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Level 3 Module

Signalling Installation – Power and Earthing: Electrical Safety

Endorsement and Authorisation

For endorsement and authorisation, please refer to NR/L3/SIG/11303.

This module is a reformatted version of the previous Signalling Installation Handbook with no change to the content other than correction of terminology.
It represents historic best practice which may no longer be relevant.

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Issue record

Issue	Date	Comments
2	September 2010	Reformatted version of previous document incorporating the text of the installation handbook.
1	August 2000	First issue.

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 4 December 2010.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

Disclaimer

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Supply

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1 Introduction

Supply voltages are likely to be dangerous. Before working on or near energised equipment you need to determine if safety precautions are necessary. This module gives guidance on how to avoid electrical hazards from signalling equipment.

Additionally, a large part of the railway has electric traction. The basic precautions to be taken on electrified track are to be found in the Rule Book, Section Z. There should be no possibility of plant, tools or materials coming within 2.75m of live overhead line equipment. Conductive tools and survey equipment should not be used within 2m of a live conductor rail, and no work should be undertaken within 300mm without the use of a protective shield.

For safe in battery rooms, see Module 2K10.

Temporary electrical installations should comply with HSE Guidance Booklet HSG141, Electrical Safety on Construction Sites.

The general requirements for safe working on or near electrical equipment are given in Railway Group Standard GM/RT1040. See also NR/SMS/EL00, NR/SMS/EL21, & NR/SMS/EL31 for maintenance procedures on power supplies.

Also see NR/L2/SIG/30005

2 Glossary

Where the following words appear in this ix, they have the following specific meanings:

- **Electrical equipment** – any device which operates electrically or through which an electrical current passes. This includes cables, conductors and terminals.
- **Exposed conductor** – any terminal or conductor which is not insulated and is capable of being touched.
- **Isolation** – the total disconnection of the electrical equipment from the power supply by the removal of plug/socket, switch, fuses or links in such a way that this is secure.
- **Live work** – carry out tests, measurements, repair or maintenance on electrical equipment which has live components that can be touched by the person doing the work.
- **Multi user lock off device** – a device which acts as a padlock but can itself be locked by many padlocks, simultaneously.
- **Person doing the work** – the person who is actually carrying out the work, rather than supervising.
- **Personal lock** – a padlock for which the person doing the work holds the only key.

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- **Voltage value** – where a value is given, unless otherwise specified, it has the following meanings:
 - a.c. supplies - the root mean square value,
 - d.c. supplies - the d.c. value,
 - pulsed supplies (e.g. impulse track circuits) - the peak value.
- **Current value** – where a value is given this is the value of the current limiting device e.g. fuse or circuit breaker

3 The Risks

Personal injury can result from electrical shock, burns, explosion and arcing. It is important to note that there is no "safe" voltage. All electrical equipment can present a risk.

Where very high levels of electrical energy are present, the terminals will be shrouded (see Module 1D15). However levels of 110 volts or more can be found on exposed terminals inside relay rooms and location cupboards and on terminals connected to track circuits (see Module 2P05). These voltages can result in a shock which produces involuntary muscular reaction which can cause injury or death.

Even low voltages are not without risk. A high capacity battery may only produce one or two volts but shorting the terminals may cause burns from the arcing or even cause an explosion.

Safety warning signs will be provided, as described in Module 1M01, stating the maximum voltage present.

3.1 Electric Shock

When a shock is received, the electric current may take multiple paths through the body and produce unpredictable results. The effect may cause muscular contractions, respiratory failure, fibrillation of the heart, cardiac arrest or injury from internal burns. A current of as little as 15 milliamps can cause death.

3.2 Electric Burns

Electric burns are due to the heating effect of the electric current passing through the body. They are very painful and can be very slow to heal.

3.3 Arcing

Arcing generates ultra violet radiation which can cause damage similar to severe sunburn. Molten metal particles from the arc can penetrate, burn and lodge in the flesh. Eyes are especially vulnerable to arc flash and can suffer irreversible damage.