

# Safe working on or near high energy electrical sources

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# Principles

## Introduction

Systems encountered in the workplace can involve very high levels of energy. The energy sources can be in a variety of forms and combinations including (but not limited to):

- Pneumatics and hydraulics
- Chemicals
- Physical potential energy
- Mechanical drives
- Electrical sources

It is important to assess the risks in order to achieve personal safety for staff or contractors (workers) when working on or near **high energy electrical sources** when the consequences of wrong actions might lead to shock, explosion or personal injury. In high energy situations an electric arc might, for example, result when operating or testing circuit breakers and switchgear, or personnel come in close proximity to live uninsulated conductors or exposed connections. Such a danger exists at both above 1000 Volts (commonly understood as high voltage – HV) and below (commonly understood as low voltage - LV or even extra-low voltage - ELV). High energy electrical sources include high capacity battery(s) and capacitors.

This Briefing does not address live-line working, such as for power transmission and distribution, which is a very specialist activity covered by organisations that need to undertake such work. It is aimed at employers and those who actively manage or do work on or near high energy electrical systems and highlights a positive approach to minimising potential injury from electric shock or arc flash energy.

## Summary

The main requirements for safe work on or near high energy electrical systems/ sources are:

1. **Make every effort to securely isolate the source of energy**, see: <http://www.theiet.org/factfiles/health/hsb58a-page.cfm> and <http://www.theiet.org/factfiles/health/hsb58b-page.cfm>
2. Plan the work to be done and utilise a safe system of work, such as permit to work (PTW) system<sup>1</sup>, if appropriate, that ensures the part of the system to be worked on will be dead or that live working is **justified, clearly identified and demarked** together with specific written methods for safe work
3. If live working is absolutely necessary then make a task risk assessment which should follow, for example, the UK's Health and Safety Executive (HSE) guidance for live working: <http://www.hse.gov.uk/pubns/priced/hsg85.pdf>
4. Ensure that only workers deemed competent by the organisation can undertake the work identified
5. Ensure that approved tools, instruments and equipment necessary for the work are available and tested before work commences
6. Determine, by way of risk assessment (generic and specific), how safety will be maintained throughout the work and what Personal Protection Equipment (PPE) will be used, if any
7. Validate a written work method before work commences
8. Agree suitable emergency provisions and communications

## Does a high energy electrical source exist and if so what is the hazard and risk?

All electrical installations whether in offices, laboratories, factories, quarries, foundries, shops, leisure centres or any other place of work must be treated with respect and care as personal injury can otherwise occur.

Organisations which have high energy electrical systems/sources will know that is the case (they know they have the need and they pay the bill) and must communicate that fact to all personnel who work for them. Tell-tale signs of high energy sources are caged installations with warning signs and controlled access, and very large metal panel installations with switchgear, metering and warning notices, but beware they are not always obvious.

The potentially fatal thermal and physical effects of an arcing circuit include:

- extreme heating with shrapnel
- rapid expansion of hot air
- superheated toxic gases and metal vapour
- pressure and sound waves
- intense light

Risks can occur during abnormal conditions on a system (or in electrical equipment) as a result of:

- a short circuit fault
- cable faults
- LV live jointing work
- faults occurring during routine opening or closing of LV and HV switchgear
- protection failure causing equipment failure during work
- human error during testing or commissioning
- cable strikes during digging or mal-operation of local equipment

## UK Legislation and Implementation

These risk aspects are covered in the HSE “Electrical Switchgear and Safety: a concise guide for users”: <http://www.hse.gov.uk/pubns/indg372.pdf> and “Electricity at Work Safe Working Practices; HSG85 2003; ISBN 9780717621644: <http://www.hse.gov.uk/pubns/priced/hsg85.pdf>. For all electrical work on or near electrical equipment, the legal requirements are set out in the Electricity at Work Regulations 1989: <http://www.legislation.gov.uk/ukxi/1989/635/contents/made> and in the accompanying HSE Guidance: <http://www.hse.gov.uk/pubns/hsc13.pdf>, the Management of Health and Safety at Work Regulations 1999: <http://www.legislation.gov.uk/ukxi/1999/3242/contents/made> and accompanying Approved Code of Practice (ACOP): <http://www.hse.gov.uk/pubns/priced/l21.pdf>.

## Carrying out a risk assessment

To help identify the precautions that are necessary for carrying out the work safely a risk assessment should be performed. This is outlined in Briefing 51b, “The need for Isolation for electrical work”: <http://www.theiet.org/factfiles/health/hsb51b-page.cfm>

## Immediately after the work

Before re-energising the circuit or circuits worked on it is necessary to make additional checks that it is safe to reapply the power.

## Further information

The above linked HSE documents may also be obtained by mail order (for which there may be a charge) from:

HSE Books,  
PO Box 1999,  
Sudbury,  
Suffolk  
CO10 2WA

Tel: 01787 881165 Fax: 01787 313995

HSE priced publications are also available from bookshops and free leaflets can be downloaded from HSE's website: [www.hse.gov.uk](http://www.hse.gov.uk)

For information about health and safety contact the HSE's Infoline: [hseinfo@connaught.plc.uk](mailto:hseinfo@connaught.plc.uk) or write to:

HSE Information Services,  
Caerphilly Business Park,  
Caerphilly  
CF83 3GG

## IET referenced Health and Safety Briefings:

<sup>1</sup> Permit to Work Systems: <http://www.theiet.org/factfiles/health/hsb33-page.cfm>

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The IET is unable to provide further information on this topic. Please contact the HSE: <http://www.hse.gov.uk/>



For further information about the IET's Health and Safety Policy Advisory Group only, please contact:

Health and Safety Policy Advisory Group Secretary  
Policy Department  
IET,  
Michael Faraday House,  
Six Hills Way,  
Stevenage.  
SG1 2AY  
01438 765690  
email: [policy@theiet.org](mailto:policy@theiet.org)  
[www.theiet.org/policy](http://www.theiet.org/policy)  
<http://www.theiet.org/factfiles/>



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