

**SPECIFICATION FOR
Radial Drilling Machine**

**Specification- Radial Drilling Machine Arm Length 2350 mm Drilling cap-60 mm
(JUDW/RDM/60 x 2350)**

Section- I

1. Unless otherwise stated, latest alterations/ revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards and environmental standards relevant to the machine, the machine manufacturers shall ensure compliance with International (CE/ISO/DIN/JIS)/National standards (IS) (wherever applicable).
2. **Description:**
Radial Drilling Machine as per Specification Arm Length 2350 mm Drilling cap-60 mm for drilling accurate holes and carrying out tapping, boring and reaming operations on ferrous and non-ferrous material.
- 2.1 **The machine shall have following capability:**
 - i. Radial drilling machine is required as per Schedule-1. The machine shall be capable of drilling accurate holes and carrying out tapping, boring and reaming operations on ferrous and non-ferrous material.
 - ii. The machine shall also be capable of performing the various drilling operations on different steel components of Locos/coaches/wagons, as per parameters given in Schedule-1.
 - iii. The machine shall be required to work in tropical conditions under ambient conditions of temperature ranging from 5-50° C, relative humidity of up to 100% and comparatively dusty shop atmosphere. All equipments should be designed to function efficiently under these conditions.
 - iv. The machine should have accuracy as per Indian Standard Specifications IS: 2199 (latest) or equivalent International Standards which shall be mentioned in the offer.
 - v. Machine should be capable of working in low and high speeds.

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Schedule-1

2.2 Leading parameters

2.2.1 Major parameters:

2.2.1.1 Drilling capacity in steel of 50 kg/mm² tensile strength 60 mm

2.2.1.2 Drilling Capacity in Cast Iron of 180 BHN 60 mm

2.2.2. Other parameters

2.2.2.1 Minimum Drilling radius from column center line 530 mm

2.2.2.2 Maximum Drilling radius from column center line 2350 mm or more

2.2.2.3 Drill head traverse (Horizontal) 1800 mm (minimum)

2.2.2.4 Vertical Arm traverse 750 mm (minimum)

2.2.2.5 Width of arm guide ways 250 mm (minimum)

2.2.2.6 Spindle/Quill traverse (Vertical) 325 mm (minimum)

2.2.2.7 Spindle motor power 4.5 KW (minimum)

2.2.2.8 Column sleeve diameter 400 mm (minimum)

2.2.2.9 Spindle taper MT 5

2.2.2.10 Spindle speed & range 12 Steps in Speed range from 40 to 1800 rpm

2.2.2.11 Number of feeds & range 6 Steps in Feed range from 0.125 to 1.25 mm/rev

2.2.2.12 Tapping capacity in steel of 50 kg/mm² (in metric) Up to M56

2.2.2.13 Angle of Arm Rotation +/- 180 Degree

2.2.2.14 Distance between base plate & spindle face. 340 mm (minimum) & 1425 mm (maximum)

Note: No deviation will be accepted in Major parameters.

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2.3 Performance Standards:

The machine should have accuracy as per Indian Standard Specifications IS: 2199 (latest) or equivalent International Standards which shall be mentioned in the offer.

2.4 Productivity: Not Applicable.

2.5 Prove out at firm's premises:

The firm is required to demonstrate at the time of inspection, in addition to their normal checks, carried out during assembly and testing as a part of quality control measures, full load cutting test with drilling capacity for respective machine, as specified in leading parameters. At least 4 nos. of drills shall be demonstrated up to 200 mm depth in steel of 50 kg/mm²(UTS). The material for cutting and cutting tools shall be arranged by the bidder / firm.

2.6 Prove out at consignee's works:

The machine performance shall be demonstrated by the supplier or his agent for proving out successful commissioning at the consignee's works on two nos. components each mentioned in Annexure F of section III for a period of two shifts of eight-hour each. The test piece/material, required will be arranged by the consignee.

3. QUANTITY & CONSIGNEE:

S. No.	Consignee	Quantity (In nos.)	Specification No.
1.	SSE/MILL WRIGHT SHOP, JAGADHRI WORKSHOP NORTHERN RAILWAY	1. (one) JUDW/RDM/60x2350	

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4. SCOPE OF SUPPLY:

The scope of supply shall include supply, installation, testing, commissioning, proving of machine inclusive of design & Construction of the machine foundation & foundation related civil work, proper earthings on machine/motors including the control gear. It shall include all the concomitant accessories/equipments 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, Preventive Maintenance during warranty of machine and supply of technical documentation. For basic design, features & general characteristics refer to section-II.

5. CONCOMITANT ACCESSORIES:

The machine should be accompanied with the following concomitant accessories:

4.2.1	Box table 1000 x 750 x 500 mm (minimum)	1 no.
4.2.2	Complete set of Service and operators' tools (Make, description & Qty. to be furnished in the bid)	1 set.
4.2.3	Grease gun for different sizes of nipples (if nipples for grease provided in the machine)	1 no.
4.2.4	Oil Gun	1 no.
4.2.5	Coolant system complete with pump & motor	1 no.
4.2.6	Low voltage machine work lamp fixed to spindle head	1 no.
4.2.7	First fill of lubricants, grease. Note:- Bidder to specify quantity, brand and make.	first fill
4.2.8	Foundation bolts and leveling wedges	1 set
4.2.9	Tapping Attachment for tapping M10 to M36 (with collets)	2 sets
4.2.10	Drill Re-sharpening Portable equipment with a grinding range of 3 mm dia to 32mm dia, capable of re-sharpening carbide drill, HSS. etc. The grinding range can be covered in one or more than one portable equipments. The equipment should also include standard accessories like – 6 jaw true chuck (5mm to 50 mm dia) – 01 no., Grinding Wheels – 02 nos and requisite no. of Allen keys spanners.	1 set
4.2.11	Morse taper reduction sleeves as per Spindle taper with adaptor and Sleeves for : MT 5x4 = 2nos, MT 4x3 = 2nos, MT 3x2 = 5 nos, MT 2x1 = 5nos.	1 set
4.2.12	Drills (HSS) for drilling from 5 mm to 50 mm dia i.e. (23.5, 25.5, 36, 40, 50 mm in taper shank standard length. (Make and size to be furnished in the offer).	2 sets
4.2.13	H.S.S. Drills (5.0, 6.8, 8.0, 10.5, 12.0, 14.5 mm) in straight shank standard length	5 nos each
4.2.14	Machine Taps for tapping	5 nos each
4.2.15	Any other accessory/ equipment, which the manufacturer considers essential to make the machine fully operational, when installed and commissioned connected to power source and give the specified output/productivity.	

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Name of Machine
Radial Drilling Machine Arm Length 2350 mm Drilling cap-60 mm
Including design & Construction of the machine foundation.
Specification No. JUDW/RDM/ 60 x 2350

Section-II

TECHNICAL SPECIFICATION

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 Organisation for Modernisation 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 Organisation
SS	Stainless Steel/Solid State
WBG	Warranty Bank Guarantee

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1. Basic Design Feature:

1.1 Safety Features:

- 1.1.1 The machine should incorporate all safety devices, so as to provide complete protection to the operator and machine from all possible operational failures. Suitable interlocking arrangements against faulty sequence of operation, sudden power failure/fluctuation in supply voltage, failure of hydraulic system, if any, should be provided. Besides, the machine must have but need not be limited to the following safety features:
- i. Safety device to limit the upper and lower travel of the arm.
 - ii. Safety stops to prevent over travel of drilling head on arm.
 - iii. Safety device to prevent damage if arm strikes an obstruction while moving down.
 - iv. Safety device for feed mechanism against over load.
 - v. Safety device to automatically trip spindle power feed at its limits of travel.
 - vi. Interlocking device to keep power traverse of arm inoperative as long as it is in the clamped position.
 - vii. Safety against powered rotation of spindle in neutral position.
 - viii. Safety nut in the arm elevating mechanism shall be provided.

NOTE: Full details of safety features provided on the machine should be explained in the offer.

1.2 Specific Characteristics

1.2.1 Rigidity and Control:

- 1.2.1.1 The machine should be rigid, robust and of sturdy construction. It should be designed to meet heavy-duty demands of machining Railway components under severe workshop conditions and should be free from vibrations.
- 1.2.1.2 All castings should be of high grade close grained cast iron like Merchandise grade GG 25/30 conforming to BS-1452-1990 Grade 250 or IS-210 Grade FG-260 or Grade 25/30 conforming to DIN 1561 or IS 14329/2000 or equivalent ISO/ international specifications. These should be suitably heat treated to ensure dimensional stability and continued accuracy over the machine life. Chemical composition of the material and heat treatment used should be indicated in the offer.
- 1.2.1.3 All-important controls should be at one place, located at a convenient position for easy reach of the operator.

1.2.2 Base

- 1.2.2.1 The base should be made from a single piece high grade Grey cast iron casting conforming to IS-210 Grade FG-260 and shall be of a robust design to ensure vibration free operation. It should be suitably ribbed to ensure rigidity.
- 1.2.2.2 Requisite number of T-slots preferably machined conforming to IS:2013 (latest) should be provided for proper clamping of work.
- 1.2.2.3 The base should contain a reservoir for the coolant along with an independent pump unit.

1.2.3 Radial Arm

- 1.2.3.1 The radial arm should be heavily ribbed high grade Grey cast iron casting conforming to IS- 210 Gr FG-260 and should provide adequate support to the drill head during machining operations and should be free from all vibrations.
- 1.2.3.2 The top arm guide ways for the drill head movement should be provided with hardened and ground wear strips. The hardness should not be less than 45 HRC. Actual hardness and surface finish should be indicated in the offer.

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- 1.2.3.3 The arm guide surfaces should be provided with suitable lubrication system. Wipers should be provided to prevent ingress of swarf and scoring of arm and column surfaces.
- 1.2.3.4 Shape of guide ways giving full details of surface finish and hardness should also be indicated in the offer.
- 1.2.3.5 When unclamped, the arm should have smooth and light rotation around the column.
- 1.2.3.6 The elevating mechanism of radial arm should be powered independently.
- 1.2.3.7 The turning of radial arm relative to the column should be prevented with a suitable locking system. Actual locking system provided should be explained in the offer.
- 1.2.3.8 Limit switches should be provided to stop the radial arm movement at extreme position.
- 1.2.3.9 Elevating motor of arm should be electrically interlocked with arm clamping. A safety nut on elevating screw shall also be provided to support the arm in case of main nut worn out to avoid accident.
- 1.2.4 Drill Head**
- 1.2.4.1 The drill head should be balanced on rollers for smooth running on guide ways along the arm. "Rollers" provided should be with roller bearings.
- 1.2.4.2 It shall be of a box construction and totally enclosed. All parts inside the drill head should be easily accessible when the covers are removed for inspection and maintenance.
- 1.2.4.3 The drill head mounted on the arm should ensure equitable distribution of weight of the head to the front and rear of the arm for proper balancing.
- 1.2.4.4 The arm should have dovetail construction for mounting of drill head in order to ensure rigid clamping.
- 1.2.4.5 The bearing surfaces of drill head should accurately match with bearing surfaces of arm. The entire bearing area of the head should be used as clamping area for clamping of head to arm.
- 1.2.4.6 The drive should be all geared. All shafts and gears should be of suitable case carburising alloy steel properly case hardened and ground. Surface hardness of the gears should not be less than Rockwell C-55 and not more than Rockwell C-63. Teeth of all gears, which are not in constant mesh, should be rounded. Composition of the material used, hardness and surface finish of shafts and gears should be indicated in the offer.
- 1.2.4.7 The main spindle should be of alloy steel, hardened & ground and should be mounted on high precision bearings. The main spindle should be free from vibrations at all speeds and loads. The surface hardness of the spindle should be 55- 60 HRC. Material specifications, hardness and surface finish of the spindle should be indicated in the offer.
- 1.2.4.8 Hand wheel should be provided for traversing the drill head along the arm. The movement of the drill head on the arm should be smooth and easy.
- 1.2.4.9 Arrangement for automatic smooth braking of the spindle should be provided. Braking should be effective within 4 to 5 seconds. Tool replacement as well as speed and feed changes should be possible in neutral position without switching off main drive motor.
- 1.2.4.10 The drill head should also be provided with built in work lamp system.

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- 1.2.4.11 Spindle drive should be by means of electric motor. The power for spindle speed should be through double clutch, which should be controlled by the starting lever. Double clutch should produce right hand & left hand rotation of the spindle.
- 1.2.4.12 A safety clutch should be provided to protect against higher load. Torque setting arrangement of safety clutch should be indicated in the offer along with the speed range.
- 1.2.4.13 A quill/sleeve should be provided to house drilling spindle and spindle bearing. Outside diameter of quill/sleeve should be hardened and super finished. Surface finish of the quill/sleeve shall be in the range of 0.1 to 0.2 microns Ra. Quill/sleeve should be accurately suited with the honed bore in the drill head to have minimum clearance for maximum rigidity. Surface hardness of sleeve shall be indicated in the offer.
- 1.2.4.14 Mechanism of hand and power traversing of main spindle should be indicated in the offer. A suitable spindle balancing arrangement should be provided on the machine.
- 1.2.4.15 Speed calculator should serve for quick and proper determination of spindle speeds and feeds. Speed calculator should indicate:
 - 1.2.4.15.1 Material specification of job to be drilled.
 - 1.2.4.15.2 Feed rate per spindle revolution when drilling.
 - 1.2.4.15.3 Cutting speeds to be used with various drills, reamers and taps in m/min. A suitable chart should be available on the machine for selection of speed and feed by using the speed calculator.

1.2.5 Column:

- 1.2.5.1 The radial drill should have double column construction, one inside the other. The inner column should be heavily ribbed all the way to the bottom to provide adequate resistance to drilling strain. A drawing showing assembly of outer and inner columns should be enclosed with the offer.
- 1.2.5.2 The outer column i.e. the sleeve should be precision ground and should revolve smoothly on antifriction bearings. Alternatively, the outer column shall be provided with rectangular guide ways on which the arm moves and revolves smoothly on anti-friction bearings

1.2.6. Feed

- 1.2.6.1 The main spindle should have arrangements for both automatic and hand feeds.
- 1.2.6.2 The radial drill should be capable of feed ranges varying from heavy drilling feeds to fine boring feeds. A feed and speed reckoner should be provided at convenient location on the machine with clear indication of the feed/speed selected through suitable rotating dials
- 1.2.6.3 Automatic power feed should be declutched for hand feed as and when required.
- 1.2.6.4 All feed gears should be of suitable case carburizing alloy steel suitably case hardened and ground. The surface hardness of the gears should not be less than Rockwell RC-55 and not more than Rockwell RC-63. Composition of the material, hardness & surface finish of the gears should be indicated in the offer.
- 1.2.6.5 Arrangements for automatic predetermined disengagement of feed should be provided with a least count of 0.1 mm.

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- 1.2.6.6 Feed movement mechanisms for the spindle should be explained in the offer. An overload clutch should also be provided in the mechanism.
- 1.2.7 Control Head**
- 1.2.7.1 Trip dogs should be provided on control head for adjusting drilling depth.
- 1.2.7.2 Control head mechanism provided on the machine should be clearly specified in the offer.
- 1.2.7.3 Suitable interlocking mechanism should be provided on the machine for both speed and feed mechanism. Details may please be furnished in the offer.
- 1.2.8 Tapping**
- 1.2.8.1 The machine should have arrangement to obviate accidental engagement of power feed during tapping operation. A suitable arrangement should be provided for automatic reversal of tap after operation.
- 1.2.9 Clamping**
- 1.2.9.1 The radial drill should be provided with power / electro-mechanical / hydraulically clamping arrangements. It should provide clamping of drill head to arm, arm to sleeve and sleeve to column with light push button control. The drill head should not shift more than 0.1 mm during clamping in any direction. The drill head should not move during drilling operation even by manual push and clamping should be positive. Details of the clamping arrangement provided should be explained in the offer.
- 1.2.10 Measuring Arrangements:**
- 1.2.10.1 All dials/scales indicating different movements should be graduated in metric units with a least count of 0.1 mm. Graduation of dials/scales should be sharp, sufficiently deep and clearly marked. Marking divisions and numbering should be understandable and clear from a distance of 500.
- 1.2.11 Noise Level**
- 1.2.11.1 Noise level of machine should not exceed 85 dB when measured at a distance of seven metre from the periphery of the machine in free field condition. The measurements shall be carried out as per NMTBA standards /ISO 3740 –1980/ DIN 45635/ IS: 10988/1984 or latest. The noise level of the machine in dB in idle condition as well as cutting/ working condition should be clearly indicated in the offer along with relevant standards.
- 1.2.12 Thermal Stability**
- 1.2.12.1 The spindle bearings should attain thermal stability in about hundred minutes of switching on the machine. The maximum temperature of these bearings should not exceed 400 C above ambient temperature.
- 1.2.13 Lubrication**
- 1.2.13.1 The machine should have suitable lubrication system. Main drive, sleeve & elevating screw/nut and arm traverse gears must be provided with auto lubrication system. Suitable arrangements for indicating failure of lubricating system should be incorporated. Sufficient number of visual indicators should be provided to enable the operator to check the lubrication of vital areas. The lubrication system provided should be explained with schematic diagram.
- 1.2.14 Coolant System**

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- 1.2.14.1 A separate self-contained coolant pump conforming to IS: 2161 (latest) complete with piping, coolant, reservoir, filter and switch along with necessary switchgear for the motor should be provided with the machine.

2. GENERAL ELECTRIC SPECIFICATION

- 2.1 The provision of this General Specification shall apply, where ever relevant.
- 2.2 All equipments and material shall comply with appropriate Indian Standards (latest), International Standards or National Standards of the country of origin provided the latter are equivalent to or better than the former. 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 in warranted by site conditions. Type of motor type of starter.

TYPE OF MOTOR

TYPE OF STARTER

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- | | | |
|-------|---|--------------------------------------|
| 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 slipring type motor | Resistance type air/fan Cooled |
| 2.3.4 | AC synchronous or synchronous induction motor. | Suitable makers standard. |
| 2.3.5 | DC motor | Resistance type/Thyristor type. |
| 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 preventor shall be provided for each motor separately. Overload protection shall not be treated as single phasing preventor. | |
| 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 equipments shall comply with the requirement of Indian Electricity Act and Rules (latest). | |
| 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 3 sets of complete electrical and electronic wiring diagrams in full details to enable the maintenance staff to locate faults in the circuits, 3 sets of part catalogues, maintenance manuals | |

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operating instructions with details of coils and windings, used in the equipment to facilitate repairs and maintenance should also be supplied.

- 2.10 For main motor class minimum "B" Class 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.

- 2.12 Two maintenance free earthing terminals shall be provided on all electric motors including the control gear.

2.13 POWER SUPPLY

- 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 $\pm 3\%$. 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 $\pm 3\%$ 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 supply. |
| ii) | Output 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, SS, 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 to cover for the entire electrical load of the machine shall be offered as a concomitant accessory, conforming to Specification for voltage stabilizer as mentioned in clause 2.13.2 above and isolation transformer to the parameters mentioned below.

- | | | | |
|------|-----------------------------|---|--|
| i) | Transformer ratio | - | 1:1 |
| ii) | Winding | - | Copper wire wound with "F" 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 rejection ratio | - | 120 dB |
| v) | Isolation | - | Capacitance 0.005 Pf: resistance greater than 1000 Mega Ohms. |

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2.13.4

Voltage stabilizer shall be equipped with a protective relay to trip the AC power supply to the machine instantaneously with audio and visual indication to the

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operator. Settings of the protective relay for low and high voltage shall be 320 volts and 460 volts respectively.

2.14 ATMOSPHERIC CONDITIONS

- 2.14.1 The ambient temperature at the site at which the machine will be installed may vary from -4°C to +50°C over the year. The relative humidity may be as high as 100%. The atmosphere is expected to be dusty. The machines offered shall be suitably tropicalised to work under these atmospheric conditions without any adverse effect on their performance.
- 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

3.1 RIGIDITY AND STABILITY

- 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 Meehanite 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)

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- 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 by-pass or render non-operational
 - 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.

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- 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 load screws. The system of adjustments incorporated shall be explained in the offer.

3.7 COOLANT SYSTEM (WHERE APPLICABLE)

- 3.7.1 Suitable coolant system with pump, motor, tank, filter etc. shall be provided. The coolant pump shall be as per IS:2161-1962. The filter 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. Details of the coolant system shall be indicated in the offer.
- 3.7.2 The supply of coolant shall be in ample volume. Provision to re-circulate the coolant shall be available. A chip and coolant tray shall be provided. The volume of coolant flow shall be indicated. It shall be adjustable.
- 3.7.3 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 for grinding machines etc. shall be clearly indicated.

3.8 LUBRICATION SYSTEM (WHERE APPLICABLE)

- 3.8.1 The machine shall be provided with an automatic lubricating system for ensuring delivery of adequate quantity of lubricant to areas requiring continuous lubrication. Suitable arrangements must be provided for indication of failure of the lubricating system.

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- 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 Reusable 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 :-
- (a) Specific location of points on the machine to be oiled lubricated/greased.
 - (b) Periodicity of lubrication of these points.
 - (c) Filter to be cleaned.
 - (d) Periodicity of cleaning filters.
 - (e) Periodicity of replenishing lubricating oil for the centralized system.
 - (f) 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. Details of lubricating system provided shall be indicated.

3.9 PNEUMATIC SYSTEM (WHERE APPLICABLE)

- 3.9.1 The compressed air supply will be provided by the customer at the machine within pressure range of 4.5-7.5 kg/cm² 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 contractor 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 be provided by the tenderer.
- 3.9.4 The make of pneumatic control equipment shall be of reputed make. The makes shall be indicated.

3.10. HYDRAULIC SYSTEM (WHERE APPLICABLE)

- 3.10.1 Hydraulic circuit must be equipped with the following safety and inspection equipments:
- (a) Pressure gauges at all places, where pressure has to be set up or inspected.
 - (b) Safety valves for hydraulic circuit if relief valve does not fulfill this function.
 - (c) Equipment for checking of temperature in the circuit or in the pump wherever necessary.
 - (d) Arrangement to show if the filters (including those in the pump set) are choked and need cleaning. The filters shall be of reusable type and indigenously available. If reusable filter cannot be offered, the filter cartridge shall be readily

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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.

- (e) Alarm for low oil level.
- 3.10.2 The sump aggregate shall have the following:
 - (a) Oil level sight gauges or any other equipment showing the minimum and maximum oil levels in sump.
 - (b) A drain plug at the lowest portion of the tank.
 - (c) It shall be possible to drain the oil from the tank without disconnecting any pipes or other fittings.
- 3.10.3 The temperature of oil in hydraulic circuits shall not exceed 60 degrees 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.
- 3.10.4 Facilities for bleeding of air in case of air lock shall be provided.
- 3.10.5 The hydraulic reservoir, pump and allied equipment shall be suitably segregated from the machine in order to remove major source of heat.
- 3.10.6 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.
- 3.10.7 First fill of hydraulic oils used on the machine shall be provided with the machine.

4.0 TECHNICAL LITERATURE:

- 4.1 One copy of the printed illustrative catalogue showing features of the machine and its elements must be enclosed with the bid.
- 4.2 The technical literature shall be provided for the complete machine, including imported and indigenously purchased components / sub- assemblies. The successful tenderer will have to furnish 4 (four) copies each of the following manuals directly to the consignee along with the machine. Out of these 04 sets, the bidder shall be required to submit one set of all documents in best available condition one month prior to the training for the machine. One set of technical literature should cover the following details:
 - (i). Operational & Maintenance manual of the machine.
 - (ii). Operational & Maintenance manual of the servo controlled voltage stabilizer.
 - (iii). Operational & Maintenance manual of the ultra-isolation transformer.
 - (iv). Instruction & Maintenance manual for Hydraulic Oil Cooling Unit.
 - (v). User manual for Tool changer system (if provided).
 - (vi). Technical & Maintenance manual for Hydraulic System
 - (vii). Technical & Maintenance manual for Lubrication System.
 - (viii). Operator Guide for CNC Control System (if provided).
 - (ix). Programming Guide for CNC Control System (if provided).
 - (x). Diagnostic & Trouble shooting Guide for CNC Control System (if provided).
 - (xi). Start-up Guide for CNC Control System (if provided).
 - (xii). Machine Software Listing (if provided).
 - (xiii). Soft and hard copies of PLC Program in ladder form with cross reference listing and PLC project file.

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- (xiv). Drawings of tooling & fixtures, hard copies in A-2 size as well as soft copy in PDF format.
- (xv). Wiring diagram, in which length of wires must be mentioned, hard copies in A-3 size as well as soft copy in PDF format.
- (xvi). Mechanical drawings (spindle assembly, table assembly, column assembly), hard copies in A-1 size as well as soft copy in PDF format.
- (xvii). Spare part manual including part lists no., hard copies in A-4 size as well as in PDF format.
- (xviii). Lay out drawings in A-1 size, which clearly shows the position of all type of electrical components in machine.

Note: All manual and literature should be in English/Hindi.

5.1 Spares

- 5.1.1 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 with the quotation for spares. It may be noted that it is the responsibility of the bidder to ensure that exhaustive list of spares is quoted which will form part of evaluation.

- 5.1.2 Spares shall be supplied along with the machine.

6.0 CONSUMABLES (If Applicable)

- 6.1 The list of consumable spares shall be furnished and quoted along with their unit rate.
- 6.2 Consumables shall be supplied along with the machine.

7.0 SPECIAL FEATURES:

- 7.1 Special features incorporated in the machine, if any, shall be indicated separately in the bid clearly indicating the advantages.

8.0 INSPECTION AND TESTING AT MANUFACTURER'S WORKS:

- 8.1 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.
- 8.2 Manufacturers must have suitable facilities at their works for carrying out various performance tests on the sub-assembly/assembly/machine. The tenderer shall clearly confirm that all facilities exist and shall be made available to the inspecting authority.
- 8.3 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.
- 8.4 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.
- 8.5 The Manufacturer shall produce invoices of bought out items/sub-assemblies to ensure genuineness of such products/verification by the Inspecting agency.

9.0 TRAINING:

- 9.1 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

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Control & AC Drives) and CNC/PLC part programming. This training shall be provided to 4 per consignee nominated by the consignee, for a period of 2 weeks free of cost at the manufacturer's premises. All charges pertaining to travel, boarding and lodging shall be borne by Indian Railways.

- 9.2 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.
- 9.3 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.

10 FOUNDATION & RELATED DRAWINGS

10.1 SUBMISSION OF GA, FOUNDATION & RELATED DRAWINGS FOR APPROVAL:

- 10.1.1 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 consignee for approval and to enable the consignee for making necessary arrangements for Installation & Commissioning of Machine on receipt. After getting approval from consignee, the supplier shall supply directly to each consignee 6 copies of approved GA foundation drawings and related diagrams for machine from the date of approval of GA drawing for information only. 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

10.1.2 APPROVAL OF GA DRAWING

To be governed by Time Schedule in following stipulations.

- 10.1.3 General Arrangement Drawings will be sent by the 'Contractor' to the Consignee within 45 days of Issue of AT / Contract. Consignee will take necessary action for approval of GA drawings. 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 within 45 day of Submission of GA drawings and given back to the contractor,

- 10.1.4 **Delays in submission of drawings by Contractor will be added to the delay in supply of machine** in case submission of GA drawing is delayed beyond stipulated time as per time schedule and LD will be levied. Thus the number of days delay in submission of GA drawing plus the number of days delay in supply of machine together will be taken as the delay in supply of machine, for the purpose of calculations of LD. However, if the contractor supplies the machine before original delivery period as per AT the number of days by which

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machine has been supplied earlier than original delivery period that many days will be subtracted from the delay in submission of GA drawings and LD will be levied accordingly. Delays in approval of the drawings by consignee will not be on account of Contractor, except as detailed below.

- 10.1.5 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 30 days from the date of issue of letter by Consignee. This period will not be counted towards LD calculation. The consignee shall ensure that all deficiencies in the Drawings shall be pointed for clarifications to the firm together at one time only instead of piecemeal multiple reference.
- 10.1.6 A repeat back reference(s) by Consignee to Contractor pointing out further defects/deficiencies in the Drawings, will be considered a delay on account of the contractor, except for special circumstances like change in location, review of arrangement etc. Thus, Contractors must take utmost care in ensuring completeness as per requirements of the Consignee.
- 10.1.7 Where GA Drawing cannot be approved by consignee due to clear site not being available etc., the Consignee must inform Contractor explaining the exact delay. However, initiative must be taken by Contractor to obtain such a certificate from Consignee.
- 10.1.8 In their own interest, contractor must maintain a log of events in this respect with clear dates and regularly inform consignee to avoid wrong levy of LD. Consignees must cooperate with Contractors by providing all assistance, including clear information about any expected delays in site availability, promptly and in writing.
- 10.1.9 If an order has been placed on the firm, the firm will have to advise the consignee well in advance regarding requirement of road permit and assistance required from the consignee, if any, so that delay on this account is avoided. Firm should also visit the site before dispatch of machine to assess the condition of path to be used for movement of trailer.

10.2 DISPATCH OF THE MACHINE FROM MANUFACTURER WORKS:

- 10.2.1 The supplier should normally dispatch the machine only after the foundation is ready for installation and commissioning of the machine on arrival.
- 10.2.2 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 consignee. In case of delay in readiness of site on part of consignee, take up the matter with concerned Railway/ PU, and advise consignee accordingly.
- 10.2.3 In case proving of component at manufacturer works, the supplier should request for the same as soon as possible after receiving contract keeping allowance of transit time etc. and approximately 60 days for consignee to handover the parts after receipt of the request accompanied by appropriate and valid bid guarantee. In the event of consignee certifying the non-availability of prove out components, such components will be deemed to be proved out at manufacturer works. However, the firm will prove out these components at consignee subject to the availability.

11.0 INSTALLATION, COMMISSIONING AND PROVING TESTS:

- 11.1 **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

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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-III shall be prepared by the consignee and the firms representative indicating the tentative time schedule for various activities of installation and commissioning. For Indian manufacturers, JRI note shall accompany the bill for 80% payment.

11.2 RESPONSIBILITIES OF CONSIGNEE AND BIDDER

11.2.1 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 15 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. The inspection of foundation, structures etc. and installation of the machine shall be done by authorized representative of consignee.

11.2.2 The bidder shall be responsible for-

- i. Design & Construction of foundation, flooring of sufficient thickness, 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 required) 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 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.

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- 11.2.3 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.

- 11.2.4 The supplier shall demonstrate machine performance and prove out the claimed capability for successful commissioning at the consignee's works. The M&P shall be deemed to be "commissioned" at consignee premises on the date when it is tested 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 15 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. 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-III. After issue of JCN the performance shall be watched for a period of one month, after which the PTC shall be issued. The issue of PTC cannot be delayed by more than 60 days from the issue of JCN. 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,

- 11.2.5 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.

12.0 SERVICE FACILITY IN INDIA AND TECHNICAL SUPPORT

- 12.1 The tenderer will clearly spell out in the offer the facilities available with him or his agent for providing adequate after-sales service in India during warranty period. The complete details such as organization for after sales service, availability of technically competent engineers and warehousing facilities for spares should be clearly indicated. Bidders not offering complete servicing/repair facilities in India to ensure quick response to maintenance/ servicing calls are not likely to be considered.
- 12.2 During warranty period, the supplier or his authorized agent shall attend for break down as soon as possible, but in no case later than 72 hours of receipt of intimation of the breakdown.

- 13.0 **COLOUR:** The machine and its accessories shall be painted in Apple Green Colour No.281 to IS:5-1978, (if any specific colour 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

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manufacturer, the same can also be considered and may be specified.

14.0 WARRANTY OBLIGATIONS– The following conditions regarding Maintenance and reliability shall also apply: -

- 14.1 The duration of Warranty shall be 02 years from the date of commissioning of the machine. The supplier shall stand a warranty for the foundation along with the machine. The machine shall be designed for a life of 15 years and all the structural members of the machine and the foundation shall be guaranteed for 15 years against cracks breakages and etc. during the course of normal operations. Tenderer would submit suitable undertaking.
- 14.2 The tenderer shall ensure that in case a failure is reported by a consignee, qualified service engineer 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.

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SECTION - III

Annexure-C

JOINT RECEIPT INSPECTION NOTE

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

* 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	
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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JOINT COMMISSIONING NOTE

Date:.....

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


Ref: AT 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 PTC for the machine:
 - a.
 - b.
 - a.

Representative of firm
Designation

Representative of consignee
Designation
(Minimum Gazetted level)



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ANNEXURE-F

SN	Components	Operations to be carried out
1.	MS Plates up to thickness of 50 mm	Drilling Operation


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