



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

An ISO 9001
Company

CAPITAL PURCHASE / MATERIALS MANAGEMENT / MANUFACTURING

ENQUIRY	Phone: +91 431 257 75 75 Fax : +91 431 252 07 19 Email : rmanohar@bheltry.co.in Web : www.bhel.com
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	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
	2620600076	30.10.2006	04.12.2006

Your are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order

Item	Description	Quantity	Delivery Schedule
10	Flash Butt Welding Machine with Process Monitoring Facility for coil formation as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com)	1 No.	31.03.2007

Note:

- (1) The detailed Technical Specification along with technical point-by-point confirmation, Commercial Terms & Conditions applicable for this Enquiry, Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference “2620600076”. Your offer should be based on all the above documents.
- (2) Also, you are requested to fill in the Supplier Registration formats available in www.bhel.com (under Advancement – Supplier Registration) and send it along with your offer.

Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For BHARAT HEAVY ELECTRICALS LIMITED Sr. Dy. Genl. Manager / Capital Purchase / MM / Manufacturing
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PART A**BUSINESS PROFILE & TECHNICAL BACKGROUND****SECTION – I**

The BIDDER is expected to give complete details against each clause in the table given below and wherever necessary an additional sheet may be attached (giving clear reference number) to cover the required details .

S. No.	PARTICULARS	VENDOR's RESPONSE
1.0	Number of Years of Experience of the BIDDER/ VENDOR in the field of design, manufacture and supply of 'FLASH BUTT WELDING STATIONS'	
2.0	Number of FLASH BUTT WELDING MACHINES supplied, installed and commissioned till date	
3.0	YEAR of LAUCNH of the Model quoted against this ENQUIRY	
4.0	Is there any other model launched after the quoted Model? Otherwise, indicate the likely year in which the next model is likely to be launched	
5.0	Number of Automatic FLASH BUTT WELDING MACHINES supplied, installed and commissioned till date in the QUOTED MODEL	
6.0	Number of FLASH BUTT WELDING MACHINES supplied, installed and commissioned till date for the following category of CUSTOMERS a) Power Utility Boiler Manufacturer b) Equipment Supplier for Process Industries [Heavy Engineering Companies] c) Research Establishments	
7.0	Details of Design Set-Up and Technology Back-Up assured for the PRINCIPAL Equipment Maker	

S. No.	PARTICULARS	VENDOR's RESPONSE
8.0	Details on International Standards / Process Codes followed in Design of the Equipment. [Copy of the English Version of relevant portion of the Standards / Codes followed, to be furnished with the Technical Offer]	
9.0	Comprehensive Details on Performance Testing - of the Equipment quoted, to be given with the Technical Offer	
10.0	Details of Quality System followed [Furnish the salient aspects of the Quality Assurance System followed]	
11.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centre in India and Asia	
12.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – II

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for the FLASH BUTT WELDING MACHINE.

S. No.	REQUIREMENTS	VENDOR's COMMENTS
13.0	The BIDDER / VENDOR shall have a minimum of FIVE Years of Experience in the Design, Manufacture & Supply of Flash Butt Welding Machines.	
14.0	The BIDDER / VENDOR shall have supplied at least one number of FLASH BUTT WELDING MACHINE of the CAPACITY/CONFIGURATION specified under PART B in the past.	
15.0	Reference List of Customers and Performance Certificate for a period not less than TWO Years from CUSTOMERS (minimum one Customer) with full contact details of CONTACT PERSON.	
16.0	BIDDER has to co-ordinate for the visit of BHEL Team (at BHEL Cost) to the Customer's Works, to witness the capability of an existing Flash Butt Welding Station, if warranted.	

SECTION – III

The BIDDER / VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser :

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
17.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical [with PART A & PART B] & Commercial and Price Bid.	
18.0	The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A just 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer.	
19.0	The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
20.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria	
21.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation	
22.0	BIDDER has to indicate the Country of Origin for the supply of equipment .	
23.0	The reference List of Customers shall be accompanied with the details (Phone Number /E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	

PART B**TECHNICAL SPECIFICATIONS FOR FLASH BUTT WELDING STATION**

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH COMPLETE TECHNICAL DETAILS
1.0.0	APPLICATION	a. The Flash Butt Welding Machine is to be used for the butt-welding of tube ends, which form part of the Tubular Coils [as shown in ANNEXURE –1] coming in High Pressure Boilers. b. The FBW Machine shall have a built-in system for Process Control. c. The FBW Machine shall have facility & capability for heat treatment (annealing) of butt welded joint after the welding process.	
2.0.0	PRODUCTIVITY	The FBW machine is expected to have a production capacity of 200 Weld Joints (for 44.5 mm diameter tube of Carbon Steel Material), on an average - in a shift of eight hours.	
3.0.0	JOB DETAILS	Only Seamless Steel Tubes	
3.1.0	Tube Outer Diameter	Tube Sizes : 31.8 , 38.1, 44.5, 51.0, 54.0, 57.0, 60.3, 63.5mm	
3.2.0	Tube Wall Thickness	Thickness Range : 2.0 mm to 10.0 mm	
3.3.0	Tube Material	a. Carbon Steel: SA192, SA210A1, SA210C b. Alloy Steel : SA209T1, SA213T11, SA213T22, SA213T91	
3.4.0	Weld Surface Area	Around 2200 sq. mm. [Tube Cross-Sectional Face Area]	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH COMPLETE TECHNICAL DETAILS
4.0.0	MACHINE CONFIGURATION	<p>Machine shall have the following as the basic elements or components :</p> <ul style="list-style-type: none"> a. Machine Frame and Foundation b. Moving and Fixed Platens c. Moving and Fixed Jaws with Tube Holding Die Mounting Facility d. Independent Hydraulic Power-Pack and Cylinders for Clamping Tubes e. Closed-Circuit Oil Chiller for controlling Hydraulic Power-Pack Oil Temperature f. Closed-Circuit Water Chiller for cooling Transformer Windings, Tube Clamping Dies, etc. g. Clamping Die Upset Mechanism h. Off-Set Locking Arrangement i. Tube Aligning Die with Inserts j. Weld Bead Shaping Mechanism at Weld Butt Joint k. Pre-heating, Flashing & Upsetting for Weld Joining Mechanism l. Operator Control Desk / HMI (HMI should be kept away from the weld flashing area) m. Main Electrical Panel with Panel cooling A/C unit (with CE Marking and with IP54 Protection). n. Machine shall be TROPICALISED in basic design and construction. o. Attachments & Accessories to enhance quality and productivity 	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
5.0.0	BUTT WELDING OPERATION		
5.1.0	Welding Process	Flash Butt - AC Resistance Welding	
5.2.0	Power Rating / Capacity	Bidder to specify the rating of the FBW Machine offered [Not lower than 150 kVA @ 50% Duty Cycle]	
5.3.0	Upset Force	Bidder to specify the design value of Upset Force for the FBW Machine offered [Not lower than 12 Tonnes]	
5.4.0	Clamping Force	Bidder to specify the design value of Clamping Force for the FBW Machine offered [Not lower than 18 Tonnes]	
5.5.0	Tube Alignment Facility	Machine to have suitable mechanical adjustment in the fixed platen for aligning both the tubes prior to butt welding, to an extent of minimum 10 mm in the horizontal and vertical directions	
5.6.0	Tube Clamping Unit	To have provision for vertical and horizontal movement to suit off-set setting and then locking to ensure a perfect tube contact, right weld joint alignment for welding and to avoid disturbance during the welding operation.	
5.7.0	Tube Clamping Length	Bidder to Specify the minimum Tube Clamping Length [BHEL desires to have a maximum of 150 mm only for clamping]	
5.8.0	Tube Clamping Means	Only by Power Hydraulics .	
5.9.0	Annealing of Flash Butt Welded Joint	To have facility for annealing of flash butt welded joint (post weld heat-treatment), immediately after welding as a supplementary process.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
5.10.0	Tube Clamping Dies	a. Minimum number of Dies are to be provided to cover the whole range of tube sizes [as given under the Clause Sl. No. 3.0.0] b. BIDDER has to give details on Dies and Inserts and to QUOTE for 2 Nos. for each set of Tube Clamping Dies and 6 Nos. of Inserts for each size of the Tubes.	
5.11.0	Annealing – Process Control	Bidder to specify the method and system offered for the pre-programming of annealing cycle and for the control of the annealing temperature, with an integral Time-Temperature Graph Indicator cum Recorder for the flash butt welded joint.	
5.12.0	Weld Joint Dressing	Machine to have an Automatic or Semi-Automatic Rotary type slag removal tool for external cleaning of flash butt welded joint immediately after welding or annealing operation.	
6.0.0	JOB HANDLING UNIT [OPTIONAL UNIT]	a. BIDDER to quote for a suitable Job [Tubular Coil] Handling Unit for the offered FBW Station. The equipment configuration can be that of a unit previously supplied by the Bidder b. Bidder to give technical details [schematic drawing] on the offered system, with a write up on the arrangement.	<i>[Finer details and freezing of dimensions for the job handling system will have to be finalized during the technical discussion stage, in case suitability is ascertained].</i>

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
7.0.0	ELECTRICAL AND ELECTRONIC DEVICES AND CONTROLS		
7.1.0	Power Source	Bidder to specify the type and capacity of the powersource with details on power transformer and associated controls	
7.2.0	Primary Voltage Control	Thyristor Controlled or IGBT Controlled through PLC. Bidder to furnish the details.	
7.3.0	Current Range	Bidder to indicate Welding Current ranges for various tubes listed under the Clause SI. No. 3.0.0	
7.4.0	Process Control and Instrumentation	To have facility for pre-programming, feedback control and recording of a. Number of Pre-Flash b. Number of Pre-Heat Cycles c. Flashing Length and d. Upsetting Length	
7.5.0	Pre-Flashing Parameters	Bidder to indicate the means of setting of Pre-Heat Current and ON-Time [Pre-Flashing] parameters though PC / PLC or CNC based system.	
7.6.0	Flashing Control	Shall be Linear and Parabolic (depending upon the job / tube material)	
7.7.0	Upsetting Stage	To have facility for Current Cut-Off Time Control and Upsetting Torque Control	
7.8.0	Travel Speed	Independent forward and reverse speed control during preheating stage. Bidder to indicate Speed Ranges	
7.9.0	Traverse Mechanism	Tube movement for pre-heating, flashing & upsetting and forward & reverse motions shall be through AC Servo Motor with Servo Drive Control or equivalent servo hydraulic	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
7.10.0	Electric Motors	All Electric Motors shall be of any of the following makes : SIEMENS / ABB / MAKES conforming to IEC Standards	
7.11.0	Monitoring of Process parameters	<p>a. Facility for monitoring the four main process parameters - Voltage, Current, Platen Movement, Force - from the Machine Control Panel during the Welding Operation and display of parameters in tabular format compulsorily conforming to BS 4204-1992</p> <p>b. Bidder to give details on the sensors & specification of associated system</p>	
7.12.0	Display & Recording of Process Parameters	Machine to have the appropriate facility for Real Time Display, Recording and Retrieval of the following Process Parameters :- Total Weld Time, Maximum Upset Force, Stroke for Maximum Upset Force, Total Pre-Heat Time, Total Flash Time, Number of Short-Circuit Flash, Stroke for First Contact, Pre-Heat Distance Measurement, Mean -Current during Flashing, Mean Force during Pre-Heating, Maximum Pre-Heating, Mean Current for Pre-Heating, Total Pre-Flash Time, Total Flashing Length, Total Upset Length, etc., by means of 'state of art' REAL TIME DISPLAY on the screen and recall of previous records off the screen, at any time for reference.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
7.13.0	Short Circuit Protection	Bidder to furnish details on the protection system provided to avoid short-circuiting of secondary side of welding transformer.	
7.14.0	Electrical Power Input	a. The electrical power input shall be $415 \pm 10\%$ V, $50 \pm 2\%$ Hz, 3 Phase AC supply through a 3 Wire System (4 th Wire for Protective Earthing). No neutral conductor. b. BHEL provide this supply at one point only and the supplier has to take care of all other electrical distribution network required for the FBW Station.	
7.15.0	Control Voltage	Control Circuit Voltage shall not exceed 110 V .	
7.16.0	Power Requirement	Bidder has to indicate the total tentative power requirement (including that for all the accessories and attachments) in kVA with the offer.	
8.0.0	MACHINE CONSTRUCTION		
8.1.0	Ambient Atmospheric Conditions	a. The FBW Machine with all Sub-Systems shall be suitable for operation in an ambient temperature of 25 to 50°C and with a Relative Humidity of 90% (both higher values do not occur simultaneously). b. The ENTIRE EQUIPMENT shall be TROPICALISED in Design and CONSTRUCTION.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
8.2.0	Machine Operation	The Basic Machine with all the Sub-Systems, Accessories and Attachments are to be designed for working in three shifts (8 hour shift) a day and all the 365 Days in a year, with the SUPPLIER recommended PREVENTIVE MAINTENANCE MEASURES.	
8.3.0	Machine Maintenance	The machine configuration and element arrangement should have easy accessibility, higher rigidity, self-aligning /fitting, locking & piloting arrangement of machine components and modules, to ensure a 'maintenance free' concept.	
8.4.0	Electrical Wiring	a. All electrical motors, limit switches etc, on the machine shall be wired using PVC sheathed cable running in conduits and converging to common terminal block b. External wiring from / to control panel, control desk, external motors etc shall be by means of screened multi-core cables	
8.5.0	Purging Gas Feeding Arrangement	In-built facility to increase or decrease the pressure of air / inert gas, to the required level from the input pressure (3 to 5 kg.) for minimizing the flash inside the tube during welding.	
8.6.0	Interlock System for Gas Supply	An air / gas pressure switch to be provided to have an interlock with welding circuit, to avoid failure	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER'S OFFER WITH COMPLETE TECHNICAL DETAILS
8.7.0	Hydraulic Power Pack - Selection Criteria	Bidder to provide details on Rating / Specification and Selection of Hydraulic Power-Pack with Cylinders for application like tube clamping and other hydraulic needs coming in the machine.	
8.8.0	Hydraulic Circuits	<ul style="list-style-type: none"> a. Hydraulics forming part of the machine and associated equipment shall be connected by reinforced synthetic rubber hoses of reputed makes and / or steel tubes of sufficient capacity. b. Hydraulic Circuit to originate from a common point on the Machine and provided with suitable oil filters, control valves and elements of reputed makes. c. All the hydraulic elements in the circuitry shall have easy access during the maintenance of machine. d. Bidder to give details on the Air Compressor, Refrigerant Air Dryer and Elements forming part of the pneumatic circuitry. 	
8.9.0	Hydraulic Power Pack - Protection Controls & Make	To have suitable means and measures for Temperature Control, High & Low Pressure Control, Oil Level Sensing, etc. All the Hydraulic Pumps & Valves shall be of Vickers or Bosch-Rexroth make.	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
8.10.0	Chiller Unit for Cooling of Sub-Systems	Suitable Capacity Refrigerant / Radiator type Chilling Units are to be provided for the cooling of Power Transformers, Tube Clamping Dies, Hydraulic Power Pack Oil, etc. Bidder to give Complete Technical Details on these Chilling Units	
8.11.0	Interlock System for Chilling Units – Coolant Flow	Suitable flow sensors are to be provided to have an interlock with welding circuit, to avoid failure of flow of cooling medium	
8.12.0	Pneumatic Circuits	<ul style="list-style-type: none"> a. Pneumatics forming part of the machine and associated equipment shall be connected by nylon reinforced synthetic rubber and / or steel tubes. b. Pneumatic Circuit to originate from a common point on the Machine and provided with a suitable Filter / Regulator /Lubricator Unit and in addition a hand wheel valve. c. Bidder to give details on the Air Compressor, Refrigerant Air Dryer and Elements forming part of the pneumatic circuitry. 	
8.13.0	Safety Guards	FBW Machine to have Safety Guards / Sliding Doors for protection against the splash / flashing for the Machine Operators. Safety Doors to have visible glasses for clear vision also. Bidder to submit details on this arrangement .	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
8.14.0	Painting	a. The heavier machine parts are to be heat-treated after fabrication (including castings and forgings) and shot blasted for surface preparation prior to painting. b. One coat of Primer with 25 μ of DFT (Dry Film Thickness) and 48 hours of compulsory curing after painting. c. Two coats of Enamel Paint (Colour – Apple Green) each with 25 μ of DFT and intermittent curing of minimum 16 hours.	
9.0.0	MACHINE SPARES		
9.1.0	COMMISSIONING SPARES	Bidder has to COMPULSORILY quote for the following items with the OFFER : a. Mechanical wearing components due to linear movement and rotation, etc. [Each 4 Nos.] b. Spares for Hydraulics Power-Pack viz., 'O' rings, Sealing Rings, Hydraulic Valve 'O' rings, etc.. [Each 4 Nos.] c. Electrical & Electronic Items: - PCB & PLC I/O Card, Digital to Analogue Card, CPU Card, HMI, Field Sensors (such as Encoders, Optical Sensors, Proximity Switch, Limit Switch), Display Unit, etc. [Each 4 Nos.]	

S.No.	PARTICULARS	SPECIFICATION / DESCRIPTION	BIDDER's OFFER WITH COMPLETE TECHNICAL DETAILS
9.2.0	OPERATING SPARE PARTS	<p>a. The Supplier shall LIST DOWN with the OFFER, the complete set of replaceable parts/items/components coming in the FBW Machine and other Sub-Systems / Accessories / Attachments and shall QUOTE the Unit Price for each item.</p> <p>b. BHEL will procure almost all parts listed under the above category with the FBW Machine.</p>	
10.0.0	MACHINE DOCUMENTATION		
10.1.0	O & M Manuals	<p>a. Six Copies of the Operation & Maintenance Manual to be given in Hard Bound Paper Copies with three copies in CD form (SOFT COPY)</p> <p>b. One Hard Copy of O & M Manual shall be submitted at the time of INSPECTION of the FBW Machine by BHEL Officials, at the Supplier's Works .</p> <p>c. The following documents and details [given under the Clause Sl. No. 12.2.0] shall form part of the Operation & Maintenance Manual</p>	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's OFFER
10.2.0	Documents and Technical Details	<ul style="list-style-type: none"> a. GA Drawing of the FBW Station. b. GA Drawing of Individual Mechanisms. c. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose.. d. Electrical Wiring Drawings – Power & Control Circuits e. Pneumatic/Hydraulic Circuit Diagram f. PLC Ladder Diagrams (Soft Copy) with Flash Memory Card. g. PLC Ladder Diagrams (Hard Copy) h. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls i. Alarm Log, Error Code, Error Messages & Remedies and On-Line Fault Diagnostics to be provided. j. PLC Programming Tool : On-Line Troubleshooting, Software Modification, Upload and Down-load of Programs. j. Specifications/Ratings of All Bought-Out-Items k. Warranty / Guarantee Card for all Bought-Out-Items l. Trouble Shooting Chart for Main and all Sub-Systems m. Machine related PC Details – Machine Operating Softwares, Parameters Selection Software, File Handling, Display Recording. CD Read and Write unit, Serial and USB Ports to be ensured. n. UPS is required for 1 hour back up time for PC data. o. Total weight of the Machine & Sub-Systems 	

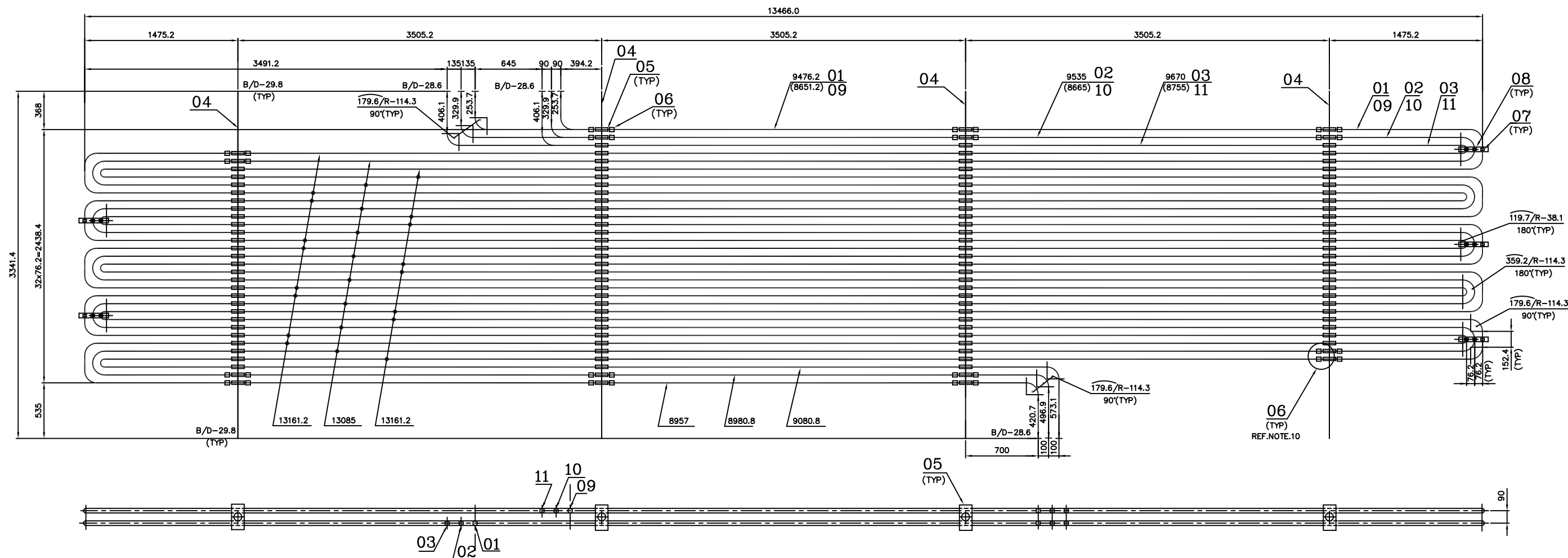
S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's OFFER
11.0.0	MACHINE INSPECTION & ACCEPTANCE		
11.1.0	Machine Performance Testing and Acceptance	<p>The FBW and Accessories shall be tested for its performance prove-out as per BHEL Technical Specifications, at the Supplier's Works prior to despatch.</p> <p>a) Welding trials have to be done with a minimum of 15 tube samples (each with Carbon Steel and Alloy Steel material) – tube sizes selected will be based on a mutually agreeable criterion. These tube joints shall also be subjected to post weld heat treatment in the machine itself.</p> <p>b) The sample welded joints should pass through the bend test and satisfy the requirements of BHEL QUALITY ASSURANCE Document IP:PP:14/01 for TESTING OF FLASH BUTT WELDS. Refer ANNEXURE-2 for the Quality Assurance Document.</p> <p>c) Monitoring of Process Parameters by the Computer in the FBW Machine for 10 consecutive weld joints, shall not deviate by 10 % as per BS 4204.1992</p>	
12.0.0	ERECTION & COMMISSIONING		
12.1.0	Mechanical Erection	Erection of the Equipment will be done by BHEL under the supervision of SUPPLIER's SERVICE ENGINEERS and as per the guidelines furnished in the Erection Manual given by the Supplier	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's OFFER
12.2.0	Machine Commissioning	Commissioning of the Equipment and Smooth Functioning of all the Sub-Systems (at BHEL Works) shall be the RESPONSIBILITY of the Supplier.	
12.3.0	Performance Prove-Out	After the successful commissioning of the machine and sub-systems, the Supplier's COMMISSIONING ENGINEER and the APPLICATION ENGINEER have to establish the Performance Prove –Out for the Machine's Capability and the Production Rate from the Machine, as given under the Specification Clause SI.No. 2.0.0	
13.0.0	TRAINING	<p>a. The Supplier shall train four of BHEL Engineers in the Operation, Trouble Shooting and Maintenance of the FBW Machine at the Supplier's Works for a minimum period of 10 Working Days, after the INSPECTION of the Equipment.</p> <p>b. The Supplier's Service Engineer / Application Engineer shall train BHEL Engineers in the Operation, Trouble Shooting and Maintenance of the FBW Machine at BHEL Works for a minimum period of 15 Working Days, after the SUCCESSFUL COMMISSIONING of the Equipment, at BHEL Works.</p>	

S.No.	PARTICULARS	BHEL SPECIFICATIONS	VENDOR's OFFER
14.0.0	TECHNICAL OFFER	<p>The Technical Offer shall contain the following :</p> <ul style="list-style-type: none"> a. Complete Scope of Supply, including Main Equipment, Job Handling Unit, All Accessories and Attachments, etc. b. List of Operating Spares, Commissioning Spares, Foundation / Anchoring Materials c. Erection, Commissioning and Performance Prove-Out Details. d. Complete description of all systems & sub-systems forming part of the FBW Station e. A schematic diagram showing the layout of the machine & associated systems with salient dimensions f. The operating sequence of the machine with broad outline of various operations involved 	
15.0.0	PERFORMANCE GUARANTEE	The Performance of the Total Equipment and/or the Components / Sub-Assemblies / Bought-Out Items shall be guaranteed for a minimum period of twenty- four months from the date of performance acceptance at BHEL Works.	

ENCLOSURE :

- 1) **ANNEXURE – 1 : TYPICAL TUBULAR COIL ASSEMBLY DRAWING**
- 2) **ANNEXURE – 2 : BHEL QUALITY ASSURANCE DOCUMENT**



NOTES: -

01. DESIGN,MANUFACTURE AND INSPECTION AS PER IBR.

02 DESIGN PRESSURE :	Ø38.1x4.5 SA210 Gr.A1	Ø44.5x7.1 SA210 Gr.C
03. DESIGN TEMPERATURE :	213.2 KG/SQ.CM(G) 326°C	207.2 KG/SQ.CM(G) 393°C

04. HYDRAULIC TEST PRESSURE AT SHOP : 319.8 KG/SQ.CM(G)

05. HEAT TREATMENT AS PER IBR.

06. PAINT MARK NO.:ECU-07

07. ITEM NOS.:07&08 ARE TO BE REMOVED AT SITE BEFORE ERECTION.

08. FABRICATION TOLERANCE AS PER BPS:1-03-000-00033.

09. QUANTITY TO BE PRODUCED: 1 No./BOILER. FOR PGMA : 19-914-1 NO.

10. FOR STOPPER PLATE WELDING REFER DRG.NO. 3-19-124-00813/01

	11	TUBE D38.1X4.5; 140505.3 LONG			15-186-053 SA210 Gr.A1	A	555.300	1	
	10	TUBE D38.1X4.5; 140188.8 LONG			15-186-053 SA210 Gr.A1	A	554.000	1	
	09	TUBE D38.1X4.5; 140525.3 LONG			15-186-053 SA210 Gr.A1	A	555.400	1	
	08	PLATE 5X25X220			15-011-029 IS2062FE410WA		0.210	10	
	07	U-PLATE PL.5X20X121	4-19-814-04468		15-011-029 IS2062FE410WA		0.100	30	
	06	STOPPER PLATE PL.6X20X30	4-19-114-04704		15-011-092 IS2062FE410WA		0.020	64	
	05	STRAP SADDLE	2-19-824-02277		WELDMENT SA240TYPE304	C	1.297	126	
	04	TUBE D44.5X7.1; 3341.4 LONG			15-187-013 SA210 Gr.C	A	23.130	4	
	03	TUBE D38.1X4.5 141420.3 LONG			15-186-053 SA210 Gr.A1	A	558.900	1	
	02	TUBE D38.1X4.5 141058.8 LONG			15-186-053 SA210 Gr.A1	A	557.500	1	
	01	TUBE D38.1X4.5 141350.3 LONG			15-186-053 SA210 Gr.A1	A	588.600	1	
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO VAR NO	MATERIAL CODE MATERIAL SPECN	A/C/P DI	UNIT QUANTITY	UNIT WEIGHT

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT			
DRN	NAME	SIGNATURE	DATE
CHD			
APPO			
DEPT CODE	ALL DIMENSIONS ARE IN MM	PROJECTION SCALE N.T.S.	WEIGHT (Kg) 3632.022
TITLE ECO UPPER COIL ASSY.		DRAWING NO : 1-19-814-XXXXX	
REV 00			

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPPALLI 620014

QUALITY ASSURANCE

SIP:PP:14/01

PAGE : 1 of 3

**TESTING OF FLASH BUTT WELDS
(FOR PRE-PRODUCTION QUALIFICATION)**

1.0 SCOPE

- 1.1 This procedure details out the requirements for selection, testing and acceptance of FLASH BUTT welded joints (For pre-production qualification).

2.0 SELECTION

- 2.1 Three Test welds/shift (one each at the beginning, middle and end) shall be taken up for testing.

- 2.1.1 When production shifts are consecutive, a test at the end of the shift can be considered as the test for the beginning of the next shift.

- 2.2 The entire circumference of each test weld shall be cut along the axis of the tube into an even number of strips of sufficient length. The width of the strips shall be maintained as below:

Width (minimum) = $t + D/4$ for tube OD 51 mm & below
and $t + D/8$ for tube OD greater than 51 mm,
where "t" is the tube wall thickness and D is the outside diameter of the tube.

Width (maximum) = 38 mm

- 2.3 One edge of one strip from each test weld shall be polished to a 600 grit finish with the final grinding parallel to the long axis of the strip. The polished surface shall be macro examined at 5X magnification. No incomplete fusion or other open flaws on the polished surface are acceptable. Defects occurring on the base metal not associated with the weld may be ignored.
- 2.4 Half of the strips from each test weld shall be prepared as Root bend specimens and the remaining half shall be prepared as face bend specimens.
- 2.5 The bend specimen shall be subjected to the recommended Post Weld Heat Treatment.
- 2.6 The specimen shall be dressed flush on both sides, corners rounded smoothly and visually examined for complete fusion and absence of other open flaws.

3.0 TESTING AND ACCEPTANCE

- 3.1 The specimen shall be bent through 90 degrees over a former having diameter 3 times the tube wall thickness.

- 3.2 In the event of any change in the tube size, weld parameters/machine settings or welding operator during the shift, new specimens will be selected as explained in Cl. 2.0.
- 3.3 The test welds shall be considered acceptable if the sum of lengths of linear indications (voids, lack of adhesion, flat spots or cold shuts) revealed in bend test of the individual strips do not exceed 5% of sum of weld lengths tested.
- 3.4 Failure in the HAZ is not acceptable.
- 3.5 Non-metallic inclusions larger than 1.5 mm in length or diameter are not acceptable.

4.0 RETESTS

- 4.1 If a test weld fails to satisfy Cl. 3.3, 3.4 & 3.5, two additional test welds shall be tested.
- 4.1.1 Production welding can be proceeded after welding the pre-production test piece with the concurrence of QC only. In case production is continued and if the preproduction test piece fails to meet the requirements, the first two welds of the product made after the welding of the test weld shall be subjected to the bend tests. If both the weld pass the tests then the lot is accepted. In case any one of the sample test weld fails, the entire lot of welds represented by the test weld shall be quarantined. The causes of the failures shall be analysed by Shop and WTC and satisfactory test results shall be obtained. The deviation from these parameters shall be analysed. The quarantined lot shall be cut and rewelded. The welding shall be continued after satisfactory results are obtained with the modified parameters.
- 4.2 If an intermittent test weld fails, 2 welds each immediately before and after the failed test weld should be taken up for testing and tested for compliance. If any test weld fails, the entire lot of welds represented by the test weld shall be cut and rewelded.

5.0 RECORDS

- 5.1 The records of pre-production tests done shall be maintained.