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:**
	2620600067	**21.09.2006**	**03.11.2006**
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	Header Pipe / Fitting Welding Station as per the technical specification & commercial conditions applicable (to be downloaded from web site **www.bhel.com**)	2 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 "2620600067". 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 *PIPE to PIPE/PIPE to FITTINGS 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 PIPE BUTT-JOINT WELDING STATION having welding machine, job handling and flux recycling unit, etc.	
2.0	Number of BUTT WELDING STATIONS supplied, installed and commissioned till date (with details on machine type, configuration, customer and quantity)	
3.0	YEAR of supply of latest PIPE BUTT WELDING STATION and the Technical Specifications of the Machine supplied.	
4.0	Number of 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) or Pressure Vessels/Pipe Lines , 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	
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]	

S. No.	PARTICULARS	VENDOR's RESPONSE
7.0	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.	
8.0	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 PIPE to FITTINGS 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 PIPE BUTT-JOINT WELDING MACHINES.	
12.0	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 PIPE BUTT-JOINT WELDING MACHINES, are to be provided with the Technical Offer.	
13.0	BIDDER has to co-ordinate for the visit of BHEL Team (at BHEL Cost) to the Bidder's Customer Works , to witness capability of an existing PIPE BUTT-JOINT WELDING MACHINE, if required.	

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
14.0	The BIDDER shall submit the offer in TWO PARTS - Technical **[**with **PART A & PART B]** & Commercial and Price Bid	
15.0	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.	
16.0	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.	
17.0	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.	
18.0	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 inclusion of all the accessories, toolings, spares, consumables, attachments, auxiliary parts, etc. with the main and basic equipment, to meet the technical specification requirements.	
19.0	The reference List of Customers shall be accompanied with (Phone Number and E-Mail ID) of the CONTACT PERSON for cross reference by BHEL	
20.0	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 PIPE TO PIPE / PIPE TO FITTINGS BUTT 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) using submerged arc welding process. The weld butt joint is formed by joining the free end of the pipes and fittings, 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 work station.

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 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 a welding powersource, welding head and the (column & boom type) manipulator carrying the welding head and also helps to position the welding head with respect to the weld joint.

c. Welding Flux Handling Unit — The system has to carry the fresh flux and keep it in the dried state using in-built heaters, supply to the welding head for the process and recycle the unused flux, so that wastage of flux is avoided. The consumption of flux will be made up by addition of baked flux in suitable quantities.

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) 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. 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 200 ^{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 219 mm to 711 mm	
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 Tonnes)	

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. Welding System c. Flux recovery system	Vendor to confirm.	
2.2.0	**JOB ROTATOR DETAILS**		
2.2.1	**JOB Clamping System :**		
2.2.2	The system shall be suitable for centering and clamping jobs mentioned in straight pipes, bends, Tees and Elbows in horizontal axis.	Vendor to confirm.	
2.2.3	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 earth. c. A hollow metallic ring of required thickness 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 with out 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. i. The job clamping arrangement shall have graduations in 'mm' on the sliding members to indicate the diameter of the job to be held inside for job setting	Vendor to confirm.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
2.2.4	**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 drive mechanism of suitable capacity on the ring. The mechanical elements should be suitably designed for the maximum load condition.		
2.2.5	Minimum & Maximum job diameter to be held by the metallic ring.	219 mm to 711 mm	
2.2.6	Height of center point from ground **[NOTE : 1200 mm for one machine and 1500 mm for the second machine]**	Vendor to confirm	
2.2.7	Maximum weight of the job to be rotated.	30,000 kgs.	
2.2.8	Axial clearance to avoid interference by job, from the periphery of the manipulator/its drives/machine element	Minimum 500 mm	
2.2.9	Axial over hang of the job (without support) from M/c.	Maximum 5000 mm	
2.2.10	Speed Range (Infinitely variable)	200 to 700 mm/min.	
2.2.11	Number of Speed Ranges	Vendor to Specify	
2.2.12	Speed Range Selection	Vendor to Specify	
2.2.13	Power Rating of AC Induction Motor (S1 Duty) in kW.	Vendor to Specify	
2.2.14	Torque of the A.C .induction motor for rotator	Vendor to specify	
2.3.0	**MACHINE BASE :**		
2.3.1	Width and Length	Vendor to specify	
2.3.2	Material Details for all elements	Vendor to specify	
2.4.0	**Type of power transmission :** Power transmission from motor to the job rotator. (Complete description of the aforesaid including dimensional details , to be furnished in the offer)	Vendor to specify	
2.5.0	Safety system to prevent the rotation of the job unless JOB is properly clamped. (Details to be given with offer)	Vendor to confirm.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
2.6.0	**OPERATION AND CONTROL SYSTEM - OPERATOR'S PANEL**		
2.6.1	a. One Panel on the equipment controller side and other with Remote Pendant along with 15 mtr cable length, having complete machine control system with required configuration, shall be provided for convenient and efficient 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)		
2.7.0	**DRIVE SYSTEM & FEATURES**		
2.7.1	Make: Internationally Reputed makes only	Vendor to specify	
2.7.2	Type: AC Digital Variable Speed Drive [latest version]	Vendor to specify	
2.7.3	Model : Technically Suitable and Latest Version (as available at the time of ordering, shall be supplied)	Vendor to specify	
2.7.4	Details of Standard Features	Vendor to specify	
2.7.5	Details of Optional Features, recommended by vendor.	Vendor to specify	
2.7.6	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 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 approximately 15 mtr cable distance. 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)
2.7.7	The control panel 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. RPM Indicator / Digital Type	Vendor to Confirm	
2.7.8	**Job Support Rollers :** Manually operated vertically adjustable job supports for supporting the pipes and bends for welding. 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 . The steady shall able to be moved conveniently to accommodate different lengths of pipes & bends.		
2.8.0	**HAND HELD UNIT**		
2.8.1	Hand Held unit of standard make along with sufficient length of interfacing cable (15 mtrs) which can be taken near to the welding spot for job setting and similar other purposes is to be offered with complete details.	Vendor to specify	
2.9.0	**LUBRICATION SYSTEM**		
2.9.1	**First filling of all required Oils & Grease etc**. should be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.	Vendor to specify	
3.0.0	**ELECTRICAL**		
3.1.0	a. 415V + 10% / -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. b. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply during construction of foundation.	Vendor to confirm	
3.2.0	Tropicalization **:** All electrical / electronic equipment shall be tropicalized.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
3.3.0	All electrical/electronic control cabinets & panels shall be dust & vermin proof and shall have IP 54 protection	Vendor to confirm	
3.4.0	a. All electrical and electronic panels including operator's panel should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, 5/15 Amp AC. b. All adapters /receptacles should have compatibility with Indian equivalents.	Vendor to confirm	
3.5.0	Motors & other electrical components shall conform to IEC or Indian Standards	Vendor to confirm	
3.6.0	Vendor shall ensure the proper earthing for the machine and its peripherals.	Vendor to confirm	
4.0.0	**SPARES FOR JOB MANIPULATOR**		
4.1.0	a. Itemized breakup of mechanical, hydraulic, electrical and electronic spares used on the machine in sufficient quantity as per recommendation of Vendor for 2 years of trouble free operation on three shifts continuous running basis should be offered by vendor. b. The list to include following, in addition to other recommended spares: **(Unit Price for each item of spare shall be offered)**	Vendor to confirm	
4.2.0	**Mechanical & Hydraulic Spares:** All types of Transducers, Flow Switches, Filters, Seals, O-rings, etc.	Vendor to confirm	
5.0.0	**BUTT-JOINT WELDING (Submerged Arc Welding) MACHINE**		
5.1.0	Purpose: The equipment is intended for circumferential welding materials as per the above cited **Specification Clause 1.0.0**, using mechanized job rotator.		

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
5.2.0	**EQUIPMENT CONFIGURATION**		
5.2.1	Machine Elements	The offered equipment shall consist of the following : a. Fully Thyristorised Welding Powersource b. Sub-Merged Arc Welding Head - with Torch Positioning Vice - mounted on Manipulator c. Control Panel for setting the Welding Parameters d. Set of Inter-Connecting Power, Earth & Control Cables	
5.3.0	**CONSTRUCTIONAL FEATURES**		
5.4.0	**WELDING POWERSOURCE**		
5.4.1	Current Range	100 to 1000 Amps.	
5.4.2	Duty Cycle	Continuous – 100 %	
5.4.3	O C V	Minimum 65 V DC	
5.4.4	Welding Voltage	20 to 50 Volts DC	
5.4.5	Power Rating	Bidder to specify the Power Rating (input) of the equipment	
5.4.6	Characteristics	Full Wave Constant Potential	
5.4.7	Input Power Supply	415 ±10% V, 50 ± Hz, 3-phase AC, 3 - wire system [4th Wire for PE/Earthing]	
5.4.8	Insulation	Class H	
5.4.9	Design Feature	Fully Thyristorised with six SCRs	
5.4.10	Transformer Windings	The transformer coils in the power and control transformers shall be of 100 % copper or superior quality aluminium windings (copper winding is preferable)	
5.4.11	Parameter Reading Meters	Factory installed Ammeter & Voltmeter (either analogue or digital type) on front panel with easy removal and replacement from front-side for meter calibration purpose. Bidder to specify the make & size of meters.	
5.4.12	Remote Control Unit	Hand-held remote control unit for welding current & voltage variation to be provided.	
5.4.13	Output Terminal	Terminals shall be of Bolt & Nut type with Nickel Coating	
5.4.14	Protection	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.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
5.4.15	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	
5.4.16	Cooling Fans	The powersource 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.	
5.4.17	Lifting Hook	Two numbers of lifting hook to be provided at suitable locations, for handling by EOT Crane	
5.4.18	Working Environment	The ambient conditions relate to a maximum value of 85% Humidity and 45 Deg. C Temperature (both maximum values do not occur simultaneously) in the Shopfloor.	
5.4.19	Castor Wheels	Four numbers of castor wheels of suitable size to be provided for easy mobility within shopfloor	
5.5.0	**WELDING HEAD**		
5.5.1	Wire Feed System	The welding head shall consist of wire feed mechanism incorporating a high torque DC geared motor, wire straightening and feed rollers, welding tip, vertical and horizontal adjustment mechanism	
5.5.2	Head Adjustment in X-Y Axes	a. Vertical Traverse : Min. 250 mm b. Horizontal Traverse to weld seam : Min. 200 mm	
5.5.3	Welding Head - Angular Displacement	a. Along the Vertical Axis : 360° b. Vertical Plane Traverse to Weld - Seam : 45° c. Vertical Plane Parallel to Weld - Seam : 45°	
5.5.4	Torch Tip Positioning	The welding head has to be adjusted transversely and also vertically to bring the welding tip in correct position and swivel up to 45° for fillet seams in fillet position.	
5.5.5	Spot Light	A preferably 24 V Spot Light (with flexible support) to view the weldment to be provided	
5.5.6	Flux Hopper	Capacity of Flux Container : 10 kgs. Open / Shut-Off Manual Control Valve and Flux Feed Tube to be provided.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
5.6.0	**MOTORISED MANIPULATOR FOR WELDING HEAD**		
5.6.1	Purpose	To position the welding head at suitable locations, so that the manipulator can be lifted by crane (or by moving on rails laid on the floor for a length of 10 mtrs.) and brought near the weld joint (job) to be welded	
5.6.2	Construction	Preferred configuration is of Column & Boom Design and to house the welding powersource on the platform. Welding Head & Control Panel are to be mounted on boom	
5.6.3	Vertical Travel	1500 mm	
5.6.4	Horizontal Travel	1500 mm	
5.6.5	Technical Features	Bidder to give a. Traverse speed for all movements b. Dimensional schematic drawing for the manipulator c. Details on drives for all axes	
5.7.0	**MOTORISED TRACTOR FOR WELDING HEAD – OPTIONAL ITEM**		
5.7.1	Purpose	An additional device (other than the column & boom type manipulator) for carrying the welding head to suit specific job applications	
5.7.2	Tractor Design	The tractor carriage shall be fabricated from steel sheets and provided with four wheels suitably insulated and for travelling on rails	
5.7.3	Trolley Drive	The trolley is to be driven by a high torque DC geared motor with the help of chain and sprocket arrangement, giving power to the four wheels, thereby avoiding any slippage of the wheels	
5.7.4	Trolley Balancing	The trolley has to support the cross/vertical beam fitted with welding head on one side and control box on the opposite side, which can be fixed on the top of the trolley.	
5.7.5	Free Drive Clutch	A suitable clutch arrangement has to be provided for disengaging the geared motor for manual pushing. And also handles for pushing and pulling the system manually.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
5.7.6	Traversing Rail	Rails made out of steel sections with suitable reinforcements, in segments of 2000 mm (in length) with suitable end couplers to build a welding track of length more than 2 mtrs.	
5.8.0	**CONTROL PANEL FOR WELDING POWER SOURCE**		
5.8.1	Current Range	100 to 1200 Amps.	
5.8.2	Welding speed	200 mm to 1000 mm/min.	
5.8.3	Wire feed speed	1.0 to 7.5 M/Min.	
5.8.4	Wire diameter	2.0 mm to 6.3 mm	
5.8.5	Welding Current	1200 amps. at maximum	
5.8.6	Control Type	The speed controls shall be thyristorised for traction, wire feed movements.	
5.8.7	Control Panel	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 and carriage speed controls.	
5.8.8	Location	The control panel shall be mountable on the welding head and shall be swivel type to fix at a convenient position for easy reading of welding parameters.	
5.8.9	Controls / Display	The control panel shall incorporate the following : a). Indicating Meters for reading welding current, voltage and carriage speed. b). Potentiometer for wire feed and carriage speed adjustment. c). Push buttons for upward and downward inching of the electrode wire. d). Switches for Start and Stop of welding. e). Forward, off and reverse movement of the carriage. f). Spot Light ON/OFF Switch g). Indication Lamp for Welding 'ON'	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
5.9.0	**INTER-CONNECTING CABLES**		
5.9.1	Length	The control cables, welding and earth cables connecting the powersource to the welding head/control panel shall have a length of five metres.	
5.9.2	Protection	Suitable sheathing to be provided for the cables for withstanding the rough use in shopfloor.	
5.9.3	End-Connectors	All the cables shall be provided with suitable end-connectors for easy fixing up.	
5.10.0	**CONSUMABLES & SPARES -** (Refer to **ANNEXURE – 5** for type & quantity).		
5.10.1	Consumables	Consumables like contact tip/nozzles for 2.4 mm, 3.15 mm, 4.0 mm, 4.8 mm and 5.0 mm dia. wires shall be quoted separately. Feed and straightening rollers suitable for the above said dia wires also may be quoted.	
5.10.2	Spares	Electrical and Mechanical spares for two years of trouble free operation shall be quoted. List to cover items listed in **ANNEXURE - 5**, enclosed.	
6.0.0	**FLUX RECOVERY UNIT & RECYCLING SYSTEM**		
6.1.0	Purpose	a. The system is meant for a typical application of recycling unfused welding flux during sub-merged arc welding operation, in the existing welding station. b. The sucking of surplus flux shall be either from weld grooves of width 20 mm to 40 mm or flat surfaces. c. Welding slag pieces of smaller sizes may also be sucked d. The temperature of unfused flux is around 150 ° C.	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
6.2.0	**EQUIPMENT CONFIGURATION**		
6.2.1	Machine Elements	The offered Flux recovery unit shall consist of the following : a. A multi-stage rotary turbine or regenerative blower coupled to an electric motor for high vacuum generation b. A vacuum chamber, provided with a fabric filter bag assembly to separate fine dust and a dust collecting tank. c. The vacuum chamber shall be connected to a primary cyclone/baffle type separator through a flexible vacuum hose. The primary separator shall have a mesh for separating slag particles and a conical bottom (hopper) with a tapping facility to drain the collected flux. d. A pressure feeding system to carry the flux from the flux-chamber to the flux-hopper fitted near the welding-head and for sucking the flux, a flexible hose with recovery / collecting nozzles (suitable for grooves and flat surface) shall be connected to the primary separator. e. A flux heating chamber with suitable electrical heating elements with temperature gauge to maintain the temperature of recycled flux at a minimum of 150 deg C, while in operation. The heating system offered shall be explained in detail with principle of operation and fool-proof electric heating mode.	
6.3.0	**CONSTRUCTION FEATURES/TECHNICAL SPECIFICATIONS**		
6.3.1	Electrical Power Input	415 V, 50 Hz, 3 Phase AC (Thro' 3 Wire System)	
6.3.2	Compressed Air Pressure	4 to 5 kg/sq.cm. (input)	
6.3.3	Electric Motor Power	5 H.P. (minimum) with continuous (100 %) Duty Cycle	
6.3.4	Air Displacement	5.0 Cubic Mtrs./Min. (Minimum)	
6.3.5	Measure of Vacuum	2200 mm of H2O (Minimum)	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
6.3.6	Recovery/Feeding Hose	40mm ID, Synthetic Rubber or Metal Braided / Reinforced Hose to withstand 150 Deg. C .	
6.3.7	Flux Handling Temperature	150 Deg. C (Maximum)	
6.3.8	Filter Area	12,500 sq.cms. (Minimum)	
6.3.9	Fine Dust Storage Capacity	25 Litres in Vacuum Unit	
6.3.10	Flux Storage Capacity	30 Ltrs. in Primary. Separator	
6.4.0	**EQUIPMENT CONFIGURATION**		
6.4.1		a. The flux feeding conduit and recovery hoses shall ensure no clogging of flux at any junctions, bends, nozzles, etc. b. Suitable accessories like crevice nozzle, extension pieces, handles, filters etc., shall be offered. c. The sucking and feeding hoses or tubing shall withstand the temperature of 150 ° C in continuous duty application with reasonably long life. d. Both electrical and mechanical spares such as rubber gaskets, filter fabric, suction hoses, V-belt, pulleys, heating elements etc. shall be offered with unit rate. Complete set of spares shall be quoted and the Indian equivalent may be mentioned in the offer. e. The equipment shall be coated with heat resistant and anti-corrosive paint because of the nature of working environment.	
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	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
8.0.0	**SAFETY ARRANGEMENTS**		
8.1.0	Following safety features in addition to other standard safety features should be provided on the machine : a. The complete welding station 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. b. Machine functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages (on display and panels) should be available. c. A detailed list of all alarms / indications provided on machine should be submitted by the Vendor. d. All the drive transmission elements , 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. e. All the rotating parts used on machine should be statically & dynamically balanced to avoid undue vibrations, Noise and suitably guarded. f. Emergency Switches at suitable locations as per International Norms should be provided. g. 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	

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**		
11.1.0	Vendor to confirm that 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 along with documentation to be supplied with the machine	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
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	
11.3.0	Recommended set of spares for all attachments are to be offered with details.	Vendor to confirm	
11.4.0	**Electrical /Electronic Spares :** All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, spares for Motors, Drives, Power Module & Control Cards for Main Drives etc.	Vendor to confirm	
12.0.0	**DOCUMENTATION:**		
12.1.0	Three sets of following documents (3 Hard copies,) in English Language should be supplied along with the machine	Vendor to confirm	
12.2.0	Operating Manuals of equipments	Vendor to confirm	
12.3.0	Programming Manuals if any for the station.	Vendor to confirm	
12.4.0	Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical / Pneumatic/ Hydraulic Circuit Diagrams. All Assembly/ Sub Assembly Drawings shall be supplied with the part list also	Vendor to confirm	
12.5.0	Maintenance, Interface & Commissioning Manuals for speed drives.	Vendor to confirm	
12.6.0	Manufacturing drawings for all supplied components like drive transmission elements.	Vendor to confirm	
12.7.0	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
12.8.0	Detailed specification of all rubber items and hydraulic/ lube fittings	Vendor to confirm	
12.9.0	Operating Manuals, Maintenance Manuals & Catalogues for all supplied Accessories.	Vendor to confirm	
12.10.0	The vendor shall submit complete Master List of parts used in the equipment.	Vendor to confirm	
12.11.0	One additional set of all the above documentation in CD as the SOFT COPY	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	
13.3.0	Commissioning spares, required for commissioning of the machine within stipulated time, shall be brought by the Vendor on returnable basis.	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	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
13.5.0	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to confirm	
13.6.0	Charges, duration, terms & conditions for E&C should be furnished in detail separately by Vendor 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	**PROVE-OUT OF BHEL COMPONENTS:**		
15.1.0	The trouble free rotation of the job rotator and welding at rated speed and maximum rated capacity along with Flux recovery operation for the straight & bend pipes, Tees & Elbows for sizes given by BHEL during the technical discussions / at the time of releasing the Purchase Order.	Vendor to confirm	
15.2.0	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	
15.3.0	Demonstration of all features of the machine, control system & accessories	Vendor to confirm	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
16.0.0	**MACHINE PROVE - OUT**		
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	
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	
18.0.0	**PERFORMANCE GUARANTEE**		
18.1.0	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	
19.0.0	**GENERAL POINTS**		
19.1.0	equipment Model No.	Vendor to specify	
19.2.0	Total connected load (KVA):	Vendor to specify	

S.No.	PARTICULARS AND BHEL SPECIFICATION		BIDDER'S OFFER (with Technical Details)
19.3.0	Floor area required (Length, Width, Height) for complete equipment & accessories	Vendor to specify	
19.4.0	Equipment lubrication	Vendor to specify	
19.5.0	Painting of Equipment / Electrical Panels using RAL 6011 Apple Green Colour (Polyurethane Paint)	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	
19.12.0	Detailed catalogues, sketch/ photographs of the equipment and accessories/ attachments should be submitted with the offer.	Vendor to confirm	
19.13.0	Hydraulic,& oil piping should be preferably metallic except places where flexible piping is essential.	Vendor to confirm	

ENCLOSURES :

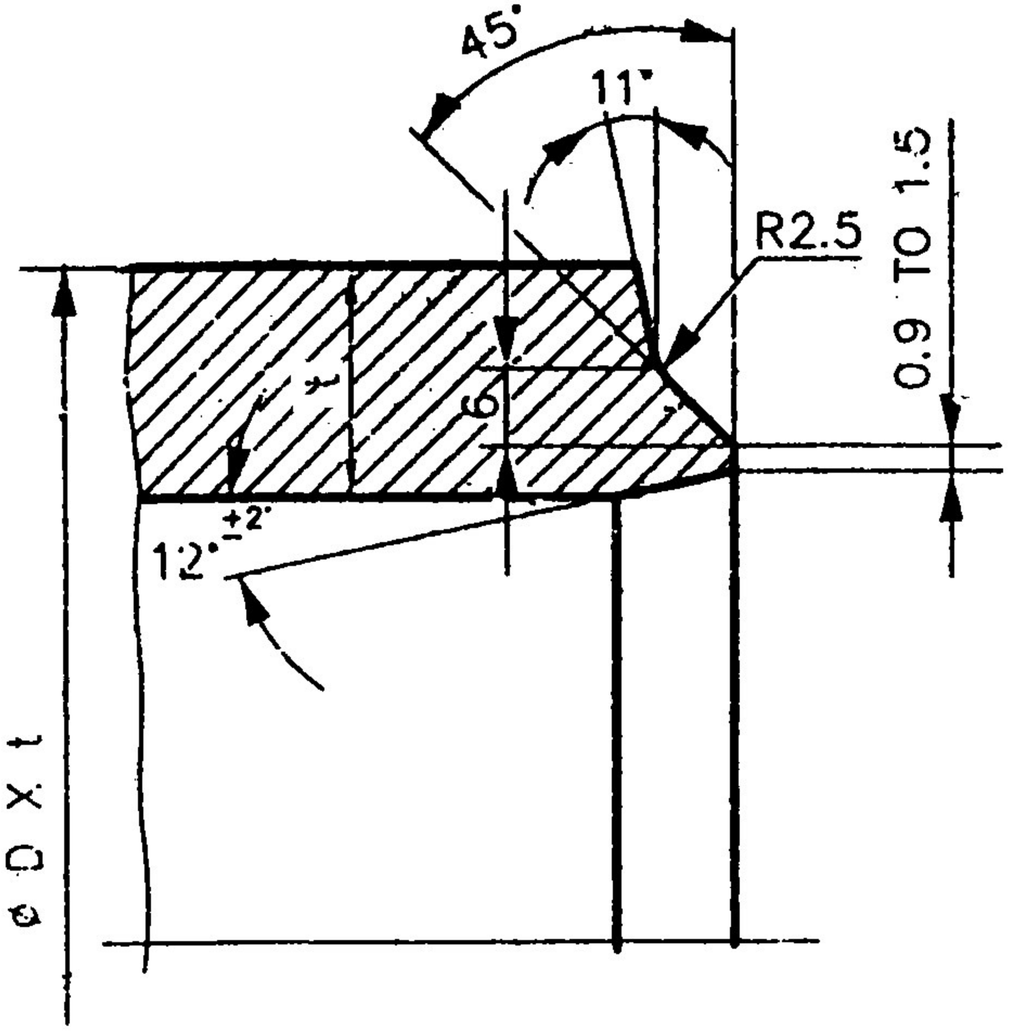
ANNEXURE –1 : Edge Preparation Styles for Butt Welding Operation

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

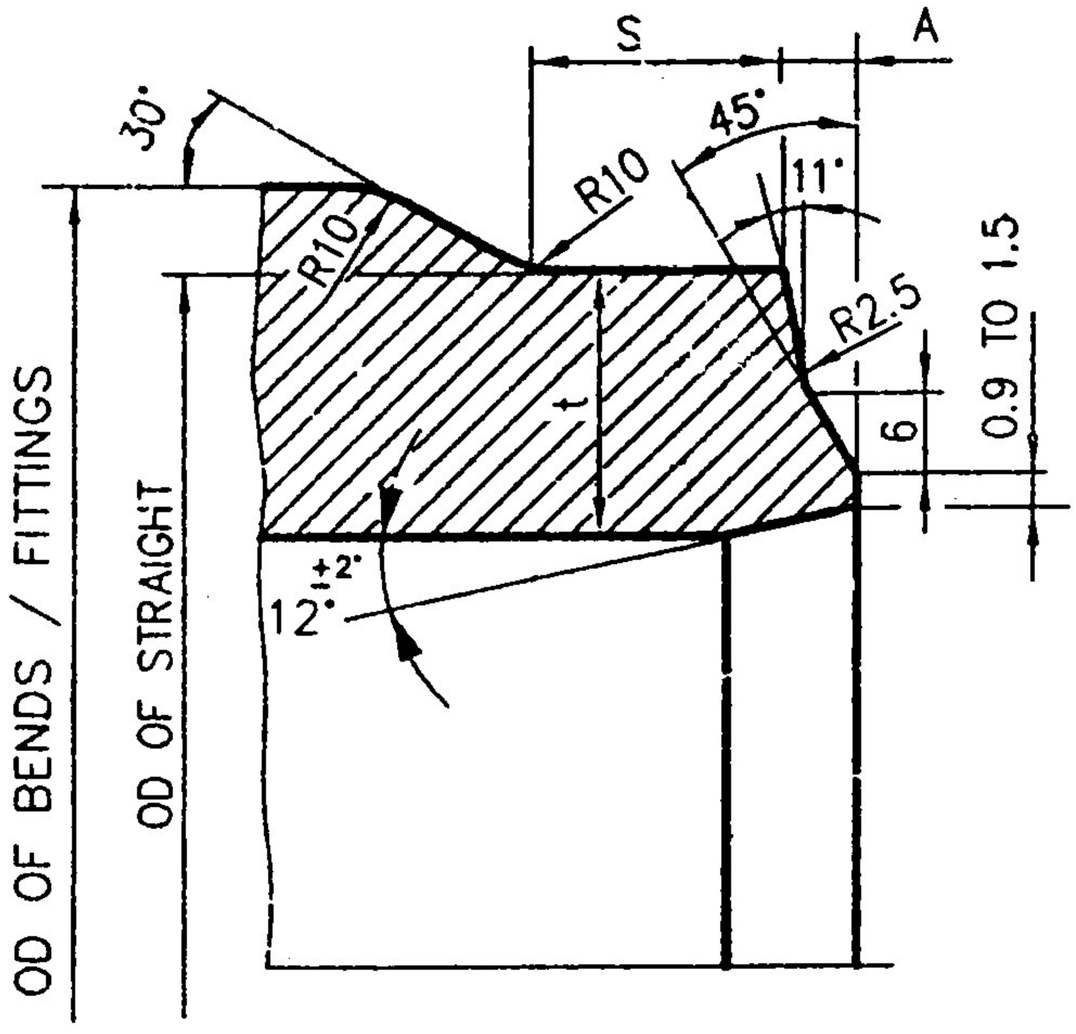
ANNEXURE - 1
Drg No. CABS-1-16 - 01
BHEL, Tiruchirappalli



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

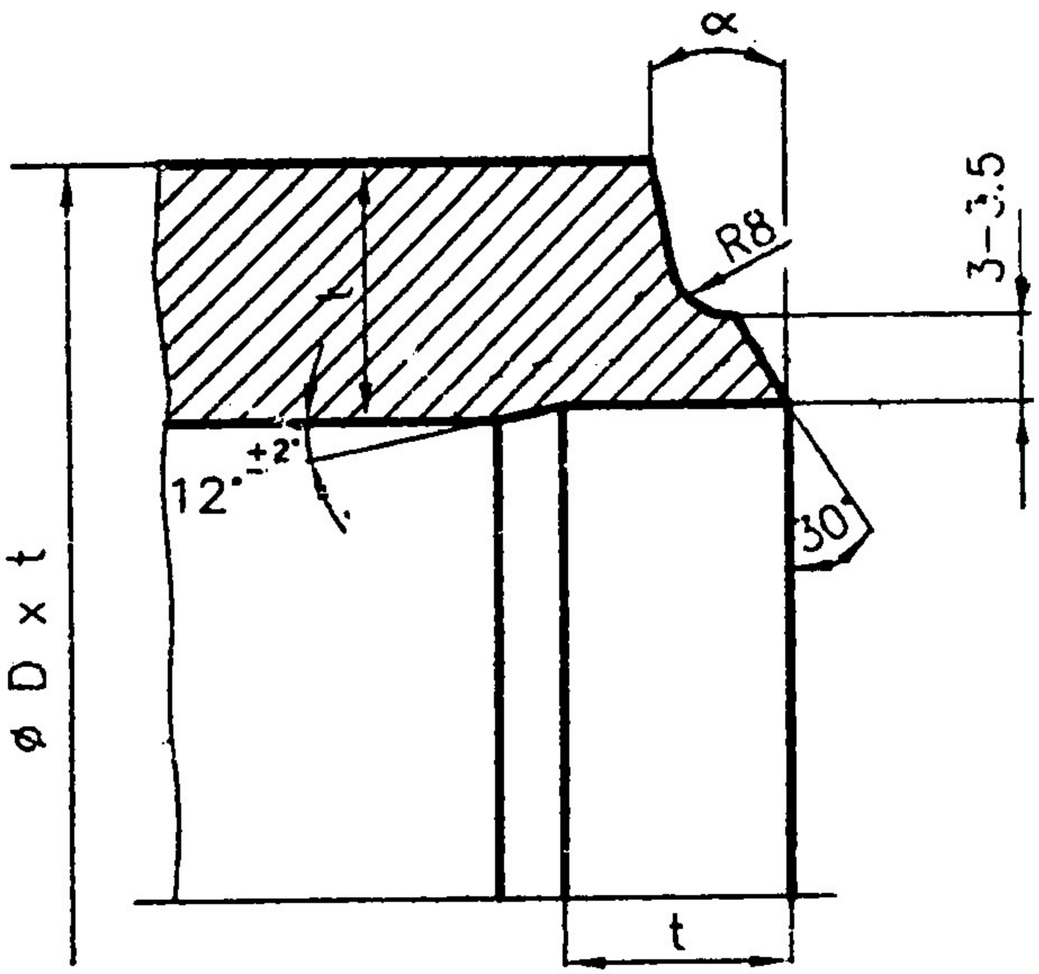


FIGURE – X

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

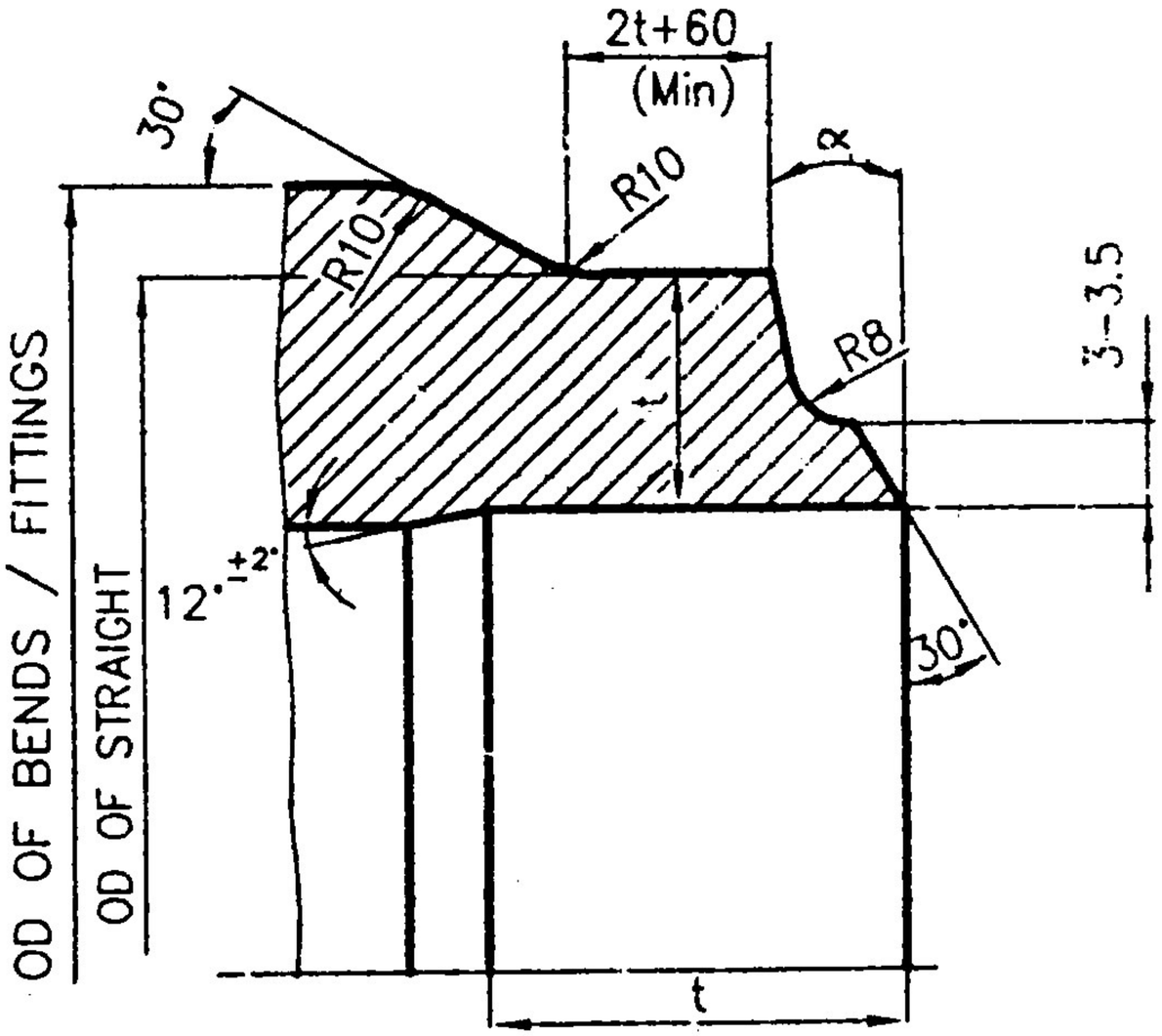


FIGURE – Xa

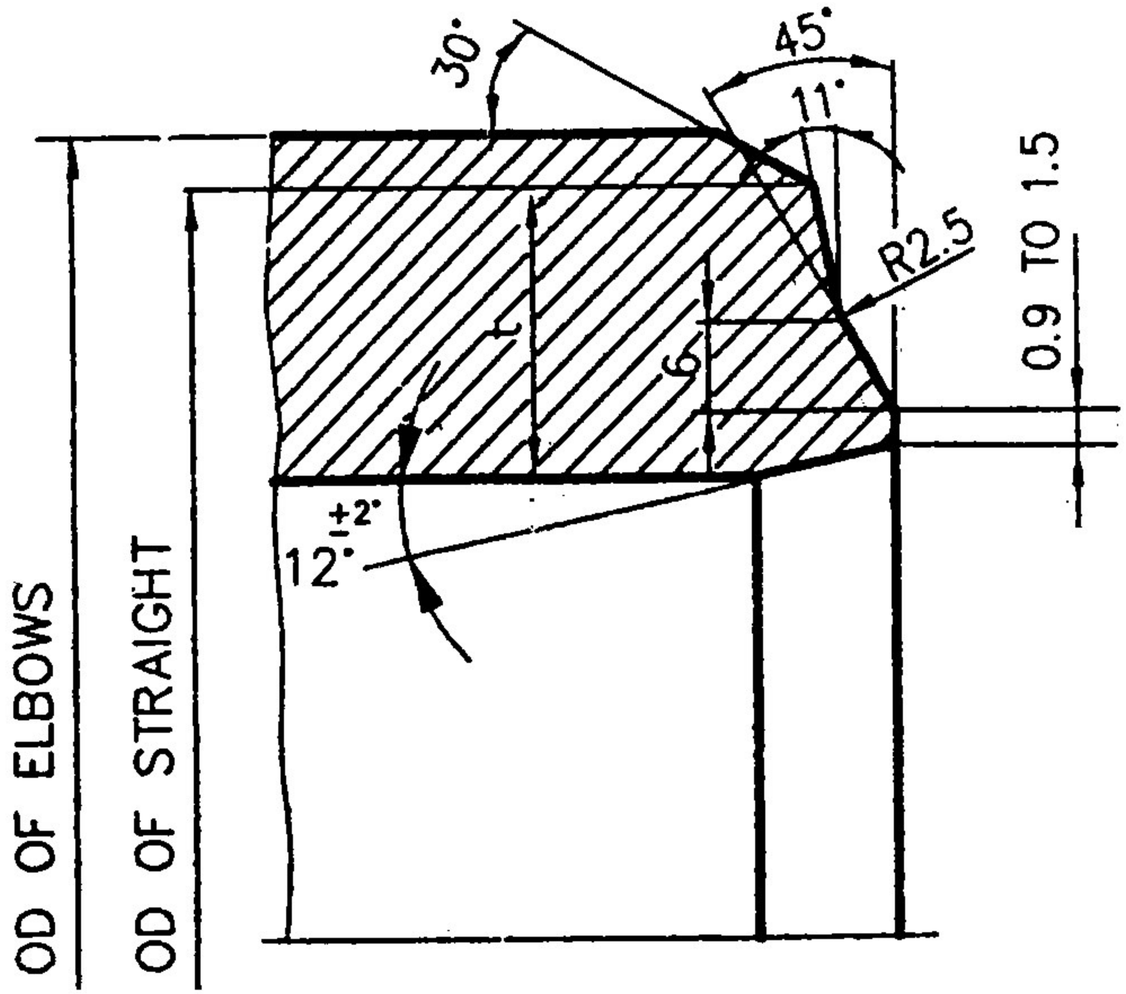
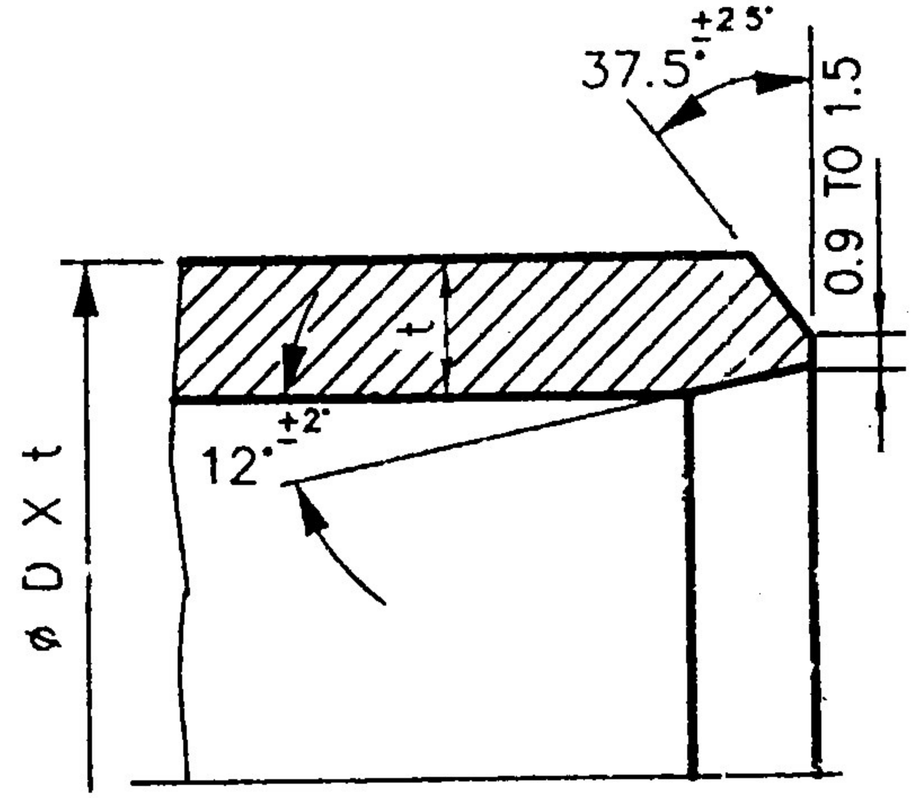


FIGURE – Z



STYLE – D

NOTES: –

01. USE WHEN t < 14.2 mm.

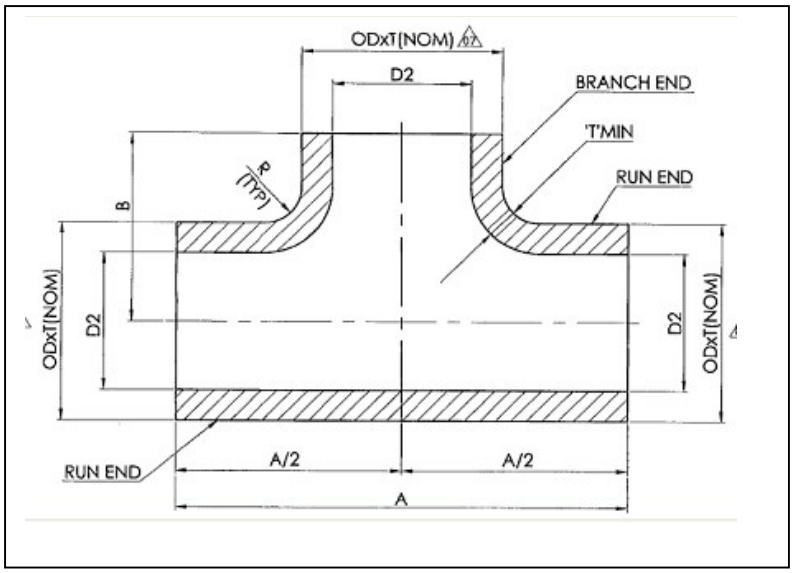
ANNEXURE - 1
Drg No CABS-1-16 - 03
BHEL, Tiruchirappalli

ANNEXURE - 2

PIPE SIZES

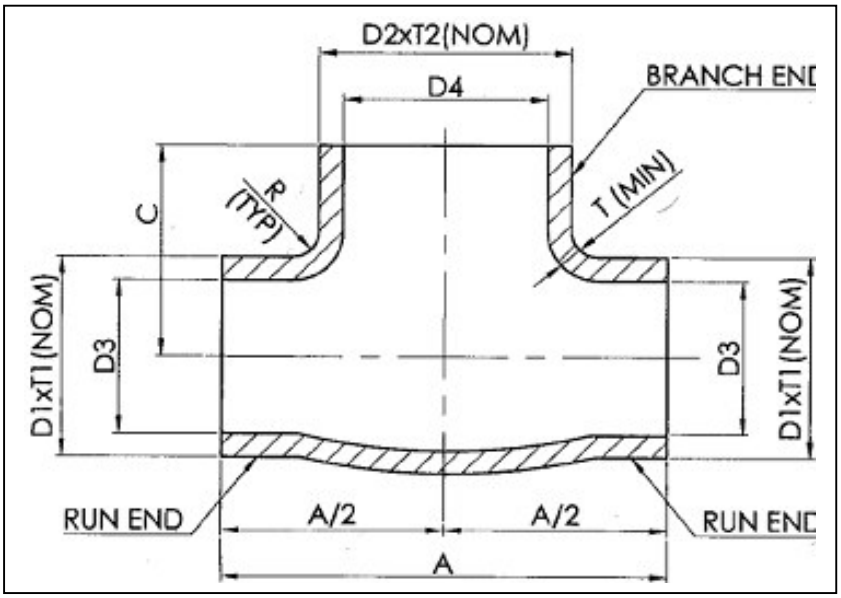
Sl. No.	Pipe Size (Outer Diameter) in 'mm'	Pipe Wall Thickness [Range in 'mm']
01	219.1	6.32 to 24.0
02	273.0	6.35 to 25.0
03	323.0	6.4 to 50.0
04	355.6	40.0
05	457	12.7 to 45
06	508	6.0 to 71.0
07	558	6.35 to 72.0
08	609.6	14.27 / 20 / 30
09	660	14.2 to 45
10	711	20 to 45

FITTINGS : ‘ T ’ ees



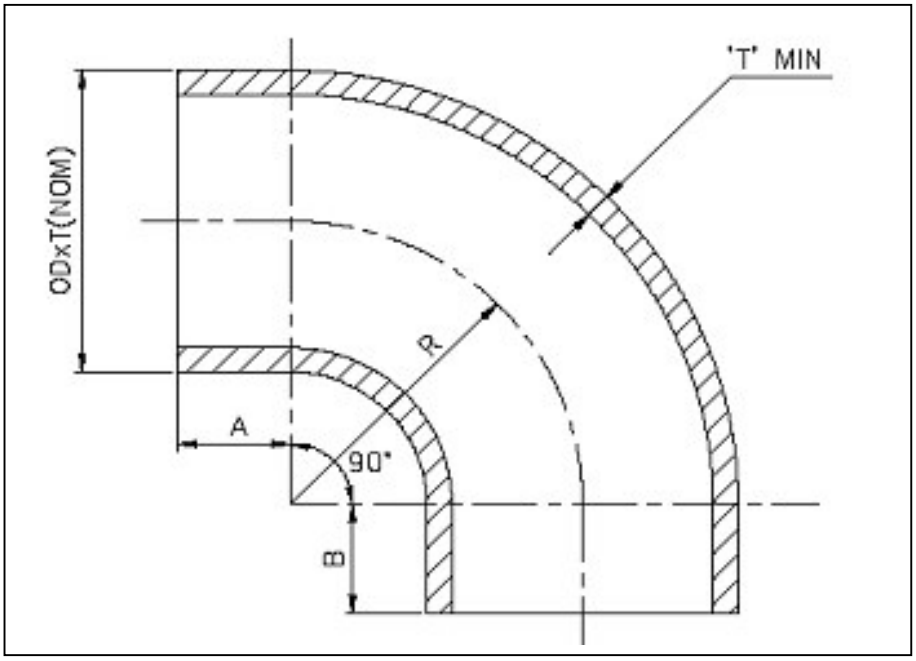
Sl. No	OD, mm	T (Nom) Thickness, mm	(A) Length, in **mm**	B in **mm**
1	219.1	18.2, 28.5, 32, 36, 40	340	170
2	244.5	42.2	600	200
3	273	32, 36, 36.5, 40, 45, 45.7	635	215
4	323.9	36, 36.5, 37.1, 38.8, 40, 45.7	710	255
5	355.6	45.7, 59	760	280
6	368	28.5, 54.85, 59, 60. 57, 68.57	760,820	280
7	406.4	51.4, 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

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

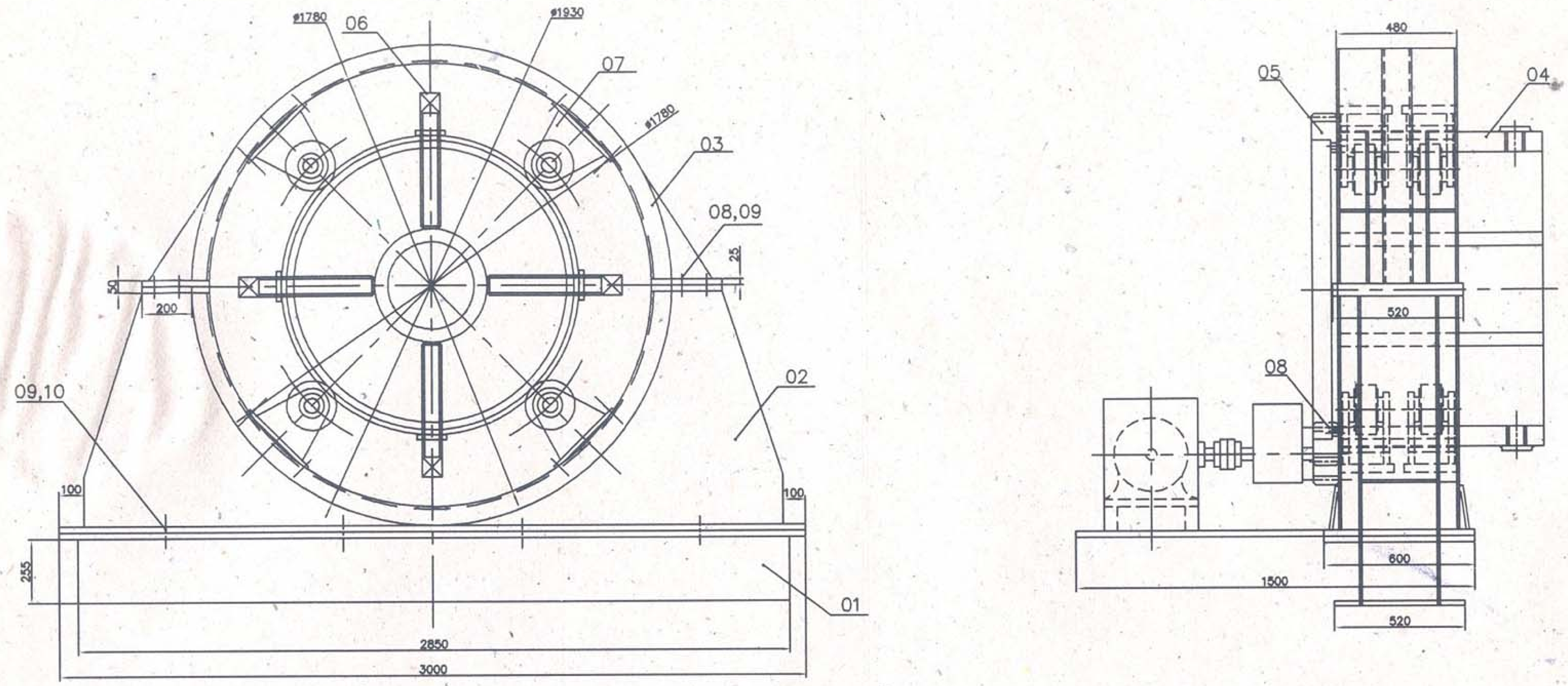
FITTINGS : ELBOWS

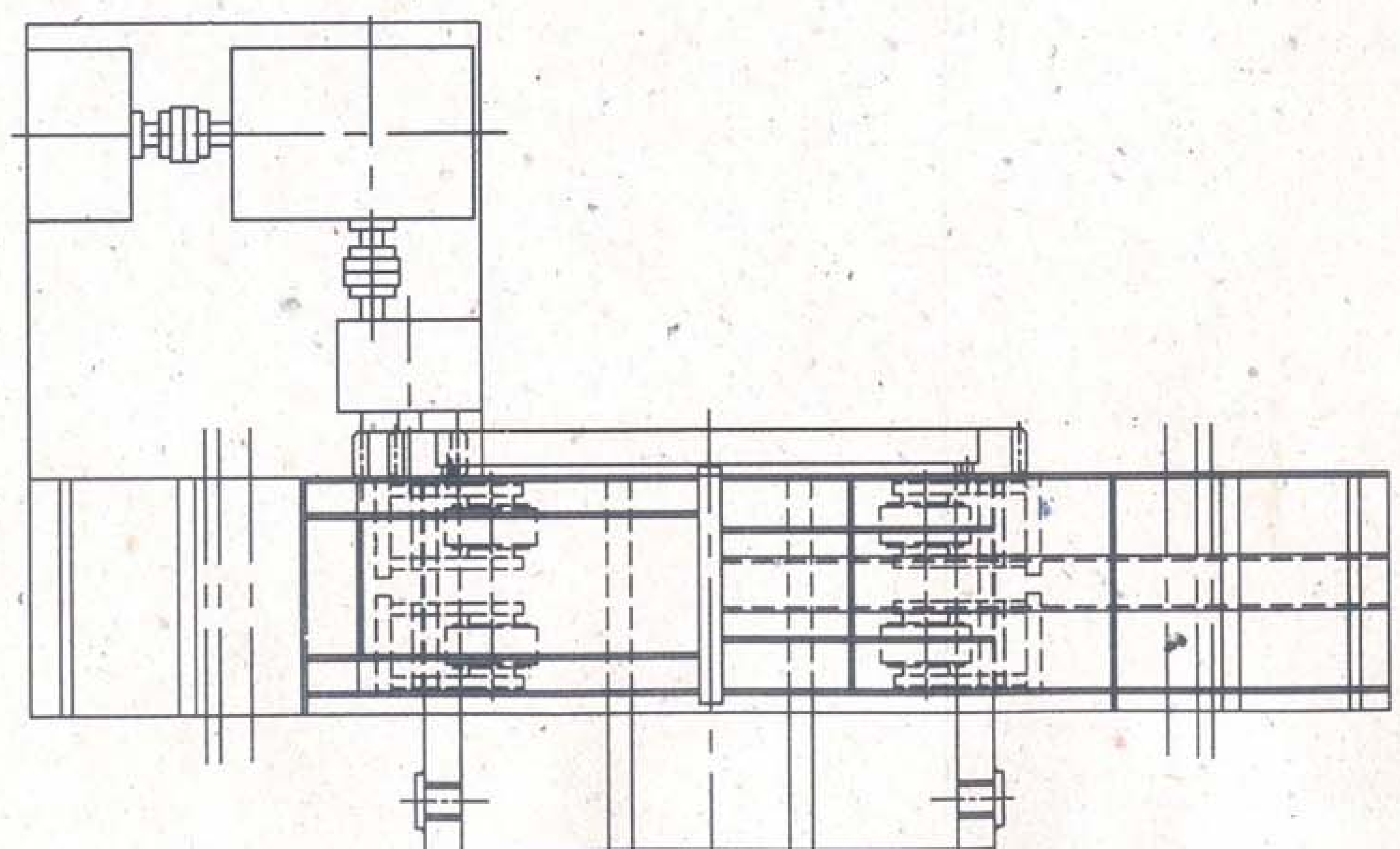


Sl.No	OD, In **mm**	T (Nom) Thick, in **mm**
1	219.1	18.28,22.85,25,28,30,32,40
2	273	32,35.4,36,36.5,40,45
3	323.9	29.14,34.28,36,40,42.28,45.7,51.42
4	355.6	35,40,50,55
5	368	36.57,40,41.14,48,50,51.42,59
6	406.4	25,32.5,45.7,51.42,57.14,62.85,68.57
7	457.2	25,45.7,51.42,57.1,65.1
8	508	25,62.85,71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

ALL DIMENSIONS ARE IN MM

CAUTION:



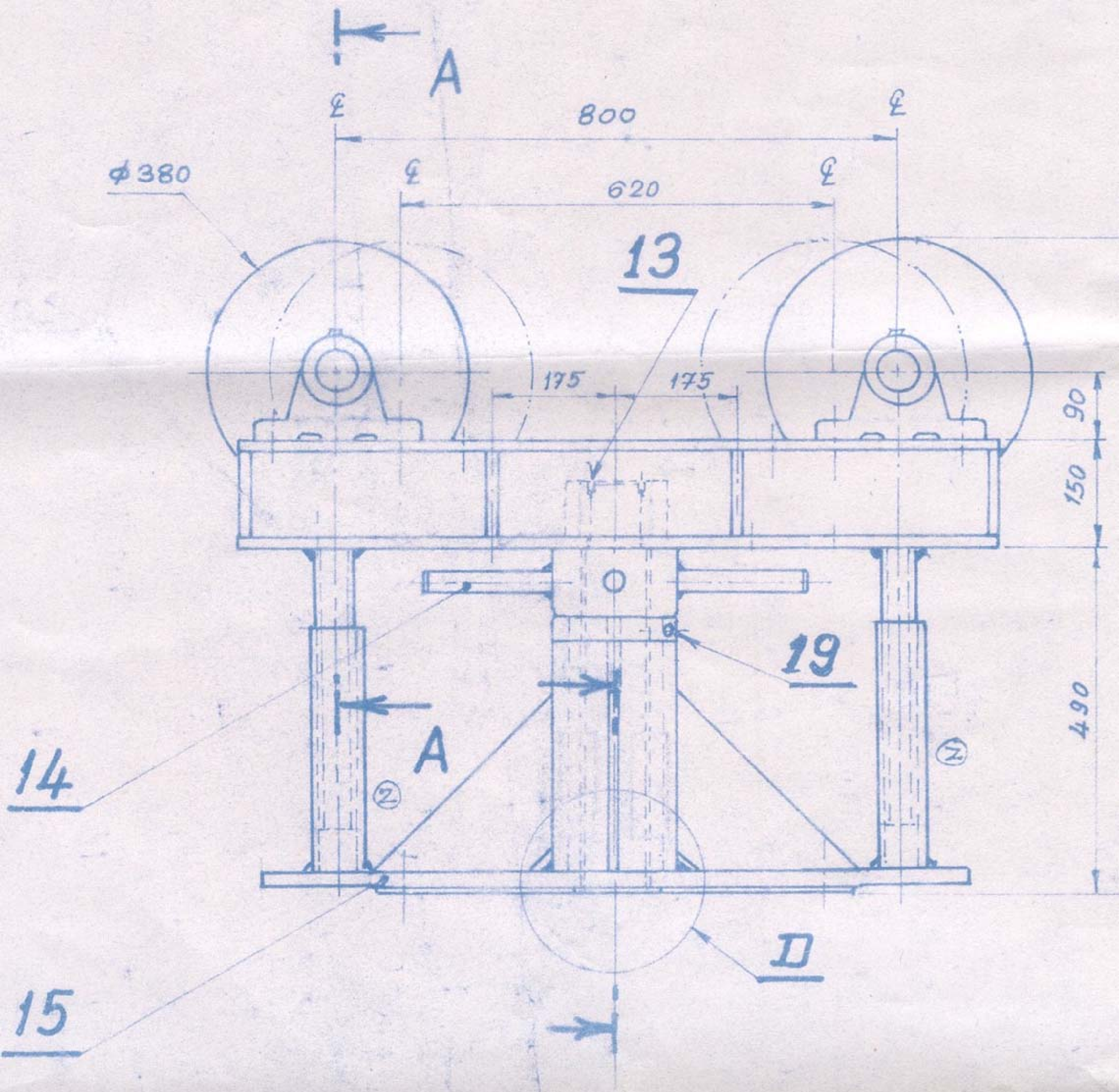


5225

11	3H.P. 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.
SCALE DRAWN				
CHECKED				
APPROVED				
DATE				
MACHINE:	TYPE:			
TITLE: TROUGH	DRAWING No: 1M000000000000	C.O 00	REV.	
	Sheet No	Sheet Size		

08


A
℄
800
℄
℄
620
℄
⌀380
13
175
175
90
150
490
19
14
A
2
2
D
15
17

ANNEXURE - 5

LIST OF SPARES & CONSUMABLES

S.No.	DESCRIPTION	QTY.	S.No.	DESCRIPTION	QTY.
AA	**POWERSOURCE SPARES**				
1.	O/P Terminal Board Assembly	1 No.	6.	Receptacles – All Types	1 Sets in each
2.	I/P Terminal Board Assembly	1 No.	7.	Cooling Fan Assembly	1 No.
3.	All types of Printed Circuit Board (PCB) – with part no and description	1 No in each.	8.	Diodes –make and type no	2 no
4.	Voltmeter	1 No	9.	Indicator Lamps	10 Nos.
5.	Ammeter	1 No.	10.	SCR module -make and type no	3 Nos
BB	**TRACTOR/WELDING HEAD /CONTROL PANEL SPARES**				
11.	D.C. Motor with make and type no	1 No.	24.	Contact Tip 5.00 mm	12 Nos.
12.	Pressure Roller Assembly	1 No.	25.	Wire Feed Nozzle (of Copper)	3 Nos.
13.	Straightening Roller Assembly	1 No.	26.	Switches	1 Set
14.	Guide Roller Assembly	1 No.	27.	Ammeter	1 No.
15.	Tightening Knob Assembly	3 Nos.	28.	Voltmeter	1 No.
16.	Wire Guide House with Spiral	3 Nos.	29.	Carriage Speed Motor with make and type no	1 No.
17.	Wire Guide Tube with Spiral	3 Nos.	30.	Sockets – All Types	1 Set
18.	Wirefeed Roll (3.15 mm dia. Wire)	3 Nos	31.	Speed Control PCB Assembly	2 Nos.
19.	Wirefeed Roll (4.00 mm dia. Wire)	6 Nos	32.	Sequence Control PCB Assly	2 Nos.
20.	Wirefeed Roll (4.80 mm dia. Wire)	6 Nos	33.	Control Transformer with ratings	1 No.
21	Wirefeed Roll (5.00 mm dia. Wire)	6 Nos	34.	Relays	1 set
22.	Contact Tip 3.15 mm	6 Nos.	35.	Main power supply PCB	1 No.
23.	Contact Tip 4.00 mm	12 Nos.	36.	Wire Spool Holder (25 kgs.)	3 Nos.