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SPARKS Magazine – Autumn Issue 2019 - Answer Sheet

Page 12 – Lighting circuits

In the most recent version of the Wiring Regulations (BS 7671) a requirement to provide 30 mA RCD protection on all circuits containing luminaires was introduced. The use of a 30mA RCD is used for additional protection in most circumstances. However, they can also be used for fault protection where required.

When designing lighting circuits there are a number of factors that need to be taken into consideration. Obviously, the usual design calculations for cable and protective devices etc. but also some additional consideration for the location of switches that could have a significant impact on the cost and the time spent installing circuits.

There are a number of methods that can be used to install lighting circuits. To start with you need to decide how you are going to supply the luminaires. The two methods commonly used are two plate method, where the supply is taken directly to the switch and the three plate method, where the supply is first taken to the Loop terminal in the ceiling rose or light fitting and then a switch wire run between the light fitting and the switch.

One-way lighting circuit.

When installing a lighting circuit where it is required to operate the luminaire from only one location a 1-way switch will be required. The 1-way switch will have a common terminal (C) and an L1 terminal. Some manufacturers mark these terminals as L1 (common) and L2. The BS symbol for a 1-way switch is 

Two-way lighting circuit.

When installing a lighting circuit where it is required to operate a luminaire from two separate locations a 2-way light switches will be required. The terminals found in a 2-way switch are common (C) L1 and L2. Some manufacturers mark these terminals as L1 (common) L2 and L3. There are two methods commonly used to wire an intermediate lighting circuit they are the conventional method (conduit method) and the conversion method. The BS symbol for a 2-way switch is 

Intermediate lighting circuit

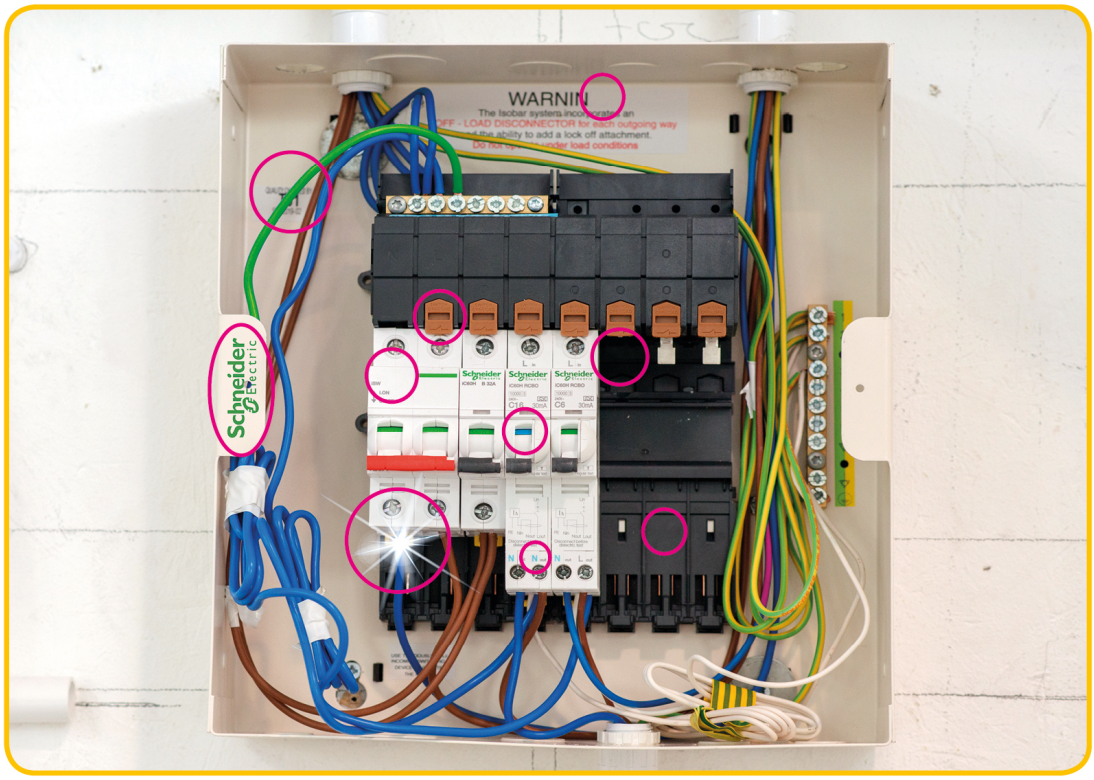
When installing a lighting circuit that is intended to operate a luminaire from three or more separate locations you will need at least one intermediate switch and two 2-way switches. The terminals usually found in an intermediate switch are L1, L2, L3 and L4. There are two methods commonly used to wire an intermediate lighting circuit they are the conventional method (conduit method) and the conversion method. The BS symbol for a 2-way switch is  and the BS symbol for an intermediate switch is .

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When working on an older installation you may come across lighting circuits that do not have a CPC. The customer can be advised that it is not required to update the installation to comply with current regulations providing that it was in compliance with the regulations at the time of installation. However, the customer should be advised of the possible risks that may be present as a result of having no CPC on the circuit.

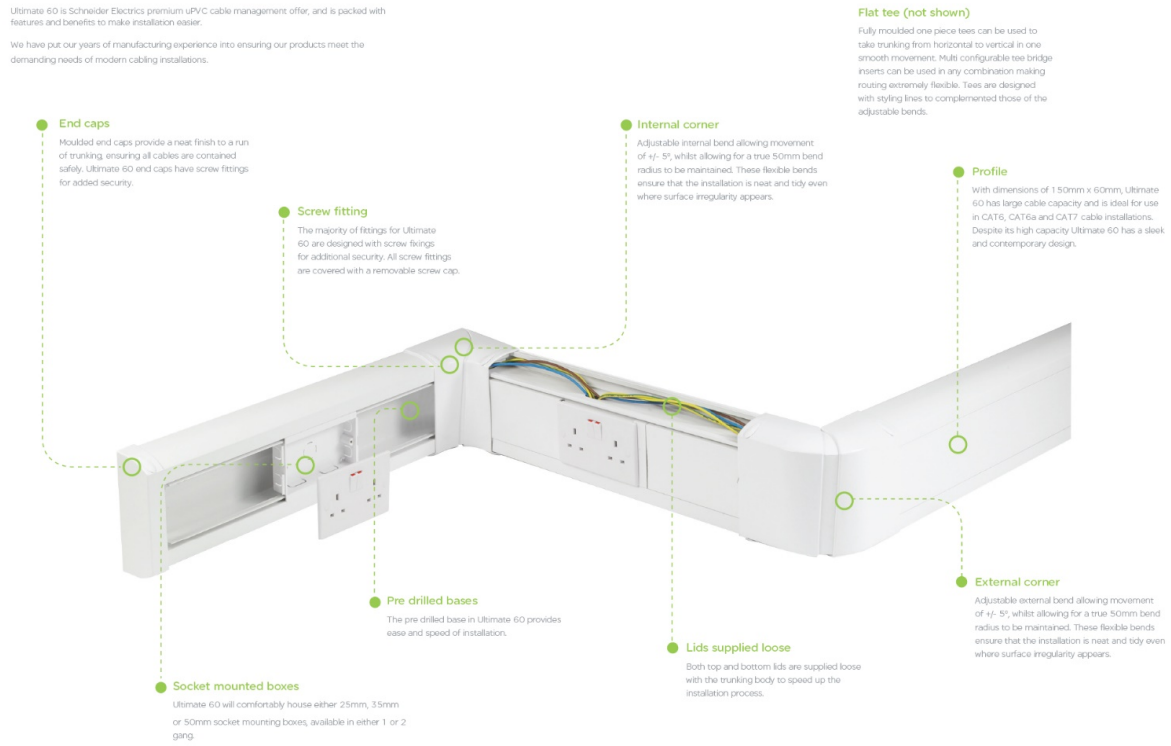
Some manufacturers now provide a Neutral (N) terminal in their switches which makes it easier for the installer when installing lighting circuits using the two plate method.

Page 21 – Spot the difference



Page 34 – Ultimate 60

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1) D
2) B

Page 56 – Electric cables

1) False
2) True
3) True
4) False
5) True
6) False
7) True
8) False
9) True
10) False
11) True
12) True

Page 57 and 59 – Electric cables

1) BS EN 61386-25:2011

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2)

By using the resistivity formula it is possible to calculate the resistance of the conductor in one move:

$$Rt = \frac{\rho \times L}{a}$$

$$Rt = \frac{17.8 \times 10\text{-}6 \times 10 \times 103}{1.5}$$

$$Rt = \frac{17.8 \times 10\text{-}6 \times 10 \times 103}{1.5} \qquad Rt = 17.8 \times 10\text{-}2 \qquad Rt = 0.12\Omega$$

Conductor (task 1)

I) Increases
II) Increases
III) Increases

Insulation (task 2)

I) Decreases
II) Remains the same
III) Increases

Page 60-62 – Discharge lighting

1) Mercury Coated Fluorescent. This refers to the tubular low vapour pressure mercury coated fluorescent lamps used for general office, small shop applications.
2) A) In series with the choke, glow type starter and parallel with the single-phase mains supply.
   B) In series with the tube

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C) In series with each end of the tube
D) In parallel with the mains supply at the luminaire terminals

3) A) Bimetallic strip
B) Glass tube
C) Capacitor
Generally known as a 'Glow-type' starter.
4) The tube will require replacement
5) Total power = 2 x 40 x 5 = **400W**
The total current for this circuit is found by applying the multiplier (1.8) as stated in the IET On-Site Guide Appendix A
So **Total power = 400 x 1.8 = 720W**

Therefore total current, It = Power ÷ Volts
= 720 ÷ 230
It = 3.13A

Alternatively the current can be found from Power ÷ Voltage and the answer multiplied by 1.8

6) When the tube is fully struck, i.e. a steady current is flowing through the tube ultra-violet light is produced from free electrons striking the mercury vapour inside the tube. A combination of phosphors is used to thinly coat the inside of the tube. The constant bombardment of the phosphor by electrons colliding with mercury vapour atoms causes the phosphor to 'glow' and produce visible light.

Page 62-63 – Luminaires and lighting

1) Highways or Roads; car parks; public gardens; sporting areas; monuments and floodlighting
2) Bus shelter, or advertising panels, road signs, telephone kiosk
3) An electrical installation comprising an assembly of associated highway distribution circuits, highway distribution boards and street furniture, supplied from a common origin
4) A Fire-fighters switch located in the low voltage circuit supplying the high voltage equipment
5) **Pelmet** – luminaire located behind a cover designed to direct the lighting and prevent discomfort glare
Track – a power track system onto which luminaires can be inserted and moved to a desired position

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6) 250V a.c. (559.5.1.201)
7) 5kg (559.5.2)
8) B refers to ‘bayonet’; E refers to ‘Edison Screw’, the numbers represent the diameter of the lamp base in mm
9) a) Equipment that distributes, filters or transforms the light transmitted from one or more lamps and which includes all the parts necessary for supporting, fixing or protecting the lamps, but not the lamps themselves, and where necessary, circuit auxiliaries together with the means of connecting them to the supply.

   b) A device placed in-line with the lamp load to limit the amount of current flowing in the circuit.

   c) Pulsing of light from a discharge light source due to the frequency of the mains supply.

10) To provide the initial discharge voltage to start the lamp. To control the current flowing through the lamp when ON

Page 64 – Power and hand tools

1) D
2) A
3) D
4) B
5) D
6) B
7) D
8) D
9) C
10) D

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