) & Manual Controller
   - R.R Recorders
   - Heating Element
   - Thermocouples
   - Ceramic Blanket
   - The customer will have to provide uninterrupted power of 100amps per phase

7. PROCEDURE
   - The heat treatment procedure parameters shall be in accordance with the instruction given in the Heat Treatment Instruction Sheet.
   - PWHT when required shall be done before hydrostatic tests and after any weld repair.
   - For specific number, location and attachment of thermocouple refer to heat treatment instruction sheet.
   - Initial Temperature 7.4.1 Initial temperature at time of starting Heat Treatment is not to exceed 315°C unless specifically permitted otherwise (depending on the material and applicable heat treatment cycle)
   - Rate of Heating 7.5.1 Up to 425° C the rate of heating shall not be less than 56° C/hr. 7.5.2 Above 425°C through to soaking temperature the rate of heating per
hour shall not exceed 222° C/hr. divided by the maximum metal thickness in inches subject to a maximum of 222° C/hr.

- Soaking Temperature and Period 7.6.1 For ASME Sec. VIII Div. I work, the soaking temperature and period shall be in accordance with table UCS 56 for Carbon Steel and Low Alloy Steels. 7.6.2 For ASME B 31.1 Work, the soaking temperature and period shall be in accordance with table 132 for Carbon Steel and Low Alloy Steels.

- Cooling Rate 7.7.1 From soaking temperature down to 425° C the maximum cooling rate per hour shall be 280° C per hour divided by the maximum metal thickness in inches subject to a maximum rate of 280° C per hour and the rate of heating shall not be less than 56° C/hr. 7.7.2 Below 425° C - Free cooling in still air.

8. TEMPERATURE RECORDING

- A heat chart shall be generated for every Heat Treatment load.
- Only currently calibrated Recorders, PID Controller and Thermocouples must be used. Recorders shall be calibrated annually or after every maintenance service. Records shall be available on file for verification.
- Thermocouples shall be attached by Electric Capacitor Discharge mechanism.

9. TEMPERATURE CONTROL:

- The temperature is automatically controlled by regulating the current through the programmers installed in the power distribution boards.

10. NOTIFICATION OF HEAT TREATMENT

- The QC Engineer or his designees shall notify the Client and or TPI as specified in the Quality Plan as to when the Heat Cycle is to commence.
- The Q.C Inspector is responsible for ensuring that a Heat Treatment Chart is generated for each Heat Treatment Cycle conducted with the following information as applicable.
  - Job number Equipment/Item number
  - Drawing number (if applicable)
  - Q.C Inspector signature on chart at the time of witnessing of loading prior to start up
  - Sketch showing location of items in furnace (if applicable) or sketch of element placement.
  - Sketch indicating placement of thermocouples onto work-piece. Items a through d should be incorporated on the original chart. Items e and f above can be indicated on the Heat Treatment. Instruction/Report which should form part of the PWHT documentation.
  - The Heat Treatment Technician is responsible for ensuring that the Heat Treatment Chart is transmitted to the QC Engineer for review and acceptance, once the Heat Treatment is complete.
  - When specifically required by Code or Client, the QC Engineer or his designee shall arrange for the testing on the Production/Coupon Plates by competent test laboratories. The Project Engineer/QC Inspectors responsible for arranging for the delivery of the coupon plate/production Test Plate to the designated Laboratory for testing.

11. RECORDS:
- The Heat Treatment information will be as per the enclosed format.
- The Temperature Chart will have the particulars like Date/Chart No./Component identification No./Starting Time/Ending Time/Holding Time.
- Recorder, PID Controller and Thermocouple Calibration Certificates.