

Section-II

ABBREVIATIONS

A-1,A-2, A-3, A-4	Standard paper sizes
AC	Alternating Current
AMC	Annual Maintenance Contract
ASA	American Standards Association
AT	Acceptance of Tender
BIS	Bureau of Indian Standard
BG	Bank Guarantee
CE	Conformité Européenne /European Conformity –Conformity to European Community Directives
PCME	Principal Chief Mechanical Engineer
PCMM	Principal Chief Material Manager
CME/Plg	Chief Mechanical Engineer/Planning
CNC	Computer Numeric Control
COFMOW	Central Organisation for Modernisation of Workshops
COS	Controller of Stores
Db	Decibel
DC	Direct Current
DIN	Deutsches Institut für Normung /German Institute for Standardization – German Standards
PFA	Principal Financial Advisor
GA (Drawing)	General Arrangement (Drawing)
HRC	Hardness Rockwell 'C' Scale (value)
Hz	Hertz
IEC-Pub	International Electro technical Commission - Publication
ISO	International organization for standardization
JCN	Joint Commissioning Note
JIS	Japanese Industrial Standards
JRI	Joint Receipt Inspection
KW	Kilo Watt
LC	Letter of Credit
LD	Liquidated Damages
LOA	Letter of Acceptance
NC	Numeric Control
NEMA	National Electrical Manufacturers Association
NIT	Notice Inviting Tenders
NR	Northern Railway
PBG	Performance Bank Guarantee
PDF	Portable Document Format
PLC	Programmable Logic Controller
PTC	Proving Test Certificate
PU	Production Unit (Any of the Railway Production Units e.g. RCF, ICF etc.)
RDSO	Research Design & Standards Organisation
SS	Stainless Steel
WBG	Warranty Bank Guarantee

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Section-II

TECHNICAL SPECIFICATION

SPECIFICATION No. NR/MECH/CNC-UFWL (BG)/WITH WORKS/2024(Rev-00)

1. BASIC DESIGN FEATURES:

1.1 SAFETY FEATURES:

1.1.1

The machine shall incorporate all safety devices so as to provide complete protection to the operator and machine. Some of the important safety features (which have to necessarily be provided but not be limited on the machine) are mentioned below :-

- i. Protection against movement of vehicle when retracting rails are not locked
- ii. Automatic tool retraction device to withdraw the tool in the event of sudden power failure
- iii. Arrangement to ensure adequate support to the vehicle in the event of sudden power failure or failure of the hydraulic system. In these eventualities, the vehicles shall continue to be securely supported.
- iv. Protection against faulty sequence of operation
- v. Two mushroom type emergency stop buttons on both sides to enable stopping of the machine in case of an emergency. The emergency stops shall override all other controls.

Note: The offer should give details of all the safety features present in the machine.

1.2 SPECIFIC CHARACTERISTIC:

1.2.1

GENERAL :

The general characteristics of the machine shall be as per clause 3.0. of Section - II.

1.2.2

Hauling System: [ie Rail cum Road Shunter & Winching Arrangement (Winch) or both]

[NOTE: As applicable for the consignees vide clause 4.2.1.5 of Section-I]

1.2.2.1

Rail cum Road Shunter:

1.2.2.1.1

A suitable arrangement of remotely operated Rail cum Road shunter with the following key features shall be provided:

Battery operated Rail cum road vehicle (shunter) shall:

- Operate on rail tracks as well as leveled Roads; maximum mode changeover time from rail to leveled road and is 2 minutes and vice versa.
- Used for shunting purposes only at Railway Shed/Depot/ workshops.
- Generate upto 15 KN of pulling force.
- Towing capacity : 135 T
- Fully remote controlled operation
- Able to rotate at 360 deg. at the same place
- Able to pull the load for a gradient value ranging from 'level' to 1 in 400 (max).
- One side fitted with CBC, and, the other side fitted with screw coupling. In addition, there must be provision in the shunter for coupling with Schaku/ Voith couplers, suitably.

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- Height of coupling above rail level shall be 1090 +15/-5 mm.
- The shunter should have provision of independent fail-safe braking system. In addition, there shall be provision of parking brake.

However, the bidder shall provide full technical details of the Battery operated Rail cum road vehicle (shunter).

1.2.2.2 Winching Arrangement (Winch):

1.2.2.2.1 A suitable arrangement like a winch without using the power of the vehicles for hauling vehicles into and out of the machining positions shall be provided. The device shall be capable of hauling vehicles having tare weight upto 135 tonnes. Full technical details of the device including make and model, power rating, capacity, etc, shall be furnished in the bid.

1.2.2.3 The hauling device shall be provided with a hand actuated emergency operation system such as a hand crank, which can be used in the event of failure of the hauling device. Arrangement shall be provided to ensure that the motor remains disengaged when the hand actuated system is being used.

1.2.2.4 An arrangement to locate the vehicle along the rails so that the wheel for machining is in the correct position shall be provided. Arrangement to be provided shall be explained in detail with a sketch in the bid.

1.2.3 Lifting and Positioning System:

1.2.3.1 A hydraulically actuated lifting system shall be provided to relieve the vehicle axle load from the retracting rails to enable its withdrawal. The retraction of rails shall be power operated through a push button. Retractable rails shall be included in the scope of supply.

1.2.3.2 A suitable wheel centering and positioning arrangement shall be provided for locating the wheelset with respect to wheel flanges. The wheel support arrangement shall be such that when lifted by the drive rollers, the wheel set will be positioned accurately with respect to centre line of machine in order to ensure that the machined wheels are within the specified tolerances as per clause 2.3.4 of Section-I. The arrangement provided shall be explained in details with a schematic diagram in the bid. Details such as material composition and load bearing capacity of the rollers shall also be provided.

1.2.3.3 Suitable arrangement shall be provided so that jacks (supports) controlled and guided by CNC system can be incorporated below the axle box to enable the profiling of wheel sets with reference to the axle box bearing centre. The jacks shall be supported on kinematically rigid members to keep the axle box-bearing centre fixed during the entire machining operation. Separate hold down devices as per clause 1.2.14 shall be provided on either side. Each axle box shall be supported on jack and simultaneously held by hold down device from top. The arrangement shall be explained in detail with the help of drawings & sketches.

1.2.3.4 Suitably designed hydraulically operated holding arrangement having two rollers shall be provided on either side for firm lateral holding of the wheel set.

1.2.3.5 Details of the above arrangement provided for positioning the wheels in vertical and horizontal planes, and in the lateral direction shall be explained in detail with sketches in the bid.

1.2.4 Drive System:

1.2.4.1 Each machining head shall be provided with an independent drive unit. Both side drive units shall be fully synchronized. Details of arrangement provided shall be explained in the bid.

- 1.2.4.2 Drive to the wheels shall be from a set of two drive rollers on either side. Drive rollers shall be of suitably heat-treated alloy steel. Each drive roller shall be driven by independent drive motor. Drive motors of all the four drive rollers shall be electronically synchronized. Distance between the drive rollers shall be designed to accommodate all wheel sets indicated in drawings at Annexure-F of section I. Material specification, hardness and surface finish of the drive rollers shall be indicated in the bid. Type, size, precision class and make of bearings shall also be indicated in the bid.
- 1.2.4.3 It shall be possible to change the speed of the drive rollers during machining without stopping the machine to facilitate cutting through work-hardened spots. **The method of speed control shall be explained in the bid.**
- 1.2.4.4 The drive rollers shall be fully floating to enable them to follow the worn-out treadprofile without losing contact with the wheel. **Arrangement provided shall be explained in detail in the bid with sketches.**
- 1.2.4.5 The machine shall be provided with a complete set of drive rollers fitted on the machine.
- 1.2.4.6 Detailed design calculations for cutting force at minimum and maximum depth of cut and feed rate shall be furnished in the bid.
- 1.2.5 **Measuring System:**
- 1.2.5.1 Probe type measurement system shall be incorporated in the machine for pre and post machining measurement of wheel sets. It should be suitably integrated with the CNC system of the machine. Suitable arrangement for protection of the probes shall be made. **The bidder shall furnish constructional details of the measuring system along with the following details:**
- No. and types of measuring probes.
 - Make and model no. of measuring system/probes.
 - Working principle of the measuring system to be explained with schematic drawings/images.**
- 1.2.5.2 The measuring system shall be capable of taking the following measurements:
- Tread diameter at defined location (63.5mm from wheel face)
 - Wheel gauge (Distance between inner faces)
 - Flange thickness
 - Flange height
 - Tread profile
 - Radial run out of wheel at tread diameter
 - Face run out of inside face of wheel
- 1.2.5.3 Computer based data acquisition and storage system shall be provided to store machining parameters. The system shall have a panel mounted computer with Window based software.. **The configuration and make of computer, monitor and printer shall be indicated in the bid.**
- 1.2.5.4 One calibration wheel set shall be supplied by the firm along with the machine. Calibration wheel set shall be machined out of the wheel sets taken from the consignee. The calibration wheel set shall be used for calibration as per recommended frequency. **Method of calibration, time taken in calibration and the recommended frequency for calibration of equipment shall be explained in the bid.**
- 1.2.5.5 The system should be equipped with internal communication interfaces through Ethernet and profibus communication and pre-loaded with remote diagnostic

system software and communication hardware. Telephone with ISD facility shall be provided by the consignee at site near the machine, for this purpose. All charges pertaining to installation and use of telephone line shall be borne by the consignee.

1.2.6

Cutting depth determination system:

1.2.6.1

The CNC system shall be capable of performing automatic cutting cycle integrated with in-process measuring system. **Arrangement provided shall be explained in the bid.**

1.2.6.2

CNC system should include software capable of turning any wheel profiles from minimum flange thickness to maximum flange thickness as given in the wheel profiles in drawings at Annexure-F of Section-III. Software should be user friendly and adequate training should be given to the nominated staff to generate part programme of new profiles.

1.2.6.3

The machine shall be provided with a CNC based system to determine minimum metal removal necessary to achieve the required profile. The system shall be capable of comparing the wear level of all the wheels of the wheel sets of each bogie and deciding the precise diameter alongwith minimal metal removal required for turning. It should be possible to define maximum permissible variation in the tread dia of two wheels on the same axle, any two wheels on the same bogie and on any two wheels of both the bogies. **Arrangement provided shall be explained in the bid.**

1.2.6.4

The required diameter shall be indicated on the screen for the operator to take corrective action, if required. Based on this decision, the CNC system shall calculate the economical distribution of cuts in order to process the re-profiling in a rough & finish cut.

1.2.6.5

In case the operator selects the target diameter, then the system shall do a feasibility check of all parameters before accepting the execution of cutting under selected parameters in order to avoid any collision of the tool post with the job.

1.2.6.6

Suitable display system to indicate the tread diameter of both wheels before and after turning shall be provided. **Arrangement provided shall be explained in the bid.**

1.2.6.7

The system shall be located so as to be clearly visible to the operator from the normal machine operating position.

1.2.7

Tread profile machining system:

1.2.7.1

The machine shall be provided with a CNC controlled profiling system. It shall be capable of automatic machining of both wheels of a wheel set simultaneously. The feed of the right hand and the left hand tools shall be synchronized. The drive to both axis of both the tool posts shall be through servo motors connected to ball screw through servo gearbox. The profiling system shall ensure constant chamfering irrespective of the wheel set width variation. Tool slides shall be equipped with hardened & ground box guideways and mating slide ways lined with extremely wear resistant PTFE liners like SKC for stick slip free movement. The chips generated during machining shall be conveyed through chip conveyor. **System provided for the same shall be explained in the offer.**

1.2.7.2

The CNC system shall generally conform to clause 1.2.18 of Schedule-II; however, feature exceeding those specified in this schedule or different in case of compatibility problem shall be acceptable.

1.2.7.3

The CNC system should ensure automatic positioning of the tools during machining cycle.

1.2.7.4

The profiling unit shall be capable of independent rapid traverse and slow feed motion.

1.2.7.5

The CNC profiling system shall be capable of turning the inner faces of wheels in

1.2.7.6 continuation with the turning operation for wheel profiling. Provision of brake disc machining shall be provided for LHB & VBE wheel sets on both the tool posts. It shall consist of quick change tool holder which can be installed in place of wheel profiling tool holder. One number tool holder of each type and 50 nos inserts of each type shall be supplied along with the machine.

1.2.8 Tooling:

1.2.8.1 Throw away carbide inserts with built-in chip breakers shall be used for all machining operations specified in cl.-2.1 of Section-I for all wheel profiles mentioned in drawings at Annexure-F of Section-III. The successful bidder shall be required to supply detailed drawings of tool holders and tool inserts with part list nos.

1.2.8.2 The location of cutting tools shall be between the two driver rollers.

1.2.9 Hydraulic System

1.2.9.1 The hydraulic power pack, reservoir, pumps, valves, gauges etc. shall be conveniently located to facilitate maintenance. The hydraulic power pack and all hydraulic elements shall be of compatible makes. Type, make and model no. of each hydraulic element shall be indicated in the bid. Only Rexroth/Vickers/Yuken/Mico-Bosch make hydraulic power pack shall be accepted.

1.2.9.2 The hydraulic system shall necessarily have the following:

- Pressure gauges wherever pressure is to be set or monitored.
- Safety valves if the relief valve does not fulfill this function.
- Temperature indicators wherever temperature is to be monitored.
- Clogging indicator for filters.

1.2.9.3 The sump aggregate shall have the following:

- Dust proof cover
- Indicator to indicate minimum and maximum oil level in the sump
- Filters to prevent ingress of dust/dirt into the hydraulic system
- Drainage connection to drain out the complete oil without disconnecting any pipe

1.2.9.4 A suitable maintenance free, chiller type heat exchanger of adequate capacity shall be provided to ensure that the hydraulic oil temperature does not exceed 50 degree C. Arrangement shall be provided to automatically connect the hydraulic system to the heat exchanger if oil temperature exceeds 45 degree C.

1.2.10 The details of system shall be furnished in the bid.

1.2.10.1 Electrostatic oil filtration equipment:

In addition to regular filters (incorporated in the hydraulic system) suitable for filtering particles of size 10 micron and above, an Electrostatic oil filtration equipment with provision of moisture absorption shall also be provided. It will draw oil from tank and return it after passing through filtration media. Suspended particles of size more than 0.01 micron present in hydraulic oil, shall be removed from oil through the Electrostatic oil filtration equipment. Details of equipment shall be furnished in the offer.

1.2.11 Lubrication System:

1.2.11.1 An automatic adjustable centralized grease lubrication system shall be provided for lubrication sliding parts. The system shall be complete including pump, level indicator, metering cartridges / progressive blocks etc.

1.2.11.2 Arrangement shall be provided to indicate failure of the lubricating system and protecting the machine.

- i. Periodicity of cleaning/replacement of filters
- ii. Periodicity of replenishing lubricating oil in the sump

1.2.11.3 The lubrication system shall be explained in bid with a lubricating diagram.

1.2.12 Swarf disposal system:

1.2.12.1 A suitable conveyor type Swarf disposal system to remove the swarf from the wheel lathe pit to out side storage place shall be offered. The constructional details alongwith motor horsepower, drive arrangement, material specifications, make and space requirement of the system should be furnished and the operation explained with a schematic diagram in the bid.

1.2.12.2 Chip Crusher

Chip crusher shall be provided to crush the chips generated during wheel machining operation. The chip crusher shall be mounted below the machine before chip conveyor with suitable hoppers and shall be capable of handling the volume of chips generated during the machining operation. It shall be box type of steel casing with number of high grade steel blades running at slow speed. Suitable safety measures shall be incorporated to handle blocking situation. Details of arrangement chip crusher arrangement and safety measures shall be furnished in the offer.

1.2.13 Controls:

1.2.13.1 All functions of the machine shall be controlled from a centralized ergonomically designed control panel through push buttons and selector switches. The control panel shall be placed so as to enable a full and clear view of the cutting points and the drive rollers to the operator. Independent machining controls one on either side shall be provided on each wheel.

1.2.13.2 Suitable low voltage industrial grade lighting shall be provided to illuminate the cutting points and operating controls.

1.2.14 Hold-down Device:

1.2.14.1 A suitable hydraulic hold-down device for machining of independent wheel sets with respect to the centre line of the axle box bearings shall be provided, one on each column. The device shall be precision guided in the machine column and shall have vertical movement through hydraulic cylinders. These cylinders shall be designed to provide adequate axle load on the axle box while machining independent wheel sets. Arrangement shall be explained in details with drawings & sketches.

1.2.14.2 Axle Box Support Jack:

A suitable axle box support jack independent of hold down device shall be incorporated for providing rigid support to the axle box to enable machining of wheel set. It shall be controlled through CNC controls. Arrangement shall be explained in details with drawings & sketches.

1.2.15 Covered shed for housing under floor wheel lathe: [Applicable for the BSB consignee only]

1.2.15.1 A cover shed for housing the complete under floor wheel lathe is to be constructed on turnkey basis including detailed design engineering, excavation and construction work on the piece of land provided by the consignee.

1.2.15.2 The bidder will have to get detailed design approved by the Govt. approved agency/structural engineer. The structural design shall take into account various site conditions including wind pressure.

1.2.15.3 The size of shed will be 35M long and 15M wide. The roof of the shed will be sloping from the centre towards both the side walls. Height of the roof at the centre and on the side wall will be about 9 meters and 8 meters respectively.

1.2.15.4 The roof of the shed is to be with trusses and covered with pre-coated sheets of minimum 0.5 mm TCT. Adequate no. of transparent sheets shall be provided in the roof for providing natural light in the shed.

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- 1.2.15.5 Heavy duty RCC flooring excluding the pit area is to be provided in the shed. The flooring shall be industrial grade flooring of at least 100mm depth PCC and 200mm depth of RCC.
- 1.2.15.6 Adequately spaced columns shall be provided on the side of the shed. These columns should be of RCC/PEB construction. Brick masonry wall shall be provided on all 4 sides (excluding the gate/shutter area on the two sides) of the shed upto a height of 3 meters with provision of metallic windows. Above the height of 3 meter to the edge of roof the side wall will be covered with pre-coated sheets of minimum 0.5 mm TCT mounted on mild steel structure.
- 1.2.15.7 All civil engineering works connected with construction of the shed is in the scope of the bidder.
- 1.2.15.8 Necessary illumination in the shed shall be provided. The average illumination of 150 lux shall be maintained in the shed and average illumination of 300 lux shall be maintained in the in pit area. Necessary electrical wiring with switches for the lamps/fixtures shall be provided.
- 1.2.15.9 **One room for under floor wheel lathe staff:**
 i) One room of size 4 meter length X 3 meter width and 3 meter height is also in the scope of work of shed required for operating and maintenance personnel. This room will be constructed within the shed in one of the corner.
 ii) Side wall shall be constructed by brick masonry with adequate column and RCC slab on the roof.
 iii) The room shall have provision of doors with lock.
 iv) Electrical wiring with switches for two lights, one ceiling fan and two 5 ampere sockets are to be provided in the room.
 v) Adequate no. of glass windows with metallic frames shall be provided in the side walls for natural light and ventilation.
- 1.2.15.10 The shed will be provided with manually operated mechanized rolling shutter on two sides (entry and exit side of the shed). The sizes of the rolling shutter should be sufficient for passing in and out of the locomotives. Firm to mention the size of the shutters in the offer.
- Note:** The sizes of shed and room mentioned above may change. Hence the firm should quote the total cost as per clause and also quote per sq. ft. cost for shed and room separately.
- 1.2.16 **Linkage of Track: [as applicable for the consignees]**
- 1.2.16.1 The scope of work will also include laying and grouting the rails in the flooring from the both side edge/single side edge of the machine pit to the both side edge/single side edge of shed for the movement of locomotive/coach/wagon. Further laying of rails to connect with the existing lines in the shed / workshop (excluding points turnouts and crossings) shall also be done by supplier only using ballast and sleepers.
- 1.2.16.2 The bidder shall quote for per meter length of the laying of the track inside the shed area and outside the shed area (from the edge of the shed to the point of linking of the existing track in the shed/workshop) separately. The total track length will depend on the actual site conditions. Necessary rails, sleepers, , elastic clips, ballast, murrum etc. and other fittings required for the same will be supplied by the Railways.
- 1.2.16.3 In case the rail/tracks on either side of shed already exist, it will be the sole responsibility of the bidder/supplier to ensure that machine rail level matches with shed rail level. In case the supplier is not able to match the machine rail level, he will undertake to lay fresh rail/track on either side of the shed matching with machine rail level at his own cost to the satisfaction of the consignee. Type of rail/track to be laid by the bidder will be similar to the existing track.
- 1.2.17 **Power supply connection:**
- 1.2.17.1 The bidder shall also provide the electrical connection from the transformer in the shed/workshop to the shed of the under floor wheel lathe for operation of the machine and lighting in the shed. The electrical cables will be laid underground

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