Domestic Wiring Practices

Learner Workbook

Version 1

Training and Education Support

Industry Skills Unit

Meadowbank

Product Code: 5638

Contents

1. Circuits for lighting

Purpose

This section introduces you to some techniques for control of lighting points. It will help develop knowledge of switching lights from one or two locations and the skills to install these circuits and accessories.

Objectives

At the end of this section you should be able to:

- Make up a material list for the installation of a light circuit from a job specification and given cable type and size
- Use safe working procedures when installing wiring systems in a framed structure
- Install a lighting circuit in a framed structure using flat TPS cables with points controlled by individual switches
- Test a lighting circuit to ensure it is safe to use and complies with requirements
- Alter the control of a luminary from a single switch (one-way switching) to switches in two locations (two-way switching).

References

- AS/NZS 3000
- Hampson, J., 2011, *Electrotechnology Practice, 2nd Ed.,* Pearson Education, Sydney
- Petheridge. K. & Neeson, I., 2012, *Electrical Wiring Practice, 7th Ed,* McGraw-Hill, Sydney.

Learning notes

Final sub-circuits

A final sub-circuit is a circuit from a switchboard to which only consuming devices or points are connected.

Installation practices

Before selecting a wiring system for an installation, you need to know something about the type of construction methods used. These methods will determine the degree of protection the cables will require.

The most common wiring system used in structures where the wiring can be concealed is thermoplastic insulated and sheathed cables, known as TPS. You can install TPS cables in wall frames, cavities and roof spaces with no further protection if you take some care to place the cables where they will not be subject to damage. If there is a risk of damage to cables, some further means of protection might be required.

Sometimes it is necessary to make openings and drill holes in structural members of a building to provide a route for cables. You need to drill holes in positions that will not weaken the structure. You should get directions on the safe location of holes from the person in charge of the building work.

Installation requirements

As well as the circuit operating in a manner that satisfies the customer, the installation must also satisfy all requirements of the AS/NZS 3000.

AS/NZS 3000 clauses relevant to lighting circuits include:

- Lighting equipment and accessories *Clause 4.5*
- Installation of TPS cables *Clauses 3.1.3; 3.3; 3.9*
- Earthing *Clauses 5.4.3; 5.4.4*
- Earth-leakage current protection *Clause 2.6.3*
- Switching arrangements *Clauses 2.3.1; 2.3.2.2.1; 2.3.4.5*
- Earthing resistance *Clause 8.3.5*
- Insulation resistance *Clause 8.3.6*
- Polarity test *Clause 8.3.7*
- Correct connections *Clause 8.3.8*

Safety testing

You must test each circuit, as outlined in AS/NZS 3000 Clause 8.3, before you connect it to the supply. This ensures the circuit is safe to use by showing:

- Earth resistance is safe and sufficiently low (AS/NZS 3000 Clause 8.3.5.2)
- Insulation resistance is safe and sufficiently high (AS/NZS 3000 Clause 8.3.6.2)
- Polarity is correct — including switches controlling active conductors (AS/NZS 3000 Clause 8.3.7.2)
- There are no short circuits between conductors (AS/NZS 3000 Clause 8.3.8.2(a))
- There is no transposition of earth and neutral conductors (AS/NZS 3000 Clause 8.3.8.2(b))
- There are no interconnections with another circuit (AS/NZS 3000 Clause 8.3.8.2(c)).

Circuit control and protection devices on the main switchboard are correctly marked to indicate:

- Corresponding active and neutral conductors for each circuit
- Relationship of equipment and the various parts of the installation.

The number of points connected to a circuit allows it to operate safely and as intended.

Practical Exercise 1.1: Single Switched Lighting (Loop at the Light)

Task

Your task is to:

- Make up a list of materials from a job specification
- Install two light points in a framed structure each controlled by a single switch.
- Test the circuit to ensure it is safe to use.

Risk Assessment

Identify any hazards, list the supervision level (D, G or B), list the risk class (A, B or C) and list control measures required in the table below:

Hazard Identification	Supervision Level	Risk Class	Control Measures

Instructions

1. Use the job specification to complete the material list of Table 1.1.

Table 1.1 - Material List

Item No.	Item Description	Quantity

Specification for Electrical Installation

Scope of Work

You are to install two light points, one using a pendant light fitting and the other, a batten holder, as shown in Figure 1.1. Each light point has independent control by one of two switches in a two-gang switch plate.

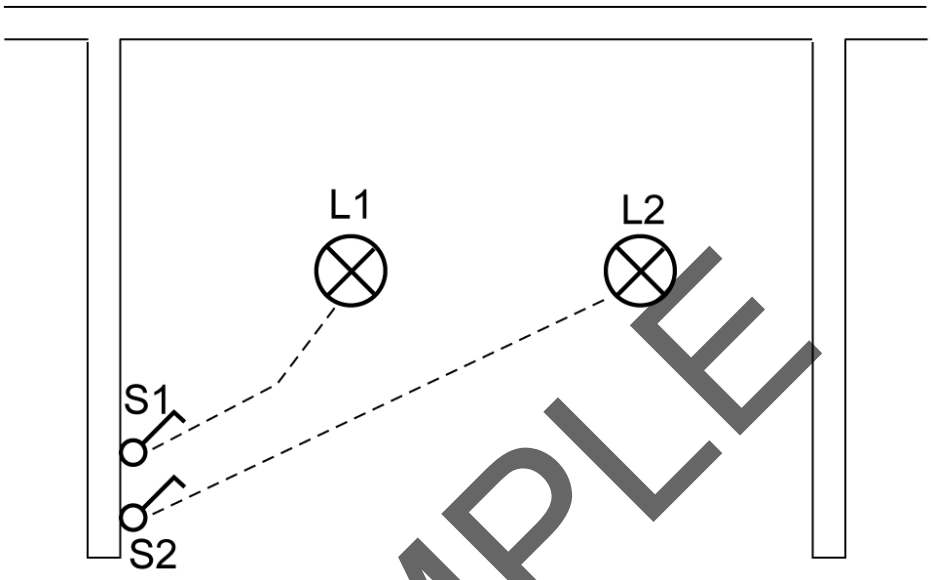


Figure 1.1 Lighting Layout

Materials

TPS cables shall be 0.6/1.0 kV grade. Insulation shall be V75 grade. All light switches are to be flush, all-insulated type, secured by the use of appropriate brackets or wall boxes. Your teacher will advise cable sizes.

Wiring Method

Wiring shall be by 'loop-at-the-light' method. You can only join the cables at the lights. You need to install the work in accordance with the current AS/NZS 3000 and all the requirements of the local Supply Authority. As far as practicable, conceal all wiring, run parallel or perpendicular to the joists and in association with other trades.

Installation

Provide light points as shown in the drawing. Unless otherwise noted, ceiling outlets are to be at the intersection of ceiling diagonals. The mounting height of the light switches is to be 1300 mm above floor level. All switches to be orientated (mounted) horizontally.

Light point L1 is to terminate in a ceiling rose with a flexible cord and lamp holder so that the lamp holder is 1.8 m above finished floor height.

Light point L2 is to terminate at a batten holder.

The final location of all accessories will be determined on site after consultation with your teacher.

Testing and Inspection

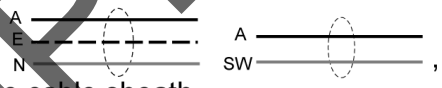
All circuits are to be tested to ensure that:

- There is earth continuity and the earth resistance is safe
- Insulation resistance is safe
- The polarity is correct.

Protection

Protection of the circuit is to be by a 10 A, 4.5 kA miniature circuit breaker and a Type II 30 mA RCD.

2. Complete the wiring diagram in Figure 1.2 below. Show the conductors as installed in sheathed cables.

Note: Draw the conductors like this - 

showing them incorporated in the cable sheath,

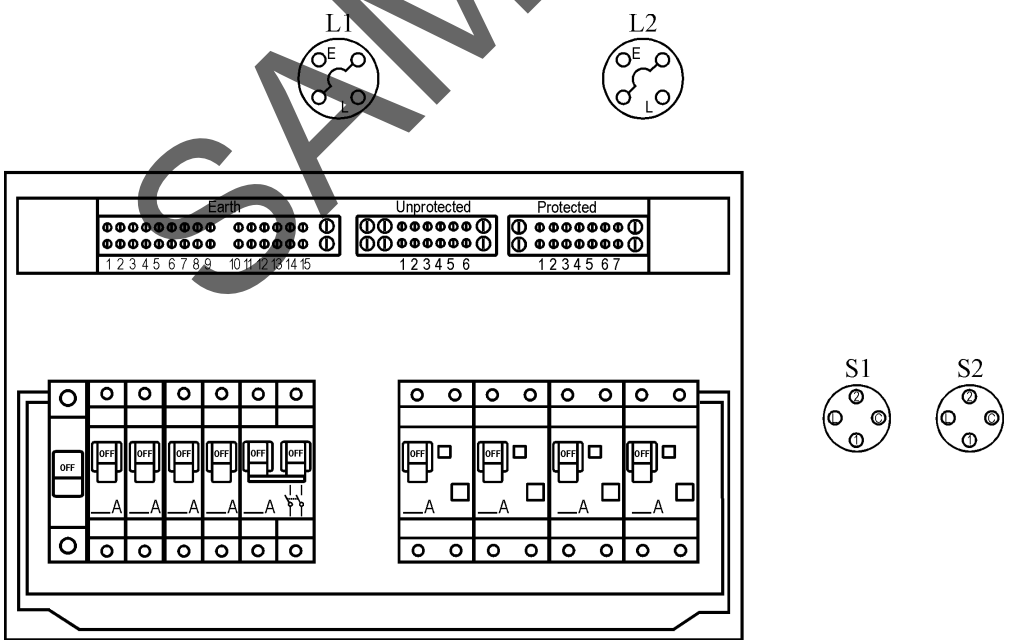


Figure 1.2 Wiring Diagram

3. Obtain your materials and tools and proceed with the installation.

4. Test your circuit for compliance with AS/NZS 3000 and Local Service and Installation Rules before connecting it to the supply. Conduct the tests specified and list the results in the table below. If you find any defects, fix them straight away. If you need any help, ask your teacher.

Test and Check List

Item	Result
Earth resistance is safe	
Insulation resistance is safe	
Polarity is correct	
There is no transposition of earth and neutral conductors	
There are no short circuits between conductors	
Switchboard is correctly marked	
Installation complies with standards and requirements	

I confirm that the installation, Practical Exercise 1.1, complies with requirements and is safe to use.

Name: _____

Signature: _____

When instructed by your teacher, connect the circuit to the supply and test that the circuit operates as intended.

5. Test that the circuit operates in the manner intended.

6. Have your work inspected by your teacher.

7. Isolate the circuit safely.