

MANUAL

ELECTRICAL SAFETY RULES

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements and gives recommendations for the development of Electrical Safety Rules (ESRs) by Shell companies and their business units (BUs).

Appendix 1 of this DEP is an example of ESRs that can be adopted by a BU as far as they are consistent with applicable regulations (see 1.2).

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them.

This DEP is intended for use in oil refineries, chemical plants, gas plants, exploration and production facilities and supply/distribution installations. This DEP applies to Shell companies where the construction, operation, and maintenance of electrical generation, distribution and utilization facilities may expose employees to electrical hazards.

When DEPs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this DEP, the Principal shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier/Vendor** is the party that manufactures or supplies coating materials, equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Additional Earth	An approved earthing device that may be applied by the recipient of an electrical permit-to-work, or of a sanction for test, to electrical equipment in addition to the circuit main earths.
Approved	Of a type or method acceptable for use in the BU or site management, as applicable.
Caution Notice	A portable notice, attached to points of isolation, which warns persons not to interfere with, or to operate, the electrical equipment to which it is attached.

Circuit Main Earth	An earthing device applied to the main circuit conductors prior to the issue of an electrical safety document or sanction for test.
Dead (De-energized)	Equipment at or about zero potential and disconnected from any live electrical power source.
De-Isolation	Electrical equipment that has been restored to its normal service position from its previously isolated position.
Earth, Earthed or Earthing (Ground, Grounded, Grounding)	Connected to the general mass of earth in such a manner that the body being earthed discharges immediately any electrical energy stored in it and furthermore is maintained at a safe potential with respect to the general mass of earth.
Earthed Notice (Grounding Tag)	A portable notice that warns persons where temporary earths are installed.
Electrical Equipment	The electrical machines, apparatus and circuits forming part of an electrical installation of an electrical power system.
Electrical Power System	All electrical installations and electrical equipment provided for the purpose of generating, transmitting and distributing electricity.
Electrical Safety Documents	a) Electrical Permit-to-work (EPTW) A form issued by a Senior Authorised Electrical Person to a Competent Electrical Person in charge of the work to be carried out on specified high voltage electrical equipment, or a low voltage switchboard's bus bars, after they have been made dead, isolated from all live conductors, and connected to earth. The electrical permit-to-work identifies the electrical equipment that has been isolated and the circuit main earths that have been applied. b) Sanction for Test (SFT) A form issued by a Senior Authorised Electrical Person to an Authorised Electrical Person in charge of the testing of specified high voltage electrical equipment that has been made dead, isolated from all live conductors, is connected to earth and is prepared to carry out testing. The sanction for test identifies the high voltage electrical equipment that has been isolated and the circuit main earths that have been applied. It also identifies which circuit main earths may be removed and replaced to allow testing to be carried out. c) Limitation of Access (LOA) A form issued by an Authorised Electrical Person to a Competent Electrical Person defining the limits and nature of electrical work that may be carried out in the vicinity of exposed live electrical equipment. The limitation of access identifies the conductors that are exposed and live, the electrical safety precautions that have been taken and the procedures to be followed by those carrying out the work.

Exposed	Not suitably guarded, isolated, or insulated.
High Voltage (HV)	Any electrical equipment that is normally operated at a voltage exceeding 1000 V.
Holder/Operating Department	The department that is the asset holder/custodian and/or operates the site or electrical equipment on which work or testing is to be carried out.
Isolated or Isolation	Disconnected from live conductors by an open isolator or adequate physical gap and from all sources of supply, so as to prevent electrical equipment being made live in error.
Live	Electrically charged.
Low Voltage (LV)	Any electrical equipment that is normally operated at a voltage not exceeding 1000 V.
Operations (in Electrical Power Systems)	Actions by which electrical equipment is connected to, disconnected or isolated from an electrical power system. It also includes the earthing of electrical equipment and the switching, isolation and earthing of electrical distribution circuits.

Persons NOTE: Naming conventions may vary between BUs or sites.	a) Appointed Person A person authorised by the BU, normally not from electrical staff, who is trained on performing specified duties on electrical equipment, e.g. opening or closing motor circuits. b) Competent Person A person authorised by the BU who has sufficient technical knowledge or experience to perform work safely. c) Competent Electrical Person (CEP) A person authorised by the BU to carry out specified LV operations on electrical power systems and work on electrical equipment. d) Authorised Electrical Person (AEP) A Competent Electrical Person authorised by the BU, to supervise or to carry out specified operations on high and low voltage electrical power systems and work on electrical equipment. The authorisation may include the authority to receive a sanction for test, issue and cancel limitations of access and perform the necessary safety procedures associated with such work or testing. e) Senior Authorised Electrical Person (SAEP) An Authorised Electrical Person authorised by the BU, to initiate work on high voltage electrical equipment. The authorisation includes the authority to issue and cancel all electrical safety documents and to perform the necessary safety procedures associated with the issue/cancellation of such documents. f) Senior Electrical Authority (SEA) An individual with an electrical engineering degree, authorised by the BU, to develop the BU or site's ESRs and to oversee the assessment of electrical competency, training and experience of persons operating and working on electrical equipment.
Safety Padlock (or Safety Lock)	Padlock or lock of a non-standard or unique type that is individually keyed (one person one lock) and used to lock switches, isolators and earthing devices, at points of isolation from where electrical equipment being worked on could be made live.
Substation	Any defined area within a building or outdoor enclosure which contains high voltage or low voltage electrical equipment such as switchgear or transformers.
Switching	Operation of circuit breakers, isolators, fuses or other methods of making or breaking an electrical circuit, including the isolation and de-isolation of electrical equipment.
Switching Programme	A schedule that lists in order the switching necessary to carry out a particular purpose on an electrical power system or circuit.
Testing	Any activity that requires application of a voltage from an auxiliary source to determine the electrical insulation or the operational condition of electrical equipment.

Work	Any activity that requires the installation, repair, removal, replacement, alteration, extension, adjustment or cleaning of electrical equipment forming part of an electrical power system.
Work Permit	A form signed, issued and cancelled, usually by a representative of the holder department, in accordance with the BU's general permit-to-work system. A work permit can take the form of, but is not limited to, hot work permit, cold work permit, clearance certificate, safety certificate and fire permit.

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets. Other documents referenced by this DEP are listed in (13).

2. REQUIREMENTS FOR ELECTRICAL SAFETY

2.1 GENERAL

BUs shall establish and maintain written Electrical Safety Rules (ESRs) for their covered operations.

ESRs shall take into consideration:

- a) Compliance with applicable regulations, (e.g. "Electricity at Work Regulations" in the UK and OSHA 29 CFR 1910 Subpart S in the USA).
- b) The complexity of the BU electrical power systems, including the amount of interconnection and the operating voltages chosen for generation and distribution/transmission.
- c) The design and nature of existing electrical equipment in use on the electrical power systems (e.g. Manufacturer and types of indoor or outdoor switchgear units, and design and construction of any overhead line circuits).
- d) The interface with any other electrical power systems not under the control of the BU (e.g. HV supplies from a local power company).
- e) The compatibility of the ESRs with the BU permit-to-work system, (e.g. work permits, hot work permits and cold work permits).

ESRs should be adapted to the size and complexity of the BU or site and its operations. For example, while the basic requirements of having an electrical safety programme apply to all types of facilities (i.e., refinery, chemical plant, terminal, gasoline service station, etc.) the details of the programmes will vary depending on the size, operations and level of complexity of the different facilities.

The scope and detail of the ESRs shall cover the following subjects:

- General requirements for electrical safety
- Responsibilities for electrical power systems
- Competency programme
- Authorisation of personnel
- Switching, isolating and earthing procedures
- Personal protective equipment
- Electrical safety documents
- Precautions before working on or testing on high voltage (HV) and low voltage (LV) electrical equipment
- Precautions for special equipment
- Work at construction sites
- Portable electrical equipment
- Precautions before excavating
- Auditing compliance with the ESRs

2.2 CONTRACTORS, VENDORS AND THIRD PARTIES

When entering into contracts with Contractors, Subcontractors, Vendors and other third parties who will have workers involved in electrical activities as defined in this DEP, the Shell company shall include provisions in the contract that require the contractors, Subcontractors, Vendors and third parties to have processes consistent with this DEP. When working at a site, the Contractors, Vendors and Third Parties shall follow all applicable site procedures.

3. DEVELOPING AND AUDITING the ESRs

The following shall apply:

- The BU or site management shall designate the Senior Electrical Authority (SEA).
NOTE: Naming conventions used in this section may vary in ESRs.
- The SEA is responsible for developing the BU or site's ESR.
- The BU shall periodically audit (at least annually) compliance with the ESRs.

4. RESPONSIBILITIES FOR ELECTRICAL POWER SYSTEMS

The BU or site management shall clearly define the responsibilities for operating and maintaining electrical power systems so that the personnel in both the holder/operating department and the electrical department are aware of the scope and limits of their operational responsibilities, for example:

- The starting and stopping of motors, the synchronising of generators etc. is normally the responsibility of the holder/operating department.
- Switching operations in electrical power systems is normally the under the control of a Senior Authorised Electrical Person.
- Isolation, earthing and testing of electrical equipment is normally the responsibility of the electrical personnel.

5. COMPETENCY PROGRAMME AND AUTHORISATION

5.1 GENERAL

No persons shall be allowed to carry out operations, work or testing on any part of the electrical power system unless they meet the requirements of the BU competency programme and are authorised to perform the task.

5.2 COMPETENCY PROGRAMME

The BU or site shall have a documented electrical competency programme. This electrical competency programme shall define the competency elements and level for each role (Appointed, Competent, Competent Electrical, Authorised Electrical, Senior Authorised Electrical and Senior Electrical Authority) and address the following.

- Electrical theory
- Hazards associated with electricity
- Techniques for working on or testing on electrical equipment
- Electrical power system upon which work or testing is to be carried out
- Applicable BU electrical safety rules and operational procedures
- Hazardous (classified) area equipment
- First aid and resuscitation
- Switching, earthing and isolation of equipment
- Initial and refresher training

Contractors performing electrical work shall have a documented electrical competency programme. The BU shall have a process for reviewing the content and authorisation process associated with the electrical competency programme.

5.3 AUTHORISATION

Before a candidate is designated by the BU or site management as an Appointed Person, Competent Person, Competent Electrical Person, Authorised Electrical Person or Senior Authorised Electrical Person the Senior Electrical Authority or designees shall assess and establish whether the candidate is competent, has received the necessary training and has the experience to undertake safely the limited tasks associated with their authorisation. This assessment may take the form of theoretical tests and practical demonstrations.

The authorisation shall be properly documented and a copy provided to the individual. The Senior Electrical Authority shall keep an up to date overview of all authorised persons.

Individuals may be authorised for more than one role.

The authorised person shall confirm that he/she has understood the work to be performed and measures to be taken and his/her authorisation is valid for the work being performed.

5.4 RENEWAL OF AUTHORISATION

All authorisations shall be valid for a maximum of three years.

When BU or site management renews a person's authorisation the Senior Electrical Authority or designate shall revalidate the individual's competency and should consider the following:

- Whether the person still carries out work or switching that requires this category of electrical authorisation
- Changes to the electrical power system and/or the introduction of new types of electrical equipment for which additional skills or training may be required
- Whether any refresher training is necessary.

6. SWITCHING, ISOLATING AND EARTHING PROCEDURES

6.1 SWITCHING PROGRAMMES

Switching programmes shall be developed in accordance with (6.2) and (6.3) and shall include the following:

- Sequence of operation
- Isolation and earthing locations
- Specific equipment numbers
- Responsibilities
- Pre start up walk-through precautions (incl. drawings, PPE's, tools, equipment, etc.)

NOTE: There may be two sets of switching programmes – one for isolating and one for de-isolating.

6.2 HIGH-VOLTAGE SWITCHING

HV switching shall not be carried out without a documented and approved switching programme.

High Voltage switching programmes should be prepared by either a Senior Authorised Electrical Person, or an Authorised Electrical Person and then approved or authorised by a Senior Authorised Electrical Person or the Senior Electrical Authority.

HV switching, including the isolation and de-isolation of electrical equipment, shall be carried out or coordinated by a Senior Authorised Electrical Person or an Authorised Electrical Person. A Competent Electrical Person may carry out the actual HV switching operations, but only under the guidance and in the presence of the Senior Authorised Electrical Person or Authorised Electrical Person who is coordinating the switching.

The opening and closing of HV circuit breakers by remote control may be carried out by a Senior Authorised Electrical Person, an Authorised Electrical Person, or an Appointed Person who is authorised to carry out selected items of HV switching from a Control Room or by remote control from some other location.

Selected items of HV switching may be carried out by an Appointed Person who is authorised to carry out the specified items of HV switching. (Examples include the opening and closing of HV motor circuits by an Appointed Person in the holder department.)

When HV switching results in an abnormal configuration of the electrical power system, the configuration shall be clearly communicated and documented (i.e. substation or control room diagram, substation log book, etc.) so that both electrical personnel and holder department personnel are aware of the potential affect on the security (availability) of the electrical supply to the main plant at the installation. For example:

- When a plant or unit is normally supplied by two or more feeders/transformers and one of the feeders/transformers is out of service.
- When restrictions are imposed on starting large motors, etc.
- When the supply capacity is restricted or a subsequent generator/ feeder circuit failure might require load shedding of selected plant to safeguard more vital supplies.

6.3 LOW-VOLTAGE SWITCHING

LV switching, including the isolation and de-isolation of electrical equipment where there is a possibility of back feeds, shall be carried out or coordinated by a Senior Authorised Electrical Person or an Authorised Electrical Person. A Competent Electrical Person may carry out the actual LV switching operations, but only under the guidance and in the presence of the Senior Authorised Electrical Person or Authorised Electrical Person who is coordinating the switching.

All other switching of LV electrical equipment without the possibility of back feeds may be carried out by a Competent Electrical Person or an Appointed Person who is authorised to carry out specified items of LV switching.

Documented switching programmes shall be developed for complex LV switching sequences. LV switching programmes should be prepared by the individual performing the switching, and approved or authorised by the Senior Authorised Electrical Person or an Authorised Electrical Person.

Documented switching programmes are not required when LV switching is carried out to avoid immediate danger to life or damage to electrical equipment. The person who takes the action should promptly inform the Senior Authorised Electrical Person.

6.4 ELECTRICAL ISOLATION (DE-ENERGIZATION)

All electrical equipment shall be regarded as being live until properly isolated and proved to be dead.

Before carrying out any maintenance, repairs, alterations, cleaning, or testing on electrical equipment the equipment shall be isolated (de-energized) from its power source. Isolation is the disconnection from live conductors by an open isolator or adequate physical gap from all sources of supply so as to prevent electrical equipment being made live in error.

Provided that safe methods are used and that approved equipment, tools and instruments required for testing are properly insulated for the rated voltage of the circuit, electrical isolation of LV electrical equipment is not required for diagnostic testing or adjustments. An additional Competent Electrical Person may need to accompany the Competent Electrical Person performing the work depending on the hazards of the work.

The operation of switching out a circuit and making it dead from all sources of supply does not by itself provide proper isolation of that circuit.

Safety padlocks (lock out devices) shall be applied to points of isolation for electrical equipment to prevent de-isolation or unexpected start-up until the safety padlock (lock out device) is removed. Caution notices (tagout tags) shall also be attached at all points of isolation from live sources of supply, to warn personnel not to interfere with such points of isolation, as work or testing may be taking place on electrical equipment.

NOTE: If a BU decides not to adopt the use of safety padlocks with unique keys, any padlocks or locks used to secure points of isolation for LV electrical equipment should be of a special series and the master keys to these shall only be issued to Authorised Electrical Persons. Similarly, if a BU decides not to use lock-out boxes to contain keys of padlocks used to secure points of isolation they shall provide an alternative 'safe method of work' to ensure that such keys cannot be used in error for the de-isolation of LV electrical equipment on which work or testing is still being carried out.

If electrical equipment does not have facilities for applying safety padlocks (lockout device) at points of isolation, additional steps shall be taken to protect workers from unexpected deisolation and startup. These steps may include one or more of the following: removal of fuses, racking out of circuit breakers or contactors, disconnecting of circuit conductors, etc. Caution notices (tagout tags) shall also be attached at all points of isolation, from live sources of supply, to warn personnel not to interfere with such points of isolation as work or testing may be taking place on the electrical equipment.

Before work is done on equipment that has been isolated, test equipment shall be used to verify that the circuit elements and equipment parts are deenergized. The test shall also determine whether any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been deenergized. The approved test equipment shall be checked immediately before and after use to make sure it is working correctly.

If mechanical work is to be carried out on plant equipment driven by electrical equipment, e.g. motors, the circuit incorporating the electrical equipment concerned shall be isolated in accordance with the requirements in this section, except for voltage verification, which is not required.

6.5 EARTHING (GROUNDING)

6.5.1 High voltage

Before work or testing is carried out on HV electrical equipment that is part of the electrical power system, the equipment concerned shall be de-energized, isolated and earthed. Earthing shall be carried out by a Senior Authorised Electrical Person or a Competent Electrical Person in the presence of the Senior Authorised Electrical Person. All conductors of a circuit shall be earthed by short-circuiting and effectively connecting the conductors to earth. Any of the following earthing methods are acceptable:

- HV earthing switches

After closing to earth, the HV earthing switch shall have a safety padlock applied, locking it into the earth position, and an earthed notice attached.

- Circuit breakers

A circuit breaker is closed to make the earth connection. The circuit breaker should have its trip feature made inoperative before closing to earth. After closing to earth the circuit breaker shall have a safety padlock applied locking it in the earth position. An earthed notice shall be attached to the circuit breaker to indicate it is in the earth position.

- Temporary earthing leads

Before approved temporary earthing leads are installed, it shall be verified by means of an approved HV testing device, suitable for the rated voltage of the circuit, that all conductors of the HV electrical equipment are de-energized. Then approved portable earthing leads with an approved insulating pole shall be applied to all conductors.

6.5.2 Low voltage

If work is to take place on a LV switchboard's isolated busbars or its incoming connections, which are directly fed from a HV/LV transformer, a circuit main earth shall be applied on the HV side of the transformer circuit or, if necessary for operational safety reasons, applied on the LV switchboard's busbars. Any circuit main earth applied on the HV side of the transformer circuit shall be applied in accordance with the HV earthing methods in (6.5.1).

If there is a possibility of induced voltages, stored electrical energy or unexpected energization due to backfeed, LV electrical equipment shall be earthed in addition to the required de-energization and isolation. LV electrical equipment isolation and earthing may be performed by a Competent Electrical Person.

7. GUARDING

Guarding shall be used, as necessary, when performing electrical work in close proximity to exposed live electrical equipment to prevent accidental contact. Guarding includes the use of covers, shields, barriers, screens or mats to eliminate the possibility of inadvertent contact by persons or objects to exposed live parts.

8. ELECTRICAL PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE appropriate for the task shall be worn by persons working on or near live electrical equipment to protect them from shock and/or arc flash hazards. When work is carried out on electrical equipment constructed with arc containment technology, arc flash PPE is not required if the work being done is in accordance with the equipment design.

9. ELECTRICAL SAFETY DOCUMENTS

9.1 GENERAL

Each BU's permit-to-work system shall address the hazards associated with working on or near electrical equipment. This system shall include Electrical Permit-to-work and Sanction for Test documents. The permit-to-work system shall also include provisions for limiting access to electrical equipment (e.g. barriers, signs, or a Limitation of Access form).

Any electrical safety documents required by the ESRs are always additional to those required by the BU permit-to-work system.

A list of typical electrical safety procedures is given in Appendix 1, Annex 1.9.

9.2 ELECTRICAL PERMIT-TO-WORK (EPTW)

The EPTW applies to the following:

- Work on any HV electrical equipment connected to the HV electrical power system.
- Work on a LV switchboard's busbars or its incoming connections, which are directly fed from a HV/LV transformer and where it may be considered necessary to apply a circuit main earth.

The EPTW shall be issued and signed by a Senior Authorised Electrical Person and given personally to the Competent Electrical Person in charge of the work to be carried out. The EPTW shall state the electrical equipment that has been isolated and the circuit main earths that have been applied.

The Senior Authorised Electrical Person shall jointly field verify with the recipient of the EPTW that all the conditions of the EPTW have been addressed. The recipient shall then sign the receipt section of the EPTW. The recipient of the permit shall review the EPTW conditions with all persons working on the equipment prior to the start of the work.

The EPTW shall remain at the work site at all times whilst the work is being carried out.

When the work on the electrical equipment for which the EPTW has been issued is completed, the recipient signs the clearance section and returns it to the Senior Authorised Electrical Person. After the removal of all circuit main earths, and caution, danger and earthed notices, etc., the Senior Authorised Electrical Person cancels the EPTW. Returning electrical equipment to service shall be in accordance with the BU's permit-to-work system and shall follow the applicable switching requirements in (6).

9.3 SANCTION FOR TEST (SFT)

Before testing is carried out on HV electrical equipment that is capable of being made live from the electrical power system, a Sanction for Test (SFT) shall be issued by the Senior Authorised Electrical Person to an authorised person in charge of the testing.

The SFT shall state the equipment that has been isolated, earthed and ready to test. The SFT shall also state the circuit main earths that may be removed and replaced to allow testing to take place.

The Senior Authorised Electrical Person shall jointly field verify with the recipient of the SFT that all the conditions of the SFT have been addressed. The recipient shall then sign the receipt section of the SFT. The recipient of the SFT shall coordinate all testing operations on isolated electrical equipment and may remove and replace the circuit main earths as necessary, subject to the provisions of the SFT, to carry out the testing.

When the testing on the electrical equipment for which the SFT has been issued is completed, the recipient signs the clearance section and returns it to the Senior Authorised Electrical Person. After the removal of all circuit main earths, and caution, danger and earthed notices, etc., the Senior Authorised Electrical Person cancels the SFT.

If an EPTW has been issued, then a SFT shall not be issued on the same electrical equipment until that document has been cleared and cancelled.

The SFT shall remain at the work site at all times when testing is being carried out.

9.4 LIMITATION OF ACCESS (LOA)

An LOA can be used when work is carried out in close proximity to exposed live electrical equipment. An example is ground level work in a HV substation that has exposed live overhead conductors from which safe working clearance distances shall be maintained by the working party.

If an LOA is utilized, an Authorised Electrical Person issues the LOA to the Competent Electrical Person in charge of the work to be carried out. The LOA identifies the work to be done and the safety precautions to be taken when working near exposed live conductors.

The Authorised Electrical Person shall jointly field verify with the recipient of the LOA that all the conditions of the LOA have been addressed. The recipient shall then sign the receipt section of the LOA. The recipient of the permit shall review the LOA conditions with all persons working under the LOA prior to the start of the work.

The LOA shall remain at the work site at all times while work is being carried out.

When the work for which the LOA was issued is complete, or the access in the vicinity of the specified electrical equipment is no longer required or allowed, the recipient signs the clearance section and returns it to the Authorised Electrical Person, who shall cancel it.

9.5 TRANSFER OF ELECTRICAL SAFETY DOCUMENTS

An electrical safety document shall not be transferred to another person. If work or testing is not completed by the recipient of an electrical safety document (e.g. because of a shift crew change), the work or testing shall be suspended and the clearance section of the document signed by the recipient.

The electrical safety document shall be cancelled and a new electrical safety document issued before work resumes.

10. ADDITIONAL PRECAUTIONS TO BE TAKEN ON SPECIFIC TYPES OF ELECTRICAL EQUIPMENT

BUs should include in their ESRs precautions to be taken when working on or near specific types of equipment with electrical hazards not already addressed in (1 through 9).

Examples that may be present at the site may include overhead lines and exposed conductors, electrical protection systems, live-line washing, portable equipment, and rotating equipment.

Sample procedures for some specific types of equipment are given in Appendix 1.

11. ELECTRICAL WORK AT CONSTRUCTION SITES

11.1 TEMPORARY CONSTRUCTION POWER

The design, installation and commissioning of a temporary electrical power distribution system that interfaces with existing electrical distribution systems shall be reviewed and approved by the Senior Electrical Authority or his designate, in accordance with the BU's engineering practices. When installed, a temporary electrical power distribution system shall be inspected/tested and its use approved by the Senior Authorised Electrical Person.

11.2 BU's ELECTRICAL SAFETY RULES AT CONSTRUCTION SITES

The BU's electrical safety rules shall apply to electrical work at construction sites except for green field sites where the BU or site management has prepared specific ESRs and operational instructions.

Any interface with the existing electrical power system, and the related operational responsibilities, shall be clearly defined before any commissioning takes place.

Switching operations to carry out isolations or earthing of existing electrical equipment or interfaces with temporary electrical power distribution systems shall be carried out or coordinated by the Senior Authorised Electrical Person of the area concerned.

Competent contractor personnel are allowed to carry out switching on temporary distribution electrical power systems.

As soon as the first connection is made between the new electrical equipment and the BU HV electrical power system (or even LV if a transformer is connected to a LV switchboard), the new electrical equipment is no longer part of a construction site or enclosure. It becomes part of an operational substation and shall come within the scope of the BU's ESRs. In addition, persons involved in the site construction or entering the substation shall be informed through activities such as safety meetings, notifications, signs, etc., as applicable, that newly constructed electrical equipment is now energized or partially energized.

11.3 NOTICE OF COMMISSIONING PROCEDURE

Before any electrical connection is made between newly constructed electrical equipment and the BU HV electrical power system, the BU project engineer or project focal point responsible for the construction work shall issue a Notice of Commissioning or equivalent form to company representatives of contractors, manufacturers, consultants and other BU departments who are involved in the site construction of the substation and the overhead lines and cables terminating in it.

The BU electrical project engineer or project focal point shall confirm to the Senior Authorised Electrical Person (SAE) or his designate that all parties have been informed. The SEA or designate shall prepare a written switching procedure and coordinate the commissioning of the substation.

12. USE OF PORTABLE/TRANSPORTABLE ELECTRICAL EQUIPMENT

12.1 GENERAL

All portable and transportable electrical equipment shall be approved by the BU.

Prior to each use, the users shall inspect and verify that the portable and transportable electrical equipment is in good condition and approved for the use in the environment in which it is to be used.

12.2 PORTABLE (HAND-HELD) ELECTRICAL EQUIPMENT

Each BU shall have a procedure that identifies the portable electrical equipment that is acceptable for the use and environment and that identifies special precautions such as the use of ground fault circuit interrupters, low voltage equipment, etc.

In addition, portable electrical equipment used in hazardous (classified) areas shall be suitably certified for that area, or authorised for use by gas testing.

12.3 MOBILE GENERATORS IN TEMPORARY INSTALLATIONS

All mobile generators in temporary installations shall be inspected prior to their use. The condition of the temporary installation shall be inspected and tested to prevent unsafe situations at a frequency defined by the BU.

Persons designated to inspect and test mobile generators shall be authorised by the Senior Electrical Authority or his designate.

12.4 EXCAVATION

Each BU shall have a procedure to identify underground services and power cables and the necessary safety precautions to be used during excavation.

13. REFERENCES

In this DEP, reference is made to the following publications:

- NOTES:
1. Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.
 2. The DEPs and most referenced external standards are available to Shell staff on the SWW (Shell Wide Web) at <http://sww05.europe.shell.com/standards/>.

AMERICAN STANDARDS

Occupational Safety and Health Standards, Electrical

OSHA 29 CFR 1910,
Subpart S

Issued by:

*U.S. Department of Labor,
Occupational Safety & Health Administration,
200 Constitution Avenue, NW
Washington, DC 20210,
USA*

BRITISH STANDARDS

The Electricity at Work Regulations (UK Statutory Instrument 1989
No. 635)

Issued by:

*The Stationery Office,
TSO orders
PO Box 29
Norwich NR3 1GN
UK*

INTERNATIONAL STANDARDS

Protection against electric shock - Common aspects
for installation and equipment

IEC 61140

Safety of power transformers, power supplies,
reactors and similar products

IEC 61558

Issued by:

*Central Office of the IEC
3, Rue de Varembe
CH 1211 Geneva 20
Switzerland*

Copies can also be obtained from national standards organizations.

APPENDIX 1 EXAMPLE OF ELECTRICAL SAFETY RULES

This appendix provides a sample set of Electrical Safety Rules (ESRs) that can be adopted for use (in whole or in part) by a BU. This appendix does not apply unless it is adopted by the BU. If adopted, the BU shall review and modify these example ESRs as necessary to address BU or site-specific requirements as well as applicable regulations. See section (2.1) of this DEP regarding the contents of ESRs.

Applicable regulations may specify different requirements for the various caution/danger notices used for work involving electricity, such as the size, content, materials of construction and placement of the notice at the equipment or area where the electrical work is being performed. Furthermore, larger signage may be required on various types of electrical equipment and/or electrical installations. The examples provided in this Appendix are samples only and shall be reviewed for appropriateness with applicable regulations.

The BU's ESRs shall be consistent with the BU's overall permit-to-work system.

EXAMPLE ELECTRICAL SAFETY RULES

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A. INTRODUCTION

These Electrical Safety Rules (ESRs) establish the Company's requirements and safe work practices to be followed in the operations of electrical power systems and in carrying out work, or testing, on or near electrical equipment.

As it is impractical to cover all situations in detail, some of the requirements and recommendations are given in the form of checklists, while others describe the basic precautions to be used as procedures together with explanatory notes.

B. DEFINITIONS

B.1 shall

Indicates a requirement, deviation from which requires approval

B.2 should

Indicates a recommendation to be considered

B.3 additional earth

An approved earthing device that may be applied by the recipient of an electrical permit-to-work, or of a sanction for test, to electrical equipment in addition to the circuit main earths.

B.4 approved

Of a type or method acceptable for use in the company.

B.5 caution notice

A portable notice attached to points of isolation that warns persons not to interfere with, or to operate, the electrical equipment to which it is attached. See Annex 1.5.

B.6 circuit main earth

An earthing device applied to the main circuit conductors prior to the issue of an electrical safety document or sanction for test.

B.7 danger

Risk of injury or loss of life from electric shock, burns or other cause.

B.8 danger notice

A portable notice that warns persons that it is dangerous to approach or interfere with live conductors. These notices indicate to persons working or testing that adjacent electrical equipment is live. An example is given in Annex 1.6.

B.9 dead (de-energized)

Equipment at or about zero potential and disconnected from any live electrical power source.

B.10 de-isolation

Electrical equipment that has been restored to its normal service position from its previously isolated position.

B.11 earth, earthed or earthing (ground, grounded, grounding)

Connected to the general mass of earth in such a manner that the body being earthed discharges immediately any electrical energy stored in it and furthermore is maintained at a safe potential with respect to the general mass of earth.

B.12 earthed notice (grounding tag)

A portable notice that warns persons where temporary earths are installed.

B.13 electrical equipment

The electrical machines, apparatus and circuits forming part of an electrical installation of an electrical power system.

B.14 electrical power system

All electrical installations and electrical equipment provided for the purpose of generating, transmitting and distributing electricity.

B.15 electrical safety documents

a) electrical permit-to-work (EPTW)

A form issued by a Senior Authorised Electrical Person to a Competent Electrical Person in charge of the work to be carried out on specified high voltage electrical equipment, or a low voltage switchboard's bus bars, after they have been made dead, isolated from all live conductors, and connected to earth.

The electrical permit-to-work identifies the electrical equipment that has been isolated and the circuit main earths that have been applied.

b) sanction for test (SFT)

A form issued by a Senior Authorised Electrical Person to an Authorised Electrical Person in charge of the testing of specified high voltage electrical equipment that has been made dead, isolated from all live conductors, is connected to earth and is prepared to carry out testing.

The sanction for test identifies the high voltage electrical equipment that has been isolated and the circuit main earths that have been applied. It also identifies which circuit main earths may be removed and replaced to allow testing to be carried out.

c) limitation of access (LOA)

A form issued by an Authorised Electrical Person to a Competent Electrical Person defining the limits and nature of electrical work that may be carried out in the vicinity of exposed live electrical equipment.

The limitation of access identifies the conductors that are exposed and live, the electrical safety precautions that have been taken and the procedures to be followed by those carrying out the work.

B.16 electrical safety operating procedures (ESOPs)

Instructions that are issued by the Senior Electrical Authority to supplement any electrical safety rules and to define policies to assist in their implementation

B.17 exposed

Not suitably guarded, isolated, or insulated.

B.18 high voltage (HV)

Any electrical equipment that is normally operated at a voltage exceeding 1000 V.

B.19 hazardous (classified) area

An area in which safety precautions are necessary because of a possible flammable atmosphere.

B.20 holder/operating department

The department that is the asset holder/custodian and/or operates the site or electrical equipment on which work or testing is to be carried out.

B.21 isolated or isolation

Disconnected from live conductors by an open isolator or adequate physical gap and from all sources of supply, so as to prevent electrical equipment being made live in error.

B.22 live

Electrically charged.

B.23 live-line working

Work on live high voltage overhead exposed conductors using approved insulated tools and methods.

B.24 live-line washing

Washing of live high voltage insulators on overhead lines and outdoor-substations with exposed conductors using approved equipment and methods.

B.25 lock-out box

An approved device, fitted with at least two locks, which may be used for the secure retention of all safety padlock keys used to lock means of isolation, earthing or other safety devices.

B.26 low voltage (LV)

Any electrical equipment that is normally operated at a voltage not exceeding 1000 V.

B.27 mechanical work

Non-electrical work on dead electrical equipment that does not require access to electrical conductors.

B.28 operations (in electrical power systems)

Actions, by which electrical equipment is connected to, disconnected or isolated from an electrical power system. It also includes the earthing of electrical equipment and the switching, isolation and earthing of electrical distribution circuits.

B.29 persons

a) appointed person

A person authorised by the company, normally not from electrical staff, who is trained on performing specified duties on electrical equipment, e.g. starting or stopping electric motors.

b) competent person

A person authorised by the company who has sufficient technical knowledge or experience to perform work safely.

c) competent electrical person (CEP)

A person authorised by the company to carry out specified LV operations on electrical power systems and work on electrical equipment.

d) authorised electrical person (AEP)

A Competent Electrical Person authorised by the company, to supervise or to carry out specified operations on high and low voltage electrical power systems and work on electrical equipment.

The authorisation may include the authority to receive a sanction for test, issue and cancel limitations of access and to perform the necessary safety procedures associated with such work or testing.

e) senior authorised electrical person (SAEP)

An authorised electrical person authorised by the company, to initiate work on high voltage electrical equipment.

The authorisation includes the authority to issue and cancel all electrical safety documents and to perform the necessary safety procedures associated with the issue/cancellation of such documents.

f) senior electrical authority (SEA)

An individual with an electrical engineering degree, authorised by the company, to develop the company's or site's electrical safety rules and to oversee the assessment of electrical competency, training and experience of persons operating and working on electrical equipment.

B.30 remote control

Control of an operation from a distance. This involves a link, usually electrical, between the control device and the electrical equipment to be operated.

B.31 safety padlock (or safety locks)

Padlocks or locks of a non-standard or unique type that are individually keyed (one person, one lock) and used to lock switches, isolators and earthing devices, at points of isolation from where electrical equipment being worked on could be made live.

B.32 standard electrical padlocks (or locks)

Padlocks or locks of an approved type fitted to prevent access by unauthorised persons to substations, or electrical equipment where an electrical safety document is not in force.

B.33 substation

Any defined area within a building or outdoor enclosure which contains high voltage or low voltage electrical equipment such as switchgear or transformers.

B.34 switching

Operation of circuit breakers, isolators, fuses or other methods of making or breaking an electrical circuit, including the isolation and de-isolation of electrical equipment.

B.35 switching programme

A schedule that lists in order the switching necessary to carry out a particular purpose on an electrical power system or circuit.

B.36 testing

Any activity that requires application of a voltage from an auxiliary source to determine the electrical insulation or the operational condition of electrical equipment.

B.37 work

Any activity that requires the installation, repair, removal, replacement, alteration, extension, adjustment or cleaning of electrical equipment forming part of an electrical power system.

B.38 working party

The persons under the direct supervision of a person issued with an electrical safety document, i.e. an EPTW, an SFT or an LOA.

B.39 work permit

A form signed, issued and cancelled, usually by a representative of the holder department, in accordance with the company's general permit-to-work system.

A work permit can take the form of, but is not limited to, hot work permit, cold work permit, clearance certificate, safety certificate and fire permit.

C. GENERAL REQUIREMENTS FOR ELECTRICAL SAFETY

C.1 GENERAL

Many factors have an impact on electrical safety. Taking into account the following principles can reduce potential hazards:

- Select electrical power systems suitable for the operational requirements, environment and competence of personnel
- Clearly define authority and responsibilities of personnel
- Establish clear procedures for all work and testing
- Provide up-to-date, readily accessible information for electrical equipment, electrical power systems and procedures
- Train personnel at all levels and regularly check their competence
- Apply a programme for the monitoring of equipment condition
- Establish and maintain an effective housekeeping programme
- Carry out regular operational audits to ensure safe operating conditions and adherence to ESRs

The electrical equipment shall be:

- Suitable for the environment in which it is to be installed, e.g. weather, dust, fumes, hazardous atmospheres and rough use
- Manufactured and tested to relevant up-to-date standards
- As simple as possible to understand and operate
- Standardised as far as is reasonably practicable to promote understanding of and familiarity with, the installation, its operation and maintenance requirements, and to make the stocking of spares viable
- Spared where necessary to allow for maintenance outages
- Capable of being readily isolated, allowing necessary maintenance to be undertaken safely with the minimum of inconvenience to operating regimes
- Adequately labelled and identified so as to clearly indicate duty, source of supply and other possible sources of electrical danger.

C.2 PERSONNEL INVOLVEMENT

All persons who may be concerned with the operations in electrical power systems and work or testing on electrical equipment shall be aware of, understand and comply with the company's or site's ESRs, as applicable, that apply to any operations, work or testing they will undertake on electrical power systems and electrical equipment.

Every person shall report immediately to their supervisor or to electrical personnel any potentially unsafe situations or conditions, or any instance of electrical equipment that is or is suspected of being in an unsafe condition. The notified supervisor or electrical personnel shall immediately take the necessary measures to notify the appropriate personnel and/or evaluate and address the reported conditions, as applicable.

Any person objecting on safety grounds to any instructions given to him regarding the switching of HV or LV electrical equipment or work or testing on electrical equipment shall make these objections clearly known to the person issuing them. The matter shall then be resolved before the switching, work or testing is started.

A failure of supply, from whatever cause, to or from any part of an electrical power system should be reported at the first possible opportunity to the Senior Electrical Authorised Person responsible for the circuits affected.

It is the responsibility of location management that ESRs and electrical safety operating procedures (ESOPs) are robust by carrying out periodic audits and reviews, which should include a review of audits carried out by the Senior Electrical Authority.

C.3 REQUIREMENTS FOR SUBSTATIONS

Every substation and its electrical equipment should be under the control of a Senior Authorised Electrical Person.

Each substation building of more than 6 metre length shall have at least two doors. These doors should be outward-opening and made in such a way that they can be opened easily without keys from the inside in case of emergency (panic doors).

All designated entrances to substations shall have fixed danger signs and clear instructions on the outside of the building stating that fires should only be tackled with CO₂ extinguishers.

Inside each substation or switch room at least one CO₂ fire extinguisher of sufficient capacity shall be present. Such extinguisher(s) should be located close to the doors for easy access. In general no fixed or automatic fire fighting facilities should be provided.

A smoke detection system comprising very early smoke detection apparatus (VESDA) should be installed in main substations. Where practicable, a common alarm should be routed from each substation directly to the plant's central fire and gas alarm system, i.e. independent of the substation alarm annunciator.

Where a fixed CO₂ or similar installation is installed in a substation, a switch to shut off the installation should be available near the entrance doors. There should be indicator lamps to show whether the installation is switched on or off. Upon entering the substation, the installation should be switched off and restored to the normal switched on position whenever the substation is unoccupied.

An audible/visible alarm should be installed to indicate when a fixed fire-extinguishing system has operated.

Each main HV substation should have its own telephone and a list of relevant telephone numbers of electrical personnel, all other associated substations and, where applicable, the power plant control room. Telephone numbers of emergency services should also be included, e.g. fire and medical departments.

A key diagram of the electrical power system with a clear indication of the associated switchgear showing the normal position, open or closed, of the switches, incomers, sectionalisers, bus couplers and distribution circuits should be clearly visible on a wall in each main HV substation.

A notice should be posted in each substation containing instructions for the resuscitation of persons exposed to electric shock. Approved means of removing persons still in contact with live electrical equipment should be available.

A number of caution notices, danger notices and earthed notices should be kept in each HV substation.

A logbook should be available in every substation to record any operations, issue/cancellation of electrical safety documents and to indicate deviations from normal situations or any special operational instructions/requirements.

All substations should be clearly identified, by application of a rational, site-wide numbering system.

Standard electrical padlocks used on doors giving access to substations shall be different from locks used on doors to non-electrical installations or premises.

Keys to standard electrical locks giving access to substations should only be in the possession of a Competent Electrical Person or an Authorised Electrical Person, or in some operational situations an Appointed Person. These persons should sign for receipt of such keys and be responsible for ensuring that they are not used by unauthorised persons.

The Senior Electrical Authority should maintain a register recording the issue of operational keys to the company's and contractor's personnel.

C.4 REQUIREMENTS FOR MARKETING, DISTRIBUTION AND RETAIL FACILITIES

The electrical facilities at marketing and distribution depots and filling stations shall have ESRs appropriate for the complexity of the operation. It shall be the responsibility of the company's or site's management, as applicable, to establish an electrical focal point, who will monitor compliance with safe practices established in the ESRs and applicable regulations.

The electrical facilities shall be subjected to regular inspections by persons authorised by the Senior Electrical Authority (or by an electrical safety focal point where there is no Senior Electrical Authority) to verify that:

- no unauthorised modifications have occurred;
- electrical safety systems are operative; and
- local staff are familiar with basic electrical safety concepts

D. RESPONSIBILITIES FOR ELECTRICAL POWER SYSTEMS

D.1 GENERAL

The company's or site's management, as applicable, shall take the necessary steps to establish Electrical Safety Rules (ESRs) as necessary, and designate a Senior Electrical Authority at the site.

The Senior Electrical Authority may be unable to carry out all the necessary activities alone and further delegation may be necessary. For that reason an authorisation system shall exist which identifies the required competencies that each person shall satisfy to perform the duties he/she is called upon to carry out. Moreover, each person involved shall be absolutely clear as to his duties and the extent of his authority to act.

D.2 RESPONSIBILITIES FOR OPERATIONS IN ELECTRICAL POWER SYSTEMS

The responsibilities for operations on items of electrical equipment shall be clearly defined so the personnel in both the holder department and the electrical department are aware of the scope and limits of their operational duties.

- NOTES:
1. The starting and stopping of motors, the synchronising of generators etc. is normally the responsibility of the holder department concerned.
 2. In view of the risks involved in switching operations in electrical power systems, such electrical power systems should be under the control of a Senior Authorised Electrical Person (except circuits to individual items of equipment, e.g. motors). The authorisation for switching, especially where back feed is possible, should normally be limited to Senior Authorised Electrical Persons, who shall have the necessary training and experience to carry out such switching duties.

The responsibility for the isolation, earthing or testing of electrical equipment is normally that of electrical personnel.

For isolation of electrical equipment the following exceptions could be made by the company's or site's management:

- a) Isolation of instrument supply lines may be carried out by an Appointed Person of the instrument department;
- b) Isolation of other LV electrical equipment, e.g. motors and heaters, may be carried out by a suitably trained Appointed Person of the holder department under the following conditions:
 - the work to be done is of a mechanical (non-electrical) nature; and
 - isolation can safely be performed by means of special devices such as load switches mounted on the switchgear panel or near the electrical equipment, which can be operated without the need to open switchgear panels.

E. AUTHORISATION OF PERSONNEL

E.1 GENERAL

No person shall be allowed to carry out operations, work or testing on any part of the electrical power system unless they meet the requirements of the company's competency programme and are authorised to perform the task.

Before being authorised by company's or site's management, the Senior Electrical Authority of the location shall assess and establish that each person has the necessary knowledge, training and experience to undertake the responsibilities of the authorisation. The Senior Electrical Authority shall establish that the person concerned is competent and has sufficient technical knowledge to perform safely the duties and activities to be carried out.

Authorisations shall be made in writing, stating clearly the category of authorisation and the activities for which the person is appointed. Before a Competent Electrical Person, an Authorised Electrical Person or a Senior Authorised Electrical Person is appointed it shall be established that the person fulfils the following important requirements:

- Adequate knowledge of electrical theory;
- Hazards associated with electricity;
- Adequate experience of work or testing on electrical equipment;
- Adequate detailed knowledge of the electrical power system upon which work or testing is to be carried out.
- Adequate level of knowledge and understanding of these electrical safety rules and operational procedures.
- Hazardous (classified) area equipment.
- First aid and resuscitation
- Switching, earthing and isolation of equipment
- Initial and refresher training

E.2 TRAINING

All Appointed Persons, Competent Persons, Competent Electrical Person, Senior Authorised Electrical Persons, and Senior Electrical Authorities shall complete training and have the required experience to perform their respective job duties involving electrical work.

Any training programmes should normally include:

- General safety course that includes instruction on the requirements of the company's permit-to-work system.
- Operational course for training in the scope and intention of these ESRs.
- Hazardous area equipment.
- First aid and resuscitation.
- On-the-job training to allow the familiarise candidates with the duties they will have to undertake on the electrical power system. These duties could include switching and earthing of electrical equipment under the supervision of a Senior Authorised Electrical Person or an Authorised Electrical Person.

E.3 ASSESSMENT

Suitably trained, experienced and competent candidates shall be assessed by the Senior Electrical Authority or his nominee, to establish that they have the necessary academic qualifications and operational experience appropriate to the category of authorisation. This assessment may take the form of theoretical tests and practical demonstrations.

NOTE: Before a candidate is appointed as an Appointed Person the Senior Electrical Authority shall establish that the candidate is competent and has received the necessary training and has the experience to undertake safely the limited tasks detailed on his/her certificate of authorisation.

E.4 RENEWAL OF AUTHORISATION

All certificates of authorisation shall be valid for not more than three years.

It is the responsibility of the authorised person to ensure that his certificate of authorisation is valid.

When renewing a person's certificate of authorisation the following aspects should be considered:

- Whether the person still carries out work or switching that requires this category of electrical authorisation
- Changes to the electrical power system and/or the introduction of new types of electrical equipment for which additional skills or training may be required
- Whether any refresher training is necessary.

The Senior Electrical Authority or designee shall reassess any person for the renewal of their authorisation.

NOTE: The Senior Electrical Authority may delegate this responsibility to the Senior Authorised Electrical Person of the areas concerned, but remains ultimately responsible for the authorisation of electrical personnel.

F. SWITCHING, ISOLATING AND EARTHING PROCEDURES

F.1 SWITCHING ON ELECTRICAL POWER SYSTEMS

F.1.1 High-voltage switching

HV switching shall be carried out or coordinated by a Senior Authorised Electrical Person or an Authorised Electrical Person.

Under all circumstances, including failure of electrical supply, all electrical equipment shall be regarded as being live until properly isolated and proved to be dead.

HV switching should normally be carried out only after a written switching programme has been agreed.

Switching programmes should be prepared by either a Senior Authorised Electrical Person, or an Authorised Electrical Person and then checked and agreed by a Senior Authorised Electrical Person or the Senior Electrical Authority.

When telephone or radio messages are being used by the Senior Authorised Electrical Person or Authorised Electrical Person to co-ordinate HV switching operations, each instruction should be repeated back in full before the operation takes place.

The Senior Authorised Electrical Person or Authorised Electrical Person co-ordinating the HV switching should speak directly to the person who is to carry out the operation.

The opening and closing of HV circuit breakers by remote control may be carried out unaccompanied by a Senior Authorised Electrical Person, an Authorised Electrical Person, or an Appointed Person (whose Certificate of Authorisation allows him to carry out selected items of HV switching from a Control Room or by remote control from some other location).

HV switching, including the isolation and de-isolation of electrical equipment, could be carried out by a Senior Authorised Electrical Person or an Authorised Electrical Person, possibly accompanied by a Competent Electrical Person depending on the type of switchgear, its ease of operation and physical location on the work site. The Competent Electrical Person may carry out the actual HV switching operations, but only under the direct supervision and in the presence of the Senior Authorised Electrical Person or Authorised Electrical Person who is responsible for that switching.

Selected items of HV switching may be carried out by an Appointed Person if it is specified on his certificate of authorisation (This could include the opening and closing of HV motor circuits by an Appointed Person in the holder department). However, a Senior Authorised Electrical Person or an Authorised Electrical Person may carry out emergency HV switching items to restore vital supplies, accompanied by an Appointed Person or Competent Person. The Senior Authorised Electrical Person, or the Authorised Electrical Person, should carry out these HV switching items themselves in the presence of an Appointed Person or a Competent Person.

HV switching, whether planned or in an emergency, should be timed and recorded in writing (substation logbook) by the Senior Authorised Electrical Person, Authorised Electrical Person or Appointed Person responsible for the operation.

When any HV switchgear device in service shows any signs of abnormality, or appears to be making unusual noises, its condition should be reported to the Senior Authorised Electrical Person who shall decide what action is necessary before any further operation of that unit takes place.

In situations where emergency HV switching is carried out to avoid danger to life or damage to electrical equipment, the person who took the action should promptly inform the Senior Authorised Electrical Person.

If HV switching results in an abnormal running arrangement of the electrical power system, this shall be clearly indicated on the diagram in the main substation, or on the plant control room diagram. This is to ensure that both electrical personnel and holder department personnel are aware of the abnormal operational situation and can appreciate its affect on

the security of supplies to the main plant at the installation. These deviations from the normal operational arrangement should also be recorded in the substation logbook.

- NOTES:
1. When a plant or unit is normally supplied by two or more feeders or transformers, the holder department shall be advised when one feeder/transformer is not available for any reason. The holder department shall always be informed when restrictions have to be imposed on starting large motors, etc.
 2. The same advice applies when the supply capacity is restricted or when a subsequent generator/feeder circuit failure might require load shedding of selected plant to safeguard more vital supplies.

F.1.2 Low-voltage switching

Switching, including isolation and de-isolation, of a LV switchboard's bus bars or its incoming circuits and on LV electrical equipment where there is a possibility of back feeds, shall be carried out or coordinated by a Senior Authorised Electrical Person or an Authorised Electrical Person possibly accompanied by a Competent Electrical Person depending on the type of switchgear, its ease of operation and physical location on the work site. A Competent Electrical Person may carry out the actual LV switching operations, but only under the guidance and in the presence of the Senior Authorised Electrical Person or Authorised Electrical Person who is co-ordinating the switching.

All other switching of LV electrical equipment, without the possibility of back feeds could normally be carried unaccompanied by a Competent Electrical Person or an Appointed Person who is authorised to carry out specified items of LV switching.

In situations where emergency LV switching is carried out to avoid danger to life or damage to electrical equipment, the person who took the action should promptly inform the Senior Authorised Electrical Person.

If the LV switching takes place in a substation then the operations should be recorded in the substation logbook.

Complex sequence of LV switching involving more than a few items of operations, should first be detailed on a switching programme before starting.

F.2 ISOLATION

The definition of isolation calls for the disconnection from live conductors by an open isolator or adequate physical gap from all sources of supply so as to prevent electrical equipment being made live in error.

NOTE: The operation of switching out a circuit and making it dead from all sources of supply does not by itself provide proper isolation of that circuit.

The HV and LV switchgear controlling HV electrical equipment is normally provided with adequate facilities for applying safety padlocks to such points of isolation for electrical equipment to prevent de-isolation taking place in error. Caution notices shall also be attached at all points of isolation from live sources of supply, to warn personnel not to interfere with such points of isolation, as work or testing may be taking place on HV electrical equipment under an electrical permit-to-work or a sanction for test.

Some LV circuits have no facilities for applying safety padlocks at points of isolation, so fuses shall be withdrawn and contactors racked out. Caution notices shall also be attached at all points of isolation, from live sources of supply, to warn personnel not to interfere with such points of isolation as work or testing may be taking place on LV electrical equipment.

When mechanical work is to be carried out for on plant driven by HV or LV electrical equipment, e.g. motors, the circuit incorporating the electrical equipment concerned shall be isolated by an Authorised Electrical Person (for HV electrical equipment) or by a Competent Electrical Person (for LV electrical equipment) or an Appointed Person as defined above.

F.3 EARTHING

Before work or testing is carried out on HV electrical equipment that is part of the electrical power system, the equipment concerned shall be de-energized, isolated and earthed by a

Senior Authorised Electrical Person in the presence of a Competent Electrical Person. All conductors of a circuit shall be earthed by short-circuiting and effectively connecting the conductors to earth. Earthing shall be carried out by a Senior Authorised Electrical Person or a competent Electrical person in the presence of the Senior Authorised Electrical Person.

F.3.1 Earthing of HV electrical equipment

In certain switchgear arrangements, fully interlocked fault-rated earthing switches are incorporated in motor circuits. Under these conditions the earthing of the circuit may be carried out by an Authorised Electrical Person.

If the construction of the electrical equipment allows, then before a circuit main earth is applied to dead and isolated electrical equipment, it shall be proved dead using an approved HV testing device.

NOTE: Circuit breakers that control motor circuits may be installed with automatic earthing facilities that make it impractical to prove the motor is dead with an approved HV testing device before applying the circuit main earth.

F.3.2 HV earthing switches

Whenever possible, HV earthing switches should be used to earth HV electrical equipment. After closing to earth the HV earthing switch shall have a safety padlock applied locking it into the earth position and an earthed notice attached.

F.3.3 Other HV earthing methods

Where HV earthing switches are not provided then the following alternative methods for applying circuit main earths are acceptable:

- A circuit breaker is closed to make the earth connection. The circuit breaker should normally have its trip feature made inoperative before closing to earth. After closing to earth, the circuit breaker shall have a safety padlock applied locking it in the earth position. An earthed notice shall be attached to the circuit breaker to indicate it is in the earth position, or
- By first checking all conductors of the HV electrical equipment with an approved HV testing device, suitable for the rated voltage of the circuit, to ensure they are dead. Then apply approved portable earthing leads with an approved insulating pole to all conductors.

If portable earthing leads are to be used the following procedures shall be carried out in sequence.

- Check the circuit to be earthed is isolated.
- Prove that each phase of the circuit is dead with an approved HV testing device, suitable for the rated voltage of the circuit. The approved HV testing device shall be checked immediately before and after use to make sure it is working correctly.
- Examine the portable earthing leads immediately before use to check they are in good condition.
- Connect the portable earthing leads to the earth before securing them to the phase conductors. Care should be taken to ensure that good contact is made.
- Earth and short-circuit all phases, even if work is to be carried out on one phase only.
- When removing the portable earthing leads, disconnect them from the phase conductors first and the earth last.

Whenever practicable, the HV electrical equipment should be earthed by the Senior Authorised Electrical Person in the presence of the intended recipient of the electrical permit-to-work or sanction for test.

F.4 EARTHING OF LV ELECTRICAL EQUIPMENT

If work is to take place on a LV switchboard's isolated busbars or its incoming connections, which are directly fed from a HV/LV transformer, the Senior Authorised Electrical Person shall either apply a circuit main earth on the HV side of the transformer circuit or may consider it necessary, for operational safety reasons, to apply a circuit main earth on the LV switchboard's busbars. Any circuit main earth applied on the HV side of the transformer circuit shall be applied in accordance with HV earthing methods as detailed in F.3.1.

If a circuit main earth is to be applied to the LV switchboard's busbars it shall be carried out generally as follows:

- Check that the LV busbars to be earthed are isolated.
- Check that each phase of the busbars is dead with an approved LV testing device suitable for the rated voltage of the circuit. The approved LV testing device shall be checked immediately before and after use to make sure it is working correctly.
- Examine the portable earthing leads, or LV earthing device, immediately before use to check they are in good condition.
- Connect the portable earthing leads, or LV earthing device, to earth before securing them to the phase and neutral conductors. Care should be taken to ensure that good contact is made.
- Earth and short circuit all phases and neutral, even if work is to be carried out on one phase only.
- When removing the portable earthing leads, or LV earthing device, disconnect them from the phase and neutral conductors first and the earth last.

LV electrical equipment isolation and earthing shall be performed by a Competent Electrical Person or more senior electrical person.

G. ELECTRICAL SAFETY DOCUMENTS

G.1 GENERAL

Any electrical safety documents required by the ESRs are always additional to those required by the company's permit-to-work system. This will avoid repeated and unnecessary references in the text of these ESRs for the need to obtain work permits before work or testing can start on or near electrical equipment.

Sections G.2, G.3 and G.4 detail the most commonly used electrical safety documents (see Appendices for typical specimen formats). They describe how these documents can be used and recommend the procedures that need to be adopted.

In addition to G.2, G.3 and G.4, the Company documents may also include the following:

- Isolation/de-isolation certificate:

A form of instruction signed by a responsible member of the asset holder department to a suitable Authorised Electrical Person to ensure the safe isolation of electrical circuits. This is usually a part of the asset holder permit system.

- Excavation certificate:

A form of declaration endorsed by all relevant service departments and issued under the Company's permit-to-work system to ensure that all underground services and power cables are identified and safe methods of excavation are used.

G.2 ELECTRICAL PERMIT-TO-WORK (EPTW)

The Electrical permit-to-work (Annex 1.1) applies to the following:

- Work on any HV electrical equipment connected to the HV electrical power system.
- Work on LV switchboard busbars or its incoming connections, which are directly fed from a HV/LV transformer and where it may be considered operationally necessary to apply a circuit main earth, either on the HV side of the transformer circuit, or on the LV switchboard busbars.

NOTE: For other LV electrical equipment, it should not normally be necessary to apply earths.

The person in charge of the working party to whom the electrical permit-to-work is issued shall be a Competent Electrical Person. The EPTW shall remain on the work site at all times while work is being carried out.

The electrical permit-to-work shall be issued and signed by a Senior Authorised Electrical Person and given personally to the Competent Electrical Person in charge of the work to be carried out. The electrical permit-to-work shall detail exactly which electrical equipment is dead, isolated and locked-off with safety padlocks from all live conductors, has been discharged, is earthed and caution, danger and earthed notices have been attached and on which it is safe to work.

The Senior Authorised Electrical Person shall jointly field verify with the recipient of the EPTW that all of the conditions of the EPTW have been addressed.

The electrical permit-to-work shall then be issued to the Competent Electrical Person in charge of the work who, after reading its contents to the Senior Authorised Electrical Person issuing it and satisfying himself that it is safe to work, signs the receipt section of the document.

When the work on the electrical equipment for which the electrical permit-to-work has been issued is completed, the recipient signs the clearance section and returns it to the Senior Authorised Electrical Person. After the removal of all circuit main earths, caution, danger and earthed notices, etc., the Senior Authorised Electrical Person cancels the electrical permit-to-work and may then carry out de-isolation to make the electrical equipment available for service.

G.3 SANCTION FOR TEST (SFT)

A SFT shall be issued by the Senior Authorised Electrical Person under whose approval the testing is initiated before the testing is carried out on any HV electrical equipment that is capable of being made live from the electrical power system.

If an EPTA has been issued, then a SFT shall not be issued on the same electrical equipment until that document has been cleared and cancelled.

The person in charge of the working party to whom the SFT is issued shall be an Authorised Electrical Person. The SFT shall remain at the work site at all times when testing is being carried out.

The SFT shall be issued and signed by a Senior Authorised Electrical Person and given personally to the person in charge of the testing to be carried out. The SFT shall detail exactly which electrical equipment is dead, isolated and locked-off with safety padlocks from all live conductors. The SFT shall state the equipment that has been isolated, earthed and ready to test. It shall also state which circuit main earths may be removed, and replaced, to allow the testing to take place.

The Senior Authorised Electrical Person shall jointly field verify with the recipient of the SFT that all of the conditions of the SFT have been addressed.

The SFT shall then be issued to the Authorised Electrical Person in charge of the testing who, after reading its contents to the Senior Authorised Electrical Person issuing it and satisfying himself that it is safe to carry out the testing, signs the receipt section of the document.

The recipient of the SFT shall be responsible for co-ordinating all testing operations on the isolated electrical equipment and for ensuring safety during the testing. The recipient may remove and replace the circuit main earths as necessary and carry out testing, including making live the electrical equipment concerned from a testing supply.

When the testing on the electrical equipment for which the SFT has been issued is completed, the recipient signs the clearance section and returns it to the Senior Authorised Electrical Person. The Senior Authorised Electrical Person removes all circuit main earths, caution, danger and earthed notices, etc., cancels the sanction for test and may then carry out de-isolation to make the electrical equipment available for service.

The HV electrical equipment that has been isolated and earthed to allow the SFT to be issued shall not be connected to the electrical power system until the SFT has been cleared and cancelled.

G.4 LIMITATION OF ACCESS (LOA)

An LOA can be used when work has to be carried out in close proximity to live LV conductors.

An LOA can also be used to allow access to substations where non-electrical activities are to be carried out and specific precautions need to be taken to ensure the working party have safe working conditions. An example is ground level work in a HV substation that has live overhead conductors from which safe working clearance distances shall be maintained by the working party.

An LOA can also be used to call for certain precautions to be taken when work or testing on control circuits associated with live HV electrical equipment is required.

The person in charge of the working party to whom the LOA is issued shall be a Competent Electrical Person. The LOA shall remain at the work site at all times while work is being carried out.

The LOA shall be issued and signed by an Authorised Electrical Person and be given personally to the Competent Electrical Person in charge of the work to be carried out. The

LOA identifies the work to be done, and the safety precautions to be taken when working near exposed live conductors.

The LOA shall be issued to a Competent Electrical Person by an Authorised Electrical Person under whose approval the work is initiated. The Competent Electrical Person, after reading its contents to the Authorised Electrical Person issuing it and satisfying himself that it is safe to work, signs the receipt section of the document.

The Authorised Electrical Person shall jointly field verify with the recipient of the LOA that all of the conditions of the LOA have been addressed.

When the work for which the LOA was issued is complete, or the access in the vicinity of the specified electrical equipment is no longer required, the recipient signs the clearance section and returns it to the Authorised Electrical Person, who shall cancel it.

NOTE: Work in close proximity to exposed live conductors should be avoided unless it is operationally necessary and then only take place if adequate safety precautions have been taken to prevent danger to the working party.

G.5 TRANSFER OF ELECTRICAL SAFETY DOCUMENTS

An electrical safety document shall not be transferred to another person. If work or testing is not completed by the recipient of an electrical safety document, e.g. because of a shift crew change, the work or testing shall be suspended and the clearance section of the document signed by the recipient.

The Senior Authorised Electrical Person shall then cancel the electrical safety document and issue a new electrical permit-to-work to a Competent Electrical Person or a new sanction for test to an Authorised Electrical Person.

An Authorised Electrical Person shall then cancel the limitation of access and issue a new limitation of access to a Competent Electrical Person.

H. PRECAUTIONS BEFORE WORKING ON OR TESTING HIGH VOLTAGE ELECTRICAL EQUIPMENT

H.1 GENERAL

No person shall carry out any maintenance, repairs, alterations, cleaning or testing on HV electrical equipment until:

- the parts are switched out from all possible points of supply and made dead.
- the parts are isolated from all possible points of supply including voltage transformers, auxiliary transformers and common neutral earthing equipment.
- safety padlocks have been applied at all isolated points of supply from the HV electrical power system and where practicable from the LV electrical power system. Caution notices have been completed and attached at all points of isolation.
- the parts are screened where necessary to prevent danger and danger notices have been completed and posted to identify adjacent live electrical equipment. Shutters of switchgear spouts containing live conductors have been locked with safety padlocks and danger notices completed and attached.
- the parts are Connected to earth by circuit main earths that have been applied at all points of isolation from HV supplies, or between such points and the point of work or testing. Earthed notices have been completed and attached to switchgear that has been used to apply the circuit main earths.
- an EPTW has been issued to a Competent Electrical Person (who may be accompanied by a Competent Person during the progress of the work if considered operationally necessary).

Alternatively the equipment shall be released for testing by the issue of a SFT to an Authorised Electrical Person who should be accompanied by a Competent Electrical Person during the progress of the testing.

For either of these alternatives the person receiving the EPTW or SFT shall be fully aware of the nature and limits of the work or testing to be done and shall understand the precautions he and his working party should take to avoid danger.

The Senior Authorised Electrical Person issuing the EPTW or SFT verifies that the precautions detailed in these recommendations are met.

H.2 USE OF SAFETY PADLOCKS AND LOCK-OUT BOXES

H.2.1 Lock-out boxes, isolations and circuit main earths

The keys to safety padlocks used to secure points of isolation and circuit main earths in position before the issue of an EPTW should be placed in a lock-out box or other approved safe place and not be removed until the EPTW has been cancelled. A key to the lock-out box should be given to the recipient of the EPTW to be retained by him until the recipient signs the clearance section of the document and returns it to the Senior Authorised Electrical Person.

H.2.2 Lock-out boxes, sanction for test

The keys to safety padlocks used to secure points of isolation before a SFT is issued should be placed in a lock-out box or other approved safe place and not be removed until the sanction for test is cancelled. A key to the lock-out box should be given to the recipient of the SFT to be retained by him until he signs the Clearance Section of the document and returns it to the Senior Authorised Electrical Person.

H.2.3 Lock-out boxes, testing and sanction for test

The keys to safety padlocks, used to secure circuit main earths, that need to be removed to allow the testing to be carried out, should be given to the recipient of the SFT so he can remove and replace these circuit main earths while testing. The recipient of the SFT shall

replace all the circuit main earths and re-lock the safety padlocks in position before signing the Clearance Section of the SFT and returning the keys to the Senior Authorised Electrical Person.

H.3 TESTING OF HIGH VOLTAGE ELECTRICAL EQUIPMENT

The following basic precautions should be taken when testing HV electrical equipment on work sites, either before it is connected to the electrical power system, or after it has been connected when a SFT to allow such testing will need to be issued.

The Authorised Electrical Person shall ensure that when a HV testing voltage is being applied, adequate precautions are taken to guard the electrical equipment to prevent danger both locally where the testing voltage is to be applied and at any remote ends.

Danger notices shall be completed and posted. Suitable warning tapes shall be used to enclose the testing area and the remote ends during the period that testing is taking place.

All electrical equipment, particularly cables, shall (SRD) be discharged to earth after the application of the testing voltage.

Temporary conductors used for applying the testing voltage shall be of adequate size and be easily visible.

Test connections shall not be applied in a cell or compartment in which there are exposed live HV conductors.

Only properly designed, maintained and approved testing equipment with well shrouded probes shall be used for applying HV tests. Where areas are set apart as test bays for such insulation testing, special arrangements shall be made so that the danger zone is adequately fenced, access points are suitably interlocked and controlled, and special arrangements have been made for the required functional earthing.

Test electrodes shall be provided with adequately insulated handles and discs and, where practicable, one pole of the HV supply should be permanently earthed.

Testing equipment shall be regularly calibrated and tested to ensure proper working at all times.

I. PRECAUTIONS BEFORE WORKING ON LOW VOLTAGE ELECTRICAL EQUIPMENT

I.1 GENERAL

No person shall carry out any maintenance, repairs, alterations, cleaning or testing on LV electrical equipment until such parts of the equipment are:

- switched out from all possible points of supply and made dead.
- isolated from all possible points of supply. The isolation should normally be carried out by opening circuit breakers or switches or by removing fuses/ links. The operating handles of these circuit breakers/switches shall be locked in the 'open' position with safety padlocks or other similar type locking devices. Caution notices shall be completed and attached at all points of isolation.
- screened where necessary to prevent danger and danger signs completed and posted to identify adjacent live electrical equipment. Where practicable, shutters or screens over live conductors should be secured with safety padlocks and danger notices completed and attached.
- proved dead with an approved LV testing device suitable for the rated voltage of the circuit. The LV testing device shall be checked immediately before and after use to check it is working correctly.
- released for work to a Competent Electrical Person. This Competent Electrical Person could be accompanied, if considered operationally necessary, by a Competent Person during the progress of the work when these electrical safety precautions have been completed.

The Authorised Electrical Person initiating this work verifies that the precautions detailed in these Recommendations are met.

I.2 USE OF SAFETY PADLOCKS AND LOCKOUT BOXES

The keys to safety padlocks used to secure points of isolation for work on LV electrical equipment should be placed in a lock-out box or other approved safe place and not be removed until the work is completed. A key to the lock-out box should be given to the Competent Electrical Person in charge of the work and be retained by him until the work is completed. Fuses and links removed to allow work on LV electrical equipment should not be replaced until the work is completed.

I.3 TESTING OF LOW VOLTAGE ELECTRICAL EQUIPMENT

Work should not normally be allowed to take place on live LV electrical equipment. However, in certain operational situations limited testing and adjustments may be done provided the following precautions are taken:

Testing or adjustments may be made with LV electrical equipment live, provided that safe methods are used and that approved equipment, tools and instruments required for testing are properly insulated for the rated voltage of the circuit. If it is necessary for safety reasons the Competent Electrical Person carrying out the testing shall wear approved electrical rubber gloves and any other PPE deemed necessary.

If the testing or adjustments require covers to be removed so that terminals, windings or connections that are live, or could be made live, are exposed, then suitable precautions shall be taken to prevent persons coming into accidental contact or interfering with that LV electrical equipment.

The Competent Electrical Person in charge of the testing or adjustments of live LV electrical equipment should be accompanied by another Competent Electrical Person during the progress of the testing or adjustments.

J. ADDITIONAL PRECAUTIONS TO BE TAKEN ON SPECIFIC TYPES OF ELECTRICAL EQUIPMENT

J.1 GENERAL

Section J details the additional precautions that are recommended to be taken when work or testing is to be carried out on any specific types of HV or LV electrical equipment in addition to those general ones called for in Sections H and I. The precautions recommended in Section J are based on established operational practices in use by some other Shell BUs, international companies and many power companies. Also included in Section J is guidance on precautions to be taken when using some types of portable equipment that is not referred to in the other sections of these recommendations.

J.2 WORK ON CABLES

J.2.1 Handling of cables

Before allowing persons to handle the outside sheath of a cable that is live the Senior Authorised Electrical Person should first examine its condition and identify necessary precautions to address the identified hazards.

J.2.2 Work on low voltage power cables

Before work starts on a LV cable, in addition to the precautions called for in section I of these Recommendations the Authorised Electrical Person should:

- Verify that caution notices are attached at each end of the cable.
- Clearly identify the cable to be worked on at the point of work.

J.2.3 Work on high voltage cables

Before work starts on a HV cable, in addition to the precautions called for in section H of these Recommendations the Senior Authorised Electrical Person shall:

- before issuing an electrical permit-to-work to the Competent Electrical Person, clearly identify the cable to be worked on at the point of work and prove it dead by approved cable spiking equipment, or other approved means of identification.
- ensure that no person cuts into the sheath which covers the conductor unless the conductor is dead, isolated and earthed.

When approved cable spiking equipment is used the Senior Authorised Electrical Person shall not issue the electrical permit-to-work to allow the cable to be cut before checking that the spike has cut through two-phase cores or through one phase core and the earthed sheath.

J.3 WORK ON OVERHEAD LINES AND EXPOSED CONDUCTORS

J.3.1 Identification of circuits

Where poles or structures support live conductors that are part of an overhead line circuit, then these poles and structures should carry an approved label or symbol to enable easy identification of the circuit from ground level. Double circuit overhead line towers and structures should carry approved labels to enable easy identification from both ground level and by persons carrying out work on one side of the tower or structure under an electrical safety document.

Anti-climbing devices installed for the purpose of preventing climbing on to towers, structures etc. should always be kept locked and be opened only on the instruction from an Authorised Electrical Person.

J.3.2 General

Before work starts on HV conductors of an overhead line circuit the Senior Authorised Electrical Person, in addition to the precautions called for in section H of these recommendations, shall:

- positively identify the line on which work is to be carried out.
- where practicable, check the line is dead with an approved HV testing device, suitable for the rated voltage of the circuit. The approved HV testing device shall be checked immediately before and after use to make sure it is working correctly.
- issue the Competent Electrical Person who is the recipient of the electrical permit-to-work with approved portable earthing leads that are to be used as additional earths.
- before allowing work to commence on the dead conductors of the circuit, check to verify the Competent Electrical Person has applied the additional earths at or as near as is practicable to the point of work. These portable earthing leads shall be used to bond together all conductors and be connected to earth.
- instruct the Competent Electrical Person to remove and re-apply these additional earths at different points of work on the overhead line, but only if they are kept between the circuit main earth positions.
- instruct the Competent Electrical Person that if the working party leaves the overhead line at any time, to check when they return that they have returned to the same line and that all earths are still in position before allowing work to start again.
- instruct the Competent Electrical Person that in the event of an approaching lightning storm, all work on the overhead line should cease immediately and a Senior Authorised Electrical Person be informed.
- check that all the additional earths have been removed from the overhead line before the Competent Electrical Person signs the Clearance Section of the EPTW.

J.4 WORK ON HIGH VOLTAGE TRANSFORMERS, REACTORS AND CAPACITORS

Before work starts on HV transformers, or HV reactors/capacitors, the Senior Authorised Electrical Person in addition to the precautions called for in section H of these recommendations shall:

- ensure that, where auxiliary or voltage transformers cannot be isolated from the HV conductors, the LV fuses or links are withdrawn and kept in a safe place during the progress of the work. Attach a caution notice at such points of isolation.
- where work is to be carried out on a HV/LV transformer, ensure that the LV windings are isolated either by the opening of a switch or withdrawal of fuses or links, so that any possible back feed is prevented during the progress of the work. Attach caution notices at points of isolation.
- ensure that circuit main earths have been applied at all of the exposed conductors of the transformer/reactor/capacitor, in addition to those applied at the points of isolation remote from the transformer/reactor/capacitor.
- before issuing the electrical permit-to-work to the Competent Electrical Person, identify at the point of work, the transformer/reactor/capacitor to be worked on.

J.5 WORK ON HIGH VOLTAGE SWITCHGEAR

J.5.1 Withdrawable electrical equipment

When work is to be carried out on withdrawable HV electrical equipment, e.g. a circuit breaker, then the Senior Authorised Electrical Person in addition to the precautions called for in section H of these recommendations shall:

- ensure that the withdrawable HV electrical equipment has been disconnected from all possible points of supply, i.e. racked out or down, and has been removed from its normal service housing.
- discharge its conductors to earth, but they need not remain connected to earth.

- secure all shutters of switchgear spouts containing live conductors with safety padlocks and attach danger signs. If this was not practicable, see that the circuit breaker cubicle door has been closed and secured with a safety padlock and attach danger signs.

Work on or testing such withdrawn electrical equipment would not normally require the issue of an electrical safety document.

J.5.2 Work on bus bar spouts

When work is to be carried out on the bus bars or bus bars spouts of multi-panel switchboards then the Senior Authorised Electrical Person in addition to the precautions called for in section H of these recommendations shall:

- ensure that the section of the bus bars on which work is to be carried out are made dead and isolated from all points of supply from which it can be made live.
- see that the isolation arrangements are secured with safety padlocks, the shutters of live spouts are locked shut.
- attach caution notices at all points where the bus bars can be made live.
- attach danger notices, where applicable, on or adjacent to electrical equipment containing live conductors at the limits of the bus bar on which work is to be carried out.
- prove with an approved voltage-testing device, suitable for the system voltage, that the bus bars are dead, The approved HV testing device shall be checked immediately before and after use to make sure it is working correctly.
- earth the bus bar at the point of testing and where practicable lock the circuit main earth with a safety padlock. Attach an earthed notice to the circuit breaker or earthing device.
- check with an approved voltage-testing device every spout where work is to be carried out. The approved HV testing device shall be checked immediately before and after use to make sure it is working correctly.
- issue an electrical permit-to-work to a Competent Electrical Person and directly supervise the work on the bus bar spouts.

J.5.3 Work in substations with exposed high voltage conductors - Safety distances to live conductors

When work is to be carried out in substations where there are exposed live HV conductors, then unless the whole electrical equipment and conductors are to be made dead, the Senior Authorised Electrical Person in addition to the precautions called for in section H of these recommendations shall:

- identify the area where work may be carried out safely and ensure that adequate safe working distances are maintained by the working party and the tools and equipment they are to use.
- issue an LOA to the Competent Electrical Person in charge of the work, specifying how the safe working distances from live conductors shall be maintained during the course of the work.
- if barriers or ropes are necessary to define the safe area of work, ensure that these are clearly visible and are not tied or supported by any structure carrying live electrical equipment or conductors. The safe area should be identified by the attaching of "green flags" inside the barriers or ropes and danger notices attached to adjoining live electrical equipment outside the safe working area. Danger and caution notices should not be attached to the ropes or barriers defining the safe area of work.
- ensure that portable ladders required for the work are of an approved non-conducting type and kept secure with a standard electrical padlock when not in use.

- see that when ladders are used to gain access to dead electrical equipment, subject to an EPTW, that they are locked in position with a standard electrical padlock or by any other suitable means, so they cannot be moved by unauthorised persons.

J.6 WORK ON ROTATING ELECTRICAL EQUIPMENT

J.6.1 Work on high voltage motors

Before work is carried out on a HV motor, the Senior Authorised Electrical Person in addition to the precautions called for in section H of these recommendations shall:

- ensure the HV motor has been isolated from all points of supply and the isolation arrangements have been secured with safety padlocks.
- see that caution notices have been attached at all points from where the HV motor could be made live.
- ensure that a circuit main earth has been applied to the HV motor via its controlling circuit breaker/or interlocked earth switch and that, where practicable, a safety padlock has been attached to prevent it being removed.
- see that the tripping and closing supply fuses of the controlling circuit breaker have been removed.
- ensure the circuit breaker bus bar shutters are secured with safety padlocks and danger notices have been attached. If this was not practicable, ensure that the circuit breaker's cubicle door has been closed and secured with a safety padlock and attach danger signs.
- ensure all remote control facilities have been secured, where practicable, with safety padlocks and caution notices have been attached.
- ensure all auxiliary equipment, e.g. heaters, lubricating pump and instrumentation, is isolated.
- prove that the HV motor circuit is dead by using an approved voltage testing device at the point of work. The approved voltage testing device shall be checked immediately before and after use to make sure it is working correctly.
- issue an EPTW to a Competent Electrical Person.

J.6.2 Mechanical work (non-electrical) on high voltage motors

Before mechanical work [non-electrical] is carried out on a HV motor, or equipment driven by that motor, the Senior Authorised Electrical Person in addition to the precautions called for in section H of these recommendations shall verify that the following precautions have been taken:

- the HV motor has been isolated from all points of supply and the isolation arrangements have been secured with safety padlocks.
- caution notices have been attached at all points from where the HV motor could be made live.
- the controlling circuit breaker's bus bar and feeder shutters are secured with safety padlocks and danger notices have been attached. If this was not practicable, see that the circuit breaker's cubicle door has been closed and secured with a safety padlock and attach danger signs.
- the Competent Person who is to carry out the work understands the precautions that the working party should take to avoid danger.

J.6.3 Work on low voltage motors

Before work is carried out on a low voltage motor, the Authorised Electrical Person in addition to the precautions called for in section I of these recommendations shall:

- ensure the LV motor has been isolated from all points of supply and that the isolation arrangements have been secured with safety padlocks.
- see that caution notices have been attached at all points of supply from where the LV motor could be made live.
- prove that the LV motor circuit is dead by using an approved voltage-testing device at the point of work. The approved voltage-testing device shall be checked immediately before and after use to make sure it is working correctly.
- ensure, where practical, the LV motor has been de-coupled from the driven unit. Otherwise, ensure the driven equipment cannot be turned by passage of air, fluid or mechanical forces acting on the driven unit, fan units or other auxiliaries.
- ensure that all auxiliary equipment, e.g. heaters, lubricating pump and instrumentation, is isolated.
- ensure that the Competent Electrical Person who is to carry out the work understands the precautions that the working party should take to avoid danger.

J.6.4 Mechanical work (non-electrical) on low voltage motors

Before mechanical work is carried out on a low voltage motor or equipment driven by that motor, the Authorised Electrical Person shall ensure that in addition to the precautions called for in section I of these recommendations shall:

- check the LV motor has been isolated from all points of supply and that the isolation arrangements have been secured with safety padlocks.
- see that caution notices have been attached at all points of supply from where the LV motor could be made live.
- see that all remote control facilities have been secured with safety padlocks and caution notices have been attached.
- check that the Competent Person who is to carry out the work understands the precautions that the working party should take to avoid danger.

J.7 WORK ON HV ELECTRICAL EQUIPMENT OPERATED BY OR CONTAINING COMPRESSED AIR

Before work is undertaken, other than operating adjustments, on HV electrical equipment operated by or containing compressed air, the Senior Authorised Electrical Person shall take the following precautions, in addition to those called for in H.1.

- the valves controlling the supply of compressed air to the electrical equipment shall be closed and the air released from the associated receivers and the pipe work, which shall be left open to atmosphere.
- the valves shall be secured in position with safety padlocks and the keys placed in a lock-out box, or other safe place, while work or testing is being carried out. Caution notices shall be attached to the valves.

Adjustments to HV electrical equipment operated by or containing compressed air, should only be carried out under the direct supervision of an Authorised Electrical Person to an approved operating procedure.

J.8 WORK ON HV ELECTRICAL EQUIPMENT CONTAINING SULPHUR HEXAFLUORIDE (SF₆)

Before work is undertaken on HV electrical equipment containing sulphur hexafluoride [SF₆] the Senior Authorised Electrical Person shall take the following precautions, in addition to those called for in Section H:

- the HV electrical equipment shall be isolated from all sources of supply of SF₆ gas and the valves closed. The equipment should be purged in accordance with the

Company's approved procedure. The associated receivers and pipe work should be left open to atmosphere. The approved procedure should be agreed with the manufacturer of the unit and include the use of personal protective equipment because of the toxic nature of the SF6 gas and the waste products produced when the circuit breaker contacts break current.

- the valves shall be secured in position with safety padlocks and the keys placed in a lock-out box, or other safe place, while work or testing is being carried out. Caution notices shall be attached to the valves.

J.9 WORK ON ELECTRICAL PROTECTION SYSTEM

The Senior Electrical Authority or his designate is typically responsible for the co-ordination of the protective relays setting for the complete electrical power system. The Authorised Electrical Persons who may be authorised to set or adjust the relays should do so in accordance with the instructions from the Senior Electrical Authority, or his nominated senior member of the Electrical Department.

Resetting of hand-reset type relays should be carried out by Authorised Electrical Persons but only after the cause of the relay trip has been investigated and properly recorded, e.g. in the logbook.

An exception may be made for motor overload relays, which can be reset by an Appointed Person (if their certificate of authorisation allows) and it is clear that the overload has being caused by previously specified operational conditions.

J.10 WORK, SWITCHING OR TESTING IN HAZARDOUS AREAS

J.10.1 General

Before any person carries out any work or testing in a designated hazardous area, all relevant permit-to-work procedures regarding safe entry and progress of work in hazardous areas shall be followed, in addition to any precautions called for in their electrical safety rules.

All the precautions called for in other sections of these recommendations that apply to operations, switching, work or testing on HV or LV electrical equipment, shall apply to all the electrical equipment located in hazardous areas.

J.10.2 Additional precautions

The Senior Authorised Electrical Person in charge of work or testing in hazardous areas should verify that:

- the incoming connections, including the neutral, are made dead and have been isolated at a unit outside the hazardous area (unless they part of an intrinsically safe circuit), before removing any covers of hazardous area type electrical equipment. Where practicable, the point of isolation shall be secured with a safety padlock and a caution notice attached.
- no switching, testing or other operations are to be carried out on hazardous area type electrical equipment, while its covers are removed and live electrical connections are exposed to the atmosphere, other than testing to prove dead.

unless:

- approved gas testing equipment is first used to check that no flammable gases that could create a hazard, are present at the point of work or testing.
- extreme care is taken when replacing the metal covers on certified electrical equipment so as not to create sparks.

J.11 WORK ON BATTERIES

In addition to precautions laid down in the asset holder permit-to-work system the following special precaution shall apply.

- Isolate and lock off any battery charger and attach a caution notice, where possible isolating the battery. As batteries represent a significant energy source, precautions shall limit inadvertent contact by the use of insulated tools and removing personal articles, e.g. watches. In addition the room shall be well ventilated and necessary personal protective equipment shall be worn.

J.12 LIVE-LINE WORKING AND LIVE-LINE WASHING

J.12.1 General

Live-line working and live-line washing operational activities may be authorised by Company or site management provided proper equipment is being used by fully qualified personnel. To ensure this, clearly written and unambiguous procedures are necessary.

If contractors are employed to carry out either live-line working or live-line washing activities on their HV overhead line electrical power systems, then their electrical safety rules should first be extended to include sections of basic rules that cover these activities. Such rules shall be communicated to affected Company or site management operational personnel who should concur with the use of these specialised activities.

J.12.2 Live-line working

Company personnel are typically not trained, authorised or equipped with the special tools necessary to carry out live-line working on HV conductors on the overhead line electrical power systems.

When contractors are selected to carry out such live-line working they shall have well proven live-line working procedures, employ trained experienced personnel and have the necessary well maintained live-line working tools and equipment to carry out such work.

The actual live-line working and the safety of the contractor team is the responsibility of the contractor supervisor. This supervisor shall verify that the procedure is carried out correctly and he shall be present on the work site throughout each procedure to ensure that it is also in accordance with the live-line working basic rules contained in these ESRs.

J.12.3 Live-line washing

Company personnel are typically not trained, authorised or equipped with the special hoses and ancillary equipment to carry out live-line washing on the HV insulators on the overhead line electrical power systems.

When contractors are selected to carry out such live-line washing they shall have well proven live-line washing procedures, adequately trained and experienced staff and all the necessary well maintained equipment to carry out such work.

The actual live-line washing and the safety of the team is the responsibility of the contractor supervisor. This supervisor shall verify that each procedure is carried out correctly and he shall be present on the work site all the time the washing is taking place, to ensure that it is also in accordance with these live-line washing basic rules.

K. ELECTRICAL WORK DURING CONSTRUCTION

K.1 GENERAL

The design, installation and commissioning of a temporary distribution electrical power system that interfaces with existing electrical distribution systems shall be agreed with the Senior Electrical Authority, in accordance with the Company's approved engineering practices. When installed, a temporary distribution electrical power system shall be inspected/tested and its use agreed by the Senior Authorised Electrical Person.

These ESRs rules shall be applied to electrical work at construction sites, except for green field sites where the Company or site management has prepared specific ESRs and operational instructions.

Any interface with the existing electrical power system, and the related operational responsibilities, shall be clearly defined before any commissioning takes place.

Switching operations to carry out isolations or earthing of existing electrical equipment or interfaces with existing electrical distribution systems shall be carried out or coordinated by the Senior Authorised Electrical Person of the area concerned.

Before any Contractor personnel are allowed to carry out switching on temporary distribution electrical power systems that come within the scope of these ESRs, a Senior Authorised Electrical Person shall verify the Contractor's competency to perform switching operations.

K.2 COMMISSIONING / TAKEOVER OF NEW ELECTRICAL EQUIPMENT

K.2.1 General

For major construction projects a formal procedure shall be adopted to ensure that the construction and commissioning of the new electrical equipment is carried out in a safe manner. This procedure shall include a method for sending a Notice of Commissioning form to all involved parties before the first electrical connection is made between new electrical equipment and the existing Company HV electrical power system.

K.2.2 Initial construction phase

During the initial stage of construction of new substations when no electrical connection exists between the new electrical equipment and any existing HV electrical power system, work can be carried out under the Company's permit-to-work system. This work does not need to come within the scope of these ESRs. However, a set of construction related electrical safety rules shall be utilised and based upon these recommendations.

K.2.3 Final construction phase

At the commissioning stage potentially dangerous situations can arise. As soon as the first connection is made between the new electrical equipment and the HV electrical power system (or even LV if a transformer is connected to a LV switchboard), the new electrical equipment is no longer part of a construction site or enclosure. It becomes part of an operational substation and should come within the scope of these ESRs.

If a HV circuit connected to a live existing substation is terminated onto a disconnector or into a circuit breaker cable box in a substation under construction, it shall be considered as a potential danger to persons performing construction work. Electrical safety documents shall be issued to safely limit access and work of these persons.

K.2.4 Scope of ESRs at construction sites

Clear instructions should be given to the non-electrical contractors (e.g. civil and building), to ensure that the use, movement and storage of their materials and equipment, especially ladders and scaffolding, complies with the provisions of the electrical safety rules.

From the time that the first connection is about to be made, it is essential that unclimbable fences and gates are erected and completed for outdoor type substations and that doors of

indoor substations are ready for locking with standard electrical padlocks or locks. These ESRs shall then be applied.

Work or testing in that substation shall now be carried out under an electrical safety document, i.e. EPTW, SFT or LOA.

K.2.5 Notice of commissioning procedure

Before any electrical connection is made between newly constructed electrical equipment and the Company's HV electrical power system, a Notice of Commissioning form be issued to all parties by the Company project engineer responsible for the construction work.

These forms shall be sent to contractors, manufacturers, consultants and other Company departments which have been involved in the site construction of the substation and the overhead lines and cables terminating in it.

The first electrical connection shall not be made until receipt of the Notice of Commissioning form has been acknowledged by all parties. This connection shall not be made before the date indicated on the form.

The Company electrical project engineer shall confirm to the Senior Authorised Electrical Person or his designate that all parties have been informed and have returned the receipt part of the Notice of Commissioning form.

The Senior Authorised Electrical Person should now ensure that this procedure has been completed for electrical equipment and associated work.

K.2.6 Notice of commissioning forms

A recommended specimen Notice of Commissioning form that can be used for this purpose is shown as Annex 1.8 of these ESRs.

L. THE USE OF PORTABLE/TRANSPORTABLE ELECTRICAL EQUIPMENT

L.1 GENERAL

All portable and transportable electrical equipment shall be approved by the Company.

Portable and transportable approved electrical equipment should be regularly inspected, tested and certified for the environment in which it is to be used.

Inspection and test certification results for all portable and transportable electrical equipment should be maintained on each site. Each item of equipment should be labelled so that the next required date for the inspection and testing is readily visible.

The user shall verify that the portable and transportable electrical equipment is in good condition each time before using it and that the inspection/test certification requirement takes place before the expiry date.

L.2 PORTABLE (HAND-HELD) ELECTRICAL EQUIPMENT

Hand-held lamps should be rated for maximum 50 V AC supply.

The types of portable electrical equipment to be used in both industrial and non-industrial areas shall be any of the following.

- Double or reinforced insulation equipment, Class II of IEC 60536, connected to the mains via a 30 mA residual current circuit breaker that protects both the supply lead and the portable electrical equipment.
- 42 V portable electrical equipment, Class III of IEC 60536, connected to a safety extra-low-voltage circuit by using double-wound safety isolating transformers, complying with IEC 60742 (SELV system)
- Air-driven equipment.
- Fibre optic light source.

Equipment used in hazardous (classified) areas shall be certified for use in that area, or authorised for use by gas testing.

L.3 MOBILE GENERATORS IN TEMPORARY INSTALLATIONS

All mobile generators in temporary installations shall be inspected prior to their use. The condition of the temporary installation shall be regularly inspected and tested to prevent unsafe situations.

The electrical personnel responsible for these inspections and testing shall be authorised by the Senior Electrical Authority or designate.

L.4 ELECTRICAL WELDING SETS

Welding should take place using direct current (DC), as the open voltage of a DC set is 110 V DC maximum, which is not dangerous to life. Note that the safe maximum voltage for AC systems is only 50 V, whilst the open voltage of welding sets is generally between 70 V and 90 V.

If it is completely impracticable to use DC welding, the welding set should be equipped with one of the following features:

- output automatically transfers from AC to DC when welding is interrupted; or
- voltage-reducing device installed to limit the voltage to 50 V AC maximum at no load

M. NOTICES

M.1 GENERAL

Temporary notices shall clearly state who posted the notice and when it was posted. Temporary notices should be cross-referenced with the work permit and/or other electrical safety documents.

Notices shall be completed, signed, attached and removed only by the Senior Authorised Electrical Person or Authorised Electrical Person under whose supervision the work or testing is carried out.

Where the local language(s) differs from the official Company language, it is strongly recommended to print the main message in the local language(s).

Notices should preferably be of a material that is sufficiently strong to withstand weathering and damage. They should be of a suitable colour to attract attention.

M.2 CAUTION NOTICES

Portable caution notices are intended as a warning against interference with electrical equipment.

Caution notices shall be attached to points of isolation (see specimen in Annex 1.5).

M.3 DANGER NOTICES

Portable danger notices are intended to warn persons that it is dangerous to approach or interfere with live conductors. These notices shall be used to indicate to persons, working or testing, that adjacent electrical equipment is live (see specimen in Annex 1.6).

M.4 EARTHED NOTICES

Portable earthed notices are intended to indicate that the electrical equipment to which they are attached has been used to provide a circuit main earth for electrical equipment that is subject to an electrical permit-to-work or a sanction for test. Their purpose is to warn persons not to interfere with the circuit main earth (see specimen in Annex 1.7).

ANNEX 1.1 ELECTRICAL PERMIT-TO-WORK

Electrical Permit-to-work (EPTW)

EPTW permit No: Not Transferable

Installation:	Work site:
Instructions to proceed are given in Work Permit No:	
1 Issue To: Senior Authorised Competent * Electrical Person The following electrical equipment has been made safe in accordance with the Electrical Safety Rules, for the work detailed in this Electrical Permit-to-work to proceed.	
Electrical Equipment:	
Voltage: AC DC	
Treat all other equipment as live	
Work to be done:	
Points at which electrical equipment has been isolated and caution notices posted at:	
Danger notices posted at:	
Circuit main earths applied at:	
Additional earth set numbers:	
Circuit main earth safety lock key numbers:	
Control fuses removed and placed at:	
Other precautions:	
Name of person(s) accompanying recipient of this EPTW:	
2 Receipt I accept responsibility for carrying out the work on the electrical equipment as detailed in this Electrical Permit-to-work and no attempt will be made by me or persons under my charge to work on any other electrical equipment.	
Signature of: Senior Authorised Competent * Electrical Person:	Time: Date:
All persons under my charge have now been withdrawn and warned that it is no longer safe to work on the electrical equipment detailed on this Electrical Permit-to-work. All additional earths have been removed. The work is complete suspended *	
Signature of Senior Authorised Competent * Electrical Person:	Time: Date:
3 Cancellation This Electrical Permit-to-work is now cancelled. The circuit mains earths are Removed Not Removed * (<i>If Not Removed an Extended Period Isolation or Sanction For Test is to be raised.</i>) This electrical equipment is Isolated De-isolated *	
Signature of Senior Authorised Electrical Person:	Time: Date:

* Delete as required

ANNEX 1.2 SANCTION FOR TEST

Sanction for Test (SFT) - High Voltage Electrical Equipment

SFT No:

Not Transferable

Installation:	Work site:	
Instructions to proceed are given in Work Permit No:		
1 Issue		
To: Senior Authorised * Electrical Person		
The following electrical equipment has been made safe in accordance with the Electrical Safety Rules, for the tests detailed in this Sanction for Test to proceed.		
Electrical Equipment:		
Tests to be done:		
Electrical equipment has been isolated and caution notices posted at:		
Danger notices posted at:		
Circuit main earth applied at:		
Circuit main earth safety lock key numbers:		
Circuit main earths which may be removed for testing:		
Circuit main earths which may <u>not</u> be removed for testing:		
Other precautions:		
Name of person(s) accompanying recipient of this SFT:		
Signature of Senior Authorised Electrical Person:		Time: Date:
2 Receipt I accept responsibility for testing the electrical equipment detailed in this Sanction for Test and for taking precautions to prevent danger.		
Signature of Senior Authorised * Electrical Person:		Time: Date:
3 Clearance All persons under my charge have now been withdrawn and warned that it is no longer safe to test the electrical equipment detailed on this Sanction for Test. All additional earths have been removed.		
Testing is Complete Incomplete *		
Signature of Senior Authorised * Electrical Person		Time: Date:
4 Cancellation This Sanction for Test is now cancelled. The circuit main earths have been removed.		
This electrical equipment is Isolated De-isolated *		
Signature of Senior Authorised Electrical Person:		Time: Date:

* Delete as required

ANNEX 1.3 LIMITATION OF ACCESS

Limitation of Access (LOA)

A Limitation of Access is issued to cover Work in close proximity to Live conductors, or Testing of Live Low Voltage conductors
It does not permit Working on Live conductors.

LOA No:
Not Transferable

Installation:	Work site:	
Instructions to proceed are given in Work Permit No:		
1 Issue		
Permission is given to: I Senior Authorised Competent * Electrical Person		
to carry out the following work testing * on the electrical equipment described below, which is in the vicinity of live exposed conductors, in accordance with Electrical Safety Rules.		
Electrical equipment:		
Location:		
Work Testing * to be done:		
No other Work/Testing shall be carried out		
Live electrical equipment:		
Caution notices posted at:		
Danger notices posted at:		
Precautions required when work/testing is carried out:		
Name of person(s) accompanying recipient of LOA:		
Signature of Senior Authorised Electrical Person:		Time: Date:
2 Receipt I accept responsibility for carrying out the work/testing in accordance with this Limitation of Access. No other work/testing will be done by me or the persons under my charge.		
Signature of Senior Authorised Competent * Electrical Person:		Time: Date:
3 Clearance All persons under my charge have now been withdrawn and warned that it is no longer permitted to carry out work/testing specified on this Limitation of Access.		
Signature of Senior Authorised Competent * Electrical Person:		Time: Date:
4 Cancellation This Limitation of Access is now cancelled.		
Signature of Senior Authorised Electrical Person:		Time: Date:

* Delete as required

ANNEX 1.4 SWITCHING PROGRAMME

Specimen

SWITCHING PROGRAMME

Purpose **Switching Programme No.....**

Proposed by : **Sheet No.....**

Agreed by : **No. of sheets**

Date :
Time :

Sketch of circuits involved and existing switch/circuit breaker position:

SWITCHING SEQUENCE

Item No	Location	Circuit	Action	Remarks	Time
.....					
.....					
.....					
.....					
.....					
.....					
.....					
.....					
.....					
.....					
.....					
.....					

Suggested operational details required on switching programme format but larger layout necessary to allow for clear entries in columns

ANNEX 1.5 CAUTION NOTICE

CAUTION

ELECTRICITY

CAUTION NOTICE

ELECTRICITY

LABEL No.		LABEL No.	
* ISC / IRA / CC No.	*	* ISC / IRA / CC No.	*
* WORK PERMIT / JOB CARD No.	*	* WP / JC No.	*
* E.P.T.W. / S.F.T. / L.O.A. No	*	* E.P.T.W. / S.F.T. / L.O.A. No	*

DETAILS :

* delete not applicable

DETAILS :

AP CIP CTP Competent Authorised Senior Authorised

Electrical Person

NAME SIGNED DATE

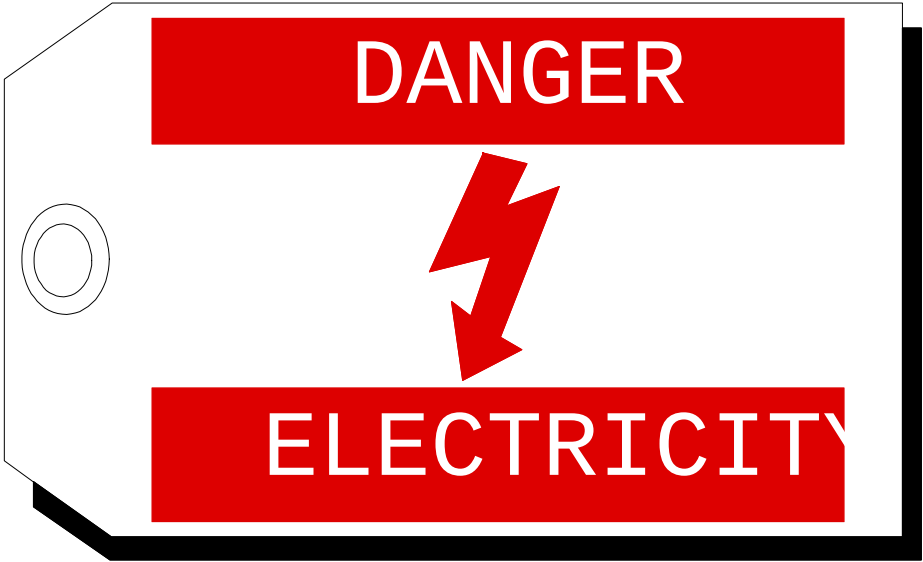
21332/OTR - (3003/94)

21332/OTR - (3003/94)

T100 - (1/1/053)

T100 - (1/1/053)

ANNEX 1.6 DANGER NOTICE



tion

DANGER NOTICE

LIVE ELECTRICAL EQUIPMENT

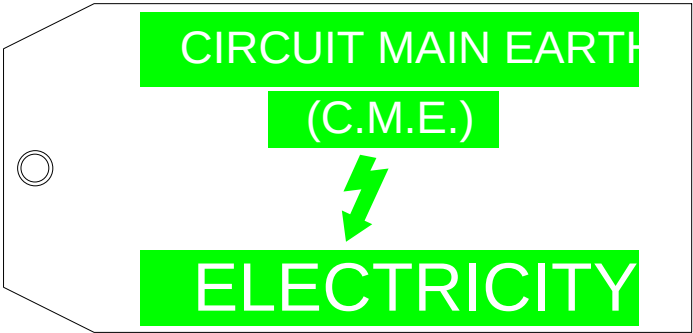
DO NOT INTERFERE WITH THIS EQUIPMENT

E.P.T.W. / S.F.T. / L.O.A. No. _____

COMPETENT	}	ELECTRICAL PERSON	NAME	_____
AUTHORISED			SIGNED	_____
SENIOR AUTHORISED			DATE	_____

T200 - (1/10/93) 21333/OTR - (1/10/93)

ANNEX 1.7 EARTHED NOTICE



SHELL U.K.
Exploration and Production

C.M.E. NOTICE

E.P.T.W./S.F.T No. _____

WORK TO BE CARRIED OUT: _____

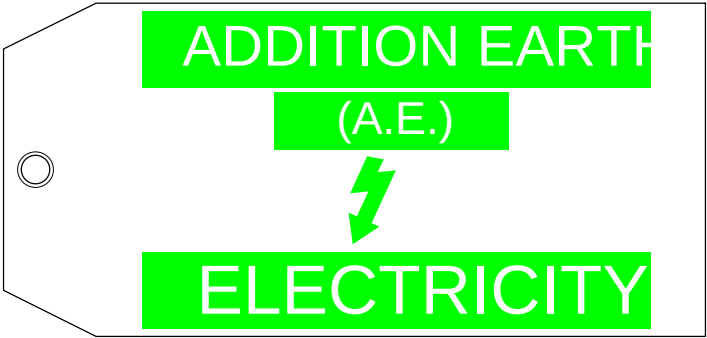
C.M.E. No. _____

NAME _____

SENIOR AUTHORISED ELECTRICAL PERSON SIGNED _____

DATE _____

T300- (1/10/93) 21334/OTR- (1/10/93)



SHELL U.K.
Exploration and Production

A.E. NOTICE

E.P.T.W./S.F.T No. _____

WORK TO BE CARRIED OUT: _____

A.E. No. _____

COMPETENT
AUTHORISED
SENIOR AUTHORISED } ELECT'L PERSON

NAME _____

SIGNED _____

DATE _____

T400- (1/10/93) 21335/OTR (1/10/93)

ANNEX 1.8 SUGGESTED NOTICE OF COMMISSIONING FORM

NOTICE OF COMMISSIONING OF HIGH VOLTAGE ELECTRICAL EQUIPMENT

NUMBER:	ISSUING LOCATION:
----------------	--------------------------

ISSUED TO: _____

LOCATION/ROUTE: _____

CONTRACT/JOB NO: _____

WITH EFFECT FROM: Time: _____ Date: _____

I give notice that the section of the works described below at the above location/route is being made **live** or by reasons of its proximity or relation to other **electrical equipment** shall be regarded as being **live** and from the time and date stated above will come under the scope of the ESRs. From that time no further **work/testing** may be done on or near this section of works unless the person in charge of such **work** is in possession of an **electrical safety document**, i.e. **EPTW, SFT or LOA**, issued in accordance with the BU ESR.

DESCRIPTION OF SECTION OF WORKS:

The **Senior Authorised Electrical Person**, who can explain the requirements of the ESRs is:

who may be contacted on site or at: _____

Signed Date Time
COMPANY PROJECT ENGINEER

ACKNOWLEDGEMENT OF CONTRACTOR

I acknowledge receipt of this Notice and confirm that all staff in my charge including subcontractors have been warned and understand that this procedure is to ensure safe working conditions.

Signed Date Time
Contractor's Representative

Contractor's Name:

Contractor's Representative Designation:

ANNEX 1.9 LIST of TYPICAL ELECTRICAL SAFETY PROCEDURES

The list below provides an overview of the Company electrical safety procedures that shall apply:

ESP no	Title
ESP 1	Issue of BU electrical safety rules, electrical safety procedures and electrical safety operational procedures
ESP 2	Procedure for the appointment of authorised persons
ESP 3	Locking procedures, provision and use of lock-out boxes and issue of keys
ESP 4	Electrical safety rule audit procedure
ESP 5	Voltage testing and phasing out devices
ESP 6	Preparation and use of switching programmes for high voltage and low voltage electrical systems
ESP 7	Earthing equipment for use on high voltage and low voltage electrical systems
ESP 8	Identification of high and low voltage cables
ESP 9	Application of low voltage earthing devices to low voltage electrical equipment
ESP 10	Identification of high or low voltage switchgear subject to an operational restriction
ESP 11	Provision of miscellaneous safety equipment for operational purposes
ESP 12	Preparation, issue, cancellation and retention of electrical safety documents
ESP 13	Procedure for the installation of temporary electrical supplies
ESP 14	Portable electrical equipment (use and classification)
ESP 15	First aid and treatment for electric shock
ESP 16	Electrical safety rules competence assurance – assessor's assessment guide
ESP17	Electrical safety rules Competence Assessment Form