





Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-552-CA-0002	Contract No. 66-6695
	BATTERY LIMIT & INTERFACES - ELECTRICAL			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.
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1 INTRODUCTION

The intent of this document is to primarily provide information for physical Interfaces related to Electrical and define the split of responsibilities between LSTK Contractors and Owner during engineering, procurement, construction, pre-commissioning and commissioning phases of the project.

2 GENERAL

LSTK Contractor shall refer to the split of responsibility involved in the various interfaces with the systems supplied by Owner/ Others.

The expected division of interface responsibility for each system is indicated below. Any additional responsibility if required during execution of the project & for completion and safe operation of the plant, the same shall be included in the scope of LSTK Contractor at no extra time and cost implication to Owner.

Interfaces in the following systems are envisaged as a minimum



- 11KV Main incoming power supply
- Emergency power supply
- Fire detection & Alarm system
- Public Address system (Loudspeaker Intercommunication system)
- Telephone system
- SCADA
- Owner/ Other's Loads
- Earthing

3 ELECTRICAL INTERFACES BETWEEN LSTK CONTRACTOR AND OWNER

The following table define the requirements on the specific areas of interfaces. This shall however be read in conjunction with the document, Contractor Scope of work – Electrical 6695-ELT-510-CA-0001 available in Volume 02 Section 06 of this tender. LSTK Contractor shall also refer to General Engineering Specification – Electrical , Key SLD, Detail SLD, Design Guidelines for Electrical facilities and all other documents/ drawings attached in the various sections of the tender to understand the complete requirements.





LSTK Contractor shall refer to the document 6695-ELT-G00-FA-0001, key SLD to understand the various unit fed from substation US-501 (in LSTK Contractor scope of work).

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1 3.1 11kV MAIN INCOMING POWER SUPPLY



11kV main incoming power supply shall be made available by the Owner at the incoming terminals of the 11kV switchgear of LSTK Contractor in the Substation US-501 (within ISBL). All further downstream electrical equipments/ facilities shall be in LSTK Contractor scope.

Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	Supply & laying of HV (11kV) and LV (control) cables from Owner's 11kV Switchgear (in new 11kV Switchgear building) to LSTK Contractor's 11kV switchgear (in Substation US-501 within ISBL).	NO	YES
2.	Providing suitable termination arrangement in LSTK Contractor's 11kV Switchgear for terminating Owner's cables (Owner's cable details will be finalized during detail engineering).	YES	NO
3.	Termination of HV (11kV) and LV (control) cables of Owner at LSTK Contractor's 11kV switchgear (in Substation US-501 within ISBL) including supply of required termination kits, glands, lugs, etc. to make the installation complete.	YES	NO
4.	Line differential relay in 11kV switchgear panel, of LSTK Contractor		
	a. Supply of Line differential relay	NO	YES
	b. Space for mounting line differential relay	YES	NO
	c. Installation of relay in the 11kV switchgear panel	YES	NO
	d. Termination of FO cable in the 11kV switchgear	YES	NO
	e. CT's for line differential relay: All technical parameters of the CT's (supplied by LSTK Contractor) shall be matched by LSTK Contractor with the CT details provided by Owner during detail engineering.	YES	NO
5.	Providing cable trays/ trenches including cable tray support structure, sand and any other infrastructure required for laying Owner's cables within LSTK Contractor battery limits. (Owner's cable details will be finalized during detail engineering).	YES	NO
6.	Testing & Commissioning of cables, switchgear (Owner & LSTK Contractor shall provide assistance to each other for this interface)	YES	YES

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1 3.2 EMERGENCY POWER SUPPLY



Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	Supply, laying of 415V LV power & control cables from Owner's Emergency switchboard (in other substation) to LSTK Contractor's 415V PCC (in Substation US-501 within ISBL).	NO	YES
2.	Providing suitable termination arrangement in LSTK Contractor's PCC for terminating Owner's cables (Owner's cable details will be finalized during detail engineering).	YES	NO
3.	Termination of LV power & control cables of Owner at LSTK Contractor's 415V PCC (in Substation US-501 within ISBL) including supply of required termination kits, glands, lugs, etc. to make the installation complete.	YES	NO
4.	Providing cable trays/ trenches including cable tray support structure, sand and any other infrastructure required for laying Owner's cables within LSTK Contractor battery limits. (Owner's cable details will be finalized during detail engineering).	YES	NO
5.	Testing & Commissioning of cables, switchgear (Owner & LSTK Contractor shall provide assistance to each other for this interface)	YES	YES

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3.3 FIRE DETECTION AND ALARM SYSTEM (FDA system)



Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	FA system design, engineering within LSTK Contractor's ISBL including estimation of quantities of all FA system equipments, layout engineering, cable routing, PDMS modelling, etc.	YES	NO
2.	Supply of fire alarm equipment i.e. Smoke detectors, linear beam detectors, manual call point, fault isolators, hooters, exit signs, siren/ siren starter power pack, DC back up supply, fire alarm panel, repeater panel, etc. based on the quantities furnished by LSTK Contractor.	NO	YES
3.	Installation of Fire alarm system equipments complete with installation supports, fixing hardware, accessories including all labour work and material	YES	NO
4.	Supply, installation, termination, testing and commissioning of fire alarm cables, power supply cables to FA panel/ repeater panel, junction boxes, cable glands, lugs, cable trays, fixing hardware, conduits, installation materials, structural supports etc. including all labour work and material within LSTK Contractor's battery limits	YES	NO
5.	Providing Input power supply (415V/240V) to Fire Alarm Panel including providing feeders in emergency board/ UPS DBs / non-UPS boards.	YES	NO
6.	Supply, laying, termination, testing and commissioning of Data high way FO cable connecting Fire alarm panel over the complex.	NO	YES
7.	Providing space in ISBL cable trays/ trenches, building entries etc for Owner's fire alarm cables (exact Owner's cable detail will be finalized during detail engineering)	YES	NO
8.	Interface of fire alarm system with fire protection/ fire fighting systems, interlocking with HVAC systems, etc. within LSTK contractor battery limits.	YES	NO
9.	Co-ordination, assistance and interface support to vendor of the fire alarm system for testing and successful commissioning of the system (testing and commissioning shall be done by fire alarm system vendor)	YES	NO

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3.4 PUBLIC ADDRESS SYSTEM (LOUDSPEAKER INTERCOMMUNICATION SYSTEM)



Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	PA system design, engineering within LSTK Contractor's ISBL including estimation of quantities of all PA equipments, layout engineering, cable routing, PDMS modelling, etc.	YES	NO
2.	Supply of PA system equipment e.g FCS rack, Amplifier rack, MCS, FCS (Field call stations), Loud speakers, beacon, power supply units, acoustic hoods (for FCS in noisy areas), etc. based on the quantities furnished by LSTK Contractor.	NO	YES
3.	Installation of Public address system equipments complete with installation supports, fixing hardware, accessories including all labour work and material	YES	NO
4.	Supply, installation, termination, testing and commissioning of PA system cables, power supply cables, junction boxes, cable glands, lugs, cable trays, fixing hardware, conduits, installation materials, structural supports etc. including all labour work and material within LSTK contractor battery limits.	YES	NO
5.	Providing feeders & Input power supply (emergency / UPS/ non-UPS) to power pack of FCS rack, etc.	YES	NO
6.	Supply, laying, termination, testing and commissioning of PA system cables from Plant Communication Central exchange (located elsewhere) to FCS-rack, Amplifier rack within LSTK Contractor ISBL.	NO	YES
7.	Providing space in ISBL cable trays/ trenches, building entries etc for Owner's PA system cables (exact Owner's cable detail will be finalized during detail engineering)	YES	NO
8.	Co-ordination, assistance and interface support to vendor of the PA system for testing and successful commissioning of the system (testing and commissioning shall be done by PA system vendor)	YES	NO

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3.5 TELEPHONE SYSTEM (EPABX)

Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	Telephone system design, engineering within LSTK Contractor's ISBL including estimation of quantities of all telephone equipments, layout engineering, cable routing, PDMS modelling, etc.	YES	NO
2.	Supply of telephone system equipment e.g telephone distribution cabinets, cable termination box, telephone sets, etc. based on the quantities furnished by LSTK Contractor.	NO	YES
3.	Installation of telephone system equipments complete with installation supports, fixing hardware, accessories including all labour work and material	YES	NO
4.	Supply, installation, termination, testing and commissioning of telephone system cables, power supply cables, junction boxes, cable glands, lugs, cable trays, fixing hardware, conduits, installation materials, structural supports etc. including all labour work and material within LSTK Contractor's battery limit.	YES	NO
5.	Providing feeders & Input power supply (emergency / UPS/ non-UPS) as per requirement.	YES	NO
6.	Supply, laying, termination, testing and commissioning of telephone system cables from Main Distribution Frame in telephone exchange (located elsewhere) to telephone distribution cabinet/ cable termination box within LSTK Contractor ISBL.	NO	YES
7.	Providing space in ISBL cable trays/ trenches, building entries etc for Owner's PA system cables (exact Owner's cable detail will be finalized during detail engineering)	YES	NO
8.	Co-ordination, assistance and interface support to vendor of the telephone system for testing and successful commissioning of the system (testing and commissioning shall be done by Telephone system vendor)	YES	NO



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3.6 SCADA

LSTK Contractor shall refer to the document Typical SCADA block diagram for Unit Substation level networking (Doc. No. 6695-ELT-G00-FA-0004) available in Volume 4 Section 6.

Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	SCADA system design, engineering within LSTK Contractor's ISBL only to the extent of substation (US-501) level networking of numerical relays, multifunction meters and hardwired I/O's.	YES	NO
2.	Supply of RTUs, SCADA equipments in LSTK Contractor's substation (US-501) based on the information furnished by LSTK Contractor.	NO	YES
3.	Installation of RTUs, SCADA equipments complete with installation supports, fixing hardware, accessories including all labour work and material.	YES	NO
4.	Supply, installation, termination, testing and commissioning of SCADA cables (refer block diagram), power supply cables, junction boxes, cable glands, lugs, cable trays, fixing hardware, conduits, installation materials, structural supports etc. including all labour work and material within LSTK Contractor's battery limit.	YES	NO
5.	Supply, installation, termination, testing and commissioning of Marshalling boxes (for hardware termination of SCADA Cables from Switchgear / UPS/Battery chargers to RTU), fixing hardware, installation materials, structural supports etc. including all labour work and material within LSTK Contractor's battery limit.	YES	NO
6.	Providing required no. of feeders & Input power supply (emergency/ UPS/ non-UPS) for the RTUs/ SCADA equipments, etc. Feeder details shall be finalised during detail engineering.	YES	NO
7.	Assignment of relay names, assignment of IP addresses, Mapping of protection & metering functions, downloading of CID files to respective relays	YES	NO
8.	Supply, laying, termination, testing and commissioning of SCADA system cables for redundant connectivity from Centralised SCADA server (located elsewhere) to Ethernet switches (in SCADA panel) located within LSTK Contractor's ISBL Substation (US-501).	NO	YES


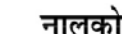
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Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
9.	Providing space in ISBL cable trays/ trenches, building entries etc. for Owner's SCADA cables (exact Owner's cable detail will be finalized during detail engineering).	YES	NO
10.	Co-ordination, assistance and interface support to vendor of the SCADA system for testing and successful commissioning of the system (testing and commissioning shall be done by SCADA system vendor)	YES	NO
11.	<p>Interface requirement for Factory Acceptance Test (FAT) at SCADA vendors works –</p> <p>Apart from the installed equipments within various switchgears, LSTK Contractor shall supply additional following equipments for FAT which shall then be handed over to the Owner as spare.</p> <p>Supply of 1no. of each type (make & model) of numerical relay. Supply of 1no. of each type of MFM. Supply of 2nos. of each type of Ethernet switch. Supply of 1no. of each type of Protocol converter. Supply of 1no. of each type of any other hardware (within LSTK Contractor scope of supply) connected to SCADA system.</p> <p>All the above shall be completely programmed by LSTK Contractor as per actual project requirement.</p> <p>LSTK Contractor shall supply and deliver all the above to SCADA vendors works as per the schedule of FAT. Location of SCADA vendors works and the schedule of FAT shall be intimated later during detail engineering.</p> <p>LSTK Contractor shall ensure that their representative shall be present at SCADA vendors works at the time of FAT</p>	YES	NO

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3.7 OWNER/ OTHER'S LOADS

Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	Estimating the no. of feeders required in various switchboards of LSTK Contractor for Owner/ Other's loads	NO	YES
2.	Sizing of all electrical equipments in LSTK Contractor's substation (US-501) i.e. transformers, switchgears, etc. considering Owner/ Other's loads also.	YES	NO
3.	LSTK Contractor shall consider heat load of Owner/ Other's switchboard, VFD's, etc, while sizing HVAC for substation (US-501).	YES	NO
4.	Provision of feeders in various switchboards for Owner/ Other's loads as per the requirement stated below in NOTE 1. However the exact requirement of number of feeders and the ratings shall be intimated to the LSTK Contractor during detail engineering.	YES	NO
5.	Provision of space in LSTK Contractor's substation (US-501) for installation of Owner/ Other's switchboard as per the requirement stated below in NOTE 2 complying to all the safety clearances as per tender requirement. The exact requirement and dimensions shall be intimated to the LSTK Contractor during detail engineering.	YES	NO
6.	Provision of connecting Owner/ Other's FA system equipments, PA system equipments, telephone system equipments, Numerical relays, multi-function meters into FA panel, PA racks, telephone distribution cabinets, Ethernet switches installed at LSTK Contractor ISBL substation (US-501).	YES	NO
7.	Providing cable trays (approx. 5nos. 600mm wide)/ trenches including cable tray support structure, sand and any other infrastructure required for laying Owner/ Other's cables within LSTK Contractor's battery limits. (Owner/ Other's cable details will be finalized during detail engineering).	YES	NO
8.	Supply, laying, termination, testing and commissioning of Owner/ Other's cables upto the feeders provided for Owner/ Other's use in LSTK Contractor's switchboards including supply of required termination kits, glands, lugs, etc. to make the installation complete.	NO	YES



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Srno.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
9.	Supply, laying, termination, testing and commissioning of Owner/ Other's cables from the Owner/ Other's FA system equipments, PA system equipments, telephone system equipments, Numerical relays, multi-function meters into the FA panel, PA racks, telephone distribution cabinets, Ethernet switches installed in LSTK Contractor's ISBL substation (US-501) including supply of required termination kits, glands, lugs, etc. to make the installation complete.	NO	YES
10.	Providing suitable termination arrangement in LSTK Contractor's Switchboards for terminating Owner/ Other's cables (Owner/ Other's cable details will be finalized during detail engineering).	YES	NO
11.	Providing suitable arrangement for earthing of Owner/ Other's switchboard, panels (Owner/ Other's panel details will be finalized during detail engineering).	YES	NO
12.	Testing & commissioning of cables and switchgears (feeders provided for Owner/ Other's use) (Owner/ Other's & LSTK Contractor shall provide assistances to each other for this interface).	YES	YES



NOTES :

- LSTK Contractor shall provide the following feeders in their switchboards for Owner/ Other's use –
 - 3nos. VCU feeders in 6.6kV switchgear for feeding Owner/ Other's 6.6 kV motor.
 - 4nos. 630A ACB feeders in PCC for feeding Owner/ Other's MCC.
 - 6nos. 63A feeders in MLDB for feeding Owner/ Other's SLDB (normal lighting load).
 - 3nos. 63A feeders in EMLDB for feeding Owner/ Other's ESLDB (emergency lighting load)
 - 4nos. 32A feeders in 110V DCDB for feeding Owner/ Other's MCC.
 - 4nos. 63A feeders in Auxiliary Service Board for feeding Owner/ Other's welding sockets, field PDB's.
 - 4nos. 32A feeders in UPS ACDB for feeding Owner/ Other's VFDs, Transducer panel and DCS/ Instrumentation loads.
- LSTK Contractor shall provide space for installation of Owner/ Other's switchboards/ panels as per the following
 - Owner/ Other's MCC of approx. dimensions 5m(W) x 1m(D) in Switchgear Room
 - Owner/ Other's VFDs of approx. dimensions 6m(W) x 1m(D) in Air-conditioned room.
 - Owner/ Other's Transducer Panel of approx. dimensions 1m(W) x 1m(D) in Switchgear Room.
- LSTK Contractor shall consider approx. total load of 250kW on 415V and 350kW on 6.6kV for Owner/ Other's loads for sizing of the equipments.
- LSTK Contractor shall ensure that outgoing feeders provided in his switchboards for feeding Owner/ Other's MCC/ motor loads shall have provision for measurement of power consumption.

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5. LSTK Contractor shall keep provision of the following additional ports in the loops of Ethernet switches of SCADA for wiring Owner/ Other's equipments:
 - a. 4nos. port in the loop of Ethernet Switch for 415V switchgear(PCC)/ 415V MCC .
 - b. 2nos. port in the loop of Ethernet Switch for HV/ LV VFD.
 - c. 4nos. port in the loop of Ethernet Switch for MFM.
6. In case of feeders provided for Owner/ Other's use in the switchgears of LSTK Contractor, it shall be the responsibility of LSTK Contractor to wire the relays & MFM's of these feeders also in the respective loops upto Ethernet switches as indicated in the typical SCADA Block Diagram.
7. In case of feeders provided for Owner/ Other's use in HV & LV Switchgear, it shall be the responsibility of LSTK Contractor to wire the transducer of these feeders in the respective transducer panel .
8. LSTK Contractor to note that the requirement stated above for load, feeder details (number & quantity), space, cable trays is preliminary. The same shall be finalised during detail engineering. However for any variation of 25% in the above details, LSTK Contractor shall comply without any time and cost implication to the Owner.






3.8 EARTHING

Sr. No.	DESCRIPTION	LSTK CONTRACTOR	OWNER/ OTHER
1.	Provision of earthing grid for ISBL plant and its connection to overall plant grid at a number of locations, to be decided during detailed engineering.	YES	NO

4 SPECIFIC INSTRUCTIONS

- 4.1 The LSTK Contractor shall ensure that full and safe access inside their Substation (US-501) & plant battery limit is provided to Owner/ Other Contractor to undertake their cable laying.
- 4.2 The LSTK Contractor shall also ensure that full access inside their battery limit is provided to Owner/ System vendors to undertake their testing work in accordance with the project schedule.
- 4.3 Supply of Fire Alarm system equipments, PA system equipments, & telephone system equipments shall be in Owner's scope in order to avoid different makes, models in the various units of the 5th Stream Alumina Refinery.
- 4.4 LSTK Contractor shall generally be responsible for handling of the free-issue items that shall be given to the LSTK Contractor by the Owner. LSTK Contractor shall be responsible for receiving & shifting from Owner's stores (location of the stores shall be intimated to the LSTK Contractor during detail engineering) the free-issue material. Further responsibility of installation, testing, commissioning shall be as per the various interfaces elaborated above. It shall be the responsibility of the LSTK Contractor to check and verify that the material given is as per the estimated quantities furnished by LSTK Contractor. Detailed procedure for handling of free issue material shall be

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furnished during detail engineering. LSTK Contractor shall comply to the same without any additional time and cost implications to the Owner.

- 4.5 Information furnished above is preliminary. Exact requirements of Owner's cable details, load details, etc. shall be intimated to the LSTK Contractor during detail engineering. LSTK Contractor shall comply without any additional time and cost implication to the Owner.
- 4.6 Attempt is made to elaborate detail scope in each interface to the extent possible. However any additional work required in any of the interfaces during detail engineering shall be performed by the LSTK Contractor without any implications to the Owner.