

Topic Skills Practice Cover Sheet

Unit Name:	UEEEL0018 Select wiring systems and select cables for low voltage electrical installations
Topic Title:	Switchboard Arrangements

Skill Practice Number:	10.1
Skill Practice Name:	Local Service and Installation Requirements

Student Name:	
Student ID:	
College/Campus:	
Group:	

Results	
Planning:	
Carryout:	
Completion:	
Overall Results:	
Comments:	

Topic Skills Practice 10.1

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Topic 10. Switchboard Arrangements

Skills Practice 10.1: Local Service and Installation Requirements

Task:

To navigate, interpret and extract information relating to the installation and connection of switchboards from your State/Territory Service and Installation Rules (SIR).

Objectives:

At the completion of this skills practice, you should be able to:

- Understand the conventions and layouts used in Service and Installation Rules.
- Use the Table of Contents to locate specific requirements within Service and Installation Rules.
- Use the Index to locate specific requirements within Service and Installation Rules.

Topic Skills Practice 10.1

1. Planning the Skills Practice

1.1 Prepare to Use Service and Installation Rules (SIR)

1.1.1 Obtain the following materials:

- Service and Installation Rules (SIR) from your State/Territory
- Pens/pencils

2. Carrying Out the Skills Practice

2.1 Use Service and Installation Rules (SIR)

2.1.1 Answer the following questions using your State/Territory Service and Installation Rules (SIR). Provide applicable clauses/references to support each answer.

1. According to your service and installation rules, what is the definition of 'consumer's mains'?

10.1 Consumer mains are conductors between the connection point and the main service equipment enclosure and form part of an electrical installation. Consumer main may be overhead, underground or within the structure.

2. Explain the terms 'point of attachment' and 'point of supply'.

The point at which the mechanical loads of overhead conductors of an overhead service or overhead consumer mains are terminated on a customer's building pole or structure

3. According to your local rules, what is the minimum insulation resistance to be measured between the conductors of a new service and earth?

1.12.3.1 the insulation resistance between conductors and between conductors and earth of new services shall not be less than 50 MΩ when tested in 500V dc insulation resistance test.

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4. According to your local service and installation rules, what is the maximum voltage drop permitted in an overhead / underground service?

1.12.3.4 (1%)

5. Explain when an electrical installation requires CT metering.

4.16 the customer must supply and install a contactor if electricity is to be supplied with the Provisions of a tariff to a CT metered portion of an installation only during certain hours.

6. Describe the requirements in your state or territory regarding who can connect and disconnect electrical installations to the supply network.

Level 2 service provider can install or alter the electricity connection in NSW.

7. Describe the requirements in your state or territory regarding the balancing of loads in multiphase electrical installations, and explain why this is necessary.

1.17.3 The loading of installation or separately metered part of an installation which is supplied by more than one phase must be arranged so that the maximum demand in active service conductors is not more than 25A above the current in any other active service conductor

8. Describe the requirements in your state or territory for the installation of underground consumer's mains. (route, minimum depth, protection, marking etc.).

2.4.1.1 Underground service cable of less than 240mm² must be installed in conduit through-out their entire length. (a) Cables must be installed in UPVC conduit for category (A) System (b) the thus conduit must be maintained a minimum 500mm depth throughout the entire length.

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9. What is the maximum permissible span for an overhead service?

3.5 The maximum span for an overhead service up to 100A is 50m. For service greater than 100A minimum span is 30m.

10. What is the minimum height for overhead service lines at the point of attachment on a house?

3.7.1 The minimum height if POA is 3m

11. What is the minimum size for copper consumer's mains in your state or territory?

NSWSIR 8.6.13/ASNZS300 7.5.11.2, 3.12.2.2 copper 0mm², Aluminium 16mm²

12. Describe your local requirements for location and accessibility of metering equipment.

4.2 The access to any enclosure for service equipment is never restricted or made unsafe. The location must always be kept clear.

13. List the minimum and maximum heights for mounting service protection devices.

4.6 No longer than 0.6m. No more than 2m above the ground, floor or platform.

14. Describe the requirements for the installation of service and metering neutral links including (as a minimum) type, location, current carrying capacity and identification.

4.10 The links must (a) be the all insulated type

Topic Skills Practice 10.1

(b) be fitted with cover suitable for sealing

(c) have a separate tunnel terminal for each conductor which is cramped not less than 2 screws

(d) have a current rating not less than the current carrying capacity of the associated incoming conductor.

(e) Not more than 2m, less than 500m, (f) service (or) meter natural link must be labelled

(f) installed at near of panel.


15. Describe your local requirements for positioning, connection and sealing of whole current energy meters.

4.12.1 In installation where whole current carrying metering is used, a control device must be provided on the load side of the meter and load control equipment at the switch board

enclosure to enable each individual tariffs to be isolated and sealed. The means of isolation

(a) the switch toggle must be sealed in open position in an acceptance manner (b) be

comprise the consumer main switch. (c) must be an independence device.

	 Feedback	Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date
			

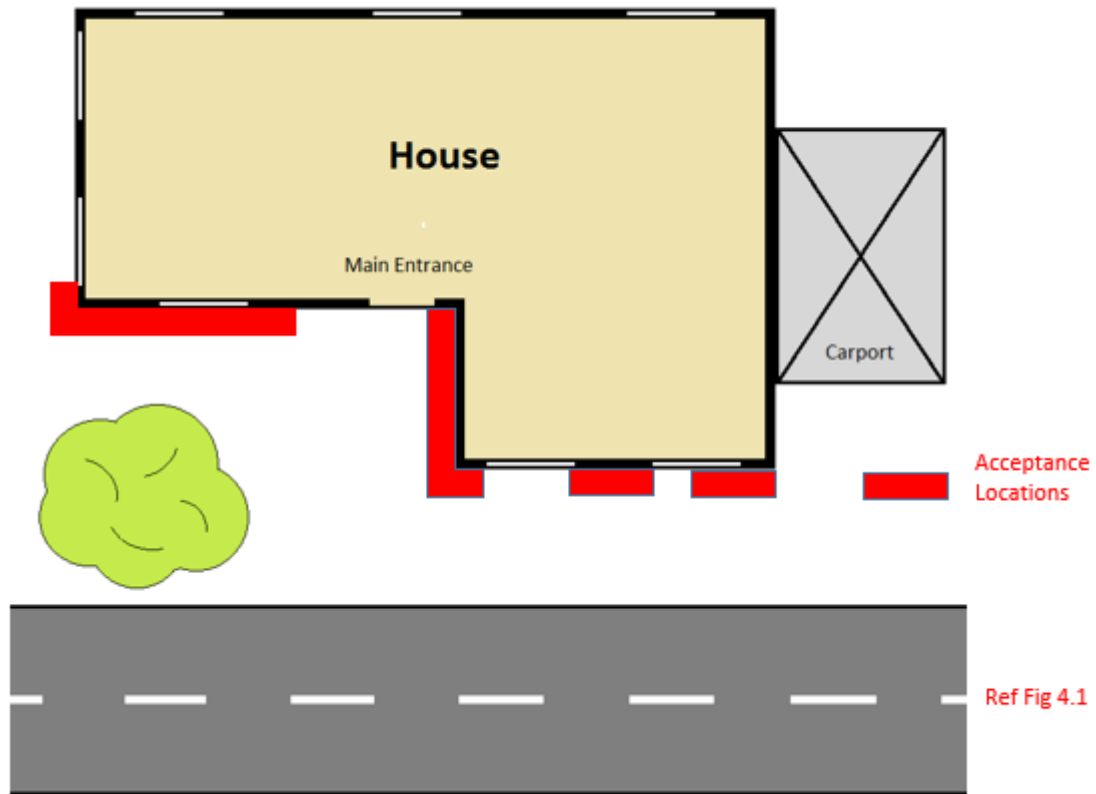
3. Completing the Skills Practice




3.1 Skills Practice Review Questions

3.1.1 After you have successfully completed the questions in section 2, answer the following review question.

1. Indicate a suitable location for the main switchboard on the following domestic site, in accordance with your local service and installation rules.

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	 Feedback	Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date	

Topic Skills Practice Cover Sheet

Unit Name:	UEEEL0018 Select wiring systems and select cables for low voltage electrical installations
Topic Title:	Switchboard Arrangements

Skill Practice Number:	10.2
Skill Practice Name:	Single Phase, Single Tariff Switchboard Arrangements

Student Name:	
Student ID:	
College/Campus:	
Group:	

Results	
Planning:	
Carryout:	
Completion:	
Overall Results:	
Comments:	

Topic Skills Practice 10.2

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Topic 10. Switchboard Arrangements

Skills Practice 10.2: Single Phase, Single Tariff Switchboard Arrangements

Task:

To design and draw a single phase, single tariff main switchboard layout incorporating network provider and customer equipment.

Objectives:

At the completion of this skills practice, you should be able to:

- Use AS/NZS 3000:2018 and your local service and installation rules to design a single phase, single tariff switchboard arrangement.
- Draw the necessary equipment for a single phase, single tariff switchboard arrangement.
- Draw the necessary connections for the connection of a single phase, single tariff switchboard arrangement.

1. Planning the Skills Practice

1.1 Research Single Phase, Single Tariff Switchboard Arrangements

1.1.1 Research AS/NZS 3000:2018, your local service and installation rules, and the following reference material to determine an acceptable arrangement of wiring and equipment for a single phase, single tariff main switchboard:

- Energy Space content pages 10.1 and 10.2.
- Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill
- Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

1.1.2 Once you feel you have sufficient knowledge of the subject matter, obtain the following materials to assist you with carrying out this skills practice:

- AS/NZS 3000:2018 Wiring Rules
- Local Service and Installation Rules (SIR)
- Suppliers catalogues – switchboard equipment
- Pens/pencils
- Ruler

Topic Skills Practice 10.2

2. Carrying Out the Skills Practice




2.1 Design the Switchboard Arrangement

2.1.1 Use AS/NZS 3000:2018 and your local service and installation rules to design a main switchboard arrangement for a single phase, single tariff electrical installation. The installation is supplied by 16 mm² protected consumers mains, and is to include the following circuits:

Ref.	Circuit	Connected Load
L1	Lighting circuit 1	12 x lighting points
L2	Lighting circuit 2	12 x lighting points
P1	Socket outlets circuit 1	8 x 10 A double socket outlets
P2	Socket outlets circuit 2	8 x 10 A double socket outlets
P3	Socket outlets circuit 3	1 x 15 A single socket outlet
R	Electric stove circuit	1 x 6.8 kW fixed electric stove unit
HWS	hot water heater	1 x 7 kW fixed instantaneous hot water heater

2.1.2 In the space below, make a list of all service and customer equipment required for the main switchboard arrangement, including suitable final subcircuit protective devices. For guidance, some fields have been pre-filled.

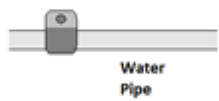
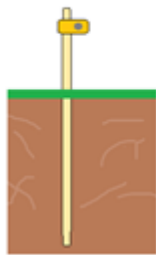
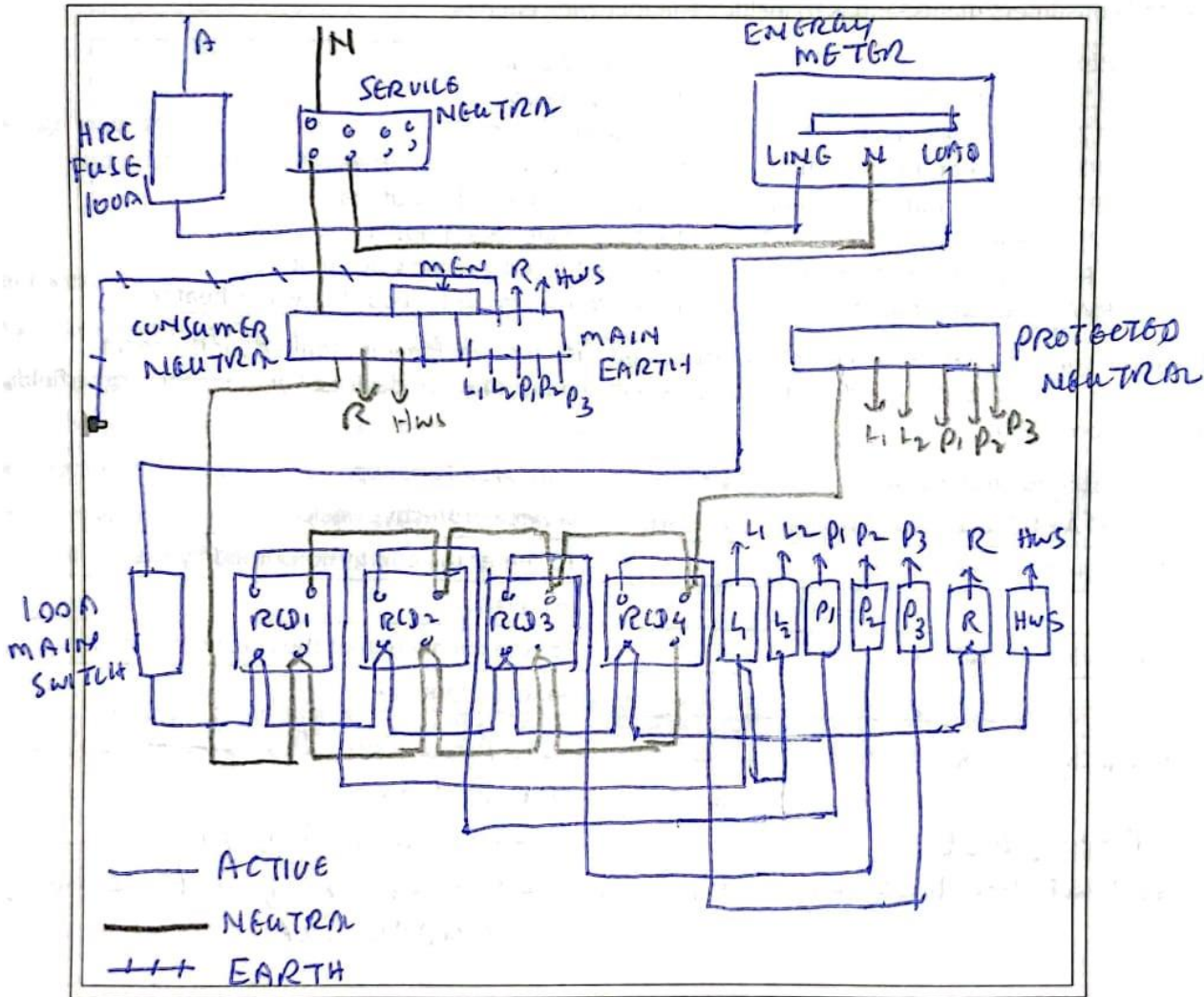
Switchboard Equipment	Purpose / Function
1 x 100 A HRC fuse	Service protective device.
1 x single tariff kWh meter	To meter the energy consumed by the Installation.
1 x service neutral link	For the connection of the consumer's mains neutral conductor.
RCD 1,2,3,4	For Providing the current leakage to earth. Protection.
Energy meter	To measure energy.
Circuit breakers L ₁ L ₂ P ₁ P ₂ P ₃	For energizing and de- energizing the Appliance.
Circuit breaker (R)	For energizing and de- energizing the stove.
Circuit breaker (Hws)	For energizing and de- energizing the Hot water heater.
1x Consumer Neutral Link	To connect RCD, R and HWS Neutrals.
1x Protected Neutral Link	To provide Neutral connection to light and power outlets.
1x Main Earth Link	To provide earthing connection to main earth and appliance earth.




	 Feedback Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date <hr/>	
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Topic Skills Practice 10.2

2.2 Draw the Switchboard Arrangement

2.2.1 On the template, draw all necessary equipment, conductors and terminations for the switchboard arrangement. Show all wiring up to the line side of each protective device, and label switchboard equipment as per AS/NZS 3000:2018 requirements.



	 Feedback	Have you teacher/trainer check your installation diagram	Teacher/Trainer Initials and Date
			

Topic Skills Practice 10.2

3. Completing the Skills Practice

3.1 Skills Practice Review Questions

3.1.1 When you have successfully completed the activities in Section 2, answer the following review questions. Provide applicable AS/NZS 3000:2018 Clause(s) to support your answers where necessary.

1. How many main switches did you include in your wiring diagram?




1

2. Describe the requirements for orientation of circuit protective devices.

2.10.3.4 – Where two or more circuit breakers are mounted in the same row, the operating mechanism of each shall cause the circuit to open where the operating means are oriented in one general direction.

3. Describe the Wiring Rules requirements regarding the location of a main switchboard. Provide applicable AS/NZS 3000:2018 clauses to support your answers.

2.3.3.4 Mainswitches shall be readily accessible and the means of operating such switches shall be not more than two meters above the ground floor or suitable platform.

	 Feedback	Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date	

Topic Skills Practice Cover Sheet

Unit Name:	UEEEL0018 Select wiring systems and select cables for low voltage electrical installations
Topic Title:	Switchboard Arrangements

Skill Practice Number:	10.3
Skill Practice Name:	Single Phase, Multiple Tariff Switchboard Arrangements

Student Name:	
Student ID:	
College/Campus:	
Group:	

Results	
Planning:	
Carryout:	
Completion:	
Overall Results:	
Comments:	

Topic Skills Practice 10.3

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Topic 10. Switchboard Arrangements

Skills Practice 10.3: Single Phase, Multiple Tariff Switchboard Arrangements

Task:

To design and draw a single phase, multiple tariff main switchboard layout incorporating network provider and customer equipment.

Objectives:

At the completion of this skills practice, you should be able to:

- Use AS/NZS 3000:2018 and your local service and installation rules to design a single phase, multiple tariff switchboard arrangement.
- Draw the necessary equipment for a single phase, multiple tariff switchboard arrangement.
- Draw the necessary connections for the connection of a single phase, multiple tariff switchboard arrangement.

1. Planning the Skills Practice

1.1 Research Single Phase, Multiple Tariff Switchboard Arrangements

1.1.1 Research AS/NZS 3000:2018, your local service and installation rules, and the following reference material to determine an acceptable arrangement of wiring and equipment for a single phase, multiple tariff main switchboard:

- Energy Space content pages 10.1 and 10.2.
- Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill
- Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

1.1.2 Once you feel you have sufficient knowledge of the subject matter, obtain the following materials to assist you with carrying out this skills practice:

- AS/NZS 3000:2018 Wiring Rules
- Local Service and Installation Rules (SIR)
- Suppliers catalogues – switchboard equipment
- Pens/pencils
- Ruler

Topic Skills Practice 10.3

2. Carrying Out the Skills Practice




2.1 Design the Switchboard Arrangement

2.1.1 Use AS/NZS 3000:2018 and your local service and installation rules to design a main switchboard arrangement for a single phase, multiple tariff electrical installation. The installation is supplied by 16 mm² unprotected consumers mains, and is to include the following circuits:

Ref.	Circuit	Connected Load
L1	Lighting circuit 1	16 x lighting points
P1	Socket outlets circuit 1	9 x 10 A double socket outlets
P2	Socket outlets circuit 2	6 x 10 A double socket outlets
P3	Socket outlets circuit 3	1 x 15 A single socket outlet
R	Electric stove circuit	1 x 6.4 kW fixed electric stove unit
HWS	hot water heater	1 x 4.7 kW off-peak storage hot water heater

2.1.2 In the space below, make a list of all service and customer equipment required for the main switchboard arrangement, including suitable final subcircuit protective devices. For guidance, some fields have been pre-filled.

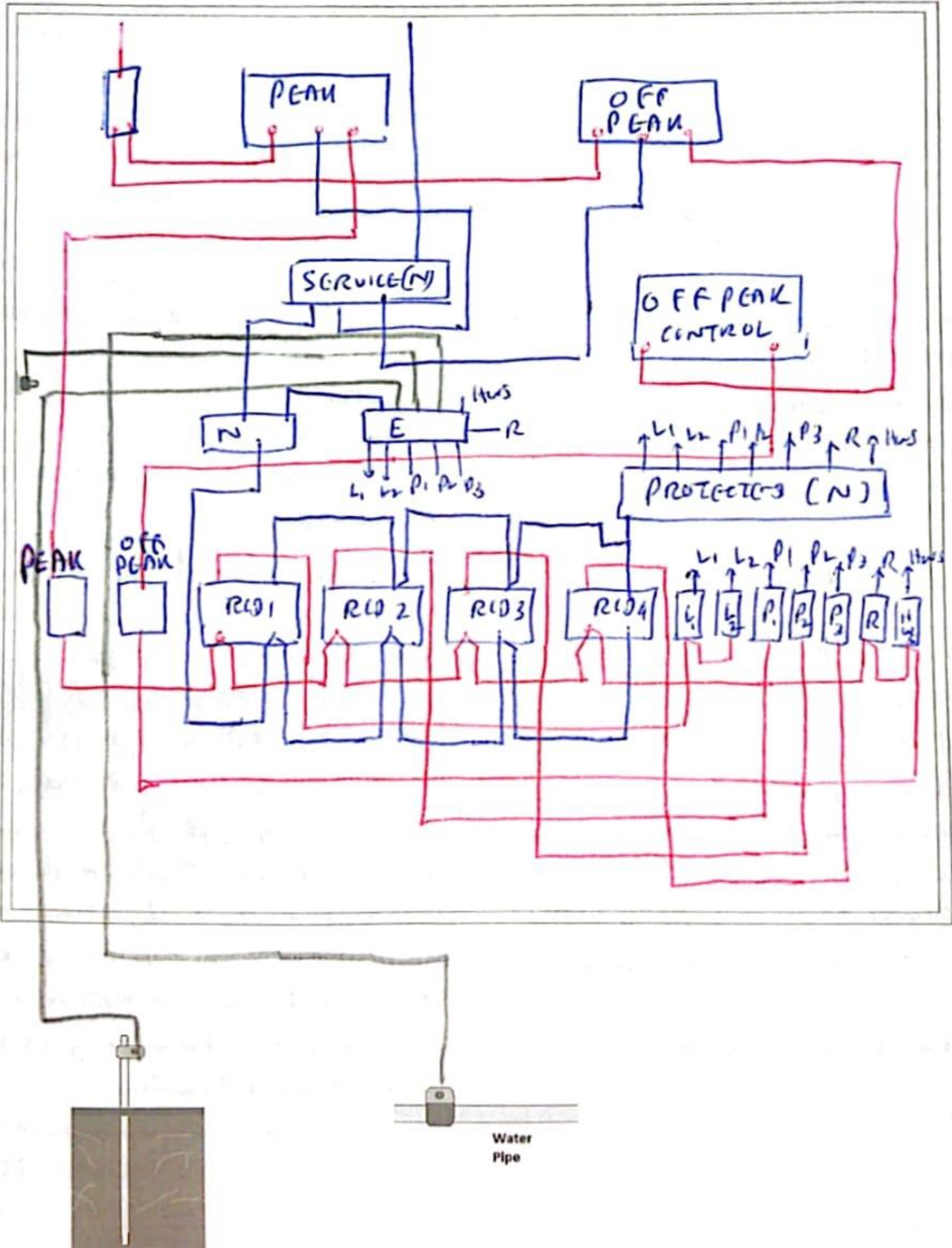
Switchboard Equipment	Purpose / Function
1 x 100 A HRC fuse	Service protective device.
1 x service neutral link	For the connection of the consumer's mains Neutral conductor.
RCD 1,2,3,4	To provide current leakage to ease protection
Circuit breaker L ₁ L ₂ P ₁ P ₂ P ₃ P ₄	Energize/de – energize
Circuit breaker R	Energize/ de energizing stove
Circuit breaker HWS	Energizing/ de energize HWS
Peak energy meter	To measure peak energy
Off peak energy meter	To measure off peak energy
Off peak control switch	To control off peak power
1x Consumer neutral Link	To control RCD, R, HWS Neutral
1x To provide neutral Link	To provide neutral connection to light & power circuit
1x main earth Link	To provide earthing connection to main Earth.

	 Feedback Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date <hr/>	
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Topic Skills Practice 10.3

2.2 Draw the Switchboard Arrangement

2.2.1 On the template, draw all necessary equipment, conductors and terminations for the switchboard arrangement. Show all wiring up to the line side of each protective device, and label switchboard equipment as per AS/NZS 3000:2018 requirements.



Topic Skills Practice 10.3

	 <i>Feedback</i>	Have your teacher/trainer check your installation diagram	Teacher/Trainer Initials and Date	

3. Completing the Skills Practice

3.1 Skills Practice Review Questions

3.1.1 When you have successfully completed the activities in Section 2, answer the following review questions. Provide applicable AS/NZS 3000:2018 Clause(s) to support your answers where necessary.

1. How many main switches did you include in your wiring diagram?

2

2. What are the AS/NZS 3000:2018 requirements for identification of main switches?




2.3.3.5

(a) Each main switch shall be marked "Main Switch" shall be readily distinguishable from other switch gears by means of grouping.

3. Describe AS/NZS 3000:2018 requirements regarding access to a main switchboard.

2.3.3.4 Main switches shall be readily accessible and the measure of operating such as

Switches shall be not none than 2 meters above the ground floor or a suitable platform.

	 <i>Feedback</i>	Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date	

Topic Skills Practice Cover Sheet

Unit Name:	UEEEL0018 Select wiring systems and select cables for low voltage electrical installations
Topic Title:	Switchboard Arrangements

Skill Practice Number:	10.4
Skill Practice Name:	Three Phase, Single Tariff Switchboard Arrangements

Student Name:	
Student ID:	
College/Campus:	
Group:	

Results	
Planning:	
Carryout:	
Completion:	
Overall Results:	
Comments:	

Topic Skills Practice 10.4

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Topic 10. Switchboard Arrangements

Skills Practice 10.4: Three Phase, Single Tariff Switchboard Arrangements

Task:

To design and draw a three phase, single tariff main switchboard layout incorporating network provider and customer equipment.

Objectives:

At the completion of this skills practice, you should be able to:

- Use AS/NZS 3000:2018 and your local service and installation rules to design a three phase, single tariff switchboard arrangement.
- Draw the necessary equipment for a three phase, single tariff switchboard arrangement.
- Draw the necessary connections for the connection of a three phase, single tariff switchboard arrangement.

1. Planning the Skills Practice

1.1 Research Three Phase, Single Tariff Switchboard Arrangements

1.1.1 Research AS/NZS 3000:2018, your local service and installation rules, and the following reference material to determine an acceptable arrangement of wiring and equipment for a three phase, single tariff main switchboard:

- Energy Space content pages 10.1 and 10.2.
- Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill
- Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

1.1.2 Once you feel you have sufficient knowledge of the subject matter, obtain the following materials to assist you with carrying out this skills practice:

- AS/NZS 3000:2018 Wiring Rules
- Local Service and Installation Rules (SIR)
- Suppliers catalogues – switchboard equipment
- Pens/pencils
- Ruler

Topic Skills Practice 10.4

2. Carrying Out the Skills Practice



2.1 Design the Switchboard Arrangement

2.1.1 Use AS/NZS 3000:2018 and your local service and installation rules to design a main switchboard arrangement for a three phase, single tariff electrical installation. The installation is supplied by 16 mm² unprotected consumers mains, and is to include the following circuits:

Ref.	Circuit	Connected Load
DB1	Distribution board 1	40 A, three phase distribution board
L1	Lighting circuit 1	15 x lighting points
P1	Socket outlets circuit 1	9 x 10 A double socket outlets
P2	Socket outlets circuit 2	1 x 15 A single socket outlet
P3	Socket outlets circuit 3	1 x 20 A three phase socket outlet

2.1.2 In the space below, make a list of all service and customer equipment required for the main switchboard arrangement, including suitable final subcircuit protective devices. For guidance, some fields have been pre-filled.

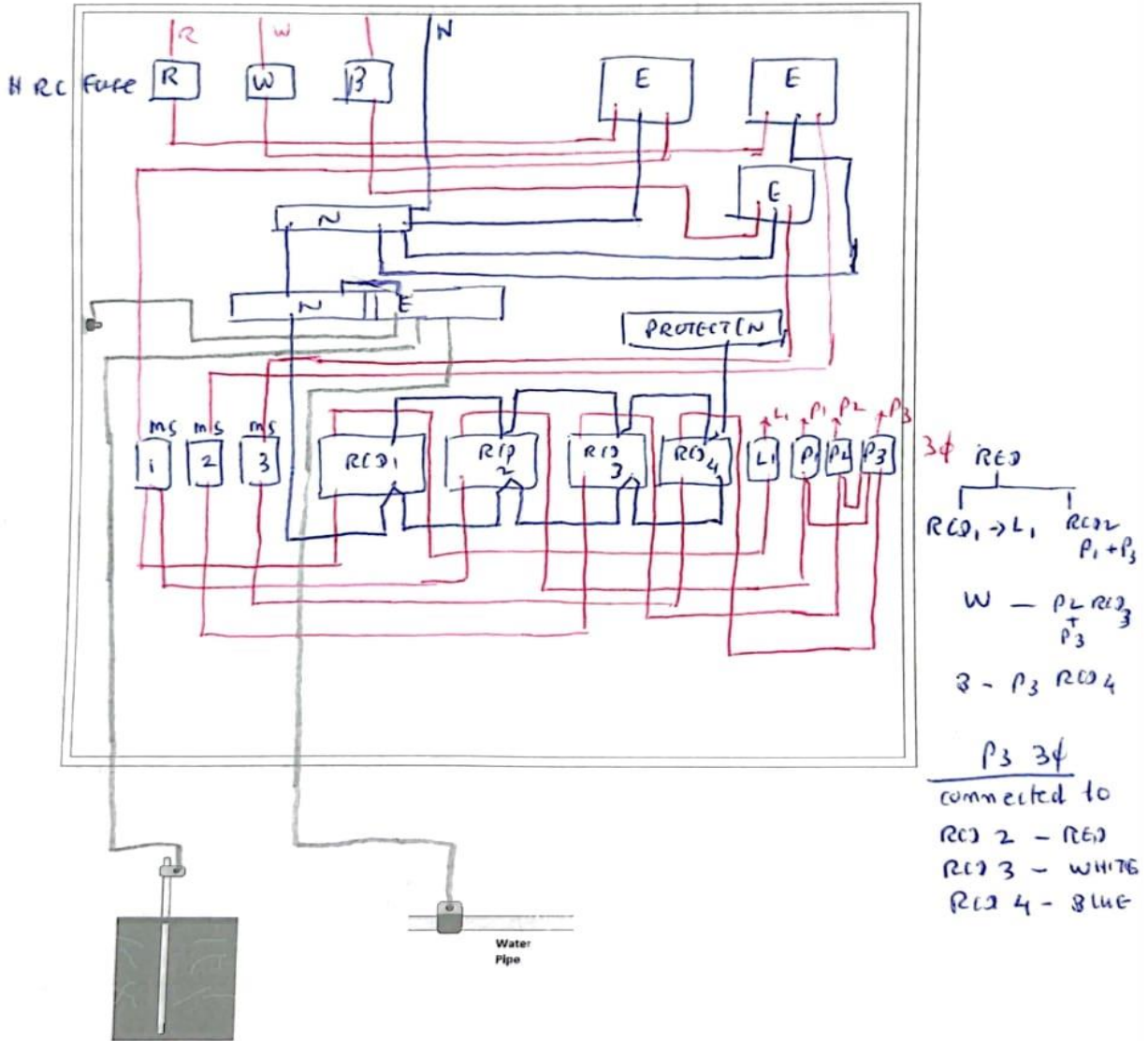
Switchboard Equipment	Purpose / Function
3 x 100 A HRC fuses	Service protective devices.
1 x service neutral link	For the connection of the consumer's mains neutral conductor.
1 x single tariff polyphase meter	To meter the energy consumed in the installation.
Circuit breakers (MS) 1, 2, 3	Energize / de energize RCD, L ₁ P ₁ P ₂ P ₃
Circuit Breakers L ₁ P ₁ P ₂ P ₃	Energize L ₁ P ₁ P ₂ P ₃
RCD ₁	To protect earth leakage fault L ₁
RCD ₂	To protect earth leakage fault P ₁
RCD ₃	To protect earth leakage fault P ₂
RCD ₄	To protect earth leakage fault P ₃
1x Consumer Neutral Link	To connect RCD
1x Protected Neural Link	To provide Neutral connection for L ₁ P ₁ P ₂ P ₃
1x Main earth Link	To provide earthing connection to main earth




	 Feedback	Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date 
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Topic Skills Practice 10.4

2.2 Draw the Switchboard Arrangement

2.2.1 On the template, draw all necessary equipment, conductors and terminations for the switchboard arrangement. Show all wiring up to the line side of each protective device, and label switchboard equipment as per AS/NZS 3000:2018 requirements.



	 Feedback	Have you teacher/trainer check your installation diagram	Teacher/Trainer Initials and Date	
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Topic Skills Practice 10.4

3. Completing the Skills Practice

3.1 Skills Practice Review Questions

3.1.1 When you have successfully completed the activities in Section 2, answer the following review questions. Provide applicable AS/NZS 3000:2018 Clause(s) to support your answers where necessary.

1. How many main switches did you include in your wiring diagram?

3

2. Describe the requirements for current carrying capacity of the service neutral link.

3.5.2 The minimum size of the neutral conductor shall be as follows .

Multiphase circuit . The current carrying capacity of the neutral conductor of multiphase circuit shall not be less than that determined in accordance with harmonic currents . 3rd or higher order harmonic currents shall be added to maximum out of balance load to determine the current carrying capacity of neutral conductor.

3. List five types of switchboard equipment that must be labeled to indicate their function and/or relationship to other equipment. Provide AS/NZS 3000:2018 clause(s) to support your answers.

1/ 10.5.2 Relationship of electrical equipment shall be marked.

2/10.5.3 Bars shall be identified whether they are active , neutral or earth.

3/10.5.4 Terminals of bars , CB, fuse, other electrical equipment on switchboard shall be marked.

4/10.5.5 Common neutral shall be legibly and permanently marked.

5/10.5.6 The rating of fuse elements shall be marked.

Topic Skills Practice Cover Sheet

Unit Name:	UEEEL0018 Select wiring systems and select cables for low voltage electrical installations
Topic Title:	Switchboard Arrangements

Skill Practice Number:	10.5
Skill Practice Name:	Three Phase, Multiple Tariff Switchboard Arrangements

Student Name:	
Student ID:	
College/Campus:	
Group:	

Results	
Planning:	
Carryout:	
Completion:	
Overall Results:	
Comments:	

Topic Skills Practice 10.5

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Topic 10. Switchboard Arrangements

Skills Practice 10.5: Three Phase, Multiple Tariff Switchboard Arrangements

Task:

To design and draw a three phase, multiple tariff main switchboard layout incorporating network provider and customer equipment.

Objectives:

At the completion of this skills practice, you should be able to:

- Use AS/NZS 3000:2018 and your local service and installation rules to design a three phase, multiple tariff switchboard arrangement.
- Draw the necessary equipment for a three phase, multiple tariff switchboard arrangement.
- Draw the necessary connections for the connection of a three phase, multiple tariff switchboard arrangement.

1. Planning the Skills Practice

1.1 Research Three Phase, Multiple Tariff Switchboard Arrangements

1.1.1 Research AS/NZS 3000:2018, your local service and installation rules, and the following reference material to determine an acceptable arrangement of wiring and equipment for a three phase, multiple tariff main switchboard:

- Energy Space content pages 10.1 and 10.2.
- Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill
- Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

1.1.2 Once you feel you have sufficient knowledge of the subject matter, obtain the following materials to assist you with carrying out this skills practice:

- AS/NZS 3000:2018 Wiring Rules
- Local Service and Installation Rules (SIR)
- Suppliers catalogues – switchboard equipment
- Pens/pencils
- Ruler

Topic Skills Practice 10.5

2. Carrying Out the Skills Practice




2.1 Design the Switchboard Arrangement

2.1.1 Use AS/NZS 3000:2018 and your local service and installation rules to design a main switchboard arrangement for a three phase, multiple tariff electrical installation. The installation is supplied by 16 mm² protected consumers mains, and is to include the following circuits:

Ref.	Circuit	Connected Load
DB1	Distribution board 1	40 A, three phase distribution board
L1	Lighting circuit 1	16 x lighting points
P1	Socket outlets circuit 1	10 x 10 A double socket outlets
P2	Socket outlets circuit 2	1 x 15 A single socket outlet
P3	Socket outlets circuit 3	1 x 20 A three phase socket outlet
HWS	Hot water heater	1 x off-peak hot water heater

2.1.2 In the space below, make a list of all service and customer equipment required for the main switchboard arrangement, including suitable final subcircuit protective devices. For guidance, some fields have been pre-filled.

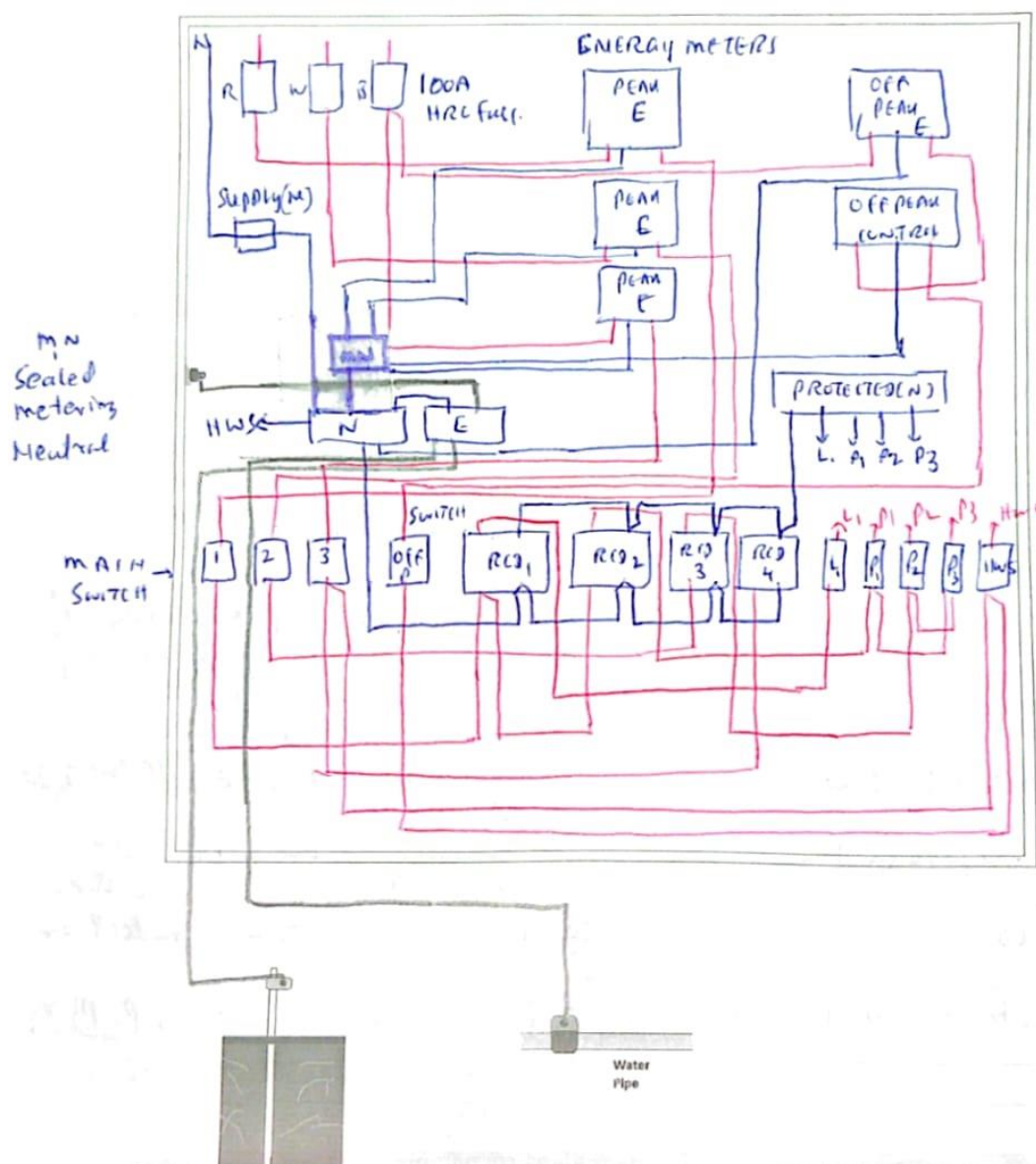
Switchboard Equipment	Purpose / Function
3 x 100 A HRC fuses	Service protective devices (SPDs)
1 x service neutral link	For the connection of the consumer's mains neutral conductor.
1 x sealed metering neutral link	For the connection of meter neutral conductors.
3x peak energy meter	To measure peak energy
1x off peak energy meter	To measure off peak energy
Off peak control	To change peak & off peak connections
3x main switches	To energize / de energize L ₁ P ₁ P ₂ P ₃ & HWS
1x Off peak switch	To energize / de energize water heater during off peak time
4x RCD	To Provide earth leak protection for L ₁ P ₁ P ₂ P ₃
1x Protected Neutral Link	To provide Neutral for L ₁ P ₁ P ₂ P ₃


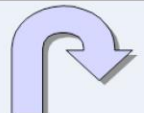

	 <p>Have your teacher/trainer check your answers</p> <p><i>Feedback</i></p>	<p>Teacher/Trainer Initials and Date</p>	
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Topic Skills Practice 10.5

2.2 Draw the Switchboard Arrangement

2.2.1 On the template, draw all necessary equipment, conductors and terminations for the switchboard arrangement. Show all wiring up to the line side of each protective device, and label switchboard equipment as per AS/NZS 3000:2018 requirements.



	 Feedback	Have you teacher/trainer check your installation diagram	Teacher/Trainer Initials and Date	

Topic Skills Practice 10.5

3. Completing the Skills Practice

3.1 Skills Practice Review Questions

3.1.1 When you have successfully completed the activities in Section 2, answer the following review questions. Provide applicable AS/NZS 3000:2018 Clause(s) to support your answers where necessary.

1. How many main switches did you include in your wiring diagram?

4

2. How many energy meters did you include in your wiring diagram?




4

3. What type of energy meters did you include in your switchboard arrangement and why?

Three energy meters measure peak energy and one energy meter measure off peak energy

4. Briefly explain how “time of use (TOU)” tariffs operate in your jurisdiction.

TOU measure off peak energy for water heater during off peak time.

	 Feedback	Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date	

Topic Skills Practice Cover Sheet

Unit Name:	UEEEL0018 Select wiring systems and select cables for low voltage electrical installations
Topic Title:	Switchboard Arrangements

Skill Practice Number:	10.6
Skill Practice Name:	Three Phase, Multiple Tenancy Switchboard Arrangements

Student Name:	
Student ID:	
College/Campus:	
Group:	

Results	
Planning:	
Carryout:	
Completion:	
Overall Results:	
Comments:	

Topic Skills Practice 10.6

UEEEL0018 Select wiring systems and select cables for low voltage electrical installations

Topic 10. Switchboard Arrangements

Skills Practice 10.6: Three Phase, Multiple Tenancy Switchboard Arrangements

Task:

To design and draw a three phase, multiple tenancy main switchboard layout incorporating network provider and customer equipment.

Objectives:

At the completion of this skills practice, you should be able to:

- Use AS/NZS 3000:2018 and your local service and installation rules to design a three phase, multiple tenancy switchboard arrangement.
- Draw the necessary equipment for a three phase, multiple tenancy switchboard arrangement.
- Draw the necessary connections for the connection of a three phase, multiple tenancy switchboard arrangement.

1. Planning the Skills Practice

1.1 Research Three Phase, Multiple Tenancy Switchboard Arrangements

1.1.1 Research AS/NZS 3000:2018, your local service and installation rules, and the following reference material to determine an acceptable arrangement of wiring and equipment for a three phase, multiple tenancy main switchboard:

- Energy Space content pages 10.1 and 10.2.
- Pethebridge, K. and Neeson, I., Electrical Wiring Practice, McGraw-Hill
- Hampson, J., Hanssen, S., Electrotechnology Practice, Pearson Education

1.1.2 Once you feel you have sufficient knowledge of the subject matter, obtain the following materials to assist you with carrying out this skills practice:

- AS/NZS 3000:2018 Wiring Rules
- Local Service and Installation Rules (SIR)
- Suppliers catalogues – switchboard equipment
- Pens/pencils
- Ruler

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2. Carrying Out the Skills Practice




2.1 Design the Switchboard Arrangement

2.1.1 Use AS/NZS 3000:2018 and your local service and installation rules to design a main switchboard arrangement for a three phase, multiple tenancy electrical installation. The installation is supplied by 35 mm² protected consumers mains, and is to include the following circuits:

Ref.	Circuit	Connected Load
L1	Common area lighting	12 x lighting points
P1	Common area power 1	9 x 10 A single phase double socket outlets
P2	Common area power 2	1 x 15 A single phase socket outlet
DB1	Unit 1	40 A single phase distribution board
DB2	Unit 2	40 A single phase distribution board
DB3	Unit 3	40 A single phase distribution board
DB4	Unit 4	40 A single phase distribution board
DB5	Unit 5	40 A single phase distribution board
DB6	Unit 6	40 A single phase distribution board

2.1.2 In the space below, make a list of all service and customer equipment required for the main switchboard arrangement, including suitable final subcircuit protective devices. For guidance, some fields have been pre-filled.

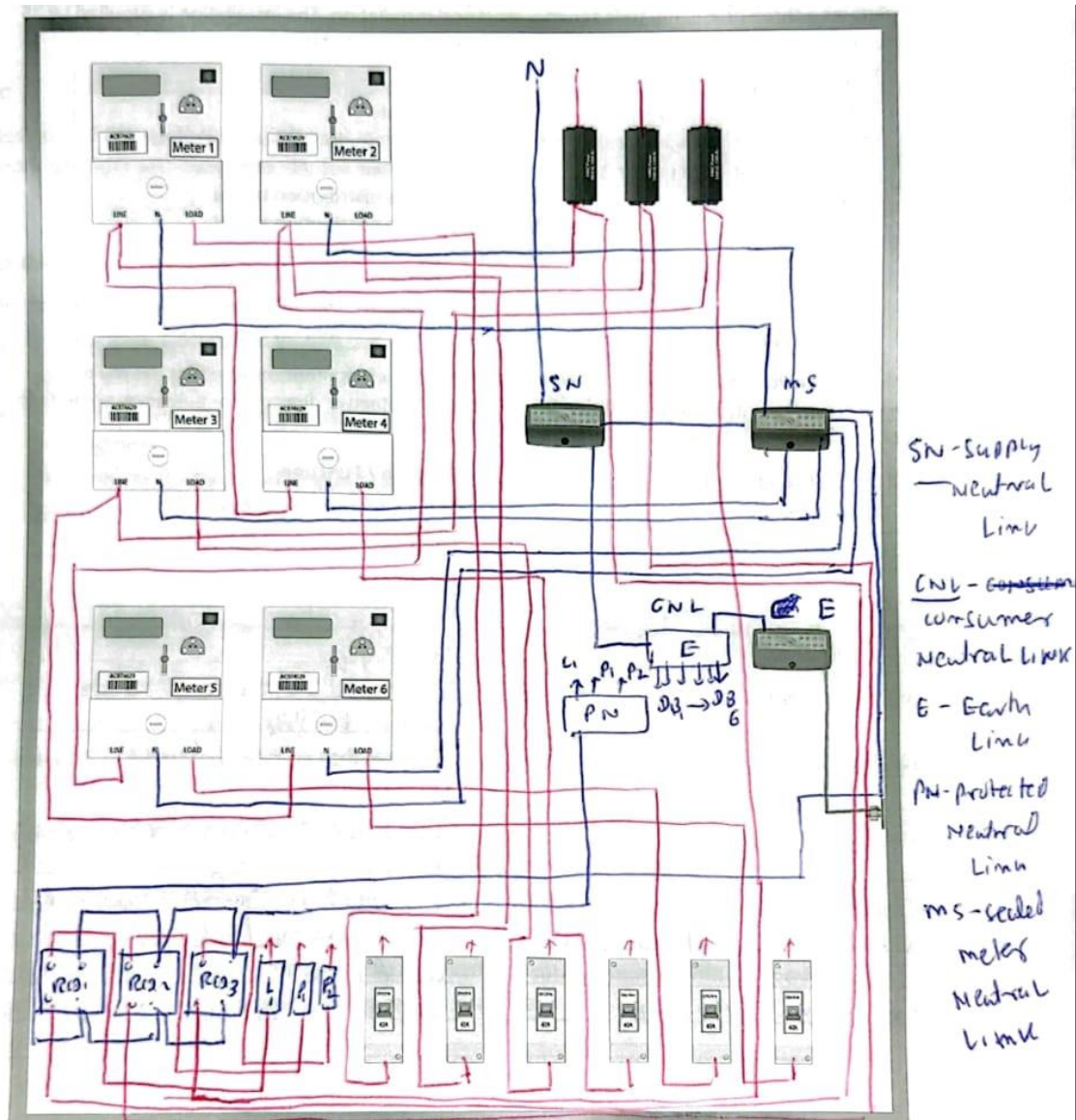
Switchboard Equipment	Purpose / Function
3 x 100 A HRC fuses	Service protective devices.
1 x service neutral link	For the connection of the consumer's mains neutral conductor.
<i>Circuit breakers DB₁ → DB₆</i>	<i>Energize DB₁ → DB₆ De energize</i>
<i>Meter 1 → 6</i>	<i>To measure energizing in DB₁ to DB₆</i>
<i>RCD₁</i>	<i>To protect earth leakage fault in L₁</i>
<i>RCD₂</i>	<i>To protect earth leakage fault in P₁</i>
<i>RCD₃</i>	<i>To protect earth leakage fault in P₂</i>
<i>1x protected Neutral Link</i>	<i>To provide neutral connection L₁ P₁ P₂</i>
<i>1x Main Earth Link</i>	<i>To provide earthing connection</i>




	 Feedback	Have your teacher/trainer check your answers	Teacher/Trainer Initials and Date	

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2.2 Draw the Switchboard Arrangement

2.2.1 On the template, draw all conductors, terminations and additional equipment necessary for the supply to the unit submains. Show all wiring up to the line side of each unit main switch, and label switchboard equipment as per AS/NZS 3000:2018 requirements.



	 Feedback	<p>Have your teacher/trainer check your installation diagram</p>	<p>Teacher/Trainer Initials and Date</p>	
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3. Completing the Skills Practice

3.1 Skills Practice Review Questions

3.1.1 When you have successfully completed the activities in Section 2, answer the following review questions. Provide applicable AS/NZS 3000:2018 Clause(s) to support your answers where necessary.

1. How many main switches were required for the switchboard arrangement?

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2. Describe the requirements for the location of the main switchboard in a multiple tenancy installation.



2.3.3.4 Electrical installations with more than one occupier. Each individual occupier shall have readily available access to an isolation switch or switches That isolate that occupier's portion of the electrical installation.

3. What are the metering requirements in your jurisdiction for electrical installations with a maximum demand greater than 100 A per phase?

NSW Electrical Service Installation Rule 4.7. (c)

For installations with consumer's main maximum demand determined in accordance with AS/NZS 3000 Exceeding the lesser of 100A per phase or the current rating of a meter as determined by the metering provider. OR otherwise metered with the use of current transformer, the circuit protection device must be on the line side of the current transformer.

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	 <p>Have your teacher/trainer check your answers</p> <p><i>Feedback</i></p>	<p>Teacher/Trainer Initials and Date</p>	
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