

**Confidential Report**

<b>Client:</b> Litho Circuits Ltd, Portal House Raheen Business Park Limerick Ireland.  <b><u>Attention:</u></b> Colm Egan	<b>Test of:</b> LL-20 & LL-10 LED Retrofit Street Lights  To: EN60598-1: 2008 Luminaires — Part 1: General requirements and tests + A11: 2009
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*Adrian Gaffney*

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**REPORT BY: A. Gaffney**

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**APPROVED SIGNATORY: J McAuley**

**JOB TITLE: Technical Manager**

**SIGNATURE:**

*John McAuley*

### Executive Summary

The LL-20\LL-10 luminaries were light fittings for use in retrofitting of street lighting applications with LED lighting technology.

Following this assessment it was found that the equipment under test complied with the requirements of EN60598-1 Luminaries — Part 1: General requirements and tests

### Revision history

Rev	Reason for change	Date
1	First issue	13/09/2016

**Litho Circuits LL-20 & LL-10 LED Retrofit Street Lights****To: EN60598-1: 2008 Luminaires —Part 1: General requirements and tests + A11: 2009****1. Equipment Under test (E.U.T.)****1.1 Identification of E.U.T.**

Brand Name:	LL-20 & LL-10
Mode; Numbers	LL-20-50W LL-20-100W LL-20-150W LL-10-100W LL-10-50W LL-10-150W
Description	Retrofit Street Light fittings
Country of Manufacture	Ireland

The luminaires were light fittings for use in retrofitting of street lighting applications with LED lighting technology. The fittings assessed were a component part containing the electric circuits and light source for retro fitting into existing street light enclosures.

The equipment assessed had dimensions were 700 x 330 x 170 mm having a mass of up to approximately 7.5Kg

**3. Marking**

<b>Location</b>	<b>Marking</b>
Rating label	Model: LL-20-XX, LL-10-XX  Voltage: 100-240V~, 50-60Hz Power 50-150W, IP67
Earth terminal symbol	Earth symbol was present on the ballast.

The equipment was marked with a company name, rated voltage, maximum, power rating, operating frequency, maximum ambient temperature, model number,

Location of connection for live neutral and earth is marked on the inlet connector.

#### 4. Construction

The equipment had a metal class I enclosure which was for outdoor use and was designed to be retro fitted into existing street lamp fittings. The mains supply was connected through a terminal block in a sealed enclosure to the LED driver circuit. The protective earth connections were colour coded yellow\green and an earth terminal stud with lock washer was provided for the enclosure. The earth symbol was indicated by a label on the mains terminal block and on the LED driver terminals.

#### 5. External and Internal Wiring

Any external wiring was provided by the installer and was not assessed here.

The internal wiring comprised of mains supply, and LED supply cables. Cable ways were smooth and the cables did not pass through the enclosure. The cables formed part of the approved LED driver and LED modules. The temperature rating was 105°C and was sufficient for use in this application. Solder was not used to join internal wiring or to tin wires for use in screw terminals.

#### 7. Provision for Earth

The EUT was of Class I construction and had an earth terminal for connection of earth to the LED driver and metal enclosures. The integrity of the earth connection was tested as described below. This unit was for retro fitting into existing street light fittings, it is essential that the earth of the unit is probably bonded to the street light enclosure.

##### 7.1 Earth Continuity Test

Using an earth continuity tester, a current of 10A was passed for one minute between the protective earth and the locations shown in the table. The maximum allowable resistance was 100mΩ.

Location	Resistance (mΩ)	Verdict
Plug PE to accessible metal parts	35	Pass
PE terminal to lamp enclosure	*	

\* The parts tested were component parts for retro fitting into street lights. The earthing to the various lamp enclosures that it could be attached to were not tested in this assessment. It is imperative that during installation that a protective earth connection to accessible metal parts of the enclosure is provided by the installer.

## 8. Protection Against Electric Shock

Access to live parts was not possible without the use of a tool once the mains wiring has been connected and the terminal box closed. Also due to its application it is very unlikely that a person would come in contact live parts during normal operation.

*Note: To maintain the equipment's protection from electric shock, an appropriate protective earth connection to the accessible metal parts must be provided by the installer.*

## 9. Resistance to Dust Solid Objects and Moisture

The component parts of the retrofit light fitting had an IP rating of IP67 for ingress of solids and liquids. This rating was assessed by inspection of the component data. The IP rating for the lamp when the retrofit light fitting has been installed was not assessed and would be dependant on the particular lamp enclosure that was used.

## 10. Insulation Resistance, Electric Strength, Touch Current and Protective Conductor Current

### 10.1 Dielectric strength test

Using an electric strength tester, an ac voltage was applied between the mains supply conductors, and the accessible metal parts of the EUT. The test voltage as shown below was applied for one minute.

There was no breakdown of the insulation.

Location	Voltage	Verdict
Live or neutral to PE and enclosure	2000Vac (BI)	Pass

### 10.2 Insulation Resistance test

Using an electric strength tester, a 500Vdc voltage was applied between the mains supply conductors and the accessible metal parts of the EUT. The test voltage as shown below was applied for one minute. Following this period the insulation resistance was measured. The measured value should be over 1MΩ.

Location	Voltage	Resistance	Verdict
Live or neutral to PE and enclosure	500Vdc	>10MΩ	Pass

### 10.3 Touch current test

The EUT was powered with a 235V, 50Hz source and the touch current was measured using the touch current measuring circuit and meter. The current was found to be a maximum of 2.6mA under normal operating conditions and when the protective earth was disconnected. The limit for this measurement for normal conditions and for single fault conditions was 3.5mA rms.

### 10.4 Earth leakage current test

The earth leakage current was measured for both normal and reverse polarity. The maximum current measured during these tests was 2.6mA as measured on the 150W unit.

## 11. Creepage Distance and Clearance

### 11.1 Clearance and Creepage distances

The following minimum clearances and creepage distances were measured:

Location	Clearance (mm)	Creepage (mm)	Verdict
Live or neutral to PE (BI)	>3.0	>3.0	Pass
Live to Neutral (BI)	>3.0	>3.0	Pass
LED driver output to enclosure (BI)	*	*	Pass

\* Function of an approve LED driver \ power supply.

The minimum allowed creepage distance for basic insulation for the mains input voltage was 2.5 mm and the LED driver output voltage was 3mm. For Double or reinforced insulation, twice the distances of basic insulation are required.

## 12. Thermal Test

### 12.1 Temperature rise test

For this test the EUT was connected to a supply of 253Vac. During the test the light fixture was set to the 100% power setting. The temperature of the following parts and locations were monitored until they stabilised. The final temperature measurements recorded are listed below.

Part/Location	Temperature Measured (C°)	Temperature at max ambient (C°)	Temperature limit
Ambient	24.0	25.0	
LED power supply	41.0	42.0	90
LED Heatsink	63.0	64.0	*
LED lens	58.0		*
Mains Terminal Box	26.3	27.3	60
Internal Cable	34.2	35.2	105
*Rated to work at 45°C ambient no case temperatures were provided			
Note: the temperature measurements were carried out on LL-20-150W unit without the street light enclosure.			
Note: A maximum ambient temperature was not listed, therefore a maximum ambient temperature of 25°C was used.			

Temperature on external surfaces complied with the requirements.

A pre-approved LED driver and LED were fitted in the luminaire so abnormal lamp faults and endurance tests were not carried out.

## 13. Resistance to heat, fire

As the internal circuitry consisted of previously approved components and the enclosure restricting access to hazardous voltages was of metal construction it was considered that the equipment complies with the requirements of these clauses.

## 14. Screw and Screwless Terminals

The screwless terminals that were used in the equipment from part of approved ballasts, controller modules, connectors and terminal blocks and were deemed to comply with the requirements of these standards.

## **15. Analysis of Test Results, Conclusions**

- 15.1** As this equipment was a component assembly for retro fit installations on existing street light fittings the equipment must to be fitted into an appropriate enclosure before it will meet the requirements of the Low Voltage Directive. The safety of the EUT is dependant on the correct installation and operation of the equipment and the observance of all the safety information contained in the provided manufacturer's documentation.
- 15.2** The operator of the equipment would need to ensure that maintenance is carried out in accordance with the manufacturer's instructions.
- 15.3** The test results were satisfactory, once the follow issue has been addressed,
- A protective earth connection should be provided by the installer from the protective earth terminal on the accessible metal parts of street light enclosure.
- 15.4** It is the responsibility of the manufacturer to ensure that adherence with Annex III and Annex IV of Council Directive 2014/35/EU is observed



**Test Equipment Used**

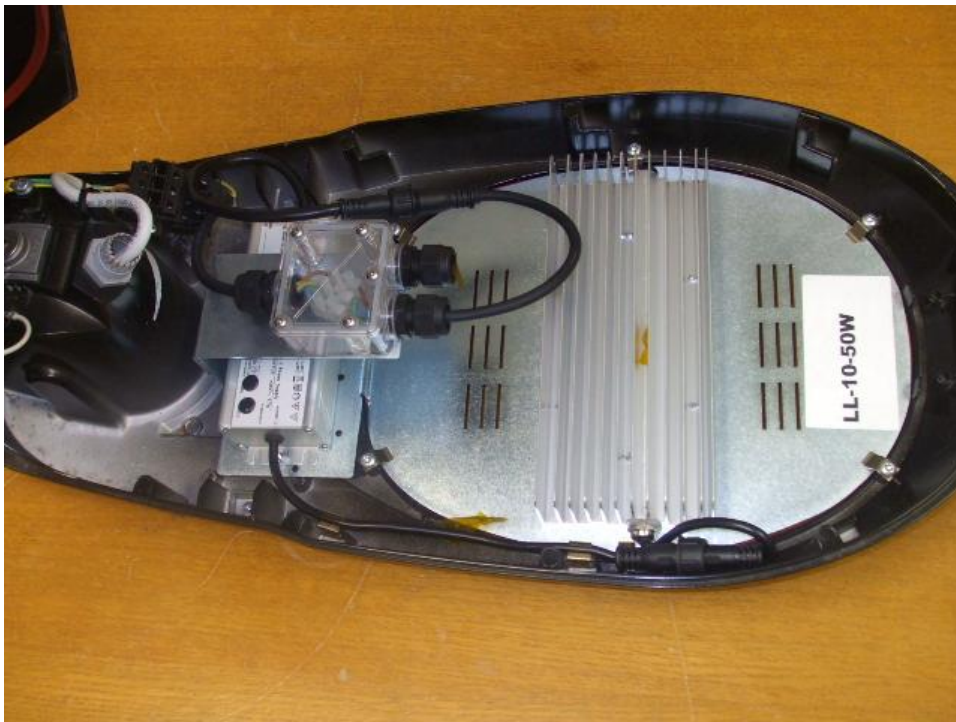
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>
Electric strength tester	Clare	HAL 101	E167
Earth continuity tester	Clare	A217	81672/A
Data logger	Agilent	34970A	US37041820
Power Metter	Voltech	PM 3000A	E673
Frequency related leakage current meter per Annex A of EN 61010-1	CEI	E153	-
Digital multimeter	Wavetek		E777
Force gauge	Mark-10 Corporation	MG50	41758
Steel sphere	Ergonomics	ITBI5	80
Test finger	Ergonomics	JFP10	186
Test pin	Ergonomics	TAP15	101
Earth leakage tester	Clare	A414	014760B1



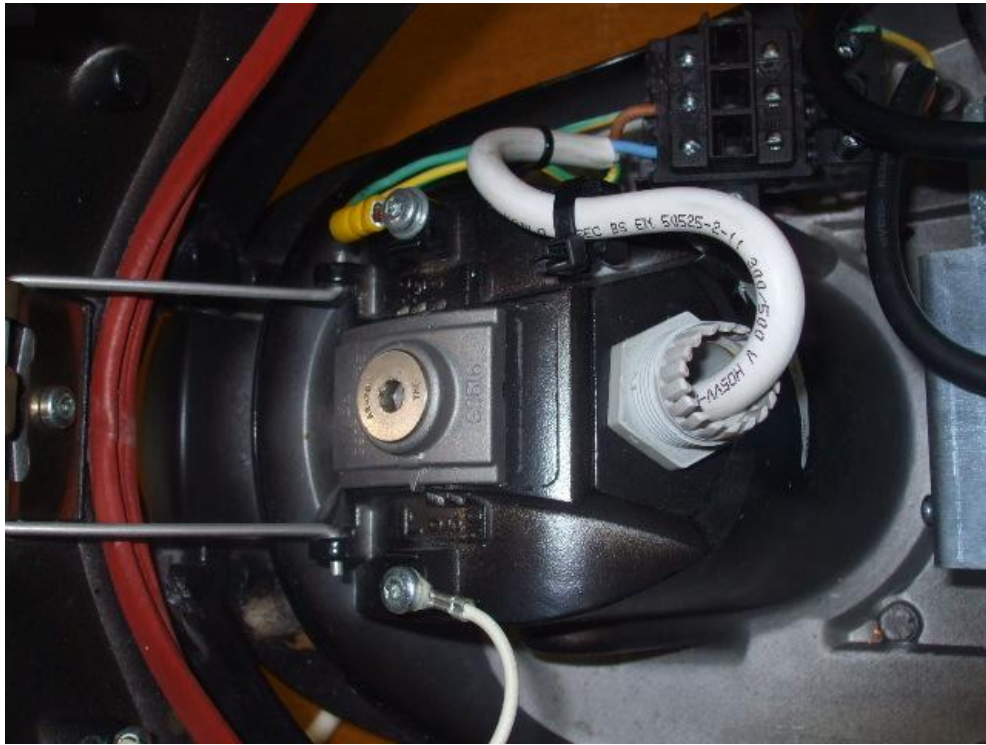
### Appendix 3: Photography



Sample street lamp enclosure



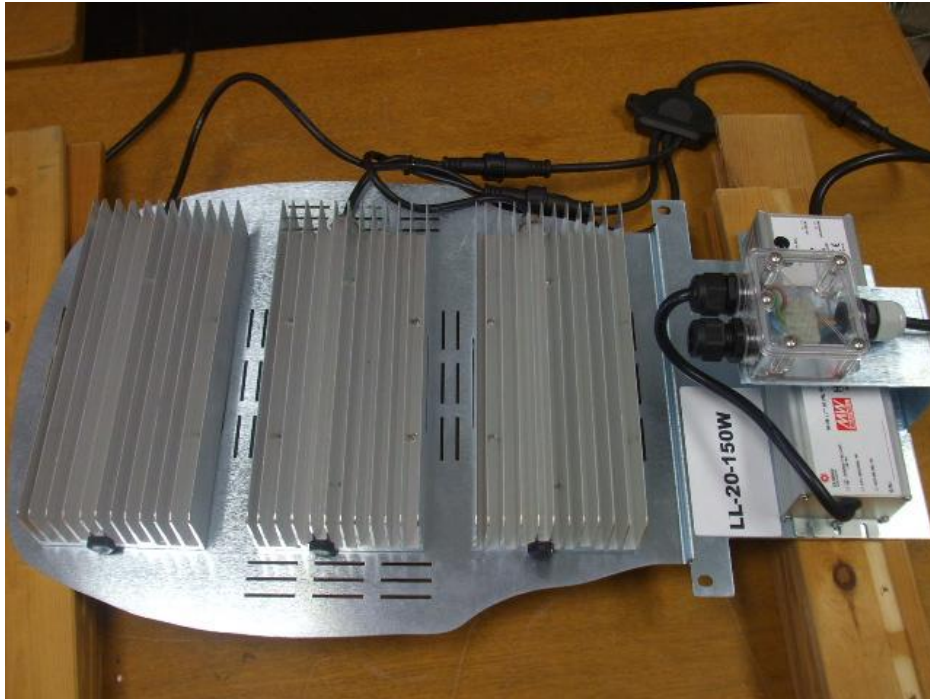
LL-10-50W retro fitting in sample enclosure



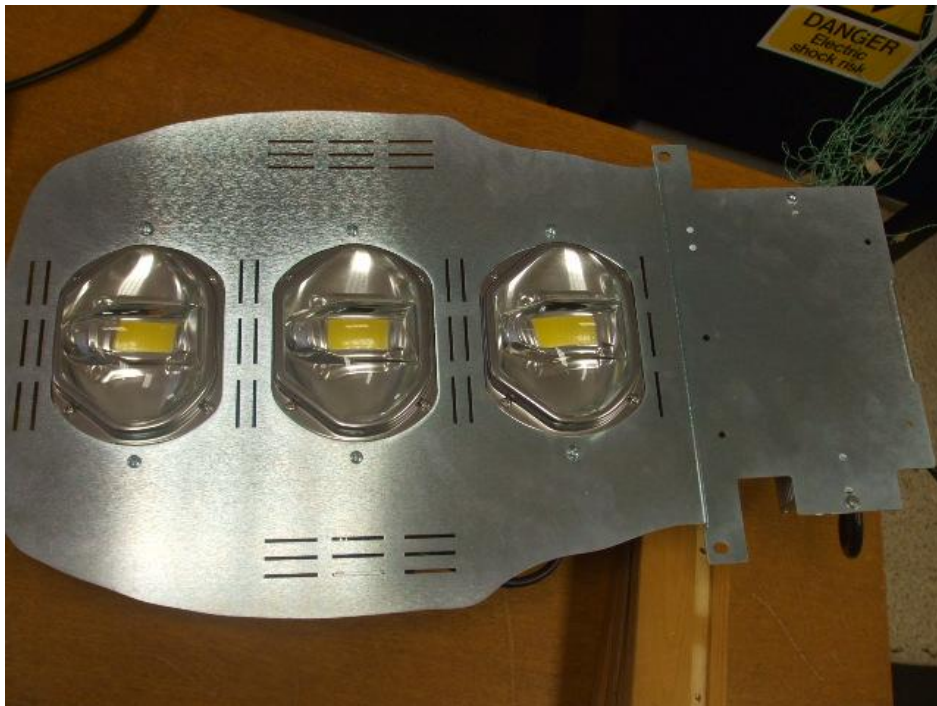
Light fitting showing earth connections



Front view of LL-10-50W



LL-20-150W rear view



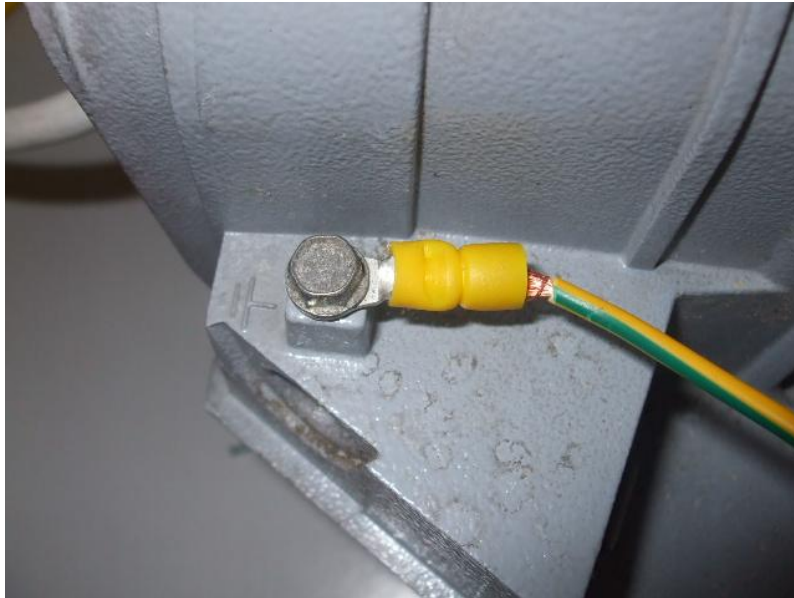
LL-20-150W front view



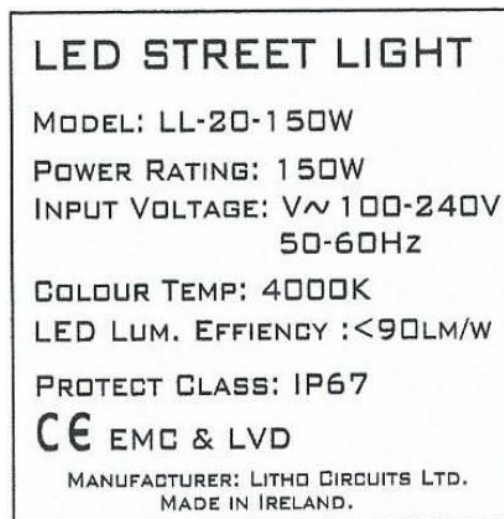
LL-20-100W rear view



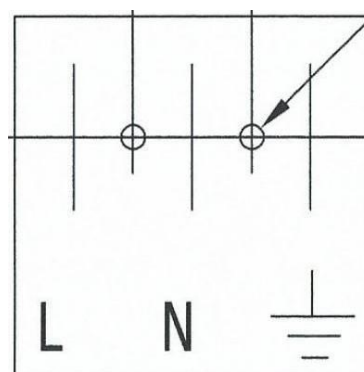
LL-20-100W front view



Chassis earth point



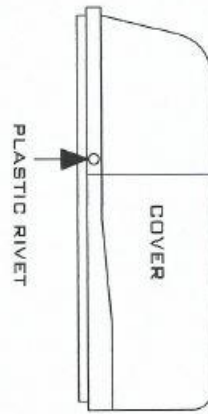
Sample rating label



Mains terminal identification label

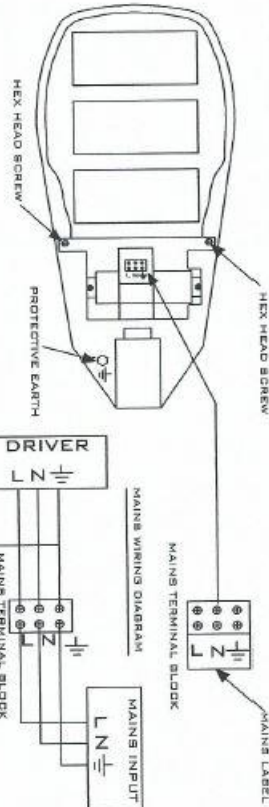
1. CUT OFF PLASTIC RIVET AND REMOVE COVER.

**STEP 1**



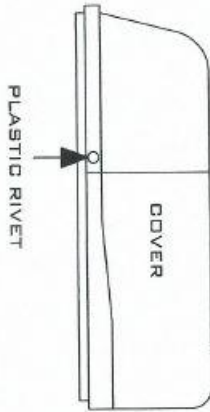
1. POSITION REPLACEMENT UNIT.  
 2. SECURE WITH 2 EXISTING HEX HEAD SCREWS. TORQUE TO 1.5 N/M  
 3. CONNECT PHOTOCELL WIRING AS PER SHEET. 2  
 4. RECONNECT MAINS AS SHOWN. USE APPROPRIATE LOCK WASHERS WHEN CONNECTING PROTECTIVE EARTHS.

**STEP 3**



**STEP 4**

1. REPLACE COVER.  
 2. INSERT PLASTIC RIVETS PROVIDED. (BOTH SIDES)



1. DISCONNECT MAINS.  
 2. DISCONNECT PHOTOCELL WIRING FROM GEAR TRAY.  
 3. REMOVE 3 HEX HEAD SCREWS.  
 4. REMOVE BULB HOLDER AND GEAR TRAY.



**LL-20 (50W/100W/150W) INSTALLATION DIAGRAM**

APPROVALS	DATE	LITHO CIRCUITS
DRAWN:		THE
REVISED:		INSTALLATION DWG
CHECKED:		BL6004
TEST NO.		REV 2

REV.	DESCRIPTION	DATE	SIGNED
C	MAINS WIRING ADDED	24/08/16	
B	TITLE CHANGE	08/05/16	
A	RELEASED	02/05/16	

Installation instructions