An ISO 9001 Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 79 38 Fax : +91 431 252 07 19 Email : tvenkat@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two Parts	**Enquiry Number:** **2620900163**	**Enquiry Date:** **29.08.2009**	**Due date for submission of quotation:** **14.10.2009**

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.
Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of **tender opening.**

Item	Description	Quantity
10	**Pipe Butt Welding Machine** as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	**5 Nos**.

Important points to be taken care during submission of offer

1. **Delivery required 8 months from the date of purchase order.**
2. **Grace period of 2 months beyond the above delivery period will be considered.**
3. **Checklist to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**

BHEL's General guidelines / instructions (refer MM/CE/GT/001) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2620900163".

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 Manager / Capital Equipment / MM

PART A
PIPE TO PIPE/FITTING WELDING STATION
SECTION – I : QUALIFYING CRITERIA

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer:

S. No.	REQUIREMENTS	VENDOR's RESPONSE
1	Only those vendors (**OEMs**), who have supplied and commissioned at least **ONE MECHANISED PIPE TO PIPE/FITTING WELDING STATION with job manipulator and wire feeder** and Column and boom type Submerged Arc Welding machines **for pipe diameter larger than 400mm** in the past ten years (from the date of opening of Tender) and such equipment is presently working satisfactorily for more than one year after commissioning (from the date of opening of Tender) should quote. However, if such equipment had already been supplied to BHEL, then that machine should be presently working satisfactorily for more than six months after it's commissioning and acceptance (from the date of opening of Tender).	
	The vendor should submit following information where similar machine has been supplied for qualification of their offer.	
1.1	Name and postal address of the customer or company where similar equipment is installed.	
1.2	Name and designation of the contact person of the customer.	
1.3	Phone, FAX no and email address of the contact person of the customer.	
1.4	Month and Year of commissioning of the equipment.	
1.5	Application for which the equipment is supplied	
1.6	Along with the Technical offer, the Vendor should submit one Performance certificate from the customer for the satisfactory performance of the equipment supplied to them. For obtaining the Performance certificate, a suggestive format is provided in **SECTION – IV.**	
1.7	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	
2.0	**DELIVERY** - The bidder shall quote the best possible delivery. However the delivery shall not exceed 8 months with an additional grace period of 2 months. The additional grace period will attract a penalty which is explained in the commercial terms of the enquiry. The delivery period shall be reckoned from date of purchase order to despatch from the vendor works.	

SECTION – I I

The BIDDER / VENDOR is requested to provide the following information:

S. No.	REQUIREMENTS	VENDOR's RESPONSE
3.0	The BIDDER/VENDOR to furnish Reference List of Customers, with full address, details of contact person, where Mechanised Pipe welding station similar to offered have been supplied in the past.	
4.0	Details of Mechanised Pipe welding station supplied to other BHEL units, if any. (Year of commissioning, max. diameter, Weight carrying capacity, Welding type)	
5.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Address of Agents / Service Centers in South India.	
6.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION – III

The BIDDER to note:

S. No.	PARTICULARS	VENDOR'S RESPONSE
7.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS. 1. Technical Offer [with PART A & PART B] & commercial offer 2. Price Bid.	
8.0	The Technical Offer shall contain a comparative statement of Technical **Specifications demanded by BHEL** and **Offer Details submitted by the Bidder**, against each clause. A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement where specific details are required may lead to disqualification of the Technical Offer.	
9.0	The Technical Offer shall be supported by product Catalogues & Data Sheets and also technical details of Bought-Out-Items with copies of Product Catalogue to the extent possible.	
10.0	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.	

SECTION – IV

The performance certificate should be produced **on Customer's Letter Head.**

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Supplier of the machine :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application :

5. a) Machine type : Pipe Butt Joint Welding Station (Column &Boom Type)

   b)Max size of pipe (Dia X thick) :

6. Performance of the Machine :
   (Strike off whichever is not applicable) Satisfactory / Good / Average / Not Satisfactory

7. Service after Sales:
   (Strike off whichever is not applicable) Satisfactory / Good / Average / Not Satisfactory

Date:

Signature & Seal of the Authority Issuing the Performance certificate

A.N R.V A.A I.K.K A.J K.H W.J M.D

PART – B

TECHNICAL SPECIFICATIONS FOR PIPE TO PIPE AND PIPE TO FITTINGS WELDING STATION

AA. JOB DESCRIPTION:

The welding station is intended to do circumferential butt-welding of steel pipes to steel pipes or steel pipes to fittings (like elbows, tees & Reducers) , using submerged arc welding process. The weld butt joint is formed by joining the free end of the pipes and fittings (details as per **ANNEXURE-2**), which are edge prepared to the styles as given in **ANNEXURE – 1.**

The root of the butt joint is welded by GTAW (TIG Welding) process and followed by minimum two layers of SMAW (Manual Arc Welding) or GMAW (Flux Cored Arc Welding) process for build up and to hold the work-piece on self-weight for further welding (by sub-merged arc welding process). The GTAW, SMAW and GMAW are not carried out in the proposed welding station and these are done separately at a different workstation.

BB. WELDING STATION CONFIGURATION:

The welding station shall have the following three distinct components: -

a.	**Job Manipulator**	It is the device, which has to hold the work-piece and to rotate (with provision for variable speed of rotation) the work-piece with circular profile for welding operation. The manipulator will have to consist of one drive unit with hallow chuck arrangement for holding the work-piece and imparting the rotation and the other for job support at the free end. **ANNEXURE–3 & 4** give only the indicative and schematic sketch for the manipulator and roller support units. The *DIMENSIONS* given in the *DRAWINGS* have to be *IGNORED*.
b.	**Welding Machine**	It is the equipment, which has to carry out the welding operation, and shall consist of one portable 1m x 1.5m - column & boom manipulator with ± 180 Deg column rotation and wheels on the base for movement on the ground and a submerged arc welding machine having a DC welding power source , controller and a welding head.

CC. DETAILED TECHNICAL SPECIFICATIONS

S.No.	PARTICULARS AND BHEL SPECIFICATION	BIDDER'S OFFER (with Technical Details)
1.0.0	**PURPOSE & WORKPIECE MATERIAL**	
1.1.0	a. The butt welding station is required to clamp, rotate and weld i. Pipes fitted together ii. One or more fittings (Tees / Reducers / Dished ends) fitted between pipe segments iii. Elbows fitted to the end of pipe OR iv. A combination of above b. The header pipes, Tees and Elbows form high-pressure components of Power Boilers for Utilities & Industries, and Industrial boilers of Process Industries. The seams shall meet Radiographic Quality requirements as required by BHEL standards. c. The components are to be clamped and Rotation is in the horizontal axis for performing cir-seam welding at the required welding speed. d. The Tees & Elbows will have a radial over hang of maximum 500 mm and cause unbalance during rotation. Axial Over hang of the jobs will be maximum 5000 mm from the center of the clamp. e. The jobs will be clamped in the job rotator/manipulator and the welding junction is subjected to preheating up to the temperature of 300 ^{0}C before welding. f. The welding may be done as close as 500 mm from the job rotator and hence the rotator should be designed to withstand the heat radiation due to preheating.	
1.2.0	**WORKPIECE MATERIAL**	
1.2.1	**A) CARBON STEEL:** SA 106 Gr B / Gr C (ASTM), AP15L Gr B (ASTM) **B) ALLOY STEEL:** SA 335 P11, P12 & P22, P91, SA 312 TP304H, SA 312 TP316 L	
1.3.0	**MATERIAL SIZES**	
1.3.1	The equipment shall be suitable for handling the pipe with outer diameter ranging from 219mm to 812 mm. (For one machine 500mm to 1016mm)	
1.3.2	The standard sizes of Pipes, Tees & Elbows are furnished under **ANNEXURE - 2**. Maximum Length of the job is 21,000 mm	
1.3.3	The weight of the single work-piece after the weld joints fit up (taken up for sub-	

	merged arc welding) will not exceed 30,000 kgs. (30 Metric Tons)	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
2.0.0	**CONFIGURATION**		
2.1.0	The Welding Station shall consist of a. A Job Rotator/Manipulator with Supports b. Column & Boom SAW Welding Machine	Vendor to confirm.	
3.0.0	**JOB ROTATOR DETAILS**		
3.1.0	**JOB Clamping System:**		
3.1.1	The system shall be suitable for centering and clamping jobs mentioned in straight pipes, bends, Tees, Elbows, reducers and Y-piece in horizontal axis.	Vendor to confirm.	
3.1.2	a. The Equipment shall have a hollow metallic housing mounted suitably on a rigid metallic base. b. The base shall have suitable anchoring provisions for fixing the equipment with the foundation arrangements on ground. c. A hollow metallic ring of required thickness/slewing ring with suitable job clamping arrangement shall be positioned concentric inside the above hollow housing. d. The arrangement between the housing and the ring should permit the ring to rotate inside the housing smooth without friction. e. The housing shall have provision for adjusting the clearance between the housing and the ring for smooth and concentric rotation. f. The job to be welded shall be held horizontally at the center, concentric with the hollow ring. g. The Job clamping arrangement should establish good contact area with the job to avoid job slipping during rotation. h. The job-clamping members shall be independently operated manually. Only square thread to be used. i. The job clamping arrangement shall have graduations in 'mm' on the sliding members to indicate the	Vendor to confirm the details of configuration and material in the GA drawing to be submitted by vendor along with offer	

	diameter of the job to be held inside for job setting. j. Earth clamp for connecting welding current return cables to be provided on this unit suitably. k. If roller arrangement is used for job rotation, the rollers should be hardened		
S.No.	**PARTICULARS AND BHEL SPECIFICATION**		**BIDDER'S OFFER (with Technical Details)**
3.1.3	**Job Rotation** - The Rotation at constant welding speed for the job held in the hollow metallic ring shall be provided in horizontal axis through suitable A.C Digital variable drive mechanism of suitable capacity on the ring. The mechanical elements should be suitably designed for the maximum load condition.		
3.1.4	Minimum & Maximum job diameter to be held by the metallic ring. For One machine of 1500mm the diameter is 500mm to 1016mm	219 mm to 812mm 500mm to 1016mm	
3.1.5	Height of center point from ground **[NOTE: 1200 mm for 3 machines and 1500 mm for 2 machines]**	Vendor to confirm	
3.1.6	Maximum weight of the job to be rotated.	30,000 kgs.	
3.1.7	Axial clearance to avoid interference by job, from the periphery of the manipulator/its drives/machine element	Minimum 500 mm	
3.1.8	Axial overhang of the job (without support) from M/c.	Maximum 5000 mm	
3.1.9	Speed Range (Infinitely variable) - To suit welding speed of 300 to 700 mm/min. for all sizes of jobs.	Vendor to confirm	
3.1.10	Speed range mode of Selection- Digitally programmable	Vendor to Specify	
3.1.11	Power Rating of AC Induction Motor (S1 Duty) in kW.	Vendor to Specify	
3.1.12	Torque of the A.C. induction motor for rotator	Vendor to specify with calculation.	
3.1.14	**MACHINE BASE:**		
3.1.15	Width and Length	Vendor to specify	
3.1.16	Material Details for all elements	Vendor to specify	
3.1.17	**Type of power transmission:** Power transmission from motor to the job rotator. (Complete description of the aforesaid mechanism including dimensional details , to be furnished in the offer)	Vendor to specify	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
3.2.0	**OPERATION AND CONTROL SYSTEM - OPERATOR'S PANEL**		
3.2.1	a. One Panel on the equipment controller side and other with Remote Pendant along with 25m cable, having complete machine control system with required configuration, shall be provided for convenient operation. b. All switches shall be within reach of Operator. All displays / indications shall also be conveniently located (Schematic Layout with details to be submitted with the offer)	Vendor to Confirm	
3.3.0	**DRIVE SYSTEM & FEATURES**		
3.3.1	Make: Siemens / ABB / Eurotherm / Danfoss	Vendor to specify	
3.3.2	Type & Model: AC Digital Variable Speed Drive [latest version] (as available at the time of ordering, shall be supplied)	Vendor to specify	
3.3.3	Details of Standard Features	Vendor to specify	
3.3.4	Details of Optional Features, recommended by vendor.	Vendor to specify	
3.3.5	a. The drive for the equipment shall be of AC Motor with Digital Controller. b. The Motor & Controller shall be of suitable capacity (kW rating) to control the job rotating speed infinitely adjustable from minimum to maximum. c. The controller should be able to control the motor speed precisely rated for rotating 30,000 kgs weight job. d. The controller shall able to be operated either from control panel or from remote station through hand held unit. e. Drive Controller Software is to be furnished. For Downloading / Up loading	Vendor to Confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
3.3.6	The control panel of the JOB Rotator shall be provided with the following features: 1. Stop & Emergency Stop 2. Speed selection: digitally programmable 3. Inching Mode /Continuous Mode Selector Switch 4. Forward Start & Reverse Start 5. Rotator speed Indicator / Digital Type.	Vendor to Confirm	
3.4.0	**REMOTE CONTROL UNIT**		
3.4.1	A portable Remote control unit having all functions as listed in clause **3.3.6** above shall be provided with 25m interfacing cable.	Vendor to specify	
3.5.0	**Job Support Roller Stand: - 1 No** a) Motorized vertically adjustable job supports (with rollers) for supporting the pipes and bends for welding. b) The supports shall have the facility to accommodate the entire pipe range mentioned as per Clause 1.0.0 and also permit free rotation of the jobs supported on them. c) The support unit shall able to be moved conveniently to accommodate different lengths of pipes & bends, using crane. Suitable hook arrangements to be provided for lifting by cranes. d) Earth clamp for connecting welding current return cables to be provided on this unit suitably. e)These support roller stand to be provided with Up / Down inching switch mounted on the structure of the stand and detachable plug-in type connections for loose cables with metallic hoses on the floor, from the view point of safety.	Vendor to Confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
4.0.0	**SUBMERGED ARC WELDING MACHINE**		
	Purpose: The equipment is intended for circumferential welding of Jobs as detailed in **Specification Clause 1.0.0 in** association with the Job Rotator.		
4.1.0	**EQUIPMENT CONFIGURATION**		
4.1.1	**Machine Elements:** The offered equipment shall consist of the following: a. Portable Column & Boom type Welding Manipulator. b. Fully Thyristorized DC Welding Power source & controller. c. Submerged Arc Welding Head – with Torch Positioning slides mounted on the Boom. d. Operator Controller. e. Set of Inter-Connecting Power, Earth & Control Cables.		
4.2.0	**PORTABLE COLUMN & BOOM TYPE WELDING MANIPULATOR.**		
4.2.1	**Construction Type**: The Manipulator shall be of the Column & Boom type with a movable boom and welding head mounted at the end of the boom. The combined purpose of the Column & Boom type Welding Manipulator and the welding head is to position the welding torch in relation to the Circumferential Butt Joint in Jobs as detailed in Clauses 1.0.0. Swiveling of the horizontal boom about the vertical column through ± 180º is intended.	Vendor to Confirm	
4.2.2	**Carriage (Base):** The column shall be mounted on the base which is required to move manually on ground by means of suitable wheels. Suitable locking arrangement at required location of the carriage to be provided. The dead weight of the carriage to be designed to prevent toppling of the machine.	Vendor to provide details.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
4.2.3	Vertical travel of the Boom on the Column (motorized)	Vendor to Confirm	
	Maximum Height under Welding Tip (Weld head in mid-stroke position)	2200 mm	
	Minimum Height under Welding Tip (Weld head in mid-stroke position)	1200 mm	
	Effective stroke :	1000 mm	
	Boom vertical travel speed (fixed speed):	Bidder to specify.	
4.2.4	Horizontal travel of the Boom (Motorized – Variable speed)	Vendor to Confirm	
	Minimum Boom extension (from center of column to welding torch tip). It may be noted that the welding torch tip will lie in line with the axis of the job rotator when the boom is at the mid position of the horizontal stroke.	Bidder to specify.	
	Maximum Boom extension (from centre of column to welding torch tip)	Bidder to specify.	
	Effective stroke :	1500 mm	
	Boom Horizontal travel speed:	100 – 700 mm/min	
	Speed holding Accuracy :	Within ± 2%	
4.2.5	Maximum sag at the end of boom: Max. 2 mm for the full stroke in the horizontal direction.	Vendor to Specify	
4.2.6	Vibration Level: Maximum 1.0 mm during the traverses	Vendor to Specify	
4.2.7	Clamps for Boom (for vertical & horizontal movements)	Vendor to provide details.	
4.2.8	Rotation of Column (about the vertical axis): Manually adjustable ± 180^{o} rotation with mechanical stoppers.	Vendor to confirm and provide details.	
4.2.9	Clamping / locking mechanism for Column rotation – manual clamping arrangement.	Vendor to provide details.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
4.2.10	Clamping mechanism for Vertical movement of the boom in position to ensure that it is securely held during welding without vibration.	Vendor to provide details.	
4.2.11	Clamping mechanism for Horizontal movement of the boom in position to ensure that it is securely held during circumferential welding without vibration. It may be noted that it should be possible to move the boom in the horizontal direction (up to ± 50 mm) during welding to adjust the Torch Offset setting in inching mode.	Vendor to provide details.	
4.3.0	**WELDING POWERSOURCE and Controller**		
4.3.1	Current Range: 100 to 1200 Amps.	Vendor to confirm	
4.3.2	Duty Cycle: Continuous – 100 % at 1200 Amps	Vendor to confirm	
4.3.3	O C V: Minimum 51 V DC	Vendor to confirm	
4.3.4	Welding Voltage: 21 to 45 Volts DC	Vendor to confirm	
4.3.5	Welding current: Maximum variation +/- 30 amps	Vendor to confirm	
4.3.6	Power Rating (input) of the equipment	Vendor to specify	
4.3.7	Characteristics: Full Wave Constant Potential	Vendor to confirm	
4.3.8	Make: ESAB / LINCOLN	Vendor to specify	
4.3.9	Input Power Supply: 415 ±10% V, 50 ± Hz, 3-phase AC, 3 - wire system [4th Wire for PE/Earthing]	Vendor to confirm	
4.3.10	Insulation: Class H	Vendor to confirm	
4.3.11	Design Feature: Fully Thyristorised with six SCRs	Vendor to confirm	
4.3.12	Transformer Windings: The transformer coils in the power and control transformers shall be of 100 % copper or superior quality aluminum windings (copper winding is preferable)	Vendor to confirm	
4.3.13	Parameter Reading Meters: Factory installed Ammeter & Voltmeter on front panel with easy removal and replacement from front-side for meter calibration purpose.	Bidder to specify the make & size of meters.	

4.3.14	Welding process controller -Remote Control Unit: A Remote control unit for pre setting of welding current & voltage to be provided.	Vendor to confirm	
S.No.	**PARTICULARS AND BHEL SPECIFICATION**		**BIDDER'S OFFER (with Technical Details)**
4.3.15	Output Terminal shall be of Bolt & Nut type with Nickel Coating	Vendor to confirm	
4.3.16	Design to take care of protection (by tripping) due to electric short-circuit, single/two phase power input instead of three phase, thermal overload/overheating, etc.	Vendor to confirm	
4.3.17	Auxiliary Power: Two numbers of tapping sockets/plug points for connecting hand-lamps of rating 24 V/40W with MCBs for protection, to be provided	Vendor to confirm	
4.3.18	Cooling Fans: The power source shall be 'force air cooled' with one/two fans of suitable rating, to withstand the continuous welding operation in the peak ambient conditions, especially in the tropical environment of 45 to 50 Deg. C.	Vendor to confirm	
4.3.19	Two numbers of lifting hook to be provided at suitable locations, for handling by EOT Crane	Vendor to confirm	
4.4.0	**PROCESS CONTROLER FOR WELDING POWER SOURCE**		
4.4.1	Current Range: 100 to 1200 Amps. (Infinitely variable with presetting)	Vendor to confirm	
4.4.2	Welding Voltage: 21 to 45 Volts DC (Infinitely variable with presetting)	Vendor to confirm	
4.4.3	Wire feed speed: 1.0 to 4.0 m/min. (infinitely variable)	Vendor to confirm	
4.4.4	Wire diameter :3.2/4.0/4.8 mm	Vendor to confirm	
4.4.5	The thyristor controller shall be suitable to operate on the input voltage of 42 Volts or 110 Volts with necessary power and control PCBs for wire feed	Vendor to confirm	
4.4.6	Location: The control panel shall be mountable on the welding head.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
4.4.7	Controls / Display: The control panel shall incorporate the following: a) Presetting of welding current & voltage. b) Meters for display of welding current and voltage. c) Inching of wire forward & reverse. d) Setting of burn back time e) Switches for Start and Stop of welding. f) Manual over-ride of pre-set parameters. g) Indication Lamp for Welding 'ON' h) Emergency OFF switch.	Vendor to confirm	
4.5.0	**INTER-CONNECTING CABLES**		
4.5.1	The control cables, welding and earth cables of required length for connecting the power source to the welding head/control panel to be provided.	Vendor to confirm	
4.5.2	Protection: Suitable sheathing to be provided for the cables for withstanding the rough use in shop floor.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
4.5.3	End-Connectors: All the cables shall be provided with suitable end-connectors for easy fixing up.	Vendor to confirm	
4.6.0	**BOOM MOUNTED WELDING HEAD**		
	A welding head mounted at the end of a movable boom is intended.		
4.6.1	**Welding Head slides.** The welding head shall be fixed to the Boom through horizontal – vertical and rotary slides enabling movement of the welding torch as follows:		
	Horizontal: 200 mm by Manual Adjustment during welding (Hand wheel) for bead positioning in the joint.	Vendor to confirm	
	Vertical: 200 mm motorized for Torch upward movement during welding for next layer.	Vendor to confirm	

	Rotary: ± 90° in vertical plane by Manual Adjustment (Hand Wheel) for Torch angle adjustment during welding.	Vendor to confirm		
4.6.2	Wire feed Head. The wire feed motor shall be of make ESAB or LINCOLN make for direct interfacing with ESAB or LINCOLN Power sources and controllers.	Vendor to confirm and provide details		
	The straightening and feed rollers in the Feed head shall ensure wire issues straight from the Contact tip/Nozzle to a length of 500 mm with sufficient number of straightening rollers and minimal setting.	Vendor to confirm and provide details		
4.6.3	Wire spool Holder: Arrangement for holding a 25 Kg standard wire spool holder in appropriate orientation to the Feed head shall also be provided in the Welding Head. The position and arrangement shall ensure easy loading of Wire coils by the operator.	Vendor to confirm and provide details		
4.6.4	Flux Hopper: Capacity of Flux Container: 10 kg. Open / Shut-Off Manual Control Valve and heat resistant Flux Feed Tube to be provided. The position and arrangement shall ensure easy loading of Flux by the operator. Flux collector with sieve to be provided to collect the flux.	Vendor to confirm and provide details		

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
4.7.0	**OPERATOR CONTROL PANEL**		
4.7.1	Controller Operations: a. Movement of motorized vertical slide in the head. b. Boom Horizontal & vertical movements. c. All controls of Welding Process controller as per **clause 4.4.7** d. Speed indicator for horizontal travel of boom. e. All controls of Job Rotator as per **clause 3.3.6**	Vendor to confirm and provide details	
5.0	**ELECTRICAL**		
5.1	415 V with fluctuation of ±10%, 50 ± 1.5 Hz, 3 Phase AC power supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor.	Vendor to Note	
5.2	All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply during construction of foundation to be delivered before start of foundation work.	Vendor to confirm	
5.3	Tropicalization **:** All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	
5.4	All electrical/electronic control cabinets & panels shall be dust & vermin proof and shall have IP 54 protection	Vendor to confirm	
5.5	a. All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220V, 5/15 Amp AC. b. All adapters /receptacles should have compatibility with Indian equivalents. c. All cables to be of copper core and protected with Flexible PVC hose.	Vendor to confirm	
5.6	Vendor shall ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
5.7	Motors & other electrical components shall conform to IEC or Indian Standards. Motors shall be of SIEMENS/ABB / CROMPTON or any other reputed make acceptable to BHEL. All switches and control elements shall be of Seimens / L&T / GEC / Alstom / telemecanique or any other reputed make acceptable to BHEL.	Vendor to specify the make of components used.	
5.8	**MACHINE LIGHTING SYSTEM**		
5.8.1	A fluorescent machine lamp with drip proof protective cover to be provided for the welding area visibility.	Vendor to confirm	
5.8.2	A spot light with sufficiently long cable should also be provided with 24V AC supply.	Vendor to confirm	
5.8.3	Flashing/Rotary type machine lamp to denote Machine ON, Working, Alarm/Tripping Condition, etc. as per Industry Standards, to be provided.	Vendor to confirm	
6.0	**MECHANICAL CONSTRUCTIONAL FEATURES**		
6.1	The base frame, column & boom carriage shall be of fully welded construction and built in closed construction.	Vendor to confirm	
6.2	If heat-treatment is required for the fabricated structure, proper heat-treatment shall be carried out prior to taking up machining or grinding works. Bidder to mention/give heat-treatment details.	Vendor to confirm	
6.3	The guide ways (sliding surface) shall be suitably hardened and ground to give a smooth traversing.	Vendor to confirm	
6.4	Suitable bellow covers with metallic / anti-tear materials are to be provided to protect the weld head slides from the dust, welding flux/slag, wastes, etc.	Vendor to confirm	
6.5	Since the jobs are welded with preheating to a temperature of 250 ^{o} C, all the machine parts shall be designed to suit this working environment.	Vendor to confirm	
6.6	Wipers are to be fitted to machine parts to clean/remove the dirt collected on guide-ways.	Vendor to confirm	

6.7	Metallic guards are to be provided for all rotating couplings.	Vendor to confirm	
S.No.	**PARTICULARS AND BHEL SPECIFICATION**		**BIDDER'S OFFER (with Technical Details)**
6.8	A lifting hook shall be provided at the top of the column, to lift the column & boom with carriage structure, by use of a crane in case of need.	Vendor to confirm	
6.9	All gears used in the machine are to be hardened and ground.	Vendor to confirm	
6.10	A operator platform to be provided near the welding head (fitted on the carriage) so as to monitor the welding, have access to all controls and loading of wire & flux when carrying out circumferential weld seam joints.	Vendor to confirm	
6.11	The wire spool shall have the facility for adjusting brake on wire coil.	Vendor to confirm	
6.12	The welding wire conduit (welding torch made of copper) to which the contact tip is screwed on shall not be more than 20 mm in diameter, as it may foul with the side walls of the weld-groove during welding.	Vendor to confirm	
6.13	The supply shall also include the return current (earth) cables of suitable rating DC power source. The length of cable set shall be suitable to connect the job of length around 21 m at the maximum.	Vendor to confirm	
6.14	The flux feeding hose or tubing from the flux hopper shall withstand the temperature of 250ºC in continuous duty application with reasonable long life.	Vendor to confirm	
6.15	Suitable Centralised lubrication units for Job rotator and Column & Boom welding machine (independently) to be provided with required no. of metering cartridges for dosing.	Vendor to confirm	
6.16	All lubricated parts like drive gears shall have provision for collecting / preventing the used Lubrication oil from spilling over on to the ground.	Vendor to confirm	

6.17	An access ladder& platform shall be provided for the maintenance staff to attend to fault in the boom vertical up and down movement mechanism/Counter balance & Pulley arrangement. Approach holes on the column to support the counter Wt, during maintenance.	Vendor to confirm	
S.No.	**PARTICULARS AND BHEL SPECIFICATION**		**BIDDER'S OFFER (with Technical Details)**
7.0.0	**LEVELING & ANCHORING SYSTEM**		
7.1.0	Complete anchoring system including foundation bolts, anchoring materials, fixators, leveling shoes etc should be supplied	Vendor to Confirm	
8.0	**SAFETY ARRANGEMENT**		
8.1	Machine shall have adequate and reliable safety interlocks/devices to avoid damage to the machine, work piece and the operator due to mistakes or the malfunctioning	Vendor to Confirm	
8.2	A detailed list of all alarms/indications provided on machine should be submitted by the Vendor.	Vendor to Confirm	
8.3	All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator, for effective use of machine.	Vendor to Confirm	
8.4	Emergency Switches at suitable locations as per International Norms should be provided.	Vendor to Confirm	
8.5	Enclosures or protective covers shall be provided for the moving parts (either linear or rotary), as a safety measure, as per industry standards.	Vendor to Confirm	
8.7	Counter-balance and Safety device for holding the boom and the welding head against rope breakage. Offer details to be elaborated.	Vendor to Confirm	
8.8	All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations, Noise and suitably guarded.	Vendor to Confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
9.0.0	**ENVIRONMENTAL PERFORMANCE OF THE MACHINE**		
9.1.0	The Machine should confirm to following factors related to environment: a) Maximum noise level shall be 85 dB(A) at normal load condition, 1meter away from the machine with correction factor for back ground noise. b) There shall not be any emissions from the machine except fumes of welding during welding operation. c) If any safety / environmental protection enclosure is required it should be built in the machine by the vendor. d) Paint of the machine should be oil / coolant resistant and should not peel off and mix up with coolant. e) The machine shall be suitable for an ambient temperature of +50 ° C and relative humidity of 85 % respectively, but both do not occur simultaneously	Vendor to Confirm	
10.0.0	**TOOLS FOR ERECTION, OPERATION & MAINTENANCE**		
10.1.0	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 shall be supplied. List of such tools shall be submitted with offer	Vendor to confirm	
11.0.0	**MACHINE SPARES AND CONSUMABLES:**		
11.1.0	Electrical and Mechanical spares for two years of trouble free operation shall be quoted. List to cover items listed in **ANNEXURE - 5**, enclosed.	Vendor to confirm	
11.2.0	All types of spares for total station and accessories should be available for at least ten years after supply of the equipment. If equipment / 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	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
11.3.0	Consumables like contact tip/nozzles/nozzle extension for 3.2 mm, 4.0 mm, and 4.8 mm dia. wires and pipe sizes as per annexure-2 shall be quoted separately. Hardened feed and straightening rollers suitable for the above said dia wires also may be quoted.	Vendor to confirm	
12.0.0	**DOCUMENTATION:**		
12.1.0	Set of Documents **to be submitted along with the Offer** for technical evaluation:		
12.1.1	General Lay-out of the machine with major and critical dimensions in line with the specification	Vendor to confirm	
12.1.2	General Assembly drawing of the following assemblies with bill of materials and critical dimensions: a) Job rotator. b) Job support roller stand. c) Column & Boom welding machine.	Vendor to confirm	
12.1.3	Sub-assembly / Arrangement drawings with bill of materials and critical dimensions for the following: a) Drive & clamping arrangement of job rotator. b) Column rotation / clamping arrangement. c) Boom vertical drive arrangement. d) Boom Horizontal drive arrangement. e) Job support roller stand vertical drive arrangement. f) Weld head slide (vertical & Horizontal) arrangement. g) Wire straightening roller arrangement.	Vendor to confirm	
12.1.4	List of bought out items with make and specification along with catalogues: Welding Power source, controllers, Drives, Motors, Gear boxes, Wire straightener,	Vendor to confirm	
12.1.5	Hydraulic / Pneumatic Circuit with Bill of Materials (if proposed in the system)	Vendor to confirm	
12.1.6	Electrical Circuit with Bill of Materials.	Vendor to confirm	
12.1.7	Video images on CD /Hard copy of literature with photographs & drawings explaining the technical features.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
12.2.0	Set of Documents **to be submitted after placement of order** for approval / verification before manufacturing:		
12.2.1	General Lay-out of the machine with major and critical dimensions in line with the specification and Preliminary Foundation drawing.	Vendor to confirm	
12.2.2	General Assembly drawing of the following assemblies with bill of materials and critical dimensions: a) Job rotator. b) Job support roller stand. c) Column & Boom welding machine.	Vendor to confirm	
12.2.3	Sub-assembly / Arrangement drawings with bill of materials and critical dimensions for the following: a) Drive & clamping arrangement of job rotator. b) Column rotation / clamping arrangement. c) Boom vertical drive arrangement. d) Boom Horizontal drive arrangement. e) Job support roller stand vertical drive arrangement. f) Weld head slide (vertical & Horizontal) arrangement. g) Wire straightening roller arrangement.	Vendor to confirm	
12.2.4	Hydraulic / Pneumatic Circuit with Bill of Materials (if available in the system)	Vendor to confirm	
12.2.5	Electrical Circuit with Bill of Materials.	Vendor to confirm	
12.2.6	Quality plan	Vendor to confirm	
12.3.0	Set of Documents **to be submitted along with machine:**		
12.3.1	**Three sets** of following documents as Hard copies and 1 set of all documents including bought out item catalogues – soft copy in CD in English Language should be supplied along with the machine.	Vendor to confirm	
12.3.2	**One set** of complete documents as Hard copy and complete documents in CD / Pen drive to be submitted during inspection at supplier's works for verification.	Vendor to confirm	
12.3.3	Operating Manuals of equipments	Vendor to confirm	
12.3.4	Programming Manuals if any for the station.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
12.3.5	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical /PCB circuit diagrams/ Pneumatic/ Hydraulic Circuit Diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list / Bill of Materials giving complete specification and make of components.	Vendor to confirm	
12.3.6	Maintenance, Interface & Commissioning Manuals for speed drives.	Vendor to confirm	
12.3.7	Manufacturing drawings for all wearing components like bushes, pulleys, gears, etc.	Vendor to confirm	
12.3.8	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable highlighting the specific model used in the supplied machine.	Vendor to confirm	
12.3.9	Detailed specification of all rubber items, hoses, fittings, etc. List of bearings, belts used to be provided.	Vendor to confirm	
12.3.10	Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories.	Vendor to confirm	
12.3.11	Complete Master List of parts used in the equipment.	Vendor to confirm	
12.3.12	Complete list of spares for equipments and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished.	Vendor to confirm	
13.0.0	**ERECTION & COMMISSIONING**		
13.1.0	a. Vendor to take full responsibility for supervision of the erection & commissioning, testing of the machine, carrying out welding of test pieces etc. b. 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. c. Other requirements like crane and helping personnel shall also be provided by BHEL.	Details of these requirements should be informed by Vendor in advance	
13.2.0	Tools, Tackles, instruments and other necessary equipment required to carry out all above activities should be brought by the Vendor.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
13.3.0	The Vendor on returnable basis shall bring commissioning spares, required for commissioning of the machine within stipulated time.	Vendor to confirm	
13.4.0	Portion, if any, of the equipment, 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 should supply sufficient quantity of touch-up paint of various colours of paint used.	Vendor to confirm	
13.5.0	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
13.6.0	Vendor should furnish charges, duration, terms & conditions for E&C in detail separately along with offer.	Vendor to confirm	
14.0.0	**AMBIENT CONDITIONS & THERMAL STABILITY**		
14.1.0	Weather conditions are tropical, Atmosphere may be dust laden during some part of the year. The equipment shall be kept in the normal shop floor condition	Vendor to confirm	
14.2.0	Thermal Stability of the complete equipment keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and vendor should ensure trouble free operation of the equipment.	Vendor to confirm	
14.3.0	The equipment, 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	
15.0.0	**ACCEPTANCE TESTS AT VENDORS WORKS:**		
15.1.0	Demonstration of all features of the machine, control system & accessories	Vendor to confirm	
15.2.0	Verification of all material test certificates	Vendor to confirm	
15.3.0	Verification of complete O&M manuals and documents as per clause 12.2.0	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
15.4.0	Bead on pipe welding at the following conditions • With Ø 4.00 mm SAW wire Coil – 25 Kg continuously welded. • Minimum & Maximum current range of Power source. • Minimum & Maximum speed range of Rotator. • Maximum extension of the Boom in Horizontal Axis. • Adjustment of Horizontal, vertical & rotary torch slides during welding.	Vendor to confirm	
16.0.0	**PROVE-OUT OF BHEL COMPONENTS**		
16.1.0	Tests / Activities to be carried out at BHEL works while commissioning the equipment:		
16.2.0	Full load test to demonstrate the maximum power & specified speed range of the equipment, welding prove out, operation of the flux recovery unit as per specification.	Vendor to confirm	
16.3.0	Demonstration of all features of the equipment, control system & accessories to the satisfaction of BHEL for efficient and effective use of the equipment	Vendor to confirm	
16.4.0	Demonstration by actual use of all supplied attachments and accessories to their full capacity.	Vendor to confirm	
16.5.0	Supervision by vendors of independent operation of each system of the equipment by BHEL after job prove out.	Vendor to confirm	
16.5.0	Satisfactory welding of 3 Production Joints continuously.	Vendor to confirm	
17.0.0	**MACHINE PACKING**		
17.1.0	Sea worthy & rigid packing for all items of complete equipment System, all accessories and other supplied items to avoid any damage/loss in transit. When the equipment is dispatched in containers, all small loose items shall be suitably packed in boxes	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
18.0.0	**PERFORMANCE GUARANTEE**		
18.1.0	Performance Guarantee for a minimum period of 12 months (for the machine in total and sub-systems or bought-out items in particular) from the date of commissioning of the machine or 18 months from the date of supply whichever is earlier.	Vendor to confirm	
19.0.0	**GENERAL POINTS**		
19.1.0	Equipment Model No.	Vendor to specify	
19.2.0	Total connected load (KVA):	Vendor to specify	
19.3.0	Floor area required (Length, Width, Height) for complete equipment & accessories	Vendor to specify	
19.5.0	Painting of Equipment / Electrical Panels using RAL 6011 Apple Green Colour.	Vendor to confirm	
19.6.0	All gears are to be hardened and ground	Vendor to specify.	
19.7.0	Total weight of the individual systems of equipment	Vendor to specify	
19.8.0	Weight of heaviest part of machine	Vendor to specify	
19.9.0	Weight of the heaviest assembly / sub-assembly of the equipment	Vendor to specify	
19.10.0	Dimensions of largest part/ sub-assembly/ assembly of the Equipment	Vendor to specify	
19.11.0	Vendor to submit, along with offer, reference list of customers where similar equipments have been supplied mentioning broad specifications of the supplied equipment i.e. Model, Load Carrying Capacity, Main Drive Rating, etc,	Vendor to confirm	
19.13.0	Hydraulic, pneumatic & lubrication piping should be preferably metallic except places where flexible piping is essential.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
19.14.0	All hydraulic components, if used shall be of Bosch Rexroth / Vickers Sperry or equivalent reputed make acceptable to BHEL. (Details to be submitted)	Vendor to specify	
19.15.0	All hydraulic hoses shall be of GATES / Aeroquip / Parker hannifin make.	Vendor to specify	
19.16.0	All Gear boxes used shall be of standard makes like Greaves / Elecon / Bonfiglioli.	Vendor to specify	

ENCLOSURES:

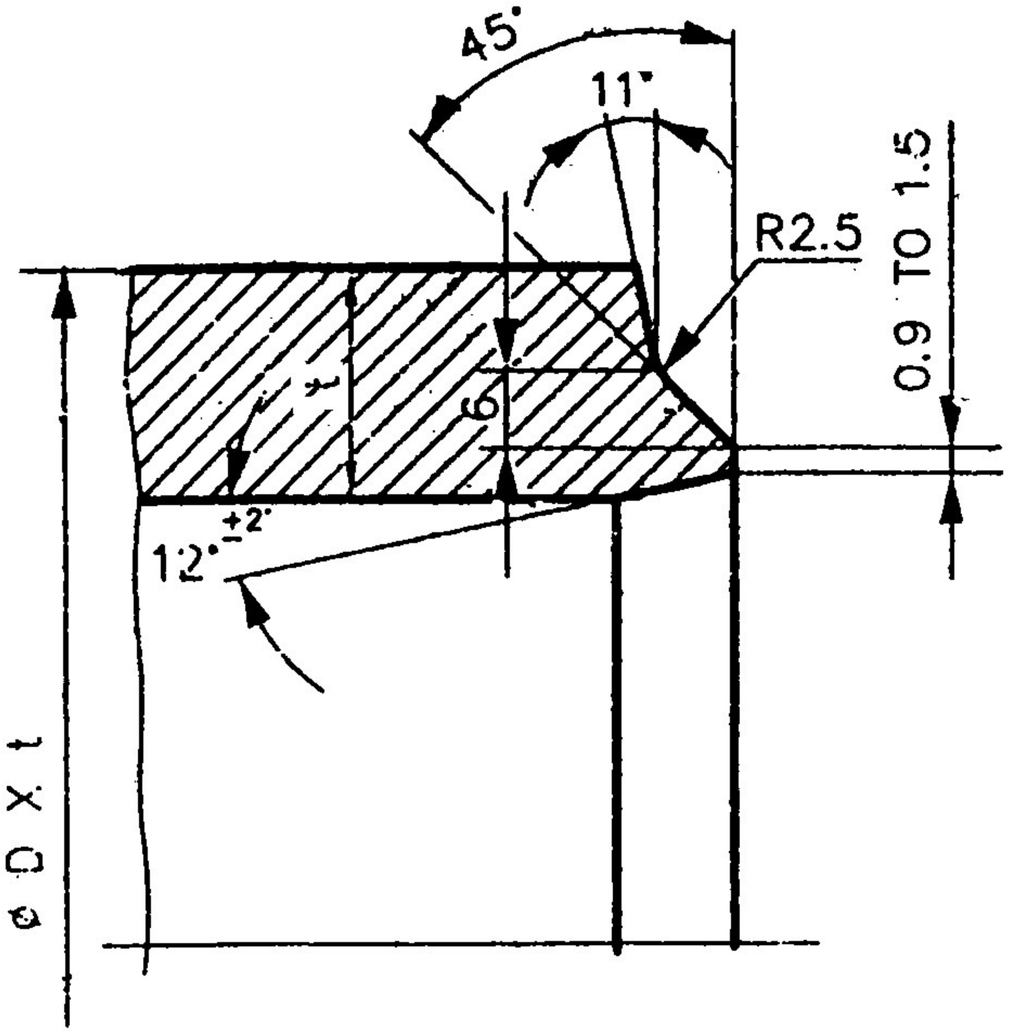
ANNEXURE –1: Edge Preparation Styles for Butt Welding Operation

ANNEXURE – 2: Standard Sizes of Pipes, Tees (Equal & Unequal) and Elbows.

ANNEXURE – 3 & 4: Indicative Schematic Sketch for Manipulator Drive and Roller Support Units

ANNEXURE – 5: List of Spares for Sub-merged Arc Welding Machine

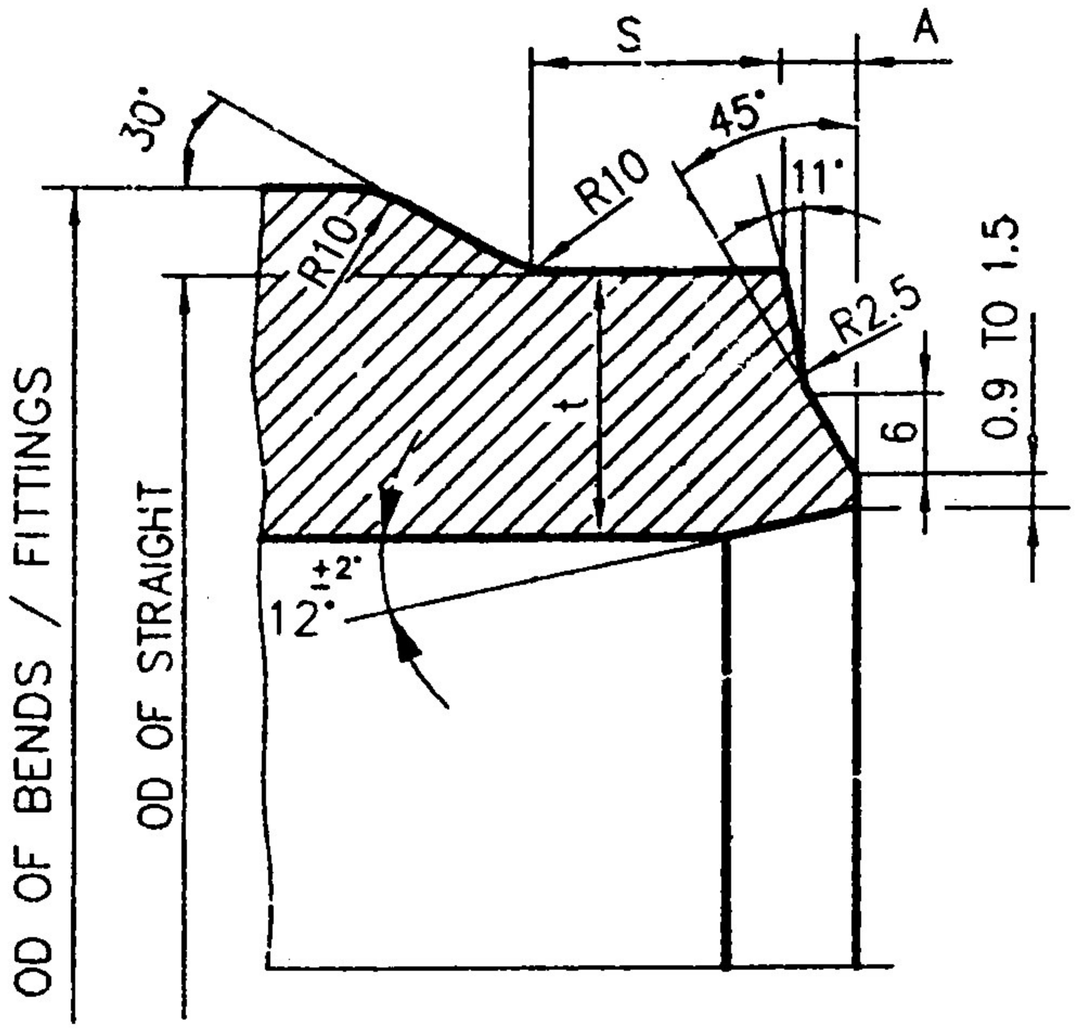
ANNEXURE - 1
Drg No. CABS-1-16 - 01
BHEL, Tiruchirappalli



USE WHEN t ≥ 14.2 mm.

STYLE – P

02. WHEN t<65 S+A = 65 Min. & t>65,S=65 Min.
WHERE t=THK OF CONN.PIPE(STRAIGHT).



STYLE – Pa

ANNEXURE - 1
Drg No. CABS-1-16-02
BHEL, Tiruchirappalli

NOTES: –

01. APPLICABLE FOR P91 MATERIAL
02. FOR OD MISMATCHING REF. FIGURE–Xa.
03. α = 6° FOR WALL THICKNESS ≤ 30 mm
04. α = 10° FOR WALL THICKNESS > 30 mm

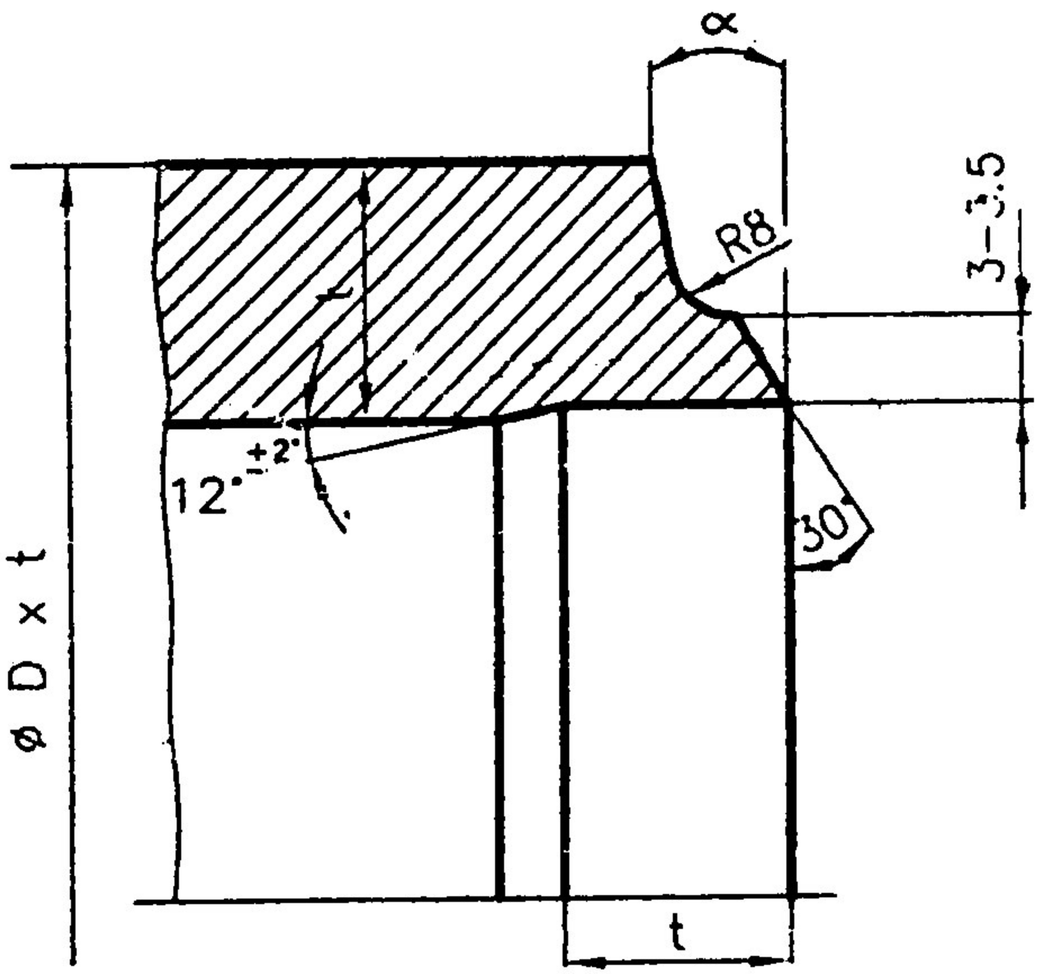


FIGURE – X

NOTES: –

01. OD OF STRAIGHT TO BE PHYSICALLY MEASURED/VERIFIED
02. α = 6° FOR WALL THICKNESS ≤ 30 mm
03. α = 10° FOR WALL THICKNESS > 30 mm

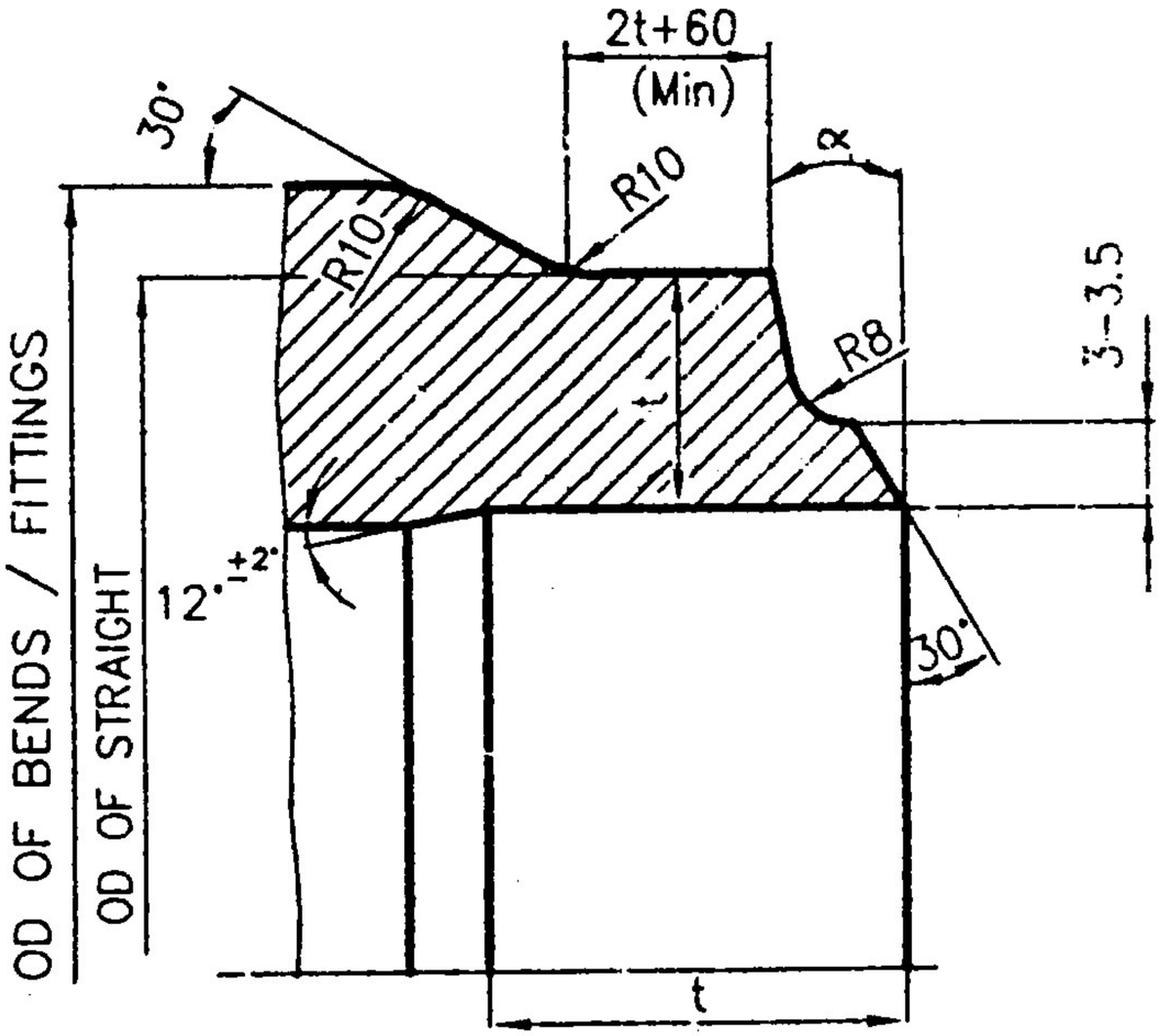


FIGURE – Xa

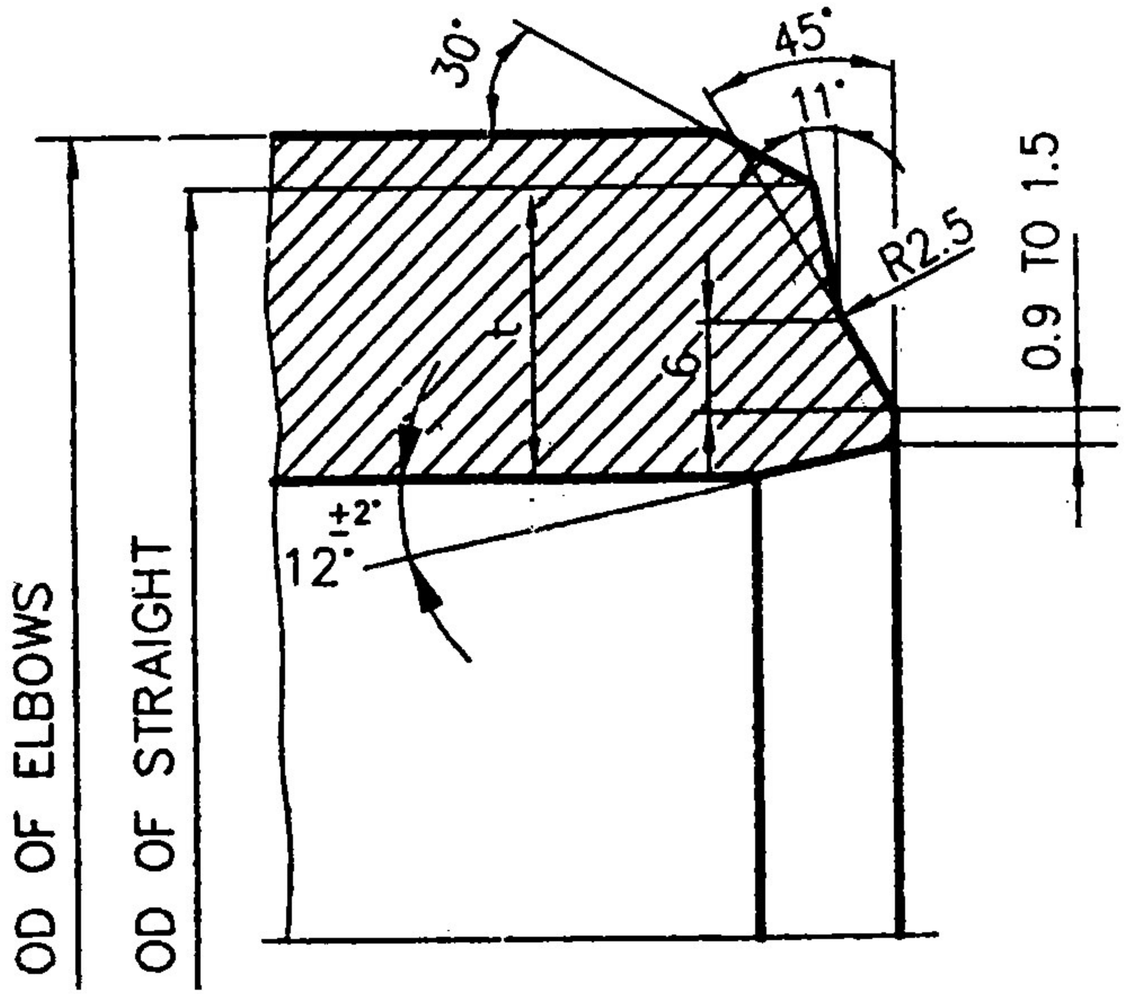
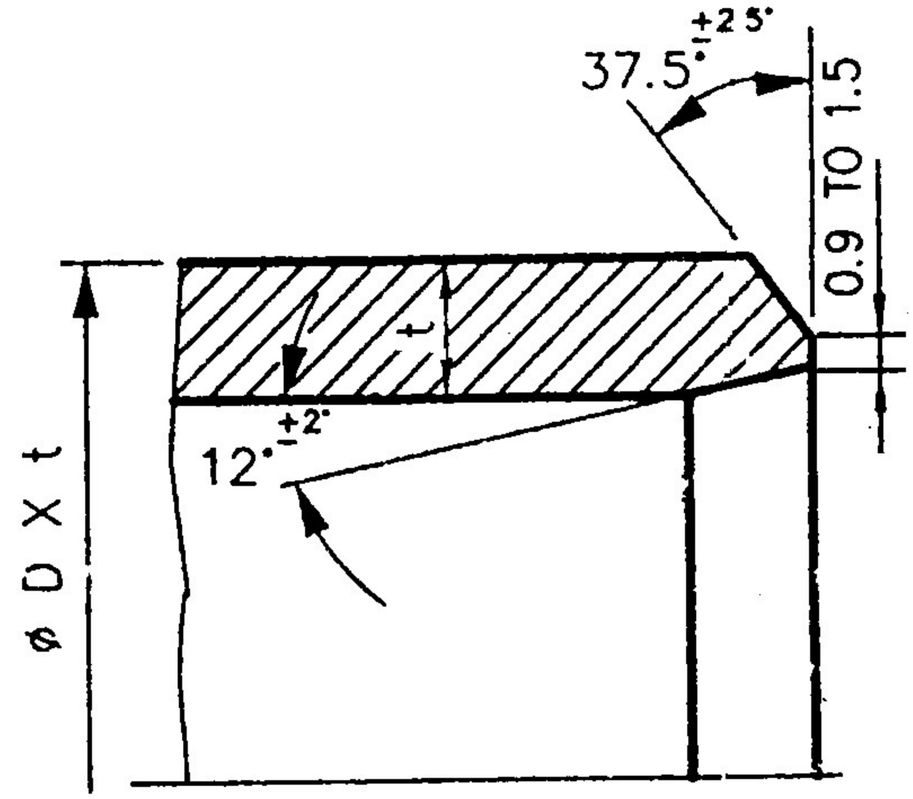


FIGURE – Z



STYLE – D

NOTES: –

01. USE WHEN t < 14.2 mm.

ANNEXURE - 1
Drg No CABS-1-16 - 03
BHEL, Tiruchirappalli

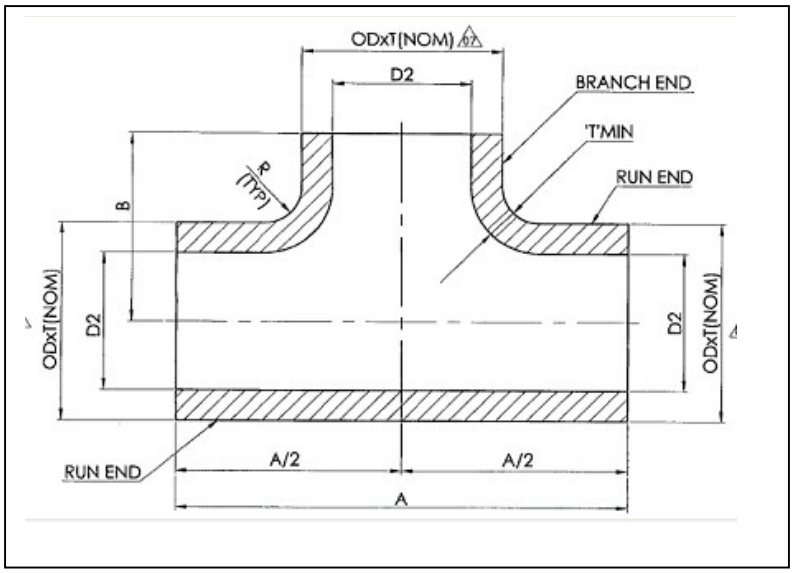
ANNEXURE - 2

PIPE SIZES

Sl. No.	Pipe Diameter	Pipe Thickness
1	219.1	28 to 40
2	273.0	25 to 50
3	323.9	36 to 65
4	355.6	40 to 92
5	368.0	50
6	406.4	50 to 93.4
7	457.2	28 to 79.4
8	508.0	25 to 110
9	558.8	40
10	609.6	38.2 to 123.8
11	660.4	45
12	711.0	20 to 45
13	762.0	80.95
14	812.0	45-60
15	864.0	27-62
16	965.0	35
17	1016.0	35-65

ANNEXURE - 2

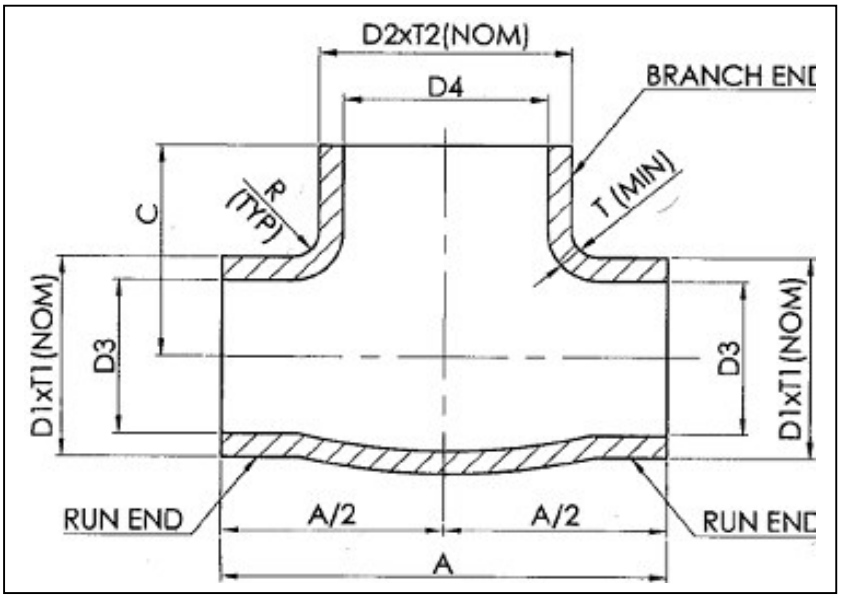
FITTINGS : ‘ T ’ ees



Sl. No	OD, mm	T (Nom) Thickness, mm	(A) Length, in **mm**	B in **mm**
1	219.1	18.2, 28.5, 32, 36, 40	340	170
2	244.5	42.2	600	200
3	273	32, 36, 36.5, 40, 45, 45.7	635	215
4	323.9	36, 36.5, 37.1, 38.8, 40, 45.7	710	255
5	355.6	45.7, 59	760	280
6	368	28.5, 54.85, 59, 60. 57, 68.57	760,820	280
7	406.4	51.4, 62.85, 74.2, 85.7	870	305
8	457.2	25, 80	1090	338
9	508	28, 40, 71, 137.1	1090,1100	385
10	558.8	28, 40	1100	425

ANNEXURE - 2

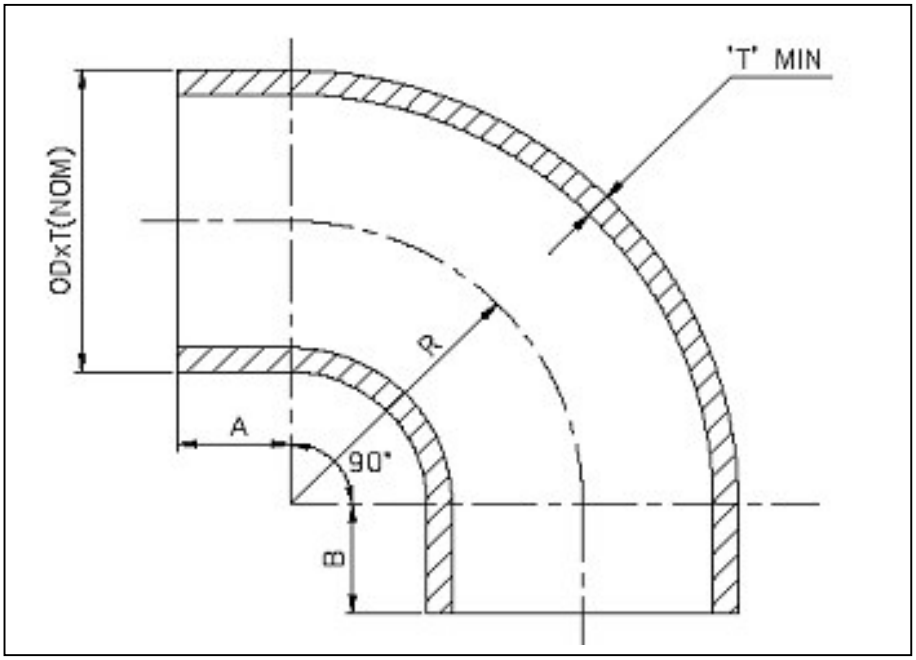
Fittings : 'T'ees



Sl.No	D1/D2 in **mm**	T1 & T2 (Nom) Thickness in **mm**	(A) Length, in **mm**	C in **mm**
1	219.1/273	34.2	990	216
2	273/323.9	34.8, 36.5	990	254
3	323.9/368	57, 68.5	790	280
4	323.9/406.4	51, 68.5, 80	870	310
5	368/406.4	62.5	870	310
6	406.4/508	68.5, 74, 85.7	1100	385
7	406.4/457.2	68.5	1090	338
8	457.2/508	80	1200	381
9	457.2/558.8	28.5	1230	415
10	508/558.8	28.5	1230	425

ANNEXURE - 2

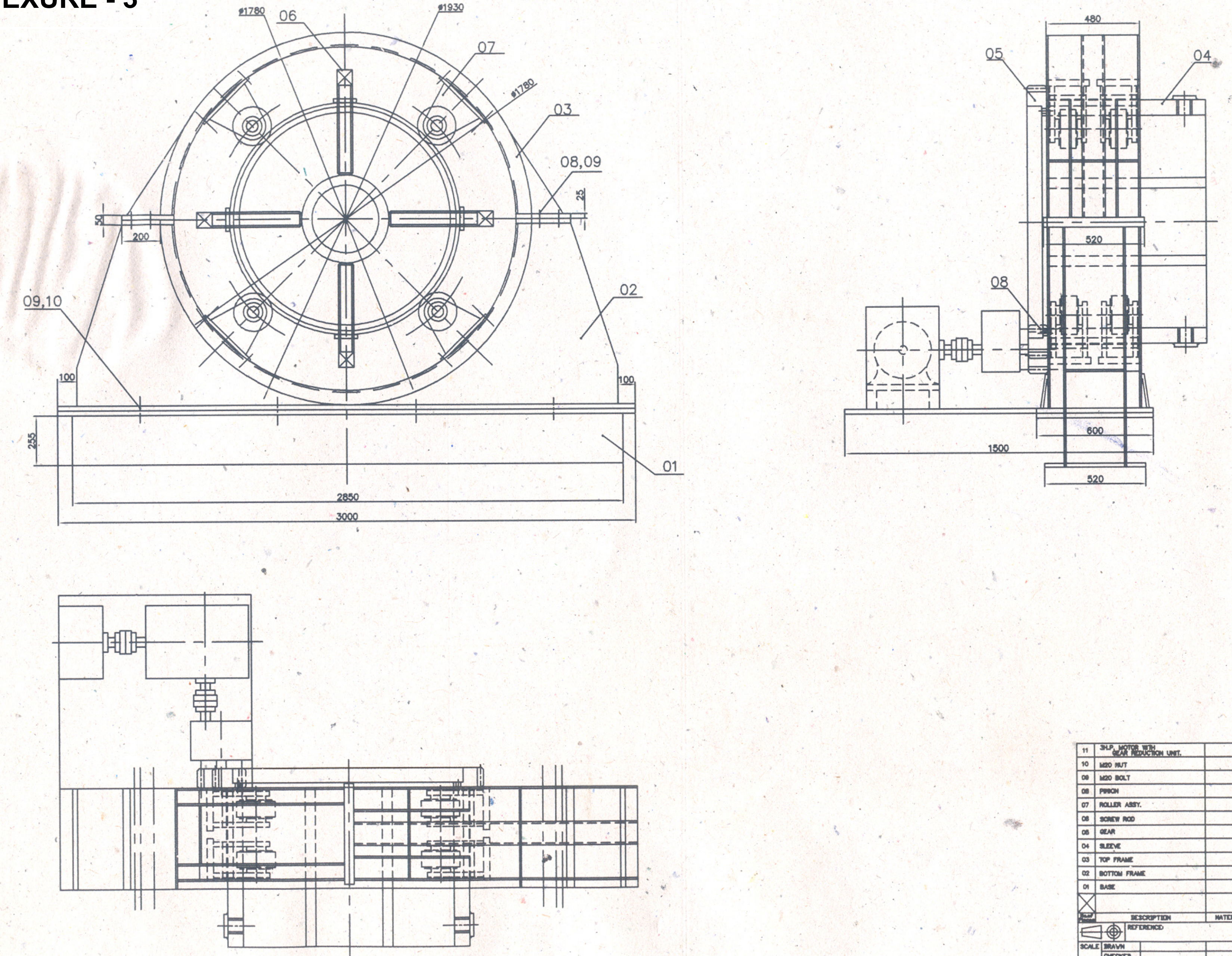
FITTINGS : ELBOWS



Sl.No	OD, In **mm**	T (Nom) Thick, in **mm**
1	219.1	18.28,22.85,25,28,30,32,40
2	273	32,35.4,36,36.5,40,45
3	323.9	29.14,34.28,36,40,42.28,45.7,51.42
4	355.6	35,40,50,55
5	368	36.57,40,41.14,48,50,51.42,59
6	406.4	25,32.5,45.7,51.42,57.14,62.85,68.57
7	457.2	25,45.7,51.42,57.1,65.1
8	508	25,62.85,71
9	558.8	28,40
10	609.6	30,40

ALL DIMENSIONS ARE IN MM

ANNEXURE - 3



11	3HP. MOTOR WITH GEAR REDUCTION UNIT.					11
10	M20 NUT					10
09	M20 BOLT					09
08	PINION					08
07	ROLLER ASSY.					07
06	SCREW ROD					06
05	GEAR					05
04	SLEEVE					04
03	TOP FRAME					03
02	BOTTOM FRAME					02
01	BASE					01
				102.3		
	DESCRIPTION	MATERIAL	STANDARD	NET.WT.IN KGS.	DRAWING No.	ITEM No.

REFERENCE: | ALTERATIONS: | DCN REF | DATE | SIGN. | INDEX

SCALE | DRAWN | CHECKED | APPROVED | DATE

MACHINE: | TYPE:

TITLE: TROUGH

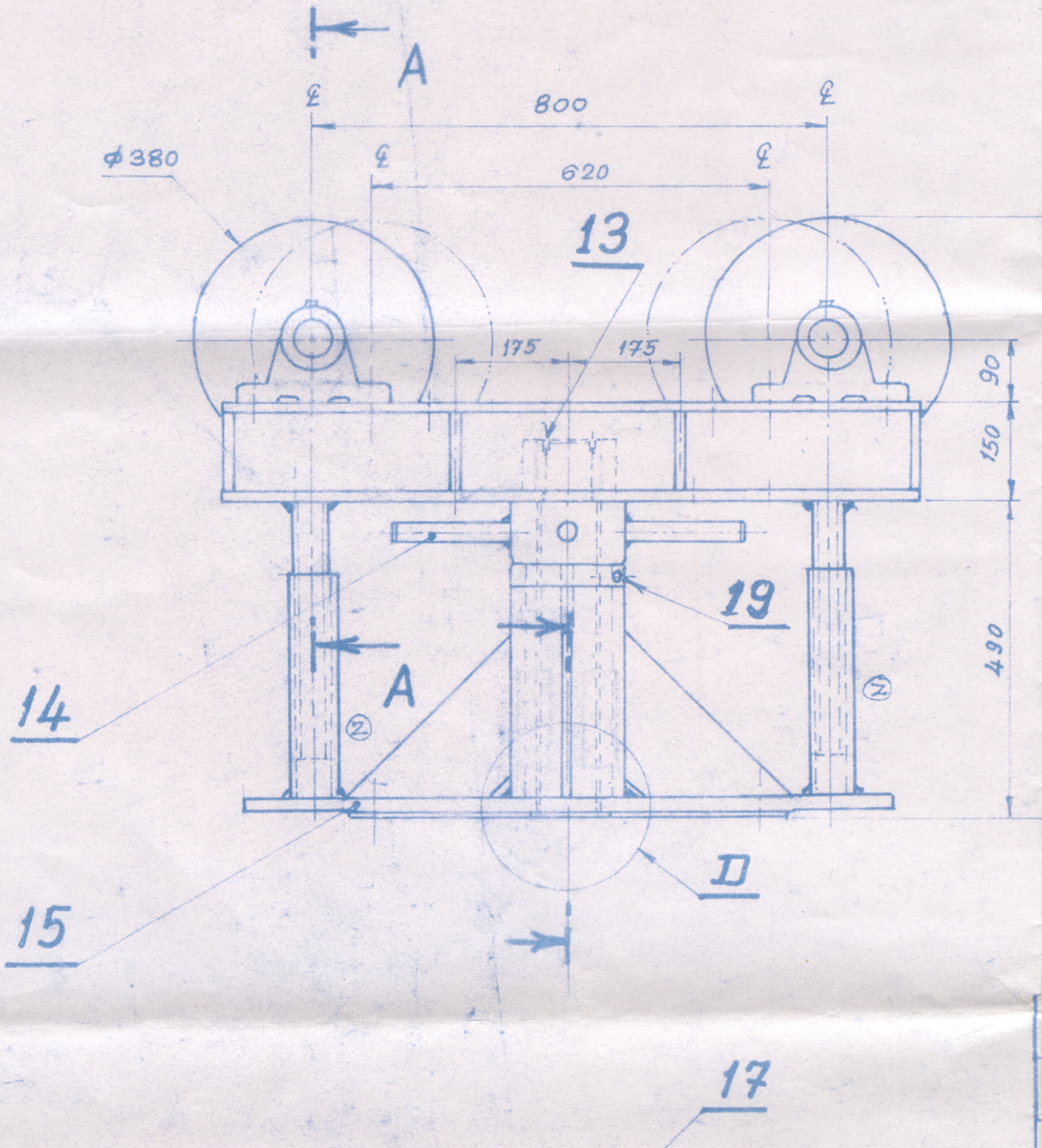
DRAWING No: 1M00000000000 | C.O: 00 | REV.

Sheet No | No.of Sheets

5225

18608

ANNEXURE - 4



ANNEXURE - 5

LIST OF SPARES & CONSUMABLES

S.No.	DESCRIPTION	QTY.	S.No.	DESCRIPTION	QTY.
AA	**POWERSOURCE SPARES**				
1	All types of Printed Circuit Boards (PCB) in the power source – with part no. and description - 1 No in each.	1 set	4.	Indicator Lamps – 3 Nos. in each type	1 Set
2	Cooling Fan Assembly	1 No.	5.	SCR module	3 Nos.
3	Diodes –make and type no	2 no			
BB	**TRACTOR/WELDING HEAD /CONTROL PANEL SPARES**				
6	A.C. Motor with gear box for boom travel	1 No.	17	Contact Tip 4.00 mm	25 Nos.
7	Pressure Roller Assembly	1 No.	18	Contact Tip 4.80 mm	2 Nos.
8	Straightening Roller Assembly	1 No.	19	Contact tip extension pieces for different Job thickness to cover range. 1no/type	1 set
9	Guide Roller Assembly	1 No.	20	Wire Spool Holder (25 kg.)	1 No.
10	Tightening Knob Assembly	1 No.	21	Switches – 1 No. in each type	1 Set
11	Wire Guide House with Spiral	1 No.	22	Ammeter for Process Controller	1 No.
12	Wire Guide Tube with Spiral	1 No.	23	Voltmeter for Process Controller	1 No.
13	Wirefeed Roll (3.20 mm dia. Wire)	2 Nos	24	Boom Speed indicator	1 No.
14	Wirefeed Roll (4.00 mm dia. Wire)	3 Nos	23	Control Transformer	1 No.
15	Wirefeed Roll (4.80 mm dia. Wire)	1 No	26	Control PCB for wire feeder – complete – 1 No in each type.	1 Set.
16	Contact Tip 3.20 mm	2 Nos	27	Vertical slide motor	1 no
CC	**JOB ROTATOR SPARES**				
28	VVVF drive for rotator	1 No	29.	Rotator Speed indicator	1 No.