

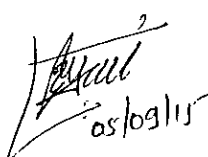

(2 x 30 MW)  
TUIRIAL HYDROELECTRIC PROJECT,  
M/s NEEPCO


PURCHASE SPECIFICATION  
FOR  
POWER HOUSE ELEVATOR

DOC. NO.: EM-PS-ELE-TRL-00  
REV - 00



BHARAT HEAVY ELECTRICALS LIMITED  
ELECTRIC MACHINE REPAIR PLANT, MUMBAI

 Dilip Wadhe PREPARED BY	 Mandvi Gupta CHECKED BY/ APPROVED BY
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 <b>BHEL-EMRP</b> <b>MUMBAI</b>	<b>PURCHASE SPECIFICATION</b>		<b>EM-PS-ELE-TRL-00</b>	
	<b>PASSENGER ELEVATOR</b>			
	<b>TUIRIAL HYDRO ELECTRIC PROJECT</b>			
	<b>(2x30 MW)</b>			
	<b>Rev. No.</b>	<b>00</b>		
	<b>Rev. Date</b>	<b>04.09.2015</b>		

## 1.0 INTRODUCTION

An Elevator (or lift) is a vertical transport vehicle that efficiently moves people or goods between floors of a building. They are generally powered by electric motors that drive traction cables and counterweight systems.-

## 2.0 SCOPE OF WORK

This scope of specification covers provision of all labour, tools, plant, materials and performance of all works necessary for the design, manufacture, quality assurance, quality control, shop assembly, shop testing, proper packing, delivery at site, site storage and preservation, erection testing and commissioning, performance testing, acceptance testing, training of owner's personnel, handing over to customer and complete with all auxiliaries, spare parts and warranting a trouble free operation.

### **Scope of supply:**

1 no. 16 passenger Elevator complete with control and accessories and Embedded parts, scaffolding, fire service switch, sound-reducing systems, safety devices, pit ladder, indicators, facia and alarms etc.

Following Mandatory Spare shall be provided:

- 1 Set of Suspension rope for total length for erection of car & counterweight
- 1 Set of ropes for over speed governors
- 1 Set of Brake parts, flexible coupling subject to wear
- 2 Sets of Limit switches of each type
- 1 Set of Centrifugal switch of each type
- 2 Set of Relays of each type
- 2 Sets of Lamps of each type
- 2 Sets of Protectors of fuses of each type

Other than the above, Two (2) sets of wear & tear along with bolts, nuts, painting material etc.


## 2.1 Completeness of the equipment

All fittings and accessories of Elevator that may not have been specially mentioned in these specifications but are usually necessary for completion of equipment, shall be deemed to be covered by the specification and shall be indicated and furnished by the Vendor without any extra charges to the BHEL. Vendor is responsible for supply and E & C of the system at site for trouble free operation.

## 3.0 STANDARDS

The system and equipment shall be designed, built, tested and installed to the latest revisions of the applicable standards listed IS: 14665 below or equivalent.

1. Factor of Safety (IS: 14665)

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Factor of safety of steel frame members and the tie rods shall not be less than 10 as per IS 14665 and exact value of Factor of safety will be calculated after placement of order.


2.	Relative Duty Factor	(IS: 14665)
3.	Number of startups per hour.	(BS: 5655)
4.	Degree of Protection	(IS: 14665)
5.	Type of Speed Control	(IS: 14665)
6.	Safety of lift, safety gears and governors	(IS: 9878)

#### 4.0 GEOGRAPHIC DETAILS OF PROJECT SITE

The project site with atmospheric temperature variation between 30°C to 11°C. Different systems of Elevator shall be suitably designed and materials for different components shall be selected suitably to remain undistorted under the wide variation of atmospheric temperature. (Annexure – I).

#### 5.0 SPECIFIC TECHNICAL & FUNCTIONAL REQUIREMENT OF SYSTEM

LIFT	
1. Type of service	Passenger Elevator
2. No. of the passengers/load capacity of the lift	16 passenger / 1088 Kgs
3. Rated speed -	1.0 m/sec.
4. Total length of travel for serving	27 meter.
5. No. of floors to be served	At EL 22.00m, 29.00m, 33.50m, 38.00m, 43.50m, 49.00m
6. Method of control	Variable voltage and variable frequency (VVVF) control system.
7. Position of machine room	Directly above the lift well.
8. Inner dimension of lift well	2400mm(W) x 2300mm (D)
9. Construction, design -	Stainless steel paneling, adequate lighting shall be provided in the car.
10. Car entrances	
a) Number & type	One number, made of stainless steel, auto Centre opening, sliding, and double closed door with a door size of 1100 mm width and 2300 mm height.
b) Method of operation	Electric power - operated with automatic door opening and closing devices.
11. Operation & interlocks	Selective or collective automatic operation with or without attendant. The lift operation shall meet the following requirements:

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	i) Lift shall not move unless the car door, landing doors and all other protected openings connected with control circuit are closed. ii) Landing doors shall be interlocked so that the landing door of any floor shall not open when the lift is not on that floor. iii) Push button control inside the car for holding the doors open for any length of time required.
12. Signals	iv) Push button control at all landings to call the car. i) Digital direction and floor indications with Up/Down indications at all landing floors. ii) Digital direction and car position indicators inside the car. iii) A wall type telephone inside the car shall be provided to connect with the station PABX. iv) Rechargeable battery operated alarm bell and emergency light.
	vi) The following additional signals also to be provided: <ul style="list-style-type: none"> <li>• Overload indication</li> <li>• Emergency stop button</li> </ul>
13. Electric supply	
a) Power -	AC 415/240 V, 50 Hz
b) Lighting and fan inside the car	AC 240V, Single Phase, 50 Hz
14. Braking arrangement	Automatic Electromechanical brakes
15. Duty cycle	Frequent duty

## 5.1 General


5.1.1 The construction of elevators shall be such that all motions shall take place smoothly and positively with no slippages, jerks and vibrations.

5.1.2 Elevator shall be provided with all safety devices, alarms, fire service switch etc.


## 5.2 Lift Car

5.2.1 Elevator car shall be carried in a complete frame of steel, sufficiently rigid to withstand the operation of the safety gear without permanent deformation to the car frame. Platform shall be of framed construction of steel.

5.2.2 The lift car shall be made of steel frame provided with closed roof. Any opening work in the roof of the lift car shall be sufficiently closed with casing to provide reasonable protection against falling articles to any person traveling in the car. The car floor shall be of stainless steel construction

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- 5.2.3** The lift car shall be provided with adequate lighting and ventilation. The car shall be fitted with a fan of adequate capacity and it shall not run when the lift is not in use. Provision to be provided in elevator for auto landing to nearest floor in case of power Failure.
- 5.2.4** Lift car platforms shall be of framed construction designed to suit the conditions of the landing. The minimum factor of safety shall meet the requirements of relevant IS Mechanical Pressure detection system for opening / closing of Landings and Car Doors.
- 5.2.5** Glass shall not be used in lift car except for covering the lighting fixtures and for the vision panels and mirrors. The total glass area in any case shall not exceed the limits specified in IS 14665.
- 5.2.6** The car doors shall be solid sliding type, Centre opening and shall be equipped with power operated automatic opening and closing devices. The operation of doors shall be so arranged that they cannot be opened, unless the lift car is within the landing zone. The doors shall be guided at top and bottom. The car door shall be so designed that their closing and opening is not likely to injure any person traveling in the car. The door shall be provided with sensitive reopening arrangements on the moving edges, which are likely to come in contact with person/ person entering or coming out of the car. The doors and their tracks shall be capable of withstanding thrust as IS.
- 5.2.7** The car shall be provided with an emergency alarm push button in red color.
- 5.3 Landing Doors**
- 5.3.1** Suitable inter-locks shall be provided for opening or closing of both the doors simultaneously.
- 5.3.2** All landing openings in the lift well enclosure shall be protected by providing the solid sliding doors, similar to the car doors and shall extend the full height and width of the landing opening. The doors shall be provided with automatic opening and closing devices.
- 5.3.3** Every landing door shall be fitted with a locking device to ensure that it shall not be possible to open the landing door from landing side until the lift is within that particular landing zone. The locking device for landing zone shall be so designed that the lock contact is not closed until the door is closed. The levers operating the locking device shall not interfere with the landing side or lift enclosures. Provision shall be made to prevent the opening of any landing doors when the car is passing that zone in response to call from another landing.
- 5.3.4** Note: All Car doors & Landing doors orientation shall be on same side.
- 5.4 Counter Weights**
- 5.4.1** Suitable counter-weight of metal shall be provided as per IS 14665.
- 5.4.2** The counter weights shall withstand the effect of buffer impact.
- 5.5 Suspension Ropes**
- 5.5.1** The car and counter-weight shall be suspended by traction steel ropes. Chains shall not be used for suspension. Car and counter-weight ropes shall be in one piece and without intermediate joints. All ropes shall be anchored to a winding drum which shall have not less than one

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complete turn of the ropes on the winding drum when the car or counter weight has reached the extreme limit of its travel. The hoist rope shall include adjustable self-aligning hitches.

**5.5.2** Factor of safety of steel frame members and the tie rods shall not be less than 10 as per IS 14665.

**5.6 Shaft and Main Driving Gears**

**5.6.1** All shafts and axles shall be made of steel. They shall have sufficient rigidity and bearing surfaces.

**5.6.2** No friction gearing, belt, chain, clutch or chain driven mechanism shall be used for connecting the main driving gear to the traction sheaves.

**5.7 Guides for Car and Counter Weights**

**5.7.1** Guide rails for the counter weight shall be machined 'T' sections and continuous throughout the entire length and shall be provided with adequate steel brackets or equivalent of such designs and spacing that the guide rails shall not deflect more than 5 mm under normal operation.

**5.8 Buffers**

**5.8.1** Buffers of oil/spring type shall be fitted under the lift car and counter weights directly or on the pit floor with suitable concrete or steel foundation. The buffers shall be capable of stopping the car or counter weight at the extreme limit of travel without permanent damage or deformation to itself or any part of the lift equipment.

**5.9 Governors**

**5.9.1** The lift shall be equipped with an over speed governor device which shall apply the safety gear in the event if the speed of the lift car and counter weights in the descending direction exceed the predetermined limit specified in IS.


**5.10 Safety Gears**

**5.10.1** The lift shall be provided with suitable safety devices attached to the lift car frame and placed beneath the car. The safety devices shall be capable of stopping and sustaining the lift car with full rated load in the car at governor tripping speed or in the event of failure of suspension ropes.

**5.10.2** Car and counter weight safety devices shall be actuated by separate governors. Vibration of the lift car frame shall not cause the safety gear to be applied.

**5.10.3** Safety gear shall not stop ascending of lift or counter weight. The governor shall, however, open the motor circuit and apply the break in the event of over speed in the ascending direction. The safety gear shall meet all other requirements specified IS 14665.

**5.10.4** Safety device like ARD (automatic rescue device) shall be provided as per latest practices

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#### 5.11 Electrical Equipment and Controls

The electrical equipment, control and interlocks shall be furnished complete for a fully automatic elevator. It shall provide smooth and uniform acceleration, retardation, and automatic slow down and stopping at all landings independent of the loading within its rated capacity. Electrical system shall consist of hoisting/lowering motors, brakes, automatic door operators, terminals and final limit switches, car lighting, signal lights and intercom set.

#### 5.12 Variable Voltage Control Equipment

The control shall be variable voltage variable frequency (VVVF) control system, which shall be arranged to provide smooth and constant acceleration and retardation under all conditions of operation.

#### 5.13 Electric Motors

The driving motors shall conform to IS 325 and shall be of suitable capacity for the duties specified. The rated capacity and torque characteristics shall properly match the requirements of lift for the specified duties. All motors shall be squirrel cage induction type, suitable for operation at 415 volts, 3 phase, 50 Hz and shall give satisfactory continuous operation within the limits of voltage and frequency variations specified. The breakdown torque of the motor shall be not less than 225% of full load torque with rated voltage and frequency. The bearings of the motor shall have ample strength to withstand the heavy shocks and vibrations to which they may be subjected to in service without undue wearing. Motors shall be screen- protected type with class-F insulation or better.

#### 5.14 Earthing

The lift structures, motor frames and metal cases and all electrical equipment, including metal conduits or cables armoring guards shall be sufficiently bonded and earthed to the earthing conductors provided in the machine room.


#### 5.15 Brakes

The lift drive shall be equipped with automatic electro-mechanical brakes.

#### 5.16 Control

The control shall be microprocessor based control with the operational card file containing a logic board with Microprocessor chip, Random Access Memory (RAM) and Erasable Programmable Read Only Memory (EPROM) chips to monitor and take over the commands of the elevator shall be provided. The Motion control shall consist of high performance, fully digital control VF drive which shall directly control the torque and speed of the Elevator Motor; and thus provide constant speed control under all load condition and Pulse Width Modulation technique shall be used for speed control. A large number of user-friendly features shall be included in the microprocessor-based controller such as:

- Motor Over current protection (Built in inverter drive)
- Fast speed/ deceleration protection
- Passenger Overload Warning
- Overload non-starter

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- Detection of stuck hall button

#### 5.17 Car operating panel

At least the following facilities shall be included in the car operating panel of each elevator:

- Red push button / switch for emergency stopping,
- Digital floor and direction indicators,
- "DOOR OPEN" button, "DOOR CLOSE" button,
- Car fan and light switches

A notice shall be provided on top of the lift car as follows:-

### ACCIDENT PREVENTION!

### TRAVEL IN DOWNWARD DIRECTION ONLY!

#### 5.18 Emergency exit

The car roof shall be provided with a 600mm x 600mm emergency exit with cover of flap type. A telescope ladder shall be mounted to the cover to allow easy access from the bottom to the roof.

#### 5.19 Car lighting, ventilation, fan and other utilities

Each elevator car shall be fitted with a luminous ceiling light which shall be left burning during the whole time the elevator is available for use. Provisions shall be made for adequate ventilation, a fan, a battery operated emergency light and a battery operated emergency alarm inside the elevators.


#### 5.20 Landing fixtures

At each landing, hall push buttons as per requirement shall be provided. A digital hall position indicator with direction indication shall be installed at every landing. All hall push buttons shall illuminate after pushing until Elevator reaches the landing. Push buttons and indicators should be flushed with wall. A fire service switch for each elevator shall be located at every landing.

### 6.0 DELIVERY, INSTALLATION AND COMMISSIONING

The Vendor shall follow the requirements of Delivery, Installation and Commissioning. In order to avoid pilferage, misplacement, damage to the various elevator components, all items are to be duly packed in suitable size wooden boxes & then to be packaged in container, before dispatch of material to site. All components are to be duly verified during inspection vis a vis packing list prepared by vendor, before sealing of container.

### 7.0 QUALITY ASSURANCE AND TESTING

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The equipment offered shall be of proven design, materials utilized shall be of that which have been established for use in such applications. The Vendor shall follow the duly approved QAP during manufacturing, shop testing, E & C and final testing at site without any price implication at later stage Details of the tests are given bellow.

### 7.1 Type Tests

The contractor is required to carry out all type tests as per relevant IS / international standards on one apparatus of each type of similar rating and shall submit the reports to the employer not older than 5 years.

**The type tests may not be mandatory if similar equipment has been type tested and test certificates for relevant tests are furnished and accepted by customer. However in absence of such type test reports / in case submitted reports are not approved by customer, bidder shall conduct all such type tests as per relevant standards & reports shall be submitted for BHEL / Customer approval without any price implication to BHEL.**

### 7.2 Shop Tests

The material used for the construction of the lift, various components of the lift including Motors, limit switches, braking devices, wire ropes and control equipment shall be tested in the shop in accordance with the latest edition of the relevant Indian Standards specification & practices to ensure that they comply with the provisions laid down in this specification. The other electrical apparatus shall also be tested for electric strength to determine their Capability to withstand high voltage. These tests shall be conducted as per requirements of applicable IS.

**The details of test mentioned above are given in Model Quality Assurance Plan of Elevator – Annexure A.**


### 7.3 Site Tests

After the equipment has been installed at site, the following test shall be carried out by the contractor in accordance with approved standard before commissioning the lift into normal service.

- i) Insulation resistance test between power /control lines and earth.
- ii) Earthing test.
- iii) Functional test for motors brakes, control equipment, door locking devices, relays, safety gears and limit switches.
- iv) Lift capability test.
- v) Functional test for safety gear under rated load condition.
- vi) All other pre commissioning test including trial runs of the lift to demonstrate satisfactory operation of the lift and it components.

7.3.1 The contractor shall arrange the necessary test weights and instruments.

7.3.2 It shall be the responsibility of the contractor to demonstrate the operation of the safety interlocks provided to the full satisfaction of the lift inspector during the inspection.

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## 8.0 DRAWINGS, DOCUMENTS AND DESIGN CALCULATIONS

The Vendor shall submit drawings and documents listed below after the award of contract.

8.1 The Vendor shall submit the design covering at least the following for review / approval by BHEL / Customer


- Detail dimension of wells,
- Calculation for selecting the rope, motor size and speed of the elevators, control & Protection
- GA Drawing for Lift, Machine room, Earthing, control panel.
- BOM, Technical Data Sheet, Catalogue.

## 8.2 **Construction methodology**

The well for elevators shall be constructed by customer, however, scaffoldings any other equipment, material etc. required for the erection of the elevator shall be arranged by the Vendor. The Vendor is required to provide all dimensions of well for proper construction. If any chipping work is required the same shall be carried out by the vendor. Assembly & commissioning of the equipment shall be done by skilled workers in workmanlike manner.

## 9.0 DOCUMENTS/ DATA REQUIRED TO BE SUBMITTED ALONG WITH BID

- a) Catalogue of each item / machine along with the Data Sheet (**Annexure – III**) duly filled.
- b) The Bidder shall submit **CHECK LIST** of the equipment as per data sheets at **Annexure –II** on placement of purchase order.
- c) List of special accessories as listed in the specification in terms of numbers indicating sizes / rating with price.
- d) Bidders to indicate number of packages of consignment with approximate size of packing box (L x W x H) and gross weight, package wise with bid.
- e) Bidder to submit list of bought out items indicating their make in bidding document.
- f) The Bidder shall submit a list of similar installation of the equipment.
- g) The Bidder shall indicate the deviation, if any, in Schedule of Technical Deviation, as per **Annexure – IV**, together with the justification for the deviation.
- h) Signed & stamped copies of Quality Assurance Plans for manufacturing, erection, commissioning as specified in this specification.
- i) Detailed list of spares offered by bidder.
- j) Optional prices for addition /deletion of 1mtr height.
- k) Optional prices for addition /deletion of 1 landing.

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**10.0 DOCUMENTS REQUIRED TO BE SUBMITTED AFTER THE AWARD OF ORDER.**

- a) All drawings shall include / show plan, elevation, side view, cross-section, skin section, blow-up view and all major self-manufactured, bought out items, standard as well as optional accessories which are covered under the bidder's scope of supply shall be labeled and included in BOQ / BOM in tubular form.
- c) Requirement of withdrawal space for maintenance, if any, shall be shown in general arrangement drawing in dotted lines with dimensions from the reference point like edge / center of the machine.
- d) Recommended clearance / maintenance space around the machine shall be shown in the general arrangement drawing in dotted lines with dimensions from the reference point like edge / center of the machine.

**11.0 VENDOR TO INSURE SUBMISSION OF THE FOLLOWING DOCUMENTS ALONG WITH THE SUPPLIES**


**11.1** O & M Manual

**11.2 Model Packing List** indicating total number of accessories along with loose (which shall be assembled during erection), spares and tooling which were included in the bid by the vendor. It shall indicate quality and quantity of items as per the scope of supply under the purchase order.

**11.3 Test Certificates:** The vendor shall furnish all test certificate / factory test report along with supply of material.

**11.4 Performance Guarantee:** Vendor shall furnish a Performance Guarantee Certificate for all the equipment, instruments along with material supply.


**11.5 Warrantee Certificate :** Vendor shall furnish Warrantee Certificate for a period of 18 months from the date of delivery or 24 months from the date of commissioning whichever is later.

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## ANNEXURE I

### GEOGRAPHIC DETAILS OF THE PROJECT SITE

Project Name	2x30 MW Tuirial
Project Address	Dist. Cachar State- Mizoram
Nearest Rail Head	Silchar <i>→ Kolosib</i>
Nearest Town	Bilkhawthlir
Nearest Airport	Silchar
Latitude	21.58° N and 24.35° N
Longitude	92.15° E and 93.29° E.
Minimum <u>Winter</u> temp. at project site	11°C
Max <u>Summer</u> temp. at project site	30°C


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## ANNEXURE II

### CHECK LIST FOR DOCUMENT TO BE SUBMITTED WITH BID.

(Bids are liable to be rejected if the Bidder does not furnish the technical data in the schedule given below)

SR. No.	Description	To be filled by Bidders
1	Submission of Data Sheets	<b>To be filled in the format given in Annexure III</b>
2	Equipment catalogue / drawing	
3	Reference List of similar installations submitted.	
4	List of all embedment parts / foundation details.	
5	List of special accessories.	
6	Type test reports.	
7	List of bought out items.	
8	Factor of Safety :: ( IS : 14665)	
9	Relative Duty Factor ( IS : 14665)	
10	Number of start ups per hour. ( BS : 5655 )	
11	Degree of Protection ( IS : 14665)	
12	Type of Speed Control ( IS : 14665)	
13	Confirm lift travel as per specification.	
14	Confirm number of landings as per specification	
15	Confirm orientation of lift doors as per specification.	
16	Confirmation for accepting QAP as per Specification.	
17	Technical Deviation if any.	
18	List of spares offered as per sl. no. 2	

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Seal


Signature of the Bidder

**Annexure III**

**DATA SHEET TO BE SUBMITTED BY THE VENDOR**

(Bids are liable to be rejected if the bidder does not furnish the technical data in the schedule given below)


Name of Project / Tech. Data	TUIRIAL
No. of the passengers/load capacity of the lift	
Design Code	
Type of service	
Travel	
No. of floors to be served	
Method of control	
Position of machine room	
Inner dimension of lift well	
Method of control	
Size of Lift Car (Internal)	
Construction, design of car	
Car entrances	
Door operation	
Signals	

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Hoist way entrance	
Electric supply	
Electric safety device	
Driving motor	
Braking arrangement	
Duty cycle	
Max live load on landings	
Worm gear	
Safety system for closing and opening of the door.	
Driving sheave	
Driving ropes	
Car ventilation	
Car lighting	
Levelling accuracy	

**Seal**

**Signature of the Bidder**

 <b>BHEL-EMRP</b> <b>MUMBAI</b>	<b>PURCHASE SPECIFICATION</b>	<b>EM-PS-ELE-TRL-00</b>	
	<b>PASSENGER ELEVATOR</b>	<b>Rev. No.</b>	<b>00</b>
	<b>TUIRIAL HYDRO ELECTRIC PROJECT</b> <b>(2x30 MW)</b>	<b>Rev. Date</b>	<b>04.09.2015</b>

**Annexure IV**

**TECHNICAL DEVIATIONS (IF ANY)**

(Bidder to specify deviations, if any, along with their bids in format given below. Vendors seeking deviations after Bid opening shall amount to rejection of their bid). Deviation specified anywhere else in their offer shall not be considered.

CI Ref.	DEVIATION

Seal

Signature of the Bidder