BHARAT HEAVY ELECTICALS LTD.
HEEP, Hardwar - 249403
WORKS ENGG. & SERVICES DEPTT.

Annexure-A

RETROFITTING OF WOTAN RAPID 5 CNC HORIZONTAL RAM BORER PLAN No. 1-114, Block-3

Requirement:

Wotan Rapid 5 CNC Horizontal Ram Borer with Rotary table & Pick up station (storage of different heads) from M/s. Wotan , Germany with the following specifications is to be retrofitted with Sinumerik 840D SL system along with Siemens 1FT6 series AC servomotors and Siemens AC servo drives for all 6 Linear axis & 1 table Rotary axis (B). All existing features and functions of the machine need to be retained as such.

Broad Specifications:

CNC Horizontal Borer Rapid 5 from M/s. WOTAN, Germany

Spindle Diameter	160mm
Ram size	340*340sq mm
Spindle Traverse(Z axis)	1000mm
Ram traverse(W axis)	700mm
Head stock vertical traverse(Y axis)	3000mm
Column horizontal traverse(X axis)	10000mm
Table traverse (U axis)	3000mm
Spindle rpm	0.8 to 1600
No. of gear ranges	4
Spindle & ram feed	0.1 to 5000mm/min
Headstock & Column feed	0.1 to 5000mm/min
Spindle & ram rapid	5000mm/min
Headstock & Column	10000mm/min
Table linear feed	0.1 to 5000 mm/min
Table linear rapid	10000 mm/min

Table rotary feed	0.1 to 270 degree/min
Table rotary rapid	1.5 rev/min

Existing configuration of CNC system , Drives & motors:

CNC System FANUC 12 M with NC PC-I & PC J I/O.

Feed motor's For X axis SIEMENS 1FT6134—6AB71—1AB2 , 95 Nm , 1500 rpm
For Y axis SIEMENS 1HU3136—0AF01 95Nm, 170V, 83 Amp, 1500rpm
For Z axis SIEMENS 1HU3108—0AD01 38 Nm, 168V, 25 Amp, 1200rpm
For W axis SIEMENS 1HU3108—0AD01 38 Nm, 168V, 25 Amp, 1200rpm
For B axis SIEMENS 1FT6132—6AB71—1AB2 , 75 Nm , 1500 rpm
For U axis SIEMENS 1FT6132—6AB71—1AB2 , 75Nm , 1500 rpm
For V axis Dandrea SIEMENS 1HU5042-0AF01 1.75 Nm , 170V , 4.0 Amp, 3000rpm

Feed Drive's For X axis SIEMENS LT Module 6SN1123—1AA00—0DA2
For Y axis SIEMENS 6RA2627—6MV30--0 , D200/85 MEQ—GCG6V30 , Input AC 3*190V 50/60 Hz, O/P Max 200V DC/85A
For Z axis SIEMENS 6RA2621—6MV30--0 , D200/40 MEQ—GCG6V30 , Input AC 3*190V 50/60 Hz , O/P Max 200V DC/40A
For W axis SIEMENS 6RA2621—6MV30 --0, D200/40 MEQ—GCG6V30 , Input AC 3*190V 50/60 Hz , O/P Max 200V DC/40A
For B axis SIEMENS LT Module 6SN1123—1AA00—0DA2
For U axis SIEMENS LT Module 6SN1123—1AA00—0DA2
For V axis SIEMENS 6RA2615—6MV30 , D200/20 MEQ—GCG6V30 , Input AC 3*190V 50/60 Hz , O/P Max 200V DC/20A

Spindle Drive
BBC ADD6801 D380 G400/240, I/P Volt 3phase 380, 50/60Hz, O/P Max 400 Volt, 240A

Spindle Motor **Kessler Make** DC motor (0.9-63-66-66)Kw , (30-2100-2210-3000) rpm, (5.4-380-400-400)V, 187 Amps , Field 180V—108V , 6.1—4.8A , Tacho 60v /1000rpm

Measuring system for X Axis	Heidenhain Scale LB326 (10240mm).
Measuring system for Y Axis	Heidenhain Scale LB326 (3040mm).
Measuring system for Z Axis	Heidenhain ROD 456 , 250 Pulses

Measuring system for W Axis Heidenhain ROD 426 , 500 Pulses
Measuring system for U Axis Heidenhain Scale LB326 (3240mm)
Measuring system for B Axis Heidenhain ROD 800 , 36000 Pulses
Measuring system for Spindle Heidenhain ROD 456 , 1024 Pulses
Measuring system for V Axis D'Andrea Heidenhain ROD 426 , 500 Pulses

A. SCOPE OF SUPPLY

S.No.	Item	Qty	Accepted (Yes/No)	Deviation	Vendor's Remarks
1.0	The CNC controller **Sinumerik 840D Solution Line with PC version PCU50.5C (6FC5210-0DF52-3AA0)** with standard features, NCU720.3PN **(6FC5372-0AA30-0AA1) or higher .** The system should have **OP 15 A Operators Panel with TFT colour display**, COM1(V.24) , COM2(V.24) , VGA, MPI Interface & USB ,2 Channels and Expansion slots. Network ready with LAN and preinstalled system software with Sinumerik operate , licence for 7 axis + spindle , Bidirectional compensation , 3D simulation , Step 7 v5.5 on screen , measuring cycles & other required software's etc. All standard features should be listed in technical offer. **Also all available optional features of Sinumerik 840 D CNC system as mentioned below should be offered and included in the offer**.	01 Set.			Vendor to provide details & comply.
1.1	Access lock on operator panel.				
1.2	Co-ordinate system transformation				
1.3	Co-ordinate system rotation.				
1.4	Look ahead of 70 blocks.				
1.5	Helical/ Spline interpolation				
1.6	Scaling				
1.7	Mirroring				
1.8	Solid Tapping				
1.9	All standard milling cycles.				
1.10	Cylindrical interpolation.				
1.11	Background editing.				
1.12	Tool management				
1.13	3axes continuous path control system for milling/boring operations				

1.14	Resolution of 0.001 mm				
1.15	Facility to store up to 999 subroutines & 9999 part programmes				
1.16	Block search with calculations in automatic mode				
1.17	Facility to store at least 20 zero offsets & 2 additive zero-offsets				
1.18	It should be possible to store 128 tool offsets				
1.19	Automatic tool offset loading facility				
1.20	Oriented Spindle stop				
1.21	Measuring system & lead screw compensation				
2.0	**The Siemens 840 controller at point 1.0 shall be supplied along with following hardware**				Vendor to Comply
2.1	SITOP power, DC-UPS Module 15, with USB INTERFACE, input: 24v DC/16A, Output:24V DC/15A (6EP1931-2EC31) for back-up of the PCU50.5C and Automatic unattended shutdown in the case of power failure or if machine switches OFF.	1No.			
2.2	SITOP power lead gel battery module 24V/20A/7AH , Maintenance free (6EP1935-6ME21)	1 No.			
2.3	Machine control panel MCP483C (6FC5203—0AF22—0AA2) suitable for 7 axis & 1 spindle	1No.			
2.4	Siemens make PLC S7-300 (Siemens make ET 200S , 8DI Input Card , , 8DO Output Card for ET 200S & IM151-1 Interface Card for ET200S , Power Module PM-E for ET 200S) shall be supplied for distributed I/O 's (Min 4 Stations) with approx. 240 nos. of Inputs, 160 nos. of Outputs are to be programmed in the PLC maintaining the existing logic.	1 Set.			
2.5	Channel Relay boards **(20 No.)** each consisting of 8 relays preferably **Phoenix contact make** should be provided for driving the PLC outputs to the machine. All PLC outputs to be routed to the machine through these Relay boards	1Set.			
2.6	SITOP DC Regulated Power Supply 24V DC /40 A and SITOP DC Regulated Power supply 24V/20A should be provided for CNC system , PLC I/Os and other auxiliaries. **Independent power supplies for CNC system , PLC Inputs and PLC Outputs shall be provided.**	3 No. each type			
2.7	A hand held unit , HT2 of Siemens make**(6FC5303—0AA00—2AA0**) with Terminal module (**6FC5303-0AA01-1AA0**) and selector switches for manual operations(jog & incremental for 7axis & spindle) .	2 No. each type			
2.8	16GB USB Pen drive .	2 No.			
2.9	**The Siemens 840 SL CNC controller at point 1.0 should be supplied along with following software preloaded SINUMERIK CNC System Software with SINUMERIK Operate and License for 7 Axis + Spindle, Bi-Directional Compensation, 3D Simulation, Set point switch over, STEP 7 V5.5 on Screen, Measuring Cycles & Tool management.**	1 Set.			
3.0	**AC SERVO MOTORS**				Vendor to comply

3.1	Synchronous AC Servo motor of 1FT6, 95Nm, 1500 RPM, Natural air cooling should be provided. (Y axis) The AC Servo motor should be Siemens **1FT6134—6AB71—1AB2.**	01No.			
3.2	Synchronous AC Servo motor of 1FT6, 50Nm, 1500 RPM, Natural air cooling Should be provided for Z & W axis. The AC Servo motors should be Siemens **1FT6105—8AB71—1AB2.**	02 No.			
3.3	Synchronous AC Servo motor of 1FT6, 5Nm, 6000 RPM, Natural air cooling Should be provided for V Dandrea axis. The AC Servo motors should be Siemens **1FT6044—4AK71—3AA1.**	01No			
4.0	**AC SERVO DRIVES**				Vendor to provide details & comply
4.1	Line filter , interface module , VSM module & CSM module **for 55.0 KW or More** for Sinamics active line module	01 Set.			
4.2	Sinamics S120 Active line module **55KW (6SL3130-7TE25-5AA3) or More**	01No.			
4.3	Sinamics S120 Single motor module input: dc 600V output: 3AC 400V , **30A (6SL3120-1TE23-0AA3) or more** for X,Y,B& U axis motor.	04 No.			
4.4	Sinamics S120 Single motor module input: dc 600V output: 3AC 400V , **18A (6SL3120-1TE21-8AA4) or more** for Z & W axis motor.	02 No.			
4.5	Sinamics S120 Single motor module input: dc 600V output: 3AC 400V , **5.0A (6SL3120-1TE21-0AA4) or more** for V axis.(Dandrea Head)	01 No.			
4.6	Sinamics drive Cliq module cabinet DMC 20 W/O drive Cliq cable (6SL3055-0AA00-6AA0)	01set.			
4.7	Sinamics S120 sensor module SMC20 for evaluation of all Incremental 1VPP encoders	01 set			
4.8	Sinamics S120 sensor module SMC30 for evaluation of all TTL encoder	02 No.			
4.9	Sinamics Numeric Contr. Extension NX10.3 (6SL3040-1NC00-0AA0) Extension drive control	01 No.			
4.10	Siemens Pre assembled Motor Encoder cables of suitable length for feed motors of Y, Z , W & V axis .	01 set			
4.11	Siemens Pre assembled Power cables of suitable length for feed motors Y, Z ,W & V axis.	01 set			
4.12	Shield terminal plates and earthing schematic for all the modules	01 Set			
4.13	Sinamics drive CLIQ signal cables with connector for interfacing all modules.	01 Set			
4.14	Analog drive interface ADI4 (6FC5211-0BA01-0AA4)	01 No.			
5.0	**SPINDLE DRIVE**				Vendor to Comply

5.1	**Sinamics DC Drive 6RA80 of 280 Amp or more DC Output current** suitable for spindle motor and tachogenerator as per details in the Broad specifications**.**	01NO.			
5.2	DC Tachogenerator of Hubner make (60V/1000rpm) for spindle motor	01 No.			
6.0	**MEASURING SYSTEM**				Vendor to provide details & comply
6.1	Heidenhain make Transducer AE LB326 (ID. No. 255337-15) for LB326 scale for **X & Y axis**.	02 No.			
6.2	Heidenhain make LB382C scale of 3240 mm Measuring length complete with scanning head AE LB382C(1 Vss output) & Adapter cable with +/- 5 micron per meter accuracy grade for **U axis**.	01 No.			
6.3	Heidenhain make ROD 486 (1024 pulses) encoder for **spindle position feedback.**	01 No.			
6.4	Heidenhain make ROD 880 (36000 pulses) encoder for **B axis position feedback**	01 No.			
6.5	Heidenhain make ROD 486 (2500 pulses) 1V ss output encoder for **V axis (Dandrea Head) position feedback**	01 No.			
6.6	EXE/Converter unit (11 micro amp to TTL) of Heidenhain make to be interfaced between existing scales/ encoder and new CNC system for X and Yaxis. Note: Average cable length from scanning head to CNC controller is 30 mtrs approx.	04 No.			
6.7	Signal cables of required length for (X, Y, B, V, U axis & spindle), couplings & all necessary interface required to interface the position feedback with the offered CNC controller /Machine. All the measuring systems should be suitable for resolutions of 1µm (0.001mm) for CNC system.	01 Set.			
7.0	Electrical cabinets of RITTAL make having sufficient space to mount all axis feed drives, spindle drive along with all switch gears of drives, PLC and other accessories. The panel shall be stand alone floor mounting type. It should be a single unit with multiple doors (The present arrangement can be studied by the vendor). The components should only be mounted on the front side only; Rear part of the panel should not have doors/ covers .Cable entry shall be from the bottom. Suitable eye hooks shall be provided for lifting the panel. Lighting with CFL lamps and one 5A, 3pin socket with on/off switch shall be provided in each section.	01 Set.			Vendor to comply
8.0	Siemens/ABB/ Schneider Electric make Power disconnector with rotary handle kit of suitable rating as per the new scheme (25% over-rated to maximum load) for switching on the power supply of panel & machine.	01 No.			Vendor to provide details & comply
9.0	Operator Control panel **(Rittal** make) swivel type incorporating the CNC Controller, MCP and selector switches for other functions as required. Front side should have handles for rotating by hand; The rear door should be on hinges with lock and not on screw mounted. One 220 VAC/ 5 Amp 3-pin service socket and switch. One 220 VAC/15Amp 3-pin service socket with switch at operator platform. (**Operation features as per** para A.1.0.1)	01 No.			Vendor to comply
10.0	**Complete switchgears of the machine** including **overloads, relays, contactors, MPCBs** etc. for feed drives(X,Y,Z,W,B,U,V), Spindle drive and all the auxiliary motors , all accessories and to	01 Set.			Vendor to comply

	cover all other machine functionalities. Contactors used on the machine shall be overrated by at least 25% than the required capacity				
11.0	Portable machine lamp with magnetic base operating at 24V DC, 35Watts approx. with 5 meter cable with conduit to be supplied.	02 Set			Vendor to comply
12.0	Machine illumination light assembly (150W metal halide single ended or equivalent LED light) mounted at the top of column for the full illumination on the working area of reputed make with well-guarded from chips and coolant.	01 Set.			Vendor to comply
13.0	2 number of Door mounted Air conditioners of ADVANCE make with suitable/sufficient capacity and proper drainage pipes for condensate are to be provided in Electrical Panels (each 1500Watt.) and 1 for Operator control panel.	01 Set.			Vendor to comply
14.0	1 . Mounting brackets, mounting plates ,couplings & all necessary interface for mounting of scales, transducers, external encoders of all axes/ spindle and other items required for ensuring accuracy & repeatability of the feed axes movement & spindle RRM. 2. All the Mechanical Fittings , Intermediate flanges , pulleys, belts, Brackets etc. required for the mounting of CNC controller , feed motors , Drives..	01 Set.			Vendor to comply
15.0	Control cables , Power cables ,signal cables, field wiring and conduits of suitable length, connectors, Lugs, Terminal Blocks, ferrules etc. required to interface the CNC/PLC system with servomotors, Spindle motor , drives and field devices to successfully complete the project.	01Set.			Vendor to comply
16.0	**Hydac/IFM** make digital pressure switches, Flow switch and float switches to replace all existing elements for hydrostatic ,axes clamping system , tool clamping & table. **Baluff/Euchner/Tecknic/Schneider/Honeywell** make limit switch/proximity switches to replace all existing limit switches/proximity switches **.**	01 Set.			Vendor to comply
17.0	Bosch Rexroth make Proportional valve controller & Proportional valve for Ram /Spindle Compensation of suitable capacity (Equal or more then presently used on machine.)	01 Set.			Vendor to provide details & comply
17.1	Siemens micro master dive for coolant motor of 2.5 KW , 415 VAC .	01 No.			Vendor to comply
17.2	AC/DC true RMS clamp meter, FLUKE model 325	01 No.			Vendor to comply
18.0	Kabel schlepp / IGUS make Drag chain for transporting cables / pipes in the head stock (approx. length 3m).	01 No.			Vendor to comply
19.0	Ultra isolation transformer for complete machine of NEEL/SERVOMAX/APLAB make with 200 KVA , 415V± 5% 50Hz . AC 3phase/3wire system without neutral mains supply available in BHEL	01 No.			Vendor to comply
20.0	**Spares: (TO BE COMPULSORILY QUOTED OTHERWISE OFFER WILL BE REJECTED) :**				Vendor to comply

20.1	PCU 50.5C as offered against point no. 1	01 No			
20.2	NCU720.3 PN as offered against point no. 1	01 No			
20.3	Sinamics S120 Active line module as offered against point no. 4.2	01 No.			
20.4	Sinamics S120 Single motor module as offered against point no. 4.3	01 No			
20.5	Sinamics S120 Single motor module as offered against point no. 4.4	01 No.			
20.6	Sinamics S120 sensor module SMC30 as offered against point no. 4.8	01 No.			
20.7	Sinamics S120 sensor module SMC20 as offered against point no. 4.7	02 No.			
20.8	Simatic ET200S Input module , Output module , Interface module and Power module as offered against point no. 2.4	02 No. each			

Para A.1.0.1

OPERATIONAL FEATURES:

The Operator Control panel **(Rittal** make) swivel type on the operator platform moving along with the Y axis incorporating the CNC Controller should have the following operational features on the MCP and provided additionally as existing on the machine.

- Axes selection keys (Separate for each axis.)
- Directional keys + & - for axis movement in jog (Separate for each axis.)
- Rapid traverse key.
- Emergency stop.
- Reset key.
- Single block switch.
- Dry run switch.(Dry run freely executable during program run in automatic)
- Coolant ON / OFF switch/key & regulator (coolant should be switch on/off during Auto/Jog mode irrespective of the definition in the part program).
- spindle continuous/inch selector switch

- spindle Forward/Reverse selector switch
- Spindle orientation switch
- A pushbutton/soft key should be provided on the MCP for activating “Delete distance to go”.
- chip conveyer forward/reverse push button
- mode selector switch
- Feed override switch
- Spindle override switch
- Spindle gear selector switches with light.
- Machine illumination switch
- Feed release switch
- Green , Yellow & Red lights for machine in order , failure & failure-stop.
- Cycle Start/Cycle Stop, Feed Start/Feed Stop & Spindle Start/Spindle Stop pushbutton/soft Key

PROGRAMMING FEATURES:

1. ISO code (G&M mode type) programming.
2. Absolute/incremental programming.
3. Decimal point programming.
4. Linear & circular interpolation on both axes.
5. Programmable dwell.
6. Scaling, Mirroring, rotation & work offset transformation
7. Storage of user defined subroutine independent of the main program.
8. Variable parametric programming with mathematical functions including trigonometric & logic functions.
9. Programmable software limits.
10. Arc-programming with radius & end-point.
11. Conditional & unconditional jump.
12. Programmable tool offset along with additive wear offsets.
13. Programmable zero offset.
14. Two Programmable additive zero offset.
15. Subroutine nesting up to 3 levels.
16. Programmable skip.
17. Facility of inclusion of message in the part programme.
18. Corner rounding & chamfering. (e.g. RND, CHF and ANG).
19. Canned cycles for:
    - Drilling, deep drilling, Boring and Tapping (both solid and flexible) cycles
    - Pocket milling (rectangular and circular)
    - Thread whirling
    - Thread Milling
21. Tool nose radius compensation G41, G42

22. Threading cycle G33
23. Coolant on/off should be programmable.
24. Programming of primary, auxiliary & existing functions through M, S, T codes.
25. A cycle/program for determining work offset at any rotation of table angle with respect to a defined work offset on the job for machining of angular details on the job.
26. Axis replacement with GEOAX command.
27. On screen graphic simulation.
28. Programming with polar coordinates.

Note: CNC controller supplied at per Point 1.0 of SOS must have all the programming / machining features required for milling operation even if not covered in Para A.1.0.1

B. SCOPE OF WORK

S. No.	Activities	Vendor to comply	Accepted (Yes/No)
1.0	Dismantling and removal of all drives(X,Y,Z,B,W,U,V & Spindle) , switch gears ,CNC, PLC, along with old cabling and wirings, cable trays etc. in the existing Electrical cabinet(s). Dismantling of Y, Z, W axes feed motors, Spindle motor, U axis linear scale ,all encoders and field devices.		
2.0	Dismantling of old swivel type CNC operator Control panel and Installation of new swivel type CNC operator control panel.		
3.0	Installation of all drives(X,Y,Z,B,W,U,V & Spindle) , PLC, CNC , switch gear , Main Rotary switch etc in the New electrical cabinet(s) with required new cable trays , rails etc.(**Switch gear and electrical system details as per PARA B.2.0.1)**		
4.0	Mounting and installation of All feed motors (Y,Z,W & V) ,Spindle motor , Incremental linear scale for U axis and spindle encoder. Design, Modification / re-engineering, manufacturing of pulley, flanges and encoder couplings etc. for feed motors, position feedbacks as per requirement.		
5.0	Cabling and wiring of CNC, PLC, Drive system, control panels and field devices. Entire Cabling including Position Feedback of the machine is to be replaced with the new cabling. Laying and routing of new conduits, cables from electrical cabinet to machine and CNC operator panel through new conduits. Refurbishment and rewiring of all the terminal boards, Junction Boxes as per requirement. Routing of the new cables through drag chain . The cables passing through the drag chain shall be inside the conduits of reputed make.		

6.0	Interfacing of new swivel type CNC operator control panel.		
7.0	Interfacing of the existing, coolant unit, Main hydraulic unit, Aerostatic unit, chip conveyer & hydraulic unit of Table with the new scheme.		
8.0	Installation, Interfacing & commissioning of the CNC, PLC, Position feedback, , spindle drive, Feed drives , D'andera Head axis (V) drive, Machine lights , portable lamps ,Coolant drive & all air conditioners .		
9.0	Modification & rewiring of PLC program as per the new CNC controller and implementation on machine. Existing electrical logic has to be retained in the new PLC Program. In case the vendor perceives that more Inputs/Outputs are required for completion for the work as per their designed and conceived electrical scheme, the same should be included in the scope of supply.		
10.0	Laser calibration of X ,Y, Z,W ,B & U axes and generation of compensation data for pitch error and backlash from a reputed agency. RAM sag compensation has to be done.		
11.0	Prove-out of all the main functions (axes & spindle) including M19(Spindle Positioning)		
12.0	Prove-out of all existing auxiliary functions (Clamping system, Coolant system, hydraulics, lubrication, chip conveyer etc.).		
13.0	Prove-out of the AAC functions (Face plate, Boring head ,D'andrea Head load / unload from and to pick up station). Party will implement all the existing functions and features associated with the attachments present on the machine (Automatic updation of limits for axes and spindle rpm as well as attachment data depending on attachment loaded) and also any additional features if possible. BHEL will ensure that the Attachments are in working condition.		
14.0	Prove-out of the network LAN function (Part program & parameter transfer).		
15.0	Manual Control of Machine independent of MDI/ CNC Part Program : Presently, following operations can be performed manually independent of MDI/ CNC Part Program. Same status is to be maintained after retrofitting also: a. Start (CW/CCW) & Stop of spindle rotation b. Inching (CW&CCW) of spindle rotation c. Regulation & Indication of spindle speed d. Start, Stop, Regulation & Indication of feed, fast traverse, inching in X ,Y ,W ,Z,B & U.		
16.0	Prove out and demonstration of all existing machine functions and programming features of new CNC System . **Siemens expert intervention will be ensured by the party wherever party itself is not able to meet the requirement related to application or program.**		

17.0	After successful demonstration of all the operational and programming features of the machine, subsequent to completion of total scope of work, one BHEL component (time cycle 3-4 days) shall be machined by BHEL under the supervision of vendor on the machine using either existing program or new program prepared by BHEL for new retrofitted system. Trouble-free running of the machine & CNC system in compliance to WO requirements during this period shall be taken into consideration for final acceptance.		
18.0	Machine should have provision to switch from direct position feedback system to indirect position feedback system (built in motor encoder) through PLC/ Custom screen which is required for service purpose only		
19.0	Alarms and message should be displayed on CNC along with full remedial description through help guide loaded for system and user defined alarms & messages. PLC alarms & messages should include the device number and/or the operand.		

PARA B.2.0.1

SWITCH GEAR AND ELECTRICAL SYSTEM:

1. In the new electrical panel(s) all feed drives , spindle drive , PLC, all switch gear, relay, contactors, overloads, fuses, MCB's should be suitably positioned and all compartments should be illuminated for ease of maintenance and proper air conditioning ensured for the cooling of the devices.

2. The switchgear (MCBs, Overloads, Contactors, and Relays etc.) should be of any one of the following makes: **Siemens, Schneider, Telemecanique or ABB**.

3. Operator control Panel should be of **Rittal** make with proper air conditioning and vermin proof.

4. The operator's control panel , should be suitably positioned in the existing location for ease of operation & maintenance.

5. All the panels, Junction boxes, devices should have nomenclatures and individual wires ferruled as per the electrical schematics. The field devices if found unhealthy will be replaced by the party.

6. The wiring of the entire machine should be replaced by new ones of adequate capacity and reputed make preferably Lapp make.

7. 220VAC, 5A plug points should be provided in the Electrical Cabinet and 220 VAC, 5 A plug point on the Operator Panel. & 15 A plug point on the operator platform.

8. All existing pressure switches , float switches & flow switches (Approx 6 Nos. each) in the hydrostatic system and clamping system shall be replaced by Hydac/IFM make **digital pressure switches** ,float switches & flow switches. The Limit switches/ proximity switches of the machine shall be replaced with Baluff/Euchner/tecknic/Schneider/Honeywell make limit switches /proximity switches

C.	**DOCUMENTATION:**		**Vendor to comply**	**Accepted (Yes/No)**
	Following documents shall be supplied with above supply	Qty.		
	Electrical circuit diagram	3 sets.		
	PLC printout in ladder form with symbols & comments in English	3 sets.		
	O&M manuals (hard copy) for CNC, PLC, Drives, Measuring systems & BOI	3 set.		
	Programming manual (hard copy) for CNC system	3 sets.		
	Machine data (NC, PLC, Setting & Alarm texts), Ghost back up , Drives data , PLC program , Electrical circuit diagram & BOI (soft copy on pen drive)	1 set		
	Details of all mechanical modifications & fittings with drawings	3 sets.		
	Soft copy of all documents and manuals	1 Set.		
D.	**WARRANTY:**		**Vendor to comply**	**Accepted (Yes/No)**
	Party shall stand warranty for all the supplied material and work for a period of one year from the date of successful commissioning of the material and final acceptance (clause –F)			
E.	**TRAINING:**		**Vendor to comply**	**Accepted (Yes/No)**
	Party shall impart training to BHEL staff for programming (**1Person**) , CNC maintenance (**1Person**) and operations (**3 Persons**), of the system at the Vendor / manufacturers works for 1 week in each area. **Expenses for boarding & lodging of BHEL personnel during training shall be borne by BHEL.**			
F.	**FINAL ACCEPTANCE:**		**Vendor to comply**	**Accepted (Yes/No)**
	Final Acceptance shall be at HEEP, BHEL, Haridwar after: a) Upon completion of the scope of supply and scope of work at BHEL. b) Final acceptance shall include clearance of all pending issues related to the work contract. c) Successful Commissioning & Demonstration of various cycles and control functions as envisaged in the technical scope. After settlement of all pending issues related to work and supply, a certificate for Completion of works in all respect shall be released within 15 days by Production and Maintenance personnel of BHEL which will be the referred document for Final Acceptance and final payment to the vendor.			
G.	**DELIVERY: (IF DELIVERY PERIOD IS NOT OFFERED/ ACCEPTABLE, OFFER WILL NOT BE CONSIDERED FOR FURTHER PROCESSING)**		**Vendor to comply**	**Accepted (Yes/No)**

1.	**Material:** Max. 6 months from the date of award of contract. Early delivery shall be acceptable **subject to approval by BHEL**.		
2.	**Work :** Within 60 days from the date of release of machine for work.		
H.	**LATE DELIVERY PENALTY (LD) CLAUSE:-**	**Vendor to comply**	**Accepted (Yes/No)**
1.	Late delivery @ ½% per week subject to a maximum of 10% of the material cost including spare parts shall be applicable for delay in deliveries		
2.	In case of delays in commissioning after handing over the machine as per clause G (2) penalty @ 2% per week subject to a max. of 10% of the Commissioning Charges shall be applicable for delay beyond scheduled commissioning date for reasons attributed to the party. Net delay for the purpose of calculating late commissioning will be considered as the delay in commissioning.		
3.	However total LD on account of clause H1 & H2 will be limited to 10% of work awarded value.		
4.	The time period from invitation date for Pre dispatch inspection from vendor to the date of arrival of pre dispatch team to vendor's works and any other reasons attributed to BHEL will not be accounted in delivery period. This period will be excluded for the purpose of calculating LD. Vender should intimate regarding PDI, 7 days in advance.		
I.	**PRE-DISPATCH INSPECTION**	**Vendor to comply**	**Accepted (Yes/No)**
1.	Pre-dispatch inspection of all the items covered under Scope of Supply at Para (A) shall be carried out by BHEL at party's works.		
2.	Supplier shall invite BHEL for carrying out pre- inspection of material under **scope of supply at PARA (A)** with 7 days prior notice		
3.	Deputed BHEL persons shall do pre acceptance at vendor works and give despatch clearance.		
4.	Expenses of Boarding and lodging of BHEL personnel during PDI shall be borne by BHEL.		
J.	**SUBMISSION OF BILL OF MATERIAL (BOM)**	**Vendor to comply**	**Accepted (Yes/No)**
	Before inviting BHEL for Pre-dispatch inspection, vendor shall submit to BHEL the Bill of Material (BOM) and proposed electrical drawing/ schematic for scrutiny and approval.		
K.	**EARNEST MONEY DEPOSIT (EMD):**	**Vendor to comply**	**Accepted (Yes/No)**
1.	Vendors have to deposit Rs 2,00,000/- as the EMD. EMD may be deposited in cash (as permissible under Income tax Act), through pay order or demand draft in favor of Account officer, HEEP, BHEL, Hardwar payable at Haridwar only.		
2.	EMD shall be converted to security deposit if the work is awarded.		

3.	EMD of unsuccessful bidders shall be refunded back normally within fifteen days of acceptance of award of work by the successful bidder.		
4.	EMD shall not carry any interest.		
5.	**EMD by bidder will be forfeited as per tender document, if**		
i)	After opening the tender, the tenderer revokes his tender within the validity period or increases his earlier quoted rates		
ii)	The tenderer does not commence the work within the period as per LOI/contract.		
6.	**Offers without EMD will be rejected and will not be considered for evaluation. However valid NSIC certificate may be considered subject to receipt of notarized copy / copy attested by gazetted officer & verification.**		
L.	**SECURITY DEPOSIT (SD):-**	**Vendor to comply**	**Accepted (Yes/No)**
1.	Successful vendor shall deposit security. The rate of security deposit will be as below:		
	• For work Up to **Rs.** 10 Lakhs : 10% of work order value		
	• Above **Rs.** 10 Lakhs upto `Rs. 50 Lakhs : **Rs.**1 Lakh + 7.5% amount exceeding **Rs.** 10 Lakhs		
	• Above **Rs.** 50 Lakhs: **Rs.** 4 Lakhs + 5% amount exceeding **Rs.** 50 Lakhs		
2.	The security deposit should be submitted before the start of work in the following forms:		
	i) Cash (As permissible under the Income Tax Act)		
	ii) Pay Order, Demand Draft in favour of **Account officer, HEEP, BHEL, Hardwar payable at Haridwar**		
	iii) Local cheques of Scheduled Banks, subject to realization.		
	iv) Bank Guarantee from Scheduled Banks/Public Financial Institution as defined in the companies Act. The Bank guarantee format should have the approval of BHEL.		
3.	Security Deposit shall not carry any interest.		
4.	EMD of successful tenderer can be converted and adjusted against the Security Deposit.		
5.	100% of the Security Deposit amount shall be refunded to the vendor after final acceptance of the machine. **SD shall be released after the submission of Performance Bank Guarantee(PBG) by the vendor**		
M.	**Performance Bank Guarantee (PBG):**	**Vendor to comply**	**Accepted (Yes/No)**
1.	Vendor shall be required to submit a performance bank guarantee (PBG) for 10% of the total work order value which shall be valid for a period of 12 months from the date of Final acceptance of machine.		
2.	The PBG shall be submitted on a non-judicial stamp paper of value not less than Rs.100/- issued by any one of the nationalised banks.		
N.	**PAYMENT TERMS:** **(Note: No advance payment shall be made to the vendor.)**	**Vendor to comply**	**Accepted (Yes/No)**

1.	Part payment will be made after completion of following milestones		
i)	First payment of 80% of material cost along with 100% taxes & duties (Excise duty, CST/VAT as applicable) shall be payable after receipt of material at HEEP, BHEL, Hardwar. Vendor to ensure that all relevant documents are submitted.		
ii)	Final payment of balance 20% of material cost, 100% of commissioning cost including service taxes as applicable amount and refund of 100% of the Security Deposit amount will be made after final acceptance, subject to submission of PBG as per Para 'M'		
2.	All the payments shall be made through e-payment after submission of following documents along with first bill		
i)	E-payment form duly filled (Form will be provided by BHEL)		
ii)	Income tax exemption letter(if applicable)		
3.	Excise duty & CST/VAT will be paid on material cost and service tax will be paid on commissioning charges at actual. Related original documents to be submitted for availing MODVAT credit by BHEL.		
4.	Timely submission of CENVATABLE invoices along with necessary documents to enable availment of CENVAT (Excise duty, Service Tax & VAT) credit by BHEL. ***Note: Wherever CENVAT credit cannot be availed within given time limit due to delay in submission of invoices or for any other reasons attributed to vendor, loss of such CENVAT credit will be recovered from such vendor.***		
O	**Risk Purchase Clause:** In case of delays in supplies / defective supplies or non-fulfillment of any other terms & conditions given in the work order the purchaser may cancel the work order in full or part thereof and may also make the purchase of the material / service from elsewhere / alternative source at the risk and cost of supplier. If Vendor does not agree to above clause, their offer is liable to be rejected. In case any vendor accepts risk purchase clause initially and subsequently declines to honor the term in the eventuality of RISK PURCHASE, they may be banned for banned for business with BHEL.	**Vendor to comply**	**Accepted (Yes/No)**

P.	**COMMERCIAL TERMS :-**	**Vendor to comply**	**Accepted (Yes/No)**
1.	Prices shall be quoted on "Firm Price" basis only. **The prices should only on F.O.R BHEL, Haridwar basis inclusive of Packing & Forwarding charges, transit insurance & Transportation charges etc.**. Applicable % of ED & Sales Tax, Installation & Commissioning Charges & service tax should be clearly indicated in attached Price bid format as per **"Annexure-B**"		
2.	Validity of offer shall be for a minimum period of 120 days from the date of Tender Opening		
3.	The material will be dispatched **to Central Plant Stores, HEEP, BHEL, Haridwar** with instructions to forward the same to **Engineer (WEX/CNC-NTS), HEEP, BHEL, Haridwar-249403**		
Q.	**QUALIFYING CRITERIA:- Offer only from the vendors meeting the following conditions will be processed further.**	**Vendor to comply**	**Accepted (Yes/No)**
1.	The average annual turnover during the **last three Financial years ending March 31st 2014** should be at least Rs. 39.03Lac**.** Audited balance sheets for the last three years should be submitted.		
2.	Party has carried out in last 7 years upto 31-01-2015. The Vendor must have successfully completed the similar projects during last seven years ending 31st January 2015 and		

	these projects should fulfill either of the following: a**. Three similar projects** with each project costing not less than Rs. 52.04 Lacs. **or** b**. Two similar projects** with each project costing not less than Rs. 65.05 Lacs. **or** c. **One similar project** with project costing not less than Rs. 104.07 Lacs. **Similar project means** retrofitting/reconditioning of a CNC Horizontal Borer with table / HMC with Siemens CNC control system and servo drives.		
3.	The above retrofitted machines should be running satisfactorily for at least 6 months prior to 31st January 2015. Vendor to provide P.O./ W.O copies and commissioning / performance certificates / relevant MOM for satisfactory operation of the above retrofitted systems along with name, address & contact details of their customer. BHEL reserves the right to verify the information provided.		

R.	**BHEL'S OBLIGATION:**	**Vendor to comply**	**Accepted (Yes/No)**
1.	Existing electrical schematic of the machine shall be provided by BHEL to the vendor.		
2.	Crane facility and lifting tackles like slings, rope, D-Shackles shall be made available while working in BHEL premises only.		
3.	Facilities of minor welding, brazing, minor machining facility required for rectification/fitting of supplied material, subject to the extent available in BHEL, shall be provided in BHEL premises only.		
4.	Any civil work required for the erection of panel shall be done by BHEL.		
5.	Electricity, water & air shall be provided by BHEL at one point only.		
6.	Consumables like lubricants, kerosene oil, cotton waste etc. will be supplied free of cost by BHEL during execution of works inside BHEL premises.		
7.	The above requirements should be informed by the vendor in advance.		

S.	**VENDORS OBLIGATION :-**	**Vendor to comply**	**Accepted (Yes/No)**
1.	The vendor shall bring all types of hand tools including pneumatic/electrical drill machines, Laser equipment's, and grinders along with general purpose measuring instruments and testing equipment with them for successful commissioning of the machine & supplied system.		

T.	GENERAL CONDITIONS	Vendor to comply	Accepted (Yes/No)
1.	**A point wise compliance statement shall be submitted by the party with reference to the above scope of supply against each clause/ sub-clause with relevant details & comments. Non-compliance to any of the clauses & quoting inadequate quantity can lead to dis-qualification of the offer.**		
2.	**The Vendor is advised to inspect the machine prior to quoting to ascertain all the relevant details required for successful completion of the work.**	**Information**	
3.	Complete specifications such as part no./Model/Type, power, torque, Rated and maximum RPMs, Rated and maximum currents of the motor and drive controllers shall be stated in the offer by the party. Ordering brochure/catalogue should be attached..		
4.	Material to be used should be of reputed make or as per IS standards		
5.	Any material not specified in scope of supply but required for successful commissioning shall be provided by the vendor free of charge.		
6.	Vendor must compulsorily quote the quantity exactly as per the Scope of supply. No reduction in quantity as per the above Scope of supply is permissible.		
7.	Vendor must quote the Spare parts separately along with the offer otherwise the offer will be rejected.		
8.	The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site **www.bhel.com.**		
9.	RULES AND REGULATIONS OF THE CENTRAL/STATE GOVERNMENT: In the event of award of any contract, vendor will have to comply and abide by all the laws/enactment of state and central government. Documents regarding registration with Sales Tax and Excise authorities may also to be forwarded along with income tax clearance.		
10.	**The award of work will be made on basis of the total of Material cost, Spare Parts cost, Commissioning charges and all taxes, duties as applicable (Total Cost to BHEL).** The vendor should submit their best price at this stage itself and they will not be allowed to revise the price. Any revision/discount given by the vendor subsequently will be ignored**.**		
11.	Check List as per Annexure 'C' must be enclosed with techno-commercial bid		
12.	The risk of delay/loss by post/courier rest with the bidder.		
13.	Conditional tender is likely to be rejected.		
14.	BHEL reserves the right to reject the lowest or any tender or accept any tender in full or in part without assigning any reasons whatsoever.		
15.	If any information/documents submitted by the contractor are found false/fake at any stage, the tender will be cancelled and earnest money deposited shall be forfeited debarring from the future participation in tenders.		
16.	In case more than one contractor quotes equal L-1 rates, lottery shall be drawn among L-1 parties to decide one L-1 party.		

U.	**PACKING:**	Vendor to comply	Accepted (Yes/No)
23.1	Supplier shall arrange for adequate protection and packing of the consignment so as to avoid loss and damage during transit and also take appropriate measures to prevent metal parts from rusting and corrosion during transit. Handling instructions shall be clearly printed /painted on the packages. Each package should carry a detailed packing slip. Supplier shall be responsible for any loss/damage during transit due to defective/inadequate packing		

V.	**OFFER :-** The offer should be submitted in two parts and in following manner.		
1.	**Techno-commercial Bid** :	**Vendor to comply**	**Accepted (Yes/No)**
i)	The envelop shall contain the Techno-commercial Bid (ANNEXURE 'A') with technical details and commercial terms & conditions along with **Unpriced priced bid as per ANNEXURE 'B' with** clear **undertaking that no deviation from BHEL's price bid format** , relevant documents like copies of ESI, PF code, PAN No., Service Tax Reg. No., TIN No., CST No., Experience Certificates, Audited Balance Sheet of last 3 years, **Tender fees**, **EMD,** Check list as per **ANNEXURE 'C' and all the documents related to clause Q** (Demand draft for tender document cost shall also be accompanied in case tender documents are down loaded from BHEL website. **Offers without the EMD and Tender Fee will not be considered except having valid NSIC certificate).**		
ii)	The envelop shall be super scribed with "Techno-Commercial Bid", Name of work & NIT No. and Date of opening		
iii)	Point-wise compliance of this scope of supply and work is to be given by vendors while submitting their techno-commercial offer in the format provided by BHEL. Each page of the compliance list has to be ink signed & stamped by the vendor.		
iv)	The vendor must note that no prices are to be quoted / mentioned in the techno-commercial offer.		
2.	**Price Bid :**	**Vendor to comply**	**Accepted (Yes/No)**
i)	The second envelope shall contain only the price bid with separate price for material & work on Price Bid Format as per **ANNEXURE 'B'**.		
ii)	Any other information in the price bid shall not be considered and the quotation is likely to be rejected. Price bid document shall be ink signed & stamped by the bidder at the bottom of each page.		
iii)	The envelope shall be sealed and super scribed with "Price Bid", Name of work & NIT No.		
iv)	Price bids of only techno commercially accepted vendors shall be opened.(In presence of available vendors at the time of opening)		
3.	Both the above two envelopes shall be kept in another sealed cover. The cover shall be super-scribed with "Quotation for (name of work), NIT No. & due date and shall be submitted in the **Tender box kept in the tender room of purchase department at the 4th floor of the Main Administrative Building of HEEP, BHEL, Haridwar -249403** and it should also contain vender's name & contact details.		

ANNEXURE 'B'

PRICE BID FORMAT

Name of Work: RETROFITTING OF WOTAN RAPID 5 CNC HORIZONTAL RAM BORER PLAN No. 1-114, Block-3
NIT NO.: 20140006/WEX/CNC/WC/RAPID5 DATE: 05/02/2015

Sl. No.	Description of item	Unit	Qty	Basic Rate (in Rs.)	Excise Duty (in %)	VAT/CST (In %) (VAT with FORM-17 or CST with C-FORM)	Service Tax (In %)	Value (in Rs.)
1.	Material	Set	01		%	%		Rs.
2.	Spares	Set	01		%	%		Rs.
3	Installation & Commissioning	Set	01				%	Rs.
	TOTAL COST							Rs.

Note: Bidder may please note that all relevant columns should be duly filled up and in case any column is left blank it will be considered as inclusive in the prices quoted. All pages to be duly signed and stamped by authorised signatory.

Signature & Seal of Vendor

ANNEXURE 'C'

CHECK LIST FOR TENDER

NIT No.: 20140006/WEX/CNC/WC/RAPID5 **Date: 05/02/2015**

Vendor shall ensure that following documents / particulars have been enclosed with tender. This check list shall be enclosed with Techno-commercial Bid.

Sl. No.	Particulars	Yes/No	Remarks
1.	**Sealed (Techno-commercial Bid+ Unpriced price bid)** as per clause V-1-i of Annexure 'A' of NIT		
2.	**Sealed Price Bid** as per Annexure 'B' of NIT		
3.	**Compliance** to all the points of the Annexure 'A' of NIT		
4.	**Audited balance sheets** for the **last three Financial years ending March 31st 2014** should be submitted required as per Clause Q-1 of Annexure 'A' of NIT.		
5.	**P.O./ W.O copies and commissioning / performance certificates / relevant MOM r**equired as per Clause Q-3 of Annexure 'A' of NIT		
6.	**Name, address & contact details of their customer** required as per Clause Q-3 of Annexure 'A' of NIT		
7.	**Tender Fee** enclosed.		
8.	**Earnest Money Deposit (EMD)** required as per Clause K of Annexure 'A' of NIT		
9.	**Complete specifications** such as part no. / Model / type of Siemens system, drive and servo motors, power, torque, rated and max RPMs, Rated and max. Currents of servo motors. Ordering brochure/catalogue should be attached required as per Clause T-4 of Annexure 'A' of NIT.		

(Signature & Seal of Vendor)