

## SAFETY ALERT

5 September 2008

### EARTHING OF ELECTRICAL INSTALLATIONS USING THE WATER RETICULATION SYSTEM

Standards Australia has re-iterated earlier warnings to tradespersons, in particular plumbers, and water utility workers to a safety hazard involving the previous practice of using continuous, metallic water reticulation systems as an earthing medium rather than using the currently required method of earthing using an earth electrode.

Following the death of a water utility worker in 2005, Energy Safe Victoria (ESV) issued a Safety Alert in September 2005 warning of electrical hazards when working on metallic water main and associated fittings.

ESV also convened a workshop to identify precautions which need to be implemented by water utilities to guard against electrical hazards associated with an abnormal voltage rise on metallic water pipes.

#### The Standards Australia alert reads:

Possible injury and damage to life and property can be caused by earthing installations that use the outdated practice of earthing to metallic pipes. This hazard can appear in two ways: through the introduction of plastic water pipes into existing metallic water reticulation systems; or by faults in the electricity distribution network conducting through metallic pipes.

In both scenarios it is the outdated method of earthing of earth electrical installations to continuous metallic water reticulation systems that is the problem.

Water reticulation systems have changed markedly in recent years with the introduction of many plastic pipes or insulated meters, either as repairs, replacements or alterations to existing services. In many cases, plastic pipes have been fitted to existing metallic systems.

This creates insulating sections that no longer have a continuous, effective and low resistance earthing network and therefore do not provide adequate earthing.

Secondly, the safety hazard can sometimes appear as a flow on effect from breakdowns in the electricity system in Australia, the 'Multiple Earthed Neutral (MEN)' system.

When a breakdown occurs in the MEN system, the neutral-earth connection becomes open-circuit in either the distributors network or in an individual electrical installation. The earth fault is then returned via the earthing system rather than the neutral conductor. As a result, a potential is applied to the water pipe system. When the pipe system is in contact with the earth along its length, this potential is low and less severe. For insulated sections, usually with shorter pipe length in contact with the earth, the potential can sometimes be large and more significant and is often different to that of the water pipe system on the other side of the installation.

If a human is in contact with the metallic water reticulation system at the time of the fault, there could be significant injury or even death caused by the flow of electrical current.

Similarly, if the water pipe system within the premises is continuous, it presents a very low resistance to earth. If local problems exist within the installation, there will be a distinct possibility that the tap connected to the continuous water pipe earth system will be at a different potential to the earth at the base of the sink. There will be a current flow once the gap between the tap and local earth is bridged by the action of attempting to turn on the tap.

Standards Australia's Committee EL-001 has taken action to provide for detection of the problem. A simple test to detect an open-circuit neutral has been developed by the Committee which has been included in the Installation Testing Standard AS/NZS 3017 published in 2007.

This test can then be called up as part of a periodic testing regime in the reverification Standard AS/NZS 3019 which is mandatory in New Zealand but not in Australia.

In addition, Standards Australia is advising enquirers through the Wiring Rules email service, to install an earth stake if there is not one already in place even though this is not a mandatory legal requirement, to ensure that the protective earthing system connecting exposed conductive parts to the earthed neutral of the distribution system is sound and to additionally fit residual current devices (RCDs) to disconnect the affected part of the installation.

*Use of an earth electrode for earthing electrical installations is the method outlined in AS/NZS 3000:2007, Electrical installations (known as the Australian/New Zealand Wiring Rules). This method of connecting to earth has been a requirement for new installations since the 1976 Edition of the Wiring Rules.*

*The Wiring Rules and its companion documents are Standards that apply to new electrical installations and alterations, additions and repairs to existing electrical installations and not to the maintenance of an electrical installation.*

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