



## JY73

### JY73.3100

JY73.3101

## LUMINAIRES AND LAMPS

### SPECIFICATION AND SCOPE

#### Descriptive Works

- a) For design and general performance requirements, refer to Section JA of the *Specification*. Specific performance requirements are provided in each trade section.

This is a Descriptive *Specification* where the *Contractor* has design responsibility, to manufacture, test, install, commission and warrant the works.

- b) Luminaires are detailed as performance specifications, to make use of best available technology at the point of supply.
- c) Luminaires and components detailed within this section are for the purpose of achieving the lighting scheme in accordance with section JV21 and the C100 RIBA Stage F1 Lighting Report C100-ATK-A-RGN-CRG02-50063.
- d) Where a particular material, product or supplier is indicated in the *Specification*, such material, product or supplier shall be deemed indicative representing the *Project Manager* design intent only. The *Contractor* may complete the installation using that product, or such other confirmed as acceptable by the *Project Manager* in writing, but shall remain fully responsible for the *Detailed Design* of the works.
- e) Interfaces:
- i) Co-ordinate with the work of others including all interfacing as required.
  - ii) Performance shall be maintained at all interface conditions.
  - iii) Complete the *Detailed Design* of all interfaces with adjoining trades prior to commencement of manufacture.

JY73.3102

#### Interpretation

Throughout this Section where 316 Stainless Steel is specified, it refers to either an austenitic stainless steel with the name X5CrNiMo17-12-2 (grade 1.4401 to BS EN 10088-1 or a Low Carbon austenitic Stainless Steel with the name X2CrNiMo17-12-2 (grade 1.4404 to BS EN 10088.-1). Selection should be made to suit fabrication method for acceptance by the *Project Manager*.

### JY73.3200

## SYSTEM DESCRIPTIONS

### System Description, Functional Requirements and Interfaces

JY73.3201

#### Reference Information

- a) *Specification* must be read in conjunction with *Design Drawings*, Station Works Information and reports (latest version to be obtained from the Employer):
- i) C100 RIBA Stage F1 Lighting Design Report C100-ATK-A-RGN-CRG02-50063.
  - ii) C100 PES Access and Maintenance Report C100-ATK-A-K2-STP-CRG02-50002.



JY73.3210

TYPE SPL-502 ESCALATOR DECK UPLIGHT

- a) Description: Recessed linear upright mounted flush within escalator deck.
- b) Location: Escalators and Incline Lifts (See *Design Drawings*) - refer to Section JX10.
- c) Typical Dimensions: Refer to *Design Drawings*.
- d) Materials and Assembly:
  - i) Glass:
    - Low iron clear laminated (Minimum interlayer thickness of 0.76mm as required by LU 1-085 and LU G-085) glass with a toughened outer pane and heat strengthened inner pane.
    - Thickness: Shall meet performance and visual requirements in accordance with Station Works Information. Glass to be capable of sustaining walk-over loadings, i.e. the uniformly-distributed and concentrated imposed loads for the adjacent floor area, as defined in the Station Works Information.
    - White frit border to internal face of glass to conceal bonding area as indicated on the Design Drawings.
  - ii) Stainless steel glazing frame:

- Frame to provide bonding surface for glazing as well as bearing surface and fixing points for interface with Escalator deck as indicated on design drawings.
  - Frame to be fabricated from 316 stainless steel with 240 grit directional brushed finish. Direction of finish to match escalator deck (see section JX10).
- iii) Luminaire housing:
- Housing to be fixed to underside of glazing frame incorporating bearing surfaces for optical materials as required. Housing to be white polyester powder coated fabricated mild steel.
  - All or part of housing to be demountable for replacement of internal components as required.
  - Luminaire driver to be mounted to outside of housing within fully IP rated removable enclosure as indicated on the *Design Drawings*.
- iv) Optical materials:
- Any optical materials to be used for diffusion of point light sources and reduction of glare to be selected with reference to LUL 1-085 Fire Performance of Materials.
- v) Fixings: To be 316 stainless steel countersunk hex pin anti-vandal fixings.
- e) Technical Requirements:
- i) IP Rating: IP65
  - ii) Operating System Compatibility: Luminaire must be compatible with lighting control system (DALI) and be capable of bi-directional communication.
  - iii) Blast Resistance: To be designed, manufactured and installed to meet the requirements of section JA.5300 under 'Exceptional Loads'.
  - iv) Ambient Temperature: Luminaire shall be capable of operating satisfactorily at an ambient temperature of 35°C.
  - v) Wiring and thermal management: Luminaire to be supplied with pre-wired accepted connection and appropriate length of flex with a metallic flexible conduit for installation and maintenance. Connector shall be capable of carrying both power and control. Refer to section JY74/ JY60
  - vi) Emergency operation: No emergency operation required.
  - vii) Efficacy: The light output ratio of the luminaire should be designed to meet the requirements of the building regulations Part L as stated in LUL 1-066 A2. Luminaire to have a minimum efficacy of 60 luminaire lumens per circuit watt.
- f) Photometric Requirements:



- i) Light Distribution: Luminaires should provide an upward distribution to provide a uniform luminance across the tunnelled concourse vault.
- ii) Glare: Optical controls (e.g. optical films) should be integrated within the luminaire glazing for glare mitigation. Luminance ratio should not exceed 12:1 from apex of vaulted tunnel to lower wall surfaces.
- iii) Visual appearance of luminous surface: Individual light sources (e.g. LED modules) shall not be visible in the diffuse lit surface of the luminaire.
- iv) Colour Temperature: 5,000 Kelvin.
- v) CRI (Ra8): 80+.

## JY73.3300 PERFORMANCE REQUIREMENTS

In addition to the performance requirements detailed in the luminaire specific clauses the following general requirements apply.

JY73.3301

### Standards

The *Contractor* shall comply with the Employer's Baseline Standards. The works generally shall be designed, constructed and installed to all relevant Eurocodes, British Standards, Crossrail, Network Rail and London Underground design standards and guidance including the following:

- a) British Standards:
  - i) BS 4533 and BSEN 60598: Luminaires. Particular requirements. Specification for fixed general purpose luminaires
  - ii) BS 7001: Specification for interchangeability and safety of a standardized luminaire supporting coupler.
  - iii) BS 5266: Emergency lighting.
  - iv) BS 7671: Requirements for electrical installations. IEE Wiring Regulations.
  - v) BS EN 55015: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
  - vi) BS EN 61000-4-1: Electromagnetic compatibility (EMC). Part 4-20 Testing and measurement techniques. Emission and immunity testing in transverse electromagnetic (TEM) waveguides.
  - vii) BS EN 61000-6: Electromagnetic compatibility (EMC). Generic standards.
  - viii) BS EN 61547: Specification for equipment for general lighting purposes. EMC immunity requirements.



- ix) BS EN 60529: Specification for degrees of protection provided by enclosures (IP code).
  - x) BS EN 50126: Railway applications. The specification and demonstration of reliability, availability, maintainability and safety.
  - xi) BS EN 62031: LED Modules for General Lighting - Safety Specifications.
  - xii) BS EN 62384 + A1: DC or AC supplied electronic control gear for LED modules - Performance requirements.
  - xiii) EN 6247: Photobiological safety of lamps and lamp systems.
  - xiv) BS EN 50171: Central power supply systems.
  - xv) BS EN 12464-1 Light and lighting. Lighting of work places. Indoor work places.
- b) London Underground Requirements:
- i) 1-066 Lighting of London Underground Assets A2.
  - ii) M-1042-A2 Fire Safety of Material used in the underground.
  - iii) 1-085 Fire safety performance of materials.
- c) International Electrotechnical Commission:
- i) IEC TS 62504 LED Terms & Definitions.
  - ii) IEC 60598-1 Luminaire requirements.
  - iii) IEC 62560 Lamps - Self-ballasted LED-lamps for general lighting services by voltage > 50 V - Safety specifications.
  - iv) IEC/ PAS 62612 Self-ballasted LED-lamps for general lighting services > 50 V - Performance requirements
  - v) IEC 62031 LED Modules for General Lighting - Safety Specifications.
  - vi) IEC 61231 International lamp coding system (ILCOS).
  - vii) IEC 62384.
  - viii) IEC 62386-101 Digital addressable lighting interface - Part 101: General requirements - System.
  - ix) IEC 62386- Part 200 Particular Requirements for Control Gear.
- d) Where standards and guidelines pertaining to LED lighting are in development. *Contractor* and Manufacturer should refer to standards listed by CELMA and the European Lamp Companies Federation at time of undertaking.
- e) The London Underground fire standards & 'The Fire precautions' (Sub Surface Railway Stations) (England) Regulations 2009.

JY73.3302

Thermal Management

- a) Luminaires must not use active thermal management, including but not exclusively fans, pumps and diaphragms.

JY73.3303

Fixings



- a) All public facing fixings, screws or bolts shall be countersunk and flush with the luminaire.
- b) All public facing fixings must be vandal resistant.
- c) All fixings should be captive to prevent them from being lost or falling from the luminaire during maintenance.
- d) Blast loads: The *Contractor* should consider blast loading within the design giving special consideration to minimising fragmentation of elements and adequate fixing retention such that elements remain fixed to the main structure. Blast loads to Crossrail requirements. Contractor to submit design proposals for mitigation of blast load effects to the *Project Manager* for acceptance.

## JY73.3400

### MATERIALS

- a) All materials must comply with the Sustainability Performance Requirements. See Section JA 7000 Series.

## JY73.3401

### Lightsources

- a) All white light sources shall provide a colour rendering of  $\geq 80Ra$  in the case of normal luminaires and  $\geq 65Ra$  in the case of emergency luminaires.
- b) LED light engines must be compliant with industry established standards such as ZHAGA or equivalent at time of procurement.
- c) Light source life must be stated at a point when the installation lumen output falls below 70% of initial lumens. This calculation must include Lamp Survival Factor (LSF) and Lamp Lumen Maintenance Factor (LLMF) as per the Industry Agreed Norm L70/ B50.
  - i) Where LED sources are in use, Lamp life must be calculated based on the installed conditions of LED lightsource within luminaire on 24hour operation with an ambient ( $T_a$ ) temperature of 35°Celsius, unless otherwise stated.
  - ii) In the absence of British or European standards or industry standards at time of undertaking, LED source life must be calculated using LM-80-2008: IESNA, Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- d) LED Colour Temperature variations must not exceed 2 MacAdam ellipses from the designated colour temperature across the lifetime of the product.

## JY73.3402

### Control Gear and Components

- a) All LED light sources assumed to have a rated life of 50,000 hours to L70 at 25°C.
- b) All electronic components and assemblies must have a MTBF of equal to or greater than the life of the light source.
- c) Ensure control gear and components are suitable for light source type, wattage and starting characteristics. Obtain from manufacturers written confirmation of compatibility.



- d) Use screw terminals for supply cables and circuit protective conductors, sized to terminate up to three 2.5mm<sup>2</sup> conductors. Provide separate terminal blocks for each incoming circuit, with marking to identify each circuit.
- e) Include a fuse holder and BS 1362 fuse in each incoming circuit phase connection.
- f) Internal wiring of luminaire must be fire resistant and comply with BS6387.
- g) The cable length between control gear and light source must not exceed the maximum recommended by the manufacturer.

JY73.3403

Metalwork

- a) See Section JZ11.

JY73.3404

Paint Finishes

- a) See section JZ30, JZ31 and JZ33.

JY73.3405

Glass

- a) See Section JZ25.

JY73.3406

Gaskets

- a) See Section JZ23.

JY73.3407

Sealants

- a) See Section JZ22.

JY73.3408

Fixings

- a) See Section JZ20.

**JY73.1000**

## **SUBMITTALS AND TESTING**

**JY73.1100**

### **SUBMITTALS**

#### **Samples, Mock-Ups, Prototypes and Quality Benchmarks**

JY73.1101

Mock-up Requirements

Mock-up processes must be used through the development of the luminaires. The following elements are to be developed through mock-up process.

- a) SPL-901, Lightbox Architectural Casing:
  - i) Glass transmission and diffusion properties, and visual appearance.
  - ii) Rear reflector materials and textures and mounting angle.
- b) SPL-902, Lightbox Luminaire:
  - i) Photometric performance in conjunction with SPL-901
- c) SPL-301, Linear Downlight:
  - i) Glass transmission and diffusion properties, and visual appearance.
- d) SPL-304, PSD Downlight:
  - i) Glass transmission and diffusion properties, and visual appearance.
- e) SPL-501, Totem Mounted Luminaire:
  - i) Arrangement and optics of lightsources to form required distribution.



- f) SPL-502, Escalator Deck Uplight:
  - i) Glass transmission and diffusion properties, and visual appearance at correct mounting angle and in environment of equivalent average brightness to final installation.
- g) SPL-806, Totem Emergency Luminaire
  - i) Arrangement and optics of lightsources to form required distribution.
- h) SPL-305, Trackside Panel Luminaires
  - i) Bracket, Mounting component, luminaire profile and optics of lightsources to form required distribution on Sign Panel.

JY73.1102

#### Prototype Requirements

- a) Prototypes of all luminaires are to be presented for approval of performance and appearance, in accordance with Section JA.4000.
- b) Prototypes to be photometrically tested in accordance with BS EN 13032-1 and IES LM-79-08.
- c) Prototypes to be demonstrated in mounting positions and environments equivalent to their project use.
- d) Where luminaires are formed from multiple components or systems the combined impact of the systems is to be demonstrated.

JY73.1103

#### Benchmark Requirements

The following quality benchmarks shall be provided in locations to the acceptance of the Project Manager, in accordance with Section JA.4000:

- a) First luminaire or system of each type installed in accordance with Section JA.4000. Installations shall not commence in other areas of that particular trade until the Project Manager has examined and accepted the quality benchmark.
- b) All luminaires to be installed must be identical in appearance and performance to the approved sample prototypes accepted by the Project Manager in accordance with 'Prototype Requirements' above.

## **JY73.1200**

### **TESTING**

JY73.1201

#### Luminaire Approval

- a) Luminaires are subject to the Crossrail Materials Compliance Process for acceptance.
  - i) A minimum of 2 luminaires of each type will be required for submission.
- b) Certification for all LUL Requirements, including:
  - i) Quality Assurance.
  - ii) Electromagnetic Compatibility.
  - iii) Fire Safety of Materials.
- c) Photometric testing must be undertaken in accordance with BS EN 13032-1 and IES LM-79-08:



- i) Light source in the form of LED light engine must be tested separately such that an LOR for the luminaire assembly is achieved.

**JY73.2000**

**FABRICATION AND WORKMANSHIP**

**JY73.2100**

**FABRICATION**

JY73.2101

General

- a) Fabrication of materials/ components shall, as a minimum, be in accordance with current regulations and standards.

**JY73.2200**

**WORKMANSHIP**

JY73.2201

General

- a) Luminaires to be built to all applicable standards listed in the Performance Requirements section of section JY73 of this Specification.
- b) Luminaires of the same type must have the same photometric performance.
- c) Luminaire must be free from sharp edges or surfaces resulting from the manufacturing process.
- d) Secondary safety support to be provided for diffusers, louvres and gear trays so they are prevented from falling if their primary support fails or is released.

**Workmanship Tolerances**

JY73.2202

General

- a) Finishes shall have a flatness criterion of 1:1000 over any length ie - the permitted deviation from the true panel shall not exceed 1.0mm either way in any 1000mm and shall be non-cumulative).

**JY73.3000**

**SYSTEMS INTEGRATION AND HANDOVER**

**JY73.3100**

**SYSTEMS INTEGRATION**

- a) Not Required.

**JY73.3200**

**HANDOVER**

JY73.3201

Documentation

- a) Certification of Crossrail Material Compliance Approval, including all test certificates obtained in the process.
- b) Luminaire Manual containing:
  - i) Luminaire Description including Reference Number and reference numbers for any sub components.
  - ii) Drawing of the product indicating key dimensions, materials and product weight.
  - iii) Installation instructions including list of all tools required.
  - iv) Typical lead times for replacement luminaire and components.
- c) Product warranty and guarantee period.

**End of Section**



<b>JY74</b>	<b>ACCESSORIES FOR ELECTRICAL SERVICES</b>	<b>1</b>
<b>JY74.3100</b>	<b><i>SPECIFICATION AND SCOPE</i></b>	<b>1</b>