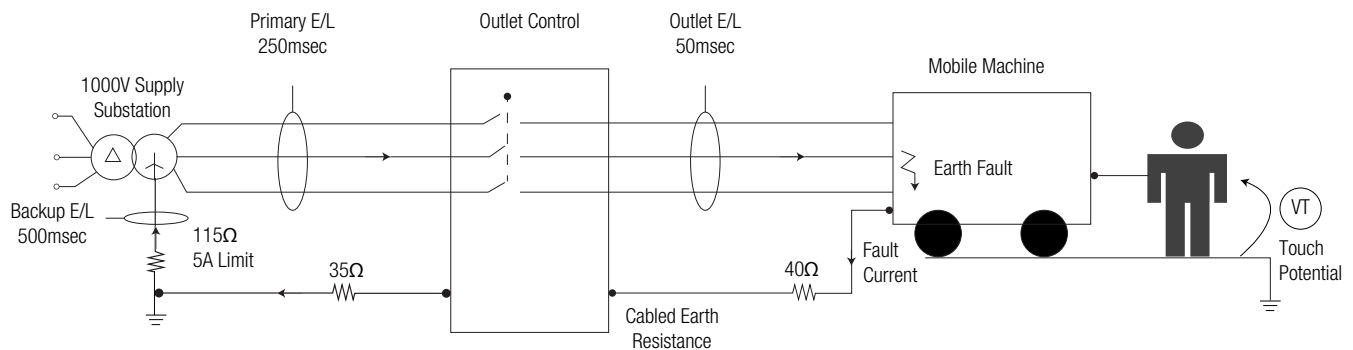


Typical Practice Is Not Necessarily Safe

Traditional earth fault limits, earth loop impedances and protection clearance time 'rules of thumb' do not always result in a safe or compliant system.

Typical underground example



In Australia, a typical 1000V underground supply system commonly has a 5A earth fault limit.

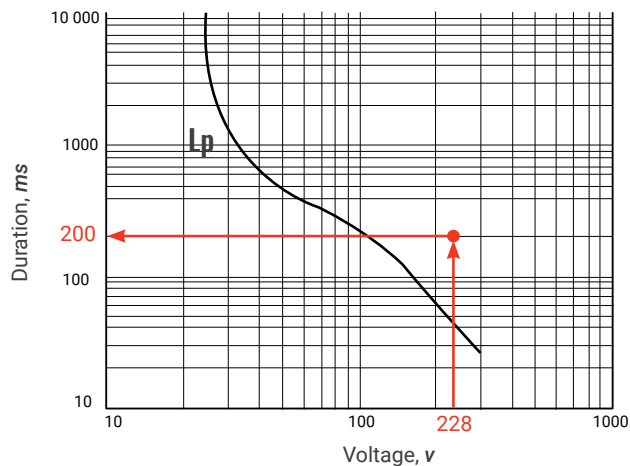
The cables feeding outlet control and the load are often protected by earth continuity relays with a 45Ω pilot earth loop impedance limit. Allowing for the pilot resistance of the installed cable length, could see the total return earth impedance for an earth fault in the load as high as 75Ω.

Worst case touch voltage is:
 $75 / (115 + 75) * 577 = 228V$

Total clearance time for outlet E/L:

- Earth leakage relay 50 msec (instantaneous)
 - Interposing relay delay 20 msec
 - Breaker/contactor delay 130 msec
- = a total clearance time of 200 msec**

AS/NZS4871 Maximum Duration of 50Hz Touch Voltage



Lp curve for wet conditions Touch voltage limit 25v

The scenario is typical of underground practice as the key operating parameters are consistent with values allowed in standards

- 5A earth fault limit
- 45 Ohm earth return impedance limit

The potential touch voltage clearance times are to the **right of the safe area** of the wet area curve (Lp) in AS/NZS4871.



Not safe or compliant

Typical Practice Is Not Necessarily Safe

What you need to do

The 2012 changes to AS/NZS4871 are more significant than generally appreciated. Traditional parameter values available under standards are not necessarily 'safe' when configured into a practical system.

Removal of prescriptive limits on key parameters including earth fault limits, trip settings and clearance times, requires all design settings to be **examined from first principles**.

Regardless of whether they fall below the wet area curve or not, all protection parameters should be **justifiable as being as low as reasonably practical**.

How to get there

- Complete an audit of your system against the requirements of AS/NZS4871
- Carefully consider the fundamental parameters including:
 - ▶ Earth fault limitation
 - ▶ Return earth impedance limit
 - ▶ Tripping ratio and total clearance times
- Review underground substations for compliance against AS/NZS4871 and Safety Bulletin SB11-04 (variable speed drives and fitment of wideband earth leakage)

How Ampcontrol can help

Not sure where to start or need some help with an audit? Ampcontrol have a range of services available to help you.

+ Engineering support

Ampcontrol's electrical engineering team have the experience and expertise to understand and evaluate your system. We can undertake protection and electrical distribution studies and provide design advice.

+ Onsite support

Ampcontrol's underground and HV service teams are available to conduct AS/NZS4871 audits. Our trained service technicians and engineers audit your site, provide standardised documentation of audit findings, and provide recommendations for any issues identified.

+ Training

We provide practical training modules including how to set and configure protection equipment as well as HV maintenance program requirements. Our training packages are custom designed to your site installation and include reference materials. Training can be conducted on a scheduled basis to ensure your staff remain up to date with requirements.