NORTHERN POWERGRID

OPERATIONAL PRACTICE MANUAL 2015

The Manual shall be read in conjunction with the Northern Powergrid Distribution Safety Rules. The information contained within the Manual is Company Policy on Operational Practice.

Issued to: Name .....(Printed)

Signature.....

Employer.....

Pay / N.I. Number.....

Date ..... /..... /.....

To be forwarded to Administration

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NORTHERN POWERGRID
OPERATIONAL PRACTICE MANUAL
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NORTHERN POWERGRID

OPERATIONAL PRACTICE MANUAL

Foreword

This companion volume to the Distribution Safety Rules (DSR) defines **The Company's** responsibility to provide **Approved** equipment and operating procedures as required by the DSR. It also defines the necessary procedures for the reporting of operational performance and incidents required by Legislation.

The Operational Practice Manual (OPM) is not a stand-alone document, it **Shall** be read in conjunction with the Distribution Safety Rules. These two volumes form the basis for safe operation of **The Company's** Electricity Distribution **System**. Words or phrases highlighted in bold in the text are defined in Section 2 of the DSR. Refer to the OPM – DSR index reference (Ref. 1) where there is a '*' symbol. Refer to the OPM – Company Policy index reference (Ref. 2) for additional information or guidance, if necessary, from other policy documents which expand on the contents of the OPM entry, where the phrase "*See Index Ref.2"* is used.

Access to and work on **The Company's** Distribution **System Shall** only be by suitably qualified and **Authorised** staff as defined in the DSR and **Approved** procedures. Work **Shall** be carried out only to agreed current safe work procedures and specifications.

PA AUTHORISATION

PA1 Access for, operations or work on **The Company's High Voltage** and **Low Voltage** Distribution **System Shall** only be by **Persons** who have demonstrated their competence and have been authorised in writing following an assessment of their ability, or are under the **Personal Supervision** of a suitably **Authorised Person**; see Index Ref. 2.

PA1.1 Agreements between **The Company** and a third party **Shall** normally require that employees of the third party work and operate in accordance with the third party's rules and procedures. **The Company Shall** require all such employees to demonstrate their competence by individual assessment. On satisfactory completion of the assessment they**Shall** be issued with a copy of Northern Powergrid **Low Voltage** Safety Rules. In exceptional circumstances the third party may, subject to written agreement with **The Company**, work and operate in accordance with the Northern Powergrid Distribution Safety Rules and Operational Practice Manual. See reciprocal arrangements relating to National Grid and IDNO's in sections PA3, PA4 and OE.

PA1.2 The standard of Competence is based on the requirements of Regulation 16 of the Electricity at Work Regulations 1989. The competence of an individual to carry out work or to supervise a **Working Party** depends upon the individual's level of knowledge, understanding following training, experience and satisfactory assessment.

***PA1.3 Persons** are **Authorised** according to their need to access the **System** to carry out their duties. It is the responsibility of the individual to ensure that any actions performed are within the bounds of his/her Competence and Authority level. Ignorance of requirements is not an excuse for neglect of duty.

PA1.4 All authorisations are subject to review according to the duties and circumstances of the individual and are subject to attendance on refresher courses at suitable intervals.

***PA2** Issue of Distribution Safety Rules, related Operational Practice Manual and keys for operational locks to individual **Competent** or **Authorised Persons**, are recorded. These items, together with Authority Certificates, **Shall** be returned to **The Company's** issuing officer on cancellation of Authorisation.

PA3 Operations on **Systems** controlled by other network operators are subject to the individual operators rules and procedures.

PA4 In the case of the National Grid operator reciprocal agreements, are in place to cover operations at the shared sites interface, (OE2.3).

PB SPECIAL PROCEDURES.

PB1 Approved Procedures - Exceptions to DSR 4.1.1.

PB1.1 **Exception (i)** Cleaning and painting the exterior of earthed metal enclosing **Live Apparatus** may be carried out at the discretion of a **Senior Authorised Person** who must carry out a risk assessment, (PD1), and take suitable precautions to eliminate risk to personnel or the system.

***PB1.2** **Exception (ii) Live Line Work**:

PB1.2.1 **Apparatus** disconnected by **Live Line** procedure. Switchgear, Pole Mounted ARCB's, Aerial Switches, Fuse Isolators etc., which once disconnected by **Live Line** procedures **Shall** be prepared for work as in WD5.2

*PB1.2.2 Hot Glove Procedures Hot Glove Work involves manipulation of **Live High Voltage Conductors** and therefore compliance with the clearances specified in DSR section 4.4 is not possible. All such work **Shall** be carried out in accordance with **Approved** Hot Glove Procedures, (WD6).

***PB2** The following procedures are **Approved** by the **Designated Engineer**.

PB2.1 **Live Oil Sampling**.
This procedure may be carried out on feeder switches, with the busbar **Live**, through the aperture provided for the insertion of test bushings, (WB1.3.2).

***PB2.2** **Work on Switchgear and Cables** to DSR 5.1.2 (Zone of Work).

Work on Switchgear at a distribution substation and jointing work on associated feeder cables may be carried out concurrently without the **Personal Supervision** of a **Senior Authorised Person**, (WB2).

***PB2.3** **Live Testing**: **Live** phasing checks may be carried out by a **Senior Authorised Person**, suitably **Authorised Person** or, for overhead line application, by a **Competent Person** under the **Personal Supervision** of an **Authorised Person**. **Approved** instruments and procedures are detailed in OB4.5.5.

PB2.4 **Cable Spiking Procedure**. A procedure to allow the removal of a cable spiking gun under a **Sanction for Test** is detailed in WC3.1.4.

***PC EVENTS and REPORTING;**

The Company is required to report specified events, including interruption of supply and accidents*; see Index Ref. 2*.

PC1 Reportable Events

PC1.1 Failure of Supply

PC1.1.1 **Low Voltage System**: Reports **Shall** be made to the Designated Supervisor or Dispatcher.

*PC1.1.2 **High Voltage System**. Immediate report **Shall** be made to the **Control Engineer.**

PC1.2 **System Incidents** Reports are required for the following:

- Defects or **System** incidents involving substation plant and **Apparatus Shall** be reported as OA2.2.
- Statutory reports to HSE under Electricity Safety, Quality and Continuity Regulations 2002.

a. Specified events defined in Regulation 31 **Shall** be reported by the Line Manager via the Safety Section.

b. Significant interruptions of supply defined in Regulation 32 **Shall** be reported by the Control section.

PC1.3 **Operational Event.** This is an unplanned or uninstructed operation on the **System** attributable to the action of an operator. Following an initial investigation, the event will be categorised as either an 'Operational Incident' where the event gave rise to:

- Recordable customer interruption(s).
- **Danger** or significant risk of **Danger** to the public or personnel.
- Damage or significant risk of damage to **Apparatus**, equipment etc.
- A significant risk to **System** security.

or an 'Operational Near Miss' in all other circumstances.

A fact finding inquiry will be held to determine the cause of the event and any appropriate remedial action will be taken subsequently.

PC1.4 Accidents Reports are required for the following:

- All accidents, incidents and near misses **Shall** be reported by the Line Manager.
- Statutory Reports to HSE/LA under Regulation 3 of the Reporting of Injuries, Diseases and Dangerous Occurrence Regulations 1995, **Shall** be reported by the Line Manager via the Safety Section.

PC2 Report Procedures

PC2.1 Report Centres

PC2.1.1 Control Centres. **The Company's** continuously manned Control Centres are the nominated report centres for all serious incidents, dangerous occurrences and events on the **High Voltage System**.

PC2.1.2 Management Unit. Reports of accidents and events/failure of supply on the **Low Voltage System Shall** be made to the designated supervisor, despatch unit, or Line Manager as required. Control Centre staff are available for other urgent reports when the designated supervisor is not available.

PC2.2 Reports

PC2.2.1 All incidents **Shall** be reported verbally to the report centre or management unit.

PC2.2.2 If a serious injury or fatality occurs on the **Low Voltage System**, reports **Shall** be made to the designated supervisor and the Control Centre.

PC2.2.3 All accidents, incidents and dangerous occurrences **Shall** be immediately reported to the responsible Line Manager and Safety Section using the Initial Report Form. The submission of forms should not be delayed due to incomplete information. Any details not immediately to hand **Shall** be submitted when they become available.

PC3 Investigation

PC3.1 Action Following an Incident. Following an accident it is essential that prompt action is taken to render appropriate first aid to all casualties.

PC3.1.1 In order to understand how and why an incident or accident occurred it is essential that an investigation is initiated as soon as practicable. Where a statutory accident report is required, other than for emergency actions, the scene **Shall** not be disturbed until clearance is given by the HSE. All incidents **Shall** be investigated; *see Index Ref. 2.*

PC3.1.2 Photographic evidence should be obtained, if possible, before anything is disturbed. This is essential in the case of a serious accident.

PC3.2 As a general guide, the following information will be required:

a. The conditions as found on site including:

- condition of **Apparatus**,

- any exposed **Conductors (Live** or **Dead)** and signs of flashover etc.,
- position of tools and equipment,
- any obstructions and
- other relevant factors such as access, lighting and weather.

b. Details of all persons directly or indirectly involved.
c. Statements from anyone who witnessed the incident.
d. Authority - what were the instructions:
   - verbal or written,
   - approved procedure or work specification.
e. Evidence of Risk Assessment
f. Details of the activity or work in progress.
g. Was any personal protective equipment being used and if so what was its condition.

PD RISK ASSESSMENT

The Health and Safety at Work Act places a duty on employers to provide safe systems of work including risk assessment. Employees have a duty under this legislation to work safely.

PD1 Requirements.

Risk assessment of all work activities is required by Regulation 3 of the Management of Health and Safety at Work Regulations 1999 see foreword to DSR's.

PD1.1 The inherent risks of operating the **Distribution System** have been broadly identified and appropriate

control measures are included in the Safety Rules. However as operating conditions are constantly changing it is the duty of all who are engaged in operations or work on the **System** to ensure on site risks are suitably assessed and appropriate control measures put in place before, during and after all activities.

PD1.2 To supplement the provisions of the Distribution Safety Rules, assessment of risks on site **Shall** take the form of:

- A personal, common sense and trained approach to routine tasks.
- A written assessment for tasks which involve the avoidance of hazards inherent in the work environment.
- Formal risk assessments for larger projects or where special precautions are required. e.g. Working on **Dead Apparatus** in '**Live** compounds'

PD1.3 Where risk assessment forms are used they **Shall** be retained for a minimum of one year to line management procedures.

PD2 **Implementation** Decisions taken to implement safety measures following a risk assessment **Shall** be:

- Informed,
- rational,
- structured and
- proportional

to the **Danger** involved.

***PE PERSONAL PROTECTION**.

Personal Protective Equipment (PPE) is provided for use by employees to provide additional safeguards in potentially hazardous situations and in order to comply with Personal Protective Equipment at Work Regulations 1992. Note PPE does not replace safe working procedures designed to avoid **Danger**.

PE1 **Approved PPE** For full requirements on provision and use *see Index Ref. 2.*

PE2 **Use of PPE**:

PE2.1 **Insulating Gloves Shall** comply with the appropriate IEC and BSEN Standards; *see Index Ref. 2*.

PE2.1.1 Gloves **Shall** be inspected before use to ensure they are within date and undamaged. Any out of date or damaged gloves **Shall** be replaced before operations are carried out.

PE2.1.2 When carrying out routine or fault switching, insulating gloves (both) **Shall** be worn before touching any **Apparatus** and **Shall** not be removed until operations are complete and the operator has moved away from the operating position.

*****PE2.1.3 Class 0 (**Low Voltage**) gloves **Shall** be used by persons for **Low Voltage** switching or work. For **Low Voltage** switching, if Class 0 gloves are not available Class 1 gloves may be used.

PE2.1.4 Class 1 (**High Voltage**) gloves **Shall** be worn for all **Live** pole mounted, open type switchgear operations and the use of potential indicators.

PE2.2 Insulation

Insulating mats approved for operational purposes **Shall** be used where additional insulation from **earth** is considered necessary e.g. operating on **Low Voltage** boards and if necessary **Low Voltage** pillars and link boxes; *see Index Ref. 2*

PE2.3 Eye/Face Protection

Eye protection **Shall** be used whenever there is **Danger** of impact, splashes or dust affecting the eyes. A full face visor **Shall** be worn to protect the eyes and face whenever there is a **Danger** of arc energy; *see Index Ref. 2*.

PE2.4 Clothing and footwear

Shall be suitable for the task in hand in accordance with company policy (*see Index Ref 2*) (e.g. coveralls, flame retardant, high visibility etc.).

PE3 Other Equipment

Any other protective clothing or equipment required for specific circumstances **Shall** be **Approved** by the **Designated Engineer**.

PF NOTICES

Notices are posted to give information on the operational state of the **System**.

When applying notices the appropriate size, (large, medium or small) **Shall** be used so that essential information is not concealed and moving parts etc. are not obstructed.

***PF1** **Caution Notices** Drawing No. 1.10.110.0003. **Shall** be applied to convey a warning at points of **Isolation** (reversible **Caution/Danger** bands to Drawing No. 1.10.110.0004 may be used on poles) and where there is a specific requirement in the DSR's this includes:

a. **Low Voltage** or protection fuse/link positions where they **Isolate** the secondary side of a transformer, auxiliary supplies or battery supplies etc. (a tape format is available for this application).

b. Points where automatic fire fighting equipment has been rendered inoperative.

Caution Notices Shall be applied or removed only by a **Person** who understands their purpose and has received training in their use.

*** PF2** **Danger Notices**, Drawing No. 1.10.110.0001. **Shall** be attached on or adjacent to **Live Apparatus** to define the limits of the work or test zone, examples are:

a. To indicate exposed **Live Conductors** in open compounds
b. Exposed **Apparatus** or **Conductors** subject to test voltage.
c. **Live Low Voltage** panels.

d. For pole mounted application a reversible **Danger/Caution** band to Drawing No. 1.10.110.0004 may be used on poles supporting **Live Conductors** (**High Voltage or Low Voltage**) adjacent to the work zone or as limit markers on poles and towers.

PF3 **Other Approved Notices**. When the use of **Caution** or **Danger** notices is not appropriate, the following notices **Shall** be used to give information to personnel working on the **System**:

PF3.1 **Danger Live Conductors Overhead**, Drawing No. 1.10.110.0002: For use in open compounds where access or work is required beneath **Live** busbars or over sailing **Conductors**.

PF3.2 **Circuit Main Earth,** Drawing No. 1.10.110.0012: This notice **Shall** be attached to switchgear which is in the circuit **Earth** position or portable earthing equipment which is used as a **Circuit Main Earth**, in both cases, prior to the issue of a **Safety Document**.

PF3.3 **Construction Earth,** Drawing No. 1.10.110.0013: A notice applied during construction work in positions where **Earths** are applied to guard against Induced voltage, backfeed etc. at a position determined by the (**Senior**) **Authorised Person** in charge of the work.

PF3.4 **Warning Notices for Apparatus connected in the 'Fault Interfering Mode**' (OA3).

PF3.4.1 Contact the **Control Engineer** on Entry and Exit - **Apparatus** in this enclosure may operate in the 'Fault Interfering Mode',

Drawing No. 1.10.110.0009. This notice **Shall** be attached to the gates of open compounds where isolators inside are configured to interrupt fault current in excess of rated capacity. (OA3).

PF3.4.2 Isolator may operate in the 'Fault Interfering Mode',

Drawing No. 1.10.110.0010. This notice **Shall** be attached to isolators which are configured to interrupt fault current in excess of rated capacity in the event of an inter-trip failure. (OA3).

PF3.4.3 Access Restricted - Contact the **Control Engineer**,

Drawing No. 1.10.110.0011.

a. Where normal protection arrangements have failed and staff have temporarily configured isolators to operate in the 'Fault-interfering-Mode' then this notice **Shall** be displayed at all entrance gates to the affected compounds (see OA3, OA2.4).

b. The notice may also be used where it is required to restrict access for other operational reasons, e.g. operational restrictions (OA2.2).

PF3.5 Designated Access Notice - Drawing No. 1.10.110 0014

This notice **Shall** be utilised to designate the agreed access point where working in a compound/chamber is permitted as in AD3.3.5. (all apparatus **Dead** and delineated by a 2m high substantial fence and secured by a personal lock). **Live** working compound

delineation is not required in these circumstances (see diagram AD4).

PF3.6 Circuit in Commission - Drawing No. 1.10.110.0005:

This notice **Shall** be used when circuits are being commissioned (change of state) and work is ongoing in the same location. e.g. When commissioning Bulk Supply Points (BSP's) or Primary substations. The notice **Shall** also be used when work, other than alterations to relay settings, is being carried out on relay panels or cubicles, (WB5.1.3).

PF3.7 Single Circuit Security - Drawing No. 1.10.110.0006.

PF3.7.1 Where a secure supply is normally available but a circuit is out of service, this notice **Shall** be applied to the relay, control or circuit breaker panels, as required, of the circuit(s) remaining in service.

PF3.7.2 Typical applications: BSP and Primary substations. Duplicate supplies to continuous processes, hospitals or transport supplies etc.

PF3.8 Protection Abnormal - Drawing No. 1.10.110.0007

PF3.8.1 Where temporary changes have been made on site to protection or normal operational settings, this notice **Shall** be displayed on or adjacent to selector switches, links or relays. If necessary a note may be left describing the abnormality. A band, Drawing No. 1.10.110.0008, is available for pole application.

PF3.8.2 Typical applications:

a. Intertrip links removed/inserted due to pilot fault.

b. Relay settings changed for abnormal running conditions etc.

c. Temporary wiring modifications which affect normal operating facilities.

PF3.8.3 The notice **Shall** also be displayed as required when switching is carried out on site:

a. Sensitive Earth Fault switched out.

b. Auto reclose selection abnormal for operational reasons or **Live Line** work (pole band version available for poles).

PG SAFETY DOCUMENTATION

Safety Documents are solely concerned with safety management, they are not work instructions. They are written confirmation that **Apparatus** identified by the **(Senior) Authorised Person** has been made safe for work or test and define the limits and nature of the activity.

All documents are duplicated and issued with a unique number. One copy **Shall** be retained by the **(Senior) Authorised Person** issuing the document, the second **Shall** be held in the possession of the recipient until work/testing is complete and the clearance section signed. The recipient **Shall** explain the content of the **Safety Document** to all members of the **Working Party** prior to commencing work. The document **Shall** be cleared and returned to the **(Senior) Authorised Person** for cancellation as soon as practicable following completion of the work/testing.

PG1 General Guidelines

a. All Documents **Shall** be legible, clear and unambiguous to the recipient.

b. Abbreviations not permitted except for those universally accepted e.g. CB, Sw, Rd. St. etc.; *see Index Ref. 2.* The use of 'ditto' or 'as above' etc. is not acceptable.

c. Where multiple entries are made in a section use a different line for each entry, where possible.

d. Any minor alterations **Shall** be initialled by the **(Senior) Authorised Person** before issuing the document.

e. No alterations may be made once the document has been issued. If any amendment or alteration to a **Safety Document** is required, it **Shall** be cancelled and a new one issued.

f. All **Safety Documents Shall** be retained for a minimum of one year to line management procedures.

***PG2 Permit to Work**

PG2.1 Other Precautions. Entries, not definitive, **Shall** include:

a. Removal of **Circuit Main Earth** in **Approved** cases.

*****b. Automatic fire extinguishing equipment rendered inoperative during work, (AC1).

*****c. Issue and record the number of unique identification flags and wristlets for overhead line work

d. **Personal Supervision** requirements by (**Senior**) **Authorised Persons**.

*****e. Issue of an **Additional Earth** schedule, when required, to cater for special precautions, (OB6.2.9).

PG2.2 Multiple Work Locations

*PG2.2.1 There **Shall** be no necessity to cross reference, it is the responsibility of the **Control Engineer** to ensure co-ordination of **Safety Documents**.

PG2.2.2 Only one **Safety Document** will normally be required per **Working Party**. Where it is not possible to supervise all **Persons** at work on the same circuit, e.g. jointing work where two work positions are not within visual and verbal communication, then it will be necessary to issue a **Permit to Work** to a **Competent Person** at each location.

PG2.2.3 On overhead lines, when more than one **Working Party** is involved, the work **Shall** be arranged so there is only one **Permit to Work** in force on any one part of the circuit or route to ensure there is no overlap in safety responsibility. The application and recovery of **Additional Earths Shall** be recorded and under the control of the recipient of the **Safety Document**. For tower work, the use of an 'Additional- Earthing-Schedule/Register' (see Appendix PG2) **Shall** be linked to a single **Safety Document** and applied in accordance with OB6.2.9.

***PG2.3** **Permit to Work** documents are not transferable. There **Shall** be no **Approved** procedure for temporary withdrawal or suspension, the document **Shall** be cancelled and a new **Permit to Work** issued.

***PG2.4** **Clearance** The recipient of the **Safety Document** is responsible for the application and accountable for the removal of **Additional Earths**. On clearance, the recipient **Shall** indicate if they 'have been removed' or 'accounted for'. Note, **Additional Earths** may remain connected only if the document is being cancelled for name change or other operational requirement i.e. responsibility for the **Additional Earth** is transferred to the recipient of a following **Safety Document** or it is to become a **Circuit Main Earth**.

***PG2.5** **Cancellation** The **Senior Authorised Person** cancelling the document **Shall**, if no other **Safety Document** is to be issued, check the operational state of the **Apparatus** and confirm this with the **Control Engineer**.

***PG2.6** **Minor Testing. Low Voltage** tests may be applied in accordance with an **Approved** procedure. *see Index Ref 2*.
The application of **High Voltage** tests as specified in section WE is not permitted under a **Permit to Work** except those allowed under section WE5.1c.

***PG3** **Sanction for Test.** The recipient of a **Sanction for Test** takes total responsibility for control and safety precautions on the **Isolated Apparatus** described in the document. They **Shall** ensure that all actions, including making the **Apparatus Live** from a test source, are in accordance with **Approved** procedures to avoid **Danger**.

Note. Not withstanding the requirements of DSR 4.7.1 (a), testing on **Isolated Apparatus** may be carried out without issuing a **Sanction for Test**, however any **Limitation of Access Shall** be cleared beforehand.

***PG3.1 Switching/Work**.

PG3.1.1 All switching and work carried out under the terms of a **Sanction for Test Shall** be recorded in a Switching Log Book.

*PG3.1.2 The recipient of a **Sanction for Test** may:

a. Personally, or where applicable instruct a **Competent Person** under **Personal Supervision**, operate switchgear, connect & disconnect test leads, remove & replace **Earths**.

b. Give authority for the operation of switchgear and for the removal & replacement of **Earths** to a suitably **Authorised Person**.

c. Arrange for the removal or replacement of **Circuit Main Earths** via the **Control Engineer.**

d. Under his/her **Personal Supervision** and to **Approved** safety/work procedures, including the application of **Additional Earths** where required, disconnect/reconnect jumpers & links, excluding oil immersed connections, to facilitate testing.

***PG3.2** **Sanction for Test** documents are not transferable. There **Shall** be no **Approved** procedure for temporary withdrawal or suspension, the document **Shall** be cancelled and a new **Sanction for Test** issued.

PG3.3 Clearance

***PG3.3.1** The recipient **Shall** record on the back of the **Sanction for Test** by deleting appropriate words, all gear & tools and all **Additional Earths** 'have' or 'have not' been removed and testing 'complete' or 'incomplete'.

PG3.3.2 **Additional Earths** may remain connected only if the document is being cancelled for name change or other operational requirement i.e. responsibility for the **Additional Earth** is transferred to the recipient of a following **Safety Document** or it is to become a **Circuit Main Earth**.

PG3.3.3 Changes to the operational state of the **Apparatus** between issue and cancellation **Shall** be recorded on the back of the **Sanction for Test** under exceptions. e.g. switchgear normally closed but left open, jumpers removed, each individual **Earth** removed etc.

PG3.3.4 In order to declare an **Earth** fully removed the switch or circuit breaker must be in the normal service **Isolated** position, (OB6.6.2).

***PG3.4 Cancellation.** The **Control Engineer Shall** be informed, as required, of the position of **Earths** and, unless work or testing is to continue under a following

Safety Document, the operational state of the **Apparatus**.

***PG4 Limitation of Access**

PG4.1 A **Limitation of Access Shall** not remain in force any longer than is necessary to complete the work. It **Shall** be cancelled as soon as practicable to avoid conflict with **System** operations or other work.

***PG4.2** The **Control Engineer Shall** record the issue and cancellation of a **Limitation of Access** where precautions are required to avoid **Danger** from the **System**, where the work may affect the integrity of the **System** or other agreed circumstances, such as entry to cable tunnels, where strict control of access is required. Circumstances include:

PG4.2.1 Work on poles and towers within 3m of **Live High Voltage Conductors** (including **Conductors** between supports) but outside **Working & Access Clearances**. Except to **Approved** procedures e.g. pole mounted transformer **Low Voltage** fuse unit change (WA2.1.6).

PG4.2.2 Work in compounds containing exposed **Live High Voltage Conductors** outside **Working & Access Clearances**:

a. At ground level (e.g. work on equipment at **Earth** potential). Except if carried out by a suitably **Authorised Person** and to an **Approved** procedure.

b. Above ground level (e.g. painting perimeter fence).

*PG4.2.3 Electrical or mechanical work on withdrawable **High Voltage Apparatus** unless included in a **Permit to Work**.

***PG4.3** Other circumstances under which a **Limitation of Access Shall** be issued for work include:

PG4.3.1 Confined spaces or vessels which require precautions to prevent **Danger**, (AB2.3.3). Precautions may include the use of breathing equipment etc.

*PG4.3.2 **Plant** and **Apparatus** operated by compressed gas etc. where a **Permit to Work** is not applicable, (WB1.5).

PG4.3.3 Disconnected **High Voltage** Cables.

PG4.3.4 Auxiliary cables subject to induced voltages.

PG4.3.5 Any other situations which require precautions to avoid **Danger** other than from the **System**, e.g. Where environmental hazards exist.

PG4.4 Where a **Permit to Work** or **Sanction for Test** is to be issued and safety precautions for access and work on **Isolated Apparatus** etc. can be included on that document then there **Shall** be no requirement to issue a **Limitation of Access**.

PG5 Cross Boundary.
Documentation is required to confirm Safety Precautions taken where more than one party controls the **Danger** for work on an item of plant or **Apparatus**. Cross boundary documentation is between two parties only, where more parties are involved the Control **Person** responsible for the **Apparatus** at the point of common coupling must make separate arrangements at each interface.
The following documentation may be used:

PG5.1 Record of Inter System Safety Precautions. Where **Control Engineers** are responsible for holding safety precautions on one side of a Control Boundary to allow a Control Engineer to give authority for the issue of **Safety Documents** on the other side of the boundary, this document **Shall** be used. The form of the document **Shall** be determined by the **System** Control Manager as required by section OC8 of the Grid Code.

PG5.2 A Circuit State Certificate provided by the rail track operator at traction supply substations, (OE4).

PG5.3 Operation, Isolation and Earthing Certificate.
Operation, Isolation and Earthing Certificate (OI&E -Appendix PG.1) **Shall** be used **t**o confirm and hold cross boundary safety precautions where a Record-of-Inter-System-Safety-Precautions (RISSP) or Circuit State Certificate is not applicable.

PG5.4 Application of Circuit State and Operation Isolation and Earthing certificates Shall be used as follows:-.

PG5.4.1 Where Circuit State or Operation Isolation and Earthing certificates are required to provide safety from **The Company's System** they **Shall** be issued and cancelled by a **Senior Authorised Person** with the sanction of the **Control Engineer.**

PG5.4.2 Where a certificate is required to hold safety precautions for work by **The Company** on a **System** controlled by a third party, it **Shall** be received or cleared by a **Senior Authorised Person** who **Shall** inform the **Control Engineer** immediately after issue and before clearance.

PG5.4.3 Work in proximity to overhead lines by The National Grid Operators contractors or third parties who have been informed, in writing, of the conditions under which proximity work may take place, (AE2.4.3).

Appendix PG1

NORTHERN POWERGRID

Operation, Isolation and Earthing Certificate No. 360550

NOTE: THIS IS **NOT** A PERMIT TO WORK OR SANCTION FOR TEST

1.0 Safety Precautions have been established on the following Apparatus under the Control of .....

1.1 Apparatus Identification: .....

1.2 Safety Precautions Established:

(a) Points of Isolation: .....

(b) Earths Applied: .....

1.3 Issue: I (Print name) ..... Being a Northern Powergrid Senior Authorised Person**/Consumers Authorised Person* Declare that from all points of supply under my Control the identified Apparatus has been Switched out*, Isolated and Locked Off*, and Earthed*

Signed ..... Time ..... Date .....

1.4 Receipt: I (Print name) ..... Being a Northern Powergrid Senior Authorised Person**/Consumers Authorised Person* acknowledge receipt of this Certificate.

Signed ..... Time ..... Date .....

1.5 Removal of Earths: The above Earths may be removed and replaced for testing purposes by an Authorised Person at the request of the recipient. This shall be recorded below.

	Signed by recipient	Time	Date
I Acknowledge above earths removed			
I Acknowledge above earths replaced			
I Acknowledge above earths removed			
I Acknowledge above earths replaced			
I Acknowledge above earths removed			
I Acknowledge above earths replaced			

* Delete words not applicable.
** Or a SAP authorised by Northern Powergrid

Form No. 837(E) Rev. 02/2012

2.0 Clearance

I (Print Name).....

Being a Northern Powergrid Senior Authorised Person**/Consumers Authorised Person* declare that all relevant Safety documents have been cancelled:

All gear and tools have* / have not* been removed

All additional earths have been removed* / accounted for*

The work is complete* / incomplete*

and the points of Earthing and Isolation declared on this certificate are no longer required by me.

Signed..... Time..... Date.....

2.1 Cancellation

I (Print Name).....

Being a Northern Powergrid Senior Authorised Person**/Consumers Authorised Person* hereby declare this Certificate is now cancelled.

Signed..... Time..... Date.....

* Delete words not applicable.
** Or a SAP authorised by Northern Powergrid

Appendix PG2 – Additional Earthing Schedule

Additional Earthing Schedule				
Circuit Name			Issuing SAP	
Circuit Identification			Recipients name	
Safety Document Reference			Issue date	
			Page 1 of 1	
Tower No / Structure	Date applied	Applied by	Date removed	Removed by

*AA LOCKING

Locks are used to restrict access to operational sites or premises and to control operation of **System Plant** and **Apparatus**. **The Company's** operational locking policy recognises the responsibility conferred upon **Persons** by their training and experience. A **Person's** authorisation level is determined by their duties and successful assessment which may result in the issue of an appropriate key.

AA1 Operational Locks

The locking policy seeks to minimise the number of keys issued to each individual. This entails the use of a Master - Sub master system wherever possible. Until a common standard is implemented existing Northeast - Yorkshire locks will be applied to control access according to the following levels.

a. Level 1: Northeast 'B' or Yorkshire Standard (star) Locks.

- Doors to chambers containing exposed **High Voltage Conductors.**
- Switchgear orifice shutters, including test spouts, VT's etc.
- Transformer off circuit tap selector switches.
- Operating handles of all 33, 66 and 132kV isolators and earthing switches.
- Operating handles and selector switches on Ground Mounted **High Voltage** outdoor switchgear.

- Earth switch handles or selectors.
- Operating handles and **Isolating Devices** of **Company** controlled switchgear in chambers to which consumers have access. Ensure emergency trip devices allow open only.
- Flag boxes for line identification equipment.
- * Fixed access ladders.

b. Level 2: Northeast 'B' or Yorkshire 'AV' Locks

Gates to compounds containing exposed **High Voltage Conductors** where **Working and Access Clearance** can be maintained for personal access.

c. Level 3: Northeast 'C' or Yorkshire 'AX' Grand Master.

- Exposed **Low Voltage Conductors** in Chambers, kiosks pillars etc.
- Control Rooms
- Doors/hoods to ground mounted totally enclosed **Apparatus**.
- Operating handles/control cubicles of pole mounted switchgear.
- Access to closing and immobilising features on outdoor ground mounted switchgear controlling overhead lines.

- Enclosures with short fence (1.37m minimum) inner compound containing exposed **High Voltage Conductors**.

d. Level 4: Northeast 'H' or Yorkshire 'AW' Sub Master.

- Non operational areas e.g. workshops, toilets, fire fighting equipment etc.
- Enclosures to non operational parts of substations or where **Apparatus** is enclosed by a fence with a minimum height of 2m.

e. Level 5: Northeast 'J'

Positions to which consumers may require access on their own premises e.g. meter cupboards and fire fighting equipment.

AA2 **Other Devices**: The following may be used instead of locks.

AA2.1 **Think Rings**: will be used to control all switching devices (except **Earth** switches), **Isolating Devices**, trip buttons etc. in indoor substations and outdoor switchgear where the access panel is secured by a level 3 lock.

AA2.2 **Integral Locks** on switchgear etc.: Keys to these locks to be kept in a key cabinet, within the substation. The cabinet **Shall** be secured with a think ring or, where consumers have access, a level 1 lock.

AA2.3 Non-standard locks

AA2.3.1 **Shall** be used where there are other hazards requiring specialist equipment for access. e.g. locations such as cable tunnels or other confined spaces, etc., (see AB2).

AA2.3.2 Personal locks **Shall** be used to control access for parts of compounds delineated with a substantial fence, chambers, etc. where all **Apparatus** within is **Dead** in accordance with AD3.3.5

AA2.4 **Consumers access** to **High Voltage** substations.

AA2.4.1 Arrangements may be as follows:

a. Individual doors for **Company** and consumer.
b. Dual locking, either a twin barrel rim lock or a locking bar with a **Company** lock on one end and the consumers lock on the other.
c. Yorkshire 'AZ' change locks may continue to be used in existing locations.

AA2.4.2 Where consumers have staff authorised by **The Company** to operate **Company** controlled switchgear, where required, think rings **Shall** replace Level 1 locks on operating handles.

AA2.5 Multi-Locking: Where other parties are involved and it is necessary for more then one lock to be fitted, e.g. in the case of securing points of **Isolation** etc., use may be made of a multi clasp device e.g. an Iso-lok.

***AA3** **Safety Lock**. **Safety Locks Shall** be a different pattern to all other locks, they **Shall** be used to secure points of **Isolation** only. Their use to secure **Earths** in position is considered inappropriate as **Earths** can be removed under the authority of a **Sanction for Test**.

AA3.1 **Approved Safety Locks Shall** be:

a. Union **S lock** - this is the preferred safety lock. NB The S key is issued to **Senior Authorised Persons** only.

b. Individual locks, coloured red, with individual keys, may continue to be used as an alternative until they are replaced by **S locks**.

c. An **Ancillary Safety Lock** (Anc S lock) **Shall** be used to secure points of isolation on ancillary equipment. (N.B. this provides isolation control on points where the **Control Engineer** has not instructed the application of an **S Lock**).

AA3.2 **Safety Locks Shall** be used, where practicable, at all points of Isolation from the **High Voltage** and **Low Voltage Systems**, where instructed by a **Control Engineer** to secure all other sources of energy and where there is a specific requirement in the Safety Rules.

AA3.2.1 Application **Shall** include the following where practicable:

a. On **High Voltage Systems** to lock open switchgear at all points of Isolation from the **System** to prevent the circuit to be worked upon from being energised.

b. To lock off **Low Voltage Isolating Devices** where it is associated with work on the HV network (prevention of backfeed).

AA3.2.2 Application of **Ancillary Safety Locks Shall** be carried out in the following circumstances where practicable:-

- Isolation of compressed air valves
- Isolation of SF6 valves
- Isolation of ancillary LV supplies
- Isolation of LV feeder ways.

N.B. This list is not exhaustive.

AA3.2.3 Where the hasp of the **Safety Lock** is too thin for a particular application, e.g. Aerial Switches, then either apply a spiral wire cage to the hasp or use the normal operating lock secured by an **Approved** device which blocks the key slot when secured by a **Safety Lock**, (Drawing No. Y040S0202).
Note: For work on withdrawable **Apparatus,** spout shutters **Shall** be locked shut with a level 1 lock (WB1.1).

AA3.2.4 **Safety Locks**, **Shall** only be applied by a **Person** who is authorised to **Isolate Apparatus** in the appropriate category and **Shall** be removed only by a **Senior Authorised Person (**or **Authorised Person** for the activity being undertaken and who holds an SAP code for any asset class). At points of isolation from the **System**, **Safety Locks Shal**l only be applied or removed to the instructions of a **Control Engineer**, (OB2.1.3 and OB6.6.2).

Where an **Ancillary 'S' lock** is used, application and removal **Shall** be by a suitably **Authorised Person**.

***AA3.2.5** There **Shall** be no requirement to record the deposit of **Safety Lock** keys when **S locks** are used. Where individual **Safety Locks** are used for isolation from the **High Voltage System**, then keys **Shall** be retained in the possession of a **Senior Authorised Person** or placed in a **Key Safe** which **Shall** be locked with an **S lock**.

*AB OPERATIONAL ACCESS

To prevent unauthorised access to operational premises and **Live Conductors**, all doors and gates etc. **Shall** be secured with suitable locks or other **Approved** means. **Persons** who have the necessary authority for access are responsible for maintaining security of the premises during the course of their visit, ensuring that doors and gates are secure and all locks are replaced on leaving. In particular they **Shall** ensure that non-competent **Persons** are only permitted to enter such areas when under the **Personal Supervision** of a **Person** holding the appropriate authority code.

AB1 Switch/Substations

***AB1.1 Access**.

AB1.1.1 The control of access to all parts of switch stations and substations **Shall** be by the application of suitable locks and issue of keys as detailed in AA1.

AB1.1.2 Where contractors, who do not normally hold authority codes for access to **The Company's** operational premises, require access, consideration should be given to carry out training for access to the substation(s) concerned and limiting entry by the use of:

a. AY Sub GM Locks (Yorkshire).
b. Dual locking arrangements.

***AB1.2 Live Conductors:** Access to **Live High Voltage Conductors** within substations **Shall** be prevented by the use of an appropriate locking device on ladders, barriers, doors etc. Where a chamber contains exposed **Live** terminals, e.g. an open bushing transformer or dividing box, there **Shall** be an additional **Danger** barrier immediately inside the door to give a warning.

***AB1.3 Ventilation**. Substation design incorporates provision for natural ventilation which may be supplemented by opening doors. Where ventilation is considered inadequate use **Approved** temporary forced ventilation equipment. Suitable arrangements may include the use of cylinder vacuum cleaners, portable air compressors etc. or the hire of specifically designed equipment.

*AB2 Confined Spaces

A “confined space” means any place, (e.g. a chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well or other similar space) in which, by virtue of its enclosed nature, there arises an actual or reasonably foreseeable risk of—

- serious injury to any **Person** at work arising from a fire or explosion;
- the loss of consciousness of any **Person** at work arising from an increase in body temperature;
- the loss of consciousness or asphyxiation of any **Person** at work arising from gas, fume, vapour or the lack of oxygen;
- the drowning of any **Person** at work arising from an increase in the level of a liquid; or
- the asphyxiation of any **Person** at work arising from a free flowing solid or the inability to reach a respirable environment due to entrapment by a free flowing solid.

There is a possibility in all of these cases of a build up of gases which could pose **Danger** to personnel. In some situations where there is perceived to be a more significant risk, specific **Approved** instructions **Shall** apply which may include the use of non standard locks to restrict access; *see Index Ref. 2.*

AB2.1 Identification and Control

Confined spaces **Shall** be identified by the use of

notices, where reasonably practicable at the entrance, to alert staff. Where locks are required they **Shall** be suitable to cover the level of perceived risk to personnel or the **System**. Non standard locks may be used if considered appropriate, keys **Shall** only be available to suitably **Authorised Persons**.

AB2.2 Precautions before Entry

Before entry to a confined space a risk assessment **Shall** be carried out, all sources of ignition in close proximity **Shall** be extinguished and the atmosphere within the confined space **Shall** be tested.

AB2.2.1 The use of de-icing fluid may be necessary to free pit covers in cold weather. Under no circumstances **Shall** a naked flame be used.

AB2.2.2 Where shallow spaces are accessed, e.g. link boxes, care **Shall** be taken to ensure that any heavier than air gases, which may have accumulated, are dispersed by agitating the air within the space, e.g. lift and replace the bell several times. Care should be taken not to introduce additional hazards e.g. LPG.

***** AB2.2.3 In cases where entry of a **Person** is required, the atmosphere **Shall** be tested using an **Approved** gas detector/oxygen meter; *see Index Ref. 2.*

a. The instruments **Shall** be checked prior to testing the air sample(s) from within the confined space. Air samples **Shall** be representative.

b. If the instruments indicate the air within the space to be safe and breathable, entry may be made subject to the provisions of AB2.3

c. Where flammable gas or abnormal oxygen levels are indicated the door must be carefully closed or the air within the space **Shall** be made safe before entry.

d. Making safe: Leave the door open and suitably guarded and, if flammable gas is present warn other **Persons** in the vicinity and extinguish any form of ignition. If natural ventilation is inadequate, carefully reseal the access and arrange forced ventilation (AB1.3).

AB2.3 Access and Work

***** AB2.3.1 When a **Person** enters a confined space, a second **Person Shall** at all times remain outside and be in constant contact with the **Person** inside. The second **Person Shall** be suitably trained, equipped and readily available to render assistance.

AB2.3.2 The air within the confined space **Shall** be monitored at all times with **Approved** instruments. The space **Shall** be vacated if an alarm operates indicating a lack of oxygen or build up of flammable gas. Re-entry must not be attempted until suitable precautions have been taken and the air is safe to breath, (AB2.2.3).

AB2.3.3 When work is to be carried out involving additional hazards e.g. LPG equipment, welding gear, anything

giving off fumes etc. or where **Danger** may exist from whatsoever source, a **Limitation of Access,** detailing the safety precautions required, e.g. the use of forced ventilation, **Shall** be issued by the **Authorised Person** in charge of the work.

AB2.3.4 **Approved** contractors or other third parties may be engaged to carry out work in confined spaces, approval **Shall** include verification that their training and procedures meet the **Company's** standards as a minimum. Otherwise they **Shall** receive **Company** training and Authorisation and work to **Company** procedures.

***** AB2.3.5 If any situation requires the use of breathing equipment then specialist contractors or, in an emergency, the fire and rescue service **Shall** be used.

AC Fire Control

For full details of policy on fire prevention *see Index Ref. 2*.
Substations may be equipped with automatic fire control equipment, there may be portable fire extinguishing equipment installed or reliance may be placed on fire fighting equipment being available with personnel. All fire protected areas and fire fighting equipment must be **Approved**, accessed and used as follows:

***AC1 Automatic**

AC1.1 Where controls for automatic fire fighting equipment are within the protected chamber, before any work, including

switching or inspection, is carried out, it is permitted to enter the chamber for a distance of up to 2 metres in order to render the equipment inoperative.
There must be:

- No obstruction to access and
- no adjacent electrical hazards.

AC1.2 Where this is not possible, as long as the fire fighting equipment is operative, treat the zone as a confined space, (AB2.2.3).

***AC2 Portable**

AC2.1 Portable fire extinguishers **Approved** for use in the vicinity of **Live Apparatus** and **Conductors Shall** be in accordance with current standards; *see Index Ref. 2*.

AC2.2 When using **Approved** portable fire extinguishing equipment to the manufacturer's or **The Company's** instructions, personnel must ensure their own safety.

***AC3 Precautions after Discharge**

AC3.1 Where there is continuing **Danger** of fire or **Danger** to life, the emergency services **Shall** be called. Where for other reasons it is necessary to enter a chamber or enclosed space which has not been adequately ventilated, and suitable trained personnel with **Approved** equipment are not available, refer the problem to the **Designated Engineer**.

AC3.2 **Ventilation Procedure**, see section AB1.3 for substation ventilation and, if considered necessary, treat the enclosure as a confined space (AB2).

AD PROXIMITY WORK

By suitably trained **Company** staff and contractors.

***AD1 Exposed Live Conductors**:

When working in proximity to exposed **Live Conductors, Working and Access Clearances**, as defined in DSR Appendix D, **Shall** be observed. They are derived from the sum of the **Safety Distance** and an application factor to take into account the actions and movements a **Person** may make when carrying out a task.

AD1.1 It is the responsibility of the (**Senior**) **Authorised Person** in charge of the work to determine the **Working and Access Clearance** to be used taking into account:

a. Position of work.
b. Details and scope of work (including tools and or machines used).
c. Guidance from DSR Appendix D

to ensure the relevant **Safety Distance** is not infringed.

AD1.2 Overhead Lines

AD1.2.1 Work within 3m but outside **Working and Access Clearance** of **Live High Voltage Conductors** requires a **Limitation of Access**, (PG4.2.1).

AD1.2.2 Vegetation Management (Engineering Recommendation G55/1) is an exception; *see Index Ref. 2*.

***AD2 Use of Machines**

When it is proposed to use machines or vehicles such as excavators, crane wagons etc. in proximity to **Live**

Apparatus or **Conductors**, consideration **Shall** be given to the effects of inadvertent operation of the equipment which may result in contact with **Conductors** etc. The operator must be suitably trained and made aware of the hazards.

AD2.1 Low Voltage.

AD2.1.1 The **Working and Access Clearance**, 1.0m for **Low Voltage**, **Shall** not be infringed under any circumstances unless work is carried out to **Approved Low Voltage Live** work procedures.

AD2.1.2 The use of machines, long objects etc. within 2m of a **Live Low Voltage** line **Shall** be subject to the **Personal Supervision** of a suitably **Authorised** or **Competent Person** who **Shall** ensure that no part of the machine etc. will approach within 1m of the **Live Low Voltage** line.

AD2.2 High Voltage.

***AD2.2.1** Under no circumstances **Shall** the **Working and Access Clearance** be infringed.

AD2.2.2 Use of Machines. Where cranes and excavators are to be used within 6m of a **Live** overhead line, the operator **Shall** be suitably trained and instructed.

a. The use of a vehicle mounted crane within 6m of a **Live High Voltage** overhead line **Shall** be subject to the **Personal Supervision** of a **Senior Authorised Person** who **Shall** ensure no part of

the crane or load **Shall** encroach within 3m of the **Live High Voltage Conductors**.

b. The use of an excavator within 6m of a **Live** overhead line **Shall** be subject to the approval of a **Senior Authorised Person**. Where it is possible for any part of the machine to infringe **Working and Access Clearance**, the work **Shall** be carried out under the **Personal Supervision** of a **Senior Authorised Person** who **Shall** ensure no infringement of **Working and Access Clearance**.

AD3 Open Compounds

***AD3.1** Safe **Working and Access Clearance Shall** be maintained from exposed **Live Conductors**.

AD3.1.1 Access may be gained by suitably **Authorised Persons** for the following:

a. Operational purposes, such as switching, cable oil pressure readings and inspections etc.
b. Work under a **Limitation of Access** as detailed in PG4.2.2
c. Work or testing under a **Safety Document** on **Dead Apparatus** delineated in accordance with AD3.3.
d. Work by **Authorised Persons** to **Approved** procedures.

AD3.1.2 Where other work is underway in the compound the **Person** in charge of the **Working Party Shall** be contacted and a risk assessment carried out to ensure there is no conflict or unacceptable hazard created by the additional activity.

AD3.2 **Access Restrictions**: Access to compounds etc. where **Apparatus** is connected to operate in 'Fault Interfering Mode' upon failure of normal protection arrangements **Shall** be subject to the procedure in (OA3):

***AD3.3 Access for Work on Dead Apparatus**.

AD3.3.1 An island work area, where **Working & Access Clearances** are maintained, **Shall** be established under the **Personal Supervision** of a **Senior Authorised Person**.

AD3.3.2 Where work is to be carried out by more than one **Working Party** on separate items of **Apparatus** a risk assessment **Shall** be carried out by the **Senior Authorised Persons** in charge of all activities to ensure there is no conflict. Independent island work areas **Shall** be established and **Safety Documents** issued to each **Working Party**, (AD3.1.2).

AD3.3.3 Where the **Working Party** includes **Persons** who have not received specific training in safe procedures for work in compounds containing **Live High Voltage Apparatus** then a suitably trained **Person Shall** be present to give **Personal Supervision**.

AD3.3.4 Where work is to be carried out utilising Island working within a compound that contains **Live High Voltage Apparatus** the following requirements **Shall** apply:-

a. The **Apparatus** to be worked on **Shall** be released for work in accordance with DSR 4.1.1.

b. The **Apparatus** made safe for work S**hall** be delineated in accordance with OPM Section AD3.4 and AD3.5

c. A 'Work-in-Live-Compounds' risk assessment and site delineation drawing shall be completed and issued along with the **Safety Document. (**See AD3.5.10 & AD3.5.11).

d. The **Senior Authorised Person** shall set the **Working Party** to work on the first day.

e. Recommencement of the work on subsequent days **Shall** be achieved utilising one of the following methods:-

I. The **Senior Authorised Person Shall** restart the **Working Party** at the commencement of each day or:

II. The recipient of the **Safety Document** who possesses restart authorisation code A2.5 **Shall** restart the **Working Party** at the commencement of each day in accordance with AD3.6.

AD3.3.5 Where work is to be carried out in a fenced area, enclosure or chamber where all **Apparatus** is **Dead** then the following requirements **Shall** apply:-

a. The Apparatus to be worked on **Shall** be released for work in accordance with DSR 4.1.1

b. The access route and work area **Shall** be delineated by a substantial barrier or temporary

fence no less than 2 metres high between **Live** and **Dead** areas to create a work area that has no **Live Apparatus** within it (see diagram AD4). Installation of the substantial barrier/fence **Shall** not compromise the 2.4 metre high statutory fence.

c. The designated operational access gate/door to the safe **Dead** area **Shall** have the operational access lock removed and replaced by a personal lock, the key to which **Shall** be issued to and retained by the recipient of the **Safety Document** for the duration of the works.

d. A "Designated Access " notice **Shal**l be applied to the identified access gate/door.

e. There is no requirement to complete and issue a Work in Live compound risk assessment or site delineation drawing as all **Apparatus** within the Work area is **Dead** and released for work under a **Safety Document**.

f. The **Senior Authorised Person Shall** set the **Working Party** to work on the first day.

g. Recommencement of the work on subsequent days **Shall** be achieved utilising the personal lock by the recipient of the **Safety Document**. This does not require the restart authorisation code.

***AD3.4 Approved Equipment**.

a. Black and yellow plastic chain in 25m lengths.

b. Yellow cones (between 1m and 1.2m) to act as independent supports for the chain.

c. Green mini cones.

d. Green lamps complete with green lenses/bulbs.

e. Large **Danger Notices** - (PF2) fitted with suitable fastening devices, e.g. 'Clam Cleat' with 2m of cord.

f. Large "Danger Live Conductors Overhead" notices.

g. Red cones (between 1m and 1.2m) to act as supports for free standing **Danger Notices** and "Danger Live Conductors Overhead" notices.

***AD3.5 Delineation Procedure.** The island working area **Shall** be delineated under the **Personal Supervision** of a **Senior Authorised Person** as follows:

***** AD3.5.1 The **Senior Authorised Person Shall** select a suitable access gate to the compound and the most suitable route to the island work area, maintaining **Working & Access Clearances** and avoiding, as far as reasonably practicable, over running **Live High Voltage Conductors**. The route from the chosen gate to the island work area entrance **Shall** be indicated by attaching **Danger Notices** to **Live High Voltage Conductor** supports and strategically placed free standing **Danger Notices** supported on red cones. Where the access route can not avoid over running **Live High Voltage Conductors**, **Working and Access Clearances Shall** be maintained and notices, 'Danger Live Conductors Overhead,' (PF3.1), **Shall** be posted. See Diagram AD.1.

***** AD3.5.2 The **Senior Authorised Person Shall** take account of access requirements for **Approved** tools, ladders,

scaffolding and other equipment, including vehicles. Subsequent security and movement of these items is the responsibility of a suitably **Authorised Person** who **Shall Personally Supervise** their movement. This **Shall** be noted under other precautions on any **Permit to Work** issued; *see Index Ref. 2*.

AD3.5.3 The island work area **Shall** be delineated by **Approved** black and yellow chain supported, at a height of approximately 1m, by approved yellow cones spaced not more than 6 metres apart.

AD3.5.4 The entrance/exit way to the island work area **Shall** be formed by creating a substantial overlapping of the chain and cones. This **Shall**, where practicable, direct egress away from **Live Apparatus** and towards the chosen entrance to the compound.

AD3.5.5 Where **Live Conductors** are present at high level above the island work area the **Senior Authorised Person Shall** specify additional precautions to avoid **Danger**. This **Shall** include posting 'Danger Live Conductors Overhead' notices, (PF3.1), and **Personal Supervision** by a **Senior Authorised Person**.

AD3.5.6 Green cones, supplemented by green lamps during darkness, if lighting is inadequate, **Shall** be placed adjacent to the chain support cones on the safe side of the chain and entrance way.

AD3.5.7 To ensure all **Live High Voltage Conductors** adjacent to the island work area are clearly identified, **Danger Notices Shall** be attached to adjacent supports and

supplementary **Danger Notices Shall** be supported on approved red cones.

AD3.5.8 On completion of the delineation of the island work area, the **Senior Authorised Person Shall** satisfy him/herself that anyone attempting to enter or exit the island work area **Shall** immediately become aware of **Live High Voltage Conductors**.

AD3.5.9 Where the work area is such that the compound has separately accessed **Live** and **Dead** areas, the compound may be divided using the chain barrier and green cones. Where the boundary of the island work area coincides with a fixed fence, no chains are required but green cones **Shall** be placed no more than 6m apart inside the fixed fence. See Diagrams AD.2 and AD.3.

AD3.5.10 A copy of the substation site plan **Shall** be marked up detailing the safe work area and selected access route. The plan **Shall** be available, in a suitable location on site, for inspection.

AD3.5.11 A risk assessment **Shall** be carried out by the **Senior Authorised Person** and the **Competent Person** who is to receive the **Safety Document**. Other members of the **Working Party** may be involved in this process if considered appropriate. A copy of the form, Appendix AD.1, **Shall** accompany the **Safety Document**.

AD3.5.12 Before commencement of work, the recipient of the **Safety Document Shall** ensure all members of the **Working Party** involved are aware of:

a. the results of the risk assessment and have signed the form.

b. all safety precautions taken and

c. restrictions & precautions necessary to avoid **Danger** during the work.

DIAGRAM AD.1 ISLAND WORKING - ACCESS UNDER CONDUCTORS

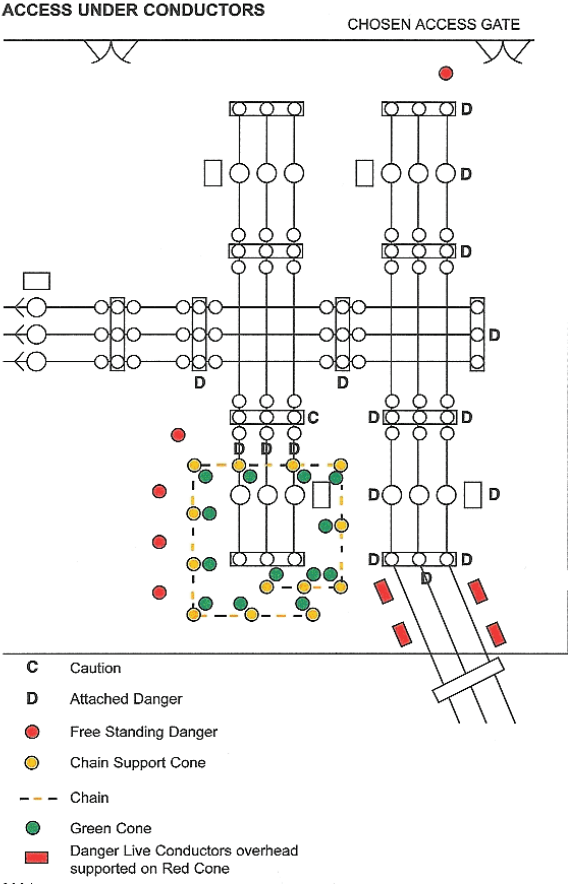
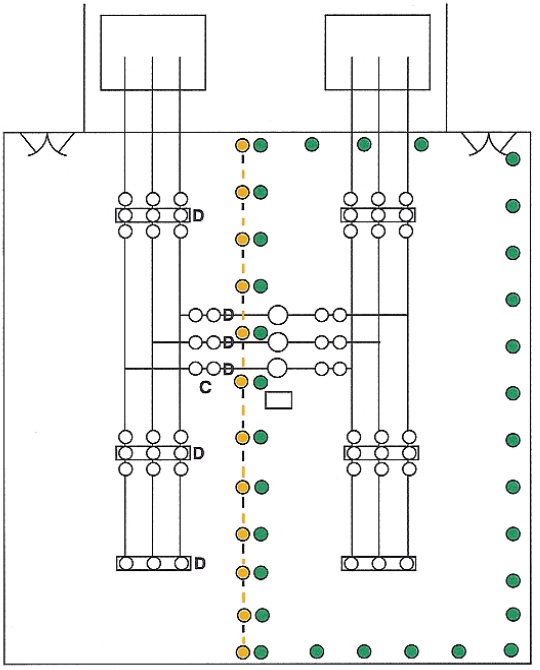


DIAGRAM AD.2 - WORK ON A COMPLETE SECTION



C Caution

D Attached Danger

Free Standing Danger

Chain Support Cone

Chain

Green Cone

Diagram AD3
Layout with Separate Compounds

Arrangement for 1.5m high internal fence

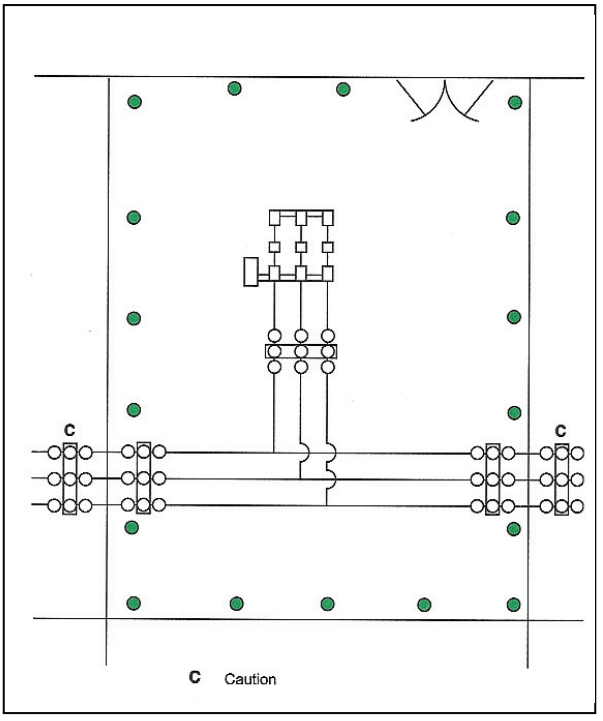
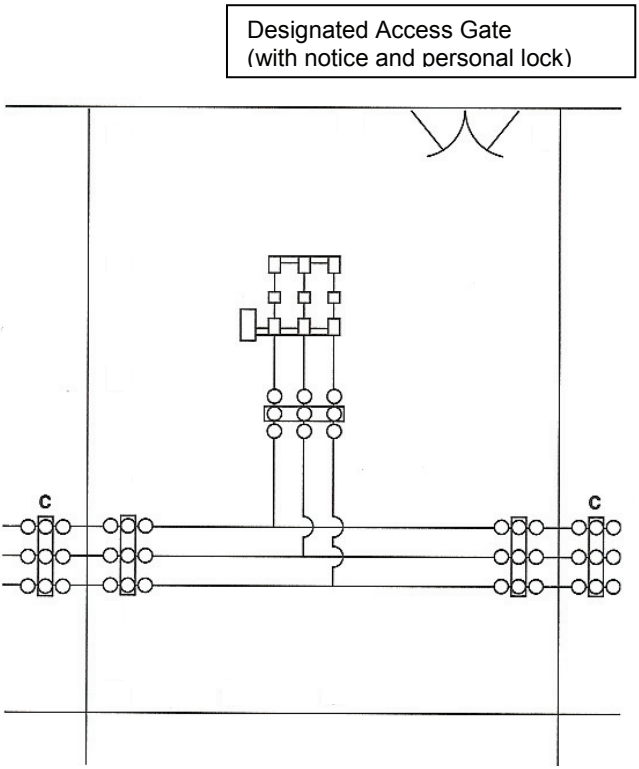


Diagram AD4
Layout with Separate Compounds

Arrangement for 2.0m high internal fence where all Apparatus is dead, isolated and earthed



AD3.5.13 When another **Person** joins the **Working Party**, the recipient of the **Safety Document Shall** ensure the newcomer is appraised of all safety precautions as AD3.5.11 and agrees with the risk assessment and signs the form.

AD3.6 Extended Work.

When the work involved lasts for more than one day, the recipient of the **Safety Document Shall** ensure that all safety precautions are in order before allowing work to restart.

AD3.6.1 Provided all is in order, the inspection **Shall** be recorded on the pro forma on the back of the risk assessment form, (Appendix AD.1).

AD3.6.2 If the recipient of the **Safety Document** has any concern about the safety precautions, work **Shall** not restart without the authorisation of a **Senior Authorised Person**.

AD3.6.3 The pro forma may be used for up to six days from the date of the risk assessment.

AD3.6.4 Where longer term work is undertaken, the **Senior Authorised Person Shall**, at intervals of not more than 7 days, review the risk assessment with the recipient of the **Safety Document** and issue a new form.

***AD3.7 Terminal Poles and High Structures**

*****AD3.7.1 Access to line terminal poles, towers or high structures located within a compound with exposed **Live High**

Voltage Conductors is permitted provided the area is delineated in accordance with AD3.3 to AD3.5

*AD3.7.2 Only **Approved** ladders, scaffolding or other access equipment, e.g. climbing irons, are to be employed to gain access, (WD1; 2). Where necessary equipment **Shall** be bonded to **Earth**.

AD3.8 National Grid Operator.

AD3.8.1 Compounds under the management of the National Grid Operator are normally secured with National Grid Operator's locks.

AD3.8.2 Where **Company** staff require access, this **Shall** be by dual locking or other suitable access arrangement. e.g. a key provided in a **Key Safe**, secured with a level 2 lock, within the substation.

AD3.8.3 Where National Grid Operator's staff require access to **Company** managed sites then access **Shall** be by dual locking or other suitable access arrangement.

AD3.8.4 Safety precautions to allow work by **The Company** or **The Company's** contractors to commence **Shall** be agreed between the National Grid Operators **Authorised Person** and the **Company's Senior Authorised Person** who is to supervise the work.

AD3.8.5 The work area(s) **Shall** be delineated in accordance with **The Company's Approved** procedures. If this is not practicable then a safety supervisor **Shall** be provided by the Grid Operating Company and the work area defined in accordance with the National Grid Operators procedures.

Appendix AD1

Work in Live Compounds: Risk Assessment

Substation: ..... Circuit/Apparatus: .....

Control Area: ..... Tel. No: .....

Description of task: .....

Carry out a risk assessment following completion of Safety Precautions and before the issue of a Safety Document.

Assessment by: ..... SAP Tel. No: .....

and ..... CP ..... on ..... /...../..... (valid for 7 days)

Persons affected: Public ☐ Working Party ☐ Other Working Parties ☐

Possible Hazards	Existing Risk Level H M or L	Additional control measures required to reduce the Risk to lowest practicable level	Final Level H[1] M or L
Oversailing Live Conductors			
Overhead Live Busbars			
AC Auxiliary Supplies			
DC Auxiliary Supplies			
Stored Energy - Springs/Air			
Tools and Equipment			
Working at height including use of Ladders, Scaffolding, etc.			
Mobile Plant and Vehicles			
Oil Handling			
Other			
Other			
Other			

[1] If unable to reduce from High, STOP & seek advice

Signed ..... SAP

Signed ..... CP

Discuss the results with all members of the work party who must agree with the assessment and sign on overleaf:

Form No. 848(E) Amended 22/11

Members of work party:

Name..... Signed.....

Name..... Signed.....

Name..... Signed.....

Name..... Signed.....

Name..... Signed.....

Name..... Signed.....

Name..... Signed.....

Name..... Signed.....

Note: Persons joining the Work Party must agree the risk assessment and sign on.

Safe Working Area - Daily Checks

Daily checks required before work is restarted:

(1) Safety Documents available and Risk Assessment valid.

(2) Confirmation of Safety Precautions:
- Access clear and unobstructed
- Warning signs in place
- Delineation equipment in place (chain and green cones)
- Safety precautions, at this location, verified (e.g. Local Earths in place).

If other Working Parties are present, confirm all arrangements with all concerned.

I confirm all safety arrangements as above are intact and it is safe for my Working Party to recommence work on the last date entered below:

ASSESSMENT

1 Date ...../...../..... Name ..... Signed .....

2 Date ...../...../..... Name ..... Signed .....

3 Date ...../...../..... Name ..... Signed .....

4 Date ...../...../..... Name ..... Signed .....

5 Date ...../...../..... Name ..... Signed .....

6 Date ...../...../..... Name ..... Signed .....

AE THIRD PARTY PROXIMITY

There are situations where third parties or their contractors work in proximity or pass under **Conductors**. Contractors **Shall** be directed to HSE guidance notes GS6 in the first instance. Further advice given on behalf of **The Company Shall** take account of **Access & Work Clearance** as in Table AE.1 and **Shall** be confirmed in writing.

AE1 Public Highways

Passing clearance beneath **High Voltage** overhead lines for high loads on public highways is as shown in Table AE.1. If these clearances cannot be maintained the overhead line **Shall** be made **Dead**, **Isolated**, **Earthed** and a **Permit to Work** issued to a **Competent Person** who **Shall** escort the load beneath the **Conductors**.

AE2 Contractors Working in Proximity to High Voltage Overhead Lines

This part is an abbreviated extract of **Company** policy which should be consulted for further details; *see Index Ref. 2*.

AE2.1 Where there is to be no work or passage of vehicles under the line, ground level barriers and high level bunting, where appropriate, **Shall** be established at a minimum horizontal distance of 6m from the nearest **Conductor**. When mobile cranes, or other equipment with boom like attachments, are being used then the horizontal distance **Shall** be the boom or jib length plus 6m.

AE2.2 In circumstances where there will be passage of vehicles under the line the establishment of vertical clearances and the erection of goal posts will be necessary. For contractors information/use it is important that goal post height is defined as height above ground and not as a distance below **Conductors**. The minimum clearance from the lowest **Conductor** to the underside of the goal post crossbar for unmetalled surfaces **Shall** be as shown in Table AE.1. However consideration should be given to increasing these clearances where crane jibs etc. may be subject to uncontrolled movement on uneven surfaces.

AE2.3 In special circumstances work may be allowed to proceed under an overhead line subject to written agreement. For further guidance *see Index Ref. 2.*

Table AE.1 Clearance for Passage of Vehicles

Situation		Voltage		
		Up to 33kV	**66kV**	**132kV**
1.	High loads on public highways	0.8m	1.0m	1.7m
2.	Unmetalled Roads Vehicles / loads of fixed height	1.1m	1.3m	2.0m
3.	Unmetalled Roads Vehicles / loads not of fixed height	2.3m	2.5m	3.2m

AE2.4 Where the nature of the work is such that safe clearance from the overhead line cannot be maintained then it **Shall** be made **Dead**, **Isolated** and **Earthed**. The issue of a **Safety Document** and the level of supervision given will be determined by the importance of the overhead line for **System** security and the need to safeguard **Company** plant and **Apparatus**.

AE2.4.1 The importance of an overhead line will be determined by the Control Manager.

AE2.4.2 Important overhead lines, e.g. transmission and primary circuits operating at 132kV, 66kV and 33kV, will require

the issue of a **Permit to Work**. The recipient **Shall** provide **Immediate Supervision** to ensure the integrity of the overhead line.

AE2.4.3 The supervision of other circuits may take the form of an occasional visit when an Operation, Isolation and Earthing Certificate has been issued to a contractors responsible **Person** under the following conditions:

a. The conditions for proximity work and nomination of a responsible **Person** is agreed in writing before any outage is arranged.

b. The contractor's responsible **Person Shall** be on site when proximity work is in progress and **Shall** be available to cancel the document at all times.

c. A Company representative will visit site at a time interval to be agreed between field staff and Control Section to check the integrity of the overhead line.

AE2.4.4 In determining whether it will be appropriate to apply **Additional Earths** to the overhead line at the point of work, consideration will need to be given to the electrical risks on site.

AE2.4.5 For single circuit overhead lines and double circuit lines with all **Conductors Dead** and **Circuit Main Earths** applied, there will normally be no requirement to apply **Additional Earths** at the point of proximity working. Where supports with flag brackets are involved, the supports within, and at the limits of the work zone **Shall** be fitted with green flags.

AE2.4.6 Where one side of a double circuit overhead line is **Live**, it will be necessary to apply **Additional Earths** at the extremities of the work area and one per support within the zone. Supports **Shall** be fitted with **Danger Notices** on the **Live** side and green flags on the **Dead** side.

AE2.5 Making Live

When proximity work is completed the overhead line **Shall** be inspected to ensure integrity and the **Safety Document Shall** be cancelled. It is important that the contractor understands that the overhead line **Shall** be considered as **Live** and the contractor **Shall** ensure that all **Persons** working on site are aware of the situation.

AE3 Contractors Working in Proximity to Low Voltage Overhead Lines

For work within 3m of a **Low Voltage** overhead line, one of the following options **Shall** be applied:

a. **Conductors** to be made **Dead** for duration of the work.

b. overhead line to be replaced with underground cable.

c. overhead line to be temporarily or permanently diverted.

d. Part insulated or bare **Conductors Shall** be fully insulated or temporarily shrouded and, if necessary, protected by a suitable barrier, goal posts etc. The site **Shall** be inspected at least every 7 days and as soon as reasonably practicable following severe weather conditions. Temporary protection **Shall** not be considered for periods longer than a month.

OA RESTRICTIONS

It is occasionally necessary to impose restrictions on operation of **System Apparatus.** It is imperative that such restrictions are initiated and complied with as soon as possible in order to ensure safety of personnel and maintain the integrity of the **System**.

OA1 Fault Level.

It is the responsibility of the **Control Engineer** to ensure **Apparatus** on the **System** is operated within its rating as far as reasonably practicable. Switchgear which may be overstressed **Shall** be recorded on the **System** diagram.

OA2 Defects.

A defect is a failure of an item of **Plant** or **Apparatus** to function as designed or expected. Typical examples are as follows:

- Failure of circuit breaker to trip.
- Failure or suspected mal-operation of protection.
- **Plant** or **Apparatus** failure or mal-operation leading to loss of supply.
- Disruptive failure of an item of **Plant** or **Apparatus.**
- Any unexplained event or abnormal occurrence.

*** OA2.1 Distressed Apparatus**

That which is showing signs of distress leading to imminent failure. e.g. overheating, smoke/vapour emission, significant loss of oil/compound, moisture

ingress etc. If switchgear is involved, no operations are permissible until all infeeds to the affected **Apparatus** have been made **Dead**.

The following procedure **Shall** be implemented:

a. Vacate the chamber and secure it with a **Safety Lock** where reasonably practicable, but only if it does not reduce security (e.g. vandal prone situations), and apply a warning notice, 'Access Restricted - Contact the Control Engineer', (PF3.4.3)

b. Inform the **Control Engineer** and switch out using a suitably rated fault breaking device.

c. If the **Control Engineer** cannot be contacted then consider using the emergency switching procedure (OB1.3.2)

d. Remedial action to be taken as soon as practicable.

OA2.2 Suspect Apparatus.

That which is showing signs of distress such as low level constant discharge, oil, gas or compound leaks, failure of similar type of switchgear etc. which are unlikely to fail immediately or in the short term.

The following procedure **Shall** be implemented:

a. Inform the **Control Engineer**.

b. Lock the chamber with a Level 1 lock where practicable but only if it does not reduce security

(e.g. vandal prone situations) and apply a warning notice (PF3.4.3).

c. A risk assessment **Shall** be carried out by Control, Safety, Operational and Technical staff where appropriate. The risk assessment **Shall** be used to formulate a temporary operating procedure to be agreed by the **Designated Engineer**.

The procedure **Shall** address the following points:

i. Switching restrictions e.g. remote operations on fault breaking or non fault breaking switchgear.

ii. Permitted access e.g. further inspection, **Low Voltage** fuse renewal etc. following a local risk assessment.

iii. Authority Code level for access.

iv. The presence of a second **Person** to remain outside the substation but within hearing distance.

v. Period for remedial action to be completed and the restriction to be removed.

OA2.3 Oil filled switchgear and on load tap changers:
The nominal performance optimised interval (NPOI) at which maintenance **Shall** normally be performed on these types of **Apparatus** should not normally be exceeded, but should this occur there is an imposed operating limit (IOL) for each asset group. Risk control measures are specified in the event that the NPOI is exceeded. Apparatus may remain in service beyond the

IOL, in such cases operational restrictions **Shall** be imposed, including the requirements of OA2.3.1 below; *see Index Ref. 2*.

OA2.3.1 Oil filled switchgear which exceeds the IOL **Shall** be subject to the following control measures immediately:

i. An operational restriction preventing local, **Live** operation of the unit.

ii Isolation of a circuit breaker at a primary substation at IOL status must be risk assessed by the site engineer (site conditions) and **Control Engineer (**operational history**)** to permit isolation with the busbar and/or feeder isolating contact **Live.**

iii a site based risk assessment **Shall** be carried out by a **Senior Authorised Person** and if considered appropriate in the light of that assessment appropriate access restrictions **Shall** be applied.

OA2.4 Notification of Defects:

Notification of incidents and restrictions **Shall** be channelled via the **Control Engineer** who **Shall** issue an Advance Report, when necessary, to notify the Manager responsible for reporting or for instigating remedial action. These **System** incidents **Shall** be investigated and reported in accordance with procedures; *see Index Ref. 2.*

OA2.4.1 Defects leading to a failure of supply **Shall** be reported in accordance with PC1.1.

OA2.4.2 Any incident which causes or has the potential to cause

a fatality or serious injury **Shall** be reported using the Dangerous Incident Notification (DIN) procedure; *see Index Ref. 2*.

OA2.4.3 Where a defect in plant or **Apparatus** has the potential to cause **Danger** it may be necessary to implement a Suspension of Operational Practice (SOP). This may comprise a restriction on access, a ban on **Live** operation, or a ban on the use of attachments e.g. test bushings.

OA2.4.4 Information on current restrictions is available on **The Company's** electronic information system.

OA3 Depletion of Intertripping

Where the controlling switchgear is remote from the transformer, reliance is normally placed on a communication link (circuit) to carry the 'intertrip' signal to trip the remote CB for a fault on the transformer. Where there is a failure of the intertrip circuit, a local motorised isolator may be set to open on receipt of a signal from the transformer protection.

OA3.1 Where this situation exists permanent notices are fixed to all doors and gates controlling access to affected **Apparatus**, (PF3.4.1) and fixed to affected isolators, (PF3.4.2); *see Index Ref. 2*. The **Control Engineer Shall** confirm that the protection is fully operational before permitting access. When access to the compound is permitted, approach within 5 metres of the affected isolators should be avoided where reasonably practicable.

OA3.2 Unplanned depletion.

OA3.2.1 When the **Control Engineer** becomes aware that intertrip circuits are not available; he/she **Shall** instruct staff to vacate the potentially hazardous areas of the affected substation(s).

OA3.2.2 If restoration of the intertrip circuit is delayed and isolators are not connected in fault interfering mode, the **Control Engineer Shall** take steps to safeguard the **System** as far as reasonably practicable.

OA3.2.3 When staff arrive on site to investigate a failure of intertrip circuits a check **Shall** be made to ensure there are no personnel in proximity to affected **Apparatus**.

OA3.2.4 Temporary warning notices, (PF3.4.3), **Shall** be attached to all doors or gates to enclosures housing affected **Apparatus** while abnormal conditions exist.

OA3.2.5 Where reasonably practicable affected **Apparatus Shall** be made **Dead** for access or, following a risk assessment, access **Shall** be restricted to essential operations only.

OA3.2.6 On completion of protection work/repairs, temporary notices, (PF3.4.3) **Shall** be removed from all doors and gates to enclosures.

OA3.3 Planned testing

OA3.3.1 Where it is proposed to carry out testing on intertrip circuits which may result in temporary depletion of

protection, the **Authorised Person** carrying out the tests **Shall** ensure no one is in the vicinity of affected **Apparatus**.

OA3.3.2 Warning notices, (PF3.4.3), **Shall** be attached to all doors or gates to the enclosures housing affected **Apparatus** to restrict access. Notices **Shall** be removed on restoration of normal protection arrangements.

OA4 Ferro-Resonance and Single phase switching.

Confirmed incidents of ferro-resonance are rare, however this situation may occur anywhere on the network where a critical combination of capacitance and inductance exists. In practice it can occur where the circuit is lightly loaded and cable is connected to transformer(s) exceeding a ratio of approximately 13m of cable length to 100kVA transformer capacity. When the ferro-resonant state occurs, a voltage in excess of twice line voltage can be generated. This may cause extensive damage to the **System**, including disruptive failure of surge arrestors, and any consumer's equipment connected.

Detailed information on critical cable lengths, connected transformers and the use of surge arresters/diverters is available; *see Index Ref. 2*.

OA4.1 Where the conditions for ferro-resonance exist, the situation **Shall** be avoided by one of the following actions:

a. Switch with load more than approximately 10% connected transformer capacity.

b. Use a ganged switch, the operation of fuse isolators or connecting/disconnecting jumpers (bows or droppers) **Live Line** is not permitted.

c. Disconnect transformers by switching at the local **High Voltage** fuse isolators/links, or as a group if beyond the cable.

OA4.2 Where there is any situation where a ferro-resonance event has occurred or it is suspected may occur, inform the **Control Engineer**.

***OB HIGH VOLTAGE SWITCHING**

Switching covers the operation of all types of switchgear including isolation and **Earthing** actions, and the energising or de-energising of circuits by **Live Line** methods, e.g. removal of jumpers (bows or droppers).

***OB1 General**

The parties involved in **Switching** operations **Shall** engage in a discussion of the intended operations so that all are aware of the implications for the **System** before formal exchange of **Switching** messages. All concerned **Shall** have a clear understanding of the purpose of operations and all work to be carried out to ensure that **Switching** is carried out in the safest and most efficient way.

Notwithstanding the requirements of DSR 3.5.7; All switchgear **Shall**, so far as reasonably practicable, be operated in accordance with the following hierarchy:

- Operate switchgear remotely (via remote control facilities or via control panels on site, etc.)
- Operate switchgear remotely using an **Approved** umbilical device
- Via the operating facilities on the switchgear.

OB1.1 Switching Instructions **Shall** include;

a. Date and time of Instruction.
b. Location.
c. Panel identification
d. Intended operation.

***OB1.2 Recording Centres**.

All operational messages, including details of **Isolation**, **Shall** be reported to the **Control Engineer** responsible for that part of the **System** at his/her designated location.

***OB1.3 Switching**

Shall normally be agreed between the **Control Engineer** and the **Authorised Person** (OB3). Except:

***OB1.3.1A **Switching** procedure which has the written approval of the **Designated Engineer**.

*OB1.3.2 Emergency **Switching.** In order to eliminate a hazard or potential hazard which is considered to be a **Danger** to **Persons**, livestock or to the **System**, action may be

taken to make part of the **System Dead.** However attempts should always be made to make the **Control Engineer** aware of the situation to jointly consider the best course of action.

a. Considerations and options may include:
   - The use of remote switching by telecontrol
   - Where there is a possibility of breaking fault current, the location of a healthy, suitably rated, switching device.
   - The existence of other hazards or problems on the **System** which may have wider safety implications.

b. If it is not reasonably practicable to contact the **Control Engineer** then any action taken **Shall** be reported as soon as practicable detailing the time, switching carried out and reason.

c. Following any emergency action, under no circumstances **Shall** further **Switching** take place without the appropriate authority.

*****OB1.3.3 Where direct communication is not possible between the **Control Engineer** and the **Authorised Person** responsible for the **Switching**, the procedure **Shall** be agreed by the **Designated Engineer** or between the Control Manager and the local Senior Manager.

OB1.4 Interlocks

Interlocks are installed to prevent operation of **Apparatus** outside of normal parameters. Where it is necessary to override interlocks for operational requirements on the **LIVE** distribution network, the following procedure **Shall** apply:

a. The requirement to override interlocks will be fully discussed between the **Control Engineer** and two **Senior Authorised Persons** who are to undertake the necessary operations.

b. The **Control Engineer Shall** issue the appropriate instructions to the **Senior Authorised Person** who will be carrying out the relevant operations.

c. All operations will be agreed with and monitored by the second **Senior Authorised Person**

d. On completion of the required operations the status of the network **Shall** be reported back to the **Control Engineer** by the **Senior Authorised Person** who has carried out the operations and then confirmed by the second **Senior Authorised Person**.

The above procedure is not applicable where the interlock is solely to prevent interference by a third party customer or the **Apparatus** is completely isolated from the **Distribution System**.

OB2 Responsibilities.

***OB2.1 Control Engineer**.

*OB2.1.1 **Control Engineers Shall** ensure all operations are recorded including:

a. Those carried out by telecontrol.

b. The removal and replacement of links which affect the automatic operation of a circuit breaker and associated protection (battery supplies, control, intertrip, bus zone etc.).

c. Where required, a Change of State declaration for commissioning or decommissioning apparatus, (WF2.3.2.).

d. On or prior to commissioning **Apparatus** ensuring all protection and auxiliary equipment is declared operational.

OB2.1.2 When safety precautions are required across control boundaries, the **Control Engineer Shall** ensure co-ordination of switching and the maintenance of safety precautions for the issue of **Safety Documents**.

OB2.1.3 The **Control Engineer Shall** instruct the application or removal of **Safety Locks** and **Caution Notices** at all points of **Isolation** from the **System.** This includes where the design of the switchgear requires the temporary removal of a **Safety Lock** for application or removal of **Circuit Main Earths**.

OB2.1.4 When single phase operations are carried out, where necessary, take precautions to minimise the effects of ferro-resonance on the system, (OA4).

OB2.2 Field Staff

*OB2.2.1 Recording. Field Staff **Shall** record all operational events and switching messages clearly and legibly. Recording **Shall** include date and time of messages, the completion time of each **Switching** operation and the as found conditions during fault investigations prior to reporting to the **Control Engineer**.

Field staff **Shall** also record the removal of trip / intertrip links and report these actions to the **Control Engineer**

Use **Shall** be made of the following where appropriate:

a. Switching Log Book with numbered pages which **Shall** not be removed, (Appendix OB.1).

b. Live line Switching/Work Record Book which **Shall** be used to record all **Live Line** switching operations and work, (Appendix WD.2).

c. Approved Switching Schedules or Programmes.

d. Substation logging facilities and procedures, if applicable, at joint operation sites (e.g. at the Grid interface).

For audit purposes, all log/record books, schedules or programmes **Shall** be retained for a minimum of 1 year to line management instructions.

OB2.2.2 When carrying out **High Voltage Switching** operations, in accordance with OB1, **Authorised Persons Shall**:

a. Use an up to date **System** diagram where reasonably practicable, in circumstances where the **Authorised Person** has been fonetracked this may not be possible, in which case the **Control Engineer Shall** assist the field staff to identify the correct switch to be operated.

b. Use a 3 second delay handle/mechanism, when operating via the facilities on the switchgear, to prevent a reflex action on ground mounted switchgear not rated for breaking fault current.

c. Keep the number of **Persons** in the switch room or area to the minimum required for the operation.

OB2.2.3 When returning circuits to service, ensure the correct status of **Apparatus** is reported to the **Control Engineer**.

OB3 Switching

OB3.1 Routine Switching

OB3.1.1 There are no special requirements for normal switching operations, routine or fault, when operating on circuits fed from a single source.

OB3.1.2 Operations involving connections between **Systems**, (system ties). Where it is required to parallel **Systems** fed from different supply points or where local generation is involved, excessive transfer current may flow. This will necessitate precautions to safeguard the **System** and consumers e.g. immobilising AVC's, altering protection settings and voltage levels; *see Index Ref. 2.*

OB3.1.3 Arc Suppression coils may be installed on rural systems to minimise the effect of transient earth faults on the **System**. Routine **Switching** operations may be carried out with Arc Suppression Coils in circuit. The coil **Shall** be bypassed for paralleling **Systems**, **Live Line Work** and may require to be bypassed under suspected fault conditions to enable earth fault protection to operate.

OB3.2 Fault Switching The unknown nature of faults on the **Distribution System** means that there are occasions when feeders are re-energised following a fault trip before the faulty part of the circuit has been identified. A balance is required to ensure **Danger** is avoided as far as reasonably practicable while restoring supplies as quickly as possible. Only healthy **Apparatus Shall** be re-energised as far as reasonably practicable. Where **Apparatus** is to be re-energised without direct identification of the position of the fault, the **System Shall** be arranged to minimise the number of times the fault is energised (preferably only once for cable faults). *see Index Ref 2*.

OB3.2.1 Safety of **Persons**. When re-energising a circuit in pursuance of fault localisation due consideration **Shall** be given to the Safety of **Persons** carrying out investigations and those in proximity to **Apparatus** being energised.

In particular personnel **Shall** be contacted to confirm conditions at their location are suitable before the circuit is re-energised when:

a. A point of **Isolation** has been established and a **Safety Document**, including cross boundary documentation, is in force.

b. **Live Line Work** is in progress.

c. A delegated Control Zone is involved (OD3.2).

d. Other work is in progress, e.g. proximity work under a **Limitation of Access**.

OB3.2.2 Other Considerations. Each event is different and, when considering re- energising, requires the use of engineering judgement based on training and experience, and an assessment of all risks involved.

Consideration must be given to the following (not exhaustive):

a. **System** integrity e.g. Switchgear ratings, protection suitability, auto reclose facility etc.

b. Effect on consumers of **System** disturbance or extension of fault interruption.

c. Reports of damage, **System** alarms and protection indications (including fault passage indicators).

d. Number of consumers involved, implication of delay due to investigations including patrol or testing.

e. Other factors including time of day, weather conditions and work in progress.

OB3.2.3 **Systems** equipped with Arc Suppression Coils: Where fault localisation is being carried out consideration **Shall** be given to closing the ASC bypass CB.

OB4 Special Requirements

OB4.1 Oil Switchgear:

OB4.1.1 Circuit Breakers; where the isolation of OCB's involves parting ventilation pipes, e.g. Reyrolle A and C switchgear, to ensure any gas is dispersed following a fault trip, a period of 10 minutes **Shall** be allowed after the fault interruption before isolation takes place.

OB4.1.2 The number of operations a circuit breaker can carry out on fault depends upon the make, type and condition of the **Apparatus,** type of fault and the fault level. The maximum number of fault operations between inspections is specified; *see Index Ref. 2.*

OB4.2 Air Break Isolating Switches

The making and breaking ratings of air break isolators are shown in Table OB.1. Category 1 and 2 switches **Shall** be labelled . The label will indicate if the normal **System** fault level is within the breaking capacity of the unit. In the absence of a label, until confirmation of category, the switch **Shall** be assumed to be Category 3.

OB4.2.1 Categories

- Category 1 - Gang operated and equipped with interrupter heads.
- Category 2 - Gang operated and equipped with any type of arcing horns
- Category 3 - All other types including rod operated unganged isolators, 33kV & 66kV plain break isolators.

*OB4.2.2 Operating aerial switchgear

a. **Apparatus Shall** be visually inspected prior to operation paying particular attention to the integrity of all insulators, insulating inserts in operating rods and **Earth** connections to metal operating handles.

b. When separate **Earth** mat and **High Voltage Earth** leads are fixed to the same pole, ensure adequate separation (at least 90^{O}).

c. **Approved** PPE including safety helmet, eye protection and class 1 (**High Voltage**) insulating gloves **Shall** be worn.

d. Ensure correct operation, e.g. for open type switchgear all phases visually checked open or closed.

OB4.2.3 When operating indoor air break isolators only **Approved** operating rods **Shall** be used. Rods **Shall** be visually inspected to ensure they are undamaged and clean before use.

TABLE OB.1 AIR BREAK ISOLATING SWITCHES

TYPE	kV	MAKING DUTY MVA	BREAKING DUTY - LOAD/TRANSFORMER CAPACITY/MAINS LENGTH						
			LOAD (Amp)	CIRCULATING (Amp)	TRANSFORMER CAPACITY (kVA)	CONNECTED CABLE SIZE AND LENGTH (km)			OVERHEAD km
						95mm^2	185mm^2	300mm^2	
Category 1	5-6.6	36	400	400	5,000	NO PRACTICAL LIMIT			NO PRACTICAL LIMIT
	11	60	400	400	7,500				
	20	120	400	400	15,000	19	15	12	
	33	180	400	400	24,000	-	9.7 (solid) 6.6 (oil)	8 (solid) 5.5 (oil)	
	66	360	200	200	40,000	-	2.6	2	
Category 2	5-6.6	36	33	Full Load	1,400	4	3	-	NO PRACTICAL LIMIT
	11	60	20	Rating or	1,400	2.7	2.1	1.7	
	20	120	17	300 amp	1,800	1.6	1.2	0.9	
	33	180	10	whichever	2,000	-	0.42	0.35	
	66	360	7	is less	2,750	-	0.065	0.05	
Category 3									NOT APPLICABLE
Unganged Slow Break	5-6.6	No Fault Making Duty	NIL	NIL	3 phase - 150 1 phase - 167	See Note			
	11-20		NIL	NIL	3 phase - 300 1 phase - 333				
Unganged Quick Break	5-11		NIL	NIL	500				
	20	Making Duty Limited To Breaking Duty	NIL	NIL	1000				
Ganged Plain Break	33-66		NIL	Where no significant change in voltage across poles	NIL				

Note:

Category 1:

(a) The breaking ratings are based on units with a manufacturer's rating of 400 Amps up to 33 kV and 200 Amps at 66 kV.
For units having other prescribed manufacturer's ratings the range of breaking duties should be amended pro-rata.

(b) The making and breaking ratings are independent of mounting arrangements.

(c) For 66 kV units the ratings are only for double head arrangements.

Category 2:

(a) The breaking ratings are for units which are mounted horizontally. For vertically mounted units the breaking rating should be reduced by 50%.

(b) The lengths of cable are based upon a cable capacitance of 1.2uF as used in ACE Report 14 to determine the length of cable that may be disconnected using Live Line Techniques.

Category 3:

Isolators controlling transformers may only be operated live after the load has been removed from the transformers by opening the low voltage isolating device. The length of cable between the isolators and the transformers must not exceed 41 metres.

TABLE OB.2 - Pole Mounted Expulsion Fuses, Links, Sectionalisers and Live Line Connection / Disconnection.

Type	kV	Making Duty MVA	Make/Break Duty: Load/Transformer Capacity/Mains Length				
			Load (Amps)	Transformer (kVA)	Cables (km)		
					95mm^2	185mm^2	300mm^2
Linegear 2000	6	80	33	150	4	3	
Others	6	36	33	150	4	3	
Linegear 2000	11	150	20	333	2.7	2.1	1.7
Others	11	60	20	333	2.7	2.1	1.7
Linegear 2000	20	270	17	500	1.6	1.2	0.9
Others	20	120	17	500	1.6	1.2	0.9

Notes:

1. Break rating of Linegear 2000 based on a maximum breaking current of 8,000 Amps for the fuse.
2. All other ratings derived from recommendations in A.C.E. Report 75.
3. Unsuitable for breaking circulating current.
4. No practical limit for length of lines to be energised/de-energised.
5. It is recommended practice to open on load rather than break pure magnetising current.
6. Links and Sectionalisers to be replaced by fuses for suspected fault make.
7. Transformer group size and cable length are also limits for Live Line purposes.

OB4.3 Pole Mounted Fuse Isolators

Making and breaking ratings are shown in Table OB.2. These fuse isolators **Shall** be operated from ground level using a minimum length of 3.6 metres of **Approved** operating rods.

Note avoidance of system disturbance due to ferro-resonance (OA4)

***OB4.3.1** The operator **Shall** wear **Approved** safety helmet, eye protection and Class 1 (**High Voltage**) insulating gloves.

OB4.3.2 Where the integrity of the circuit is in doubt, particularly under suspect fault conditions, temporarily replace sectionalisers (automatic sectionalising links) and solid links with fuses. If successful, restore links or sectionalisers after a suitable interval (5 mins.).

OB4.4 High Voltage Fuse Switch Units

Fuse renewal is classed as a switching operation and may be carried out with the incoming circuit **Live** provided:

a. It is carried out by or under the **Personal Supervision** of a **Senior Authorised Person**.

b. The **Senior Authorised Person** is conversant with the design of the **Apparatus**.

c. There is no adjustment of clamps required. i.e. the replacement fuse is the same physical size.

The Senior Authorised Person Shall first carry out a risk assessment to assess the cause of the fuse operation to determine if discrimination with the LV

protection is a likely cause. Where a potential suspect transformer is identified then consideration **Shall** be given to replacing the fuses with the switchgear **Dead** and re-energising remotely in accordance with the principles contained in OB1.

OB4.5 Voltage Testing & Live Check Phasing.

OB4.5.1 For details of Voltage Testing devices **Approved** for use on **The Company's Systems** and the **Approved** procedures for use see *Index Ref. 2*. All will give an indication when the **High Voltage System** is inadvertently backfed.

OB4.5.2 The use of Voltage Testing devices **Shall** be restricted to the class of **Apparatus** for which they have been **Approved** and applied by:

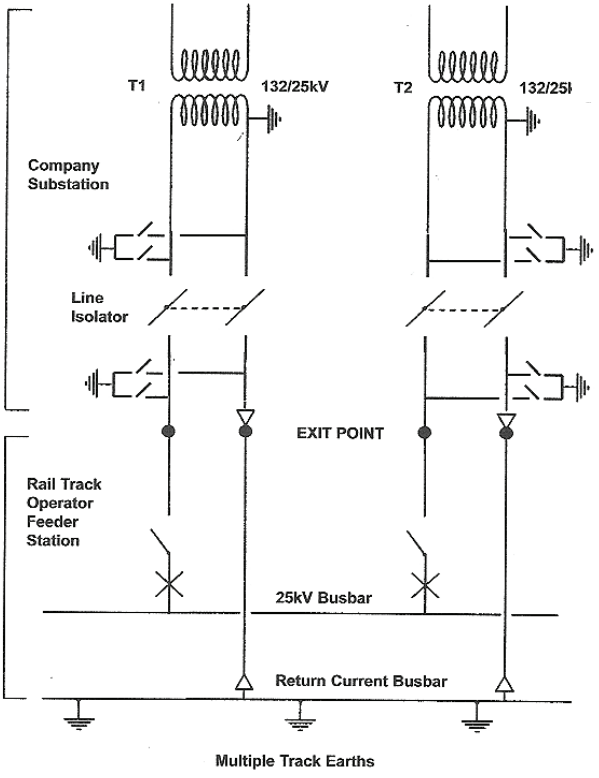
a. **Senior Authorised Persons**

b. **Authorised Persons** holding the appropriate authority code.

c. For line application, a **Competent Person** under the **Personal Supervision** of a suitably **Authorised Person**.

OB4.5.3 Before use all instruments **Shall** be examined, fully extended, cleaned, and used in accordance with manufacturer's and **Company** instructions.

DIAGRAM OB.1 TRACTION SUPPLY -
TYPICAL ARRANGEMENT



OB4.5.4 When applying voltage testing and phasing devices to **Conductors**, the operator's hands **Shall** remain in the hand grip zone, utilising insulating gloves and wearing required PPE. The device **Shall** be tested immediately before and after application by the use of **Approved** equipment.

***OB4.5.5** Under suitable conditions, determined by a **Senior Authorised Person**, phasing may be checked **Live** using **Approved** instruments:

a. Devices **Shall** be tested immediately before and after application and used in accordance with manufacturer's and **Company** instructions.

***b.** Safe distances from **Live Conductors** must be strictly maintained at all times (but see DSR 4.4.2(b) for application to spouts).

*** OB4.6 Traction Supplies**:

Operational procedures associated with electricity supplies for traction purposes **Shall** be in accordance with the joint operational agreement for each location.

Where the rail network operates on a 25kV single phase **System** the return conductor (rails) is connected to **Earth** at multiple points. **Danger** may therefore arise because of the possibility of carrying return current from the **System** or the possibility of a rise in **Earth** potential if a fault were to occur on the rail supply **System**.

Work on the return conductor between the supply Isolator and the return current busbar **Shall** only be carried out when all 25kV supplies to the Feeder Station have been made **Dead**, see Diagram OB.1.

OB5 Isolation

OB5.1 Switchgear/Fusegear:

OB5.1.1 Where a feeder switch is to be used as a point of isolation, the physical locking of the handle, using a level 1 lock for 'operational isolation' or a **Safety Lock** for 'safety isolation' from the **System**, will be deemed to fulfil the requirement.

***OB5.1.2** For fuse replacement where non isolatable fuses are fitted e.g. 'Pad Mounted Units', a **Permit to Work** is required.

*OB5.2 Transformers

***OB5.2.1** Where there is no local **High Voltage** switchgear controlling the transformer or where work is to be carried out on local switchgear as well as the transformer itself, isolation may be achieved at remote points by:

a. Operation of remote switchgear.

b. Removal of jumpers (droppers or bows) under a **Permit to Work** or by **Live Line** techniques.

c. Removal of links under a **Permit to Work**.

***OB5.2.2** CB's switches and isolators controlling the **Low Voltage** windings of a Transformer, Auxiliary Transformer or VT **Shall**, where practicable, be **Isolated** and a **Safety Lock** and **Caution Notice** applied.

Where this is not practicable the following alternative methods are **Approved**:

a. Use of locking bar or proprietary shroud.

b. Where circuit breakers or fuse switches cannot be Isolated the mechanism **Shall** be immobilised, **Safety Lock** and **Caution Notice** applied.

c. Where none of the above are possible, the chamber containing the switch/**Isolating Device Shall** be locked closed with a **Safety Lock** and a **Caution Notice** applied.

d. Alternative methods, subject to the **Approval** of the **Designated Engineer**, may be sought.

***OB5.2.3 Voltage transformers:**

Shall be made dead for renewal of **High Voltage** fuses/links.

Where an isolatable voltage transformer is not equipped with self closing shutters it **Shall** not be isolated unless a **Permit to Work** is issued.

Alternatively, isolation of the VT is permissible by withdrawing the **Low Voltage** VT fuses and application of a **Caution Notice** and **Safety Lock** where practicable.

OB6 Earthing High Voltage Conductors.

OB6.1 Approved Equipment.

*****OB6.1.1 Earthing Through Switchgear.

The connection to **Earth** through circuit breakers and earthing switches installed on the **System** is **Approved** as a **Circuit Main Earth** or **Additional Earth**. Ancillary

equipment which is provided to facilitate the connection is deemed **Approved** for that purpose.

OB6.1.2 For **Approved** Portable earthing equipment *see Index Ref 2.*

OB6.2 General

OB6.2.1 Earthing Hierarchy, when **Apparatus** is connected to **Circuit Main Earths** the following hierarchy **Shall** be followed:-

a. Via suitably rated switchgear (earthing switch or circuit breaker with integral earthing or in accordance with the procedure in OB6.4.1)

b. Via a circuit breaker with accessory earthing facilities or via approved portable earthing equipment at the discretion of the **Authorised Person.**

Consideration **Shall** be given by the **Authorised Person** to the duration of work and accessibility of the equipment to third parties when portable earths are applied and the site is left unattended.

Where portable earthing equipment is used it **Shall** be applied in accordance with DSR 4.3.3.

***OB6.2.2** Where overhead line work is to be carried out and a circuit breaker with integral earthing or earthing switch is available at a tail end substation, where reasonably practicable, it **Shall** be used as the first **Earth.**

OB6.2.3 A **Circuit Main Earth** applied by means of a circuit breaker or earthing switch may, for work or operational

reasons and before any **Safety Document** has been issued, be replaced by **Approved** portable earthing equipment under the authority of a **Switching** instruction from the **Control Engineer**.

OB6.2.4 **Approved** portable earthing equipment **Shall** only be used as a **Circuit Main Earth** with the involvement of the **Control Engineer** or at locations specified in a switching schedule or programme.

OB6.2.5 During the application or removal of **Approved** portable earthing equipment the **Control Engineer Shall** not instruct any other **Switching** operations on the same section of **System**.

*OB6.2.6 Where work is to be carried out on **Conductors** in a span under which runs an existing overhead line that cannot be made safe in accordance with DSR 4.1.1 or otherwise protected, e.g. scaffold & netting, a **Circuit Main Earth Shall** be provided between the point(s) of work and the **Live** overhead line. Note: it is the Field **Authorised Person's** responsibility to make the **Control Engineer** aware of this requirement. *See Index Ref 2* **Approved** procedure for crossings

*OB6.2.7 Following application of a **Circuit Main Earth** a 'Circuit Main Earth' notice and where a locking facility exists a level 1 lock **Shall** be applied, (PF3.2).

*OB6.2.8 Where work is to be carried out on **Apparatus** which is connected to an overhead line, to prevent **Danger** from induced voltage and backfeed, a **Circuit Main Earth** or **Additional Earth Shall** be provided at the terminal pole or tower (see DSR4.5.7 for precautions under adverse weather conditions).

a. On 33, 66 and 132kV systems, provided the portable earth is in addition to fully rated **Circuit Main Earths,** applied at the points of isolation, **Approved** portable earthing equipment suitable for overhead lines may be used.

b. Where the **Earth** at the cable termination is to be a **Circuit Main Earth** e.g. the cable is to be disconnected, the line re-energised and there is no suitably rated portable earthing equipment available for 33, 66 or 132 kV systems, then it will be necessary to construct an **Earth** specifically for the purpose and apply it under the terms of a **Permit to Work**.

c. Totem pole (inverted pole equipment) substations and switch stations which have only a short length of exposed **Conductors** which are connected to an underground cable **Shall** not be considered as an overhead line subject to induced voltage, but see DSR4.5.7 for approach of a lightning storm.

*OB6.2.9 The application and removal of **Additional Earths** after the issue of a **Safety Document** is normally the responsibility of the recipient. The **Senior Authorised Person** issuing the **Safety Document**, may use an **Additional Earth** schedule to specify the requirements where special precautions are required. For tower work an additional earthing schedule **Shall** be used to record the application and removal of **Additional Earths** throughout the work. (see PG2.2.3).

*OB6.2.10 The **Control Engineer** is responsible for the position of **Circuit Main Earths**. When a **Sanction for Test** is

cancelled, the position of **Earths Shall** be confirmed, or alterations reported, to the **Control Engineer**. (see PG3.3.3)

OB6.3 Metalclad Switchgear

*OB6.3.1 **Live Conductors Shall** be completely covered and secured before earthing connections are made. Orifice shutters **Shall** be locked shut as required, e.g. when applying **Earths** to feeder spouts, the busbar spouts **Shall** be locked shut. If this condition cannot be obtained both sets of contacts **Shall** be made **Dead** before any earthing is carried out on the panel.

OB6.3.2 Circuit breakers may have transfer earthing facilities or may require attachments to effect the **Earth** connection (accessory earthing). Where the fitting of attachments requires the opening of shutters thereby exposing **Conductors**, then the **Conductors Shall** be checked with an **Approved** voltage testing device and proved **Dead**.

*OB6.3.3 When using a circuit breaker to effect the **Earth** connection it **Shall**, where reasonably practicable, be closed remotely.

OB6.4 Open Terminal Apparatus

*OB6.4.1 On open terminal **Apparatus** where there is no earthing switch consideration **Shall** be given to initially **Earth** the feeder via the CB using the following procedure: (consideration **Shall** be given to the impact on Busbar Zone protection)

a. Prove the feeder and a short section of isolated **Conductor** on the busbar side of the circuit breaker **Dead**

b. Apply portable **Earths** to the isolated **Conductor** on the busbar side

c. Close the circuit breaker

d. Apply portable **Earths** on the feeder side of the circuit breaker as required.

OB6.5 Portable Earthing Equipment.

*OB6.5.1 **Approved** portable earthing equipment may serve as **Circuit Main Earths** or **Additional Earths**. The equipment, including operating rods and poles, **Shall** be examined immediately before use paying particular attention to condition of contacts, leads, clamps, connections and cleanliness.

OB6.5.2 When used as a **Circuit Main Earth** their capacity **Shall** be within the **System** fault level at the point of application. Consideration may have to be given to applying two or more sets where necessary, i.e. high fault level; or construct as OB6.2.8b. *see Index Ref. 2.*

OB6.5.3 In the case of portable earthing equipment for metalclad switchgear, the operator's hands **Shall** remain behind the hand guard while the **Earth** is applied.

OB6.5.4 **Approved** portable earthing equipment **Shall** be applied to overhead lines. The earthing connection may be made to an earth stake, earth wire, ground anchor or stay rod.

When a stake is employed for the **Earth** connection it **Shall** be driven fully into the ground and, where reasonably practicable, be placed outside the immediate work area or be suitably screened or guarded; *see Index Ref. 2*.

OB6.5.5 When **Approved** portable earthing equipment is applied at earthed poles it **Shall** bond line **Conductors** to the main **High Voltage Earth** connection. At transformer poles it **Shall** also bond to the **Low Voltage Earth** connection.

OB6.6 **Removal of Circuit Main Earths**

OB6.6.1 When unavoidable removal of **Circuit Main Earths,** after a **Permit to Work** has been issued, is necessary during work, e.g. CT change on Reyrolle 'C' gear, renewal of **Conductors** in the first span of an overhead line tee off, the work **Shall** continue under the **Permit to Work** subject to the **Personal Supervision** of the **Senior Authorised Person** in charge who **Shall**:

a. Inform the **Control Engineer** who **Shall** ensure the **Circuit Main Earth** which is to be removed is not quoted on any other **Permit to Work.**

b. Ensure the **Circuit Main Earth** is replaced as soon as practicable. This **Shall** be noted on the **Permit To Work** (PG2.1).

*****c. On single panel feeder or VT panels etc., where **Earths** are removed for cleaning purposes etc. only one phase **Shall** be disconnected at a time and the **Earth** replaced before continuing with the next phase.

OB6.6.2 **Earths** are not considered to be fully removed from switchgear with integral earthing facilities unless the **Apparatus** is restored to the normal service **Isolated** position. This may require the removal of attachments, manipulation of isolators, selectors or switch carriage.

a. Where any of these actions requires the removal of a **Safety Lock**, then authority is required from the **Control Engineer**.

b. If the selectors have not been moved then the **Control Engineer Shall** be informed that the device is open but selectors are in the **Earth** position.

Appendix OB.1

Remember to apply the Golden Rules of SWITCHING Discipline to achieve operational excellence

Date -- / -- / ---- **Northern Powergrid Switching Log Book** Page 001

Time Instructed	Location	Panel	Operation	Time Completed	Time Reported

*OC LOW VOLTAGE OPERATIONS & PROCEDURES

*There **Shall** be no **Approved** procedures for applying **High Voltage** rules and procedures to operations/work on **Low Voltage Apparatus** and **Conductors**.

*OC1 Authorisation.

All **Persons** engaged in operations, work or testing on the **Low Voltage System Shall** be **Competent** and / or **Authorised** in accordance with section PA1.

*OC2 Low Voltage Control and Co-ordination

OC2.1 **Control of Operations** on the **Low Voltage System (**Work on distributors excluding the connection of service cables with a maximum cross sectional area of 35mm^2 and inspection of feeder pillars and link boxes) **Shall** be either:

a. Through the **Control Engineer** when in conjunction with **High Voltage** operations or,

b. with the sanction of a **Low Voltage** control coordinator and,

c. under Control of an **Authorised Person**.

OC2.2 **Low Voltage Control Coordination. (**Work on distributors excluding the connection of service cables with a maximum cross sectional area of 35mm^2 and inspection of feeder pillars and link boxes). The **Low Voltage** control coordinator **Shall**

a. ensure that there is no conflict between requests for local **Low Voltage Control** of the **Low Voltage** network(s),

b. record all operations and certain work activities (see WA2.1.1) on the **Low Voltage System**,

c. record all abnormalities, both permanent and temporary, notified by **Competent** and **Authorised Persons** on the return of **Low Voltage Control.**

d. provide guidance on **Low Voltage** network configuration when requested and including points of **Low Voltage** system infeed (Generation, BEES apparatus or EAVC units). This must be verified on site by the **Authorised Person** as the responsibility for **Low Voltage** operations lies with the **Authorised Person** undertaking the operations.

OC3 Operations

OC3.1 Switching.
On the **Low Voltage System, Switching Shall** be carried out by an **Authorised Person**.

OC3.1.1 An **Authorised Person Shall** have a request for **Low Voltage Control** approved by the **Low Voltage** control coordinator before commencing work and /or operations.

OC3.1.2 On completion/suspension of work and/or operations the **Authorised Person Shall** return **Low Voltage Control** to the **Low Voltage** control coordinator and **Shall** report any changes to network running conditions.

OC3.1.3 In cases of emergency involving hazard to public, staff or the **System**, switching to eliminate **Danger**, i.e. to make the circuit **Dead**, may be carried out without reference to the appropriate **Low Voltage** control coordinator.

However the circumstances necessitating emergency switching **Shall** be reported as soon as possible after the incident to the appropriate **Low Voltage** control coordinator, (OC2).

OC3.1.4 Switching by signal or prearranged understanding is forbidden.

OC3.1.5 Where switching on the **Low Voltage System** affects the **High Voltage System**, e.g. **System** parallels, auxiliary supplies to substations etc., the **Authorised Person Shall** inform the **High Voltage System Control Engineer**.

OC3.1.6 When carrying out **Low Voltage Switching** operations, the operator **Shall** wear appropriate long sleeved, protective clothing and use **Approved** personal protective equipment, (PE2). The following is given as a guide:

Ground mounted

a. **Low Voltage** substation switch boards incorporating exposed **Conductors** – full face protection, insulating gloves, and if required by risk assessment additional insulation from ground (Insulating mat or insulating boots).

b. Link Boxes or Feeder Pillars and service termination **Apparatus** – full face protection, insulating gloves and, if required by risk assessment, additional insulation from ground (Insulating mat or insulating boots). All permanent phase barriers must be in place or suitable

shrouding **Shall** be applied. Measures **Shall** be taken to ensure no loose items fall into link boxes. If necessary, where additional hazards exist, e.g. descending into a deep link box, a second person **Shall** be present.

c. Pole mounted - Safety helmet, full face protection and insulating gloves.

Note Provided **Working and Access Clearances** are not infringed and **Approved** access equipment is used, fuse replacement can be carried out on pole mounted transformers, section fuses etc.

*****OC3.1.7 Where it is required to test **Low Voltage Conductors**, to prove **Dead** or check **System** conditions operators **Shall** use **Approved** personal protective equipment, as detailed in paragraph OC 3.1.6, and only **Approved** testing devices or instruments **Shall** be used; *see Index Ref. 2.*

OC3.2 Overload or Suspect Fault Conditions.

When investigating supply irregularities record all operations on a suitable form which **Shall** be left in a prominent place in the substation.

OC3.2.1 General Procedure. Restoring supplies where a fuse controlling a **Low Voltage** distributor has blown:

a. Test for blown fuse(s) and evidence of backfeed.

b. Remove affected carrier(s) checking hinged action in the process.

c. If there is evidence of back feed, carry out further investigation.

d. Check the feeder route where reasonably practicable for evidence of disturbance or third party activity.

e. Connect a fault re-energising device, check discrimination and transformer rating and if satisfactory, close.

f. If successful, check supplies, use clamp ammeter where reasonably practicable to note load picked up.

g. If the CB remains closed for 5 minutes,

h. Replace the fuse in the fuse carrier with the correctly rated element, comparing barrel dimensions to ensure adequate clearance.

i. Open and remove the fault re-energising device and insert the fuse with a continuous positive action.

j. Repeat for other phases if necessary.

OC3.2.2 Where a re-energising device is unavailable:

a. Carry out relevant parts of the procedure in OC3.2.1

b. Where the circuit has an operational restriction then for fuse replacement or closing a circuit breaker or fuse switch which is not suitably rated for closing on fault, the **Low Voltage** busbars **Shall** be made **Dead** from a suitably rated switching device. Where this device is part of the **High Voltage System**, switching **Shall** be carried out by a suitably **Authorised Person** to the instructions of the **High Voltage System Control Engineer**.

OC3.2.3 Intermittent Faults.

a. If a fuse blows for a second time or an auto-reclose device operates within 1 month of its initial installation an auto reclose device **Shall** be installed on each phase in line with customer service policy (*see Index Ref 2*). Where auto-reclose devices cannot be fitted or are not suitable consideration may be given to temporarily increase the fuse size (requires check on protection / discrimination and transformer rating).

b. The number of reclose operations set for auto-reclose equipment (e.g. Faultmaster / Modular Rezap) may be set up to a maximum of 5 auto-reclose operations to lock out. Any higher reclose values to lock-out will need to be individually risk assessed.

c. Following 'lock out' of a reclosing device, the full re-energising procedure **Shall** be followed. Following a check of the feeder route the device may, if required, be closed by remote operation.

d. When an intermittent fault has been repaired or after a specified period of time in line with customer service/intermittent fault policy, the **System Shall** be returned to normal. (i.e. Remove auto reclose device and restore normal fuse size).

OC3.2.4 The fitting of an auto-reclosing device to **Low voltage** circuits with containing overhead conductors requires special consideration. The auto-reclose feature **Shall** only be enabled with the consent of an **Authorised Person** who will risk assess the circuit route and consider the following in determining the fitting of reclose devices in automatic mode:

a. The proportion of overhead line and underground cable

b. Fault condition or other information that may indicate the likely position of the fault

c. The likelihood of a bare multiphase overhead network passing fault current and clashing the conductors

d. The perceived level of public safety risk posed by the physical location of the overhead conductors

In all situations the maximum number of auto-reclose shots **Shall** be in accordance with the customer service policy *see Index Ref 2.*

***OC3.3 Isolation**.

OC3.3.1 **Low Voltage Apparatus Shall** where practicable be secured in the **Isolated** position with an **Ancillary Safety Lock** and a **Caution Notice Shall** be attached. Use **Shall** be made of proprietary shrouds/caution tape where available.

a. See OB5.2.2 for isolation on the **Low Voltage** side of transformers.

b. For work on a **Low Voltage** distributor remote from a substation the distributor **Low Voltage** fuses **Shall** be removed, a **Caution Notice** posted and an **Ancillary Safety Lock** applied where practicable.

*****OC3.3.2 **Screening.** The application of **Approved** screening, shrouding and **Danger Notices Shall** be carried out or moved only by or under the **Personal Supervision** of a

suitably **Authorised Person**. Additional precautions to exclude **Danger** will include the use of insulated tools and suitable PPE **Approved** for the work.

Approved screening for:

a. Lines; Drawing Nos. 1.09.117.0261; 0271; 0281; 0291; 0301

b. Link Boxes; Drawing No. 1.18.012.0002

c. Open Low Voltage Distribution Boards; Portable screens to Drawing No. 1.02.0004.0028 or purpose built continuous enclosure constructed of suitable material; see Index Ref. 2.

OC3.4 Earthing

*****OC3.4.1 **Approved** devices **Shall** be used; *see Index Ref. 2*. The shorting and earthing devices **Shall** be fitted as near as practicable to the point-of-work or between the point-of-work and any potential infeeds.

OC3.4.2 The shorting & earthing device **Shall** be inspected immediately before use paying attention to cleanliness and the condition and security of contacts, clamps and leads. Do not use if there is any sign of damage.

OC3.4.3 The circuit **Shall** be isolated, (OC3.3.1) and a voltage indicator used to prove **Dead** before applying the earthing device, (OC3.1.7).

OC4 Procedure for energising Low Voltage Apparatus and Conductors:

a. **Apparatus Shall** be fully assembled and connected with all gear and tools removed.

b. All members of the **Working Party Shall** be warned that it is no longer safe to work on the **Apparatus** and, if issued, any **Safety Document** cancelled.

c. Check that no hazard will be created by testing or energising the **Apparatus**.

d. Carry out insulation and continuity tests etc. as appropriate, (WE1.1; 2.1).

e. Remove **Notices** and make **Live**.

*f. Check for polarity, earth loop impedance, phase rotation (for 3 phase) and correct operation.

OD DELEGATED CONTROL

In order to ensure minimum delay in implementing safety procedures during routine or fault work at times of maximum activity on the **System** there is a procedure for delegated control of certain operations on the **System** at voltages up to and including 20kV. Delegated control places an additional burden on the field engineer on site who must be capable of undertaking the responsibilities of a **Control Engineer** to ensure overall safety and the field responsibilities of a **Senior Authorised Person** for the implementation of safety precautions to carry out work safely.

OD1 Conditions for Delegated Control.

OD1.1 Under normal conditions, Delegated Control of a defined section of **System** may be given to a suitably **Authorised Person** from a single point. This may be

either a tail end circuit or a section of a feeder route up to a point or points of **Isolation** established under the authority of the **System Control Engineer**, (OD3.3.1).

OD1.2 Under fault conditions when **Switching** to isolate faults under **System Control**, is complete, (OD3.3.2).

OD1.3 Limited Delegated Control where communication difficulties would cause undue delay, (OD3.3.3).

OD2 Responsibility.

OD2.1 **System Control Engineer**.

OD2.1.1 The **Control Engineer** at **The Company's** Control Centre, who is normally in charge of the part of the **System** to be transferred to Delegated Control will agree:

a. Release and return to **System Control** via a transfer statement.

b. Agree time for the transfer.

c. Acknowledge any alterations and **System** conditions.

d. Update records

OD2.1.2 Delegated Control will not be agreed if:

a. Circuits cross **Control** boundaries.

b. Adverse **System** conditions prevail.

c. Communication problems are experienced (apart from OD3.3.3).

d. Duration will be over 36 hours.

e. Field Engineer declines for reasons of workload, responsibility etc.

*OD2.2 **The Delegated Control Engineer**

A **Senior Authorised Person**, who is additionally trained and authorised to assume the duties of a **Control Engineer** in the field.

OD2.2.1 A Delegated **Control Engineer Shall**:

a. Use a suitable, up to date, **System** diagram.

b. Establish and maintain suitable means of communication with the Control Centre at all times when the circuit is under Delegated Control.

c. Request Delegated Control of part of the **System** from one point.

d. Record all operations using a **Switching** schedule or a **Switching** log book, as required and record the issue and cancellation of **Safety Documents** on a Safety Document Record, (Appendix OD.1), for the duration of Delegated Control. Note, records to be retained for a minimum of 5 years to line management procedures.

e. Liaise with the **System Control Engineer** before initiating switching which will make **Apparatus Live**.

f. Return the circuit to the **System Control Engineer** in the event of:

i a valid request from the **System Control Engineer**,

ii any significant change in agreed **Switching** or **System** conditions. or

iii the occurrence of an operational event (**Switching** error) or serious accident

OD2.2.2 A Delegated **Control Engineer** may:

a. Switch,

b. Isolate and de-isolate.

c. Apply and remove **Circuit Main Earths**.

d. Issue and cancel **Safety Documents.**

e. Receive only a **Sanction for Test**, no other **Safety Document**.

f. Issue **Switching** Instructions to up to two other **Authorised Persons**, i.e. not more than three **Authorised Persons** involved at the same time.

g. Give authority for issue and acknowledge cancellation of **Safety Documents**.

Further detailed guidance on **Approved** delegated control procedures is provided detailed Delegated Control Code of Practice. *see Index Ref 2*

OD3 Delegation Procedure,

OD3.1 **Circuit State**: The **System Control Engineer** will agree the release and return of the delegated circuit in the **Live**, **Dead**, **Isolated** or **Earthed** state.

OD3.2 **Changing Conditions**: If a circuit breaker which normally feeds the delegated circuit has tripped on fault, it **Shall** not be reclosed until the Delegated **Control Engineer** has been contacted and confirms **System** conditions are suitable, (OB3.2.1c).

OD3.3 **Operations**:

OD3.3.1 Routine.

Arrange outage to normal Control Centre booking procedure, a switching schedule **Shall** be prepared with transfer statements included at appropriate points. This switching schedule **Shall** be used by all **(Senior) Authorised Persons** involved in the operations.

Any preparatory **Switching**, when isolation is required at remote ends, **Shall** be carried out under instruction of the **System Control Engineer**.

The Delegated **Control Engineer Shall**:

a. Confirm transfer of the circuit to Delegated Control and commence Delegated **Control** operations, including work/testing as required.

b. On completion of Delegated Control operations contact the **System Control Engineer** and relinquish Delegated **Control** of the circuit. Confirm any **System** changes and the operational state of all **Apparatus**.

Switching to return the **System** to normal **Shall** be carried out to the **System Control Engineer's** instructions.

OD3.3.2 Fault:

When **Switching** to isolate faults under **System Control** is complete. Delegated **Control** of a circuit may be implemented to locate the fault and carry out repairs.

a. The transfer statements **Shall** be recorded in a Switching Log Book.

b. All operations under Delegated **Control**, including work and testing, **Shall** be recorded in a Switching Log Book 'Test Results Sheet' and Safety Document Record as appropriate.

c. On completion of Delegated **Control** operations contact the **System Control Engineer** and relinquish Delegated Control of the circuit. Confirm any **System** changes and the operational state of all **Apparatus**.

Instructions to make the circuit **Live**, and any subsequent **Switching** to return the **System** to normal, **Shall** be instructed by the **System Control Engineer**.

OD3.3.3 Other: At the discretion of the **System Control Engineer,** where there are communication difficulties and extenuating circumstances, a limited delegation of **Control** responsibility may be given to a suitably experienced **Senior Authorised Person**. The procedure **Shall** take the form of a **Switching** instruction, which may include the issue and cancellation of a **Safety Document**, up to the point where the circuit is ready to be energised.

Appendix OD.1

NORTHERN POWERGRID

Delegated Control Engineers
SAFETY DOCUMENT RECORD Delegated Control Engineer .....

1) APPARATUS RELEASED FROM the SYSTEM .....

2) POINTS of ISOLATION Held by System Control .....

3) POINTS of ISOLATION Held by Delegated Control .....

4) CIRCUIT MAIN EARTHS APPLIED .....

5) DOCUMENT SEQUENCE .....

PW/SfT No.	Work/Testing	ISSUE			Removed*		CANCEL			Work/Testing, delete comp. or incomp. Exceptions
		SAP	Time	Date	Gear & Tools	Add. Earths	SAP	Time	Date	
										(Complete/incomplete)
										(Complete/incomplete)
										(Complete/incomplete)
										(Complete/incomplete)
										(Complete/incomplete)
										(Complete/incomplete)
										(Complete/incomplete)

*Indicate Y (yes) or N (no)

6) WORK DONE .....

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OE INTERFACE - OPERATIONAL PROCEDURES and SAFETY RULES

OE1 Operational Boundaries Shall be clearly defined.

OE1.1 Documentation

OE1.1.1 Schedules and diagrams detailing the ownership and **Control** responsibility for each piece of **Apparatus Shall** be available.
Note, Ownership does not imply **Control** responsibility.

OE1.2 **Operations:**

At the Grid interface operations are governed by the provisions of the Operations section of the Grid Code and at the Consumer / Network Operator / Independent Distribution Network Operator interface by the Operations section of the Distribution Code.

OE1.2.1 Operational Liaison - In order to assess the effect of any action on the **System**, where required, information in relation to operations or events which are proposed, or have happened, **Shall** be exchanged. It is not necessary to give the reason.

OE1.2.2 Communication channels for use by nominated officers of both parties **Shall** be agreed. Information may be passed by prior arrangement or reasonable request. This arrangement **Shall** not preclude the voluntary exchange of relevant information in pursuance of good operational practice.

OE1.2.3 Examples of information which may be required:

a. Operation of a Circuit Breaker or Switch which may affect another **System**.

b. **System** parallels.

c. Generator synchronisation.

d. Scheduled outages.

OE2 **National Grid Interface**

Operations to establish Safety Precautions across boundaries at Grid Substations are governed by the provisions of section OC8 of the Grid Code. Agreements are in place between the National Grid Operator and **The Company** for joint management sites; *see Index Ref. 2*.

Discussion **Shall** take place between **The Company Control Engineer** and Grid **Control Engineer** to decide the safety precautions necessary for the intended work. Each **Control Engineer Shall** instruct **Switching** operations on their own **Systems** unless subject to a delegation of authority .

OE2.1 **Access** to Grid substations **Shall** be by dual locking or other suitable access arrangement.

OE2.2 **Site responsibility** schedules are available at all locations detailing operational responsibility for all items of plant and **Apparatus**. In general, the owner of the busbar is the designated site manager.

OE2.3 **Reciprocal agreements**, "Multi User Switching" and "Delegated Authority" contracts, are in place which recognise Authorisation levels:

OE2.3.1 Suitably authorised National Grid Operator's staff may operate **Company** controlled **Apparatus** to **The Company's Control Engineers** instructions.

OE2.3.2 Suitably authorised **Company** Staff may operate National Grid Operator controlled **Apparatus** to Grid **Control Engineers** instructions.

OE2.3.3 Field staff will not be required to use the other company's switching terms but must complete substation switching logs etc. where appropriate and comply with the National Grid Operator's rules for some operating procedures which require the presence of 2 persons; *see Index Ref. 2*

OE2.3.4 **Control** staff must be familiar with both methods of switching.

OE2.3.5 Work on site by **Company** personnel **Shall** be carried out under DSR's and AD3.8 - liaise with National Grid Operator where necessary.

OE2.4 Documentation

Following implementation of the required Safety Precautions, a 'Record of Inter System Safety Precautions' (RISSP) document **Shall** be issued by the party holding the safety precautions and numbered by the party who is proposing to carry out the work in accordance with section OC8 of the Grid Code.

OE2.4.1 The form of the document **Shall** conform to Control Procedures and the requirements of Grid Code section OC 8.

OE2.4.2 Where work is required by both parties, RISSP documents **Shall** be issued by each party to the other.

OE2.4.3 If testing is required, both parties **Shall** agree to the tests and there **Shall** only be one RISSP in force issued by the party not testing.

OE2.4.4 Removal of earths may be carried out under a **Sanction for Test**. If earths are not replaced following cancellation of the **Sanction for Test**, the RISSP **Shall** be cancelled as soon as practicable.

OE3 Network Operator / Independent Distribution Network Operator / Consumer Interface.

OE3.1 Control

OE3.1.1 Where the other party has a recognised **Control** and safety system, i.e. Operations are carried out to DSR standards, a similar procedure to that at the Grid boundary may be implemented i.e. both **Control Engineers** co-ordinate the implementation of Safety Precautions in accordance with their own Safety Rules and the RISSP/OIE procedure **Shall** be used to hold points of **Isolation** and **Earthing**. In the case of an Independent Distribution Network Operator this will be in accordance with the bilateral agreement between the **Company** and the Independent Distribution Network Operator.

OE3.1.2 Where the other party has a **Control** procedure for operations only and or a local **Control** arrangement for Safety Precautions then **The Company's Senior Authorised Person Shall** ensure that safety precautions are co-ordinated and carried out correctly on both sides of the boundary.

OE3.2 Locks and Notices:

OE3.2.1 Where practicable, **Company** locking policy **Shall** be implemented at points of **Isolation** and **Earthing** in addition to the other party's arrangement. This may be achieved by the use of an 'Iso-lok' clasp or similar locking device. If required, this arrangement **Shall** be afforded to the other party for the locking of isolation & earthing facilities on **The Company's** side of the boundary when documentation is being issued by **The Company**.

OE3.2.2 **Caution** and **Danger Notices Shall** be applied as required.

OE3.3 Recording:

OE3.3.1 A record of safety precautions **Shall** be made on either an Operation, Isolation & Earthing Certificate, Appendix PG.1, or another operator's form **Approved** by **The Company**, e.g. a Circuit State Certificate used by the Rail Track operator.

OE3.3.2 Under normal circumstances it will only be necessary to issue one certificate except where both parties are carrying out work.

OE3.3.3 Where **The Company** controls the **Danger**, an OIE certificate **Shall** be issued, with the sanction of the **Control Engineer**, to the other network operator/consumer for work to be carried out by the other party.

OE3.3.4 Where the other network operator/consumer controls the **Danger** an OIE certificate, or other **Approved** document, **Shall** be issued for work by **The Company** and the **Control Engineer Shall** be informed after issue and before cancellation. If the 'Other Party' does not have suitable documentation for confirming and holding safety precautions, a **Company** OIE certificate **Shall** be used.

OE3.3.5 Where both parties control the **Danger** and both are to carry out work then each **Shall** issue a certificate to the other detailing the relevant safety precautions. **Circuit Main Earths Shall** not be interfered with by the work of either party.

OE3.4 **Testing**: May be carried out subject to the agreement of both parties:

a. Only one OIE certificate, issued by the party not testing, **Shall** be in force.

b. Where **Circuit Main Earths** are removed for test purposes a record **Shall** be made on the OIE document.

Where **Circuit Main Earths** are not replaced on completion of testing, the OIE **Shall** be cancelled as soon as practicable.

OE4 Interface with Rail Operator utilising traction supplies.

OE4.1 Access to and work on **Company's Apparatus** on land under the management of the Rail Track Operator **Shall** be in accordance with the Rail Track Operators safety requirements. Engineering recommendation G38/1 sets out the operational procedures to be followed between the parties (*see Index Ref 2)*. No work **Shall** be undertaken on a rail track operator's property until the operator has been consulted.

OE4.2 **The Company Control Engineer Shall** liaise with the Rail Track Operators responsible **Person** (Electrical) to confirm outage requirements.

OE4.3 **Switching**, work or testing **Shall** be carried out as under OE3 except:

a. Where individual locks are used to secure points of **Isolation** keys may be locked in a **Key Safe** secured by a **Safety Lock** or retained by a **Senior Authorised Person**.

b. A suitable cross boundary safety precautions document **Shall** be issued (i.e. Circuit-Status-Certificate {CSC}, Operation,-Isolation-and-Earthing certificate {OIE} etc.),

OE4.4 The **Control Engineer Shall** confirm with the Network Rail Operators responsible **Person** the issue and cancellation of Circuit State Certificates.

OE5 Systems owned by Third Parties:

OE5.1 **Faults on Third Party Systems**

OE5.1.1 **High Voltage**. When a fault on a third party, (consumer or Independent Distribution Network Operator) **System** results in the operation of a **Company** controlled circuit breaker, **Switching** to restore supply may be carried out to the instructions of the **Control Engineer** by an **Authorised Person** in liaison with the third party.

OE5.1.2 **Low Voltage**. When a fault on an Independent Distribution Network Operator's **Low Voltage System** results in the operation of a **Company** controlled fuse, **Switching,** in liaison with the third party, to restore supply may be carried out after the **Low Voltage** control coordinator has approved a request for local **Low Voltage Control** by an **Authorised Person**. Where necessary links or fuses at the interface with the Independent Distribution Network Operator's network will be removed in order to restore supply to the **Company's** network and facilitate fault location and repair by the Independent Distribution Network Operator. *see Index Ref 2* – IDNO interface document

OE5.2 **Maintenance Agreements.**
Where a contract has been made with a consumer to take responsibility for maintenance, then operational responsibility for the **Apparatus Shall** be taken by the contracting branch of **The Company** and the Distribution Safety Rules **Shall** apply. All details and operational information, including restrictions, must be up to date.

OE5.2.1 Details of consumers **Systems** need not be shown on **The Company's System** diagram and database.

OE5.2.2 **The Company's** contracting branch **Shall** be responsible for all **Control** and operations of consumers **Systems** to **Approved** procedures. However where supply is taken from **The Company's System**, the **Control Engineer Shall** be consulted before energising or re-energising a circuit.

OE5.2.3 In the interface situation, for work by contractors including **The Company's** contracting branch, an OIE certificate **Shall** be required. (OE3.3.3)

OE5.3 Systems Controlled by Other Operators.

Other than an OIE Certificate at the interface **The Company's Control Engineer** will not require notification of the issue or cancellation of OIE certificates or **Safety Documents** on **Systems** controlled by other operators.

WA Work Methods.

The Distribution Safety Rules provide guidance and instruction to avoid the inherent **Danger** from the **System**. Any risk associated with **Live Conductors** in the work area **Shall** be eliminated by making them **Dead** where reasonably practicable.

WA1 **Live Working**

Live work can only be justified under the Electricity at Work Regulations if the following criteria can be met:

a. It is unreasonable to be made **Dead**, and

b. it is reasonable to work **Live** and

c. suitable precautions are taken to prevent injury.

e.g. It will be unreasonable for the **Apparatus** to be made **Dead** if consumers require supply and reasonable to work **Live** if safe work procedures can be applied.

WA1.1 **Low Voltage Systems**. Under most conditions on the **Low Voltage System** it will be necessary to work using **Live** working techniques or, because of the **Danger** of backfeed, work on **Dead Apparatus** as if it were **Live**.

***WA1.1.1** Work or testing on **Live Low Voltage Systems Shall** only be carried out by **Competent Persons** using **Approved** tools and equipment to **Approved** procedures. **Immediate Supervision** may be required or a **Limitation of Access** issued where it is considered other hazards, including environmental, may exist; *see Index Ref. 2*.

*****WA1.1.2 Work on **Live Apparatus**. A second person, who is trained to recognise **Danger**, **Shall** be continuously available at the location to obtain or render immediate assistance in the event of an emergency; *see Index Ref 2* (RTN Live Working).

WA1.2 **High Voltage Systems**. Work **Shall** be carried out as specified in section WD6

WA2 Setting to Work

WA2.1 **Low Voltage Systems**.

WA2.1.1 The **Person** in charge **Shall** instruct work to commence when:

a. **Control** procedures are complied with, (OC2).

b. The **Low Voltage** control coordinator has granted any required **Low Voltage** control to the **Person** in charge of the **Working Party**.

c. In the case of fault repair work on **Low Voltage** mains circuits, any auto reclose device connected to the circuit has been set to one trip.

d. The **Apparatus** to be worked upon has been identified by labels, records etc. and for cables, in accordance with section WC2 and WC3 for **High Voltage** cables.

e. The **Competent Person** in charge of the **Working Party** fully understands the nature and extent of the work to be done.

WA2.1.2 Task instructions **Shall** be clear and unambiguous, instructions may be:

a. To an appropriate **Approved** work procedure, otherwise

b. written where reasonably practicable or

c. verbal for simple tasks where the risk involved is low.

WA2.1.3 Responsibility for **Working Party**.

*a Where two or more **Persons** of the same authority level are present in a **Working Party**, irrespective of employer, one **Person Shall** be designated to take the lead role and be responsible for:

- accepting Safety Documentation or work instructions as appropriate,
- recording on site risk assessment,
- instructing other members of the **Working Party** of the nature & extent of the work and any limitations or safety precautions to be observed.

b. Where work is suspended and the **Working Party** is to leave site, the lead **Person Shall** ensure all **Apparatus** and the site is left safe & secure and the appropriate supervisor is informed.

c On completion of work under **Low Voltage** control a **Competent Person Shall** return the **Low Voltage Control** of the **Low Voltage** network(s) to the **Low Voltage** control

coordinator and he **Shall** report any changes to the network configuration, including temporary works as well as permanent extension and disconnection. The **Authorised Person Shall** record any changes to the network configuration on the company's asset records system.

WA2.1.4 Metal enclosed switchgear: No work may be carried out on **Live Conductors**, other than testing, unless special dispensation is given by the **Designated Engineer**.

a. Where covers are required to be left open or removed for testing then suitable precautions **Shall** be taken to avoid **Danger**.

b. Where covers are not hinged and it is required to expose uninsulated **Conductors** for testing or inspection, where reasonably practicable the **Conductors Shall** be made **Dead** for removal and replacement of the covers or suitable precautions taken to avoid **Danger**

WA2.1.5 **Low Voltage** Boards. Apart from fitting labels etc. which may be carried out following a suitable risk assessment, **Live** work is permitted, subject to all **Live** parts being suitably screened & guarded and the work carried out in accordance with the provisions of WA1.1. All other work will require the incoming circuit to be made **Dead** and work carried out to the appropriate **Approved** procedure.

WA2.1.6 Transformer **Low Voltage** cabling and switchgear: For pole mounted transformers, provided **Working and Access Clearances** are maintained from **High Voltage Conductors**, the transformer **Low Voltage** fuse units can be changed in accordance with an **Approved** work

procedure. In all other circumstances, for work on the transformer **Low Voltage** cables and or the **Low Voltage Isolating Device**, work **Shall** be carried out under the terms of a **Permit to Work**.

WA2.1.7 Link Boxes and Feeder Pillars.: **Shall** be suitably labelled to identify the **Apparatus** and circuits, and for underground link boxes, the orientation. All **Conductors Shall** be made **Dead** for work except the following, which **Shall** be carried out in accordance with an **Approved** procedure.

a. Cleaning

b. Contact dressing.

***WA2.1.8** Service Cut-outs **Shall** only be changed **Live** in accordance with the appropriate **Approved** work procedure.

WA2.2 High Voltage Systems

***WA2.2.1** Work **Shall** be carried out on **Apparatus** connected to **High Voltage Systems** only when released under procedures complying with, or **Approved** exceptions to, the Distribution Safety Rules.

WA2.2.2 Redundant **Apparatus Shall** be disconnected from the **System** under Distribution Safety Rules and, where appropriate be released for dismantling in accordance with WF2.

WA2.2.3 Precautions for work on **Apparatus** not yet connected to the **System Shall** conform to Distribution Safety Rule standards, (WF3).

WA3 Work Handover.

WA3.1 Low Voltage

Where the **Working Party** is to be changed, a formal handover **Shall** take place to the designated lead **Person** of the second **Working Party**. This handover **Shall** be recorded. Preferably the handover is best undertaken on site and documented between the two parties. Where an on-site handover is not practicable then both parties must ensure the handover is comprehensive and fully understood. Consideration will be given to:

- Temporary rearrangement made to the **Low Voltage** system.
- Detail of any partially completed work e.g. for cable jointing works any incomplete or partially completed joints, for overhead line repairs the position of shorting and earthing devices and tools connected to conductors.
- Services disconnected.
- Location of any mobile generator.

WA3.2 High Voltage

Where Supervisory responsibility is transferred to another **(Senior) Authorised Person** an effective handover **Shall** take place to ensure the **(Senior) Authorised Person** taking over is fully conversant with the **System** and the state of the **Isolated Apparatus.** This **Shall** include:

a. State of circuit including position of **Apparatus**, sectioning points, cables cut etc.

b. Testing and work carried out to date

c. **Safety Documents**, including numbers, issued

Relevant details **Shall** be recorded in the **(Senior) Authorised Person**'s Switching Log Book fault record sheet or in a suitable form which can be transferred between the **Persons** responsible for progress.

WB SUBSTATION PLANT and APPARATUS

As well as the inherent **Danger** from the **System**, there are also risks to health and safety from other forms of energy involved in the operation of substation **Plant** and **Apparatus**. It is the responsibility of the (**Senior**) **Authorised Person** in charge to ensure there is no risk from local energy sources such as springs and ancillary supplies etc.

WB1 Switchgear

*WB1.1 **Withdrawable Apparatus**. When preparing for work under a **Limitation of Access** spout shutters **Shall** be locked with a level 1 lock, unless the spout shutters are a point of isolation for other work.

*WB1.2 **Orifices/Busbars**. When work is carried out on switchgear orifices or busbar connections etc. access to such connections **Shall** be indicated directly by the **Senior Authorised Person** in charge of the work, who **Shall** prove the conductors **Dead** before allowing access. The **Permit to Work Shall** be endorsed in the

section 'Other Precautions' detailing the extent of **Personal Supervision** required.

WB1.3 **Oil.** Great care must be taken when handling oil and associated equipment as contamination or the entry of any foreign body into the oil chamber can have disastrous results. Oil, especially contaminated as WB1.3.1, is environmentally hazardous and has the potential to cause skin problems. It is therefore very important to avoid spills, pay attention to personal hygiene and wear **Approved** PPE as required. Spills **Shall** be dealt with in accordance with the **Approved** procedure, *see Index Ref. 2* , and reported to the Environmental Management Representative.

WB1.3.1 PCB Contamination. Polychlorinated Biphenyl's (PCB's) cause an ecological hazard. If involved in a fire, they can give off highly toxic products. Spills should be avoided so that oil & PCB do not accumulate in the ground or enter drains and water courses. Exposure to PCB will cause skin problems.

a. All **Apparatus** manufactured before 1989 and containing more than 5 litres of oil, should have been tested for PCB content, a test record sheet completed and labels applied as below:

- < 50 ppm Tested for PCB's and (green) label applied
- > 50 < 500 ppm PCB Contamination and (yellow) label applied
- Any contamination above 500 ppm should have been dealt with by a specialist contractor and a (yellow) 'decontamination label' applied

to the **Apparatus** and the controlling door/gate.

Records of tests for PCB contamination are maintained in a database, *see Index Ref. 2*.

b. Where **Apparatus** manufactured pre 1989 is not suitably labelled and identified in the database, an **Approved** oil test kit **Shall** be used to determine the PCB level and the appropriate label fitted.

c. Oil contaminated with PCB's should be dealt with as follows:

- 10 - 50ppm segregate & dispose via oil contractor
- 50ppm - dispose as hazardous waste by an **Approved** contractor.

d. Spills involving oil contaminated with PCB's **Shall** be dealt with by personnel using disposable PPE as required.
- As with all oil spills, all contaminated soil, vegetation etc. must be removed and all contaminated material, including disposable PPE etc., **Shall** be disposed of via an **Approved** Contractor.
- The Environmental Management Representative **Shall** be informed of contamination above 50ppm.

WB1.3.2 Live Oil Sampling. For details of the approval and risk assessment for taking oil samples from switches through the aperture provided for the insertion of test bushings

with the busbar **Live**, see Index Ref. 2. In addition to the specific switching procedure outlined, samples may be obtained under the following conditions:

a. The outgoing circuit is operationally **Isolated** and **Earthed** at the sampling point to the instructions of the **Control Engineer**.

b. The sampling is carried out to the **Approved** procedure by a suitably **Authorised Person**, under the terms of a **Limitation of Access**. *(see Index Ref 2)*

WB1.4 Vacuum.

See WE4.2.2 for requirements when vacuum interrupters are subjected to an overvoltage test.

WB1.5 Compressed Gas.

*****WB1.5.1. Where a reduction in pressure would prevent a circuit breaker from tripping, the circuit breaker **Shall** be opened before work commences.

*****WB1.5.2 The **Senior Authorised Person Shall** ensure that drain valves, nuts or bungs are left open to the atmosphere to ensure no unwanted build up of pressure.

WB1.5.3 The provisions of DSR 5.6.1 and 2 **Shall** apply to gas installations as well as air for the purpose of isolation and adjustment. Where special precautions are required due to the nature of the gas, e.g. Sulphur Hexafluoride, then this **Shall** be carried out in accordance with an **Approved** procedure, (WB1.5.4).

*WB1.5.4 Sulphur Hexafluoride (SF6) Sulphur hexafluoride gas has a high dielectric strength and excellent arc quenching properties. It is colourless, odourless, non toxic and 5 times heavier than air. However when exposed to an electric arc in the presence of impurities (small amount of oxygen) toxic compounds may form, under normal circumstances these are contained within the gas chambers. SF6 is a greenhouse gas therefore discharge should be avoided. The volume of SF6 in **System** equipment and **Apparatus** is relatively small and should not cause any problems of oxygen deficiency. However, precautions **Shall** be taken if there is a possibility that a build up of gas is likely e.g. in a confined space or where a large volume of SF6 may be involved. Where switchgear containing large volumes of SF6 is installed indoors, a suitable notice, indicating the presence of and the amount of gas contained in the **Apparatus**, **Shall** be fixed so that it is visible from each entrance.

a. Routine operations and maintenance, including gas testing and topping up, which do not require access to SF6 compartments carried out in accordance with relevant work specifications will not require the use of special protective clothing or equipment.

b. Maintenance requiring internal access to SF6 compartments **Shall** only be carried out by specially trained and equipped staff, *see Index Ref. 2*.

c. Failure of SF_6 compartments **Shall** be reported to the **Control Engineer**. The presence of any

decomposition products may be indicated by a pungent odour similar to rotten eggs or irritation may be experienced in the eyes or upper respiratory tract. The following precautions **Shall** be taken:

- Immediately vacate the chamber containing the **Apparatus** or equipment and do not re-enter until a suitably trained **Person** has declared the area safe.
- Ensure anyone attending the site who may be affected, e.g. members of Rescue Services, is made aware of the hazard and the risk involved.
- Work including the removal of decomposition products **Shall** only be undertaken by specially trained and equipped staff, *see Index Ref. 2*.

***WB1.6 Zone of Work**. This is defined as work in a discrete location on **Apparatus** which is **Isolated** and **Circuit Main Earths** are applied at remote locations. In this case **Personal Supervision** by a **Senior Authorised Person** for work on spouts & busbars in accordance with DSR's 5.4; 5.5 and locking to DSR 3.4.3; 5.3.2 and 5.4.1b is not required.

WB1.6.1 Requirements for Zone of Work:

a. There is no **Live High Voltage Apparatus** in the substation or discrete part of the substation i.e. **Apparatus** is in a chamber with separate access or fenced area.

b. All possible sources of backfeed have been **Isolated** and no work is in progress on any related **Live Low Voltage** source within the work area.

c. **Circuit Main Earths or Additional earths** are applied as close as practicable to the point of work, e.g. At remote switchgear or cable terminations at poles where overhead lines are part of the feeder, and will not be interfered with by any other work. (Exception, WB1.6.4)

d. When setting to work:

- Prove **Dead** by closing **Earth** switches and where appropriate, checking spouts with an **Approved** voltage testing device.
- Spare panels with cables made off but not equipped with switchgear, e.g. YSE IVIO skeleton panels, **Shall** have an **Additional Earth** applied.

WB1.6.2 Application of Zone of Work.

a. Ring Main Units or multi panel switchboards equipped with Switches, CB's, Switch Fuses etc. in distribution substations.

b. Two such substations in series where a **Circuit Main Earth** can be applied at an intermediate point such as a tee off substation or overhead line terminal pole.

c. Section of **High Voltage** switchgear in a chamber of a substation with separate access with no **Live High Voltage Apparatus** within the chamber.

In all other cases the full requirements of DSR 3.4.3, 5.4 and 5.5 **Shall** be applied.

***WB1.6.3** Testing. Where immediate access is required for testing under a **Sanction for Test**, there **Shall** be no requirement to reconnect isolatable **Apparatus** to the **Circuit Main Earths** on cancellation of the **Permit to Work**.

***WB2 Work on Switchgear and Cables**.

The procedure below has been **Approved** (PB2.2) to allow work on switchgear at a distribution substation and jointing work on associated feeder cables to be carried out concurrently without the **Personal Supervision** of a **Senior Authorised Person**.

WB2.1 The circuit **Shall** be prepared for work in accordance with DSR 5.1.2 and the following precautions taken:

The **Senior Authorised Person Shall** prove the **Apparatus Dead** by:

a. closing the incoming feeder earth switches

b. Isolate the transformer and apply an **Additional Earth**. Where this is not reasonably practicable and work is required to be carried out on the transformer circuit , the **Senior Authorised Person Shall Personally Supervise** work on the transformer to the stage where he/she is satisfied

that there is no **Danger**. i.e. All **Conductors** exposed during the work are proved **Dead**

c. Where applicable prove all spouts **Dead** using a potential indicator.

d. Issue a **Permit to Work** for work on all **High Voltage Apparatus** within the substation.

e. Trace the feeder cables visually, or by the loop method from the **Earthed** feeder termination to the jointing position(s) or identify and spike the cables in accordance with WC3.1.2/3

f. Issue a **Permit to Work** for work on each feeder (one per feeder).

g. Where the transformer **Low Voltage** isolators that are a stated point of isolation being replaced the **Senior Authorised Person Shall** ensure that the new **Low Voltage** isolators are in the isolated position and **Safety Lock** and **Caution Notice** fitted prior to being connected to the transformer and the **Control Engineer** informed. **Low Voltage** work may continue provided that :

i. Existing **Low Voltage** cables have been cut remotely to isolate the old **Low Voltage** board

ii. The new transformer **Low Voltage** isolators are open with a **Safety Lock** and **Caution Notice** applied

iii. All new cable terminations on the new **Low Voltage** board **Shall** be carried out with the board dead

iv. Any jointing to re-energise the new **Low Voltage** board **Shall** be carried out after manipulation of conductors around the transformer isolators has been completed

WB2.2 Feeder route to be temporarily jointed through. Where it is necessary, e.g. for system security, to joint the feeder through the procedure in WB2.1 **Shall** be followed up to the issue of the **Permit to Work** documents,

WB2.2.1 Under these **Safety Documents**:

a. Prepare the feeder cables to joint through

b. At the switchgear cut/disconnect the feeder cables

c. Cancel all **Safety Documents**

WB2.2.2 Work can now continue as follows:

a. On the feeder route continue working as normal to joint the feeder through

b. At the substation to continue work on all **High Voltage** Apparatus issue a **Limitation of Access**. The **Senior Authorised Person Shall** ensure that additional earths are maintained to the existing **High Voltage** apparatus and applied to the new **High Voltage** apparatus as soon as reasonably practicable. **High Voltage** testing may only be undertaken when the **Limitation of Access** has been cleared/cancelled

WB3 Transformers, Capacitors, Battery Electrical Energy Storage (BEES) Apparatus and Enclosed Apparatus.

*WB3.1. Identification of transformers and other enclosed **Apparatus**, such as capacitors, reactors etc., can be confirmed by local labelling. Where there is any doubt then **Approved** identification equipment **Shall** be used from the controlling switch panels, either **High Voltage** or **Low Voltage**, to confirm identification.

WB3.2 **Insulation**

WB3.2.1 Where **Apparatus** contains oil, checks for contamination with PCB's **Shall** be in accordance with WB1.3.1.

WB3.2.2 Where **Apparatus** contains other toxic liquids, e.g. Formel or Askarel, no attempt **Shall** be made to interfere with the liquid. Any instances **Shall** be referred to the **Designated Engineer**.

*WB3.3 Notwithstanding the requirements of Rule 5.7.2, in the case of pole mounted transformers or network transformers supplied from an overhead **System**, an **Earth** can be applied either at the points of isolation from **High Voltage** supplies or between such points and the point(s) of work in accordance with Rule 4.1.1.(c)

*WB3.4 On capacitors, where practicable, **Additional Earths Shall** be applied to the instructions of the **Senior Authorised Person**.

WB3.5 **Battery Electrical Energy Storage apparatus:** Work on BEES apparatus **Shall** be done with units isolated from

the distribution network (where appropriate) and carried out strictly in accordance with the manufacturer's installation, operation and maintenance instructions by specifically trained staff, *see Index Ref 2*.

WB4 Ancillary Supplies.

The isolation of all **Low Voltage** or battery supplies to any **Apparatus** to avoid **Danger** during work is the responsibility of the (**Senior**) **Authorised Person** in charge.

WB4.1 Restoration of **Ancillary Supplies.** There are circumstances when it is necessary to restore **Low Voltage** or battery supplies to **Apparatus** released from the **System** under a **Safety Document** to check for correct operation, e.g. tap change motors on transformers. Precautions to avoid **Danger** during the restoration of ancillary supplies **Shall** be documented in the appropriate risk assessment.

WB4.2 **Auxiliary Batteries**: The **Control Engineer Shall** be informed before work is carried out on battery installations in substations. Work may be undertaken by suitably trained **Persons** who **Shall** take all necessary precautions to avoid **Danger** including the wearing of suitable **Approved** PPE, (PE2).

WB5 Protection and Auxiliary wiring etc.

The **Control Engineer Shall** be informed before any alterations, routine checks or work are carried out on protection circuits, auxiliary wiring or battery circuits associated with switchgear trip/close circuits or

supervisory equipment. The implications for **System** security **Shall** be discussed including the possibility of a 'risk of trip'.

WB5.1 **Precautions for Work**.

WB5.1.1 Where reasonably practicable auxiliary and battery supplies **Shall** be made **Dead** or shrouded to prevent accidental contact.

WB5.1.2 Use insulated tools and, where necessary, **Approved** PPE. *see Index Ref 2*

WB5.1.3 Relay wall frames and cubicles. When work, other than setting changes, minor modification etc. is being carried out on a relay panel then:

a. The adjacent panels **Shall** have a 'Circuit in Commission' notice applied and, unless otherwise screened, be covered by a transparent sheet (PF3.5).

b. Where work is required in the rear of cubicles, 'Circuit in Commission' notices **Shall** be applied on the doors of adjacent cubicles.

c. Where more than one circuit is accessed by a door, 'Circuit in Commission' notices and a transparent sheet **Shall** be applied to adjacent circuits which are in commission.

WB5.2 **Protection Checks**.

Protection equipment associated with the **System Shall** not be tested without the agreement of the **Control Engineer** who **Shall** be informed of:

a. the implication for **System** security,

b. any alterations to settings and

Where settings are left abnormal because of protection or pilot cable faults etc. a 'Protection Abnormal Notice' **Shall** be attached (PF3.8).

WC CABLES

***WC1** **Excavation** To minimise the possibility of striking cables and other services during excavation work, wherever possible appropriate authorities should be consulted and their plans made available to those on site. All work **Shall** be carried out in accordance with the New Roads and Street Works Act. The following safe working practice **Shall** be observed:

WC1.1 **Cable Records:** Records, showing all cable routes, position and type etc. **Shall** where practicable, be made available on site to those doing the work. If there is any difficulty in relating the records to the site situation a supervisor **Shall** be consulted.

WC1.2 **Cable Location Devices: Approved** types, suitable for the purpose, **Shall** be used to locate or confirm the position of cables and or other services, *see Index Ref. 2*.

***WC1.3 Safe Excavation.** At all times personnel must be aware that if they encounter any problems or any signs of a cable fault, excavation must cease immediately. They **Shall** then seek advice from a supervisor.

WC1.3.1 Hand Tools.

a. Spades and shovels are the preferred hand tools, which **Shall** be used cautiously in the vicinity of cables and other services.

b. Picks and pins may be used with care to break hard layers or free lumps of stone but not in soft ground or near cables and other services.

c. **Approved** PPE **Shall** be worn including overalls, buttoned up to neck with sleeves rolled down and gloves.

d. Where there is any potential **Danger**, e.g. excavating in the vicinity of a **Low Voltage** cable fault, a face visor **Shall** be worn until the fault has been positively identified and made safe, (PE2).

WC1.3.2 Hand Held Power Tools.

a. Where practicable hand held power tools must not be used within 0.5m of the indicated line of a cable or other utility service equipment buried in or below a hard surface.

b. Further excavation, using hand tools, **Shall** be carried out by undermining the hard surface to fully identify all services or confirm their absence.

c. Use of power tools may recommence once all utility services are located (or proved to be absent from the proposed excavation) and there is no risk of damage to the services.

WC1.3.3 Mechanical Excavators: where possible carry out the following:

a. Preliminary planning. Follow NRSWA routine to identify other services WC1, Consult cable records as WC1.1 and use cable locating Devices WC1.2.

b. Confirm location of services by consulting directly with appropriate authorities and where appropriate by excavating trial holes.

c. All personnel must keep clear of moving parts while an excavator is in use.

d. May be used up to 0.5m of the indicated line of a cable with a 'banksman' in attendance to look out for obstacles.

e. Further excavation may be carried out using hand tools as WC1.3.2 b

f. When safe, mechanical excavation may recommence as WC1.3.2c

g. If a cable is damaged it **Shall** be treated as **Live** until proved **Dead** (see WC6), the driver must remain in the cab or jump clear to avoid possible touch potentials.

WC1.3.4 On completion of excavation, any cable to be worked upon **Shall** be identified in accordance with **Approved** procedures.

WC1.4 Exposed cables and joints **Shall** be blinded or otherwise suitably protected as soon as reasonably practicable to prevent **Danger** or interference.

WC2 Low Voltage Cables

*WC2.1 **Identification**.
The **Person** in charge of the work **Shall** consult the appropriate records, (WC1.1).

WC2.1.1 Where all cables in the vicinity are known to be **Low Voltage**, identification by size, outer covering, including embossing, or protection method **Shall** be deemed adequate. Where this is not possible, positive identification of the correct **Low Voltage** cable will be achieved by further testing or the exposure of a service joint or connection to identifiable **Low Voltage Apparatus**.

WC2.1.2 Where any adjacent cable is known or suspected to be **High Voltage**, then in addition to the above in WC2.1.1, positive identification **Shall** be confirmed from records.

If there is any doubt about the identification of the **Low Voltage** cable to be worked upon and the identification of all adjacent **High Voltage** cables, then identification of the **Low Voltage** cable or all **High Voltage** cables, **Shall** be confirmed by the use of **Approved** cable identification equipment. (WC3.1.2). Particular care is needed in

areas where it is known non standard cables exist e.g. plain lead or tape armoured **High Voltage** cables or wire armoured **Low Voltage** cables. Where there is any doubt a **Senior Authorised Person Shall** be consulted.

WC2.2 **Work**.
General procedures, including control and setting to work, **Shall** be as outlined in OC2 and WA1.1; 2.1

WC2.2.1 Where necessary, **Approved** personal protective equipment **Shall** be used at all times, (PE2).

***WC2.2.2.** All work **Shall** be carried out to **Approved** procedures and:

***a.** **Approved** insulated tools **Shall** be used; *see Index Ref. 2*.

***b.** All exposed metal work, including cable sheath etc. **Shall** be shrouded using **Approved** insulating material; *see Index Ref.2*.

***c.** Metallic cable sheaths **Shall** be bonded using insulated conductor; see Index Ref. 2.

WC3 High Voltage Cables

WC3.1 Identification Procedures

***WC3.1.1** Where the cable can be traced to an identifiable termination or only one cable exists in a location and there can be no doubt about its identification from records, the cable **Shall** be spiked, subject to the exception in WC3.2.

WC3.1.2 When other cables are in the vicinity identification **Shall** be carried out at the point(s) of work using **Approved** cable identification equipment. Obsolete cable identification equipment which remains on the **Approved** list can be used if it is still serviceable; *see Index Ref. 2*.

WC3.1.3 Following identification:

a. The cable **Shall** be proved **Dead** by spiking using **Approved** equipment (*see Index Ref.2*) to the manufacturer's instructions.

b. The **Control Engineer Shall** agree to the spiking operation and be informed as soon as practicable after the operation.

c. The spike **Shall** not be removed within two minutes of the spiking action.

WC3.1.4 When identification and spiking is carried out under a **Sanction for Test**:

a. Identify the cable using signal injection equipment. Mark the cable at all spiking positions.

b. At the spiking location furthest from the signal source, if more than one, spike the cable.

c. Confirm that the correct cable has been spiked by checking loss of signal beyond the spike position or by other suitable means e.g. change of core resistance.

d. When the cable is to be spiked at a second position use another cable spiking gun. If

unavailable, reapply the earth(s) before removing the cable spiking equipment.

e. Spike the cable in the second position and restore the signal. Check loss of signal beyond the spike position.

WC3.2 **Approved** exceptions. The cable need not be spiked:

WC3.2.1 Where the cable can be traced visually or using a 'running noose' to a point where the **Conductors** are **Earthed**.

WC3.2.2 When repairing minor damage or where damage to the cable is to be avoided, e.g. for internal joint examination or cable re-sleeving, the cable **Shall** be identified with the active participation of the **Competent Person** who is to carry out the work.

a. The recipient of the **Permit to Work Shall** participate in the identification procedure and confirm the identification by verifying the injected signal is lost at the point of work when disconnected at source.

b. Where there is any doubt about the cables identity it **Shall** be spiked, (WC3.1.4).

c. Following the issue of a **Permit to Work** all work **Shall** be undertaken under the **Personal Supervision** of the **Senior Authorised Person** who conducted the identification test.

WC3.2.3 Where the cables are associated with ongoing work that have been previously identified, spiked, capped and clearly labelled further spiking is not required.

WC3.3 **Movement of cables**:

WC3.3.1 Cables **Shall** be made **Dead** before any attempt is made to physically move them. Where there is any doubt about a cables identification, it **Shall** be **Isolated** and **Earthed** and a **Sanction for Test** issued for identification, (WC3.1.2) The **Person** in charge of the work **Shall** participate in the identification procedure and confirm the signal is lost at the point of work when disconnected at source.

*WC3.4 **Insulated Sheath Cable Installations**.

WC3.4.1 Work or testing on the sheath **Shall** not be carried out unless a **Safety Document** has been issued, (WE5.2 for testing).

WC3.4.2 The cable **Shall** be identified in accordance with WC3.2.2 prior to the issue of a **Permit to Work** for serving or sheath repairs.

WC3.4.3 Earth link boxes **Shall** be identified by their position and labelling.

WC3.4.4 The links providing the **Earth** connection to the sheath **Shall**, where practicable, be removed after the testing equipment has been connected to the sheath and replaced before the test equipment is disconnected.

WC3.5 **Interconnection of 'Hot' and 'Cold' sites.**

WC3.5.1 Where work is to be carried out on an **High Voltage** cable that interconnects between sites where there may a difference in **Earth** potential under fault conditions (e.g. between 'Hot' and 'Cold' sites) then special operating procedures apply, *see Index Ref 2*

***WC4 Auxiliary**.

Auxiliary cables are normally associated with **High Voltage** cables. If, after consulting records, there is any doubt about the identification of the auxiliary cable it **Shall** be identified in accordance with WC3.1.2.

WC4.1 **Induced voltage.**
Experience has shown that problems arising from induced voltages are limited to auxiliary cables associated with overhead systems. However precautions **Shall** be taken in all cases to minimise the effects of any induced voltage.

WC4.1.1 Special precautions may be required for work or testing on auxiliary cables associated with certain 132kV, 275kV or 400kV circuits; *see Index Ref. 2*.

***WC4.1.2** Any **High Voltage Conductors** associated with catenary mounted auxiliary cables **Shall**, where reasonably practicable, be made **Dead**. If not then consideration **Shall** be given to lowering the catenary so that work may be carried out at ground level. The restriction on work more than 3m from a support with the **Conductors Live** will not then apply.

WC4.1.3 Disconnect the cores at all points and where practicable short and **Earth**.

WC4.2 **Work**

WC4.2.1 For catenary mounted cables the sheath/armours and catenary **Shall** be covered with **Approved** insulating material for a distance of 1 metre on each side of the point of work.

WC4.2.2 Exposed sheath / armours of underground auxiliary cables **Shall** be covered with **Approved** insulating material and an **Approved** insulating mat used when working on **Conductors**.

WC4.2.3 When working on one **Conductor**, the others **Shall** be insulated or so placed to avoid contact.

WC4.2.4 When working on fibre wrap installations with the **High Voltage conductors Live** then this **Shall** be carried out in accordance with an **Approved** procedure, *see Index Ref 2*.

WC5 Disconnected Cables

Disconnected Cables which have been cut and declared removed from the **System Shall** have their conductors shorted and connected to the cable sheath at the cap end position.

WC5.1 Disconnected cables may be worked upon provided they are identified as far as reasonably practicable, in

accordance with WC2.1 for **Low Voltage** and WC3.1 for **High Voltage** cables.

WC5.2 For **High Voltage** cables a **Limitation of Access Shall** be issued for work.

WC5.3 When spiking disconnected (abandoned) cables which have not been definitely identified, as well as the **Control Engineer**, the dispatcher or call centre **Shall** be informed to verify no problems arise on the **Low Voltage** system.

WC5.4 When it is necessary to confirm that a suspected abandoned **Low Voltage** cable is **Dead**, it **Shall** be treated as **Live** until the cable has been opened and the cores have been tested to prove **Dead**.

WC6 Faulted/Damaged

***WC6.1** Movement or excavation of faulty or damaged cables is prohibited until the cable has been Identified and proved **Dead** in accordance with an **Approved** procedure as follows:

***WC6.2 Low Voltage Cables**.

WC6.2.1 Identification. (WC2.1)

a. An indication of the fault position may be given by:

- Cable visible after damage.
- Ground disturbance coincident with fuse operation (may include flash marks).
- Sounds of discharge.

- Smell of burning etc.

or by use of fault location equipment such as pulse echo or injected signal etc.

b. Confirmation of the existence of the cable **Shall** be sought from records.

c. Identification may be obtained from circuit labelling where:

- There is only one cable installed in the vicinity and
- fuses are blown consistent with damage or
- loss of supply in the immediate vicinity of the fault / damage is confirmed following **Switching**.

d. Where there are multiple cables in the vicinity and definite identification of the faulty cable cannot be obtained then all other cables **Shall** be identified or all cables in the vicinity made **Dead**.

*WC6.2.2 Excavation. Initial excavation for the testing of faulty or damaged **Low Voltage** cable **Shall** take place at a point sufficiently remote from the point of fault / damage to avoid **Danger**, (WC1.3.1).
This **Shall** normally be at least 2m away from the indicated point of fault ensuring that 1m of solid ground is maintained between the excavation and the point of fault. If the faulty or damaged cable has been definitely identified, in accordance with WC6.2.1c, or all supplies in the vicinity have been cut off, then the 1m of solid ground need not be maintained.

***WC6.2.3 Making Safe. The cable **Shall** be proved **Dead** by **Approved** means at the position of excavation as in

WC6.2.2. There is no **Approved** procedure to allow testing at the point of damage.

WC6.2.4 On confirming the cable is **Dead** beyond the test position the point of damage **Shall** be traced visually, or by using a running noose, to the point of fault.

WC6.3 **High Voltage** cables **Shall** be switched out and **Safety Documents** issued for identification and repair, (WC3).

WC7 Induced Voltage

WC7.1 Experience has shown that cables or ancillary equipment associated with **High Voltage** cable routes are not subject to problems arising from induced voltages from other **Live** circuits in the vicinity. For details on interconnection between Grid Supply Points; *see Index Ref. 2*.

WC7.2 Where a circuit includes both cables and overhead lines and a **Safety Document** is issued to carry out work on the cable or associated switchgear connections, **Circuit Main Earths** or **Additional Earths Shall** be applied as near as practicable to the cable connection.

WC7.2.1 On circuits operating up to and including 20kV Portable Earthing Equipment **Shall** be used as in OB6.5

WC 7.2.2 On a circuit operating at 33, 66 or 132kV provided fully rated **Circuit Main Earths** are applied at the points of isolation, **Approved** portable earthing equipment suitable for overhead lines may be used for the **Additional Earth.** See OB6.2.8b if a fully rated **Earth** connection is required.

***WC7.3** Pole mounted substations, switch stations or short lengths of conductor connected to a cable termination **Shall** not normally be considered as a line subject to induced voltage. However on the near approach of a lightning storm, work on any **Apparatus** connected to this type of installation **Shall** cease immediately unless there is an **Earth** between this point and the point of work.

WD OVERHEAD LINES

WD1 General.

***WD1.1** Before climbing poles, towers or structures above 2m personnel **Shall** be trained and be proficient in the use of **Approved** harnesses, access methods, including permanently attached climbing and rescue procedures., (Appendix WD.1).

***WD1.2** Climbing and Work, above 2m.

a. An additional **Person**, suitably trained and equipped, **Shall** be in a position to safeguard the site and obtain or render assistance in the event of an emergency.

b. Where **Live** working is involved the second **Person Shall** be at ground level.

***WD1.3 Stability**

Before any pole, tower or structure is climbed it **Shall** be subjected to a visual inspection, looking for:

a. Signs of damage or decay

b. Damage to steelwork or insulators

c. Signs that the structure may not be stable. e.g. excavation around or nearby.

Wood poles **Shall** be further checked for stability, check gouge mark, and tested for decay; *see Index Ref. 2*.

A structure whose stability is in doubt **Shall** not be used for personal support. Access **Shall** be by independent means e.g. hydraulic platform or scaffolding or by other approved means. See WD3.3 for precautions where **Conductors** are **Live**.

WD2 Identification & Access to Work Area

*****WD2.1 Overhead lines **Shall** be identified using records, **System** diagrams, circuit identification plates, number plates, and where fitted, flag brackets.

WD2.2 **Access**. All access ladders and equipment **Shall** be inspected before use.

*****WD2.2.1 For detail of portable ladders **Approved** for use *see Index Ref.2.*

WD2.2.2 Fixed ladders provided for access to towers or high structures etc. **Shall** be deemed **Approved** for the intended purpose.

WD2.2.3 For detail of other equipment, such as scaffolding, towers and climbing irons used for access to overhead lines and high structures *see Index Ref. 2.*

*****WD2.2.4 Access gates through anti-climbing devices on towers etc., **Shall** be bolted shut unless access is required during work or inspections. They may, where necessary,

be temporarily locked with a suitable lock and the key retained.

WD3 Defining Work Area & Setting to Work

WD3.1 Safe working Area .

***WD3.1.1 Danger Notices**, bands (limit markers), or red pennants fixed to poles or towers in compliance with DSR 4.4.4 and Appendix D **Shall** be secured by or under the **Personal Supervision** of the **(Senior) Authorised Person** in charge of the work. (See WD3.4 for exception after first application).

***WD3.1.2 Live** overhead lines adjacent to work areas **Shall** be identified and screened in accordance with 4.1.1(d) see also OB6.2.6 where live lines cross.

*WD3.2 Where one **Permit to Work** covers multiple work locations on a circuit, each location **Shall** be identified by a **Senior Authorised Person** unless the overhead line **Conductors** can be followed unbroken from one point of work to the other. See WD4.5.3 for double / multi circuit with keyed flag brackets.

*WD3.3 **Climbing**.

WD3.3.1 Before touching an unearthed pole or structure supporting **Apparatus** or **Conductors** which are **Live** or have not been proved **Dead** above 3.7m from ground level or within 3m of **High Voltage** conductors, a visual inspection **Shall** be carried out for signs of damage or distress on all insulators, fittings and steelwork.

WD3.3.2 If it is suspected that insulation is not sound e.g. insulators are cracked, sheds shattered etc. or discomfort is felt when touching the pole, a report **Shall** be made immediately to an appropriate supervisor or **Control Engineer**. No climbing is allowed until the **Conductors** have been accessed, using means independent of the pole or at an adjacent pole where visual inspection indicates it is safe to climb, and proved **Dead**.

WD3.3.3 When work is to be carried out on one circuit of a wood pole double circuit overhead line of unearthed construction, the steelwork **Shall** be proved **Dead** and **Earthed** prior to commencement of work.

***WD3.3.4 **Approved** procedure for climbing and work on towers above **Working and Access Clearance** of **Conductors** with **Conductors Live**. Ensure NO infringement of **Safety Distance**: Climb

a. Within tower

b. Outside face at right angles to line where **Working and Access Clearances** can be maintained. e.g. straight line or angle towers less than 30 degrees.

c. Where the angle is more than 30 degrees and terminal towers, climb to an agreed route under the **Personal Supervision** of a **Senior Authorised Person**. Alternatively, the **Senior Authorised Person** can carry out a documented risk assessment for the tower work and issue additional **Approved** documents for each

structure to the recipient of the **Safety document**. *see Index Ref 2.*

Work from within the body of the tower using short tools (no more than 0.5m long).

WD3.4 **Setting to Work**. In addition to the identification procedure in accordance with DSR 5.11.1, where double or multi-circuit overhead lines are involved or flag brackets are fitted, the following **Shall** apply:

***WD3.4.1** At the first pole or tower the **Senior Authorised Person Shall** identify the circuit and carry out or **Personally Supervise** the fitting, where appropriate, of:

- Green flag.
- **Danger Notice**, fitted at ground level on circuits remaining **Live**.
- Red pennants, except where all conductors are **Dead**.
- Prove **Dead** and apply **Additional Earths**.
- Issue the unique circuit identification flags and wristlets to the recipient of the **Safety Document**.

WD3.4.2 At subsequent poles or towers the **Competent Person** in charge of the **Working Party** may carry out the procedure. Provided the conductors are continuous and can be seen to be **Earthed**, the use of a voltage indicator may be dispensed with. See WD4.5.3.

WD3.4.3 Under DSR 5.14.3, the **Senior Authorised Person** has special responsibility for supervision on double circuit or multi circuit overhead lines at terminal poles, tee off or large angle towers etc. where clearances may be

reduced. When work is protracted e.g. for work on cable sealing ends, work may continue under the control of a **Competent Person** subject to the following:

The **Senior Authorised Person Shall** initially prepare the site with the assistance of the **Competent Person** who is to continue supervising the work ensuring that:

a. Additional screening is in place if necessary
b. Separate means of safe access is provided
c. **Working and Access Clearances** can be maintained at all times including when erecting and dismantling access equipment.

WD4 Work

***WD4.1** Protection against backfeed or induced voltage.

*WD4.1.1 The provision of a **Circuit Main Earth** or **Additional Earth** within one span of the point of work will provide protection against induced voltages in the **Conductors**. To protect against backfeed from private generation, where reasonably practicable, **Low Voltage** sources of infeed **Shall** be isolated. Where **Low Voltage** isolation is not reasonably practicable **Earths Shall** be applied to the overhead line either side of the point of work.

*WD4.1.2 Where **Conductor** continuity is interrupted at the point of work (e.g. jumpers, droppers, bows, aerial fuses, airbreak isolators, conductor breakage) a set of **Earths**, bonded to a common **Earth**, **Shall** be applied to each side before the break or connection is made in accordance with DSR 5.10.3c.

WD4.1.3 Where work is to be carried out on a transformer under a **Permit to Work** issued on an overhead line, an **Additional Earth** or **Circuit Main Earth Shall** be applied on the **High Voltage** side and bonded to the transformer **High Voltage** and **Low Voltage Earths**. Where the transformer **High Voltage** terminals are disconnected from **Earth** then isolate the **Low Voltage** side and secure as OB5.2.2.

WD4.1.4 When work is to be carried out on a pole mounted transformer with open **Low Voltage Conductors** within the work zone, precautions **Shall** be taken to ensure there is no **Danger** from backfeed. Either:

a. Treat the **Low Voltage Conductors** as **Live** or

b. create an equipotential zone by shorting & **Earthing** the **Low Voltage Conductors** and connecting all **Apparatus** to **Earth** as in WD4.1.3.

WD4.2 Proximity to **Live** overhead lines. Any Auto Reclose feature on adjacent overhead lines should be switched out if there is any **Danger** of contact e.g. change in **Conductor** tension during work.

WD4.3 Movement of Conductors:

WD4.3.1 When any overhead line **Conductor** is to be moved, erected, dismantled or subject to a change in tension, due regard must be taken of the effect on other **Apparatus** & equipment and other persons, including members of the public. In all cases a comprehensive risk assessment, taking account of the possibility of conductor breakage **Shall** be carried out. (PD1).

***WD4.3.2** Crossings - Account **Shall** be taken of the risk involved and the type and importance of the crossing. Precautions taken **Shall** be in proportion to the risk to eliminate any hazard as far as reasonably practicable. e.g. Where tension is being altered, consideration **Shall** be given to the use of adequate secondary attachments. *see Index Ref 2* approved procedure for crossings. See also OB 6.2.6

Safety precautions **Shall** include the use of signs & guarding to ensure safety of passing persons / traffic. Where appropriate use **Shall** be made of scaffolding / towers, netting or vehicular mounted towers etc.

While **Conductor** erection or dismantling is in progress, the crossing **Shall** be supervised by an attendant who **Shall** be in communication with the **Person** in charge of the operation.

Particular regard should be paid to the crossing of or proximity to:

a. Lines (including telecoms) - Guard to prevent damage and make dead if possible or take precautions to avoid **Danger**.

b. Roads - The Local Highway Authority will require notification for work on or near roads in accordance with the requirements of current Street Works Regulations. Small private roads and tracks will require the owners consent. Signs and guarding **Shall** be used in all cases.

c. Rail - The network operator will require notification and additional precautions **Shall** be required where the line is electrified, (OB6.2.6).

d. Rivers/Canals - The local river authority may have to be involved especially where navigable or used for recreational purposes.

Advice should be sought from the Safety Section where the Supervising Engineer envisages any difficulty.

WD4.4 Double Circuit overhead lines with one circuit Live.

WD4.4.1 Where work is carried out on a double, or multi circuit overhead line with one or more, circuit(s) **Live**, **Additional Earths Shall** be applied at every support to be worked upon.

WD4.4.2 Where work involves no change in **Conductor** tension the work may be carried out under the control of the **Competent Person** in charge of the **Working Party**.

WD4.4.3 Where **Conductor** tension is to be changed the **Immediate Supervision**, **Personal Supervision** in the case of loop in, tee off, terminal and large angle positions etc., of a **Senior Authorised Person** or a suitably **Authorised Person** is required to ensure at all times, **Working and Access Clearances** are maintained from the **Live** circuit to the **Conductors** and associated tensioning equipment.

WD4.4.4 Where work is to be carried out involving significant changes to the normal working tension of the **Earth Conductor** of a double or multi circuit overhead line, preferably, all circuits should be prepared for work in accordance with DSR 4.1.1. Where this is not possible due to **System** limitations then one circuit **Shall** be prepared for work and a **Permit to Work** issued for work

on the **Earth Conductor** with access via the **Dead** circuit. Work may then commence under the **Immediate Supervision**, **Personal Supervision** in the case of loop in, tee off, terminal and large angle positions etc., of a **Senior Authorised Person** who **Shall** ensure at all times, **Working and Access Clearances** are maintained from the **Live** circuit to the **Conductors** and associated tensioning equipment.

WD4.5 Suspension/Restarting Work.

WD4.5.1 If work is suspended and the **Working Party** leaves the overhead line, then the **Competent Person** in charge of the **Working Party Shall** be responsible for safe custody of the **Safety Document** and any other safety equipment, e.g. green flags and wristlets. The overhead line and all equipment **Shall** be left in a safe condition and if necessary safeguarded against unauthorised interference. If this necessitates the removal of **Circuit Main Earths**, the **Permit to Work(s) Shall** be cancelled beforehand by a **Senior Authorised Person**.

WD4.5.2 Restarting Work.

a. If work is under a **Limitation of Access** then provided the overhead line is re-identified and the limit marker confirmed in place, work can be reinitiated by the **Competent Person** in charge of the **Working Party** under the terms of the **Limitation of Access**.

b. If work is under a **Permit to Work**, provided

- The overhead line is re-identified.
- **Earths** are visible from the work position.

- Other precautions, such as positioning of notices etc., have been confirmed.

The **Competent Person** in charge of the **Working Party** may instruct his **Working Party** to apply **Additional Earths** if necessary and recommence work.

WD4.5.3 Double/Multi Circuit Lines. If the circuit is equipped with circuit identification symbols and keyed flag brackets, provided:

a. The overhead line is identified.
b. Correct wristlets are available.
c. Keyed green flags fit the flag brackets, then:
d. A suitably **Authorised Person** may, where required, fix red pennants, prove the overhead line **Dead** and apply **Additional Earths**.

Work may then be restarted without the presence of a **Senior Authorised Person**, (WD3.4.1).

WD4.5.4 Where there is any doubt about re-identification of the work position in WD4.5.2; 3, a **Senior Authorised Person Shall** be informed. The **Senior Authorised Person Shall** exercise judgement to impose any restriction felt necessary to secure the safety of staff before instructing the work to restart.

WD4.6 On completion of work:

WD4.6.1 The **Competent Person** in charge of the **Working Party Shall** ensure the site is left safe and locked where appropriate in accordance with DSR9.2.6 to ensure there is no hazard to people, animals or vehicles.

***WD4.6.2** Where flags and wristlets have been issued at the commencement of work the **Senior Authorised Person Shall** ensure they are all accounted for on completion.

WD5 Work and Live Line methods.

WD5.1 **Apparatus** erected outside **Working and Access Clearances** prior to connection by **Live Line** methods **Shall** be carried out under a **Limitation of Access** in accordance with PG4.2.1.

WD5.2 Work on **Apparatus** disconnected by **Live Line** procedures **Shall** be carried out as follows:

a. According to the appropriate **Live Line Work** procedure or

b. discharged to **Earth** and a **Limitation of Access** issued (when outside of **Working and Access Clearance**).

***WD6 High Voltage Live Line Work**.

WD6.1 **Approval**

***WD6.1.1** **High Voltage Live Line Work** can be carried out by Hot Glove or Hot stick **Approved** procedures (*see Index Ref 2)*. Hot Glove Work involves manipulation of **Live**

High Voltage Conductors and therefore compliance with the clearances specified in DSR section 4.4 is not possible. All such work **Shall** be carried out in accordance with **Approved** procedures using **Approved** tools and equipment (*see Index Ref. 2)*.

WD6.1.2 Where **System** conditions make it appropriate, disconnections or reconnections may be carried out on a de-energised overhead line, using **Approved Live Line** procedures, under the authority of the **Control Engineer**. No deviation from **Approved** hot stick/hot glove procedures is allowed except with the written approval of the **Designated Engineer**.

WD6.1.3 **High Voltage Live Line Work** on **High Voltage** circuits operating in parallel **Shall** be carried out in accordance with **Approved** procedures and using **Approved** tools and equipment (*see Index Ref. 2)*.

WD6.2 Requirements

*****WD6.2.1 Authorisation: For reference to authorisation codes and training procedures *see Index Ref. 2*.

*****WD6.2.2 Supervision: The **Authorised Person** in charge is responsible for ensuring that all team members are conversant with the object and detail of the work and methods of operation. Supervision can only rotate between team members to an **Approved** procedure

*****WD6.2.3 The **Authorised Person** in charge **Shall** record the proposed **Live Line Work** on a numbered page in a Live

Line Switching / Work Record Book, Appendix WD.2, and advise the **Control Engineer**, detailing the:

a. **Authorised Person** (or **Persons** where the responsibility of supervision rotates between team members).

b. Location or circuit and, where appropriate, pole numbers.

c. Location of the controlling CB.

d. Type of Work.

e. Work Specification / Procedure.

WD6.2.4 The **Control Engineer Shall** log (consistent with WD6.2.3):

a. The name of the **Authorised Person**, where responsibility for supervision rotates between team members. Only one is required to inform the **Control Engineer** but all names **Shall** be recorded in the Control Log.

b. The Live Line Work Record / Switching Log page number.

c. Location or circuit and, where appropriate, pole numbers.

d. Type of work and work specification/procedure.

***WD6.2.5** The **Control Engineer Shall** take into consideration protection settings back to the source substation (primary or secure busbar) when setting a circuit to one trip to lockout for **Live Line Work**. This action may be carried out by telecontrol where facilities exist. As far as reasonably practicable an instantaneous trip **Shall** be selected.

WD6.2.6 **High Voltage Live Line Work** which is carried out from ground level or does not involve contact with **Conductors**, does not require the immobilisation of auto reclose equipment controlling the circuit.

WD6.3 Access

*WD6.3.1 Poles **Shall** be inspected for damage or decay before climbing etc. as WD1.3, for integrity of insulation as WD3.3 and **Approved** procedures followed to avoid steelwork becoming **Live** (WD6.1.1).

WD6.4 Procedures / Work

WD6.4.1 Connection to and disconnection from **Live** overhead lines **Shall** be carried out in a controlled manner:

a. The break or contact **Shall** be made with a sharp definite movement in order to avoid arcing.
b. The direct cutting of **Conductors Shall** only be carried out under controlled conditions with **Approved** tools and predictable loads.
c. Connection of circuits should initially be made with a flexible lead fitted with live line taps.
d. Transformers or cables may be connected / disconnected up to the capacity indicated for pole mounted expulsion fuses in Table OB.2. There is no practical limit for overhead lines. See WD6.4.2 for restrictions where there are mixed circuits.
e. Where the load is either unpredictable or in excess of the capacities in Table OB.2 **Approved** load make / break devices **Shall** be used.

WD6.4.2 Restrictions on **Live Line** switching. Where circuits contain cable and transformers there is a possibility of ferro-resonance occurring if single phase switching or disconnection is carried out (OA4.1). Precautions **Shall** be taken to avoid this problem by e.g. when disconnecting a cable, disconnect transformer(s) first.

***WD6.4.3** Where the work identified cannot be totally completed then the **Control Engineer Shall** be informed.

Appendix WD.1 Rescue Procedure

Where rescue of a person is required from a pole, tower or other high structure summon help from the emergency service, carry out a risk assessment to ensure your own safety then:

Pole top rescue, Diagram WD.1 shows a method of attachment using a sling, carabiner and Figure of 8 Descender. Procedure as follows:

a. Climb pole and assess casualty for vital signs. If required, start resuscitation and continue at suitable intervals during the rescue process.

b. Attach sling to a suitable anchorage point.

c. Pass suitable rope (12mm) through and round Figure of 8 Descender as Diagram WD.1.

d. Connect Figure of 8 Descender to sling via a caribiner.

e. Fasten one end of the rope to the casualties harness with a bowline and take the strain on the other side.

f. While still taking strain, cut the casualty free of the fall arrester etc. and lower to the ground.

g. Continue resuscitation and or first aid as necessary until qualified help arrives.

Tower or structure rescue. Diagram WD.2, 3 and 4 shows use of a descender kit.

Procedure as follows:

a. Climb tower or structure and assess casualty for vital signs. If required, start resuscitation and continue at suitable intervals during the rescue process.

b. Climb to a position above casualty.

c. Attach rescue kit to a suitable anchorage point and then to your harness front ring/loop via the attached caribiner, (Diagram WD.2).

d. Lower yourself onto the rescue kit.

e. Operate the rescue kit handle smoothly while descending, Diagram WD.3 and stop just above the casualty.

f. Connect the rescue kit to the casualty.

g. Cut the casualty free of the fall arrester etc.

h. Lower yourself and the casualty to the ground.

i. Continue resuscitation and or first aid as necessary until qualified help arrives.

DIAGRAM WD.1

Attachment using Sling, Carabiner and Descender

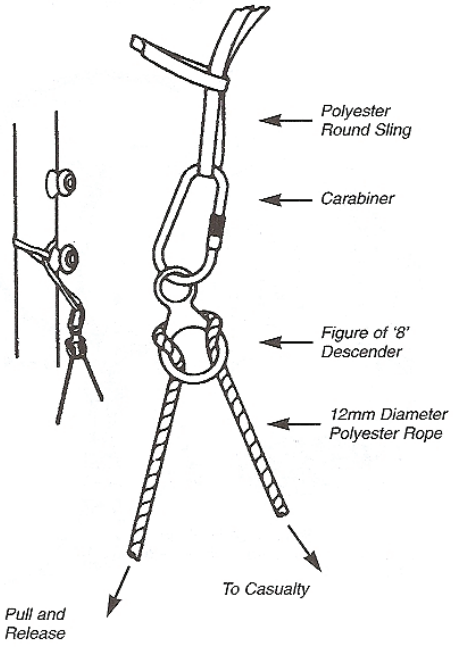


DIAGRAM WD.2

Descender Kit

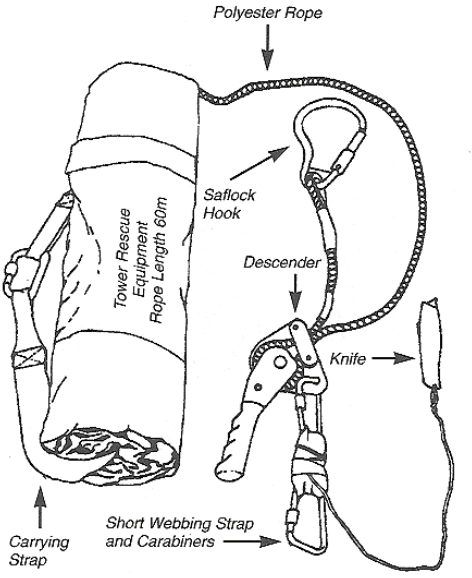
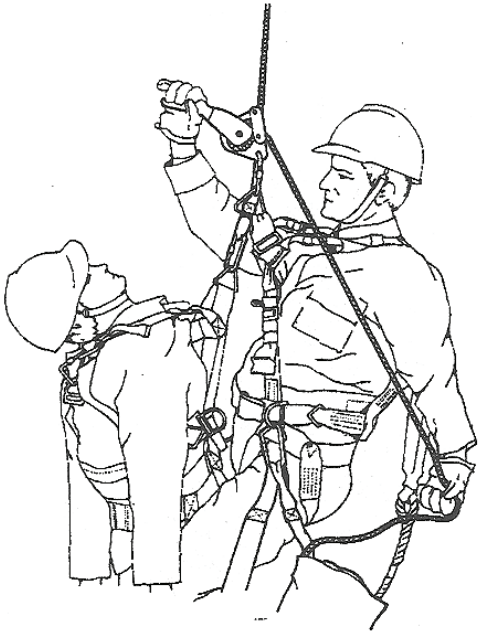


DIAGRAM WD.3

Rope attached to a secure point of structure above Casualty using Saflock Hook

DIAGRAM WD.4



Descending with the Casualty Attached

Appendix WD2

Live Line Switching/Work Record No. L .....

Date: ..... / ..... / .....

Authorised Person(s) Supervising: .....

.....

.....

Location/Feeder: .....

.....

.....

Support Number(s): .....

Controlling CB at: ..... Subs/Sw Stn

Circuit: .....

Type of Work: .....

.....

.....

.....

Work Specification/Procedure No: .....

.....

.....

Consent of ..... Control Engineer. Time .....

Completion/Suspension reported to Control Time .....

Remarks: .....

.....

.....

Form No. 832(E) Rev. 02/2012

WE TESTING

The Company has a duty under legislation to ensure the **System** is operated and maintained to prevent **Danger** as far as reasonably practicable. Therefore, before connecting or reconnecting any **Apparatus** or circuit to the **System,** tests **Shall**, where reasonably practicable, be carried out to ensure integrity of insulation.

WE1 General Requirements

WE1.1 Responsibility

WE1.1.1 It is the responsibility of the **Authorised Person** carrying out the test to ensure precautions are taken to avoid **Danger**. This includes:

a. Safeguarding any remote points where exposed **Conductors** may be energised from the test site.
b. Suspension of work on associated ancillary equipment.
c. Proving **Dead** before touching **Conductors**

*****WE1.1.2 Following the application of a test voltage, **Apparatus Shall** be safely discharged and **Shall** remain connected to **Earth** where required to avoid **Danger**.

WE1.2 For construction work, safety precautions to DSR standards **Shall** be taken.

WE2 **Test Requirements. Apparatus Shall** normally be energised within 24 hours of testing. Test voltages are shown in Table WE.1 for cables, Tables WE2 for switchgear and Table WE3 for transformers and Table

WE4 for voltage transformers. For newly installed **Apparatus** where commissioning testing is undertaken prior to connection to the **System**, subject to a **Senior Authorised Person's** risk assessment in accordance with WE6.1.1 the 24 hour requirement need not apply.

WE2.1 Low Voltage. IR and continuity testing of **Low Voltage Apparatus** and **Conductors Shall**, where reasonably practicable, be carried out using **Approved** instruments. Manufacturer's operating instructions must be observed. Tests for insulation resistance **Shall** be carried out at 500 volts and applied for 1 min. each test.

WE2.2 High Voltage

Testing **Shall** be carried out using **Approved** instruments or equipment, which **Shall** be used in accordance with manufacturer's and or **The Company's** instructions; *see Index Ref. 2*.

WE2.2.1 No **Apparatus Shall** be connected or reconnected to the **System** unless:

a. They have been subjected to and satisfied the relevant test criteria or

b. where specific exemptions are given as detailed below or

c. with the approval of the **Designated Engineer**

WE2.2.2 **Approved** exemptions following construction work:

a. Certain classes of VT having the **High Voltage** star point permanently **Earthed** and it is not reasonably practicable to remove this **Earth**.

b. Overhead lines, but all insulators **Shall** be checked for soundness as they are installed.

WE2.2.3 **Approved** exemptions following maintenance as WE2.2.2 and:

a. Ground mounted **Apparatus** where exposed insulation is involved.

b. Any circuit where it is necessary to disconnect permanently bolted connections to **Apparatus** prior to testing. e.g.. permanently connected single phase to earth VT's; transformer windings with star point solidly connected to **Earth** etc.

WE2.2.4 **Approved** exemption - Cable connection sockets (e.g. Pfisterer connections). Testing is not required following removal and refitting of blanking plugs. This type of connection is not designed to be energised unless it is connected in the service position, has a dummy plug inserted or is fitted with a blanking plug. Where testing of the circuit is required, including a VT and or other associated **Apparatus**:

a. Where reasonably practicable test from the remote end.

b. Alternatively, where test sockets are provided, the circuit may be subjected to test voltage by removing the blanking plugs from the test sockets and inserting plugs with short test leads attached.

c. Testing following replacement of the blanking plugs is impracticable therefore before insertion each blanking plug must be inspected and confirmed to be clean and undamaged.

d. If there is any doubt about the blanking plug's condition it **Shall** be replaced.

e. As blanking plugs are not interlocked, a check **Shall** be made to ensure they are inserted in all three phases before the circuit is energised.

WE2.2.5 **Approved** exception where design of switchgear does not have a designed test orifice to facilitate the testing of the circuit and the cable type is single core type XLPE construction. (e.g. underground cable circuit from the Ring-Main-Unit to a remote transformer). The following procedure **Shall** apply:-

a. Work will be undertaken as normal under a **Permit-to-Work** (e.g. transformer change / cable connection) with the point of isolation and **Circuit Main Earth** quoted, being at the tee-off controlling device on the Ring-Main-Equipment.

b. On completion of the jointing termination, the **High Voltage** terminations are left disconnected from the cable box stalks within the transformer or switchgear dry box and the clearance of the **Permit to Work** is endorsed as 'work incomplete'.

c. Issue a **Sanction for Test** to undertake the required **High Voltage** testing.

d. Issue a **Permit to Work** to undertake the final re-connection of the transformer **High Voltage**

connections and fit the flexi boots under the personal supervision of a **Senior Authorised Person**.

e. Where practicable, due to the final connection work being done after pressure testing, re-energising the circuit should consider the use of re-energising from a remote location.

WE2.2.6 **Approved** exception Where the design of switchgear incorporates a metering Voltage Transformer connection and does not have a designed test orifice to facilitate the testing of the circuit there is also the option to:-

a. Access the voltage transformer by removing a panel under a **Permit to Work** and disconnecting the voltage transformer windings.

b. Carry out the required testing from within the voltage transformer chamber under a **Sanction for Test** to avoid breaking down the cable termination at the switchgear dividing box.

c. On completion of testing, reconnect voltage transformer windings and replace the access panel under a **Permit to Work**.

d. Where practicable, due to the final connection work being done after pressure testing, re-energising the circuit should consider the use of re-energising from a remote location.

WE2.2.7 **Approved** exception where the design of switchgear does not have a designed test orifice to facilitate the testing of the circuit and the cable type is not XLPE or does not lend itself to cable termination disconnection in

WE2.2.5 (paper lead) cables supplying a transformer there is also the option to:-

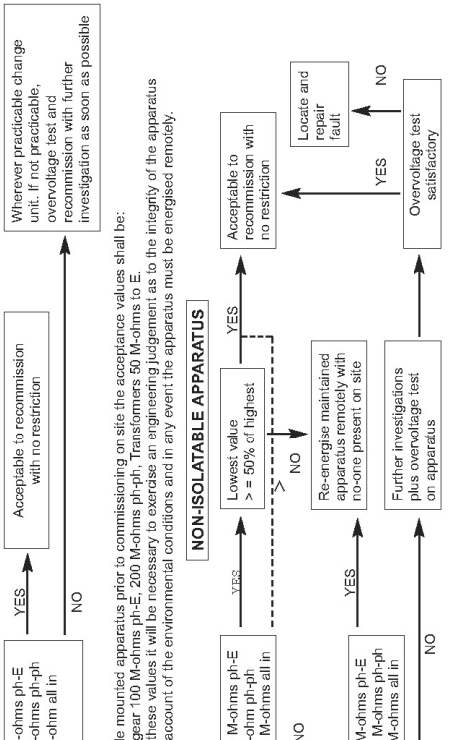
a. Remove transformer lid and disconnect transformer windings under a **Permit to Work.**

b. Carry out the required cable testing from within the transformer under a **Sanction for Test**.

c. On completion of testing, reconnect transformer winding, adjust oil levels as necessary and replace the transformer lid under a **Permit to Work** and under the **Personal Supervision** of the **Senior Authorised Person**.

d. Where practicable, due to the final connection work being done after pressure testing, re-energising the circuit should consider the use of re-energising from a remote location.

DIAGRAM WE.1



Note: For pole mounted apparatus prior to commissioning on site the acceptance values shall be:
Switchgear 100 M-ohms ph-E, 200 M-ohms ph-ph, Transformers 50 M-ohms to E.
Below these values it will be necessary to exercise an engineering judgement as to the integrity of the apparatus taking account of the environmental conditions and in any event the apparatus must be energised remotely.

WE3 Recording

a. The results of any testing carried out on **Apparatus** prior to connection or reconnection to the **System Shall** be recorded on a test result form, (Appendix WE.1).

b. The form **Shall** be retained or the results recorded with the **Apparatus** records.

c. Guidance on the acceptability of IR tests on isolatable **Apparatus** is given in Diagram WE.1

WE4 Overvoltage Tests

Subject to **Approved** exceptions, before connection to the **System**, tests **Shall** be carried out on:

a. All new **Apparatus**.

b. That which has been subjected to modification or repair affecting insulation, unless a manufacturer's test certificate applies. See section WE5.1 for on site testing.

*c. Test leads should be a minimum of 2.5mm^2 csa, suitably insulated and easily identifiable, i.e. brightly coloured.

WE4.1 Cables

Following installation and jointing and before energising, cables **Shall** be subjected to a dc test voltage as shown in Table WE.1, (exception WE4.1.3)

WE4.1.1 Application:

a. Apply test voltage to each individual phase in turn for a period of 15 mins. with both other phases connected to **Earth**.

b. Alternatively, apply test voltage to 2 phases with the third phase connected to **Earth** for a period of 7.5 mins. Carry out a further two tests, changing connections so that each phase is subjected to test voltage for 15 mins.

WE4.1.2 11/20kV cables operating at 20kV **Shall** be subjected to a reduced test voltage.

WE4.1.3 XLPE Insulation.

a. Up to and including 25kV treat as paper insulated cables for test purposes. See column 1 of Table WE1

b. At 33kV either test with dc or VLF, see columns 1 and 2 of table WE.1

c. 66kV and 132kV either ac tests, at power frequency or VLF test in accordance with table WE.1.

Where these tests are not practicable, then a 5kV insulation resistance test followed by a to 24 hour “soak” period **Shall** be applied. This option requires the completion of a risk assessment by the **Senior Authorised Person** in accordance with Table WE5. Consideration **Shall** also be given to installing temporary

access restrictions / screening for the duration of the ‘soak’ period.

Where circuits contain a mixture of XLPE and fluid insulated cables, test as XLPE. See columns 2 and 3 of table WE.1

TABLE WE.1 Cable Test Voltages (kV)

Working Voltage (kV)	Test voltage and duration			
	1	2		3
	DC	VLF (RMS)	VLF PEAK	AC (*)
	15 min	60 min	60 min	60 mins
Up to 0.65	500V IR			
2.75 to 3.3	6			
5.2 to 6.6	12			
11	20			
20	37 *			
25	37			
33	50	36	50	
66	100	66**	94**	72
132	200	141	200	132

Note - For 11/20 kV cable test at 28kV dc for 15 minutes.

- * AC test frequency's for EHV testing range from 20Hz to 300Hz
- ** Values reduced from national recommendations of 71kV / 100kV to 66kV / 94kV to accommodate local testing capability.

WE4.2 Switchgear

Before commissioning or following repair which affects or may affect the integrity of the insulation, switchgear **Shall** be subjected to test voltage as detailed in Table WE.2.

WE4.2.1 Tests **Shall** be applied to earth, between phases and across the gap.

WE4.2.2 Vacuum Interrupter: Where testing is required, to avoid a possible X ray hazard, no personnel **Shall** approach within 3 metres of a vacuum interrupter which is subjected to an overvoltage test. Test values to be applied across the break are detailed in Table WE.2.

TABLE WE.2 Switchgear Test Voltages (kV)

Working Voltage (kV)	Test voltage and duration	
	1	2
	DC	AC
	1 min	1 min
Up to 0.65	500V IR	
2.75 to 3.3	6	5
5.2 to 6.6	12	10
11	20	16
20	37	30
25	37	30
33	50	50
66	100	85
132	200	150

Above test voltages to be applied to free standing post CTs

The test method will be selected by the test engineer based on site circumstances and configuration of **Apparatus**.

WE4.3 Transformers

Before commissioning or following repair which affects or may affect the integrity of the insulation, transformers **Shall**, where reasonably practicable, be subjected to test voltage as detailed in Table WE.3 and WE.4.

WE4.3.1 Application - The windings of transformers **Shall** be tested to **Earth** with all other windings connected to **Earth**.

a. For transformers up to and including 20kV ac test voltages **Shall** be used where practicable otherwise DC testing is acceptable. Where **High Voltage** cables are directly connected they **Shall** be tested as one unit using the DC test voltages, i.e. all three phases of the cable to **Earth**.

b. For new or refurbished transformers at 25kV, 33kV 66kV and 132kV, which have a valid test certificate, 5kV insulation resistance tests or Approved diagnostics tests **Shall** be applied after installation on site.

c. For return to service, following fault or site works, of transformers at 25kV, 33kV, 66kV and 132kV **Approved** diagnostic tests **Shall** be applied.

WE4.3.2 Diagnostic tests for 25kV, 33kV, 66kV and 132kV transformers include:

a. 5kV insulation resistance tests following:

i. Tap changer and selector minor non-intrusive work.
ii. Main transformer minor non-intrusive work.
iii. Bushing replacement.

b. Ratio test at each tap position and 5kV insulation resistance tests following tap changer and selector intrusive work involving dismantling and rebuilding.

c. Dissolved gas in oil test, 10kV AC insulation tests, 10kV AC single phase excitation tests and frequency response analysis test following clearance of fault current for an internal transformer fault.

d. For Replacement CTs where manufacturer's test results are provided a 5kV insulation resistance test is sufficient.

TABLE WE.3 Transformers Test Voltages (kV)

Working Voltage (kV)	Test voltage and duration	
	1	2
	DC	AC (1 Min)
Up to 0.65	N/A	2
2.75 to 3.3	6 (15 mins)	5
5.2 to 6.6	12 (15 mins)	10
11	20 (15 mins)	16
20	37 (15 mins)	30
25	See WE4.3.2	
33		
66		
132		

WE4.3.3 **Voltage Transformers (VT's)**

a. The **High Voltage** winding **Shall** be tested to the **Low Voltage** winding and **Earth** with an ac test voltage for 1 min. as per Table WE.4, or **Approved** diagnostic tests **Shall** be applied.

b. The **Low Voltage** winding **Shall** be tested to **Earth** using a 500 volt insulation tester for 1 minute.

TABLE WE.4 Voltage Transformers Test Voltages (kV)

Working Voltage (kV)	Test voltage and duration
	AC (1 minute)
Up to 0.65	
2.75 to 3.3	2
5.2 to 6.6	3.8
11	6.4
20	11.5
25	14.4
33	19
66	38
132	76

WE5 IR Testing

WE5.1 Unless an overvoltage test is carried out on site, and subject to exceptions in WE2.2.3, IR tests of 1 min. duration using a 5kV insulation tester **Shall** be carried out before **Apparatus** is connected or reconnected to the **System** on the following:

a. Ground mounted **Apparatus** following maintenance.

b. Ground mounted isolatable switchgear which has been subjected to the prescribed tests in a workshop.

c. Metal clad pole mounted **Apparatus**, which has been subjected to the prescribed tests in a

workshop or has a valid manufacturer's test certificate, typically for **Live Line** procedures.

WE5.2 **Insulated Sheath Cables**: When it is required to carry out tests on the serving of insulated sheath cable systems, care should be taken to avoid induced voltages from adjacent **Live** circuits (WC3.4).

a. The links providing the sheath **Earth** connection **Shall** where practicable be removed after the test equipment has been connected and replaced before disconnection.

b. IR tests on the serving of Insulated sheath cables **Shall** be carried out using a 1kV insulation tester for 1 minute.

c. As this is not a test of primary insulation, low test results do not imply the circuit is unfit for reconnection to the system. Where a cable serving insulation resistance of 50kΩ or less is obtained, efforts should be made to locate the fault to prevent any further deterioration of the cable sheath.

WE6 Energising Apparatus.

WE6.1 No work since disconnection.

Where **Apparatus**, including lines and cables have been made dead in the course of work, e.g. a CB isolated for work on a feeder or for operational reasons, e.g. a transformer switched out for loss saving, there is a perceived risk of loss of integrity of insulation. This risk

may be greater on land not under the control of **The Company** due to the activities of others.

WE6.1.1 To assess individual situations a risk assessment **Shall** be carried out, taking into account:

a. Public access near switchgear etc.

b. Cables - The risk of **Danger** from a cable fault is normally low and they are normally buried therefore they may be considered as inaccessible to the public. However, it will be prudent to check the route to establish that no third party is carrying out excavation work.

c. Pressure cable - The integrity of an oil or gas cable may be inferred as sound if the pressure is normal.

d. Integrity of a line - There are no meaningful tests that can be carried out to confirm this. Reliance will have to be placed on visits to all known vulnerable locations and reports of damage.

WE6.1.2 Guidance on the test requirements is given in Table WE.5 . However if there is any doubt a full test **Shall** be applied.

Table WE.5 Test requirements where no work has been carried out.

Time Lapse	Situation		
	Public Access	No public access Local operation	No public access Remote operation
< 24 hrs	None	None	None
> 24 hrs < 7 days	5 kV IR Test		
> 7 days < 28 days	Overvoltage Test	5 kV IR Test	
> 28 days		Overvoltage Test	

WE6.2 Commissioning Following Work.

Where for contingency purposes testing is carried out more than 24 hours before **Apparatus** is commissioned the same concerns exist as for re-energising **Apparatus** where no work has been carried out. The guidance available in section WE6.1 may be used.

Appendix WE.1

NORTHERN POWERGRID Test Results

Feeder (route) ..... **Voltage** ..... **kV**

IR Test (5kV - 1 min.)

R to E .....
Y to E .....
B to E .....
R to Y .....
R to B .....
Y to B .....

Overvoltage test: Voltage Applied ..... kV ac/dc*

Time	Leakage Current (mA)
15 mins. dc or 15 min. ac	R to Y, B & E .....
	Y to R, B & E .....
	B to R, Y & E .....
Or 7.5 mins. dc	R & Y to B & E .....
	R & B to Y & E .....
	Y & B to R & E .....

HV Apparatus - Substation .....

Switchgear: Manufacturer ..... Type ..... Voltage ..... kV

Situation indoor/outdoor* Weather conditions .....

Test*: 5kV dc, 1 min. ..... kV dc 15/7.5* mins. ..... kV ac, 1 min.

Isolatable Apparatus Name	Panel 1	Panel 2	Panel 3	Panel 4
OPEN Across break R to R				
Y to Y				
B to B				
CLOSED Continuity (✓ if OK)				
R to E				
Y to E				
B to E				
B to Y				
Y to R				
R to B				
Transformer/VT Name	Unit 1	Unit 2	Unit 3	Unit 4
Voltage Ratio				
Primary to E & Sec				
Secondary to E				
Includes Cable (Y/N)				

Feeder Route

R to E ..... B to Y .....
Y to E ..... Y to R .....
B to E ..... R to B .....

All in (Transformer(s) connected) ..... to E

Remarks .....

Tested by ..... Signed ..... Date ..... / ..... / .....

*Delete as required

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WF SYSTEM ALTERATIONS

It is essential to avoid **Danger** that there be no confusion about the state of **Apparatus** to be worked upon. **Danger** may arise due to assuming **Apparatus** is disconnected from the **System** or that it is safe to carry on work when newly constructed **Apparatus** is connected to the **System**. The **Senior Authorised Person** is responsible for ensuring a Change of State Notice is issued where necessary, (Appendix WF.1).

WF1 **Apparatus** may exist in two states:

WF1.1 Connected to the **System** and under Distribution Safety Rules where the **Apparatus** is dressed with operational locks and rings etc. and can only be worked upon when released under a **Safety Document**.

WF1.2 Off the **System**, either fully disconnected and released under a Change of State Notice or in the construction state where free access is available and nothing is locked off.

WF1.3 It is the responsibility of the (**Senior) Authorised Person** in charge to ensure all involved are aware at all times of the electrical state of all **Apparatus** on site. Particular care must be taken if work is in proximity to **System Apparatus** or the new works are connected to the **System** in stages.

WF2 **Disconnection**.

Apparatus may be declared off the **System** only if it is to be permanently removed and it will not be reconnected at a later stage of the work. Wherever possible all

disconnection work, including removal of **Apparatus** from site, **Shall** be carried out under Distribution Safety Rules. Where this is not reasonably practicable and ex **System Apparatus** remains on site the following **Shall** be observed:

WF2.1 **Apparatus** cannot be declared removed from the **System** unless it is outside **Working and Access Clearance** from bare **Live Conductors**, it cannot be made **Live** by a **Switching** operation e.g. closing CB isolators (racking in) or replacing jumpers (droppers or bows) and all potential sources of backfeed have been permanently disconnected.

WF2.2 When **Apparatus** is disconnected from the **System**, all operational locks rings and labels etc. **Shall** be removed.

WF2.3 **Further Work**:

WF2.3.1 When **Apparatus** is declared off the **System** and requires further work for dismantling purposes following cancellation of the **Safety Document**, a Change of State Notice **Shall** be completed and the **Control Engineer** informed by the **Senior Authorised Person**.

WF2.3.2 The **Working Party Shall** be issued with a copy of the Change of State Notice.

WF2.3.3 The **Senior Authorised Person Shall** demonstrate to the **Working Party** that the **Apparatus** is **Dead**, remove operational locks & rings, remove redundant circuit identification labels and change any 'Circuit Main Earth' notices to 'Construction Earth' notices where necessary.

WF3 New Works

The safe conduct of all work and testing on plant and **Apparatus** not connected to the **System** is the responsibility of the responsible **Person** in charge of the project. Work **Shall** be planned so far as reasonably practicable to ensure no electrical hazard is introduced during the construction stage.

WF3.1 **Construction**: All work must be carried out safely in accordance with current legislation. The application of the principles of the Distribution Safety Rules will, in most situations, avoid **Danger** from electrical hazards.

WF3.1.1 **Approved** Earthing Equipment (OB6.1) **Shall** be applied to the **Apparatus** as soon as reasonably practicable and a 'Construction Earth' notice applied, (PF3.3).

WF3.1.2 Further **Additional Earths Shal**l be used where required to provide protection against induced voltage etc.

WF3.1.3 Avoid connecting sources of backfeed or take precautions to avoid **Danger**.

WF3.1.4 Where work is to be carried out in proximity to **Live Apparatus**, e.g. adjacent to overhead lines or in substations, identify and screen as necessary (PF2).

WF3.1.5 When testing ensure all involved are aware of the **Danger**, take precautions in accordance with DSR 7 and WE.

WF3.2 Connection

Where reasonably practicable all new **Apparatus** in any one location **Shall** be connected to the **System** at the same time.

WF3.2.1 If staged connection is unavoidable the **Apparatus** in each subsequent stage must be outside **Working and Access Clearance** and treated as WF3.1. Any **Apparatus** which can be made **Live** by **Switching**, connection of jumpers (droppers or bows) or connection to a panel which can accept a circuit breaker, **Shall** be declared on the **System**.

WF3.2.2 Immediately prior to the point in the construction work when a connection is to be made whereby the **Apparatus** could be made **Live** by **Switching** or connection of jumpers (droppers or bows) etc. the following **Shall** apply:

a. The (**Senior) Authorised Person Shall**, where necessary, apply operational locks, rings, notices, etc. and ensure circuit identification labels etc. are in place.

b. A Change of State Notice **Shall** be completed and all involved made aware of the situation. If considered necessary a copy of the notice may be issued to the contractor or team leader.

c. The **Senior Authorised Person Shall** inform the **Control Engineer** of the issue of the Change of State Notice.

d. The **Control Engineer Shall** log the Change of State Notice number and accept the new works as part of the **System**.

e. All subsequent work or testing **Shall** require the issue of an appropriate **Safety Document**.

Appendix WF1

NORTHERN POWERGRID

No. CS.....

Change of State Notice

I ..... of .....
Senior Authorised Person Company

hereby declare the **High Voltage Apparatus** detailed below is to be treated as:

Live and no work may be carried out except under Distribution Safety Rules*
Disconnected from the **HV System** and is safe to dismantle*

HV Apparatus .....

.....

.....

.....

.....

.....

Where applicable locks / rings / notices have been applied / removed*
and **Earth** notices changed.

Signed ..... Time ..... : ..... Date ..... / ..... / .....
Senior Authorised Person

..... **Control Engineer** Informed: Time ..... : ..... Date ..... / ..... / .....
Control Area

Received ..... Time ..... : ..... Date ..... / ..... / .....
Contractor / Team Leader

*Delete as required

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OPM - DSR REFERENCE

OPM Ref	DSR Ref	Description
PA1.1	1.2	Third parties working on the company system
PA1.3	9	Duties.
PA2	1.4	Issue of Safety Rules.
PB1.1	4.1.1 x i	Earthed Metal - Painting etc.
PB1.2.2	4.1.1 x ii	Hot Glove procedure.
PB2	1.6	Approved Procedures.
PB2.2	5.1.2	Work on Switchgear & Cables.
PB2.3	3.8	Live testing.
PB2.3	7.3.3	Live phasing checks etc.
PC	1.8	Reporting Procedures.
PC1.1.2	3.7	Failure of Supply.
PE	1.10	Personal Protective Equipment.
PE2.1.3	8.6.2	Insulating Gloves - LV.
PE2.1.3	8.7.2	Insulating gloves for LV work.
PF1	2D.19	Caution Notice.
PF2	2D.20	Danger Notice.
PG2	4.6	Permit to Work.
PG2.1 b	3.2.1 (b)	PtW - Other precaution - Auto fire protection.
PG2.1 c	9.4.4 (ii)	PtW - Other precaution - flags & wristlets.
PG2.1 e	5.10.3 (b)	Earth Schedule.
PG2.2.1	4.6.2 (c);	PtW - Cross reference.

OPM Ref	DSR Ref	Description
	.3 (c)	
PG2.3	4.6.4	PtW - Suspension.
PG2.4	4.6.3 (b)	Clearance of PtW and Additional Earths.
PG2.4	9.2.6	Clearance of PtW.
PG2.5	9.4.5 (iv)	Cancellation of PtW.
PG2.6		Minor testing under PTW
PG3	4.7	Sanction for Test.
PG3	4.7.1 (a)	Testing Isolated Apparatus.
PG3.1	7.2	Recording operations under SfT.
PG3.2	4.7.4	Sanction for Test - Suspension.
PG3.3.1	4.7.3	Clearance of SfT.
PG3.4	9.4.5 (iv)	Cancellation of SfT.
PG4	4.8	Limitation of Access.
PG4.2	4.8.1 (b)	LoA – Control Engineer recording issue.
PG4.2.3	5.3.3	LoA Work on withdrawable Apparatus.
PG4.3	4.8.1 (b)	LoA - Other circumstances.
PG4.3.2	5.6.4	LoA work on Compressed Gas installations.
AA	3.1.2	Locking Policy.
AA1 a	3.3.3	Locks on access ladders and gates.
AA3	4.2.2 (a)	Safety Locks.
AA3.2.3	4.2.2 (b)	Recording deposit of Safety Lock keys.
AB	3.1.1; .2	Operational Access.

OPM Ref	DSR Ref	Description
AB1.1	3.4	Access to HV Apparatus (Sw. and Substations).
AB1.2	3.4.1	Access to Live HV conductors.
AB1.3	3.1.3(i)	Ventilation.
AB2	3.1.3; .4	Confined spaces.
AB2.2.3	3.1.3(iii)	Atmosphere testing in a confined space.
AB2.3.1	3.1.3(v)	Second Person - Confined Space.
AB2.3.5	3.1.3(ii)	Breathing Apparatus.
AC1	3.2.1	Auto fire control.
AC2	3.2.2	Portable fire extinguishers.
AC3	3.2.3	Precautions after discharge.
AD1	App. D	Working and Access Clearances.
AD2	3.10	Machines.
AD2.2.1	App. D	Working and access clearance for machines.
AD3.3	4.5.1	Island working.
AD3.4	4.5.1 (a)	Island working - Equipment.
AD3.5	4.5.1 to 6	Island working - Delineation.
AD3.5. 1	4.5.2	Island working - Access Route.
AD3.5. 2	4.5.4; .5	Island working - Access for Equipment.
AD3.7	3.3	Terminal Poles and High Structures.
AD3.7.1	4.5.1 (c)	Access to terminal poles etc. in Compounds.
AD3.7.1	5.10.1 (b)	Climbing equipment.
AD3.7.2	4.5.1 (c)	Access - work above ground level in

OPM Ref	DSR Ref	Description
		Compounds.
OA2.1	3.5.7	Distressed Apparatus.
OB	3.5	HV Switching.
OB1	3.5.5	Requirements for Switching.
OB1.2	4.2.2 (b)	Recording Centres.
OB1.3	3.5.1	Agreement for Switching.
OB1.3.2	3.5.1	Emergency Switching.
OB1.3.3	3.5.2	Switching - no communication.
OB2.1.1	3.6.2	Operations - recording by Control Engineers.
OB4.2.2	3.5.8	Operating aerial switchgear - PPE.
OB4.3.1	3.5.8	Operating aerial switchgear - PPE.
OB4.5.1	5.4.2 (a)	Specification and use of Voltage Indicators.
OB4.5.1	5.4.4 (i)	Specification and use of Voltage Indicators.
OB4.5.1	5.5.2 (a)	Specification and use of Voltage Indicators.
OB4.5.1	5.5.4 (i)	Specification and use of Voltage Indicators.
OB4.5.5	3.8	Voltage Testing devices.
OB4.5.5	4.4.2 (b)	Safety distances - Spouts.
OB4.5.5 b	4.4.1	Safety distances.
OB4.6	5.7.1 (c)	Traction supplies.
OB5.1.2	4.2.3	Replacement of non-isolatable fuses.
OB5.2	5.7.1	Isolation of transformers.

OPM Ref	DSR Ref	Description
OB5.2.1	5.7.1 (a)	Transformer - Remote isolation.
OB5.2.2	5.7.1 (d)	Transformers etc. - LV Isolation.
OB5.2.3	5.7.1 (e)	Withdrawable VT's etc.
OB6.1.1	4.3.1 (a)	Circuit Main Earths via CB or fixed device.
OB6.2.1	4.3.1	Earthing procedure.
OB6.2.10	4.3.4 (c)	Earths - position following cancellation of SfT.
OB6.2.2	4.3.1 (a)	First Earth at point of Isolation.
OB6.2.6	5.10.7	Under running Live Conductors.
OB6.2.7	4.3.1	Application of CME notice and lock.
OB6.2.8	5.1.2	GM Apparatus connected to lines.
OB6.2.8	5.5.2 (c)	GM Apparatus and cables connected to lines.
OB6.2.8 (c)	4.5.7	Adverse weather.
OB6.2.9	4.3.5	Additional Earths Responsibility of CP.
OB6.2.9	5.10.3 (b)	Additional Earth schedule.
OB6.3.1	4.3.3 (d)	Earthing & exposed Live Conductors.
OB6.3.3	4.3.1 (a)	Circuit Main Earth via CB - remote operation.
OB6.4.1	4.1.1 (c)	CME - Open Switchgear, no integral Earth Sw.
OB6.5.1	4.3.1 (b)	Application of Portable Earth.
OB6.5.1	4.3.2	Portable Earth equipment, Inspect before use.
OB6.5.1	4.3.3	Procedure for the use of Portable

OPM Ref	DSR Ref	Description
		Earths.
OB6.5.1	5.4.2 (b)	Portable Earths - busbar spouts.
OB6.5.1	5.5.2 (b)	Portable Earths - single panel boards etc.
OB6.5.5	5.5.2 (b)	Portable Earths - earthed poles.
OB6.6.1 c	5.5.3; 4 (i)	Removal of Earths during work.
OC	8.1.1	LV System.
OC	8.8.1	No application of HV rules to LV.
OC1	8.1.4	Authorisation for LV.
OC2	8.1.4	Control of LV Systems.
OC3.1.5	8.2.6; 8.7.1	Test instruments etc.
OC3.3.1	8.2.1	LV isolation.
OC3.3.2	8.2.4	LV Screening.
OC3.3.2	8.2.5 (c)	LV Screening.
OC3.4.1	8.1.3	LV Earthing devices.
OC3.4.1	8.2.2	LV Earthing devices.
OC3.4.1	8.4.1	LV Earthing devices.
OC4. f	8.1.6	Checks following energising.
OD2.2	9.4.6	Control Engineer in the field.
WA1.1.1	8.1.5	Work on LV - Safety documents.
WA1.1.1	8.5.1	LV Live work to Approved procedures.
WA1.1.1	8.5.2	LV Live work to Approved procedures.
WA1.1.1	8.5.3	LV Live work with Approved tools etc.
WA1.1.1	8.6.2	Work on bare LV conductors.
WA1.1.2	8.6.4	Second Person - LV Live Work.

OPM Ref	DSR Ref	Description
WA1.2	6	HV Live Line work.
WA2.1.3	8.5.2	Working Party - Responsibility.
WA2.1.8	8.6.2	LV cut outs - changing Live.
WA2.2.1	4.1.1	Work on HV Apparatus.
WB1.1	5.3.2	Withdrawable Apparatus - Locking spout shutters.
WB1.2	5.4; 5	Identification & Supervision for busbar/spout work.
WB1.5.1	5.6.1	Compressed air - work under LoA.
WB1.5.1	5.6.4	Compressed air - work under LoA.
WB1.5.2	5.6.1 (c)	Compressed air - Release to atmosphere.
WB1.5.3	5.6.1; 2	Compressed gas - rules as for compressed air.
WB1.5.4	5.6.3	Apparatus containing SF_6.
WB1.6	3.4.3	Relaxation for locking spouts - Zone of Work.
WB1.6	5.1.2	Zone of work, relaxation to DSR's 5.4; 5.
WB1.6	5.3.2	Relaxation for locking spouts – Zone of Work.
WB1.6.3	5.1.2 (b)	Exception for testing.
WB1.6.4	5.1.2	Zone of Work - switchgear and cables.
WB2.1	5.7.3	Identification of Transformers.
WB2.3	5.7.2	CME, transformers fed from lines.
WB2.4	5.8.4	Additional Earths - Capacitors.

OPM Ref	DSR Ref	Description
WC1	3.9	Excavation of cables.
WC1.3	3.9	Safe Excavation.
WC2.1	8.3.1	Cable identification.
WC2.1	8.6.1	Cable identification.
WC2.2.2	8.5.1	LV Cable work - Approved tools and procedures.
WC2.2.2 a	8.6.2	Approved tools & equipment for Live LV work.
WC2.2.2 b	8.6.1	Insulating material for shrouding.
WC2.2.2 c	8.6.2	Insulated bonding Conductors.
WC3.1.1	5.9.2	HV Cable identification.
WC3.3.1	4.1.1	Identify before moving if doubt.
WC3.4	5.9.3	Cable insulated sheath installations.
WC4	8.3.2	Auxiliary cables - Identification & Induced voltage.
WC4.1.2	5.10.8	Auxiliary cables - catenary supported.
WC6.1	3.9	Faulted Cables - prove dead before touching.
WC6.1	5.9.1	Faulted Cables - prove dead before touching.
WC6.1	8.3.1	Faulted Cables - prove dead before touching.
WC6.2	8.3.1 (c)	Safe excavation in proximity to LV cable fault.
WC6.2.3	8.3	LV Cable fault - Testing making safe and work.

OPM Ref	DSR Ref	Description
WC7.3	4.5.7	Totem (Inverted) pole (equipment) substations.
WC7.3	5.10.9 (a)	Cable fed pole mounted Apparatus - lightning.
WD1.1	3.3.2	Appendix WD.1 rescue procedures.
WD1.1	5.10.1 (a)	Appendix WD.1 rescue procedures.
WD1.2	3.3.2	Second Person - Climbing above 2m.
WD1.3	3.3.1	Precautions before climbing.
WD1.3	6.3.9	Access to damaged poles.
WD2.1	5.10.0 (ii)	Line identification.
WD2.2.1	5.10.1 (b)	Portable ladders.
WD2.2.4	3.3.3	Towers - gates through anti climbing guards.
WD3.1.1	5.10.5.2	Safe Work Zone.
WD3.1.2	5.10.0	Safe Working Zone - Adjacent Live line.
WD3.2	5.11.1	Multiple work positions.
WD3.3	5.10.1 (d)	Check for Live steelwork.
WD3.3	5.12.3 (a)	Precautions against steelwork becoming Live.
WD3.3.4	5.10.6	Climbing Towers above W & A clearance.
WD3.4	5.11.1	Line Identification.
WD3.4.1	5.12.1 (b)	Double Circuit lines.
WD3.4.1	5.13; 14; 15	Lines with Flag Brackets.
WD3.4.3	5.14.3	Supervision by SAP (delegation).

OPM Ref	DSR Ref	Description
WD4.1	4.3.5 (b)	Protection against backfeed.
WD4.1.1	5.10.3 (a)	Additional Earths at point of work.
WD4.1.2	5.10.3 (c)	Additional Earths across a break in Conductor.
WD4.2	5.10.7	Auto Reclose on adjacent Live Lines.
WD4.3.2	5.10.7	Movement etc. of Conductors at crossings, HV.
WD4.3.2	8.1.7	Movement etc. of Conductors at crossings, LV.
WD4.5.1	5.10.4	Suspension of Work.
WD4.6.1	9.2.6	Completion of work, CP.
WD4.6.2	9.4.5 (ii)	Completion of work, SAP.
WD6	6	Conditions for Live Line work.
WD6.1.1	4.4.1	Exception for Hot Glove work.
WD6.1.1	4.4.3 (a)	Approach to non isolated conductors (Hot Glove).
WD6.1.1	6.1.1	Approved Live Line procedures.
WD6.1.1	6.1.4	Approved Live Line tools and equipment.
WD6.1.1	6.3.1	Exception for Hot Glove work.
WD6.1.1	6.3.11	Exception for Hot Glove work.
WD6.1.1	6.3.7	Approach to non Isolated Conductors (hot glove).
WD6.2.1	6.1.2	Live Line Authorisation.
WD6.2.2	6.1.3	Live Line Supervision.
WD6.2.3	6.3.3	Recording procedure. App. WD.1 LL

OPM Ref	DSR Ref	Description
		Record.
WD6.2.5	6.3.3	Live Line - Protection settings.
WD6.3.1	6.3.9	Precautions before climbing.
WD6.3.1	6.3.10	Live Line - Check for Live steelwork.
WD6.4.3	6.3.5	Incomplete Live Line work.
WE1.1.2	7.3.1	Discharge after Test.
WE4 c	7.3.2	Test leads.
WF3.1.5	7	Construction works - Testing.

Index Reference 2

OPM Ref	Policy Reference	Subject
PA1	HAS/042	Operational authorisation
PC, PC3.1.1	HAS/011	Accident and incident reporting and investigation
PE1, PE2.1, PE2.3	HAS/029	Requirements for PPE / Insulating gloves
PE2.2		Insulating mats
PG1	CRL/001/013 to 016. NE legacy O801	Abbreviations for use in Safety Documents
PG2.6		Minor testing
AB2, AB2.2.3	HAS/013/001	Confined Spaces
AC, AC2.1	HAS/017; DSS/O31	Fire Prevention and control
AD1.2.2	DSS/024	Vegetation management
AD3.5.2		Guidance on safety documents
AE2, AE2.3		Third party in proximity to high voltage overhead lines
OA2.3		Oil filled switchgear
OA2.4,	HAS/011 &	Investigation of

OPM Ref	Policy Reference	Subject
OA2.4.2	RPC/001/021	incidents.
OA3.1		Depletion of inter-tripping
OA4		Ferro-resonance
OB3.1.2		Switching operations
OB3.2		Fault switching
OB4.1.2	MNT/001/001	Circuit breaker operations on fault
OB4.5.1		Voltage testing devices
WD6.1.3		High Voltage Live Line Work
OB6.2.6, 6.5.2, 6.5.4		Portable earthing equipment
OC3.1.7		Low voltage testing devices
OC3.2.3		Intermittent LV faults
OC3.4.1		Screening
OC3.5.1		Low voltage earthing
OD2.2.2		Delegated Control
OE2, 2.3.3		National Grid interface
OE5.1.2		IDNO Interface
WA1.1.1, WA1.1.2	RTN	Live working procedures
WB1.3	EOC 16	Oil spill
WB 1.3.1		PCB contamination

OPM Ref	Policy Reference	Subject
		records
WB 1.3.2	RTN/001/500/610/916	Live oil sampling
WB1.5.4		Access to SF_6 compartments
WB3.5		Battery electrical storage systems
WB5.1.2		Insulated tools
WC1.2		Cable location devices
WC2.2.2		Insulated tools and cable sheath bonding
WC3.1.2		Cable identification equipment
WC3.1.3		Cable spiking equipment
WC3.5.1		Jointing at 'Hot' earthing sites
WC4.1.1	YE legacy OPS/102/024	Work on auxiliary cables
WC4.2.4		Work on fibre warp cable
WC7.1	YE legacy OPS/102/024	Induced voltages, interconnection between Grid Supply Points
WD1.3	NSP/004/112	Wood pole inspection and test
WD2.2.1	NE legacy SCOP MISC	Access equipment –

OPM Ref	Policy Reference	Subject
	2 and YE legacy SAF/001/102	portable ladders
WD2.2.3	NE legacy SCOP MISC 2 and YE legacy SAF/001/101	Access equipment – other
WD3.3.4		Procedure for climbing towers
WD4.3.2		Crossing conductors
WD6.1.1	OPS/106/001/001 to 008.	High voltage live line work
WD6.1.3		High Voltage Live Line Work on circuits operating in parallel
WD6.2.1	HAS/042	High voltage live line work system authority codes and training
WE2.2	To be supplied by Standards.	High voltage testing