

Bharat Heavy Electricals Limited

HIGH PRESSURE BOILER PLANT, TIRUCHIRAPALLI-620014.

CONTROLS & INSTRUMENTATION



CI:1728:ELEV / Rev 00

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SPECIFICATION FOR PASSENGER AND GOODS CUM PASSENGER ELEVATOR

REV. NO	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
00	03-04-2019	FRESH RELEASE	AA <i>[Signature]</i>	KB <i>[Signature]</i>	AKP <i>[Signature]</i>

CLAUSE NO.	TECHNICAL DELIVERY CONDITIONS	
1.0	SITE CONDITIONS	
	Altitude above MSL	Less than 1000m.
	Relative humidity	100%.
	Design Ambient Temp.	50 deg.C
	Atmosphere	Tropical, Dusty, Corrosive and highly polluted.
	Wind loads	As per IS-875(Part 3)
2.0	GENERAL	
	This specification is intended to cover the design, engineering, manufacture, inspection, delivery, erection, commissioning, maintenance and services before handing over to Customer for Passenger Elevator and Goods cum Passenger Elevator in boiler applications. Vendor shall ensure accurate, reliable and trouble-free operation in corrosive, dusty environments.	
3.0	PRE QUALIFICATION REQUIREMENT (APPLICABLE IN CASE OF OPEN TENDER)	
	The elevator offered shall be in satisfactory operation for boiler application in fossil fuel fired thermal power plants of unit rating 250MW or above. Vendor shall submit a list of reference thermal plants (with elevator capacity, landing levels and travel) where their elevator is in satisfactory operation for more than one year. Commissioning and service support for the elevator shall be available in India	
4.0	STATUTORY REQUIREMENTS	
	All registration and statutory inspection fees if any, in respect of his work pursuant to this contract shall be to account of the elevator vendor. However, any registration, statutory inspection fees lawfully payable under the provision of any statutory laws and its amendments from time to time, during erection in respect of the plant equipment ultimately to be owned by Customer shall be to the account of the Customer. Should any such inspection or registration need to be re-arranged due to the fault of the vendor or his sub-contractor, the additional fees for such inspection and / or registration shall be borne by the vendor. While the statutory payment shall be made by Customer for any registration, statutory inspection etc. during erection, the vendor shall be responsible for carrying out and co-ordinating various activities with the statutory authority as well as for obtaining the clearance and registration of the equipment.	
5.0	REFERENCE STANDARDS	
	The Elevators shall be designed in line with the recommendation contained in the latest editions of Standards IS: 14665: 2000 (All Parts) . The equipment shall comply with latest revision of Indian standard and wherever 'IS' is not available, it shall comply with the generally accepted international codes and practices.	
6.0	SCOPE OF WORK	
	i) Design, engineering, manufacture, inspection, delivery, erection, commissioning and handing over. ii) Maintenance & services during guarantee period. iii) Necessary erection / commissioning spares and consumables shall be included in vendor scope. iv) Necessary tools and tackles required for maintenance, testing and inspection shall be covered in vendor scope. v) Necessary chain and pulley block along with hand operated geared trolley arrangement for horizontal movement across the monorail, hoist, rope and hook arrangements at the machine room ceiling to carry out the maintenance and erection of equipment shall be supplied by Elevator vendor. The necessary mono-rail beam will be supplied by BHEL. vi) A steel ladder for access to the pit shall be supplied by the Elevator vendor. vii) Guard to protect the hoist way including temporary barricades at hoist way openings shall be supplied by Elevator vendor. viii) Scaffolding as per erection requirement shall be provided by the Elevator vendor. After completion of handing over activities, the scaffolding materials may be taken back by the vendor. ix) All the electrical equipment including Lift well, Hoist way & machine room lighting with fittings, Power/control/trailing cables, MCCB/MCB & ELCB for 415 V AC 3ph supply and 240 V AC single phase supply (to receive the incoming feeders provided by Customer) shall be included in the Elevator vendor scope. x) The vendor shall assume all responsibility for proper design and operation of each and every component of the elevator as well as the elevator as a whole. Complying with Indian electricity rules & Indian electricity acts and applicable statutory requirements (of Government of India and applicable States) as well as procedural formalities also shall be taken care by the Elevator vendor.	
7.0	EXCLUSIONS	
	Works not included in elevator contract, but furnished by others in accordance with local codes and regulations and the approved drawing of the Elevator vendor. i) Civil works associated with the Elevator pit. ii) Furnishing and installation of steel beams (Hoisting beams) in the machine room to lift equipment during installation and to facilitate maintenance.	

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	iii) Machine room civil works including concrete flooring. iv) Steel structures for Columns and associated bracings and approach platforms up to landing doors at each level. v) Supporting steel material between hoist way & car will be provided by BHEL.	
8.0	ELEVATOR PARTICULARS & DESIGN PARAMETERS	
	i) Passenger Elevator and Goods cum Passenger Elevator shall be provided with 1 no. fireman's switch (Alarm Switch). ii) The Elevator shall be located on the side of the boiler as indicated in the plant layout drawing which will be provided during detailed engineering. iii) Entry to the Elevator shall be indicated in the enquiry. Foundation plan and elevation with landing levels shall be as per BHEL drawings. iv) The entire system and accessories should not contain any asbestos material.	
9.0	Design Criteria and Equipment specification for Passenger Elevator & Goods Cum Passenger Elevator.	
	i) Type of service ii) Number required iii) Load on the Elevator iv) Rated speed v) Total travel vi) No. of floors to be served (Landing levels) vii) Entrances viii) Method of control Motor Speed Control: Logic Control: ix) Flooring of Car x) Position of Machine room xi) Design, construction and finish of car	Passenger Elevator and Goods cum Passenger Elevator As per enquiry As per enquiry 0.55 meter/ sec for Goods cum Passenger Elevator 1.0 meter/sec for Passenger Elevator. As per enquiry As per enquiry One number in each floor Variable Voltage variable frequency (VVVF) control. Microprocessor based Control with automatic level adjustment. The control system shall be of field proven design and having satisfactory track record. Chequered plate (6 mm thick). Car floor shall comprise of a smooth non-slip surface. Directly above the Lift shaft SS (ASTM-304 No: 4 Hairline finish)
	xii) Car door xiii) Landing door xiv) Car Enclosure xv) Lighting and fan in the car xvi) Method of operation of car door and landing door xvii) Operation of Elevator xviii) Signals / Indicator	SS (ASTM-304 No: 4 Hairline finish) MS sheet fabricated, smooth finish, spray painted to approved shade. SS (ASTM-304 No: 4 Hairline finish) LED light fittings for illumination level of 100 lux on Car floor shall be provided. Cabin charger ventilation fan with control suitable for operation on 240 V, 50 Hz, AC single phase power supply shall be provided. Adequate ventilation and illumination of car to be ensured. Power operated type – automatic, Horizontal Centre opening / closing car and landing doors. Automatic, simplex, selective, collective with and without attendant, through illuminated pushbutton station located inside the car with provision for locking control in Auto or attendant position. Car position indicator in car, Digital hall position indicator at all floors, Up & down travel direction position indicator, tell-tale lights at all floors. Soft touch keys and digital luminous display in car operating panel and on all floors landings. "Door Open" button and "Door Close" button shall be provided in car operating panel. Battery operated alarm bell and emergency light with suitable battery and battery charger and controls. Audio annunciation and Visual indication for car position indication inside the car and at landing platforms shall also be provided inside the car. Overload warning indicator with visual & audio annunciation. All fixtures shall be in stainless steel face plates. For facilitating the movement of visually & hearing impaired persons, hall lantern and car arrival chimes shall be provided.

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	xix)	Shaft lighting	The Elevator shaft shall be suitably illuminated by providing CFL fittings at every 3m (three metres) from bottom of Lift well.
10.0	DETAILS OF SPECIAL TREATMENT FOR ELEVATOR		
	As the Elevators are to be installed in a heavily polluted and dusty area in a thermal power station. All the Elevator components shall be given special corrosion resistant treatment.		
	i)	Car guide & Counter weight guide	Anti-corrosive epoxy paint
	ii)	Fish plates	Anti-corrosive epoxy paint
	iii)	Car & Counter weight buffer	Anti-corrosive epoxy paint
	iv)	Supports(Buffer)	Anti-corrosive epoxy paint
	v)	Rail Brackets	Anti-corrosive epoxy paint
	vi)	Bracket & rail fasteners	Zinc-passivated with epoxy painted
	vii)	Tie down bolts	Zinc-passivated with epoxy painted
	viii)	Machine	Anti-corrosive epoxy paint
	ix)	Brake adjusting screw & coupling fasteners	Zinc-passivated
	x)	Bracket	Anti-corrosive epoxy paint
	xi)	Controller cabinet	Anti-corrosive epoxy paint as per industry standard.
	xii)	Hall buttons	Dust-proof with stainless steel hardware.
	xiii)	Car operating panel	Dust proof contact & button with SS hardware. Main face plate SS. All fixtures shall be in Stainless Steel face plates.
	xiv)	Governor	Cover and casting epoxy painted. Other components zinc plated.
	xv)	Governor Tension frame	Hot dip galvanised and anti-corrosive epoxy paint with M.S. shaft for sheave.
	xvi)	Car frame, level brace rods and counter weight frame	Epoxy paint as per IS-1477 Part 1 & 2.
	xvii)	Safety equipment (Linkages)	Zinc-plated
	xviii)	Safety switch and car gate switch	IP-65. Dust proof heavily zinc plated arm, stainless steel shaft and housing as per vendor standard.
	xix)	Guide shoe	Zinc-plated
	xx)	Cam bar mountings and channels	Zinc-plated and anti-corrosive epoxy paint
	xxi)	Counter weight frame	Anti-corrosive epoxy paint
	xxii)	Guide shoe with Nylon ribs	Zinc-plated
	xxiii)	Filter weights	Anti-corrosive epoxy paint
	xxiv)	Rope fasteners	Zinc-passivated and chromate dipped
	xxv)	Hoist rope	Greased, Self-lubricating
	xxvi)	Governor rope	Greased, Self-lubricating
	xxvii)	Landing door	Anti-corrosive epoxy paint
	xxviii)	Alarm and door open bells (Electronic hooter)	Painted.
	xxix)	Junction box	Metallic body - dust proof with Anti-corrosive epoxy paint
	xxx)	Hall position indicator and car position indicator	Dust proof with stainless steel enclosure and Face plate. All fixtures shall be in Stainless Steel face plates.
11.0	MECHANICAL EQUIPMENT		
11.1	ELEVATOR CAR		
	The car platform frame and sling shall be of steel construction. The platform shall be suitably isolated from its sling. The car shall be enclosed with suitably braced and reinforced sheet metal panel. The sheet metal panel shall have ventilation slots at the base. All other exposed steel or cast surfaces shall be painted with anti-corrosive epoxy paint and suitable primer. The car shall be provided with the following accessories: i) Car control station with position indicator inside the car and at landing platforms. ii) An emergency stop switch (shall have two sets of potential free contact. Second one shall be taken and terminated in machine room for further connection by Customer). This is as per IS 14665 Part 2 Amendment 3 Clause 9.6 - "An emergency stop switch, of manually opened and closed type, shall be provided on top of every lift car and shall be marked conspicuously". iii) A three pin plug & socket with switch on top of Elevator car for use by persons working there on.		

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	iv) Telephone instrument shall be provided inside the car. Connection from the same shall be brought up to the machine room for further connection to plant network by Customer. Telephone instrument provided inside the car shall have provision for hands free operation also, i.e. Speaker phone shall be provided for hands free operation. v) For better safety, elevator vendor to provide car top barricade on car top to ensure that service personnel stay inside the car region. A selector switch and a set of push buttons shall be provided to operate the elevator locally for inspection and maintenance. The selector switch when set to position "inspection" shall exclude control from other places and movement of the car in the desired direction shall be effected by the push buttons. For normal operation of the elevator, the selector switch shall be set to the position "Working". It shall be possible to operate the elevator only when the appropriate button is kept in pressed condition. The roof shall be strong enough to support at least two persons. vi) Adequate lighting and ventilation shall be provided in the Elevator car. The car shall be fitted with fan of adequate capacity and LED light fittings. The car platform shall be robust in construction and elegant in appearance. vii) The car shall be provided with an emergency alarm push button inside the Elevator car which shall be clearly marked. The alarm shall be clearly audible outside the Lift way in order to obtain assistance in case of breakdown or failure between the floors. viii) Car interior shall be equipped with handrails on three sides.
11.2	CAR DOOR The car door shall be of hollow metal construction minimum 16 gauge thick sheet steel. Sides of the door shall be flush with all seams continuously welded. Guide shoes shall be rubber or roller type designed for operation on unlubricated guides. The car door shall be provided with locking gear of heavy and robust construction, so arranged mechanically and interlocked that the doors cannot be opened unless the Elevator car is within a particular landing zone. Conversely the Elevator shall not move until all the landing doors are closed and interlocked properly. Construction of car door shall meet the requirement of BS 476 (Part 20 & 22). Width of Car Entrance shall be 1800mm for Goods cum Passenger elevator and 1100mm for Passenger elevator. The live load shall be taken into consideration while designing doors, door frame and hanger tracks. The car doors shall be designed such that their closing and opening is not likely to injure a person. Electronic door detector (Infra-red curtain type) shall be provided. Mechanical device shall also be provided to re-open the door if presence of person or any object is detected in between the door.
11.3	LANDING DOORS All landing openings in the Lift well enclosure shall be protected with doors which shall extend the full height and width of the landing opening. The type of door provided shall be similar to the Elevator car door. Every landing door shall be fitted with a locking device. The door shall be suitably interlocked so that they cannot open unless the car is within a particular landing zone. The locking device is closed until the door is closed. The levers operating the locking devices shall not interfere with the landing side or Elevator enclosures. Landing doors of the elevators shall have fire resistance of at least two hours as per IS 14665 Part 2/Sec-1 Amendment no.1. These doors shall also be smoke tight as far as possible. Construction of Landing door shall meet the requirement of BS 476 (Part 20 & 22). Rain canopy for landing door operating panel shall be provided.
11.4	LOAD PLATE A load plate displaying the rated load of the Elevator in terms of persons and kilograms shall be fitted in the car in a conspicuous position.
11.5	SUSPENSION ROPES The car and the counter weights shall be suspended by steel wire ropes. Chain shall not be used for suspension. Not less than four independent stranded steel wire suspension ropes shall be used for car or counter weights of the Elevator with traction drive. The diameter of the stranded rope shall not be less than 12.5 mm and minimum factor of safety shall not be less than 12. The suspension ropes shall conform to latest edition of IS 2365 – "Specification for steel wire suspension ropes for Lifts and hoists".
11.6	SHEAVES AND PULLEYS All driving sheaves and pulleys fixed to and revolving with the shaft shall be fixed by means of sunk keys of sufficient strength and quality. Sheaves and pulleys shall be made of cast iron as per the latest edition of IS 14665 and free from cracks, sand holes and other injurious defects. They shall have suitable flanges and smoothly machined rope grooves. The diameter of the sheave or pulley shall be as specified in the latest edition of IS 14655 or equivalent International Standards.

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11.7	SHAFT
	Shafts and axles shall be forged steel. They shall have sufficient rigidity and bearing surface. Any shaft when stepped shall be turned to a reasonable radius at the point of reduction.
11.8	COUNTER WEIGHTS
	The Elevator shall be provided with suitable counter weights located in the Lift shaft. The counter weight shall be designed for smooth and easy operation of the Elevator and shall be in accordance with Indian Standard (or) equivalent International Standard. Suitable counter weight screen shall be provided in the Elevator shaft. The counter weights shall consist of cast iron weight contained in structural steel frame. The traction should be such that no appreciable slip may occur but that slip shall be free to take place upon the landing of either the car or the counter weights.
11.9	GUIDE RAILS
	Guide rails for the car and counter weights shall be machined 'T' sections and continuous throughout the entire length and shall be provided with adequate steel brackets or equivalent fixing of such design and spacing between brackets shall be such that to avoid any deflection during the normal operation. Guide rails section shall be adequate to withstand the forces resulting from the application of the safety gear when stopping the counter weights or fully loaded car. The guide shoes or their lining shall be easily renewable, adjustable and self-lubricated. Guides shall be of such length that it shall not be possible for any of the car or the counter weight shoes to run off the guides.
11.10	BUFFERS
	Sufficient number of buffers of spring loaded type shall be fitted below the Elevator car and counter weights. The buffers shall be capable of stopping the car or counter-weights without permanent damage or deformation to itself or any part of the Elevator equipment. The number of buffers shall be so fixed as to ensure proper sharing of the impact loads by all of them.
11.11	EMERGENCY SAFETY DEVICES AND BRAKES
	The Elevator shall be provided with safety device attached to the Elevator car frame and placed beneath the car. The safety device shall be capable of stopping and sustaining the Elevator car up to governor tripping speed with full rated load in car. The application of the safety device shall not cause the Elevator platform to become out of level in excess of 3 cm/m measured in any direction. Slack rope switches, if necessary, shall also be provided. The Elevator vendor shall also provide personnel evacuation system during the power failure to the Elevator. The Machine shall be provided with direct current spring set, solenoid release double shoe brakes of sufficient capacity to stop the car at any position with the design load. These brakes shall be designed in such a way that it gets applied automatically in the event of power failure. In case fire alert, a safety device shall ensure automatic return of the cabin to the floor access level. Emergency indicator to indicate the location of elevator in case of elevator being stuck up between the floors through automatic flushers (both visual & audio).
11.12	AUTOMATIC RESCUE DEVICE (ARD)-(BATTERY DRIVE)
	Vendor shall provide a modern advanced electronic drive system of "RESCUING Passengers Trapped in an ELEVATOR" in case of power failure. In addition to the above, bell and cranking device to be provided with hand wheel connected with motor shaft for manual lowering of elevator to the nearest landing level. For all Elevators with ARD, an audio & visual indicator shall be provided inside the Elevator car to alert the person trapped inside that he/she is being rescued. Capacity of battery shall be such that minimum three rescue operations can be performed without recharging. ARD panel shall be suitable for floor mounting.
11.13	OVERLOAD DEVICE
	Every passenger Elevator shall be provided with an overload device, which will prevent the Elevator from starting in case the Elevator car is loaded to 110 percent of the rated capacity of the Elevator or more. Elevator shall remain stationery with door open. Audio & visual warning device (Load weighing device) shall be provided to alert the passenger in case of overload.
11.14	OVER SPEED GOVERNOR AND GOVERNOR ROPES
	Governor shall be located where there is sufficient room for their proper operation and where they cannot be struck by the Elevator car or counter weight in the event of over run. Each governor shall be marked with tripping speed in terms of car speed in m/sec and the motor control and brake control circuit shall be opened before or at the time the governor trips. As per IS 14665 (part4/Sec 4):2001, the nominal rope diameter for over speed governor shall be minimum 6mm. However for elevators where travel height is more than 90 meters, the nominal rope diameter for over speed governor shall be minimum 8mm.

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11.15	LEVELLING DEVICE
	The Elevator shall be provided with a two way automatic levelling device. The levelling device shall take care of overrun and under run of the car and rope stretch, such that car floor is within 6.0 mm from the landing level at all floors while in operation. Aprons of sufficient depth shall be fitted to the car floor to ensure that no space is permitted between the threshold and the landing while the car is being levelled to floor.
11.16	MACHINE ROOM AND OVERHEAD STRUCTURES
	All the overhead machinery shall be supported on beam to be furnished by the vendor. The machinery support beam shall rest on top of or be designed to be framed into the vendor's structural steel frame for the boiler house. The Elevator drive controller and all other apparatus and equipment of Elevator installation, except such apparatus and equipment which function in the machine room shall be located at the top of the Lift well. Adequate machine room and hoist way lighting shall be provided by the Elevator vendor. Machine room shall be provided with minimum 200 Lux illumination. Sound reducing materials below machines in machine room shall be provided. The maximum load transmitted by the heaviest equipment to the machine room floor and other structures like guides etc. shall be furnished by the Elevator vendor. MACHINE ROOM Air conditioning Machine room shall be provided with 5 tonnes or with 1 No. of two tonne and 2 nos. of 1.5 tonne capacity A/C units (minimum). If higher capacity of A/C is required for proper cooling, the same is to be indicated in the offer.
11.17	TERMINAL SLOW DOWN NORMAL STOPPING AND FINAL LIMIT SWITCHES
	Every electric lift shall be provided with upper and lower terminal slowdown and normal stopping limit switches arranged to stop the car automatically within the limits of top car clearance and bottom run by (over travel) from any speed attained in normal operation in accordance with IS 14665 (Part 3/Sec 1): 2000. Such limit switches shall act independently of the operating device and the final limit switches. Final limit switches in accordance with IS 14665 (Part 3/Sec 1): 2000 shall be provided to stop the car automatically within the top and bottom clearance independent of normal operating device and the terminal stopping device. The switches shall be so arranged so as to open before the buffers are engaged. The final limit switch shall act to prevent movement of the car under power in both directions of travel and shall after operating, remain open until the Elevator car has been moved by a hand operating mechanism within the limits of normal travel. Elevator shall be suitable for continuous 24 hours round the clock operation.
12.0	ELECTRICAL EQUIPMENT AND CONTROLS
12.1	OPERATION AND INTERLOCKS
	The operation of the Elevator shall be simplex, selective, collective, and automatic, with or without operator. The Elevator operation shall conform to the following requirements. i) The operation of the Elevator shall be through a push button station located inside the car. ii) The Elevator shall not move unless the car door, landing door and all other protected openings connected with the control circuit are closed. iii) Two push buttons, one for upward and the other for downward movement at each intermediate landing and one push button at each terminal landing shall be provided in the landing floors in order to call the car. iv) The landing doors shall be interlocked so that the landing door at any floor shall not open when the Elevator is not on that floor. v) Push button shall be fixed in the car for holding the doors open for any length of time required.
12.2	ELEVATOR DRIVE
	The Elevator drive shall be equipped with automatic electromagnetic coil type brakes. The Elevator shall be driven by a drive suitable for method of control offered by the Elevator vendor. No friction gearing or clutch mechanism shall be used for connecting the main driving gear to the sheaves.
12.3	ELECTRIC MOTORS
	Motors shall be as per IS 325 and suitable for the Variable Voltage Variable Frequency (VVVF) application. All motors shall be squirrel cage induction type, suitable for operation at 415 V (+/- 10% variation), 3 phase, 3 wire, 50HZ (+3% to -5% variation) supply suitable for frequent starting with S4 duty class (S3 duty class also acceptable, if necessary for the application and subject to end user acceptance), CDF 40%, Maximum 150 starts per hour at 50 Deg. C ambient and with IP 54 protection class for enclosures. Motor pull out torque shall be at least 275% of

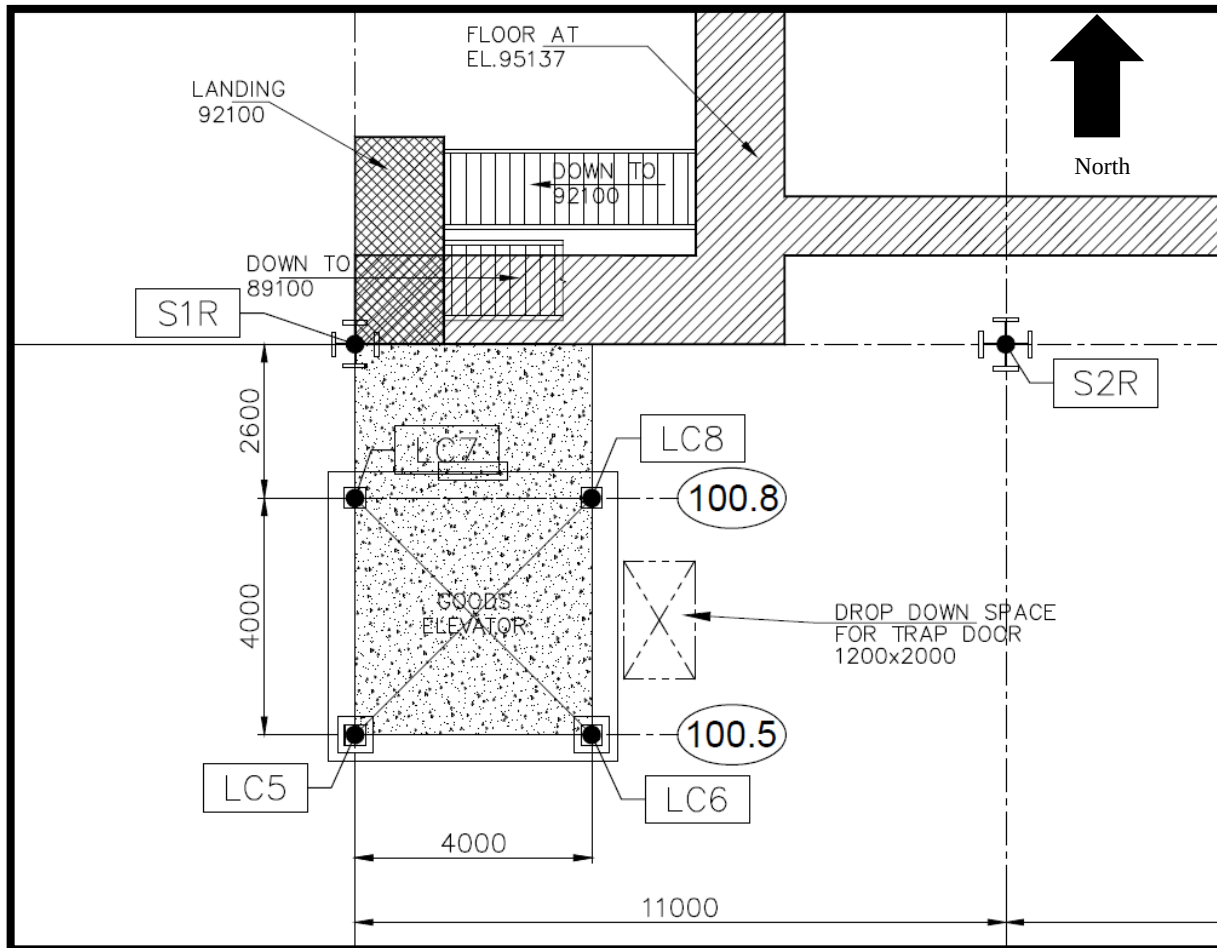
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	rated torque (Pull out torque 240% of rated torque also acceptable, if necessary for the application and subject to end user acceptance). Motor shall be of TEFC type. Motor insulation shall be class F or superior with temperature rise limited to 70 Degree Celsius. Motor paint shade shall be RAL 5012.
12.4	CONTROLLERS
	The controllers shall be designed to start, accelerate, stop and reverse the elevator when the appropriate push buttons are pressed. The controllers shall be advanced microprocessor based having latest design. Contact finger buttons shall be easy to adjust and replace. The speed control device shall give smooth, easy and accurate speed control. The Elevator controls shall be housed in dust and vermin proof enclosures. The controls shall be wired with stranded copper conductor cables. All equipment mounted shall be neatly labelled as per wiring diagram. Ventilating louvers are to be provided in the panels. Control panel shall be suitable for floor mounting.
12.5	CABLES AND INTERNAL WIRING
	Wiring shall be done as required to interconnect all Elevator electrical equipment including all power wiring from the main supply source in the machine room. Power cables shall be 1100 V grade multi core, stranded with XLPE insulation, FRLS type ST2 inner sheathed, galvanised steel wire armoured and overall extruded FRLS, Type ST2 PVC outer sheath. If unarmoured cables are used all the cabling/wiring between the equipment in the lift machine room and between machine room and equipment in the lift well and at the landings shall be wired in HDP conduit/ galvanised steel conduit. The circular trailing cables shall conform to IS 4289 Part-I (Elastomer insulated) or IS 4289 Part II (PVC insulated) / Flat type trailing cable shall conform to IEC 60227-06. All other cables shall conform to latest edition of IS: 7098, IS:1554 & IS:5831. Following FRLS properties shall be complied with. a) Oxygen index of min. 29 (as per IS:10810 Part-58) b) Acid gas emission of max. 20% (as per IEC-754-I). c) Smoke density rating shall not be more than 60% (as per ASTM D-2843).
12.6	CABLING AND EARTHING
	Earthing shall be carried out as per IS 14665, IS 3043 and Indian Electricity Rules. The Elevator structures, motor, frames, metal cases and all electrical equipment including conduit, cable armouring and guards shall be properly bonded and earthed by two separate and distinct connections. The earth connection station mat shall be done by Customer.
12.7	POWER SUPPLY
	One three phase 415V, AC, 50 Hz Emergency Supply for Elevator main motor, and one single phase 240V, AC, 50Hz supply feeders for lighting, air conditioner and control panels will be provided in the machine room by BHEL. The exact Power requirement in kVA of three phase supply and single phase power supply shall be indicated in the offer itself by the vendor. All other power supplies required for elevator shall be derived by the vendor from these power supplies. The junction box having MCCB/MCB/ELCB Isolation of adequate rating shall be arranged by the vendor to receive the above supplies. The Elevator vendor shall also indicate the proposed location of junction box in the machine room. All further distribution, cabling and wiring from the junction box shall be carried out by the Elevator vendor. The vendor shall arrange to tap power supply required for constructional purposes from the point terminated by Customer.
13.0	OTHER REQUIREMENTS
	Electric high speed door operators for the opening and closing of the car doors and landing doors shall be furnished and installed. The car and landing doors shall be mechanically connected and shall move simultaneously in opening and closing. The car door and landing door shall be power closed and shall be controlled in opening and closing by oil cushioning mechanism built into the gear unit or alternate arrangement equally / better than this. Necessary lockable switches shall be provided in the Elevator machine room to control the operation of the door. Should the electric power fail, it must be possible for the doors to be opened from within the car, provided the car is exactly at the landing level. Overload relays shall be provided to protect the drive motor against overload or a power failure. Suitable protection shall be provided on the controller to protect the Elevator equipment from phase reversal, low voltage. Suitable arrangement shall be provided to intimate Boiler unit control room during emergency in the form of audio-visual alarm.

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	Complete set of special tools and tackles required shall be supplied along with Elevator. Each tool and tackle shall be stamped so as to be identified easily for its use and size. Tools shall be supplied in a steel tool box. The list of tools and tackles shall be furnished along with the offer by the vendor. One number Fire extinguisher (suitable for electrical fire) shall be provided along with each elevator.
14.0	SPARES
	The vendor shall furnish the List of start-up, commissioning and recommended spare parts during normal operation separately in the offer with item wise price under the title "Schedule of Spare Parts". The spares recommended above with unit prices shall be valid for at least for three years of normal consumption for operation of the plant. The vendor shall also indicate the service expectancy for these spare parts under normal operating conditions before the replacement is necessary. All the spares offered shall be strictly interchangeable with the parts for which they are intended for replacement.
15.0	DRAWINGS / DOCUMENTS
	The following preliminary documents / drawings should be enclosed along with the offer without fail. i) Detailed description of the system offered. ii) List of thermal power plants where the offered system is in operation. iii) Performance certificate of the system offered. iv) Write-up on interlocks, controls and safety devices provided. v) General Arrangement of Elevator (including hoist way, pit well etc.) vi) General Arrangement of machine room and equipment in machine room. vii) Electrical control scheme with legend and write-up. viii) Machine room Air-Conditioning details. ix) Foundation and loading details of machine room floor and the concrete structure. x) Filled in vendor data sheet for Elevator. xi) Filled in vendor quality plan for Elevator. xii) The major components of Elevator with weight details to be indicated by the vendor in the offer itself. xiii) The make, type, capacity, range of all bought out items xiv) Any deviation from the enquiry specification shall be indicated in the "Sub-delivery Enquiry Deviation Format" attached along with the enquiry. No deviations, unless explicitly taken up by vendor in the enquiry stage itself in the said format and accepted by BHEL in writing, shall be considered after firm order. In case no deviations are there, vendor to indicate "No-deviation" in the fully filled up format. The following documents / drawings shall be submitted within 15 days from the firm order. i) Elevator General Arrangement drawings for BHEL/Customer approval. ii) Elevator Technical Datasheet Separate contract-wise drawing approvals shall be obtained by vendor before manufacture of elevators.
16.0	WARRANTY
	The Elevator Vendor shall guarantee that the materials, workmanship and performance of the apparatus installed under this specification is perfect in every respect and that they will make good of any defects (not due to careless operation) which may develop within 18 months from the date of formal handing over of the equipment.
17.0	MAINTENANCE
	After the completion of the installation, maintenance and service for the equipment furnished under this specification shall be provided by the vendor for a period of eighteen months. This service shall include monthly inspections of the installation during regular working hours by trained employees and shall include all necessary adjustments, greasing and oiling, cleaning, supply of genuine standard parts to keep the equipment in proper operation except any part made necessary by misuse, accidents or negligence caused by others.
18.0	ACCEPTANCE
	After erection, the performance of the Elevator shall be tested for ascertaining the conformity with the specification and upon satisfactory completion of the tests, the Elevator will be taken over. The responsibility for obtaining commissioning and handing over protocol signed by Customer lies with the Elevator vendor.
19.0	QUALITY ASSURANCE AND TESTING
	i) Vendor shall prepare Quality plan in Customer format along with enquiry. This QP will be reviewed by BHEL and if any comments given by BHEL shall be incorporated by vendor. ii) In case of order receipt, this QP will be submitted for Customer approval. Any comments given by Customer shall be incorporated by vendor for further approval by Customer.

CLAUSE NO.	TECHNICAL DELIVERY CONDITIONS
	iii) In case of vendor having Customer approved Reference Quality Plan (RQP), Endorsement sheet shall be submitted by vendor for getting Customer approval. iv) Elevators are subject to inspection by BHEL & Customer and inspection call shall be given 15 days in advance. v) Materials can be despatched only after obtaining CHP clearance & MDCC clearance from Customer.
20.0	PACKING
	Packing shall be done as per vendor standard. However, the following points to be taken are by the vendor. At the time of shipment equipment shall be clean inside and outside. The vendor shall pack all equipment and materials furnished by him in such a manner as to ensure protection against damage and deterioration during shipment and storage which includes local transportation and site storage. Modules, or electronic equipment shall be wrapped and sealed in plastic to protect from rain and dust. The plastic wrapping shall include, as required, the use of a desiccant to protect the equipment from excessive moisture. All the items shall be treated and packed for long storage under the climatic conditions prevailing at site. Each item part shall clearly be marked or labelled on the outside of the packing in single case. The general description of the contents shall be shown on the outside of such cases. All cases, containers and other packages shall be marked suitably and numbered for the purpose of identification. All cases, containers and other packages are liable to be opened for such examination as may be felt reasonable by the BHEL / Customer. The vendor shall bear in mind the shipment of the equipment having ball or roller type bearings for which the following special provisions shall apply: i) If temporary transit bearings are fitted to such equipment, then, additionally, two complete sets of service bearings shall be included and shipped with such equipment. ii) If the item of the equipment is shipped with service bearings in position, then additionally one complete set of service bearings shall be included and shipped with such equipment. In either or both of the above provisions, the cost of the additional sets of bearings shall be included in the offer. iii) If replacement of any bearing is required due to damages during shipment or other causes, the spare bearings shall be used to replace at free of charge.
21.0	O&M MANUALS
	Vendor to furnish standard O&M manuals for each capacity of elevator, immediately after the release of first purchase order for BHEL's further use (Two copies of CD-ROM). The O&M manual prepared shall be such that the same shall be usable along with the relevant drawing for each project. Project wise O&M manuals along with project-wise details, if any, has to be updated by vendor and handed over to site (Customer & BHEL/Site, after commissioning of elevator) in necessary format as desired by Customer.
22.0	LIST OF ELEVATOR OPTIONAL PRICES
	The following optional prices to be indicated along with offer. i) Rate for addition / deletion of 1 number landing. ii) Rate for addition / deletion of 1Mtr. in travel height. iii) Additional price of Automatic Rescue Device (ARD) for increased height of 15 Mtrs. iv) Audio annunciation in the form of metres

1) Elevator Location diagram for GOODS CUM PASSENGER ELEVATOR

- a) Capacity 3000 Kg, Speed 0.55m/Sec.
- b) Lift well size: 4000mm X 4000mm.
- c) Location of Car entrance is on the boiler side and Trap door is as indicated in the drawing.
- d) Supporting channel for fixing car bracket and counterweight bracket will be provided by BHEL.



2) Elevator Location diagram for PASSENGER ELEVATOR

- a) Capacity 1088 Kg, Speed 1.00m/Sec.
- b) Lift well size: 4000mm X 4000mm.
- c) Location of Car entrance is on the boiler side and Trap door is as indicated in the drawing.
- d) Supporting channel for fixing car bracket and counterweight bracket will be provided by BHEL.

