







Plant <b>1.0 MTPA ALUMINA REFINERY STREAM-5</b>	Client <b>NALCO</b>	Contract Code <b>NAL</b>	Document ID <b>6695-EQS-552-CA-0001</b>	Contract No. <b>66-6695</b>
	<b>Scope of Work for Contractor- Static Equipment</b>			 <b>नेशनल एल्युमिनियम कम्पनी लिमिटेड</b> <b>National Aluminium Company Ltd.</b>
				Rev <b>01</b> Page <b>2</b> of <b>5</b>

LSTK contractor's scope of work regarding all static equipment in Product Hydrate, Calciner and Alumina transfer system (i.e. in overall scope of this LSTK package) shall include, but not limited to following (This document shall be read in conjunction with document Scope of work for contractor for process & general scope of work of static equipment and other tender documents):-

1. Review of process datasheets, equipment datasheets / technical specifications of the equipment and applicable project specifications given in tender documents for completeness / correctness & consistency. Obtain clarifications, if required, from Consultant. Check availability of all applicable documents, project specifications in the tender.
2. In case of conflict between process datasheet, equipment datasheet (and within data given in the equipment datasheet), design codes & applicable project specifications; most stringent requirement of these documents shall be considered & followed by Contractor. In any case, discrepancies found between these documents shall be referred to Consultant for the resolution and resolution given by Owner / Consultant / Licensor on the same shall be followed without any cost / time implication to the project.
3. Mechanical design of the equipment. Preparation of stress analysis / design calculations for all the pressure parts / non pressure parts of equipment including supports / anchoring, reaction on shell / dish due to lifting lugs, support brackets, nozzle local load, loads due to wind & seismic, stresses induced while erecting vertical equipment from horizontal position etc.

FEA analysis for cases not covered by Code design, for components as specified in equipment datasheet / specification & as requested by Owner / Consultant during detail engineering.



4. Preparation of technical specifications / mechanical datasheets for enquiry purpose. This should generally include all the requirements including (but not limited) to the following,
  - Licensor's requirements. Contractor shall ensure that all Licensor & tender requirements are fulfilled.
  - Applicable codes, statutory requirements, design conditions, operating conditions, minimum & maximum temperatures and MDMT, applicable project specifications & engineering standards etc. Latest edition, revision, issue and addenda of all the Codes/Standards/regulations shall apply.
  - Specific design conditions such as steam out conditions, temperature/pressure cycles, number of cycles for expansion below design etc.
  - Material of Construction for all parts & specific requirements related to it, e.g. impact testing, normalising, etc.
  - Minimum thickness requirements as per design calculations / GES requirements
  - For storage tanks, Contractor to give attention to minimum thickness (in addition to API 650 requirement) of plates for tank bottom/shell/roof and specify it in the enquiry specification to avoid practical problem of buckling during welding.
  - Stress relieving, Post Weld Heat Treatment & NDT requirements
  - Service of the equipment & specific requirements related to it.
  - Corrosion allowance
  - Requirement of lining, cladding, weld overlay
  - Requirements of internals such as trays, distributors, mist eliminators, vortex breaker, supports for internals etc.
  - For vessels, Contractor shall add following specific requirements, as applicable

Plant <b>1.0 MTPA ALUMINA REFINERY STREAM-5</b>	Client <b>NALCO</b>	Contract Code <b>NAL</b>	Document ID <b>6695-EQS-552-CA-0001</b>	Contract No. <b>66-6695</b>
	<b>Scope of Work for Contractor- Static Equipment</b>			 <b>नेशनल एल्युमिनियम कम्पनी लिमिटेड</b> <b>National Aluminium Company Ltd.</b>
				Rev <b>01</b> Page <b>3</b> of <b>5</b>

a) Sketch showing the general arrangement, main dimensions and internals (vortex breaker, distributors, demister pad etc) including nozzle location & orientation diagram.

b) Position of all instruments shall be shown (pressure, temperature, liquid levels including high and low levels and alarm and trip settings). Size of nozzle as per process requirement



- For heat exchangers,
  - a) Heat transfer duty, heating/ cooling curves (as required)
  - b) Process design conditions at inlet/ outlet/ intermittent conditions
  - c) Physical properties of fluids at inlet/ outlet/ intermittent conditions
  - d) Type of exchanger
  - e) Thermal rating of exchangers, to establish size, surface, fouling factors, no. of shells, tube sheet layout etc.
  - f) Applicability of test ring / test flanges / dummy shell (for hydrotest of kettle type exchangers, exchangers stubbed in column etc.) / any other accessory required for hydrotest of the heat exchangers and it's supply by equipment manufacturer to the site for site hydrotest. Contractor to ensure that these accessories are supplied to the site with the equipment itself.
  - g) Davit or suitable lifting arrangement or both shall be provided to heat exchangers channel cover and removable shell cover for ease of maintenance.
- Location/elevation/orientation of nozzles indicating specific process design requirement
- High and low liquid levels including trip levels, if any.
- Shop & site hydrotest requirements
- Spares of all categories
- Nozzle table (including nozzle schedules, nozzle projections, flange ratings, type of flange face, minimum external nozzle local loads etc.)
- Instrument nozzles on the equipment shall be provided with 2 numbers (40 mm x 6 mm) of bracing bars welded at 90° to each other
- Mechanical drawings / dimensional sketch of the equipment with sufficient details for the fabricator to prepare fabrication drawings. Tube layout and setting plan for heat exchangers
- Supporting Arrangement / structural arrangement wherever applicable
- Requirement of connection plate for equipment supported on structures
- Anchor bolt templates. Contractor to ensure that anchor bolt templates shall be manufactured by equipment manufacturer only. Equipment manufacturer shall not subcontract this work to sub-vendor. It shall be specified in Order Specification.
- For equipment with low temperature service, requirement of PTFE plate between base plate and foundation support of the equipment.
- Fire proofing requirements
- Weights (empty, operating & hydro-test) and loads (shear force & moments due to wind / seismic)
- Field joints if any
- Specific access requirements
- Requirement of external attachments (support clips, earthing lugs, lifting lugs etc.)
- Provision of cathodic protection, sacrificial anodes, internal painting

Plant <b>1.0 MTPA ALUMINA REFINERY STREAM-5</b>	Client <b>NALCO</b>	Contract Code <b>NAL</b>	Document ID <b>6695-EQS-552-CA-0001</b>	Contract No. <b>66-6695</b>
	<b>Scope of Work for Contractor- Static Equipment</b>			 <b>नेशनल एल्युमिनियम कम्पनी लिमिटेड</b> <b>National Aluminium Company Ltd.</b>
				Rev <b>01</b> Page <b>4</b> of <b>5</b>

- Surface preparation & painting, it's type and details as per project specifications i.e.GES. Contractor shall confirm and refer latest colour codes before final coating on the equipment.
- Pickling & passivation (required for all stainless steel equipment/components).
- Insulation requirements specifying type, category and thickness of insulation as per project specification i.e.GES.

Wherever personal protective (PP) insulation is used in place of personal protective guard (PPG), the painting system below the insulation shall be compactable with insulation and shall be as per the painting specification.

- For Third party inspection requirement , please refer volume 1.
  - Positive material identification requirement
  - Packing specification in line with project packing specification
  - Inspection of assembly of mating fabricated body flanges at shop and protection of body flanges and large equipment with thin walls during transportation by providing temporary internal stiffeners.
  - Documentation requirements
  - Vendor list for bought-outs
  - Guarantees
  - General and Special Terms and Conditions
  - Unit rate / Per Kg rate shall be taken from the equipment vendors for addition / deletion of nozzles, external support cleats, increase / decrease in skirt length etc.
  - Identification of items falling under purview of statutory bodies (IBR / CCOE / SMPV / OISD etc), adherence to it's requirements and approval from respective statutory body.
  - LSTK contractor shall refer document '**Technical Questionnaire**' and cover other requirements as applicable.
5. With preparation of Enquiry Specifications, Contractor shall prepare and maintain a 'Hold-List' which shall cover all points which would be under HOLD at that point of time mentioning reason for hold and responsible department/party for clearing each hold. Hold-List shall be updated regularly for addition/closure of hold points and updated Hold-List shall be submitted to Consultant for information after every 2 weeks. 1st Hold-List shall be submitted within a month of start of detail engineering.
  6. Contractor to note that for all equipment for which PWHT/stress relieving is applicable and radiography of weld joints is required to be performed as per applicable Codes/Standards/Project Specifications, Radiography shall also be done after PWHT / stress relieving.
  7. Datasheets / Technical specifications for the equipment shall be developed by Contractor.
  8. Contractor shall identify if any special non destructive testing (NDT) equipment shall be required for any equipment/unit for monitoring the equipment/unit during on stream operation/shutdown. This special non destructive testing equipment shall be supplied by Contractor with the equipment/unit for which it is required. Equipment model/brand approval shall be sought from Owner or Process Licensor before placing the order.
  9. Evaluation of vendor offers and technical recommendation / selection of vendors.

Plant <b>1.0 MTPA ALUMINA REFINERY STREAM-5</b>	Client <b>NALCO</b>	Contract Code <b>NAL</b>	Document ID <b>6695-EQS-552-CA-0001</b>	Contract No. <b>66-6695</b>
	<b>Scope of Work for Contractor- Static Equipment</b>			 <b>नेशनल एल्युमिनियम कम्पनी लिमिटेड</b> <b>National Aluminium Company Ltd.</b>
				Rev <b>01</b> Page <b>5</b> of <b>5</b>

10. Preparation of Order Specification for ordering taking care of all the points discussed with respective vendors during evaluation stage.
11. Review and approval of vendor documents (design calculations, fabrication drawings, GA drawings, QA plan, ITP, Time schedule, WPS / PQR, Foundation details etc.). Contractor shall ensure that all vendor documents shall conform to tender requirements, order Specification, design code, statutory regulations and project specifications.  
Issue nozzle orientation and additional / actual loads on nozzles in excess of the limit defined in the Project Specification, along with comments on Rev. 00 documents to equipment manufacturers. Finalization and release of external attachments (like platform, ladder, pipe support cleats etc.) orientation sheets.  
Submit vendor drawings and documents for review or approval of Owner/Consultant/Licensors, as required and ensure that their comments are incorporated by the vendor. This is as applicable as per project requirement for critical items.  
Contractor shall closely follow up / expedite delivery of critical / long lead items.
12. Preparation of load data list, Anchor Bolt Schedule, Painting and Insulation BOM etc.
13. Obtaining all statutory approvals :As per GENERAL CONDITIONS OF CONTRACT specified in volume 1.
14. Ensure proper interface with other disciplines within LSTK scope for correctness of information (e.g. Civil for Anchor Bolts & Foundation, Piping for Nozzle Orientation and loading, Flange ratings, Pipe class, platform and ladder orientations etc).
15. Ensure proper documentation (including 'As-Built documentation') by equipment vendor in accordance with the documentation requirements.
16. Ensure that all the necessary spares are supplied along with the equipment, in accordance with the Spare Philosophy mentioned elsewhere in the tender document.
17. Ensure proper packing & transportation of the equipment to site according to applicable project specification and best industry practices (max. length, max. diameter and maximum weight limitations to be taken into consideration).
18. Prepare and submit final As-built documentation (with third party inspection agency's approval stamps as applicable).
19. Refer '**Annexure – 1**' to this document which is currently not attached. It will be given to successful Contractor after receipt of award. Annexure - 1 gives sample format for General Arrangement Drawing. Contractor to fix a format for General Arrangement Drawing including (but not limited to) information asked in it. Contractor shall also develop and fix standard formats for all other typical documents and ensure that it is followed by various equipment manufacturers during detail engineering maintaining uniformity & ease of data/information retrieval at site & by Owner/Consultant. All such document formats shall be sent to Consultant for review.