

Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0025	Contract No. 66-6695
	TECHNICAL SPECIFICATIONS – GOODS CUM PASSENGER ELEVATOR / LIFT			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.
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INDEX SHEET

The document Cover Sheet indicates revisions made in this document along with the purpose of issue of the revised document. The details of revisions made in the enclosures of this document are listed in the table of *Contents* below and the enclosures listed therein are an integral part of this document.

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	A4	Index Sheet	1	01	
Part-I	A4	General Specification	12	00	
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1.0 INTRODUCTION

This specification covers the following scope of work for goods cum passenger elevator / lift:

- Design, manufacturing,
- Site installation & supervision
- Assembly of all the bought outs item supplied loose.
- Inspection at manufacturer works,
- Site testing , pre-commissioning & performing guarantee run test at site
- Obtaining statutory approval
- Imparting training to Owner's representative
- Annual maintenance
- Two year operation spare and commissioning spare.

Equipment to be supplied shall comply with latest revision of applicable Indian Standards (IS), IEC Standards and specific codes and standards mentioned in clause 'Codes and Standards' of Part-II of this specification.

Standard and descriptive requirement is covered in Part-I while specific requirement is covered in Part-II. Requirements for testing at manufacturer's works are covered in Part-IV.

All equipment and components shall be **New** having proven track record and shall have a design life of minimum **25 years**.

2.0 GENERAL REQUIREMENTS

LSTK Contractor shall offer the elevator as per data sheet Part II of this specification and furnish the information / features specific to their brand against items marked with an 'asterix (*)' in part-II of this specification during detail engineering. The elevator shall be suitable for transportation of goods & passengers from grade to the highest platform/landing with number of intermediate landings. All elevation, number of landings shall be finalised by LSTK contractor during detail engineering.

The elevator shall be suitable for installation in a structure or civil building designed by others, under site conditions as specified in Part-II.

2.1 Construction Requirement & scope

- a. General construction of passenger or goods elevator shall be completely enclosed suitable for the ingress protection specified in data sheet Part-II.
- b. Refer Part-II for the number of landing platform or nos. of floors. LSTK Contractor shall consider the required number Indicator cum push buttons at each landing floor. Size of machine room to be provided by LSTK contractor. Minimum size required as per the prevailing standard shall be considered and indicated in offer. Specific ventilation requirement of machine room shall be indicated in offer.
- c. Refer Annexure-I for the Block diagram of typical interface between vendor and LSTK Contractor battery limits
- d. LSTK Contractor shall include minimum following items in his scope of supply.
 - a. Completely assembled car cabin with doors.
 - b. Control panels with required Automation programmable controllers, VVVF drives.
 - c. Power & control cabling between Equipment within vendor scope of supply.
 - d. Counter weights and its guide rails with suitable accessories.

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- e. All protective & safety devices as required as per statutory standard and as per the project specific requirement listed in Part-II data sheet. These are not limited to door limit switches, car cabin door close or open emergency buttons etc.
- f. Drive mechanism with rope, Suitable motors with required duty, located in machine room.
- g. Operator console in car cabin suitable for attendant & dual control for goods elevator / lift.
- h. Landing Push button station and up /down arrow display, display showing current status of car cabin on each landing floor.
- i. Emergency drive mechanism in case of power failure.
- j. Overload alarm (beep) and display with landing doors remaining open
- k. Provision of Telephone to contact safety /security.
- l. Speaker for PA system.
- m. Manual fire alarm call point and capable of receiving building fire alarm signal to bypass all call signal from landing floor.
- n. Pit Ladder.
- o. Lighting in car, pit, machine room and hoistway.

2.2 Equipment Specification

a. Motor Drive Unit

The elevator motor shall be controlled by a variable voltage variable frequency (V.V.V.F.) micro-processor control system, which shall control and monitor every aspect of elevator/lift operation at all stages of the car motion cycle on real time basis. Motor drive unit shall be single wrap traction type driven by a squirrel cage induction motor as per Part-II and shall include the motor, electromagnetic brake, steel work, gear box and sheave all compactly mounted on a single base or bed plate. The shaft shall be provided with ball bearings to take up the thrust. Tapered roller bearing shall be furnished for the sheave shaft to ensure alignment and long bearing life. Driving sheave shall be grooved to ensure sufficient traction and to minimize the rope wear. The elevator machine controller and all other apparatus pertaining to the elevator shall be placed in a machine room directly over the shaft way over steel beams. The area classification of machine room shall be as specified in Part-II.

The A.C. V.V.V.F. drive system shall control A.C. voltage and frequency concurrently with the hoist motor to regulate the elevator's / lift's actual performance to match closely the ideal speed pattern, obtain maximum efficiency of operation and provide a very smooth ride. Frequency shall range fully between zero and rated value.

The Controller shall be provided with a self-diagnostic programme to keep downtime to a minimum possible. The controller shall intelligently adjust door time in response to car calls, landing calls and "Door Open" button operation.

Test buttons as required shall be provided in the controller. Operation of test buttons shall make both the car and landing buttons inoperative and permit the elevator/lift to be operated in either direction from machine room for test purposes by pressing corresponding test buttons in the controller. It shall not, however, interfere with the emergency stop switches inside the car or on the top of the car or landing floor during test mode.

b. Counter Weight, Guides and Fastening

All counter weights sections shall be carried in a structural steel frame and shall be secured by at least two tie rods passing through the holes in all the sections. The factor of safety of counter weight sections shall be as per relevant IEC standards. All counter weights shall be of metal & shall travel between rigid guide rails.

The max. deviation from true plumb and alignment of guide rails shall be 2 mm. All support framing shall be rigid and shall be designed to restrict displacement of the point of support of

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brackets to 3 mm under normal working conditions. The whole guide rail installation, including expansion joints, shall be designed for a smooth ride. The guide-rails shall be protected during storage and installation with a rust inhibiting coating which shall be cleaned off on completion of installation.

Guide-shoes shall be adjustable type & mounted so as to provide continuous contact with guide rails under all conditions. At least four replaceable guide shoes with renewable lining or set of roller guides shall be provided, two at the top and two at the bottom of the weight. Additional guide shoes shall be provided on each side of buffer frame in case of oil buffers.

Elevator/Lift shall be equipped with roller guides for up and down travel. There shall not be any metal-to-metal contact between Car and rail. Roller shall be mounted on ball bearings to provide quiet operation and excellent ride quality. (It is not required in case the design varies however the ride quality shall not be compromised for any other design).

c. Car Cabin

Frame of car cabin shall be MS structural steel with epoxy painted and walls shall be SS304. The internal clear dimensions of the CAR cabin shall not be less than those specified in IS 14665-Part I, NBC & CPWD General specifications for elevator /Lift. The car shall be so mounted on the frame that vibration and noise transmitted to the passengers inside is minimised or negligible. Internal of the car shall be SS 304 modular sheet as specified in Part –II of data sheet. Handrail in cabin shall be provided at two sides of car cabin. The cabin floor, roof and walls shall be free of distortion and undue deflection as per IS 14665 – Part 4, Section 3. The roof of car shall be sheet steel and should be capable of supporting 2 persons.

Car cabin shall have modular construction type false ceiling, suitable for LED or CFL lights for instant glow without flickering. Module size ceiling shall allow easy removal of ceiling for maintenance of equipment installed above the car cabin. False ceiling shall have required fire rating. LSTK Contractor shall also provide emergency escape route from ceiling so that if require car cabin can be evacuated in case of emergency.

d. Hoisting And Governor Ropes

Bright steel wire ropes with fibre cores suitable for Elevator/Lift duty as per BIS Code shall be used for hoisting ropes. Not less than 3 independent suspension ropes shall be provided and designed to share load equally by means of adjustable shackle rods with equalizer springs at each end of hoisting ropes.

Each rope shall have adequate section to provide a minimum factor of safety of 4 based on the max. force on the rope. Governor ropes shall be similar to hoisting ropes. Their ends shall be securely attached to the car and to the safety gear. The governor ropes shall be tensioned by a weight loaded device in the pit. The LSTK Contractor shall submit the technical details and source of supply of ropes as well as a certificate of performance of ropes from an approved test laboratory or Authority.

e. Governor

Governors shall be located in such a way that they do not come directly in the way of the elevator car or counter weight in the event of over run of the car. Governor for car safety gears shall be adjusted to actuate the safety gear at the speed specified.

f. Brakes

Electromagnetic spring loaded brake shall be provided in the elevator. They shall be designed to provide smooth stops under variable loads. Supplier shall furnish complete details of brakes

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including brake drum, couplings, gear boxes including gear ratio, lubrication, etc. (like make, type, material & dimensions).

g. **Car Cabin Door And Landing Floor Doors**

Frame of the door shall be extruded SS304. Seven tank surface treatment shall be provided before final epoxy paint in case of steel frame. External wall panels shall be made from structural sheet steel with epoxy paints. Internal wall panel shall be modular in construction and made of SS304 sheets.

h. **Door Operators**

The door operators shall be VVF inverter controlled heavy duty A. C. motor, allowing variable opening and closing speeds, and full synchronization of car and landing doors. If LSTK Contractor do not have the motorised inverter controlled door operators then, LSTK Contractor shall indicate own proprietary design along with literature, catalogue. Design offered shall have proven track record.

i. **Buffers**

Spring Buffers shall be fitted on pit floor with suitable concrete or steel foundation.

j. **Operator Console In Car Cabin**

Operator console shall be proven design, feather touch either LED lamps or LCD display type. Preferred type shall be LCD display. LSTK Contractor shall provide the sample of such operator console for Owner / Consultant approval. List of the required indications, push buttons & control switch shall be as per Part-II.

Goods cum passenger elevator / lift shall be provided with lockable switch with attendant and dual control as per IS 14655 Part 2.

k. **Indicator Cum Push Buttons At Landing Floors**

Self-illuminated type up/down push button with integral lamp, flushed to wall, feather touch push button station shall be provided on each landing floor. Each landing floor shall have indicator; which will indicate current location/position of car cabin. Bigger size separate up & down arrow mark indicating current status of car cabin motion shall be provided above the door on each landing floor.

l. **Electric Cables**

Traveling electrical cables shall be multi-core with high conductivity stranded copper conductors specifically designed for lift/elevator duty. The cables shall be provided with retaining straps and individual cable clamps. Travelling of the cables shall be either trolley or drum or festoon arrangement.

m. **Power Cum Controller Panel/Cabinets**

The Power cum programmable controller panel/cabinet shall be free standing sheet steel enclosed, dust weather and vermin proof, having degree of protection as per Part-II. The sheet steel shall be cold rolled, 2 mm thick and properly braced to prevent wobbling. Cable glands shall be double compression type made from nickel plated brass. Lugs shall be tinned copper crimping type. Earth bus shall be provided to connect with Owner earthing cables.

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Emergency isolation load break switch shall be provided at accessible ground level with provision of pad locking in OFF position. This switch shall be switched OFF in case of emergency and pad locked in OFF position for safety & maintenance.

LSTK Contractor can provide the provision to simulate the operation in programmable control for testing of the control system.

If Goods cum passenger elevator / lift is located in classified hazardous area, then control panel location shall be in safe area as far as possible otherwise power cum control panel shall be suitable for classified hazardous area specified in Part-II. Machine room shall be pressurized if is within 15m from hazardous area Zone-2 extent/boundary.

Each hinged door of the Power & control panel shall be grounded with earth bus located inside the panel. Minimum ground wire size shall be 2.5 sq.mm copper conductor.

Brief specifications of panel components shall be as follows:

i. Switches

Switches shall be hand operated, air break, heavy duty, quick make, quick break type conforming to applicable standards and required duty.

The rating of switch shall be so chosen as to get complete protection by associated O/L relay or fuse under all normal/abnormal conditions such as full load, overload, locked rotor, short circuit etc. Switch handle shall have provision for locking in both fully open and fully closed positions.

ii Contactors

Contactors suitable for motor starters shall be of the full voltage, single throw, electro-magnetic type unless otherwise specified. Contactors of AC-4 duty class shall be suitable for elevator/Lift duty.

Contactors shall be provided with a three element, positive acting, ambient temperature compensated time lagged.

iii Electronic Thermal over load relay

Electronic Thermal overload relay shall be with variable setting range for motor full load current, Single phasing protection, possibility to select trip class, Auto/Manual reset function, Stop/test function with trip indication, three element, positive acting, ambient temperature compensated type.

Setting range of overload relay shall preferably be 60% to 120% of the full load current of motor. Range of overload relay shall be coordinated with fuse, contactor and motor rating for type-2 coordination.

The Overload Relay shall be hand reset type, reset Push Button shall be provided on the front door of the Panel. It shall be possible to reset the relay from the front of the Panel without opening the compartment door.

iv. Fuses

Fuses shall be of the HRC link type having rupturing capacity of 80 kA and shall be complete with base and carrier. Fuses shall be provided with visible operation indicators to show that they have operated. Fuses shall provide Type 'C' co-ordination for contactor.

All accessories, live connections shall be adequately shrouded, and it shall be possible to change fuses with the circuit alive, without danger of contact with live metal.

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v. Control, Auxiliary & Instrument Transformers

Transformers shall be dry cast epoxy resin insulated type. It shall be responsibility of the supplier to ensure that the class and VA burdens of the instrument transformers provided are adequate for the contactors, relays and meters connected to therein. Transformer rating selected shall be 20% higher than actual required load VA as design margin.

vi. Relays

Necessary auxiliary relays for alarms, time-delay relays, voltage relays as required for control & protection shall be mounted inside the cabinet. Relays shall be equipped with externally reset, positive action operation indicator. Voltage relays shall have sufficient thermal capacity for continuous energization, using external resistors, if necessary.

Auxiliary relays shall be rated to operate satisfactorily between 80% & 110% of the rated voltage. Potential free contact for following specific relays shall be provided with at least two potential free contacts for Owner's use. One set of contact shall be used for DCS and other set of contact may be used for ground level alarm annunciations.

- a) Common alarm signal to DCS.
- b) Common Trip signal to DCS. (Drive over load , door drive unit stuck)
- c) Phase sequence reverse or phase failure.
- d) Power supply failed.

vii. Control & Selector Switches

Control & selector switches shall be of the rotary type provided with properly designated escutcheon plates clearly marked to show the operating positions.

Selector switches shall have stay put contacts with oval handles. The number of contacts & their operation in each switch shall be as indicated in control schematic (when enclosed) or shall be as per the requirements of the connected circuit.

viii. Push Buttons

All push buttons shall be of push to actuate type having 1NO and 1NC self reset contacts. They shall be provided with integral escutcheon plates, engraved with their functions. Push button contacts shall be adequately rated for the service and ambient.

ix. Cabinet Internal Wiring

Control cabinets shall be supplied completely wired, ready for external connections at the terminal blocks. All wiring shall be carried out with 650V/1100V grade, PVC insulated, wires. Power circuits shall be wired with stranded copper conductor of required current rating.

All the wires shall be routed in PVC channel/ trough of suitable size. Three phase power cables and control cables shall run in different channel or PVC trough. Each wires shall have unique ferrule number for easy identification of wires. Wires shall have cross ferruling philosophy. Wires shall be colour coded based on the operation voltage level as mentioned below :

- a. Three phase 4 wires : Red , Yellow, Blue and black for (phases & neutral)
- b. 230V AC for illumination, utility sockets & control supply : Phase-Red & black neutral
- c. 110 V AC for control supply of grey wires with Red sleeve for phase & black sleeve for neutrals
- d. Green wires for Ground/earth wires.

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Engraved identification ferrules each of independent type, marked to correspond with the wiring diagram shall be fitted at both ends of each wire. All wiring shall be terminated on terminal blocks. Terminals shall be adequately rated for the circuit current.

Each motor to be controlled from control cabinet shall be provided with isolating switch, HRC fuses, contactors with hand reset type electronic thermal overload relay, motor ON/OFF and trip indicating lamps & other equipment required for satisfactory operation & control of the motor.

2.3 Operation Requirement

- a. The operation of the elevator door shall be manual and automatic as specified in Part-II. The type (Motorised or manual) of elevator door shall be as specified in the Part-II. All the controls shall be located inside the car.

The operation of the elevator shall be with single speed provided with, constant pressure up and down inching buttons in the car unless otherwise specified in Part-II. These buttons can be operated even when the car or landing or both entrance is/are open after the car has come to normal stop through safety limit switches.

- b. An electric contact for the doors shall be provided which shall prevent the movement of elevator from the landing unless both the doors are closed. Each hoist-way door shall also be equipped with positive electromechanical interlock so that the elevator can be operated only if the interlock is established
- c. Automatic response device (ARD) shall be provided to operate the elevator and bring down to the nearest landing in case of power failure. Vendor can provide the battery backup automatic response system to bring car cabin at ground landing floor in case of power failure and open the door.

Also, in case of power failure or failure of door, it shall be possible to open the car and landing doors manually from the landing side to rescue trapped persons.

- d. An emergency push button red in colour shall be provided in the car cabin to enable the operator to give alarm in case of emergency. The alarm bell for this purpose shall be provided in the ground floor.
- e. Momentary pressing of a car button shall send the car to the landing selected where the car shall automatically stop. After car button is pressed, uninterrupted use of the car shall be ensured until the desired landing is reached and the car gate or door is opened and closed.
- f. Momentary pressing of landing button shall bring the car to this landing unless the car is already in use.
- g. A time delay shall be provided to render the car inoperative from the landing button for a few seconds after a stop is made. This interval shall be sufficient to permit a waiting passenger to open and close the car cabin door and car gate and press a car button without interference from the landing buttons.
- h. Bell shall be installed on the car and shall ring while a landing button is pressed and the car gate or hoist way door is open.

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	Part-I			
GENERAL SPECIFICATION				

2.3.1 Method of controls

Method of control system shall be one of the following:

i) Attendant & dual control

In this type of control, operation is directly controlled by attendant with help of the key switch. Dual operation is type where provisions of both automatic and attendant control are provided. Transfer of control is achieved by key operation switch provided in car cabin operator console. This method of control system shall be recommended for Goods cum passenger elevator/lift.

ii) Automatic push button operation

Automatic method of control of operation is initiated by movementary pressing push button either located in car cabin console or landing floor. This operation sets car cabin in motion and stops automatically at required landing floor. Car controller answers the call on first come register basis. Car cabin controller set car movement and stops at designated desired location on sequential register basis.

2.3.2 Type of control System

The types of control system are as follows:

- I. Collective control
- II. Single push button collective control
- III. Down collective control
- IV. Direction collective control for one car cabin
- V. Direction collective control for two or three cars.
- VI. Group supervisory control

Type IV Direction collective control or type V Direction collective control system shall be implemented for Goods cum passenger lift based on single or multiple car cabin located in same building or process unit.

2.3.3 Safety Features

Elevator / lift shall be provided with safety devices or features as follows:-

- i. Against overload.
- ii. Safety gear on car so that in the event of rope breaking or loosening, the car will be brought to rest immediately by means of grips on the guides.
- iii. The over speeding car shall be automatically brought to a gradual stop on guide rails and power supply to the hoist motor shall be switched off.
- iv. Overspeed centrifugal governor operating the safety gear in case of overspeeding of car in the down direction.
- v. Car cabin door shall be locked when passengers are in the moving car, till the elevator/lift car cabin is brought to rest.
- vi. Overtravel limit switches at top and bottom limits of travel to disconnect the power supply and apply brakes to stop the car within a defined safe distance in case of overtravel in either direction.
- vii. Ultimate terminal switches to stop the car cabin automatically within top & bottom clearances independently of normal over travel limit switches.
- viii. Protective guards to counterweights in pit, rope sheaves and wherever required.

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- ix. Toe guard apron to the car platform.
- x. Landing door limit switches : Electrical interlocks shall be provided to ensure that the car does not operate unless all doors are closed and unless the car reaches a landing zone. Multi-beam infrared / ultrasonic electronics curtains shall be provided to scan the doorway and reverse the door closing in case of any obstruction.
- xi. Each car cabin door shall be provided with an appropriate interlock which shall prevent movement of the car door when car cabin is in motion and all the doors are closed & locked. The interlocks shall also prevent opening of doors except at the landing where the car is stopping or has stopped.
- xii. Car safety device shall be provided such that whenever excessive descending speed is attained, the car stops. The safety device will be operated by a centrifugal governor located at top of the hoist way and connected to the governor through a continuous rope. Suitable means shall be supplied to cut-off power from motor and apply brake on application of safety device.
- xiii. Terminal/End limit switches shall be provided to slow down and stop the car automatically at the terminal landings and final limit switches shall be provided to automatically cut-off the power and apply the brakes in case the car travels beyond the terminal landings.
- xiv. As per statutory requirement & lift regulation, Fireman's switch shall be provided at ground floor.

2.4 Machine & Machine Room

- a. Machine room shall be provided at the top or ground elevation with pulley at top. Machine room structural or civil building shall be designed by other. LSTK Contractor can also recommend the elevator design which does not require separate machine room. LSTK Contractor shall indicate the size of the machine room along with the offer indicating location of chain pulley block or manual hoist requirement for erection of elevator. Floor opening required for car cabin movement shall be indicated with location of cable guide ways, car/cab guide ways showing the spacing and clearances.
- b. Brake coils, drive motor unit, motor winding & controller relay coils housed in machine room shall be protected against fungus growth by fungicidal treatment. LSTK Contractor will provide main earthing connection to earth bus located in machine room and supplier shall carry out earthing of various electrical equipments located inside the machine room. Also the supplier has to make suitable arrangement for effective earthing of the electrical equipments mounted on the top of car/inside the car.

2.5 Nameplate

Main name plate shall be provided inside car cabin. Name plate shall have following minimum data :

- a. Capacity in kgs. and nos. of persons with static weights.
- b. Emergency and safety instructions and warning instructions
- c. Year of Manufacturer and sr. Numbers
- d. Emergency help line telephone numbers.
- e. Certificates of statutory approval with tag number.

Name plates of approved design shall be provided on Power cum programmable controller panels, Junction boxes and each equipment shall have their name plate identification in line with dispatch document.

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	GOODS CUM PASSENGER ELEVATOR / LIFT Part-I GENERAL SPECIFICATION			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.	
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Name plates shall also be provided for all components (i.e. Indicators, touch buttons and auxiliary switch) mounted inside power cum controller panel, operator console inside car cabin and each landing elevation. All internally mounted components shall be identified by painting with the item nos. (as per approved scheme drawings) on or adjacent to the component. Identification by stickers is not acceptable.

Material of name plates shall be SS 316 or approved equivalent. The letters shall be engraved. Inscription details on name plate shall be as per LSTK Contractor requirements which shall be provided during vendor drawing approval stage.

3.0 FACTORY ACCEPTANCE TEST

Owner/ Consultant/ LSTK Contractor shall have right to carry out stage inspection.

All Type tests and Routine tests as specified in Part-IV shall be carried out during final inspection. Minimum fifteen days advance notice shall be given for carrying out final inspection.

LSTK Contractor/ Vendor shall ensure that all programmable controllers and variable voltage variable frequency (VVVF unit) controllers are properly configured for the intended interlocks, protection, desired operation & functions as per the approved schemes. All relevant functions and operations shall be demonstrated during the final inspection at factory on Power cum control panel and at site after complete assembly.

LSTK Contractor/ Vendor shall ensure that all meters associated with testing of the equipment are calibrated by a competent authority and the calibration certificates are valid at the time of carrying out the testing of equipment.

4.0 PACKING

All parts of car cabin and loose equipment such as drive unit, rope guides, Special cables, power & Control Panel, brakes, landing doors, cab/car door, Operator console shall be properly packed to protect the equipment during transportation and storage at site prior to installation. Type of packing shall take into account mode of transportation, weather conditions, distance to installation site etc. Vendor shall furnish packing details for LSTK Contractor approval.

5.0 SITE ACTIVITIES

5.1 Erection And Site Supervision Of Installation

Vendor shall depute his personnel to the site for erection & supervision of installation of all the equipment associated with elevator. Vendor also have to depute competent engineer at site along with packing list, installation guide lines for providing guidance to installation contractor or erection crew. It is vendor / LSTK Contractor responsibility to ensure that necessary precautions are taken for proper alignment and assembly of Car cabin, guide ways, doors alignment and interlock safety switches.

Installation requirements

- a) LSTK Contractor to provide 3ph., 4Wire, 415V, 50Hz and 1 no. TPN fused load break switch of required rating at ground floor at accessible location for emergency switching off the Power and for maintenance. This switch shall have provision for pad locking in OFF position. The LSTK Contractor will provide supply & install the power cable from this switch up to the power cum control panel located in machine room. Vendor shall make necessary arrangement for distributing the power in the machine room and further distribution to all the associated equipment of elevator beyond this isolator.

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- b) All the cables (other than festoon cables system) routed from shaft well shall be adequate protection such as Cable tray or conduit and supported of clamped at every 600 mm distance. Each cables shall have distinct cable tag number. Complete cabling between control cabinet & elevator accessories shall be supplied and carried out by Vendor.
- c) Special care and precautions shall be taken of the hanging elevator cable loops between the points of suspension as the loops are prone to twist/distortion.
- d) Cable anchorages, both in elevator well and car shall have adjustment facilities for rotation of each cable to eliminate twists without disturbing or disconnecting the other cables
- e) All elevator control cables shall be of same size & have same number of cores to have uniformity. The cables inside the hoist way shall be neatly dressed. Individual cables shall be cleated to hoist way wall with saddle and spacer arrangement. The distance between the two saddles shall not be more than 300mm. The flexible cables travelling along with the car shall be carefully selected to avoid any mechanical stresses to be developed on flexible cables.
- f) Vendor shall indicate maximum vertical centre to centre distance permissible between supports for guide rails. The guide rails shall be supplied by the vendor.
- g) Vendor shall depute the competent site supervisor along with team of erection crew.
- h) Scaffolding requirement shall be clearly indicated in the offer. Vendor shall depute the competent scaffolding supervisor at site as & when required.
- i) Any stage inspection is required during assembly or erection of goods cum passenger elevator from statutory authority same shall be in vendor scope.
- j) Construction power shall be provided at one point at ground level on chargeable basis.
- k) LSTK Contractor shall provide the bar chart showing engineering, procurement, assembly, site testing and hand over cycle.

5.2 Site Testing And Commissioning

Vendor shall depute his competent specialists with assisting team to site during testing and commissioning phase, to check proper configuration of all programmable controllers, VVVF , Safety switches and assisting for carrying out testing and setting, demonstrating connectivity, boxing up etc.

Following document is envisaged for LSTK Contractor review:

- a) Quality assurance plan followed during erection.
- b) Site testing protocol
- c) Pre-commissioning test report
- d) Dispatch /shipping document with part List and part number descriptions.

LSTK Contractor shall include erection of complete goods cum passenger elevator/lift, site supervision, Testing and Commissioning as indicated in Part-IV.

Spares required during testing and commissioning of the elevator, Mandatory Spares as well as Spares for 2 years' Operation and Maintenance, shall be supplied by the Vendor/ LSTK contractor, as elaborated elsewhere in the package. Special tools & tackles required for elevator maintenance shall also be supplied by LSTK Contractor.

The entire site QAP, testing & pre-commissioning protocol have to be signed by LSTK Contractor, Owner and consultant before load test and / or performance test.

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5.3 Statutory Approval

It is Vendor/LSTK Contractor responsibility to take statutory approval from state and/or central Authority for installation & commissioning of elevator as per the latest safety standard, rules and regulation.

Vendor/LSTK Contractor should not start the erection of elevator without the statutory approval. LSTK contractor shall arrange inspection and initial certification of elevator installation at site by applicable statutory authorities. All inspection/certification expenses shall be borne by LSTK contractor.

5.4 On Site Training

LSTK Contractor shall include the cost of on-site training of Owner's operating staff. Minimum half day training for 4 to 8 persons shall be included in LSTK Contractor scope.

6.0 GUARANTEED PERFORMANCE

The performance figures indicated in Part-II shall be guaranteed within the tolerance specified or as permitted by relevant standards. In case of failure of the equipment (including bought out items) to meet the guaranteed performance, Owner/ LSTK Contractor reserves the right to reject the equipment. However, Owner/ LSTK Contractor also reserves the right to use the rejected equipment until the new equipment meeting the guaranteed performance requirement is supplied by the Vendor.

If any equipment supplied by the Vendor/LSTK Contractor fails at site during erection, commissioning or service (within guarantee period), the Vendor/LSTK Contractor shall repair and put back into successful operation the failed equipment within the time frame and procedure of repair agreed with the Owner depending on nature of failure, at no extra cost to the Owner.

The period of guarantee of the equipment shall be as per the agreed commercial terms & conditions.

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 thyssenkrupp		PART - II : DESIGN DATA SHEET		Contract No:	66-6695	
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GENERAL	001	Make	:	As per Vendor List- Electrical		
	002	Tag no.	:	*		
	003	Capacity	:	*		
	004	Location in Plant	:	Process Unit / commercial building /Substation Building *		
	005	Installation	:	Indoor /Outdoor *		
	006	Hazardous area classification	:	Zone I or II, Gas group IIA/IIB or IIC, Temp T3 *		
	007	Quantities	:	*		
	008	Type of Service	:	Good cum passenger elevator *		
	009	Collaboration of Supplier	:	*		
	010	Location of manufacturing plant	:	*		
CODES & STANDARDS	011	IS - 14665 (Part 1 to 5): Electric Traction Lifts				
	012	National Building code (NBC)	:	Conformity with lift act & rules		
	013	Indian factory act and state factory act.	:	IS : 1248 - Indicating Meters		
	014	Indian Electricity act and CEA Regulations	:	IS : 2705 - Current Transformers		
	015	Fire Insurance Authority Regulations	:	IS : 3156 - Potential Transformers		
	016	IEC 61439/IS 8623 (All parts) - Specification for low voltage switchgear & control gear assemblies				
	018	IS/IEC : 60947-Low voltage switchgear and control gear				
	019					
INPUT SUPPLY	020	Rated input Voltage	:	415 volts ,3 Phase 4 wire		
	021	Voltage variations	:	±10%		
	022	Rated input frequency	:	50 Hz		
	023	Frequency variation	:	±5%		
	024	Combined Voltage & frequency Variation	:	±10%		
	025	01 Fault level	:	___ kA *		
	026	Scope & battery limit	:	As per Annexure-I		
	027					
GENERAL REQUIREMENT OF ELEVATOR	028	Carrying Capacity offered	:	Kg		
	029	Car Cabin speed (IS14665,Part2,Sec-1) m/sec.	:	0.5 to 0.75(4 to 5 flrs), 0.75 to 1.5 (6 to 12 flrs)		
	030	Total travel length	:	*		
	031	Nos of Landing floors	:	*		
	032	Car cabin floorspace (As per IS14665,Part-1,Table1,2,4)	:	x	mm	*
	033	Internal Car cabin clear height in mm	:		mm	*
	034	No. of car cabin doors.	:	1 or 2 per landing floor *		
	035	Cab /car door Size(As per IS14665,Part-1,Table 1,2,4)	:	1000 x 2200 mm *		
	036	Landing floor door size (length xWidth)	:	1000 x 2200 mm *		
	037	Cab/car door operation	:	Automatic & manual		
	038	Landing floor door operation	:	Automatic & manual		
	039	Frame for car cabin	:	MS painted frame & SS304 wall		
	040	Outer wall sheet material of car cabin	:	SS304 wall sheet		
	041	Frame for car cabin & landing floor doors	:	SS304 wall sheet		
	042	Material of car cabin & landing floor doors sheets	:	SS304 sheet		
	043	Door material	:	SS304 sheet		
	044	Cab /car flooring	:	SS304 chequered plate 6 mm thick		
	045	Handrail in car/cab	:	Minimum 2 sides		
	046	Material of Handrail	:	SS 316 mirror polished		
	047	Ceiling of car cabin	:	Modular removal type		
	048	Emergency exit for evacuation	:	Through modular ceiling		
	049	Fire Rating of car cabin	:	2 hour fire rating (alternatively the lift shaft can be fire rated along with the car door) *		
	050	Attendant and dual control as per IS14665 part 2	:	For Goods cum passenger Elevator with key switch		
	051	Type of control as per IS14665 Part 2	:	Directional collective control for 1, 2 & 3 car cabins		
	052	Ventilation fan with ON/OFF switch	:	Require with 6 air changes per hour		

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GENERAL REQUIREMENT OF ELEVATOR/LIFT	051	Lighting inside & above car cabin, Pit well	: LED or CFL fixtures			*
	052	Integrated battery back up lighting	: Yes, with 15/ 18W CFL fixture with 2 hour back up			*
	053	Car/Cab operating console	: Preferred LCD touch screen or LED.			*
	054	Landing floor control	: LED or self illuminated flushed PB station and Up /down motion			
			arrow with car cabin current status indicator			*
	055	Up/down arrow above each door of landing floor	: LED type for each landing floor			*
		Component Details	Make	Type	Material	
	056	Gear Box				*
	057	Drum				*
	058	Coupling				*
	059	Lift rope				*
	060	Brake				*
	061	Buffer				*
	062	Brake capacity	: Sufficient to hold the car at rest with 125% of its rated load.			
	063	Drive Unit details				
	064	Nos of Electrical Motors	:			*
	065	Motor Controls	: VVVF			*
	066	Cable guiding system	: Trolley / drum /festoon cable			*
	067	Cable guiding support distance	:			in mm
	068	Safety Device tripping speed/ time lag	:			in seconds
	069	Pit depth required by vendor from ground elevation	:			mm
	070	Floor opening for car/cab (widthxdepth) in mm	:			
	071	Location of lift ropes	: Side or rear			*
	072	Lubrication oil type & quantity in Gear Box	:			*
073	Connected electrical Load	:			KW	
074	Guaranteed maximum electrical load at Guaranteed capacity	:			KW	

OPERATING DEVICES	075	Operating Devices	In car/cab	M/c room	Landing floor	Make
	076	a) Flush mounted car operating panel with series of push buttons numbered to correspond to the landings served	YES			*
	077	b) "UP" & "Down" inching button	YES			*
	078	c) "STOP" push button	YES	YES		*
	079	d) Car Position indication	YES		YES	*
	080	e) Indication of direction of car travel ("Up"/"Down")	YES		YES	*
	081	f) Lift/car call push button with "UP"/"DOWN" arrows			YES	*
	082	g)Emergency call push button for alarm (bell /buzzer)	YES			*
	083	h) Door open and over load warning bell /buzzer	YES			*
	084	i) Visual floor call indicator with buzzer	YES			*
	085	j) Normal / Emergency light	YES			*
	086	k) Ventilation fan (above ceiling) with switch	YES			*
	087	l) Vertically mounted telephone or PA call point & speaker	YES			*
	088	m) Emergency Hand cranking device or ARD	YES			*
	089	n) Emergency door open button	YES			*
	090	o) Door close button	YES			*
	091	Provision of PA system speaker or telephone	YES			*
	092	Emergency bell or Fire Alarm button	YES			*
	093	Provision of CCTV camera	YES			*
	094	Isolation switch at ground floor(pad lockable in OFF pos)	YES		Ground floor	*
	095	Provision of interface with FA Panel : Potential free contact to be wired from FA Panel in case of Fire in the associated building.Elevator shall automatically move to ground floor and doors shall be opened. No further movement until the Panel is Reset.	YES/NO			*
	096	Safety limit switches	YES	YES	YES	*
	097	Make & Type of Camera : IP based , with fixed angle , without remote control. Indoor type				*
	098	Door safety switch :Multi-beam infrared / ultrasonic electronics curtains type safety switch shall be provided to scan the doorway and reverse the door closing in case of any obstruction				*

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		PART - II : DESIGN DATA SHEET								
		MOTOR DETAILS	099	Make	: As per Vendor List- Electrical					
			100	Rating & rated speed	:	KW	*	rpm	*	
			101	Rated Voltage	: 415 V , 3 phase					
102	Degree of ingress protection		: IP56							
103	Construction		: TEFC							
104	Continuous Duty factor		: 40%							
105	Minimum permissible starts per hour		: <u>120</u>							
106	Motor starter type		: VVVF *							
107	Locked rotor current (max)		:	720% of rated full load current						
108	Class of Insulation		: Class F							
109	Max. temperature rise of winding above ambient:		: Limited to class B							
110	Minimum Voltage at which motor shall be able to start & accelerate to rated speed at full load	: 80%								
111	Type of hazardous area protection	: *								
POWER CUM CONTROL PANEL	112	Make	: As per Vendor List- Electrical *							
	113	Location	: Machine room at top							
	114	Mounting	: floor , back to wall, single front							
	115	Degree of Ingress Protection as per IS 13947	: Indoor IP4X							
	116	Enclosure sheet steel	: Frame 2 mm and door, partition 1.6 mm							
	117	Minimum clearance	: Phase to Phase : 25 mm & Phase to ground 20 mm							
	118	Earth bus	: 30x 6 mm aluminium							
	119	Overall size of panel (LxDxH) in mm	: *							
	120	Total Weight of panel	:	Kgs *						
	121	Cable entry	: Top /Bottom *							
	122	Panel Cooling	: Natural ventilated or with cooling fan *							
	123	Components details	Make	Type	Rating					
	124	a) Isolation switch /main switch				*				
	125	b) Power contactor				*				
	126	c) Variable Voltage Variable frequency device /VVVF				*				
	127	d) Electronic thermal & single phase over load relay				*				
	128	e) HRC fuse				*				
	129	f) Selector switch				*				
	130	g) Programmable logic controller (PLC) or microprocessor based elevator control system				*				
	131	h) Control Transformer				*				
	132	i) Auxiliary relays				*				
	133	j) Timers if any				*				
	134	l) Internal Wiring				*				
	135	m) Indicating meters				*				
	136	n) Potential & Status indicating lamps				*				
	137	o) Illumination lights inside panel				*				
	138	p) Cooling fan if installed.				*				
	139	q) Control & Power terminal block				*				
	140	r) Phase protection relay				*				
	141	Painting								
	142	a) Primer	: Two coats of epoxy based primer							
	143	b) Final paint	: Two coats of epoxy							
	144	c) Final paint shade	: Manufacturer standard.							
145	d) minimum paint thickness	: 60 microns								
146	e) Surface treatment	: Seven tank process								

Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0025	Contract No. 66-6695	
	GOODS CUM PASSENGER ELEVATOR / LIFT Part-III - Drawings & Documents Enclosed			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.	
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Following drawing(s)/document(s) is/are enclosed:

Sr. No.	Drawing / Document No.	Size	No. of Sheets	Description
1	Annexure -I	A3	1	Interface block diagram indicating vendor & LSTK Contractor battery limits.

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 ThyssenKrupp				Contract No:	66-6695		
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Tests		Reference Documents	Sample size	Scope of Inspection			
				Vendor	Owner / Consultant / LSTK Contractor	Remark	
A FACTORY VERIFICATION /ACCEPTANCE TEST							
i	Stage inspection & progress review	As per PO	on each rating/unit.	P	W		
ii	Review of packing list & physical inspection of all the subsupplier loose components	Packing list/Shipping list		P	W		
iii	Review of material & test certificates of all the components including make verification.	Vendor drawing		P	W		
iv	Routine test on Power & control panel			P	W		
	a) Visual Check of Tag nos., paint shade and finish, busbar marking/ sleeving, shrouding, identification/ location of components	Vendor drawing		P	W		
	b) 1 min. power freq. voltage withstand test	IS 3427, IS 12729/ IEC 62271-1		P	W		
	c) Verification of test certificates for bought out items/ components	-do-		P	W		
v	Review of type test certificate for motors			P _{PROTO}	R		
B ONSITE ACCEPTANCE /COMMISSIONING AND GUARANTEE RUN							
i	Visual Check of Tag nos., paint shade and finish, busbar marking/ sleeving, shrouding, identification/ location of components	Approved GA drawings	100%	P	W		
ii	Dimensional check incl. operating height, clearances,	Approved GA drawings		P	W		
iii	Verification supporting & Earthing arrangement	Approved GA/layout drawings		P	W		
iv	Varification of Bill of material including make of components	GA drawings		P	W		
v	Earthing continuity check & Insulation resistance test	As per IS14665, IS 3043		P	W		
vi	Dielectric test on power & control circuits of control panel/cabinet.	IS 3427, IS 12729/IEC 62271-1		P	W		
vii	Carrying capacity load test	order spec.		P	W		
viii	Intended operation & function test from machine room	Schematics, interlock list & operation manual		P	W		
ix	Intended operation & function test from car/cab operator console.			P	R		
x	Intended operation & function test from each landing floor.			P	R		
xi	All the safety interlocks covering landing door and /or car door limit switches.			P	W		
xii	Demonstration of Handwheel manual operation from Machine room or ARD test.	Vendor documents		P	W		
xiii	Verification of all guarantee parameter listed in Part-II (Lift capacity,speed etc)	-do-		P	W		
xiv	Test to check whether the safety gear stops the lift car with rated load at Overspeed	-do-	P	W			
xv	Test to check whether the safety gear stops the lift car with Overload	-do-	P	W			
xvi	Test check of Emergency stop, cab lights,Fire alarm, Telephone system and Camera system,any trip/fault alarm siganal to DCS system	-do-	P	W			
xvii	Verification of software loading, programming of VVVF , microprocessor controller in Normal & Test modes.	-do-	P	W			
xviii	Verification of 2 years operation spare with their individual function test on components, accessories, spares as per PO	-do-	P	W			
xix	Verification of loose components, accessories, spares as per PO	-do-	P	W			
xx	Verification of test certificates for bought out items/ components	-do-	P	W			
Notes:							
1) W = Witness, R = Review, P = Perform on project equipment, P _{PROTO} = Perform on prototype.							

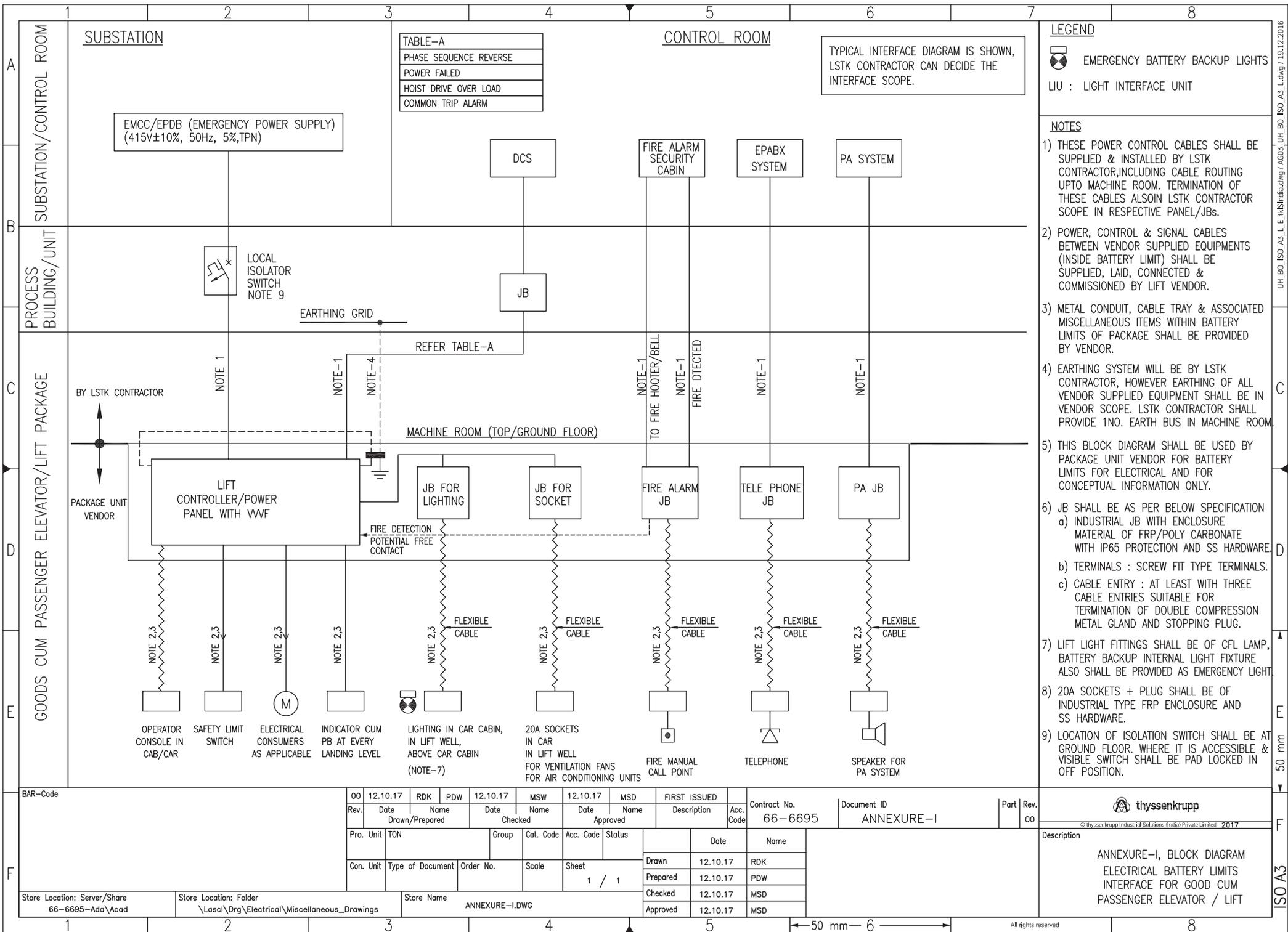


TABLE-A

PHASE SEQUENCE REVERSE
POWER FAILED
HOIST DRIVE OVER LOAD
COMMON TRIP ALARM

TYPICAL INTERFACE DIAGRAM IS SHOWN, LSTK CONTRACTOR CAN DECIDE THE INTERFACE SCOPE.

- LEGEND**
- EMERGENCY BATTERY BACKUP LIGHTS
 - LIU : LIGHT INTERFACE UNIT

- NOTES**
- THESE POWER CONTROL CABLES SHALL BE SUPPLIED & INSTALLED BY LSTK CONTRACTOR, INCLUDING CABLE ROUTING UPTO MACHINE ROOM. TERMINATION OF THESE CABLES ALSO IN LSTK CONTRACTOR SCOPE IN RESPECTIVE PANEL/JBs.
 - POWER, CONTROL & SIGNAL CABLES BETWEEN VENDOR SUPPLIED EQUIPMENTS (INSIDE BATTERY LIMIT) SHALL BE SUPPLIED, LAID, CONNECTED & COMMISSIONED BY LIFT VENDOR.
 - METAL CONDUIT, CABLE TRAY & ASSOCIATED MISCELLANEOUS ITEMS WITHIN BATTERY LIMITS OF PACKAGE SHALL BE PROVIDED BY VENDOR.
 - EARTHING SYSTEM WILL BE BY LSTK CONTRACTOR, HOWEVER EARTHING OF ALL VENDOR SUPPLIED EQUIPMENT SHALL BE IN VENDOR SCOPE. LSTK CONTRACTOR SHALL PROVIDE 1NO. EARTH BUS IN MACHINE ROOM.
 - THIS BLOCK DIAGRAM SHALL BE USED BY PACKAGE UNIT VENDOR FOR BATTERY LIMITS FOR ELECTRICAL AND FOR CONCEPTUAL INFORMATION ONLY.
 - JB SHALL BE AS PER BELOW SPECIFICATION
 - INDUSTRIAL JB WITH ENCLOSURE MATERIAL OF FRP/POLY CARBONATE WITH IP65 PROTECTION AND SS HARDWARE.
 - TERMINALS : SCREW FIT TYPE TERMINALS.
 - CABLE ENTRY : AT LEAST WITH THREE CABLE ENTRIES SUITABLE FOR TERMINATION OF DOUBLE COMPRESSION METAL GLAND AND STOPPING PLUG.
 - LIFT LIGHT FITTINGS SHALL BE OF CFL LAMP, BATTERY BACKUP INTERNAL LIGHT FIXTURE ALSO SHALL BE PROVIDED AS EMERGENCY LIGHT.
 - 20A SOCKETS + PLUG SHALL BE OF INDUSTRIAL TYPE FRP ENCLOSURE AND SS HARDWARE.
 - LOCATION OF ISOLATION SWITCH SHALL BE AT GROUND FLOOR. WHERE IT IS ACCESSIBLE & VISIBLE SWITCH SHALL BE PAD LOCKED IN OFF POSITION.

Rev. 00		Date 12.10.17		RDK		PDW		Date 12.10.17		MSW		Date 12.10.17		MSD		FIRST ISSUED		Contract No. 66-6695		Document ID ANNEXURE-I		Part 00		Rev. 00					
Pro. Unit TON		Group		Cat. Code		Acc. Code		Status		Date		Name		Description		Acc. Code		Contract No.		Document ID		Part		Rev.		Description			
Con. Unit		Type of Document		Order No.		Scale		Sheet 1 / 1		Date 12.10.17		Name RDK		Description		Acc. Code		Contract No.		Document ID		Part		Rev.		Description			
Store Location: Server/Share 66-6695-Ada\Acad		Store Location: Folder \Lasc\Dr\Electrical\Miscellaneous_Drawings		Store Name ANNEXURE-I.DWG		Scale		Sheet 1 / 1		Date 12.10.17		Name RDK		Description		Acc. Code		Contract No.		Document ID		Part		Rev.		Description			
Date 12.10.17		Name RDK		Date 12.10.17		Name PDW		Date 12.10.17		Name MSD		Date 12.10.17		Name MSD		Date 12.10.17		Name MSD		Contract No. 66-6695		Document ID ANNEXURE-I		Part 00		Rev. 00		Description ANNEXURE-I, BLOCK DIAGRAM ELECTRICAL BATTERY LIMITS INTERFACE FOR GOOD CUM PASSENGER ELEVATOR / LIFT	

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50 mm

ISO A3