

**REVISED TECHNICAL SPECIFICATION  
FOR PROCUREMENT OF**

**SECTION-IV**

**ELECTRIC DRIVEN ROTARY SCREW TYPE AIR COMPRESSOR (500 CFM, 10 KG /CM2)**

**SPECIFICATION NO: CRW/HRT/ECR/IR/EDAC /2026(Rev.01)**

**( BASED ON COFMOW SPECIFICATION NO: COFMOW/IR/EDAC /2019(Rev.01))**

**1. Types of compressor: Electric driven rotary screw type air compressor (500 cfm, 10 kg /cm2)**

**2. Description**

2.1 Electrically driven, rotary screw, air-cooled, microprocessor based stationary air compressors having parameters as per clause 2.2 (Schedule-I). The air compressors are basically energy conversion devices for transforming electrical/ fossil fuel energy to compressed air form. They are used in the Railways, primarily for running pneumatic tool, heavy machinery & plant, air testing of rolling stock, painting application etc.

**2.2 LEADING PARAMETERS (SCHEDULE-I):** The Air Compressor shall confirm to the following major & other parameters

**SCHEDULE-I**

**2.2.1. MAJOR PARAMETERS**

2.2.1.1 Free air delivery	500 CFM $\pm$ 30 CFM
2.2.1.2 Working Air pressure (Min)	10.0 to 10.5 Kgs/cm <sup>2</sup>

**2.2.2 OTHER PARAMETERS**

2.2.2.1 Input Power	415 V $\pm$ 10%, 3 $\phi$ , 50Hz $\pm$ 3%
2.2.2.2 Noise Level (Max.)	85 $\pm$ 5 dB at a distance of 7 meter in free field condition
2.2.2.3 Air quality level at output	
a) Oil content level	0.01mg/m <sup>3</sup>
b) Dust particle Level	0.1 micron
c) Dust contamination in ppm	0.1mg/m <sup>3</sup>

Note 1.: (i) No deviation shall be permitted in Major parameters.

Note-2:

- Free air delivery, working pressure, power and specific energy consumption shall be as per ISO: 1217 (i.e. taking into account all losses) at the point of discharge of after cooler and moisture separator.
- The FAD will be measured at the discharge terminal point of the compressor package in accordance with the CAG/PNEUROP PN2CPTC2 Test Code (Annex C to ISO 1217).
- The FAD is to be given in terms of ACFM where ACFM is actual cubic feet per minute at inlet conditions.
- Formula for calculation of input power calculation of the motor  
Input power of the motor =  $\sqrt{3} \times \text{Voltage} \times \text{Full load current} \times \text{Power factor}$
- The bidder shall give the detailed calculations of power consumption for each schedule. Due consideration and details of efficiency of air compressor should also be provided.

SSE/PCS/CRW/HRT

SSE/PLG/CRW/HRT

Dy.CME-III/CRW/HRT

13/6/26

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**PERFORMANCE STANDARDS:**

The compressor shall be capable of working in normal Indian Railways workshop environment with maximum ambient temperature up to 50°C and maximum relative humidity up to 98%.

The compressor shall be capable to perform as per the requirements of ISO: 1217 (latest) for packaged compressors.

**PRODUCTIVITY/CAPABILITY:**

The compressor shall be capable of working continuously in three shifts, 6 days in a week at full rated capacity. The air compressor shall also be capable of supplying compressed air at full rated capacity at the specified pressure as per Parameter 2.2.1.1/2.2.1.2 of clause 2.2 (Schedule-I).

The compressor shall be capable of working in normal Indian Railways workshop environment with maximum ambient temperature up to 50°C and maximum relative humidity up to 98%.

**PROVE OUT AT FIRM'S PREMISES:**

The manufacturer should demonstrate the load test conforming to requirements of ISO-1217 (latest on the offered Elect. Driven Air Compressor) at the manufacturer's works. Rigidity of the machine must be demonstrated to the satisfaction of the appointed Inspector or Inspecting Agency.

The demonstration/inspection of the compressor shall also be carried out to verify first as per clause 2.2 (Schedule-I), at manufacturer's premises for a period of at least 8 working hours for one compressor from the batch offered for inspection at a time and remaining compressors from the same batch offered for inspecting shall be run for a period of 2 hours or till the steady operating conditions at full rated capacities are attained with Power consumption of each Schedule of the Electric Air Compressors.

**PROVE OUT AT CONSIGNEE'S WORKS:**

The contractor or his authorized agent shall demonstrate the air compressor performance & capability after successful commissioning at the respective consignee's works for a period of 6 days working continuously having three 8 hrs. Shifts each day with Power consumption of each Schedule of the Electric Air Compressors. Thereafter the consignee shall watch the machine performance for a period of one month or minimum 100 hrs. of operation, whichever is later before final proving test certificate is issued.

**3. QUANTITY & CONSIGNEE:**

SL.NO.	CONSIGNEE	QUANTITY REQUIRED
1.	SSE/PCS/CRW/HRT	01

**4. SCOPE OF SUPPLY:**

The scope of supply shall include Design, manufacture & supply of electrically driven rotary screw, microprocessor based stationary air compressor as per parameters in Schedule-I with air-cooled oil cooler, air-cooled after cooler and moisture separator/ dehumidifier along with automatic drainage trap as well as manual drainage trap ON TURNKEY BASIS. It includes all the concomitant accessories/ equipment as detailed in the specification and other concomitant accessories/ equipment, which the manufacturer considers essential to make the machine fully operational, when installed and commissioned. It shall also include installation and commissioning of related equipment, training of personnel in operation and maintenance of machine and supply of technical documentation. For basic design features & general characteristics refer to Section V.






**LIST OF CONCOMITANT ACCESSORIES:**

The following Concomitant Accessories should accompany along with the air compressor.

S N	DESCRIPTION	QTY
1	Vertical Air receiver of 3 M <sup>3</sup> capacity conforming to IS: 2825 and IS: 7938 with all mountings -01 no	01 No
2	Seamless air piping of suitable bore between Compressor and air receiver including sockets, NRV, Tee/elbow joints, isolating valves etc.	50 M
3	First Fill of oils and lubricants	First fill
4	Maintenance tool kit	01 Set
	a. D Spanner set -01 no	
	b. Ring Spanner 01.no	
	c. Slide Wrench-6"-01 no	
	d. Slide Wrench-12"-01 no	
	e.. Drive wrench -6"-01no	
	f. Screw Driver 12"-01no	
	g. Cutting Plier-01no	
	h. Nose Plier Set-01no	
	i. Allen Key Set-01 no	
	j. Empty tool kit bag-01no	
5	Electrical cable to connect compressor panel to supply distribution board.	50 Mtr
6	Set of maintenance spare/consumables.	For two years maintenance
7	Compatible servo Controlled voltage stabilizer(Servo Controlled voltage stabilizer should be preferably from indigenous make such SERVOMAX/CONSUL/APLAB).  Note- In case any other reputed make is offered, satisfactory justification with credentials for the same will have to be given in the offer.	01 No
8	Compatible refrigerated air drier for compressor confirming to clause 2.2(schedule -I)	01 No
Note- Any other equipment required to make the compressor fully functional at site shall be listed under concomitant accessories		

## TECHNICAL SPECIFICATION

## SECTION-V

ABBREVIATIONS

A-1,A-2, A-3, A-4	Standard paper sizes
AC	Alternating Current
AMC	Annual Maintenance Contract
AT	Acceptance of Tender
BG	Bank Guarantee
CME	Chief Mechanical Engineer
CME/PCM	Chief Mechanical Engineer/Post Contract Management
CNC	Computer Numeric Control
COFMOW	Central Organization for Modernization of Workshops
COS	Controller of Stores
Db	Decibel
DC	Direct Current
FA&CAO	Financial Advisor & Chief Accounts Officer
GA (Drawing)	General Arrangement (Drawing)
HRC	Hardness Rockwell 'C' Scale (value)
Hz	Hertz
IEC-Pub	International Electro technical Commission - Publication
JCN	Joint Commissioning Note
JRI	Joint Receipt Inspection
Kw	Kilo Watt
LC	Letter of Credit
LD	Liquidated Damages
LOA	Letter of Acceptance
NC	Numeric Control
NIT	Notice Inviting Tenders
PBG	Performance Bank Guarantee
PDF	Portable Document Format
PLC	Programmable Logic Controller
PTC	Proving Test Certificate
PU	Production Unit (Any of the six Railway Production Units e.g. RCF, ICF etc.)
RDSO	Research Design & Standards Organization
SS	Stainless Steel
WBG	Warranty Bank Guarantee
CRW/HRT	Carriage repair workshop/Harnaut



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## 1. BASIC DESIGN FEATURES

### 1.1 SAFETY FEATURES

The machine design shall ensure safety of the operator and the compressor at all times including accidental slipping of the test sample under test. Details of safety features provided in the machine shall be furnished in the bid.

Suitable interlocks should be provided to protect the air compressor in the event of any system failure and fluctuation in voltage and frequency.

Mushroom type emergency stop shall be provided on the machine, which shall be easily accessible and capable of disabling the machine, drives in case of any emergency.

Noise level of the compressor with canopy during operation shall not exceed 85 +/-5 dB at a distance of 7m when measured as per relevant IS/ISO standard in free field condition. The actual noise level shall be indicated in the bid.

All the pipes, cables etc. on the machine should be well supported and protected. These should not create any hindrance to machine operator's movement for effective use of machine.

### 1.2 SPECIFIC

#### CHARACTERISTICS

##### GENERAL FEATURES:

The leading parameters of the compressor shall be as at clause 2.2 of Section-IV.

The compressor shall be microprocessor-based machine of rugged/ robust construction, shock proof and user friendly to operate.

The equipment should be enclosed type, compact and with modular construction. It should be designed to provide easy access for maintenance and operation on-site.

The equipment should be suitably designed to meet with the Indian climatic conditions during transportation, assembly and operation.

The general electrical design shall conform to clause 2.0 of Section-V, wherever applicable.

### 1.3 CONTROLS:

Microprocessor based centralized control panel, automatic electronic control, alpha- numeric display, actuation of alarms & trips through pressure & temperature transmitters, ergonomically designed and within easy reach of the operator with the following features:

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|--|---|
| I. Data read out display   | - Working pressure, operating temperature, sump pressure, no. of motor starts, operating hours, service information and status data during shut downs & emergency stops.                            |
| II. Setting of Operating parameters  | - Working pressure (Full load / No load), warning levels, service levels.   |
| III. Fault Diagnostics   | - Automatic indication of faults and shut down in case of high air-end discharge temperature, low unloaded sump pressure, starter fault, main motor overload, fan motor overload, reverse rotation. |
| IV. Automatic part load operation controls to ensure proportionately lower power consumption under part load working conditions. |   |

### 1.2.3 FILTERS

**1.2.3.1 AIR INTAKE FILTERS:** Heavy duty, multistage with particle removal down to 2 - 3 microns and maintenance user friendly with respect to cleaning and replacement. Suitable indication/ feature shall be provided in case of choking/ servicing due.

**1.2.3.2 OIL FILTERS:** Filtration capacity of 25 microns and maintenance friendly with respect to cleaning and replacement. Suitable indication/ feature shall be provided in case of choking/ servicing due.



**AIR-OIL SEPARATOR:** Multi stage oil separation to ensure oil carries over less than 2 - 3 ppm oil. Pressure drop in the separator shall not exceed 0.2 kg/cm<sup>2</sup>. It should be maintenance user friendly with respect to cleaning and replacement.

**1.2.4 BEARINGS:** Only SKF/FAG/NORMA/NTN/KOYO/NBC/NSK/ TIMKIN acceptable makes.

**1.2.5 CABLING & TUBING:** Provision of following: -

- (a) Instruments tubing from measuring points to gauge panel.
- (b) Unloader piping from suction valves to Unloader.
- (c) Power cabling between starter and motor neatly lay out through cable trays with fixing clamps.
- (d) Control cabling between various instruments and starter-cum-control panel duly terminated properly lay through ducts/cable trays with fixing clamps.

#### AIR DRIER

Refrigeration type, packaged, self-contained fully automatic air drier capable of handling free air delivery at the operating pressure as specified in Parameter of clause 2.2 (Schedule-I) along with automatic drainage arrangement and a DRO to indicate dew point, which shall be 5° C at standard design ambient conditions. Pressure drop in the drier shall not exceed 0.5 Kg./cm<sup>2</sup>.

If standalone refrigerated air dryers are offered instead of integrated units then the acceptable make of the same will be limited to Sabro Dominick Hunter/ Bry Air/ Purifair / Shalco / Ultrafilter/ Gerni/SUMMITS/Kirloskar/Elgi/Spin AQM or similar.

## 2 GENERAL ELECTRICAL SPECIFICATION

2.1 The provision of this General Specification shall apply, wherever relevant.

2.2 All equipment's and material shall comply with appropriate Indian Standards (latest) or National Standards of the country of origin provided the latter are equivalent to or better than the former. Items for which Indian Standards are not published, National Standards shall be acceptable. The tenderer shall indicate the Standards applicable. The following standards are applicable in particular. (Corresponding International Standards like ASA, NEMA, BSS, DIN etc. may also be quoted).

- |      |                    |  |
|------|--------------------|--|
| IS : | 325-1979 (latest)  | - Three phase induction motors (corresponding to IEC pub-34-1) (Latest).   |
| IS : | 1248 (Latest)      | - Direct acting indicating analogue electrical measuring instruments and their accessories (corresponding to IEC Pub-51) (Latest).                                     |
| IS : | 1231-1974 (Latest) | - Dimensions of three phase induction motors (corresponding to IEC Pub-72-1) (Latest).   |
| IS : | 1271-1985 (Latest) | - Classification of insulation material for electrical machinery & apparatus in relation to their thermal stability in service (corresponding to IEC-Pub-85) (Latest). |
| IS : | 6875 (Latest)      | - Push Buttons and related control switches corresponding to IEC Pub/73) (Latest).   |
| IS : | 375-1963 (Latest)  | - Marking and arrangement of switch gear, bus bars, main connection & auxiliary wiring.  |
| IS : | 996-1979 (Latest)  | - Single phase small AC and universal electrical motors.   |
| IS : | 1356 (Latest)      | - Electrical equipment of machine tools.   |
| IS : | 2516 (Latest)      | - Circuit breakers (corresponding to IEC Pub-56) (Latest)  |

2.3 Unless specified in the main specification, the AC motors and starters shall be of the following type. Tenderer is, however, free to give alternative proposal along with justification, if in his view alternative proposal is warranted by site conditions. Type of motor type of starter.

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	TYPE OF MOTOR	TYPE OF STARTER
2.3.1	Any type of AC motor starting current of which does not exceed 75 amps.	Direct on line.
2.3.2	AC squirrel cage, introduction motors, starting current of which is above 75 amps. If started direct on line	Star delta or Auto transformer type.
2.3.3	AC slip ring type motor	Resistance type air/fan Cooled
2.3.4	AC synchronous or synchronous induction motor.	Suitable maker's standard.

2.3.5	DC motor	Resistance type/Thyristor type.
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- 2.4 The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories.
- 2.4.1 **No Voltage Protection** - No voltage protection shall be provided so that machine will not start up again by itself when, following an interruption the supply is restored.
- 2.4.2 **Short Circuit Protection** - To protect against short circuits due to insulation failure of faulty connections HRC fuses shall be provided for each motor. The rating of the fuse shall be such as to take care of the over current due to motor starting.
- 2.4.3 **Over Load Protection** - To prevent motors from overloading, overload protection shall be provided separately for each motor. Three phase motors shall be protected by overload tripping devices on each phase.
- 2.4.4 **Single Phasing Protection** - A separate current sensitive delayed action single phasing preventer shall be provided for each motor separately. Overload protection shall not be treated as single phasing preventer.
- 2.5 Control equipment shall be mounted in separate drip proof enclosures. Control enclosures and compartments are to be so designed as to give adequate protection against ingress of dust, oil, coolant or chips. All control devices like contractors etc. shall be front mounted on a rigidly fabricated metal panel for ease of operation. All other electrics shall be installed that they are readily accessible when the doors and covers are opened. Hinged covers shall be interlocked with the machine tool control to prevent operation of the machine when cover is open.
- 2.6 The motor shall be totally enclosed with or without fan cooled frame. Screen protected drip proof type motor may be provided if it is mounted inside protective enclosures.
- 2.7 The electrical equipment's shall comply with the requirement of Indian Electricity Act and Rules.
- 2.8 All instruments shall be of the Industrial Grade "A" (IS-1248) switch board type the range of the instrument shall be such that the maximum load expected in the circuit shall produce a deflection of 60% to 80% of the full scale.
- 2.9 The supplier shall furnish 04 sets of complete electrical and electronic wiring diagrams in full details to enable the maintenance staff to locate faults in the circuits, 04 sets of part catalogues, maintenance manuals operating instructions with details of coils and windings, used in the equipment as per clause 4 of Section-V to facilitate repairs and maintenance should also be supplied.
- 2.10 For main motor class minimum "B/F" insulation shall be provided. If any other class of insulation is proposed, detailed justification for providing different class of insulation shall be given.
- 2.11 Motors shall be designed to withstand frequent starts, stops and reversals as demanded in the operation of the machine.

Two earthing terminals shall be provided on all electric motors including the control gear.

POWER SUPPLY

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2.13.1 The machine shall be suitable for operation on 415 volts 3 phase 50 cycles AC 3 wire or 4 wire system with neutral solidly earthed. The supply voltage may vary up to +10 -20%. The frequency may vary up to + 3%. However, full rated power of the motor shall be available at the lower voltage. Firm should confirm satisfactory performance of the machine at incoming power supply in the range 415V+10-20% and 50HZ+3% frequency or should provide voltage stabilizer as specified against clause 2.13.2 below of required capacity.

2.13.2 The voltage stabilizer, if required, shall conform to :

- i) Input Voltage - 320 to 460 volts 3 phase 4 wire unbalanced supply.
- ii) Out put Voltage - 415 volts
- iii) Regulation -  $\pm 1\%$  from No load to Full load.
- iv) Rate of correction - 20 volts per second per phase.
- v) Wave from distortion - NIL
- vi) Efficiency - Not less than 97%.
- vii) Winding and class of insulation - Copper wire wound with "B" class of insulation or better.

2.13.3 In case of machines equipped with NC, Solid State , CNC, Thyristor controlled devices and other sophisticated electronic gadgets including microprocessors etc. which are susceptible to power line spikes and surges, a suitable voltage stabilizer and ultra isolation transformer of adequate capacity to cover for the entire electrical load of the machine shall be offered conforming to Specification for voltage stabilizer as mentioned in clause 2.13.2 above and isolation transformer (if required) to the parameters mentioned below. Indigenous make voltage stabilizer and isolation transformer from the reputed manufacturers are acceptable.

- i) Transformer ratio - 1:1
- ii) Winding - Copper wire wound with "B" class insulation or better.
- iii) Protection - To arrest spikes and surges to the order of 3 KV for 200-400 micro seconds duration.
- iv) Common mode noise rejection - 120 dB
- v) Isolation - Capacitance 005 Pf: resistance greater than 1000 Mega Ohms.

2.13.4 Voltage stabilizer shall be equipped with a protective relay to trip to trip the AC power supply to the machine instantaneously with audio and visual indication to the operator. Settings of the protective relay for low and high voltage shall be 320 volts and 460 volts respectively.

## 2.14 ATMOSPHERIC CONDITIONS/ TROPICALISATION

2.14.1 The ambient temperature at the site at which the machine will be installed may vary from +0°C to +50°C over the year. The relative humidity may be as high as 98%. The atmosphere is expected to be dusty. The machines offered shall be suitably tropicalized to work under these atmospheric conditions without any adverse effect on their performance.

2.14.2 The tenderer should clearly indicate the features / sub assemblies provided in electrical, mechanical and electronic systems to achieve the above objectives.

2.15 The temperature rise shall not reach such a value that there is a risk of injury to any insulating material or adjacent parts.

2.16 The drive shall be capable of operating at any one of the speed required independent of the load in accordance with the requirements of the machine.

## 3. GENERAL CHARACTERISTIC

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- 3.1.1 The machine shall be robust, rigid and of sturdy construction. It shall be designed to meet heavy duty demands of various operations on the machine under normal Workshop environment for such machines. It shall be free for vibrations even when working at full capacity.
- 3.1.2 All machine castings shall be made of close grained high grade cast iron like Mechanite or equivalent materials meeting IS-210 Standards to ensure durability and rigidity. The casting shall be thermal stress relieved to ensure stability and continued accuracy.
- 3.1.3 All machine fabrications of critical load bearing assemblies like beds, columns etc. shall be adequately strengthened and stress relieved.
- 3.1.4 Change in ambient temperature shall not affect the performance of the machine.
- 3.1.5 There shall be no change in the performance of the machine either on switching on the machine or after continuous running.
- 3.1.6 There shall be no resonant vibrations throughout the working range of the machine at all load levels.

### 3.2 SAFETY CONTROLS

- 3.2.1 The machine shall incorporate safety devices to provide protection to the operator and machine against all possible operational and machinery failures.
- 3.2.2 Suitable interlock shall be provided to prevent machine operations in the event of:
- 3.2.2.1 Faulty sequence of operation.
- 3.2.2.2 Fluctuation in supply voltage.
- 3.2.2.3 Resumption of power supply after power failure.
- 3.2.2.4 Non-positioning of safety guards.
- 3.2.2.5 Failure of hydraulic system (where applicable)
- 3.2.2.6 Failure of lubricating system (In case of automatic including drop in pressure lubrication)
- 3.2.3 A fault or damage in the control circuit or interruption re-establishment after an interruption of fluctuation in whatever manner in the power supply to the machinery must not lead to dangerous situations in particular.
- 3.2.3.1 The machinery must not start unexpectedly.
- 3.2.3.2 The machinery must not be prevented from stopping if command has already been given.
- 3.2.3.3 No moving part of the machinery or piece held by the machinery shall fall or be ejected.
- 3.2.3.4 The protection devices must remain effective.
- 3.2.4 The machine shall be fitted with an emergency stop device to enable actual or impending danger to be averted. This device must be:-
- 3.2.4.1 Conveniently located.
- 3.2.4.2 Clearly identifiable.
- 3.2.4.3 Stop the machine as quickly as possible without causing additional hazards.
- 3.2.4.4 The emergency stop must remain engaged. It should be possible to disengage it only by appropriate operation. Disengaging the control must not restart the machinery but only permit restarting.
- 3.2.5 Safety features shall also include.
- 3.2.5.1 Safety device against overload for all mechanical and electric items to the extent possible.
- 3.2.5.2 Safety stops against over-running of slides.
- 3.2.6 Guard and protection devices shall protect exposed persons against risks related to moving transmission parts (such as pulleys, belts, gears, rack and pinion, shafts etc.) and moving parts directly involved in the process to the extent possible. This shall meet the following requirements:-
- 3.2.6.1 Be of robust construction
- 3.2.6.2 Not give rise to any additional risk
- 3.2.6.3 Not be easy to bypass or render non-operational

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- 3.2.6.4 Be located at an adequate distance from danger zone
- 3.2.6.5 Cause minimum obstruction to the view of the production process.
- 3.2.6.6 Rigidly connected and not prone to rattling
- 3.2.6.7 Enable essential work to be carried out without the guard or protection device having to be dismantled
- 3.2.7 A load meter shall be provided to indicate the load on the machine. The meter shall have a suitable mark to indicate the maximum load the machine can take. Full details of the above and other safety features indicating how each one functions must be explained in the offer.

### 3.3 OPERATIONAL CONTROLS

- 3.3.1 The operation of the machine shall be by push buttons or levers. The basic rules for the direction of operation of controls and the corresponding direction of movements of the machine tools shall be as per IS: 2987-1985.
- 3.3.2 The control devices shall be
  - 3.3.2.1 Clearly visible and identifiable.
  - 3.3.2.2 Ergonomically positioned for safe operation without hesitating or loss of time, and without ambiguity.

### 3.4 LIGHTING

- 3.4.1 Integral lighting suitable for the operations concerned where its lack is likely to cause a risk despite ambient lighting of normal intensity shall be provided.
- 3.4.2 The manufacturer must ensure that there is no area of shadow likely to cause nuisance, that there is no irritating dazzle and that there are no dangerous stroboscopic effects due to lighting provided by the manufacturer.
- 3.4.3 Integral parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.
- 3.4.4 The machine lighting should be of low voltage so as to prevent any hazard to the operator.

### 3.5 MACHINE MAINTAINABILITY

- 3.5.1 The machine shall be so designed as to require minimum possible maintenance and to give trouble free service.
- 3.5.2 All assemblies/parts of the machine shall be easily accessible for maintenance.
- 3.5.3 The machine shall not require major dis-assembly for checking and replacement of a particular part, especially for parts requiring periodical check up and replacement.
- 3.5.4 The manufacturer must provide means of access e.g. stairs, ladders, cat walks etc. to allow access safely to all areas used for production, adjustments and maintenance operations.

### 3.6 WEAR COMPENSATION ADJUSTMENT

- 3.6.1 The original built in accuracy of the machine shall be capable of being maintained conveniently and economically by suitable adjustments for taking up wear on slides, bearings and lead screws. The system of adjustments incorporated shall be explained in the offer.

### 3.7 COOLANT SYSTEM (WHERE APPLICABLE)

- 3.7.1 The coolant system will be required, if wet cutting is offered. A Recirculating type flood coolant system through adjustable trajectory multiple nozzle around the spindle. The self-contained coolant system should be completed with coolant pump, piping, coolant reservoir, filter etc. should be provided. The supply of coolant should be in ample volume of at least 40 lpm with provision of internal coolant through spindle of more than 5 bar pressure. System should have preferably flood coolant arrangement as built in feature. The details of the system & Coolant Flow Diagram showing filters, pumps, valves, tanks etc. to be submitted with the offer.
- 3.7.2 The coolant system should consist of pumps, coolant tank, filter drum (made of high quality steel net filter) and re-circulation arrangement. There should be provision of two stage filtration i.e. pre filtration and fine filtration (20 micron size) checking device should be provided for verifying coolant level and pressure. The coolant system should be programmable through the CNC control. A chip and coolant tray shall be provided. The volume of coolant flow shall be indicated. It shall be adjustable. The Technical details including make, model should be furnished with the offer.



- 3.7.3 All attachments, tool holders, adapters etc. shall have the provision for internal & through coolant. In case it is not possible to provide tool holder/adaptor with provision for internal/through coolant, the length of the External coolant nozzle / External coolant pressure / External coolant flow rate should be such that it should be sufficient to flood the tool cutting tip while cutting.
- 3.7.4 An enclosure shall be provided to prevent the coolant from splashing outside the machining zone. Details of enclosure shall be provided. Specific requirements of coolant system in milling head shall be clearly indicated.
- 3.7.5 It should be ensured that the coolant should not affect table bearings & spindle bearings. Details of the arrangement provided should be explained in the offer.
- 3.7.6 Coolant collection and recirculation system should be leak proof & perfect to avoid any spillage on shop floor, trenches for cables & foundation pit of the machine etc.

### 3.8 LUBRICATION SYSTEM (WHERE APPALICABLE)

- 3.8.1 The machine shall be provided with an CNC controlled automatic centralized lubricating system for ensuring delivery of adequate quantity of lubricant in regular interval to areas requiring continuous lubrication i.e. headstock gearing, spindle assembly, all sliding surfaces and ball screws shall be provided through continuous cycle, independent motor driven pump complete with filter and safety pressure switch. The centralized lubrication system should be from reputed make i.e. Rexroth, Vogel or Cenlub. Suitable arrangements must be provided for indication of failure of the lubricating system. The make, number of cooling points, other relevant data etc. should be indicated in the offer.
- 3.8.2 The system shall be provided with interlock to prevent machine operating/starting in the event of the failure lubrication system.
- 3.8.3 Suitable filters capable of filtering chips, dust particles etc. shall be provided. Indicators for showing clogged condition of filters shall be available. The filters shall be indigenously available. If reusable filter cannot be offered, the filter cartridge shall be readily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
- 3.8.4 Lubrication and filter cleaning chart shall be displayed on a metal plate at a conspicuous location on the machine indicating :-
- Specific location of points on the machine to be oiled lubricated/greased.
  - Periodicity of lubrication of these points.
  - Filter to be cleaned.
  - Periodicity of cleaning filters.
  - Periodicity of replenishing lubricating oil for the centralized system.
  - Any other similar relevant information.
- 3.8.5 Points where manual lubrication is needed shall be separately indicated. Frequency of lubrication shall be also clearly mentioned.
- 3.8.6 Lubricating oils used in the machine shall be available in India. Successful tenderer will be required to indicate brand names of approved oils manufactured by various Indian Oil Companies.
- 3.8.7 First fill of lubricating oils used in the machine shall be provided with the machine.

### 3.9 PNEUMATIC SYSTEM (WHERE APPLICABLE)

- 3.9.1 Pneumatic system shall be provided with air filter, oil filter & air dryer. The system should incorporate safety device for disabling the machine in case of drop in pressure below 10 kg/cm<sup>2</sup>.
- 3.9.2 The compressed air supply will be provided by the customer at the machine within pressure range of 10 kg/cm<sup>2</sup> and a moisture content or 1000 ppm. The pneumatic system of the machine should be designed accordingly. An alarm shall be provided for low air pressure.
- 3.9.2 Suitable filter/moisture trap shall be provided by the tenderer in the system of pneumatic air intake. The filter shall be reusable type and indigenously available. If reusable filter cannot be offered, the filter cartridge shall be easily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
- 3.9.3 Air pressure regulator, if necessary, shall also be provided by the tenderer.
- 3.9.4 The make of pneumatic control equipment shall be of reputed make & shall be indicated.

**3.10. HYDRAULIC SYSTEM (WHERE APPLICABLE)**

- 3.10.1 The Machine shall be provided with a suitable Re-circulating Type hydraulic system to cater to the needs of the hydraulic systems / Sub-systems required for guide ways and other components. The hydraulic Tank should be preferably placed at shop floor. No Tandem pumps should be used. Maximum desired permissible pressure should be less than 90 Kg/sq.cm. Hydraulic pumps capacity (flow / pressure) to be intimated & should be kept low which is sufficient for functional requirement but does not add unnecessary heat to the system).
- 3.10.2 Hydraulic circuit must be equipped with the following safety and inspection equipment:
- Pressure gauges at all place, where pressure has to be set up or inspected.
  - Safety valves for hydraulic circuit if relief valve does not fulfill this function.
  - Equipment for checking of temperature in the circuit or in the pump wherever necessary.
  - Arrangement to show if the filters (including those in the pump set) (with electric clogging indicator and alarm on PLC) should be used to avoid frequent clogging of the filters and other maintenance related problems. Filter elements should, preferably be of EPE / Hydac make. The filters shall be of reusable type and indigenously available. If reusable filter cannot be offered, the filter cartridge shall be readily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
  - Alarm for low oil level.
- 3.10.3 The sump aggregate shall have the following:
- Oil level sight gauges or any other equipment showing the minimum and maximum oil levels in sump.
  - A drain plug at the lowest portion of the tank.
  - It shall be possible to drain the oil from the tank without disconnecting any pipes or other fittings.
- 3.10.4 The temperature of oil in hydraulic circuits shall not exceed 60°C in any case. Suitable arrangement shall be incorporated to ensure that the oil is not overheated under local weather conditions at continuous normal working of the machine. Details of the arrangement provided should be furnished in the offer.
- 3.10.5 Facilities for bleeding of air in case of air lock shall be provided.
- 3.10.6 The hydraulic reservoir, pump and allied equipment shall be suitably segregated from the machine in order to remove major source of heat.
- 3.10.7 Hydraulic oils used on the machine shall be available in India. Successful tenderer will be required to indicate brand names of approved oils supplied by various Indian Oil Companies.
- 3.10.8 First fill of hydraulic oils used on the machine shall be provided with the machine. The firm shall also submit estimated annual consumption of oil on 7000 hours per year working basis.
- 3.10.9 The hydraulic system elements shall be from reputed Indian manufacturers like M/s. REXROTH, Vickers, Yuken & Parker etc. The make of different elements shall be clearly indicated. Details of Hydraulic system shall be indicated.

**4. TECHNICAL LITERATURE:**

One copy of the printed illustrative catalogue showing features of the machine and its elements must be enclosed with each copy of the bid.

The successful tenderer will have to furnish, for each machine 04 sets of the technical literatures of complete machine including imported and indigenously purchased components/sub-assemblies to the consignee directly within 3 months of placement of AT. Out of these 04 sets, the tenderer shall be required to submit one set of all documents in best available condition one month prior to training cum inspection of the machine. Tenderers should provide a list of literature, which they will supply along with the machine. One set of technical literature should cover the following details:

- Operational & Maintenance manual of the air compressor.
- Operational & Maintenance manual of the servo controlled voltage stabilizer.
- Operational & Maintenance manual of the ultra-isolation transformer.
- Instruction & Maintenance manual for Hydraulic Oil Cooling Unit.

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- v. Diagnostic & Trouble shooting Guide for Microprocessor based Control System.
- vi. Soft and hard copies of PLC Program (if any) in ladder form with cross reference listing and PLC project file.
- vii. Wiring diagram, in which length of electrical wires must be mentioned, hard copies in A-3 size as well as soft copy in PDF format.
- viii. Mechanical drawings (spindle assembly, table assembly, column assembly), hard copies in A-1 size as well as soft copy in PDF format.
- ix. Spare part manual including part lists no., hard copies in A-4 size as well as in PDF format.
- x. Lay out drawings in A-1 size, which clearly shows the position of all type of electrical components in machine.
- xi. Operational & Maintenance manual of the servo controlled voltage stabilizer.

**Note:** All the literature should be at least in English language.

#### 5. SPARES:

Two lists of recommended perishable and non-perishable spares required for normal maintenance to cover complete range of mechanical, hydraulic and electrical equipments including controls on double shift working basis for two years should be furnished. The quantities should relate to, in case of non-perishable spares, to two years normal maintenance. And in case of perishable spares to the duration of its shelf life or two years whichever is less. Shelf life should be indicated for spares. It may be noted that it is the responsibility of the bidder to ensure that exhaustive list of spares is quoted.

#### 6. CONSUMABLES:

**Since the machine will be under warranty period of IRS terms and condition.**

The tenderer should quote & furnished the detailed list of such consumables if required for meeting these requirements. These consumables shall be supplied along with the machine.

#### 7.DELETED

#### 8.DEVIATIONS:

The tenderer shall certify that the offered machine fully meets the specification. Various design features incorporated in the machine to fulfill different technical performance requirements shall be fully explained in the offer. However, minor deviations from these specifications which do not affect or in any way interfere with the stipulated performance standards or would result in improved safety/ reliability or would reduce recurring maintenance/operating cost of the machine, can be considered for acceptance. The tenderer in such eventuality shall clearly indicate the details of these deviations and their implications.

All Deviations (Both Major & Minor) shall be clearly indicated in the deviation statement.

#### 9.INSPECTION AND TESTING AT MANUFACTURER'S WORKS:

The machine shall be inspected and tested during different stages of its manufacture starting from raw material till the completion of machine, by the purchaser or his authorized representative at the supplier's or his sub-supplier's works. The Quality Assurance Programme as per Annexure-I shall be submitted along with the bid. The bidder must submit the exhaustive QAP incorporating the tests as given in Annexure-I along with other tests /stage inspection as followed by them.

A load and functional test like no load test and maximum Horse Power test must be carried out at the manufacturer's works. Rigidity of the machine shall be demonstrated to the satisfaction of appointed inspector or inspecting agency.

A Sample Inspection Chart for inspecting the equipment shall be supplied along with the bid. The inspection chart should indicate all the tests that are carried out during the machine manufacture and also the tests to be offered to inspecting agency. The standard to which this inspection chart conforms should be clearly indicated. Against each test, acceptable limit/ range of values shall be indicated.

The complete machine shall be inspected at manufacturer's premises as per approved GA drawing. Inspecting authority shall not carry out the final inspection in case GA Drawing is not approved by the consignee.

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**10. TRAINING:**

Free training by the firm shall be imparted in operation and maintenance of the machine. The training to be imparted shall cover operation, troubleshooting and repair of all mechanical, hydraulic, electrical & electronics equipments (CNC Control & AC Drives) and CNC/PLC part programming. This training shall be provided to 03 per consignee nominated by the consignee, for a period of one week free of cost at the consignee premises.

Subsequently, technical experts from the manufacturer will fully and adequately provide training to operators and maintenance staff nominated by the consignee at the time of commissioning of the machine.

The supplier will be responsible for co-coordinating with the consignee the travel plans of trainees to ensure that the training is imparted on the machine at its assembly and testing stage. The bidder shall also submit training schedule along with the offer.

Note: All training should be imparted in English/Hindi only.

**11. SUBMISSION OF GA, FOUNDATION & RELATED DRAWINGS FOR APPROVAL:**

For each machine, the supplier shall first submit 01 copy of foundation drawings with details of construction of foundations, complete layout of machine elements like bed, hydraulic tank, coolant tank, electrical panel, Servo Controlled Voltage Stabilizer etc. and other related diagrams (Mechanical, Hydraulic, Electrical & Electronics) along with machine weight, overall dimensions, electrical load with length of 3 phase, 415 V AC electric power cable for approval within 30 days of issue of purchase order. After getting approval from consignee, the supplier shall supply directly to consignee 6 copies of approved GA foundation drawings and related diagrams for machine. This information should be furnished on the pattern indicated in detail in the following IS Specifications (Latest) or relevant international standards,

- i) IS: 2974 (Pt.I Para 4.1) for reciprocating type machine.
- ii) IS: 2974 (Pt.III Para 3.1) for rotary type machine (medium & high frequency).
- iii) IS: 2974 (Pt.IV para 4.1) for rotary type machines of low frequency.
- iv) IS: 2974 (Pt.V para 3.1) for impact type machines other than hammers

**12. APPROVAL OF GA, FOUNDATION & RELATED DRAWINGS:**

General Arrangement Drawings will be sent by the 'Contractor' to the Consignee within 30 days of issue of purchase order. The 'Contractor' should ensure that drawings sent to consignee are complete in all respects as specified in technical specification. The GA drawings shall be approved by the consignee and given back to the contractor within next 15 days.

In case Consignee finds some deficiencies in the Drawings and returns the same for rectification to the 'Contractor', the contractor must return the rectified drawings within 15 days from the date of issue of letter by Consignee. The consignee shall ensure that all deficiencies in the Drawings shall be pointed for clarification to the firm together at one time only instead of piecemeal multiple references. Firm should also visit the site before dispatch of machine to assess the condition of path to be used for movement of machine.

**DISPATCH OF THE MACHINE FROM MANUFACTURER WORKS:**

The supplier should normally dispatch the machine only after the foundation is ready for installation and commissioning of the machine on arrival.

In case of delay on part of consignee in providing the clear site for construction of foundation or any other facility as specified in the contract to the supplier, the supplier will report the matter to DY.CME/CRW/HRT and consignee. In case of delay in readiness of site on part of consignee, DY.CME/CRW/HRT shall take up the matter with concerned Railway/ PU, and advise supplier accordingly.

In case proving of component at manufacturer works, the supply



**INSTALLATION, COMMISSIONING AND PROVING TESTS: (ON TURNKEY BASIS)**

**Joint Check** – The contractor or his agent would be required to carry out a joint check at consignee's end, along with the consignee, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that this joint receipt inspection be done immediately on receipt of the machine by consignee & bidder's representative to avoid commissioning delays due to shortages/transit damages. After receipt of the machine as above a Joint Receipt Inspection note (JRI) as per Annexure-C of Section-VI shall be prepared by the consignee and the firms representative indicating the tentative time schedule for various activities of installation and commissioning.

**RESPONSIBILITIES OF CONSIGNEE AND BIDDER**

The **consignee** shall be responsible for-

- i. Provision of a clear covered (except where shed is in the scope of contract) site for construction of foundation as per the schedule to ensure its readiness before arrival of machine at site.
- ii. In case where construction of shed is also in the scope of contractor the consignee shall ensure site is encroachment and encumbrance free.
- iii. Electricity, water and compressed air for installation and commissioning of machine shall be provided free of cost within one week of arrival of machine at site.
- iv. Wherever a road mobile crane has to be arranged by the supplier for material handling, a clear approach for it up to the site has to be provided.
- v. Clear covered space for storage of material/equipment required for working/ construction of foundation and installation of the machine etc.
- vi. The consignee shall arrange the raw material for prove out at their end within 07 days of the dry run of the machine (installation, power connection, auxiliary connection like air, water connection) failing which such components will be deemed to have been proved out. The components supplied by the consignee in time will be required to be proved out within 30 days thereafter.

The **bidder** shall be responsible for-

- i. **Design & Construction** of foundation, civil works (in line with scope of supply) suiting local soil conditions at the site.
- ii. Advise consignee in time regarding schedule for requirement of clear site for construction of foundation and other infrastructure, resources & facilities required.
- iii. Construction of foundation as well as flooring (if damaged by bidder during work) of sufficient thickness suiting local soil conditions, for machine shall be completed by the bidder at the site provided by the consignee before receipt of the machine at their premises.
- iv. Provision of all tools and equipment, technical and unskilled manpower, material handling accessories/ equipment and material for installation and commissioning.
- v. Unloading of the machine on receipt (both imported and indigenous machine) and its movement to the site of installation including provision of road mobile crane.
- vi. The bidder should ensure the proper earthing for the machine and its peripherals/accessories.
- vii. The bidder shall be responsible for meeting all the criteria set by the state pollution control board and central pollution control board, wherever applicable, with respect to air, water, noise, land etc. the bidder shall be responsible for obtaining clearance /certificate for installation/commissioning/operation of the machine/system supplied. The consignee will provide the administrative help for establishment of communication with the pollution control board.

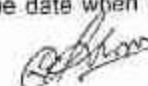
Consignee will provide only 415 V+10%-20%, 3 phase 50 Hz±3% AC supply at a single point (mains). All types of cables, connections, circuit breakers etc. required for connecting power supply point to different parts of the machine/control cabinets, shall be the responsibility of the bidder. Requirement of grounding/earthing with required material shall also be incorporated by the bidder during construction of foundation.

Electrical work like laying of power/electrical cables & earthing wires from mains to machine control panel (upto 20 meters) as well as within the machine, with supply of all materials shall also be carried out by the supplier.

The supplier shall demonstrate machine performance and prove out the claimed capability for successful commissioning at the consignee's works, as per clause 2.2(schedule I) of Section-IV. The M&P shall be deemed to be "commissioned" at consignee premises on the date when it is tested



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and meets with the specified capabilities/functions according to the technical specifications. In addition to above, in case of tooled-up M&P, the M&P shall be deemed to be "Commissioned" at consignee premises on the date when "prove out" components specified as per the relevant clause of technical specification have been successfully proved out meeting the productivity requirements of Technical specification. The consignee shall arrange the raw material for prove out at their end within 07 days of dry run of the machine (installation, power connection, auxiliary connections like air, water etc.) failing which such components will be deemed proved out. The components supplied by consignee in time will be required to be proved out within 30 days thereafter. Any delay in providing the "raw material or any other input" for proving out shall not be logged on supplier's account.

A Joint Commissioning Note (JCN) to this effect shall be made as per the format at Annexure-D of section VI. After issue of performance shall be watched for a period of one month, after which Commissioning Certificate are the performance shall be watched for a period of one month, after which the if some minor breakdowns are noticed after the issue of JCN, these shall be attended as per warranty obligations and suitable extension of the warranty period. If an assembly/sub-assembly requires to be taken back to the manufacturer's premises for repair/replacement either before commissioning or during warranty, the manufacturer or his agent would be required to submit BG of suitable amount. In case the entire machine has to be taken back, a Bank Guarantee for the cost of the machine would have to be submitted. The bank guarantee should be of adequate value so as to cover the cost of the assembly/sub-assembly/paid up cost of the machine.

### 13.DELETED

### 14.BUGHT OUT ITEMS

The tenderer shall furnish along with the offer a list of all critical items/ sub-assemblies which are bought out by the tenderer and proposed to be used, along with the manufacturer's name, brand model etc. The successful tenderer may be required to produce invoices to ensure genuineness of such products / verification by the Inspecting agency.

The tenderer should clearly indicate that in case of components/sub assemblies taken from reputed companies such as Vickers, Rexroth, RITTAL, THK, and Shenburger etc., the parent company has already entered into contract with their Indian units/affiliates for undertakings repairs/after sales service during warranty and post warranty.

S.No.	Sub-assembly	Make
1.	Microprocessor & Drive Controller	SIEMENS/FANUC/Heidenhain or OEM make
2.	Hydraulic system	Rexroth/Vickers/Yuken/Parker
3.	Feed back devices	Heidenhain, Fagor, Siemens, Fanuc, Mitsubishi
4.	Ball screws	THK/INA/Tsubaki/Rexroth/Stelmeyer/star/Gamfior/Schenburger/Shuton.
5.	Spindle Bearings	FAG/SKF/Timken/NTN/KOYO/NORMA/NBC/NSK
6.	Lubrication System	Centlub/Dropco/Vogel/ Rexroth
7.	Electrical Control Cabinet	RITTAL/ Siemens or of other reputed make with IP55 Protection level
8.	Servo Controlled Voltage Stabilizer	Servomax/Consul/ Aplat
9.	Bearings	SKF/FAG/NBC/Timken
10.	Electromagnetic clutch	Vortex/Ghatge Patil
11.	A.C. Motors	NGEF/BBL/ABB/KEC/Crompton
12.	Brake motors	Siemens/KEC/Crompton/NGEF/BBL
13.	D.C. Motor	KEC/Siemens/Crompton/NGEF/BBL
14.	Contactors	Siemens/BCH/ABB/Lakshmi
15.	Limit switches	BCH/Siemens/L&T
16.	Push button	Teknic/Siemens
17.	'O' Rings & rubber seals	Merlin/Parker/Busak/Hunger
18.	Pneumatic Control Equipment	Festo/Shayo Norgen/Shradder Scoville/Electro Pneumatics/Luthra
19.	Control gears	L&T/Siemens/BCH/ABB/Shneider
20.	Filters	Hydac, Hydroline
21.	Cable/wire	Finolax/KEI
22.	Gear reducer	Elecon/Greaves/Shanthi/ZF/New Allenbury



23.	AC Drive	Fanuc/Siemens
24.	AC servo motor	Fanuc/Siemens
25.	DC drive	Siemens, KEC
26.	PLC	Siemens/Messung/Hitachi/Mitsubishi
27.	Couplings	Fenner/Love Joy Inc., USA/Flex Couplings, Pune
28.	Air circuit breaker	Siemens/L&T

**Note:** (i) In case any other reputed make is offered, satisfactory justification with credentials for the same will have to be given in the offer.

(ii) The tenderer should explicitly mention "not applicable" against the items indicated above, whichever is not applicable in the offered machine.

#### 15.COLOUR:

Paint of the machine should be oil / coolant resistant and should not get peeled off and mixed up with coolant.

The machine and its accessories shall be painted in Apple Green Color No.281 to IS:5-1978, (if any specific color code standardized by BIS is available, the same be given). The machine can also be painted in equivalent RAL/DIN/other International Standards. If there is a standard color scheme of the manufacturer, the same can also be considered and may be specified.

#### 16.WARRANTY OBLIGATION –The following conditions regarding Maintenance and reliability shall also apply:-

The machine shall be designed for a life of 20 years with regular maintenance and all the structural members of the machine and the foundation shall be guaranteed for 20 years against cracks breakages and etc. during the course of normal operations. Tenderer would submit suitable undertaking.

The warranty period would also cover comprehensive preventive maintenance, which will be inclusive of all spares, material and labour cost. All maintenance consumables like lubricants and grease except hydraulic oil / machine coolants shall form part of the scope of the preventive maintenance during the warranty. The cost of preventive maintenance to be carried out during warranty period should be quoted separately.

The payment of preventive maintenance schedule carried out during warranty period shall be made by FA&CAO/ECR annually at the end of each year after completion of the work and issue of certificate by the consignee as per Annexure-E of section-VI.

The machine shall at all times give contractual out-put and accuracy. Any deficiency or break down for a total of 02 hr. or more for a day would be treated as failure for the day, for the purpose of extending warranty period.

The tenderer shall ensure that in case a failure is reported by a consignee qualified service engineers shall visit the site within two days from the date of complaint on calendar day's basis. The period of three days (excluding date of complaint) after the failure reported shall be treated as grace period, which will not count towards breakdown time for up to one failure per month and a maximum of 3 failures per quarter. In case the number of failure exceeds one failure per month or three during any quarter of warranty, grace period of only 1 day will be permissible for such additional failure. Complaints shall be lodged by consignee by fax phone, e-mail or per bearer at address given by the tenderer.

The details of preventive maintenance to be provided during warranty period shall be indicated by the tenderer giving details of type of preventive schedule, periodicity on items to be checked, items to be replaced and expected plant down time. Preventive maintenance schedules shall be conducted on weekends as far as possible or any other day through mutual agreement with consignees. Total breakdown hours shall be calculated after discounting grace period and preventive maintenance period.

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Penalty will be levied on the bidder for breakdown period on working days basis (excluding holidays) after discounting for the grace period. Penalty will be calculated as percentage of annual preventive maintenance charges and will be deducted from the respective annual payments as under.

Breakdown period	Applicable penalty
Up to 150 hours in each quarter and not exceeding 500 hours annually	Nil
Exceeding 150 hours - up to 200 hours in any quarter and not exceeding 500 hours annually	5 % of annual preventive maintenance charges
Exceeding 500 hours - up to 750 hours annually	10% of annual preventive maintenance charges
Exceeding 750 hours - up to 1000 hours annually	25% of annual preventive maintenance charges
Exceeding 1000 hours annually	50% of annual preventive maintenance charges and Encashment of Warranty Bank Guarantee besides other action like noting adverse performance of the bidder and/or agent for future tenders and their offer in the subsequent tenders will not be considered for placement of any order.



**SECTION VI****ANNEXURE-B OF SECTION VI****FORMAT FOR INDEMNITY BOND**

This deed of Indemnity executed by M/s ----- hereinafter referred to as Indemnifier which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, representative and assignees in favour of FA&CAO/ECR, Hjjpur hereinafter referred to as the 'Indemnified' which expression shall unless repugnant to the context or meaning thereof, include its successors and assignees witnesses as to.

Whereas the Indemnifier herein had participated in a global tender for the supply of ----- (machine name) which is opened on ----- (date) on terms and conditions set out inter alia in the Tender Document.

And whereas, clause of the above mentioned tender document described that the machine shall be designed for a life of 20 years with regular maintenance and all the structural members of the machine should be guaranteed for 20 years against cracks, breakages etc. during the course of normal operations from the date of commissioning whichever is earlier of the stores supplied by the Indemnifier to the Indemnified.

The indemnifier hereby irrevocably agrees to indemnify the indemnified that in the event of the said machine not achieving the life guarantee, the indemnifier shall as may be deemed necessary repair the defective machine at site, free of cost, within a reasonable time specified by the indemnified or reimburse the pro-rata cost of the machine to the extent a life not achieved as per the guarantee, or supply a spare stores for the defective portion only free of cost at site.

Tenderer's authorized signatory  
With seal

Station:

Date:

Witness: 1. -----  
(Signature with Name, Designation & Address)

2. -----  
(Signature with Name, Designation & Address)

## ANNEXURE-C OF SECTION VI

**JOINT RECEIPT INSPECTION NOTE**

Note: With the issue of JRI, payments are released to the contractor, as per the terms of Contract. Consignee shall satisfy themselves that the conditions of contract are met before issue of JRI.  
Date.....

Sub: Receipt of consignment for machine.....

Ref: Contract No.....

1.	Name of consignee/Railway	
2.	Machine name	
3.	Quantity	
4.	Name of supplier	
5.	Consignment of the machine received on	
6.	The foundation & associated works essential for "Safe Installation of Machine" are ready (for turnkey contracts only) "	

- \* If there are Delays on account of Consignee such as clear site is not given, then the condition 6 will not be a valid ground for holding JRI.

It is certified that the consignment of the machine has been received complete and in good condition as per specification shown in the contract.

Tentative plan for installation and commissioning of the machine is as under:

1.	Date of clear site provided	
2.	Contract	Turnkey/Non-turnkey
3.	Status of readiness of foundation:	
3(a)	Already constructed on	
3(b)	Under construction & likely date of its completion	
3(c)	Construction yet to be started from _____ and likely date of its completion	
4.	Status of availability of electrical power, water and compressed air etc.	Available/Not-available
5.	Number of components to be proved out on the machine	
6.	Likely date for start of erection/installation	
7.	Likely date for switch-on the machine	
8.	Likely date of completion of commissioning of the machine	

Representative of firm  
Designation



Representative of consignee  
Designation  
(Minimum Gazetted level)



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## ANNEXURE-D OF SECTION VI

JOINT COMMISSIONING NOTE

Date .....

Sub: Commissioning of (name of machine) .....

Ref: CONTRACT No .....

1.	Name of consignee/Railway	
2.	Machine name	
3.	Quantity	
4.	Name of supplier	
5.	Machine received on	

6. All the parameters of the machine are found okay. The proving test on the machine was conducted from ..... to ..... and machine is working satisfactorily.
7. Machine has finally been commissioned on ..... The machine has been handed over for regular use and kept under one month observation to watch its performance.
8. Following minor deficiencies (if any) found during joint observation trials are to be attended/rectified by the firm during one month observation and before issuing the Commissioning Certificate.
- a.
- b.
- a.

Representative of firm  
Designation



Representative of consignee  
Designation  
(Minimum Gazetted level)



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## ANNEXURE-E OF SECTION VI

**PERFORMANCE APPRAISAL FORM**  
**APPRAISAL ON COMPLETION OF WARRANTY PERIOD**

Dated: \_\_\_\_\_

To, M/s. ....

1.	CONTRACT No.	
2.	Consignee/Railway	
3.	Name of supplier	
4.	Machine Name	
5.	Machine received on	
6.	Machine commissioned on	
7.	PTC issued on	Not applicable
8.	Warranty period expired on	
9.	<b>Performance during warranty period:</b>	
9(a)	Total number of breakdowns	
9(b)	Total downtime in number of days	
10(a)	Any warranty complaint pending on date	Yes/No
10(b)	If yes, then the date and nature of defect(s)	
11	In Case, Warranty clause No. 15 of the machine during warranty period is also given in Bld, then following details of In breakdown hours for preceding eight quarters may also be furnished.	

Quarter	Period		Breakdown hours
	From	To	
1			
to			
8			

Signature \_\_\_\_\_  
 Name \_\_\_\_\_

Designation  
 DY.CME/Sr.DME/Dy.CEE/Sr.DEE Office Stamp

**Note:**

- i.) This appraisal may please be sent immediately on completion of warranty period. If any extension of warranty period required, may please also be mentioned with details.
- ii) Sr.Scale Officer having independent charge is also authorized to sign.



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**ANNEXURE-I  
QUALITY ASSURANCE PLAN**

**MACHINE DESCRIPTION**

Category	S. No.	Component/ Process	Sample Size	Type Of Check	Quality record	Type Of check	REMARKS
Bought Out Raw Material		Steels	1 Sample / Size	Chemical & Mech.	TC & INV.	CHP	
Bought Out Components		Bearings	100%	Visual	Inv	CHP	
		Electric Motors	100%	Review of TC	TC & INV	V	
		Hydraulic Pumps & Elements	100%	Review of TC	TC & INV	V	
		Rubber Seals, O Rings & Seals	100%	Visual	TC & INV	V	
		Controllers	100%	Review of TC	TC & INV	V	
		Ball Screw	100%	Visual	IIR	V	
Bought out sub-assemblies		Weld joints	100 %	RT	IR	CHP	
		Load Bearings	5 %	DPT	IIR	V	
		Others					
		Hardness and	100%	Hardness	IIR	V	
In process Inspection stage							
		Heat Treatment	100%	Review of Inv.	IIR	V	
		Castings	100%	Visual	IIR	V	
		Spindles	100%		IIR	V	
		surface finish of components	Random	Surface	IIR	V	
		Noise level	100 %	Sound	IR	CHP	
		Temperature rise	100 %	Measurement	IIR	V	
		Structures Geometry alignment, Guide ways	100%	Relevant ISO/DIN/IS/JIS standard	IR	CHP	

INV - Invoice, TC - Test Certificate, V - Verification, CHP - Customer Hold Point, CHP - Customer Hold Point  
IR - Inspection Report (by inspecting agency)

SSE/PCS/CRW/HRT-EMP  
12/06/2026

*[Signature]*  
12/06/26  
SSE/PLG/CRW/HRT

Dy.CME-II/CRW/HRT

*[Signature]*  
12/6/26  
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