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electrician's newsletter

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First Edition of The Electrician's Newsletter

The first edition of the Electrician's Newsletter (No. 01 – May 2001) has been received favourably by the electrical industry. Many electricians contacted our staff to offer their congratulations on the quality of the publication.

The Electrician's Newsletter is a web-based document. However copies may be available at selected electrical trade outlets.

To receive future copies of this Newsletter, electricians must register their email address with the Office of Energy.

This can be carried out on the Office of Energy website or by email to:

register@energy.wa.gov.au.

Winners of Trade Tool Vouchers

As advertised in the first edition of the Newsletter, three electricians who registered before 30 June 2001 to receive future issues of the Newsletter by email, were randomly selected to each receive a $100.00 trade tool voucher.

Congratulations go to the winners of the trade tool vouchers, John Johnston, Rick Sommerford and Robert McKee.

The Trade Tool Vouchers were kindly donated by MM Electrical.

Mitchell Ross, Regional Manager of MM Electrical (far left) congratulates Rick Sommerford whilst, from left to right, John Johnston, Robert McKee and Kevan McGill, Deputy Director Energy Safety, look on

Continuity of the Earthing System

An article in Issue No. 1 (May 2001) of the Electrician's Newsletter described the final sub-circuit design based upon the Wiring Rules and the "WA Electrical Requirements". The article referred to the mandatory Wiring Rules' requirement that the resistance value of the protective earthing conductor (or installation earth conductor) must be low enough to permit the passage of an earth fault current to operate the protective device.

The following article is provided to explain the requirements of the Wiring Rules' Clause 6.3.3.2 "Continuity of the earthing system" mandatory test.

Referring to Diagram 1 (on this page), the path when an active to earth fault occurs includes the installation protective earthing conductor, MEN link, distribution neutral conductor, transformer and active conductor, installation active and the installation protective device. This is called the 'fault loop' and the magnitude of the earth fault current flow is limited by the sum of all the individual circuit impedances.

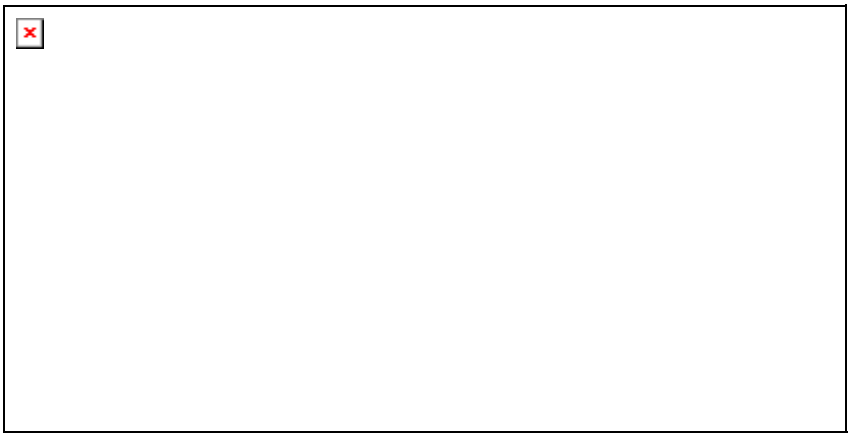

Diagram 1
Fault Loop Path

Hence, to ensure the protective device operates requires a **low fault loop impedance path** with a resultant high earth fault current flow.

Earth Resistance Checks

Earth resistance tests are required to confirm the installed earthing system will sustain a high earth fault current and cause the associated circuit protective device to operate, whilst maintaining cable integrity during a fault between live parts and exposed conductive parts.

Referring again to Diagram 1, the resistance from any point of the electrical installation required to be earthed (socket outlet), to the point where the main earthing conductor is connected to the neutral conductor (MEN connection) of the supply system (heavy bold line), must be low enough to permit the passage of current necessary to operate the circuit protective devices. To confirm this value (which is dependent upon the type and rating of the protective device and the fault-loop impedance of the associated conductors) requires **either one** of the following tests to be performed:

Test 1: Earth Resistance - Electricity Supply not Connected (De energized)
Obtain the resistance value of the **protective earthing conductor** using a quality ohm meter and compare this value to the **maximum** allowable resistance as shown in the Table (on this page).

1 Test Equipment Required

- A multimeter set to ohms
- Insulated flexible copper conductor of suitable length ie. the "long lead"

2 Preparation

- Check that the installation is electrically isolated.
- Connect the "long lead" to one terminal of the ohm meter.
- Connect a standard test lead to the other terminal of the ohm meter (short lead).
- Connect the two leads together, and

- zero the multimeter or, if this is not possible,
- record the resistance of the test leads.

- Disconnect the water pipe equipotential bonding conductor and the water heater earthing conductor (if applicable).

Note: Care must be taken that there are no parallel earth paths when conducting this test, ie. the earthing system must not be connected to either the water or gas pipes.

- Disconnect the MEN link from the main neutral link and connect it to the long lead (ie. long lead now connected to the earth bar via the MEN link).

3 Earth Resistance Test Procedure

- Using the long lead and multimeter, measure the earth resistance between each point of every subcircuit and the MEN link at the switchboard (refer to Diagram 2 below).
- Confirm the measured values are **less than** those values as provided in the Table (on this page).
- Record the test results on a self adhesive label and place inside the meter enclosure.

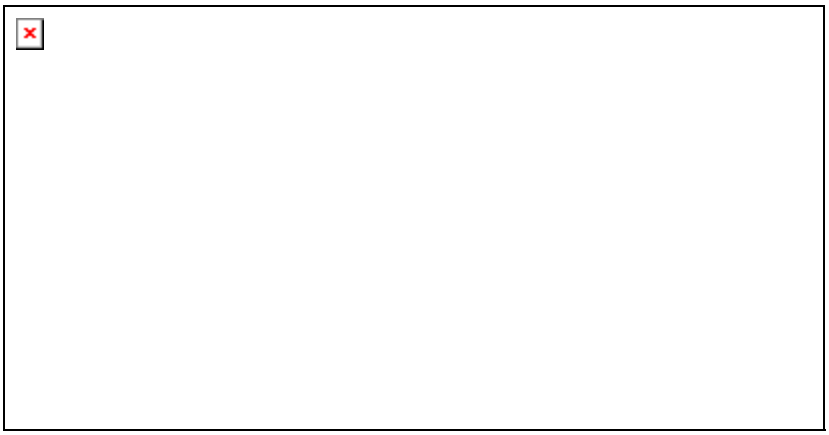

Diagram 2
Earth Resistance, Electricity Supply not Connected (De energised)

Equipment that must comply with the values provided in the table (ie. 0.4 sec. maximum disconnection time) includes:

- socket outlets with a current rating of up to and including 63 amperes
- hand held Class 1 equipment
- portable equipment intended for manual movement during use.

Note: Other equipment including final sub circuits supplying fixed or stationery equipment must disconnect within 5 seconds. This specific issue is planned for the next edition of this Newsletter.

4 Test Completion Tasks

- Re-connect the MEN link to the main neutral link.
- Re-connect the water pipe equipotential bonding conductor.

Test 2: Earth Resistance - Electricity Supply Connected (Energized)

Obtain the fault-loop impedance of each sub circuit using a quality fault-loop impedance meter (refer to manufacturer's instructions). Compare the measured fault-loop impedance value with the maximum value provided at Appendix B, Table B4.1 of the Wiring Rules.

Notes:

1 If an RCD operates during the test, the test result is considered satisfactory.
2 If the value measured is **greater** than the allowable maximum, then the following items must be checked:

- that the MEN connection is sound
- that the active, neutral and earth conductor/equipment connections are all sound
- the conductor sizes for all circuit are correct.

If, after carrying out the above checks, the fault-loop impedance values do not satisfy the requirements of Table B4.1, then the electricity supply authority must be contacted to advise them

of the discrepancy.

Important: The Wiring Rules state that Test 1 (earth resistance test) is mandatory and Test 2 (fault loop impedance test) is optional, however the Office of Energy recommends using Test 2 (fault-loop impedance tests) in lieu of Test 1 for determining the resistance of protective earthing conductors where the electricity supply is available.

Table – Maximum Resistance Values of Final Subcircuit Protective Earthing Conductors

Protective Device Rating	Conductor Size		Circuit Breakers			Fuses
			Type B	Type C	Type D	
			Disconnection Times			
A	Active mm^2	Earth mm^2	0.4 sec			0.4 sec
			Maximum Final Subcircuit Earth Conductor Resistance Ω			
6	1.0	1.0	3.08	1.65	1.00	3.69
10	1.5	1.5	1.85	1.00	0.60	2.06
16	2.5	2.5	1.16	0.62	0.38	0.99
20	2.5	2.5	0.93	0.50	0.30	0.68
25	4.0	2.5	1.07	0.57	0.34	0.76
32	4.0	2.5	0.72	0.38	0.23	0.51
40	6.0	2.5	0.66	0.35	0.21	0.44
50	10.0	4.0	0.54	0.29	0.17	0.34
63	16.0	6.0	0.44	0.23	0.14	0.26

Electrical Licensing Board Aims for Full Compliance

The Electrical Licensing Board is responsible for licensing only those persons who are competent and who perform compliant electrical work to mandatory industry standards. The Board considers that all licence holders have a responsibility to maintain their own competence and knowledge of regulations and standards.

Persons who do not maintain their competence will have their licence status reviewed by the Board with the possible outcome of licence cancellation or suspension. To implement this, the Board recently embarked on a ‘no tolerance’ policy in regards to persons who are incompetent or negligent.

When the Board is made aware that a licence holder has carried out substandard work, it will require that person to demonstrate that they are competent for licensing purposes. This means they will have to complete a competency assessment. As of 1 August, 20 persons have been requested by the Board to demonstrate their competence by undertaking a formal assessment. Failure to satisfactorily complete the assessment will result in the licence being suspended. The person may also have to attend a formal disciplinary hearing before the Board.

All persons who have had their licence suspended will need to demonstrate their competence to the Board before a licence will be re-issued. This may include working for some time under supervision to gain further practical competence, in accordance with regulation 50 of the *Electricity (Licensing) Regulations 1991*. In such cases the supervisor will also be required to provide a report to the Board attesting to the person’s level of competence.

The Board considers that this policy is necessary to maintain appropriate standards within the industry.

The Board seeks cooperation of all persons in industry to achieve its aim of full compliance.

Alternative formats of the Electrician’s Newsletter may be available to meet the needs of people with disabilities.

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