مجلس أبـــوظبـي لـلـجـودة والـمـطابـــقـة
ABU DHABI QUALITY & CONFORMITY COUNCIL

Abu Dhabi Specification

معايير أبوظبي الفنية

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الإصدار الأول

Exterior Light Emitting Diode-(LED) -Luminaires

الإنارة االخارجية الفعّالة بالثنائيات الباعثة للضوء (LED) – مصابيح الإضاءة الموفرة للطاقة

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Amendment Page

To ensure that each copy of this ADS contains a complete record of amendments, the Amendment Page is updated and issued with each set of revised/new pages of the document. This Technical Report is a live document which can be amended when necessary. QCC operates an LED Working Group which prepared this document and can review stakeholder comments in order to review and amend this document, issuing an updated version when necessary.

Amendment			Discard		Insert	
No	Date	*Sections Changed	Page(s)	Issue no	Page(s)	Issue no
1	10/12/2013	Document launched	-	-	9	1.0

About the Abu Dhabi Quality and Conformity Council

The Abu Dhabi Quality and Conformity Council (QCC) was established by law No. 3 of 2009, issued by His Highness Sheikh Khalifa Bin Zayed Al Nahyan, President of the UAE and ruler of Abu Dhabi.

QCC is responsible for the development of Abu Dhabi Emirate's Quality Infrastructure, which enables industry and regulators to ensure that products, systems and personnel can be tested and certified to UAE and International Standards.

Products certified by QCC receive the Abu Dhabi Trustmark. The Trustmark is designed to communicate that a product or system conforms to various safety and performance standards that are set by Abu Dhabi regulators.

1- Introduction

The QCC Working Group for Energy (LED Lighting) was formally established in July 2013 with a view to confirming an (ADS) Abu Dhabi Specification for LED Lighting, based on the technical specification part of the Abu Dhabi Conformity Scheme for LED lighting previously developed.

2 - Scope

This Abu Dhabi Specification (ADS) defines the specifications for the types of LED exterior luminaires (LED Fixtures including all non LED components) to be used wherever applicable. It applies to white, coloured and RGB LED Fixtures. (For coloured/RGB fixtures all aspects apply with the exception of CCT and CRI criteria)

Types of LED Exterior Luminaires:

Fixture Type/Use		General Description
1	Street Light Fixture	Lighting Fixture/head for mounting on a separate pole for the specific design for lighting roadways or parking areas with roadway lighting optics and gear.
2	Roadway Tunnel Light Fixture	Lighting Fixture for mounting under a tunnel or underpass ceiling bare soffit or recessed within a tunnel ceiling system for the specific design for lighting roadways with roadway lighting optics and gear.
3	General Column Fixture	Lighting Fixture combined with an integral decorative pole above 1.2m in height for the specific design for lighting pathways and pedestrian areas.
4	Bollard	Vertical Lighting Fixture up to 1.2m in height for the specific design for lighting pathways and pedestrian areas.
5	In-ground (buried)	(US often called In-grade) Fixture mounted flush to the surface of the finished ground level with cast or buried housing and components.
6	Floodlight	Directional surface-mounted fixture with any beam angle (including spotlight applications) for direct illumination purposes. Has some form of mounting bracket, spike or components and can be oriented to face upwards, downwards or sideways to suit application.
7	Sports Application Floodlight	Directional surface-mounted fixture with any beam angle for direct area illumination purposes. Has some form of mounting bracket or components, is generally oriented to aim downwards from separate poles and must be impact resistant to associated sport balls or equipment.
8	Bulkhead	Any surface wall-recessed or wall-semi-recessed fixture not falling into another specific category.
9	Underwater Fixture	Fixture of any type for permanent underwater installation.
10	Special	Can be linear decorative string lighting, special projectors or light-art/bespoke fixtures that are to be located outdoors.
11	Hazardous area luminaires	Area specific - Zone 1 or Zone 2 protection – or equivalent.

3 - Acknowledgements

QCC would like to thank the members of the Working Group listed below.

The membership of the QCC Working Group is as follows:

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18	Gerasimos Pavlidis	iGuzzini
19	James Sayer	iGuzzini

4.- Abu Dhabi Requirements on LED Exterior Lighting Fixtures (Luminaires)

All lumen figures quoted and used shall be **Delivered (Hot) Lumen** i.e. the light is in thermal equilibrium within the luminaire.
All stated criteria shall also apply to coloured/RGB LED fixtures with the exception of the nominal CCT rating and minimum CRI values as these refer only to white-sourced fixtures.

White LEDs shall be from a manufacturer of LEDs with **ANSI/NEMA/ANSLG C78.377-2011** – (American National Standard for Chromaticity of Solid State Lighting Products) or equivalent IEC/International Standard.
The nominal Correlated Colour Temperature (CCT) ANSI standard LED colours accepted are 2700K, 3000K, 3500K, 4000K, 4500K, 5000K and 5700K.

1. Whole Luminaire Efficacy and Minimum Colour Rendering Index

Specifications:

Minimum Luminaire Efficacy and associated Minimum Colour Rendering (CRI – Colour Rendering Index) rating shall be as follows:

Fixture Type	Minimum Luminaire Efficacy*	Minimum CRI-rating
Street Light Fixture	≥ 75 lm/W	65
Roadway Tunnel Light Fixture	≥ 75 lm/W	65
General Column Fixture	≥ 50 lm/W	80
Bollard	≥ 50 lm/W	80
In-ground (buried)	≥ 50 lm/W	80
Floodlight	≥ 50 lm/W	80
Sports Application Floodlight	≥ 75 lm/W	60
Bulkhead	≥ 50 lm/W	80
Underwater Fixture	≥ 50 lm/W	80
Special	≥ 50 lm/W	80
Hazardous Area Luminaires	≥ 50 lm/W	70

*Minimum luminaire efficacy is given as lumen Output (lm) over input power (W) at standard laboratory conditions. All tests to be taken at 230V.

Test method/reporting:
Perform tests IES LM-79-08 or equivalent IEC/International standards. Declare colour correlated temperature (CCT).

2. Optical Control, Photometry & Lamp Source Replacement

Specifications:

The luminaire shall be fitted with optical refractors, diffusers and/or reflectors. Different optics shall be proposed to exactly suit the specific application the fixture is intended for.

The LEDs shall be removable and replaceable without any possible risk to maintaining luminaire photometry and without the need to demount the fixtures for sake of future upgrading/maintenance requirements.

Test method/reporting:

Written descriptions of optical control shall be provided.
Independent laboratory IES or EULUMDAT photometric test reports shall be submitted for the luminaire photometric files used in any lighting calculations. For LED fixtures, or for LED components used within conventional fixtures, the source testing should conform to IES LM-79-08 standards or equivalent IEC/International standards.

3. Thermal Management

Specifications:

The LED modules shall be mounted in such a way to ensure excellent heat dissipation. The design of the luminaire shall be such that there is a direct thermal path from the LED junctions to the atmosphere thus providing a thermal transfer effect throughout the life of the luminaire. The thermal solution shall be proprietary and designed by the lighting manufacturer to enable the luminaires to work efficiently in Abu Dhabi climatic conditions. The luminaire shall be provided with a demonstrated ventilation arrangement allowing heat to be dissipated to the atmosphere. The luminaire shall be designed to prevent collection of debris by proven and stated means. The design shall be such that the luminaire shall be self-cleaning in normal operation.

The whole fixture with all components (including LEDs and drivers) shall operate between (Ta) -20°C and 50°C (60°C for roadway tunnel fixtures) and be suitable for storage between -20°C and 80°C.

All low-level lighting fixtures must have elements/components and glass suitably temperature rated for touch. Refer to the guidelines of IEC 60598-1 Luminaires – Part 1: General requirements and tests, IEC 60598-2-3 Luminaires – Part 2-3: Particular requirements – Luminaires for road and street lighting and IEC 60598-2-13 Luminaires – Part 2-13: Particular requirements – Ground recessed luminaires – Annex A – Guide for good installation practice. For maximum operating temperatures:

- In normally non-accessible areas (according to wiring rules) – No temperature limit.
- In restricted accessible areas (e.g. pedestrian and pedal cycles access restricted only) <100°C.
- In all other accessible areas (e.g. carriageways, parking) 65-80°C.
- In particular areas (where working temperatures may cause injuries, e.g. nurseries, swimming pools) <40°C.

Test method/reporting:
Provide written descriptions of thermal management strategies, thermal solution design and ventilation shall be provided.
Provide calculations on percentage depreciation of light output at 50°C (60°C for roadway tunnel fixtures) using IES LM-82-12 or IES LM-79-08 or equivalent IEC/International standard.
Provide written descriptions of components/glass temperature ratings.

4. Street Lighting Fixture Mounting

Specifications:

Street Lighting Fixtures shall be provided with a heavy-duty rugged cast aluminum (or proven equivalent material) adjustable slip fitter mountable to suit any proposed pole application from either below or from the side.

Test method/reporting:
Provide written descriptions of lighting fixture mounting design.

5. Ingress Protection

Specifications:

The luminaire gear and LED optical-unit components shall be externally fully rated to the minimum IP (Ingress Protection) rating and IK (Mechanical Strength) rating as set out in the table below for each specific fixture-type and have proven means of negating internal condensation build-up for their application and be able to operate in high relative humidity.

Fixture Type	**Minimum IP-rating**	**Minimum IK-rating**
Street Light Fixture	IP-65 (66 for the driver/ components)	IK07
Roadway Tunnel Light Fixture	IP-65 (66 for the driver / components)	IK07
Column Fixture	IP-65	IK07
Bollard	IP-65 (top and bottom)	IK07
In-ground (buried)	IP-67 (top and bottom)	IK08
Floodlight	IP-66	IK07
Sports Application Floodlight	IP-66	IK08
Bulkhead	IP-65	IK07
Underwater Fixture	IP-68 (including all connections)	IK10
Specials	IP-65-68 (to suit type/application)	IK07
Hazardous area luminaires	IP-65 (Zone 2 and 22, Ex n protection class)	IK07
	IP-67 (Zone 1 and 21, Ex e, Ex d protection class)	IK08

Any glass diffusers or components must have a minimum IK08 rating.
For any fixtures intended for operation pointed upwards as an option and/or have optical components on the top of fixtures, the fixture design must be suitably IP rated for their upwards orientation and be proven the design does not allow water and debris to collect on the glass/synthetic cover.

Test method/reporting:
IP rating determined by IEC 60529, EN 60598-1, EN 60598-2-3 or equivalent International Standard

IK rating determined by IEC 62262 or equivalent International Standard
Written description of design characteristics negating water and debris collection for fixtures intended to point upwards and/or with optical components on the top of the fixture.

6. Copper Content and Corrosion Resistance, Synthetic materials

Specification:

All aluminium die-cast components shall have a copper content of 1% by mass maximum for proved and demonstrated corrosion resistance. Where different metallic materials are used together, then proof of avoidance of electrolysis with any touching dissimilar metals must be assured.
All synthetic materials shall be 100% UV Stable and scratch resistant

Test method/reporting:
Provide written confirmation of aluminium component copper content UV stability and scratch resistance of synthetic materials in the form of supplier technical reports.

7. Driver Technical Requirements

Specifications:

Within the fixture the drivers shall meet the following requirements:

- **7.1** Case (Tc oC) Temperature rating -40oC to +80oC at a minimum 95% Relative Humidity (RH). Luminaires with open drivers need to prove Luminaire ambient of 50°C maximum (60°C maximum for roadway tunnel fixtures) in equivalence with this requirement.
- **7.2** Input voltage; capable of 120-277 volt, single phase.
- **7.3** Drivers shall have a Power Factor (PF) of L ≥ 0.90.
- **7.4** Power supplies shall be UL Class 1 or 2 output or conform to IEC 61347-1 or a similar International standard.
- **7.5** Surge protection: Must satisfy the requirements of IEEE/ANSI C62.41.2-2002, Scenario I Location Category C or International equivalent.
- **7.6** Drivers shall comply with FCC 47 CFR part 18 non-consumer RFI.EMI standards or equivalent.
- **7.7** Drivers shall be Restriction of Hazardous Substances (RoHS) compliant.
- **7.8** Drivers shall have a Total individual luminaire Harmonic Distortion (THD) of: ≤20% in accordance with ANSI C82.77-2002 or equivalent.

Test method/reporting:
Provide LED driver manufacturer data sheets, test reports and/or certification documentation demonstrating conformity to the specification.

8. LED Luminaire Useful Life Requirements

Specifications:

Demonstrate 50,000 hour useful life of the luminaire based on the simplified B20-L70 threshold at ambient temperature (Tq) of 35°C (average annual night time temperature for Abu Dhabi Emirate).

Test method/reporting:
Provide lumen maintenance report from the LED chip manufacturer following IES LM-80 (including IES TM-21 reported lifetime for the luminaire) or IES LM-82 or equivalent IEC/international standards.

9. Luminaire Photobiological Safety

Specification:

Luminaire must comply with Photobiological Safety of lamps and lamp systems in accordance with the requirements of IEC 62471 or ANSI/IES RP-27.3-2007

Test Method:
Provide test results for IEC 62471, ANSI/IES RP-27.3-2007 or equivalent International standards.

10. LED Luminaire vibration testing for roadway tunnel fixtures

Test whole fixture/luminaire as per IEC 60068-2-6 or equivalent international standard. Test method specifics to be determined by the supplier dependent on the potential vibration exposure.

Test method/reporting:
Provide test results for IEC 60068-2-6 or equivalent International standard.

5- References

JEDEC JESD22-A108C Temperature, bias and operating life

ANSI/NEMA/ANSLG C78.377-2011 Specifications for the Chromaticity of SSL products

IES LM-79-08 Approved method: Electrical and Photometric measurements of solid-state lighting products

IES LM-80-08 Approved method for measuring Lumen Maintenance of LED light sources

IES LM-82-12 Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature

IEC 60598-1 Luminaires – General requirements and tests

IEC 60598-2-3 Luminaires – Particular requirements - Luminaires for road and street lighting

IEC 60598-2-13 Luminaires – Part 2-13: Particular requirements – Ground recessed luminaires – Annex A – Guide for good installation practice

IEC 60529 Degrees of protection provided by enclosures (IP Code)

IEC 62262 Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK Code)

IEC 62471 Photobiological safety of lamps and lamp systems

ANSI/IES RP-27.3-2007 Recommended practice for photobiological safety for lamps – Risk group classification and labeling

IEC 60068-2-6 Environmental testing – Part 2-6: Tests – test Fc: Vibration (sinusoidal)

IES TM-21-11 Projecting long term maintenance of LED light sources

IEEE/ASNI C62.41.2-2002 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

FCC 47 CFR part 18 Industrial, Scientific and Medical equipment

ANSI C82.77-2002 Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment

UL Class 1 and 2 power output Refer to UL standards 1012 (Class 1) and 1310 (Class 2)

IEC 61347-1 Lamp control gear - Part 1: General and safety requirements