HINDUSTAN AERONAUTICS LIMITED,
AIRCRAFT DIVISION, NASIK

NAME OF WORK

CIVIL, ELECTRICAL AND OTHER UTILITY SERVICES FOR CONSTRUCTION OF HANGARS,
UTILITY BUILDINGS AND ALLIED FACILITIES FOR PACKAGE -CIVIL- II (ROTABLE COMPLEX)
IN FACTORY [EXCLUDING PRE-ENGINEERED BUILDING STRUCTURES (PEB)]

TENDER NO.NK/FW-CAP-ROH/577/10-11

VOLUME –II

TECHNICAL SPECIFICATION
TECHNICAL SPECIFICATIONS FOR LIFTS

PART -V

1.0 SCOPE

This specification covers the requirements of design, manufacture, assembly, testing, delivery, installation & commissioning of Passenger and Goods lift with machine room requirement M/s. HINDUSTAN AERONAUTICS LIMITED, AIR CRAFT DIVISION, OJHAR, OJHAR TOWN SHIP PO, NASIK, MAHARASTRA.

2.0 SITE CONDITIONS

- Temperature: Maximum 45 Deg. C
  Minimum 10 Deg. C
- Humidity: Not more than 80% at maximum temperature.
- Rainfall: 1000 - 1500mm Per Annum

3.0 ELECTRICAL SUPPLY SPECIFICATIONS

3. System voltage Nominal voltage : - 415 V

4. Voltage variation limits : - +/- 10%

5. No. of phases : - 3

6. Frequency : - 50 c/s

7. Frequency variation limits : - +3% or -5%

8. Fault level : - Not exceeding 50 KA at 415 V

9. Neutral earthing on LV side : - Solidly earthed

5.0 INSTALLATION

a). The LIFT shall be installed as per IS : 1860.

  Wiring and earthing shall be extended from the electrical shaft & lift shaft as per requirement.

  Power cable & earthing point will be made available at power panel at one location for each lift by other agencies.

b). All openings at the various landings shall be temporarily guarded during installation.

c). All safety procedures associated with lifting of heavy equipment, operation of electrical tools & earthing should be strictly complied with.

d). All electrical wiring shall have flame resisting moisture proof insulation and will be run in heavy gauge metal conduit/casing.

SIGNATURE OF TENDERER WITH SEAL

EMPLOYER
The trailing cable between the car and lift well will be multicore type designed for lift services and will have flame resisting moisture proof covering.

Cables should conform to relevant IS amended up to date.

The supply and erection of lift shall conform to the latest lift act in force and modern lift practice in all respects.

All wiring and earthing etc. shall conform to IE rules and regulations

(vii) TESTING

All equipment included in contractor's scope of supply shall be tested at Manufacturer's Works, before delivery and necessary Test Certificates shall be submitted for approval of Consultants.

6.1 The Contractor shall carry out all performance tests after installation, in the presence of the Client / Consultants, as per specification.

The Contractor shall bear all expenses for such tests.

6.2 The Contractor shall be responsible for executing the contract as per Indian Electricity Rules, Rules and Regulations of supply authorities and the Rules of the local Electrical Inspectorate.

Any changes/modifications pointed out by the authorities shall be carried out at no extra cost

(x) OTHER TESTS

Each elevator shall be tested at site as per IS 4666 & EN 115. Among others, the tests shall include:

a) Operational tests with functional check on safety devices
b) Speed of operation at rated load
c) Over speed tests.
d) Leveling accuracy
e) HV test
f) Earth resistance.

7.0 TAKING OVER OF INSTALLATION

7.1 The equipment & installation shall be deemed to have been taken over by the Client, when the following are completed:

(x) The Consultants have certified that all contractual obligations have been fulfilled by the Contractor.

(xi) All performance tests shall be carried out in the presence of client / consultant and Test Certificates are furnished in requisite copies.

(xii) The installation is approved by the lift inspectorate.

(xiii) The 'As Built' Drawings are submitted. (Hard and soft Copies)

8.0 COMPONENTS & ACCESSORIES

The following components & accessories forming a part of the elevator installation shall be supplied and installed.

All the items shall conform to the requirements of the BIS listed above and the specification.

e) Guide rails of steel with working surfaces machined for the car and counter weight.
(f) Spring buffers located in the lift pit.

(g) Steel car frame with replaceable guide shoes.

(h) Lift cars fitted with all interiors, false ceiling, flooring, ventilation fan, lights, operator’s panel, floor indicator, Lift mirror, Handrails, emergency stop facility etc.

(i) Motor operated sliding, center opening car doors wherever applicable.

(j) Motor operated sliding, center opening landing doors wherever applicable.

(k) Counter weight with guide shoes.

(l) Safety gears.

(m) Speed governors.

(n) Suspension ropes

(o) Sheaves & pulleys

(p) Lift machines

(q) Controllers & wiring materials

(r) Terminal stopping and final limit switches.

(s) Leveling devices

(t) Lifting beam for machines.

(u) Any other accessories as required.

**Lift Announcement:**

The lift shall be provided with special announcements as follows:-

(a) When supply is out and lift is working in ARD (Automatic rescue device) announcement shall be “supply is out you may alight from the lift as soon as the door opens”

(b) When supply is out, ARD is not working, and the lift stops in between floors announcement shall be “ARD” is not working please ask help through intercom”

90 General Technical Specification

91 DETAILS OF LIFT WELL

9.1.1. The lift well shall be as per clause 5 of IS: 14665.

9.1.2. There shall be no other opening in the lift well except for the landing openings.

All landing openings in lift well enclosures shall be protected by doors, which shall extend to the full height and width of the landing opening

9.1.3. Light points shall be provided in the lift well at a spacing not exceeding 10m.

All the light points shall have control from the machine room.
A socket outlet may also be provided at a suitable place for use by maintenance staff above the ground floor landing.

9.2 LIFT PIT:

The lift pit shall be provided proper water proofing treatment so that the same remains dry.

If the lift pit depth is more than 1.6m, a ladder to the height of 0.75m above the lift pit floor shall be provided to reach the lift pit.

The lift pit shall have provision for a separate access.

In case of two lifts in the well, one access to the lift pit shall be adequate.

d) MACHINE ROOM:

The load carrying capacity of the floor shall be obtained from the lift manufacturers.

Suitable lifting beams below the machine room shall be provided for lifting any heavy object as per requirement of the lift manufacturer.

 Provision for pulley for lifting of heavy items / lift machinery is required which will facilitate inspection and repair.

The machine room shall be properly ventilated.

9.4 PARTITION IN LIFT WELL

Where two or more lifts are installed in a common lift well provision shall be made by dividing beam and rigid metal screen to separate each lift from an adjacent lift or its counter weight.

e) GUIDE RAILS

The guide rails shall be as per IS: 14665.

Rigid steel guides shall be used for guiding lift car and counterweight throughout its travel.

The strength of the guides, its attachments and the joints shall be sufficient to withstand the forces imposed due to the operation of the safety gear and deflection due to uneven loading of the lift car.

Only machined guide rails shall be provided for passengers and hospital lifts.

The guide tracks shall be supported at suitable intervals and shall be embedded into the walls.

Wood or fiber blocks or plugs shall not be used for securing guide brackets.

9.6 GUIDE SHOES

Two numbers of guide shoes at the top and two numbers at the bottom shall be provided on the lift car and counter weight.

Guide shoes shall be provided with adjustable mountings and shall be rigidly secured in accurate alignment at the top and bottom on each side of the car sling and counterweight frame construction.

When oil buffers attached to the bottom of the counterweight are used then additional guide shoes shall be provided on each side of the buffer frame.

For passenger lifts and bed-cum-passenger lifts, sliding guide shoes shall be provided for speeds up to 1.5 mps (meter per second.)
Sliding guide shoes for cars shall be flexible.

Solid guide shoes can be used for counter weights for speeds up to 1.0 mps.

When speed exceeds 1.5 mps, roller guide shoes shall be provided for car and the counterweight.

97 **BUFFERS:**

Buffers shall be provided at the bottom limit of travel for cars and counterweights.

Energy dissipation type buffers shall be used wherever the rated speed of the lift exceeds 1 mps but energy accumulation type buffers shall be preferred if the rated speed of the lift does not exceed 1 mps.

**(e)** **COUNTER WEIGHT:**

The counterweights shall be of metal and it shall be in the form of multiple sections.

It shall be contained and secured within a steel frame and shall be equal to the weight of the complete car plus approx 50% of the rated load.

At least, four guide shoes, capable of being easily renewed or having renewable linings shall be provided on the counterweight.

**(g)** **SUSPENSION ROPES**

Cars and counterweights shall be suspended from round strand steel wire ropes of best quality having a tensile strength not less than 12.5 tonnes/cm².

The size and number shall be in accordance with standard Code of practice/BIS specifications.

Lubrications between the strands shall be achieved by providing impregnated hemp core. The nominal diameter of the ropes shall be at least 8mm.

**9.9.1. COMPENSATION ROPES**

For travels over 40 m and/or rated speed of the lift exceeds 2.5 mps, the proven of compensation ropes with tensioning pulleys shall be considered.

For speeds of 2.5 mps or below, quiet operating chains or similar devices shall be used as the means of compensation.

For speeds above 3.5 mps, an anti-rebound arrangement of idler tension pulley shall be provided to prevent the counterweight jumping with the application of the car safety gear.

**(h)** **CAR CONSTRUCTION**

The lift car construction shall be in conformity with Code of Practices, BIS specifications and IE Rules.

**1.CAR FRAME**

The lift car body shall be carried in a steel car frame sufficiently rigid to withstand the operation of the safety-gear without permanent deformation of the car frame.

The deflection of the members carrying the platform shall not exceed 1/1 000 of their span under static conditions with the rated load evenly distributed over the platform.

**2 CAR ENCLOSURES:**

The whole of the internal face of the car shall be of 1.5 mm thick Mild steel sheet.

A suitable backing shall be used to reinforce the car wall panels.
A stainless steel handrail shall be provided on three sides of the lift car, extended to within 150 mm of all corners and a stainless steel skirting panel approximately 100 mm deep shall be provided.

Stainless steel false ceiling with concealed fluorescent light fitting and ventilating fan complete with metal ceiling diffuser shall be provided.

The car ventilation fan shall be switched off within a period which shall be adjustable from 5 to 15 minutes after the last registered call is answered.

The lift car excluding linings, shall be constructed of non-combustible materials.

The lift car shall have adequate illumination.

The illumination level shall not be less than 150 lux on the lift floor level.

3 EMERGENCY LIGHTING:
The lift car shall also be provided with emergency lighting operated by a rechargeable battery supply.

The lighting shall be automatically switched on in the event of failure of normal power supply to the lift.

4 CAR PLATFORM:
The lift car platform shall be designed on the basis of rated load evenly distributed.

The dimensions shall conform to IS: 14665 unless otherwise specified.

The flooring shall be smooth and non-skid type.

The PVC/rubber flooring of minimum 3mm thickness shall be preferred for passenger and bed-cum-passenger lifts.

The flooring for goods lift shall be strong enough to take the rated load without any deformation or damage.

5 CAR ROOF:
The car roof shall be solid type and capable of supporting a weight of at least two persons (approx 140 kg) without causing permanent deformation.

Ceiling lights shall be of recessed type and be protected by stainless steel metal bars.

A recessed ceiling fan complete with heavy duty metal diffuser and capable of providing 20 air changes per hour in the car shall be provided.

6 CAR DOORS:
The doors for passenger lifts shall be of metal and the internal face of the car door shall be suitably lined as the same in the lift car.

The doors shall be in two panels and centre opening with automatic power opening and closing unless otherwise specified.

The car shall be equipped with an electronic door sensor which can detect an obstruction at the car entrances and control the closing of the doors.

The car door shall be provided with an electrical switch which will prevent the lift car from being started or kept in motion unless all car doors are closed.

7 DOOR RE-OPENING DEVICE:
Door re-opening device shall be fitted to the leading edge of both car door panels, which shall automatically initiate re-opening of the door in the event of a passenger being struck (or about to be struck) by the door in crossing the entrance during the closing movement.

It shall be so designed and installed that for centre opening doors the obstruction of either leading edge when dosing will cause it to function.
8 "DOOR-OPEN" ALARM FOR MANUALLY OPERATED DOORS:
For manually operated doors and were assisted doors, a 'door open' alarm shall be provided in the
car to draw attention to a car or landing door which has been left open for an adjustable period up
to 10 minutes.

(i) LANDING DOORS

The car entrance shall be provided with a car door, which shall extend to the full height and width of
the car opening.

The opening for the landing doors shall not be wider than that of the lift car.

The top track of the door shall not obstruct the car entrance.

All landing openings in lift well enclosures shall be protected by doors which shall extend to the
full height and width of the landing opening.

1. VISION PANELS

The landing doors shall be provided with transparent vision panel of minimum thickness 6mm,
made of an approved material or glass of a tempered or laminated type.

2. LANDING DOOR LOCKING DEVICE

Every landing door shall be provided with an effective locking device so that it shall not normally be
possible to open the door from the landing side unless the lift car door is in that particular landing
zone.

It shall not be possible under normal operation to start the lift car or keep it in motion unless all
landing doors axe in the closed position and locked.

(j) TERMINAL STOPPING AND LIMIT SWITCHES

The lift shall be provided with normal terminal stopping switches and limit switches.

They shall be positively operated by the movement of the car.

These switches shall either be mounted on the car frame or in the lift well.

9.12.1 The limit switches shall either open directly by mechanical separation of the circuits feeding the
motor and brake, and provisions shall be made so that the motor cannot feed the brake solenoid,
or open, by an electrical safety device, the circuit directly supplying the coils of the two contactors,
the contacts of which are in series in the circuits supplying the motor and brake.

(k) SAFETY GEAR

The lift (except service lift) shall be provided with safety gears capable of operating only in the
downward direction and capable of stopping a fully laden car, at the tripping speed of the over-
speed governor, even if the suspension devices break, by gripping the guides and holding the car
there.

(1) OVER-SPEED GOVERNOR

The car safety shall be operated by speed governor located overhead and driven by governor rope
suitably connected to the car and mounted on its own pulley.

Over-speed governor shall operate the safety gear at a speed at least equal to 115% of the rated
speed.

For rated speeds upto 1 mps maximum governor tripping speed shall be either 140% of the rated
speed or 0.88mps, whichever is higher.
For rated speed exceeding 1 mps, maximum governor speed shall be 115% of the rated speed plus 0.25 mps.

The means for adjusting the over-speed governor shall be sealed after setting the tripping speed.

1. GOVERNOR ROPES

The governor ropes shall not be less than 6 mm in diameter and shall be of flexible wire rope.

The rope shall be tensioned by a tensioning pulley and the pulley (or its tension in weight) shall be guided.

The breakage or slackening of the governor rope shall cause the motor to stop by means of an electrical safety device.

The device shall be of bi-stable type requiring manual reset.

(m) OVERLOAD DEVICE AND FULL LOAD DEVICE

The lift shall be provided with an overload device which shall operate when the load in the car is 10% or more in excess of the rated load of the lift.

The overload device, when in operation, shall:

(i) prevent any movement of the car,

(ii) prevent the closing of any power operated door whether fitted to the car or to the landing at which the car is resting, and

(iii) give audible and visible signals inside the car.

The lift shall resume normal operation automatically on removal of the excessive load. The overload device shall be inoperative while the Lift car is in motion.

9.15.1. FULL LOAD DEVICE

The lift (other than a service lift) shall be provided with a full load device having an adjustable setting range from 80% to 100% of the rated load and when operated, it shall bypass all landing calls.

When the load in the car is reduced, the car shall stop for landing calls as normal.

9.16 EMERGENCY ALARM DEVICE

An emergency alarm push button together with a buzzer (or an alarm bell) shall be provided in the lift car and connected to the machine room and the main entrance lift lobby and backed up by an emergency supply. The pattern of lift alarms shall be distinguishable from that of fire alarms.

9.16.1 An intercom system connecting the lift car and the machine room /guard room (if manned) shall be provided.

9.17 EMERGENCY EXIT

The lift car shall be provided with an emergency exit in the roof of minimum size 500 mm x 350 mm x 400 mm in diameter.

Panels for emergency exits shall:

- be clear of any apparatus mounted above the roof of the lift car

- be capable of being opened, re-closed and re-locked without a key

- be provided with an electric safety device which will prevent operation of the lift
When the panel is not locked, operate the buzzers (or alarm bells) and also switch off the car ventilation fan.

CONTROL AND INDICATION IN CAR

The lift car shall have a control faceplate made of stainless steel with thickness of not less than 2.5mm and comprising:

(i) Call buttons with acceptance signals to correspond with the landing served
(ii) An alarm push button with protection from being operated accidentally
(iii) "Door open" and "Door close" push buttons
(iv) Audible and visible signals in connection with the overload device
(v) light switch, alarm reset switch, fan switch and cleaner's "Stop-switch" keeping the car door open in the form of key switches or housed in a recessed metal box with hinged or sliding lid which will be key-locked,
(vi) Two-way intercom speaker (optional),
(vii) The control faceplate shall be fixed onto the car panel by stainless steel screws.

9.18.1 For lifts equipped with attendant control, the control faceplate shall also incorporate a non-stop button for the purpose of bypassing landing calls, but the calls shall remain registered until answered. This button shall be inoperative unless the lift is operated by an attendant.

9.18.2 The car direction and position indicator shall be of digital type display with LED's actuated by solid state circuitry unless otherwise specified. The position indicator shall have a minimum height of 50 mm and easy to read even from distance and properly illuminated.

9.19 LIFT MACHINERY FOR ELECTRIC LIFT

9.19.1 LIFT MOTOR

The induction motor shall be designed to operate for an unlimited period according to the expected duty of the lift.

The motor may be supplied and controlled by static elements when A.C. variable speed system is specified.

9.19.2 MOTOR GENERATOR SET (Not Applicable)

The motor generator set shall comprise a motor and a generator built as a complete unit directly coupled.

The motor and the generator shall be suitably rated to deal with the load and speed specified.

Controls shall be provided so that the set shall start up on the registration of a landing call or car call and shall continue to run for a period which shall be adjustable from 5 to 15 minutes, after the last registered call is answered.

9.19.3 BEARING AND GEAR CASE

Bearings shall be of the ball bearing type or sleeve ring type with oil ring bearings

Gear cases shall be provided with thrust bearings suitable for the application.

9.19.4 EMERGENCY OPERATION BY MANUAL DEVICE

For geared lift machines, the hoisting machine shall be provided with a smooth wheel which may be fitted to the shaft to move the lift car up or down by manual operation.

The direction of movement of the car shall be clearly indicated on the machine.
9.19.5 EMERGENCY OPERATION BY ELECTRICAL SWITCH
For machines where the manual effort to raise the car together with its rated load exceeds 400N, an electrical switch for emergency operation shall be installed in the machine room.

Directional push buttons protected against accidental operation shall be provided in the machine room such that when the emergency electrical switch is operated,

The car can be moved up or down by applying constant pressure on the buttons.

The car speed under the emergency operation shall not exceed 0.63 m/s.

The emergency electrical switch and its push buttons shall be so placed that the machine can readily be observed during operation.

9.19.6 ELECTRO-MECHANICAL BRAKE
Every lift machine shall be provided with a brake which is capable of stopping the machine when the car is traveling at its rated speed and with the rated load plus 25%.

It shall also be fitted with a manual emergency operating device capable of having the brake released by hand while a constant manual pressure is required to keep the brake open.

9.21 GOODS LIFT

9.21.1 DETAILS OF THE GOODS LIFT CAR
The side and rear wall panels shall each be provided with three-equally-spaced full length lateral protective wooden battens of 200 mm wide by 25 mm thick.

The surface of the wooden battens shall be covered with 1.0 mm thick metallic sheet as required.

The top battens shall be fixed at a height of 1100 mm above finished car floor level.

The car roof shall be able to support the weight of two persons without causing permanent deformation.

Ceiling lights shall be of recessed type and be protected by stainless steel metal bars.

A recessed ceiling fan complete with heavy duty metal diffuser and capable of providing 20 air changes per hour in the car shall be provided.

The car floor shall be constructed of metallic sheet of suitable thickness with 2 mm high multi-grip non-slip pattern.

The floor construction shall be in the form of a metal drain pan (optional).

In case of metallic floor being drain type, the rear and side edges shall be folded up by 100 mm from the floor to form the drain pan.

All joints and the corners of the pan shall be welded to prevent water leakage.

The goods lift cars may also be constructed as mentioned above except the floor drain system.

9.21.2 GOODS LIFT CAR DOOR
The car doors shall be robust, manually operated, horizontally sliding and made of stainless steel / MS sheet. Power operated, automatic, horizontally sliding doors shall be multi-panel of stainless steel construction, similar to those for passenger lifts, but strong enough for goods lift use.

§ SERVICE LIFT

Neither the internal depth nor the internal width of the car shall exceed 1.00 m. The overall internal height of the car shall not exceed 1.20 m. The rated load shall not exceed 250 kg.

9.22.1 LIFT CAR AND METHOD OF DRIVE
Service lift cars shall be of rigid construction and totally enclosed except for service openings and made of wood or metal and reinforced at the point of suspension.
The car shall not be made of inflammable materials.

Two pairs of renewable guide shoes shall be fitted.

Unless otherwise specified, removable shelves shall be fitted inside the car and be so retained that they shall not be displaced by the movement of the car.

The car shall be constructed with openings on opposite sides and shall be provided with some form of protection to prevent the goods from projecting outside the car.

The method of drive for the lift shall be by traction i.e. sheaves and ropes or by positive drive using drum and ropes without counterweights.

9.22.2 GUIDE:
The car and counterweight shall each be guided by rigid guides.

Guides and their fixings shall be capable to withstand the application of the safety-gear (if provided) when stopping a fully loaded car or counterweight.

9.22.3 BUFFER:
Buffers shall be provided under all cars and counterweights.

A lift with positive drive shall be provided with additional buffers on the car top to function at the upper limit of travel.

The buffers used shall be one of the following types viz spring, rubber or resilient plastic.

9.22.4 COUNTERWEIGHT:
Counterweights shall be of metal.

A metal frame shall be provided to prevent their displacement.

In the case of drum drive, there shall be no counterweight.

9.22.5 SUSPENSION
Cars and counterweights shall be suspended by means of round strand steel wire ropes.

The factor of safety of suspension ropes shall not be less than 10,

The minimum number of ropes shall be two and they shall be independent.

The diameter of sheaves or pulleys shall not be less than 30 times the rope diameter.

9.22.6 SAFETY GEAR
Safety gear tripped by an over-speed governor shall be provided for the car where the rated capacity is 250 kg, accessible spaces exist beneath the lift well or gross car roof area equals to or greater than 0.37 m².

Where there is an accessible space beneath the well, the counterweight shall be equipped with safety gear.

9.22.7 LOAD PLATE AND WARNING NOTICE
A load plate giving the contract load of the lift in kg shall be fixed in a prominent position at each landing entrance.

A warning notice in English, Hindi and local language shall be prominently fixed at each landing entrance.

9.22.8 CAR AND LANDING DOOR
All landing openings in the lift well shall be protected by doors.
Every car or landing door shall be provided with an electric safety device which shall prevent the lift from being operated when any car or landing door is open.

It shall not be possible during normal operation to open a landing door unless the car is in the unlocking zone.

The landing doors shall be provided with the facility of being unlocked from outside with the aid of a special purpose key provided for use only by a competent lift worker.

**TERMINAL STOPPING SWITCHES**

Service lifts shall be provided with terminal stopping switches to stop the car automatically at or near the terminal service levels.

**(iii) PAINTING**

All exposed metal parts especially iron parts shall be painted with 2 coats of approved synthetic enamel paint after 2 coats of synchromesh primer after erection and before commissioning the lift.

**11.0 APPROVAL**

The supplier shall obtain the approval of drawings & installation from the CEIG.

Also approval shall be obtained from fire authorities for the features provided.

**12.0 DOCUMENTATION**

The suppliers shall furnish the following documentation in requisite number of copies (one each group of buildings)

(f) GA drawing of shaft & lift well giving all details to the civil contractors

(g) Lifting hook size and locations.

(h) Rail supporting and wall inserts

(i) Bracket location, shaft ventilation opening size and location.

(j) Control schematic GA of controllers

(k) Operation and maintenance manual

(l) Test certificates.

(m) As Built drawings.

**13.0 EXCLUSIONS**

The following are excluded from the scope of lift suppliers work

(2) Builders works associated with lift well, pit, and wall inserts.

(aa) Lifting beams.

(bb) Electrical wiring upto the Lift panel with isolator for incoming supply, earthing and lighting in lift shaft.

**14.0 SCHEDULE OF QUANTITIES**

The prices shall be quoted as per Annexure – I enclosed
15.0 GUARANTEE

15.1 The equipment supplied and the installation shall be guaranteed for satisfactory performance and workmanship, for a period of 12 months from the date of handing over the entire installation to the client in good working condition and liability of supplier under this guarantee include factored items repair or replacement of all defective parts if any, which may prove faulty during this period including such parts as may be tendered inoperative by wear-and tear but exclude such parts as may be rendered inoperative by vandalism.

The contractor shall replace free of cost all equipment or parts supplied by him and found defective within this period.

In case the contractor fails to replace or render services for defective materials & parts, the client reserves the right to do so, at the contractor's risk and expenses without prejudice.

16. FREE SERVICE

Periodical Service for the first 12 months will be carried out after the Lift has been handed over or offered for inspection.

The date of commencement of free service will remain unchanged irrespective of any delay in building completion, availability of permanent power supply, inspection, taking over or commencing the use of lift.

The Comprehensive AMC charges applicable for 3 years after warranty period shall be indicated separately.

17. SCHEDULE OF TECHNICAL PARTICULARS

The technical particulars called for in Annexure-II should be filled and furnished in the same format.

RECOMMENDED MAKE ; OTIS, JOHNSON, KONE
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<th>Materials</th>
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<td>HT Cable Termination Kit</td>
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<td>Kaycee / L&amp;T / Salzer</td>
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<tr>
<td>19)</td>
<td>Meter – Ammeter and Voltmeter (Analog Type)</td>
<td>AE/Meco/Rishab</td>
</tr>
<tr>
<td>20)</td>
<td>Indicating Lamps / Push Buttons:</td>
<td>Technik / Vaishno / ABB / Schneider / Siemens</td>
</tr>
<tr>
<td>21)</td>
<td>CT’S – Resin Cast</td>
<td>Voltamps / Kappa / Kalpa</td>
</tr>
<tr>
<td>22)</td>
<td>Contactors / Overload Relays/MPCB’</td>
<td>Siemens/ L&amp;T</td>
</tr>
<tr>
<td>23)</td>
<td>Indicating True RMS Meter(DIGITAL TYPE)</td>
<td>Conzerv / HPL Socmac / Rishab</td>
</tr>
<tr>
<td>24)</td>
<td>Industrial Power Socket Outlets (Metal Clad)</td>
<td>Crompton/ MDS /Cuttler Hammer</td>
</tr>
<tr>
<td>25)</td>
<td>MCB Distribution Boards</td>
<td>Legrand / L&amp;T-Hager</td>
</tr>
<tr>
<td>26)</td>
<td>Domestic Switches &amp; Sockets / Fan Regulators (MODULAR TYPE) Sample to be approved</td>
<td>MK/Anchor –Roma/Crabtree</td>
</tr>
<tr>
<td>27)</td>
<td>Telephone &amp; LAN Sockets</td>
<td>D-Link/Tyco</td>
</tr>
<tr>
<td>28)</td>
<td>Light Fittings(Industrial / Commercial)</td>
<td>Philips / Wipro / Bajaj/Crompton</td>
</tr>
</tbody>
</table>
### Light Fittings (Decorative / Architectural)
- Artlite / Pasolite / Thorn / Reiz / K-Lite / Havells

### Ceiling Fans 5 star rated
- Usha / Bajaj / Havells

### Exhaust Fan
- Crompton / Almonard

### Wall Mounted Fans
- Almonard / Crompton

### FRLS Wire
- Finolex / Polycab

### FRLS PVC Conduits & Accessories (Heavy duty only)
- VIP / National / Nelco

### MS Conduits & Accessories
- GI Bharat / Supreme / Javeri / BEC / BIS approved

### Perforated & Ladder type Cable Trays
- Elcon / Profab / Patni

### Raceways / PVC Trunking
- Schneider / Honeywell / Legrand

### Batteries SMF Type
- Exide

### Battery Charger
- Universal / Abhay Electric

### Telephone Connector Terminal Box
- KRONE.

### Telephone Cables Jelly filled Armored Paired Cables
- Delton / Finolex / Polycab / Havell

### Telephone cabling system
- TATA Telekom / Siemens / Lucent / D-Link / Adonix / Molex

### LAN Data cabling system
- Tyco

### RJ45 Patch Panel
- Tyco

### Communication Rack
- APW – President

### Street Light Pole
- Baja / Metal Coats (K-LITE)

### PA System
- Philips / Ahuja

### Safe Earth Electrode
- Aslok Safe Electrode Type T-39Z

### Flameproof / Increased Safety Switchgear & lighting fixtures
- Flameproof Equipments P Ltd / Sudhir Switchgear / CEAG / Baliga

### Steel
- TATA / Vizag / Jindal / SAIL

### Wire Rope
- Usha Martin / Fort William / Bharat wire ropes / Desh wire products

### General

1) Detail submittals in the form of catalogues specification sheets, and samples were called for, shall be submitted one week from the date of order and approvals shall be obtained on the type of accepted make before procurement are made.

2) Out of the approved makes of materials mentioned above, the make of materials to be used on the work shall be as decided by the Consultant/Client jointly.
3) In respect of materials for which approved makes are not specified above, the material makes to be decided by the Consultant/Client jointly and as per sample approved before procurement.

4) Equipments approved and supplied shall have local servicing facilities available in the region.

5) In case of non availability of the first indicated makes, the contractor shall opt for the other makes after getting approval from the Consultant/Client jointly. If the difference of amount is on the lower side, the same shall be passed on to the Clients.
## List of Approved Makes

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MAKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift</td>
<td>Kone/Otis/Johnson/thyssenkrupp</td>
</tr>
</tbody>
</table>
Armament aggregate O/H shop Passenger lift Dimensions as per site conditions (above dimensions of lift pit revised due to actual position of PEB structural vertical & Horizontal member)
Mechanical and Avionics aggregate O/H shop Goods lift dimensions as per Site conditions (above dimensions of lift pit revised due to actual position of PEB structural vertical & horizontal member).