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 : rrmanohar@bheltry.co.in Web : www.bhel.com

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620600063	**21.09.2006**	**30.10.2006**
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	High Productive Orbital Tube Welding Station as per the technical specification & commercial conditions applicable (to be downloaded from web site **www.bhel.com**)	3 Nos.	31.08.2007

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 "2620600063". 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 Dy. Genl. Manager / Capital Purchase / MM / Manufacturing

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF *ORBITAL TUBULAR COIL BUTT-JOINT WELDING STATION*

SECTION – I

The BIDDER is expected to give complete details against each clause in the table given below, with additional sheets those may be attached (giving clear reference number) to furnish and cover the requisite details / documents.

S. No.	PARTICULARS	VENDOR's RESPONSE
1.0	Profile of the Company bringing-out the years of Experience of the BIDDER in the field of machine design , manufacture and supply of CUSTOM BUILT ORBITAL STEEL TUBE BUTT-JOINT WELDING STATION involving welding head & tube end preparation machine handling, fixtures for setting for weld joint formation, pre-heating (process option), welding and data recording operations.	
2.0	Number of AUTOMATIC ORBITAL TUBE BUTT WELDING STATIONS supplied, installed and commissioned till date (with details on machine type / model, configuration, customer and quantity)	
3.0	YEAR of supply of latest AUTOMATIC ORBITAL TUBE BUTT WELDING MACHINE and the Technical Specifications of the Machine supplied.	
4.0	Number of AUTOMATIC ORBITAL TUBE BUTT WELDING STATIONS supplied, installed and commissioned till date for the CUSTOMERS who are mainly the manufacturers of Power Utility Boilers (of High Pressure Ratings), with brief technical specifications of the supplied machines.	
5.0	Details on the Firm's Registration and the FINANCIAL STRENGTH of the COMPANY (Balance Sheet for the last **3** years) shall be submitted with the TECHNICAL OFFER	

S. No.	PARTICULARS	VENDOR's RESPONSE
6.0	Details on International Standards / Design Process Codes followed in Design and Manufacture of the Equipment. [Copy of the English Version of relevant portion of the Standards / Codes followed, to be furnished with the Offer]	
70	Comprehensive Details (including Test Charts) on Performance Prove-Out Testing (which will be conducted at the time of INSPECTION by CUSTOMER ENGINEERS) - of the Equipment Offered, to be given with the Technical Offer.	
80	Details of Quality System followed [Furnish the salient aspects of the Quality Assurance System followed] from the stage of raw material / bought-out-item sourcing to final performance testing at BIDDER's works (coming in various stages of machine building) .	
9.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Addresses of Agents / Service Centres in India. Competency & Experience of the Local Service Agency are to be elaborated.	
10.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – II

The BIDDER has to meet the following requirements, in general, to get qualified for submitting an offer for ORBITAL TUBE BUTT-JOINT WELDING STATION

S. No.	REQUIREMENTS	VENDOR's COMMENTS
11.0	The BIDDER shall have a minimum of FIVE Years of Continuous Experience in the field of Design, Manufacture and Supply of AUTOMATIC ORBITAL TUBE BUTT-JOINT WELDING MACHINES.	
12.0	The BIDDER shall have supplied at least one number of AUTOMATIC ORBITAL TUBE BUTT-JOINT WELDING MACHINE (having almost/similar capacity and basic specifications given in PART B of the Technical Specifications) in the recent past, say in the last five years.	

S. No.	PARTICULARS	VENDOR's RESPONSE
13.0	Reference List of Customers and Performance Certificate (for a period not less than two years) from minimum two CUSTOMERS, with full contact details of CONTACT PERSON, for whom the BIDDER had supplied similar type of AUTOMATIC ORBITAL TUBE BUTT-JOINT WELDING MACHINES, are to be provided with the Technical Offer.	
14.0	BIDDER has to co-ordinate for the visit of BHEL Team (at BHEL Cost) to the Customer's Works (preferably Power Utility Boiler Manufacturer), to witness capability of an existing AUTOMATIC ORBITAL TUBE BUTT-JOINT WELDING MACHINE, if warranted.	
15.0	BHEL is specific about the materials of construction, basic design/dimensional aspects of various sections, structural parts, machine base, etc. forming part of the proposed tube welding station, as the machine is to be installed in a rough working environment in a major and heavy fabrication shopfloor. Hence complete details of machine building have to presented, during the technical discussions at BHEL, to meet BHEL specification requirements.	

SECTION – III

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

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
16.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical **[with PART A & PART B]** & Commercial and Price Bid.	
17.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' preferably with the copies of Product Catalogue, are to be enclosed.	

S.No.	REQUIREMENTS	VENDOR's COMPLIANCE
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 mere 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement [without any supporting technical write-ups, photos and datasheets] may lead to outright disqualification of the Technical Offer.	
19.0	The BIDDER / VENDOR shall assure a continuous support for the supply of SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works.	
20.0	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 of the inclusion of all the accessories, toolings, attachments, auxiliary parts, spares, consumables, etc. with the main and basic equipment, to meet the technical specification requirements.	
21.0	Any soft copy, giving the salient features of the proposed machine or equipment with all sub-systems and auxiliaries, and /or showing live-demo of an existing and working machine of similar configuration and capacity will be highly appreciated by BHEL.	
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 (Phone Number and E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	
24.0	In case of preliminary qualification of the offer, on technical grounds, the BIDDER may be called for a detailed technical discussion on the original technical offer at BHEL Works, with a notice period of not less than 2 weeks.	

PART B

TECHNICAL SPECIFICATIONS for AUTOMATIC ORBITAL TUBE BUTT-JOINT WELDING STATION [*including equipment handling system]*

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
1.0.0	**PURPOSE & APPLICATION**		
1.1.0	a. The welding station is intended to build up tubular coils (coming in high pressure steam boilers) by joining simple loops / circuits of tubes . [**ANNEXURE – 1 & 2** give typical loop/circuit and built-up tubular coil] b. The tubular loops or circuits are inter-connected by means of butt welding the tube ends , by keeping the loops/circuits in horizontally flat position. c. The welding station is expected to carry-out the following operations : 1. buffing and fine machining of tube ends for weld edge preparation 2. butt weld joint fit-up using mechanical fixtures 3. butt welding of weld joint by automatic orbital welding process 4. weld data logging and report generation		**[BIDDER is expected to give technical write up on welding station design, construction and operational features to bring out the capability of the proposed equipment, to meet the BHEL specification requirements]**
2.0.0	**WORK PIECE / JOB DETAILS**		
2.1.0	**TUBE DIMENSIONS**		
	Range of Diameter [O.D.]	31.8 mm to 76.1 mm	
	Range of Wall Thickness	2.4 mm to 15 mm	
	Width of Coil to be built-up	2750 mm [maximum]	
	Length of Coil to be built-up	20000 mm [maximum - 20 Metres.]	

<table>
<tr><th>S.No.</th><th>PARTICULARS AND BHEL SPECIFICATION</th><th>BIDDER'S OFFER
(with complete Technical Details)</th></tr>
<tr><td>2.2.0</td><td>ABSOLUTE TUBE SIZES
<table>
<tr><th>S.No.</th><th>OD, in mm</th><th>THICKNESS, in mm</th></tr>
<tr><td>1</td><td>31.8</td><td>3.2 / 3.6 / 4.0 / 5.0</td></tr>
<tr><td>2</td><td>38.1</td><td>3.2 / 4.0 / 5.0 / 6.3</td></tr>
<tr><td>3</td><td>44.5</td><td>4.0 / 4.5 / 5 / 6.3 / 8 / 9 / 10</td></tr>
<tr><td>4</td><td>47.63</td><td>5 / 6.3 / 8 / 10</td></tr>
<tr><td>5</td><td>51.0</td><td>3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12</td></tr>
<tr><td>6</td><td>54.0</td><td>3.6 / 4 / 4.5 / 5 / 6.3 / 8 / 10 / 12</td></tr>
<tr><td>7</td><td>57.0</td><td>4 / 5 / 6.3 / 8 / 10</td></tr>
<tr><td>8</td><td>60.3</td><td>4 / 5 / 6.3 / 8 / 10 / 12.5</td></tr>
<tr><td>9</td><td>63.5</td><td>4.8 / 5.6 / 6.3 / 10 / 12.5</td></tr>
<tr><td>10</td><td>76.1</td><td>7.1 / 10 / 12.5</td></tr>
</table></td><td>[NOTE :
All are OD (Outer Diameter) controlled tubes with a tolerance of maximum +18 %, on tube wall thickness.]</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>2.3.0</td><td>MATERIAL SPECIFICATION</td><td></td></tr>
<tr><td></td><td>A) CARBON STEEL : SA 192, SA 210A1, SA 210C [ASTM]

B) ALLOY STEEL : SA 209T1, SA 213T11, SA 213T22, T-23
SA 213T91, T-93

C) STAINLESS STEEL : SA 213 TP304H, SA 213 TP321H,
SA 213 TP347H</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>2.4.0</td><td>WELD JOINT DETAILS</td><td></td></tr>
<tr><td></td><td>a. Style of Edge Preparation : Refer to EP Styles given in ANNEXURE – 3
b. Tube End Condition : Machined in automatic end preparation line
c. Weld Joint Location : Length of straight portion on either side of weld joint ≥ 100 mm
c. Preheating Temperature : Minimum 200º C [for Alloy Steel Tubes only]
d. Weldment Testing Modes : Radiography and / or Ultrasonic Testing
e. Weld Quality Appraisal : As per ASME Section I, V and VIII (Division 1 & 2) for Radiography Test</td><td></td></tr>
</table>

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
3.0.0	**MACHINE OUTPUT / PRODUCTIVITY**		
3.1.0	BIDDER has to specify the minimum output of welded joints, possible from the workstation, for the tubes with the following dimensions/details, in a single shift of 8 hrs. [BHEL's expectation is a minimum of 35 to 40 joints] : a. Built-Up Coil Length : ≤ 20000 mm b. Width of Built-Up Coil : ≤ 2500 mm c. Weld Joint Style as per the EP Sketches : (Bevel – J) given in **ANNEXURE-3.** d. Tube Size :- 51.0 mm (OD) x 11 mm (wall thickness) **OR** 63.5 mm (OD) x 8 mm (wall thickness) e. Tube Material :- SA213T91 , SA213T22, SA 213 TP347H		
4.0.0	**WELDING STATION CONFIGURATION**		
4.1.0	Each Welding Station shall consist of the following equipment & facilities :		
	Main Manipulator / Gantry Structure for Machine/Tool Handling	1 No.	
	Automatic Welding Machine with Controls & Data Recording Unit	1 No.	
	Tube End Buffing / Edge Preparation (EP) / End Finishing Unit	2 Nos.	
	Tube Butt Joint Fit-Up Fixture / Job Clamping Unit	2 Nos.	
	Tungsten Electrode Grinder	1 No.	
	Floor mountable Rails for the Manipulator / Gantry Structure	1 set	
	Inter-connecting Cables and Hoses	2 sets	
	Accessories / Clamping Devices Buffing / End Finishing Unit	1 set	
	Consumables / Tool Bits required for all operations	1 set	
	Air Booster with FLR Unit and Moisture Trap (if warranted)	1 set	
	Operating and Service Tool Kit	1 set	
	Tube Pre-Heating Unit with Setting & Recording Devices	1 set	
	Provision of Vision System for viewing the location of weld torch with respect to the weld groove	1 No.	
	An IBM make LAPTOP Computer of latest version (for software & data handling) and NIKON make 8.1 Mega Pixel Digital Camera with Accessories (for picturisation of welds and cross sections)	1 set	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
4.2.0	**MAIN MANIPULATOR / GANTRY / CANTILEVER STRUCTURE**		
4.2.1	Purpose	The manipulator/gantry structure is required to hold the orbital welding head, buffing / machining unit, job holding fixture / clamping unit, etc. envisaged for the easy positioning and handling of the sub-systems required to carry-out the butt welding at locations which will be arbitrarily coming up in the tubular coils' design.	
4.2.2	Schematic Lay-Out	a. The work-station is expected to be laid out in such a fashion that two coils (each within an envelope of 20 Mtrs. X 3 Mtrs.) are to be simultaneously taken up for build-up by butt welding (such that when welding is taken up on one job, other welding preparatory works are carried out on a second coil or on a second joint located at a farther point) . b. The BIDDER is expected to suggest one or two alternative proposals so that a higher productivity is achieved with minimum physical fatigue / strain experienced by the operator. c. The jobs (tubular loops or circuits) are to be laid on stands so that the working height is at 1200 mm and the manipulator / cantilever / gantry structure covers the entire profile of the tubular coil geometry (which is under build-up)	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
4.2.3	Design Features	The BIDDER has to provide the following details : a. Axes of movement to cover the job profiles b. Traverse Speed for each Axis of movement c. Traverse Stroke for each Axis of movement d. Facilities (like Spring Balancers) for holding Welding Head, Weld Control Pendant, Buffing/Fine machining Unit, Clamping Fixture, etc. e. Weight Carrying Capacity and Working Length for each tool or equipment from the manipulator / gantry structure f. Clamping mechanism (hydraulically or pneumatically operated) for tube butt-joints without tack weld and to facilitate automatic orbital welding g. Schematic Diagram of the offered gantry / cantilever type structure or manipulator, to carry-out the welding operations.	
4.3.0	**BUFFING UNIT**		
4.3.1	Purpose	The buffing unit is to remove rust and paint from the surface of the tube, near the weld edge prepared location, prior to welding	
4.3.2	Type	Flap Wheel or a better option (to be specified)	
4.3.3	Buffing Stroke	50 mm	
4.3.4	Buffing Wheel Drives	Electric or Pneumatic (Electric drive is preferred with 230 V / 110 V AC Single Phase Supply)	
4.3.5	Technical Details	Bidder to specify a. Drive Motor Rating & Speed b. Buffing Wheel Size	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
4.4.0	**TUBE END FINE MACHINING / EDGE PREPARATION UNIT**		
4.4.1	Purpose	The tubular loops or circuits transferred to the Orbital Welding Station will have tube ends with edge preparations suitable for butt welding. Due to handling and other reasons, these tube ends may have to be trimmed and remachined (with little metal removal to make a perfect joint) prior to welding.	
4.4.2	Type of Machining Unit	Electric (with 230 V / 110 V AC Single Phase Supply) or Pneumatic (with air supply at a pressure of 60 to 70 PSI)	
4.4.3	Type of Edge Preparation	'V' or 'J' Style Weld Groove	
4.4.4	Operations	Beveling, ID truing, J –Cutting, land facing	
4.4.5	Clamping	On Outside Diameter of Tubes	
4.4.6	Feed	Manual hand wheel feed on upper side	
4.4.7	Motor Rating & Speed	Bidder to specify	
4.4.8	Tool Package	For 37½ ° & 45° bevels, J Type Cutting	
4.4.9	Clamping Jaws	To suit each Tube O.D.[see **Clause No.2.2.0**]	
4.4.10	Power Cable (if electrically powered)	Electric Supply through 3-Core cable from a common point with suitable voltage	
4.4.11	Compressed Air Hose (if pneumatically operated)	For connection to the end preparation unit & FRL unit with quick coupling	
4.5.0	**LOOSE COIL / LOOP SUPPORTING TABLES**		
4.5.1	Purpose	Each tubular coil may consist of 6 to 8 loops / circuits, which are to be butt welded to form the final tubular coil as given in the **ANNEXURE-2.** These loose circuits / loops are to be conveniently spread on a work table to see that the butt-joints are fitted up and welded.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
4.5.2	Work Table	The proposed work table shall be suitable for working with the Manipulator / Gantry / Cantilever Structure described under the **Specification Clause No. 4.2.0**	
4.5.3	Job Clamping Units	a. The work station table shall have the clamping devices (hydraulically or pneumatically operated) to hold the tube butt joint in position during the orbital welding operation. b. The design of the Clamping Device shall such that it does not foul with the welding head or the job loops.	
4.5.4	Axial Clearance between clamp jaws	To suit the orbital welding head	
4.5.5	Radial clearance between adjacent tubes in the coil	Bidder to specify most minimum clearance possible . [The clamp body & jaws should be narrow enough to clamp tubes having radial clearance of minimum 50 mm - **preferred**]	
4.5.6	Working Height	The working height for the operator shall be 1200 mm from the floor.	
4.5.7	Offer Details	a. The BIDDER has to quote for the entire system including the clamping devices and work tables. **OR** b. BIDDER has to supply the Clamping Devices and provide Manufacturing Drawings for the Work Table for manufacture by BHEL	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
5.0.0	**ORBITAL WELDING HEAD AND CONTROL SYSTEM**		
5.1.0	**POWERSOURCE**		
5.1.1	Type	Micro-processor controlled, Programmable, Inverter type	
5.1.2	Make & Model	Bidder to specify	
5.1.3	Switching Frequency	Bidder to specify	
5.1.4	Welding Process	GTAW, DC Straight Polarity, Constant Current	
5.1.5	Memory	99 Welding Programs	
5.1.6	Multiple Parameter Values within a program (for sectoral programming)	Bidder to specify number of programmable levels	
5.1.7	Welding Data Entry	Through a 'dust & moisture proof' Membrane Key Pad	
5.1.8	Front Panel Display (in English)	Bidder to describe	
5.1.9	Output Current Range	3 to 200A [D.C.] @ 100%	
5.1.10	Current Accuracy	±1% of setting	
5.1.11	Welding Voltage Range	5 to 20 VDC @ 200A	
5.1.12	Gas Pre-flow / Gas Post-flow Time	0 to 99 sec	
5.1.13	Current Pulse Frequency	0.05 to 50 pulses / sec	
5.1.14	Pulse Current Time	0.01 to 10 sec	
5.1.15	Background Current Time	0.01 to 10 sec	
5.1.16	Current Up-slope / Down-slope Time	0 to 99 sec	
5.1.17	Time setting for each current level	0 to 999sec	
5.1.18	Rotation Start / Stop Delay	0 to 99 sec	
5.1.19	Wire Feed Start / Stop Delay	0 to 99 sec	
5.1.20	Torch Rotation Speed	0 to 250mm/min	
5.1.21	Torch Rotation Speed Regulation	±1% of setting	
5.1.22	Filler Wire Feed Speed	Bidder to Specify	
5.1.23	Filler Wire Feed Speed Regulation	±1% of setting	
5.1.24	Torch Oscillation Speed	Bidder to Specify	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
5.1.25	Oscillation Dwell Time at both ends (independently adjustable)	Bidder to specify	
5.1.26	AVC Function	±1% regulation	
5.1.27	Programming increments for welding current & time parameters	0.1 Amp. / 0.1 Sec.	
5.1.28	Welding parameter override during welding	Programmable limits (Bidder to specify range)	
5.1.29	High Frequency Unit	For arc starting	
5.1.30	Water Cooling Unit for Torch [Bidder to check for Gas Cooling provision]	Built-in and of suitable capacity for the weld head and torch	
5.1.31	Gas hose with end fittings – Gas cylinder to power source	Length to suit long travel on cable festoon	
5.1.32	Gas Flow Setting	Gas flow meter with gas solenoid operating push button switch for presetting gas flow rate, provided on the Front Panel	
5.1.33	Fault Protection Sensors	For gas & cooling water flow	
5.1.34	Arc Sensing	Bidder to specify means & modes for arc initiation and sensing	
5.1.35	Welding Speed Selection	Automatic calculation and setting of rpm based on tube outside diameter & welding speed	
5.1.36	Data Logger [with facility to retrieve weld parameters for each pass/joint]	Shall be Built-in. Bidder to specify	
5.1.37	Maximum Number of Data Log Files in Memory	Bidder to specify	
5.1.38	Printer (for weld data)	Built-in	
5.1.39	Safety Lock	Key lockable switch – Programming / Operation / Lock	
5.1.40	EMI Interference Suppressor	Bidder to specify the details for EMI suppression in input supply line	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
5.2.0	**WELDING HEAD**		
5.2.1	Type	Low profile tube orbital welding head of rugged construction	
5.2.2	Rating	200A 100% duty cycle	
5.2.3	Cooling for Torch & Body	Water cooled	
5.2.4	Multi-segment Clamp Ring Type Mounting on Tube	For easy mounting / dismounting of head	
5.2.5	Axial Clearance	200 mm [BIDDER requested to quote for an Unit suitable for 100 mm, as an OPTIONAL Head]	
5.2.6	Radial Clearance	Bidder to specify minimum required for reliable operation. **[Job calls for a minimum clearance of 50 mm]**	
5.2.7	Servo controlled Oscillation & Dwell Stroke Length (20mm) Speed Dwell Time	Bidder to specify	
5.2.8	Servo Controlled AVC	20mm stroke	
5.2.9	Servo Controlled Rotation Motor	Speed 0 to 250mm/min	
5.2.10	Cross Seam Adjustment	Bidder to specify range	
5.2.11	Servo Controlled Synchronized Pulsed or Continuous Wire Feed Motor (on board)	Bidder to specify	
5.2.12	Wire Size	0.8, 0.9 & 1.0mm	
5.2.13	Wire Nozzle Adjustment (Manual)	Vertical, horizontal & angular	
5.2.14	Lead / Lag adjustment	± 15°	
5.2.15	Tilt In / Out	± 10°	
5.2.16	Wire Nozzle and its mounting arrangement	Shall be capable of withstanding the high temperatures without loosening	
5.2.17	Wire Spool Carriers	Low Profile, head mounted	
5.2.18	Miniature Wire Spools	500gms	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
5.2.19	Tungsten Electrode Size	Ceriated Tungsten Electrode Size 2.0mm and 2.4mm [or further suggested by the BIDDER]	
5.2.20	Tungsten Tip included angle	15 Deg. to 30 Deg.	
5.2.21	Cable and Hose Package	The cable and hose package for the welding head shall be adequately sheathed with heat and abrasion resistant material. It shall withstand repeated winding / rewinding while in operation	
5.2.22	Number of Coiling Required	The welding head and cable winding shall be suitable for continuous operation for 6 passes on the tube without interruption	
5.2.23	Thermal Stability	a. All the metallic and non-metallic components of the welding head shall withstand the intense heat radiation during above welding b. Bidder to specify minimum arcing hours / number of joints before replacement	
5.3.0	**REMOTE OPERATOR PENDANT**		
5.3.1	Features	Pendant shall contain the following controls : a. Selector Switch: Weld / Setting b. Welding Program Access & Selection c. Gas purge switch for gas flow setting d. Inching operation for head rotation & wire feed e. Welding current up/down (manual override) f. Sequence Start / Stop g. Emergency stop h. Display of welding parameters	

S.No.	PARTICULARS AND BHEL SPECIFICATION			BIDDER'S OFFER (with complete Technical Details)
5.4.0	**CHART RECORDER WITH INTERFACE CABLE**			
5.4.1	Purpose	For real time recording of weld current, pulse current, time, arc voltage, wire feed speed and rotation speed		
5.4.2	No of Channels	6		
5.5.0	**TUNGSTEN GRINDER**			
5.5.1	Type	Bench Mounting, Motor operated		
5.5.2	Electrode to be ground	Ceriated Tungsten		
5.5.3	Tungsten Diameter	2.0mm, 2.4mm		
5.5.4	Tungsten Grinding angle	15 to 30 degrees		
5.5.5	Dust Extraction System	Fitted to the machine		
6.0.0	**ELECTRICAL & ELECTRONICS SYSTEMS**			
6.1.0	415V ± 10%, 50HZ +/-3 Hz, 3 Phase AC **[3 wire system without neutral]** power supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply during construction of foundation.		Vendor to confirm	
6.2.0	Tropicalization**:** All electrical / electronic equipment shall be tropicalized.		Vendor to confirm	
6.3.0	All electrical & electronic control cabinets & panels should be dust and vermin proof		Vendor to confirm	
6.4.0	All electrical components in the cabinets should be mounted on DIN Rail		Vendor to confirm	
6.5.0	Control circuit voltage shall not exceed 110 V.		Vendor to confirm	
6.6.0	All Electric enclosures shall have IP 54 protection		Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
6.7.0	All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220 V, 5/15 Amp AC. All adapters /receptacles should have compatibility with Indian equivalents.	Vendor to confirm	
6.8.0	All motors shall be of any of the following makes : M/S Siemens / Asea Brown Boveri / GE or other makes conforming to IEC standards	Vendor to confirm	
6.9.0	All cables moving with traversing axes should be installed in Caterpillar / Drag Chain arrangement. Additionally, all the cable trays required for laying of cables should be included in the offer.	Vendor to confirm	
6.10.0	Vendor should ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
7.0.0	**SERVO VOLTAGE STABILIZER - OPTIONAL ITEM**		
7.1.0	Indian make Oil / Air Cooled servo Controlled Voltage Stabilizer suitable for complete machine, its drives, controls, PLC etc with no undesirable Harmonics in the stabilizer output.	Vendor to confirm	
7.2.0	Make. : NEEL / DELTA / AEI / POWER AID	Vendor to confirm	
7.3.0	Model & Rating (Suitable for the machine load. Vendor to specify the noise level also)	Vendor to Specify	
7.4.0	Spares Package for the Voltage Stabilizer for 2 years working should also be offered.	Vendor to submit	
8.0.0	**PRE – HEATING SYSTEM - OPTIONAL ITEM**		
8.1.0	A suitable tube pre-heating unit to be offered with modular type induction coil heating arrangement, so as to attain a temperature of 200 Deg. C prior to welding. Technical Details are to be provided.		

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
8.2.0	Associated temperature pre-setting device and actual measured value display unit are to form part of the supply.	Vendor to confirm	
8.3.0	Technical Details are to be provided fo rthe whole offered pre-heating system.	Vendor to specify	
8.4.0	Spares Package for the pre-heating system for two years working shall also be offered.	Vendor to submit	
9.0.0	**DIAGNOSTIC SYSTEM**		
9.1.0	**TELE-DIAGNOSTIC SERVICE**		
9.1.1	a. Tele-diagnostic service shall be provided thro' International Telephone Line along with required Hardware/Software package for the supplied PLC/CNC system for remote diagnosis & correction of the problems in PLC of the m/c. This shall be provided free of charge for the guarantee period. b. The Vendor shall inform terms and conditions for the service after guarantee period. Subsequently, it should be possible to use other platforms, such as Internet or ISDN, subject to their availability in future. BHEL will provide the necessary telephone line near the machine.	Vendor to confirm	
9.2.0	**FAULT DIAGNOSTIC SYSTEM**		
9.2.1	Vendor's own diagnostic system with required hardware & software shall be supplied and installed in the Control System. This shall include customized auto-diagnostic system, which shows detailed cause and remedy for the fault on the display for faults related to mechanical and electrical maintenance.	Vendor to confirm	
9.2.2	Help guide shall be provided to use both diagnostic systems	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
10.0.0	**PNEUMATIC CIRCUITS**		
10.1.0	Basic Requirements	a. Pneumatics forming part of the machine and associated equipment shall be connected by nylon reinforced synthetic rubber and / or steel tubes. b. BHEL will terminate the shop compressed air supply at the hand wheel valve to be provided by the supplier. Pneumatic Circuit to originate from this common point and supplier has to provide a suitable Filter / Regulator /Lubricator Unit and in addition a hand wheel valve. c. The compressed air will be at a pressure of 60 PSI to 70 PSI . All pneumatic systems on the machine shall be designed to operate efficiently at this air pressure or Bidder should provide an air booster to maintain the air pressure. d. Service air moisture trap to admit moisture free air supply to machine. Bidder to specify/provide along with the FLR unit e. All pneumatic components shall be of reputed make like FESTO / NOGRAN	
11.0.0	**HYDRAULIC SYSTEM**		
11.1.0	BIDDER has to strictly adhere to the specifications listed under **ANNEXURE-4**, giving the requirements for Hydraulics Design and Construction.	Vendor to Confirm	
11.2.0	Hydraulic system should be centralized.	Vendor to Confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
11.3.0	Hydraulic Tank shall be located at floor level with hydraulic pipelines neatly laid out (Technical Details should be furnished in the offer)	Vendor to Confirm	
11.4.0	Make Rexroth / Vickers Sperry or equivalent from a reputed manufacturer. (Details to be submitted)	Vendor to specify	
11.5.0	Quick-Fix type End Couplings are to be used for inter-connections and shall be of international standards.	Vendor to specify	
11.6.0	Hydraulic circuits shall be designed with minimum number of control valves and to suit oil of ISO VG 46 or 68 only. Also minimum number of check-points to be provided wherever pressure is required to be read for setting and trouble shooting. MINIMESS Pressure Gauge - 1 No with Connecting Hose to be provided.	Vendor to confirm	
11.7.0	The control voltage for all solenoid operated valves	24 V DC	
11.8.0	Automatic shut off provision, failure indication , etc..	Vendor to specify	
11.9.0	Cooling system of sufficient capacity to maintain complete Hydraulic System, including lubrication oil, hydrostatic oil and gearbox oil, etc. at a temperature not exceeding 50 deg C irrespective of the ambient conditions. Complete details should be submitted	Vendor to specify	
11.10.0	Filtration System and Hydraulic Pump Capacity	Vendor to specify	
11.11.0	Each pump should have an independent motor. Tandem pumps should not be used	Vendor to specify	
11.12.0	**First filling of all required Oils & Grease** shall be supplied by vendor. Indian equivalent & specifications of oils/ greases are also to be provided by the vendor.	Vendor to specify	
12.0.0	**IN-BUILT SAFETY ARRANGEMENTS**		
12.1.0	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
12.2.0	A detailed list of all alarms / indications provided on machine should be submitted by the Vendor.	Vendor to specify	
12.3.0	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to Confirm	
12.4.0	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, work piece and the operator due to the malfunctioning or mistakes.	Vendor to specify	
12.5.0	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm	
12.6.0	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	
13.0.0	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE**		
13.1.0	The Machine should confirm to following factors related to environment:	Vendor to Confirm	
13.2.0	Maximum noise level shall be 85 dB(A) at normal load condition, 1 meter away from the machine with correction factor for back ground noise.	Vendor has to demonstrate	
13.3.0	There shall not be any emissions from the machine except fumes of welding during butt welding.	Vendor to confirm	
13.4.0	Paint of the machine should be oil / coolant resistant and should not peel off and react with gases/fumes.	Vendor to confirm	
14.0.0	**MACHINE LEVELLING & ANCHORING SYSTEM**		
14.1.0	Complete anchoring system including foundation bolts, anchoring materials, fixators, levelling shoes etc should be supplied	Vendor to specify	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
15.0.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE**		
15.1.0	The Vendor shall bring special tools and equipment required for erection of the machine. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm	
15.2.0	Any Test mandrel required for checking & alignment of the machine components etc. should be supplied	Vendor to confirm.	
16.0.0	**MACHINE SPARES**		
16.1.0	Itemized break-up of mechanical, hydraulic, electrical and electronic spares used in the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis shall be offered by vendor. The list is to include following, in addition to other recommended spares: **(Unit Price for each item of spare shall be offered)**	Vendor to confirm	
16.2.0	**Mechanical & Hydraulic Spares:** All types of Pumps, Valves, Pressure Switches, Transducers, Flow Switches, Filters, Seals, O-rings, Hydraulic Hoses etc.	Vendor to confirm	
16.3.0	**Electrical / Electronic / PLC Spares:** All types of Printed Circuit Boards, Relays, Contactors, Proximity Switches, Push Buttons, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Encoders, Indicating Lamps, Spares for PLC System, Servo Motors for Feed Drives, Power Module & Control Cards for Drives etc.	Vendor to confirm	
16.40	Recommended set of spares for all attachments are to be offered with details.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
16.5.0	All types of spares for total machine and accessories shall be available for at least ten years after supply of the machine. If machine or control is likely to become obsolete in this period, the vendor should inform BHEL sufficiently in advance and provide drawings of parts / details of spares & suppliers to enable BHEL to procure these in advance, if required	Vendor to confirm	
16.6.0	Vendor to confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm	
17.0.0	**MACHINE DOCUMENTATION**		
17.1.0	O & M Manuals	a. Three Copies of the Operation & Maintenance Manual to be given in Hard Bound Paper Copies with three copies in CD form (SOFT COPY) , for EACH WORK-STATION. b. One Hard Copy of O & M Manual shall be submitted at the time of INSPECTION of the Orbital Welding Station by BHEL Officials, at the Supplier's Works. c. The following documents and details [given under the **Clause Sl. No. 17.2.0**] shall form part of the Operation & Maintenance Manual	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
17.2.0	Documents and Technical Details	a. GA Drawing of the Orbital Welding Station. b. GA Drawing of Individual Sub-Systems and 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 in hard & soft copy. f. PLC Ladder Diagrams (Soft Copy) with Flash Memory Card for m/c operation logic backup. g. PLC Ladder Diagrams (Hard Copy) h. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls in CD. 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. k. PLC of Allen Bradley, Siemens, Fanuc is only required. l. Fault diagnostics and remedies and on line sequence of operations should be displayed in HMI unit. m. Flash memory card for CPU of PLC to be ensured. n. Specifications/Ratings of All Bought-Out-Items. o. Warranty / Guarantee Card for all Bought-Out-Items.	

S. No.	PARTICULARS AND BHEL SPECIFICATION			BIDDER'S OFFER (with complete Technical Details)
17.2.0	Documents and Technical Details	p. Trouble Shooting Chart for Main and all Sub-Systems. q. Machine related PC Details – Machine Operating Softwares, Parameters Selection Software, File Handling, and Display Recording. CD Read and Write unit, Serial and USB Ports to be ensured. r. UPS is required for 1 hour back up time for PC and PLC datas. s. Total weight of the Machine & Sub-Systems.		
18.0.0	**TRAINING**			
18.1.0	The Vendor shall train Four BHEL's Engineers in Operation and Maintenance (Mechanical, Electrical/ Electronics and PLC System) of the Machine at Vendor's works, for not less than 10 working days.		Vendor to confirm	
18.2.0	The Vendor shall impart training to BHEL's Machine Operators and Maintenance crew in Operation and Maintenance after the commissioning of the Machine at BHEL works for not less than 15 working days		Vendor to confirm	
18.3.0	Airfare, boarding & lodging for the BHEL Trainees shall be borne by BHEL.		Vendor o Confirm	
18.4.0	Vendor to quote for training on per man per week basis for training at vendor's work		Vendor to confirm	
18.5.0	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel		Vendor to Confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
19.0.0	**MACHINE ERECTION & COMMISSIONING**		
19.1.0	Vendor to take full responsibility for supervision of the erection, vendor shall start up, test the machine, it's control & all types of other supplied equipment, carrying out welding of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by Vendor in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL.	Details of these requirements should be informed by Vendor in advance	
19.2.0	Erection & Commissioning of Voltage stabilizer & Isolation Transformer shall also be responsibility of the Vendor.	Vendor to confirm	
19.3.0	Successful proving of BHEL Requirements by the Vendor shall be considered as part of commissioning. All tests, as mentioned in **SPECIFICATION CLAUSE No. 21.0.0** shall form part of commissioning activity.	Vendor to confirm	
19.4.0	Tools, Tackles, Test Mandrels, instruments and other necessary equipment required to carry out all above activities should be brought by the Vendor.	Vendor to confirm	
19.5.0	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor on returnable basis.	Vendor to confirm	
19.6.0	Portion, if any, of the machine, accessories and other supplied items where paint has rubbed off or peeled during transit or erection should be repainted and merged with the original surrounding paint by the vendor. For this purpose, the Vendor shall supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm	

S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
19.7.0	Schedule of Erection and Commissioning (E & C) shall be submitted with the offer.	Vendor to confirm	
19.8.0	Charges, terms & conditions for E&C shall be given (in detail) separately by Vendor along with offer.	Vendor to confirm	
20.0.0	**AMBIENT CONDITIONS & THERMAL STABILITY**		
20.1.0	The Orbital Welding Station 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).	Vendor to confirm	
20.2.0	Weather conditions are tropical, Atmosphere may be dust laden. Machine shall be kept in the normal shop floor condition. The ENTIRE EQUIPMENT shall be TROPICALISED in Design and CONSTRUCTION. [The offered machine shall be suitable for the above and details of provisions on the machine for the same are to be furnished by Vendor]	Vendor to confirm	
20.3.0	The machine, including attachments and accessories, should be suitable for 24 hrs. Continuous operation to its full capacity for 24 hour a day and 7 days a week throughout.	Vendor to Confirm	
21.0.0	**MACHINE PERFORMANCE PROVE-OUT**		
21.1.0	a. The prove-out trials of the welding operation shall be for the tubular coils / circuits or for other sizes given by BHEL during the technical discussions / at the time of releasing the Purchase Order. b. The production rate expected out of the machine, as detailed under the **Specification Clause No. 3.0.0**, will be the base.	Vendor to confirm	

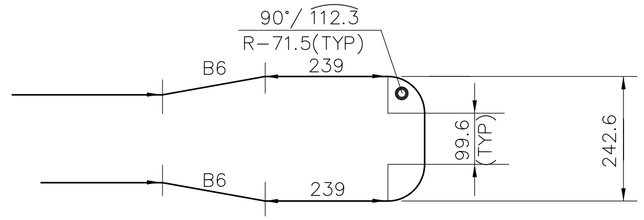
S. No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with complete Technical Details)
22.0.0	**MACHINE PACKING**		
22.1.0	Sea worthy & rigid packing for all items of complete machine, control system, all accessories and other supplied items to avoid any damage/loss in transit. When machine is dispatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	
23.0.0	**GUARANTEE TERMS**		
23.1.0	Performance Guarantee for a minimum period of 24 months (for the machine in total and sub-systems or bought-out items in particular) from the date of acceptance of the machine.	Vendor to confirm	
24.0.0	**GENERAL POINTS**		
24.1.0	Machine Model Number and other related details	Vendor to provide	
24.2.0	Total Connected Load (in kVA)	Vendor to specify	
24.3.0	Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify	
24.4.0	Painting of Machine and Electrical Panel – RAL 6011 Apple Green (Polyurethane Paint)	Vendor to confirm	
24.5.0	Total Weight of the Machine & Accessories	Vendor to specify	

Enclosures:

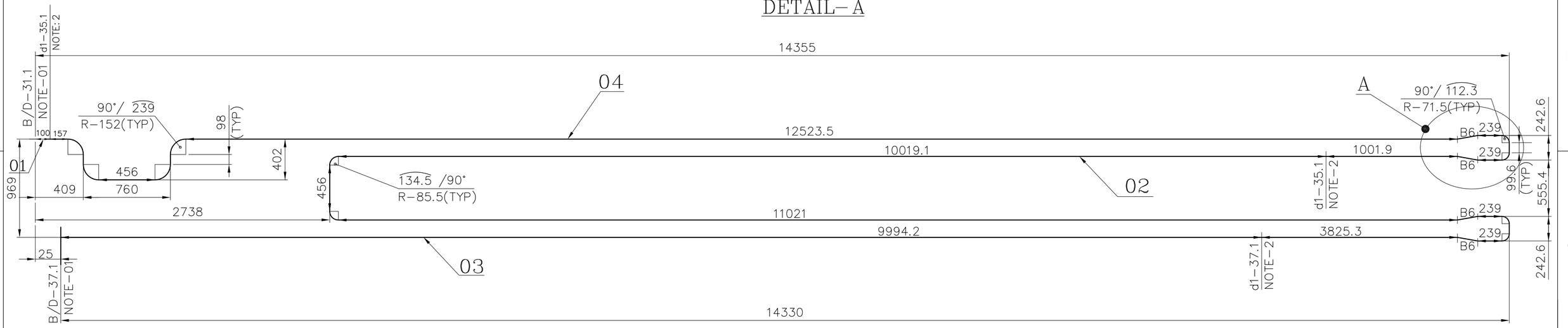
ANNEXURE - 1 : Typical Loops or Circuits
ANNEXURE - 2 : Typical Coil to be built-up by Orbital Welding
ANNEXURE - 3 : Tube End Edge Preparation Styles
ANNEXURE - 4 : Hydraulics Design & Construction [Hydraulic Circuitry]

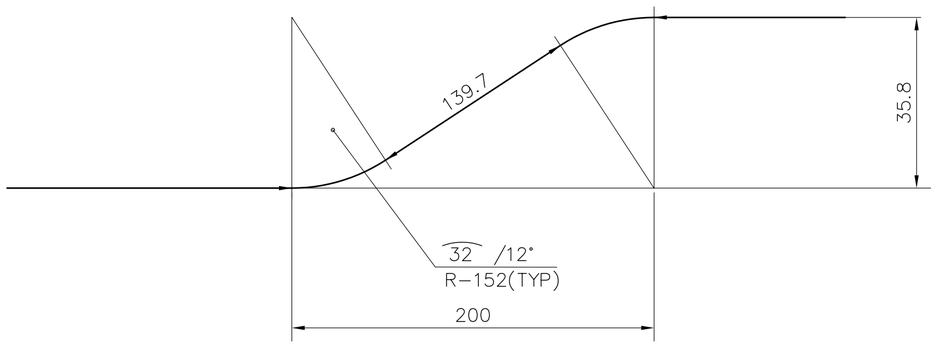
DRAWING NO:

FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER PLANT STD. NO TP 023 0299



DETAIL- A





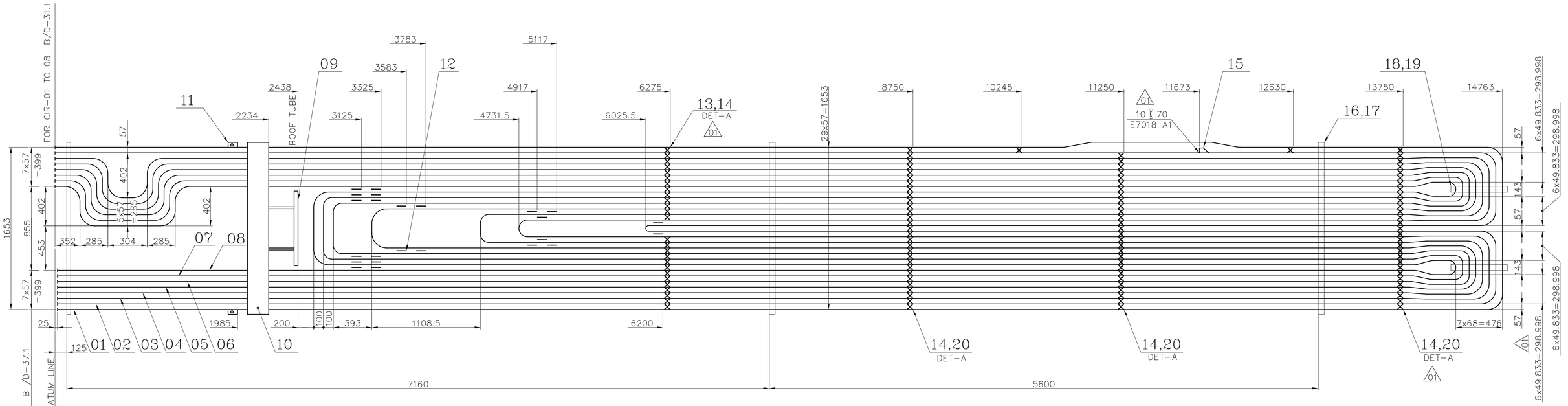
DETAIL- B6

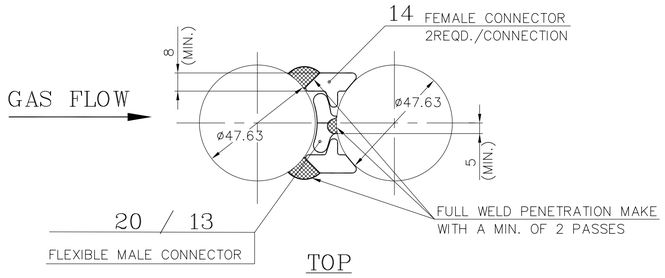
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C/P	UNIT / QUANTITY	UNIT WEIGHT	GS	ZONE
	04	TUBE D47.63x6.0; 16500 LONG				15-092-043	A		107.800		
						SA 213 T91		DI	1		
	03	TUBE D47.63x5.0; 9994.2 LONG				15-189-064	A		152.150		
						SA 213 T22		DI	1		
	02	TUBE D47.63x8.0; 26800 LONG				15-189-076	A		146.950		
						SA 213 T22		DI	1		
	01	TUBE D47.63x8.0; 100 LONG				15-189-076	A		0.830		
						SA 213 T22		DI	1		

CIRCUIT

DRAWING NO:

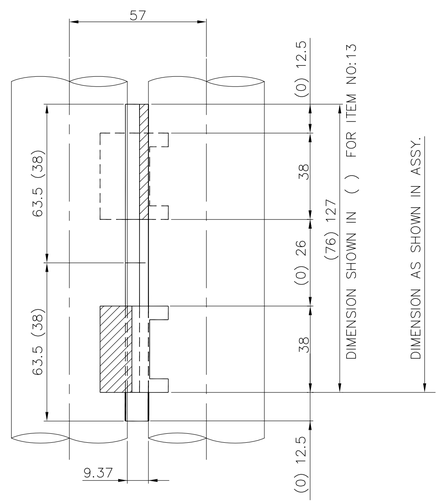
FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER PLANT STD. NO TP 023 0299





TOP

GAS FLOW



DETAIL-A

DESIGN PRESSURE : 176.8 KG/CM^2(G)

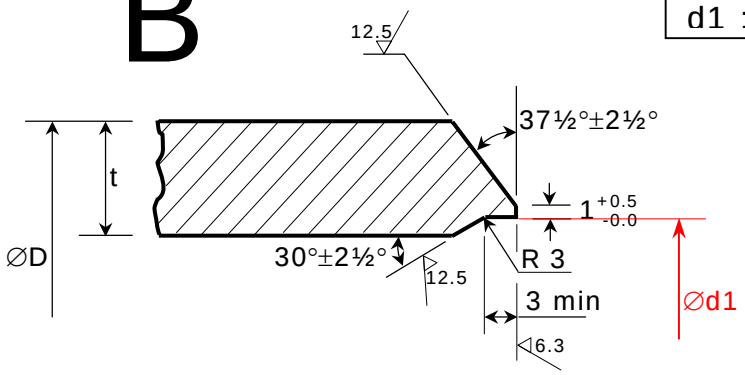
VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C/P	UNIT / QUANTITY	UNIT WEIGHT	GS	ZONE
	18	ISA 6X50X50; 535 LONG				15-013-156			2.400		
						IS2062FE410WA			2		
	17	PLATE 6X50; 1830 LONG				15-011-092			4.300		
						IS2062FE410WA			3		
	16	ISA 6x50x50; 1735 LONG				15-013-156			7.800		
						SA2062FE410WA			3		
	15	SUPPORT LUG		6112-2042-21		92-013-183	C		0.220		
						SA351GR.CH20			1		
	14	FLEX.CONNECTOR (FEMALE)		4-11-395-00503		92-051-023	C		0.040		
						SA351GR.CH20			228		
	13	FLEX.CONNECTOR (MALE)		6112-0032-21		92-005-432	C		0.040		
						SA351GR.CH20			26		
	12	TIE LUG		6112-0030-23		94-287-003	C		0.100		
						SA387GR.22CL2			24		
	11	LIFTING LUG		6112-4020-22		94-182-005	C		0.550		
						SA387GR.22CL2			2		
	10	ROOF SEAL BAND		3-11-278-02188/01		15-942-266	C		15.800		
						SA387GR.22CL2			2		
	09	HEAT SHIELD		3-11-278-02251					3.260		
						WELDMENT			1		
	08	CIRCUIT-08		2-11-278-09533					384.130		
						WELDMENT			1		
	07	CIRCUIT-07		2-11-278-09532					407.730		
						WELDMENT			1		
	06	CIRCUIT-06		2-11-278-09531/01					386.330		
						WELDMENT			1		
	05	CIRCUIT-05		2-11-278-09530					380.330		
						WELDMENT			1		
	04	CIRCUIT-04		2-11-278-09529					365.330		
						WELDMENT			1		
	03	CIRCUIT-03		2-11-278-09528/01					360.930		
						WELDMENT			1		
	02	CIRCUIT-02		2-11-278-09527/01					339.730		
						WELDMENT			1		
	01	CIRCUIT-01		2-11-278-09526					242.210		
						WELDMENT			1		
	20	FLEX.CONNECTOR (MALE)		4-11-078-01791/01		92-051-040	C		0.130		
						SA351GR.CH20			88		
	19	PLATE 6X50; 631 LONG				15-011-092			1.500		
						IS2062FE410WA			2		

SH. VERTICAL PLATEN ASSY.

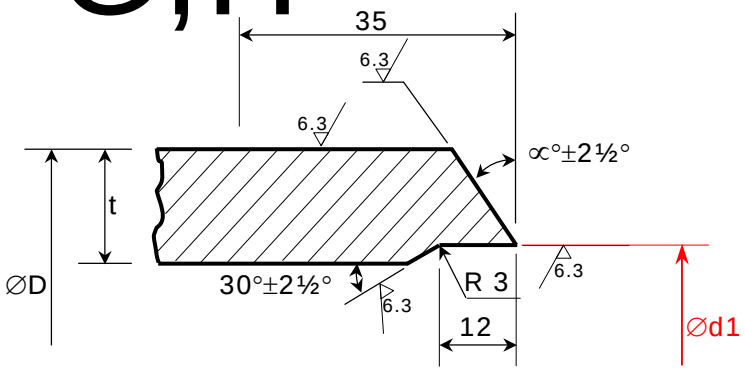
TUBE EDGE PREPARATION DETAILS

D : Tube OD
t : Tube thickness
d1 : Bore ID

B

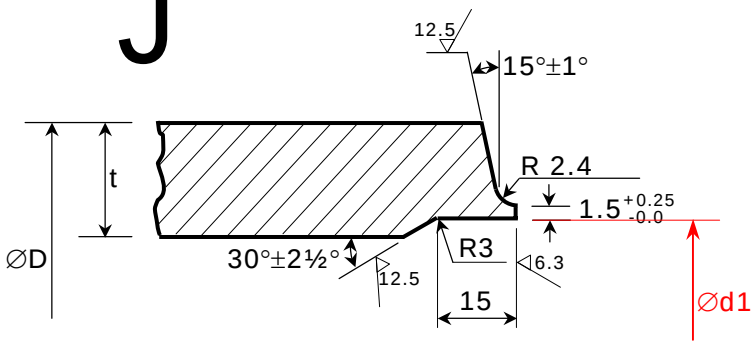


G,H



∝ = 37½° for t≤ 5.6mm
∝ = 45° for t>5.6mm

J



ANNEXURE - 4

HYDRAULICS DESIGN and CONSTRUCTION *:* -

1. All the power packs, manifold/valve cartridges, pressure & flow regulation stations are to be separately kept away from the machine. The cylinders, hydraulic heavy pressure joints are to be ensured with welded nipple joints.

2. Provisions and suitable clamping are to be made properly for dampening and arresting the vibrations induced and transmitted to the hydraulic joints.

3. The proposed hydraulic hoses and the joints are to be of metric size with male swivel nut and female adaptor on the cylinder ends with leak proof fittings. No ferrule joints are to be proposed in the hydraulic system.

4. All hydraulic pumps for the power packs should be loaded only during the times of machine operational requirement and to be in the unloaded condition, during ideal running conditions. All hydraulic pumps should have 100% standby provisions.

5. All hydraulic power pack return oil from cylinders, relief valves, hydro motors and other hydraulic valves are to be routed through a common return line to the oil tank. For oil cooling arrangement, the return oil to the tank can be routed through a suitable cooler/chiller unit to maintain the oil temperature below 40/45 °C, as the machine has to work in a TROPICALISED CONDITION throughout the year.

6. The hydraulic valves input oil viscosity and micron level cleanliness has to be clearly mentioned in the offer.

7. As an option, a centrifuge unit for oil, dust and moisture separation has to be offered.

8. All hydraulic components of the power pack such as pump, cylinders, valves, pressure regulators, flow regulators, hydro motors, etc. are to be only of Rexroth, Vickers or Denesion.

9. The details of bought-out items, coming as the internal components of hydraulic unit, have to be given item wise for the procurement of spares [such as oil seals, 'O' rings, all rubber items, cylinders, piston and piston rings, bearings, bushes, etc.] with the main equipment.

10. The hydraulic power pack and other associated elements are to be adequately designed and selected, to enable a smoother operation of the hydraulic cylinders during linear movements and to ensure leak proof working arrangements for a nil failure or a safe sealing, during the machine operation.

11. Since the machine is intended to work in three shifts a day and for all the 365 days in an year, the BIDDER shall give complete details [including detailed schematics] on the hydraulics, with the TECHNICAL OFFER.

[M B] [S R] [W J] [G S] [R Su] [K A] [H R]