

| SERVICING AND METERING | | SECTION 5 |
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1. SERVICING

1. When undertaking work under live conditions, appropriate PPE, mats, sleeves, etc, shall be used at all times. Where required, a Safety Observer shall be posted.
2. Persons about to work on, or within reach of live circuits shall be appropriately trained and authorised for the purpose of the work.
3. The work crew nominated to carry out the work shall make a safety assessment before any work is commenced. The surrounding conditions shall be carefully examined to determine whether the work can be done safely. Possible hazards such as earthed situations, exposed live metal, weather conditions and the movement of persons, material and equipment in the vicinity shall be considered.
4. Only appropriate and functional testers in combination with an independent earth shall be used to undertake neutral supply (NST), polarity, insulation resistance, installation checks and voltage testing.
5. The supply neutral only shall be connected to an installation neutral. Conductors shall be visually identified, the neutral tagged and all appropriate NST and polarity tests performed prior to energising a customer's installation.
6. When connecting, replacing or reconnecting a service, all tests shall be performed in accordance with the VESI Installation Supply Connection Tests and Procedures including specific individual Distributors requirements.
7. If incorrect test results are detected and cannot be corrected, immediately isolate the service and report back to your Team Leader or Report Room.
8. Before disconnecting multiphase services, identify and tag the existing phase sequence.
9. A phase sequence check shall be undertaken on multiphase installations.
10. If incorrect phase sequence test results are detected and cannot be corrected, immediately isolate the service and report back to your Team Leader or Report Room. Phase rotation of customer's equipment must be considered prior to altering or rectifying.
11. At both the supply and customer's end, make sure all tails are secure and safe, and always identify and tag the neutral.
12. Ensure appropriate clearances are maintained at all times.
13. Underground service cables shall be insulation resistance (meggered) and continuity tested prior to energisation. Refer to Section 3 of the VESI Installation Supply Connections Tests & Procedures manual.

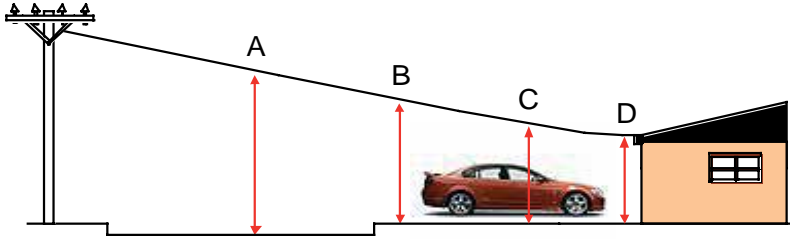
14. Ensure that customer load is removed (i.e. fuses removed or circuit breaker open) before disconnecting or reconnecting services.
15. When re-connecting a customers premises by fuse insertion, (ie for new tenants in a rental property) and load is present and nobody home, leave the installation "OFF" at either the switchboard or by the service fuses.
16. TABLE 1 shows the regulatory height requirements for service lines according to the Network Assets Regulations, 1999. Where a new or replacement service does not meet these requirements, refer to company procedures.
17. Where a premise is deemed electrically unsafe it should be isolated, "Defected" and Dispatch notified. Individual circuits of an installation shall only be inspected, and/or isolated by a Licensed Electrical Worker or a Licensed Electrical Inspector. Where a premise has a minor electrical fault that does not pose a risk to employee or public safety, i.e. faulty FMJB, it should be "Defected" and Dispatch notified.

TABLE 1.

| | SERVICE CABLE LOCATION | Minimum Distance |
|---|--|------------------|
| A | Above a public roadway | |
| | Over a 2m wide strip in the centre of each carriageway of a road | 5.5m |
| B | Over any other part, eg. kerb line of: | |
| | A freeway, highway, primary road, main road or OD route | 5.5m |
| | A secondary or collector road ¹ or forest or tourists road ² | 4.9m |
| | Any other road, eg Local traffic streets | 4.6m |
| C | New Service | |
| | Over a driveway or ground traversable by vehicles | 4.6m |
| | Existing Service | |
| | Over a driveway or ground traversable by vehicles | 3.9m |
| D | All Services | |
| | Elsewhere, i.e. garden beds, lawns and footpaths Point of Supply | 3.0m |

¹ For the definitions of roads see Melways Map Symbols

² For the definitions of roads see Vicroads Townships Maps



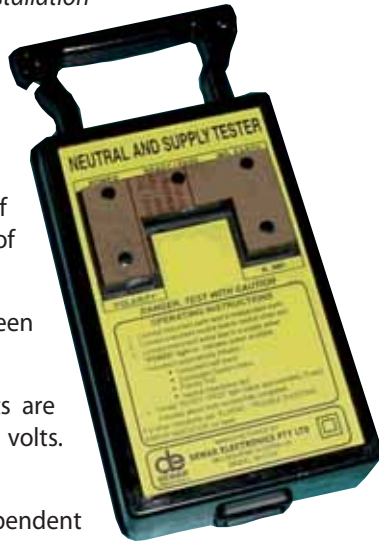
Overhead service heights

2. NST IMPEDANCE TESTING

The purpose of testing with a Neutral & Supply Tester (NST) in accordance with the VESI *Installation Supply Tests & Procedures Manual* is to demonstrate that the active and neutral connections from the network supply to the customers installation are correct.

The tester performs a self check test of its internal operations and a number of other functions which prove:

- That the supply voltage is between 205 and 264 Volts AC (+ - 5 %)
- That the neutral to earth volts are less than the active to earth volts. (Polarity)
- That the impedance of the independent earth is less than 10 k Ω to earth.
- That the supply neutral has less than 5 Volts (+ - 5 %)
- If the results of these tests are suitable, the NST is then capable of testing the impedance of the circuit, which is the last function performed.



Impedance is best described as the opposition to current flow in an alternating current circuit. As voltage (Electro Motive Force) is the force used to push current, impedance is the resistance, which opposes the current and results in a subsequent voltage drop within the circuit. It is upon this principle that the NST determines impedance.

The NST does this by measuring the active to neutral voltages over three consecutive alternating current cycles. The NST applies a 13.3 amp load to the second of these cycles and compares the voltage variations of this loaded cycle with the first and third cycles that are measured with no load applied. By calculating the voltage drop between the active and neutral conductors under this known load the NST can determine the amount of impedance present in the circuit.

Important points to remember when testing are that:

- The instrument is testing the loop impedance of the active and the neutral conductors. Subsequently if the instrument was to fail its impedance test the impedance may be present in the neutral conductor, the active conductor or a collective combination of both.
- The instrument will pass its impedance test if there is any path of less than 1Ω impedance to earth and this may include other paths within the MEN system such as installation earths.
- As the instrument only applies the testing load for one cycle (1/50th of a second) this does not necessarily prove that the neutral conductor will definitely function efficiently under full or consistent load conditions.

For test procedures and descriptions of approved test equipment refer to the VESI, "Installation Supply Connection Tests & Procedures".

3. METERING

General Requirements

Persons about to work on live apparatus shall:

- Subject to the job safety assessment:
 - Wear protective clothing and use protective equipment suitable for the proposed work.
 - Before proceeding with the installation of metering equipment on the premises of new customers, employees shall test all components of the installation to be worked upon in order to prove that they are not alive, and to make the work area secure by locking off switches and/or fitting earthing bonds and/or other physical breaks as appropriate.
 - Inspect all test equipment and test leads to ensure that they are in safe working condition.
 - Use insulated tools as appropriate.
 - Use particular caution when working on metal cased equipment or in enclosed spaces or areas where body movement is restricted.
 - Apply an approved insulating sheath over any conductor, which is removed from its terminal.

Direct Metering

Installation and removal of electric meters and metering devices shall be performed by trained, authorised personnel using appropriate personal protective equipment and test equipment.

Other than where exemptions are granted, work on customer's low voltage installations shall only be performed by persons licensed by ESV.

Direct Meter Types



Mechanical Clock Face Meter



Mechanical Digital Read Meter



EMS 2100 Meter



EMS2600 Meter

To ensure the metering is correct, it is essential that the following requirements are met:

1. The metering equipment must be appropriate for the load and tariff.
2. The connections must be made correctly.
3. Metering equipment must be fixed to meter panels in a manner that prevents accidental penetration or abrasion of a conductors insulation. This can be achieved by the use of nylon hardware or approved metal screws.
4. The location must be permanently accessible and suitable for the equipment used. Refer to the current edition of the Victorian Service & Installation Rules.
5. A record must be taken of the equipment installed and/or removed.
6. All metering equipment must be transported carefully as they could be damaged internally or made inaccurate by rough treatment.
7. Always seal metering equipment including metering panels with the correct seal and tag neutral conductors.
8. At the completion of the installation of the metering equipment, all tests shall be carried out in accordance with the VESI Installation Supply Tests & Procedures.

Existing Installation – Replacement of Direct Metering

Refer to VESI Installation Supply Connection Tests & Procedures Manual, Section 4.

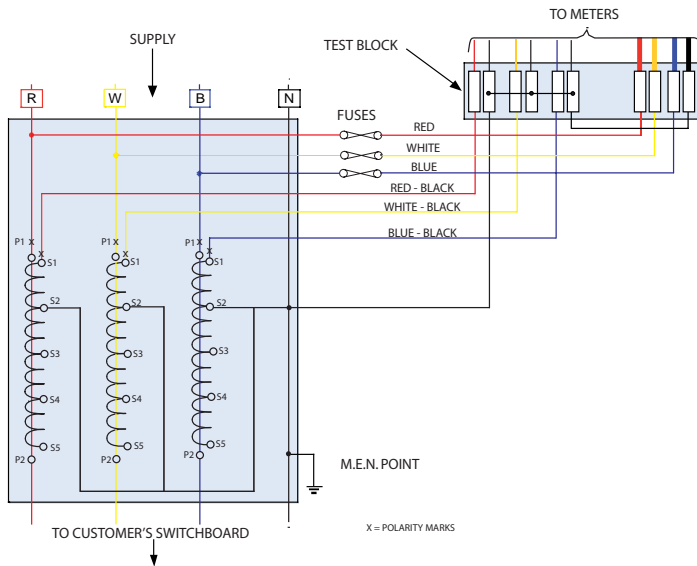
4. CT METERING

General

All works conducted on CT metered equipment shall be in accordance with clause 14.5 of the *Green Book 2006 - Code of Practice on Electrical Safety for the Distribution Businesses in the Victorian Electricity Supply Industry* and the *VESI Installation Supply Tests & Procedures*.

CT Metering – General Requirements

The purpose of CT metering is to accommodate customers requiring a load greater than 100amps. This has been adopted because conductors of higher rating cannot be satisfactorily terminated on direct connected meters.



Other than where exemptions are granted, work on customer's low voltage installations shall only be performed by persons licensed by ESV. Employees shall perform as much of the installation inspection and testing work as practicable, de-energised.

Work on CT Metering (Alive)

Work on live metering equipment is permitted for testing or investigative purposes by authorised persons. Test equipment may only be connected/disconnected from live metering equipment terminals when it can be done safely and the actions of connection/disconnection do not involve the making or breaking of customer load.

Persons undertaking live work shall be appropriately trained and authorised for the purpose of work.



CT Chamber showing LV buswork and CT's

The person nominated to carry out the work shall make a safety assessment before any work on live apparatus is commenced. The surrounding conditions shall be carefully examined to determine whether the work can be done safely. Possible hazards such as earthed situations, exposed live metal, weather conditions and the movement of persons, material and equipment in the vicinity shall be considered.

In situations which present the possibility of making inadvertent simultaneous contact with exposed live metal of different phases and/or earth, eg, when entering the space behind a switchboard or when working on a cubicle type switchboard or control panel, persons shall wear protective clothing and use protective equipment and methods.

At no time shall the secondary circuit of the CT be opened while the primary is energised. The transformer must be shunted before opening the secondary metering circuit.

Before working on the secondary circuits of current transformers, the person shall ensure that all necessary precautions are taken:

- To prove that secondary conductors are at earth potential.
- To prevent an open circuited secondary situation.

Before working on voltage circuits on a meter panel the circuit shall be isolated by:

- Removing the fuse cartridges for permanently fused voltage circuits; or
- Opening the voltage links in the meter test block.

When testing or inspecting voltage circuits that are not permanently fused, the voltage links at the meter test block shall be opened and temporary fused links inserted.

- Voltage circuits connected to the supply side of a meter panel shall be isolated before work commences.
- No work shall be carried out on a bonded secondary installation. The installation shall be de-energised and replaced with metering to current standards.

Work on CT metering (De-energised)

Where the JSA reveals that the work cannot be performed live in a safe manner, the work party shall:

- Isolate in an approved manner.
- Test the conductors to prove that they are not alive.
- Make the work area secure by locking off switches and/or fitting earthing bonds and/or other physical breaks as appropriate.

Existing Installation – Alterations and/or Additions

When conducting works on CT Meter Panels the worker shall consider the wiring arrangement of the particular installation and where appropriate supplement this procedure with additional practices as required within the Code.

1. Test primary and secondary work areas for de-energised.
2. Install “Installation Under Test” notice.
3. Identify current, voltage and any switching active and neutral conductors and mark as appropriate.
4. Establish existing phase sequence.
5. Insert ‘shorting’ plugs into the current circuit of the meter test block. (All Phases)
6. Open the current links of the meter test block (All Phases)
7. Isolate the voltage/potential circuits from the meter by removing the fuse cartridges or opening the voltage links in the meter test block.
8. Test for De-energised
9. Conduct Metering Replacement/Alterations.
10. Restore voltage/potential supply to meters by inserting fuses or closing voltage links in test block as appropriate.
11. Close the current links at the meter test block (All phases).
12. Remove the ‘shorting’ plugs from the current circuit of the meter test block (All phases).
13. Test Phase Sequence.
14. Check meter for correct meter registration under customer load.
15. Check correct Voltage and Current phase relationships, for each phase.
16. Conduct specialist-metering checks/tests in accordance with meter provider requirements.



CT Metering enclosure showing meters and separate CT Chamber

17. Check if correct constant is applied to the meter label.
18. Check all connections and equipment.
19. Seal metering and associated equipment.

5. READING ELECTRICITY METERS

Occasionally fieldworkers will be asked to read customers electricity meters. When asked to do so it is vital that the correct information is recorded as this is billable information to a customer.

Clock Face Mechanical Meters

- Stand directly in front of the meter
- Read from left to right, obtaining one number from each clock face
- If the hand is between two numbers, always record the lesser of the two, not necessarily the closer. (The exception is when the hand is between 9 and 0, in which case you write down 9).
- Using the example at Figure 1, the reading would be 04508 kWh's

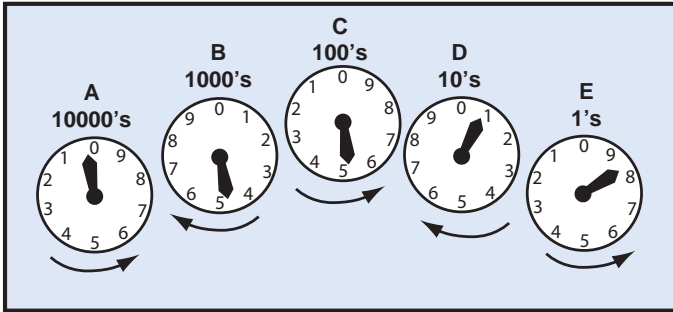


Figure 1

NOTE: When the hand appears to be exactly on a number, look at the dial to the right.

In the example below in Figure 2, if the hand at 'C' has not passed 0, the number 5 at 'B' has not actually been reached and so the reading is the lower number, which are 4. The total reading is therefore 04980 kWhs.

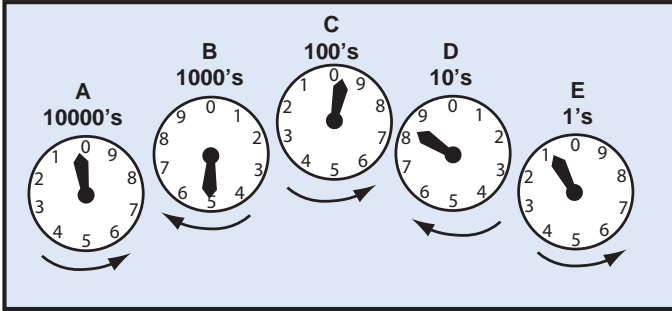


Figure 2

Digital Read Mechanical Meters

To read this type of meter, simply read the digits from left to right. In the example at Figure 3, the reading would be 425836 kWhs



Figure 3

Where there are 2 rows of digits, this indicates a 2-rate meter reading a high and a low tariff, (see Figure 4). In this case, simply record the readings from left to right making sure to note which is the high and which the low tariff.



Figure 4

EMS 2100 & 2600 Electronic Meters

When the Display button is pressed, the meter will automatically scroll through a series of up to 20 displays. Each display will have a number on the left-hand side of the reading.

As the meter scrolls through each display, note down the readings for the following display numbers:

- 03 – Total kWh
- 04 – kWh usage, Peak
- 06 – kWh usage, Off-Peak
- 07 – kWh usage, Off-Peak Hot Water

NOTE: *The Boost button can be used if there is a single element electric hot water service. If the hot water service has run out of hot water, press the boost button once. The unit will automatically switch itself off when boosting is complete.*

6. ADVANCED INTERVAL METER INFRASTRUCTURE (AIMI)

In early 2006, the Victorian Government formally endorsed the deployment of advanced interval meters to all Victorian electricity consumers taking supply of less than 160 MWh per annum.

Currently, most Victorian electricity supply points are metered with electro-mechanical accumulation meters that only record total consumption and are subject to manual reading every three months. Starting at the end of 2008, more than 2.5 million new meters (often referred to as “smart meters”) will be installed over a 4 year period. These meters will allow Victorian consumers to better manage their energy use by providing more detailed information about their consumption with the opportunity to save money on their power bill and reduce greenhouse gas emissions.

Further advantages are expected to be gained by remote or wireless technology, such as reading and disconnect/reconnect.