

1. SCOPE

This section of the Energy Networks Live Working Manual (LWM) details the procedures to be followed before work is carried out on **Live** panels.

The procedure applies the principles established by ScottishPower Safety Rules (Electrical and Mechanical) 4th Edition to achieve **Safety from the System** and in particular OPSAF-10-012 (PSSI 12) - **Low Voltage Apparatus**.

The procedure also includes considerations to avoid inadvertant **System** operation (eg. activation of tripping, intertripping or protection circuits) during work and/or leaving situations when work is complete that may result in a failure of control and protection systems to operate correctly in future.

Authorisation WL 1.08 now incorporates the removal/insertion of control or protection fuses/links (sometimes referred to as 'red-spot fuses') required to achieve isolation for work in panels. Previously this authorisation was granted separately (where required) to **Persons**, using OP-2 with limitation L24.

2. ISSUE RECORD

This is a [Reference](#) document. The current version is held on the EN Document Library.

It is your responsibility to ensure you work to the current version.

Issue Date	Issue No.	Author	Amendment Details
May 2004	3	Jack Neilson	Minor editorial changes to re-style document to current PowerSystems format.
Sept 2018	4	Dave Naylor Mark Brookman	Major update. Now applies to all control or protection panels. Electro-technical work defined. Now deals with non-electro-technical work in panels. Precautions included to prevent inadvertent protection operation or depletion. WL 1.08 now includes fuse/link removal/insertion (previously OP-2 L24)

3. ISSUE AUTHORITY

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4. REVIEW

This is a [Reference](#) document which has a 5 year retention period after which a reminder will be issued to review and extend retention or archive.

DISTRIBUTION

This document is part of the Live Working Manual but does not have a maintained distribution list.

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6. DEFINITIONS

Terms printed in bold type are as defined in the ScottishPower Safety Rules (Electrical and Mechanical) 4th Edition.

For the purpose of this section of the LWM the following definition applies:-

Dangerous Potential(s):

Voltages greater than 50 volts ac or 120 volts dc. The Electricity at Work Regulations 1989 recognise 50 volts ac as a safe working voltage.

Electro-technical work:

Work on small wiring, relays and related work on control and protection systems which is typically carried out on or within control panels and relay panels, including installing relays or wiring in existing panels.

Activities such as inspection of control panel interiors, identification of ferrule numbering and visual tracing of wiring routes not requiring the use of tools is not considered to be *Electro-technical work*.

7. DANGERS

The main **Dangers** to **Persons** from carrying out work on control and protection systems is from electric shock, explosion, arcing or burns arising from contact with terminals or **Apparatus** within the panel that are **Live** at *Dangerous Potential(s)*.

8. ADDITIONAL HAZARDS

Whilst not directly introducing **Danger**, the following hazards may arise as a result of undertaking work on control and protection systems with the potential to cause harm to **Persons** working on or near the **System**, or to the general public and other people at work. These procedures have been written including steps to mitigate the hazards.

1. Inadvertant **System** operation due to vibration of relays or incorrect application / loss of control of tools or test equipment.
2. Unintended interference with **Systems** not intended to be worked on resulting in a failure of those **Systems** to function correctly in future.

9. ASSESSMENT

All work on or so near **Live** exposed **LV** conductors that **Danger** may arise requires a risk assessment to be completed before the commencement of work to ensure that **Danger** will not arise during the course of the work. This risk assessment shall be carried out by an **Authorised Person** or **Senior Authorised Person** who holds **Live** working authorisation WL 1.08.

Particular care is required where the panel to be worked on is part of **Apparatus** containing **HV** conductors. Prior to work involving accessing, cutting or drilling panels which may enclose **HV** conductors, an on-site risk assessment shall be carried out by a suitable **Senior Authorised Person**.

In all cases, as part of the risk assessment, **Apparatus** shall be subjected to a routine inspection prior to the start of any work to ensure that **Danger** will not arise due to the condition of the **Apparatus**. Should this inspection reveal any significant deficiency in the **Apparatus** which could give rise to **Danger**, no attempt shall be made to work on the **Apparatus** whilst it is **Live** until a suitable **Senior Authorised Person** has been consulted and has assessed the situation.

10. PERSONAL PROTECTIVE EQUIPMENT

The minimum personal protective equipment to be worn during work on control and protection systems is coveralls and light eye protection. Specific sections later in this procedure may require additional items for example rubber gloves.

11. WORK THAT IS NOT ELECTRO-TECHNICAL WORK

Work in a **Live** control or protection panel that is not *Electro-technical work* may be undertaken by a suitable **Authorised Person** without the need to implement the procedures in sections 12 and 13 and there is no requirement to hold the WL 1.08 authorisation category.

This work may be undertaken by an **Authorised Person** working unaccompanied, however the risk assessment shall consider if being accompanied by another **Authorised Person** will substantially contribute towards the implementation of a safe system of work and if so, a second **Authorised Person** shall be present.

The work area shall be adequately lit and there shall be adequate working space. The **Authorised Person** shall consider the use of **Approved** rubber gloves to prevent contact with **Live** terminals. Care shall be taken when opening control panels with door-mounted relays to reduce the likelihood of causing an inadvertent protection operation.

12. ELECTRO-TECHNICAL WORK - GENERAL

Within panels several voltages may be present, both ac and dc, supplied from various sources. It may not be reasonably practicable for these supplies to be **Isolated**. Where it is not reasonably practicable, **Approved** shrouding and, where appropriate, **Approved** rubber gloves shall be used to prevent contact with **Live** terminals or other terminals not intended to be worked on.

Work shall only be carried out if the work area is adequately lit and there is adequate working space. During the course of work the **Authorised Person** shall be able to maintain a firm and steady stance at all times and shall avoid using horizontal surfaces within panels for the temporary storage of tools. Work on or near batteries and CTs shall be in accordance with OPSAF-12-008 (LWM 3.2) and OPSAF-12-010 (LWM 3.4) respectively.

The removal of control or protection fuses/links, application of shrouding and *Electro-technical work* may be undertaken by an **Authorised Person** working unaccompanied, however the risk assessment described in (i) below shall consider if being accompanied by another **Authorised Person** will substantially contribute towards the implementation of a safe system of work and if so, a second **Authorised Person** shall be present.

Care shall be taken when opening control panels with door-mounted relays to reduce the likelihood of causing an inadvertent protection operation.

Before any **Live** work takes place, the following steps shall be taken by a suitable **Person** who holds authorisation category WL1.08:

- i. Undertake a risk assessment to identify all *Dangerous Potential(s)* present within the panel to be worked on. The checklist below shall be used for this purpose. Reference shall be made to electrical drawings and the presence and magnitude of voltages shall be confirmed using an **Approved** voltmeter. Ensure the instrument has fused leads and the correct function and measurement range has been selected.

Panel heating	Voltage indicators
Panel illumination	Ring indication supplies
Alarm schemes	Bus-wiring from adjacent panels
Motors, eg. spring charging, tap-changer or raise/lower	CT's – possible open circuit of Live CT's
Indication supplies	Voltage transformer supplies
Battery charger supplies	Other related equipment

Consider also the possibility that a *Dangerous Potential* may be presented on other connections under fault or through-fault conditions.

- ii. Determine whether safety can be achieved, in order of preference, by:-

Isolation of *Dangerous Potentials* present within the panel

and/or

Shrouding of adjacent **Live** terminals and **Apparatus** on which work is not to be carried out;

Work shall only proceed if either of these methods or a combination of them can achieve safety, otherwise the panel(s) shall be made not **Live** before work commences.

- iii. Identify if other control or protection systems are present in the panel to be worked on which may require precautions to be taken to protect their integrity and prevent inadvertent operation. Examples may include bus zone or frame leakage protection, tripping or inter-tripping circuits and control or automation systems.
- iv. Determine any further precautions required to protect against inadvertent interference with other protection or control systems by, for example, the use of **Approved** shrouding or the application of **Approved** signage (eg **Danger Notices**, '**Live** circuit' or 'Caution circuit in commission' labelling) either within the panel or on adjacent **Plant** and **Apparatus**.
- v. Consider the effect of isolating certain protection or control supplies. For example automation schemes may be inadvertently triggered if a supply is **Isolated** in an unmanaged fashion. The **Control Person** shall be contacted before depleting a control or protection system.
- vi. The appropriate supplies shall be **Isolated** before (if necessary) implementing the requirements of section 13 to make safe any remaining *Dangerous Potential(s)*.

13. PROCEDURE

13.1 WL1.08 – Electro-Technical Work in Control and Protection Panels

Live work authorisation WL1.08 shall be held by the **Person** implementing the precautions in this procedure. After the precautions have been implemented, the **Authorised Person** undertaking the *Electro-technical work* need not hold WL1.08.

The following detailed procedure shall be applied before *Electro-technical work* is undertaken on relays, terminations, terminal blocks, multi-cores and small wiring on or within any control or protection panel in a substation.

If the assessment described in section 9 above determines that it is not reasonably practicable for all *Dangerous Potentials* to be **Isolated**, **Approved** shrouding shall be applied by the **Authorised Person** to remaining **Live** terminals that present **Danger**. In addition other control or protection systems that need to be protected from inadvertent contact shall be shrouded.

The following steps shall be followed:-

Step 1

Check the **Apparatus** (including all doors, covers, plates, conductors, insulators, and barriers) is secure and in good condition.

Step 2

Check the **Apparatus** and its surroundings for any signs of distress/disturbance which may have affected the insulation or security of the installation.

Step 3

Check for the presence of foreign bodies, excessive dust or dirt, vermin, rust, scale, dampness or any other condition which may affect the insulation.

Step 4

Identify the work zone, that is, the zone into which personnel, tools and equipment are likely to enter during the course of the work.

Step 5

Examine **Approved** shrouding to ensure that there are no defects or damage which could reduce its effectiveness.

Step 6

Apply **Approved** shrouding to all terminals and other **Apparatus** that is **Live at Dangerous Potentials** or which needs to be protected from inadvertent contact. **Approved** shrouding and/or **Approved** insulated caps may be used provided they can be effectively secured. Ensure shrouding offers sufficient mechanical protection - this may require double thickness shrouding. The shrouding may be secured using **Approved** insulated clamps.

Approved rubber gloves shall be worn during the application and removal of shrouding.

The **Approved** shrouding shall be applied in such a way as to create a Safe Working Zone for the work to be carried out.

Step 7

The **Authorised Person** who applied the **Approved** shrouding in accordance with Step 6 shall instruct the **Authorised Person** who is to carry out the work that he may proceed with the agreed work within the Safe Working Zone using **Approved** tools and equipment and personal protective equipment.

Work shall be carried out in a methodical manner ensuring that during the course of work **Danger** will not arise from:-

- (i) the unexpected release of backing plates, screws or bolts;
- (ii) the consequence of dropping or losing control of tools, backing plates, screws or bolts;
- (iii) **Approved** shrouding becoming dislodged.
- (iv) Interfering with adjacent control or protection systems resulting in an inadvertent operation or causing a depletion of the adjacent system.

In the event that any of the **Approved** shrouding becomes dislodged, all work shall cease until a **Person** who holds authorisation category WL1.08 has reapplied the shrouding. At this time, steps 2 to 6 inclusive shall be repeated.

On completion of work:

- (i) the shrouding shall be removed wearing **Approved** rubber gloves
- (ii) the panel shall be visually inspected to ensure that there has been no defect introduced during the course of work that may affect normal functioning of the **System**
- (iii) the **Control Person** shall be informed to agree the restoration of supplies to control or protection systems
- (iv) supplies shall be restored and commissioning / function tests shall be completed as required