





Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0022	Contract No. 66-6695
	TECHNICAL SPECIFICATIONS INDUSTRIAL LED LUMINAIRES			
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<p>TKIS - India / Vendor</p> <p>Category Codes (Submission Purpose)</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>1</td><td>For Approval</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>For Review / Comments</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>For Information</td></tr> <tr><td><input type="checkbox"/></td><td>4</td><td>For Engineering</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>For Enquiry</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>For Order Placement</td></tr> <tr><td><input type="checkbox"/></td><td>7</td><td>Final & Approved</td></tr> <tr><td><input type="checkbox"/></td><td>8</td><td>Released for Construction</td></tr> </table> <hr/> <p>Acceptance Codes (Approval Codes)</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>1</td><td>Approved</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>Approved for Manufacturing / Fabrication with Comments as marked</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>Not Approved / Resubmit</td></tr> <tr><td><input type="checkbox"/></td><td>4</td><td>Retained for Information / Records</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>Reviewed</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>Reviewed as Noted / Resubmit</td></tr> </table> <p>Remarks for AC2 : This marked-up drawings is hereby approved for fabrication / manufacturing and shall be re-submitted after revision. This drawing should be revised only to the extent of TKIS - India / Owner / Client comments. Any other changes made by you will not be considered unless clearly highlighted in covering letter asking for approval.</p> <p>This approval / review does not absolve the supplier from the full responsibility for design and fabrication.</p> <p>Date : ___/___/___ Name : _____</p>	<input type="checkbox"/>	1	For Approval	<input type="checkbox"/>	2	For Review / Comments	<input type="checkbox"/>	3	For Information	<input type="checkbox"/>	4	For Engineering	<input type="checkbox"/>	5	For Enquiry	<input type="checkbox"/>	6	For Order Placement	<input type="checkbox"/>	7	Final & Approved	<input type="checkbox"/>	8	Released for Construction	<input type="checkbox"/>	1	Approved	<input type="checkbox"/>	2	Approved for Manufacturing / Fabrication with Comments as marked	<input type="checkbox"/>	3	Not Approved / Resubmit	<input type="checkbox"/>	4	Retained for Information / Records	<input type="checkbox"/>	5	Reviewed	<input type="checkbox"/>	6	Reviewed as Noted / Resubmit	<p>TKIS - India / Owner / Client</p> <p>Category Codes (Submission Purpose)</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>1</td><td>For Approval</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>For Review / Comments</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>For Information</td></tr> <tr><td><input checked="" type="checkbox"/></td><td>4</td><td>For Engineering</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>For Enquiry</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>For Order Placement</td></tr> <tr><td><input type="checkbox"/></td><td>7</td><td>Final & Approved</td></tr> <tr><td><input type="checkbox"/></td><td>8</td><td>Released for Construction</td></tr> </table> <hr/> <p>Acceptance Codes (Approval Codes)</p> <table border="0"> <tr><td><input type="checkbox"/></td><td>1</td><td>Approved</td></tr> <tr><td><input type="checkbox"/></td><td>2</td><td>Approved for Manufacturing / Fabrication with Comments as marked</td></tr> <tr><td><input type="checkbox"/></td><td>3</td><td>Not Approved / Resubmit</td></tr> <tr><td><input type="checkbox"/></td><td>4</td><td>Retained for Information / Records</td></tr> <tr><td><input type="checkbox"/></td><td>5</td><td>Reviewed</td></tr> <tr><td><input type="checkbox"/></td><td>6</td><td>Reviewed as Noted / Resubmit</td></tr> </table> <p>Date : ___/___/___ Name : _____</p>	<input type="checkbox"/>	1	For Approval	<input type="checkbox"/>	2	For Review / Comments	<input type="checkbox"/>	3	For Information	<input checked="" type="checkbox"/>	4	For Engineering	<input type="checkbox"/>	5	For Enquiry	<input type="checkbox"/>	6	For Order Placement	<input type="checkbox"/>	7	Final & Approved	<input type="checkbox"/>	8	Released for Construction	<input type="checkbox"/>	1	Approved	<input type="checkbox"/>	2	Approved for Manufacturing / Fabrication with Comments as marked	<input type="checkbox"/>	3	Not Approved / Resubmit	<input type="checkbox"/>	4	Retained for Information / Records	<input type="checkbox"/>	5	Reviewed	<input type="checkbox"/>	6	Reviewed as Noted / Resubmit
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Rev.	Status	Description	Date	Prepared	Date	Checked	Date	Approved	AC
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Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0022	Contract No. 66-6695		
 thyssenkrupp	TECHNICAL SPECIFICATIONS INDUSTRIAL LED LUMINAIRES			 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.

CONTENTS

Part	Docu Size	Description	No. Of Pages	Rev. No.	Revised Clauses
	A4	Index sheet and status of revision	2	0	-
Part-I	A4	General specifications	3	0	-
Part-IIA	A4	Design Data Sheet	2	0	-
Part-IIB	A4	Design Data Sheet (Vendor's data)	1	0	
Part-III	A4	Inspection Test Plan	1	0	-

Plant 1.0 MTPA ALUMINA REFINERY STREAM-5	Client NALCO	Contract Code NAL	Document ID 6695-ELT-G00-EC-0022	Contract No. 66-6695
	INDUSTRIAL LED LUMINAIRES Part-I – General Specifications			 नेशनल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.
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1.0 INTRODUCTION

This specification covers the design, manufacturing, inspection, testing and performance of Industrial type LED Luminaires. Equipment to be supplied shall comply with latest revision of applicable Indian & IEC standards and also specific Codes & Standards mentioned in clause 'Codes and Standards' of Part-II of this specification.

Equipment and services to be furnished under this specification shall be as per various parts of this specification. Standard and descriptive requirement is covered in Part-I while specific requirement is covered in Part-II. Requirements for testing at vendor's work is covered in Part-III.

2.0 GENERAL REQUIREMENTS

- 2.1 All LED (Light Emitting Diodes) luminaires shall be suitable for satisfactory operation under site ambient conditions, supply voltage and frequency variations as specified in Part-II.
- 2.2 All luminaires, LED Modules and control gear boxes shall be Industrial weatherproof type with minimum degree of ingress protection as specified in Part-II.
- 2.3 All luminaires shall be provided with minimum 3 nos. 650V grade terminals suitable for termination of LSTK Contractor/Owner incoming 2.5 mm² copper conductor cable/wires.
- 2.4 A warning inscription "Isolate power supply elsewhere before opening the enclosure" shall be provided on each enclosure for all luminaries and control gear boxes.
- 2.5 A protective wire guard shall be provided for well glass and bulkhead fittings for extra mechanical protection to the glass cover.
- 2.6 The material of wire guard shall be as specified in Part-II. Wireguard for well glass luminaire shall have provision for suspension.
- 2.7 Power factor for all lighting fixture shall be minimum 0.9 at full load.
- 2.8 LED Modules:
 - a. Modules shall be either built-in, integral or independent type according to the method of installation.
 - b. Modules shall be so designed and constructed that in normal use they operate without danger to the user or surroundings.
 - c. For LED modules, all electrical measurements, unless otherwise specified, shall be carried out at voltage limits (Min/Max), current limits (Min/Max) or power limits (Min/Max) and minimum frequency, in a draught-free room at the temperature limits of the allowed range specified by the manufacturer. Unless the manufacturer indicates the most critical combination, all combinations (Min/Max) of voltage/current/power and temperature shall be tested.
 - d. Integral modules not having their own enclosure shall be treated as integral components of luminaires and shall be tested and assembled in the luminaire.
 - e. For self-ballasted LED modules, the electrical measurements shall be carried out at the tolerance limit values of the marked supply voltage.

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- f. Unless otherwise specified, the tests on modules shall be carried out at an ambient temperature of $25 \pm 2^\circ\text{C}$.

2.9 Control gear:

- Lamp controlgear shall be so designed and constructed that in normal use they operate without danger to the user or surroundings.
- Output voltage of controlgear shall not differ by more than $\pm 10\%$ from the rated voltage of LED modules.

- 2.10 All luminaries/ LED Module / Control gear boxes shall be permanently marked either by raised lettering cast integrally or by a plate attached to the body of the fitting / Module to indicate the particulars as per IS 16103 / 16104 / 16107:

LED Luminaires shall be clearly and durably marked with the following mandatory markings:

- Name of the Manufacturer, or responsible Vendor/ LSTK Contractor / supplier.
- Rated supply voltage / voltage range with supply frequency.
- Rated Wattage (Watts).
- Rated Lumen.

3.0 ACCESSORIES



LED luminaire shall be complete with LED module and control gear box (integral, in-built or independent type) as specified in Part-II.

4.0 CABLE ENTRY

- All light fittings shall be provided with cable entry of size and type as specified in Part-II. Top entry is not acceptable.
- Control gear box for non self-ballasted type luminaries shall be provided with three bottom cable entries for loop in, loop-out with one entry suitably plugged with metallic plug.
- All light fittings and control gears shall be provided with 650V, 10A terminals suitable for termination of cables of size as specified in Part-II.

5.0 EARTHING

All fittings, LED module and control gear boxes shall be provided with one internal and one external earthing terminals, suitable for cable termination of size as specified in Part-II.

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6.0 PAINTING

All metallic surfaces shall be sand blasted, phosphated and painted with two coats of primer and two coats of paint. Final shade and type of paint shall be as specified in Part-II.

7.0 PRODUCT IMPROVEMENT

If any change is made in the standard model (after order placement), same shall be acceptable if the improved product complies with the specification without any additional cost to Owner. Change of model after drawing approval is not acceptable.

8.0 FACTORY ACCEPTANCE TEST & DESPATCH

Owner / Consultant / LSTK Contractor shall have the right to carry out stage inspection and shop visit to review the manufacturing progress. However manufacturer need not hold any of the manufacturing activity for stage inspection.

Inspection and testing shall be carried out based on latest revision of this specification and approved vendor drawings approved for manufacturing. In case of any ambiguity between vendor drawing and specification, the requirement indicated in technical specifications shall govern.

All tests as specified in Part-III shall be carried out during final inspection at manufacturer's works in the presence of LSTK Contractor / his consultant on sample quantities before dispatching the equipment to site.

Fifteen days advance notice shall be given for witnessing the final inspection and testing.



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



After successful completion of inspection and testing, vendor/LSTK Contractor shall furnish all as-built documents in required number of sets. Only after receipt of final documents in Consultant Office, the release order for dispatch of material will be issued.


9.0 PERFORMANCE GUARANTEE


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 equipment to meet guaranteed performance, LSTK Contractor/Owner, reserves the right to reject the equipment. However, Owner/Consultant also reserves the right to use the rejected equipment until a new equipment meeting the guaranteed performance requirements is supplied by the vendor.

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

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		PART - IIA					
		DESIGN DATA SHEET					
GENERAL	001	Make	: As per Vendor List- Electrical				
	002	Rated Voltage	: 1-ph, 220V				
	003	Voltage Variation	: +/- -10%				
	004	Frequency	: 50Hz				
	005	Frequency Variation	: +3 % / -5%				
	006	Combined Voltage & Frequency variation	: 10% (absolute)				
	007	Quantity	: *				
	008	Acceptable quantity variation after the order placement	: *				
	009						
	010		:				
CODES	011	IS 10322 : Specification for luminaires					
	012	IS 15885-2 : AC or DC supplied Electronic controlgear for LED modules - Particular requirements					
	013	IS 16101/ IEC 62504 : General Lighting - LEDs and LED Modules - Terms and definitions					
	014	IS 16102-1 : Self-ballasted LED lamps for general lighting services - safety requirements					
	015	IS 16103-1 : LED modules for general lighting - safety requirements					
	016	IS 16103-2 : LED modules for general lighting - performance requirements					
	017	IS 16104 : AC or DC supplied Electronic controlgear for LED modules - Performance requirements					
	018	IS 16105 : Method of measurement of Lumen maintenance of LED sources					
	019	IS 16106 : Method of electrical and photometric measurements of LED products					
	020	IS 16107 :Luminaires performance - particular requirements of LED luminaire					
	021	IS 16004 : DC or AC supplied electronic control gear for LED modules					
	022	IES LM-79: Electrical and photometric measurements of solid state lighting products					
	023	IES LM-80: Approved method for measuring lumen depreciation of LED light sources					
		IS 16108 : Photobiological safety of lamps and lamp systems					
ACCESSORIES	024	1) LED MODULE					
		a) Type of module (Self-ballasted / Non-ballasted type)	:	*			
		b) Type of installation (built-in / integral / independent)	:	*			
		c) Degree of enclosure protection (independent module)	:	IP55 min.			
		d) Nominal power (watts)	:	Refer Part-II B			
		e) Rated Maximum Temperature (Tc)	:	Refer Part-II B			
	025	2) CONTROLGEAR					
		a) Type of controlgear	:	constant voltage / constant current type *			
		b) Power factor	:	Refer Part-II B *			
		c) Degree of enclosure protection (independent module)	:	IP55 min.			
		d) Total circuit power (watts)	:	Refer Part-II B *			
	026	3) WIRE GUARD :					
		a) Wire guard for protection of glass cover in well	:	Required			
		glass & bulkhead fitting					
		b) Finish of wire guard	:	G.I. / SS / Powder Coated Stainless Steel (SS)			
		c) Assembly for suspension of wire guard	:	Required			
		required in case of well glass luminaire					
		d) Thickness of wire guard					
		i) For well glass	:	3	mm		
		ii) For Bulkhead	:	3	mm		

 नालको NALCO नेपाल एल्युमिनियम कम्पनी लिमिटेड National Aluminium Company Ltd.		INDUSTRIAL LED LUMINAIRES PART - IIA DESIGN DATA SHEET		Code	NAL			
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CONSTRUCTION (LIGHT FITTINGS, CONTROL GEARS, JUNCTION BOXES)	027	Material of Construction	: CRCA Sheet Steel / Stainless Steel (SS 304)					
	028	Degree of Protection	: IP55 min.					
	029	Type of Luminaire	: *					
	030	Final Paint Shade	: FOR OUTDOOR: Shade-632 of IS-5 : FOR INDOOR: RAL-7032					
	031	Hardware for light fittings and control gear box	: Stainless steel					
		Gasket	: Neoprene					
	032	Internal Wiring	:					
		a) Type	: ISI approved, 650V grade, PVC insulated, copper conductor					
		b) Size	: min. 0.5 sq.mm					
	033	Terminal size	: Suitable for termination of 3Cx2.5 sqmm copper cable					
	034	Reflector type	: *					
	035	Cable Gland	: Nickel plated brass double compression					
	036	Make of Components	:					
	037	Cable Glands	: As per Vendor List- Electrical *					
	038	IS 16103-1 : LED modules for general lighting - safety requirem:	: *					
	039	Driver	: *					
			CABLE ENTRY FOR	SIZE	POSITION			
			LUMINAIRE / C.G.BOX		& NO. OF ENTRIES			
		042	LED Tube light	3/4"ET / M20	Side, 2			
043		LED well Glass (self-ballasted)	3/4"ET / M20	Side, 2				
044		LED well Glass (Non self-ballasted)	3/4"ET / M20	Side, 1				
045		LED Floodlight (self-ballasted)	3/4"ET / M20	Bottom /Side, 2				
046		LED Floodlight (Non self-ballasted)	3/4"ET / M20	Bottom /Side, 1				
047		LED Streetlight	3/4"ET / M20	Side, 1				
048		Low, Medium, High Bay Fittings (self-ballasted)	3/4"ET / M20	Side, 2				
049		Low, Medium, High Bay Fittings (Non self-ballasted)	3/4"ET / M20	Side, 1				
050		Control gear box	3/4"ET / M20	Bottom, 3				
051		Internal Earthing terminal : Screw type suitable for 2.5 sq. mm Copper conductors						
DOCUMENTS /DRAWINGS		Description	For Review / Approval	Final, As-Built Documentation.				
	052	Catalogues indicating dimensional details alongwith brief specs.	For No. of copies of drawing/documents to be issued by LSTK Contractor for Approval/Review/Information during Detail Engineering and as a part of final, As built documentation - LSTK Contractor to refer requirement indicated elsewhere in the tender					
		& Enclosure protection						
	053	Lighting distribution diagrams polar curves, isolux diagrams & coefficient of utilisation charts for each type of fixtures.						
	054	Quality Assurance Plan & Inspection Test Plan						
	055	Type Test certificates						
	056	Routine Test certificates						
	057	FIA certificate						
	058	Impact test certificate for glass (for well glass fitting)						
	059	LM79 Certificate						
060	LM80 Certificate							
NOTE : 1. For items marked " * " thus, data to be furnished / confirmed by LSTK Contractor during detail Engineering								

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		PART - II B DESIGN DATA SHEET (VENDOR'S DATA)				Doc.		6695-ELT-G00-EC-0022			
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VENDOR DATA	LED VENDOR DATA :										
	A	LED Tube light / down light :									*
	1	Rating	6W	9 W	12W	15W	18W	40W			
	2	Losses									
	3	LED Module Nominal Power (W)									
	4	Rated Maximum Temp (°C)									
	5	Power Factor									
	6	Total Circuit Power (W)									
	7	Lumen output									
	B	LED Street light :									*
	1	Rating	30 W	60W	90W	120W	150W	170W	210W		
	2	Losses									
	3	LED Module Nominal Power (W)									
	4	Rated Maximum Temp (°C)									
	5	Power Factor									
	6	Total Circuit Power (W)									
	7	Lumen output									
	C	LED Flood light:									*
	1	Rating	10 W	30W	60W	80W	120W	160W			
	2	Losses									
	3	LED Module Nominal Power (W)									
	4	Rated Maximum Temp (°C)									
	5	Power Factor									
	6	Total Circuit Power (W)									
	7	Lumen output									
	D	LED Medium / High bay light :									*
	1	Rating	80 W	100W	150W						
	2	Losses									
	3	LED Module Nominal Power (W)									
	4	Rated Maximum Temp (°C)									
	5	Power Factor									
	6	Total Circuit Power (W)									
	7	Lumen output									
	E	LED well glass :									*
	1	Rating	35W	80 W	100W	150W					
	2	Losses									
	3	LED Module Nominal Power (W)									
	4	Rated Maximum Temp (°C)									
	5	Power Factor									
	6	Total Circuit Power (W)									
	7	Lumen output									
	F	LED Tube light with battery backup :									*
1	Rating	6W	9 W	12W	15W						
2	Losses										
3	LED Module Nominal Power (W)										
4	Rated Maximum Temp (°C)										
5	Power Factor										
6	Total Circuit Power (W)										
7	Lumen output										
For items marked " * " thus, data to be furnished by LSTK Contractor during detail Engineering.											

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