TECHNICAL REQUIREMENTS FOR DUPLEX L.P. FEED WATER HEATER

1. Scope Of Work :

This specification covers requirements for Thermal, Hydraulic & mechanical design, material procurement, manufacture & testing of Duplex (LPH-1&2) Low Pressure feed Water Heaters for 800 MW TG set as per attached drawing.(No. HXE/SK/1769)

Scope also includes performance testing at site to prove guaranteed parameters. All instruments required for testing shall be in vendor scope. The price for test may be quoted separately.

The complete Heater shall be dispatched in fully assembled condition, duly tested as per code and securely packed.

2 Codes and Standards :

The following codes in their latest edition shall form the basis for design, material, fabrication, inspection, testing and acceptance of equipment.

(a) HEI standard for Feed water Heater.
(b) ASME Sec VIII, Div-I, ASME Sec-II, ASME Sec. V, ASME Sec. IX.
(c) TEMA Class "C'
(d) National & Local laws or regulations as applicable.
(e) WRC 107 & 297 as applicable.

Thermal design of Heater shall be as per **reputed software** or proven practices of the vendor.

Vendor to submit thermal & mechanical calculations as per above codes for BHEL's approval before start of fabrication.

3. Deviations:

In general no deviation shall be permitted but this does not preclude possible innovations or improvements on the part of vendor based on available facilities. Such deviations must be clearly pointed out at the time of submitting the bid.

4. Material Specification :

i. All material and accessories required for fabrication, inspection, testing etc. of Duplex Heater shall be supplied by the vendor.

ii. In addition to the requirements of material as per attached drawing, material shall also meet the requirements as specified in this specification and other specification enclosed with the enquiry.

iii. All materials for pressure parts and parts welded to pressure parts shall be accompanied with mill test certificates duly certified by reputed third party inspection agency.

iv. The heater minimum design metal temperature may be considered as 0 deg C unless specified other wise in the drawing.

vi. Plates :

(a) All plates used for pressure parts shall be vacuum degassed & normalised.

(b) Plates for pressure parts having thickness 12mm to 50 mm shall be UT tested as per SA 435.

(c) Plates for pressure parts having thickness greater than 50 mm shall be UT tested as per SA 578 Level B.

(d) Impact test requirements shall be as per Code.

vii Tubes :
All tubes shall be as per SA688 TP 304 unless specified otherwise in the drawing. The residual stress in the tube shall not be more that 4.0 kg/mm2.

viii Forgings :
All forgings to SA105 and SA 266 above 75 mm thickness, all tube sheet forgings and all other forgings except standard flanges upto 8" Nb shall be 100% UT tested as per para AM203.2 of ASME Section VIII, Div-2

ix. Pipes :
Pipes shall be seamless and sizes above 1 1/2" shall be hot finished. Dimensions and tolerances shall be in accordance with ANSI B36.10 or ANSI B36.19 as applicable.

5. Fabrication :

Edge Preparation:

The preparation of edges for welding shall be done using machining, chipping, cold shearing, flame cutting or combination of these. All welding edges after cutting shall be Dye penetrant or Magnetic particle examined for laminations, cracks or segregation.

Rolling & Dishing

Rolling for bending and forming of plates shall be in longitudinal direction of the plates. Re-rolling of welding is normally not recommended. However if for large diameter shells re-rolling of shell is inevitable, procedure for re-rolling along with extent of NDT shall be submitted for approval of inspector. All welds on the section to be re-rolled must be ground flush.

All dished ends shall be preferably in single piece construction. Dished end with one chordal seam are acceptable with shell diameter greater than 1.5 M. In such case, the chordal seam shall preferably be in the middle one-third of the blank. Dished end shall be torispherical (Knuckle radius 15% of Out side Diameter and crown radius 80 % of outside shell diameter) or 2:1 ellipsiodal. Dished end shall be subject to Dye penetrant test on knuckle portion both inside & outside after normalising. All plates for dished end shall be UT tested.

Welding

All welding shall be carried out by qualified welders as per ASME Sec. X. Records of qualified welders shall be submitted to inspector prior to start of the work. All welding shall be done with electrodes, fillers and fluxes of reputed make with proven reproducibility of results. For carbon steel parts, electrodes shall be of low hydrogen type.

Tube to Tube Sheet Joint

Tube-Tube sheet joint shall be expanded with 2 grooves. Tube holes shall be drilled as per TEMA special close fit tolerance. Vendor to submit its tube expansion procedure for review by BHEL.

Nozzles & Reinforcing pads

Nozzle pipes shall be attached to the heat exchanger component by full penetration weld. Unless otherwise indicated in the drawing. Necks of all nozzles shall be flush with inside of the heat exchanger component.

Reinforcing pads wherever required shall be of same or equivalent material as the heat exchanger component to which it is welded. All RF pads shall be provided with two 1/8" NPT tapped holes located 180 deg apart for air soap solution test at a pressure of 1.25 Kg/Cm2.

6.0 Non Destructive Testing

NDT (Non Destructive Test) shall be carried out by personnel qualified by ASNT / ISNT or equivalent. Minimum extent of radiography shall be spot unless full radiograph is a code requirement. Further, all 'T' joints must be radio graphed and at least and one shot must be taken on each L & C seam.

7.0 Heat Treatment

PWHT shall in general be done as required by drawing, data sheet, code etc. No welding or heating is permitted after PWHT operation.

8.0 Inspection & Testing

The material shall be as per the specification. Co-related material test certificates shall be furnished to BHEL' authorized inspector for review & acceptance before starting the work / fabrication. Material induction at Vendor's works and sample testing shall be done as per agreed QP.
Inspection shall be carried out both during fabrication and before delivery and also for sub-ordered material if any. The stages of inspection shall be as per mutually agreed quality plan.

9.0 Stamping, Name Plate & Warning Plates :

Heat exchanger shall be fitted with SS name plate. Warning plates if required shall be provided.

10.0 Protection & Despatch.

After completion of all testing and inspection, the inside of complete equipment shall be thoroughly drained and dried by passing hot air until no further increase in relative humidity of out going air is observed. Dry out shall be done simultaneously on both shell & tube side. After drawing equipment shall be purged and filled with dry nitrogen.

Painting of Duplex heater shall be as per BHEL spec. HE77003.

11.0 Vendor's Guarantee

The vendor shall be completely responsible for the compliance to specification, code requirements, material, fabrication & workmanship of the Duplex Heater. In this regard it may be noted that review by BHEL

shall not relieve the vendor of his responsibility of meeting all requirements and ensuring satisfactory performance of the equipment. Guarantee period shall be two years or conductance of performance guarantee test which ever is later.

12.0 Spares

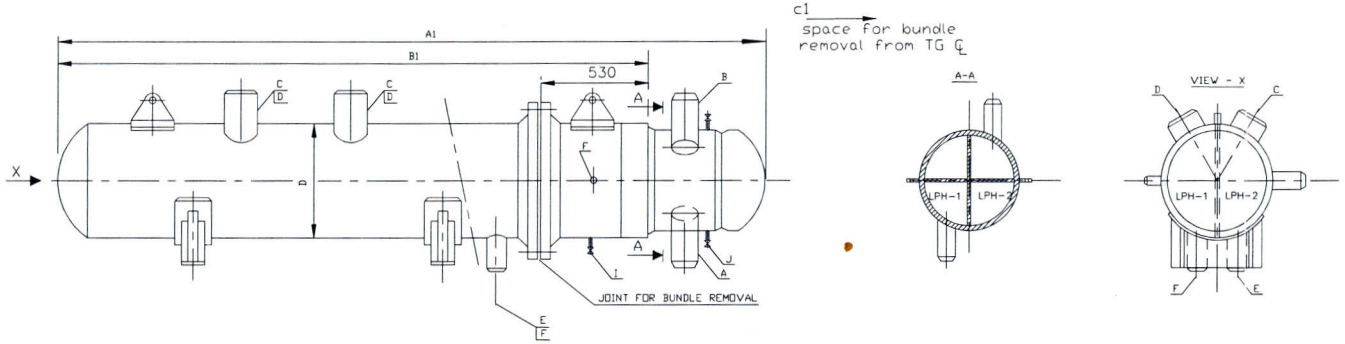
Spares required for 2 year and 5 year operation shall be offered by the vendor separately.

13.0 Operation & Maintenance

5 copies of Operation & Maintenance manuals shall be submitted by the vendor along with the supply.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

DRAWING NO HXE/SK/1769



TECHNICAL DATA

EQPT NAME	DESIGN PRESSURE,kg/cm2		TEST PRESSURE, kg/cm2		DESIGN TEMP. , deg C		COROSSION ALLOWANCE, mm		WEIGHT, kg.			DIMENSIONS, mm			
	SHELL SIDE	TUBE SIDE	SHELL SIDE	TUBE SIDE	SHELL SIDE	TUBE SIDE	SHELL SIDE	TUBE SIDE	DRY	OPERATING	FLOODED	A1	B1	C1	D
LPH-1&2	3 & FULL VACUUM	46	3.9	59.8	150	150	3.2	3.2	38000	48000	70000	13500	11800	21500	1800

NOZZLE SCHEDULE

REF.	NO.	DESCRIPTION	SIZE(Dnom), MM	REMARKS
A	01	CONDENSATE INLET	400	COMMON FOR
B	01	CONDENSATE OUTLET	400	LPH-1 & 2
C	02	STEAM INLET	800	LPH-1
D	02	STEAM INLET	800	LPH-2
E	01	DRAIN OUTLET	300	LPH-1
F	01	DRAIN OUTLET	300	LPH-2
G	01	AIR VENT	100	LPH-1
H	01	AIR VENT	100	LPH-2
I	02	SHELL DRAIN	25	LPH-1 & 2
J	02	CHANNEL DRAIN	25	LPH-1 & 2

MATERIAL

SHELL -SA 516 Gr-70
WATER BOX -SA 516 Gr-70
TUBE PLATE -SA 516 Gr-70
TUBES -WELDED AUST. SS 304

NOTE

INFORMATION FURNISHED IS TENTATIVE ONLY.

LPH1&2 (DUPLEX) WILL BE PLACED INSIDE THE CONDENSER NECK

THERMAL DATA

NO.	DESCRIPTION	LPH-1	LPH-2	
01	CONDENSATE FLOW	1593.413	1593.413	Tons / Hr
02	CONDENSATE INLET TEMP.	47.7	79.1	Deg. C
03	CONDENSATE OUTLET TEMP.	79.1	97.8	Deg. C
04	CONDENSATE INLET ENTHALPY.	48.1	79.4	Kcal / kg
05	CONDENSATE OUTLET ENTHALPY	79.4	98.2	Kcal / kg
06	EXTRACTION STEAM FLOW	93.386	55.347	Tons / hr
07	EXTRACTION STEAM PRESSURE	0.5219	1.06	ata
08	EXTRACTION STEAM TEMP.	0.971 $	103.9	Deg. C
09	EXTRACTION STEAM ENTHALPY	616.3	640.9	Kcal / kg
10	TTD	2.8	2.8	Deg. C

$ D

REF. DRG NO.

INVENTORY NO. SIGN & DATE

CBOM NO. | STATUS OF DRG.

AGREED DEPT.	NAME	SIGN	DATE

GRADE OF UNTOL. DIM.:-
M/CG- V/C/M/F AA 0230208
WELDING-A/B/C/D-AA621104
GAS CUTTING-'T3'AA0621101

REV.	DATE	ALTERED	CHECKED

TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME
DRN	MAHENDRA
CHD	SK.BAVEJA
APD	L.KISHORE

DEPT. HXE | SCALE | WEIGHT(Kg.) | REF. TO ASS

CODE 4222

TITLE: DUPLEX LPH-1&2

DRAWING N HXE/

SHEET NO.