



Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

CAPITAL EQUIPMENT/ MATERIALS MANAGEMENT

An ISO 9001
Company

ENQUIRY	Phone: +91 431 257 70 49 Fax : +91 431 252 07 19 Email : csguna@bheltry.co.in Web : www.bhel.com
NOTICE INVITING TENDER	

TWO PART BID	Enquiry Number:	Enquiry Date:	Due date for submission of quotation:
Tender to be submitted in two parts.	2620900164	29.08.2009	15.10.2009

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	LPG Fired Continuous Discharge Roller Hearth Furnace as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 No.

Important points to be taken care during submission of offer

1. Delivery required 10 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 "2620900164".

Tenders should reach us before 14:00 hours on the due date
Tenders will be opened at 14:30 hours on the due date
Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

Sr.Manager / MM / Capital Equipment

PART A
CONTINUOUS DISCHARGE FURNACE

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	<p>Only those vendors (OEMs), who have supplied and commissioned at least ONE CONTINUOUS DISCHARGE ROLLER HEARTH FURNACE for furnace temperature of 800 °C or higher in the past ten years (on the date of opening of Tender) and such machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of Tender) should quote.</p> <p>However, if such machine 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 (on the date of opening of Tender).</p>	
	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 machine 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 machine.	
1.5	Application for which the machine 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 machine 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	<p>DELIVERY - The bidder shall quote the best possible delivery. However the delivery shall not exceed 10 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.</p> <p>The delivery period shall be reckoned from date of purchase order to despatch from the vendor works.</p>	

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 Continuous Roller Hearth furnace have been supplied in the past.	
4.0	Details of Continuous Roller Hearth furnace supplied to other BHEL units, if any. (Year of commissioning, Length, Width, capacity and Operating temperature)	
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

1. Supplier of the machine		
2. Make & Model of the M/C		
3. Month & Year of Commissioning		
4. Application for which M/C is used		
5	a) Length b) Width c) Operating Temperature d) WT. Carrying Capacity	
6. Performance of the Machine (Strike off whichever is not applicable)		Satisfactory / Good / Average / Not Satisfactory
7. After sales service (Strike off whichever is not applicable)		Satisfactory / Good / Average / Not Satisfactory
8. Any Other remarks		
Date:		Signature & Seal of the Authority Issuing the Performance Certificate

PART B

**CONTINUOUS DISCHARGE ROLLER HEARTH FURNACE
(Fuel: LPG)**

TECHNICAL DATA & SPECIFICATIONS: CONTINUOUS DISCHARGE ROLLER HEARTH FURNACE (LPG FIRED)

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL:			
1.1	Purpose: Stress Relieving and annealing of all tubular coils forming pressure parts of Utility Boilers and Industrial Boilers			
1.2	Job Details: Material: Mild Steel & Alloy Steel Configuration: Tubular Coils & Panels Diameter Range: 31.8 to 76.1 mm OD Wall Thickness: 2.4 to 15 mm Job Length: Up to 24 M Job Width: Up to 3500 mm Weight of Job Lot: Not exceeding 8 Tons			
2.0	FURNACE:			
2.1	Operating Parameters:			
2.1.1	Charge Capacity	8 Tons		
2.1.2	Heat Treatment Cycles to be carried out	Stress Relieving, Annealing,		
2.1.3. a)	Maximum Furnace Temperature	Vendor to specify		
b)	Maximum Charge Temperature	790°C +/- 10°C		
c)	Rate of Heating (selection has to be infinitely variable in the range specified)	35 to 200 °C / Hour		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.1.3.d)	No of Zones	Four		
2.1.4	Job Temperature Uniformity in all 4 zones of the furnace	± 10°C		
2.1.5	Fuel	LPG		
2.2	Furnace Configuration			
2.2.1	Fuel - LPG Gas Fired firing system			
2.2.2	Roller Hearth Type with Vertical Lifting Doors partially open depending on job height in Continuous Discharge Mode			
2.2.3	Automatic Zone Temperature Control with Programming of Heat Treatment Cycle			
2.2.4	Ceramic Fiber block module Lining (roof and doors)			
2.2.5	Hard refractory brick construction on the side walls and hearth			
2.2.6	Recuperator System for Energy Conservation			
2.2.7	Chamber Rollers. Charge (Infeed) and Discharge Roller Tables			
2.3	Furnace Chamber Inside (Effective) Dimensions			
2.3.1	Wall to Wall width	3850 mm		
2.3.2	Inside Length (Front Door to Back Door)	16000 mm		
2.3.3	Inside Height (above Roller Hearth Top)	900 mm		
2.4	Combustion System:			
2.4.1	The furnace has to be provided with the required number of nozzle-mix high velocity burners suitably designed for firing LPG. The positioning of the burners inside the furnace should be designed to create high degree of turbulence in the furnace atmosphere, increased convection heat transfer co-efficient, resulting in better uniformity and thermal efficiency even at lower temperature.	Vendor to Confirm		
2.4.2	Fuel	LPG		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.4.3	LPG Gas Pressure-BHEL can supply at 2.0 kg/cm ²	Vendor to Specify		
2.4.4	Max required flow rate of LPG	Vendor to Specify		
2.4.5	Burners Type-(High Velocity Burner of Reputed make acceptable to BHEL) (Vendor to furnish model no. and technical details of burners)	Vendor to Specify		
2.4.6	Number of rows and arrangement of Burners (Schematic drawing should be furnished along with the offer)	Vendor to specify		
2.4.7	Number of Burners (Calculation details should be submitted with the offer)	Vendor to Specify		
2.4.8	Burner Rating	Vendor to Specify		
2.4.9	Burner turn - down ratio (higher ratio is preferred)	Vendor to specify		
2.4.10	Flame Length	Vendor to Specify		
2.4.11	Type of Temperature Control	PID		
2.4.12	No. of Temperature control Zones	Four		
2.4.13	LPG gas burner material of construction shall be SS 310 inside portion.	Vendor to Confirm		
2.4.14	LPG gas igniter material of construction shall be SS 310.	Vendor to Confirm		
2.4.15	Two ways solenoid valve shall be brass material and should be flame proof as per IS: 2148 gas group class IIA, IIB.	Vendor to Confirm		
2.4.16	Isolation valves shall be fire safe design as per IS: 2148	Vendor to Confirm		
2.4.17	Vent valves opening position to be indicated in the control panel	Vendor to Confirm		
2.4.18	All vent valves shall be routed above roof to better air mix up in atm.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.4.19	All valve flanges shall be raised face with serrations.	Vendor to Confirm		
2.4.20	Wherever electrical input is available with any instrument in the LPG line such as Igniter cables, scanner related items, junction boxes, transmitter, limit switches shall be flame proof enclosure with double compression cable gland provision for cable entry/exit.	Vendor to Confirm		
2.4.21	All cables should be Flame Retardant Low Smoke design only	Vendor to Confirm		
2.4.22	Copper clad asbestos gasket to be used for flanges valves	Vendor to Confirm		
2.4.23	The complete piping system with all mechanical components should withstand minimum 5 bar pressure	Vendor to Confirm		
2.4.24	Provide 2 Nos. of "y" type / simplex filter with 4 Nos. of isolation valves in place of a common filter.	Vendor to Confirm		
2.4.25	Instrument impulse line shall be SS 316, Sch 40.	Vendor to Confirm		
2.4.26	Copper washer shall be provided to all pressure gauges and switches	Vendor to Confirm		
2.4.27	All Flanges should be provided with copper earthing	Vendor to Confirm		
2.4.28	One spectacle blind shall be provided for each furnace near terminal point at gas train piping.	Vendor to Confirm		
2.4.29	TIG root run welding shall be carried out for all welding joints in LPG line.	Vendor to Confirm		
2.4.30	Provide one isolation valve for all pressure gauge /pressure switch	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.4.31	Forced Draught (FD) Fan:			
a)	FD Fan with VFD of suitable capacity (including excess air) has to be provided to ensure proper combustion	Vendor to Confirm		
b)	Air flow	Vendor to Specify		
c)	Air Pressure	Vendor to Specify		
d)	Power Rating (KW)	Vendor to Specify		
e)	Type of blower: Centrifugal	Vendor to confirm		
f)	Make of Blower	C-Doctor/Patel/Flakt		
2.4.32	Induced Draught (ID) Fan:			
a)	ID Fan of suitable capacity if required to be provided before the stack	Vendor to Confirm		
b)	Air flow	Vendor to Specify		
c)	Air Pressure	Vendor to Specify		
d)	Power Rating (KW)	Vendor to Specify		
e)	Type of blower: Centrifugal	Vendor to Specify		
f)	Make of Blower	C-Doctor/Patel/Flakt		
2.4.33	The FD Fan and ID Fan have to be suitably sized to ensure a Balanced Draft System	Vendor to confirm		
2.4.34	A standby fan each for both FD and ID system has to be provided	Vendor to confirm		
2.4.35	Bell mouth (Silencer) inlet to be provided with suitable filter on the suction side of FD fan. Vendor must provide suitable handling facility for cleaning the filter element by 1 person	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.4.36	All the Fans (FD & ID) should comply with the following test parameters: 1. Full welding of impeller blades with the rotating base plate. 2. Availability of sufficient strengthening stiffeners in the body / support structure of the blower. 3. Noise level: Max. 85 ± 3 dBA @ 1.5 meter distance. 4. Vibration level: As per ISO-2372. Upto 2.8 mm/sec (RMS). 5. Dynamic balancing of impeller at rated speed.	Vendor to confirm		
2.4.37	Dampers:			
a)	Damper - has to be provided after the furnace hearth and before the stack in the flue gas path to regulate draught	Vendor to Confirm		
b)	The damper has to work on auto mode and its opening should get adjusted automatically depending upon the draught required in the furnace (positive). (Complete details should be furnished with the offer)	Vendor to specify		
c)	Provision should be there to operate the damper in manual mode also.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.5	<p>Refractory Lining: (For, roof, doors) Ceramic fiber blocks modules with back up layer of suitable density and thickness (conforming to ASTM-892-C-1993) to ensure that the skin temperature of the furnace does not exceed 80°C. The anchor material should be SS304.</p> <ol style="list-style-type: none"> 1. Vendor to furnish calculations for choice of insulation material 2. The supplier shall provide MSDS for all refractory material (including ceramic wool) – It shall cover “cradle to grave”. 3. The supplier shall indicate the applicability of the ceramic material under Hazardous Wastes Management, Handling and Trans boundary Movement) Rules, 2008. 	Vendor to Confirm		
2.5.1	Size of Ceramic Fiber Block Modules (Size should be under the standard manufacturing range of the supplier)	Vendor to Specify		
2.5.2	Density	Vendor to specify		
2.5.3	Thickness	Vendor to Specify		
2.5.4	Max. Service Temperature	Vendor to specify		
2.5.5	Make: M/s MMTCL or M/s Unifrax only	Vendor to confirm		
2.5.6	Size of Back up Blanket layer (Size should be under the standard manufacturing range of the supplier)	Vendor to Specify		
2.5.7	Density	Vendor to specify		
2.5.8	Max. Service Temperature	Vendor to specify		
2.5.9	Thickness	Vendor to Specify		
2.5.10	Make: M/s MMTCL or M/s Unifrax only	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.6	Furnace Hearth and side walls:			
2.6.1	Inside the Fixed hearth and side walls to be lined with hard refractory & Insulation brick construction with Calcium silicate board backup of suitable thickness and combination to ensure that the skin temperature of the furnace does not exceed 80°C.	Vendor to Confirm		
2.6.2	The peripheral refractory has to be held and supported by a set of heat resisting grey cast iron castings, conforming to IS 3355, type E	Vendor to Confirm		
2.7	Burner blocks:	90% High Alumina material		
2.8	Furnace Door:			
2.8.1	Number of Doors	Two		
2.8.2	Steel construction with ceramic fiber modules lining inside and a set of heat resisting grey cast iron castings, conforming to IS 3355, type E around the periphery of the door and with suitable counter balance arrangement	Vendor to Confirm		
2.8.3	Operation	Vertical		
2.8.4	Drive: Electric drive with Speed reduction Gear Box, Electromagnetic Brake etc. for each door at ground level.	Vendor to confirm		
2.8.5	Drive Motor Rating	Vendor to Specify		
2.8.6	Door limit switches should be provided suitably	Vendor to confirm		
2.8.7	The Periphery of the door has to be designed suitably so that positive sealing is established with the furnace by the door in closed position.	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.8.8	In the unlocked position, and while lifting the door, it should move away from the opening and slide up on the cast iron end plates of the furnace without interfering on any furnace structure.	Vendor to confirm		
2.8.9	All the pneumatic equipments and interlock elements are to be suitably protected from failure due to heat from the furnace	Vendor to confirm		
2.9	Furnace Construction (General):			
2.9.1	The complete furnace structure including the sidewalls and roof are to be manufactured from rolled steel sections and plates of suitable thickness (Min 10mm) (Complete details should be furnished with the offer)	Vendor to confirm		
2.9.2	The various load bearing members are to be designed conservatively to ensure rigidity of the complete casing.	Vendor to confirm		
2.9.3	A schematic diagram showing the layout of the furnace & associated systems with salient dimensions should be furnished along with the offer	Vendor to confirm		
2.10	RECUPERATOR:			
2.10.1	The recuperator shall be of metallic with counter flow heat transfer arrangement. MOC of hot face shall be SS304 (Complete details of construction should be furnished with the offer)	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.10.2	Recuperator has to pre-heat the air to minimum 250°C. Recuperator Bypass with suitable valves to be provided- Thermal calculation to be enclosed	Vendor to confirm		
2.10.3	The recuperator has to be located suitably in the flue gas path above the ground itself.	Vendor to confirm		
2.10.4	On line indication of inlet, exit temp of air and flue gas to be available.	Vendor to confirm		
2.11	FLUE DUCT:			
2.11.1	Flue duct Position (Suitably insulated)	Vendor to Specify		
2.12	STACK:			
2.12.1	The stack for flue gas outlet has to be designed and constructed with refractory brick lining and venturi suitably to leave the waste gas at a lowest temperature without dilution	Vendor to specify		
2.12.2	Chimney height shall satisfy the requirements of Tamil Nadu Pollution Control Board (TNPCB) norms with respect to emission of SO _x ; NO _x and Suspended Particulate Matter (SPM). The guidelines to calculate the chimney height is as follows: $H = 14 (Q)^{0.3}$. Q – SO _x emission rate in Kg/hr; H – Height of stack in meters from ground level. However the height of the chimney shall be the Height calculated by the above formula OR 20m(Bldg height 14M) whichever is higher	Vendor to Specify		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.12.3	At two planes (one at 2.0 meters from the ground level and the other at 6 D height of the chimney. where D is the inner diameter of the chimney), four portholes shall be provided at 90 deg each. Each porthole shall be of 100 mm inner diameter, welded with a standpipe 100 mm long fixed with a flange and bolted with a dummy plate.	Vendor to Confirm		
2.12.4	Platform, with toe guard, should be provided all around the chimney 1.0 m below each plane to house the sample collection equipment and for working clearance for crew. Handrail should be provided all round the platform. Staircase shall be provided for both traverse point planes.	Vendor to Confirm		
2.12.5	Suitable ladder with cage should be provided to reach platform at both sampling planes.	Vendor to Confirm		
2.12.6	Suitable monkey ladder with safety rungs shall be provided up to the top of the chimney	Vendor to confirm		
2.12.7	The stack shall be provided with a weather cowl	Vendor to Confirm		
2.12.8	The stack shall be provided with complete lightning arrester system including lightning arrester spike, copper conductor tape from spike to test link, test link, earth pit as per Indian standards	Vendor to Confirm		
2.12.9	Exit temperature, Oxygen, SPM (in mg/cu.m), SPM (Microns), Sox; NOx; CO; flue gas velocity at the outlet tip of the chimney	Vendor to Specify		
2.12.10	The demonstration (proving) of the parameters as per 2.12.9 is in the scope of vendor. Necessary calibrated measuring instruments used for this purpose is in the scope of the supplier.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.13	ROLLER CONVEYOR SYSTEM:			
2.13.1	The Roller Conveyor System shall comprise of an In feed (Charge) Table, Furnace Roller Hearth, and a Discharge Conveyor (Complete details should be furnished with the offer)	Vendor to Confirm		
2.13.2	Drive shall be transmitted to the rollers by means of standard roller chain and double sprockets, the sprockets being keyed into the roller shaft.	Vendor to Confirm		
2.13.3	The entire installation have a speed range of 75 mm to 450 mm per minute	Vendor to confirm		
2.13.4	Motorized Drive Type and Rating (VVFD)	Vendor to Specify		
2.13.5	Make of VVFD---ABB/SIEMENS/ EUROTHERM/ DANFOSS/L&T	Vendor to confirm		
2.13.6	The roller chain drives and associated mechanisms for the charge and discharge tables are to be provided with suitable guards with provision for lubrication and maintenance. (Complete details should be furnished with the offer)	Vendor to confirm		
2.13.7	In-feed (Charge Table):			
	a) Type	Roller Table		
	b) Length	24000 mm		
	c) Width	Around 3800 mm		
	d) Roller material	Mild Steel		
	e) Number of rollers/Roller Spacing-Preferred spacing 850mm	Vendor to Specify		
	f) Roller size –as per 3M18B1013584/01	Vendor to confirm		
	g) Roller mounting & bearing arrangement	Vendor to specify		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.13.7	h) The entire roller table to be supported by a structural steel framework.	Vendor to confirm		
	i) Suitable side guides to contain the load on the roller are to be provided.	Vendor to confirm		
2.13.8	Discharge Table:			
	a) Type	Roller Table		
	b) Length	24000 mm		
	c) Width	Around 3800 mm		
	d) Roller material	Mild Steel		
	e) Number of rollers & Roller spacing Preferred spacing 850mm	Vendor to Specify		
	f) Roller size –as per 3M18B1013584/01	Vendor to Confirm		
	g) Roller mounting & bearing arrangement	Vendor to Specify		
	h) The entire roller table to be supported by a structural steel framework.	Vendor to confirm		
	i) Suitable side guides to contain the load on the roller are to be provided.	Vendor to confirm		
2.13.9	Furnace Rollers:			
	a) Material	Mo-Re No.1 alloy containing a minimum of 25% Ni and 20% chromium		
	b) Type	Centrifugally Cast		
	c) Roller size –as per Drg 2M18B1004708/02	Vendor to confirm		
	d) Number of rollers -32 Rollers equally spaced	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.13.9	e) Roller mounting & bearing (self aligning) arrangement	Vendor to specify		
	f) Provision is to be made on the mountings to enable accuracy of alignment of the rollers.	Vendor to specify		
2.14	PIPELINES & VALVES:			
2.14.1	BHEL will provide LPG at one point near the furnace. All piping for LPG to the furnace gas control valves and to other points is in the scope of the vendor	Vendor to confirm		
2.14.2	All air piping from the fans to the control valves and to other points is in the scope of the vendor	Vendor to confirm		
2.14.3	Required valve for control of gas and air is in scope of the vendor	Vendor to confirm		
2.14.4	All hot air pipe lines to be insulated	Vendor to confirm		
2.15	ELECTRICAL:			
2.15.1	Tropicalization: All electrical / electronic equipment shall be tropicalized.	Vendor to Confirm		
2.15.2	All Electric enclosures shall have IP 54 protection	Vendor to Confirm		
2.15.3	All electrical components in the cabinets should be mounted on DIN Rail	Vendor to Confirm		
2.15.4	a) 415V with fluctuation of +/- 10%, 50HZ +/-3 %, 3 Phase AC power supply will be provided by BHEL at a single point near the furnace in the control room, as per layout recommended by Vendor. b) All cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the equipment/control cabinets, shall be the responsibility of vendor.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
2.15.4	c) Requirement of grounding/earthing with required material details should be informed by vendor well in advance so that it could be incorporated during construction of foundation.			
2.15.5	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. All adapters / receptacles should have compatibility with Indian equivalents.	Vendor to Confirm		
2.15.6	Motors & other electrical/Instrumentation components shall conform to IEC or Indian Standards. Only copper core cable to be used	Vendor to Confirm		
2.15.7	All the cable trays required for laying of cables should be included in the offer.	Vendor to Confirm		
2.15.8	Vendor should ensure the proper earthing for the furnace and its peripherals.	Vendor to Confirm		
3.0	SAFETY ARRANGEMENTS:			
3.1	Following safety features in addition to other standard safety features should be provided on the machine:	Vendor to Confirm		
3.2	Furnace should have adequate and reliable safety interlocks / devices to avoid damage to the furnace, work piece and the operator due to the malfunctioning or mistakes. Furnace functions should be continuously monitored and alarm / warning indications through lights/ alarm number with messages on panels should be available.	Vendor to specify		
3.3	A detailed list of all alarms / indications provided should be submitted by the Vendor.	Vendor to specify		
3.4	All the pipes, cables etc. should be well supported and protected.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
3.5	All the rotating parts should be statically & dynamically balanced to avoid undue vibrations and suitably guarded.	Vendor to Confirm		
3.6	Emergency Switches should be provided at suitable locations	Vendor to Confirm		
3.7	4 Nos Gas leak detector to be provided to cover critical gas leak zone. The system should have independent control with alarm. Vendor to provide the test certificate with LPG sample for LEL as per standard. Functional test with same sample to be done after commissioning of the instruments at site. Supply of standard sample gas is under vendor's scope	Vendor to Specify		
4.0	INSTRUMENTATION & CONTROL SYSTEM:			
4.1	All controls will be located in a Control Room adjacent to the furnace. BHEL will construct the Control room based on inputs to be provided by the vendor	Vendor to Confirm		
4.2	Furnace temperature control (4 Zones) Auto/Manual with PID tuning. Preferred Makes. Yokogawa, Eurotherm and Chino.	Vendor to Confirm		
4.3	Furnace over temperature control (4 Zones) to be made available at control panel only.	Vendor to confirm		
4.4	Vendor to offer temperature control for individual zones with inbuilt error message indication type burner sequential controller for individual burners. (Complete details should be provided along with the offer). Preferred Makes: Esapyronics, Honeywell, Kromschroder.	Vendor to confirm		
4.5	Recuparator protection for preheat temperature control.	Vendor to confirm		
4.6	The system shall comprise, but not be limited to the following:			

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
4.6.1	Zonal Thermocouples: 2 Nos. of Duplex thermocouples to be provided. One thermocouple for temperature controller, second for excess temperature controller 3rd for recorder and 4th as a spare. Thermocouple type-k with protective sheath to be of inconel with adjustable flange 1 metre long. Asbestos compensating cables to be provided for heat resisting.	Vendor to confirm		
4.6.2	K- type Compensating cables of the Temperature recorder to be wired from the control panel to 6 location of each side wall of the furnace for material temperature measurements. Holes for thermocouples to be provided in between the burners at suitable locations approved by BHEL. Thermocouples will be provided by M/S. BHEL. Supply of suitable length of compensating cables is vendor's scope.	Vendor to confirm		
4.6.3	Suitable rated modulating motors / Control elements for 4 Zones	Vendor to confirm		
4.6.4	Mass flow based zonal control system for temperature controls-This has been indicated in 4.2.	Vendor to confirm		
4.6.5	Minimum 8 Point Micro Processor based temperature recorder with chart width 180 mm along with 50 nos. of chart paper packs. Preferred Makes. Yokogawa, Eurotherm and Chino.	Vendor to confirm		
4.6.6	Pressure switches, flow transmitters for gas, air and control elements.	Vendor to confirm		
4.6.7	Furnace pressure transmitters and control elements	Vendor to confirm		
4.6.8	Instruments cables and compensating cables	Vendor to confirm		
4.6.9	Piping for air, LPG and pneumatics.	Vendor to confirm		
4.6.10	Junction boxes	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
4.6.11	Any other requirement to complete the system	Vendor to specify		
4.7	Possibility of over viewing the status in the control room.	Vendor to confirm		
4.8	For excess temperature control of respective zone, it should be possible to set the limit value of each zone in the Control panel. In case of zonal temperature overshoots the maximum set value; it should control all safety systems along with raising audio visual alarm.	Vendor to Confirm		
4.9	Other features required:			
	a) Alarm annunciation	Vendor to Confirm		
	b) Gas flow measuring system: Orifice type volumetric flow measurement with totalizer to be indicated in the control panel	Vendor to Confirm		
	c) Safety system and alarm indication required are to be indicated.	Vendor to Confirm		
4.10	Separate panels should be provided for instruments, Burner sequence controller. Separate Control transformer (415V/230V) should be provided for the Instrumentation panel.	Vendor to Confirm		
4.11	PI Diagram, schematic circuit diagram for instruments control system to be submitted along with offer	Vendor to Confirm		
4.12	Suitable UPS supplied by vendor for recording temperature for max 30 minutes in case of power failure	Vendor to confirm		
4.13	Required Motor Control Centers shall be provided for control of all fans and blowers (This point should be separated from instrumentation and control)	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
4.14	Gas Train System details to be given for all the components with P and I diagram Suitable pressure gauge with isolation valve to be provided in the inlet and outlet of the gas train system. An additional pressure gauge in the gas train system after the main safety valve shall be provided.	Vendor to Confirm		
4.15	Burner purge cycles with adequate purging time for safe operation shall be provided.	Vendor to Confirm		
4.16	Manual Gas Shut Off Valve shall be provided apart from the safety shutoff valve in the gas train.	Vendor to confirm		
4.17	Push button Control Station shall be provided near the furnace for all manual operations	Vendor to confirm		
4.18	Local push button stations shall also be provided for roller conveyors, fans and door drives	Vendor to Confirm		
4.19	Maintenance platform at suitable height for instrumentation to be provided	Vendor to confirm		
4.20	Instruments Calibration: Calibration certificates to be provided for process values measuring instruments, Transmitters, Thermocouples and compensating cables. Test certificates required for Pressure switches and modulating motors etc. are to be provided at the time of inspection of the furnace at vendor works. Vendor has to carry out re-calibration for all the above calibrated items at BHEL site during commissioning. After placement of order vendor has to provide the Calibration certificate and test certificate as per BHEL format.	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
4.21	Ignition & Flame Supervision: Spark ignitor of high voltage type(H.V) to be used.The flame monitoring system to be with U.V. scanner or Ionisation rod for its reliability.In case of U.V Scanner, it must be provided with suitable air cooling. The flame supervision circuit is linked to the gas solenoid valve for each burner. This enables to monitor and control the flame of each burner continuously through furnace sequence controller.	Vendor to confirm		
5.0	LEVELING & ANCHORING SYSTEM			
5.1	Complete anchoring system including foundation bolts, anchoring materials, leveling shoes etc should be supplied	Vendor to confirm		
6.0	TOOLS FOR ERECTION, OPERATION & MAINTENANCE:			
6.1	The Vendor shall bring special tools required for erection of the machine. Necessary tools like Torque Wrench, Spanners, Keys, grease guns etc. for operation and maintenance of the machine should be supplied. List of such tools should be submitted with offer	Vendor to confirm		
7.0	SPARES:			
7.1.a	Itemized breakup of mechanical, refractory pneumatic, electrical, electronic and instrumentation spares used on the furnace 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. (Unit Price of each item of spare should be offered)	Vendor to confirm		
7.1.b	Mechanical & Pneumatic Spares: All types of Valves, Pressure Switches, Transducers, Flow Switches, actuators etc.	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
7.1.c	Electrical /Electronic: All types of Relays, Contactors, Proximity Switches, Push Buttons, Indicating Lamps, Semiconductor Fuses, Special Fuses, Circuit Breakers, Main Power Switch, Field Sensors etc.	Vendor to confirm		
7.2	<p>Following spares to be quoted compulsorily</p> <p>a. Burner 2 Nos.</p> <p>b. Burner Blocks 20 Nos.</p> <p>c. Refractory collar bricks(at the roller ends on side walls) (1set=2nos) 20 Sets</p> <p>d. Furnace casting for furnace front plate and door Periphery Each 10 Nos.</p> <p>e. Gas Solenoid Valve 4 Nos.</p> <p>f. UV Flame Detector/ Ionization Rod 4 Nos.</p> <p>g. Thermocouple-duplex 6 Nos.</p> <p>h. Flow transmitter for gas 1 No.</p> <p>i. Flow transmitter for air 1 No.</p> <p>j. Pressure switch for gas 1 No.</p> <p>k. Pressure switch for air 1 No.</p> <p>l. Furnace Pressure transmitter 1 No.</p> <p>m. Actuator for gas 2 No.</p> <p>n. Actuator for air 2 No.</p> <p>o. Seal kit for pneumatic cylinder 1 Set.</p> <p>p. PID type digital controller 1 No.</p> <p>q. Push button 1 Set.</p> <p>r. Relays 1 Set.</p> <p>s. Indication lamp 1 Set.</p> <p>t. Limit switches 4 Nos.</p>	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
7.2	u. Contactors 1 Set v. Fuse 1 Set w. 180mm wide strip chart roll 25 Nos. x. Ribbon cartridge 3 Nos. y. Burner sequential controller- 6 Nos. z. Excess temp controller- 1no aa. Air solenoid valve 4 Nos.	Vendor to confirm		
7.3	Vendor to confirm that complete list of spares for machine and accessories, along with item part no / specification / type / model, and name & address of the spare supplier shall be furnished along with documentation to be supplied with the machine	Vendor to confirm		
8.0	DOCUMENTATION: Five sets of following documents (5 Hard copies,) in English language should be supplied along with the machine	Vendor to confirm		
8.1	Operating & maintenance Manuals of Furnace	Vendor to confirm		
8.2	The O&M Manual should contain the following a. Drawing of the Furnace. b. GA Drawing of Individual Mechanisms. c. Sub-Assembly Drawings (without dimensions) for sub-systems for maintenance purpose d. Dimensional Sketches (plan, front and side view) of the entire panel and detailed view of position and layout of controls, display and other man machine interface will be submitted for ergonomics e. Furnace control schematic f. Electrical Wiring Drawings – Power & Control Circuits g. Pneumatic Circuit Diagram h. Engineering manual for the controller	Vendor to confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
8.2	i. Back up programme for the controller with necessary licensed software	Vendor to confirm		
	j. Complete Printed Circuit Board Schematics indicating check points (Test Points) for Electronic Controls			
	k. Trouble Shooting Chart for Main and all Sub-Systems			
8.3	One Hard Copy of O & M Manual shall be submitted at the time of inspection of the furnace by BHEL Officials	Vendor to confirm		
8.4	Catalogues, O&M Manuals of all bought out items including drawings, wherever applicable.	Vendor to confirm		
8.5	The vendor shall submit complete Master List of parts used in the machine.	Vendor to confirm		
8.6	One additional sets of all the above documentation on CD	Vendor to confirm		
9.0	TRAINING:			
9.1	The Vendor shall impart training to BHEL's Operators & Maintenance crew in O & M (Mechanical, Electrical & Control System) after the commissioning, at BHEL for 15 working days	Vendor to confirm		
10.0	FOUNDATION:			
10.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Purchase order. The layout should consist of all requirements pertaining to complete furnace including space requirement for Control Room, Blowers, and Stack etc. Vendor shall furnish the foundation layout and static and dynamic load details within 3 months of Purchase order. BHEL shall design and construct complete foundation for the furnace as per the Vendor's recommendation.	Vendor to confirm		

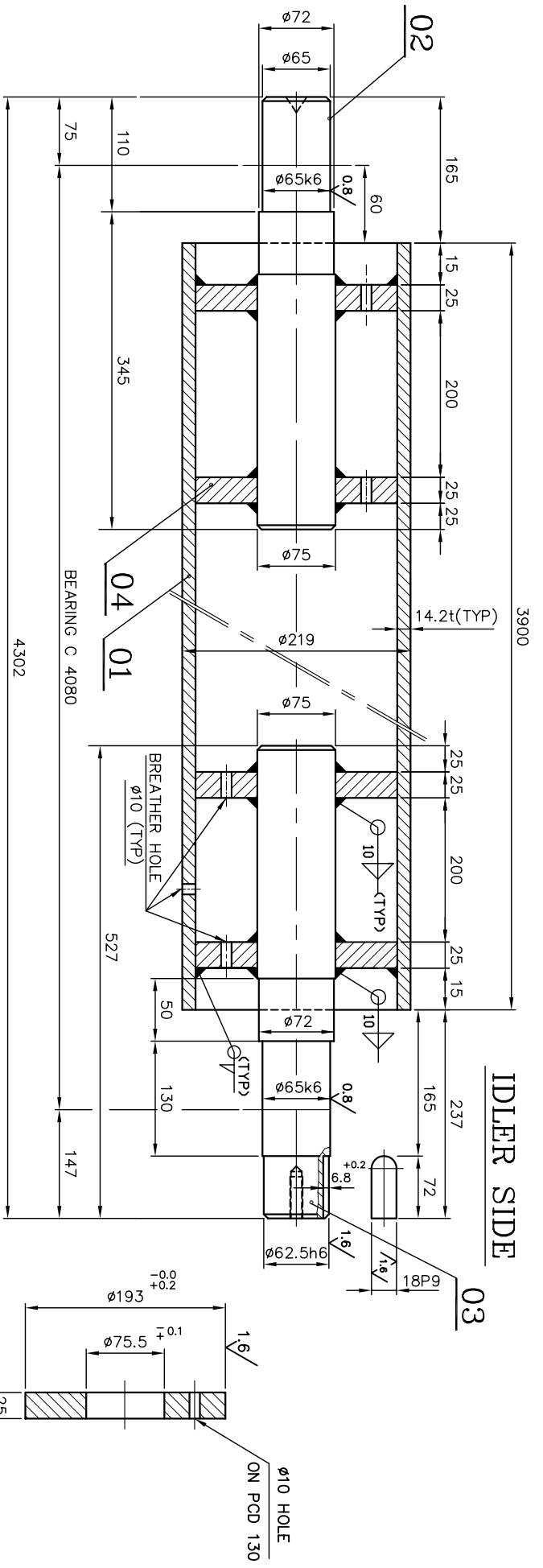
Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
11.0	ERECTION & COMMISSIONING			
11.1	Vendor to take full responsibility for carrying out the erection, start up, testing and commissioning of the furnace & it's controls & all types of other supplied equipment. The vendor shall arrange required manpower & tools for the same.	Vendor to Confirm		
11.2	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 free of cost. Fabrication requirements like gas, electrode at site is in the scope of vendor BHEL will also provide EOT crane for handling and lifting during erection at site free of cost	Vendor to Confirm		
11.3	Successful proving of BHEL components by the Vendor shall be considered as part of commissioning. All tests, as mentioned in clause 12.0 (Furnace Inspection Acceptance) shall form part of the commissioning activity.	Vendor to Confirm		
11.4	The Vendor should bring tools, Tackles, gas cutting and welding equipments and other necessary equipment required to carry out all above activities.	Vendor to Confirm		
11.5	The Vendor shall bring commissioning spares required for commissioning of the machine on returnable basis within stipulated time	Vendor to Confirm		
11.6	Schedule of Erection and Commissioning shall be submitted with the offer.	Vendor to Confirm		
11.7	Vendor should furnish charges, duration, terms & conditions for E&C in detail separately along with offer.	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
12.0	FURNACE INSPECTION & ACCEPTANCE			
12.1	The furnace shall be offered for inspection to BHEL for completeness of supply at supplier's works prior to dispatch	Vendor to Confirm		
12.2	The furnace shall be tested by the vendor for its performance prove-out as per BHEL Specifications, at BHEL after erection and commissioning Furnace calibration for the following Stress relieving cycles to be tested and proved. 1. Carbon steel 610 ± 15deg 15 min 2. Carbon steel 610 ± 15deg 30 min 3. T1 Material 635 ± 15deg 15 min 4. T1 Material 635 ± 15deg 30 min 5. T11 Material 655 ± 15deg 15 min 6. T11 Material 655 ± 15deg 30 min 7. T 22 Material 695 ± 15deg 15 min 8. T 22 Material 695 ± 15deg 30 min 9. T 91 Material 745 ± 15deg 30 min	Vendor to Confirm		
13.0	PAINTING:			
13.1	For Furnace, Recuperator & Stack	Vendor to Confirm		
13.1.1	Primer painting: One coat of primer painting at vendor's works and one coat of primer after erection	Vendor to Confirm		

Sl.No.	DESCRIPTION	SPECIFICATION	BIDDER'S OFFER [with technical details]	DEVIATIONS / REMARKS
13.1.2	Final painting: Vendor to paint the complete furnace chamber with 2 coats of heat resistant Al paint (of grade 250 deg C) and the entire chimney, recuperator & flue path with 2 coats of heat resistant Al paint (of grade 400 deg C). All new fabricated items to be painted after one coating of primer paint.	Vendor to Confirm		
13.2	For Fans, control Panel: Two coats of IS 281 Synthetic Enamel Apple Green Color Paint	Vendor to Confirm		
13.3	Air & Gas Pipelines: Two coats of Blue & Yellow color synthetic enamel paint or as per instructions of BHEL and with indication of direction of flow marked at suitable intervals	Vendor to Confirm		
14.0	PACKING:			
14.1	Rigid packing for items like fans, blowers, drives, electric / electronic panels and controls and such other items susceptible to damage during transit	Vendor to confirm		
15.0	GUARANTEE:			
15.1	12 months from the date of commissioning and acceptance at BHEL works or 18 months from the date of supply whichever is earlier.	Vendor to confirm		
16.0	GENERAL:			
	a) Furnace Model No.	Vendor to specify		
	b) Total connected load (KVA):	Vendor to specify		
	c) Floor area required (Length, Width, Height) for complete machine & accessories	Vendor to specify		
	d) Total weight of the furnace	Vendor to specify		
	e) All cables used shall be of copper core only	Vendor to confirm		

CAUTION: THIS DRAWING IS OUR SOLE PROPERTY AND SHOULD NOT BE USED IN ANY FORM FOR ANY PURPOSE WITHOUT THE WRITTEN PERMISSION OF BHARAT HEAVY ELECTRICALS LIMITED TRICHIRAPPALLI - 620 014.

ALL DIMENSIONS ARE IN MM

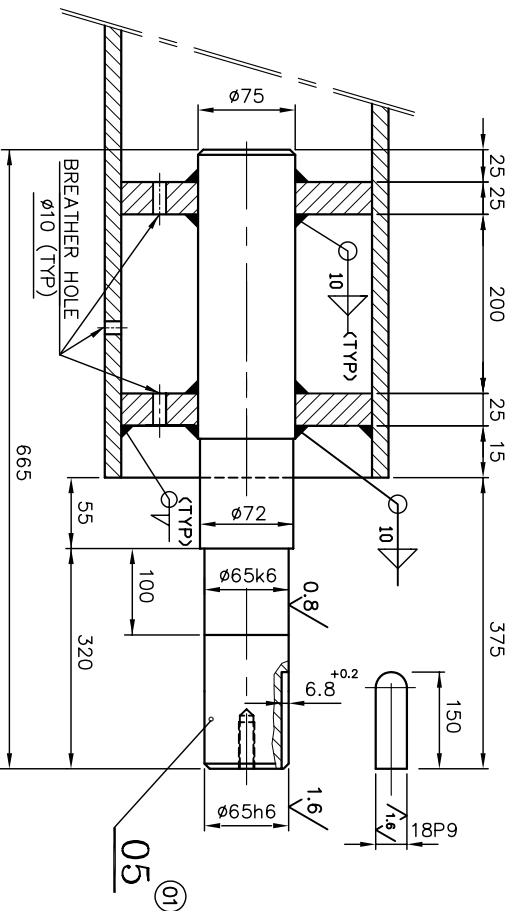


$\phi 62.5h6$	-0.000	$\phi 65k6$	$+0.021$	$18p9$	$+0.030$
$\phi 65h6$	-0.019	$\phi 65k6$	$+0.002$	$18p9$	$+0.000$

3.2/1.6/0.8
✓/✓/✓

NOTE:-
ALL WELDED CONSTRUCTIONS

ITEM No.04

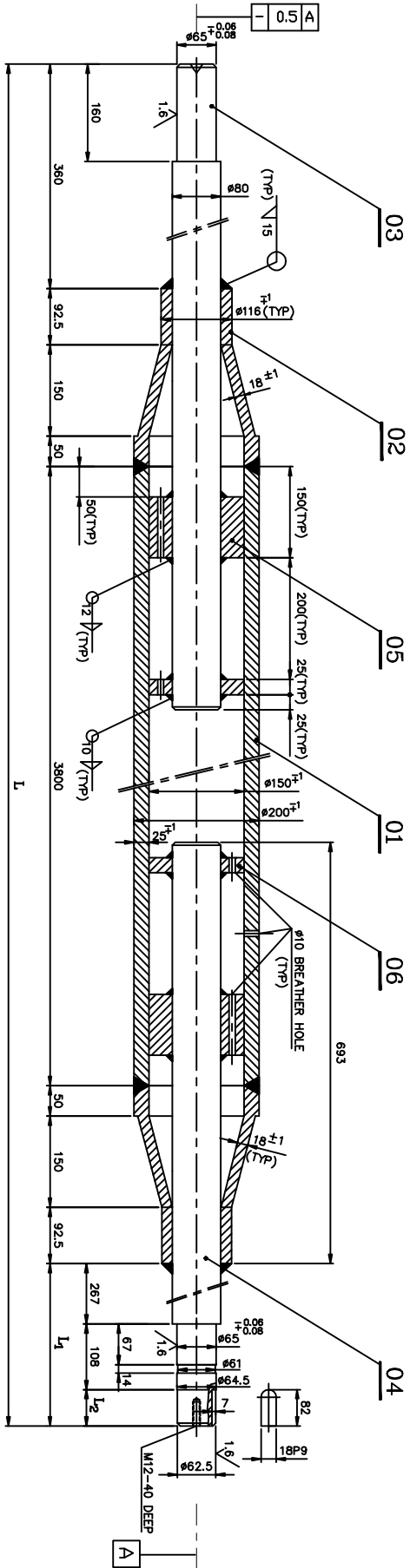


DRIVE SIDE

ITEM No.	DESCRIPTION	MATERIAL	STANDARD	NET WT IN KGS.	DRAWING No.	ITEM INDEX
01	STUB AXLE $\phi 75 \times 665$ L	45 C8	IS: 7283	23.06		05
04	PL. 25t x ID. 75 x OD. 190.6	Fe: 410 WB	IS: 2062	22.96		04
01	STUB AXLE $\phi 75 \times 527$ L	45 C8	IS: 7283	18.27		03
01	STUB AXLE $\phi 75 \times 455$ L	45 C8	IS: 7283	15.77		02
01	PIPE $\phi 219 \times 14.2$ x ... 3900L	SA.106 Gr.B	ASME	279.82		01
				359.88		

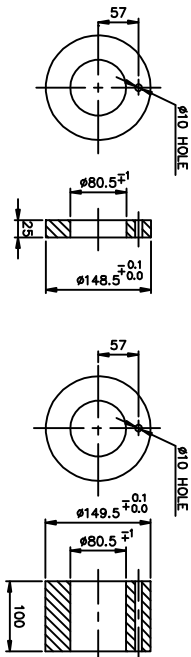
DESCRIPTION	MATERIAL	STANDARD	NET WT IN KGS. <td>DRAWING No. <td>ITEM INDEX</td> </td>	DRAWING No. <td>ITEM INDEX</td>	ITEM INDEX
REFERENCE: 4793/03/11		ALTERNATIONS: ITEM No.05 ADDED	DCN REF	DATE	SIGN.
			23/07/09	CSJ	(01)

SCALE	DRAWN	P.A.ROSS	CHECKED	N.T.S	DATE	08-07-08
MACHINE: CONTINUOUS DISCHARGE FURNACE						
TITLE: CHARGE TABLE & DISCHARGE TABLE ROLLER ASSY.						
TYPE: PRECISION CONTROL S-CDF			REV.			



*WELDING PROJECTION SHALL BE GROUND FLUSH TO MAINTAIN EQUAL TO PIPE OD

GROOVE SHALL BE MADE TO SUIT THE GROOVE SCREW OF UICR SIZE ONLY.



ITEM No.05

ITEM No.06

②

DRIVE ROLLER	L	L ₁	L ₂	SHAFT LENGTH
DRIVE ROLLER	5240	495	120	1188
DRIVEN ROLLER	5202	457	82	1150

** OD SHALL BE MACHINED AFTER CHECKING THE ID OF ROLLER.

MATERIAL
 IS:4522-Gr.11
 EQUIVALENT ASTM A297/A297M
 GRADE HN.

CHEMICAL COMPOSITION:-
 C - 0.20-0.60%
 Cr - 18-22%
 Ni - 23-27%
 Mo - 0.5% MAX.

NOTE:-
 FOLLOWING TESTS WILL BE CARRIED OUT
 1.CHEMICAL ANALYSIS.
 2.PNEUMATIC PRESSURE TEST @6kg/cm²(g).
 3.D.P TEST FOR ALL WELD JOINTS.

02	PL.25X10.80.5KOD.149.5	Fa.410 WB	IS:2062	5.05	06
02	PL.100X10.80.5KOD.149.5	Fa.410 WB	IS:2062	20.22	05
01	SHAFT #80X118L (1150L)	45 C8	IS:7283	43.97	04
01	SHAFT #80X1053L	45 C8	IS:7283	41.05	03
02	TAPER SLEEVE	***	***	48.08	02
01	ROLLER-#200X3800LX25TH	***	***	417.83	01
				576.20	

REVISION	DATE	DESCRIPTION	BY	CHKD	DATE	INDEX
1	03/03/03	4793/03/03	P.A.ROSS			01
2		TABLET COLUMN ADDED			30.03.08	02

NO.	REV.	DATE	DESCRIPTION
01			
02			

NO.	REV.	DATE	DESCRIPTION
01			
02			

FURNACE ROLLERS
 (CDF FURNACE)

DRAWING NO: **ZM181004710802**
 SHEET NO: **01** OF **02**