

# Licensed Electrician's Assessment (LEA)

Licensed Electrician's Practical Assessment  
Sample Paper 1 (2020)



Candidate Surname	
Candidate Given Names	

**Circle the appropriate answer below.**

- Is the candidate's photo ID valid? Yes  No
- Does the IR tester supplied by candidate meet calibration requirements? Yes  No
- Does the type of IR tester supplied by candidate meet the assessment requirements? Yes  No

Candidate	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Print name	Signature	Date
Assessor	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Print name	Signature	Date

Marks Allocation											Possible	Actual
Question 1	Meter Panel and Switchboard Wiring										35	
Question 2	Electrical Installation Testing	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	32		
Question 3	MEN System Voltage Measurement	3.1				3.2				18		
Question 4	Visual Defects										15	
<b>Total</b>											100	

Candidates need to obtain 75% or more to pass this assessment.

Final Percentage	Pass/Fail

I have conducted this assessment, and certify I am independent of the candidate.

Assessor	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Print name	Signature	Date
Reviewed by (If necessary)	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Print name	Signature	Date

## Reference Material

- AS/NZS 3000:2018 Wiring Rules
- AS/NZS 3017:2007 Electrical installations – Verification guidelines
- AS/NZS 3008.1.1:2017 Electrical installations – Selection of cables
- The Victorian Service and Installation Rules 2014

## Instructions

- Personal notepads and paper are not permitted
- Pens only must be used. Answers in pencil may not be marked.
- Do not remove any sheets from this assessment paper or the room
- Papers with no name or signature will not be marked
- A mark will be deducted for each missing or incorrect unit where required.
- Speak to the assessor if you require assistance or have a query.

This LEP assessment will comprise of four questions. Throughout the assessment, the LEP assessor will instruct you as to which workstation to use, and when to move to them.

Question One	Meter Panel and Switchboard Wiring
Question Two	Electrical Installation Testing
Question Three	MEN System Voltage Measurements
Question Four	Visual Defects

Working Time: 4 hours  
Reading Time: 10 minutes

At the end of this time you will be asked to stop.

**Inform your assessor if any equipment is missing or not available – DO NOT TAKE ANYTHING FROM ANOTHER WORKSTATION.**

Candidate     
Print name Signature Date

## Question 1

Wiring Bay Number	
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### Meter Panel and Switchboard Wiring

#### A mark will be deducted for each missing or incorrect unit where required

You are required to install a 3 $\Phi$  4 wire 400/230V 50Hz air conditioned business premises. The installation comprises a 3 $\Phi$  meter panel and main switchboard in a common enclosure, and a separate 1 $\Phi$  distribution board. The main switchboard and the distribution board are situated in the same building.

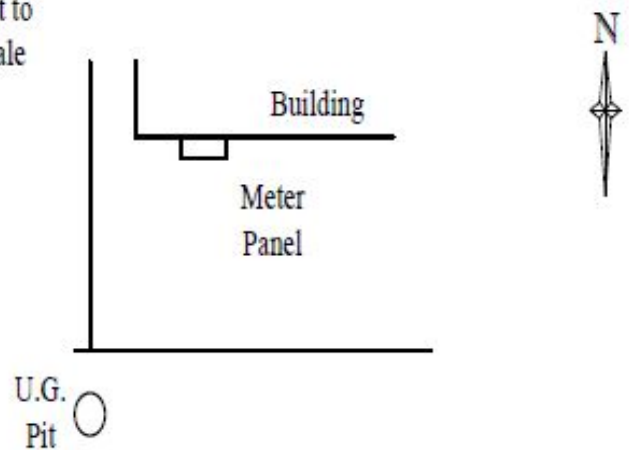
The installation is located at 37 City Road, Jonesville.

The installation will be supplied from:

- Overhead supply** – from the fused overhead line connector box to the main switchboard. The consumers mains are V90 SDI stranded copper cables. The cables are run enclosed in air.
- Underground supply** – from the service pit, the cables run underground in PVC conduit at a depth of 500mm. The consumers mains are V90 SDI stranded copper cables.

The meter panel enclosure is located on the front of the building, 4 meters from the southern property boundary, and 3 meters from the western property boundary. The underground pit is located at the south west corner of the property.

Not to scale



All wiring and identification is to be carried and completed to the requirements of AS/NZS3000:2018 Wiring Rules. You may ignore voltage drop requirements. Assume unity power factor on all loads. Assume short circuit protection is provided on the supply side of the consumers mains. All cables installed are solid/stranded and will operate at normal operating temperatures.

You must select and arrange main switches, circuit breakers, RCDs and cables from the equipment provided. Divide the equipment in the installation into final sub-circuits, as per AS/NZS3000:2018 requirements. Select the **minimum** permissible cable size (cables available for final sub-circuits are 1.5mm<sup>2</sup>, 2.5mm<sup>2</sup>, 4mm<sup>2</sup> and 6mm<sup>2</sup>) and correct circuit protective device rating for each circuit.

Do not cut any cables or bus-bar, or take any equipment from another workstation, unless directed by your assessor. Inform your assessor if there is any equipment missing or not provided.

**Note:** Although Appendix C of AS/NZS3000:2018 Wiring Rules is classed as informative (i.e. for guidance only), Appendix C Tables C1, C2, C5 and C9 may be used in this assessment where appropriate.

**Note:** AS/NZS3008.1.1 shall be used for all cable selection and cable current ratings.

**The installation will comprise of the following:**

Equipment installed from the main switchboard:

- 1 - 3 $\Phi$  24A reverse cycle air conditioner, 230V control, wired to an external enclosure.  
The manufacturer's instructions state the air conditioner must have RCD protection.
- 1 - 1 $\Phi$  4.7kW range
- 42 - 230V 16W LED luminaires, installed over two circuits. Both circuits are to be installed on the same phase.
- 1 - 230V 3.8kW electric vehicle charger

Equipment installed from the distribution board:

An isolating device is required to be fitted at the distribution board to control all loads.

- 16 – 230V 10A double socket outlets installed over two circuits
- 40 – 230V 16W LED luminaires on one circuit

Note: Use of RCDs and/or RCBOs permitted.

The 3 $\Phi$  final sub-circuit wiring is V90 single insulated cable, installed enclosed in the cable duct/conduit provided.

The 1 $\Phi$  sub-main is V90 single insulated cable, installed enclosed in the cable duct/conduit provided.

All 1 $\Phi$  final sub-circuit wiring in the installation is two core and earth V90 flat copper TPS, installed partially surrounded in thermal insulation.

Note: This installation will never be connected to the electrical supply. Some parts and equipment may not satisfy the requirements of AS/NZS3000:2018 and other associated standards, they are only used in the assessment environment to keep assessment costs to a minimum. Please ask your assessor if you have any questions in relation to this.

Calculate the maximum demand of the installation. Use the maximum demand table below for your working.

Maximum Demand Table Used \_\_\_\_\_

Circuits	Load Group	Calculations	MD		
			Red	White	Blue
1 - 3Φ 24A reverse cycle air conditioner					
1 - 1Φ 4.7kW range					
42 - 230V 16W LED luminaires all on the same phase					
1 - 230V 3.8kW electric vehicle charger					
Distribution Board					
16 - 230V 10A double socket outlets					
40 - 230V 16W LED luminaires					
<b>Distribution Board MD</b>					
<b>Totals</b>					

Based on the maximum demand calculation, select the current rating of the main switch, the **minimum** size of the consumers mains cable and the **minimum** size of the main earth conductor.

Based on the maximum demand calculation, select the current rating of the distribution board isolator and the **minimum** size of the sub-main cable.

Enter these details into the table below, and state the AS/NZS 3008.1.1 Table number and column number used for your cable selection:

Consumers Mains: Table..... Column .....

Sub-main: Table..... Column .....

Three phase load: Table..... Column .....

Single phase loads: Table..... Column .....

Maximum Demand of the Installation	Current Rating of the Main Switch	Size of the Consumers Mains Cable	Size of the Main Earth Conductor

Maximum Demand of the Distribution Board	Current Rating of the Distribution Board Sub-main Circuit Protection	Size of the Sub-Main Cable

Question 1 = 35 marks

## Question 2

Bay Number	
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### Electrical Installation Testing

A mark will be deducted for each missing or incorrect unit where required.

Using your insulation resistance and continuity tester, carry out the following tests, as required under AS/NZS3000:2018, on the electrical installation indicated by the assessor.

#### NEUTRAL CONDUCTORS MUST NOT BE DISCONNECTED

Insert the meter readings with the correct units, and other information as required, in the appropriate places throughout question 2.

#### 2.1 Resistance of Main Earth and Bonding Conductors

Test	Record Instrument Reading & Units	Indicate if Test is Pass or Fail
Main Earthing Conductor		
Bonding conductor to water pipe		

(1 + 1 = 2 marks)

#### 2.2 Insulation Resistance of Wiring

Circuit Test	Record Instrument Reading & Units	Indicate if Test is Pass or Fail
Whole Installation (wiring only)		
Final sub-circuit 1		
Final sub-circuit 2		
Final sub-circuit 3		
Final sub-circuit 4		

(5 x 2 = 10 Marks)

#### 2.3 Earthing and Insulation Resistance of Appliance

Test	Record Instrument Reading & Units	Indicate if Test is Pass or Fail
Earthing of Exposed Metal		
Insulation Resistance		

(1 + 2 = 3 marks)

## 2.4 Resistance of Protective Earthing Conductors

Determine Pass or Fail using Table 8.2 of AS/NZS3000:2018 Wiring Rules

Test	Active Cond. Size mm <sup>2</sup>	Earth Cond. Size mm <sup>2</sup>	Protective Device Rating Type C	Active Cond. Resistance (R <sub>ph</sub> ) (Given)	R <sub>e</sub> Value & Units (Measured)	R <sub>phe</sub> Value & Unit (Calculated)	Indicate if Test is Pass or Fail
Ceiling Rose	1.5mm <sup>2</sup>	1.5mm <sup>2</sup>	10A	0.90Ω			
Fluorescent	1.5mm <sup>2</sup>	1.5mm <sup>2</sup>	10A	0.50 Ω			
Socket Outlet 1	2.5mm <sup>2</sup>	2.5mm <sup>2</sup>	16A	0.25 Ω			
Socket Outlet 2	2.5mm <sup>2</sup>	2.5mm <sup>2</sup>	20A	0.40 Ω			

(4 x 1 = 4 marks)

## 2.5 Polarity Test of Consumer's Mains

Test	Record Instrument Reading & Units	Indicate if Test is Pass or Fail
Consumer's Mains Active		
Consumer's Mains Neutral		

(1 +1 = 2 marks)

## 2.6 Operation of Switches

Switch Under Test	Indicate which conductor is being switched ACTIVE/NEUTRAL/NEITHER	Indicate if Test is a Pass or Fail
Ceiling Rose		
Fluorescent Light		
Socket Outlet 1		
Socket Outlet 2		
Fan Socket Outlet		

(5 x 1 = 5 marks)



## 2.7 Testing of Circuit for Automatic Disconnection of Supply

Measure the fault loop impedance of the final sub\_circuit supplying the socket outlet listed in the table below.

The final sub\_circuits are protected by Type C miniature circuit breakers. The nominal supply voltage of the electrical installation is 230 volts.

Complete the table below, and determine Pass or Fail using Table 8.2 of AS/NZS3000:2018 Wiring Rules

Test Point	Conductor Size		Type C Circuit Breaker Rating	Measured Value & Units	Value of $R_{phe}$ & Units From T8.2	Indicate if Test is a Pass or Fail
	Active mm <sup>2</sup>	Earth mm <sup>2</sup>				
Appliance socket outlet	2.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>				

(2 marks)

## 2.8 Testing of Operation of RCDs

Using the RCD tester provided, test the three (3) RCD's and record their trip time and trip current at zero degrees.

RCD Under Test	Earth Leakage	
	Trip Time Value & Units	Trip Current Value & Units
1		
2		
3		

(1 + 1 + 1 = 3 marks)

You are installing a new circuit to supply a 32A socket outlet in a commercial installation. Are you required to install an RCD on this circuit?

Answer: \_\_\_\_\_

Wiring Rules Clause Number: \_\_\_\_\_

1 mark

(3+1=4 marks)

## Question 3

### MEN System Voltage Measurements

A mark will be deducted for each missing or incorrect unit where required

The equipment on this test panel consists of:

- The earth electrode from the 400/230V distribution system substation MEN star point.
- A single phase electrical installation with earth electrode and bonding to a metallic underground water pipe.

Using the instrument provided, carry out the following tests. On the simulated MEN electrical installation, you are required to take voltage measurements, as follows:

#### Question 3.1

- With the main switch "ON" and all circuit breakers in the "OFF" position, take a voltage measurement across the terminals of the point of supply.
- Measure the voltage between the
  - independent earth and frame of the appliance (refrigerator)
  - independent earth and water tap/pipe
  - appliance terminals

in each of the switchboard conditions outlined in the table below.

The main switch is to be in the "ON" position in all cases

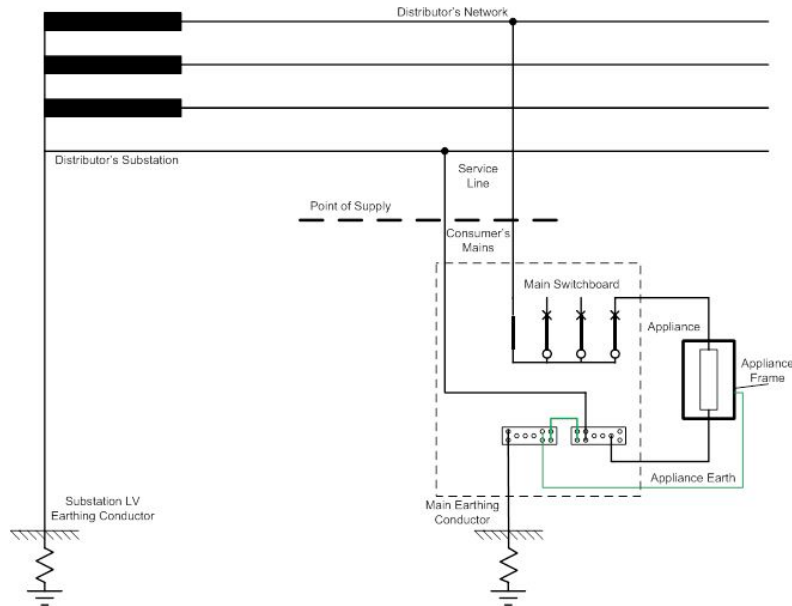
- Record the voltage readings and units, and write them in the table
- Answer the two questions in relation to your readings
- Draw the current path and the location of the fault (if any) on the diagram supplied

Measure and record the supply voltage at the point of supply (Main switch on, all circuit breakers off)				_____ Volts		
Test Condition	Circuit Breaker 1	Circuit Breaker 2	Circuit Breaker 3	Independent Earth and Appliance Frame (refrigerator)	Independent Earth and Water Tap/Pipe	Appliance Terminals (refrigerator)
1	ON	Off	Off			
2	ON	ON	Off			
3	ON	ON	ON			

Is the electrical installation you have measured above safe? Yes / No

Draw the current path of your measured circuit on the diagram below, and indicate on the diagram the location of the fault (if any). Indicate if you have drawn a:

high impedance circuit / open circuit / no fault circuit (cross out those not applicable)



(3+1+2+4 = 10 marks)

### Question 3.2

Answer the following four (4) questions about the MEN system.

Note: these questions may not directly relate to your measurements or diagram above.

1. In a healthy distribution and electrical installation the current return path is:
  - (a) in series with the general mass of earth
  - (b) via the MEN connection and main earth
  - (c) via the main neutral conductor
2. In an installation with an open circuit main neutral conductor, the current will return via the earthing system:
  - a) True
  - b) False
3. In an installation with a high impedance main neutral conductor, as loads increase the voltage at the appliance terminals:
  - a) Increases
  - b) Decreases
  - c) Stays the same
4. An open circuit main neutral conductor will not affect the voltage available at the terminals of an appliance within the installation:
  - a) True
  - b) False

(2+2+2+2=8 marks)

## Question 4

<b>Your workstation/s to inspect are:</b>	
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### Visual Defects

When instructed by the assessor, carry out a visual inspection of the installation.

You are to find five (5) installation defects and record them in the table below. **A maximum of three (3) defects may be taken from the switchboard enclosure.**

- Record five **different** instances of non-compliance with the Wiring Rules AS/NZS3000:2018
- Record the defect in the column provided (1 mark)
- Record the complete Wiring Rules Clause (2 marks)
- Indicate the switch or socket outlet number and panel location when recording the defect
- Only the first five recorded defects will be marked

Panel Location	Wiring Defect	Wiring Rules Clause Number

[5 x (1 + 2) =15 marks]