1.4 Wiring Systems Requirements

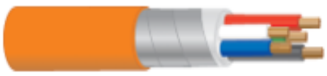
Introduction

Wiring systems provide a means of connecting electrical equipment to the supply. They are an essential and critical part of every installation. There are a range of acceptable types of wiring systems, each providing different features and advantages in different installation scenarios. It is important for an electrician to understand the different types, and be able to select wiring systems in accordance with the Wiring Rules, to suit a variety of situations. In this topic, you will learn about the requirements and factors that need to be considered when selecting wiring systems.

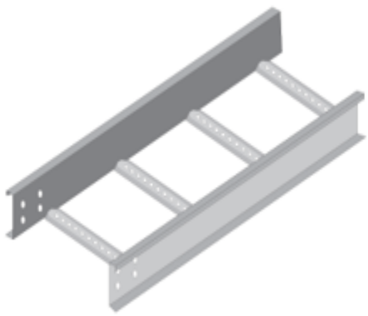
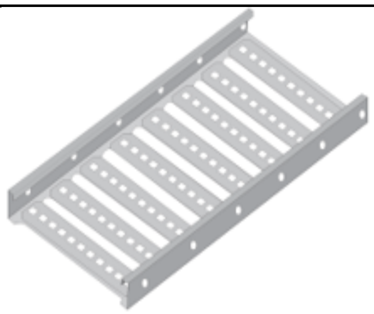
Wiring Systems

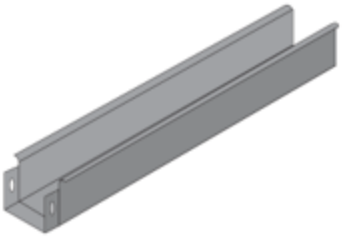
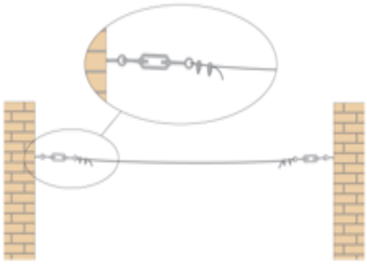
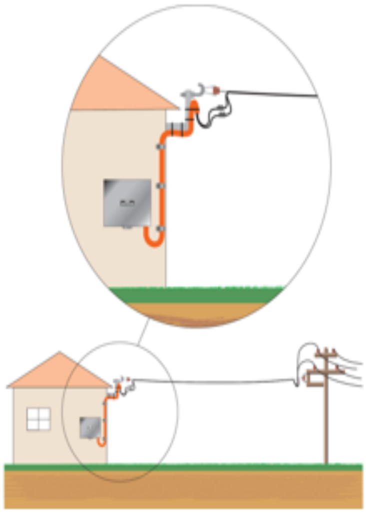
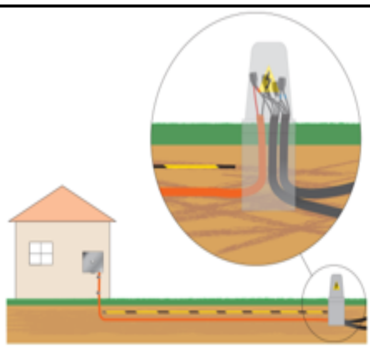
The term 'wiring system' refers to electrical cabling as well as any enclosures and/or supports associated with the cabling. The following table shows the general types of cables used in wiring systems.

Wiring Systems Cables		
Type	**Illustration**	**Application**
Insulated Unsheathed Cable		Single insulated cables are commonly installed in commercial and industrial installations and must be installed in a wiring enclosure such as conduit, trunking or duct.
Insulated and Sheathed Cable	 	TPS cables are used widely in domestic, commercial and industrial installations, and are commonly installed: • Unenclosed in building cavities. • Clipped to surfaces. • Embedded in rendered walls. • Tied to cable tray or ladder.

		• Tied to catenary systems. • Enclosed in conduit, trunking or duct.
Screened and Armoured Cables	 	Screened cables are used where protection against electromagnetic interference is required, typically in industrial settings. Armoured cables are used where protection against mechanical damage is required, typically in heavy industrial settings.
Mineral Insulated Metal Sheathed (MIMS) Cable		Fire rated cables such as MIMS and Radox are used where higher temperatures may be present, or to provide the required fire performance for safety services.

The following table shows the general types of wiring supports and enclosures used in wiring systems.

Wiring Systems Supports and Enclosures		
Type	**Illustration**	**Application**
Cable Ladder		Cable tray and cable ladder is used to support cables where fixing to other building materials is undesirable or impractical. Commonly used to support insulated and sheathed cables in commercial and industrial installations.
Perforated Tray		

Conduit		Conduit, duct and trunking are used where cables are required to be enclosed. Metallic conduits can be used where a particular risks of mechanical damage exists.
Trunking		
Catenary Systems		Catenary systems are commonly used to support temporary construction wiring and cables above false ceilings. They may also be used where cabling is required between separate buildings.
Aerial Systems		Aerial systems are used in outside parts of electrical installations, such as where cabling is required between separate buildings, or where a supply is required from overhead powerlines.
Underground Systems		Underground wiring systems are used where aerial conductors are undesirable or not practical. Cables can be 'buried direct' (i.e. unenclosed) or enclosed in a wiring enclosure.

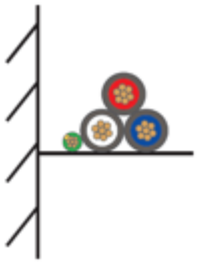
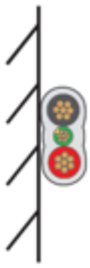
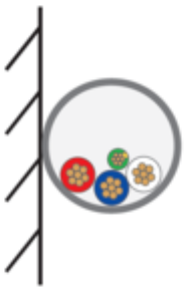
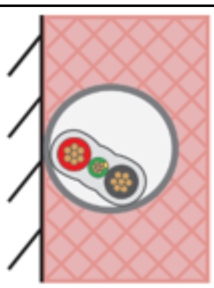
Wiring Systems in Australian Standards

There is a range of acceptable above ground and underground wiring systems specified in AS/NZS 3000:2018. These wiring systems are described in more detail in AS/NZS 3008.1.1:2017, where they are broken down into the following general categories:

- Unenclosed in Air.
- Enclosed (above ground).
- Buried Direct in the Ground.

- In an Underground Wiring Enclosure.

The following table shows how wiring systems are classified and identified in AS/NZS 3008.1.1:2017 for the purposes of cable selection.

Wiring Systems in Australian Standards		
Installation Method	**Illustration**	**Details**
Spaced from a surface		Includes: • Cables supported on ladders, perforated trays, racks, cleats and hangers. • Cables suspended on a catenary wire.
On a surface		Includes: • Cables clipped to walls, floors ceilings, or other surfaces. • Cables embedded directly (unenclosed) in cement render, concrete or plaster. • Cables laid in a ventilated trench or open trunking. • Cables in a switchboard or other similar enclosure.
In a wiring enclosure		Includes: • Cables installed in a wiring enclosure that is: ◦ Installed in air. ◦ Embedded in cement render, concrete, masonry or plaster (above the ground). ◦ Laid in a ventilated trench or open trunking. • Cables installed in: ◦ Closed trunking. ◦ Wiring enclosures fixed to a wall. ◦ A trench with a removable cover.
Partially surrounded by thermal insulation		Includes enclosed and unenclosed cables that are: • Partially surrounded by thermal insulating material, for example cables run between a building surface and insulation batts in a roof space or wall cavity. • Installed in an enclosed trench.

Completely surrounded by thermal insulation		Includes enclosed and unenclosed cables that are: • Completely surrounded by thermal insulating material, for example, cables run between two insulation batts in a roof space or wall cavity.
Buried direct in the ground		Includes unenclosed cables laid at a minimum depth of: • 300 mm under continuous concrete. • 500 mm in other areas.
In an underground wiring enclsoure		Includes enclosed cables laid at a minimum depth of: • 300 mm under continuous concrete. • 500 mm in other areas.

Continuous Current Carrying Capacity

The continuous current carrying capacity of a conductor indicates the maximum amount of current the conductor can carry continuously without sustaining damage. The term is usually shortened to 'current carrying capacity', and you may see it abbreviated as 'CCC'.

The primary factors that determine the current carrying capacity of a conductor are:

- The thermal properties of the insulation.
- The ability of the conductor to dissipate heat.

Whilst the properties of the cable insulation are fixed at the time of manufacture, the ability of a cable to dissipate heat varies significantly depending on the installation conditions and the presence of certain external influences. The following table explains how these issues can affect the integrity of wiring systems.

Design Considerations – Derating Factors		
Design Factor		**Effect on Wiring System**
Installation conditions that affect current carrying capacity	Above or below the ground	When compared to a cable installed above ground, the same cable installed underground will have a slightly higher current carrying capacity due to the reduced ambient temperature.
	Enclosed or unenclosed	When compared to a cable installed in air, the same cable installed in a wiring enclosure will have a slightly reduced current carrying capacity due to a reduced ability to dissipate heat.
	Surrounded by thermal insulation	When compared to a cable installed in air, the same cable installed surrounded by thermal insulation will have a significantly reduced current carrying capacity due to much lower ability to dissipate heat.

	Touching or spaced from a surface	When compared to a cable installed purely in air, the same cable installed on a surface will have a slightly reduced current carrying capacity due to a reduced ability to dissipate heat.
	Touching or spaced from other cables	When cables are installed next to one another, spacing them apart allows for greater air circulation around the cables, and therefore greater heat dissipation. For this reason, spaced cables will have higher current carrying capacities than touching cables.
	Bunched with cables of other circuits	Bunching cables significantly reduces air circulation, and therefore the ability of the cables to dissipate heat. For this reason, bunched cables must have a derating factor applied to their current carrying capacities.
External Influences that affect current carrying capacity	Direct sunlight	Installing cables in direct sunlight reduces the ability of the conductors to dissipate heat, resulting in reduced current carrying capacity.
	Ambient temperatures	The reference temperature for cables installed above ground in Australia is 40ºC, therefore: • A derating factor must be applied where cables are installed in ambient temperatures greater than 40ºC. • A rating factor may be applied where cables are installed in ambient temperatures that are less than 40ºC.
	External heat sources	Exposure to external heat sources reduces the ability of the conductors to dissipate heat resulting in reduced current carrying capacity.
	Thermal insulation	Where a cable passes through thermal insulation, e.g. to terminate into a light fitting, the entire cable may need to be treated as being partially or completely surrounded depending on the length of cable that is within the thermal insulation. Note that cables installed in ceilings, walls or under floors of domestic installations must be selected based on the assumption that thermal insulation will be installed at some stage in the future (if not already).
External Influences that pose the risk of damage	Water and humidity	Potential for short-circuits due to the ingress of moisture.
	Solid foreign bodies	Potential for short-circuits and reduced ability to dissipate heat due to the buildup of dust.

	Corrosive or polluting substances	Potential for damage to wiring due to chemical reactions.
	Impact	Potential for mechanical damage to wiring, supports and enclosures.
	Vibration and other mechanical stresses	Potential for loosening of terminations resulting in 'hot joints'.
	Flora and fauna	Potential for mechanical damage, for example from tree roots or rodents.
	Hazardous areas	Potential for ignition of explosive atmospheres.

Selecting Wiring Systems

There are a range of factors to consider when selecting wiring systems for particular situations including:

- Building construction methods.
- Installation requirements.
- External influences.
- Fire performance.
- Mutual detrimental effects.
- Maximum demand.
- Voltage drop.
- Fault loop impedance.
- Cost.

AS/NZS 3000:2018 Requirements

The following table highlights the relevant sections of AS/NZS 3000:2018 containing standards relevant to the selection of wiring systems.

Selection of Wiring Systems – Wiring Rules Requirements	
AS/NZS 3000:2018	**Summary**
Clause 3.2	*Types of Wiring Systems* Provides details of acceptable types of wiring systems, including types of cables, supports, enclosures and installation methods.
Clause 3.3	*External Influences* Provides details and requirements for protection against common external influences that may be harmful to wiring systems.

Clause 3.9	*Installation Requirements*
	
	Provides minimum standards relating to the installation of wiring systems, including:
	
	• Support and fixing.
	• Protection against mechanical damage.
	• Acceptable and prohibited locations.
	• Minimum radius for cable bends.
	• Specific requirements relating to:
	  ○ Consumer's mains.
	  ○ Sheathed cables.
	  ○ MIMS cables.
	  ○ Flexible cords.
	  ○ Track systems.
	  ○ Under-carpet wiring.
	• Segregation from other services.
	• Fire performance.
	• Limitation of eddy currents and electromagnetic interference.

Clause 3.10	*Enclosure of Cables* Specifies when cables are required to be enclosed, lists acceptable types of wiring enclosures, and details minimum standards for their installation, including: • Support and fixing. • Continuity of conductive enclosures. • Protection against external factors. • Bending of enclosures. • Termination and passage for conductors through openings. • Specific requirements relating to cable trunking.
Clause 3.11	*Underground Wiring Systems* Provides details of the acceptable types, classification and installation requirements for underground wiring systems, including: • Protection against mechanical damage. • Minimum depth of cover. • Identification. • Segregation from other services.
Clause 3.12	Aerial Wiring Systems Provides details of acceptable types and sizes of conductors and supports used in aerial wiring systems, and installation requirements including: • Maximum spans. • Minimum clearances. • The need for safety warnings in certain locations.
Clause 3.13	*Cables Supported by a Catenary* Provides details of acceptable conductors, supports and clearances required for catenary wiring systems.

Clause 3.15	*Busways, including Rising Mains Systems* States that busbar trunking systems must: • Comply with AS/NZS 3439.2 • Be installed in accordance with the manufacturer's instructions.
Clause 3.16	*Earth Sheath Return (ESR) System* Provides details of acceptable conductors and arrangements for an earth sheath return (ESR) system.
Clause 7.2	*Safety Services* Provides specific additional requirements for the installation and arrangement of circuits supplying safety systems, addressing the following types of issues: • Wiring system (WS) classifications. • Control and protection arrangements. • Identification. • Segregation.
Appendix D	*Minimum Sizes for Posts, Poles and Struts for Aerial Line Conductors* Provides guidance on the selection and installation of supporting poles and posts for aerial conductors, including: • Design factors and selection methods. • Sinking poles and posts (depth in ground). • Attachment to buildings.

To assist your understanding of the topic content, click the link below and undertake the activity.

Check Your Progress

This learning activity consists of 11 parts designed to develop your understanding of wiring systems used in electrical installations, including installation conditions, external influences and current carrying capacity of conductors. It is recommended that you have copies of both AS/NZS 3000:2018 and AS/NZS 3008.1.1:2017 to assist you with completing this activity.

Topic 1.4 Learning Activity

In this skills practice, you are required to select wiring systems for a variety of installation scenarios. You will be able to undertake this skills practice at your desk, and you may wish to have a copy of AS/NZS 3000:2018 available for reference.

Topic 1.4 Skills Practice

Undertaking this Topic Content Quiz will help you to confirm your understanding of the fundamental safety and performance requirements affecting the design of electrical installations including thefactors that will affect the selection of wiring systems for electrical installations.

Topic 1 Content Quiz

Last modified: Thursday, 28 November 2019, 8:48 AM

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FURTHER LEARNING RESOURCES

Textbook References

Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill

Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

AS References

AS/NZS 3000:2018 (Section 3 and Appendix D)

AS/NZS 3008.1.1:2017 (Sections 2 and 3)

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2.1 Maximum Demand

Introduction

The 'maximum demand' of a circuit can be defined as the maximum amount of current that will be needed to supply the connected equipment at any one time. When designing electrical installations, the maximum demand is determined for all mains, submains and final subcircuits, as this is the first step towards selecting suitable cable sizes and equipment ratings.

As you work through this topic, you will learn about the methods and factors to consider when determining the maximum demand on consumer's mains and submains.

Determining Maximum Demand

The Wiring Rules specifies four acceptable methods of determining maximum demand, each of which is suited to different scenarios. The following table explains the acceptable methods of determining maximum demand.

Methods of Determining Maximum Demand		
Method	**Description**	**Application**
Calculation	Maximum demand is determined using values from Tables C1 (domestic) or C2 (non-domestic) provided in AS/NZS 3000:2018 Appendix C.	Used for determining the maximum demand on mains and submains during the design of new installations.
Assessment	Maximum demand is determined by evaluating the connected load in relation to: • Capacity. • Operating characteristics. • Duty cycle. • Intended use.	Used to determine the maximum demand of final subcircuits supplying single items of equipment and for installations with unusual or widely fluctuating loads or where the number and types of loads in unknown.
Measurement	Maximum demand is determined in an existing installation by examining the current consumed over a 30 minute period of high demand.	A maximum demand ammeter is used to determine the maximum demand. This method is only suitable for existing installations.

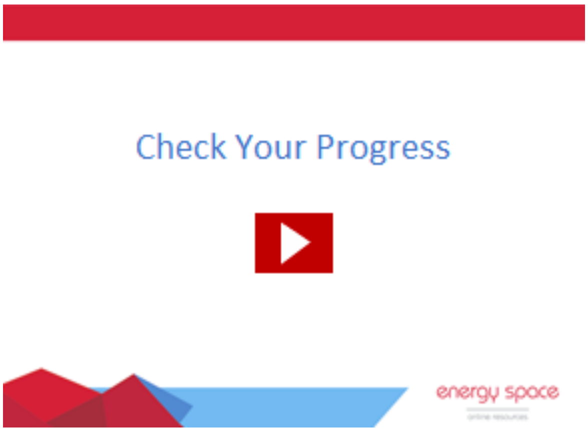
Limitation	Maximum demand is determined by adding the nominal current ratings of downstream circuit protection devices protecting associated downstream final subcircuits and/or submains.	Most commonly used to determine the maximum demand of final subcircuits supplying multiple items of equipment (e.g. socket outlets circuits).

Limitation

As discussed in the table above, 'limitation' refers to determining the maximum demand from the nominal current ratings of the circuit protection devices protecting associated downstream final subcircuits and/or submains. For example:

- A set of submains supplying a distribution board that consists of two 20 A final subcircuits and two 16 A final subcircuits have a maximum demand of 72 A when determined by limitation (i.e. 20 + 20 + 16 + 16 = 72 A).
- A socket outlets final subcircuit protected by a 20 A Type C circuit breaker has a maximum demand of 20 A when determined by limitation.

To assist your understanding of the topic content, click the link below and undertake the activity.



This learning activity consists of 3 parts designed to develop your understanding of the acceptable methods for determining maximum demand.

Topic 2.1 Learning Activity

Last modified: Thursday, 28 November 2019, 8:55 AM

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FURTHER LEARNING RESOURCES

Textbook References

Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill

Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

AS References

AS/NZS 3000:2018 (Sections 1 and 2)

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2.2 Determining Installation Maximum Demand – Consumer's Mains and Submains

Maximum Demand on Consumer's Mains

During the design phase of an electrical installation, the simplest and most common method of determining the maximum demand on consumer's mains is by calculation. This is achieved through the application of the following Tables in AS/NZS 3000:2018:

- Table C1 for domestic installations.
- Table C2 for non-domestic installations.

When calculating the maximum demand on consumer's mains, all loads in the installation must be taken into account, and the following factors must be taken into consideration.

<table>
<tr><th colspan="2">Maximum Demand on Consumer's Mains</th></tr>
<tr><th>Factors</th><th>Details</th></tr>
<tr><td>Type of Installation</td><td>The type of installation will determine the AS/NZS 3000:2018 tables and columns that should be used, as follows:
Single domestic (Table C1, Column 2)
Multiple domestic (Table C1, Columns 3 to 5)
Non-domestic residential (Table C2, Column 2)
Non-domestic commercial/industrial (Table C2, Column 3)</td></tr>
<tr><td>Intended Use</td><td>It is unlikely that every socket outlet, lighting point and appliance in an installation will be utilised at full capacity all at the same time. This is known as load 'diversity', and allows the maximum demand to be reduced below the total full load current.

Diversity factors include:
The operating conditions and characteristics of the connected load.
The number and distribution of the connected load.
These factors have already been taken into account in the values specified in Tables C1 and C2.</td></tr>
</table>

Load Grouping	When calculating maximum demand, the connected load is categorised into ‘load groups’. The load groups of the connected equipment will determine the calculation that is applied. There are 13 load groups for domestic installations (see Table C1) and there are 10 load groups for non-domestic installations (see Table C2).
Distribution of Loads Between Phases	Where there is more than one phase, the total load must be distributed between phases as evenly as possible. Where phase loadings are unequal, the maximum demand is equal to the heaviest loaded phase.

Worked Example – Maximum Demand on Consumer's Mains – Single Domestic

A three bedroom house has the following connected load:

Qty.	Load
28	230 V lighting points
24	230 V, 10 A double socket outlets
1	230 V, 15 A single socket outlet
1	8.2 kW, 230 V electric cooktop
1	3.5 kW, 230 V electric wall oven
1	27 A (max) reverse cycle ducted air conditioning
1	12.1 kW, 230 V instantaneous water heater

Determine the maximum demand on the single phase consumer's mains.

A house is classified as a single domestic electrical installation therefore AS/NZS 3000:2018 Table C1 column 2 is used.

Load	Load Group	Calculation	Demand
28 x Lighting points	(a) (i)	3 + 2 = 5 A	5 A
24 x 230 V, 10 A double socket outlets (48 points)	(b) (i)	10 + 5 + 5 = 20 A	20 A
1 x Single 15 A socket outlet	(b) (ii)	10 A	10 A
1 x 8.2 kW electric cooktop	(c)	(8,200 / 230) x 0.5 = 17.83 A	18 A
1 x 3.5 kW electric wall oven	(c)	(3,500 / 230) x 0.5 = 7.61 A	8 A
1 x 27 A (max) reverse cycle ducted air conditioning	(d)	27 x 0.75 = 20.25 A	21 A
1 x 12.1 kW instantaneous water heater	(e)	(12,100 / 230) x 0.333 = 17.52 A	18 A
		Maximum demand on consumer's mains:	100 A

*Note: when calculating maximum demand, answers should always be rounded up (rounding up to the nearest ampere is generally acceptable). This is because it's better for the calculated maximum demand to be slightly higher than necessary, than for it to be slightly lower than necessary!

Worked Example – Maximum Demand on Consumer's Mains – Multiple Domestic

A unit block consisting of 9 living units has the following load:

- 6 x two bedroom units
- 3 x three bedroom units
- A communal load

The communal load is detailed in the following table:

Communal Load	
Qty.	**Load**
12	230 V twin tube fluorescent luminaires (0.35 A each)
6	100 W, 230 V flood lights
6	230 V, 10 A single socket outlets

Each two bedroom unit has the following connected load:

Two Bedroom Units	
Qty.	**Load**
8	230 V lighting points
1	150 W, 230 V bathroom exhaust fan
12	230 V, 10 A double socket outlets
1	10 kW, 230 V electric stove
1	3.6 kW, 230 V storage water heater

Each three bedroom unit has the following connected load:

Three Bedroom Units	
Qty.	**Load**
14	230 V lighting points
2	150 W, 230 V bathroom exhaust fan
17	230 V, 10 A double socket outlets
1	10 kW, 230 V electric stove
1	4.8 kW, 230 V storage water heater

Determine the maximum demand on the three

Worked Example – Maximum Demand on Consumer's Mains – Multiple Domestic

A three bedroom house has the following connected load:

Qty.	Load
28	Lighting points
24	Double 10 A socket outlets
1	Single 15 A socket outlet
1	8.2 kW electric cooktop
1	3.5 kW electric wall oven
1	27 A (max) reverse cycle ducted conditioning
1	12.1 kW instantaneous water he

Determine the maximum demand on the sin phase consumer's mains.

A house is classified as a single domestic elec installation therefore AS/NZS 3000:2018 Tabl column 2 is used.

Load	Load Group	Calculation	Den
28 x Lighting points	A (i)	3 + 2 = 5 A	5
24 x Double 10 A socket outlets	B (i)	24 x 2 = 48 points 10 + 5 + 5 = 20 A	2(
1 x Single 15 A socket outlet	B (ii)	10 A	1(
1 x 8.2 kW electric cooktop	C	(8200 / 230) x 0.5 = 17.83 A	1{
1 x 3.5 kW electric wall oven	C	(3500 / 230) x 0.5 = 7.61 A	8
1 x 29 A (max) reverse cycle ducted air conditioning	D	27 x 0.75 = 20.25 A	2

phase consumer's mains.

A unit block is classified as a multiple domestic electrical installation. In this case, there would be 3 living units per phase (9 units in total distributed across three phases), therefore AS/NZS 3000:2018 Table C1 column 3 is used.

Load	**Load Group**	**Calculation**	**Demand**		
			A	**B**	**C**
Lighting points	(a) (i)	6 A per phase	6 A	6 A	6 A
10 A socket outlets	(b) (i)	10 + (3 x 5) = 25 A	25 A	25 A	25 A
Electric stoves	(c)	15 A per phase	15 A	15 A	15 A
Storage water heaters	(f)	6 x 3 = 18 A	18 A	18 A	18 A
12 x fluorescent luminaires (0.35 A each)	(h)	6 x 0.35 = 2.1 A	2 A	2 A	-
6 x 100 W flood lights	(h)	6 x 100 = 600 W 600 / 230 = 2.61 A	-	-	3 A
Communal socket outlets	(i)	2 x 2 = 4 A	4 A	4 A	4 A
		Maximum demand on consumer's mains:	70 A	70 A	71 A

The maximum demand is taken as the heaviest loaded phase, therefore the maximum demand on the unit block consumer's mains is 71 A per phase.

1 x 12.1 kW instantaneous water heater	E	(12100 / 230) x 0.333 = 17.52 A	18
		Maximum demand on consumer's mains:	10

Worked Example – Maximum Demand on Consumer's Mains – Non-Domestic

A factory unit has the following connected load:

Qty.	Load
12	230 V twin tube fluorescent luminaires (0.35 A per fitting)
18	230 V high intensity discharge (HID) luminaires (1.75 A per fitting)
16	230 V, 10 A double socket outlets
4	230 V, 15 A single socket outlets
6	400 V, 20 A single socket outlets
1	9.6 kW, 230 V storage water heater
1	4.8 kW, 400 V lathe motor (9.7 A per phase)
2	230 V single phase arc welders (18 A primary rated current)

Determine the maximum demand on the three phase consumer's mains.

A factory unit is classified as non-domestic therefore AS/NZS 3000:2018 Table C2 column 3 is used. Note the distribution of equipment across phases.

Load	Load Group	Calculation	Demand		
			A	B	C
12 x Fluorescent luminaires (0.35 A per fitting)	(a)	12 x 0.35 = 4.2 A	-	-	5 A
18 x HID luminaires (1.75 A per fitting)	(a)	9 x 1.75 = 15.75 A	16 A	16 A	-
16 x 230 V Double* 10 A socket outlets *16 x 2 = 32 sockets in total	(b) (i)	1,000 + (11 x 750) = 9,250 W 9,250 / 230 = 40.2 A 1,000 + (7 x 750) = 6,250 W 6,250 / 230 = 27.2 A	41 A	41 A	28 A
4 x 230 V, 15 A socket outlets	(b) (iii)	15 A 15 A 15 + (15 x 0.75) = 26.25 A	15 A	15 A	27 A
6 x 400 V, 20 A socket outlets	(b) (iii)	20 + ((5 x 20) x 0.75) = 95 A	95 A	95 A	95 A
1 x 9.6 kW, 230 V storage water heater	(c)	9,600 / 230 = 41.74 A	-	-	42 A
1 x Lathe motor (9.7 A per phase)	(d)	9.7 A per phase	10 A	10 A	10 A

2 x Single phase arc welders (18 A)	(h)	18 x 2 = 36 A	18 A	18 A	
		Maximum demand on consumer's mains:	195 A	195 A	207 A

The maximum demand is taken as the heaviest loaded phase, therefore the maximum demand on the factory consumer's mains is 207 A per phase.

To assist your understanding of the topic content, click the link below and undertake the activity.

Maximum Demand on Submains

As with consumer's mains, the simplest and most common method of determining maximum demand on submains during the design phase of an electrical installation is by calculation. This is achieved through the application of the following Tables in AS/NZS 3000:2018:

- Table C1 for domestic installations.
- Table C2 for non-domestic installations.

The methods and factors relating to the maximum demand of submains are essentially the same as those for consumer's mains, except that when calculating the maximum demand on submains, only the loads supplied by those submains should be taken into account.

*Note: the following table is a reproduction of the table on content page 2.2

Maximum Demand on Submains	
Factors	**Details**
Type of Installation	The type of installation will determine the AS/NZS 3000:2018 tables and columns that should be used, as follows: • Single domestic (Table C1, Column 2) • Multiple domestic (Table C1, Columns 3 to 5) • Non-domestic residential (Table C2, Column 2) • Non-domestic commercial/industrial (Table C2, Column 3)

<table>
<tr><td>Intended Use</td><td>It is unlikely that every socket outlet, lighting point and appliance in an installation will be utilised at full capacity all at the same time. This is known as load ‘diversity’, and allows the maximum demand to be reduced below the total full load current.

Diversity factors include:

• The operating conditions and characteristics of the connected load.
• The number and distribution of the connected load.

These factors have already been taken into account in the values specified in Tables C1 and C2.</td></tr>
<tr><td>Load Grouping</td><td>When calculating maximum demand, the connected load is categorised into ‘load groups’. The load groups of the connected equipment will determine the calculation that is applied.

There are 13 load groups for domestic installations (see Table C1) and there are 10 load groups for non-domestic installations (see Table C2).</td></tr>
<tr><td>Distribution of Loads Between Phases</td><td>Where there is more than one phase, the total load must be distributed between phases as evenly as possible. Where phase loadings are unequal, the maximum demand is equal to the heaviest loaded phase.</td></tr>
</table>

Worked Example – Maximum Demand on Submains – Multiple Domestic

This worked example follows on from the multiple domestic scenario on content page 2.2. The unit block has a total of 9 living units, each of which are supplied by a set of single phase submains. This time, we will determine the maximum demand on the single phase submain to unit No. 7.

No. 7 is a three bedroom unit and has the following connected load:

Qty.	Load
14	230 V lighting points
2	150 W, 230 V bathroom exhaust fan
17	230 V, 10 A double socket outlets
1	10 kW, 230 V electric stove
1	4.8 kW, 230 V storage water heater

The submain is supplying an individual living unit therefore AS/NZS 3000:2018 Table C1 column 2 is used.

Load	Load Group	Calculation	Demand
14 x Lighting points	(a) (i)	14 + 2 = 16 points = 3 A	3 A
2 x 150 W, 230 V bathroom exhaust fan	(a) (i) (see Note *e*)		
17 x 230 V, 10 A double socket outlets (34 points)	(b) (i)	10 + 5 = 15 A	15 A
1 x 10 kW, 230 V electric stove	(c)	(10,000 / 230) x 0.5 = 21.74 A	22 A
1 x 4.8 kW, 230 V storage water heater	(f)	4,800 / 230 = 20.87 A	21 A
Maximum demand on submains:			61 A

Worked Example – Maximum Demand on Consumer's Mains – Multiple Domestic

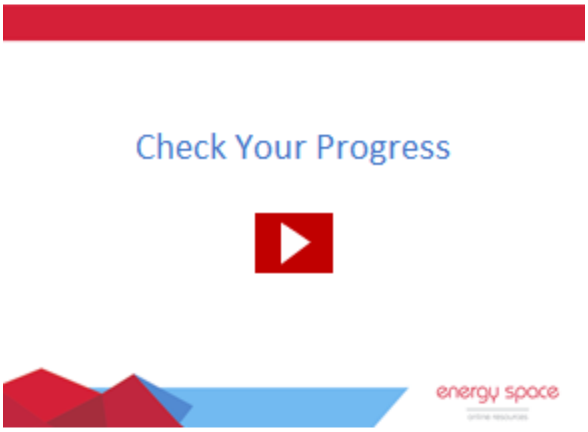
A three bedroom house has the following connected load:

Qty.	Load
28	Lighting points
24	Double 10 A socket outlets
1	Single 15 A socket outlet
1	8.2 kW electric cooktop
1	3.5 kW electric wall oven
1	27 A (max) reverse cycle ducted air conditioning
1	12.1 kW instantaneous water heater

Determine the maximum demand on the single phase consumer's mains.

A house is classified as a single domestic electrical installation therefore AS/NZS 3000:2018 Table C1 column 2 is used.

To assist your understanding of the topic content, click the link below and undertake the activity.



This learning activity consists of 4 parts designed to develop your understanding of the AS/NZS 3000:2018 Tables used to calculate maximum demand on consumer's mains and submains, and the factors that need to be taken into consideration. You will need a copy of AS/NZS 3000:2018 available to assist you with completing this activity.

Topic 2.2 Learning Activity

In this skills practice, you are required to calculate the maximum demand on the consumer mains of a single domestic electrical installation and a non-domestic electrical installation. You will be able to carry out this skills practice at your desk, and you will need to have a calculator and a copy of AS/NZS 3000:2018 available for reference.

Topic 2.2.1 Skills Practice

In this skills practice, you are required to calculate the maximum demand on the consumer's mains and submains of a multiple domestic electrical installation. You will be able to carry out this skills practice at your desk, and you will need to have a calculator and a copy of AS/NZS 3000:2018 available for reference.

Topic 2.2.2 Skills Practice

Last modified: Monday, 23 November 2020, 2:57 PM

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ADMINISTRATION

FURTHER LEARNING RESOURCES

Textbook References

Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill, Seventh Edition

Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

AS References

AS/NZS 3000:2018 (Appendix C)

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2.3 Determining Installation Maximum Demand – Final Sub-Circuit

The 'maximum demand' is the amount of current that is needed to supply a given circuit. AS/NZS 3000:2018 states that maximum demand of final subcircuits shall be determined by:

- Assessment for final subcircuits supplying individual items of equipment (e.g. a stove circuit)
- Limitation for final subcircuits supplying multiple items of equipment (e.g. a socket outlets circuit)

In general, an item of equipment with a demand of 20 A or more should be supplied on its own circuit.

AS/NZS 3000:2018 Appendix C provides guidance on determining maximum demand.

This learning activity consists of 7 parts designed to develop your understanding of the AS/NZS 3000:2018 Tables used to calculate maximum demand on final sub circuits, and the factors that need to be taken into consideration. You will need a copy of AS/NZS 3000:2018 available to assist you with completing this activity.

Topic 2.3 Learning Activity

Undertaking this Topic Content Quiz will help you to confirm your understanding of maximum demand, including requirements, methodology and factors for consideration.

Topic 2 Content Quiz

Last modified: Thursday, 28 November 2019, 10:40 AM

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FURTHER LEARNING RESOURCES

Textbook References

Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill

Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

AS References

AS/NZS 3000:2018 (Appendix C)

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3.1 Cable Selection

Introduction

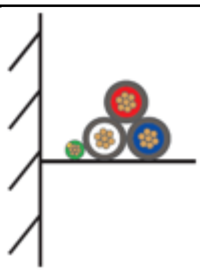
To ensure electrical installations operate safely, it is essential that the selected wiring and equipment is suitably rated to carry the applicable design current without overheating. This characteristic is known as the continuous current carrying capacity, sometimes abbreviated as CCC. In this topic you will learn about the factors that affect the current carrying capacity of conductors, associated Wiring Rules performance standards, and approved methods for selecting cables to satisfy current carrying capacity requirements.

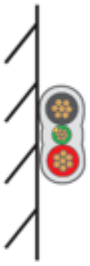
Installation Conditions

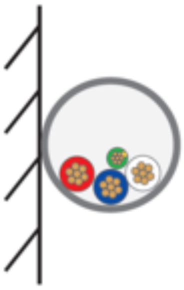
There is a range of acceptable above ground and underground wiring systems specified in AS/NZS 3000:2018. These wiring systems are described in more detail in AS/NZS 3008.1.1:2017, where they are broken down into the following general categories:

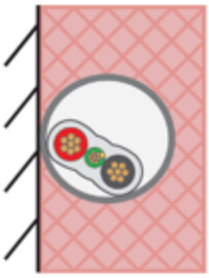
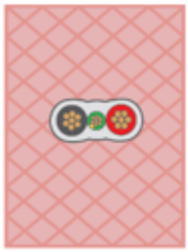
- Unenclosed in Air.
- Enclosed (above ground).
- Buried Direct in the Ground.
- In an Underground Wiring Enclosure.

The following table shows how wiring systems are classified and identified in AS/NZS 3008.1.1:2017 for the purposes of cable selection.

Wiring Systems in Australian Standards		
Installation Method	**Illustration**	**Details**
Spaced from a surface		Includes: • Cables supported on ladders, perforated trays, racks, cleats and hangers. • Cables suspended on a catenary wire.

On a surface		Includes: • Cables clipped to walls, floors ceilings, or other surfaces. • Cables embedded directly (unenclosed) in cement render, concrete or plaster. • Cables laid in a ventilated trench or open trunking. • Cables in a switchboard or other similar enclosure.

In a wiring enclosure		Includes:
		• Cables installed in a wiring enclosure that is:
		  ◦ Installed in air.
		  ◦ Embedded in cement render, concrete, masonry or plaster (above the ground).
		  ◦ Laid in a ventilated trench or open trunking.
		• Cables installed in:
		  ◦ Closed trunking.
		  ◦ Wiring enclosures fixed to a wall.
		  ◦ A trench with a removable cover.

Partially surrounded by thermal insulation		Includes enclosed and unenclosed cables that are: • Partially surrounded by thermal insulating material, for example cables run between a building surface and insulation batts in a roof space or wall cavity. • Installed in an enclosed trench.
Completely surrounded by thermal insulation		Includes enclosed and unenclosed cables that are: • Completely surrounded by thermal insulating material, for example, cables run between two insulation batts in a roof space or wall cavity.
Installed in direct sunlight	 	Includes cables that are installed where they are: • Exposed to direct sunlight, for example, supported on ladder tray on the roof top of a commercial building.
Buried direct in the ground		Includes unenclosed cables laid at a minimum depth of: • 300 mm under continuous concrete. • 500 mm in other areas.

In an underground wiring enclsoure		Includes enclosed cables laid at a minimum depth of: • 300 mm under continuous concrete. • 500 mm in other areas.

Continuous Current Carrying Capacity

The continuous current carrying capacity of a conductor indicates the maximum amount of current the conductor can carry continuously without sustaining damage. The term is usually shortened to ‘current carrying capacity’ and you may see it abbreviated as ‘CCC’.

The main factors that determine the current carrying capacity of a conductor are:

- The cross-sectional area of the conductor.
- The type of insulation.
- The installation conditions.

Whilst the cable size and insulation are fixed at the time of manufacture, the installation conditions vary widely. AS/NZS 3008.1.1:2017 provides a clear process for selecting cables based on the type, size and installation conditions, to ensure that the current carrying capacity is sufficient for the application. This process starts by identifying the type of cable and method of installation in Table 3, and then going to the appropriate current carrying capacity and derating tables as indicated.

Note: AS/NZS 3000:2018 requires that cables installed in ceilings, walls or under floors of domestic installations must be selected based on the assumption that thermal insulation will be installed at some stage in the future (if not already).

Rating and Derating

The current carrying capacities listed in AS/NZS 3008.1.1:2017 are based on a standard set of conditions. It may be the case that the installation conditions are different to these standard conditions, and so a rating or derating factor may need to be applied.

For example: wiring installed above ground is considered to be operating in an ambient temperature of 40ºC.

- If the ambient temperature at the actual installation location regularly reaches 50ºC, then a derating factor needs to be applied, resulting in a reduced current carrying capacity for the circuit wiring.
- If the maximum ambient temperature at the installation location does not exceed 30ºC, then a rating factor may be applied, resulting in an increased current carrying capacity for the circuit wiring.

The following table lists the specific installation conditions that require the application of rating/derating factors.

Rating/Derating Factors		
Installation Conditions	**Effect on Current Carrying Capacity**	**AS/NZS 3008.1.1:2017**
Harmonics in balanced three phase systems	Cables must be de-rated if the third harmonic content of the phase current exceeds specified limits.	Table 2

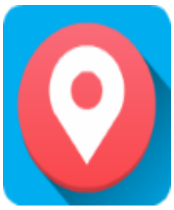
Bunched with cables of other circuits	Cables must be de-rated because reduced air circulation around cables results in a reduced ability to dissipate heat.	Table 22
Multiple circuits grouped together in close proximity	Cables must be de-rated if the specified minimum spacings between circuits are not maintained.	Tables 23 to 26
Ambient temperature	Cables must be de-rated when installed in ambient temperatures exceeding the reference temperature. Cables may be rated when installed in ambient temperatures that are lower than the reference temperature.	Table 27
Depth of laying (underground wiring systems)	The appropriate rating factor must be applied when underground cables are laid at a depth that exceeds 0.5 m.	Table 28
Thermal resistivity of the soil (underground wiring systems)	Cables must be de-rated when installed in soil with a thermal resistivity that exceeds 1.2ºC.m/W. Cables may be rated when installed in soil with a thermal resistivity that is less than 1.2ºC.m/W.	Table 29

Further aspects of the electrical installation that may require consideration of their potential effects on current carrying capacity include:

- Varying loads (i.e. allowances for diversity).
- Electromagnetic interference.

Further information on installation conditions can be found in Section 3 of AS/NZS 3008.1.1:2017.

This learning activity consists of 7 parts designed to develop your understanding of different installation conditions and other factors that affect the current carrying capacity of cables. It is recommended that you have copies of AS/NZS 3000:2018 and AS/NZS 3008.1.1:2017 to assist you with completing this activity.



Topic 3.1 Learning Activity

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FURTHER LEARNING RESOURCES

Textbook References

Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill

Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

AS References

AS/NZS 3000:2018 (Section 3)

AS/NZS 3008.1.1:2017 (Section 3)

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3.2 Australian Standards Cable Selection Requirements

Terms and Definitions

The following table explains some of the terms and definitions associated with circuit protection.

Circuit Protection – Terms and Definitions		
Terms	**Symbol**	**Definitions**
Nominal Current	I_N	The maximum current that the protection device will permit to flow indefinitely.
Maximum Demand	I_B	The maximum current required to supply the circuit equipment.
Current Carrying Capacity	I_Z	The maximum current that the conductors can carry continuously without sustaining damage.

Coordination

Circuit protection devices and circuit wiring must be correctly ‘coordinated’ to ensure equipment is adequately protected. When correctly coordinated, the protection device will permit the circuit design current to flow indefinitely, but will disconnect any overcurrent prior to the cables or equipment sustaining damage.

To achieve this, the circuit arrangement must satisfy the following equations:

- For circuit breakers:

$$I_B \leq I_N \leq I_Z$$

- For HRC fuses:

$$\boxed{I_B \leq I_N \leq 0.9 \times I_Z}$$

Where:

I_B = the maximum demand for the circuit

I_N = the nominal current of the protective device

I_Z = the continuous current carrying capacity of the circuit conductors

To assist your understanding of the topic content, click the link below and undertake the activity.

Check Your Progress

energy space

Cable Selection

To use AS/NZS 3008.1.1:2017 to select cables based on current carrying capacity requirements, the applicable installation condition must first be referenced from Table 3, which is divided into four parts, as shown below:

- Table 3(1) – unenclosed in air
- Table 3(2) – enclosed
- Table 3(3) – buried direct
- Table 3(4) – underground wiring enclosure

Table 3 of AS/NZS 3008.1.1 directs the reader to the relevant current carrying capacity tables and de-rating tables for each installation condition. The correct current carrying capacity table must then be selected based on the cable insulation type and temperature rating*. The acceptable operating temperatures for different types of cables are given in AS/NZS 3008.1.1:2017 Table 1 and AS/NZS 3000:2018 Table 3.2.

*Note that V-90 TPS cables should be selected based on a maximum operating temperature of 75ºC.

This learning activity consists of 5 parts designed to develop your understanding of how to select cables in accordance with AS/NZS 3000:2018 and AS/NZS 3008.1.1:2017 based on current carrying capacity requirements. It is recommended that you have copies of AS/NZS 3000:2018 and AS/NZS 3008.1.1:2017 to assist you with completing this activity.

Topic 3.2 Learning Activity

In this skills practice, you are required to select cables based on the requirements for current carrying capacity. You will be able to undertake this skills practice at your desk, and you will need to have copies of AS/NZS 3000:2018 AS/NZS 3008.1.1:2017 available for reference.

Topic 3.2 Skills Practice

Undertaking this Topic Content Quiz will help you to confirm your understanding of the factors affecting the current carrying capacity of cables and the methods of selecting cables based on current carrying capacity.

Topic 3 Content Quiz

Last modified: Thursday, 28 November 2019, 2:20 PM

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FURTHER LEARNING RESOURCES

Textbook References

Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill

Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

AS References

AS/NZS 3000:2018 (Section 3)

AS/NZS 3008.1.1:2017 (Section 3)

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Topic 6.1 Learning Activity

Click ***Attempt Quiz Now*** to commence the activity.

Grading method: Highest grade

Summary of your previous attempts

Attempt	State	Grade / 9.00	Review
1	Finished Submitted Sunday, 3 April 2022, 7:20 PM	0.00	Review
2	Finished Submitted Sunday, 3 April 2022, 7:27 PM	9.00	Review

Highest grade: 9.00 / 9.00.

RE-ATTEMPT QUIZ

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Topic 7.6 Learning Activity

Click ***Attempt Quiz Now*** to commence the activity.

Grading method: Highest grade

Summary of your previous attempts

Attempt	State	Grade / 5.00	Review
1	Finished Submitted Thursday, 21 April 2022, 7:52 PM	0.00	Review
2	Finished Submitted Thursday, 21 April 2022, 8:32 PM	4.80	Review

Highest grade: 4.80 / 5.00.

RE-ATTEMPT QUIZ

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Started on	Monday, 7 February 2022, 10:36 AM
State	Finished
Completed on	Monday, 7 February 2022, 8:05 PM
Time taken	9 hours 29 mins
Grade	**12.40** out of 13.00 (**95.38**%)

Question 1

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 Clause 1.7.1 specifies that electrical equipment must be selected and arranged to protect against the harmful effects of:

1) electric shock ✓

2) fire ✓

3) high temperatures ✓

4) physical injury ✓

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.7.1 (b)

Question 2

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 Clause 1.6.1 states that an electrical installation must be designed to:

- Provide protection against harmful effects ✓.
- Function as intended ✓.
- Be compatible with the supply ✓.
- Reduce inconvenience in the event of a fault ✓.
- Allow for safe operation, inspection, testing and maintenance ✓.

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.6.1

Question 3

Partially correct

Mark 0.40 out of 1.00

For each example, match the main external influence that must be taken into consideration.

A submersed pump in a sewerage treatment plant	Water	✓
Cables installed in the riser of a ten story building	Thermal insulation	✗
Cables installed in the wall cavities of a house	Solid foreign bodies	✗
Underground and aerial cables installed near large trees	Flora	✓
A socket outlet installed in a workshop area where a large amount of dust is produced	Mechanical stresses	✗

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 3.3.2

The correct answer is: A submersed pump in a sewerage treatment plant – Water, Cables installed in the riser of a ten story building – Mechanical stresses, Cables installed in the wall cavities of a house – Thermal insulation, Underground and aerial cables installed near large trees – Flora, A socket outlet installed in a workshop area where a large amount of dust is produced – Solid foreign bodies

Question 4

Correct

Mark 1.00 out of 1.00

For each example, match the main external influence that must be taken into consideration.

Equipment installed in a chemical factory	Corrosive substances	✓
Cables installed in the animal enclosures of a zoo	Fauna	✓
Cables connecting a portable generator to equipment	Vibration	✓
Cables installed near industrial ovens	External heat sources	✓
TPS cables installed in direct sunlight	Solar radiation	✓

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 3.3.2

The correct answer is: Equipment installed in a chemical factory – Corrosive substances, Cables installed in the animal enclosures of a zoo – Fauna, Cables connecting a portable generator to equipment – Vibration, Cables installed near industrial ovens – External heat sources, TPS cables installed in direct sunlight – Solar radiation

Question 5

Correct

Mark 1.00 out of 1.00

According to AS/NZS 3000:2018, which of the following methods is suitable to remove or prevent the risk of physical injury from electrically actuated mechanical movement?

Select one or more:

- [x] a. Provision of isolation devices ✓
- [ ] b. Provision of a basic insulation
- [x] c. Provision of emergency stopping devices ✓
- [ ] d. Provision of fuses
- [ ] e. Provision of fan-forced cooling apparatus

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.5.13

The correct answer is: Provision of isolation devices, Provision of emergency stopping devices

Question 6

Correct

Mark 1.00 out of 1.00

Parts of a building that require a fire rating are constructed out of [non-flammable] ✓ building materials such as steel or concrete, and are appropriately sealed so that in the event of a fire, it does not [spread] ✓ to other parts of the installation.

Sealing penetrations with fire pillows and fire [retardant mastic] ✓ are common methods of reinstating the [fire rating] ✓

Mark 1.00 out of 1.00 of a structure.

Refer to content page 1.1

Question 7

Correct

Mark 1.00 out of 1.00

Leaving a cable penetration in a fire rated wall unsealed:

Select one:

- ( ) a. all of these
- ( ) b. is permissible where 100 mA RCD protection is used
- ( ) c. will not reduce the fire rating
- (•) d. provides a path for a fire to spread ✓

Refer to content page 1.1 and AS/NZS 3000:2018 Clauses 1.5.12 and 3.9.9

The correct answer is: provides a path for a fire to spread

Question 8

Correct

Mark 1.00 out of 1.00

The design of an electrical installation must ensure compatibility ✓ with the supply voltage, current type and frequency, and take into account any limitations placed on the use of specific equipment ✓ or on the production of harmonics ✓.

Guidance should be sought from the local network provider ✓ regarding the installation of equipment that may have detrimental effects on the supply network.

Network providers may have restrictions ✓ placed on intermittent heavy loads, highly capacitive or inductive ✓ loads, or equipment requiring high starting currents ✓.

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.6.2

Question 9

Correct

Mark 1.00 out of 1.00

The design of the installation cannot exceed the number of phases ✓ and maximum current available from the supply ✓, and must utilise a compatible system of earthing ✓.

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.6.2

Question 10

Correct

Mark 1.00 out of 1.00

Which of the following are acceptable methods of determining maximum demand, as specified in AS/NZS 3000:2018?

Select one or more:

- [ ] a. estimation
- [x] b. limitation ✓
- [x] c. assessment ✓
- [x] d. measurement ✓
- [ ] e. comparison
- [x] f. calculation ✓

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 2.2.2

The correct answer is: calculation, limitation, measurement, assessment

Question **11**

Correct

Mark 1.00 out of 1.00

What is the maximum permissible voltage drop at any given point in an electrical installation?

Maximum Voltage Drop: 5 %

AS/NZS 3000 Clause: 3 . 6 . 2

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 3.6.2

Question **12**

Correct

Mark 1.00 out of 1.00

Electrical installations are divided into circuits to:

- Avoid danger
- Allow for safe operation, inspection, testing and maintenance .
- Reduce inconvenience in the event of a fault

AS/NZS 3000 Clause: 1 . 6 . 5

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.6.5

Question **13**

Correct

Mark 1.00 out of 1.00

When designing the number and type of circuits for an installation, consideration must be given to:

- The relationship relationship
  Mark 1.00 out of 1.00 of the equipment to the rest of the installation
- The operating characteristics and ratings of the loads to be connected
- Limiting the consequences of circuit failure
- Ease of maintenance, alterations and additions with minimal interruption to other parts of the installation.

Refer to content page 1.1

Started on	Tuesday, 8 February 2022, 7:39 PM
State	Finished
Completed on	Tuesday, 8 February 2022, 7:42 PM
Time taken	2 mins 36 secs
Grade	**6.00** out of 6.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

According to AS/NZS 3000:2018, which of the following are acceptable methods of fault protection?

Select one or more:

- [ ] a. Use of class I equipment
- [ ] b. Use of obstacles
- [x] c. Electrical separation ✓
- [x] d. Automatic disconnection of supply (ADS) ✓
- [ ] e. Placing live parts out of reach
- [ ] f. Use of enclosures with a minimum protective rating of IP4X
- [x] g. Use of class II equipment ✓

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 1.5.5

The correct answer is: Automatic disconnection of supply (ADS), Use of class II equipment, Electrical separation

Question 2

Correct

Mark 1.00 out of 1.00

An electrical installation must be designed to protect against overcurrent either by:

- The use of devices that [automatically disconnect the supply] ✓automatically disconnect the supply

  Mark 1.00 out of 1.00 before an overcurrent can [cause injury or damage] ✓cause injury or damage

  Mark 1.00 out of 1.00, or

- Limiting the [possible overcurrent] ✓possible overcurrent

  Mark 1.00 out of 1.00 to a [safe value] ✓.

Refer to content page 1.3 and AS/NZS 3000:2018 Clause 1.5.9

Question 3

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 states that the overcurrent protection of an installation must include protection against:

Select one or more:

- [x] a. Short circuit currents ✓
- [ ] b. Direct contact
- [ ] c. Abnormal voltages
- [ ] d. External influences
- [ ] e. Earth leakage currents
- [x] f. Overload currents ✓

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 2.5.1

The correct answer is: Overload currents, Short circuit currents

Question 4

Correct

Mark 1.00 out of 1.00

Abnormal voltages can appear in an electrical installation as a result of:

Select one or more:

- [x] a. nearby switching of heavy loads ✓
- [x] b. short-circuits occurring between circuits of different voltages ✓
- [x] c. nearby switching of inductive loads ✓
- [x] d. nearby switching of capacitive loads ✓
- [x] e. lightning ✓

Refer to content page 1.2

The correct answer is: lightning, nearby switching of heavy loads, nearby switching of capacitive loads, nearby switching of inductive loads, short-circuits occurring between circuits of different voltages

Question 5

Correct

Mark 1.00 out of 1.00

Faults occurring between circuits operating at different voltages can result in the breakdown of insulation due to voltage ratings being exceeded.

The deemed-to-comply requirements for segregating two wiring systems operating at different voltage levels can be found in AS/NZS 3000:2018 Clause: 3 . 9 . 8 . 3

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 3.9.8.3

Question 6

Correct

Mark 1.00 out of 1.00

According to the AS/NZS 3000:2018 requirements for segregation, identify whether or not it is acceptable to enclose the following wiring systems in the same wiring enclosure.

A 24 V a.c. lighting circuit and a 230 V a.c. socket outlets circuit.	acceptable, provided that the 230 V circuit conductors are double insulated
A 2500 V d.c. circuit and a 230 V a.c. lighting circuit.	not acceptable under any circumstances

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 3.9.8.3

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HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0 / TOPIC 1.3 LEARNING ACTIVITY

Started on	Wednesday, 9 February 2022, 8:30 PM
State	Finished
Completed on	Wednesday, 9 February 2022, 8:34 PM
Time taken	3 mins 55 secs
Grade	**10.00** out of 10.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Factors that will affect the arrangement of final subcircuits in an installation include:

- The relationships between the items of electrical equipment to be connected.
- The loads, operating characteristics and ratings of the equipment to be connected.
- Limiting the consequences of a fault or overload in a section of the installation.
- The ability to perform maintenance, alterations and additions with minimal interruption to other parts of the installation.

Refer to content page 1.3

Question 2

Correct

Mark 1.00 out of 1.00

Identify whether or not the following equipment is suitable to be supplied on the same circuit.

A 10 A, 230 V socket outlet and a 20 A, 400 V socket outlet	Not Suitable
A 6 kW, 230 V stove and a 6 kW controlled load hot water heater.	Not Suitable
A 7.8 kW, 400 V motor and a 6 kW, 400 V air-conditioner.	Not Suitable
A 10 A, 230 V double socket outlet and a 10 A, 230 V single socket-outlet.	Suitable
Two 25 A, 230 V appliances.	Not Suitable
A 12 W, 230 V LED downlight and a smoke detector.	Suitable

Refer to content pages 1.3 and AS/NZS 3000:2018 Appendix C

Question **3**

Correct

Mark 1.00 out of 1.00

Select the typical load requirements for the following circuits in a four bedroom residential home.

The load requirements on socket outlets circuits between 7 am and 9 am would typically be high.

The load requirements on lighting circuits between 11 am and 2 pm would typically be low.

The load requirements on lighting and socket outlets circuits between 6 pm and 9 pm would typically be high.

The load requirements on air-conditioning circuits during mid-summer would typically be high.

The load requirements on heating circuits during mid-winter would typically be high.

The load requirements on cooking appliance circuits between 6 pm and 9 pm would typically be high.

Refer to content pages 1.3

Question **4**

Correct

Mark 1.00 out of 1.00

Select the typical load requirements for the following circuits in an industrial factory unit, operating from 7am till 5pm Monday to Friday.

The load requirements on socket outlets circuits between 7 pm and 9 pm would typically be low.

The load requirements on lighting circuits between 1 pm and 5 pm would typically be high.

The load requirements on lighting and socket outlets circuits between 7 am and 12 pm would typically be high.

The load requirements on motor driven plant circuits between 10 pm and 2 am would typically be low.

Refer to content pages 1.3

Question 5

Correct

Mark 1.00 out of 1.00

Select the typical load requirements for the following circuits in a coffee shop, operating from 6:30 am till 2pm Monday to Sunday.

The load requirements on socket outlets circuits between 7 am and 9 am would typically be high ✓.

The load requirements on lighting circuits between 11 am and 2 pm would typically be high ✓.

The load requirements on lighting and socket outlets circuits between 2 pm and 6 pm would typically be low ✓.

The load requirements on cooking appliance circuits between 10 am and 1 pm would typically be high ✓.

Refer to content pages 1.3

Question 6

Correct

Mark 1.00 out of 1.00

A socket-outlets final subcircuit in a domestic installation supplies 9 x 10 A double socket outlets and is protected by a 20 A Type C 30 mA RCBO.
Determine:

- The circuit loading in accordance with AS/NZS 3000:2018 Table C9
- The maximum demand of the circuit in accordance with AS/NZS 3000:2018 Clause C2.5.1

Circuit Loading: 18 ✓ A

Maximum demand: 20 ✓ A

The method used to determine the maximum demand of the circuit was by limitation ✓.

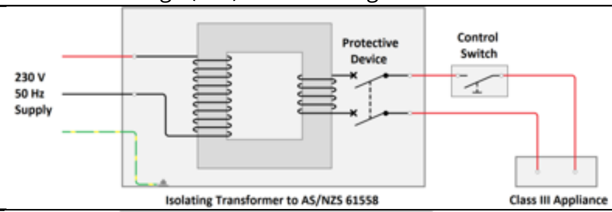
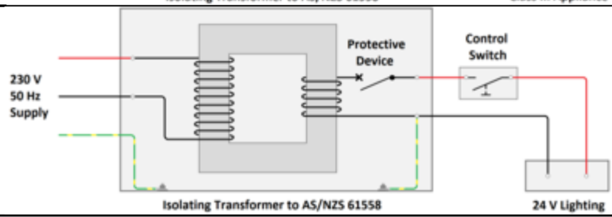
Refer to content page 1.3 and AS/NZS 3000:2018 Clause C2.5.1 (b) and Table C9

Question 7

Correct

Mark 1.00 out of 1.00

Identify the extra-low voltage (ELV) circuit arrangements illustrated below.

	SELV ✓
	PELV ✓

Refer to content page 1.3 and AS/NZS 3000:2018 Clauses 1.4.96 and 1.4.105

Question 8

Correct

Mark 1.00 out of 1.00

According to the Wiring Rules, the upper voltage limits for a SELV circuit are:

- 50 ✓ V a.c.
- 120 ✓ V d.c.

Refer to content page 1.3 and AS/NZS 3000:2018 Clause 1.5.7 (a)

Question 9

Correct

Mark 1.00 out of 1.00

Select whether the following statements are true or false in relation to isolated supplies.

Isolated supplies may be supplied at voltages up to 500 V.	True ✓
Isolated supplies must be segregated from each other and from all other circuits.	True ✓

Refer to content page 1.3 and AS/NZS 3000:2018 Clause 7.4.3 (a) and (b)

Question 10

Correct

Mark 1.00 out of 1.00

According to the Wiring Rules, which of the following are acceptable sources of supply for a separated circuit?

Select one or more:

- [ ] a. Autotransformer
- [x] b. Isolated inverter ✓
- [x] c. Isolating transformer ✓
- [x] d. Generator output ✓
- [ ] e. Distribution transformer

Refer to content page 1.3 and AS/NZS 3000:2018 Clause 7.4.2

The correct answer is: Isolating transformer, Generator output, Isolated inverter

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/ TOPIC 1 DESIGN AND SAFETY REQUIREMENTS TO MEET INSTALLATION PERFORMANCE

/ TOPIC 1 CONTENT QUIZ

Started on	Friday, 24 June 2022, 12:03 PM
State	Finished
Completed on	Friday, 24 June 2022, 1:57 PM
Time taken	1 hour 54 mins
Grade	**37.00** out of 40.00 (**92.50**%)

Question 1

Incorrect

Mark 0.00 out of 1.00

The demand on heating circuits is usually highest during:

Select one:

a. winter

b. summer ✗

c. autumn

d. spring

Refer to content page 2.1

The correct answer is: winter

Question 2

Correct

Mark 1.00 out of 1.00

Which of the following external influences would reduce the current carrying capacity of a cable?

Select one:

- a. A large tree
- b. An ambient temperature of 50ºC ✓
- c. The presence of rodents
- d. The presence of water

Refer to content page 3.1, AS/NZS 3000:2018 Clause 3.3 and AS/NZS 3008.1.1:2017 Clause 3.5.3

The correct answer is: An ambient temperature of 50ºC

Question 3

Correct

Mark 1.00 out of 1.00

The acceptable methods of determining maximum demand in an electrical installation are calculation, assessment, measurement and:

Select one:

- a. moderation
- b. application
- c. protection
- d. limitation ✓

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 2.2.2

The correct answer is: limitation

Question 4

Correct

Mark 1.00 out of 1.00

The design of an electrical installation must include control and isolation devices to:

Select one:

- a. prevent or remove hazards and allow maintenance of electrical equipment ✓
- b. protect against direct contact
- c. allow for safe operation of electrical equipment
- d. protect against abnormal voltages

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.5.2

The correct answer is: prevent or remove hazards and allow maintenance of electrical equipment

Question 5

Correct

Mark 1.00 out of 1.00

The maximum permissible voltage drop at any point in a 230 V electrical installation is:

Select one:

- a. 20 volts
- b. 11.5 volts ✓
- c. 16 volts
- d. 6.9 volts

230 x 0.05 = 11.5 V
Refer to content page 1.2 and AS/NZS 3000:2018 Clause 3.6.2

The correct answer is: 11.5 volts

Question 6

Correct

Mark 1.00 out of 1.00

For PELV circuits, protective equipment must:

Select one:

- a. not operate in unearthed conductors
- b. operate in all earthed conductors
- c. operate in one active conductor only
- d. operate in all unearthed conductors ✓

Refer to content page 2.2 and AS/NZS 3000:2018 Clause 7.5.9.1

The correct answer is: operate in all unearthed conductors

Question 7

Correct

Mark 1.00 out of 1.00

The effect of solar radiation should be taken into consideration when designing a circuit to be installed:

Select one:

- a. on a cable tray system
- b. in open trunking
- c. underground
- d. in direct sunlight ✓

Refer to content page 1.1

The correct answer is: in direct sunlight

Question 8

Incorrect

Mark 0.00 out of 1.00

Which of the following is an example of fauna affecting a wiring system?

Select one:

- a. Rats chewing through cable insulation
- b. Biological waste causing corrosion of a cable tray
- c. Buildup of dust on equipment terminals
- d. Tree roots damaging underground cables ✗

Refer to content page 1.1

The correct answer is: Rats chewing through cable insulation

Question 9

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 requires that electrical installation equipment shall be selected and installed in a way that does not cause danger from:

Select one:

- a. high temperatures
- b. electric shock
- c. physical injury
- d. All of these ✓

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.7.1 (b)

The correct answer is: All of these

Question 10

Correct

Mark 1.00 out of 1.00

Why must the characteristics of the electrical supply be considered during the design of an electrical installation?

Select one:

- (selected) a. To ensure compatibility with the installation ✓
- b. So that the supply characteristics can be changed where required
- c. To ensure incompatibility with the installation
- d. So that the most cost effective energy tariffs can be selected

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 1.6.1 (c)

The correct answer is: To ensure compatibility with the installation

Question 11

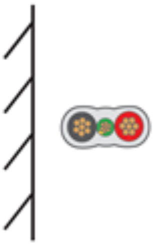
Correct

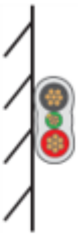
Mark 1.00 out of 1.00

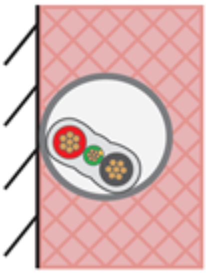
Which of the following diagrams represents a TPS cable clipped to a timber floor joist?

Select one:

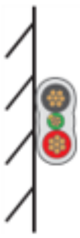
a. 

b. 

c. 

d. 

Refer to content page 3.1, AS/NZS 3000:2018 Table 3.1 and AS/NZS 3008.1.1:2017 Tables 3(1), 3(2) and 3(3)

The correct answer is: 

Question 12

Correct

Mark 1.00 out of 1.00

Which of the following features of an electrical installation must be compatible with the supply?

Select one:

- a. Voltage and frequency
- b. All of these ✓
- c. Maximum demand and power factor
- d. Type of current and number of phases

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 1.6.2

The correct answer is: All of these

Question 13

Correct

Mark 1.00 out of 1.00

Protection against abnormal voltages in an electrical installation can be achieved by:

Select one:

- a. the use of RCDs
- b. the use of overvoltage devices and suitable circuit segregation ✓
- c. electrical separation
- d. supply at PELV

Refer to content page 1.3 and AS/NZS 3000:2018 Clause 1.5.11.2

The correct answer is: the use of overvoltage devices and suitable circuit segregation

Question 14

Correct

Mark 1.00 out of 1.00

An example of a PELV circuit is:

Select one:

- a. a ceiling fan
- b. a solar cell
- c. a 230 V lighting circuit
- d. a laptop power supply ✓

Refer to content page 2.2

The correct answer is: a laptop power supply

Question 15

Correct

Mark 1.00 out of 1.00

Electrical installations must be designed so that:

Select one:

- a. they function as intended ✓
- b. live parts are placed out of reach
- c. the entire installation is automatically disconnected in the event of overcurrent
- d. None of these

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.6.1

The correct answer is: they function as intended

Question 16

Correct

Mark 1.00 out of 1.00

Installing several circuits bunched together will:

Select one:

- a. have no effect on the current carrying capacity of the cables
- b. facilitate the dissipation of heat
- c. increase the current carrying capacity of each cable
- d. reduce the current carrying capacity of each cable ✓

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Clause 3.5.2

The correct answer is: reduce the current carrying capacity of each cable

Question 17

Correct

Mark 1.00 out of 1.00

An example of equipment that would be suitable for supply from the same circuit are:

Select one:

- a. two 20 A, 230 V socket outlets
- b. two 32 A, 400 V socket outlets
- c. two 10 A, 230 V socket outlets ✓
- d. a mercury vapour HID lamp and a ceiling fan

Refer to content page 2.1

The correct answer is: two 10 A, 230 V socket outlets

Question **18**

Correct

Mark 1.00 out of 1.00

Which of the following is an acceptable method of overcurrent protection?

Select one:

- a. Use of obstacles
- b. Automatic disconnection of supply ✓
- c. Use of basic insulation
- d. Use of Class II equipment

Refer to content page 1.3 and AS/NZS 3000:2018 Clause 1.5.9

The correct answer is: Automatic disconnection of supply

Question **19**

Correct

Mark 1.00 out of 1.00

Which of the following is the most suitable wiring system for the supply of a socket outlet mounted on a single brick rendered wall in a domestic residence?

Select one:

- a. TPS tied to a cable tray
- b. TPS buried directly in the cement render ✓
- c. TPI enclosed in a steel conduit
- d. Surface mounted MIMS cable

Refer to content page 3.1

The correct answer is: TPS buried directly in the cement render

Question 20

Correct

Mark 1.00 out of 1.00

A typical application for a SELV circuit is:

Select one:

- a. a circuit supplying underwater pool lights ✓
- b. the internal circuit of a fluorescent luminaire
- c. a DOL motor starter
- d. a general purpose socket outlets circuit

Refer to content page 2.2

The correct answer is: a circuit supplying underwater pool lights

Question 21

Correct

Mark 1.00 out of 1.00

Which of the following is a suitable method of reinstating the fire rating where a wiring system penetrates a fire rated wall?

Select one:

- a. Seal the penetration with silicon
- b. Seal the penetration with sawdust and an epoxy resin
- c. All of these are acceptable methods
- d. Seal the penetration with fire pillows and fire retardant mastic ✓

Refer to content page 1.2

The correct answer is: Seal the penetration with fire pillows and fire retardant mastic

Question **22**

Correct

Mark 1.00 out of 1.00

TPS cables installed underground at a depth of 600 mm, in a HD PVC conduit are classed as a:

Select one:

- a. Category A wiring system ✓
- b. Category D wiring system
- c. Category B wiring system
- d. Category C wiring system

Refer to AS/NZS 3000:2018 Clause 3.11.3.1 and Tables 3.5 and 3.6

The correct answer is: Category A wiring system

Question **23**

Correct

Mark 1.00 out of 1.00

Protection methods for cables installed near building surfaces are given in AS/NZS 3000:2018 Clause:

Select one:

- a. 3.9.4.4 ✓
- b. 3.12.1
- c. 3.4.2.1
- d. 3.10.2

Refer to content page 3.2 and AS/NZS 3000:2018 Clause 3.9.4.4

The correct answer is: 3.9.4.4

Question 24

Correct

Mark 1.00 out of 1.00

Placing live parts in an IP56 enclosure is a suitable method of:

Select one:

- a. fault protection
- b. additional protection
- c. protection against thermal effects
- d. basic protection ✓

Refer to content page 1.3 and AS/NZS 3000:2018 Clauses 1.5.4.2 (b) and 1.5.4.4 (a)

The correct answer is: basic protection

Question 25

Correct

Mark 1.00 out of 1.00

Electrical installations must be designed so that they:

Select one:

- a. can operate on both alternating and direct current
- b. minimise inconvenience by maintaining supply to faulty equipment
- c. All of these
- d. can be safely operated and maintained ✓

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 1.6.1

The correct answer is: can be safely operated and maintained

Question **26**

Correct

Mark 1.00 out of 1.00

Which of the following is a suitable type of cable for an ESR system?

Select one:

- a. All of these
- b. Four-core twisted XLPE cable
- c. TPS cable
- d. MIMS cable ✓

Refer to content page 3.2 and AS/NZS 3000:2018 Clause 3.16

The correct answer is: MIMS cable

Question **27**

Correct

Mark 1.00 out of 1.00

The maximum aerial span for a 16 mm2 two-core twisted XLPE cable is:

Select one:

- a. 60 m ✓
- b. 40 m
- c. 30 m
- d. 50 m

Refer to content page 3.2 and AS/NZS 3000:2018 Table 3.9

The correct answer is: 60 m

Question **28**

Correct

Mark 1.00 out of 1.00

Which method of determining maximum demand can only be used in a functioning electrical installation?

Select one:

- a. Assessment
- b. Limitation
- c. Calculation
- d. Measurement ✓

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 2.2.2

The correct answer is: Measurement

Question **29**

Correct

Mark 1.00 out of 1.00

The AS/NZS 3000:2018 requirements for enclosure of cables is found in Clause:

Select one:

- a. 3.7
- b. 3.14
- c. 3.10 ✓
- d. 3.5

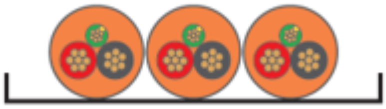
Refer to content page 3.2 and AS/NZS 3000:2018 Clause 3.10

The correct answer is: 3.10

Question **30**

Correct

Mark 1.00 out of 1.00



What is the de-rating factor for each of the cables pictured above, installed touching on a single perforated tray?

Select one:

- a. 0.87
- b. 0.82 ✓
- c. 0.97
- d. 1.04

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 3(1) and 24 (item 7, column 7)

The correct answer is: 0.82

Question **31**

Incorrect

Mark 0.00 out of 1.00

Which of the following is the most suitable wiring system for a circuit supplying fluorescent lighting in a multi-story car park?

Select one:

- a. MIMS tied to a cable tray ✗
- b. TPI enclosed in an embedded conduit
- c. TPI tied to a cable tray
- d. TPS clipped direct to a surface

Refer to content page 3.1

The correct answer is: TPI enclosed in an embedded conduit

Question 32

Correct

Mark 1.00 out of 1.00

Leaving a cable penetration in a fire rated wall unsealed:

Select one:

- (●) a. is not permitted as it provides a path for the spread of fire ✓
- ( ) b. is permissible, provided that the penetration does not exceed 25 mm in diameter
- ( ) c. will not reduce the fire rating of the wall
- ( ) d. is permissible where 30 mA RCD protection is provided

Refer to content page 1.2 and AS/NZS 3000:2018 Clauses 1.5.12 and 3.9.9.3

The correct answer is: is not permitted as it provides a path for the spread of fire

Question 33

Correct

Mark 1.00 out of 1.00

Which of the following devices is an acceptable provision for removing unexpected danger associated with moving mechanical parts of electrically actuated equipment?

Select one:

- ( ) a. Thermal overload
- ( ) b. Type D MCB
- (●) c. Emergency stopping devices ✓
- ( ) d. 30 mA RCD

Refer to content page 1.1 and AS/NZS 3000:2018 Clauses 1.5.13 and 2.3.5.1

The correct answer is: Emergency stopping devices

Question 34

Correct

Mark 1.00 out of 1.00

For the purposes of cable selection based on current carrying capacity, the ambient temperature for cables in air in Australia is:

Select one:

- a. 25ºC
- b. 30ºC
- c. 35ºC
- d. 40ºC ✓

Refer to content page 3.1 and AS/NZS 3000:2018 Clause 3.3.2.1 (a) (i)

The correct answer is: 40ºC

Question 35

Correct

Mark 1.00 out of 1.00

Between the hours of 7 am and 9 am in a residential home would typically be considered as:

Select one:

- a. shoulder
- b. None of these
- c. peak ✓
- d. off-peak

Refer to content page 2.1

The correct answer is: peak

Question 36

Correct

Mark 1.00 out of 1.00

According to AS/NZS 3000:2018, one of the reasons an electrical installation must be divided into circuits is to:

Select one:

- a. reduce the maximum demand
- b. provide protection against thermal effects in normal service
- c. provide both basic and fault protection
- d. allow for safe operation, inspection, testing and maintenance ✓

Refer to content page 1.2 and AS/NZS 3000:2018 Clause 1.6.5

The correct answer is: allow for safe operation, inspection, testing and maintenance

Question 37

Correct

Mark 1.00 out of 1.00

Which of the following is an important factor to consider when determining whether equipment is suitable to be supplied from the same circuit?

Select one:

- a. Diversity
- b. All of these ✓
- c. Operating voltages of the equipment
- d. Maximum demand of the equipment

Refer to content page 2.1

The correct answer is: All of these

Question **38**

Correct

Mark 1.00 out of 1.00

Which of the following external influences poses the risk of damage to a wiring system?

Select one:

- a. All of these ✓
- b. The presence of flora
- c. Vibration
- d. Impact

Refer to content page 3.1 and AS/NZS 3000:2018 Clause 3.3.2

The correct answer is: All of these

Question **39**

Correct

Mark 1.00 out of 1.00

Which of the following external influences will directly affect a cable installed between floors, in the riser of a ten storey building?

Select one:

- a. Mechanical stresses ✓
- b. Solar radiation
- c. Mechanical damage
- d. Water

Refer to content page 1.1 and AS/NZS 3000:2018 Clause 3.3.2.8

The correct answer is: Mechanical stresses

Question **40**

Correct

Mark 1.00 out of 1.00

Which of the following is an important factor to consider when determining the number and type of circuits for an electrical installation?

Select one:

- a. All of these
- b. Whether the circuits can be placed out of reach
- c. The intended use of the equipment to be connected ✓
- d. The cost of circuit protective devices

Refer to content page 2.1

The correct answer is: The intended use of the equipment to be connected

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HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0 / TOPIC 2.1 LEARNING ACTIVITY

Started on	Wednesday, 23 February 2022, 6:30 AM
State	Finished
Completed on	Wednesday, 23 February 2022, 6:38 AM
Time taken	8 mins 31 secs
Grade	**2.50** out of 3.00 (**83.33**%)

Question 1

Correct

Mark 1.00 out of 1.00

What are the four acceptable methods of determining maximum demand, as listed in AS/NZS 3000:2018?

Select one or more:

- [x] a. Assessment ✓
- [x] b. Calculation ✓
- [ ] c. Application
- [x] d. Limitation ✓
- [ ] e. Estimation
- [x] f. Measurement ✓
- [ ] g. Specification

Refer to content page 2.1 and AS/NZS 3000:2018 Clause 2.2.2

The correct answer is: Calculation, Limitation, Measurement, Assessment

Question 2

Correct

Mark 1.00 out of 1.00

Match the methods of determining maximum demand in consumer's mains and submains.

Where the maximum demand is determined using Tables C1 or C2 from AS/NZS 3000:2018 Appendix C.	calculation ✓
Used to determine maximum demand in installations with unusual or widely fluctuating loads or where the number and types of loads in unknown.	assessment ✓
Where the maximum demand is determined by adding the current ratings of circuit protective devices protecting associated downstream final subcircuits and/or submains.	limitation ✓
Where the maximum demand is determined in an existing installation by examining the current consumed over a 30 minute period of high demand.	measurement ✓

Refer to content page 2.1 and AS/NZS 3000:2018 Clause 2.2.2

The correct answer is: Where the maximum demand is determined using Tables C1 or C2 from AS/NZS 3000:2018 Appendix C. – calculation, Used to determine maximum demand in installations with unusual or widely fluctuating loads or where the number and types of loads in unknown. – assessment, Where the maximum demand is determined by adding the current ratings of circuit protective devices protecting associated downstream final subcircuits and/or submains. – limitation, Where the maximum demand is determined in an existing installation by examining the current consumed over a 30 minute period of high demand. – measurement

Question 3

Partially correct

Mark 0.50 out of 1.00

The method of determining maximum demand that can only be used for an existing electrical installation is measurement ✓.

During the design phase of an electrical installation, the most common method of determining the maximum demand on the consumer's mains is by limitation ✗.

Refer to content page 2.1 and AS/NZS 3000:2018 Clause 2.2.2

Started on	Monday, 7 March 2022, 7:27 PM
State	Finished
Completed on	Monday, 7 March 2022, 7:29 PM
Time taken	2 mins 38 secs
Grade	**4.00** out of 4.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Factors to consider when determining the maximum demand of consumer mains include:

- The type of installation.
- The number of connected loads.
- The load grouping of connected loads.
- Allowance for diversity.
- The suitable and practical distribution of loads across phases.

Refer to content page 2.2 and AS/NZS 3000:2018 Appendix C

Question 2

Correct

Mark 1.00 out of 1.00

The table that should be used to calculate the maximum demand of consumer mains for a three bedroom house is AS/NZS 3000:2018 Table C 1

The table that should be used to calculate the maximum demand of consumer's mains for a block of units is AS/NZS 3000:2018 Table C 1.

The table that should be used to calculate the maximum demand of consumer's mains for a youth hostel is AS/NZS 3000:2018 Table C 2.

The table that should be used to calculate the maximum demand of consumer's mains for a factory unit is AS/NZS 3000:2018 Table C 2.

Refer to content page 2.2 and AS/NZS 3000:2018 Tables C1 and C2

Question 3

Correct

Mark 1.00 out of 1.00

Factors to consider when determining the maximum demand of submains include:

- The [type] ✓ of installation - single domestic / multiple domestic / non-domestic.
- The number of [connected loads] ✓.
- The [load grouping] ✓ of connected loads.
- Allowance for load [diversity] ✓.
- The suitable and practical [distribution] ✓ of loads between [phases] ✓.

Refer to content page 2.2 and AS/NZS 3000:2018 Appendix C

Question 4

Correct

Mark 1.00 out of 1.00

The maximum demand of a submain supplying part of a hospital should be calculated using AS/NZS 3000:2018 Table [C2] ✓ column [2] ✓.

The maximum demand of a submain supplying unit 6 in a block of 12 units should be calculated using AS/NZS 3000:2018 Table [C1] ✓ column [2] ✓.

The maximum demand of a submain in an office building should be calculated using AS/NZS 3000:2018 Table [C2] ✓ column [3] ✓.

The maximum demand of a submain supplying a granny flat in the backyard of a 4 bedroom house should be calculated using AS/NZS 3000:2018 Table [C1] ✓ column [2] ✓.

Refer to content page 2.2 and AS/NZS 3000:2018 Tables C1 and C2

Started on	Friday, 24 June 2022, 4:02 PM
State	Finished
Completed on	Saturday, 25 June 2022, 8:12 PM
Time taken	1 day 4 hours
Grade	**7.00** out of 15.00 (**46.67**%)

Question 1

Incorrect

Mark 0.00 out of 1.00

According to AS/NZS 3000:2018 Clause C2.5, which method should be used to determine the maximum demand of a 10 A socket outlets final subcircuit?

Select one:

- a. Calculation ❌
- b. Measurement
- c. Limitation
- d. Assessment

Refer to content page 2.1 and AS/NZS 3000:2018 Clause C2.5.1

The correct answer is: Limitation

Question 2

Incorrect

Mark 0.00 out of 1.00

The method of determining maximum demand used in installations with unusual or widely fluctuating loads or where the number and types of loads is unknown would be by:

Select one:

- a. limitation
- b. measurement
- c. calculation ✗
- d. assessment

Refer to content page 2.1 and AS/NZS 3000:2018 Clause 2.2.2

The correct answer is: assessment

Question 3

Correct

Mark 1.00 out of 1.00

Which of the following is an important factor to consider when determining maximum demand on consumer mains?

Select one:

- a. All of these ✓
- b. Balancing loads between phases
- c. Operating characteristics of loads
- d. Allowance for diversity

Refer to content page 2.2 and AS/NZS 3000:2018 Clause C2.1

The correct answer is: All of these

Question 4

Correct

Mark 1.00 out of 1.00

The method of determining maximum demand on mains and submains that utilises tables C1 or C2 from AS/NZS 3000:2018 is:

Select one:

- a. limitation
- b. assessment
- c. calculation ✓
- d. measurement

Refer to content page 2.1 and AS/NZS 3000:2018 Clauses 2.2.2 and C2.2

The correct answer is: calculation

Question 5

Incorrect

Mark 0.00 out of 1.00

Electrical equipment should be supplied from a separate circuit when the equipment has load requirements that are equal to or greater than:

Select one:

- a. 20 A
- b. 25 A
- c. 32 A
- d. 16 A ✗

Refer to content page 2.1 and AS/NZS 3000:2018 Clause C5.1

The correct answer is: 20 A

Question 6

Incorrect

Mark 0.00 out of 1.00

According to AS/NZS 3000:2018 Appendix C, what is the maximum demand of a circuit supplying a 230V, 20 A socket outlet?

Select one:

- a. 25 A
- b. 15 A ✗
- c. 20 A
- d. 40 A

Refer to content page 2.1 and AS/NZS 3000:2018 Clause C2.5.1

The correct answer is: 20 A

Question 7

Incorrect

Mark 0.00 out of 1.00

According to AS/NZS 3000:2018 Appendix C, what is the maximum demand of a domestic 230 V, 11 kW stove?

Select one:

- a. 40 A
- b. 48 A
- c. 32 A
- d. 25 A ✗

Refer to content page 2.1 and AS/NZS 3000:2018 Table C5

The correct answer is: 32 A

Question 8

Incorrect

Mark 0.00 out of 1.00

The maximum demand on final subcircuits in a domestic electrical installation:

Select one:

- a. should be calculated using AS/NZS 3000:2018 Table C1 ✗
- b. should be determined by measurement
- c. should be determined by either assessment or limitation
- d. need not be determined

Refer to content page 2.1 and AS/NZS 3000:2018 Clause C2.5.1

The correct answer is: should be determined by either assessment or limitation

Question 9

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3000:2018 Table should be referenced to calculate the maximum demand on the consumer mains of a motel?

Select one:

- a. Table C2 column 3
- b. Table C1 column 3
- c. Table C1 column 2
- d. Table C2 column 2 ✓

Refer to content page 2.2 and AS/NZS 3000:2018 Table C2

The correct answer is: Table C2 column 2

Question **10**

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3000:2018 Table should be referenced to calculate the maximum demand on the consumer mains of a coffee shop?

Select one:

- a. Table C2 column 2
- b. Table C1 column 2
- c. Table C2 column 3 ✓
- d. Table C1 column 3

Refer to content page 2.2 and AS/NZS 3000:2018 Table C2

The correct answer is: Table C2 column 3

Question **11**

Correct

Mark 1.00 out of 1.00

Equipment that is to be connected on the same circuit should have:

Select one:

- a. various uses and operating characteristics
- b. varied operating voltages
- c. a maximum demand greater than the nominal current rating of the protective device
- d. a similar demand and intended use ✓

Refer to content page 2.1 and AS/NZS 3000:2018 Clause C5.1

The correct answer is: a similar demand and intended use

Question 12

Correct

Mark 1.00 out of 1.00

Which of the following is an important factor to consider when determining maximum demand on submains in a factory unit?

Select one:

- a. Any external influences
- b. The intended use of the equipment to be connected ✓
- c. Number of staff
- d. The factory operating hours

Refer to content page 2.3 and AS/NZS 3000:2018 Clause C2.1

The correct answer is: The intended use of the equipment to be connected

Question 13

Incorrect

Mark 0.00 out of 1.00

The method of determining maximum demand by adding the current ratings of circuit protection devices protecting associated downstream final subcircuits and/or submains is:

Select one:

- a. limitation
- b. measurement ✗
- c. calculation
- d. assessment

Refer to content page 2.1 and AS/NZS 3000:2018 Clause 2.2.2

The correct answer is: limitation

Question **14**

Incorrect

Mark 0.00 out of 1.00

Which AS/NZS 3000:2018 Table should be referenced to calculate the maximum demand on the consumer mains of a block of 12 units?

Select one:

- a. Table C1 column 4
- b. Table C2 column 2 ✗
- c. Table C1 column 2
- d. Table C1 column 3

Refer to content page 2.2 and AS/NZS 3000:2018 Table C1

The correct answer is: Table C1 column 3

Question **15**

Correct

Mark 1.00 out of 1.00

Which of the following is an important factor to consider when determining maximum demand on consumer mains for an apartment block?

Select one:

- a. the fault loop impedance
- b. the size of the circuit conductors
- c. the type of wiring systems used
- d. the number of loads/points ✓

Refer to content page 2.2 and AS/NZS 3000:2018 Clause C2.1

The correct answer is: the number of loads/points

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HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0 / TOPIC 3.1 LEARNING ACTIVITY

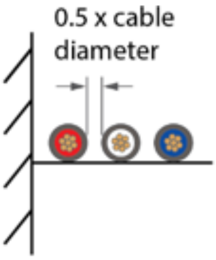
Started on	Tuesday, 15 March 2022, 8:52 PM
State	Finished
Completed on	Tuesday, 15 March 2022, 9:23 PM
Time taken	31 mins 34 secs
Grade	**7.00** out of 7.00 (**100.00**%)

Question 1

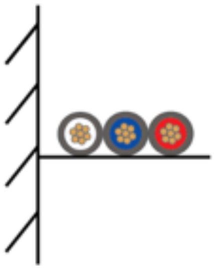
Correct

Mark 1.00 out of 1.00

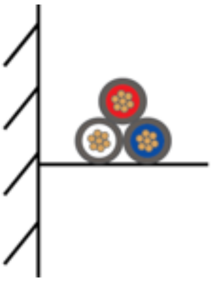
Match the single core cable configurations to the diagrams.



single core cables laid flat and spaced ✓

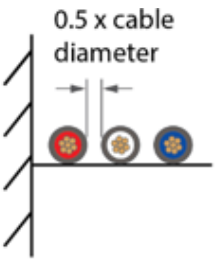


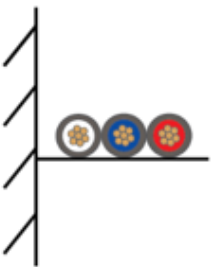
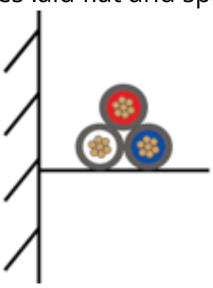
single core cables laid flat touching ✓



single core cables laid in trefoil ✓

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Table 3(1)

The correct answer is: 

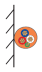
– single core cables laid flat and spaced,  – single core cables laid flat touching,  – single core cables laid in trefoil

Question 2

Correct

Mark 1.00 out of 1.00

Use AS/NZS 3008.1.1:2017 to correctly identify the installation conditions represented in each diagram.

 TPS cable fixed to a wall with cable clips ✓

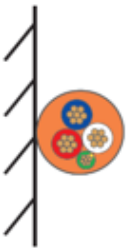
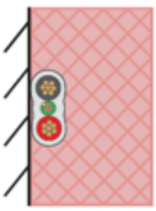
 TPS cable installed on cleats ✓

 SDI cables installed in three separate underground conduits ✓

 TPS cable installed in a wall cavity between the wall surface and thermal insulation ✓

 TPS cables laid on perforated cable tray ✓

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 3(1), 3(2) and 3(4)

The correct answer is:  – TPS cable fixed to a wall with cable clips,  – TPS cable installed on cleats,  – SDI cables installed in three separate underground conduits,  – TPS cable installed in a wall cavity between the wall surface and thermal insulation,  – TPS cables laid on perforated cable tray

Question 3

Correct

Mark 1.00 out of 1.00

Use AS/NZS 3008.1.1:2017 to correctly match the installation conditions to each diagram.

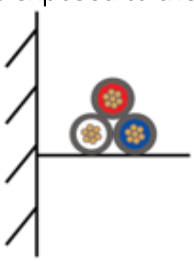
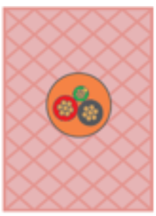
 SDI cables installed outside exposed to the sun ✓

 SDI cables installed in an underground conduit ✓

 SDI cable tied to a cable ladder in trefoil ✓

 TPS cable installed in a wall cavity where it is completely surrounded by thermal insulation ✓

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 3(1), 3(2), 3(4), 4 to 15, 20 and 21

The correct answer is:  – SDI cables installed outside exposed to the sun,  – SDI cables installed in an underground conduit,  – SDI cable tied to a cable ladder in trefoil,  – TPS cable installed in a wall cavity where it is completely surrounded by thermal insulation

Question 4

Correct

Mark 1.00 out of 1.00

The current carrying capacity of a cable will vary depending on whether it is installed [above] ✓ or below the [ground] ✓, and whether it is enclosed or [unenclosed] ✓.

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 4 to 21

Question 5

Correct

Mark 1.00 out of 1.00

External influences that can reduce the current carrying capacity of cables include:

- [grouping] ✓ several cables together
- high ambient [temperatures] ✓
- installation in [thermal insulation] ✓
- [exposure] ✓ to direct sunlight
- the presence of [harmonics] ✓

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Clause 3.5 and Tables 4 to 21

Question 6

Correct

Mark 1.00 out of 1.00

The current carrying capacity of a cable depends on:

Select one:

- a. its ability to dissipate heat
- b. its ability to supply a load
- c. the breaking capacity of the upstream protective device
- d. the nominal current rating of the upstream protective device

Refer to content page 3.1

The correct answer is: its ability to dissipate heat

Question 7

Correct

Mark 1.00 out of 1.00

Identify the AS/NZS 3008.1.1:2017 derating table applicable to each scenario.

De-rating where multiple circuits are installed supported on the same catenary wire.	Table 22
De-rating of three socket outlets circuits wired in orange circular and installed on the same cable tray.	Table 24
De-rating where single core cables supplying different circuits are installed together buried direct in the ground.	Table 25(1)
De-rating where several multicore cables are installed together in a conduit.	Table 22

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 22, 24 and 25(1)

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Started on	Monday, 21 March 2022, 6:17 AM
State	Finished
Completed on	Monday, 21 March 2022, 6:19 AM
Time taken	2 mins 27 secs
Grade	**4.63** out of 5.00 (**92.50**%)

Question 1

Correct

Mark 1.00 out of 1.00

In order to comply with AS/NZS 3000:2018 requirements for coordination between cables and protective devices:

- The current carrying capacity of a cable must be [greater than or equal to] ✓ the nominal current of the protective device.
- The current carrying capacity of a cable must be [greater than or equal to] ✓ the maximum demand of the circuit.
- The maximum demand of the circuit must be [less than or equal to] ✓ the nominal current of the protective device.

Refer to content page 3.2 and AS/NZS 3000:2018 Clause 2.5.3.1

Question 2

Correct

Mark 1.00 out of 1.00

Identify whether the following protection arrangements comply with AS/NZS 3000:2018 requirements for coordination of conductors and protection devices.

Is it permissible to use a 20 A fuse to protect a cable having a current carrying capacity of 20 A?	no ✓
Is it permissible to use a 20 A circuit breaker to protect a cable having a current carrying capacity of 20 A?	yes ✓
Is it permissible to use a 35 A fuse to protect a cable having a current carrying capacity of 40 A?	yes ✓
Is it permissible to use a 32 A circuit breaker to protect a cable having a current carrying capacity of 28 A?	no ✓

Refer to content page 3.2 and AS/NZS 3000:2018 Clause 2.5.3.1

Question 3

Partially correct

Mark 0.63 out of 1.00

Identify the AS/NZS 3008.1.1:2017 table applicable to each installation condition.

Two single core cables in a conduit, mounted on a brick wall	Table 3(2) ✓
Multi-core cables installed in an enclosed trench with a removable cover	Table 3(2) ✓
A TPS cable partially surrounded by thermal insulation	Table 3(3) ✗
Three single core cables laid in trefoil, installed 0.3 m below concrete	Table 3(1) ✗
A TPS cable buried in a rendered wall	Table 3(2) ✗
A two core cable installed underground in a conduit	Table 3(4) ✓
Three single core cables tied to a cable tray	Table 3(1) ✓
Two single core cables in conduit, installed 300 mm below a concrete footpath	Table 3(4) ✓

Refer to content page 3.2 and AS/NZS 3008.1.1:2017 Tables 3(1), 3(2), 3(3) and 3(4)

The correct answer is: Two single core cables in a conduit, mounted on a brick wall – Table 3(2), Multi-core cables installed in an enclosed trench with a removable cover – Table 3(2), A TPS cable partially surrounded by thermal insulation – Table 3(2), Three single core cables laid in trefoil, installed 0.3 m below concrete – Table 3(3), A TPS cable buried in a rendered wall – Table 3(1), A two core cable installed underground in a conduit – Table 3(4), Three single core cables tied to a cable tray – Table 3(1), Two single core cables in conduit, installed 300 mm below a concrete footpath – Table 3(4)

Question 4

Correct

Mark 1.00 out of 1.00

According to AS/NZS 3008.1.1:2017, what is the normal operating temperature of V-90 cables?

Answer: 75 ✓ ºC

Refer to content page 3.2 and AS/NZS 3008.1.1:2017 Table 1

Question 5

Correct

Mark 1.00 out of 1.00

V-90 cables should be selected based on an operating temperature of:

Select one:

- a. 40ºC
- b. 60ºC
- c. 75ºC ✓
- d. 90ºC

Refer to content page 3.2 and AS/NZS 3008.1.1:2017 Table 1

The correct answer is: 75ºC

Josue De de Oliveira Moura Log out

HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0

/ TOPIC 3 CABLE SELECTION BASED ON CURRENT CARRYING CAPACITY REQUIREMENTS

/ TOPIC 3 CONTENT QUIZ

Started on	Tuesday, 28 June 2022, 11:23 AM
State	Finished
Completed on	Tuesday, 28 June 2022, 11:47 AM
Time taken	24 mins 12 secs
Grade	**16.00** out of 20.00 (**80.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

The three conductors pictured above are:

Select one:

- a. installed exposed to direct sunlight ✓
- b. in a wiring enclosure
- c. laid flat and spaced
- d. installed underground

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 4 to 15, 20 and 21

The correct answer is: installed exposed to direct sunlight

Question 2

Incorrect

Mark 0.00 out of 1.00

Select the installation condition that will achieve the greatest current carrying capacity for a 25 mm^2 XLPE SDI cable.

Select one:

- a. In a wall cavity, partially surrounded by thermal insulation ✗
- b. In a conduit, saddled to a wall
- c. In air, suspended from a catenary
- d. In open trunking

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 4 to 21

The correct answer is: In air, suspended from a catenary

Question 3

Correct

Mark 1.00 out of 1.00

What is the normal operating temperature of a 2.5 mm^2 V90 two-core and earth TPS cable tied to a cable tray?

Select one:

- a. 90ºC
- b. 100ºC
- c. 40ºC
- d. 75ºC ✓

Refer to content page 3.2 and AS/NZS 3008.1.1:2017 Table 1 or AS/NZS 3000:2018 Table 3.2

The correct answer is: 75ºC

Question 4

Correct

Mark 1.00 out of 1.00

Which of the following installation conditions requires a de-rating factor to be applied to the current carry capacity of the conductors?

Select one:

- a. Installed in an environment with an ambient temperature of 45ºC
- b. All of these require derating factors to be applied ✓
- c. Installed on an unperforated cable tray
- d. Installed bunched with other circuits

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 22 to 29

The correct answer is: All of these require derating factors to be applied

Question 5

Incorrect

Mark 0.00 out of 1.00

Which of the following is an accurate description of the installation conditions pictured above?

Select one:

- a. Multicore cable installed buried directly in the ground
- b. Single-core cables installed underground in a wiring enclosure
- c. Multicore cables installed in an underground wiring enclosure ✗
- d. Single-core cables installed buried directly in the ground

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Table 3

The correct answer is: Single-core cables installed underground in a wiring enclosure

Question 6

Incorrect

Mark 0.00 out of 1.00

A suitable current carrying capacity for a cable protected by a 40 A HRC fuse is:

Select one:

- a. 43 A
- b. All of these are suitable ✗
- c. 40 A
- d. 45 A

Refer to content page 3.2, AS/NZS 3000:2018 Clause 2.5.3.1

The correct answer is: 45 A

Question 7

Incorrect

Mark 0.00 out of 1.00

For the purposes of cable selection based on current carrying capacity, what is the reference ambient temperature for cables installed underground in Australia?

Select one:

- a. 25^{0}C
- b. 90^{0}C
- c. 75^{0}C
- d. 40^{0}C ✗

Refer to content page 3.2, AS/NZS 3000:2018 Clause 3.3.2.1 (b) (i) and AS/NZS 3008.1.1:2017 Clause 3.4.4 (a)

The correct answer is: 25^{0}C

Question 8

Correct

Mark 1.00 out of 1.00

To determine the appropriate current carrying capacity table to use for multicore cables installed in underground wiring enclosures, you should consult AS/NZS 3008.1.1:2017:

Select one:

- a. Table 3(2)
- b. Table 3(3)
- c. Table 3(4) ✓
- d. Table 3(1)

Refer to content page 5.2 and AS/NZS 3008.1.1:2017 Table 3(4)

The correct answer is: Table 3(4)

Question 9

Correct

Mark 1.00 out of 1.00

AS/NZS 3008.1.1:2017 Table 3(2) provides guidance on selecting suitable carrying capacity tables for:

Select one:

- a. underground cables
- b. unenclosed cables
- c. All of these
- d. enclosed cables ✓

Refer to content page 3.2 and AS/NZS 3008.1.1:2017 Table 3(2)

The correct answer is: enclosed cables

Question 10

Correct

Mark 1.00 out of 1.00

What is the main factor that determines the current carrying capacity of a given cable?

Select one:

- a. The characteristics of the connected load
- b. How easily the cable can dissipate heat ✓
- c. The supply voltage
- d. The size of the associated protective earthing conductor

Refer to content page 3.1

The correct answer is: How easily the cable can dissipate heat

Question 11

Correct

Mark 1.00 out of 1.00

To ensure correct coordination between cables and protection devices, the maximum demand of the circuit should be:

Select one:

- a. greater than the nominal current rating of the circuit protection device
- b. doubled to allow for diversity
- c. greater than the current carrying capacity of the circuit conductors
- d. less than or equal to the current carrying capacity of the circuit conductors ✓

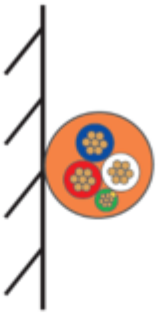
Refer to content page 3.2, AS/NZS 3000:2018 Clause 2.5.3.1

The correct answer is: less than or equal to the current carrying capacity of the circuit conductors

Question 12

Correct

Mark 1.00 out of 1.00



Which of the following is an accurate description of the installation conditions pictured above?

Select one:

- a. Multicore cable in air suspended from a catenary
- b. Multicore cable installed clipped directly to a wall ✓
- c. Multicore cable installed in air on a cable ladder
- d. The diagram represents all of these

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Table 3

The correct answer is: Multicore cable installed clipped directly to a wall

Question 13

Correct

Mark 1.00 out of 1.00

A suitable current carrying capacity for a cable protected by a 40 A circuit breaker is:

Select one:

- a. 45 A
- b. All of these are suitable ✓
- c. 43 A
- d. 40 A

Refer to content page 3.2, AS/NZS 3000:2018 Clause 2.5.3.1

The correct answer is: All of these are suitable

Question **14**

Correct

Mark 1.00 out of 1.00

Select the installation condition that will achieve the greatest current carrying capacity for two 16 mm^2 V90 SDI cables.

Select one:

- a. In two separate HD PVC conduits, underground at a depth of 600 mm
- b. Buried directly in the ground at a depth of 600 mm ✓
- c. In an enclosed trench
- d. In a single HD PVC conduit, underground at a depth of 600 mm

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 4 to 21

The correct answer is: Buried directly in the ground at a depth of 600 mm

Question **15**

Correct

Mark 1.00 out of 1.00

To ensure correct coordination between cables and protection devices the current carrying capacity of the circuit conductors should be:

Select one:

- a. less than the nominal current rating of the circuit protection device
- b. less than the maximum demand of the circuit
- c. greater than or equal to the nominal current rating of the circuit protection device ✓
- d. halved to allow for diversity

Refer to content page 3.2, AS/NZS 3000:2018 Clause 2.5.3.1

The correct answer is: greater than or equal to the nominal current rating of the circuit protection device

Question 16

Correct

Mark 1.00 out of 1.00

The three conductors pictured above are:

Select one:

- a. laid flat and spaced
- b. laid flat and touching
- c. in a wiring enclosure
- d. in trefoil ✓

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Table 3

The correct answer is: in trefoil

Question 17

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 states that wiring systems should be installed in domestic installations based on the assumption that:

Select one:

- a. thermal insulation will be installed in ceilings, walls and under floors ✓
- b. the operating temperatures of cables will not exceed 40ºC
- c. the residence will be renovated within 7 years
- d. they will be inaccessible to the occupants

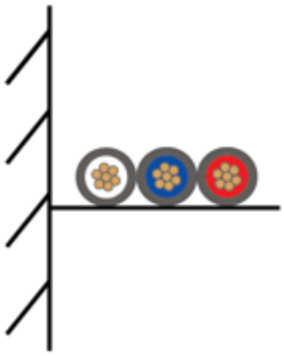
Refer to content page 3.1 and AS/NZS 3000:2018 Clause 3.4.1

The correct answer is: thermal insulation will be installed in ceilings, walls and under floors

Question **18**

Correct

Mark 1.00 out of 1.00



The three conductors pictured above are:

Select one:

- a. laid flat and spaced
- b. in trefoil
- c. in a wiring enclosure
- d. laid flat and touching ✓

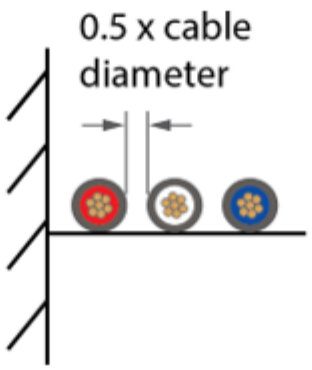
Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Table 3

The correct answer is: laid flat and touching

Question 19

Correct

Mark 1.00 out of 1.00



The three conductors pictured above are:

Select one:

- a. laid flat and touching
- b. in trefoil
- c. in a wiring enclosure
- d. laid flat and spaced ✓

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Table 3

The correct answer is: laid flat and spaced

Question 20

Correct

Mark 1.00 out of 1.00

Given the same installation conditions, a 6 mm^2 cable will have:

Select one:

- a. a lesser current carrying capacity than a similar 2.5 mm^2 cable
- b. a greater current carrying capacity than a similar 10 mm^2 cable
- c. a greater current carrying capacity than a similar 4 mm^2 cable ✓
- d. a lesser current carrying capacity than a similar 4 mm^2 cable

Refer to content page 3.1 and AS/NZS 3008.1.1:2017 Tables 4 to 21

The correct answer is: a greater current carrying capacity than a similar 4 mm^2 cable

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Started on	Monday, 21 March 2022, 6:28 AM
State	Finished
Completed on	Monday, 21 March 2022, 6:29 AM
Time taken	1 min 35 secs
Grade	**4.00** out of 4.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Identify how the voltage drop in a 2.5 mm^2 socket outlets final subcircuit will be affected by varying each of the following circuit parameters.

- Increasing the route length of the circuit will [increase the voltage drop] ✓.
- Increasing the cable size to 4 mm^2 will [reduce the voltage drop] ✓.
- Increasing the load on the circuit will [increase the voltage drop] ✓.
- Increasing the operating temperature of the circuit conductors will [increase the voltage drop] ✓.

Refer to content page 4.1

Question 2

Correct

Mark 1.00 out of 1.00

According to AS/NZS 3000:2018, the maximum permissible voltage drop at any point in an electrical installation Is [5] ✓% of the nominal supply voltage.

This means that:

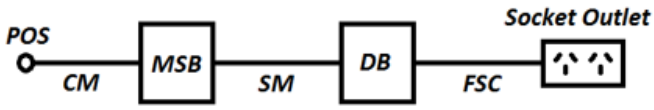
- The maximum permissible voltage drop in a 230 V, 50 Hz electrical installation is [11.5] ✓ V.
- The maximum permissible voltage drop in a 400 V, 50 Hz electrical installation is [20] ✓ V.

230 x 0.05 = 11.5 V
400 x 0.05 = 20 V
Refer to content page 4.1 and AS/NZS 3000:2018 Clause 3.6.2

Question 3

Correct

Mark 1.00 out of 1.00



What is the maximum permissible voltage drop in volts, for the 230 V socket outlets final subcircuit pictured above, where the voltage drop on the single phase consumer's mains is 0.5 %, and the voltage drop on the submain is 2 %?

Provide your answer in the units indicated, correctly rounded to three significant figures.

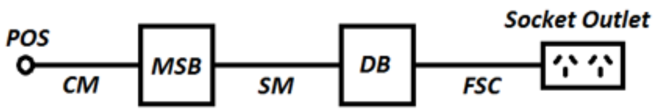
Maximum Voltage Drop: 5.75 V

230 x 0.005 = 1.15 V
230 x 0.02 = 4.6 V
1.15 + 4.6 = 5.75 V
230 x 0.05 = 11.5 V
11.5 – 5.75 = 5.75 V
Refer to content page 4.1 and AS/NZS 3000:2018 Clause 3.6.2

Question 4

Correct

Mark 1.00 out of 1.00



What is the maximum permissible voltage drop in volts, for the 230 V socket outlets final subcircuit pictured above, where the voltage drop on the single phase consumer's mains is 1 %, and the voltage drop on the submain is 2.8 %?

Provide your answer in the units indicated, correctly rounded to three significant figures.

Maximum Voltage Drop: 2.76 V

230 x 0.01 = 2.3 V
230 x 0.028 = 6.44 V
2.3 + 6.44 = 8.74 V
230 x 0.05 = 11.5 V
11.5 – 8.74 = 2.76 V
Refer to content page 4.1 and AS/NZS 3000:2018 Clause 3.6.2

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/ TOPIC 4.2 LEARNING ACTIVITY

Started on	Monday, 21 March 2022, 6:35 AM
State	Finished
Completed on	Monday, 21 March 2022, 6:39 AM
Time taken	3 mins 32 secs
Grade	**4.00** out of 4.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Select the correct AS/NZS 3008.1.1:2017 voltage drop table for each of the following scenarios.

Bare Al aerial conductors	Table 51 ✓
Bare Cu aerial conductors	Table 50 ✓
120 mm² SDI flexible cables laid on a cable tray in trefoil	Table 46 ✓
2.5 mm² Cu twin and earth TPS cable in a wall cavity	Table 42 ✓
70 mm² SDI flexible cables laid flat and touching on a cable ladder	Table 47 ✓
16 mm² Cu SDI cables tied to a cable tray in trefoil	Table 40 ✓
MIMS cable installed on a cable ladder	Table 49 ✓
6 mm² Cu SDI cables installed in an underground conduit	Table 41 ✓

Refer to content page 4.2 and applicable tables in AS/NZS 3008.1.1:2017

The correct answer is: Bare Al aerial conductors – Table 51, Bare Cu aerial conductors – Table 50, 120 mm² SDI flexible cables laid on a cable tray in trefoil – Table 46, 2.5 mm² Cu twin and earth TPS cable in a wall cavity – Table 42, 70 mm² SDI flexible cables laid flat and touching on a cable ladder – Table 47, 16 mm² Cu SDI cables tied to a cable tray in trefoil – Table 40, MIMS cable installed on a cable ladder – Table 49, 6 mm² Cu SDI cables installed in an underground conduit – Table 41

Question 2

Correct

Mark 1.00 out of 1.00

AS/NZS 3008.1.1:2017 Tables 40 to 51 provide three phase values of VC at 50 Hz for different cable types and installation methods.

Refer to content page 4.2 and AS/NZS 3008.1.1:2017 Tables 40 to 51

Question 3

Correct

Mark 1.00 out of 1.00

The values of Vc provided in AS/NZS 3008.1.1:2017 Tables 40 to 51 are measured in:

Select one:

- a. millivolts per ampere metre (mV/A.m)
- b. volts per ampere metre (V/A.m)
- c. amperes per millivolt metre (A/mV.m)
- d. volts per metre (V/m)

Refer to content page 4.2 and AS/NZS 3008.1.1:2017 Tables 40 to 51

The correct answer is: millivolts per ampere metre (mV/A.m)

Question 4

Correct

Mark 1.00 out of 1.00

The correct equation for determining the voltage drop in a given cable is:

a. $V_c = \dfrac{V_d \text{ x length x max demand}}{1000}$ millivolts

b. $V_d = \dfrac{V_c \text{ x length x max demand}}{1000}$ volts

c. $V_d = \dfrac{V_c \text{ x length}}{1000 \text{ x max demand}}$ volts

d. $V_d = \dfrac{\text{length x max demand}}{V_c \text{ x } 1000}$ volts

Answer = b

Refer to content page 4.2 and AS/NZS 3008.1.1:2017 Clause 4.2

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/ TOPIC 4 CABLE SELECTION BASED ON VOLTAGE DROP REQUIREMENTS

/ TOPIC 4 CONTENT QUIZ

Started on	Tuesday, 28 June 2022, 4:00 PM
State	Finished
Completed on	Wednesday, 29 June 2022, 12:15 PM
Time taken	20 hours 15 mins
Grade	**9.00** out of 10.00 (**90.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

What is the effect on the voltage drop in a circuit if the operating temperature of the circuit conductors increases from 35⁰C to 75⁰C?

Select one:

- a. There will be no effect on the voltage drop
- b. The voltage drop will decrease
- c. The voltage drop will drop to zero
- d. The voltage drop will increase ✓

Refer to content page 4.1

The correct answer is: The voltage drop will increase

Question 2

Correct

Mark 1.00 out of 1.00

Increasing the route length of circuit conductors will:

Select one:

- a. reduce the voltage drop in the circuit
- b. increase the supply voltage and decrease the percentage of voltage drop
- c. increase the voltage drop in the circuit ✓
- d. have no effect on the voltage drop in the circuit

Refer to content page 4.1

The correct answer is: increase the voltage drop in the circuit

Question 3

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3008.1.1:2017 table should be referenced to determine the voltage drop of a 230 V socket outlets circuit supplied by TPS Cu cable?

Select one:

- a. Table 42 ✓
- b. Table 41
- c. Table 43
- d. Table 40

Refer to content page 4.2 and AS/NZS 3008.1.1:2017 Table 42

The correct answer is: Table 42

Question 4

Incorrect

Mark 0.00 out of 1.00

Which AS/NZS 3008.1.1:2017 table should be referenced to determine the voltage drop in a set of 400 V XLPE SDI Cu submains installed in trefoil on a cable ladder?

Select one:

- a. Table 42
- b. Table 41
- c. Table 40
- d. Table 43 ✗

Refer to content page 4.2 and AS/NZS 3008.1.1:2017 Table 40

The correct answer is: Table 40

Question 5

Correct

Mark 1.00 out of 1.00

Which of the following factors affects the voltage drop on the wiring of a circuit?

Select one:

- a. All of these affect voltage drop ✓
- b. Conductor material
- c. Cross-sectional area of conductors
- d. The magnitude of the load current

Refer to content page 4.1

The correct answer is: All of these affect voltage drop

Question 6

Correct

Mark 1.00 out of 1.00

The values of Vc given in AS/NZS 3008.1.1:2017 voltage drop tables are measured in:

Select one:

- a. A.m/mV
- b. V/A.m
- c. mV/A.m ✓
- d. A.m/V

Refer to content page 4.2 and AS/NZS 3008.1.1:2017 Tables 40 to 51

The correct answer is: mV/A.m

Question 7

Correct

Mark 1.00 out of 1.00

The maximum permissible voltage drop in a 230 V, 50 Hz installation is:

Select one:

- a. 20 V
- b. 7.5 V
- c. 11.5 V ✓
- d. 23 V

230 x 0.05 = 11.5 V
Refer to content page 4.1 and AS/NZS 3000:2018 Clause 3.6.2

The correct answer is: 11.5 V

Question 8

Correct

Mark 1.00 out of 1.00

Increasing the load on circuit conductors will:

Select one:

- a. have no effect on the voltage drop in the circuit
- b. reduce the voltage drop in the circuit
- c. increase the voltage drop in the circuit ✓
- d. increase the supply voltage and decrease the percentage of voltage drop

Refer to content page 4.1

The correct answer is: increase the voltage drop in the circuit

Question 9

Correct

Mark 1.00 out of 1.00

What is the maximum voltage drop permitted at any point within an electrical installation?

Select one:

- a. 2.5 % of the nominal supply voltage
- b. 7.5 % of the nominal supply voltage
- c. 5 % of the nominal supply voltage ✓
- d. 11.5 % of the nominal supply voltage

Refer to content page 4.1 and AS/NZS 3000:2018 Clause 3.6.2

The correct answer is: 5 % of the nominal supply voltage

Question **10**

Correct

Mark 1.00 out of 1.00

The maximum permissible voltage drop in a 400 V, 50 Hz installation is:

Select one:

- a. 40 V
- b. 7.5 V
- c. 11.5 V
- d. 20 V ✓

400 x 0.05 = 20 V
Refer to content page 4.1 and AS/NZS 3000:2018 Clause 3.6.2

The correct answer is: 20 V

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Started on	Tuesday, 22 March 2022, 6:33 AM
State	Finished
Completed on	Tuesday, 22 March 2022, 6:35 AM
Time taken	1 min 38 secs
Grade	**5.00** out of 5.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Identify how the earth fault loop impedance of a final subcircuit will be affected by varying the following parameters.

- Increasing the route length of the circuit will [increase the earth fault loop impedance] ✓.
- Increasing the cable size will [reduce the earth fault loop impedance] ✓.
- Replacing the cable with one that has a higher temperature rating will [have no effect on the earth fault loop impedance] ✓.

Refer to content page 5.1

Question 2

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 requires that the impedance of the earthing system is sufficiently low so that, at any point in the installation, the following equation is satisfied:

$Z_s \times I_a \leq U_o$

Where:

Z_s = [impedance of the earth fault loop] ✓

I_a = [instantaneous trip current of the protection device] ✓

U_o = [nominal phase voltage in volts] ✓

Refer to content page 5.1 and AS/NZS 3000:2018 Clause 5.7.4

Question 3

Correct

Mark 1.00 out of 1.00

Maximum values of earth fault loop impedance can be found in which AS/NZS 3000:2018 Table?

AS/NZS 3000:2018 Table: 8.1 ✓

Maximum values of conductor resistance for cables up to 16 mm^2, to ensure automatic operation of various protective devices, can be found in which AS/NZS 3000:2018 Table?

AS/NZS 3000:2018 Table: 8.2 ✓

Refer to content page 5.1 and AS/NZS 3000:2018 Tables 8.1 and 8.2

Question 4

Correct

Mark 1.00 out of 1.00

Where supply is not available the impedance of the earth fault loop can be verified by measuring the resistance ✓ of the circuit active and protective earthing conductors ✓. The measured value must be less than or equal to ✓ the value given in AS/NZS 3000:2018 Table 8.2.

Refer to AS/NZS 3000:2018 Clause 8.3.9.2.3

Question 5

Correct

Mark 1.00 out of 1.00

Determine the maximum permitted circuit length for a 230 V final subcircuit that is protected by a 25 A Type D circuit breaker, and is supplied by a 6 mm^2 two-core and earth TPS cable, with a 2.5 mm^2 protective earthing conductor.

Provide your answer in the units indicated, correctly rounded to three significant figures.

Maximum Circuit Length: 46.2 ✓ m

L_{max} = (0.8 x 230 x 6 x 2.5) / ((25 x 12.5) x (22.5 x 10^{-3}) x (6 + 2.5))

L_{max} = 2760 / (312.5 x 0.0225 x 8.5)

L_{max} = 2760 / 59.8

L_{max} = 46.2 m

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Started on	Saturday, 2 April 2022, 10:22 AM
State	Finished
Completed on	Sunday, 3 April 2022, 7:13 PM
Time taken	1 day 9 hours
Grade	**5.00** out of 5.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Identify the applicable AS/NZS 3008.1.1:2017 resistance/reactance table for each of the following scenarios.

TPS cable (circular conductors) resistance at 50 Hz	Table 35 ✓
Multicore cable with shaped conductors resistance at 50 Hz	Table 36 ✓
120 mm² SDI flexible cable resistance at 50 Hz	Table 37 ✓
2.5 mm² Cu twin and earth TPS cable reactance at 50 Hz	Table 30 ✓
70 mm² Cu SDI flexible cable reactance at 50 Hz	Table 31 ✓
Insulated single core Al aerial conductor resistance at 50 Hz	Table 39 ✓
MIMS cable resistance at 50 Hz	Table 38 ✓
MIMS cable reactance at 50 Hz	Table 32 ✓
Bare Cu single core aerial conductor reactance at 50 Hz	Table 33 ✓
6 mm² Cu SDI cable resistance at 50 Hz	Table 34 ✓

Refer to content page 5.2 and applicable AS/NZS 3008.1.1:2017 tables.

The correct answer is: TPS cable (circular conductors) resistance at 50 Hz – Table 35, Multicore cable with shaped conductors resistance at 50 Hz – Table 36, 120 mm² SDI flexible cable resistance at 50 Hz – Table 37, 2.5 mm² Cu twin and earth TPS cable reactance at 50 Hz – Table 30, 70 mm² Cu SDI flexible cable reactance at 50 Hz – Table 31, Insulated single core Al aerial conductor resistance at 50 Hz – Table 39, MIMS cable resistance at 50 Hz – Table 38, MIMS cable reactance at 50 Hz – Table 32, Bare Cu single core aerial conductor reactance at 50 Hz – Table 33, 6 mm² Cu SDI cable resistance at 50 Hz – Table 34

Question 2

Correct

Mark 1.00 out of 1.00

Resistance tables in AS/NZS 3008.1.1:2017 provide values of a.c. resistance at 50 Hz in ohms per kilometre of cable for aluminium and copper cables at a variety of operating temperatures.

Reactance tables in AS/NZS 3008.1.1:2017 provide values of reactance at 50 Hz in ohms per kilometre of cable, for a variety of insulation types and installation methods.

Refer to content page 5.2 and AS/NZS 3008.1.1:2017 Tables 30 to 39

Question 3

Correct

Mark 1.00 out of 1.00

Which of the following is the correct equation for determining impedance from resistance and reactance values?

Select one:

- a. Z = R + X
- b. Z = √R2 + √X2
- c. Z = √(R + X)
- d. $Z = \sqrt{(R^2 + X^2)}$

Refer to content page 5.2

The correct answer is: $Z = \sqrt{(R^2 + X^2)}$

Question 4

Correct

Mark 1.00 out of 1.00

A 95 mm^2 XLPE single core Cu cable is installed on a cable tray in trefoil as part of a three phase submain set. The cable operating temperature is 75ºC, and the route length of the circuit is 120 m.

(a) Which AS/NZS 3008.1.1:2017 table and column should be used to find the reactance of the conductor at 50 Hz?

AS/NZS 3008.1.1:2017

- Table: 30 ✓
- Column: 4 ✓

(b) Determine the value of Xc and the actual reactance of the conductor, correctly rounded to three significant figures.

- Xc Value: 0.0868 ✓ Ω/km
- Conductor Reactance: 10.4 ✓ mΩ

(c) Which AS/NZS 3008.1.1:2017 table and column should be used to find the a.c. resistance of the conductor at 50 Hz?

AS/NZS 3008.1.1:2017

- Table: 34 ✓
- Column: 4 ✓

(d) Determine the value of Rc and actual resistance of the conductor, correctly rounded to three significant figures.

- Rc Value: 0.236 ✓ Ω/km
- Conductor Resistance: 28.3 ✓ mΩ

(e) Use the impedance equation to determine the impedance of the submain conductor, correctly rounded to three significant figures.

- Conductor Impedance: 30.2 ✓ mΩ

X = (0.0868 x 120) / 1000 = 0.010416 = 10.4 mΩ

R = (0.236 x 120) / 1000 = 0.02832 = 28.3 mΩ

$Z = \sqrt{((0.010416)^2 + (0.02832)^2)} = 0.03017 = 30.2$ mΩ

Refer to worked example on content page 5.2 and AS/NZS 3008.1.1:2017 Tables 30 and 34

Question **5**

Correct

Mark 1.00 out of 1.00

A 6 mm^2 PVC insulated two-core and earth cable supplying a single phase final subcircuit has circular copper conductors, an operating temperature of 75ºC, and a route length of 56 m.

(a) Which AS/NZS 3008.1.1:2017 table and column should be used to find the reactance of the conductors at 50 Hz?

AS/NZS 3008.1.1:2017

- Table: 30 ✓
- Column: 9 ✓

(b) Determine the value of Xc and the actual reactance of the 6 mm^2 active conductor in the multicore cable, correctly rounded to three significant figures.

- Active Conductor Xc Value: 0.0967 ✓ Ω/km
- Active Conductor Reactance: 5.42 ✓ mΩ

(c) Determine the value of Xc and the actual reactance of the 2.5 mm^2 protective earthing conductor in the multicore cable, correctly rounded to three significant figures.

- Earth Conductor Xc Value: 0.102 ✓ Ω/km
- Earth Conductor Reactance: 5.71 ✓ mΩ

(d) Which AS/NZS 3008.1.1:2017 table and column should be used to find the a.c. resistance of the conductors at 50 Hz?

AS/NZS 3008.1.1:2017

- Table: 35 ✓
- Column: 4 ✓

(e) Determine the value of Rc and actual resistance of the 6 mm^2 active conductor, correctly rounded to three significant figures.

- Active Conductor Rc Value: 3.75 ✓ Ω/km
- Active Conductor Resistance: 210 ✓ mΩ

(f) Determine the value of Rc and actual resistance of the 2.5 mm^2 protective earthing conductor, correctly rounded to three significant figures.

- Earth Conductor Rc Value: 9.01 ✓ Ω/km
- Earth Conductor Resistance: 505 ✓ mΩ

(g) Use the impedance equation to determine the impedance of the 6 mm^2 active conductor, correctly rounded to three significant figures.

- Active Conductor Impedance: 210 ✓ mΩ

(h) Use the impedance equation to determine the impedance of the 2.5 mm^2 protective earthing conductor, correctly rounded to three significant figures.

- Earth Conductor Impedance: 505 ✓ mΩ

(i) Determine the combined active to earth fault path impedance of the final subcircuit multicore cable. Provide your answer correctly rounded to three significant figures.

- Combined Active-Earth Conductor Impedance: 715 ✓ mΩ

X_{ph} = (0.0967 x 56) / 1000 = 0.0054152 = 5.42 mΩ

X_e = (0.102 x 56) / 1000 = 0.005712 = 5.71 mΩ

R_{ph} = (3.75 x 56) / 1000 = 0.21 = 210 mΩ

R_e = (9.01 x 56) / 1000 = 0.50456 =505 mΩ

Z_{ph} = √((0.0054152)^2 + (0.21)^2) = 0.21 = 210 mΩ

Z_e = √((0.005712)^2 + (0.50456)^2) = 0.50503 = 505 mΩ

Z_{phe} = 0.21 + 0.505 = 0.715 = 715 mΩ

Refer to worked example on content page 5.2 and AS/NZS 3008.1.1:2017 Tables 30 and 35

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/ TOPIC 5 CABLE SELECTION BASED ON FAULT LOOP IMPEDANCE REQUIREMENTS

/ TOPIC 5 CONTENT QUIZ

Started on	Wednesday, 29 June 2022, 4:14 PM
State	Finished
Completed on	Sunday, 3 July 2022, 9:58 PM
Time taken	4 days 5 hours
Grade	**13.00** out of 16.00 (**81.25**%)

Question 1

Correct

Mark 1.00 out of 1.00

Which of the following will cause the earth fault loop impedance for a given circuit to increase?

Select one:

- a. A reduction in the route length of the circuit conductors
- b. An increase in the route length of the circuit conductors ✓
- c. An increase in the cross-sectional area of the circuit conductors
- d. None of these will have any effect on the earth fault loop impedance

Refer to content page 5.1

The correct answer is: An increase in the route length of the circuit conductors

Question 2

Correct

Mark 1.00 out of 1.00

Which of the following will cause the earth fault loop impedance for a given circuit to decrease?

Select one:

- a. A reduction in the cross-sectional area of the circuit conductors
- b. An increase in the route length of the circuit conductors
- c. An increase in the cross-sectional area of the circuit conductors ✓
- d. None of these will have any effect on the earth fault loop impedance

Refer to content page 5.1

The correct answer is: An increase in the cross-sectional area of the circuit conductors

Question 3

Correct

Mark 1.00 out of 1.00

What is the maximum value of earth fault loop impedance to ensure disconnection in 0.4 s, for a circuit protected by a 25 A HRC fuse?

Select one:

- a. 0.7 Ω
- b. 1.6 Ω ✓
- c. 1.1 Ω
- d. 0.2 Ω

Refer to AS/NZS 3000:2018 Table 8.1

The correct answer is: 1.6 Ω

Question 4

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3008.1.1:2017 table should be referenced to determine the reactance of a 25 mm^2 MIMS cable?

Select one:

- a. Table 33
- b. Table 32 ✓
- c. Table 31
- d. Table 34

Refer to content page 5.2 and AS/NZS 3008.1.1:2017 Table 32

The correct answer is: Table 32

Question 5

Correct

Mark 1.00 out of 1.00

What is the maximum value of earth fault loop impedance for a circuit protected by a 32 A Type C circuit breaker?

Select one:

- a. 2.0 Ω
- b. 0.6 Ω
- c. 1.8 Ω
- d. 1.0 Ω ✓

Refer to AS/NZS 3000:2018 Table 8.1

The correct answer is: 1.0 Ω

Question 6

Incorrect

Mark 0.00 out of 1.00

What is the maximum value of resistance for the protective earthing conductor of a 2.5 mm^2 circuit protected by a 20 A Type C circuit breaker?

Select one:

- a. 0.5 Ω
- b. 1.0 Ω
- c. 1.5 Ω ✗
- d. 1.2 Ω

Refer to AS/NZS 3000:2018 Table 8.2

The correct answer is: 0.5 Ω

Question 7

Correct

Mark 1.00 out of 1.00

The earth fault loop impedance for a given circuit must be:

Select one:

- a. high enough to prevent a fault current flowing in the protective earthing conductor
- b. low enough to cause effective operation of the circuit protective device in the required time ✓
- c. determined from the impedances of the circuit active and neutral conductors
- d. high enough to prevent a fault current greater than the nominal rating of the circuit protective device

Refer to content page 5.1 and AS/NZS 3000:2018 Clause 5.7.1

The correct answer is: low enough to cause effective operation of the circuit protective device in the required time

Question 8

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3008.1.1:2017 table should be referenced to determine the a.c. resistance of a 2.5 mm^2 TPS cable with circular copper conductors?

Select one:

- a. Table 37
- b. Table 34
- c. Table 35 ✓
- d. Table 36

Refer to content page 5.2 and AS/NZS 3008.1.1:2017 Table 35

The correct answer is: Table 35

Question 9

Incorrect

Mark 0.00 out of 1.00

What is the maximum value of combined resistance for the active and protective earthing conductors of a 2.5 mm^2 circuit protected by a 16 A Type C circuit breaker?

Select one:

- a. 2.3 Ω
- b. 1.5 Ω
- c. 0.9 Ω ✗
- d. 1.2 Ω

Refer to AS/NZS 3000:2018 Table 8.2

The correct answer is: 1.2 Ω

Question 10

Correct

Mark 1.00 out of 1.00

What is the maximum value of earth fault loop impedance for a circuit protected by a 20 A Type C circuit breaker?

Select one:

- a. 1.5 Ω ✓
- b. 0.9 Ω
- c. 1.2 Ω
- d. 1.9 Ω

Refer to AS/NZS 3000:2018 Table 8.1

The correct answer is: 1.5 Ω

Question 11

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3008.1.1:2017 table should be referenced to determine the a.c. resistance of a 70 mm^2 flexible cable with circular copper conductors?

Select one:

- a. Table 36
- b. Table 39
- c. Table 37 ✓
- d. Table 38

Refer to content page 5.2 and AS/NZS 3008.1.1:2017 Table 37

The correct answer is: Table 37

Question 12

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3008.1.1:2017 table should be referenced to determine the reactance of a 120 mm^2 XLPE SDI cable?

Select one:

- a. Table 29
- b. Table 31
- c. Table 30 ✓
- d. Table 32

Refer to content page 5.2 and AS/NZS 3008.1.1:2017 Table 30

The correct answer is: Table 30

Question 13

Correct

Mark 1.00 out of 1.00

Which AS/NZS 3008.1.1:2017 table should be referenced to determine the a.c. resistance of a 25 mm^2 SDI Cu cable?

Select one:

- a. Table 34 ✓
- b. Table 32
- c. Table 33
- d. Table 31

Refer to content page 5.2 and AS/NZS 3008.1.1:2017 Table 34

The correct answer is: Table 34

Question 14

Correct

Mark 1.00 out of 1.00

What is the maximum value of earth fault loop impedance for a circuit protected by a 10 A Type B circuit breaker?

Select one:

- a. 0.9 Ω
- b. 4.3 Ω
- c. 1.3 Ω
- d. 5.8 Ω ✓

Refer to AS/NZS 3000:2018 Table 8.1

The correct answer is: 5.8 Ω

Question 15

Correct

Mark 1.00 out of 1.00

What is the maximum value of earth fault loop impedance to ensure disconnection in 5 s, for a circuit protected by a 63 A HRC fuse?

Select one:

- a. 0.9 Ω ✓
- b. 1.9 Ω
- c. 0.6 Ω
- d. 1.8 Ω

Refer to AS/NZS 3000:2018 Table 8.1

The correct answer is: 0.9 Ω

Question 16

Incorrect

Mark 0.00 out of 1.00

What is the maximum route length for a 50 mm^2 submain protected by a 160 A Type C circuit breaker?

Select one:

- a. 126 m
- b. 106 m
- c. 83 m
- d. 68 m ✗

Refer to AS/NZS 3000:2018 Table B1

The correct answer is: 83 m

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HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0 / TOPIC 6.1 LEARNING ACTIVITY

Started on	Sunday, 3 April 2022, 7:23 PM
State	Finished
Completed on	Sunday, 3 April 2022, 7:27 PM
Time taken	3 mins 55 secs
Grade	**9.00** out of 9.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 defines 'isolation (isolating function)' as a function intended to [cut off] ✓ the [supply] ✓ from the whole installation, or a discrete section of it, by separating it from [every source] ✓ of electrical energy for reasons of [safety] ✓.

AS/NZS 3000:2018 Clause: [1] ✓. [4] ✓. [75] ✓

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 1.4.75

Question 2

Correct

Mark 1.00 out of 1.00

Part 2 of AS/NZS 3000:2018 requires that each circuit in an electrical installation can be effectively isolated from the supply. Which of the fundamental design principles given in Part 1 is this requirement intended to address?

Select one:

- ○ a. minimize inconvenience in the event of a fault
- ○ b. protect persons, livestock and property from harmful effects
- ○ c. ensure the installation functions as intended
- ○ d. ensure compatibility with the supply
- ◉ e. facilitate safe operation, inspection, testing and maintenance ✓

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 1.6.1

The correct answer is: facilitate safe operation, inspection, testing and maintenance

Question 3

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 requires that isolating switches must operate in [all active conductors], and must not operate in [earthing or PEN conductors].

Refer to AS/NZS 3000:2018 Clauses 2.3.2.1.2 (c) and 2.3.2.2.1

Question 4

Correct

Mark 1.00 out of 1.00

Which of the following circuits are required to be provided with an isolation device?

Select one or more:

- [x] a. Strip heating circuit
- [x] b. Pool pump circuit
- [x] c. Electric stove circuit
- [x] d. 10 A socket outlets circuit
- [x] e. Cooktop circuit
- [x] f. Circuit supplying in-floor heating cables
- [x] g. Instantaneous water heater circuit

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 2.3.2.1.1

The correct answer is: Electric stove circuit, 10 A socket outlets circuit, Instantaneous water heater circuit, Strip heating circuit, Circuit supplying in-floor heating cables, Pool pump circuit, Cooktop circuit

Question 5 Correct

Mark 1.00 out of 1.00

Coming into contact with the moving parts of electrically actuated machinery can cause:

Select one or more:

- a. crushed limbs ✓
- b. broken bones ✓
- c. cuts ✓
- d. severed limbs ✓
- e. bruises ✓
- f. puncture wounds ✓
- g. sprains ✓

Refer to content page 6.1

The correct answer is: broken bones, severed limbs, crushed limbs, cuts, bruises, sprains, puncture wounds

Question 6 Correct

Mark 1.00 out of 1.00

Identify whether the following statements are true or false in relation to electrical installation control requirements.

A programmable relay is suitable for use as an isolation device.	False ✓
An emergency switching device must have the capacity to break the full load current.	True ✓
Shut down devices for mechanical maintenance must operate in all active conductors.	False ✓

Refer to content page 6.1 and AS/NZS 3000:2018 Clauses 2.3.2.2.1, 2.3.5.2 and 2.3.6.3

Question 7

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 requires that emergency switches must:

1) Not re-energize ✓ the circuit upon release of the device.

2) Require manual ✓ re-setting where danger is present.

3) Be readily accessible ✓.

Refer to AS/NZS 3000:2018 Clauses 2.3.5.1, 2.3.5.2 and 2.3.5.3

Question 8

Correct

Mark 1.00 out of 1.00

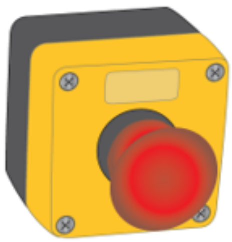
AS/NZS 3000:2018 requires that mechanical maintenance shut down devices must have a clearly labeled 'OFF' position ✓, and be designed to prevent unintentional operation ✓.

Refer to AS/NZS 3000:2018 Clauses 2.3.6.2 (b) and (c)

Question 9

Correct

Mark 1.00 out of 1.00



The switching device shown above is suitable for which type of electrical control function?

Select one:

- a. Light switch
- b. Emergency stop button ✓
- c. STOP/START motor control
- d. Main switch

Refer to AS/NZS 3000:2018 Clauses 2.3.5.2

The correct answer is: Emergency stop button

Started on	Sunday, 3 April 2022, 7:28 PM
State	Finished
Completed on	Sunday, 3 April 2022, 7:29 PM
Time taken	1 min 16 secs
Grade	**4.00** out of 4.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

The purpose of a functional switch is to

control the operation of the circuit ✓.

AS/NZS 3000:2018 states that a functional switch

need not operate in all active conductors ✓.

Refer to content page 6.2 and AS/NZS 3000:2018 Clauses 2.3.7.1 and 2.3.7.2

Question 2

Correct

Mark 1.00 out of 1.00

Which of the following control devices are functional control switches?

Select one or more:

- [ ] a. A circuit breaker
- [x] b. A three-heat switch
- [ ] c. A load-break isolator
- [x] d. A simmerstat
- [ ] e. An emergency stop pushbutton
- [x] f. A motor STOP/START station
- [x] g. A light switch

Refer to content pages 6.1, 6.2 and AS/NZS 3000:2018 Clause 2.3.7

The correct answer is: A light switch, A simmerstat, A motor STOP/START station, A three-heat switch

Question 3

Correct

Mark 1.00 out of 1.00

The purpose of a functional control switch is to:

Select one or more:

- [ ] a. facilitate inspection, testing and maintenance
- [ ] b. minimise inconvenience in the event of a fault
- [ ] c. protect persons, livestock and property from harmful effects
- [x] d. ensure the installation functions as intended
- [x] e. facilitate safe operation

Refer to content pages 6.2 and AS/NZS 3000:2018 Clause 1.6.1

The correct answer is: ensure the installation functions as intended, facilitate safe operation

Question 4

Correct

Mark 1.00 out of 1.00

Which of the following devices is not permitted to be used as a functional control switch?

Select one:

- a. A fuse ✓
- b. A semi-conductor device
- c. A pushbutton
- d. A simmerstat

Refer to content pages 6.2 and AS/NZS 3000:2018 Clause 2.3.7.2

The correct answer is: A fuse

Josue De de Oliveira Moura Log out

HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0 / TOPIC 6 SELECTING DEVICES FOR ISOLATION AND SWITCHING / TOPIC 6 CONTENT QUIZ

Started on	Monday, 4 July 2022, 6:30 PM
State	Finished
Completed on	Monday, 4 July 2022, 11:05 PM
Time taken	4 hours 35 mins
Grade	**10.00** out of 10.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Which of the following is important to consider when selecting switching devices for an electrical installation?

Select one:

- a. Circuit operating voltage and demand
- b. The type of switching required
- c. The installation conditions
- d. All of these ✓

Refer to content pages 6.1 and 6.2

The correct answer is: All of these

Question 2

Correct

Mark 1.00 out of 1.00

Which of the following requirements applies to an isolation device?

Select one:

- a. Must be capable of being overridden remotely
- b. Must be installed in a position that is not readily accessible
- c. Must have a minimum of rating of IP56
- d. Must be identified to indicate the circuit or equipment they isolate ✓

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 2.3.2.2.2

The correct answer is: Must be identified to indicate the circuit or equipment they isolate

Question 3

Correct

Mark 1.00 out of 1.00

Emergency switches must be provided in an electrical installation:

Select one:

- a. to protect circuit conductors against the damaging effects of overcurrent
- b. to remove unexpected danger ✓
- c. to ensure proper functioning of the connected equipment
- d. to disconnect the supply where mechanical maintenance work might involve the risk of physical injury

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 2.3.5.1

The correct answer is: to remove unexpected danger

Question 4

Correct

Mark 1.00 out of 1.00

An example of an emergency switch is:

Select one:

- a. the test button on an RCD
- b. an emergency stop button ✓
- c. the main switch of a lift service
- d. a Type D circuit breaker

Refer to content page 6.1

The correct answer is: an emergency stop button

Question 5

Correct

Mark 1.00 out of 1.00

Which of the following requirements applies to an isolation device?

Select one:

- a. Must operate in all circuit conductors
- b. Must be installed out of reach
- c. Must be a semiconductor device
- d. Must have clearly labeled ‘ON’ and ‘OFF’ positions ✓

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 2.3.2.2.1 (c)

The correct answer is: Must have clearly labeled ‘ON’ and ‘OFF’ positions

Question 6

Correct

Mark 1.00 out of 1.00

What is the purpose of functional (control) switching in an electrical installation?

Select one:

- a. To minimize inconvenience in the event of a fault
- b. To facilitate safe operation ✓
- c. To facilitate inspection, testing and maintenance
- d. To protect persons, livestock and property from harmful effects

Refer to content page 6.2 and AS/NZS 3000:2018 Clause 2.3.7.1

The correct answer is: To facilitate safe operation

Question 7

Correct

Mark 1.00 out of 1.00

The purpose of providing each circuit of an electrical installation with an isolation device is to:

Select one:

- a. facilitate safe operation, inspection, testing and maintenance ✓
- b. ensure compatibility with the supply
- c. ensure the installation functions as intended
- d. protect persons, livestock and property from harmful effects

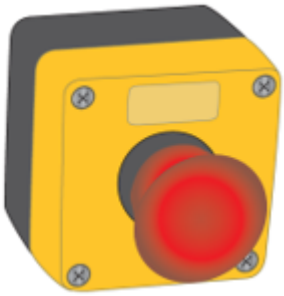
Refer to content page 6.1

The correct answer is: facilitate safe operation, inspection, testing and maintenance

Question 8

Correct

Mark 1.00 out of 1.00



Which of the following is a suitable application for the switch pictured above?

Select one:

- a. Light switch
- b. Emergency stop switch for a conveyor system ✓
- c. Main switch
- d. Isolator for an electric stove

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 2.3.5.2

The correct answer is: Emergency stop switch for a conveyor system

Question 9

Correct

Mark 1.00 out of 1.00

According to AS/NZS 3000:2018, a shut-down device for mechanical maintenance is required to operate in all active and neutral conductors.

Select one:

- a. True
- b. False ✓

Refer to content page 6.1 and AS/NZS 3000:2018 Clause 2.3.6.3

The correct answer is: False

Question 10

Correct

Mark 1.00 out of 1.00

Electrically actuated equipment with hazardous moving mechanical parts must be provided with:

Select one:

- a. a shut-down device for mechanical maintenance
- b. emergency stopping devices
- c. an isolator
- d. All of these ✓

Refer to content page 6.1 and AS/NZS 3000:2018 Clauses 1.5.13, 2.3.2.1.1, 2.3.5.1 and 2.3.6.1

The correct answer is: All of these

Josue De de Oliveira Moura Log out

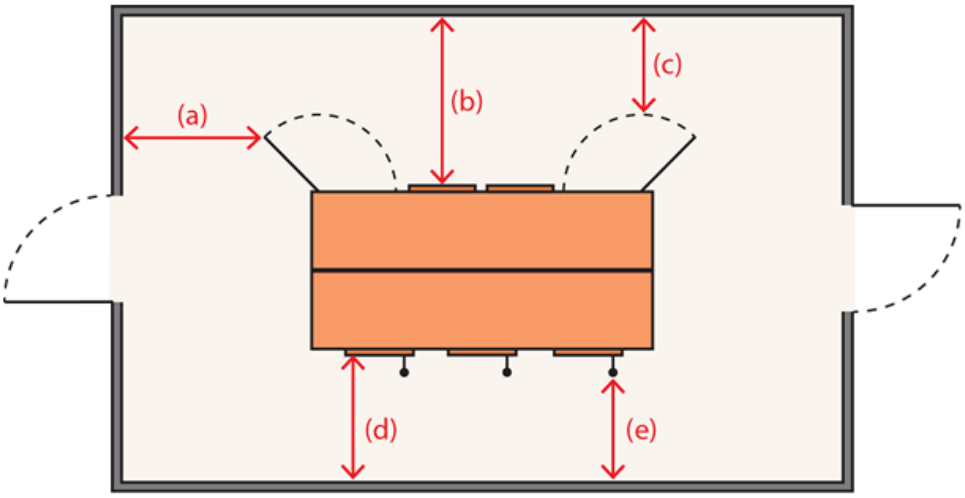
HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0 / TOPIC 7.1 LEARNING ACTIVITY

Started on	Tuesday, 12 April 2022, 7:42 PM
State	Finished
Completed on	Tuesday, 12 April 2022, 7:59 PM
Time taken	16 mins 41 secs
Grade	**8.00** out of 8.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00



What are the minimum distances indicated in the switchroom pictured above?

Minimum distance (a): 0.6 m

Minimum distance (b): 1 m

Minimum distance (c): 0.6 m

Minimum distance (d): 1 m

Minimum distance (e): 0.6 m

Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.10.2.2 and Figures 2.19 to 2.24

Question 2

Correct

Mark 1.00 out of 1.00

According to AS/NZS 3000:2018, the main switchboard of an installation is required to be readily accessible, and located within easy access of an entrance to the building.

Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.10.2.3 (a)

Question 3

Correct

Mark 1.00 out of 1.00

Identify whether the following statements are true or false in relation to AS/NZS 3000:2018 requirements for switchboards.

It is not necessary to indicate the location of a main switchboard in a single domestic installation.	True
It is prohibited to install the main switchboard of a multiple domestic installation in any single tenancy.	True
An IP66 switchboard is permitted to be installed within a refrigeration room.	False
For a small block of six units, it is permissible to install the main switchboard in one of the ground floor units.	False

Refer to content page 7.1 and AS/NZS 3000:2018 Clauses 2.10.2.3, 2.10.2.4 and 2.10.2.5

Question 4

Correct

Mark 1.00 out of 1.00

A main switchboard must be marked for identification with which words?

Select one:

- a. MAIN SWITCHBOARD
- b. HIGH VOLTAGE
- c. MAIN FEEDER
- d. DANGER
- e. POWER DISTRIBUTION

Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.10.2.4

The correct answer is: MAIN SWITCHBOARD

Question 5

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 requires that:

- Switchboard equipment is marked or arranged to indicate the corresponding active and neutral ✓ conductors for each circuit.
- Protection devices installed in switchboards are marked to indicate their relationships to the parts of the installation ✓.

Refer to content page 7.1 and AS/NZS 3000:2018 Clauses 2.10.5.2 and 2.10.5.4

Question 6

Correct

Mark 1.00 out of 1.00

AS/NZS 3000:2018 states that cable entries into a switchboard enclosure must provide a close fit. This is so that in the event of a fire starting ✓ in the switchboard, the risk of the fire spreading ✓ is reduced.

Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.10.7

Question 7

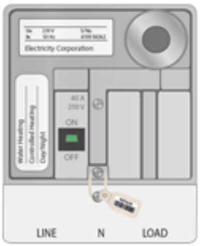
Correct

Mark 1.00 out of 1.00

Identify each of the following items commonly found in electrical switchboards.

Circuit breaker ✓

Terminal link ✓



Controlled load relay ✓

Residual current device (RCD) ✓

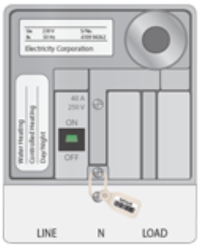
Current transformer (CT) ✓

Your answer is correct.

Refer to content page 7.1

The correct answer is: 

– Circuit breaker,  – Terminal link,



– Controlled load relay, 

– Residual current device (RCD), 

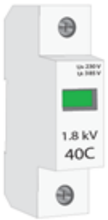
– Current transformer (CT)

Question 8

Correct

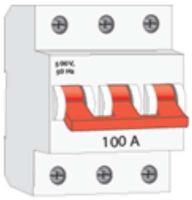
Mark 1.00 out of 1.00

Identify each of the following items commonly found in electrical switchboards.

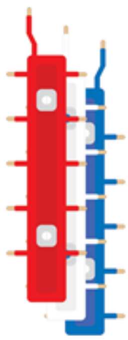


Surge protection device (SPD) ✓

Energy meter ✓



Three pole main switch ✓

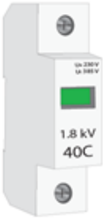


Busbars ✓

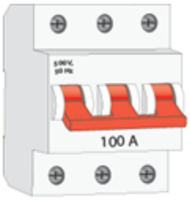
Service fuse ✓

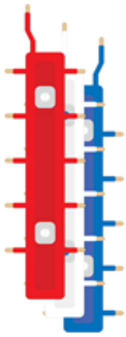
Your answer is correct.

Refer to content page 7.1

The correct answer is: 

– Surge protection device (SPD), 

– Energy meter, 

– Three pole main switch,  – Busbars, 

– Service fuse

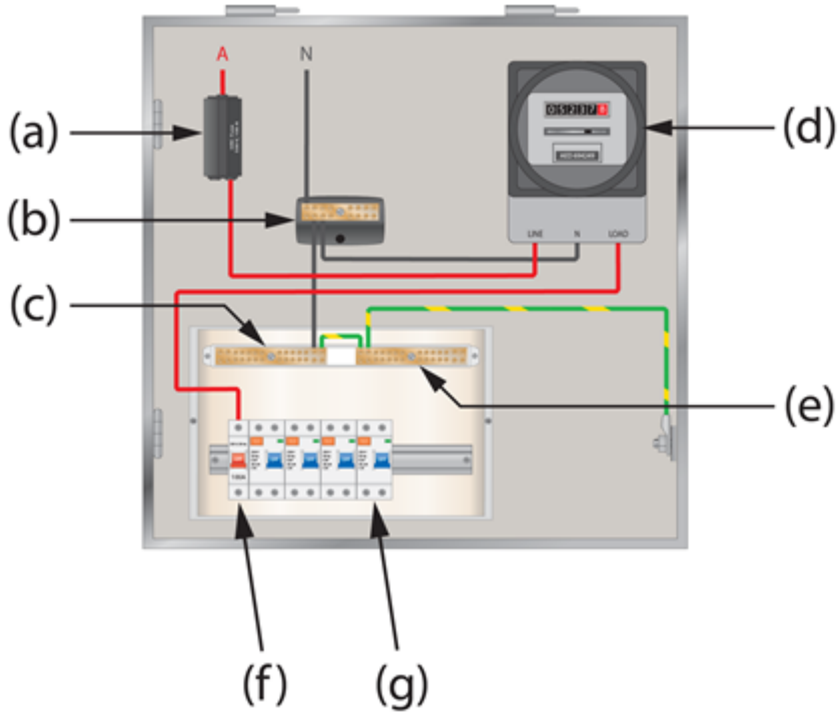
Started on	Tuesday, 12 April 2022, 8:28 PM
State	Finished
Completed on	Tuesday, 12 April 2022, 8:33 PM
Time taken	4 mins 26 secs
Grade	**2.00** out of 2.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

Match the columns to identify the switchboard equipment.



(a)	Service fuse ✓
(b)	Service neutral link ✓
(c)	Consumer neutral link ✓
(d)	Whole current energy meter ✓
(e)	Main earth terminal ✓
(f)	Main switch ✓
(g)	Circuit breaker ✓

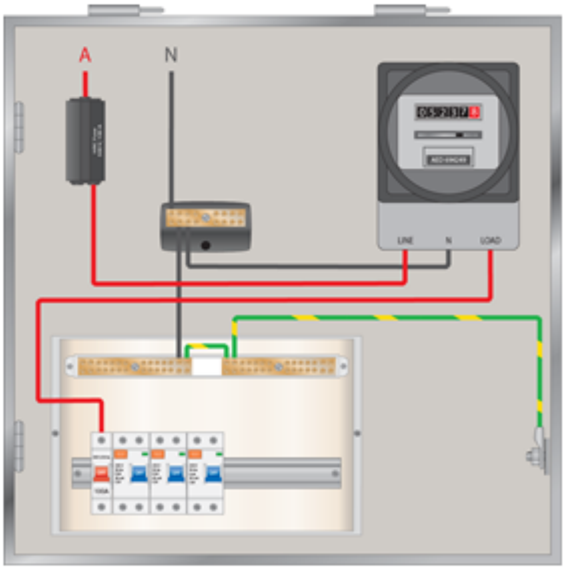
Refer to content page 7.2

The correct answer is: (a) – Service fuse, (b) – Service neutral link, (c) – Consumer neutral link, (d) – Whole current energy meter, (e) – Main earth terminal, (f) – Main switch, (g) – Circuit breaker

Question 2

Correct

Mark 1.00 out of 1.00



The kWh meter in the diagram is connected in series with the main switch.

Answer: True ✓

Does the switchboard arrangement pictured have TOU metering capability?

Answer: No ✓

How many neutral links are there in the switchboard arrangement?

Answer: 2 ✓

Refer to content page 7.2

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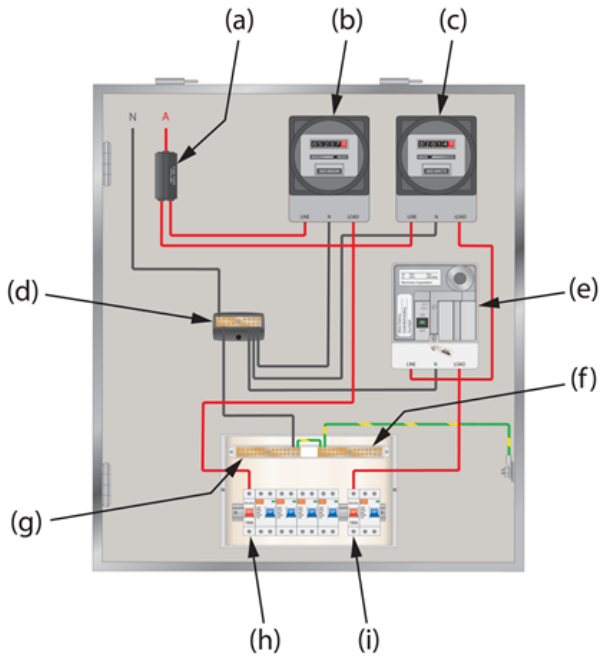
Started on	Thursday, 21 April 2022, 6:51 PM
State	Finished
Completed on	Thursday, 21 April 2022, 7:41 PM
Time taken	49 mins 53 secs
Grade	**4.00** out of 4.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00



Match the columns to identify the switchboard equipment.

(a)	Service fuse ✓
(b)	Peak tariff energy meter ✓
(c)	Off-peak tariff energy meter ✓
(d)	Service neutral link ✓
(e)	Controlled load relay ✓
(f)	Main earth terminal ✓
(g)	Consumer neutral link ✓
(h)	Peak supply main switch ✓
(i)	Off-peak supply main switch ✓

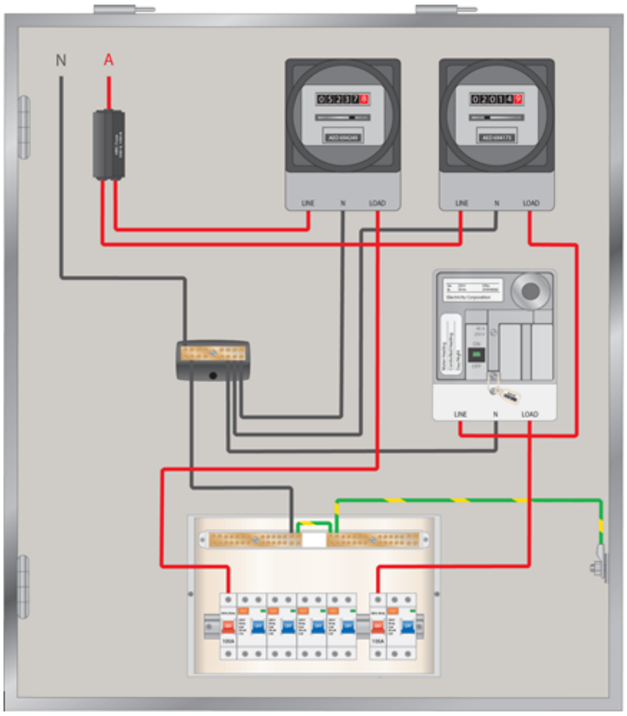
Refer to content page 7.3

The correct answer is: (a) – Service fuse, (b) – Peak tariff energy meter, (c) – Off-peak tariff energy meter, (d) – Service neutral link, (e) – Controlled load relay, (f) – Main earth terminal, (g) – Consumer neutral link, (h) – Peak supply main switch, (i) – Off-peak supply main switch

Question **2**

Correct

Mark 1.00 out of 1.00



The load control relay in the diagram is connected in series with the off-peak energy meter, and the off-peak main switch.

How many main switches are there in the installation?

Answer: 2

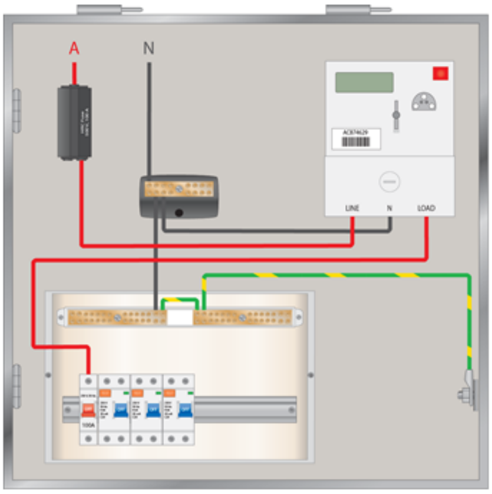
The energy meter neutrals are terminated into the service neutral link.

Refer to content page 7.3

Question 3

Correct

Mark 1.00 out of 1.00



The kWh meter in the diagram is connected in series with the main switch.

Answer: True

Does the switchboard arrangement pictured have TOU metering capability?

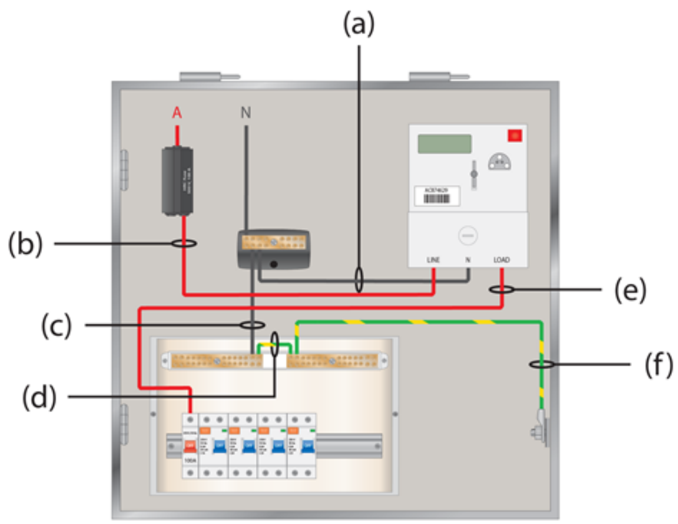
Answer: Yes

Refer to content page 7.3

Question **4**

Correct

Mark 1.00 out of 1.00



Identify the minimum cable sizes for each conductor in the switchboard wiring arrangement. The installation is supplied by 16 mm^2 consumer's mains that are unprotected on the supply side.

Cable	Minimum Cross-sectional Area of Conductor
(a)	4 mm^2 ✓
(b)	16 mm^2 ✓
(c)	16 mm^2 ✓
(d)	16 mm^2 ✓
(e)	16 mm^2 ✓
(f)	16 mm^2 ✓

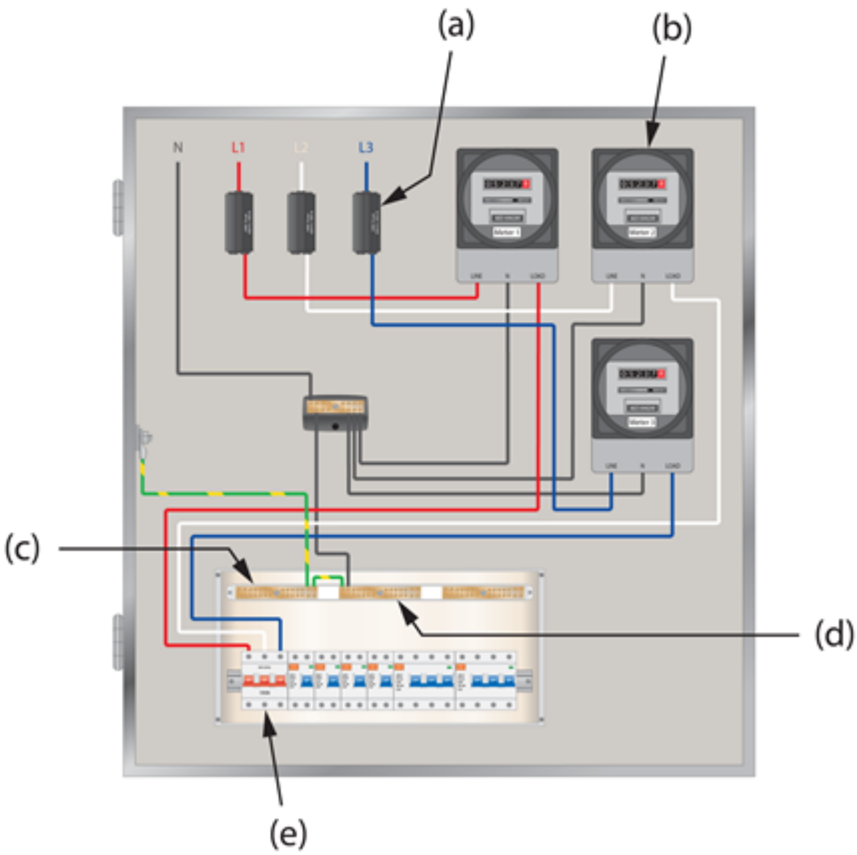
Refer to content pages 7.2 and 7.3

Started on	Thursday, 21 April 2022, 7:41 PM
State	Finished
Completed on	Thursday, 21 April 2022, 7:44 PM
Time taken	3 mins 17 secs
Grade	**2.00** out of 2.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00



Match the columns to identify the switchboard equipment.

(a)	Service fuse
(b)	Induction type energy meter
(c)	Main earth terminal
(d)	Consumer neutral link
(e)	Main switch

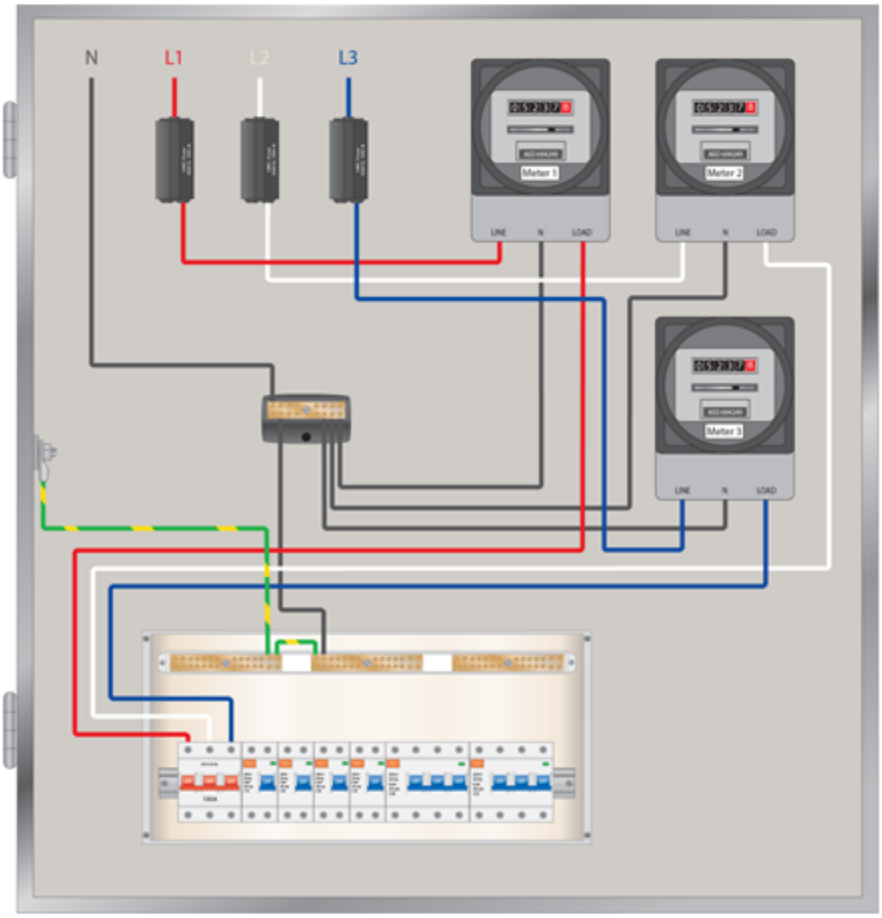
Refer to content page 7.4

The correct answer is: (a) – Service fuse, (b) – Induction type energy meter, (c) – Main earth terminal, (d) – Consumer neutral link, (e) – Main switch

Question 2

Correct

Mark 1.00 out of 1.00



How many supplies are there on the switchboard pictured above?

Answer: 1 ✓

The switchboard arrangement pictured features

a service neutral link and a consumer neutral link ✓.

The switchboard pictured must be clearly and legibly marked for identification with the words MAIN SWITCHBOARD ✓.

How many main switches are there in the installation?

Answer: 1 ✓

Refer to content page 7.4

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HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0

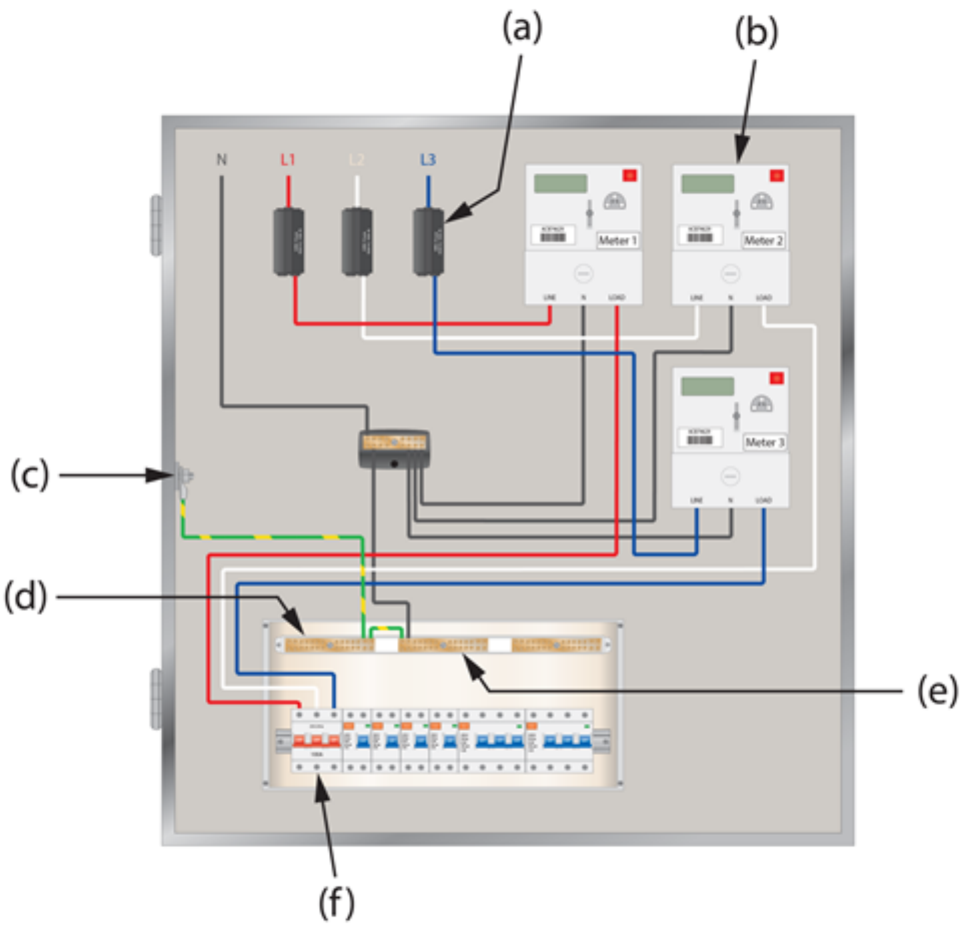
/ TOPIC 7.5 LEARNING ACTIVITY

Started on	Thursday, 21 April 2022, 7:50 PM
State	Finished
Completed on	Thursday, 21 April 2022, 7:52 PM
Time taken	1 min 29 secs
Grade	**2.00** out of 2.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00



Match the columns to identify the switchboard equipment.

(a)	Service fuse ✓
(b)	Single phase electronic meter ✓
(c)	Switchboard enclosure earth bond ✓
(d)	Main earth terminal ✓
(e)	Consumer neutral link ✓
(f)	Main switch ✓

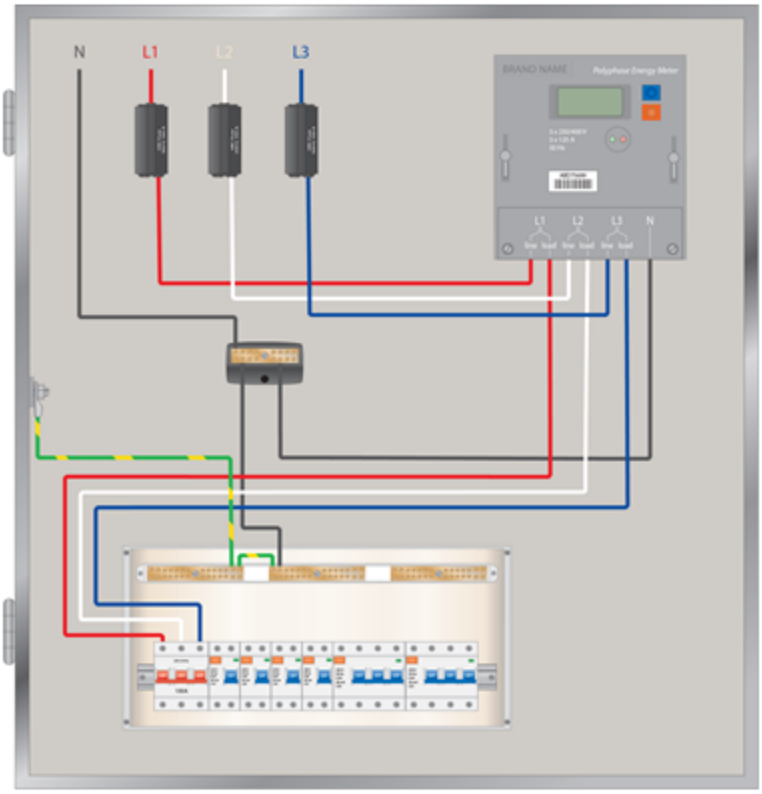
Refer to content page 7.5

The correct answer is: (a) – Service fuse, (b) – Single phase electronic meter, (c) – Switchboard enclosure earth bond, (d) – Main earth terminal, (e) – Consumer neutral link, (f) – Main switch

Question 2

Correct

Mark 1.00 out of 1.00



How many supplies are there on the switchboard pictured above?

Answer: 1 ✓

What type of energy metering has been used?

Answer: Polyphase metering ✓

The switchboard arrangement pictured features a service neutral link and a consumer neutral link ✓.

What is the total number of links on the switchboard pictured above?

Answer: 4 ✓

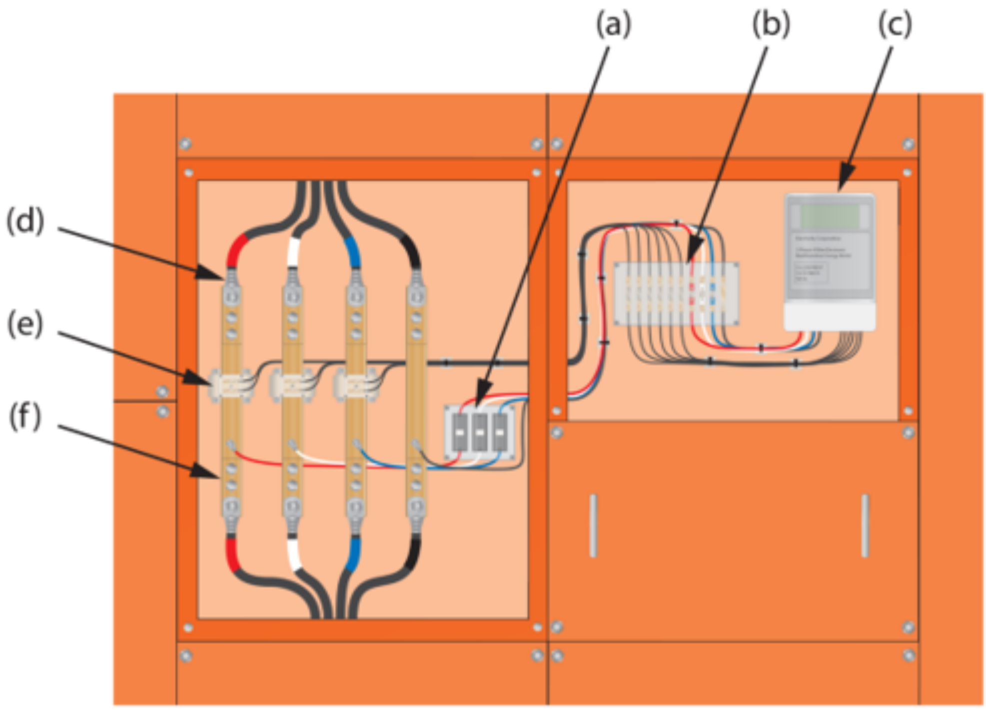
Refer to content page 7.5

Started on	Thursday, 21 April 2022, 8:33 PM
State	Finished
Completed on	Thursday, 21 April 2022, 8:41 PM
Time taken	8 mins 43 secs
Grade	**2.00** out of 2.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00



Match the columns to correctly identify the switchboard components.

(a)	Potential fuses ✓
(b)	Metering test block ✓
(c)	Polyphase energy meter ✓
(d)	Cable lug termination ✓
(e)	Current transformer ✓
(f)	Busbar ✓

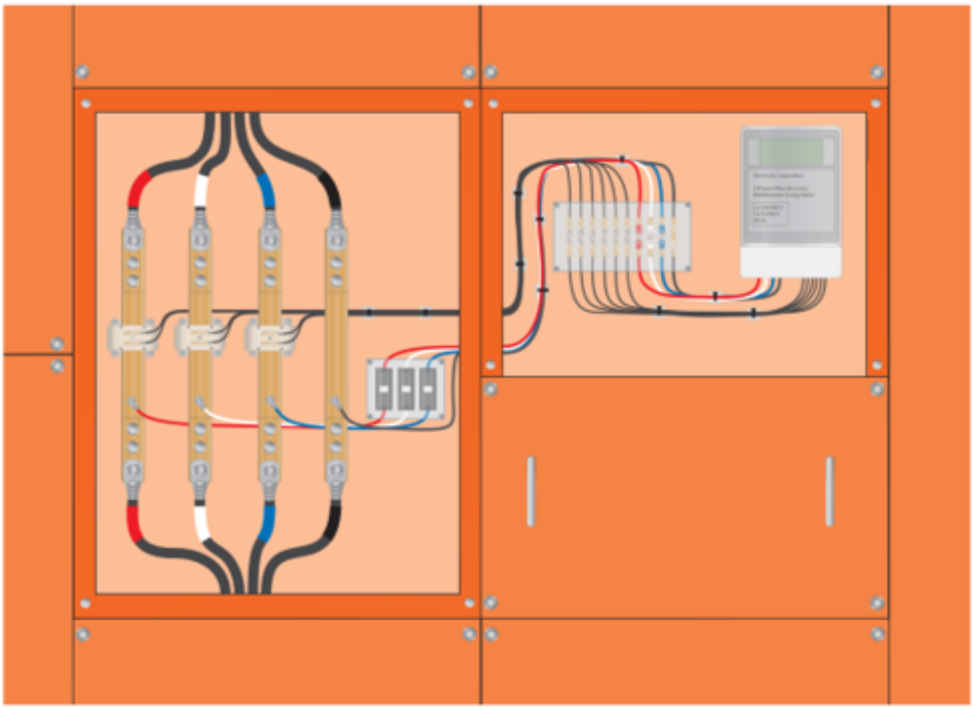
Refer to content page 7.7

The correct answer is: (a) – Potential fuses, (b) – Metering test block, (c) – Polyphase energy meter, (d) – Cable lug termination, (e) – Current transformer, (f) – Busbar

Question 2

Correct

Mark 1.00 out of 1.00



CT metering is used for supplies that are greater than 100 A per phase.

The reason the energy meter is located in a separate switchboard compartment from the consumer's mains is to comply with Network Provider spacing requirements.

Where CT metering is used, the network provider specifies the type of wiring and method of installation for the connection of the current transformer secondary circuit.

Answer: True

For safety, the secondary terminals of a CT must be shorted before the meter is disconnected.

Refer to content page 7.7

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HOME / EXEMPLAR LEARNING / ENERGY SPACE / NAT10809005.R3.0 / TOPIC 7 SWITCHBOARDS / TOPIC 7 CONTENT QUIZ

Started on	Friday, 8 July 2022, 8:27 PM
State	Finished
Completed on	Friday, 8 July 2022, 8:44 PM
Time taken	17 mins 3 secs
Grade	**16.00** out of 16.00 (**100.00**%)

Question 1

Correct

Mark 1.00 out of 1.00

A main switchboard must be installed:

Select one:

- a. on the 1st floor of a multi-storey electrical installation
- b. none of these
- c. within easy access of an entrance to the building ✓
- d. in a dedicated cupboard

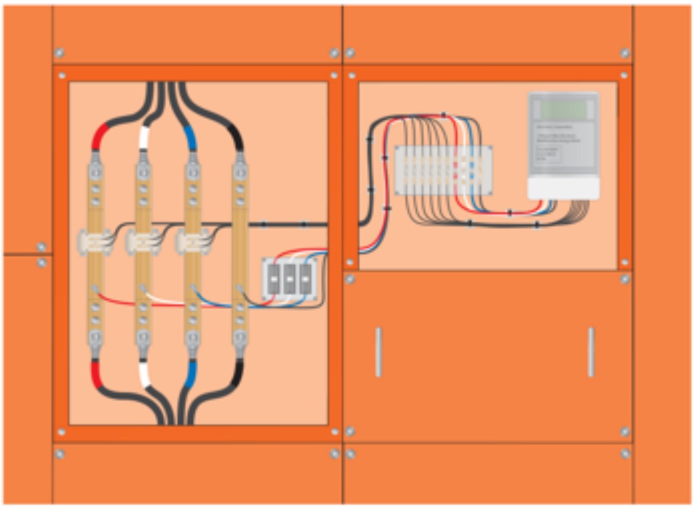
Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.10.2.3

The correct answer is: within easy access of an entrance to the building

Question 2

Correct

Mark 1.00 out of 1.00



The diagram above shows a:

Select one:

- a. single phase, dual tariff main switchboard arrangement
- b. three phase, CT metered main switchboard arrangement ✓
- c. three phase, multiple tenancy main switchboard arrangement
- d. three phase, unmetered main switchboard arrangement

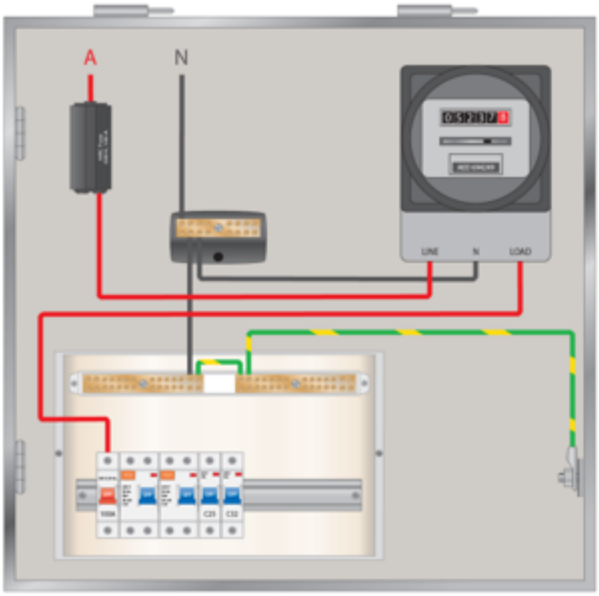
Refer to content page 7.7

The correct answer is: three phase, CT metered main switchboard arrangement

Question 3

Correct

Mark 1.00 out of 1.00



The diagram above shows a:

Select one:

- a. single phase, CT metered main switchboard arrangement
- b. three phase, dual tariff main switchboard arrangement
- c. single phase, dual tariff main switchboard arrangement
- d. single phase, single tariff main switchboard arrangement ✓

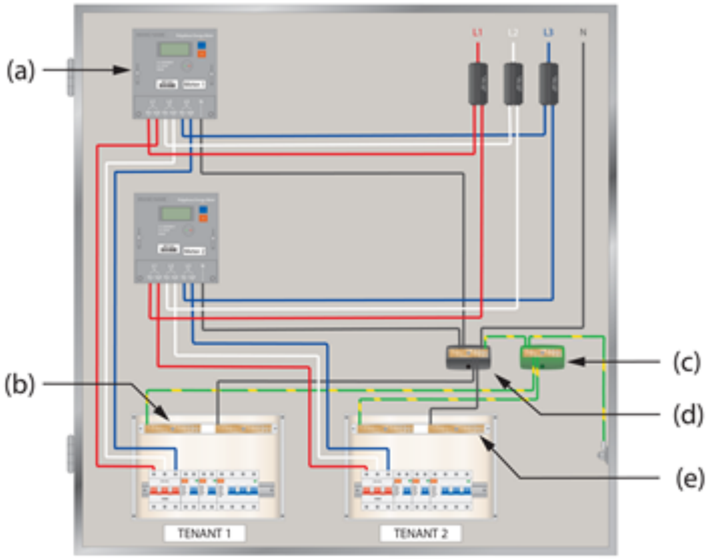
Refer to content page 7.2

The correct answer is: single phase, single tariff main switchboard arrangement

Question 4

Correct

Mark 1.00 out of 1.00



In the switchboard arrangement pictured above, the link indicated by the letter (d) is the:

Select one:

- a. active link
- b. main earth link
- c. service neutral link ✓
- d. protected neutral link

Refer to content page 7.6

The correct answer is: service neutral link

Question 5

Correct

Mark 1.00 out of 1.00

The device pictured above is:

Select one:

- a. a whole current meter
- b. a power transformer
- c. a voltmeter
- d. a current transformer ✓

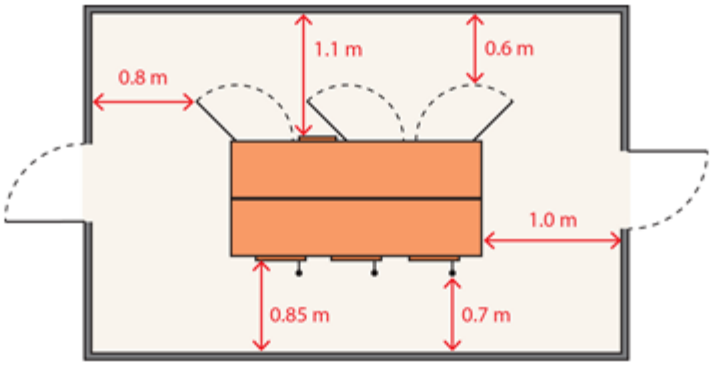
Refer to content page 7.1

The correct answer is: a current transformer

Question 6

Correct

Mark 1.00 out of 1.00



Does the switchroom arrangement pictured above comply with AS/NZS 3000:2018 requirements for location of switchboards?

Select one:

- a. No
- b. Yes

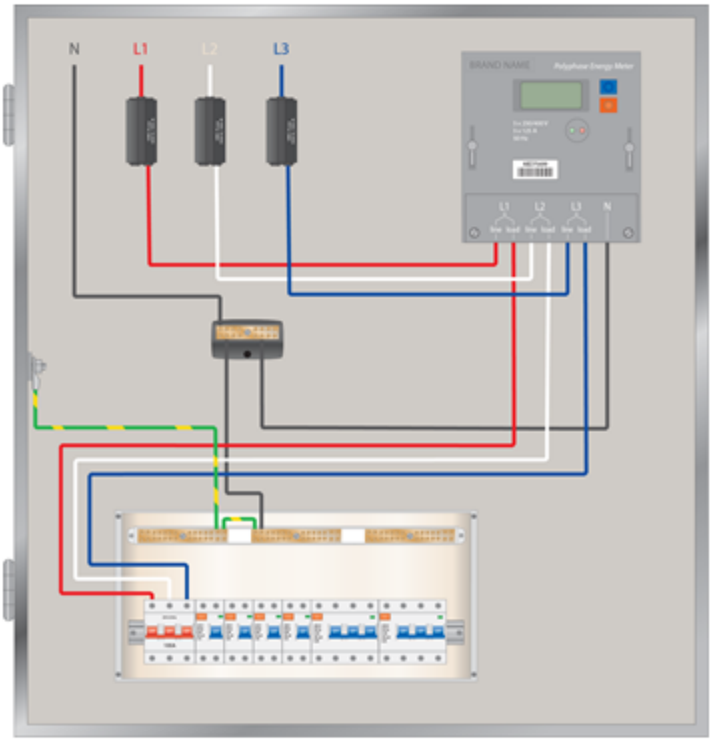
Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.10.2.2 and Figures 2.19 to 2.24

The correct answer is: No

Question 7

Correct

Mark 1.00 out of 1.00



The diagram above shows a:

Select one:

- a. single phase main switchboard with TOU metering
- b. three phase main switchboard with polyphase metering ✓
- c. three phase main switchboard with CT metering
- d. three phase, unmetered main switchboard arrangement

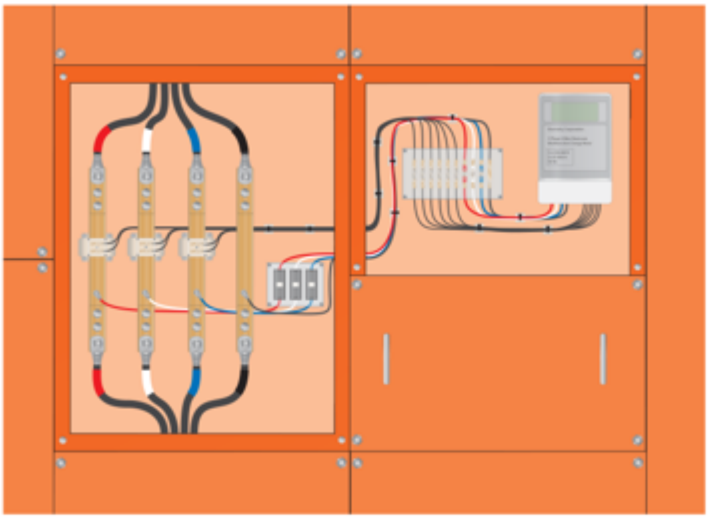
Refer to content page 7.5

The correct answer is: three phase main switchboard with polyphase metering

Question 8

Correct

Mark 1.00 out of 1.00



From the options provided, select the most likely application for the switchboard arrangement pictured above.

Select one:

- a. A hospital ✓
- b. A kebab shop
- c. A coffee shop
- d. A six bedroom house

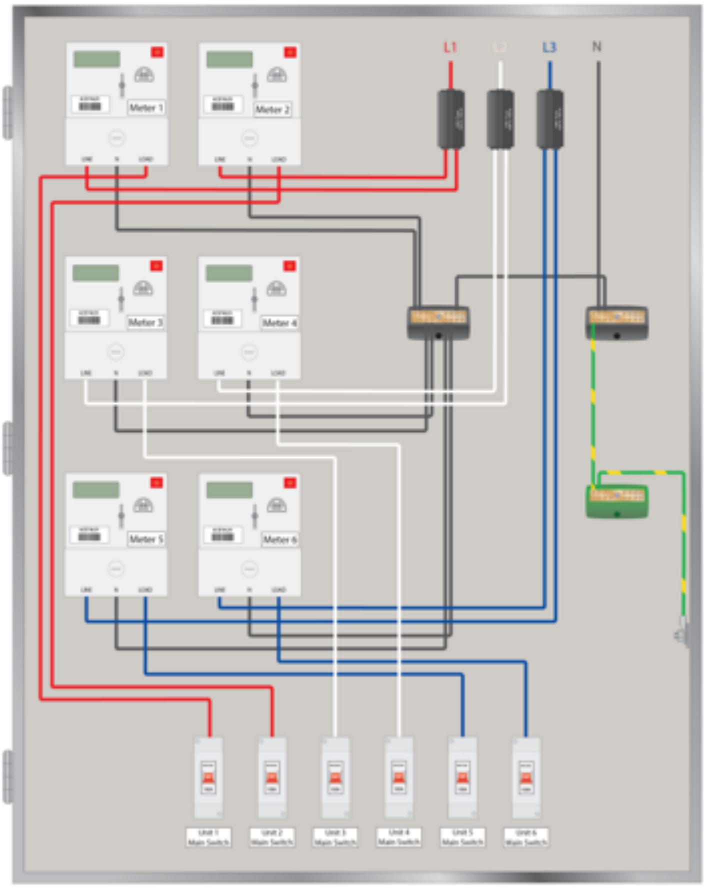
Refer to content page 7.7

The correct answer is: A hospital

Question 9

Correct

Mark 1.00 out of 1.00



The diagram above shows a:

Select one:

- a. three phase, single tariff main switchboard arrangement
- b. three phase, CT metered main switchboard arrangement
- c. three phase, multiple tenancy main switchboard arrangement ✓
- d. single phase, dual tariff main switchboard arrangement

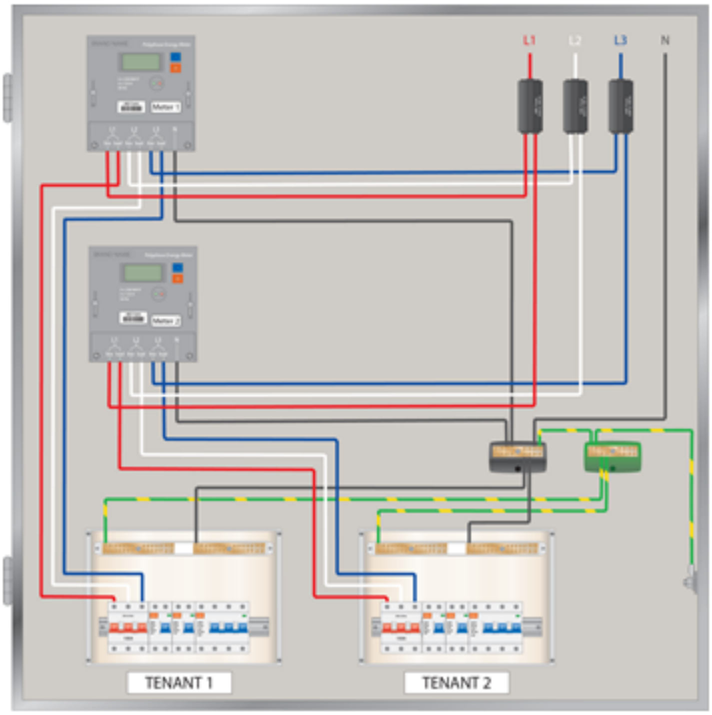
Refer to content page 7.6

The correct answer is: three phase, multiple tenancy main switchboard arrangement

Question **10**

Correct

Mark 1.00 out of 1.00



The diagram above shows a:

Select one:

- a. three phase, dual tariff main switchboard arrangement
- b. single phase, dual tariff main switchboard arrangement
- c. three phase, single tariff main switchboard arrangement
- d. three phase, multiple tenancy main switchboard arrangement ✓

Refer to content page 7.6

The correct answer is: three phase, multiple tenancy main switchboard arrangement

Question 11

Correct

Mark 1.00 out of 1.00

The number of main switches in an electrical installation will depend on:

Select one:

- a. the number of main switchboards
- b. the method of connection to the supply
- c. the number of separate services
- d. the space available on the main switchboard

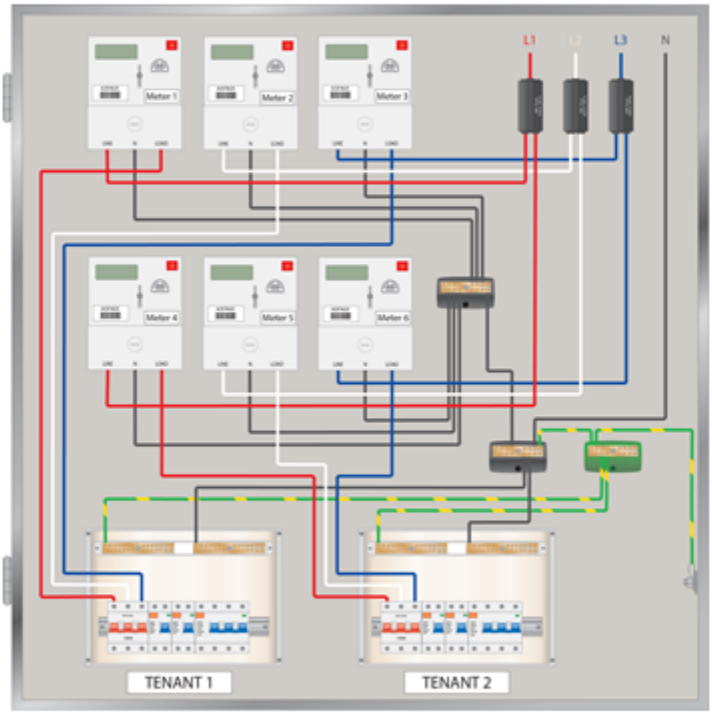
Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.3.3.2

The correct answer is: the number of separate services

Question 12

Correct

Mark 1.00 out of 1.00



How many neutral links are there in the switchboard arrangement pictured above?

Select one:

- a. 2
- b. 3
- c. 4 ✓
- d. 5

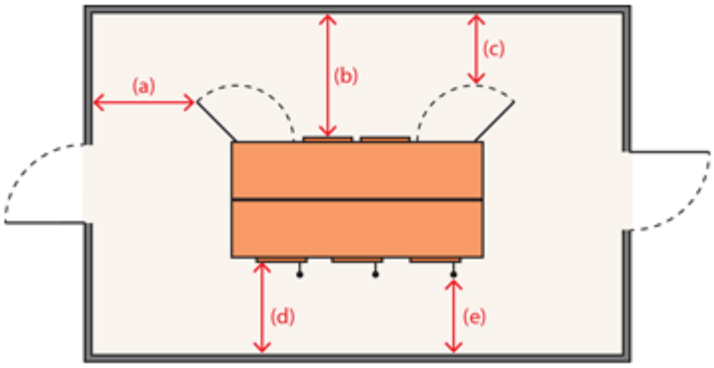
Refer to content page 7.6

The correct answer is: 4

Question 13

Correct

Mark 1.00 out of 1.00



For the switchroom pictured above, what is the minimum clearance specified in AS/NZS 3000:2018 for (b)?

Select one:

- a. 1.0 m ✓
- b. 0.8 m
- c. 0.6 m
- d. 0.4 m

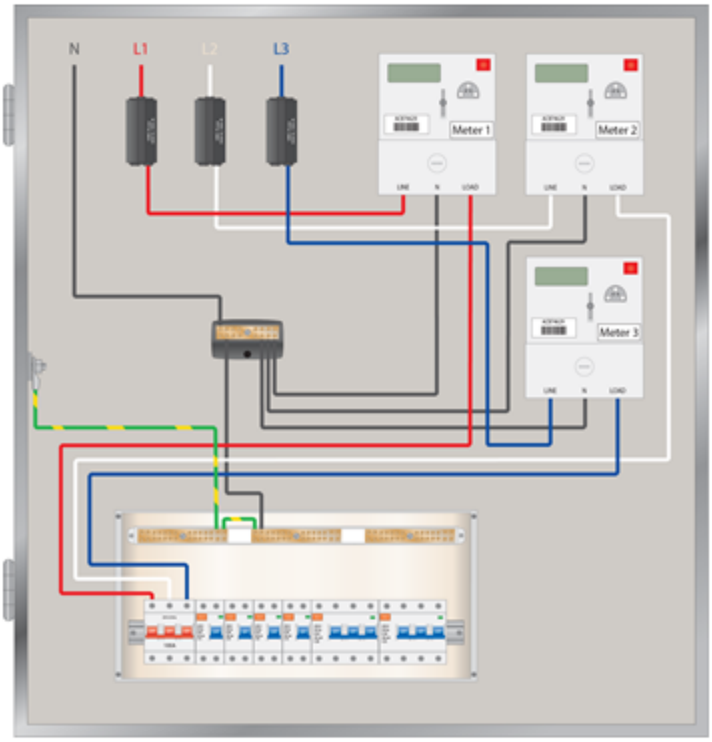
Refer to content page 7.1 and AS/NZS 3000:2018 Clause 2.10.2.2 and Figures 2.19 to 2.24

The correct answer is: 1.0 m

Question 14

Correct

Mark 1.00 out of 1.00



The main switchboard arrangement pictured above would be suitable for the supply of:

Select one:

- a. three shops
- b. a six bedroom house ✓
- c. a block of six units
- d. a shopping centre

Refer to content page 7.5

The correct answer is: a six bedroom house

Question 15

Correct

Mark 1.00 out of 1.00

A whole current meter must be capable of carrying:

Select one:

- a. the full load current of the service ✓
- b. 50 % of the full load current of the service
- c. 75 % of the full load current of the service
- d. 25 % of the full load current of the service

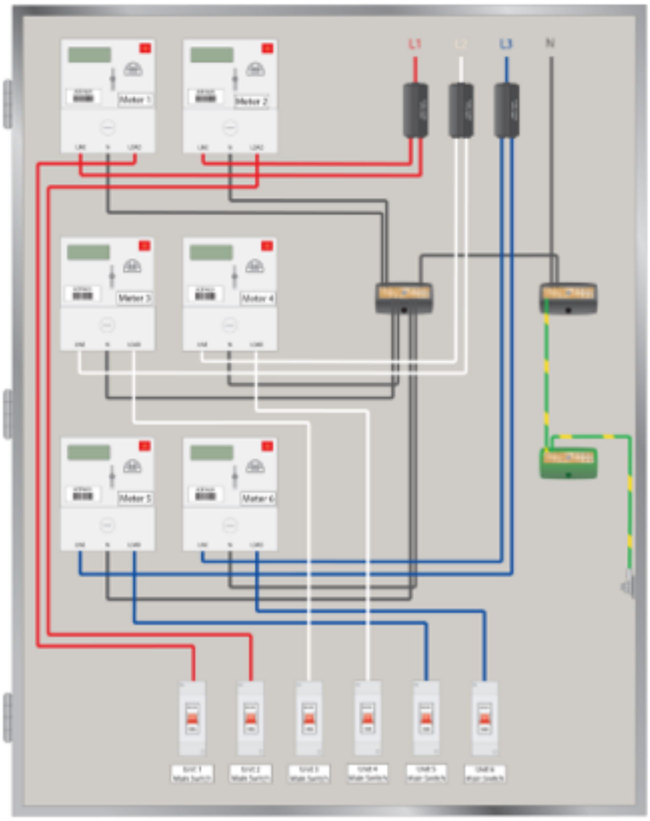
Refer to content page 7.1

The correct answer is: the full load current of the service

Question 16

Correct

Mark 1.00 out of 1.00



The main switchboard arrangement pictured above would be suitable for the supply of:

Select one:

- a. a six bedroom house
- b. a block of six units ✓
- c. a factory unit having a maximum demand of 350 A per phase
- d. a shopping centre

Refer to content page 7.6

The correct answer is: a block of six units