

Although many injuries are prevented by residual current devices (RCD), there is a lack of confidence that they will operate reliably. To what extent can the devices be trusted? An indication of how often they fail to work has been published by the Electrical Safety Council, giving the findings of a 2-phased research programme [1].

The first phase looked at the results of studies carried out in other countries in the early 1990s. One in Italy where 21,000 RCDs were tested found 7% to be faulty. These are significant failures, but do not necessarily apply today because of improvements in design and manufacture. However the research has led to a better understanding of why RCDs fail.

In the second phase of the research, conducted in the UK, a preliminary report from the Council after testing 607 RCDs records a failure rate of 3.8%, dropping to 2.8% when RCDs that had been deliberately shorted out are removed from the sample.

Why does an RCD fail? The likely causes are:
Deliberate shorting out (to prevent nuisance tripping)
Ingress of moisture and contaminants
Component misalignment
Disruption of contact surfaces causing contact welding

The ingress of moisture and dust was reckoned by many researchers as a major cause of failure. Either moving parts in electromechanical RCDs get clogged up, or circuit boards cease to operate properly – significant failure rates in electronically-operated RCDs were also reported.

These faults, in most cases, can be picked up by pressing the test button. In fact the main conclusion is that the reliability of RCDs will greatly improve if the test button that subjects the device to an earth-fault condition is operated regularly. This of course has to be followed up by replacing the faulty RCD without delay.

The form of RCD protection in school laboratories or workshops will vary. Some rooms will have RCDs mounted in an accessible location controlling all of the socket outlets in the room or workbench. In others, the RCD will be out of sight in a cupboard. Others will have RCDs on socket outlets. Yet others will have portable RCDs. Quite a lot to manage. Please see that they are tested regularly to the installer's or manufacturer's instructions.

Time your tests so as not to inconvenience others. Because a successful test will result in power being switched off, any computers will be powered down unless there is battery, or other form of, backup.

Recommendation

Check your RCDs regularly by depressing the test button. This will improve their reliability.
Replace if dud.

RCD protection

It is now 13 years since SSERC published its recommendation in the Bulletin [2] that some form of supplementary protection from the electricity supply should be installed in practical work areas. The follow-up is worth reporting on.

To explain why we had carried out research into RCD protection, like much of our work, it was demand led. A school was in dispute with their employer. When their request for RCD protection in a new suite of labs had been turned down by the council electrical engineer they turned to us for a second opinion. That's what triggered our risk assessment into the electricity supply, the result being our recommendation that science laboratories and technology workshops should have RCD protection. We sent our report to the school and published it in the Bulletin. Some weeks later we got a telephone call from a gentleman who introduced himself as the chief inspector of the National Inspecting Council of Electrical Installation Contractors (NICEIC) – the industry's independent voluntary regulatory body for electrical installation safety matters to whom electrical engineers go for technical advice in the Wiring Regulations. Telling us that one of his clients had sent him a copy of the article for comment he said that he didn't disagree with any of it (albeit that there was some wrong terminology) and asked for permission to copy the article to distribute to all 50 NICEIC inspectors for information.

Since our report, there has been raised recognition that RCDs, in areas used by the general public, are important in preventing death by electrocution from the mains supply. The Electrical Safety Council encourage their use in the home.

Yet from anecdotal evidence, many councils have been slow in fitting them in labs and workshops. A pity. Perhaps this reminder will get them interested.

References

Research into the in-service reliability of RCDs Switched On The Electrical Safety Council 7 2007.
RCD Protection Bulletin 185 SSERC 1995.