**1. GENERAL:**

- 1.1 This document deals with requirements for submitting offers and executing the order on placement of Purchase order / Contract for the subject item. The equipment under this specification is required for hot rolling Mill in Seamless Steel Plant in BHEL, Tiruchirappalli, for cutting tubes to length suitable for shipment. The tube diameter vary between 19 and 133 mm, thickness between 2 and 12.5 mm and length between 3 and 20 meters.
- 1.2 Bidders have to submit the offers as below by filling in the "Vendor's response" column with relevant information against each point in the respective sections below by providing information on model no, parameters etc. The technical requirements shall also be confirmed for each clause.
- 1.3 Note: A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the "Vendor's response" column is not acceptable and may lead to disqualification of the Technical Offer.
- 1.4 Brand and model No. of the items offered must be indicated in the offer
- 1.5 The offer shall Consist of Sections:
- 1.5.1 Part A:
- a. General Requirements
 - b. Technical offer
 - c. Commercial terms and conditions
 - d. Un-priced Price bid as per Part B (i.e. Price bid as per list shown in Part B of this Specification with the price value blanked)
- 1.5.2 Part B: Price bid for all items with split of major components:

Sl.No	Particulars	Qty	Rate
01			
02			
03			
04			
05			
06			

- 1.6 The supplier may visit SSTP and understand the requirements before bidding.
- 1.6.1 List of spares with part identification no. (Tools, Mechanical, Electrical & Electronics) to be maintained for ensuring continuous operation with least delay time shall be provided in the offer with price.

2. QUALIFYING CRITERIA FOR THE SUPPLY

- 2.1. The VENDOR has to necessarily provide the following details, for making an assessment of the firm's capability and competency: [The VENDOR is expected to give complete details against each clause in the table given below and wherever necessary an additional sheet may be attached (giving clear reference number) to cover the required details]



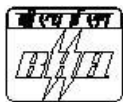
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Sl. No.	PARTICULARS	Vendor's response with ref. cl. No. of detailed offer.
1.0	Number of Years of Experience of the VENDOR in the field of design, manufacture and supply of 'machineries for fabrication, machining and similar industries.	
2.0	Number of machines supplied, installed and commissioned till date, in the QUOTED MODEL / Technology. Attach a reference list of customers with machine type, model, year of supply and contact address.	
3.0	Details of Design Set-Up and Technology Back-Up if any for the PRINCIPAL Equipment Maker	
4.0	Details on International Standards followed in Design of the Equipment.	
5.0	Confirmation to performance testing requirement of the equipment prior to dispatch from supplier's end	
6.0	Details of Quality System followed (Kindly furnish the salient aspects of the QA system followed)	
7.0	Details on SERVICE-after-SALES Set-Up in India including the addresses of Agents/Service Centers in India and Asia	
8.0	Any Additional Data to supplement the manufacturing capability of the VENDOR	

- 2.2. The VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for this test system. Confirmation against each clause is to be indicated in the space provided.

Sl. No.	REQUIREMENTS	Vendor's confirmation and ref. to detail enclosed
9.0	The VENDOR shall have a minimum of <u>2 Years</u> of Continuous Experience in the Design, Manufacture & Supply of 'machineries for fabrication, machining and similar industries'. Indicate the actual experience.	
9.0	The VENDOR shall have supplied at least 2 number of the machine in offered model / Technology, within the last five years. The equipment shall be working satisfactorily at least for the past 2 years. Indicate the number of equipment (of quoted model / Technology) sold in India & Other Countries.	
10.0	<u>Performance Certificate in original from CUSTOMERS</u> (minimum 2 Customers) for satisfactory working of the machine for the past 2 years with full contact details of CONTACT PERSON for cross reference by BHEL shall be submitted with the offer. Please confirm.	



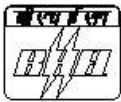
- 2.3. The VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser. Confirmation against each clause is to be indicated in the space provided.

Sl. No.	REQUIREMENTS	Vendor's confirmation and ref. to detail enclosed
11.0	The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details.	
12.0	The Commercial Offer (given with the Technical Offer – Part I) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of Scope of Supply.	
13.0	The points confirmed by the supplier based on the clarifications sought for the original offer shall be incorporated in the revised final offer wherever applicable. Pl. confirm	
14.0	The Vendor shall provide a complete list of out sourced / Bought-Out-Items: electrical, electronic and mechanical components with Source name, Model no., Specification, catalog and drawings. Pl. confirm.	
15.0	Break up cost for Mechanical, Cutting Head, Electricals, Length measurement facility Coolant feed arrangement for blade and job under cutting, Chip removal system etc. shall be furnished. Optional Systems / items shall be indicated separately. Pl. confirm	
16.0	Portion of Supplies from Foreign countries and from Indian source shall be separately grouped both in the Technical offer (Part I) and in the price bid (Part II).	
17.0	An approximate break up of weight of each sub-system as above shall be indicated in the offer for comparison purpose. Pl. confirm	

3. Job Description: Seamless

- 3.1.** Steel Seamless Steel Tubes made by hot rolling in long lengths in the Hot Mill need to be cut to length suitable for shipment by means of a cutting machine of sufficient capacity to meet the requirement of this specification. The tubes are delivered to the cutting machine in a layer of a set of tubes varying in number from 1 tube to as many as needed to form a layer width of about 800 mm. The parameter of the the material to be processed in the machine are tabulated below:

Tube diameter	min. mm	31,8
	max. mm	133
Outside diameter tolerance	+/-	- 0.1 to +0.4 mm.
Tube bending	max mm	2 mm/M, 15 mm max.
Tube temperature	≤ °C	45
Wall thickness	min. mm	4
	max. mm	14
Layer width	min. mm	31,8

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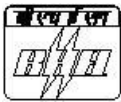
	max. mm	800
Incoming length	min. mm	3000
	max. mm	65,000
Finished length	min. mm	3
	max. mm	24
Scrap pieces		always
Head scrap piece length	min. mm	200
	max. mm	1500
Tail scrap piece length	min. mm	200
	max. mm	1500
Material grade		carbon steel & low alloyed steel (Cr up to 13%)

4 TECHNICAL DESCRIPTION OF SAW**4.1 General:**

- 4.1.1 The sawing machine shall be designed with the latest, technology components. The machine shall be designed for the cutting of a layer of tubes. The cutting direction shall be preferably horizontal.
- 4.1.2 The sawing machine will have a combination of horizontal and vertical clamping at the inlet and at the outlet for clamping tube layers. The beginning and end of cutting shall be automatically controlled based on actual layer width.
- 4.1.3 Necessary damping unit and guiding system shall be incorporated for reducing vibration and chatter marks on cut edges. The guide ways and moving parts shall have necessary wear reduction methodologies like LM guide ways, ball screw arrangement, activation only during the cutting process etc.

4.2 SAW HEAD

- 4.2.1 The saw shall be designed with a sturdy main spindle bearing instrumental in improving gear stiffness.
- 4.2.2 The gears used in the machine shall be with hardened and ground toothed wheels, with the bearings running in backlash-free adjusted roller bearings. The toothed wheels are to be adjusted backlash-free. The entire inside (bearings, toothed wheels) shall run in oil. A special design of the saw gear box shall guarantee high torsion rigidity, and no backlash, i.e. an optimum condition for the cutting of tubes with carbide tipped circular saw blades.
- 4.2.3 The guiding elements must also be absolutely backlash-free. Additional to the main guiding, a special damping unit shall be planned, which is only activated during cutting. The guidings are designed in such a way, that the guiding starts exactly where the cutting power leads into the guiding.
- 4.2.4 The machine shall be driven by three phase motor preferably with toothed belt. A frequency transformer or equivalent shall be planned for continuous speed control.
- 4.2.5 For the erection and adjustment of the sawing machine, height adjustment leveling elements are to be provided.

**4.3 FEED Mechanism**

- 4.3.1 the feed drive of the saw head shall be driven by an AC servo motor hydraulic device. The drive shall be designed as a pre-clamped backlash-free system preferably with double nut arrangement. The design of the ball roller spindle shall ensure a very long life cycle. For compensation of the weight a hydraulic cylinder or similar arrangement shall be used if required.
- 4.3.2 The design for system for changing saw blades shall be faster and easier aiming for 1 minute change over.

4.4 BRUSH EQUIPMENT

- 4.4.1 A motorized chip brush equipment to ensure optimal cleaning of each cutting tooth (synthetic cleaning brush) which offers a high service life, an assurance of superior cleaning and which does not impair the quality of the cutters shall be provided.

4.5 SAW BLADE SPRAY LUBRICATION

- 4.5.1 For improved saw blade life, spray lubrication with nozzle-system shall be provided. The system shall include a container that is filled with a lubricant. The fluid in atomised form with air shall deposit in small quantities on the cutters. The quantum and spray force shall be adjustable as required.

4.6 CENTRAL LUBRICATION UNIT

- 4.6.1 A central lubrication unit shall be provided, intended for the lubrication of of all the moving parts. The central lubrication unit shall be automated to operate at preprogrammed occasions.

4.7 CLAMPING EQUIPMENT

- 4.7.1 The clamping equipment shall be designed to be rigid enough. It shall aid in such a way also that tubes with thin walls can be positioned perfectly without deforming.
- 4.7.2 A system to measure the length of the tube shall also be provided to set and determine the tube length for each batch.
- 4.7.3 For protection of the clamping equipments in the inlet and outlet, protection units are to be incorporated. These protection units shall be strong enough to absorb the hits of the tubes / tube layers.

4.8 MACHINE COVER

- 4.8.1 All movable parts of the sawing machine are to be covered and thereby the machine is protected against any unauthorised use.

4.9 SAW Blade

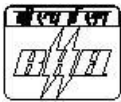
- 4.9.1 The saw blade used shall be preferably of Carbide tipped design. Sufficient no. of blades shall be supplied for commissioning the equipment and initial trials. The details of blade including probable supplier's details shall be provided.

4.10 CUTTING DATA OF SAWING MACHINE

- 4.10.1 Cutting parameters, cutting cycle time and tool life time valid for offered saw blades shall be provided in the offer. These parameter shall be provided as recommended by the saw blade supplier.

4.11 CHIP CONVEYOR

- 4.11.1 A chip conveyor transports the chips into a container (Container not included in supplier's scope of supply but design to be provided) outside of the sawing area. It is to be driven by a three phase gear motor. Type, size, design features shall be indicated in the offer.

**4.12 SAW BLADE CHANGING DEVICE**

4.12.1 If required, a saw blade changing device to lift, load and fix the blade on to the machine shall be provided.

4.13 HYDRAULIC EQUIPMENT

4.13.1 The hydraulic station for the sawing plant shall be equipped with pump, control valves, Hydraulic cylinders, heating, cooling and oil level indication device. The system shall be designed for continuous operation in 3 shifts. The system shall be controlled centrally by a digital control system.

4.14 PNEUMATIC

4.14.1 Compressed air at 5 bar max. pressure will be provided by buyer for the spraying device, the saw blade cooling device and cleaning nozzles. Necessary filtering unit, drying unit and control system shall be part of the supply.

4.15 ELECTRIC EQUIPMENT:**4.15.1 GENERAL**

4.15.1.1 The sawing machine shall have a set of switch cabinets, terminal boxes and an operator desk, motor protection system, necessary cooling system etc. suitably integrated.

4.15.1.2 Main power supply (buyer's scope of supply)

Main Voltage: 3 x 380 VAC + PEN / 50Hz +/- 1Hz, TN-C-Network

(TerraNeutral-Combined-Network)

Voltage fluctuation: +/- 10%

4.15.2 OPERATOR DESK

4.15.2.1 The operator desk must include the following parts:

- Push buttons:
- Emergency Stop
- Control voltage ON/OFF
- Signal lamp for error

4.15.2.2 The machine must work in manual and automatic mode. The system shall offer reliable operation,

4.15.2.3 The following modes of control must be possible:

4.15.2.3.1 Manual

Every single step of the machine must be operatable separately.

The working positions of the different devices (e.g. end layer,...) are controlled by sensors, in order to prevent damages.

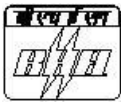
4.15.2.3.2 Single cut

Program for one complete sawing cycle without material handling.

4.15.2.3.3 Automatic

Program for fully automatic manufacturing cycle. Automatic will be started by pressing the START button and will stopped anytime by pressing the STOP button.

4.15.2.3.4 The entire Saw system shall have error reporting and audio/visual display. Items covered by self diagnosis shall be indicated in the offer. Auto shut off systems shall be provided wherever essential (including for safety requirements). The system shall be functionally

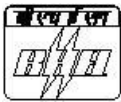


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- disabled when any one of the critical element is malfunctioning with over ride provided for Operator.
- 4.15.3 REPAIR- AND SERVICE CONTRACT
- 4.15.3.1 In case of use of PLC based system for all driving components, the same shall be from reputed supplier like SIEMENS and a repair-/service contract with a running time of 2 years shall be delivered with the sawing machine.
- 4.15.3.2 This repair-/service contract includes fault locating and changing of damaged components by Siemens-technician on the spot.
- 4.15.3.3 This repair-/service contract comes into force at beginning of commissioning at the customer's site.
- 4.16 The technical data for the Saw shall be provided in a similar format as below

<u>Machine data</u>			
Total length	mm		
Total width	mm		
Total height	mm		
Flange diameter	mm		
Total weight	kg		
<u>Saw blades</u>			
Saw blade diameter	mm		
Thickness	mm		
Material Grade			
<u>Layer width according to customer's specification</u>			
Biggest layer width	mm		
<u>Main drive data three phase motor with FU</u>			
Nominal power	kW		
Rated speed	Rpm		
Infinitely output speed range	Rpm		
<u>Feed motor AC Servo motor</u>			
Nominal power	kW		
Infinitely feed speed		up to	mm/min
Rapid return	mm/min		
<u>Central lubrication device</u>	kW		
<u>Hydraulic</u>	kW		
<u>Control System make</u>			



4.17 The Total system shall be in compliance to permitted emission levels (Eg.: CE).

4.18 **DOCUMENTATION**

4.18.1 The documentation shall be supplied one-fold on paper and one-fold on CD-Rom in English language consisting of the following:

machine erection and general notes

erection manual, assembly drawing and part lists

general description of function and function cycle

maintenance instructions

lubrication instructions

operating instructions

circuit diagram, cable list, etc.

hydraulic and switch plans

part list and wear part list

Final foundation drawings, which contain all sizes, cable channels and load indexes and final layout drawings of the plant

4.18.2 The documentation on CD-ROM shall be in the following format:

Documents and lists in PDF format

Drawings in DWG format

Layout and foundation plan in DWG format

4.19 **TIME SCHEDULE UNTIL DATE OF SHIPPING**

4.19.1 The delivery time of supplying the equipment and the documentation at various stages of the contract as below shall be provided in the offer.

Contract effectiveness

Receipt of buyers workshop layout

Preliminary Layout drawings of the sawing machine

Confirmation of the preliminary layout by the buyer

Delivery of Basic Information

Delivery of Basic Design

Delivery of Detail Design

Final foundation drawings, which contain all sizes, cable channels and load indexes

Hydraulic principle drawing

Electrical plan including drawing of control desk, cable list, final electricity content (power supply,...), final dimension of operation desk, switch cabinet

Delivery of the assembly drawings, spare and wear part list, information about the sawing machine

Technical documentation

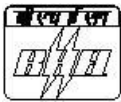
Changed parts of the documentation

Equipment delivery date

5 **INSTALLATION, PERFORMANCE & ACCEPTANCE OF THE SYSTEM:**

5.1 The system shall be installed and commissioned by the manufacturer of the system.

5.2 The system shall be shipped after inspection and testing at Suppliers works by BHEL. 20 days prior notice shall be given for this inspection.

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- 5.3 The system performance shall be checked on a set of tubes, which will be provided by the supplier in minimum, middle and max. size range.
- 5.4 Testing methods and acceptance norms for each subsystems for tests at Suppliers works and after installation shall be detailed out in the offer.
- 5.5 Production Run shall be tested for 24 Hrs continuously. The rated output for a reference size commensurate to the speed of cutting for that size shall be demonstrated for 8 hours shift.
- 5.6 Service shall be provided by the supplier during guarantee period and also later through AMC. The system supplied must be supported by way of spares, availability and service for a minimum period of 15 years.
- 5.7 Guarantee for the trouble free performance of the system shall be provided for min. 1 year for 3 shift operation. This shall be by way of performance Bank guaranty as applicable. The guarantees of the seller refer to
- Acceptance Test
- Sawing cycle time without material transport
- Cutting quality
- Tool life time
- Noise level
- Rectangularity of cut
- and any other aspect agreed upon.
- 6.0 **Training and Documentation:**
- 6.1 Supplier shall provide operational and first level system maintenance training for 4 persons at suppliers works. Further training as required shall be provided at BHEL for operation and maintenance.

7.0 The Following commercial points also may be confirmed.

S.No	Description	BHEL Offer / Requirement	Vendor's confirmation
01	PAYMENT	[i] 80% payment against despatch documents. [ii] 20% after successful commissioning against submission of Performance-Bank-Guarantee or 10% value of Contract covering guarantee period	
02	DELIVERY	6 Months from the date of Letter-of-Intent	
03	INSPECTION	Will be carried out at Vendor's Works and the Performance test is to be witnessed by BHEL.	
04	WARRANTY	The equipment shall be warranted for a minimum Period of 12 months from Commissioning or 18 Months from the date of dispatch whichever is earlier	
05	TRAINING	Refer Clause 7.0	
06	PERFORMANCE BANK GUARANTEE	A Performance-Bank-Guarantee is to be submitted For a value of 10% of the Contract value at the time of Commissioning ,to cover the guarantee period.	
07	LIQUIDATED DAMAGES	0.5% per Week subject to a maximum of 15% for the delayed supplies and Commissioning.	
08	PERFORMANCE	As per this specification.	