

RAIL COACH FACTORY, KAPURTHALA		
Specification No.	Description	Covering Page
Mech/M&P/3200/GM/4 Rev.- NIL	Radial Drilling Machine	

Designation	Name	Signature	Date	Level
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Issue/ Rev	Changes	Date

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1.0 IMPORTANT INSTRUCTIONS TO TENDERERS FOR FILLING TECHNICAL BID

- 1.1 Bidders are required to give clause wise comments on the technical specifications, confirming compliance/non-compliance with details of deviations if any along with their effect on the performance. Back references to be avoided, offers are likely to be ignored in case of non-compliance of these instructions for furnishing the information.
- 1.2 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).
- 1.3 Tenderers should offer and quote for all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. Even if bidder does not recommend the purchase any of these accessories, the price must be quoted for comparison purposes and their recommendation/suggestion indicated in the offer. Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.
- 1.4 In case, any item is required in sets, please specify nos./pieces per set. This is essential for proper technical evaluation of the offer. Offers received without this may be considered as incomplete and liable to be rejected.
- 1.5 The bidder should quote only for the specified make of sub-assemblies and equipment wherever specified. Makes of sub-systems other than the specified ones will normally not be acceptable. In case, some other make is quoted, specific reasons for the same including its features/advantages over specified makes must be brought out in the offer.
- 1.6 In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly.
- 1.7 The Purchaser may accept internationally accepted alternative specifications which ensure equal or higher quality than the specifications mentioned in the Technical Specification. However, the decision of the Purchaser in this regard shall be final.
- 1.8 Purchaser reserves the right to verify the details submitted by the bidder by actual site visits.
- 1.9 Other terms & condition of the contract will be as per Indian Railway Standard conditions of contract.

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2.0 PURPOSE

Radial Drilling Machine is required for drilling of LHB components like centre pivot assembly, damper supports etc.

3.0 DESCRIPTION AND SCOPE OF SUPPLY

3.1 The scope of supply shall include design, supply, manufacturing, installation, testing, commissioning and proving of machine on turnkey basis. It includes 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 and maintenance of machine and supply of technical documentation.

3.2 The total value of the offer will be calculated on.

- i. The cost of the basic machine.
- ii. Cost of the concomitant accessories according to tenderer specification.
- iii. Cost of any other accessory treated as concomitant accessory.
- iv. Application duties and taxes, insurance, freight and installation and Commissioning charges.

4.0 GENERAL FEATURES

The machine shall have following capability:

- 4.1 Radial drilling machine is required as per Schedule- I & II. The machine shall be capable of drilling accurate holes and carrying out tapping, boring and reaming operations on ferrous and non-ferrous material.
- 4.2 The machine shall also be capable of performing the various drilling operations on different steel components of coaches, as per parameters given in Schedule-I.
- 4.3 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.
- 4.4 The machine should have accuracy as per Indian Standard Specifications **IS: 2199 (latest)** or equivalent International Standards which shall be mentioned in the offer.
- 4.5 Machine should be capable of working in low and high speeds.

5.0 CONCOMITANT ACCESSORIES:

5.1 The machine(s) should be accompanied with the following concomitant accessories:

- a) Box table 1000 x 750 x 500 mm (minimum) - 1 no.
- b) Complete set of service and operators Tools - 01 set (**Make, description & Qty. to be furnished**)
- c) Grease gun for different sizes of nipples
- d) Oil Gun- 01 no.

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- e) Coolant system complete with pump & motor - 1 no.
 - f) Low voltage machine work lamp fixed to spindle head – 01 no.
 - g) First fill of lubricants, grease and hydraulic oil, if any (Bidder to specify quantity, brand and make. These should preferably be from indigenous sources of IOC, HPCL, BPCL, Castrol.)
 - h) Foundation bolts and leveling wedges -01 Set.
- 5.2 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.
- 5.3 The cost of each of the listed concomitant accessory should be quoted separately. Wherever, for any reason, the cost of any concomitant accessory is included in the basic price of the machine, the same should be specifically mentioned.
- 5.4 The tenderer shall supply a list of concomitant accessories, which will be supplied along with the machine. The cost of each listed concomitant accessory should be quoted separately. Wherever for any reason the cost of any concomitant accessory is included in the basic price of the machine the same should be specifically mentioned.

6.0 SPARES

- 6.1 The tenderer should furnish details of spares covered under warranty.
- 6.2 List of important spare parts and accessories with their part number and costing.
- 6.3 The tenderer should be furnishing the price list of spare parts required for two years normal maintenance of the equipment. Sources of supply of spares used other than that of manufacturer should be furnished by the tenderer.
- 6.4 List of recommended spares for normal maintenance after expiry of warranty period to till useful life of the equipment.
- 6.5 List of recommended consumables for two years shall be quoted separately.
- 6.6 Useful life estimated/expected for each equipment and its sub assembly should be indicated by the tenderers

7.0 OPTIONAL ACCESSORIES:

Spares required for normal maintenance to cover complete range of mechanical, hydraulic and electrical equipments including controls on double shift working basis .–One set

8.0 ESSENTIAL CHARACTERISTICS AND TECHNICAL PARAMETERS.

8.1 Safety Features:

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:

- 8.1.1 Safety device to limit the upper and lower travel of the arm.

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- 8.1.2 Safety stops to prevent over travel of drilling head on arm.
- 8.1.3 Safety device to prevent damage if arm strikes an obstruction while moving down.
- 8.1.4 Safety device for feed mechanism against over load.
- 8.1.5 Safety device to automatically trip spindle power feed at its limits of travel.
- 8.1.6 Interlocking device to keep power traverse of arm inoperative as long as it is in the clamped position.
- 8.1.7 Safety against powered rotation of spindle in neutral position.
- 8.1.8 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.

8.2 Rigidity and Control :

- 8.2.1 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.
- 8.2.2 All castings should be of high grade close grained cast iron like Meehanite 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.
- 8.2.3 All-important controls should be at one place, located at a convenient position for easy reach of the operator.

8.3 Base

- 8.3.1 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
- 8.3.2 Requisite number of T-slots preferably machined conforming to IS:2013 (latest) should be provided for proper clamping of work.
- 8.3.3 The base should contain a reservoir for the coolant alongwith an independent pump unit.

8.4 Radial Arm

- 8.4.1 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.
- 8.4.2 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.
- 8.4.3 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.

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- 8.4.4 Shape of guide ways giving full details of surface finish and hardness should also be indicated in the offer.
- 8.4.5 When unclamped, the arm should have smooth and light rotation around the column.
- 8.4.6 The elevating mechanism of radial arm should be powered independently.
- 8.4.7 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.
- 8.4.8 Limit switches should be provided to stop the radial arm movement at extreme position.
- 8.4.9 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.

8.5 Drill Head

- 8.5.1 The drill head should be balanced on rollers for smooth running on guide ways along the arm. "Rollers" provided should be with roller bearings.
- 8.5.2 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.
- 8.5.3 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.
- 8.5.4 The arm should have dovetail construction for mounting of drill head in order to ensure rigid clamping.
- 8.5.5 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.
- 8.5.6 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.
- 8.5.7 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.
- 8.5.8 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.
- 8.5.9 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.
- 8.5.10 The drill head should also be provided with built in work lamp system.

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- 8.5.11 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.
- 8.5.12 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.
- 8.5.13 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.
- 8.5.14 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.
- 8.5.15 Speed calculator should serve for quick and proper determination of spindle speeds and feeds. Speed calculator should indicate:
- 8.5.16 Material specification of job to be drilled
- 8.5.17 Feed rate per spindle revolution when drilling
- 8.5.18 Cutting speeds to be used with various drills, reamers and taps in m/min.
- 8.5.19 A suitable chart should be available on the machine for selection of speed and feed by using the speed calculator.

8.6 Column

- 8.6.1 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.
- 8.6.2 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.

8.7 Feed

- 8.7.1 The main spindle should have arrangements for both automatic and hand feeds.
- 8.7.2 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.
- 8.7.3 Automatic power feed should be declutched for hand feed as and when required.
- 8.7.4 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.

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8.7.5 Arrangements for automatic predetermined disengagement of feed should be provided with a least count of 0.1 mm.

8.7.6 Feed movement mechanisms for the spindle should be explained in the offer. An overload clutch should also be provided in the mechanism.

8.8 Control Head

8.8.1 Trip dogs should be provided on control head for adjusting drilling depth.

8.8.2 Control head mechanism provided on the machine should be clearly specified in the offer.

8.8.3 Suitable interlocking mechanism should be provided on the machine for both speed and feed mechanism. Details may please be furnished in the offer.

8.9 Tapping

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.

8.10 Clamping

8.10.1 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.

8.10.2 The drill head should not shift more than 0.1 mm during clamping in any direction.

8.10.3 The drill head should not move during drilling operation even by manual push and clamping should be positive.

8.10.4 Details of the clamping arrangement provided should be explained in the offer.

8.11 Measuring Arrangements:

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 mm.

8.12 Noise Level

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 alongwith relevant standards.

8.13 Thermal Stability

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.

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8.14 Lubrication

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.

8.15 Coolant System

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

9.0 GENERAL CHARACTERISTIC

9.1 Rigidity and Stability

- 9.1.1 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.
- 9.1.2 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.
- 9.1.3 All machine fabrications of critical load bearing assemblies like beds, columns etc. shall be adequately strengthened and stress relieved.
- 9.1.4 Change in ambient temperature shall not affect the performance of the machine.
- 9.1.5 There shall be no change in the performance of the machine either on switching on the machine or after continuous running.
- 9.1.6 There shall be no resonant vibrations throughout the working range of the machine at all load levels.

9.2 Safety Controls

- 9.2.1 The machine shall incorporate safety devices to provide protection to the operator and machine against all possible operational and machinery failures.
- 9.2.2 Suitable interlock shall be provided to prevent machine operations in the event of
 - a) Faulty sequence of operation.
 - b) Fluctuation in supply voltage.
 - c) Resumption of power supply after power failure.
 - d) Non-positioning of safety guards.
 - e) Failure of hydraulic system (where applicable)
 - f) Failure of lubricating system (In case of automatic including drop in pressure lubrication)
- 9.2.3 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.

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- 9.2.4 The machinery must not start unexpectedly.
- 9.2.5 The machinery must not be prevented from stopping if command has already been given.
- 9.2.6 No moving part of the machinery or piece held by the machinery shall fall or be ejected.
- 9.2.7 The protection devices must remain effective.
- 9.2.8 The machine shall be fitted with an emergency stop device to enable actual or impending danger to be averted. This device must:-
- Be Conveniently located.
 - Be Clearly identifiable.
 - Stop the machine as quickly as possible without causing additional hazards.
- 9.2.9 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.
- 9.2.10 Safety features shall also include.
- 9.2.11 Safety device against overload for all mechanical and electric items to the extent possible.
- 9.2.12 Safety stops against over-running of slides.
- 9.2.13 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:-
- Be of robust construction
 - Not give rise to any additional risk
 - Not be easy to by pass or render non-operational
 - Be located at an adequate distance from danger zone
 - Cause minimum obstruction to the view of the production process.
 - Rigidly connected and not prone to rattling
 - Enable essential work to be carried out without the guard or protection device having to be dismantled
- 9.2.14 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.

9.3 Operational Controls

- 9.3.1 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.
- 9.3.2 The control devices shall be
- Clearly visible and identifiable.
 - Ergonomically positioned for safe operation without hesitating or loss of time, and without ambiguity.

9.4 Lighting

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- 9.4.1 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.
- 9.4.2 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.
- 9.4.3 Integral parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.
- 9.4.4 The machine lighting should be of low voltage so as to prevent any hazard to the operator.

9.5 Machine Maintainability

- 9.5.1 The machine shall be so designed as to require minimum possible maintenance and to give trouble free service.
- 9.5.2 All assemblies/parts of the machine shall be easily accessible for maintenance.
- 9.5.3 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.
- 9.5.4 The manufacturer must provide means of access e.g. stairs, ladders, cat walks etc. to allow access safety to all areas used for production, adjustments and maintenance operations.

9.6 Wear Compensation Adjustment

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.

9.7 Coolant System (Where Applicable)

- 9.7.1 Suitable coolant system with pump, motor, tank, filter etc. shall be provided.
- 9.7.2 The coolant pump shall be as per IS:2161-1962.
- 9.7.3 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.
- 9.7.4 Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
- 9.7.5 Details of the coolant system shall be indicated in the offer.
- 9.7.6 The supply of coolant shall be in ample volume. Provision to re-circulate the coolant shall be available.
- 9.7.7 A chip and coolant tray shall be provided. The volume of coolant flow shall be indicated. It shall be adjustable.
- 9.7.8 An enclosure shall be provided to prevent the coolant from splashing outside the machining zone. Details of enclosure shall be provided.
- 9.7.9 Specific requirements of coolant system for grinding machines etc. shall be clearly indicated.

9.8 Lubrication System (Where Applicable)

- 9.8.1 The machine shall be provided with an automatic lubricating system for ensuring delivery of adequate quantity of lubricant to areas requiring

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continuous lubrication. Suitable arrangements must be provided for indication of failure of the lubricating system. The system shall be provided with interlock to prevent machine operating/starting in the event of the failure lubrication system.

- 9.8.2 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.
- 9.8.3 Lubrication and filter cleaning chart shall be displayed on a metal plate at a conspicuous location on the machine indicating :
- 9.8.4 Specific location of points on the machine to be oiled lubricated/greased.
- 9.8.5 Periodicity of lubrication of these points.
- 9.8.6 Filter to be cleaned.
- 9.8.7 Periodicity of cleaning filters.
- 9.8.8 Periodicity of replenishing lubricating oil for the centralized system.
- 9.8.9 Any other similar relevant information.
- 9.8.10 Points where manual lubrication is needed shall be separately indicated. Frequency of lubrication shall be also clearly mentioned.
- 9.8.11 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.
- 9.8.12 First fill of lubricating oils used in the machine shall be provided with the machine.
- 9.8.13 Details of lubricating system provided shall be indicated.

9.9 Pneumatic System (Where Applicable)

- 9.9.1 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.
- 9.9.2 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.
- 9.9.3 Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
- 9.9.4 Air pressure regulator, if necessary, shall be provided by the tenderer.
- 9.9.5 The make of pneumatic control equipment shall be of reputed make. The makes shall be indicated.

9.10 Hydraulic System (Where Applicable)

- 9.10.1 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.

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- 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 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.
- 9.10.2 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.
- 9.10.3 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.
- 9.10.4 The hydraulic reservoir, pump and allied equipment shall be suitably segregated from the machine in order to remove major source of heat
- 9.10.5 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.
- 9.10.6 First fill of hydraulic oils used on the machine shall be provided with the machine.

9.11 Atmospheric Conditions

- 9.11.1 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 98%. 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.
- 9.11.2 The temperature rise shall not reach such a value that there is a risk of injury to any insulating material or adjacent parts.
- 9.11.3 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.

10.0 BOUGHT OUT ITEMS

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

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10.2 The bidder 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.	CNC & Drive Controller	SIEMENS/FANUC/Heidenhain
2.	Hydraulic system	Rexroth/Vickers/Yuken/Atos/Parker
3.	Feed back devices	Heidenhain, Fagor, Siemens, Fanuc
4.	Ball screws	THK/INA/Tsubaki/Rexroth/Steinmeyerstar/ Gamfior / Shenburger/Shuton.
5.	Air conditioner for Control cabinet	RITTAL/Warner Finley/Kelvin
6.	Spindle Bearings	FAG/SKF/Timken/NTN/KOYO
7.	Lubrication System	Cenlub/Dropco/Vogel/ Rexroth
8.	Electrical Control Cabinet	RITTAL/ Siemens/ Rockwell or BCH make with IP55 Protection level
9.	Servo Controlled Voltage Stabilizer	Neel/Servomax/Consul/Aplab
10.	Ultra Isolation Transformer	Neel/Servomax/Consul/Aplab
11.	Electromagnetic clutch	Vortex /Ghatge Patil
12.	A.C. Motors	NGEF/BBL/ABB/KEC/Crompton/ Siemens/ Allen Bradley
13.	Brake motors	Siemens/KEC/Crompton/NGEF/BBL
14.	Proximity Switch	Elap/Schneider/Omron/Scanner
15.	Contactors	Siemens/BCH/ABB/Schneider/L&T
16.	Limit switches	BCH/Siemens/L&T/Teknic/Euchener/Honeywel I,USA
17.	Push button	Teknic/Siemens/ Schneider/BCH
18.	'O' Rings & rubber seals	Merlin/Parker/Busak/Hunger/Merkel/Soloseal/ Walkersolo/Halite
19.	Pneumatic Control Equipment	Festo/Shavo Norgen/Shradder Scovil/ Electro Pneumatics/Parker/SMC Pneumatics
20.	Control gears	L&T/Siemens/BCH/ABB/Schneider
21.	Cable/wire	Siemens/Indramat/ Hubershnuer/ Finolex/Havells
22.	Gear reducer	Elecon/Greaves/Shanthi/ZF/New Allenbury/ Bongfillivali
23.	AC Drive	Fanuc/Siemens/ABB/Allen Bradley/ Schneider
24.	AC servo motor	Fanuc/Siemens/ABB/Allen Bradley /Schneider
25.	PLC	Siemens/Fanuc/Mitsubishi/Messung/Hitachi/ ABB/Allenbradley/Schneider
26.	Air circuit breaker	Siemens/L&T
27.	Connectors	Harting/Kontakt/L&T/Omron

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28.	Hydraulic seamless tubes	Parker/Maharashtra seamless/Indian seamless
29.	MCCB	Schneider/ABB/Siemens/L&T
30.	Cutting tools	SANDVIK/KENNAMETAL – WIDIA/ISCAR/ TAEGU-TEC
31.	Drills and Taps	Addison/Zenith(IT)/Universal

Note:

1. In case any other reputed make is offered, satisfactory justification for the same will have to be given in the offer.
2. The bidder should explicitly mention “Not applicable”, against the items, indicated above, which ever is not applicable in the offered machine.

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

12.0 FOUNDATION & RELATED DRAWINGS

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

12.1.1 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 within 04 weeks of the receipt of Purchase Order to each 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 each machine within 04 weeks 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

12.2 APPROVAL OF GA, FOUNDATION & RELATED DRAWINGS:

The consignee shall either approve the GA drawings or if necessary return them to the supplier/contractor for correction within 02 weeks of its receipt from the supplier/contractor, under clear signatures with date. The complete process for

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the approval & supply of correct GA drawings shall not exceed six weeks from the date of first submission

13.0 COMMISSIONING AND PROVING OUT :-

13.1 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(s), as specified in leading parameters. At least 4 nos. of drills shall be made up to 200 mm depth for respective machine(s). The material for cutting and cutting tools shall be arranged by the bidder / firm.

13.2 Prove out at consignee's works:

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

13.2.1 The supplier should take full responsibility of commissioning the unit & training of the Intended user.

13.2.2 User shall also be trained in using day to day maintenance & cleaning of unit.

13.2.3 Any precaution & extra care intended in the use of the equipment should be explicitly informed.

14.0 ELIGIBILITY CRITERIA

14.1 The tenderer shall be registered on IREPS website (www.ireps.gov.in) to participate in the tendering process.

14.2 The tenderer shall have established quality control system and organization to ensure adequate control at all stages of the manufacturing process.

14.3 The tenderer shall provide a performance statement giving a list of major supplies of same/similar equipments effected in last 5 years to the reputed organizations giving details of the order no. and date and the quantity supplied and whether the supply was made within the delivery schedule. Such period shall be reckoned from the date of opening of tender. Tenderer should also provide the prove out test certificate of his supply/supplies.

14.4 Tenderer not submitting the requisite information may note that his offer is liable to be ignored.

15.0 TECHNICAL LITERATURE

15.1 One copy of the printed illustrative catalogue showing isometric view/sketch & features of the machine and its elements must be enclosed with each copy of the bid.

15.2 The successful tenderer will have to furnish for each machine 02 copies of spare parts catalogue giving the part list number of each component with exploded views and assembly drawings, maintenance manual, trouble shooting guide, operational manual of the machine.

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15.3 Document in the service / technical manual. Firm shall also provide time within which all service calls shall be attended.

16.0 SPECIAL FEATURES

Special features incorporated into the machine, if any shall be indicated separately by the tenderer, clearly indicating the advantage of these features.

17.0 MAKE

17.1 The supplier shall clearly mention whether the system quoted is Indian make or imported. If Indian make, the tender should be accompanied by duly sanctioned factory license & relevant documents & also produce records of installation & satisfactory after sales service performance of their equipment from at least one govt. Institution of similar or large size for duration at least 3 Years duration.

17.2 If imported item, the OEM firm should be registered for operations in India for a minimum period of last 3 years. In case this is not so, the dealer should be authorised regional supplier & service provide for the late 3 years. He should also produce installation & satisfactory after sales service record of duration at least last 3 years from at least one govt. Institution for a system of similar or larger size. Further the tender should be accompanied by authorisation certificate from OEM.

17.3 The supplier shall furnish the complete details of Model No. Make & Manufacturer's details/ address, Country and authorization details of Dealership.

17.4 The firm shall provide the calibration certificate of National / International Traceability along with validity of at least two years.

18.0 SERVICING FACILITIES

18.1 Service facility in Punjab, Address and contract details including phone and fax no. to be provided. The facility should have the necessary equipments recommended by the manufacture to carry out preventive maintenance test as per guideline provided in the service / maintenance manual. Firm should provide list of equipment available for providing calibrations and routine maintenance support as per manufacturer.

18.2 Supplier will undertake for service repairs & replacement of any needed part as & when needed.

18.3 Maintenance contract to be quoted after the expiry of maintenance period quoted above with details of scheduled visits, part covered under contract & cost of parts not covered as well.

18.4 The tenderer shall clearly spell out in the offer about the facility available with him or his agent/dealer for providing adequate after sales service in Punjab during warranty period.

18.5 The tenderer shall also indicate the service organization located at various places in India and availability of trained staff, maintenance spares etc.

18.6 The contractor shall give a comprehensive spare part list with OEM details and price for all the sub systems.

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- 18.7 The tenderer/contractor shall provide list of spares, consumables required for maintenance for 5 years after completion of warranty period
- 18.8 For maintenance during warranty following criteria shall be considered.
- A) Service engineer of the supplier shall be available for attending to the system faults during first 07 days after successful commissioning of equipments during 09.00 - 17.00 hrs on all working days including Saturdays.
 - B) Service engineers shall visit RCF on quarterly basis thereafter till the end of warranty/extended warranty period for Preventive Maintenance at least for one full day at a time.
 - C) In case of any breakdown affecting the performance of the system completely or partly, firm shall depute its service engineer as soon as and when informed by any suitable means like Fax, SMS or email possible after receiving such call.
 - D) Breakdown period shall be calculated from 8 hours after it's reporting to the firm upto the time it is attended. If intimation to the firm is delayed from Railway's side, then the breakdown period calculation will start from the time by which it is reported to the firm.
- 18.9 Total up time of the system should be at least 90%. Up time shall be counted in following manner:-
- A) Total breakdown of less than 8 hours shall be ignored for the purpose of this calculation.
 - B) Penalty may be imposed if the down time is more than 10% without any valid reasons. The levy of token penalty as deemed fit based on the merit of the case may also be consider as per clause 17 (b) of GCC -201.
- 18.10 Warranty period for part or machine shall be extended after completion of warranty period by the duration under which the part or machine remains under breakdown during warranty.
- 18.11 Tenderer shall provide list of spares, consumables required for maintenance for 5 years after completion of warranty period as per annexure-A
- 18.12 Tenderer shall provide expected life for the components of the system and provide the maintenance schedule required for 10years for as per annexure -A
- 18.13 Tenderer shall provide the service charges /per day/per man for deputing service engineer on the machine on requirement separately for Indian and Foreign engineer.

19.0 DEVIATIONS:

The tenderer should clearly certify that the machine offered fully meets the specification various design features incorporated in the machine to fulfil different technical performance requirements should be fully explained in the offer. However, minor deviations from this specification, 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.

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20.0 SCHEDULE OF ANNUAL MAINTENANCE CONTRACT (AMC) FOR PERIOD OF 5 YEARS AFTER COMPLETION OF WARRANTY PERIOD

- 20.1 Tenderer shall provide proposal for 5 year Annual Preventive Maintenance schedule to be executed after completion of warranty period in the format as per annexure-B.
- 20.2 The firm shall maintain the machine in good working condition during the contract period and shall correct the fault or failures, repair or replace the worn or defective parts/equipment during the normal working hours of shop where the equipment has been installed. Unserviceable parts/equipment need to be replaced at no extra cost with brand new parts/equivalent or superior specification.
- 20.3 The firm shall respond by deputing service personal to oral / telephonic/ or other modes of intimation for repair and maintenance of the said machines within 2 hours.
- 20.4 The firm shall ensure that the machine is in proper working condition, to the full capacity, after repair and maintenance.
- 20.5 To have a timely supply of spares during AMC, the contractor shall furnish a total list of spares which should contain list of spares that shall be arranged by the firm, both chargeable, duly mentioning the charge against each item, and spares which shall be non-chargeable, and list of spares to be held by RCF.
- 20.6 The contractor shall clearly list-out the list of consumables required for day-to-day operation of the machine. It shall be the scope of RCF to arrange the consumables once the completion certificate is issued for the retrofitted machine.
- 20.7 The tenderer/contractor shall provide suitable standby when repairs exceeds 2 hours. When any equipment is taken for repair to the tenderer/contractor's premises suitable standby equipment should be provided.
- 20.8 Besides attending the breakdown calls, the firm shall attend to the corrective and preventive maintenance of the machines once in a month.
- 20.9 The AMC is valid for five years from the date of completion of the warranty period . No freight is admissible.
- 20.10 During the AMC period, whatever equipment is defective shall be handed over to RCF. During completion of the AMC period the machines should be handed over in full working condition to its full capacity.
- 20.11 The firm should maintain a register duly indicating the nature of defects and repair attended and got signed by RCF authority. Preventive maintenance schedule should be made. The schedule should be made in such a way that more than one machine should not be attended on the same day. A copy of the schedule should be given to RCF at the beginning of the AMC and the schedule should be strictly followed and on carrying out the preventive maintenance the same should be entered in the register and got signed by RCF authority.
- 20.12 AMC charges shall be paid quarterly as one quarter of the total AMC charges applicable for that year on submission of bills duly certified by the engineers in charge with regard to the satisfactory execution of AMC during the period for which the bill is claimed. Duties & taxes as applicable at the time of payment shall be deducted at source.

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ANNEXURE-A

S.N.	ITEM	PART NO.	SERVICE LIFE	PRICE

ANNEXURE –B

S.N.	YEAR	AMC CHARGES
1.	IST YEAR	
2.	IIND YEAR	
3.	IIIRD YEAR	
4.	IVTH YEAR	
5.	VTH YEAR	

21.0 WARRANTY

As per IRS conditions or as quoted by the tenderer whichever is later.

Note: Tenderer to furnish following detail of the High Rise Hydraulic Platform offered

S.no.	Technical Parameter	Offered by Tenderer

SCHEDULE-I

S.no	Description	Value
1.	Drilling Capacity in Steel	65 mm
2.	Spindle Speed and Range	12 Steps in speed range of 40 to 1800 rpm
3.	Drilling Radius Maximum	1500mm
4.	Numbers of feeds and Range	10 steps in feed range of around 0.035 to 2.2 mm/rev
5.	Working Surface table area	1300 x 800 mm
6.	Spindle Travel Auto/Manual	350 mm
7.	Taper in spindle	MT-5
8.	Travel of Rail (Vertical)	750 mm
9.	Travel of Drilling Head (Horizontal)	1000 mm
10.	Distance between Base to spindle	700/1450 mm

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SCHEDULE-II

1.0 GENERAL ELECTRIC SPECIFICATION

- 1.1 The provision of this General Specification shall apply, where ever relevant. 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.
- 1.2 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 switchgear, busbars,

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	main connection & auxillary 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)

- 1.3 Unless specified in the main specification, the AC motors and starters shall be of the following type:

S.No.	TYPE OF MOTOR	TYPE OF STARTER
1.	Any type of AC motor starting current of which does not exceed 75 amps.	Direct on line.
2.	AC squirrel cage, induction motors, starting current of which is above 75 amps. if started direct on line	Star delta or Auto transformer type.
3.	AC slipring type motor	Resistance type air/fan Cooled
4.	AC synchronous or synchronous induction motor	Suitable makers standard.
5.	DC motor	Resistance type/Thyristor type.

Tenderer is, however, free to give alternative proposal along with justification, if in his view alternative proposal is warranted by site conditions

- 1.4 The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories.
- 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.
 - 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.
 - 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.
 - 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.
- 1.5 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.
- 1.6 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.

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- 1.7 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.
- 1.8 The electrical equipments shall comply with the requirement of Indian Electricity Act and Rules (latest).
- 1.9 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.
- 1.10 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 operating instructions with details of coils and windings, used in the equipment to facilitate repairs and maintenance should also be supplied.
- 1.11 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.
- 1.12 Motors shall be designed to withstand frequent starts, stops and reversals as demanded in the operation of the machine.
- 1.13 Two earthing terminals shall be provided on all electric motors including the control gear.

2.0 POWER SUPPLY

- 2.1 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.
- 2.2 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.
- 2.3 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.
- 2.4 The voltage stabilizer, if required, shall conform to following :

S.No.	Description	Value
1.	Input Voltage	320 to 460 volts 3 phase 4 wire supply.
2.	Out put Voltage	415 volts
3.	Regulation	+ 1% from No load to Full load.
4.	Rate of correction	20 volts per second per phase.
5.	Wave from distortion	NIL
6.	Efficiency	Not less than 97%.
7.	Winding and class of insulation	Copper wire wound with "B" class of insulation or better.

Voltage stabilizer shall be equipped with a protective relay to trip the AC powersupply 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.

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