

TECHNICAL SPECIFICATIONS OF LED LIGHTING

During the procurement of LED lighting, the following specifications should be followed:-

1.0 Technical Requirements of LED:

- a. LED efficacy shall be greater than $> 140 \text{ Lumen/Watt @ } 350 \text{mA}$ drive current. In respect of LEDs of higher power ratings, drive current greater than 350mA can be accepted if the LED's LM 80 / IS: 16105 test reports support the same.
- b. LED type shall be SMD (surface mounted device) type LED for all applications. COB type to be considered only for applications such as Highbays, Flood Lights & Flameproof Light Fittings .
- c. Approved makes for different LED technology/types shall be as follows:

LED	Approved Make
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Technology/ Type	
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<u>SMD</u>	Nichia, Osram, Lumileds (Erstwhile Philips Lumileds), CREE
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<u>C.O.B</u>	Citizen, Bridgelux
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Domestic/Decorative Luminaires	Everlight Taiwan, Edison Taiwan, Samsung Korea, Osram Germany along with makes approved for SMD
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- d. Test Report for Ambient Temperature of 55 / 85 / 105 Deg C at Rated and Maximum current shall be submitted for SMD type LED. For COB type LED, as soldering temperature is not applicable for COB technology, LM 80 test report shall be submitted.
- e. TM 21 life projection calculations along with LM80 for all three ambient temperature of 55 / 85 / 105°C as per applicable standard shall be submitted to substantiate that life of LED Chip shall be more than 50000 Hrs for both commercial and Industrial range and 25000 Hrs for LED Bulb, domestic and decorative Range.
- f. Reported life Span of LEDs used in the Luminaire shall be greater than 50,000 Hrs at the soldering point temperature of 85°C and at the luminaire driving current.

- g. The LEDs shall comply to Photo biological Safety norms as per IEC 62471/EN62471/IS:16108 and should fall in the exempt group for indoor luminaires and in exempt or low risk group for outdoor LED luminaires.
 - h. View angle: Typical 120°
 - i. Colour temperature of the proposed white colour LED shall be from 5700K (i.e. 5665K±355K) to 6500K for indoor type luminaire Step 5 or Step 3 McAdam, as per ANSI standard C78.377A, & 5700K (i.e. 5665K±355K). For outdoor type luminaires, Step 7 McAdam, as per ANSI standard C78.377A, will be accepted on account of colour consistency.
- Colour Rendering Index (CRI) : CRI should include all colour range from R1 to R15, shall be > 80 for Indoor luminaire and > 70 for Outdoor luminaire.

2.0 Technical requirements for LED driver

- a. Min. efficiency of driver: The minimum efficiency of LED driver shall be 85% for driver power output rating ≤40W and 87% for driver power output rating > 40W
- b. Power factor of complete fitting : Greater than 0.90 (Except for Domestic/Decorative LED Luminaire)
- c. In - built high voltage cutoff: ≥290V (High)
- d. Short circuit protection /Open load protection shall be required
- e. Driver Surge Protection standard: Surge Protection for minimum 2kV for indoor and minimum 3kV for Outdoor LED systems shall be provided. However, If a site is prone to lightning and surges, 10kV surge protection shall be required. In case of outdoor luminaires, the Surge Protection Device (SPD) should be series type with fail safe.
- f. Total Harmonic Distortion (THD) : Less than 10 % for full load for more than 20 W and less than 20% for less than 20 W. Not applicable for Domestic/Decorative LED fixtures.
- g. Isolated driver should be used.
- h. Potting of LED Driver: For driver power output rating > 50W, potted driver shall be a mandatory requirement.
- i. The power supply shall be connected to the LED PCBs through proper connectors.
- j. EMI/ EMC compliance: Compliance to the following EMI/ EMC standards:

- i. CISPR 15/ IS:6873 (CE, RE, CDN) or compliance to equivalent EN standard.,
- ii. IEC: 61547 (reference standards are listed as follows)
- k. Driver shall comply with the safety requirements laid down in IEC: 61347 - 2 - 13/ EN: 61347 - 2 - 13/ IS: 15885 - 2 - 13.
- l. Driver shall also comply with the performance requirements as per IEC: 62384/ IS: 16104.

3.0 Technical requirements of electronic components used

The circuit boards and electronic components to be used in the luminaire should be of rating/ type so as to provide reliable functioning. Following shall be the requirements during procurement:

- a. MCPCB is to be used for SMD technology for LED wattage in excess of 0.5. The minimum thickness should be 1.0 mm for indoor and 1.6 mm for outdoor type luminaire. However, the same is not applicable for COB.
- b. FR4 grade PCBs of min. thickness of 1.6 mm shall be used in driver circuits. The same is not applicable for COB.

4.0 Technical requirements of luminaire:

- a. The luminaire shall have LM - 79 / IS: 16106 test report from a NABL accredited laboratory.
- b. The min. system lumen efficacy of the luminaire shall be 95 lm/W (for luminaire system wattage $\leq 15W$) and 100lm/W for wattage $>15 W$. The same shall be at least 50 lm/W for decorative fixtures
- c. Following shall be required in terms of secondary lens/ optics:
 - i. Indoor lights like bulb, tube, down lighter with a diffuser may not have secondary lens.
 - ii. Outdoor industrial luminaire like well glass , flat glass may not have secondary lens/optics.
 - iii. For other Industrial and outdoor fixtures, luminaire must have secondary lens/optics of type PMMA/Borosilicate glass/Polycarbonate
- d. Color temperature : 5700K (5665 \pm 355K, as per ANSI standard C78.377A)
- e. CRI: CRI should include all colour range from R1 to R15 and Ra shall be > 80 for Indoor luminaire and > 70 for Outdoor luminaire. Housing of

luminaire:Housing of outdoor and/or FLP shall be Pressure die-cast LM6/ADC12/LM24. For indoor, non-weather proof items like CRCA/PC/Aluminium Extrusion housing can be used.

- f. Cover type:For outdoor type fittings, cover type shall be Toughened glass or UV stabilized polycarbonate whereas, whereas, for indoor and non-weather proof items, UV stabilized Poly Carbonate can be used.
- g. Housing ingress protection:

Application Type	Minimum Ingress Protection Required
LED Street Light	IP66
LED Flood Light / Outdoor Industrial	IP65
Domestic and Commercial Indoor(Such as Admin building, stores)	IP20
Toilet fixtures	IP44
Industrial Indoor(such as High bay fittings, Medium bay fittings)	IP54

- h. Impact Resistance: For outdoor fittings minimum impact resistance shall be IK – 05 and not applicable for indoor fixtures.
- i. Temperature rise test: When the luminaire has stabilized thermally, soldering point temperature shall be ≤ 85 deg C for SMD type but for COB type the temperature rise test shall not be applicable.
- j. Temperature rise (above ambient) of heat sink should generally remain within 20°C – relaxation on this account can be granted as long as the soldering point temperature limit of 85°C is not violated and there is no unacceptable outcome.
- k. BIS Registration: The luminaire shall have BIS approval for surface mounted luminaire as applicable.
- l. Flameproof light fittings shall be certified for use in hazardous area as per area classification and the flameproof certificate shall be submitted along with the offer. Explosion proof certificate from PESO shall be submitted before or along with supply of such light fittings.

5.0 Inspection and Testing:

For large orders (Estimated value more than rupees one crore) the following tests may be considered for carrying out post award. Following acceptance tests shall be carried out as per relevant standards and approved sampling plan:

- i. Visual and dimensional checks
- ii. Resistance to humidity test
- iii. Insulation resistance (IR) test
- iv. High Voltage test
- v. Over-voltage protection
- vi. Surge protection
- vii. Total harmonic distortion (THD) test
- viii. Reverse polarity test
- ix. Temperature rise test
- x. Ingress protection test

However, for small tenders, tender approving authority may take a view on the above and may accept type test/ routine test certificates from NABL accredited Labs.

Type test report/ certificate as per relevant standards on selected sample including endurance test as per IS10322 & Safety test for Drivers as per IS15885 from NABL accredited lab shall be submitted along with the offer and supply.

Additional output features for Canopy lights

Output Requirements - Driver

Output Type	Dimmable
Dimming Control Signal	0-10V Analogue
Output Voltage	Compliant with SELV regulation < 60 V DC.
Output Current	As per need of specific luminaire
Output CC Tolerance	< +/- 5% of CC Limit
Output Ripple Current	< 5% of rated output current
Short Circuit Protection	Output must be protected against Short Circuit

Output Requirements - Lighting Controller

Autonomous ON-OFF	Driver shall be with RTC Controller for Automatic turn-on and turn-off of luminaire as per schedule given by IOCL. Driver shall have RTC controller with battery for 5 Year working without recharging.
Dimming for Power Saving	Two or Three Dimming Levels (70% and 50% as per time schedule given by IOCL based on need).