

## Topic Skills Practice Cover Sheet

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

<b>Skill Practice Number:</b>	10.2
<b>Skill Practice Name:</b>	Single Phase, Single Tariff Switchboard Arrangements

<b>Student Name:</b>	
<b>Student ID:</b>	
<b>College/Campus:</b>	
<b>Group:</b>	

<b>Results</b>	
<b>Planning:</b>	
<b>Carryout:</b>	
<b>Completion:</b>	
<b>Overall Results:</b>	
<b>Comments:</b>	

# 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:

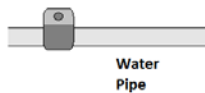
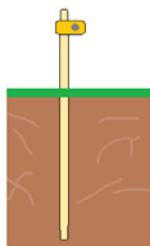
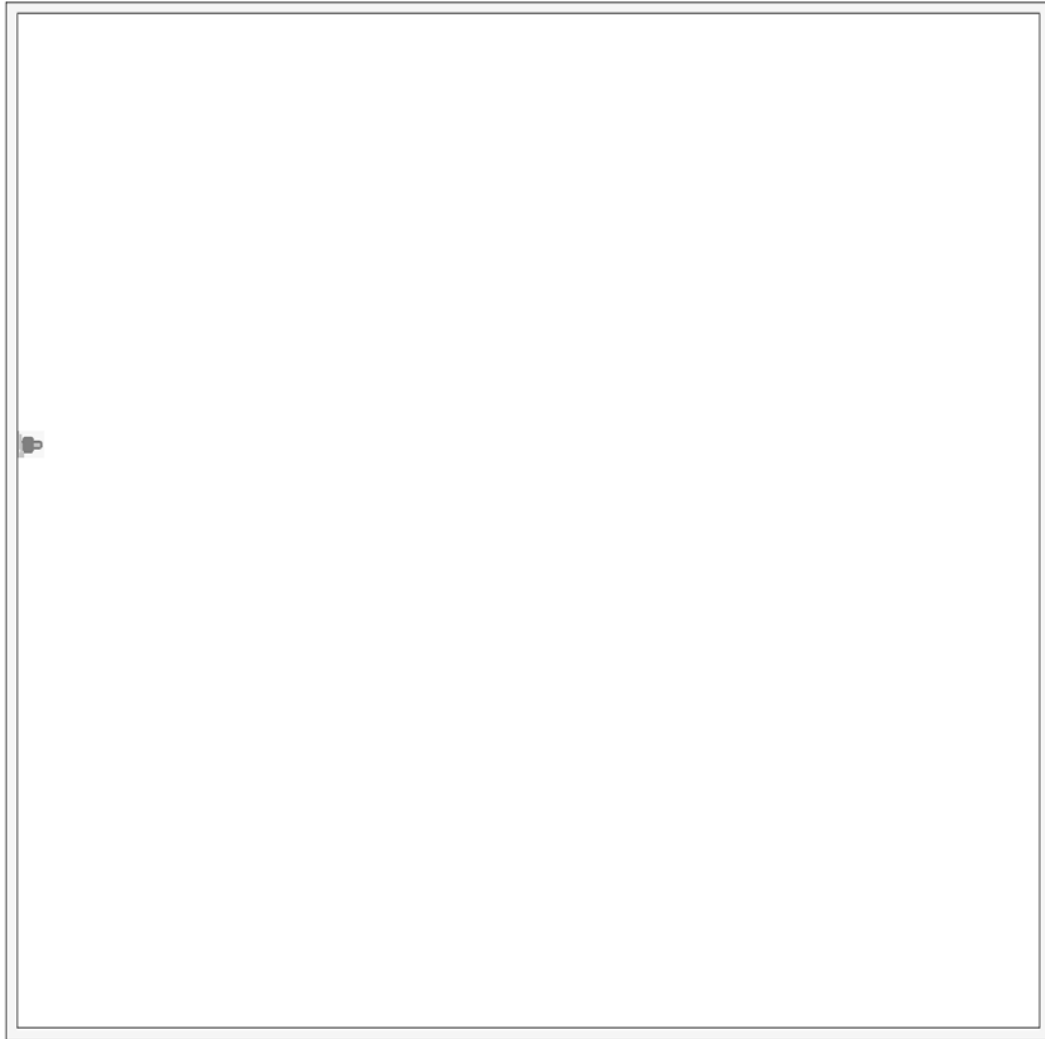
- AS/NZS 3000:2018 Wiring Rules
- Local Service and Installation Rules (SIR)
- Suppliers catalogues – switchboard equipment
- Pens/pencils
- Ruler






# Topic Skills Practice 10.2

## 2.2 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.



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

# 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?

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

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

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

## Topic Skills Practice Cover Sheet

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

<b>Skill Practice Number:</b>	10.3
<b>Skill Practice Name:</b>	Single Phase, Multiple Tariff Switchboard Arrangements

<b>Student Name:</b>	
<b>Student ID:</b>	
<b>College/Campus:</b>	
<b>Group:</b>	

<b>Results</b>	
<b>Planning:</b>	
<b>Carryout:</b>	
<b>Completion:</b>	
<b>Overall Results:</b>	
<b>Comments:</b>	

# 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

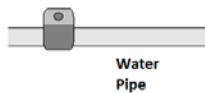
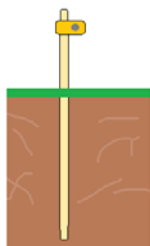
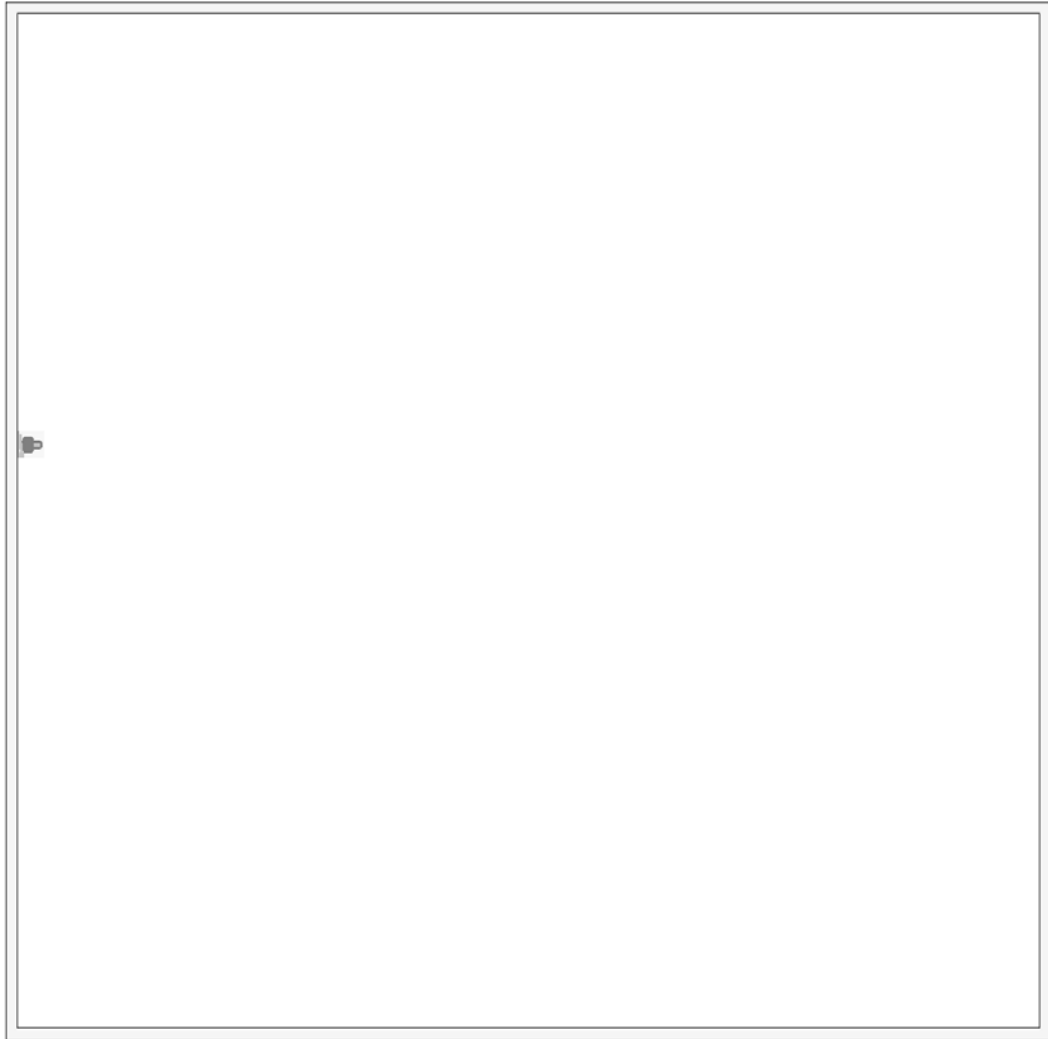







# Topic Skills Practice 10.3

## 2.2 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.



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

# Topic Skills Practice 10.3

## 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?

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

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

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

## Topic Skills Practice Cover Sheet

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

<b>Skill Practice Number:</b>	10.4
<b>Skill Practice Name:</b>	Three Phase, Single Tariff Switchboard Arrangements

<b>Student Name:</b>	
<b>Student ID:</b>	
<b>College/Campus:</b>	
<b>Group:</b>	

<b>Results</b>	
<b>Planning:</b>	
<b>Carryout:</b>	
<b>Completion:</b>	
<b>Overall Results:</b>	
<b>Comments:</b>	

# 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 mm<sup>2</sup> 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.

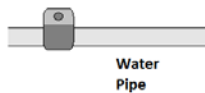
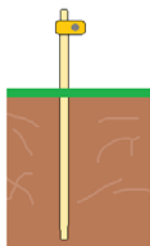
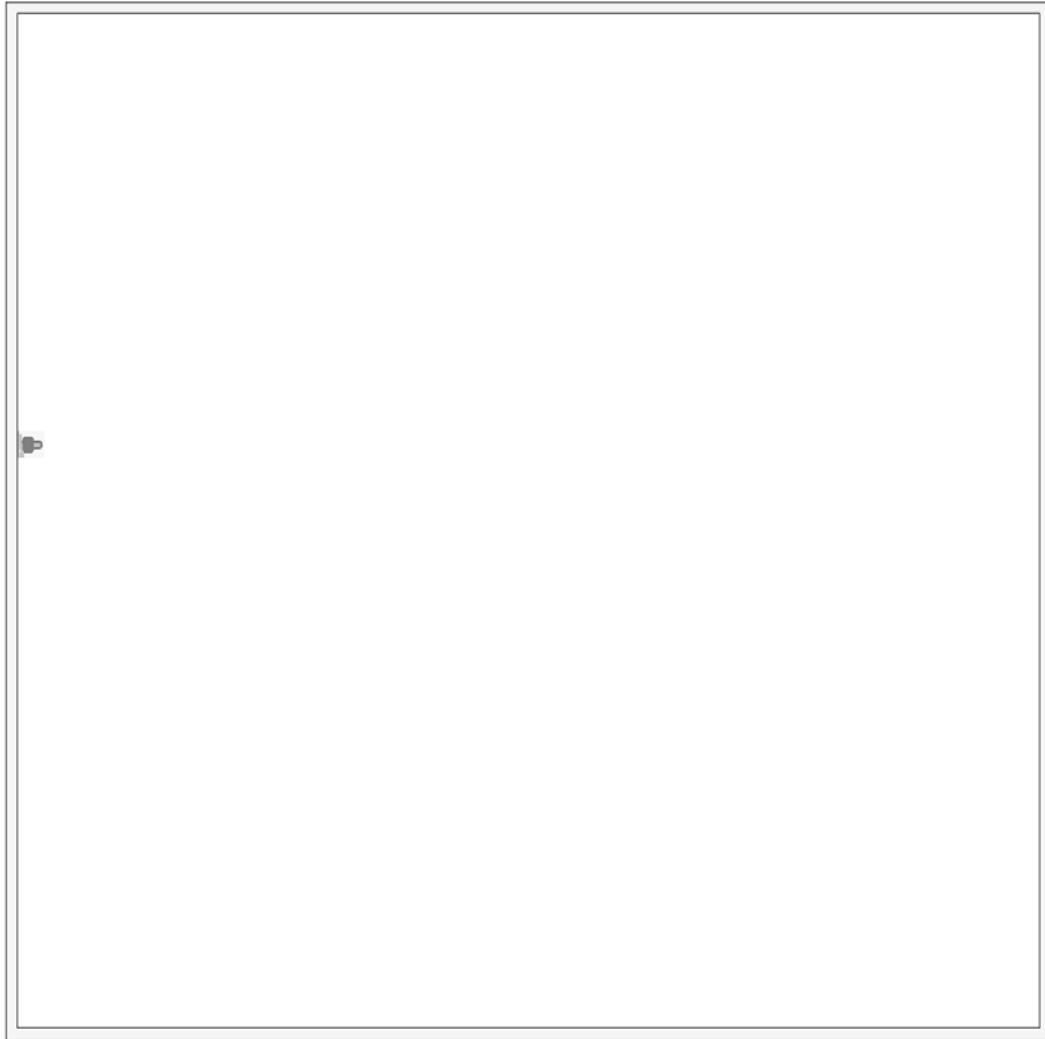
Switchboard Equipment	Purpose / Function
3 x 100 A HRC fuses	Service protective devices.
1 x service neutral link	For the connection of the consumer's mains neutral conductor.
1 x single tariff polyphase meter	To meter the energy consumed in the installation.




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

# 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.



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

# 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?

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

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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.




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

## Topic Skills Practice Cover Sheet

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

<b>Skill Practice Number:</b>	10.5
<b>Skill Practice Name:</b>	Three Phase, Multiple Tariff Switchboard Arrangements

<b>Student Name:</b>	
<b>Student ID:</b>	
<b>College/Campus:</b>	
<b>Group:</b>	

<b>Results</b>	
<b>Planning:</b>	
<b>Carryout:</b>	
<b>Completion:</b>	
<b>Overall Results:</b>	
<b>Comments:</b>	



# 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:

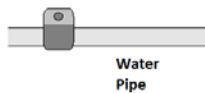
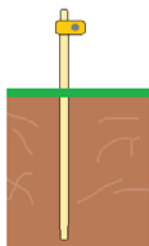
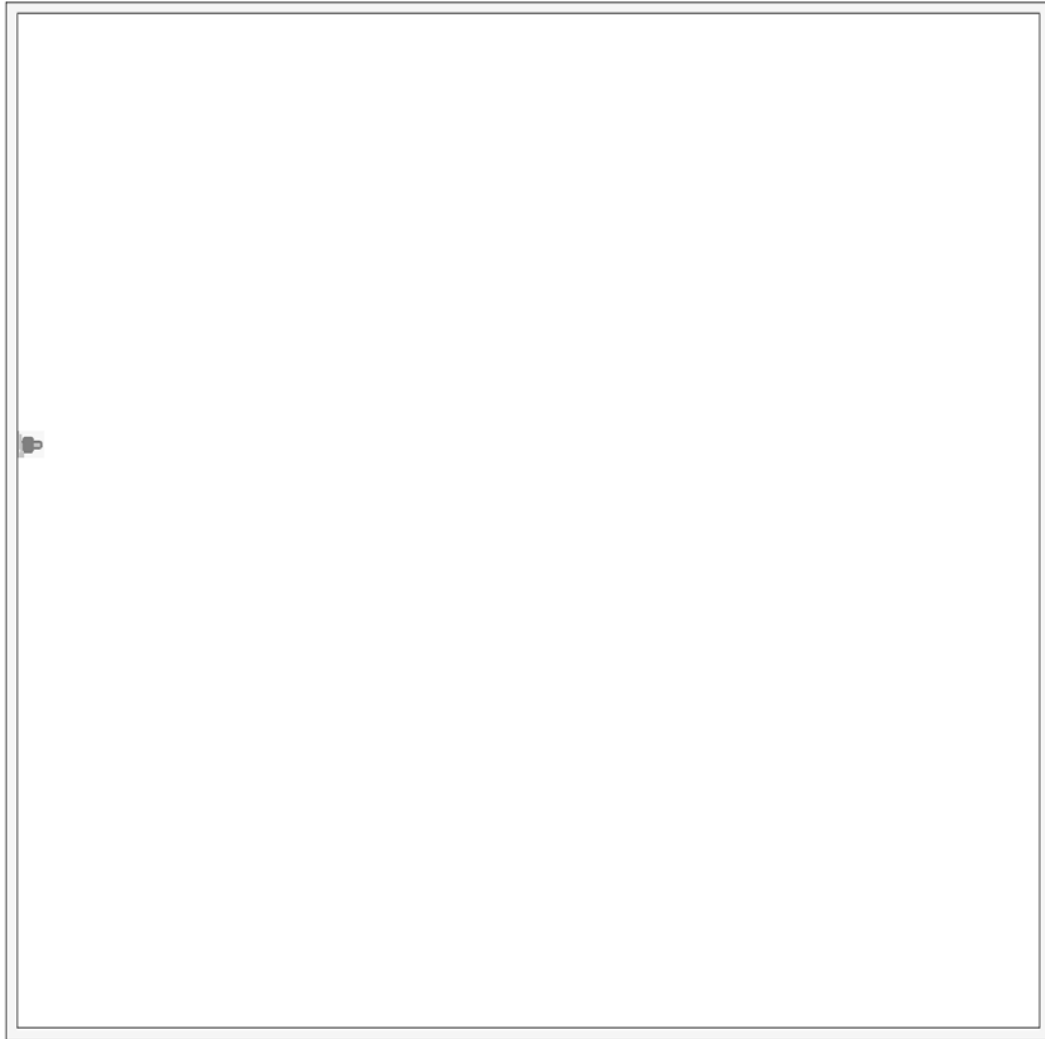
- AS/NZS 3000:2018 Wiring Rules
- Local Service and Installation Rules (SIR)
- Suppliers catalogues – switchboard equipment
- Pens/pencils
- Ruler






# Topic Skills Practice 10.5

## 2.2 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.



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

# 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?

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

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

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




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

## Topic Skills Practice Cover Sheet

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

<b>Skill Practice Number:</b>	10.7
<b>Skill Practice Name:</b>	Main Switchboard Arrangements for CT Metering

<b>Student Name:</b>	
<b>Student ID:</b>	
<b>College/Campus:</b>	
<b>Group:</b>	

Results	
<b>Planning:</b>	
<b>Carryout:</b>	
<b>Completion:</b>	
<b>Overall Results:</b>	
<b>Comments:</b>	

# Topic Skills Practice 10.7

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

## Topic 10. Switchboard Arrangements

### Skills Practice 10.7: Main Switchboard Arrangements for CT Metering

#### Task:

To design and draw a three phase main switchboard layout incorporating CT metering.

#### 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 switchboard arrangement with CT metering.
- Draw the necessary equipment for a three phase switchboard arrangement with CT metering.
- Draw the necessary connections for the connection of a three phase switchboard arrangement with CT metering.

## 1. Planning the Skills Practice

### 1.1 Research Main Switchboard Arrangements for CT Metering

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 switchboard arrangement with CT metering:

- 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 10.7

## 2.2 Draw a Single Line Diagram

2.2.1 In the space provided below, draw a single line diagram to represent the three phase electrical installation with CT metering. Be sure to use standard symbols, and include all main switches, protection devices and metering equipment.

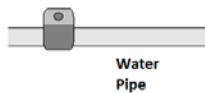
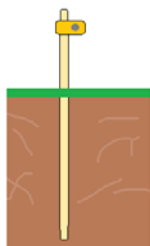
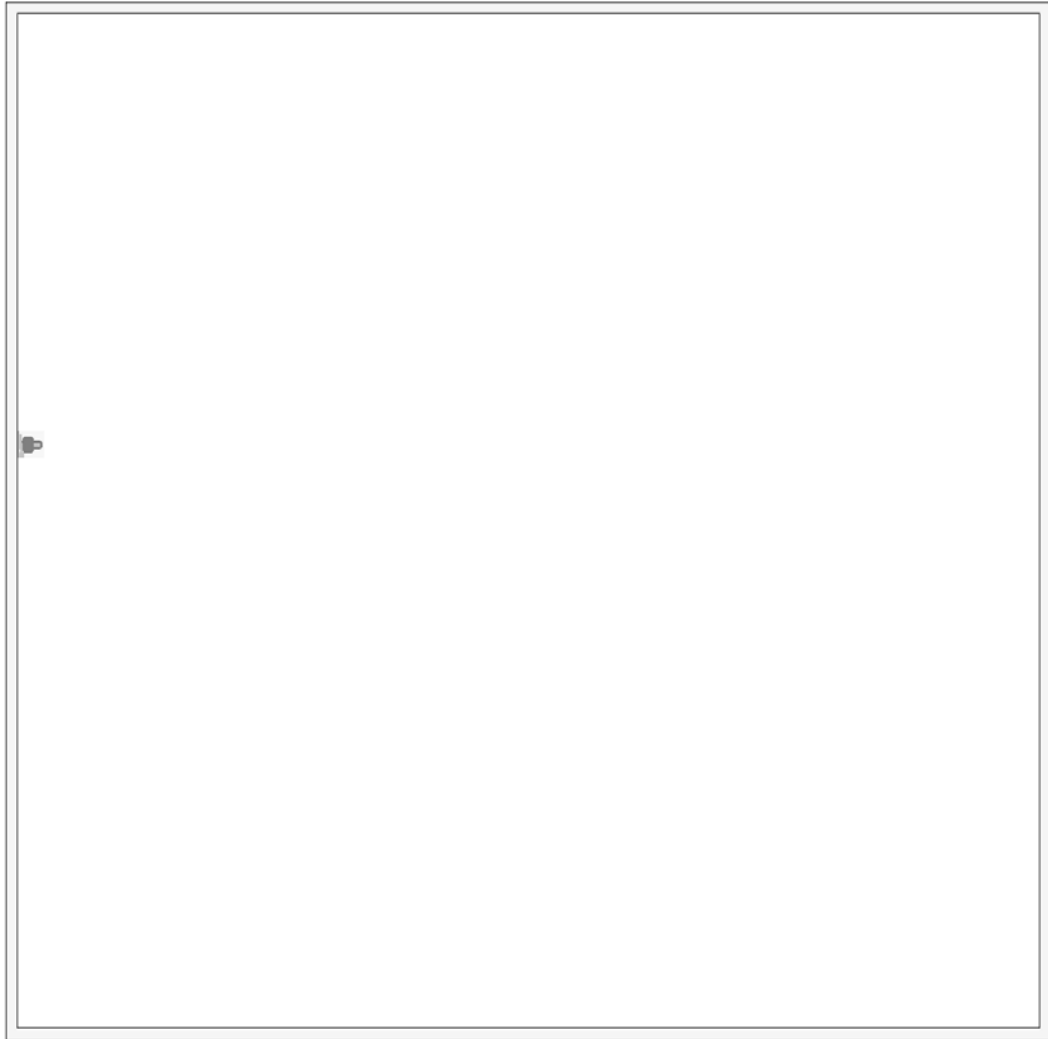
	 <i>Feedback</i>	Have you teacher/trainer check your installation diagram	Teacher/Trainer Initials and Date	






# Topic Skills Practice 10.7

## 2.3 Draw the Switchboard Arrangement

2.3.1 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.



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

# Topic Skills Practice 10.7

## 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?

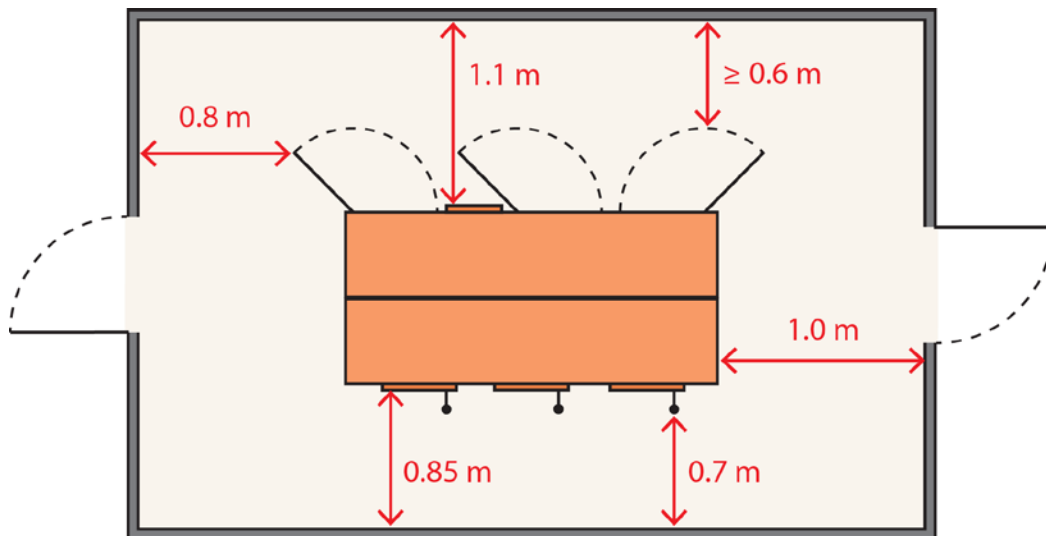
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2. Under what circumstances is CT metering required in your jurisdiction?

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3. Does the switchroom arrangement shown above comply with the Wiring Rules? Explain why, and provide applicable AS/NZS 3000:2018 clauses to support your answer.

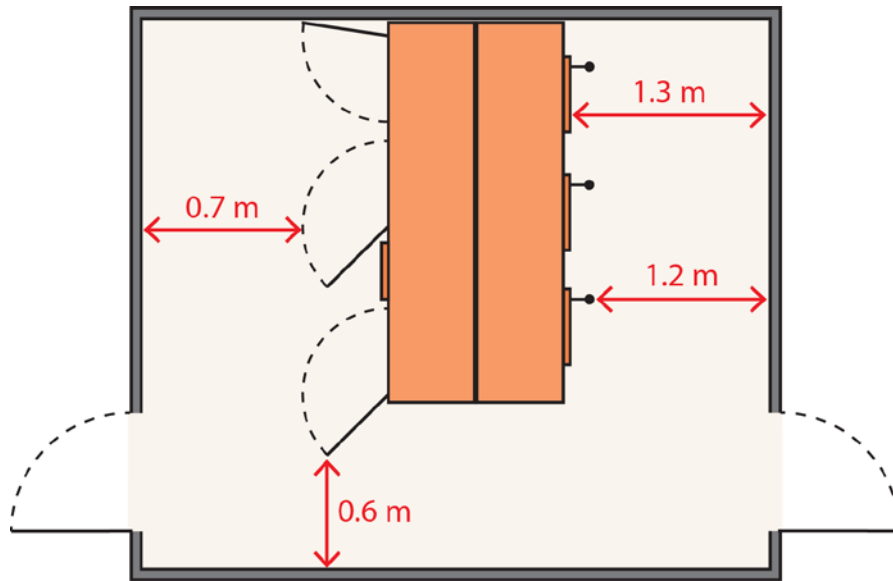
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## Topic Skills Practice 10.7





4. Does the switchroom arrangement shown above comply with the Wiring Rules? Explain why, and provide applicable AS/NZS 3000:2018 clauses to support your answer.

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