Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirapalli – 620014, TAMIL NADU, INDIA
An ISO 9001 Company

MATERIALS MANAGEMENT

TITLE NIT REF NO.: **NIT_ 86228**	Phone: +91 431 2575636 / 7427 Email : sonu@bhel.in / Subramanian.s@bhel.in

Tender Reference No: **GEM/2024/B/5542482**	**Enquiry Date:** **24.10.2024**	**Previous Due date for submission of Quotation: 15.11.2024**
You are requested to quote the Bid number date and due date in all your correspondences. This is only a request for quotation and not an order		

CORRIGENDUM-2

Details of Corrigendum

1. **Revisions in Annexure-II: Specification & Scope of Work (S. Nos: 1.2, 2.47, 2.5.5 & 3.1)**
2. **Due date for opening (Part-1) of this tender is extended upto 23.11.2024**

All other terms and conditions as published in the above mentioned Tender Reference No. remain unaltered.

BHEL commercial terms & conditions and all annexure can be downloaded from BHEL web site **http://www.bhel.com** under above mentioned NIT reference and participate in this tender through the website **https://gem.gov.in/**

Tenders should reach us before 14:00 hours on the due date through GeM. Technical bid will be opened after 14:30 hours on the due date.	**(Sonu Majhi)** **Senior Manager /MM /CP&SP** For **Bharat Heavy Electricals Limited**

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ANNEXURE II

Supply, Commissioning and prove out of hydraulic power pack and other Assy. for system bender bay 4 tube bending machine

	SPECIFICATION & SCOPE OF WORK	
S.No	**Description**	**Vendor to confirm**
1	**SCOPE OF WORK**	
1.1	Design, Manufacturing, supply, commissioning and prove out of HYDRAULIC POWER PACK along with Hydraulic actuators as per BHEL reference drawings 1M12A1301499, 1M12A1301500, 1M12A1301501, 1M12A1301502, for SYSTEM BENDER TUBE BENDING MACHINE located at bay 4/ building 50	
1.2 (REV.01)	Required operation and function in the Hydraulic circuit 1M12A1301499, 1M12A1301500, 1M12A1301501, 1M12A1301502, 1. Tube stop raise - 1 Cylinder 2. Tube stop advance - 1 Cylinder 3. Collet close - 1 Cylinder 4. Pinch roller hydro motor - 1 Motor 5. Elevator up & down hydro motor - 2 Motors 6. Heater up - 1 Cylinder 7. Heater in - 1 Cylinder 8. Table advance - 2 Cylinders 9. Radial gripper close - 2 Cylinders 10. Upper die lock - 2 Cylinders 11. Upper die return - 1 Motors 12. Upper die close - 2 Cylinders 13. Clamp die - 2 Cylinders 14. Master bar return - 1 Cylinder 15. Pressure Die - 2 Cylinders 16. Bend - 2 Cylinders 17. Pressure die assist - 1 Cylinder **Note 1**: Hydraulic cylinder assembly drawings given only for reference purpose. **Note 2:** Elevator up & down hydro motors Model no: 35M-80A-1C-20 (2 nos), Pinch roller hydro motor (1 No), Upper die return hydro motor (1 No), Upper die close (2 nos), Pressure Die (2 nos), bend (2 nos) operation new hydraulic cylinders to be supplied as per drawing attached. **Note 3:** Sl. No 1 to 17 All hydraulic cylinders and hydro motor seal kits to be supplied and assembled during the commissioning.	
1.3	Design Specifications for Pump flow, Motor HP/Kw, working pressure range, operating temperature range; type of fluid to be used, sequence of events shall be as per BHEL Ref dwgs: 1M12A1301499, 1M12A1301500, 1M12A1301501, 1M12A1301502,	
1.4	SUPPLY, INSTALLATION AND COMMISSIONING IS VENDOR`S SCOPE.	
1.5	Integration of the new hydraulic power pack with the existing electrical control panel and operator console in the machine	
2	**HYDRAULIC SYSTEM - FEATURES:**	
2.1.0	The hydraulic system shall be designed in accordance with ISO 4413:1998 (take recent) or equivalent.	
2.1.1	Installation of complete hydraulic systems shall be according to IS 10481: 1983 (take recent) or equivalent ,'Guide for applications and installation of oil hydraulic systems'.	
2.1.2	The supplier shall provide a circuit diagram in accordance with ISO 1219-2 or equivalent which reflects the system design, identifies the components and satisfies the requirements as per BHEL DRAWING NO: 1M12A1301499, 1M12A1301500, 1M12A1301501, 1M12A1301502, 1M12A1301705-0-0 All the components of the hydraulic system should confirm to the hydraulic circuit diagram.	

2.1.3	The system shall be designed and constructed so that components are located where they are accessible and can be safely adjusted and serviced. Hydraulic components including piping shall be accessible and fitted so as not to interfere with adjustment or maintenance. Particular attention shall be given to the location of systems and components that need regular maintenance.	
2.2.0	**Hydraulic pumps and motors**	
2.2.1	2 Nos Hydraulic pumps and motors used	
2.2.2	Hydraulic pumps and motors shall be mounted so that a) They are accessible for maintenance; b) No shaft misalignment is introduced as a result of the duty cycle, temperature variations or applied pressure loadings; c) Induced axial and radial loads are within limits specified by the pump/motor supplier; d) Drive couplings and mountings are capable of repeatedly withstanding the maximum torque generated under all operating conditions; e) The transmission or amplification of torsional vibration is limited using couplings that are adequately damped. Pump shall be located and positioned adjacent to Tank to ensure flooded suction and shall be mounted on suitable anti vibration pads.	
2.2.3	Hydraulic pumps and motors shall be installed such that a) piping connections are configured to prevent external leakage; tapered pipe threads or connection mechanisms that require sealing compounds shall not be used; b) loss of primary or case lubrication is prevented during periods of inactivity; c) the pressure at the pump inlet port is not less than the minimum specified by the pump supplier for the operating conditions and the system fluid used.	

2.3.0	**Cylinders**	
2.3.1	Materials for construction (cylinder) for all the components are as follows (OR ITS EQUIVALENT ACCEPTABLE TO BHEL ENGINEERS): Bidder to specify in offer itself CYLINDER TUBE (SEAMLESS): ST52-W/EN 8/EN 24 PISTON ROD OR RAM: EN 8/ EN 24 PISTON : EN 8 LOCK NUT : EN 24 TIE RODS : EN 24 END COVERS/FLANGES: EN 8/EN 24 FASTENERS HIGH TENSILE GRADE: 10.9/12.8 SEALS : PU/PTFE/VITON OR ITS COMBINATION in the Makes as specified here	
2.3.2	Cylinders shall be designed and/or selected with the following characteristic as per BHEL drg which shall be given once the order is placed.	
2.3.3	Resistance to buckling: Attention shall be given to stroke length, loading and cylinder mountings in order to avoid bending or buckling of the cylinder piston rod at any position.	
2.3.4	Loading and overrunning: For applications in which overrunning or other external loads are encountered, the design of the cylinder and its mountings shall take into account the maximum expected load or pressure peak.	
2.3.5	Mounting fasteners for cylinders and attachments shall be designed and installed to accommodate all predictable forces. As far as possible the fasteners should be free from shear forces. Foot mounted cylinders should have means to absorb shear loads, rather than depending on mounting fasteners. The mounting fasteners shall be adequate to absorb overturning moments.	

2.3.6	Cylinder bore and rod shall be hard chrome plated to 55HRC (MIN) AND 40 MICRONS THICK (MIN). Cylinder bore to be honed to a surface finish not less than 20-micron inch, Piston rod should be hard chrome plated to 40 microns thick(MIN) and 55 HRC min hardness. The supplier should produce test certificate for the hardness and chrome painting thickness from an authorized certifying agency.	
2.3.7	Latest standard wear resistant sealing arrangement with bearing guide strip to work in titling condition of the cylinder shall be used. Only standard makes of seals like PARKER/MERKEL/HUNGER/HALLITE/SKF are ACCEPTABLE.	
2.3.8	Cross sectional assembly drawing of cylinder with its complete dimensions, material of construction and standard wear resistant sealing arrangements are to be provided along with offer by the offerer.	
2.3.9	The successful vendor should provide the detailed drawings and bill of materials with Makes and Part number to BHEL for approval before manufacturing.	
2.4.0	**Valves**	
2.4.1	Valve types shall be selected to take into account correct function, leak tightness, and resistance against foreseeable mechanical and environmental influence. Surface mounted and/or cartridge valves are preferred wherever practicable.	
2.4.2	When mounting valves, the following should be considered: a) independence from their associated fluid piping or connector; b) access for removal, repair or adjustment; c) effects of gravity, impact and vibration on the valve; d) sufficient clearance for wrench and/or bolt access and electrical connections; e) provisions to ensure that valves cannot be incorrectly mounted; f) location as close as possible to their actuators; g) installation so that they cannot be damaged by an operating device;	
2.4.3	For surface-mounted valves provisions should be applied to ensure a) detection of leaking valves or valve operating devices; b) elimination of detrimental effects of back pressure; c) adequate spacing between adjacent valves for the use of protective conduit; d) manifolds or sub plates with mounting surfaces in accordance with ISO 4401, ISO 5781, ISO 6263, ISO 6264, ISO 7790 and ISO 10372.	
2.4.4	Cartridge valves Manifolds with cavities in accordance with ISO 7368 and ISO 7789 should be used for cartridge valves.	
2.4.5	Line-mounted valves should be connected using ports in accordance with ISO 6149-1 or four bolt flange connections in accordance with ISO6162orISO6164.	
2.4.6	All pressure setting shall be accurate with zero pressure drop.	
2.4.7 (REV.01)	1 No Proportional valve shall be provided for booster cylinder. 1 No Moog servo valve seal kit shall be provided for bending cylinder as per given BOM	
2.4.8	Electrical connections The control voltages for all the solenoids of the valves shall be of 24v dc and all solenoid operated valves should have manual over-ride provision and light indicating solenoids.	
2.4.9	Electrical connections to a supply shall be in accordance with appropriate standards, e.g. IEC 204-1. For hazardous operating conditions, the appropriate degree of protection (e.g. explosion proofing, water proofing) shall be employed. Electrical connections be separable, oil-tight, plugin connector conforming to ISO 4400 or ISO 6952.	

2.4.10	Terminal block housings to valves should Where terminal block housings are specified on the valves, they shall be constructed as follows: a) the appropriate degree of protection in accordance with IEC 529; b) adequate space for permanently located terminals and for the terminal cable, including an additional length of cable; c)captive fasteners for the electrical access cover to prevent loss, e.g. screws with retaining washers; d)suitable securing device for the electrical access cover, e.g. a chain; e)cable connections with strain relief.	
2.4.11	**Solenoids** Solenoids shall be selected (e.g. cyclic rate, temperature rating, etc.) so that they are capable of operating the valves reliably at the nominal voltage of 10%. Solenoids shall be protected against the entry of extraneous fluid or dirt in accordance with IEC 529.	
2.4.12	**Manual override** If an electrically controlled valve needs to be operated for safety or other reasons when electrical control is not available, then it shall be fitted with manual override facilities. These shall be designed or selected so that they cannot be operated inadvertently, and they shall reset when the manual control is removed, unless otherwise specified.	
2.4.13	**Symbol plates** Symbol plates shall be attached to the valve in such a way that the positions and controls represented agree directionally with the operating device movement.	
2.4.14	**Adjustments** Valves that permit adjustments of one or more controlled parameters should have the following characteristics: a) provisions for securing the valve adjustment; b) provisions for locking the adjustment to prevent unauthorized change, as agreed between purchaser and supplier; c) provisions for monitoring the parameter being adjusted.	
2.4.15	**Removal** Irrespective of the valve connection method used, removal of the valve shall not require the removal of any associated piping or connectors. Associated piping or connectors may be loosened to provide removal clearance.	
2.4.16	**Manifold block** Bender –I and Bender –II separate suitable hydraulic valves manifold block shall be supplied by vendor.	
2.5	**General points**	
2.5.1	All Pressure gauges available in machine shall be replaced with new pressure gauges	
2.5.2	Required cleaning materials like cotton waste, kerosene shall be issued by BHEL at free of cost.	
2.5.3	Shop Compressed air Pressure shall be 4 - 4.5 bar at 1" line	
2.5.4	Supplier shall indicate the any additional required components/systems which are required to make the system functional (if required) one.	
2.5.5 (REV.01)	Makes of all bought out items shall be as follows unless otherwise specified elsewhere and shall be accepted to BHEL; All couplings with guards: WMI/FENNER/ ALFEX / SKF/ LOVEJOY; Hydraulic fittings: PARKER/SWAGELOC/HYLOC; Hydraulic hoses: AEROQUIP/ GATES/ PARKER. Hydraulic valves & Pumps: REXROTH / PARKER DENISON (PUMP)/ EATON – VICKERS/ YUKEN	

	Hydraulic Seals and o rings: PARKER/MERKEL/HUNGER/HALLITE PU tubes & one touch fittings: FESTO /PARKER; Pressure gauge: REXROTH/WIKA/WAREE/PARKER; Any other makes recommended by the supplier shall be approved by BHEL.	
2.6	**Fluid reservoirs**	
2.6.1	**The reservoir:** a) shall adequately dissipate heat from the fluid under normal working conditions when heat exchangers are not installed in the system; b) should contain all the fluid that can flow from the system under normal operation or maintenance conditions; c) shall maintain the fluid level at a safe working height and allow sufficient fluid access to supply lines during all operating cycles and operating attitudes, and allow adequate space for thermal expansion and air separation; d)should provide a slow recirculating velocity which will allow for the release of entrained air and the precipitation of heavy contaminants; e) should separate the return fluid from pump intake points by baffles or other means; if baffles are used, they shall not prevent thorough cleaning of the reservoir. If the fluid reservoir is of the pressure-sealed type then the special requirements of that type of unit shall be considered.	
2.6.2	**Construction** Reservoirs should be separate and removable from the machine structure.	
2.6.3	**Spillage** Provisions shall be made to prevent spilled fluid from returning directly to the reservoir.	
2.6.4	**The supporting structure should** a) Raise the base of the reservoir to a height not less than 150 mm above the site floor level to facilitate handling, draining and to improve heat dissipation; b) Have supports of sufficient area to allow for adjustment by shims, wedges, etc., during assembly and installation	
2.6.5	Vibration and noise Care shall be taken to prevent excessive structure borne vibration and airborne noise, particularly when components are mounted in or directly to the reservoir.	
2.6.6	**The reservoir top:** a) shall be positively fastened to the reservoir body; b) shall, if removable, be designed to prevent the ingress of contaminants; c) should be designed and constructed to avoid the formation of areas that will collect and trap external solid and fluid contaminant and waste.	
2.6.7	**Configuration** The reservoir configuration shall satisfy the following requirements: a) Suction lines shall be sized so that the pump intake characteristics are in accordance with manufacturer recommendations; b) Suction lines shall be located so that adequate fluid supply is maintained at the minimum operating fluid level and that air ingestion and the formation of vortices in the fluid are eliminated; c) Return lines to the reservoir should discharge below the minimum operating fluid level; d) Return lines to the reservoir shall discharge at the lowest practical velocity and promote the desired fluid circulation pattern within the reservoir. e) The reservoir circulation shall not promote the entrainment of air; any pipe access into the reservoir shall be effectively sealed; f) Should be designed to minimize resuspension of settled contaminants in the system fluid; g) Should use a "blind" (no through-hole) method of fastening for attaching the reservoir top to the body, for attaching access covers and any agreed components.	

2.6.8	The power pack should be tropicalized for Indian conditions - for an ambient temperature of 40 deg c. suitable oil cooling arrangement to be provided - preferably with oil chiller & heat exchanger, considering 3-shift operation of the machine and to maintain the oil temperature within 50 deg c.	
2.6.9	**Maintenance provisions shall fulfill the requirements specified below:** a) access covers shall be provided that can be removed and replaced by one person. The covers shall provide access to all internal areas for cleaning and inspection; b) suction strainers, return diffusers and other replaceable internal reservoir components shall be easily accessible for removal or cleaning; c) the reservoir shall be provided with a device to permit draining; d) the reservoir should be shaped to allow complete drainage.	
2.6.10	The reservoir shall be designed to provide adequate structural integrity under the following conditions: a) filled to maximum capacity with the system fluid; b) subjected to positive and negative pressures caused by the withdrawal or return of fluid at rates required by the system under all foreseeable conditions.	
2.6.11	suitable vibro-mounts, compensators (flexible bellows), delivery hose between pump and valve block, polypropylene pipe & hose clamps, etc are to be provided to minimize the vibration induced and transmitted to the hydraulic joints. hydraulic tank shall have proper clamping arrangement for fixing the tank in the ground with required anchoring bolts.	
2.6.12	**Surface treatment shall be such that:** a) All interior surfaces are thoroughly cleaned and all moisture, dirt, chips, flux, scale, slag, fibrous materials and any other contaminants removed, b) Any interior finishes are compatible with the fluid used in the system and the environmental atmosphere and shall be applied as recommended by the supplier of the finish. When such finishes are not used, ferrous interior surfaces should be coated with a rust inhibitor compatible with the fluid, c) Exterior finishes are compatible with the fluid,	
2.6.13	The reservoir should be constructed in such a manner that handling by a fork lift or slings and crane can be carried out without causing permanent distortion. The lifting points should be identified.	
2.6.14	**Fluid level indicators** a) shall be permanently marked with system "high" and "low" levels; b) should have additional marks as appropriate to specific systems; c) shall be fitted at each filling point so that they are clearly visible when filling.	
2.6.15	Filling points should be fitted with sealed and captive covers to prevent the ingress of contaminants when closed.	
2.6.16	Air breathers on atmospheric reservoirs should be provided which to a cleanliness level compatible with the system requirements, environmental conditions in which the system is to be installed.	
2.7	**Filtration and fluid conditioning**	
2.7.1	Filtration shall be provided to limit the in-service particulate contamination level to values appropriate for the components selected and the intended application. The contamination level shall be expressed in accordance with ISO 4406. The use of a separately pumped filtration system should be given due consideration.	
2.7.2	Filters shall be located in pressure, return and/or auxiliary circulation lines as necessary to achieve the cleanliness levels required by the system.	
2.7.3	All filter assemblies shall be equipped with a device that indicates when the filter requires servicing. This device shall be readily visible to the operator or maintenance personnel.	
2.7.4	Filter assemblies whose elements cannot withstand full system differential pressure without damage shall be equipped with bypass valves.	
2.7.5	When filters are located in flow lines subject to pressure and flow pulsations likely to affect the filtration efficiency, the flow fatigue characteristics of the filter element shall be taken into account. In severe cases, damping devices should be installed.	
2.7.6	Filters shall be installed where they are readily accessible, and adequate space shall be allowed for replacing filter elements.	

2.7.7	The filter element identification number and quantity required shall be permanently marked on the filter housing.	
2.7.8	When feasible, means shall be provided for replacing filter elements without shutting down the system.	
2.7.9	**Suction strainers or filters** Unless agreed between purchaser and supplier, filtration on pump suction lines shall not be used. Inlet screens or strainers are acceptable. If used, suction filtration devices shall be equipped with an integral bypass valve to limit the maximum pressure drop at rated system flow to a value that ensures that the requirements of 6.1.7 c) are satisfied. An electrical device is recommended to indicate unacceptable pump inlet pressure or to enable automatic system shut down.	
2.8	**Piping**	
2.8.1	Fluid velocity through piping, piping connections and manifolds should not exceed (design information) a) for suction lines: 1,2 m/s b) for pressure lines: 5 m/s; c) for return lines: 4 m/s.	
2.8.2	**Use of fittings and connections** The number of separable connections in the piping system should be kept to a minimum (e.g. by use of bent pipes instead of elbow fittings).	
2.8.3	**Design of layout** a) Piping should be designed to discourage its use as a step or ladder. External loads should not be imposed upon piping. b) Piping shall not be used to support components where they would impose undue loads on the piping. Undue loads may arise from component mass, shock, vibration and surge pressure. c) Every connection to piping should be accessible for tightening without disturbing adjacent piping or equipment, particularly where piping terminates in a cluster of fittings.	
2.8.4	**Piping location** a) Piping should be identified or located in such a manner that it is not possible to make an incorrect connection that might cause a hazard or malfunction. b) Piping, both rigid and flexible, shall be mounted to minimize installation stresses and be located to protect against foreseeable damage and not restrict access for adjustment, repairs, replacement of components or work in progress.	
2.8.5	**Tube and hose connectors** Tube and hose connectors that employ elastomeric seals are preferred. All metal tube connectors shall be in accordance with ISO 8434, part 1, 2, 3 or 4 and ISO 6162 or ISO 6164, when applicable. All hose fittings shall be in accordance with ISO 12151, part 1, 2, 3, 4 or 5.	
2.8.6	The hydraulic power pack shall be provided with minimum number of pipes / pipe joints and as far as possible usage of manifolds / stacked valves construction is preferred.	
2.8.7	All the pipe / hose fittings shall be of standard weld nipple with o-ring seating type (din 3865) heavy series fittings only and no ferrule joints are to be proposed in the hydraulic system. all threaded connections shall be of inches sizes.	
2.8.8	**Pressure rating of connectors** Connectors shall have a rated pressure not portion of the system in which they are used.	
2.8.9	Steel tubes should conform to the specifications stated in ISO 10763.	
2.8.10	Piping, including cored and drilled holes, shall be free of detrimental foreign matter such as scale, burrs, swarf, etc., that may restrict flow or be dislodged and cause malfunction of and/or \damage to any component including seals and packing's.	
2.8.11	The pipelines to be painted with standard colors as per the color coding accepted internationally for hydraulic systems. the power pack shall be painted in apple green color. to be mentioned by the offerer.	
2.8.12	Before Commissioning All piping of the hydraulic circuit must be thoroughly cleaned from both inside and outside; and The reservoir should be cleaned from inside.	

2.8.13	To facilitate maintenance, means shall be provided or components so fitted that their removal from the system for maintenance a) shall not lead to excessive loss of fluid; b) should not require draining of the reservoir c) should not necessitate extensive disassembly of adjacent parts.	

2.9	**Hose assemblies**	
2.9.1	Hose assemblies shall a) Be constructed from hoses which have not been previously used in operation as part of another hose assembly and which fulfill all performance and marking requirements given in appropriate standards b) Be marked with dates of manufacture (e.g. quarter and year) for both hoses and hose assemblies; c) Be provided with a recommendation on service life by the system supplier not be used at pressures which exceed the manufacturer's recommended rated pressure;	
2.9.2	**Installation of hose assemblies shall** a) Have a minimum length necessary to avoid sharp flexing and straining of the hose during the component operation. Hoses should not be bent at a radius smaller than the recommended minimum bending radius; b) Minimize torsional deflection of the hose during the installation and use, e.g. as a result of a rotating connector jamming; c) Be located or protected to minimize abrasive rubbing of the hose cover; d) Be supported, if the weight of the hose assembly could cause undue strain.	
2.10	**Fluid loss**	
2.10.1	Means shall be provided to prevent the system fluid from draining back into the reservoir when the system is switched off 'if such drainage could cause a hazard. When a fluid spill would constitute a fire hazard, the system should be designed to shut down automatically if piping or another component ruptures.	
2.10.2	Adjustable control mechanisms shall hold their settings within specified limits until reset	
2.10.3	Pressure and flow control valves shall be selected so that changes in working pressure, working temperature and load do not cause malfunction or a hazard.	
2.10.4	Pressure and flow control devices or their enclosures shall be fitted with tamper-resistant devices where an unauthorized alteration to pressure or flow can cause a hazard or malfunction. Means shall be supplied for locking the setting of adjustable components or of locking their enclosures, if changes or adjustment can cause a hazard or malfunction.	
2.10.5	The direction of movement of manually operated levers shall not be confusing; for example, moving a lever up shall not lower the controlled device.	
2.10.6	Any actuator required to maintain its position or to adopt a specific position for safety in the event of a control system failure shall be controlled by a valve that is either spring biased or detent located to a safe position.	
2.10.7	Where actuators are controlled by servo or proportional valves and malfunction of the control system may result in the actuators causing a hazard then means shall be provided to maintain or recover control of these actuators.	

2.10.8	A full flow filter without bypass and with a readily visible element condition indicator should be installed in the supply line and close to a servo or proportional valve if a valve malfunction caused by contaminant could create a hazard. The collapse strength of the filter element shall exceed the system maximum working pressure. Blockage of fluid flow by non-bypass filters shall not create a hazard.	
2.11	**Other design considerations**	
2.11.1	The selection of the hydraulic Pumps, valves, cylinders and other accessories shall be based on the flow and pressure applicable to that part of the circuit.	
2.11.2	The latest version of pumps **(variable axial piston pumps preferred)**, valves, accessories, etc., should be used with Rexroth /Vickers/Denison make only.	
2.11.3	Monitoring of system parameters Where changes in system operating parameters could constitute a hazard, clear indication of the system operating parameters shall be provided.	
2.11.4	**Test points** It is recommended that an adequate number of test points be used on all systems, regardless of size and complexity. Test points installed in hydraulic systems to verify pressure shall a) be accessible; b) be permanently attached; c) have a safety cap that is permanently attached to minimize the ingress of contamination; d) be designed to ensure safe and rapid engagement of the test point at maximum working pressure.	
2.11.5	Pressure measuring minimess check points (preferably with ¼" BSP stud end) to be provided, wherever required for quick pressure measuring and pressure setting while trouble shooting. one set of handheld minimess pressure gauge (glycerin filled) of suitable range with minimess hose (1 to 1.5m length) also has to be supplied along with the power pack. fixed pressure gauges provided in the system should be of glycerin filled type and should have suitable gauge isolators	
2.11.6	Location of position sensing devices If the locations of position sensing devices become changed after a motion sequence or cycle time has been stablished, the devices shall either be returned to their original positions or else the motion sequence or cycle timing shall be re-adjusted.	
2.11.7	Fluid sampling A means of obtaining a representative fluid sample in accordance with ISO 4021 should be provided to allow for checking fluid cleanliness condition. If a sample valve is provided from a high pressure line, a label warning of a high pressure jet hazard shall be installed and the sample valve shall be shielded.	
2.11.8	**Temperature sensing** A temperature sensing device should be installed in the reservoir	
2.12	**Identification**	
2.12.1	The following particulars shall be provided by the supplier permanent and readily visible form on all components: a) the manufacturer's or supplier's name and brief address; b) the manufacturer's or supplier's product identification; c) the rated pressure; on the electrical circuit diagram. and shown, if practicable, in a d) symbols according to ISO 1219-1, with all ports correctly identified. Where lack of available space would result in lettering too small to be legible, information may be provided on supplementary materials such as instruction/maintenance sheets, catalogue sheets or accessory tags. Each component shall be given a unique item number and/or letter. This unique item number shall be used to identify the component on all diagrams, lists and layouts. It should be clearly and permanently marked on the installation adjacent to, but not on, the component. The order of stacking modules shall be clearly indicated adjacent to, but not on, the stack.	
2.12.2	The hydraulic circuit drawing stenciled on a metallic plate shall be fitted on the power pack on the visible side.	

2.12.3	**PORTS** All port connections should be in accordance with- ISO 6149 for threaded ports and stud ends, or- ISO 6162 or ISO6164 for four-screw flange port connections. All ports, power take-off, test and bleed points and drain outlets (e.g. reservoir drains) shall be clearly and distinctly identified. The identification shall correspond to the data on the circuit diagram. When components have standard port identifications applied by the component supplier, these ~ shall be supplemented by identifications corresponding to the circuit diagram	
2.12.4	**Valve control mechanisms** Electrical control mechanisms (solenoids and their attaching plugs or cables) shall be identified on the electrical and hydraulic circuit diagrams with the same identification. Non-electrical control mechanisms and their functions shall be clearly and permanently identified with the same identification used on the circuit diagram.	
2.12.5	**Internal devices** Cartridge valves and other functional devices (orifice plugs, passages, shuttle valves, check valves, etc.) located within a manifold, mounting plate, pad or fitting shall be identified adjacent to their access openings. Where access openings are located under a component or components, identification shall, if practicable, be provided adjacent to the component and marked "CONCEALED".	
2.12.6	A function plate should be provided for each control station and located where it can be easily read. The function plate information shall be relevant and easily understood, providing positive identification of system function controlled.	
3	**GENERAL POINTS**	
3.1 (REV.01)	Electrostatic oil cleaner filter elements & oil chiller unit inlet and outlet hydraulic hoses (not less than 05 meters) with end fittings to be added as a part of scope of supply. the details shall be submitted with offer.	
3.2	Input power supply of 415v, 3 ph, 3 wire, 50 hz with isolator will be provided by bhel to hydraulic pump motor.	
3.3	The electric motor with 1440 rpm shall be conforming to s1 - continuous duty with ip-55 protection.	
3.4	All proximity sensors should be of reputed makes like technic / omron/ifm or any reputed make acceptable to BHEL	
3.5	All electrical terminations to be provided with suitably sized cable glands.	
3.6	The power pack and all connected materials are to be selected in accordance with is 10481-2002 /iso 4413-1998.	
3.7	Supplier shall visit the site and see the existing facility for complete understanding of our system requirements before submission of offer.	
3.8	It is the responsibility of vendor to erect and commission the above system with sufficient manpower, tools & tackles and required fasteners, fittings.	
3.9	BHEL shall provide all the civil work if required. necessary power, water, compressed air, welding set & cutting set with consumables like electrodes and gases and any machining required at site will be provided by BHEL free of cost.	
3.10	Supplier shall quote for materials supply and erection work separately.	
3.11	The refrigerator type oil chiller shall be of Advanced cooling systems/ Daikin/Rittal/ Werner finley make with latest environment friendly refrigerants like R134A/R 407C /R32 only.	
3.12	The vendor to submit the suitably designed hydraulic & electrical circuit with BOM for technical evaluation.	
3.13	The Power pack should be designed taking into account the energy efficiency (proper unloading during idling and loading only when required, chiller on-off with feedback from tank oil temp sensor, etc.). All the components used shall be latest & energy efficient models. Details should be submitted.	
3.14	Hydraulic oil will be provided by BHEL during commissioning at BHEL works. Vendor to provide the oil during pre-dispatch inspection	
4	**DOCUMENTS**	
4.1	**In case of ordering, the following drawings to be submitted for BHEL'S approval:-**	

4.1.1	Hydraulic circuit with BOM.	
4.1.2	Cross sectional drawing with major and mounting dimensions of all hydraulic cylinders with BOM.	
4.1.3	Electrical schematic and control circuit diagram with complete bill of materials including makes of each components in it.	
4.1.4	Layout of hydraulic and electrical system	
4.1.5	Electrostatic oil cleaner shall be of 100 lph capacity and to be added as a part of scope of supply. the details shall be submitted with offer.	
4.1.6	The hose make shall be parker/aeroquip/gates only acceptable.	
4.1.7	Limit switches shall be of omron/siemens/cutler hammer only acceptable	
4.1.8	Dismantle the existing system (hydraulic cylinder, Hydraulic valves, Hydraulic pipe line and hoses) during erection and commissioning will be Vendor scope.	
4.1.9	For designing and selection of components vendor shall visit the site and get acquaintance for submitting a competitive offer with hydraulic circuit.	
4.1.10	Hydraulic circuit with bill of materials giving complete purchase specifications and make of each item.	
4.1.11	Details of sealing arrangement and proposed seal make and part no.	
4.2	**Documents to be provided along with offer for technical evaluation:**	
4.2.1	The following documents to be provided along with offer for technical evaluation. in the absence of all the required documents, the offer will not be considered.	
4.2.2	Hydraulic circuit	
4.2.3	Technical catalogues/details of pump, valves, chiller and cylinders (with major dimensions) in hardcopy along with the offer.	
4.2.4	Any unspecified items which are required for function of hydraulic power pack must be included in the scope of supply and the details has to be specified by the offerer.	
4.2.5	Standard: NFPA/JIC/ISO standards only acceptable and standard to be mentioned by the offerer while quoting for manufacturing of hydraulic cylinders & all accessories.	
4.2.6	Make of bought out items.	
4.3	**Documents to be provided for approval before manufacturing:**	
4.3.1	In case of ordering, the supplier should provide the following documents for our approval before manufacturing.	
4.3.2	Hydraulic circuit with bill of materials giving complete purchase specifications and make of each item.	
4.3.3	Cross sectional assembly drawing of cylinder with complete dimensions and sealing arrangements.	
4.3.4	Cross sectional assembly drawing of cylinder with its complete dimensions, material of construction and standard wear resistant sealing arrangements are to be provided along with offer by the offerer.	
4.3.5	Electrical schematic and control circuit diagram with complete bill of materials including makes of each components in it.	
4.3.6	Electrical wiring diagram with ferrule numbers.	
4.3.7	Complete scope of supply along with makes for each item.	
4.4	**Documents to be supplied along with material supply**	
4.4.1	Three sets of the following documents are to be provided along with power pack (both hard copy and soft copy-cd):	

4.4.2	Hydraulic circuit in accordance with ISO 1219-2 (preferably with standard coloring) with bill of materials giving purchase specifications for each item. a) general arrangement drawing; b) piping and connector layout; c) time and/or sequence and function descriptions; d) floor plan; e) installation drawings and instructions; f) other drawings, as necessary; g) maintenance and operating data and manuals; h) performance test results;	
4.4.3	Function diagram for the entire operations of the system giving solenoid sequences, interlocks and pressure & flow parameters for each operation.	
4.4.4	List of rubber items like o-rings, piston / rod seals, wipers, etc. with complete purchase specification.	
4.4.5	Pump lay out and piping lay out giving sizes of each pipe line.	
4.4.6	Cross sectional assembly drawing for all the cylinders giving major dimensions, seal details, mounting details, pressure ratings, etc.	
4.4.7	Detailed technical catalogues in original for all components in the system.	
4.4.8	Electrical schematic/ control circuit diagram with bill of materials giving complete purchase specification of all bought out components.	
4.4.9	One number of anodized hydraulic circuit plate has to be fixed in the power pack at convenient place & a 3-d form of hydraulic layout drawing to be supplied to BHEL	
4.5	**ELECTRICAL POINTS**	
4.5.1	Bender - I and II both side input and output cables shall be clubbed together via “Harting connector” to facilitate single point isolation!	
4.5.2	Bender - I and II upper die limit switches and related control wires shall be clubbed together via “Harting” connector to facilitate single point isolation!	
4.5.3	Bending encoders (both bender) mounting mechanisms to be altered/modified and to be moved to accessible area to facilitate easy maintenance. Feasibility to be seen and to be implement if possible.	
4.5.4	Y-axis carriage related hydraulic hoses and control cables – chain link mechanism to be revamped with state of the art modern one. Feasibility to be seen and to be implement if possible.	
4.5.5	Tube slow sensor(old and obsolete) shall be replaced with latest model.	
4.5.6	Tube stopper limit switch to be changed to proximity sensor	
4.5.7	All the hydraulic solenoids shall have in built glowing indicator (solenoid on – red led glow, off – red led not glow)	
4.5.8	All field area cables and junction boxes shall be renewed with new one with proper routing and tagging	
4.5.9	Bender-II home limit switch shall be modified with proximity sensor!	
4.5.10	Existing hydraulic solenoids output is 110v ac. However, if the vendor provides different solenoid output(24V DC/AC), necessary modifications in the existing control panel shall be under vendor scope.	
4.5.11	All interfacing and successful integration with electrical system shall be the whole responsibility of the supplier!	

5	**OTHER WORKS**	
5.1	**Cleaning and painting**	
5.1.1	During external cleaning and painting of equipment, sensitive materials shall be protected from incompatible liquids. During painting, all nameplates, data marking and areas that should not be painted (e.g. piston rods, indicator lights, etc.) shall be covered, and the covers shall be removed afterwards.	
5.1.2	**Preparation for transportation**	
5.1.3	Identification of piping Whenever systems must be dismantled for transportation, the piping and connections shall be clearly identified. The identification shall correspond to the data on any appropriate drawings.	
5.1.4	**Packaging** All equipment shall be packaged in a manner that protects it from damage, distortion, contamination and corrosion and presewes its identification during transportation.	
5.1.5	**Sealing of openings** Only sealing caps that prevent reassembly until they are removed shall be used. Exposed openings in hydraulic systems/components shall be sealed, and male threads shall be protected, during transportation. The protection shall be removed immediately prior to reassembly.	
5.2	**Testing and inspection**	
5.2.1	Tests to prove the correct operation of the system and all safety devices;	
5.2.3	Pressure test to test each part of the system at the maximum pressure that may be sustained under all conditions for intended use.	
5.2.4	Fluid leakage--No measurable unintended leakage shall be permitted other than slight wetting insufficient to form a drop.	
5.2.5	The power pack will be tested at supplier's works for the operating parameters.	
5.2.6	The cylinder assembly will be tested to a pressure of 350 kg/cm2 at supplier's works for a holding time of minimum 15 minutes at both ends and intermediate position for leak free sealing.	
5.2.7	Test certificates for hydraulic pressure testing, material, hardness and thickness of chrome plating to be submitted during pre-dispatch inspection	
5.2.8	The supplier should provide all the facilities for testing at suppliers work and prove the performance of the power pack and cylinders.	
6	**WARRANTY**	
6.1	Warranty for products against defective materials and workmanship for a period of 12 months from the date of commissioning or 18 months from the date of dispatch whichever is earlier, except normal wear and tear of components like rubber components.	
7	**SCOPE OF SUPPLY**	
7.1	Power pack and its accessories including hydraulic cylinders, valves, oil chiller unit, electro static oil cleaning unit, oil contamination indicator with hoses & minimess coupling, Hydro motors. qty: one set	
7.2	**Spares:**	
7.2.1	Complete seal kit for the above hydraulic cylinders- qty: 1 sets.	
7.2.2	Hydraulic hoses - qty: 1 set	
7.2.3	Hand lever operated Grease Lubrication Pump with four jaw coupler , capacity-5 kg --- 1 no and capacity- (8-10 kg) --- 1 no.	
7.2.4	Various size hydraulic seal Installation & removal special tool kit for Rod seal, U-Cup and piston seals.	

8	**DELIVERY**	
8.1	The bidder shall quote the best possible delivery. However the delivery period shall not exceed 16 weeks from the date of Purchase Order.	
9	**PERFORMANCE GUARANTEE AND PROVE OUT:**	
9.1	The Performance of the Total Equipment and/or the Components / Sub-Assemblies /Bought-Out-Items shall be guaranteed for a minimum period of twelve months from the date of performance acceptance at BHEL Works. After retrofit the output of the machine should be increased from the existing condition.	