Technical Bulletin 118

Safe electrical isolation of gas appliances
Date issued: 1 July 2016

Note: *This version of Technical Bulletin (TB) 118 replaces the version originally published on 25 August 2011, which is now withdrawn. This version has been reviewed and, where appropriate, revised to ensure that it remains current and relevant.*

This Technical Bulletin provides guidance to Gas Safe registered businesses/engineers on the safety precautions to take when working on appliances and the safe electrical isolation of gas appliances.

Note 1: *The health and safety enforcing authorities in all geographical areas covered by Gas Safe Register, ie, Great Britain (GB), Northern Ireland, Isle of Man and Guernsey, regard the guidance in this Technical Bulletin (TB) as a 'best practice' requirement and would expect all Gas Safe registered businesses/engineers to apply its requirements when and where appropriate circumstances/relevant appliances are encountered. For details of current health and safety legislation, gas safety legislation, building legislation and industry standards for the geographical areas covered by Gas Safe Register, see the Legislative, Normative & Informative Document List (LNIDL)[1] by logging into your online account at: https://www.gassaferegister.co.uk/sign-in/*

Introduction

Electric shock is defined as: "A dangerous physiological effect resulting from the passage of electric current (amps) through the body." Sometimes, this passage of current can lead to nothing more than some small discomfort to the person receiving the shock, while at other times it can **kill** the person receiving the shock.

A person making direct contact between line (live) and neutral will not normally cause an over-current protective device – eg, fuse or circuit-breaker – to operate, as body resistance is usually quite high, (around 2,500 ohms). A person making contact between line and earth will produce a small increase in phase current of about 10mA to 300mA, which again, is unlikely to be detected by over-current protective devices.

However, if a residual current device (RCD) is installed in the circuit, there will be a slight imbalance between the line and neutral currents that can be detected by a sufficiently sensitive RCD.

Electric shock

Many factors play a part in determining the extent of injury received from an electric shock, including luck. Many people experience electric shock at some time in their life. Fortunately for most of them, contact is broken by reflexes before too much current has passed through the body.

An electric shock may not injure or kill the person receiving it, but there are consequential hazards that could prove harmful, such as falling off a step ladder. *Figure 1* (below) illustrates the passage of electrical current through the human body.

Not everyone will receive the same level of shock from the same source: it depends on variables such as the individual's body resistance, their health, etc. However, it is generally accepted that 50mA (0.05 Ampere) is the lethal level. Below this level, contact with a live source normally throws us away from that source.

Above 50mA, the muscles contract or freeze and we are unable to break contact. The heart's rhythm is interrupted and it may stop beating altogether (ventricular fibrillation). Burns to the parts of the body in contact with the source can occur, together with burning of internal organs and loss of breathing.

Legislation

Health and Safety at Work etc Act 1974 (HSWA) (United Kingdom)

The HSWA applies to everyone concerned with work activities, including employers, the self-employed and employees. The duties are expressed in general terms so that they apply to all types of work

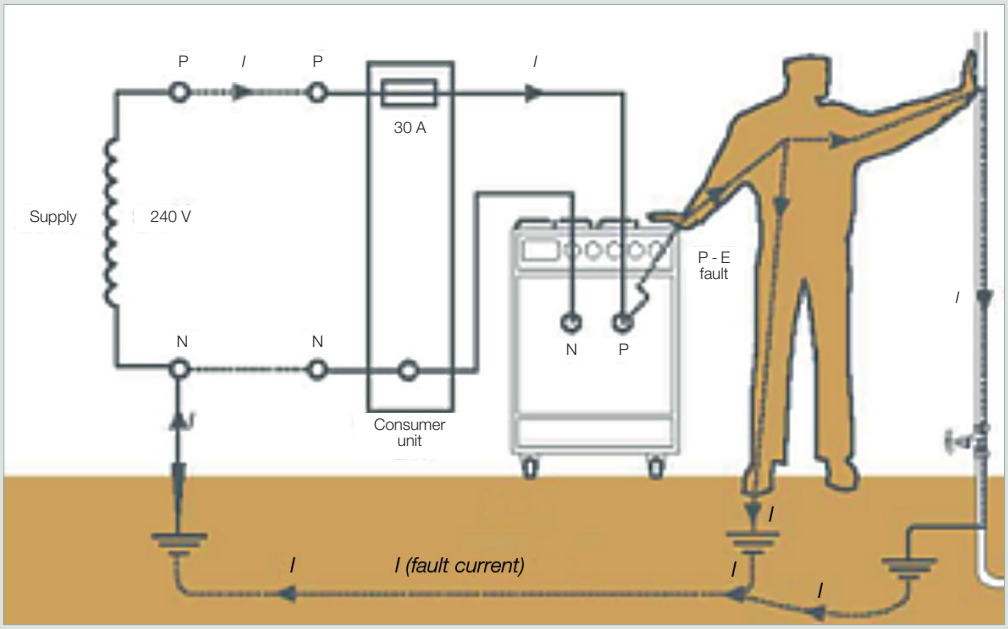

Figure 1: *The passage of electrical current through the human body*

activities and work situations. Every employer has a duty to ensure, as far as is reasonably practicable, the health, safety and welfare at work of their employees.

Note 2: *Similar requirements apply in other geographical areas covered by Gas Safe Register (see also Note 1).*

Electricity at Work Regulations 1989 (EWR) (Great Britain)

The EWR came into force on 1 April 1990, made under the HSWA. The regulations require precautions to be taken against the risk of death or personal injury from electricity in work activities. Regulation 13 of EWR covers the precautions that need to be taken on equipment that has been made 'dead'.

In the case of many gas appliances, the means of electrical isolation can be adjacent to the appliance and could be in the form of a plug and socket outlet, or switched fused connection unit, which is under the direct control of the competent person carrying out the work. These devices can be used for the isolation of the appliance without further precautions being taken, provided that there is no risk that the supply could be reinstated by others.

Regulation 14 of EWR requires that 'dead' working should be the normal method of carrying out work on electrical equipment. Live working should only be carried out in certain circumstances where it is unreasonable to work dead – for example, fault finding and testing. When fault finding and testing, there are instances where the electrical equipment needs to be live, and so suitable precautions need to be taken to prevent injury.

Regulation 14 of EWR states: *"No person shall be engaged in any work activity on or near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless:*

(a) it is unreasonable in all the circumstances for it to be dead; ***and***

(b) it is reasonable in ***all*** *circumstances for him to be at work on or near it while it is live;* ***and***

(c) suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury."

Regulation 16 of EWR requires the person carrying out the work to be competent: *"No person shall be engaged in any work activity where technical knowledge or experience is necessary to prevent danger, or where appropriate, injury, unless he/she possesses such knowledge or experience, or is under such a degree of supervision as may be appropriate having regard to the nature of the work."*

Guidance on safe isolation of electrical equipment (including appliances) when carrying out work

The means of isolation for the equipment must be under the control of the person carrying out the work. This can be achieved in a number of ways:

- Posting warning notices at the point of isolation: *and*
- Use of locking devices for plugs or switched fused connection units; *or*
- If the means of isolation is adjacent to the equipment and is visible while working on the equipment, no further precautions are required.

If the isolation of a circuit breaker is required, then a proprietary locking device with a padlock should be used, not insulating tape. The person carrying out the work should retain the key to the padlock at all times.

Where fuses are used, then removing the fuse and (where applicable) the fuse carrier is a suitable means of isolation, provided that the person carrying out the work retains the fuse. Where the carrier cannot be withdrawn, a lockable fuse insert should be used.

Warning notices should be posted to warn others that work is being carried out and the fuse should not be replaced.

Important: *The neutral coming into the installation of a TT system may not be at earth potential. Therefore, when working on a TT system, it is essential that the means of isolation being used disconnects* ***all*** *the live conductors (line and neutral).*

Proving electrically dead

Once the means of isolation has been identified, and following the isolation of the equipment, it is vitally important that the equipment is checked to ensure it is electrically dead before work commences. The use of an approved voltage indicator is required to prove that the equipment is dead. This could be a proprietary test lamp, or a two-pole voltage detector (*Figure 2*). The HSE recommends that a multi-meter is not used for proving dead.

Figure 2: *An example of a two-pole voltage detector*

Figure 3: *Typical proving unit*

It is important to test the approved voltage indicator on a known supply or proving unit (*Figure 3*) before and after use. Testing should be carried out between all line conductors (live and neutral) and live conductors to earth.

Technical Bulletin 118

continued

Note 3: *Single pole or non-contact live-circuit detectors, sometimes referred to as voltage sticks, should be used for identifying live equipment, not for proving that it is dead. Only devices that make contact with the conductor (ie, not proximity devices) should be used for proving dead. However, non-contact or proximity detectors can be useful in indicating if something is live, eg, when attempting to remove a single cable installed in trunking containing many single cables.*

Safe isolation procedure

The following procedure can be used as a guide to ensure the correct procedure is followed when isolating a piece of electrical equipment such as a gas boiler.

Stage 1

With the responsible person's permission, ensure it is safe and acceptable to isolate the equipment. Remove the load from the circuit by turning off the equipment if possible, by operating any on/off switches.

Switched fused connection unit

Turn off the switch and remove the fuse carrier where possible. If the carrier is not removable, remove the fuse and secure the carrier in the open position if it is not adjacent to the equipment being worked on (*Figure 4*). The fuse should be kept by the person carrying out the work.

Plug and socket outlet

Switch off the socket outlet (if switched) and remove the plug. Remove the plug top fuse if practicable. If the plug and socket outlet is not adjacent to the equipment being worked on, then the plug will need to be secured against inadvertent reconnection by another person. There are a number of proprietary devices on the market for this.

Stage 2

Test the voltage indicator on a known source/supply before use, for example, on a proving unit (*Figure 3*).

Stage 3

Using the proven voltage indicator, check that there are no dangerous voltages present between the following connections:

- Earth (cpc) and line
- Neutral and line
- Earth and neutral.

It is also important to check all other terminals, such as a pump over-run, switched live and any other external connection to the equipment.

Important: *When checking between the earth (cpc) and all live conductors, including the neutral, it is important that the earth connection is made first and removed last to prevent a dangerous voltage appearing on the tip of the voltage indicator.*

Stage 4

Reprove the voltage indicator on the known source to ensure the voltage indicator is functioning correctly.

Further information and guidance

It is important that the person carrying out the work is competent to undertake the task in hand. They should also be aware of any specific requirements that may be placed upon them by the type of environment they are working in – for example, a 'Permit to Work' may be required in certain circumstances.

Note 4: *For information about the dangers of cables buried in walls etc, see TB 117[3].*

Further guidance can be found at:

- www.hse.gov.uk/electricity/
- esc.org.uk/business-and-community/electrical-industry/best-practice-guides.html

Note 5: *For general information about the process behind the development of Gas Safe Register Technical Bulletins and the expectations for all stakeholders, see TB 1000[4] by logging into your online account at: https://www.gassaferegister.co.uk/sign-in*

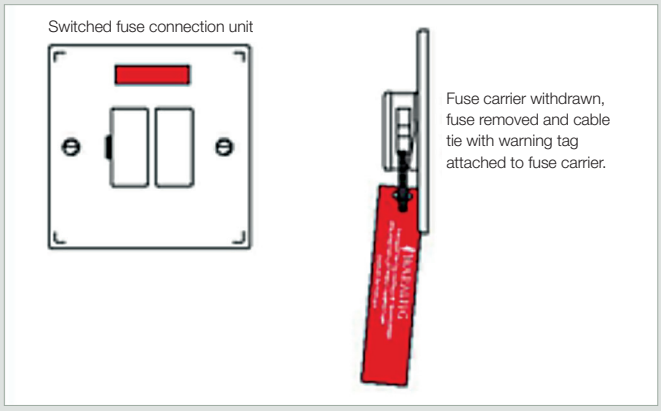

Figure 4: *An example of safe isolation for a fuse connection unit*

Bibliography

(1) LNIDL – *Gas Safe Register Legislative, Normative & Informative Document List*

(2) HSG85 – *Electricity at work – Safe working practices (HSE Books)*

(3) TB 117 – *The dangers of cables buried in walls and partitions*

(4) TB 1000 – *An introduction to Gas Safe Register Technical Bulletins*