

BHEL – ISG BANGALORE	SPECIFICATIONS FOR STORAGE AND RETRIEVAL MACHINE	SPECIFICATION NO IS -1- 08 - 2012 / 01
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WARD-34, HIGH PRESSURE BOILER PLANT, BHEL-TRICHY

ENQUIRY SPECIFICATION

FOR

STORAGE AND RETRIEVAL MACHINE



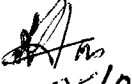
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IMPORTANT NOTES :

1. Vendor shall take a xerox copy of this enquiry specification and against each clause, sub clause no. explicitly mentioned their acceptance by mentioning 'agreed' or bringout deviations (if any) in the right hand side and enclose the same with the offer.

2. Deviations if any, from enquiry specification enclosed shall be clearly spelt in the offer, Otherwise it shall be presumed that the offer conforms to our enquiry specifications. No deviation or concession shall be entertained during the detailed engineering stage in the event of an order which shall be noted.

PREPARED BY  (P.V. TOPPO)	CHECKED BY  (R.DAS) 25/05/2009	APPROVED BY  (R.DAS) 25/05/2009
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SECTION-I

GENERAL SITE INFORMATION

2.0 CONDITIONS:

- 2.1 Project site : BHEL, TRICHY, TAMIL NADU, INDIA.
2.2 Max. ambient temperature : 50°C
2.3 Min. ambient temperature : 15°C
2.4 Maximum relative humidity : 100%, Does not occur with maximum temperature.
2.5 Altitude above mean seal level : Less than 100 Mtrs.
2.6 Environmental condition : Tropical humid climate where electromagnetic noise, high temperature, dust and mechanical shocks & vibrations are prevalent.

2.7 POWER SUPPLY SYSTEM

- System voltage : 415V, +/- 10%, 3Ø, 50 Hz. +/- 3Hz (3 wire, without neutral)
- Control Voltage : 240 V, 1Ø, 50 Hz. AC

2.8 Warehouse details.

Clear shop floor covered area available : Please refer enclosed layout drawings.

SECTION-II

APPLICABLE STANDARDS

The equipment shall conform to the latest Indian /International standards as regards safety, and other essential provision specified therein for installation and operation of plant and equipment and as per the regulations of factory rule.

The tenderer shall clearly indicate in their technical offer the list of standards to which equipments are conforms to.

Applicable Standards

a)	FEM 9.831 1994 Section IX	Calculation principles of storage and retrieval machines tolerances, deformations and clearances in the high bay warehouse
b)	IS 1079 1994 IS 10748 2004 IS 8500 1991 IS 513 1994	Hot rolled carbon steel sheets and strips. Hot rolled steel strips Structural steel – High strength Quality. Cold rolled steel sheets and strips
c)	IS 2932 2003	Enamel, synthetic Paints.
d)	IS 1363/67 2002 IS 3655 1985	Hexagon Head bolts, nuts / Fasteners Recommended practice for electro plating.
e)	IS 6005 1998	Code of practice for phosphating of iron and steel.
f)	IS 801 1975 reaff 2001 IS 800 1984 reaff 2003	Use of cold formed steel structural members. Code of practice for general construction in steel.
g)	IS 101 Reaffirmed 2004	Methods of sampling and test for paints.

Applications:

The Storage and Retrieval Machine is a part of ASRS (Automatic Storage and Retrieval System) which will be implemented in Ward-34, High Pressure Boiler Plant, BHEL-Trichy. Finished Valves are to be stored in two sizes of bins and the bins are to be stacked in and retrieved from the high rise racks to P&D station by a Storage and Retrieval Machine.

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SECTION–III

SCOPE OF SUPPLY & SERVICES

The new Storage and Retrieval Machine for ASRS is coming next to the existing ASRS in Ward-34, High Pressure Boiler Plant, BHEL-TRICHY. **The supplier should visit the project site to asses the actual requirement before quoting. SR Machine construction shall be similar to the existing machine as far as possible.**

The details scope is described below.

Sl.No.	DESCRIPTION	QTY	REMARKS
3.0	STORAGE AND RETRIEVAL MACHINE		
3.1a	<p><u>Scope of supply includes in Manually operated Storage and Retrieval machine:</u> The scope of supply includes, Detailed design of Storage and retrieval machine and analyses for safe working under full load and full speed condition as per requirement given in the technical specifications, Drawing approval, manufacturing, stage inspection, fabrication / assembly, painting, Testing and inspection, packing, transportation to BHEL Trichy site, Supply includes Manually operated Storage and retrieval machine with Top rail (I section channel) with mounting plates and hardware, Bottom rail with fixing hardware, <u>Shrouded Bus bar with collector and cables</u>, and all other equipment required for safe operation and completeness of the system. Operator's cabin to be provided in SR- machine for manual operations.</p>	1 Unit	
3.1b	<p><u>Automation package: (Latest laser beam based)</u> <u>Laser beam based fully automatic, semi-automatic and manually operated Storage and retrieval machine with Warehouse management software (WMS) for inventory control, with compatibility to SAP. Stored pieces will be identified by an alpha-numeric material code.</u> The SR machine must be controlled from a latest model available branded PC (HP, WIPRO,COMPAQ make only) as system controller and through PLC for automatic operations. PC along with other supporting hardware like UPS etc. to be mounted in a cabinet.</p> <p>a) <u>Positioning of Stacker machine</u> in X and Y directions shall be by absolute positioning systems and not by incremental systems. For X direction of Stacker machine, laser positioning should be used. b) <u>Warehouse management software (WMS)</u> with compatibility to SAP to link to main computer. c) <u>Inventory control software(ICS) :</u> This module shall manage the inventory of the entire material stored in ASRS and have the database of all transactions. d) <u>Location control software (LCS):</u> Location of each container and its status shall be continuously monitored and controlled by the LCS module. e) <u>Handling control software module(HCS):</u> This module shall monitor the movement of equipment and controls the functions of actual process of traveling, hoisting, forking etc. f) Following reports are to be generated from WMS. (1) Full inventory data report, (2) Item wise data report, (3) Vendor wise data report, (4) Customer wise report, (5) Location wise report, (6) Past transaction report- date wise, (7) User wise data report.</p> <p><i>Automation package shall be quoted separately (Take off price)</i></p>	1 set	

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3.1c	Spares : Spares for 2 Year normal operation for 2.0 T Capacity Stacker Crane As per list attached in section 3.2	1 lot	
3.1d	Scope of Erection & Commissioning Services: Receiving, Storing and handling at site, installation (erection, alignment) of Storage and Retrieval machine, stage inspection during erection, testing jointly with BHEL, repainting if required, supply of documentation, demonstration to final user of ASRS at Ward-34, High Pressure Boiler Plant, BHEL-TRICHY.	1 lot	
	System data		
3.1.1	Length of the system : 19,100 mm		
3.1.2	Height of the system : 12,000 mm		
3.1.3	Width of the system : 3700 mm		
3.1.4	Number of levels : 11		
3.1.5	Number of rows : 2		
3.1.6	Aisle width between racks : 1600 mm		
3.1.7	Bin size a) Big : 1300 W x 1000 D x 800 H (Incl. Leg height 100 mm) b) Small 1300 W x 1000 D x 600 H (Incl. Leg height 100 mm)		
3.1.8	Number of locations/ Bins(Big) : 128		
3.1.9	Number of locations/ Bins(Small) : 48		
3.1.10	Total Number of columns in one row : 8		
3.1.11	Load per locations (SWL) : 2000 Kg		
3.1.12	Total storing capacity : 352 MT		
3.1.13	Total number of Bins(Big + Small) : 176 Nos.		
3.1.14	Number of Storage and Retrieval M/c : 1 Set		
3.1.15	Linear speed : Fast: 96 Mtrs/ min. Slow: 2.0 Mtrs./Min.		
3.1.16	Speed for Hoist : Fast: 17 Mtrs/ min. Slow: 3.0 Mtrs./Min.		
3.1.17	Fork Speed : 12 Mtrs/ min.		
3.1.18	Bottom guide rail : Steel squire Bar (50 x 50 sq.mm minimum)		
3.1.19	Top guide rail : C channel + I Section Beam		
3.1.20	Number of P&D Station : 1		
3.1.21	Power supply through : shrouded Bus bar (Copper)		
3.1.22	Stacker machine construction: Double column-Box construction		
	SPARES: Vendor to supply the following spares.		
3.2	Spares for Stacker Crane for 2.0 T Crane (for 2 Year normal operation):	Qty	Remarks
3.2.1	List of Insurance spares:		
3.2.1.1	Hoist Motor	1 No.	
3.2.1.2	Fork Motor	1 No.	
3.2.1.3	L T Motor	1 No.	
3.2.1.4	Joy Stick XD2EC1111	1 No.	
3.2.1.5	Joy Stick XD2GA8441	1 No.	
3.2.1.6	Hoist Drive With DBR	1 No.	
3.2.1.7	Fork Drive with DBR	1 No.	
3.2.1.8	Long Travel Drive with DBR	1 No.	
3.2.1.9	Bus Bar current Collector	1 No.	
3.2.1.10	PLC Modules	1 Set	
3.2.1.11	Command card and feedback card	1 Set	
3.2.1.12	PC interfacing card	1 Set	

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3.2.2	List of regular spares:		
3.2.2.1	Rope for 1 crane 2.0 T capacity	1 Length	
3.2.2.2	Oil seals, Bearing, Brake liner & Brake coil	1 set	
3.2.2.3	Power contactor for hoist drive	1 No.	
3.2.2.4	Power contractor for other drives	1 No.	
3.2.2.5	Control contractor	1 No.	
3.2.2.6	Control transformer	1 No.	
3.2.2.7	MCB two pole	1 No.	
3.2.2.8	MCB three pole	1 No.	
3.2.2.9	MCCB three pole	1 No.	
3.2.2.10	Limit switch 2 NO.+2 NC.	1 No.	
3.2.2.11	Sensors	1 Set	
3.3	Documentation : As per Section-VI 6 sets of final drawings, documents, manuals, catalogue shall be submitted.	1 lot	
3.4	Data sheet and calculation: Data sheet and calculations are to be submitted by the vendor for approval before fabrication to start.		
3.5	Commissioning spares Any item/items used in the total system, fails during commissioning shall be replaced by the supplier free of cost.		
3.6	Dispatch of Stacker Crane to site : The Storage and Retrieval machine materials shall be transported by road/ rail by the vendor and delivered to the site at BHEL, Trichy.		
3.7	Installation at site : Installation of Storage and Retrieval machine are in the scope of the vendor		
3.8	Testing and final commissioning at site : The performance of Storage and Retrieval machine are to be tested jointly by the supplier and BHEL engineers by loading the racks. On completion of successful testing the functions are to be demonstrated to the final users' representatives.		
3.9	Pre-dispatch testing of Storage and Retrieval machine: Storage and Retrieval machine materials will be tested by BHEL engineers for satisfactory performance at the premises of the successful bidder, by BHEL and certified for dispatch to the site. No materials shall be dispatched without prior testing and clearance by BHEL engineers.		
3.10	Any requirement not covered in this specification but essential for the satisfactory operation of the equipment shall be deemed to be within the scope of supplier.		
3.11	All statutory safety rules and regulations prevailing in the area will be observed by the supplier during fabrication and installation buildup.		
3.12	Double column Storage and Retrieval machine construction must be identical with the existing one, supplier must visit BHEL Trichy to identify the actual requirement before quoting.		
3.13	Training at BHEL After commissioning the Vendor shall train BHEL personnel, at BHEL, in the operation and control of the crane, for a period of six days.		

Note: List of two years recommended operational spares along with price of each item in line with Sl. No. 3.2 may be furnished.

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SECTION-IV
TECHANICAL SPECIFICAIONS

Sl No.	Description	Remarks
4.1	<u>Material:</u> - All material used shall be of tested quality -The equipment and all supplies offered should be new, unused and best of its kind	
4.2	<u>System:</u>	
4.2.1	Stacker and Retrieval machine shall be designed for industrial application and extra heavy-duty operation. The S / R machine shall be designed and manufactured as per FEM – 9.831, FEM-9.851 and other relevant international codes.	
4.2.2	The S/R machine is required to retrieve / place the bins from / to transfer station and to stack / retrieve the bins to / from racking system	
4.2.3	The S/R machine shall be equipped with suitably designed telescopic forks for stacking / retrieving the bins / from the racking system on either side of the S/R machine. The forks shall be supported on a carriage, which will move up & down on a stiff mast guided on rollers.	
4.2.4	The complete equipment shall be of robust and rugged design in order to remain stable under all load positions & load conditions.	
4.2.5	Operator sitting in the operators' cabin shall control the operations of S/R machine. Latest type Joystick based system should be provided for operating the system.	
4.2.6	The S/R machine shall be provided with suitable drives for travel and raising/lowering of carriage with forks. The motors shall be designed considering acceleration horsepower. For accurate positioning of the forks for stacking / retrieving, a suitable creep speed shall be provided.	
4.2.7	The S/R machine shall be provided with an operator's cabin, which shall be integral with carriage supporting the forks, to enable manual operation and inspection of bins. Sufficient floodlight shall be provided on the S/R machine to illuminate the area of operation within the aisle. Dead man stop shall be provided on operating handle.	
4.2.8	An anti tilting device shall be provided with the S/R machine wheel assembly and the track fixtures shall be designed accordingly. The details of anti tilting devices and fixing of rail shall be furnished with the offer.	
4.2.9	All gears of gear boxes shall be ground gears.	
4.2.10	Adequate safety feature shall be provided in the S/R machine for stoppage at the end the rail at both the ends. The S/R machine should operate in slow speed at the end of aisle and suitable sensors or Limit Switches should detect the slow speed zone. The end of track should also be detected by independent sensor or limit switch for stopping the S/R machine. In addition to the above shock buffer shall also be provided at the end of the rail to prevent over-run of the S/R machine	
4.3	<u>Telescopic fork</u>	
4.3.1	Telescopic twin fork arrangement shall be provided on the S/R machine, which shall be able to load / unload bins from the racking arrangement on both sides of the S/R machine. The forks shall be of forged steel & heat-treated. Safety devices shall be provided to prevent fork traverse during travel of S/R machine and also to prevent travel of S/R machine while forks are extended.	
4.3.2	A profile gauge control system shall be provided at this place for checking the dimensions of the bins for trouble free handling by the S/R machine while loading the bins from transfer station.	

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4.3.3	The following facilities should be provided in Forks:	
4.3.3a	If forks come in contact with any obstruction, the forward movement of forks shall cease.	
4.3.3b	The drive for the forks shall provide smooth movement of forks without any jerks.	
4.3.3c	The movement of forks shall be provided through suitably designed guides.	
4.3.3d	Suitable mechanical stoppers to prevent fork over run shall be provided.	
4.3.3e	Fork motion shall be monitored and controlled through proximity/ limit switches for precise fork positioning.	
4.3.4	The telescopic fork should be offered for inspection separately. Engineers from BHEL will inspect the fork. If the fork is outsourced, the SRM supplier should arrange for inspection at Original Equipment Manufacturers works.	
4.4	Lifting carriage	
4.4.1	Lifting carriage fitted with forks shall be provided with operator's cabin.	
4.4.2	Hoisting of carriage shall be by minimum 2 ropes and provided with fail safe mechanism to arrest the fall of carriage in the event of failure of wire ropes. Each wire rope should be capable of holding the cabin and pay load individually. In the event of breakage of one rope it shall be possible to lower the carriage to the ground level. In the event the carriage gets stuck at any point due to failure of rope system or otherwise, provision shall be there for operator to rescue himself safely without any external assistance.	
4.4.3	All safety provisions necessary on a cabin moving with operator shall be provided in the design of carriage and must ensure complete safety of operating personal.	
4.4.4	The carriage shall be provided with suitable overload- detector system with audio-visual indication at operator's cabin. In such cases all the motions of the machine shall cease till the cause of overload is rectified.	
4.4.5	The forks carriage frame shall be guided and restrained over its full length of travel with a set of suitably designed rollers.	
4.4.6	The operator cabin shall be designed to provide the driver clear and maximum vision. All controls shall be located for ease of operation. The cabin shall be provided with an operator seat of cushioned and adjustable type. Operator's over head guard shall also be provided. An emergency switch, horn button, machines & fork travel and carriage up/down movement indicator, brake on / release indicator, etc. In addition the bidder can provide other switches and indicators for smooth and safe control of the machine.	
4.5	Mast & Travel Carriage	
4.5.1	Mast shall be of box construction, fabricated from rolled steel sections / plates. It shall be of robust and strong design to withstand all forces during acceleration / deceleration and under most sever conditions of loads that may develop under different working conditions.	
4.5.2	The mast ends shall be suitably connected to the travel carriages. The travel carriages shall be provided with running & guide wheels. The bottom running wheels on travel carriage shall be provided with suitable drive mechanism and run on rails supported on floor.	
4.5.3	Top guide wheels on travel carriage shall run on rails of adequate size supported from racking system.	
4.5.4	Bottom carriage shall be provided with substantial safety stops to prevent the fall of crane to less than 25 mm in the event of breakage of track wheel / axle.	
4.5.5	Safety stops shall not interfere with replacement of wheels.	
4.5.6	Rail sweeps shall be provided for both sides of the travel wheels for cleaning the rails.	

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4.6	ELECTRICALS FOR S/R MACHINES	
4.6.1	<p>Scope of work:</p> <p>The scope of work involves design, manufacture, assembly, performance testing at manufacturer's works, supply of all equipment required for completion, receiving at site, storing, unpacking, erection, cabling testing and commissioning of all the electrical equipment required for high rise storing system.</p> <p>The bidder shall also submit one set of electrical circuit diagrams for approval by BHEL. The supplier should provide additional terminal blocks, rerouting of few cables, relocation of terminal box for facilitating easy accessibility for maintenance and minor changes in circuit if required/ suggested by BHEL. The supplier before final painting and dispatch shall carry out these minor modifications/ additions required for automation.</p> <p>All electrical / electronic equipment shall be tropicalized.</p>	
4.6.2	The item involved are :	
4.6.2a	Motors for all mechanisms (in standard frame sizes)	
4.6.2b	Variable voltage variable frequency/(VVVF) electrical drives for AC motor so as to obtain a smooth control on speed and torque. VVVF drives shall be suitably over rated to provide adequate power to the motor at all times.	
4.6.2c	Local start / stop push button stations, local-off-remote selector switches and a stay put type emergency stop button.	
4.6.2d	BHEL will provide a separate power distribution board near to the SRM and from this point onwards supply and erection of all material required for completion of the electric's shall be in the scope of the bidder. This shall include all interconnecting power, control cables, load break switch, power panel for S/R machine, power control and instrumentation cables between Motor control panel, motors, proximity and limit switches, including glands and terminations of all cables.	
4.6.2e	All the panels and equipment on the SRM shall be earthed at two points with suitably sized wire rope/ earth strip in accordance with the statutory requirements. For these earth pits / earthing points in warehouse shall be provided by BHEL for hook up with earthing grid. From this point onwards all required earthing arrangement shall be in the scope of the supplier.	
4.6.2f	<p>SERVO VOLTAGE STABILISER:</p> <p>A servo voltage stabilizer suitable for the total load of the system shall be supplied.</p>	
4.6.2g	A box mounted MCCB with lockable emergency push button for tripping shall be supplied for power supply connection to the system.	
4.6.2h	All electrical and electronic panels including operator's cabinet should be provided with fluorescent lamps for sufficient illumination and power receptacles of 220Volts, AC, 5/15 Amps.	
4.7	GENERAL	
4.7.1	Following shall be ensured by the supplier:	
4.7.1a	Minor modification of schemes / changes in components, if any, suggested during scrutiny / approval of drawings and execution of work by BHEL should be carried out by the supplier/ contractor at no extra cost.	
4.7.1b	Equipment offered shall be of best quality to ensure smooth, efficient and trouble free operation of system.	
4.7.1c	No equipment shall be dispatched without inspection and/ or clearance by BHEL.	
4.7.1d	The scope of supplier includes all electrical equipment / sensors/ limits switches/ interlocks required for smooth, safe and efficient working of SRM. All facilities/ equipment/ tools & tackles required during installation, testing & commissioning are to be arranged by supplier.	

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4.7.1e	<p>Electrical</p> <p>415V, 50 Hz TPN phase power will be made available by BHEL at point close to the system. The supplier scope will start from this point. Shrouded Bus Bar system required for feeding the drives is included in the scope and the supporting shall be preferably from the rack. One conductor shall be exclusively for earthing the stacker apart from earthing through rails. Earth pits / the owner will provide earthing points. Supply & laying of G.I earth strip of adequate size and connecting the same to the earth conductor of trolley line & rails of stacker at required intervals is included in the scope of supplier.</p> <p>Obtaining all statutory clearances from Electrical Inspector, CEA, etc. as applicable for the entire electrics supplied & erected by the contractor is included in the scope.</p> <p>MCC / control panel shall be in IP-54 class of enclosure while all field mounted devices viz. Limit switches, sensors, P.B stations shall be heavy duty and in IP-65 enclosure.</p> <p>All switches shall be AC 23 category and motor starter gear shall comprise of heavy duty power contractors (AC3 or AC 4 as applicable), single phasing preventor, overload protection separately and motor duty MCBs for individual feeder isolation (in preference to switch fuse units) with type-2 co-ordination. All necessary indication lamps, annunciation's, alarms etc as per the requirement of customer/ owner shall be provided during engineering/ drawing approval stage.</p> <p>Safety interlocks necessary to ensure that during maintenance operation all the movements of S/R machine are possible in slow speed only for safety.</p>	
4.8	LT MOTORS	
4.8.1	Shall comply with latest revision of IS – 325 1991.	
4.8.2	Shall be 3 phase squirrel cage induction motors other wise specified.	
4.8.3	Shall be adequately rated and suitable for operation on power supply system indicated.	
4.8.4	Shall operate satisfactorily with the voltage and frequency variations specified.	
4.8.5	Shall be continuously maximum rated.	
4.8.6	Shall be totally enclosed fan cooled, stable for either direction of rotation	
4.8.7	Degree of protection shall correspond to IP-54 per IS 4691 for all motors.	
4.8.8	Shall be able to start on load and run up at a minimum of 80% of rated voltage and to deliver continuously rated torque at specified power supply conditions and shall be able to run for five minutes at 50 Hz and 75% of normal voltage.	
4.8.9	Locked rotor current of motors shall not exceed six times rated current motor.	
4.8.10	<p>Shall have class F insulation with temperature rise limited to class F. Temperature rise of motors under rated service condition shall not exceed the limits specified below by resistance method of measurement.</p> <p>Class of insulation : F (rise limited to class B)</p> <p>Permissible temp. : up to 60 deg. C Rise (over an ambient of 45 deg.C)</p>	
4.8.11	Shall have a robust case iron terminal box securely fixed to the frame. The terminal box shall be mounted centrally. Both ends of each winding of motor shall be brought out to its terminal box and links shall be provided to give delta connection. Each terminal box shall have ample room for termination PVC aluminum cables and shall have a removable cover with an oil resisting watertight gasket. The interior of all terminal boxes shall be painted white. Each terminal box shall have a removable gland plate. Necessary double compression brass cable glands and tinned copper lugs shall be included for motors installed in outdoor and all the motors shall have single compression brass cable glands.	

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4.8.12	Terminal box shall be rotatable in steps of 90 degree.	
4.8.13	Two separate earthing terminals shall be provided on the frame of each machine. In addition, one earthing terminal shall be provided in the terminal box for terminating the four-core cable.	
4.8.14	All bearings shall be ball and/ or roller type. Bearings shall be provided with greasing nipples so that bearings can be greased from outside when required, inherently protected against over greasing with seals to prevent ingress of grease into winding	
4.8.15	NAMEPLATE: Each motor shall have nameplate indicating details as per IS: 325 (1991) and fixed near terminal box.	
4.8.16	The motors should be offered for inspection by BHEL for which the SRM supplier should arrange for inspection at Original Equipment Manufacturers works.	
4.9.	<u>SAFETY</u> Safety of system & operator is of utmost importance. Hence, supplier should confirm adherence to all the following features in addition to other safety feature mentioned else where in the technical specification.	
4.9.1	<u>Electrical Features:</u>	
4.9.1a	Slack rope detection by a safety switch that cuts off total movement of the stacker.	
4.9.1b	Over speed governor for lifting carriage that mechanically actuates the safety catches and cuts off total movement of crane	
4.9.1c	Electrical switches that detect the end of aisle traveling zones, resulting and ensuring safe operation at low traveling speeds at the end of the aisle and cut traveling movement at the extreme position.	
4.9.1d	Interlocking of traveling and forking movement.	
4.9.1e	Load detection on the stacker crane which will cut off the movement if load is more than specified.	
4.9.1f	Traveling movement not allowed if – - Pallet not centered on forks in manual mode. - Pallet overhangs the transfer station.	
4.9.1g	Dead man switch.	
4.9.1h	Operator cabins open safety switch to ensure operator safety in case on board semi-automatic mode of operation.	
4.9.1i	Should sense bin presence on Fork	
4.9.1j	Should sense bin presence in rack locations	
4.9.1k	Fail safe brakes for all motors.	
4.9.1l	Warning beacon to be provided to indicate crane in operation.	
4.9.2	<u>Mechanical safety</u>	
4.9.2a	End of aisle shock absorber for S/R machine and transfer car.	
4.9.2b	End of travel buffer for lifting carriage	
4.9.2c	Safety catch on lifting carriage.	
4.9.2d	Anti tilting device during traveling movement of the stacker crane on the floor.	
4.9.2e	Continuous rail cleaning brush for floor rail.	
4.9.2f	Adjustable rail clamps to ensure alignment.	
4.9.2g	Resilient rubber pads on adjustable for vibration damping.	
4.9.2h	The noise level shall not exceed 85 dB at a distance of 1M from the crane	

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4.9.3	The bidder shall submit a quality assurance plan (QAP) along with technical bid encompassing all activities from design stage to commissioning. The QAP shall indicate the various stage inspections during major activities such as design, material selection, manufacturing, erection, trial / commissioning etc. The stage inspection shall clearly indicate the characteristics / parameter being inspected, the norm for inspection and the agency carrying out the inspection.	
4.10	Tests	
4.10.1	Functional test	
4.10.2	Performance test	
4.10.3	Reliability Trials with analysis	
4.10.4	Endurance Trials	
4.10.5	The successful bidder shall carry out performance guarantee tests at site after commissioning of the Storage Retrieval Machine	
4.10.6	Commissioning spares not used shall become the property of the owner	
4.10.7	Supply of initial Oil, lubricants shall be included in the scope of bidder	
4.10.8	The bidder shall clearly list the owner's responsibility	
4.11	INSPECTION	
4.11.1	The successful bidder has to submit an inspection procedure within 30 days of placement of order. The inspection procedure shall be finalized and approved by BHEL.	
4.11.2	Engineers of BHEL will inspect the SRM at the suppliers' works in assembled condition. The engineers will inspect all the functions, except L T motion, which will be inspected after erection at the site. Engineers will also inspect (at OEM works) the sub-assemblies/ equipment like Telescopic Fork, Brake Motors, Gearboxes etc., being procured by the supplier from Original Equipment Manufacturers for which SRM supplier should make necessary arrangements.	
4.11.3	The supplier shall give the final inspection call a minimum of 2 weeks in advance. The final inspection call shall be sent along with the copies of internal / shop test reports and acceptance, material test certificates from a govt. approved test laboratory (physical & Chemical) etc.	
4.11.4	No equipment or part items shall be dispatched without provisional acceptance certificate and dispatch instruction issued by BHEL.	
4.11.5	All components, assemblies and subassemblies shall be shop tested as per relevant standards and test certificates to be submitted by the bidder.	
4.11.6	The bidder will be solely responsible and accountable for delays and defects due to re-inspection.	
4.11.7	The material used shall be new and best of its kind available and shall conform to standards as mentioned in the enclosed specifications.	
4.11.8	The supplier shall guarantee satisfactory performance or equipment for 24 months from date of commissioning and handing over. The equipment and parts shall be also warranted for the above period for any manufacturing defect and faulty design.	
4.11.9	The guarantee shall also cover faulty design /material /workmanship and manufacturing. All rectification or replacement under the guarantee shall be done free of cost by the supplier.	

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4.11.10	The supplier should study the specifications and satisfy himself regarding the workability of the proposed system and shall take full responsibility for the design of the S/R machines, quality of the material workmanship, guaranteed operation and smooth performance etc of the equipment. This technical specification is only for guidance of the supplier and hence all the items necessary for safe and satisfactory operation and guaranteed performance of the proposed equipment along-with existing facilities shall be included in his offer through these might not have been specifically mentioned in technical specifications.	
4.11.11	Approval of drawings and/or inspection by BHEL does not absolve or relieve the supplier from any of his obligations under this contract and he shall be wholly and solely responsible for the satisfactory operation and guaranteed performance of the equipment.	
4.11.12	The supplier shall ensure guaranteed performance and rated capacity of SR Machine.	
4.11.13	After satisfactory completion of preliminary acceptance test, the guarantee test shall be conducted in the manner described below:	
4.12	INSTRUCTIONS	
4.12.1	Bidder shall furnish necessary technical supervisory personnel of his organization to supervise the erection and commissioning of the equipment to comply with the requirements of the specifications. The responsibility for timely erection, commissioning, testing and handing over shall be on the bidder only.	
4.12.2	All equipment and component parts shall be guaranteed against fault in design, defective or improper material, and poor workmanship for two years after handing over the system. If any defects/ mal-performance occur during the guarantee period, the supplier shall make all the necessary or desirable alternations/repairs/replacements free of cost.	
4.12.3	The bidders shall furnish a comprehensive write up or brochure on designing, manufacturing and testing facilities including Quality Assurance System available in the manufacturer's works.	
4.12.4	General arrangement drawings of the S/R Machine with sections. The drawing shall indicate major dimensions and sizes of the steel sections and floor loading.	
4.12.5	A comprehensive write-up or brochures on details of design, technical specifications, manufacturing and testing facilities including Quality Assurance System, in the manufacturer's works.	
4.12.6	Any other relevant literature, drawings, certificates that bidder may desire to submit to complete his proposal and to indicate the special features not encountered usually.	
4.12.7	List of special tools & tackles and commissioning spares.	
4.12.8	List of two years recommended operational spares along with price of each item.	
4.12.9	Testing & commissioning procedures at site after erection.	
4.12.10	Bar chart indicating various activities of execution of the contract viz. basic engineering, detailed engineering, submission of drawings to BHEL for approval, manufacturing, packing & transport, erection, commissioning, etc	
4.13	Documents to be submitted Before final dispatch of equipment.	
4.13.1	Operating and maintenance manuals.	
4.13.2	Control/ safety/ system description & system capacity.	

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4.13.3	Lubrication pipeline diagrams, lubrication schedules giving type (Indian equivalent of lubricants) Frequency of lubrication and quantity per fill and quantity required for two years period.	
4.13.4	Wiring diagram of control panels showing the inter connection between the terminals of various equipment and devices located on or within the panel.	
4.13.5	Single line diagram of stacker/ L.T. MCC control schemes	
4.13.6	Test certificates for all equipment and bought out components.	
4.13.7	Routine test certificate for electric motor and other electrical equipment and battery charger unit.	
4.13.8	All drawings/ circuits etc. as approved by owner/ consultant	
4.13.9	One reproducible copy, soft copy in CD and 5 sets of all drawings & documents, which has been in the “approved /for Reference” category during the course of execution of the contract, shall be submitted to owner along with supply of the system.	
4.14.1	All materials used shall be of tested quality.	
4.14.2	All units shall be in metric system.	
4.14.3	The equipment and all supplies offered shall be new, unused and best of its kind.	
4.14.4	All moving parts/bearing shall have adequate lubrication so that bearing or other parts do not get unusually heated in the course of operation. Sufficient lubrication points shall be provided wherever necessary and all such points shall be easily accessible.	

TECHNICAL SPECIFICATIONS TO BE FILLED BY THE SUPPLIER		
4.15	STACKER AND RETRIVAL MACHINE	
4.15.1	STANDARDS FOLLOWED FOR DESIGN & MFG.	
4.15.2	RATED/ DESIGNED CAPACITY	
4.15.3	LOAD CENTRE	
4.15.4	LIFT	
4.16	SPEEDS	
4.16.1	HOIST (UP/DOWN LADEN/UNLADEN)FAST/SLOW IN Mt/Min	
4.16.2	FORK SPEED IN Mt/ Min	
4.16.3	TRAVEL (LT) FAST/SLOW IN Mt / Min	
4.17	FORKS	
4.17.1	DIMENTIONS WIDTH & THICKNESS IN MM	
4.17.2	LENGTH IN MM	
4.17.3	SPACING MAXIMUM (STANDARD) IN MM	
4.17.4	MATERIAL OF CONSTRUCTION	
4.17.5	MAXIMUM DEFLECTION AT THE EXTREME POSITION WITH LOAD	

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4.18	NO. OF WHEELS IN BOTTOM CARRIAGE	
4.18.1	FRONT/REAR (DRIVEN)	
4.18.2	TYPE	
4.18.3	SIZE DIA IN MM	
4.18.4	MATERIAL	
4.18.5	SIZE OF RAIL	
4.19	POWER SUPPLY SYSTEM	
4.19.1	TYPE	
4.19.2	LOCATION	
4.19.3	BOTTOM & TOP CARRIAGE & MAST	
4.19.4	TYPE	
4.19.5	CONSTRUCTION	
4.19.6	MATERIAL	
4.20	DETAILS OF HOIST/LOWER CARRAIGE	
4.20.1	DESCRIPTION	
4.20.2	CONSTRUCTION	
4.20.3	GUIDE SYSTEM	
4.20.4	SAFETY FEATURES	
4.20.5	HYDRAULIC SYSTEM IF ANY	
4.21	DRIVE DETAILS	
4.21.1	MOTOR	
4.21.2	TYPE OF DRIVE	
4.21.3	TYPE OF BRAKING	
4.21.4	DETAILS OF VVVF CONTROLS	
4.21.5	SAFETY INTERLOCK	
4.21.6	TYPE OF BRAKING	
4.21.7	SAFETY FEATURES	
4.22	FLOORING	
4.22.1	FLOORING TYPE & FINISH REQUIRED	
4.22.2	WHEEL PRESSURE & AREA OF CONTACT	

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4.23	OPERATORS CABIN	
4.23.1	LOCATION	
4.23.2	COMPLETE DETAILS	
4.24	DESCRIPTION OF SPECIAL FEATURES IF ANY	
4.25	DETAILS OF GUIDE ROLLERS WHEEL ON TOP CARRIAGE	
4.25.1	TYPE	
4.25.2	NUMBER	
4.25.3	MATERIAL	
4.26	DETAILS OF TRANSFER SYSTEM	
4.26.1	ELECTRICAL	
4.26.1.1	OPERATING VOLTAGE	
4.26.1.2	CONTROL VOLTAGE	
4.26.1.3	ELECTRIC DRGS	
4.26.2	STANDARD FOLLOWED FOR DESIGN & MFG.	
4.26.3	DESCRIPTION OF VARIOUS MODES OF CONTROL & OPERATION	
4.26.4	DETAILS FOR SAFETY FEATURES	
4.26.5	DETAILS OF POWER SUPPLY SYSTEM TO VARIOUS EQUIPMENTS	

4.27	<u>PAINTING</u>	
4.27.1	The SRM should be painted with Golden Yellow color. The Control panel should be painted with RAL 6011 Apple Green (polyurethane paint) .	
4.27.2	Surface preparation: The steel structures shall be cleaned of dirt and grease. The heavier layer of rust shall be removed by grinding prior to actual surface preparation.	
4.27.3	Blast Cleaning : All equipments shall be sand blast cleaned to SA 2 ½ to Swedish standard SI 055 900. This involves very through blast cleaning. Mill scale, rust and foreign matter shall be removed to the extent that the only traces remain in the room of slight stains. Finally the surface is cleaned with a vacuum cleaner, clean dry compressed air or a clean brush. It shall then correspond in appearance to the prints designated as S A 2 ½.	
4.27.4	Painting : i)primer : Epoxy Zinc rich primer, 1 coat, 35 microns DFT ii)Intermediate coat : Epoxy high build Micaceous iron oxide, 1Coat, 75 microns iii)Finishing paint : Epoxy / enamel finishing paint, 2 Coats, 35 microns DFT	
4.27.5	The paint manufacturer shall certify general compatibility between primer and finishing paint. The whole system of paint shall be from the same manufacturer. Paint manufacturer's recommendation shall be followed for application of paint, thickness of coating etc.	
4.27.6	The supplier shall supply 10% of one coat of finishing paint along with the equipment which shall be applied the equipment which shall be applied to the equipment at site for touch up.	

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4.28	Control panel painting:	
4.28.1	Mill scale, rust etc shall be removed by pickling in a batch dilute sulfuric, hydrochloric or phosphoric acid, with or without heating, followed by through rinsing by fresh water to remove acid traces. Pickling in sulfuric acid may be followed by dipping in dilute phosphoric acid containing iron phosphate. Prior to pickling heavy deposits of oil, grease, soil and other foreign matters shall be removed by solvent cleaning.	
4.28.2	The cleaned surface shall be given a phosphate coating consisting of thin layer of zinc, iron or manganese phosphate deposited by immersion or power spray. The coating weight shall not be less than 5 gm/sqm.	
4.28.3	The phosphate coated surfaces shall be finished painted with two coats of RAL 6011 Apple Green (polyurethane paint) .The total dry film thickness of the finish coats shall not be less than 50 microns.	

LIST OF PREFERRED MAKE OF ELECTRICAL & MECHANICAL COMPONENTS.		
4.29	Electrical equipment:	
4.29.1	Motors : CGL/KEC/ALSTOM/ COEL Motors	
4.29.2	VVVF Drives : ABB/ SEIMENS/ TELEMCHANIQUE.	
4.29.3	DiscType brakes : PETHE/EMCO/BCPL.	
4.29.4	Shoe brake : BCH/INDUSTRIAL SYNDICATE / STROM KRAFT / ELECTROMAG DEVICES/ ELECTRONIC & POWERCONTROL CO.	
4.29.5	Limit Switches : SIEMENS/ STROMKRAFT / EPC/ BCH/ Technocrat/AEG /GENELE/AG MECH/AGENGG.	
4.29.6	Push button station : SIEMENS/ L&T/BCH/ GE Power Controls.	
4.29.7	Resistors : BCH/ STROM KRAFT/ INDUSTRIES SYNDICATE / Electromag devices/ PEFCO/ SIEMENS/ RESITECH/ OHMARIC controls.	
4.29.8	Contractors : L & T/ SIEMENS/BCH/TELEMCHANIQUE.	
4.29.9	HRC fuses : SIEMENS/L&T/GEC ALSTHOM.	
4.29.10	Cables : CCI/ UNIVERSAL/FORT GLOSTER/ Asian CABLES/ Delton/ Finolex/ NICCO	
4.29.11	Electric Hoist Control : BCH, SIEMENS, controls & switchgear co. Ltd.	
2.29.12	Servo Voltage stabilizer : NEEL/ DELTA / AEI / POWER AID	
2.29.13	MCCB : SIEMENS/ GEC ALSTHOM.	
4.30	Mechanical Equipment:	
4.30.1	Wire Rope : Bombay wire rope/ United wire rope/ Usha Martin/ Fort Williams/ J K Steels	
4.30.2	Bearings : SKF/ FAG/ NBC/ TIMKEN	
4.30.3	Couplings : Hi cliff/ Concord/ Wellman Incandescant/ New Allenburry works	
4.30.4	Oil seals : Vasco Seals/ Rubber equipment and Engineering Comp. Ltd.	
4.30.5	Telescopic Fork : Euro fork, Italy / Demag, UK/ Spring Vale Group, UK	
4.30.6	Gear boxes : Siti/ Elecon/ Any other reputed manufacturers	

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SECTION-V

INSPECTION AND TESTING

- 5.1 The supplier shall carry out tests for all parts and bough-out items, and internal test certificates shall be furnished along with inspection call.
- 5.2 Tests shall be carried out in accordance with QAP(Quality Assurance Plan) which is to be enclosed along with offer by the supplier.
Acceptance criteria shall be in accordance with referred standards.
- 5.3 All test certificates shall be strictly in A4 size. All copies of test certificates shall be duly signed by authorized person and it shall be on a good paper with legible printing.

SECTION-VI

DOCUMENTATION:

List of drawings, catalogues & Manuals to be submitted by the supplier during project execution:-

Sl. No	Document title/Proj. drg. No.	No. of copies	Status	Submission Schedule from the date of LOI
1.1 1.2	Layout and General arrangement drawings. Detailed BOM (indicating type, size, quantity etc)	4	For approval	20 days
2.0	Catalogues & maintenance manuals	6	For information and final document	4 weeks
3.0	Internal Test Certificates	6	Final document	Along with inspection call
4.0	Inspection report and Test Certificates	6	Final document	1 week after inspection.
5.0	As built drawings for items mentioned in Sl. 1	6	Final document	1 week after inspection.

All drawings shall show the following particulars in the lower right hand corner:

Project Title, Name of the Customer, Title of the drawing, Date of drawing, Supplier's Drawing No., Total No. of Sheets, Sheet No., Revision No. & Date,

All drgs shall be checked and signed by supplier.

Any relevant change while approving the design / drawing will be accepted by supplier

Final payment is subjected to furnishing the complete documentation in required number of sets.

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SECTION-VII

APPLICABLE ANNEXURES

- Annexure-1 : Basic layout drawing of ASRS - 1 Sheet
Annexure-II : Part-A, Qualifying criteria - 3 Sheet

SECTION-VIII

INFORMATION TO BE FURNISHED ALONG WITH THE TECHNICAL OFFER:

- a. Vendor shall take a xerox copy of this enquiry specs and against each clause, subclause no. explicitly mentioned their acceptance by mentioning 'agreed' or bringout deviations (if any) in the right hand side and enclose the same with the offer.
- b. QAP (Quality assurance plan) to be submitted along with offer, duly signed & stamped by the supplier along with detailed inspection and test schedules.
- c. Unpriced price offer along with detailed BOM (corresponding items shall be given with price-breakup in price bid separately in sealed envelope).
- d. All other information as asked in section 3 & 4.
- e. Configuration diagram indicating all dimensions.
- f. Method of forming hollow sections:
- g. The supplier should give details of process that will be adopted for major items
- h. Process adopted for cleaning and phosphating the parts.
- i. Supplier shall submit complete details of all members of the complete structure including fasteners anchor bolts with all dimensions, thickness, weights etc.

SECTION – IX

GUARANTTEE AND MAINTENANCE

9.1 GUARANTTEE

During the Guaranttee period, any defect or malfunctioning of the equipment shall be rectified at site by the Vendor within 48 hours of fault reporting at his own cost which includes the cost of required spares /deficient parts / Consumable and that of deputing qualified personnel for repair / preventive maintenance.

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SECTION – X

INSTALLATION AND COMMISSIONING

10.1 INSTALLATION

Supplier shall depute his expert engineer to BHEL TRICHY site to **supervise** installation & Commissioning as per scope & services in Section-III.

10.2 Testing and final commissioning at site :

On completion of successful testing the functions are to be demonstrated to the final users' representatives.

10.3 Safety

It is the responsibility of the successful bidder to ensure the safety of his staff at the work spot during erection and are covered by insurance policy. He should ensure that his workers follow all the safety regulations of BHEL.

SECTION – XI

PRICE SCHEDULE

11.1 Price format shall correspond to total scope with the breakup price item wise as shown in the scope of supply shall be given as listed under section-III, in sealed envelope super scribing at the top "Price Bid".

- a) Manually operated Storage and Retrieval machine.
- b) Unit rate for 2 years normal operation and maintenance Spares as per list attached.
- c) Erection and commissioning services to be quoted separately.
- d) Freight charges to be quoted separately.
- e) Automation Package. (Take off price, shall be quoted in a separate sealed envelope super scribing at the top "Price Bid for automation package") with 6 months validity period.

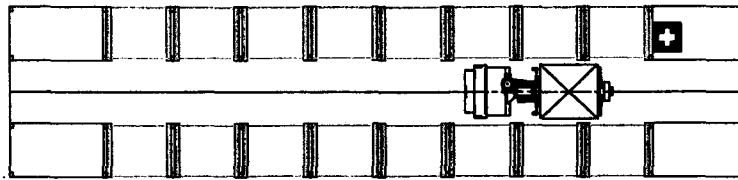
Note: 1. Order may be placed on later date for the automation package.

2. Break up price to be furnished for the purpose of addition / deletion of the scope during detailed engineering.

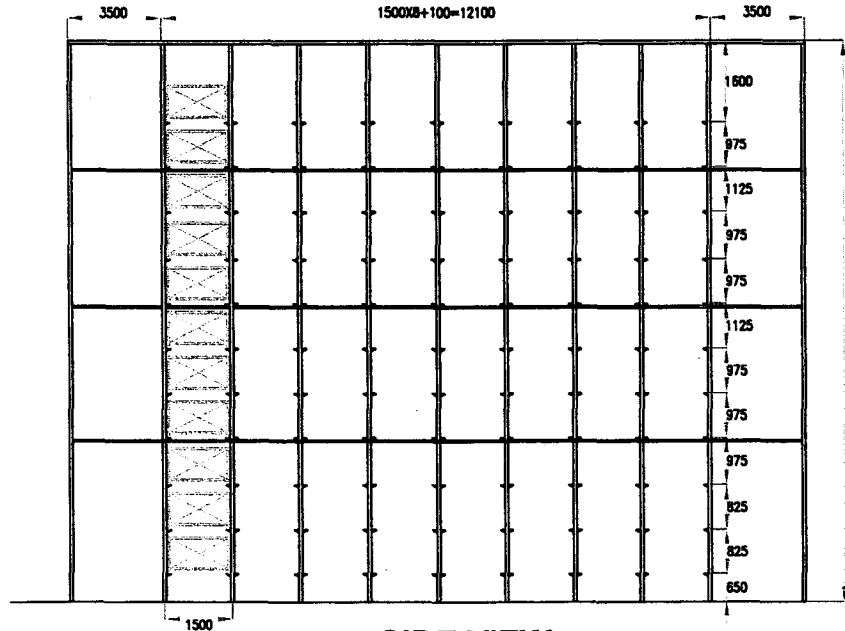
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

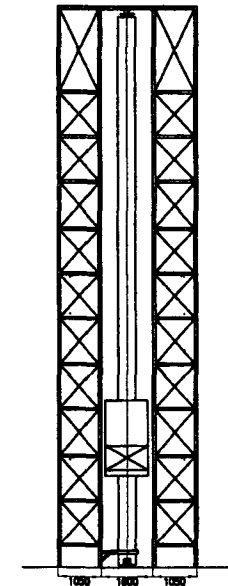
ANNEXURE - I



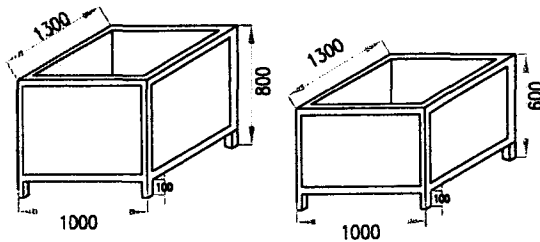
TOP VIEW



SIDE VIEW



FRONT VIEW



PALLETS DETAILS

NO. OF COLUMNS: 8
 NO. OF LEVELS: 11 (First 3 level Small Pallets and remaining are Big Pallets)
 TYPE OF RACKING: SINGLE DEEP
 TOTAL NO. OF BINS: 176 BINS
 LOAD PER LOCATION: 2.0 TONS
 TOTAL STORING CAPACITY: 352 TONS

IS-3-GA-374-701-S001

DRG. NO.

INVENTORY NO.

FORM 66-301 A

REV. NO.	DATE	DESCRIPTION	BY	APPD.	APPROVED
07					
06					
05					
04					
03					
02					
01					

FOR TENDER PURPOSE ONLY					
	NAME	SIGN.	DATE		
DESIGNED	R.Das		11.09.2008		
DRAWN	Ratnesh	Ratnesh	11.09.2008		
CHECKED	P.V.Toppo		11.09.2008		
APPROVED	R.Das		11.09.2008		

CUSTOMER/ PROJECT :		ACTUATOR WARD - 34, BHEL, TIRUCHIRAPALLI			
BHARAT HEAVY ELECTRICALS LIMITED INDUSTRIAL SYSTEMS GROUP, BANGALORE					
TITLE :					NO. OF SHEETS 01 SHEET NO. 01
G.A. OF RACKS FOR ASRS FOR BHEL, TIRUCHIRAPALLI					
SCALE N.T.S	JOB NO. IS-1-08-2012	DRG. NO. IS-3-GA-374-701-S001	REV. 00		



DIR : ASRS

FILE NO.: 105297

PART A**STACKER CRANE FOR HANDLING ACTUATORS - 2 TON CAPACITY****SECTION - I : QUALIFYING CRITERIA**

The BIDDER has to compulsorily meet the following requirements to get qualified for considering the technical offer for the STACKER CRANE FOR HANDLING ACTUATORS

S. No.	REQUIREMENTS	Vendor's Response
1	<p>Only those vendors (OEMs), who have supplied and commissioned at least one stacker crane of 2 ton capacity or more, with integrated controls for an ASRS system in the past ten years and such crane should be working satisfactorily for a minimum period of one year after commissioning, as on the date of opening of this Tender are eligible to quote.</p> <p><i>(However, if such machine is already supplied to BHEL, then that machine should be working satisfactorily for a minimum period of six months after commissioning, as on the date of opening of this Tender.)</i></p>	
The vendor should submit the following information where similar stacker crane for ASRS has been supplied, for qualification of this offer.		
1.1	Name and postal address of the customer or company where similar stacker crane is installed.	
1.2	Name and designation of the contact person of the customer.	
1.3	Phone, FAX no and email address of the contact person of the customer.	
1.4	Month and Year of commissioning of the stacker crane.	
1.5	Pay-load capacity of stacker crane supplied.	
1.6	Along with the Technical offer, the Vendor should submit one Performance certificate from the customer for the satisfactory performance of the stacker crane supplied to them. For obtaining the Performance certificate, a suggestive format is provided in SECTION - IV .	
2.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	

SECTION - I I

The BIDDER / VENDOR is requested to provide the following information:

S. No.	REQUIREMENTS	Vendor's Response
3.0	The BIDDER/VENDOR to furnish Reference List of Customers, with full address, details of contact person, where STACKER CRANES for ASRS have been supplied in the past.	
4.0	Details of STACKER CRANES for ASRS supplied to other BHEL units, if any. (Year of commissioning, payload).	
5.0	Details on SERVICE-AFTER-SALES Set-Up in India including the Address of Agents / Service Centers in South India.	
6.0	Any Additional Data to supplement the manufacturing capability of the BIDDER for the subject equipment.	

SECTION - III

The BIDDER to note:

S.No.	PARTICULARS	Vendor's Response
7.0	The BIDDER / VENDOR shall submit the offer in TWO PARTS. 1. Technical Offer [with PART A & PART B] and Commercial offer. 2. Price Bid.	
8.0	The Technical Offer shall contain a comparative statement of Technical Specifications demanded by BHEL and Offer Details submitted by the Bidder , against each clause. A just 'CONFIRMED' or 'COMPLIED' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer.	
9.0	The Technical Offer shall be supported by product Catalogues & Data Sheets and also technical details of Bought-Out-Items with copies of Product Catalogue to the extent possible.	
10.0	The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation.	

SECTION – IV

The performance certificate should be produced on Customer's Letter Head.

PERFORMANCE CERTIFICATE

1. Supplier of the Stacker Crane for ASRS		
2. Make & Model of the stacker crane		
3. Month & Year of Commissioning		
4. Application for which crane is used		
5	a) Payload capacity	
	b) Type of controller used	
6. Performance of the Equipment (Tick whichever is applicable)		Best in the market
		Satisfactory
		Good
		Average
		Not Satisfactory
7. Any Other remarks		
Date:		Signature & Seal of the Authority Issuing the Performance Certificate