Guidelines for NIE Networks and the Environment **Technical Supplement**

Northern Ireland Electricity

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Technical Supplement

Content

1.0 Introduction

Technical Supplement

Introduction

Northern Ireland Electricity plc (NIE) has set out its environmental management philosophy and outlined its approach to delivering sustainable developments within the publication entitled "Guidelines for NIE Networks and the Environment".

This Technical Supplement to the Environmental Guidelines document provides NIE's policy and procedural documentation for carrying out its activities in the natural and man-made environment.

The policies and procedures contained in this Technical Supplement will be periodically reviewed and updated, reflecting changes in environmental concerns/issues, new technology/techniques and NIE's commitment to continual improvement.

2.0 NIE Policy Statements

Technical Supplement

NIE's Vision for the Future

A premier Northern Ireland Company; a first rate performer in the eyes of its investors, its customers and its staff; externally oriented and at one with its commercial, regulatory and physical environment; and a recognised contributor to the social and economic development of the community in which it operates.

Environmental Policy Statement

Northern Ireland Electricity plc is responsible for the transmission, distribution and supply of electricity to customers throughout Northern Ireland.

NIE will manage responsibly the impact of its business operations on the environment and, in this respect as in all other aspects of business, the Company aims to be a first rate performer in the eyes of investors, customers and staff. The Company is committed to continual improvement and to being a recognised contributor to the community in which it operates.

NIE's policy on the environment reflects this commitment and aims to protect the environment and to ensure a sound environmental approach in all activities.

Specifically these aims are :

Not merely to comply with relevant legislation and regulatory requirements relevant to our business, but also to honour the obligations set out in the statement on the preservation of amenity and fisheries. Where practicable and economically viable we must strive to develop corporate standards of practice in excess of such requirements.

To monitor the environmental impact of our operations and to develop procedures to prevent or abate any forms of pollution resulting from our activities. We will communicate and co-operate with local, national and international regulatory agencies charged with pollution control.

To assess the potential environmental effects of any new developments and to promote the standards of best practice operating throughout the industry, improving on such standards where practicable and economically viable.

To encourage an open attitude on all environmental issues and to make available environmental information to all NIE stakeholders. Staff will be trained in appropriate aspects of environmental management and the Company will publish an annual report on its environmental performance.

In particular we will endeavour through all our business activities and operations to conserve the environment of Northern Ireland and to make our community proud of its electricity company and its continuing care for the environment in which we live.

Statement on the Preservation of Amenity and Fisheries

Northern Ireland Electricity plc (NIE) acknowledges its obligations under the Electricity (Northern Ireland) Order 1992 to prepare a statement of the manner in which it intends to meet the requirements of Schedule 9 to this Order.

In fulfilment of these requirements NIE will have regard to:

(a) The conservation of the natural beauty and amenity of the countryside,

(b) The protection of its flora and fauna,

(c) The protection of its geological and physiographical features, and

(d) The protection of sites, buildings and objects of architectural, historical, and archaeological importance.

NIE will take these considerations into account for all relevant developments.

In planning and carrying out these projects NIE will consult where appropriate with all bodies. NIE will involve them at an early stage and will ensure that measures agreed during these consultations are incorporated in the planning, construction, and operation of the projects.

This will particularly include the Department of the Environment, the Department of Agriculture, the Fisheries Conservancy Board for Northern Ireland, and the Foyle Fisheries Commission. NIE will also meet periodically with these bodies to discuss general environmental issues related to its activities and to establish constructive dialogue on major amenity issues.

Where the activities of NIE have any effect on the environment, NIE will do what it reasonably can to mitigate such effects. This will include assessment of potential effects at the planning stage and the production of environmental impact statements where appropriate for major projects. Execution of projects and management of operational sites will be carried out in an environmentally sensitive manner so far as is reasonably practicable.

NIE will ensure that it has access to relevant expertise and will promote awareness of the need to preserve amenity within the Company. Where contractors are employed, they will be required to comply with statutory obligations and with NIE standards.

NIE recognises the importance of environmental matters to Northern Ireland and the need to carry out all its activities in an environmentally responsible way. It has therefore initiated the development of a comprehensive Environmental Policy Statement.
This Statement on the Preservation of Amenity and Fisheries will form part of the policy statement and will be reviewed from time to time and if required, amended.

31 March 1993

Policy Statement on Electric and Magnetic Fields and Health

Northern Ireland Electricity recognises that there is concern about a possible connection between electric and magnetic fields (EMF) and health. These fields are produced by all electrical installations and equipment such as domestic appliances, overhead lines, underground cables and motor vehicles.

NIE is committed to the health, safety and welfare of the public and its employees.

To date, over 10,000 scientific papers have been produced on EMF and over eighty independent and authoritative scientific review panels have concluded that it has not been established that mains frequency EMF cause adverse human health effects. The National Radiological Protection Board (NRPB), the UK body with a statutory responsibility for advising on EMF, has concluded that "there is no clear evidence of adverse health effects at the levels of electromagnetic fields to which people are normally exposed". NIE carries out its activities in compliance with NRPB guidelines.

We believe that present evidence does not justify any change in the industry's operating practices, or the everyday utilisation of electricity by our customers.

NIE cares about our customers' concerns, and we are committed to providing members of the public, customers, and our employees with full and up to date information about EMF and health. We have therefore adopted the following principles in relation to EMF:

- We will continue to support and contribute to the funding of credible research into EMF. This includes an independent trust which supports biological research.
- We will continue to monitor closely scientific research, overseas developments and major reviews of scientific, medical and engineering research concerned with electric and magnetic fields.
- We will provide full and up to date information about EMF and health to the general public enabling them to make informed judgements on the latest research.
- We will respond to requests from our customers and the general public, regarding the measurement of field strenghts in the vicinty of homes and premises.

NIE will also constantly review its approach to ensure that it is consistent with the best available knowledge on this matter at any time.

May 1997

3.0 NIE Codes of Practice

Technical Supplement

Code of Practice on Landowners

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Foreword

This code of practice is issued under the direction and with the approval of the Managing Director, Networks.

This is the first version of the document to be issued.

The information contained herein shall be used by NIE personnel and Contractors engaged by NIE.

Introduction

In the course of normal business NIE staff and Contractors engaged by NIE will need to gain access to private property. In order to establish and maintain good relations with landowners it is essential that good practice is adopted at all times and that landowner problems are dealt with promptly and courteously. This document details the NIE commitment to landowners with regard to:-

1) Access;
2) Works;
3) Damage/Compensation; and
4) Wayleave Payments.

1.0 Access to Property

From time to time access is required to property in order to install, renew, inspect, maintain and monitor apparatus. It is only in exceptional circumstances that vehicular access should be made without prior notification to landowners.

The following access procedure should be adopted.

a) Only in exceptional emergency circumstances should any works be carried out without first obtaining the permission of landowners.

b) In general, on all project work, contact with landowners should be made by Wayleave Officers who clear the sites to Engineers, Supervisors, Surveyors and Contractors before work proceeds. Any disputes/special requirements regarding wayleaves should be referred to the Project Leader for resolution/implementation. The Wayleave Officer is an integral part of the project team and will liaise with landowners on all matters. Landowners should be encouraged to refer all queries, site problems, disputes and claims to the Wayleave Officer for resolution. In addition Contractors will have, under the Conditions of Contract, further obligations to meet with regard to the landowner and use of the land.

c) Vehicle access routes should be agreed with landowners. The number of vehicles brought on to a property should be kept to a minimum. Where necessary access routes should be clearly marked on site.

d) Gates should be kept closed and, where required, locked during works.

e) Upon completion of a Project each landowner should be visited by the Wayleave Officer to settle land damage claims etc. Claims should be referred to the Project Leader for authorisation before payment.

In circumstances where NIE personnel other than Wayleave Officers contact landowners to gain access for minor works inspection, survey and routine maintenance the general procedure should be as follows:

1) Whenever feasible, a pro forma letter should be distributed to all known landowners confirming an intention to carry out minor works. The works supervisor should be supplied with a list of the landowners contacted by letter.

2) Before entering land, contact should be made with the landowner where it is reasonably practicable to do so.

3) The reason for access should be explained and details given of any other requirements necessary during the site visit eg. hedge cutting to facilitate survey and tree cutting.

4) Permission to proceed should be sought.

5) Where permission is refused the matter should be referred to Wayleaves Department for resolution.

2.0 Works on Property

When carrying out works on property the following procedure should be adopted:

a) Take all reasonable steps to avoid damage to property.

b) Plan works carefully to avoid unnecessary interference to landowner operations.

c) Ensure that works are properly supervised.

d) Do not remove walls, fences or hedges without prior agreement.

e) Do not cut hedges, lop or fell trees without prior agreement.

f) Ensure that all 'notifiable' precautions are adhered to.

g) Keep working areas to a minimum.

3.0 Damage/Compensation

In appropriate circumstances, NIE is responsible for making good any damage which has resulted as a consequence of carrying out works on property belonging to others. If such damage can not be made good then the owner of the property should be compensated appropriately.

The following commitments should be observed with landowners.

a) Make good or reasonably compensate in respect of land damage caused by works.

b) Fully compensate any crop loss suffered as a result of works.

c) Replace or reasonably compensate in respect of walls, fences and hedges damaged or removed during works.

d) Replace or reasonably compensate in respect of land drainage damaged during works.

e) Leave timber cut in manageable lengths for landowner.

f) Commission independent assessor in the event of a disputed claim.

g) Pay ESI scale fees for any agent retained by a landowner in negotiating and settling a damage claim.

h) Agree damage claim as quickly as possible to ensure that payment is made promptly.

4.0 Wayleave Payments

In Northern Ireland wayleave payment rates for electricity lines are the subject of agreement with the Ulster Farmers Union.

The annual payment rates which are based on the type and size of structure will be reviewed periodically.

The rate includes 2 elements.

a) The basic annual rent due for equipment placed on a property.

b) The annual compensation payable in respect of interference with normal agricultural operations.

Code of Practice for the Extension, Alteration and Removal of NIE Networks

Contents

Foreword

This code of practice is issued under the direction and with the approval of the Managing Director, Networks.

This is the first version of the document to be issued.

The information contained herein shall be used by persons who have responsibility for the planning, design specification and construction of NIE transmission and distribution networks.

Introduction

This code of practice cancels and supersedes DI 6/10-D Rev 3 "Service Policy Regarding Overhead Electricity Lines" and CI 11/009 Rev 19/6/84 "Alterations to Equipment".

As a consequence of changes in public perception and legislation associated with the privatisation of the electricity supply industry in Northern Ireland, it has been necessary to review company policy relating to new extensions to the network and the alteration and removal of overhead lines. In formulating the policy it has been necessary to strike a balance between environmental, technical and economic requirements.

This document is intended to provide guidance in the planning of new extensions, alterations and removal of NIE Networks.

Section 1. New Extensions to the Network

1.1 Overhead Lines and Substations

Policy

Where there is a requirement to extend its network the NIE approach, in common with general world practice, is to seek overhead line connections where it is reasonable and practical to do so. When a substation is required in addition to an overhead line, an iterative process is adopted in order to develop a preferred scheme which is sustainable in terms of environmental, technical and economic considerations. Where appropriate alternative line designs will be considered.

Guidelines

NIE has developed a document entitled 'Methodology for Substation Site Selection and Overhead Line Route Selection'. This document is attached in Annex A and should be used as the basis for developing overhead line and substation schemes. It is supported by Annexes B to D. The following documents should also be consulted:

a) Code of Practice on the Siting of Substations in Rural Areas.

b) Code of Practice for Substation Buildings.

Whenever a scheme is limited to the provision of a secondary distribution substation the following document should be consulted:

c) The Provision of Substations by Northern Ireland Electricity in New Developments.

1.2 Undergrounding

Underground cables are often suggested as an alternative to overhead lines and in the interests of consistency, it would seem preferable that standard criteria be established to identify situations where as a matter of routine, undergrounding should be considered. However it is not possible to apply a consistent approach across all voltages as it is necessary to strike a balance between environmental, technical and economic considerations. Consequently NIE has found it necessary to develop separate policies and guidelines for transmission voltages and distribution voltages.

1.2.1 Transmission Voltages (275kV & 110kV)

Policy

NIE considers on its merits every case for using underground cables for amenity reasons instead of overhead lines.

In view of the significantly higher additional costs for undergrounding, the company reserves detailed considerations for those locations where benefits of maintenance of visual amenity can be demonstrated to:

a) outweigh the adverse effects upon other environmental factors;

b) justify the high technical cost; and

c) be technically possible and not conflict with the company's statutory duties.

In identifying such locations, NIE takes account of the views of appropriate expert advisers, statutory environmental bodies and other organisations it considers appropriate.

Guidelines

NIE has developed guidelines for undergrounding overhead lines. The document is attached in Annex D and should be used as the basis for developing potential underground cable schemes at transmission voltages of 275kV and 110kV.

1.2.2 Distribution Voltages (33kV, 11kV, 6.6kV, LV & Undereave Conductors)

Policy (33kV, 11kV, 6.6kV)

In urban areas underground cable will be used where reasonably practicable for new extensions to the network.

In rural areas overhead lines will normally be used for new extensions to the network. However, underground cables may be used, when reasonably practical in rural areas in the following circumstances:-

a) Motorway and dual carriageway crossings.

b) Connection of ground mounted secondary substations.

c) Connection of new switchboards to the overhead line network.

d) Where the benefits of maintenance of visual amenity can be demonstrated to:

1) outweigh the adverse effect upon other environmental factors.

2) justify additional cost.

3) be technically possible and not conflict with the company's statutory duties.

Policy (LV & Undereave Conductors)

In urban and rural areas underground cable will be used, where reasonably practicable for extensions to the network.
However, overhead lines and undereaves may be used where it is not reasonably practicable to use underground cables, for example:-

a) If the cost of excavation is excessive (eg rock).

b) If the underground cable route length is excessive compared with the overhead line option.

c) If it is not reasonably practicable to replace undereaves with underground cables without major disruption to customer's property, then new undereaves cables may be installed.

Guidelines (33kV, 11kV, 6.6kV, LV & undereaves conductors).

NIE has developed guidelines for undergrounding overhead lines. The document is attached in Annex D and should be used as the basis for developing potential underground cable schemes at 33kV, 11kV, 6.6kV, LV and undereave conductors.

Section 2. Alterations to Existing Lines

2.1 275kV, 110kV and 33kV Tower Lines

NIE will continue to work with developers and planning authorities to avoid alterations to tower lines that pass over developing areas.

In exceptional circumstances lines will be altered to facilitate proposed development. Costs for these alterations will be negotiable.

2.2 110kV Wood Pole Lines

NIE will continue to work with developers and planning authorities to minimise the need for alterations to lines that pass over developing areas.

In exceptional circumstances lines will be altered to facilitate proposed development. Costs for these alterations will be negotiable.

2.3 33kV, 11kV, 6.6kV, LV Wood Poles Lines and Undereave Conductors

NIE will carry out the minimum overhead alteration necessary to maintain recommended and statutory safety clearances free of charge to permit development.

All new equipment associated with an alteration shall, as far as practicable, be sited to avoid crossing the curtilage of an existing or proposed dwelling. In the event that this is not possible an easement should be taken for any equipment on or over the curtilage of a dwelling.

If the line in question already crosses an exceptionally constrained area immediately adjacent to the development or if there are subsequent phases of the development to follow consideration should be given to replacing the complete section of line affected with underground cable. Guidance for the selection and prioritising the removal of existing overhead lines for undergrounding is given in section 3.2.

If NIE decides to proceed with the undergrounding of such a line then for that portion within the development:-

a) Temporary overhead line alterations to permit development before the line can be recovered should be kept to a minimum.

b) Cable trenching within the site boundary will be carried out by the developer at no cost to NIE.

c) Cable will only be laid in drum lengths.

Section 3. Removal of Existing Lines for Undergrounding

3.1 275kV and 110kV Lines

Existing 275kV and 110kV lines will remain in place.

3.2 Distribution Overhead Lines

33kV and lower voltage overhead lines over established exceptionally constrained areas shall be selected for undergrounding. This work will proceed on a prioritised basis against a financial limit set by the company on an annual basis. The age and condition of overhead lines selected for undergrounding may be taken into consideration when prioritising the timing of the work.

ANNEX A
Methodology for Substation Site Selection and Overhead Line Route Selection

A.1. Substation Site Selection

A.1.1 Networks design team to determine an area of search for a potential substation site.
See Annex B: Scheme development.

A.1.2 Study the area of search and identify potential substation sites with sympathetic environmental features, suitable for further consideration.

A.1.3 Study the potential substation sites in detail to evaluate and determine the preferred site/sites using the following criteria whenever practicable.

Criterion 1. Utilise zoned industrial areas or semi industrial areas where practicable.

Criterion 2. Avoid locations which impact upon existing properties, proposed building sites and land designated for potential housing development.

Criterion 3. Avoid locations which have a significant visual impact.

Criterion 4. Consider implications of civil works to develop site, including road traffic implications.

Criterion 5. Consider potential substation designs.

Criterion 6. Consider suitability of site and immediate surrounds of site for overhead line feeders. Refer to the company underground cable policy document (where appropriate).

Criterion 7. Assess the impact on the community during the preparation, construction, operation and dismantling of the site.

Criterion 8. Consider the impact of wirescape from overhead line feeders.

A.2. Overhead Line Route Selection

A.2.1 Identify alternative overhead line connections to preferred substation site/sites using the following process:

(a) Define a study area. (Desk top appraisal of geographical features and existing network configuration).

(b) Produce a detailed constraints map indicating factual considerations

(c) Assess landscape development and character, protective landscape designations and future landscape potential.

(d) Develop route corridors using a routeing strategy based on;

(1) the constraints map/landscape considerations.

(2) advice from planning consultant, environmental consultants and landscape architect.

(3) technical considerations.

(4) established routeing practice - The Holford rules (See Annex C).

(e) Advise local council and general public regarding preliminary scheme proposals.

(f) Have preliminary discussions with DOE planning service.

(g) Complete a desk top survey and carry out initial fieldwork to produce preliminary route options using guidelines detailed in either section A2.2 or section A2.3, dependant upon line voltage.

(h) Develop and revise route options and line designs by site investigation of technical and environmental considerations.

(i) Assess final route options against routeing strategy to determine the preferred route/routes and line designs.

A.2.2 Guidelines for routeing overhead transmission lines:

(a) The objective is to identify a technically feasible, reliable and economically viable line route which creates the least visual intrusion and has the least significant effect on the environment.

(b) Wherever possible, a line should be routed to avoid the most sensitive and valued natural and man made features.

(c) The potential effects of a line route need to be determined and assessed. The effects can be reduced by careful route selection but can seldom be eliminated. The extent and significance of any resulting effects and measures which can be taken to mitigate against them, require careful evaluation.

(d) The Holford rules together with guidelines issued by the National Grid Company detail established principles for overhead transmission line routeing and these rules and guidelines should be used as the basis for routeing practice.

(e) A major effect of an overhead line is visual. An analysis of the likely impact of the line route on properties, roads, recreation areas etc is essential and requires rigorous examination in order to achieve a route with least significant effect on the landscape character and least visual impact on the viewer and amenity.

(f) The line route should also take account of the potential impact upon other considerations such as land use, landscape, landowners and occupiers resulting from the construction, operation and dismantling of a line. The likely effect has to be reconciled with measures which can be taken to avoid, reduce or remedy any adverse effects.

(g) During the route selection process particular attention should be given to the following:

(1) Land topography and landscape character

(2) Protection of the landscape

(3) Potential of the landscape

(4) Statutory and non-statutory consultees

(5) Impact on dwellings, including gardens, yards, outhouses and appurtenances

(6) Impact on roads

(7) Impact on tourist attractions and other important locations

(8) Impact on flora and fauna

(9) Potential development

(10) Disturbance during construction, maintenance and dismantling

(11) Locations for line supports

(12) Foundation requirements for line supports

(13) Access requirements to facilitate line erection

(14) Wirescape

(15) Health and safety regulations.

A.2.3 Guidelines for routeing overhead distribution lines

As per section A.2.2 and in addition:

(a) Select line route to match hedge lines as far as possible in conjunction with section A2.2, f) and g).

(b) Select line route to take into consideration the crossing of lower voltage lines.

(c) Select line route to take into consideration the presence of BT equipment.

A.3 Development of Preferred Scheme

A.3.1 Evaluate preferred substation sites/designs and preferred line route/designs to determine a preferred scheme offering the best practical environmental option.

A.3.2 Refer preferred scheme to the Network's planning staff for efficiency and cost evaluation.

A.3.3 Present preferred scheme to local councils and affected landowners.

A.3.4 Complete a more rigorous environmental examination of the preferred scheme, (landscape and visual, planning and land use, flora and fauna etc) evaluate and if necessary, revise scheme.

A.3.5 Refer the preferred scheme to DOE planning service for initial comment. Evaluate and if necessary, revise scheme.

A.3.6 Complete an Environmental Assessment of preferred scheme and publish an Environmental Statement.

A.3.7 Submit preferred scheme to DOE planning service for approval.

Note: Sections A2, A3.2, A3.3, A3.4, A3.5, A3.6 and A3.7 should be applied to overhead line schemes not requiring a substation connection.

ANNEX B
Scheme Development

Generation of alternative schemes and scheme selection

The procedure envisaged in moving from initial scheme proposals to develop alternatives which fully embrace local environmental considerations and recognised as being best practice in accordance with our vision statement is set out below. It is assumed that the starting point is an initial scheme which meets the reinforcement objectives and has embodied the fundamental environmental, technical and economic objectives with minimal operating costs and maximum scheme life. However it is implicit in adopting this procedure that no aspect of scheme development can be finalised until the entire scheme is finalised.

(a) Having prepared an initial scheme, a desk study of constraining features and existing network configuration relative to those features should be carried out to define a general area within which the initial scheme may be established without loss of benefit or increased costs.

(b) A further desk study to determine a larger area within which similar though possibly less efficient schemes may be established should be carried out. The schemes should be as effective as the initial scheme in terms of strength of reinforcement but could incur slightly higher losses and be more costly. The intrinsic environmental benefits of the most efficient scheme, which are scheme life and generation related should not change as a consequence.

(c) The areas defined in items (a) and (b) (the area of search), should be examined on site to determine apparent environmental constraints. This process will enable potential substation sites and potential line route connections to be established.

(d) The site examination carried out under item (c) should include a study of industrial/semi-industrial zones located beyond the larger area defined in item (b). A special study of scheme efficiency and costs measured against environmental gain should be rationalised under item (e).

(e) The potential substation sites and line route connections (alternative schemes) should be evaluated from an environmental, technical and economic viewpoint. Intrinsic in this process is the input of informed independent opinion and the consideration of network reinforcement, scheme efficiency and related costs.

(f) The alternative schemes should be evaluated to establish a preferred scheme which represents the best balance between environmental impact, efficiency and cost. This process also requires the input of informed independent opinion.

Note: Items (c), (e) and (f) are integral to Annex A.

ANNEX C
Guidelines for line routeing

C.1 Introduction

The Holford Rules

These guidelines on line routeing were formulated by Sir William Holford, later Lord Holford. NIE uses the Holford Rules, with some notes of clarification added, as a basis for the company's approach to line routeing. Since the formulation of the rules, formal requirements for environmental assessment have been introduced and major overhead lines particularly transmission lines operating at 275kV and 110kV will be required to undergo an environmental impact assessment. While environmental assessments address wider topics that the visual amenity on which the Holford Rules concentrate, the rules are still a reliable tool in selecting and assessing line route options at all voltages.

The Holford Rules:

GUIDELINES FOR THE ROUTEING OF NEW HIGH VOLTAGE OVERHEAD TRANSMISSION LINES

Rule 1

Avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the line in the first place, even if the total mileage is somewhat increased in consequence.

Note on rule 1

(a) Investigate the possibility of alternative routes, avoiding if possible the areas of highest amenity value. The consideration of alternative routes must be an integral feature of environmental statements.

(b) Areas of highest amenity value are:

(1) Areas of Outstanding Natural Beauty

(2) Country parks

(3) Heritage sites

(4) Ancient monuments

Rule 2

Avoid smaller areas of high amenity value, or scientific interest by deviation; provided that this can be done without using too many angle towers, ie the more massive structures which are used when lines change direction.

Note on rule 2

(a) Some areas (eg. areas of special scientific interest) may require special consideration for potential effects on ecology (eg. to their flora and fauna).

(b) Where possible choose routes which minimise the effects on the settings of areas of architectural, historic and archaeological interest including conservation areas, listed buildings, listed parks and gardens and ancient monuments.

Rule 3

Other things being equal, choose the most direct line, with no sharp changes of direction and thus with fewer angle towers.

(a) Where possible choose inconspicuous locations for angle towers, terminal towers and sealing end compounds.

Rule 4

Choose tree and hill backgrounds in preference to sky backgrounds wherever possible; and when the line has to cross a ridge, secure this opaque background as long as possible and cross obliquely when a dip in the ridge provides an opportunity. Where it does not, cross directly, preferably between belts of trees.

Rule 5

Prefer moderately open valleys with woods where the apparent height of towers will be reduced, and views of the line will be broken by trees.

Notes on rules 4 and 5

(a) Utilise background and foreground features to reduce the apparent height and domination of towers from main viewpoints.

(b) Minimise the exposure of numbers of towers on prominent ridges and skylines.

(c) Where possible avoid cutting extensive swathes through woodland blocks and consider opportunities for skirting edges of copses and woods.

(d) Protect existing vegetation, including woodland and hedgerows, and safeguard visual and ecological links with the surrounding landscape.

Rule 6

In country which is flat and sparsely planted, keep the high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, so as to avoid a concatenation or 'wirescape'.

Note on rule 6

(a) In all locations minimise confusing appearance.

(b) Arrange wherever practicable that parallel or closely related routes are planned with tower types, spans and conductors forming a coherent appearance; where routes need to diverge, allow where practicable sufficient separation to limit the effects on properties and features between the lines.

Rule 7

Approach urban areas through industrial zones, where they exist; and when pleasant residential and recreational land intervenes between the approach lines and the substation, go carefully into comparative costs of undergrounding, for lines other than those of the highest voltage.

Note on rule 7

(a) When a line needs to pass through a development area, route it so as to minimise as far as possible the effect on development.

(b) Alignments should be chosen after consideration of effects on the amenity of existing development and on proposals for new development.

(c) When siting substations take account of the effects of the terminal towers and line connections that will need to be made and take advantage of screening features such as ground form and vegetation.

Supplementary notes

(a) Residential areas

Avoid routeing close to residential areas as far as possible on grounds of general amenity.

(b) Designation of county, district and local value

Where possible choose routes which minimise the effect on special landscape areas, areas of great landscape and other similar designations of county, district or local value.

(c) Alternative tower design

In addition to adopting appropriate routeing, evaluate where appropriate the use of alternative tower designs now available where these would be advantageous visually, and where the extra cost can be justified.

ANNEX D
Guidelines for Undergrounding Overhead Lines

D.1 Introduction

The following guidelines set out the categories of area which NIE believes are the highest priority and where consideration may be given to undergrounding. They indicate those exceptional circumstances where NIE believes undergrounding might be justified.

D.2 Exceptionally Constrained Areas

D.2.1 Definition

The term "exceptionally constrained areas" has been adopted to refer to situations where physical or amenity factors relating to people, landscape, flora and fauna (including biodiversity), land use and development weigh most heavily against the use of overhead lines and therefore where consideration of underground cables is warranted. In such areas, judgement on the merits of each case will be required by NIE and where appropriate by independent expert advisers to justify the use of overhead lines in preference to underground cables.

The nature of the "exceptionally constrained areas" varies in urban and rural areas and the key factors are outlined below as a basis for the consideration of the potential use of underground cable.

D.2.2 Exceptionally constrained urban areas

Urban areas where there may be exceptional constraints on siting of overhead transmission lines comprise those locations where the density of residential, community and associated development and public open space is such that a reasonably direct overhead route is impracticable.

D.2.3 Exceptionally constrained rural areas

Of special concern in the siting of overhead lines in the countryside is the protection of important landscape features in designated areas of amenity value.

'Exceptionally constrained rural areas' are locations within or immediately alongside designated areas where the scale of new lines would dominate unspoilt landscape.

Examples of designated areas of amenity value:-

Areas of Outstanding Natural Beauty

Heritage sites

Country parks

Ancient monuments

Areas of Special Scientific Interest

Habitats (S.P.A. & S.C.A.)

Wetlands (Ramsar)

National nature reserves

Potential Areas of High Biodiversity Importance

D.3 Transmission Overhead Lines

The substantial cost of high voltage underground transmission cables coupled with the environmental and operational disadvantages are important reasons for the limited use of underground cables. The NIE approach is to seek overhead connections wherever possible. There are often severe disadvantages associated with transmission cables and a summary of the main influences for the NIE preference for overhead lines over underground cables are detailed in section D.5.

D.4. Potential Use of Transmission Underground Cables

When planning the routeing for transmission connections in exceptionally constrained areas, consideration may be given to the use of underground cables.

The potential use of underground cable in, or close to, exceptionally constrained urban and rural areas, would require that this is shown to be the most cost effective means of avoiding the need for high voltage overhead lines which would seriously harm the amenity of these areas. Consideration would have to be given in any case to the adverse effects on amenity of underground cables, sealing-end compounds, terminal towers and ancillary equipment and to any technical considerations that apply. In 'exceptionally constrained rural areas' consultation with independent landscape experts is desirable so that any environmental assessment will be subjected to informed independent scrutiny.

As a result of these considerations NIE would expect lengths of underground cable to be short. These guidelines give a positive indication of the circumstances which NIE believes may justify the use of 275kV and 110kV underground cables. As stated previously a judgement will be required by NIE and independent expert advisers on the merits of each case.

D.5 NIE Preference for Transmission Overhead Lines over Transmission Underground Cable

Set out below are some of the major considerations influencing the NIE preference for overhead lines over underground cables.

(a) The installation of high voltage transmission overhead lines provides an efficient and economical grid system.

(b) Faults on overhead lines are quickly identified and more economical to repair than those on underground cables.

(c) Faults on underground cables take longer to repair with a delayed circuit restoration to the main grid system.

(d) The cost of installing underground cables at 110kV and 275kV voltages is substantially greater than the cost of erecting overhead lines.

(e) Overhead lines minimise land take and physical disturbance.

(f) Underground cables in trenches or ducts take up a greater area of land than that needed for overhead lines.

(g) Additional land is also needed for sealing end compounds and terminal type towers where underground cables are joined to overhead lines at 110kV and 275kV voltages.

(h) Development above a cable route is severely restricted because of the need to protect the cable from damage and the need for permanent access.

(i) Excavation of land for cable installation, maintenance and repair is more disruptive to landowners, and the land, than overhead lines.

(j) No trees or hedges are allowed to grow over or near cables and no excavations can be made below 0.5 metres in the vicinity of the cable.

(k) Excavation of cable trenches may cause damage to sites of archaeological or nature conservation interest.

(l) Unstable ground conditions may have a detrimental effect on underground cables.

(m) Sealing end compounds and terminal towers can cause visual problems in sensitive locations and can be difficult to site.

(n) It is significantly more difficult to uprate high voltage underground cables.

Northern Ireland Electricity

CODE OF PRACTICE ON THE SITING OF SUBSTATIONS IN RURAL AREAS

Northern Ireland Electricity plc. Registered Office, 120 Malone Rd. Belfast BT9 5HT Registered in Northern Ireland NI 26041
Document Reference: 22 / 002 Version 1 May 1997

CONTENTS

FIGURES

Northern Ireland Electricity

This code of practice is issued under the direction and with the approval of the Transmission and Distribution Asset Manager.

This is the first version of the document to be issued.

The information contained herein shall be used by persons who have responsibility for the design, specification, construction and maintenance of NIE open terminal type substations and other capital schemes.

INTRODUCTION

NIE plc has responsibility under schedule 9 of the Electricity (NI) Order 1992 to have regard to the need to conserve the natural beauty and amenity of the countryside and shall, so far as is reasonable, mitigate the impact of its activities on the environment.

The construction, installation, operation and modification of open terminal substations does cause disturbance to the environment, the main issues being:

a) Visual impact
b) Impact on landscapes
c) Pollution
d) Electro magnetic fields (EMFs)

It is incumbent on NIE to develop policies and procedures which address these issues when choosing sites for substations. However, other criteria, particularly cost and technical suitability must also be considered.

The purpose of this document is to provide guidance on the requirements for the economic siting of substations to mitigate their impact on local environments. Technical considerations are beyond the scope of this document.

It must also be borne in mind that a substation is only one part of an overall scheme and must be viewed in this context. Not withstanding the following recommendations, the siting of substations shall incorporate the requirements for mitigating the impact of overhead line and underground cable circuits.

1.0 SITING

The following guidelines should be adopted when choosing a substation site. The recommendations apply particularly to rural locations but can and should be applied to urban locations where appropriate. The aim is to economically mitigate the visual impact of substations on the landscape from all vantage points of the site .

1.1 NATURAL CONCEALEMENT

Where possible and so far as is reasonably practicable, sites should be chosen so that concealment is provided by the natural ground contours or by siting the substation behind existing mature woodland or established dense undergrowth (figures 1.1a and 1.1b).

1.2 NATURAL BACKDROPS

Choose sites where existing trees, hedgerows, slopes or other natural features provide a natural backdrop to the substation (figures 1.2a and 1.2b).

1.3 OPEN LANDSCAPES

In areas where the character of the existing landscape offers little or nothing in the way of concealing features, the size of the site should be chosen to facilitate landscaping and/or artificial screening. In such circumstances, finished slopes should be compatible with the surrounding topography and any planted trees and shrubs should be indigenous to the locality (figure 1.3).

1.4 PROXIMITY TO ROADS

Avoid, so far as is reasonably practicable, road-frontage sites. Where possible substations should be sited off secondary roads or at an adequate distance from main roads to provide better concealment (figure 1.4).

1.5 ACCESS

Access roads to substation entrances should be taken from existing lanes where available. Where such lanes are not available, access roads should follow the natural contours and respect existing field boundaries.
When creating access roads or substation entrances traditional field patterns should be preserved and care should be taken to avoid the removal of field boundary hedges and stone walls more than is necessary. Where possible such boundaries should be re-instated following any access works.

1.6 OTHER FACTORS

Substation sites should avoid, so far as is reasonably practicable:

a) Hill-top locations or other prominent locations (figure 1.5).

b) Areas of amenity value eg. areas of outstanding natural beauty

c) Predominantly water backdrops such as lakes (figure 1.6).

d) Densely populated areas

Substation sites should take into consideration the proximity to existing electrical infrastructure.

1.7 EARLY PURCHASE OF SITES

Sites purchased well in advance of substation development should be planted early. This would provide an established screen prior to a substation being constructed and would limit the visual impact of substation construction and installation from the outset.

1.8 CIVIL COSTS

Bearing in mind the previous recommendations, sites shall be chosen with due consideration being paid to minimising the costs associated with civil works. Particular attention should be paid to choosing a site which avoids or limits the need for piling foundations.

Sites should be chosen which are as flat as possible, but not susceptible to flooding, to avoid excessive levelling costs. Where possible, sites should offer sufficient drainage to avoid the need for installing drainage systems.

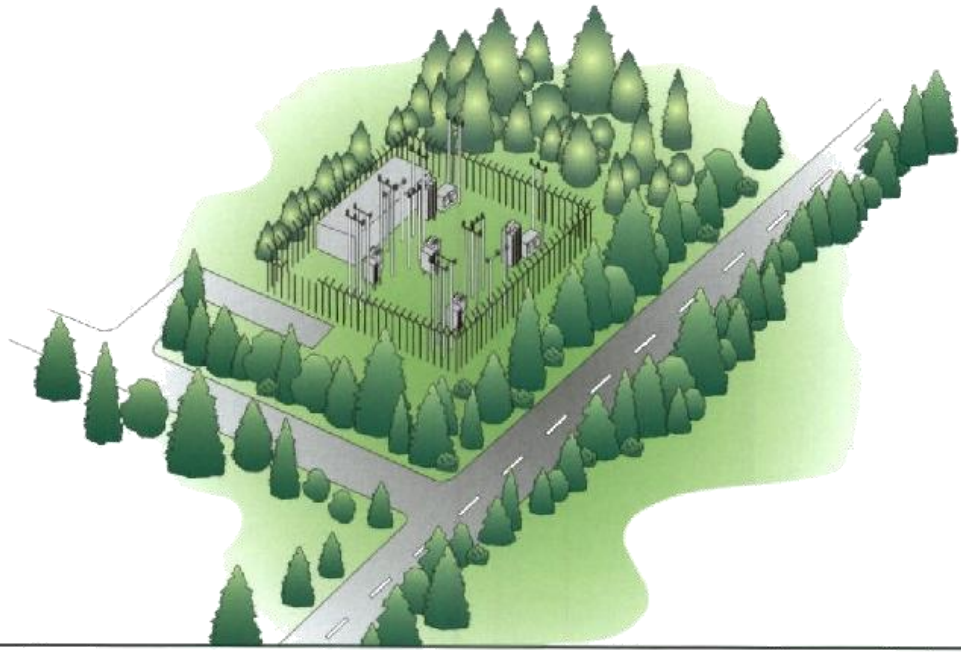
2.0 BOUNDARIES

Site boundaries should, where possible, be identified using existing hedgerows. Where such natural boundaries do not exist, the extent of the new substation development should be identified using a fence and associated hedging plants (figure 1.7).

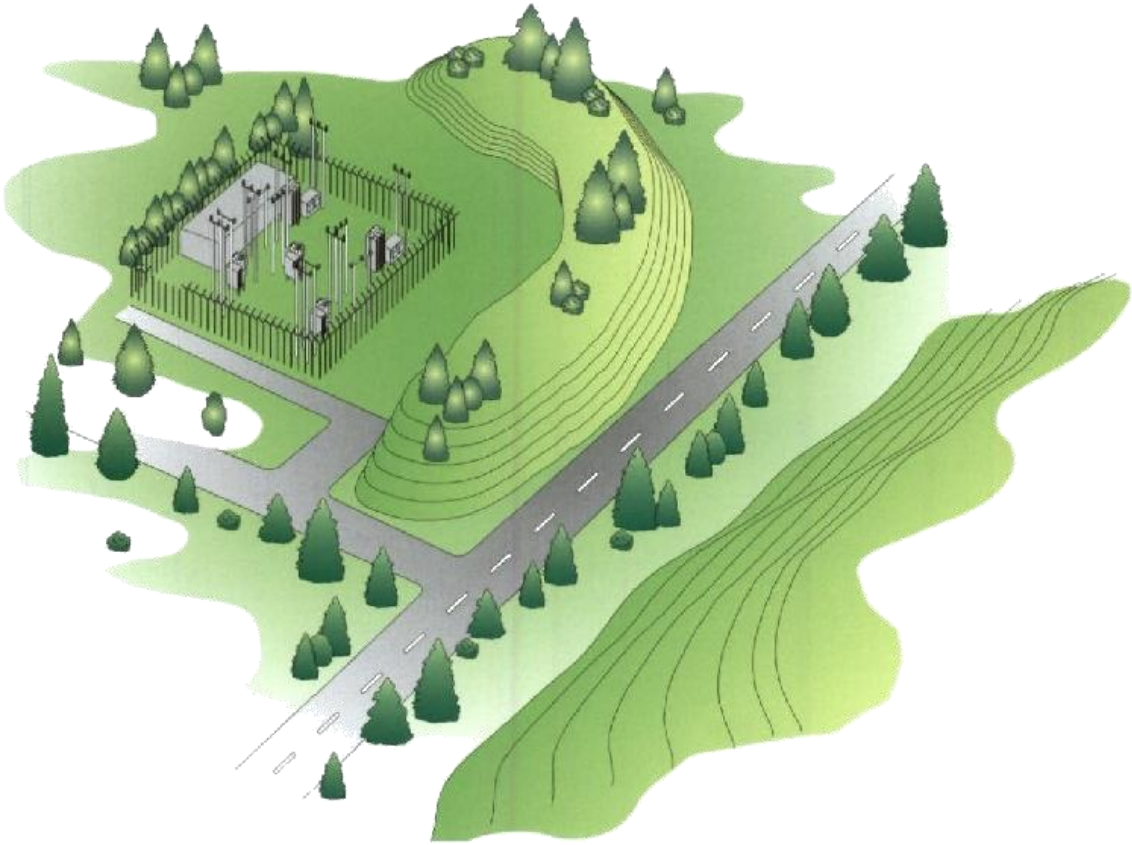
Hedging plants should, where possible, be indigenous to the locality.

Site boundary fences should also ensure that the delineated areas take into account future developments of the site eg. modification of single transformer substation to a two transformer site.

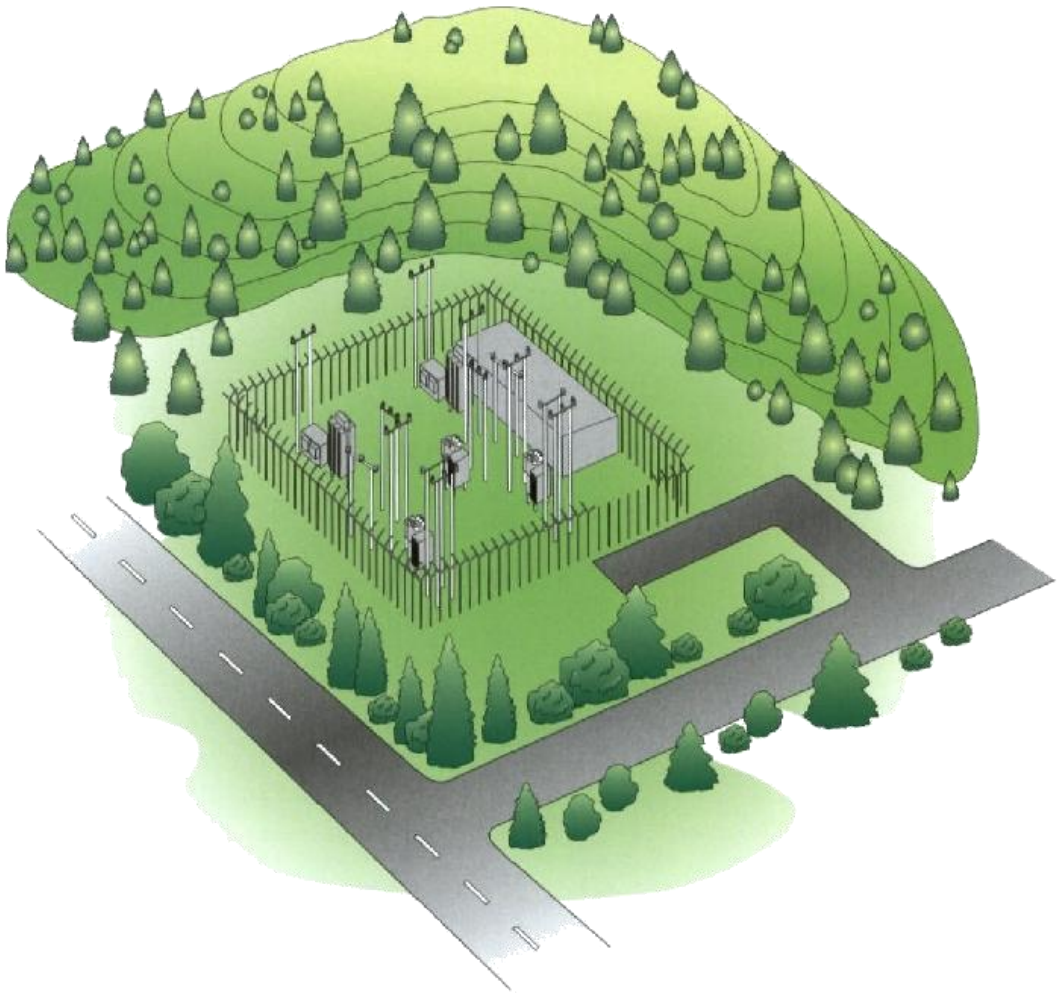
1.1a NATURAL CONCEALMENT USING EXISTING WOODLAND



1.1b NATURAL CONCEALMENT USING NATURAL GROUND CONTOURS

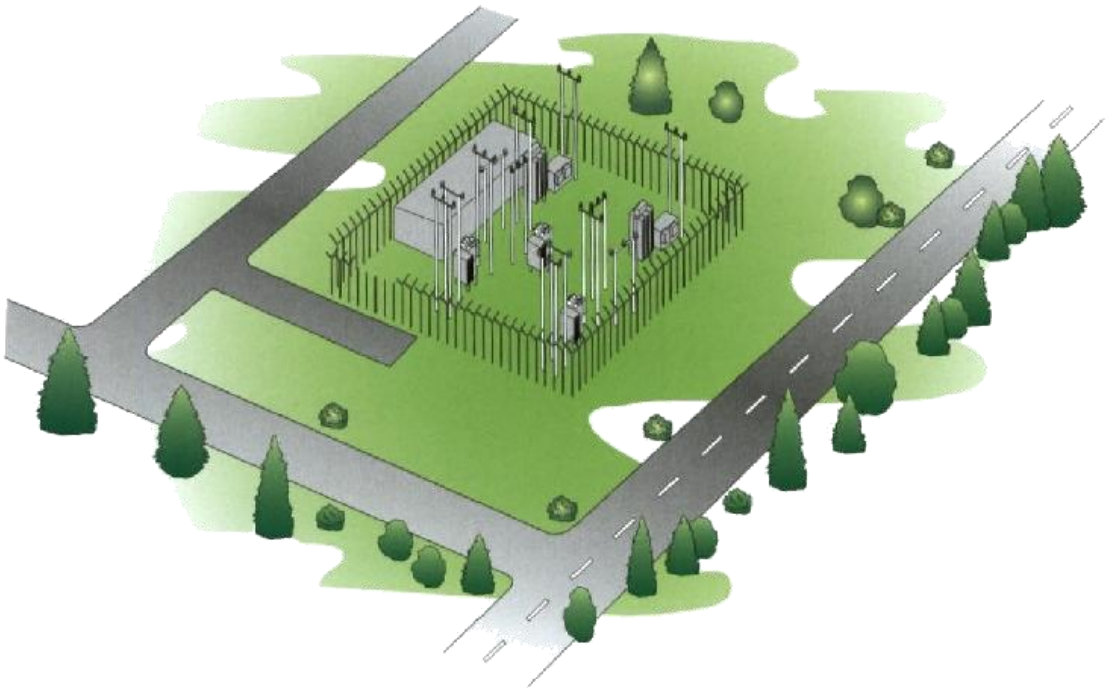


1.2a NATURAL BACKDROP USING NATURAL FEATURES (SLOPE)

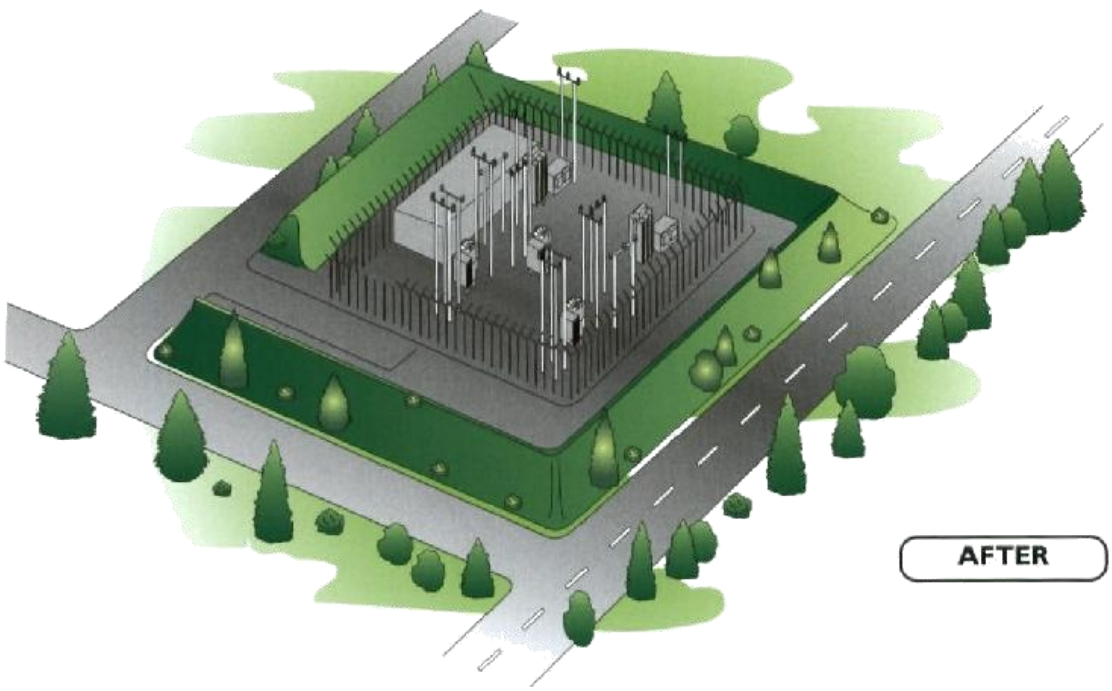


1.2b NATURAL BACKDROP USING EXISTING TREES

1.3 OPEN LANDSCAPES

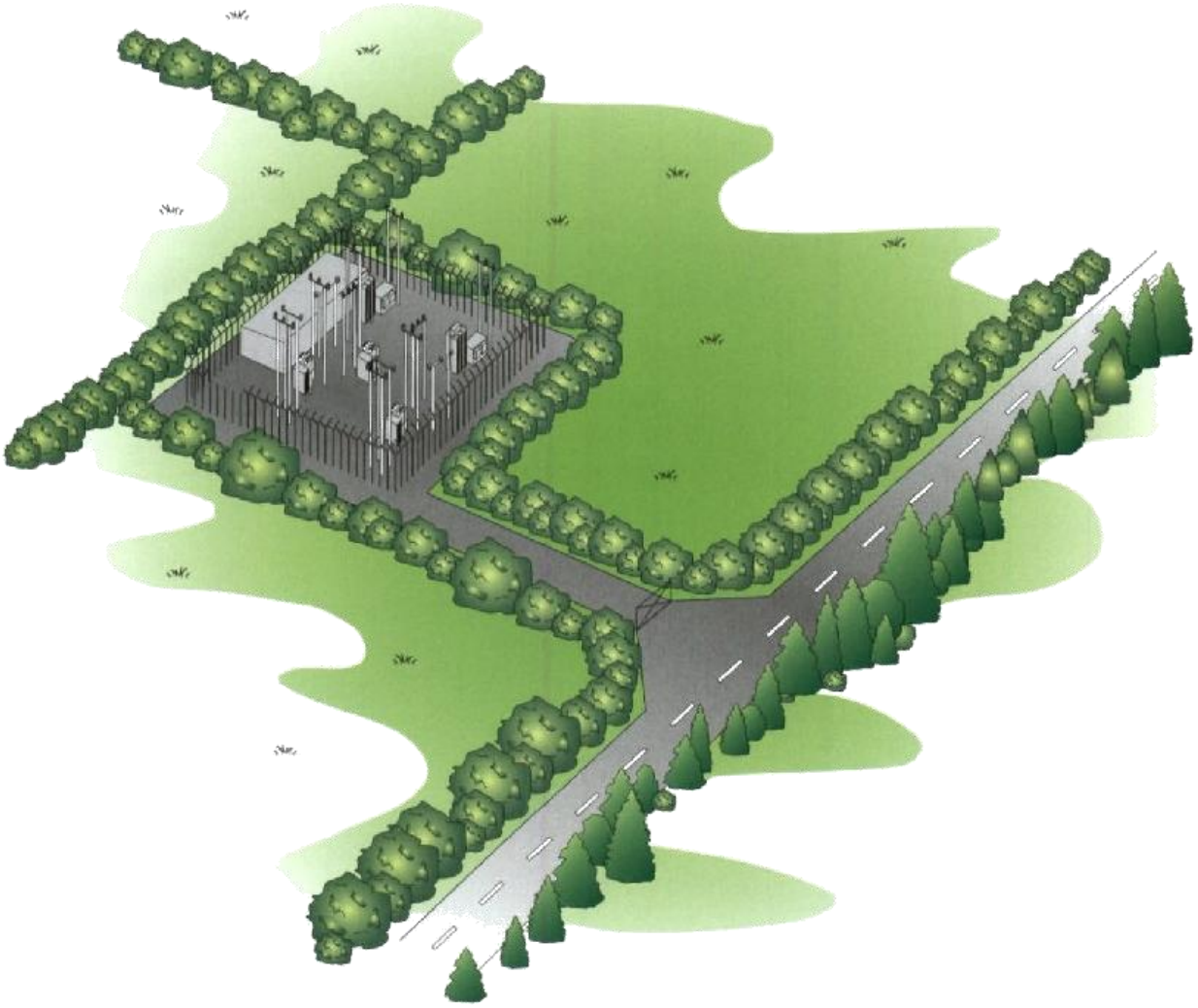


BEFORE

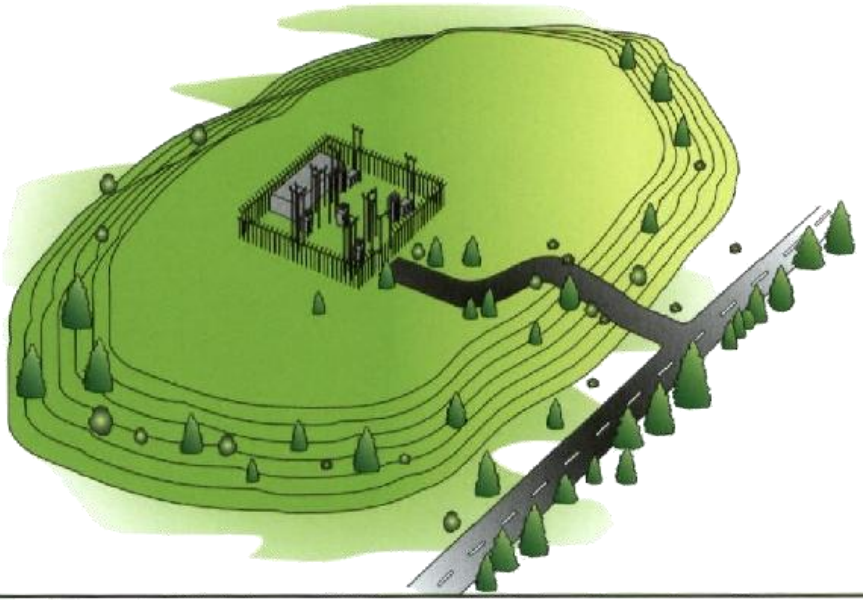


AFTER

1.4 PROXIMITY TO ROADS

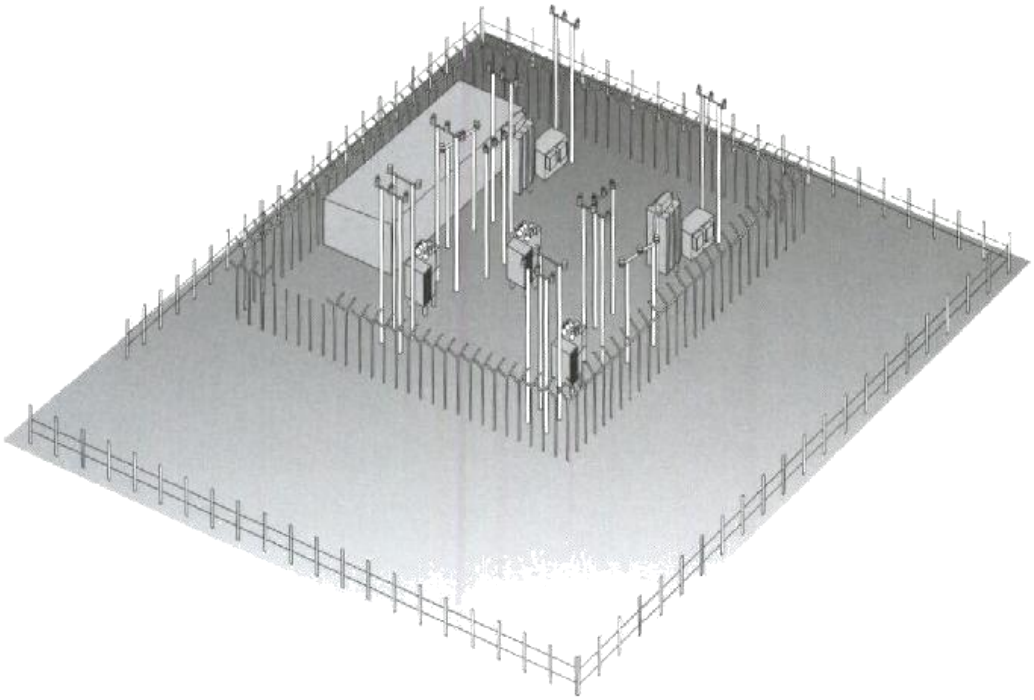


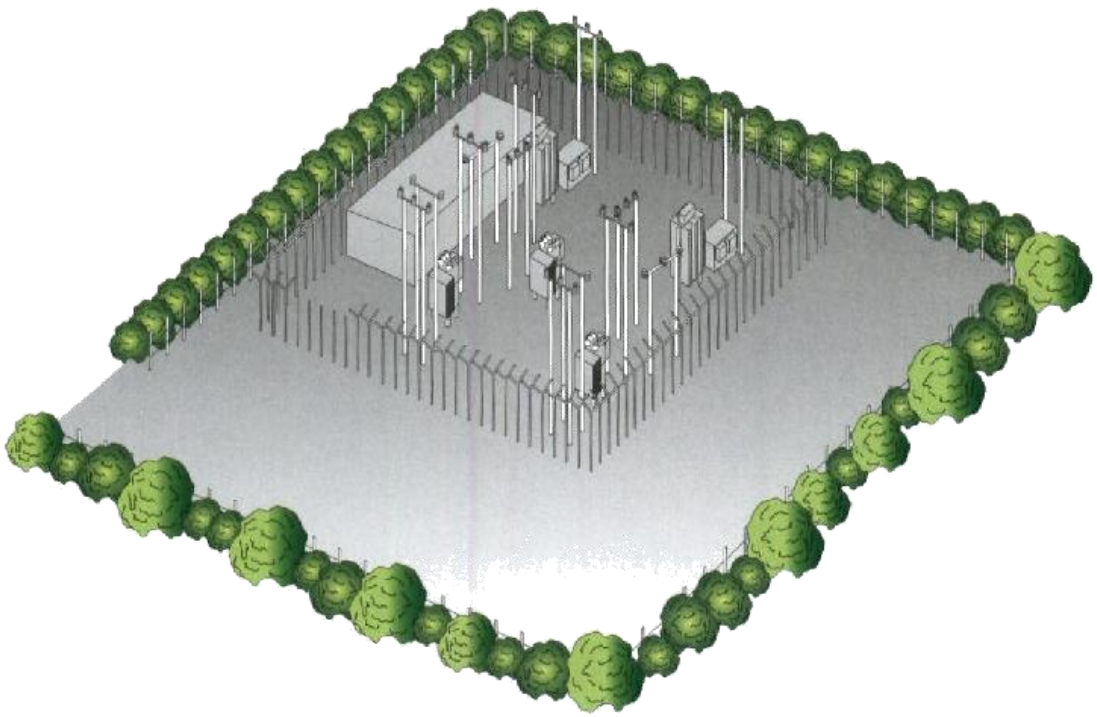
1.5 AVOID HILLTOP LOCATIONS



1.6 AVOID WATER BACKDROP LOCATIONS

1.7 BOUNDARY IDENTIFICATION USING FENCE AND HEDGING PLANTS





Code of Practice for Substation Buildings

Foreword

This code of practice is issued under the direction and with the approval of the Network Planning Manager.

This is the second version of the document to be issued.

The information contained herein shall be used by persons who have responsibility for the design, specification, construction and maintenance of NIE substation buildings.

Introduction

The purpose of this document is to provide guidance on the requirements for substation buildings.

The document applies to buildings constructed for Grid, Main and Primary type substations. It does not apply to Secondary Distribution substations.

The aim of the document is to provide a consistent approach to the design, appearance and layout of all substation buildings.

1.0 STRUCTURAL REQUIREMENTS

1.1 General

Buildings shall be designed to comply with BS CP3, Chapter 5: Part 2 and withstand a maximum gust wind speed of 50 ms^{-1}.

Buildings shall have sufficient mechanical strength to withstand all static and dynamic loads due to normal operation of plant and equipment.

Within the building construction, all load-bearing parts shall be fabricated from materials with a fire rating of at least 4 hours. Combustible materials used for partition walls should be treated in such a way as to provide a fire rating of at least 2 hours.

Switch rooms, control rooms and battery rooms shall be designed so as to minimise the effect of condensation and prevent the ingress of water, so far as is reasonably practicable.

Where specific requirements are available, the building design, including walls, roof and doors shall take into account the expected mechanical loading and internal pressure generated by an electrical fault in enclosed plant or equipment.

1.2 Walls

Walls shall comply with the general requirements outlined in section 1.1

The exterior walls of substation buildings shall be capable of withstanding the effects of atmospheric elements eg. rain, sun, wind, frost etc. and shall prevent the ingress of moisture into internal cable-draw pits.

Where pipes, cable ducts etc are required to run through the substation building, either externally or internally, they shall not affect the structural integrity of the walls.

Walls are generally not required to have cavity wall insulation.

The choice of materials and finishes used in the construction of the exterior walls shall be such as to be aesthetically sympathetic with other buildings in the locality. Where problematical situations exist eg. high risk of vandalsim, landscapes of significant amenity value etc, architectural advice should be sought.

The finishes for rural and urban locations should be as indicated below:

Rural:	Self-coloured maintenance free dash (or equivalent) finish.
Urban:	A finish which matches brick-work of other buildings in the locality. In the absence of any other brick buildings a rustic red brick shall be adopted.

Additional site specific aesthetic measures for some buildings may be needed to blend in with sensitive localities.

1.3 Roofs

Roofs shall comply with the requirements outlined in section 1.1 and shall generally be darker than the outer walls of the building and constructed using naturally coloured materials so as to be in sympathy with the local environment.

In the absence of site specific requirements a dark grey concrete tile shall be used.

The preferred type of roof is a pitched roof and shall be designed to be completely waterproof. Pre-cast concrete slabs shall also be provided to contain the pressure build-up caused by equipment faults.

Grid and Main substation roofs shall be provided with sufficient thermal insulation as to minimise the degree of condensation and heat loss.

In some locations it may be appropriate to construct a flat roof building, due to the finishes and appearance of adjacent properties. The roof shall be made of pre-cast concrete slabs which shall be designed so as to be completely waterproof and be sufficiently anchored to the walls so as to contain the pressure build-up caused by equipment faults.

Alternatives to pre-cast concrete slab and pitched roofs may be acceptable provided the general requirements outlined in section 1.1 can be achieved.

1.4 Doors

1.4.1 General

Doors shall comply with the general requirements outlined in section 1.1.

1.4.2 External Doors

All ground-level rooms within a substation building with an external wall should have at least one external access door. Such doors shall open outwards, be fitted with an approved security lock in accordance with Appendix 10 of HSRI 100 and shall be furnished with the required notices and safety signs.

External doors and doorframes shall require minimum maintenance, normally fabricated from hard wood and offer a fire rating of at least 2 hours.

In designated 'high risk' areas (cf NIE Code of Practice 7/17 'Substation Security') and in those locations where external doors open directly into a public area, the doors shall be made from GRP, steel or equivalent, offering a high degree of vandal resistance. These doors shall have a fire rating of at least 2 hours.

Switchrooms shall have external doors or removable panels which are suitably sized and configured to facilitate the installation/removal of plant and equipment.

All external doors to switchrooms, control and battery rooms shall be weatherproof.

Doors to transformer rooms fitted with ventilation louvres shall be designed such that the louvres do not compromise the fire rating of the door nor the degree of vandal resistance. A vermin guard shall be incorporated within the design of the louvre.

External doors shall be able to be unlocked from within.

Provision shall be made to secure external doors when opened so as to prevent inadvertent closing eg. strong winds etc.

1.4.3 Internal Doors

Internal doors between various rooms within a substation building are not required to have locks and shall have a fire rating of at least 2 hours. Internal doors and doorframes shall require minimum maintenance.

1.5 Windows

Primary substation buildings shall not have windows. However Main and Grid substation buildings may have windows provided they are not on a wall forming, or adjacent to, the security perimeter. Windows should only be located on walls where

the glass cannot be broken by persons throwing objects from outside the security perimeter. Windows shall be fabricated from white uPVC and be double-glazed with shatter-proof glass.

1.6 Rain-water Drainage

Substation buildings shall incorporate a method of rainwater drainage to ensure that roof run-off flows into the main drainage system of the substation, where appropriate.
Where the substation is designated as being in a high risk area (cf Substation Security and Safety Code of Practice 7/17) attention should be paid to reducing the risk of rainwater down pipes being used as climbing aids.
The preferred method of reducing such risk is to use internal downpipes which empty into a horizontal back-inlet gully trap.

1.7 Building Security

Substation buildings should be designed to comply with the requirements of NIE Code of Practice 7/17 on Substation Security.

2.0 Interior Requirements

2.1 Finish of Interior Walls

Internal walls shall offer a durable finish, free from flaking and dust, and resistant to general corrosion. The finish of internal walls shall have a fire rating of at least two hours and any services passing through these walls should be suitably fire stopped.

A fair-face masonry finish (or equivalent) shall normally be adopted; painting is not required.

2.2 Electrical Installations

All electrical installations within substation buildings shall be designed in accordance with the requirements of the most recent edition of BS 7671.

All electrical building services shall be marshalled to a three phase central consumer unit mounted within the control room.

Particular attention shall be paid to those electrical installations within battery rooms housing lead-acid or alkaline batteries. The design of these installations shall comply with section 527 of BS 7671 so as to minimise the risk of fire in a potentially hydrogen rich environment.

2.3 Air Conditioning and Ventilation

This covers heating, humidity control and ventilation. In addition to the requirements detailed below, rooms containing batteries should comply with the requirements of BS 6132 and BS 6133.

2.3.1 Temperature

Substation building designs shall incorporate sufficient heating and ventilation to ensure that the temperature within control rooms are maintained:

1) at a minimum of 15°C within Grid and Main Substations utilising suitably rated storage heaters;and
2) at a minimum of 5°C in Primary Distribution substation.

Battery rooms shall be maintained at a minimum temperature of 5°C and comply with the requirements of BS 6132 and BS 6133.

Switchrooms rooms are required to be maintained at a minimum of 5°C to minimise the likelihood of condensation.

Control rooms within Primary Distribution substations shall be provided with fan assisted wall heaters and an adjustable 0-2 hour timer switch, to raise the temperature to a minimum of 15°C on occasions when staff are working in these locations. Such heaters shall not be fitted with a ON/OFF switch only.

2.3.2 Ventilation

2.3.2.1 General

Ventilation systems shall be designed to comply with the requirements of BS 5925.

Generally natural ventilation should be used throughout buildings, ensuring an average flow rate of 0.8 Ls^{-1} per m^2 of floor area. Ventilation openings shall be designed so as to prevent any dangerous proximity to live parts and any dangerous ingress of alien bodies.

2.3.2.2 Rooms Containing Batteries

Rooms within substation buildings which shall house battery installations shall comply with the requirements of NIE Code of Practice for DC systems for Grid, Main and Primary substations (Doc ref 7/020).

Within such rooms particular attention should be paid to ventilation requirements as detailed in BS 6133 and BS 6132. The ventilation system should ensure the average concentration of hydrogen does not exceed 1% by providing a flow of air across the batteries such that inlet vents on one side are at low level and the outlets on the opposite wall are at a high level. Such high level outlets shall vent to the open air. If vents cannot be fitted on an external wall, the vent shall be ducted to atmosphere using non-corrodible ducting. External vents shall be fitted with a vermin guard.

2.3.3 Humidity Control

Relative humidity shall be maintained throughout the building at between 40 - 70%.

2.4 Lighting Requirements

2.4.1 General Lighting Requirements

Substation buildings shall be designed so as to have a Standard Service Illuminance of 300 lx throughout in accordance with the CIBSE Code for Interior Lighting.

In general the location of luminaires shall be such that the distribution of light is uniform across the working area. In switchrooms, the luminaries shall be arranged so as the front and rear of the switchgear panels are well illuminated.

It is preferred that in battery rooms luminaries shall be gas tight and be provided over the access areas and not over the battery cells.

2.4.2 Emergency Lighting Requirements

All Primary, Main and Grid substations shall have an emergency lighting system installed providing a minimum luminance of at least 0.2 lx within the substation building. The emergency lighting system is for aiding the escape process only and is not designed for standby work. Should standby work (eg. repairs) be required under emergency circumstances portable lighting should be used.

Emergency lighting systems shall comply with the requirements of BS 5266 and the system shall ensure that when supply to normal lighting fails the emergency lighting will:

(i) indicate clearly and unambiguously the escape routes

(ii) provide illumination along escape routes to allow safe movement

(iii) ensure that fire fighting equipment can be readily located

All exits, emergency exits and escape routes within a substation building shall have an exit sign fitted so as to readily identify the exit and escape route. Signs shall comply with the European Signs Directive.

The luminaries of the emergency lighting system shall be part of a combined emergency luminaire (or be of the self-contained type and operate in a non-maintained mode).

The system shall incorporate tamper proof test switches to check operation of the emergency lighting system.

2.5 Floors

All flooring shall be designed so as to have sufficient mechanical strength to withstand all static and dynamic loads due to normal operation of plant and equipment.
Switchrooms and battery rooms shall have concrete floors with a rubbed up concrete finish and shall be sealed to the approval of NIE.

Control Rooms shall have computer type cavity flooring, with associated concrete sub-floor and concrete dwarf walls to ground level.

Battery rooms shall be coated with a chemical resistant coating including a 100mm skirting.

Floor surfaces should be free from holes, slopes, uneven or slippery surfaces and should minimise the likelihood of slipping if a spillage occurs.

Cable trenches/basements at the rear of switchgear shall be floored so that they are readily accessible eg. hard-wood baulks.

2.6 Cable Ducting

To prevent the mechanical damage of cable sheaths, ducts shall facilitate the entry of cables into buildings.

The cable ducts shall conform with the requirements of NIE Specification 204-12 ' Underground Cable Ducts including Flexible Pipe '.

Cable ducts shall be designed to take into consideration methods of;

(i) preventing the ingress of moisture into the building, if applicable.

(ii) preventing dangerous gases entering the building, if applicable.

(iii) preventing burning oil entering the building, if applicable.

(iv) preventing vermin entering the building.

3.0 Fire Risk and Prevention

3.1 General

Substation buildings shall be designed to comply with the levels of fire resistance specified in Section 1 and the requirements of NIE Code of Practice 7/9-D 'Limiting Fire Risk at Distribution Substations' (and the associated Distribution Instruction).

The fire ratings of materials shall be as specified in the appropriate sections of this Code of Practice.

3.2 Provision of Fire Fighting Equipment

3.2.1 Main and Grid Substations

All Main and Grid Substation Buildings shall have one CO_2 and one dry powder type fire extinguisher located so as to be readily convenient to the switchroom and battery room. Provision shall be made for the maintenance and inspection of all such extinguishers.

3.2.2 Primary Distribution Substations

Distribution substation buildings shall not be furnished with fire extinguishers.

4.0 Facilities

4.1 Sanitary and Washing Facilities

All Main and Grid Substations shall have sanitary and washing facilities.

All Primary Distribution Substations shall, where reasonably practicable, have sanitary and washing facilities.

Where appropriate the buildings shall incorporate a separate room containing a sanitary convenience and washing station. The washing stations shall incorporate a wash-basin and should have a running supply of hot and cold water.

In addition, battery rooms within Grid and Main substations shall be fitted with a washing station.

Rooms containing sanitation facilities shall be fitted with a coat hook, toilet-paper dispenser, hand-towel dispenser and a means of providing for the disposal of hand towels *etc.*

The room shall be well ventilated so as to ensure that offensive odours do not linger and illuminated to the levels detailed in section 3.3.1.

The discharge of a toilet should be either to a public sewer, where available, or aseptic tank with an appropriatley designed method of discharge. Other methods of sewage discharge may be acceptable subject to the approval of NIE.

4.2 Notices and Signs

The exterior of substation buildings shall be furnished with the safety signs and statutory notices detailed in NIE Code of Practice 7/17 ' Substation Security ' and as listed in Table 1 over.

Table 1 - Requirements for Notices and Signs

NOTICE	LOCATION
NIE Health & Safety at Work Notice	Inside all Buildings
Electric Shock Notice	Inside all Buildings
SF6 Warning Signs	Outside all relevant Buildings
CO_2 Warning Signs	Outside all relevant Buildings
Asbestos Warning Signs	Outside all relevant Buildings
Hard Hat Signs	Outside, on perimeter fence or at access doors on building perimeter walls
Safety Signs	Outside, on perimeter fence or at access doors on building perimeter walls
Statutory Notices	Outside, on perimeter fence or at access doors on building perimeter walls

Annex A
References

BS 5266	"Emergency Lighting - Code of Practice for the Emergency Lighting of premises other than cinemas and certain other specified premises used for entertainment."
BS 5925	"Code of Practice for ventilation principles and designing for natural ventilation."
BS 6132	"Code of Practice for safe operation of alkaline secondary cells and batteries."
BS 6133	"Code of Practice for safe operation of lead-acid secondary cells and batteries."
BS 7671	"Requirements for Electrical Installations."
BS CP3	"Basic Data for the Design of Buildings."

CIBSE Code for Interior Lighting

NIE Code of Practice 7/9-D	"Limiting fire risk at distribution substations."
NIE Code of Practice 7/17	"Substation Security."
NIE Code of Practice 7/020	"Code of Practice for DC systems for Grid, Main and Primary substations."
NIE Specification 204-12	"Underground Cable Ducts including Flexible Pipe."
DOE NI	"A Design Guide for Rural Northern Ireland", HMSO Publications

4.0 NIE Guidance Documents

Technical Supplement

Guildlines For Dealing With Birds Roosting On Overhead Lines

Contents **Page**

Foreword

This information document is issued under the direction and with the approval of the Transmission and Distribution Assets Manager.

Introduction

The purpose of this document is to give guidance on managing the problem of birds roosting on overhead lines and fouling the ground below, leading to complaints from the public.

Section 1.0 Policy Statement

Northern Ireland Electricity recognises that there is concern about bird fouling from birds roosting on overhead line conductors and associated structures and also recognises that individual members of the public will have difficulty resolving a bird fowling problem. Regrettably there does not appear, at present, to be a practical long term solution to this problem. NIE has undertaken to trial possible solutions, to give advice and to carry out actions which it deems reasonably practical to alleviate the problem, provided the action is economically viable. NIE does not accept liability for the problem and cannot undertake to provide a solution.

Section 2.0 Measures

2.1 Principles

NIE cares about customers' concerns and is committed to providing members of the public, customers and our employees with full and up to date information about bird fouling. The following principles relating to birds roosting on our equipment have been adopted:

- we will continue to monitor closely developments, reviews and research concerned with bird fouling, and when appropriate, contribute to the trials of new developments within this field
- we will respond to requests from our customers and the general public, by providing any assistance that is reasonably practical and economically viable
- we will constantly review our approach to ensure that it is consistent with the best available knowledge on the subject at any time.

2.2 Actions

In situations where NIE deems it suitable, one or more of the following approved actions may be taken.

(i) ***Distress calls*** have been found to be a deterrent in some cases. Tape recordings of distress calls are most effective when played as birds are about to roost and set at a suitable decibel level.

(ii) ***Artificial birds of prey*** can be fitted to distribution poles and transmission towers in an attempt to scare birds away. More effect is derived if the artificial bird is attached so that movement occurs. Care has to be taken to ensure that the bird is securely fixed to the structure and positioned at the highest point on the structure.

(iii) ***Ultra sonic bird scaring devices*** have also been found to be a deterrent in certain instances. The location of the device has to be carefully selected and the frequency level set to suit individual site requirements. These devices are expensive and require regular maintenance and adjustment to attain any degree of success. Consequently, the use of ultra sonic devices tends to be limited. NIE will provide one of these devices on a short term loan if requested.

(iv) ***Hair brush rollers*** can be fitted to most distribution lines to prevent birds from roosting on the line conductors. These 'rollers', which rotate on impact, may only be applied to one third of a span as any additional 'rollers' may lead to excessive loading and failure in service. Care should be taken with the positioning of these 'rollers' to maximise the benefit to all persons residing under the span in which the 'rollers' are to be fitted.

(v) ***A pinnacle device*** can be fitted to distribution pole cross-arms to prevent birds from roosting. It is normally fitted along with the rollers to maximise effectiveness.

Section 3.0 Costs

As an act of good will towards customers, NIE will pay all reasonable costs associated with methods (i), (ii) and (iii) where it is deemed that nuisance exists irrespective of who is second comer to a site.

Where considered appropriate methods (iv) and / or (v) will be implemented on overhead lines free of charge if NIE is a second comer to a site. However, where lines have been established for some time and this work is requested by a member of the public, a quotation for the work will be provided and the work will be put in hand on acceptance.

Guidelines for dealing with birds flying into overhead lines

Contents **Page**

Foreword

This information document is issued under the direction and with the approval of the Transmission and Distribution Assets Manager.

Introduction

The purpose of this document is to give guidance on managing the problem of birds flying into overhead lines causing damage to themselves and / or the overhead line.

Section 1.0 Policy Statement

Northern Ireland Electricity recognises that there is concern about birds flying into overhead conductors and associated structures and recognises that individual members of the public will have difficulty resolving this problem. Regrettably there does not appear at present to be a practical long term solution to this problem. NIE has undertaken to research and trial possible solutions, to give advice and to carry out actions it deems reasonably practical to alleviate the problem, provided the action is economically viable. NIE does not accept liability for the problem and cannot undertake to provide a solution.

Section 2.0 Measures

2.1 Principles

NIE cares about customers' concerns and is committed to providing members of the public, customers and employees with full and up to date information about bird diversion away from overhead lines. The following principles relating to birds flying into NIE equipment have been adopted:

- we will continue to monitor closely developments, reviews and research concerned with bird striking overhead lines, and when appropriate, contribute to the trials of new developments within this field

- we will respond to requests from our customers and the general public, regarding problems with birds flying into our equipment by providing any assistance that is reasonably practical and economical viable

- we will constantly review our approach to ensure that it is consistent with the best available knowledge on the matter at any time.

2.2 Actions

Currently there is limited knowledge available about bird behaviour patterns around overhead lines. There are many types of bird divertors on the market but no information about what is appropriate for varying situations. NIE has undertaken to research this problem with respect to both pigeons and swans. In situations where NIE deems it suitable bird diverters may be fitted.

2.2.1 Pigeons

Pigeon fancying is a popular sport in Northern Ireland and these birds fly into overhead lines on occasions. Bird diverters can be fitted on distribution overhead lines with limited success.

2.2.2 Swans

Whooper swans are a protected species and Northern Ireland provides the wintering grounds for a significant population of this type of bird. They are a large heavy bird and may damage lines they fly into as well as injuring the birds themselves. Swans flying into overhead lines frequently lead to outages for customers. If NIE is approached every attempt will be made to alleviate the problem if a significant population of swans are involved. It should be noted that swans will change their flight patterns year by year depending upon the local crops within the fields upon which they feed. This means that a problem area one year could be problem free the next. Each case needs to be evaluated separately and there is no set type of diverter or spacing that is recommended. There are examples of divertors fitted at all voltages within Northern Ireland.

Section 3.0 Costs

Since there is some limited success from preventative measures for pigeons, a policy has been adopted to fit bird diverters on overhead lines free of charge if NIE is a second comer to a site or if line alterations were carried out and it can be shown that collisions are a consequence. Alterations to lines include moving lines as well as lowering or raising the lines. However, where lines have been established for some time and diverters for pigeons are requested by a member of the public, a quotation for the work is provided and the work will be put in hand on acceptance. Work will only be carried out providing that the pigeon lofts do not contravene DOE Planning Service Regulations.

NIE will pay for the cost of fitting bird divertors for swans were it is deemed that fitting diverters will make a significant difference.

Northern Ireland Electricity

PROVISION OF SUBSTATIONS BY NORTHERN IRELAND ELECTRICITY IN NEW DEVELOPMENTS

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Document Reference: 22 / 001 Version 1 - May 1997

MESSAGE

This publication has been prepared to set out the general requirements of Northern Ireland Electricity plc ("NIE") for the provision of substations in new developments and should be read in conjunction with publication SP2 entitled Provision of Mains and Services by Northern Ireland Electricity plc in Housing Developments.

CONTENTS

Northern Ireland Electricity

INTRODUCTION

Electricity substations: why and where

Every new development needs electricity. Most new developments need an electricity substation. Developments also need planning permission and one of the factors the Planning Service considers when making its decision is the siting of the substation: in particular how well it is incorporated into the plan as a whole. We have written this booklet to encourage developers to start thinking at the earliest stage about how best to site a substation so as to satisfy everyone involved.

What does that mean in the real world? Firstly, a substation has to be in a spot which meets our own necessarily stringent technical standards and practical requirements. Secondly, it has to satisfy a public which cares increasingly about the impact of buildings on the landscape. Why does that matter? Partly because their concerns are reflected in the planning requirements but also because good relations is good business practice.

Nuts and bolts of a supply system

The typical supply system consists of an underground cable or overhead line which brings high voltage electricity to the development, and a substation which converts the supply from high to low voltage. A mains cable then carries the low voltage supply around the development.

The ideal site: now you see it, now you don't

The ideally-sited substation is one which is easy to get at for those who have to, but otherwise goes unnoticed. There are various ways to achieve this, none of which are complicated as long as they are planned at an early stage. We explain how in the next few pages and give you several examples of good and not-so-good practice.

Every site is different

Although the booklet contains most of what you need to know, every site is different. We can't provide all the answers here. So do contact us as early as possible so that we can use our experience and expertise to help make your progress towards planning permission as smooth, efficient and cost-effective as possible.

Best practice: or, "Don't bin the booklet!"

We want to make it clear that the booklet does embody what Northern Ireland Electricity regards as best practice. So developers should understand we reserve the right to refuse to install substations in cases where they have manifestly ignored our recommendations.

PLANNING AND LIAISING

Let's talk soon

You need electricity. We need to plan your supply so that we can minimise the number of substations, work out sensible routes for the cables, and maximise their use. To do that, we need to talk to you as early as possible about the first and any subsequent phases of your development.

Existing substations

There is a possibility that your supply could come from an existing substation which is nearby and happens to have spare capacity.

New substations: your place or theirs?

If there is no suitable existing substation, you should start planning where to put a new one at the outset. If there are to be other building projects on adjacent land, the most rational solution may be to share a substation with a neighbouring developer. In that case, we can help to establish the best site available, on equitable terms.

What kind: ground- or pole-mounted?

In this booklet we're talking principally about housing developments and these are usually supplied from what we call 'ground-mounted' substations.

This term differentiates them from 'pole-mounted' substations which are sometimes used to supply isolated developments in the country, or to provide electricity to a development under construction while we wait to get access to the permanent site.

A ground-mounted station supplied by a high voltage underground cable is usually a simple kiosk or a plain brick building.

Small, medium or large?

The size and type of substation depends on: the nature of the development; the character of its surroundings; your plans for it in the longer-term; the size and type of equipment we shall have to install as a result of those plans; any particular environmental factors; and any conditions required by the Planning Service.

Do come and talk to us about all these factors as early as possible.

Keep us posted or What do you mean, you've "moved the goalposts..." ?

Most developments undergo change between the first idea and the finished project. Changes which may not seem all that radical to the developer can have a profound effect on the cost and efficiency of the electrical supply. It is imperative to keep us fully informed so that our plans and yours remain in step from first to last.

THE IDEAL SITE

Practicalities, aesthetics and safety

A substation in an ideal position is one which is close to the incoming supply, easy for us to get at, but otherwise wholly unobtrusive.

Our engineers must be able to get at a substation easily both to install equipment and to maintain it. Installation involves a heavy-weight vehicle and a crane. So the site must be within 14 metres of a public or private road.

As for being unobtrusive, it is important that the structure neither spoils its surroundings, nor presents a security risk to the over-adventurous. It shouldn't tempt people to dump litter, nor attract children, nor the attention of loiterers or vandals.

Loitering can lead to physical damage and physical damage to a substation is potentially dangerous. Graffiti are unsightly and expensive to remove or to paint over. Litter is an unhygienic eyesore. And children are at particular risk if they get access. So unless these factors are fully taken into account when planning a site for a substation, we cannot guarantee to install one at all.

Integration: making it 'belong'

How do you make a substation unobtrusive? If you look at the examples on pages 9 to 18 you will get a number of ideas.

The best way is to associate the substation with neighbouring buildings, to fit it in as an integral part of the overall layout. It becomes insignificant because it is just one of many related structures. It doesn't stand in isolation.

Screening

The Planning Service may require a substation to be screened as a condition of planning permission. A carefully sited substation may also need screening to help it merge into the development. If a substation is sited well, screening may not be necessary, as in the example on page 13. That one is tucked in among the adjacent houses so neatly it looks as if it belongs to one of them. This in itself provides an element of protection.

In cases where screening is necessary or desirable, it can be done either with fencing or planting. If you use fencing, choose a type that suits the site. For example, don't use heavy industrial fencing on a housing development. And if you have already chosen one style of fencing for the rest of the development, use the same kind for the substation.

To use an entirely different style for the substation alone is to draw attention to it, possibly of an unwelcome kind.

The fencing or planting must go outside the area which we shall lease for the substation. It is up to whoever buys the adjoining property to take care of the fencing or planting, and it is up to the developer to make sure that arrangements covering its care and maintenance are incorporated in the sales agreement. Finally, make sure that if you screen the substation, you don't inadvertently create a space which becomes an ad hoc playground or attracts the kind of anti-social behaviour we have already talked about.

THE IDEAL SITE

Subdued colouring

We already have a range of colours which we know from experience will enable a kiosk to blend in with a variety of surroundings.

Avoiding fire hazards

The substation must not create a fire hazard, nor be in the way of people escaping from a fire. So it must be:

- at least 1.0 metre from any building
- at least 2.0 metres from any kind of escape route, windows and eaves as well as doors, and including those on upper floors, regardless of the height
- at least 6.0 metres from domestic oil or gas tanks

Noise

There is very little noise from a kiosk substation. Even so, it is wise to keep them at least 5.0 metres away from windows so as to avoid any chance of a complaint.

Road traffic and the substation

The Roads Service has its own regulations about these sites. Briefly, a substation mustn't interfere with the sightlines of drivers or people crossing the road. Nor can it be placed somewhere where there is a risk of it getting hit by traffic.

In short: the practicalities

The site for your substation should:

- be within 14 metres (the maximum distance at which the crane can operate) from a public or private roadway
- have its own separate and direct access from the road
- be within the building line

The road itself should have an axle-loading of at least 10 tonnes.

In short: the safety angle

Security is the most important factor to consider when choosing a site for a substation. Its final appearance is also extremely important, but security comes first.

Children must be kept out of substations. So if the site is screened either by planting, a fence or a wall, it is vital to make sure this actually keeps children out rather than helping them to get in. Make sure there are no fixtures of any kind on or close to the fence which could help them to get over it.

ACQUIRING THE SITE

Leasing or buying

Whenever a substation is installed partly or wholly to supply a development on privately-owned land, NIE will acquire the site (including those parts needed for access and maintenance) either by:

- lease, or
- purchase of the fee simple

Life of the lease

The period of the lease should be not less than that of the buildings on the development, normally 999 years is sought. (Leases from public authorities may be only 99 years).

In the case of brick substations, the lease includes the building with NIE being responsible for maintaining it.

Easement and rights of way

In all cases, the developer must provide easement for the cables to reach the substation. And if a right of way has to be established to allow NIE staff to get to the substation site, the developer must provide that too.

Starting work

NIE starts to install its equipment only when:

- the necessary statutory consents have been given
- the legal formalities have gone far enough to satisfy the NIE's solicitor.
- The building has been approved by the NIE Group Manager, Network Projects.

TECHNICALITIES

Introducing the drawings

The technical drawings on the following two pages are for information only. They are not intended to be used for construction purposes. Whenever necessary, we provide the developer with a copy of the latest drawings (we reserve the right to amend or update them at any time) together with construction details and a specification.

Boundaries and access: the developer's role

It is up to developers to provide any boundary, fencing, screening or landscaping that may be needed, and to construct a path or right of way able to withstand the appropriate axle-weight (a maximum of 10 tonnes) using concrete or tarmac.

Alternative sites

If we are asked to put the substation on an alternative suitable site - either by the developer or the DoE - Planning and Roads Service - the cost of any extra work will be charged to the developer unless the new site is demonstrably better from NIE's point of view.

THE TECHNICAL DRAWINGS

The site

The developer is expected to make available the substation sites which NIE chooses and indicates on the plans. The 'site' includes the access path, right of way, and easement for cabling.

The kiosk

Northern Ireland Electricity prefers to install kiosks. They come in two sizes.

We show them both.

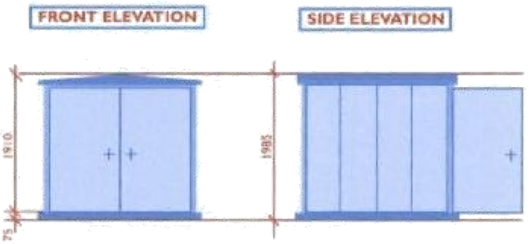
The foundations

This drawing shows typical foundations for a kiosk substation. Whenever we install a kiosk, it is the developer's job to prepare the site for the foundations and, if necessary, to build retaining walls. We may also ask them to provide the sub-base and capped trestle walls for a fixed price.

The brick building

The Planning Service sometimes insists on a brick building. Developers can also request a brick structure in preference to a kiosk, in which case they are responsible for the construction (according to our specification and drawings) and the cost, although NIE may make a contribution.

TECHNICAL DRAWING 1/2



THE KIOSK

SITE WITH ACCESS FROM FOOTPATH

NIE total lease site area A-B-E-H-G-D-A

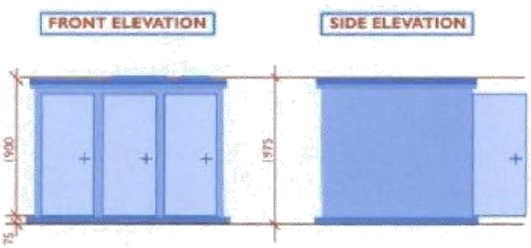
NIE total easement area D-G-H-F-D

SITE WITH ACCESS OVER SERVICE WAY

NIE total lease site area A-B-E1-H1-G-D-A

NIE total easement area D-G-H1-F1-D

NOTES: area A-B-C-D-A to be hardcored and covered with 50mm concrete



THE KIOSK WITH EXTENSION SWITCH

SITE WITH ACCESS FROM FOOTPATH

NIE total lease site area A-B-E-H-G-D-A

NIE total easement area D-G-H-F-D

SITE WITH ACCESS OVER SERVICE WAY

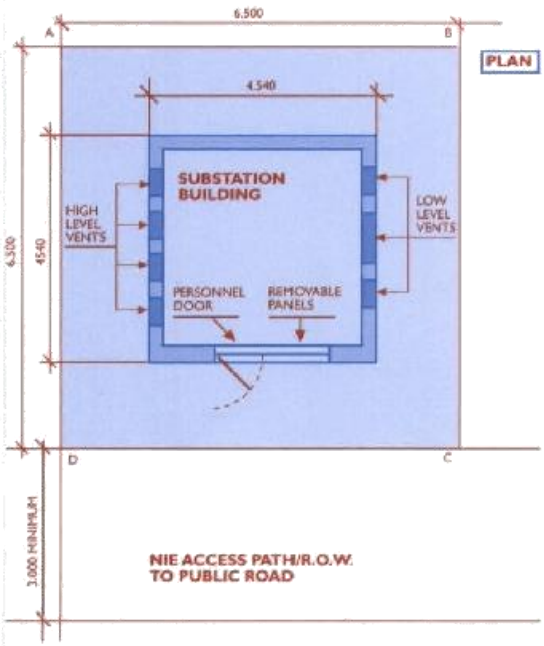
NIE total lease site area A-B-E1-H1-G-D-A

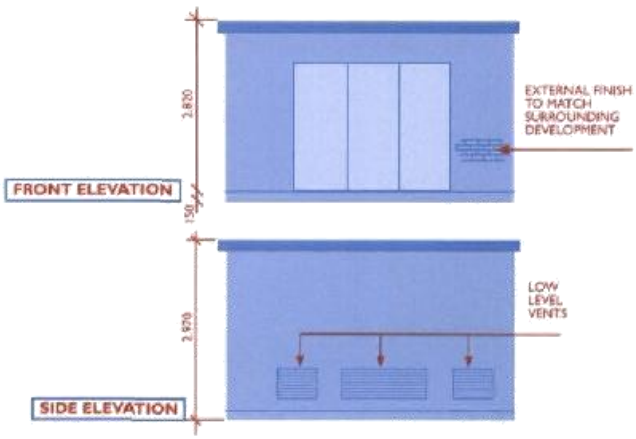
NIE total easement area D-G-H1-F1-D

NOTES: area A-B-C-D-A to be hardcored and covered with 50mm concrete

Northern Ireland Electricity

TECHNICAL DRAWING 3/4



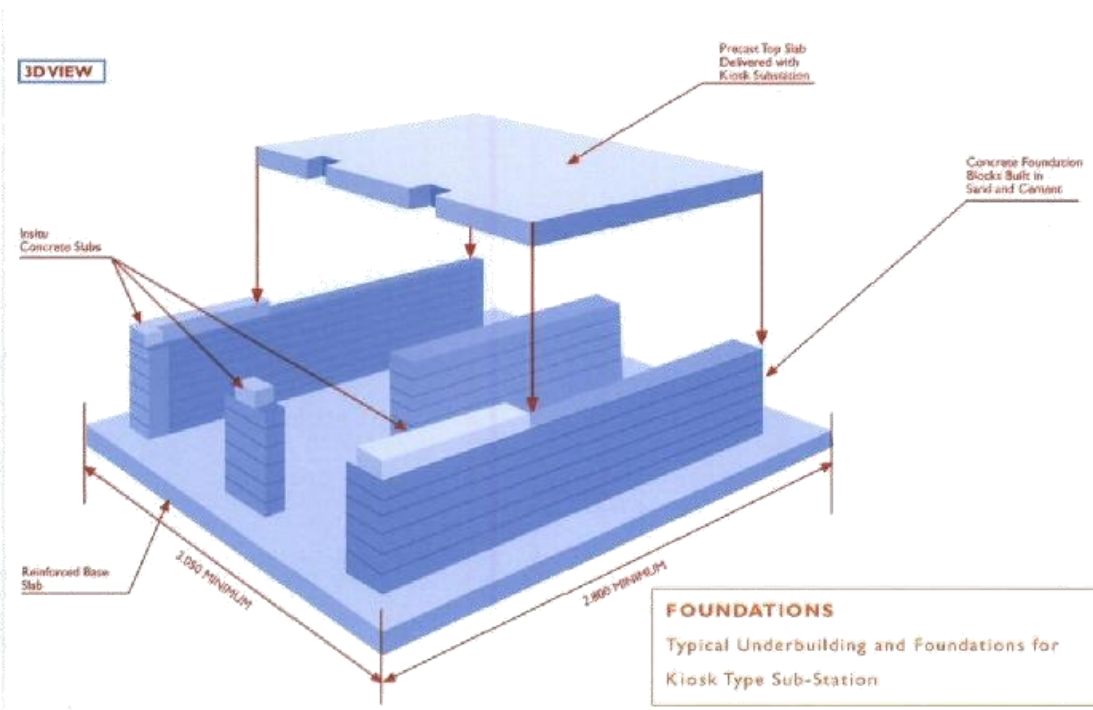


THE BRICK BUILDING

NIE total lease site area A-B-C-D-A

(and access path as appropriate)

area A-B-C-D-A to be hardcored and covered with 50mm concrete



FOUNDATIONS

Typical Underbuilding and Foundations for Kiosk Type Sub-Station

IN BETWEEN

E X A M P L E

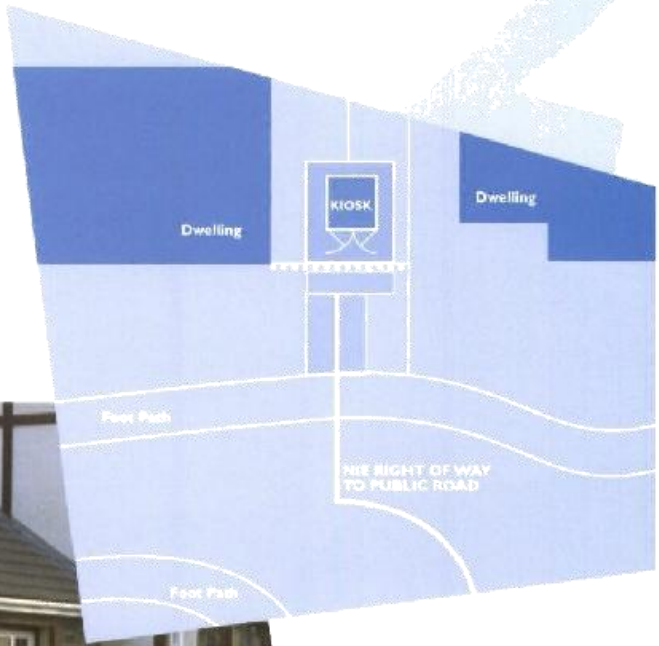
comments

	HIDDEN	PARTLY HIDDEN	VISIBLE
1	set neatly between two houses, this kiosk is hidden by a timber screen		
2	access for maintenance is by a path		

Northern Ireland Electricity

IN BETWEEN

E X A M P L E



comments

HIDDEN PARTLY HIDDEN VISIBLE

1 set neatly to the side of the house, behind the building line, this kiosk is well hidden by a timber fence

2 access for maintenance is via the driveway and small gate in the fence

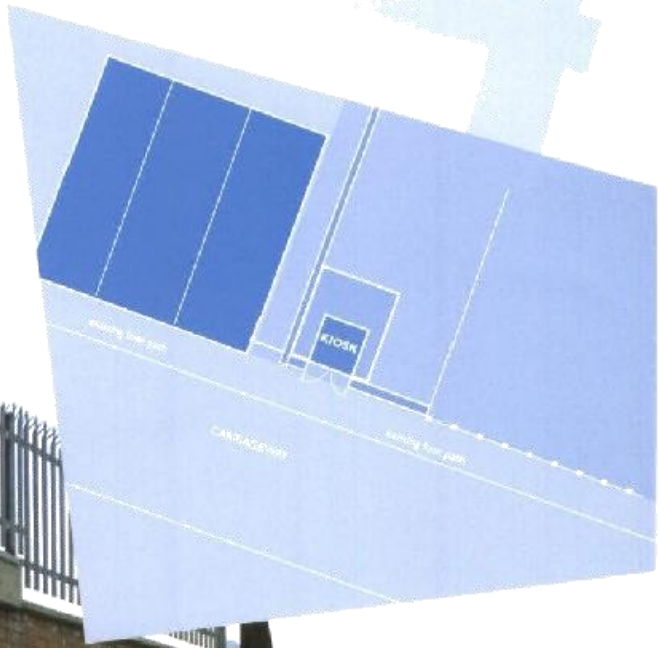
ON THE CORNER

E X A M P L E

comments

	HIDDEN	PARTLY HIDDEN	VISIBLE
1	completely hidden by timber fence, this kiosk appears to be part of the garden		
2	access for maintenance is through a gate in the fence		

Northern Ireland Electricity



comments

HIDDEN PARTLY HIDDEN VISIBLE

1 completely hidden by the brick boundary wall, this kiosk is tucked away in a secure corner of a commercial site

2 access for maintenance is through the timber doors

SIDE BY SIDE

E X A M P L E

comments

	HIDDEN	PARTLY HIDDEN	**VISIBLE**
1	placed so that it lines up with the front of the house and the adjoining garden walls, this kiosk blends well with its surroundings		
2	a timber screen fence and gate could easily be added to hide and secure the kiosk if necessary		
3	access for maintenance is good		

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ON THE EDGE

E X A M P L E

comments

HIDDEN PARTLY HIDDEN **VISIBLE**

1 set on the edge of an industrial estate, the site for this kiosk has been carved out of the surrounding embankments

2 the style of boundary fencing is appropriate to the setting

3 access for maintenance is through a gate in the fence

comments

	HIDDEN	**PARTLY HIDDEN**	VISIBLE
1	tree and shrub planting will grow up to provide an effective screen for this kiosk which has been set behind the site boundary fence		
2	the steel mesh fencing is both unobtrusive and strong viewed from an angle it creates a more solid screen		
3	access for maintenance is through a gate which matches the style of the fence		

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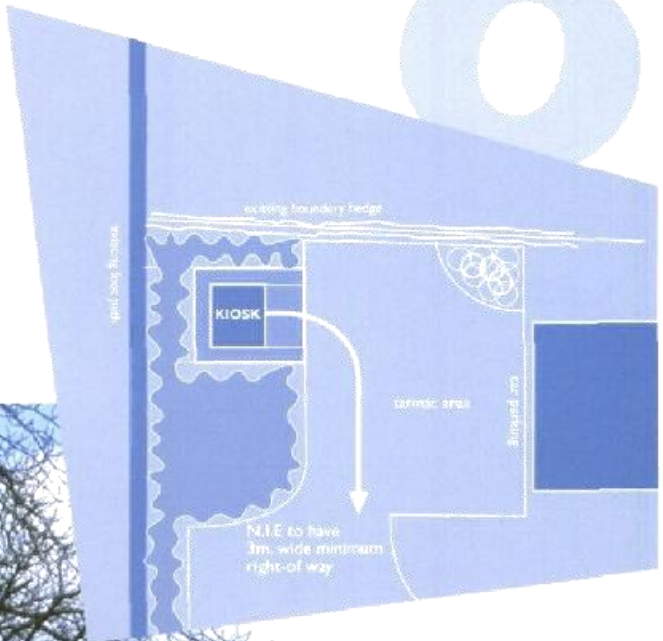
IN A CORNER

E X A M P L E 8



comments

HIDDEN **PARTLY HIDDEN** VISIBLE

1 set in an area of tall shrub planting within a parking area, this kiosk blends well with its surroundings even though it is isolated from the buildings

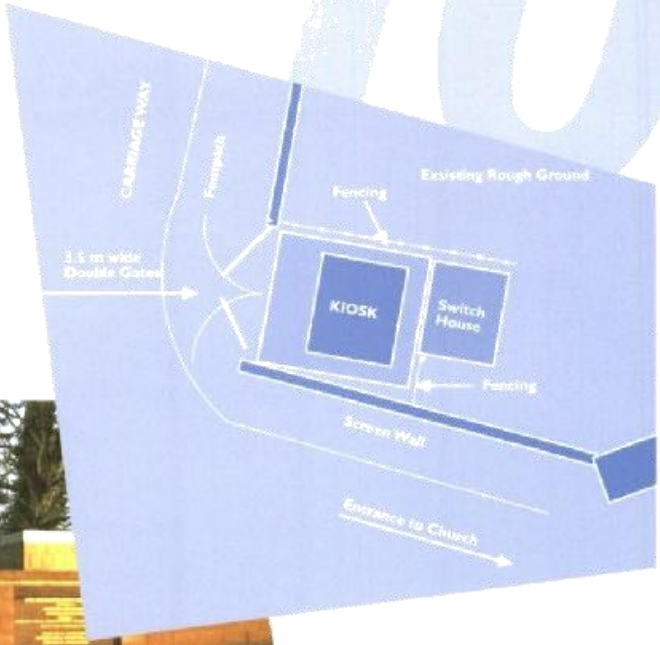
2 access for maintenance through the parking area is good

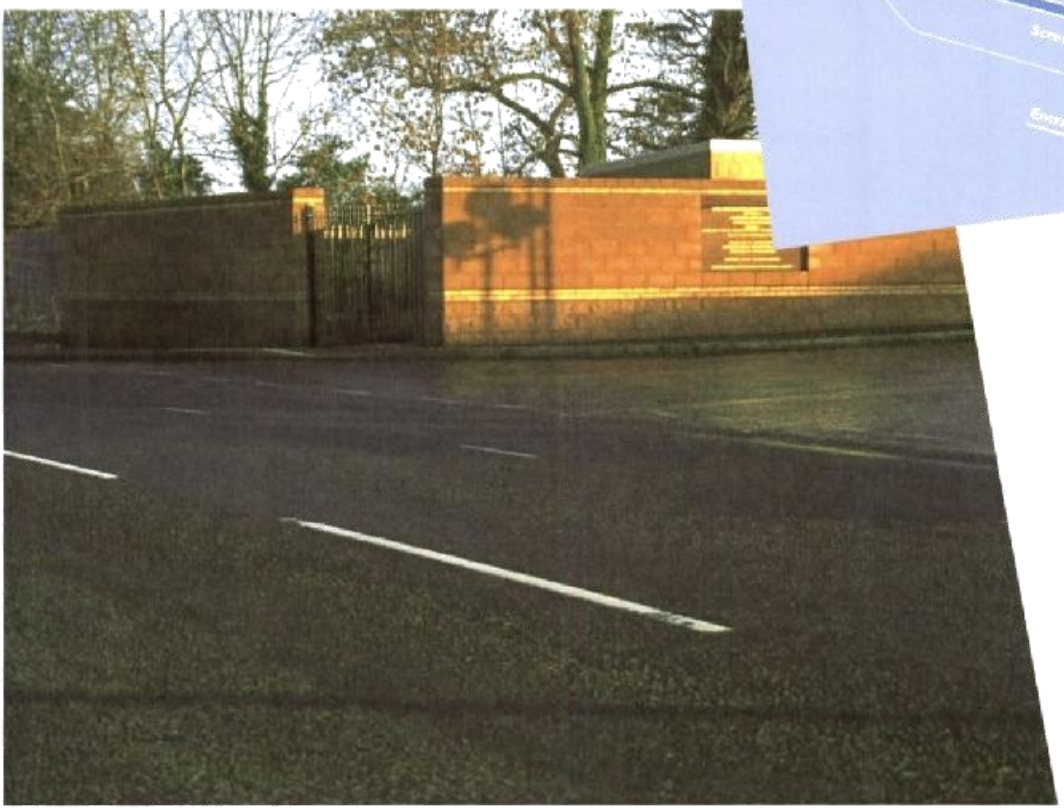
IN A CORNER

E X A M P L E 9

comments

	HIDDEN	**PARTLY HIDDEN**	VISIBLE
1	a neat brick wall helps the kiosk to blend in with the adjoining buildings		
2	access for maintenance through the parking area is good		





comments

	HIDDEN	**PARTLY HIDDEN**	VISIBLE
1	a substantial brick wall flanking the entrance to this site is used to hide the kiosk,		
which		can only be seen when viewed head on	
2	access for maintenance through steel gates built into the wall is good		

Flowchart for a typical housing development

1. The developer/architect designs the housing layout

2. They send to the appropriate NIE district details of:
   - the proposed household heating systems
   - a site plan for each phase of the development
   - details of the electrical installations in the houses
   - a tally of the total number and type of houses

3. NIE will plan the electrical supply, and if a substation is necessary, will choose a suitable site.

4. NIE will return the plan to the developer or architect marked with the proposed substation site.

5. The developer/architect applies for planning permission from the Planning Service.

6. The Planning Service makes its decision

NIE ADDRESSES and TELEPHONE NUMBERS

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Useful Contact Details

- For enquiries regarding this document or any aspect of your electricity supply, please phone our Customer Helpline on
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  or email: **customercontact@nie.co.uk**

- Any aspect of your electricity bill, please phone our Customer Helpline on
  Tel. 08457 455455
  or email: **homeenergy@nie.co.uk**

Minicom telephone for customers who are deaf
Tel. 08457 147128 Available 24 hours a day

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Consumer line: http://consumerline.org

This document has been printed on paper made with wood fibres from a sustainable forest.

Design, origination, print commissioned and managed by
the Stationery Office Northern Ireland
J 0121489 9/00 C 1 CN 9261