

1. SCOPE

This document defines the measures to be taken to safeguard members of the public who are in the vicinity of electrical network apparatus in order to comply with the requirements of the Electricity Safety, Quality and Continuity Regulations 2002. The measures comprise warning signs and restriction of access that will apply to apparatus at all times. The latter as applied to substations meet or exceed the recommendations contained in the Selston report. This document also defines the policy for ensuring site security at major substations.

Additional measures to safeguard the public whilst work is being carried out (such as guarding and signing of excavations) are not within the scope of this document.

2. ISSUE RECORD

This is a controlled maintained document.

All copies printed via the Intranet or photocopied will be deemed uncontrolled.

Issue Date	Issue No	Author	Amendment Details
August 2001	1	R H Bracey	Initial Issue: 12 Page Document
June 2005	3	R H Bracey	Risk management explanation included in section 8.1. Audit requirement included in section 8.3: 15 page document
October 2005	4	R H Bracey	Section 9.2.1 amended to include reference to walls. Issue authority changed:15 page document
April 2007	5	P Fidler	Branding edited and text reviewed as unchanged

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
P Fidler Engineering Opex Asset Strategist	Stephen Stewart Asset Strategy Manager	J Sutherland Chief Engineer

1 REVIEW

This document shall be subject to review in the event of any changes to Statutory Legislation or, if none, no later than three years after publication.

CONTENTS

1	SCOPE	1
2	ISSUE RECORD	1
3	ISSUE AUTHORITY	1
4	REVIEW	1
5	CONTENTS	2
6	DEFINITIONS	3
7	RELATED DOCUMENTS	4
8	GENERAL	4
8.1	LEGAL REQUIREMENTS	4
8.2	SITE ASSESSMENT	5
8.3	CLASSIFICATION OF LOCATIONS	5
8.4	FORM AND INSTALLATION OF SIGNS	6
9	SUBSTATIONS	6
9.1	SIGNS	6
9.1.1	<i>Mandatory signs</i>	6
9.1.2	<i>Additional safety signs (fences, walls and doors)</i>	7
9.1.3	<i>Additional safety signs (within secondary substation compounds)</i>	7
9.1.4	<i>Additional safety signs (within primary and grid substation compounds)</i>	8
9.1.5	<i>SF₆ warning signs</i>	8
9.1.6	<i>CO₂ warning signs</i>	8
9.1.7	<i>Retrospective action</i>	8
9.2	ENCLOSURE	8
9.2.1	<i>Fencing</i>	8
9.2.2	<i>Buildings and prefabricated housings</i>	9
9.2.3	<i>Retrospective action</i>	10
9.3	SUBSTATION SITE SECURITY	10
10	OVERHEAD LINES	11
10.1	SIGNS	11
10.1.1	<i>General requirements</i>	11
10.1.2	<i>Positioning of safety signs</i>	12
10.1.3	<i>SF₆ warning signs</i>	13
10.1.4	<i>Support identification</i>	13
10.1.5	<i>Retrospective action</i>	13
10.2	ANTI-CLIMBING DEVICES	13
10.2.1	<i>General requirements</i>	13
10.2.2	<i>Fitting of anti-climbing devices</i>	14
10.2.3	<i>Alternative anti-climbing devices</i>	14
10.2.4	<i>Retrospective action</i>	14

11	OTHER EQUIPMENT.....	14
11.1	FUSE PILLARS AND CABINETS	14
11.2	NETWORK PILLARS	14
11.3	RETROSPECTIVE ACTION.....	14
12	LOCATIONS REQUIRING SPECIAL CONSIDERATION	15
12.1	FISHING AND OTHER RECREATIONAL AREAS	15
12.2	LAYBYS AND PARKING AREAS	15
12.3	FORESTRY AREAS	15
12.4	WORK UNDER OR ADJACENT TO OVERHEAD LINES	15

4. DEFINITIONS

For the purposes of this document, the following definitions apply:

Large lattice steel structures – all steel lattice towers and masts having any face greater than 300 mm wide.

Safety sign – a sign in accordance with Schedule 1 of ESQCR.

Substation – includes switching station and sealing end compound.

Substation Compound – the outdoor area of a substation that contains apparatus.

Substation Grounds – the outdoor area of a substation that does not contain apparatus.

5. RELATED DOCUMENTS

The following documents are referred to in this policy document:

Statutory Legislation

ESQCR The Electricity Safety, Quality and Continuity Regulations 2002
S.I. 2002 No. 2665.

PowerSystems documents

ASSET-01-017 Security Policy
OHL-01-007 Overhead Lines in the Vicinity of Recreational Sites
EPS-03-026 Specification for Safety Signs and Property Plates

Electricity Networks Association Publications

ENATS 43-90 Anti-climbing devices and safety signs for hv lines up to and including
400kV
Booklet Guidance on the Security of Substation Sites
Selston Report Child trespassers in substations

Health and Safety Executive

Guidance Note GS6 Avoidance of danger from overhead electric power lines

6. GENERAL

6.1 Legal Requirements

Certain legal obligations are defined in ESQCR with regard to provision of safety and other signs and precautions against access. Certain Regulations in ESQCR are not retrospective in application. PowerSystems' policy in respect of retrospective action is detailed herein.

With regard to risk management, the measures taken in respect of signage and prevention of access take account of the nature of equipment and the use of land. The former sets the minimum standard to be adopted and the latter can call for enhancement.

6.2 Site Assessment

Site assessment is required in all cases to determine the extent of measures to be employed. The requirements stated in this document are the minimum acceptable. Site assessment may require additional measures depending on the circumstances. Further advice is contained in PowerSystems document ASSET-01-017 and the ENA booklet “Guidance on the Security of Substation Sites”. Whenever sites are routinely inspected the classification of the location shall be reviewed and the existence of any hazardous use of land shall be recorded.

6.3 Classification of Locations

To assist with the practical interpretation of the ESQCR with respect to risk assessment, the location of electrical network apparatus shall be classified as follows:

High Risk locations

A location is defined as **High Risk** if any of the following apply:

- There is a record of interference or vandalism within the previous two years.
- It is in the vicinity of areas where children or youths are known to or are suspected of playing or congregating or are likely to frequent (e.g. adjacent to schools, housing estates, play areas, pedestrian ways, isolated or derelict buildings or structures). Play areas may or may not be close to houses and may be indicated by worn or trampled ground such as where football is played or where rope swings are attached to nearby trees or structures.
- It is in the vicinity of a recreational area or site (e.g. parks, beaches, fishing areas, sailing clubs, caravan parks and camping sites).

Normal Risk locations

All other locations are defined as **Normal Risk**.

Periodic checks on the change of use of land and the circumstances, which may lead to the need to recategorise locations to suit the changed situation, shall be an integral part of asset inspection procedures. All changes in categorisation shall be subject to audit in accordance with the appropriate Quality System.

6.4 Form and Installation of Signs

The **safety sign** is defined in ESQCR. The various forms of this and all other signs required by this policy can be found in PowerSystems document EPS-03-026.

Where **safety signs** are installed at locations in the Principality of Wales they shall be bilingual.

Signs shall be installed as detailed in sections 9 to 12 of this document. Signs shall always be fastened and maintained in such a position and manner that:

- They are clearly visible to a member of the public approaching them and
- They do not provide a climbing aid. On a palisade type fence this can be achieved by fixing the sign at the level of the top cross member supporting the slats.

7. SUBSTATIONS

7.1 Signs

7.1.1 Mandatory signs

All substations (other than those that are pole mounted with exposed live conductors not less than 4.3 metres above ground level) shall be fitted with the following signs:

- A **safety sign** and
- A substation property notice (showing the substation name, the name of the owner – SP Transmission, SP Distribution or SP Manweb as appropriate - and a current emergency telephone number).

Both these signs shall be fitted at each point of access defined as follows:

- For substations that comprise a building only or a building with an attached compound – the main access door.
- For substations that comprise a compound only or a compound that contains a building – the main access gate.
- For substations comprising a separate building and compound – the main access door and the main access gate.

Where a substation has, in addition, a boundary fence or wall enclosing the substation grounds, and the above signs are not readily visible from the boundary access gate, then both signs shall also be fitted to the boundary access gate.

At joint-user substations, the substation property notice shall contain the details applicable to the company which is responsible for site access and security and which owns or operates the majority of the equipment at the site. However, where there are separate but adjacent substations owned or operated by different companies on the same site, each substation must have an individual property notice and multiple property notices are required at common boundary access gates.

7.1.2 Additional **safety signs** (fences, walls and doors)

Additional **safety signs** are required in the following circumstances:

- In a **High Risk** location.
- At all locations where there are exposed live conductors or connections.
- At any other location where local knowledge considers it appropriate.

Additional **safety signs** shall be fitted as follows:

- To all building access and emergency doors.
- To fencing and walls surrounding compounds.
- To boundary fencing and walls except where all apparatus is housed in a building.

A minimum of one additional **safety sign** shall be fitted to each side of a surrounding fence or wall; further **safety signs** shall be fitted on long surrounds so that the space between adjacent **safety signs** on any one side does not exceed 10 metres.

7.1.3 Additional **safety signs** (within secondary substation compounds)

Additional **safety signs** shall be fitted inside secondary substation compounds in the following circumstances:

- In a **High Risk** location.
- At all locations where there are exposed live conductors or connections.
- At any other location where local knowledge considers it appropriate.

In secondary substation compounds that meet the above criteria, at least one additional **safety sign** shall be attached to each of the following:

- Free-standing transformers and regulators.
- Unit type substations.
- Free-standing metalclad switchgear items (e.g. ring main unit).
- Multi-panel metalclad switchboards so that there is at least one sign every three panels.

Refer to section 11.1 for the policy in respect of lv fuse pillars and cabinets.

7.1.4 Additional **safety signs** (within primary and grid substation compounds)

In primary and grid substation compounds, additional **safety signs** shall not be attached to equipment or busbar supports and any such existing signs shall be removed in accordance with an agreed programme. This is to avoid confusion with signs erected temporarily when work is carried out in these locations.

7.1.5 SF₆ warning signs

Where SF₆ filled apparatus is located in any substation, then one SF₆ warning sign shall be fitted at each point of access defined as:

- All doors giving access to buildings containing SF₆ filled apparatus.
- All gates giving access to compounds containing SF₆ filled apparatus.

7.1.6 CO₂ warning signs

Where CO₂ automatic fixed firefighting equipment is located in a substation building, then one CO₂ warning sign shall be fitted alongside each door giving access to the building.

7.1.7 Retrospective action

Existing substation signing shall be brought up to the required standard and older non-compliant signs removed following the next programmed inspection and in any case no later than January 2005.

7.2 Enclosure

All substations shall be enclosed. Enclosure may take the form of fencing, a building or a prefabricated housing.

7.2.1 Fencing

Fencing can perform two distinct functions:

- Prevention of public access to substation compounds (a compound fence) and
- Prevention of public access to substation grounds (a boundary fence).

Acceptable types of fencing (including gates) for these two applications are defined below.

Compound fences

In **High Risk** locations or where the compound contains exposed high voltage conductors or connections, then a 2.4 metre minimum height palisade type fence or approved equivalent shall be used. The height may be increased where deemed necessary by site assessment (for example to ensure site security as detailed in SUB-02-010). At substations where a compound containing exposed high voltage conductors is surrounded by a wall, then the minimum wall height shall be 2.4 metres. If the wall height is less than 3.0 metres, then the wall shall be topped with an anti-climbing device. This requirement shall also apply where the wall is part of a building (e.g. the substation control room).

In **Normal Risk** locations where there are no exposed high voltage conductors or connections, then a 2.0 metre high palisade type fence shall be used for all new installations. Existing fencing or walls surrounding older substations will normally be adequate and not require deliberate replacement but individual locations shall be checked to ensure that where walls or wooden panel fencing exists there is adequate visibility into the compound from outside.

At all locations, a site assessment shall be carried out to determine if additional measures (e.g. provision of barbed wire guards) are required to deter access from adjacent objects (such as a wall or building).

Where hedging or shrub screening has been planted or is being contemplated, consideration shall be given to the effect of this screen on the visibility of signs, visibility into compounds and its possible use as a climbing aid. Such screens should be avoided if at all possible, but if it cannot then the hedging or shrubs should be located at least 2 metres from any compound fence and they should be of a species that will not be climbable. Additionally, total screening is not permissible – some degree of visibility into compounds is essential.

Boundary fences

Chain link fencing shall normally be used. A wall is an acceptable alternative but access gates must be suitably arranged to allow the interior to be visible to local residents and passers-by.

7.2.2 Buildings and prefabricated housings

In some circumstances, substation apparatus is totally enclosed within a building or prefabricated housing (total enclosure is standard for all new secondary substations). Fencing is not required in these circumstances unless the substation site is such that the boundary requires delineation.

7.2.3 Retrospective action

Where buildings, enclosures, fences or gates exist, it shall be ensured that there are no constructional features that would assist unauthorised access. The ENA booklet “Guidance on the Security of Substation Sites” should be consulted for further information. There shall also be adequate visibility into substation compounds. Existing substation fences shall be brought up to the required standard as follows (note that in some locations where cost effective it may be prudent to consider fitting a prefabricated housing rather than upgrading fencing):

High Risk locations: in accordance with an agreed programme.

Normal Risk locations: following next programmed inspection.

7.3 Substation Site Security

In order to safeguard substation assets from deliberate attack, a security assessment shall be performed whenever a new substation is planned or substantial refurbishment is to be undertaken. The security assessment shall be based on the criticality of the site and its vulnerability to deliberate attack. The security assessment methodology and protection measures are detailed in document ASSET-01-017.

8. OVERHEAD LINES

8.1 Signs

8.1.1 General requirements

All overhead line supports shall be fitted with **safety signs**. The current design of this sign (yellow and black on a yellow background, introduced in October 1993) is different to those used in the past.

The danger notice required by earlier overhead line regulations (a notice with the wording “DANGER” in red lettering on a white background or vice-versa) and the new style of sign incorporating a pictogram (yellow and black on a white background, introduced in October 1988) must be replaced by the current design of **safety sign** as follows:

- whenever any material alteration is made to a line (e.g. rebuild, refurbishment or reconductoring)
- in any case, no later than January 2013.

Where the line is materially altered or if for any other reason danger notices or additional signs at recreational areas require to be replaced, changed or augmented, **safety signs** in accordance with the current standard shall be applied to the section of line being altered.

Where **safety signs** are being fitted on existing supports to replace existing danger notices they shall be positioned in accordance with this section and the old notices shall be removed.

Such additional **safety signs** as will be necessary to provide a warning from any direction of approach shall be fitted if deemed necessary following a site assessment.

8.1.2 Positioning of safety signs

Large lattice steel structures

On large lattice steel structures **safety signs** shall be fitted to structure faces as detailed below on the first suitable bracing adjacent to the structure leg above the anti-climbing device.

High Risk locations: one **safety sign** shall be fixed to each face of the structure (total of four signs).

Normal Risk locations: one **safety sign** shall be fixed to the two faces of the structure that are most likely to be approached by the public (total of two signs).

All other types of high voltage overhead line support in High Risk locations

On every hv overhead line support in **High Risk** locations a minimum of two **safety signs** shall be fitted approximately 3 metres above ground and immediately above any anti-climbing device. On supports without stays, the **safety signs** shall face outwards so as to be visible to a person approaching at right angles to the line. On angle and terminal supports, one of the **safety signs** shall be fitted facing the stays, with the other fitted diametrically opposite. Note that for supports with more than one member (e.g. "A", "H", Rutter or "Lame-leg" poles), each member shall be treated as a separate support as far as **safety signs** are concerned.

All other types of high voltage overhead line support in Normal Risk locations

On every hv overhead line support in **Normal Risk** locations, as a minimum, one **safety sign** shall be fitted approximately 3 metres above ground and immediately above any anti-climbing device. On supports without stays, the **safety sign** shall face outwards so as to be visible to a person approaching at right angles to the line. The position of the **safety sign** shall alternate on adjacent supports so that a person approaching the line can see a sign on every second pole. On angle and terminal supports, a **safety sign** shall be fitted facing the stays. Note that for supports with more than one member (e.g. "A", "H", Rutter or "Lame-leg" poles), each member shall be treated as a separate support as far as **safety signs** are concerned.

All low voltage overhead line supports

On every low voltage overhead line, one **safety sign** shall be fitted approximately 3 metres above ground and immediately above any anti-climbing device.

8.1.3 SF₆ warning signs

Where pole mounted SF₆ filled apparatus is installed, then one SF₆ warning sign shall be fitted to the pole above the **safety sign(s)**.

8.1.4 Support identification

All supports regardless of voltage shall be fitted with a consecutive identification number together with any other markings as required by the appropriate policy.

8.1.5 Retrospective action

Existing signing shall be brought up to the required standard as follows:

Safety and other signs

High Risk locations: at the earliest opportunity.

Normal Risk locations: when any material alteration is made to the line (i.e. rebuild, refurbishment or reconductoring) or following next programmed inspection, whichever is earlier.

8.2 Anti-climbing Devices

8.2.1 General requirements

The fitting of anti-climbing devices to high voltage overhead lines “where the circumstances reasonably require” is a requirement of ESQCR. The provision of anti-climbing devices is based upon risk assessment taking into account the following factors:

- The classification of the location.
- Whether the support is climbable.
- The proximity of any obstacles that would aid climbing.

Location classification is dealt with in section 8.3 of this document.

Climbability of supports and proximity of obstacles are defined in ENATS 43-90.

It is not a requirement of ESQCR that anti-climbing devices be fitted to low voltage overhead lines supports. However, within PowerSystems, anti-climbing devices shall be fitted to all low voltage overhead line supports that are considered to be “easily climbable” as defined in ENATS 43-90.

8.2.2 Fitting of anti-climbing devices

The types of anti-climbing device and their application shall be as detailed in ENATS 43-90.

The application of enhanced anti-climbing devices to large lattice steel structures requires a risk assessment. This must take into account the proximity of any horizontal structure members to the anti-climbing guard.

8.2.3 Alternative anti-climbing devices

The use of an approved prefabricated anti-climbing device as an alternative to barbed wire (whether wrapped or fitted to outrigger brackets) is not precluded by this policy.

8.2.4 Retrospective action

Existing anti-climbing guards shall be brought up to the required standard in accordance with an agreed programme.

9. OTHER EQUIPMENT

9.1 Fuse Pillars and Cabinets

Substation fuse pillars and fuse cabinets in all locations whether ground or equipment mounted shall be fitted with an electrical hazard warning sign. One sign shall be fixed centrally on each door of the pillar or cabinet.

9.2 Network Pillars

Network pillars (fused or unfused) in all locations shall be fitted with an electrical hazard warning sign. One sign shall be fixed centrally on each door of the pillar.

9.3 Retrospective Action

Pillar and cabinet signing shall be brought up to the required standard as follows:

High Risk locations: at the earliest opportunity.

Normal Risk locations: following next programmed inspection.

10. LOCATIONS REQUIRING SPECIAL CONSIDERATION

Certain locations in the vicinity of or beneath overhead lines require special consideration.

10.1 Fishing and other Recreational Areas

The specific measures to be adopted at fishing and other recreational areas (eg caravan parks, camping sites, etc) are detailed in OHL-01-007.

1.1 Laybys and parking areas

Laybys and parking areas require individual risk assessment to ensure that members of the public carrying out normal activities at such locations are not put at risk. The existence of laybys and parking areas shall be identified during line inspections and the details communicated to Business Risk and Safety who will then arrange for a risk assessment in conjunction with the owner / responsible authority.

Mitigating measures to reduce the risk shall be taken. These might include increasing clearances, rendering the line conductors more visible and provision of appropriate warning signs (both by PowerSystems and the owner / responsible authority).

10.2 Forestry Areas

Responsibility for work in forestry areas rests with the owner concerned who should comply with the requirements of HSE Guidance Note GS6.

At locations where overhead lines cross forestry access roads and tracks, there may be a wayleave requirement to install warning signs that indicate the safe clearance to the line. These signs are designed to provide a general warning to vehicle/loader drivers/operators of the electrical hazard from overhead lines at crossing points.

The responsibility for provision and installation of these signs (including reimbursement of costs) is normally specified in the relevant wayleave agreement. In general, warning signs shall be made available upon request to owners of forestry areas in reasonable numbers. The forestry area owner will be responsible for their erection and maintenance. Such signs shall not be attached to overhead line supports or other PowerSystems equipment.

10.3 Work under or adjacent to overhead lines

Reference should be made to HSE Guidance Note GS6 for further information in respect of third parties working under or adjacent to overhead lines. The scope of the Guidance Note includes agriculture and horticulture.