



ENERGY
NETWORKS
ASSOCIATION

Technical Specification 43-8

Issue 3, 2004

OVERHEAD LINE CLEARANCES

With Amendment 1, 2004

Energy Networks Association
Engineering Directorate

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Amendment 1 to ENATS 43-8 Issue 3, 2004 Overhead Line Clearances

The following amendment has been made to correct an editorial error within the document.

In clause 11.3.2 on page 19; replace paragraph 2:

“A horizontal physical barrier shall be erected to form a roof between the area of work and the overhead line such that the safe clearance limit cannot be infringed. The distances in Table 11.2, Item 11.2.1 shall be treated as a minimum necessary clearance and shall be used to calculate the height of the underside of the physical barrier.”

with:

“A horizontal physical barrier should be erected to form a roof between the area of work and the overhead line such that the safe clearance limit cannot be infringed. The distances in Table 11.2, Item 11.2.1 shall be treated as a minimum necessary clearance and shall be used to calculate the height of the underside of the physical barrier.”

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SPECIFICATION FOR OVERHEAD LINE CLEARANCES

FOREWORD

This Specification represents the current practice of Energy Networks Association Member Companies (ENAMC), in the UK, for clearances for overhead lines and includes the statutory ground clearance requirements of The Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR).

Overhead line clearances for new overhead lines operating at 45 kV and above shall be compliant with BS EN 50341 and BS EN 50341-3-9.

Overhead line clearances for new overhead lines operating below 45 kV shall be compliant with prEN 50423-1, prEN 50423-2 and prEN 50423-3.

For overhead lines which are designed using probabilistic thermal rating concepts which allows a defined conductor temperature exceedance then the 'specified maximum conductor temperature' shall be replaced by the 'maximum likely conductor temperature' in accordance with Regulation 17 (1) of ESQCR 2002. The minimum clearances shall be determined from the relevant tables and voltages contained in this document.

Clearances in this Specification are based on the conductor sag at the defined maximum or likely conductor temperature and are not based on the sag of conductor with ice or snow applied.

The requirements for air clearances have been contained previously in a number of documents. This Specification presents comprehensive schedules of clearances for all lines at all voltages.

This Specification on overhead lines clearances supersedes the following documents:

- (i) Engineering Recommendation L11/4.
- (ii) Engineering Recommendation L40/1.
- (iii) Engineering Recommendation G35.
- (iv) The clearances given in ENA TS 43-12.
- (v) Issue 2 of this Specification.

1 SCOPE

This Specification specifies the minimum clearances between ENAMC overhead lines at all nominal system voltages and objects, ground, railway property and other ENAMC overhead lines. The Specification also refers to National Agreements between ENAMC and other Authorities.

Clearances specified refer to bare, lightly and effectively insulated line conductors and have been determined to provide safety to the general public and protection against flashover of the line. These clearances are based on normal use of any land, buildings or structures crossed by the line, unusual situations can only be determined by local assessment and may require an increase in the clearances specified or other measures to be taken for example as described in ENA TS 43-90. **All clearances shall therefore be determined by the appropriate ENAMC, considering the circumstances in which the line is used and having regard to the use of the surrounding land.** This Specification has been produced primarily for use by such personnel, who may find Appendix A useful.

This Specification may be of use to the general public, and to bodies outside the ENAMC as a general guidance document, but in all cases where definitive clearances are required contact **shall** be made with the owner of the overhead line. This is particularly important where a change in land use is envisaged. An appropriate member of that company's staff will then determine the clearance to be adopted for that particular situation, along with any precautions deemed necessary.

Where effectively insulated conductors are used, ground clearances over roads accessible to vehicular traffic shall be maintained as stated in Regulation 17 (2) (a) of ESQCR 2002.

Clearances over other ground or in proximity to objects may be reduced provided the effectively insulated conductor is not placed in a position where it is likely to be damaged or where persons going about normal everyday activities could come into contact with it.

Where other considerations, e.g. induced voltages would dictate the use of metallic screens or enhanced clearances, the owner of the overhead line will specify the requirements. This Specification for overhead line clearances need not be applied retrospectively to existing lines subject to the requirements of Regulation 2 (8), ESQCR 2002 with regard to "material alteration".

2 REFERENCES

This Specification makes reference to, or should be read in conjunction with, the following Documents:

Statutory Instrument 2002 No. 2665, The Electricity Safety, Quality and Continuity Regulations 2002

BS EN 50341-1 1999, 'Overhead electrical lines exceeding AC 45 kV – General Requirements'

BS EN 50341-3-9 1999, 'Overhead electrical lines exceeding AC 45 kV - UK National Normative Annexe'

prEN 50423-1, 'Overhead electrical lines exceeding AC 1 kV up to and including AC 45 kV - Part 1: General requirements - Common specifications'

prEN 50423-2, 'Overhead electrical lines exceeding AC 1 kV up to and including AC 45 kV - Part 2: Index of National Normative Aspects'

prEN 50423-3, 'Overhead electrical lines exceeding AC 1 kV up to and including AC 45 kV - Part 3: Set of National Normative Aspects'

BS 7354:1990, 'Code of Practice for the design of high-voltage open-terminal substations'.

HSE guidance note GS6 (rev) 'Avoidance of Danger from Overhead Lines' ISBN 0 11 885 6685.

SMCC 004, "Notes of Guidance on Safe Working of Third Parties in Close Proximity to Live Overhead Conductors"

ENA TS 43-02, 'Design of Steel Tower Overhead Transmission Lines at 132 kV and Higher Voltages', Clause 12 only.

ENA TS 43-12, 'Insulated aerial bundled conductors erection requirements for LV overhead distribution systems.'

ENA TS 43-90 'Anti climbing devices and safety signs for HV lines up to and including 400 kV'.

ENA TS 43-122 XLPE Covered-Conductors For Overhead Lines (Having Rated Voltages U_0/U Greater Than 0.6/1 kV Up To and Including 19/33 kV)

Engineering Recommendation G39/1, 'Model Code of Practice Covering Electrical Safety in the Planning, Installation, Commissioning and Maintenance of Public Lighting and Other Street Furniture'.

Engineering Recommendation G45/1, 'Notes of Guidance for Electricity Boards on the Use of Irrigators, Slurry Guns and High Pressure Hoses in the Vicinity of Overhead'

Engineering Recommendation G55/1, 'Safe Tree Working in Proximity to Overhead Electric Lines.'

Engineering Recommendation EB/BT.2 'Conditions for BT and Public Suppliers' Joint Use of Poles'.

Engineering Recommendation PO.1, Post Office Memorandum A80 (e), 'Protection of Post Office Lines from Contact with Low or Medium Voltage Power Lines'.

Engineering Recommendation PO.2, Post Office Memorandum A23l (b), 'Protection of Post Office Lines from High Voltage Power Lines'.

Note: P.O.1 and P.O.2 are to be replaced by P.O.5 when this is issued (early 2004).

Engineering Recommendation PO.3, 'Technical Conditions Applicable under Master Wayleave Agreements between the Post Office and the Electricity Supply Industry for Wayleaves on Post Office Telecommunications Property'.

Railway Master Wayleave Agreement.

3 DEFINITIONS

For the purpose of this Specification, the following definitions apply:

Application Factor

The distance (dependent upon working situation) which is added to the safety distance to determine working and access clearance.

Basic Electrical Clearances

Clearance to earth ascribed to air insulation for each nominal system voltage. Basic electrical clearances do not include any additions for constructional tolerances, wind effects, etc.

Cable

A conductor, or assembly of conductors, which are effectively insulated and incorporates an earthed metallic screen.

Controlled Zone

The inside of an enclosure efficiently protected by fencing not less than 2.4 m (8 ft.) in height or other means necessary to meet the requirements of ESQCR 2002 Regulation 11 (b).

Covered Conductor (CC)

A design of conductor that can be lightly or effectively insulated and may be manufactured in accordance with ENA TS 43-122.

Note: In the Guidance Notes to the ESQC Regulations CC is referred to as BLX, which is a trade name used in Scandinavia.

Creep

The non-elastic stretch of a conductor. This consists of two parts - bedding down of the strands and the long-term stretch of conductor material.

Effectively Insulated Conductor

A line conductor which is insulated for continuous phase to phase or phase to earth contact and is protected, so far as is reasonably practicable, against mechanical damage or interference having regard to its accessibility.

Note: The implication here is that insulated conductors (such as low voltage aerial bundled conductors but not high voltage CC conductors) may be placed such that they are ordinarily accessible, providing they are safe in the particular circumstances.

Jumper Connection

A connection at a support from a phase conductor to another conductor or to a terminal on transformers, switchgear, fusegear, line taps, etc. at support.

Lightly Insulated Conductor

A line conductor which is insulated against momentary phase to phase or phase to earth contact and is considered as a bare conductor for clearance purposes.

Note: This level of insulation may not be designed to support the full phase to earth or phase-to-phase voltage (as appropriate). For example the covering on some types of HV or EHV CC overhead line conductors could be described as *lightly insulated*. Other types of CC exist that can be effectively insulated.

Line Conductor

A conductor used, or to be used, for conveying a supply of electricity. A line conductor is deemed to include a through jumper.

Normal Use of Land

The type of work or activity which is likely to occur on or over a particular piece of land or water.

Object

Any building, wall, fence, structure, stationary vehicle, tree, vegetation or similar with an elevation above ground level.

Overhead Line

Apparatus in the open air and above ground level coming within the scope of ESQCR 2002.

Safety Distance

Distance from nearest exposed conductor or from an insulator supporting a conductor is maintained to avoid danger.

Specified Maximum Temperature

The likely maximum temperature of the conductor resulting from a combination of climatic conditions and the rated electrical load under normal operating conditions.

System Voltage

The nominal RMS phase-to-phase voltage of a three-phase AC system.

Wire

A wire which is not designed to convey electricity but which is attached to a support carrying line conductors, e.g. flying stay wire.

4 DERIVATION OF CLEARANCES

In general, the clearances specified in this Specification have been derived from the summation of the following:

- (i) Basic electrical clearance as specified in BS EN 50341-1, increased by 10 % and rounded up, or where past practice has employed greater clearances, these have been retained.
- (ii) An appropriate physical distance to allow for the normal use of the ground or object to which clearance is required. This is termed the **Application Factor**.

It has not been possible to specify all the clearances by the above method since some shall comply with Statutory Requirements. In addition, certain clearances, e.g. to railways, are the subject of agreement with the appropriate companies.

In some cases, the clearance derived by the summation of (i) and (ii) is greater than the statutory clearance and in these cases, it is this greater clearance which is quoted in this Specification.

Throughout this Specification statutory clearances are highlighted by being *printed in italic type*.

Note: Appendix A, "Clearance to Objects – Philosophy" clarifies the process used to determine the clearances. Where overhead lines are refurbished, or constructed, so that the basic impulse level (BIL) exceeds those used in determining the clearances, then the clearances will have to be re-assessed. This is particularly pertinent in cases where a line is insulated for a higher voltage than that at which it is operated.

5 APPLICATION OF CLEARANCES

The following factors require to be taken into consideration when providing clearances to overhead lines:

- (i) Allowance shall be made for the effects of creep in conductors, as the specified clearance shall be maintained for the life of the conductor.
- (ii) In some cases, lines are operated at a lower voltage than that for which they are designed. It is important when specifying clearances to fixed objects that the clearances appropriate to the intended nominal operating voltage of the line be adopted.
- (iii) When an overhead line is being erected in proximity to existing objects, the clearances shall allow for future maintenance of the object.
- (iv) When work is to be carried out, or objects are to be erected in proximity to an existing overhead line, the clearance may require to be increased substantially to allow for the operation and movement of site traffic. Detailed guidance on safe working methods are given in HSE guidance note GS6. If utilised, the clearances provided in Section 11 will allow the site operator to comply with GS6.

6 CLEARANCES TO GROUND, ROADS AND OBJECTS

6.1 Clearances to Ground and Roads

The clearances specified in Table 6.1 shall not be infringed at the specified maximum conductor temperature with the conductor (including its suspension insulators if fitted) hanging vertically in still air or deflected at any angle up to 45° from the vertical.

Table 6.1 - Clearances to Ground and Roads

Item	Description of Clearance	Nominal System Voltage (kV)				
		Minimum Clearance (m)				
		≤ 33	66	132	275	400
6.1.1	Line conductor at any point not over road. (Note 1)	5.2	6.0	6.7	7.0	7.6
6.1.2	Line conductor to road surface other than as specified in 6.1.3, 6.1.4, and 6.1.5. (Note 2)	5.8	6.0	6.7	7.4	8.1
6.1.3	Line conductor to road surface of designated '6.1m high load' routes. (Note 3)	6.9	7.1	7.5	8.5	9.2
6.1.4	Line conductor to motorway or other road surface where 'Skycradle' can be used. (Note 4 & 6)	8.2	8.4	8.8	9.8	10.5
6.1.5	Line conductor to motorway road surface where scaffolding is to be used on:					
	(i) Normal 3 lane motorways. (ii) Elevated 2 lane motorways (Note 5 & 6)	14.0 11.0	14.2 11.2	14.6 11.6	15.6 12.6	16.3 13.3
6.1.6	Bare live metalwork, e.g. transformer terminals, jumper connections, etc. (Note 7)	4.3	4.3	Controlled Zone Safety Rules Apply		

Notes:

1. The specified ground clearance for effectively insulated conductors at locations, which are not over roads accessible to vehicular traffic, are included in Section 6.3. Such conductors shall be positioned so that they are not likely to be damaged or cause injury.
2. The height of any wire or cable (other than a line conductor) which is attached to a support carrying a line conductor is 5.8 m above any roadway irrespective of the line voltage. The clearances specified allow for the safe passage below the

line of a vehicle of maximum height 5 m. These clearances are based on a vehicle height not exceeding 5 m (except for the 6.1 m high load routes).

3. 'High load' routes are roads designated by the Department for Transport, for which the higher load clearance of 6.1 m shall be maintained.
4. These clearances apply to situations where it is possible to use a Skycradle for conductor erection and maintenance. These clearances allow for the positioning of the Skycradle under a live circuit. Where the circuit under which the Skycradle is to be positioned and any adjacent circuit can be made dead during the slewing of the Skycradle, then these clearances can be reduced to 7.6 m for all voltages.
5. In situations where the Skycradle cannot be used to erect or maintain lines, which cross a motorway, these clearances should be adopted. They allow for the erection of scaffolding / guard netting with the overhead circuits live.
6. Should the use of Skycradles or the erection of temporary scaffolding in proximity to overhead lines be considered then appropriate guidance shall be sought relating to acceptable working methods and appropriate preparation prior to any work commencing.
7. These clearances apply to supports of overhead lines that in addition support transformers, isolators, cable sealing ends, etc. These clearances do not apply to pole mounted, LV fuses as long as they are effectively insulated and the fuse carriers are in place. These clearances are not required for effectively insulated jumper connections but shall be maintained from any bare jumpers and terminals.

6.2 Clearances to Objects

The clearances specified in Table 6.2 shall not be infringed at the specified maximum conductor temperature with the conductor (including its suspension insulators if fitted) hanging vertically in still air or deflected at any angle up to 45° from the vertical towards the object unless otherwise specified. The clearances apply in any direction.

Table 6.2 - Clearances to Objects

Item	Description of Clearance	Nominal System Voltage (kV)				
		Minimum Clearance (m)				
		≤ 33	66	132	275	400
6.2.1	Line conductor to any object which is normally accessible (including permanently mounted ladders and access platforms) or to any surface of a building. (Note 1 and Fig. 1)	3.0	3.2	3.6	4.6	5.3
6.2.2	Line conductor to any object to which access is not required AND on which a person cannot stand or lean a ladder. (Note 2)	0.8	1.0	1.4	2.4	3.1

Item	Description of Clearance	Nominal System Voltage (kV)				
		Minimum Clearance (m)				
		≤ 33	66	132	275	400
6.2.3	Line conductors to that part of a tree under / adjacent to line and:					
	(i) Unable to support ladder / climber.	0.8	1.0	1.4	2.4	3.1
	(ii) Capable of supporting ladder / climber.	3.0	3.2	3.6	4.6	5.3
	(iii) Trees falling towards line with conductors hanging vertically only. (Note 3 and Fig. 2(a))	0.8	1.0	1.4	2.4	3.1
6.2.4	Line conductors to trees in Orchards and Hop Gardens. (Note 4 and Fig.2(b))	3.0	3.2	3.6	4.6	5.3
6.2.5	Line conductors to irrigators, slurry guns and high pressure hoses (Note 5)	30.0	30.0	30.0	30.0	30.0
6.2.6	Line conductor to street lighting standards with:					
	(i) Standard in normal upright position.	1.7	1.9	2.3	3.3	4.0
	(ii) Standard falling towards line with conductor hanging vertically only.	1.7	1.9	2.3	3.3	4.0
	(iii) Standard falling towards line. (Note 6, Fig. 3 and 4)	0.4	0.7	0.8	1.4	1.9

Notes:

1. These are the minimum clearances that shall be maintained between an overhead line conductor and a normally accessible structure or surface of a building (walls, roof, windows etc.). They permit a person to stand on or against these structures but only allow for free movement of short hand held objects. Detailed guidance on the avoidance of danger from electric lines on construction sites is contained in HSE guidance note GS6.
2. Account should be taken of the possible movement of the object, e.g. flagpole in the wind. These clearances also apply to moving objects to which access is precluded during passage below the line. The height or position of the object should take into account any possible undulating or rocking movement of the object, e.g. a mobile crane jib travelling over uneven ground. Detailed guidance on the avoidance of danger from electric lines on construction sites is contained in HSE Guidance note GS6
3. Clearances quoted in 6.2.3 (i) and (ii) are minimum acceptable clearances but in practice, larger clearances will be necessary to take account of growth rates of trees and of the swaying of trees / branches in the wind. Clearances quoted in 6.2.3 (iii) are recommended in order to protect lines from falling trees but due to wayleave considerations will not always be attainable. Detailed guidance on the avoidance of danger from electric lines in forests is contained in Engineering Recommendation G55/1.

4. These clearances shall be obtained vertically when any part of a tree is within 7.5 m horizontally of a line. For hop gardens, the clearances apply to the strain wires forming the mesh supporting system.
5. The clearance quoted is for general guidance only. Detailed guidance on the use of irrigators, slurry guns and high-pressure hoses in the vicinity of overhead lines is contained in Engineering Recommendation G45/1.
6. The clearances quoted in 6.2.6 (i) assume that maintenance platforms will be positioned such that clearances quoted in Item 6.2.1 are maintained. Where effectively insulated conductors are used, clearances may be reduced to those indicated in Fig. 4. The clearances quoted in 6.2.6(iii) can be neglected if the location of the lighting column is such that impact by a vehicle is improbable.. Engineering Recommendation G39 contains guidance on maintenance of street lighting columns in proximity to overhead lines. Where for maintenance purposes the operative requires to work on the upper part of a lantern, within the clearances specified in 6.2.1, appropriate safety measures shall be taken, which shall be agreed in advance between the distribution or transmission company and the lighting maintenance company or authority. The clearances quoted in 6.2.6 (ii) include additional clearance to allow for the erection of street lighting columns.

6.3 Clearance from effectively insulated low voltage lines attached to poles

Effectively insulated conductors for example Aerial Bundled Conductors (ABC) installed in accordance with ENA TS 43-12 shall comply with the clearances in this section. However, clearances between other power lines and above railways, as detailed in sections 7 and 8 and Tables 7.1 and 8.1 below, shall be met.

6.3.1 Ground Clearance

Clearances to roads shall still comply with paragraph 6.1 and Table 6.1 above however clearances in other locations are provided in Table 6.3 below.

Table 6.3 - Ground Clearance

Location	Minimum Clearance (m)
Along the line of hedgerows, fences and boundary walls etc.	4.0
Domestic driveways with an access width of 2.5 m or less which is defined by gateposts, hedges or other fixed features.	4.3
Between buildings where there is no vehicular access.	3.5

6.3.2 Clearances to Buildings and Structures

The clearances in Table 6.4 below do not apply to mains or services attached to buildings. In determining clearances the following conditions should be considered as appropriate, sags at the maximum working temperature of 75°C and an angular deflection of 30° at a working temperature of 30°C. Deflected conditions need not be considered if the span is effectively shielded from wind by the building or structure.

Table 6.4 - Clearance to Buildings and Structures

Location	Minimum Clearance (m)
Vertical clearance to any surface or structure that is accessible without access equipment (see Fig. 5).	3.0
Horizontal distance to any surface of a building or structure which is accessible without access equipment (see Fig. 5).	1.0
Clearance to parts of a building or structure not normally accessible (see Fig. 5). See note 1.	0.5
Clearance to free-standing apparatus such as street lighting columns, traffic signs, British Telecom poles or columns (see Fig. 5).	0.3

Notes:

1. This clearance is to prevent mechanical abrasion of the conductor. When connecting from a pole to a building it is only necessary to ensure that the attachment route avoids risk of abrasion.

6.3.3 Systems Attached to Buildings

For conductors attached to buildings consideration needs to be given as to additional protective measures to prevent danger. Reference should be made to the appropriate construction system for example ENA TS 43-12 for ABC.

7 CLEARANCES WHERE POWER LINES CROSS OR ARE IN CLOSE PROXIMITY

The following minimum clearances shall apply where power lines cross or are in close proximity to one another. In all cases the clearances shall be determined by the ultimate nominal system voltage of the upper or lower line, whichever is greater.

Table 7.1 - Minimum Clearances where Power Lines Cross or are in Close Proximity

Item	Description of Clearance	Nominal System Voltage (kV)						
		Minimum Clearance (m)						
	Conductor or earth wire to:	0.4	11	33	66	132	275	400
7.1.1	Lowest line conductor or earth wire of upper line to highest line conductor of lower line. (Note 1)	1.0	1.8	2.0	2.3	2.7	3.7	4.4
7.1.2	Lowest line conductor or earth wire of upper line to earth wire of lower line where erected. (Note 1)	0.7	1.4	1.6	2.3	2.7	3.7	4.4
7.1.3	Lowest line conductor or earth wire of upper line to any point on a support of the lower line on which a person may stand. (Note 2)	2.7	2.8	3.0	3.2	3.6	4.6	5.3
7.1.4	Support of upper line and any conductor of lower line. (Note 2)	7.5	7.5	7.5	7.5	15.0	15.0	15.0

Notes:

1. One of the following methods of determining clearances shall be adopted.
 - (a) With the upper conductors / earth wire hanging vertically and the lower conductors / earth wire deflected at 45° under the following conditions:
 - (i) Upper conductor at its specified maximum temperature coincident with lower conductor at an assumed temperature of 25°C less than its specified maximum temperature.
 - (ii) Lower conductor at a temperature of -5.6°C (no ice) coincident with upper conductor at an assumed temperature of 20°C.

or alternatively, (b) With the upper conductor / earth wire hanging vertically at its specified maximum temperature and the lower conductor / earth wire deflected at any angle up to 45° at a temperature of -5.6°C (no ice). In localities where there is a high likelihood of conductor icing it may be appropriate to consider the effects of such icing.
2. Clearance shall be obtained with the conductor / earth wire at its specified maximum temperature and deflected by any angle up to 45°.

8 RAILWAY CROSSINGS

Clearances to railways and their associated lines, buildings and yards are covered by the second schedule (General and Engineering) of the Condition Railway Master Wayleave Agreement.

Table 8.1 lists the principal vertical clearances referred to in the above Agreement. For horizontal clearances to railway circuits (excluding traction wires) reference should be made to the Agreement.

Table 8.1 - Principal Vertical Clearances to Railways and Associated Structures

Item	Description of Clearance	Nominal System Voltage (kV)				
		Minimum Clearance* m (ft)				
		≤ 33	66	132	275	400
8.1.1	Ground level.	6.1 (20)	6.1 (20)	6.7 (22)	7.0 (23)	7.6 (25)
8.1.2	Ground level at roads or yards where road mobile cranes are likely to be employed.	10.7 (35)	10.7 (35)	11.2 (37)	11.5 (38)	12.2 (40)
8.1.3	Rail level (see Note 1).	7.3 (24)	7.3 (24)	8.0 (26)	8.2 (27)	8.8 (29)
8.1.4	Buildings, gantries or other structures on which a man might stand and to traction wires (see Note 1).	3.0 (10)	3.0 (10)	3.7 (12)	4.6 (15)	6.1 (20)

* The imperial values take precedence since they are specified in the Agreement.

Notes:

- 1 The clearances specified in 8.1.3 and 8.1.4 do not incorporate any allowances for use of scaffolding or Skycradle across railway tracks / traction wires during erection / maintenance of overhead lines. Clearances of 2.75 m (9 feet) and 4.9 m (16 feet) are required between scaffold net or Skycradle boom and traction wires and rail respectively.

9 WATERWAY CROSSINGS

Clearances to waterways are not subject to a single national Agreement but are dealt with by agreement with the appropriate Authority.

10 TELECOMMUNICATION LINES

Vertical and lateral clearances to telecommunication lines are specified in Engineering Recommendations PO.1 (1975), PO.2 (1975), PO.3 (1976), for voltages up to and including 33 kV.

Note: PO 1 and PO2 are to be replaced by PO5 in early 2004.

Engineering Recommendation EB/BT.2 'Conditions for BT and Public Suppliers' Joint Use of Poles' specifies the clearance requirements for apparatus when poles are jointly used.

11 WORK IN PROXIMITY TO OVERHEAD LINES.

This section deals with the use of plant or vehicles in proximity to overhead lines. Where work is undertaken using ladders, scaffold, mobile platforms etc. then the clearances provided in Tables 6.1 and 6.2 shall be used unless other risk mitigation can be employed such as temporary shrouding of the overhead conductor.

Whenever work is to be carried out in proximity to overhead lines consideration shall always be given to the possibility of making the line dead, or diverting it around the area affected.

The Health and Safety Executive provide guidance for the avoidance of danger from overhead lines in their Guidance Note GS6. The ENAMC shall be prepared to provide, preferably in writing, safety clearances and advice on safe working methods to those working in proximity to overhead lines. Where work can only be carried out safely with the line dead, this shall be the subject of precise written agreement between the ENAMC and the site operators.

11.1 Horizontal Clearances – on sites where there will be no work or passage of plant under lines.

HSE Guidance Note GS6 recommends that the ENAMC should be contacted for advice for any work within 15 m of a line erected on steel towers and 9 m of a line erected on wood poles.

Table 11.1 details typical minimum values for horizontal separation of the lines and safety barriers.

Table 11.1 - Horizontal Distances to Safety Barriers

Voltage / Type	≤33 kV Wood Pole	66 kV Wood Pole	132 kV Wood Pole	132 kV Tower	275 kV Tower	400 kV Tower
Minimum horizontal distances to safety barriers.	6.0 m	6.0 m	6.0 m	9.0 m	12.0 m	14.0 m

Note: Site conditions will dictate whether this clearance is adequate and consideration shall be given to line parameters e.g. span length, maximum sag etc. when calculating an actual clearance.

11.2 Vertical Passing Clearances – on sites where vehicles will pass under the lines.

Table 11.2 details these passing clearances and Appendix 2 provides their derivation.

The clearances given in Table 11.2, Item 11.2.1 are for vehicles with fixed height loads travelling on unmetalled roads.

Where the load carried by vehicles is variable then the vertical passing clearance shall be increased. These clearances are given in Table 11.2, Item 11.2.2.

Table 11.2 - Vertical Passing Clearances

Item No.	Nominal System Voltage		≤33 kV	66 kV	132 kV	275 kV	400 kV
11.2.1	Passing Clearance fixed height loads	m	0.8	1.0	1.4	2.4	3.1
11.2.2	Passing Clearance variable height loads	m	2.3	2.5	3.2	4.1	5.0

The above clearances shall be used to determine the maximum distance to the underside of barriers erected to prevent vehicles or plant from infringing these clearances whilst traversing the line. The height to the underside of the barrier shall be the minimum ground clearance of the line less the specified passing clearance in Table 11.2.

11.3 Vertical Clearance – on sites where work will be undertaken beneath the line.

Work beneath the line shall be deemed to be any work carried out within the minimum horizontal distances specified in Table 11.1 or the calculated distance (see note under 11.1) whichever is greater.

HSE Guidance Note GS6 provides recommendations for working under the line and uses two cases. "Work at ground level only (for example pipe laying)" and "Erection of buildings or structures underneath an overhead line". In both cases the clearances are the same and these are shown in Table 11.2 Item 11.2.1.

11.3.1 Work at ground level only.

Where work is carried out at ground level only the passing clearance of fixed height loads is permissible, as HSE Guidance Note GS6 requires that no vehicle or item of plant shall reach beyond the safe clearance limit. Where plant has the capability to reach into the safe clearance limit it shall be fitted with a physical restraint in order to prevent such action.

HSE Guidance Note GS6 requires that all such work shall be “under the direct supervision of a responsible person”.

11.3.2 Work on buildings or structures underneath an overhead line

This includes all work under an overhead line and includes new construction, work on existing structures and demolition.

A horizontal physical barrier shall be erected to form a roof between the area of work and the overhead line such that the safe clearance limit cannot be infringed. The distances in Table 11.2, Item 11.2.1 shall be treated as a minimum necessary clearance and shall be used to calculate the height of the underside of the physical barrier.

Where a conductive material is used to form the barrier this shall be earthed.

The line shall be made dead if, during the erection of the physical barrier, safety clearances would be infringed.

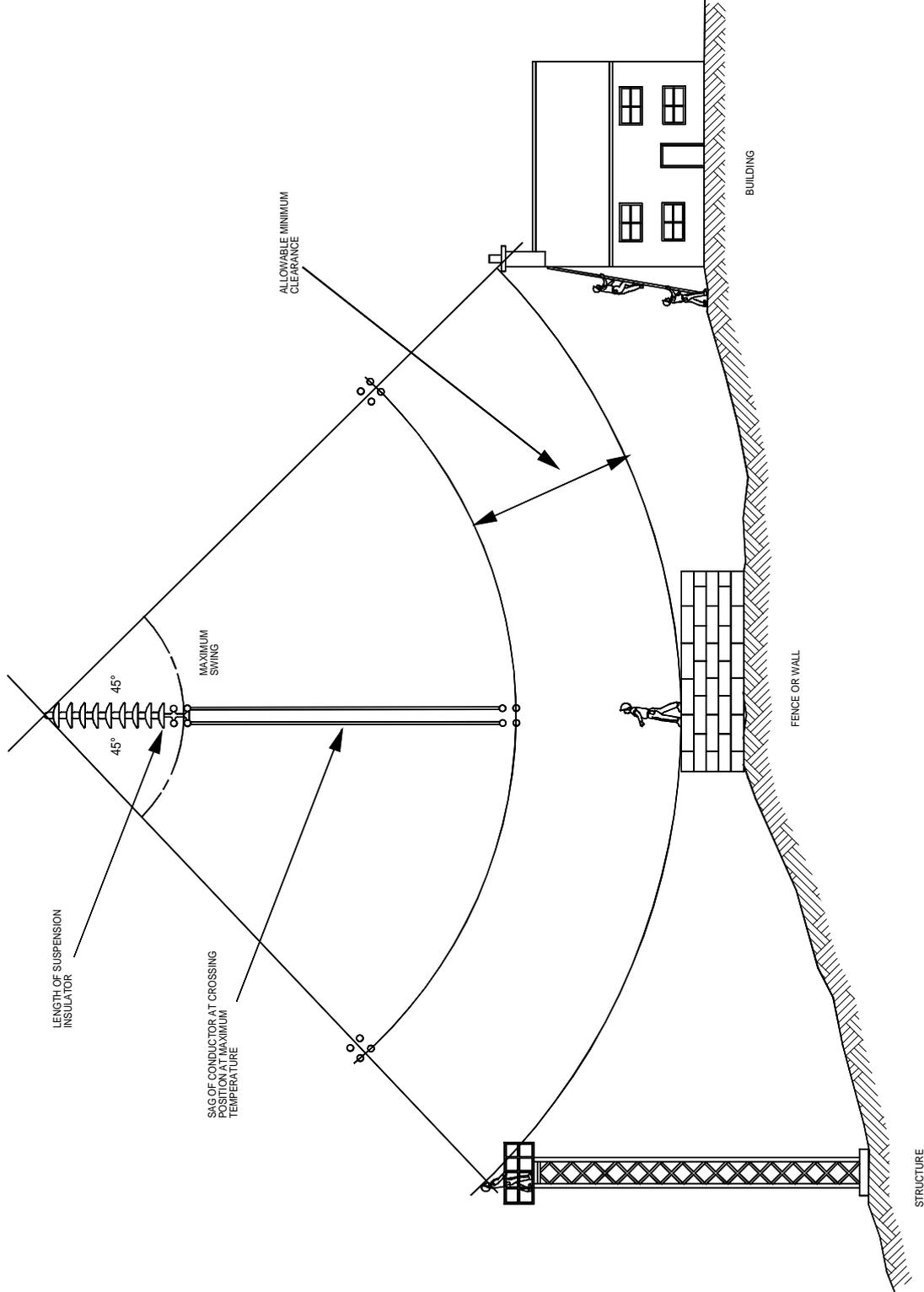


Fig. 1 Clearance to objects (on which a person can stand)

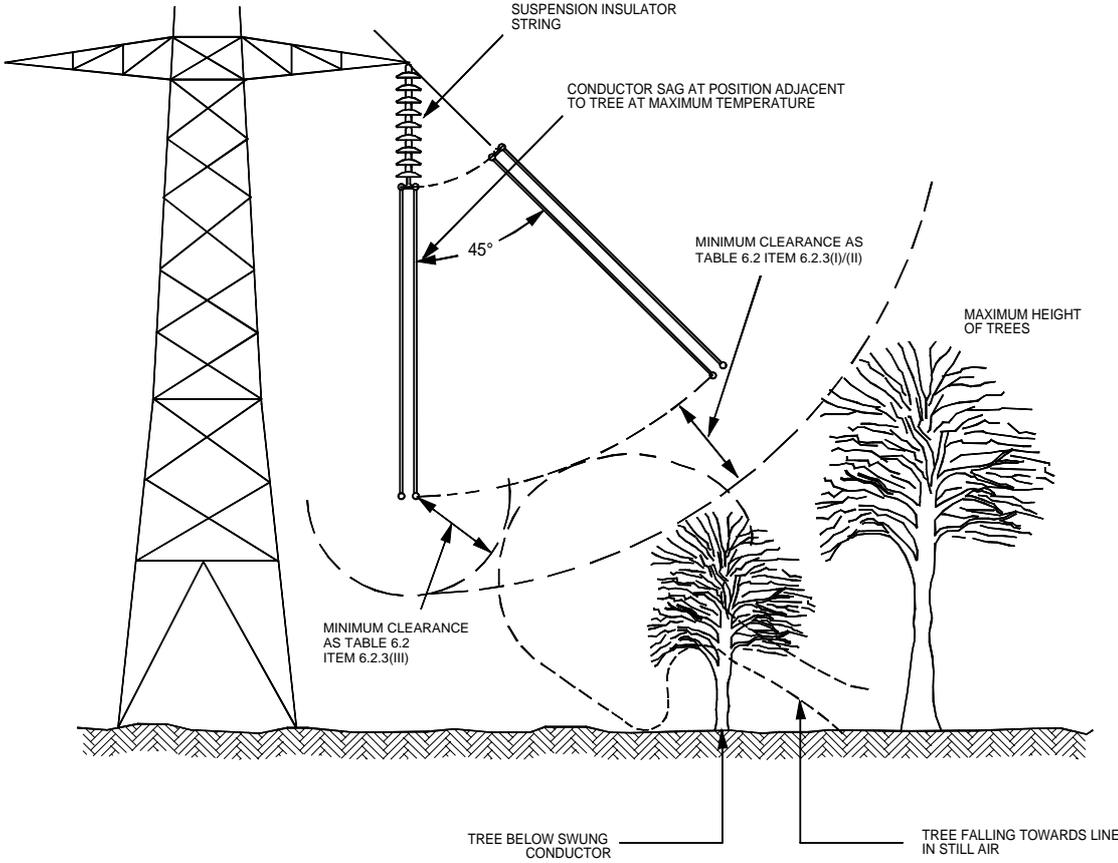
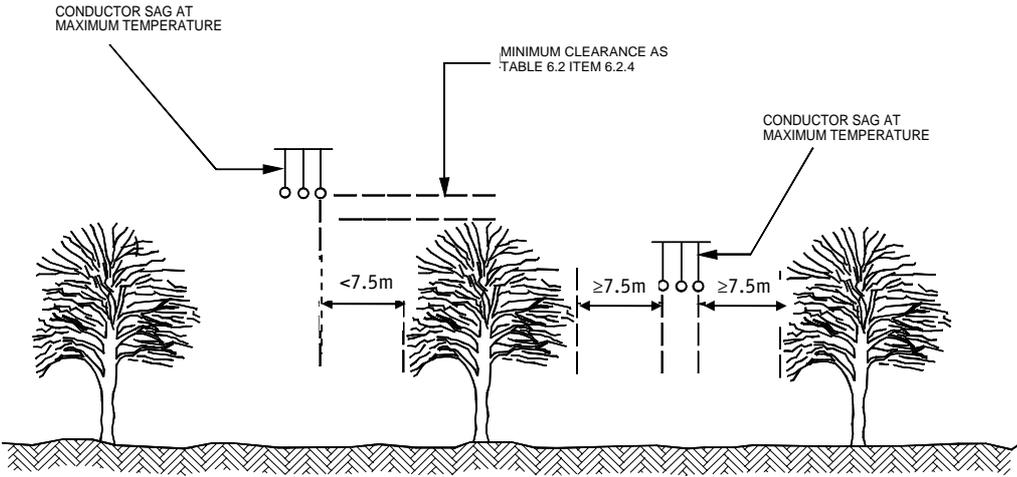


Fig. 2(a) Clearance to trees



Note: The leftmost configuration shows that when a tree is horizontally closer to the line than 7.5m, then vertical clearance, from the treetop, shall be maintained.

Fig. 2(b) Clearance to trees in orchards and hop gardens

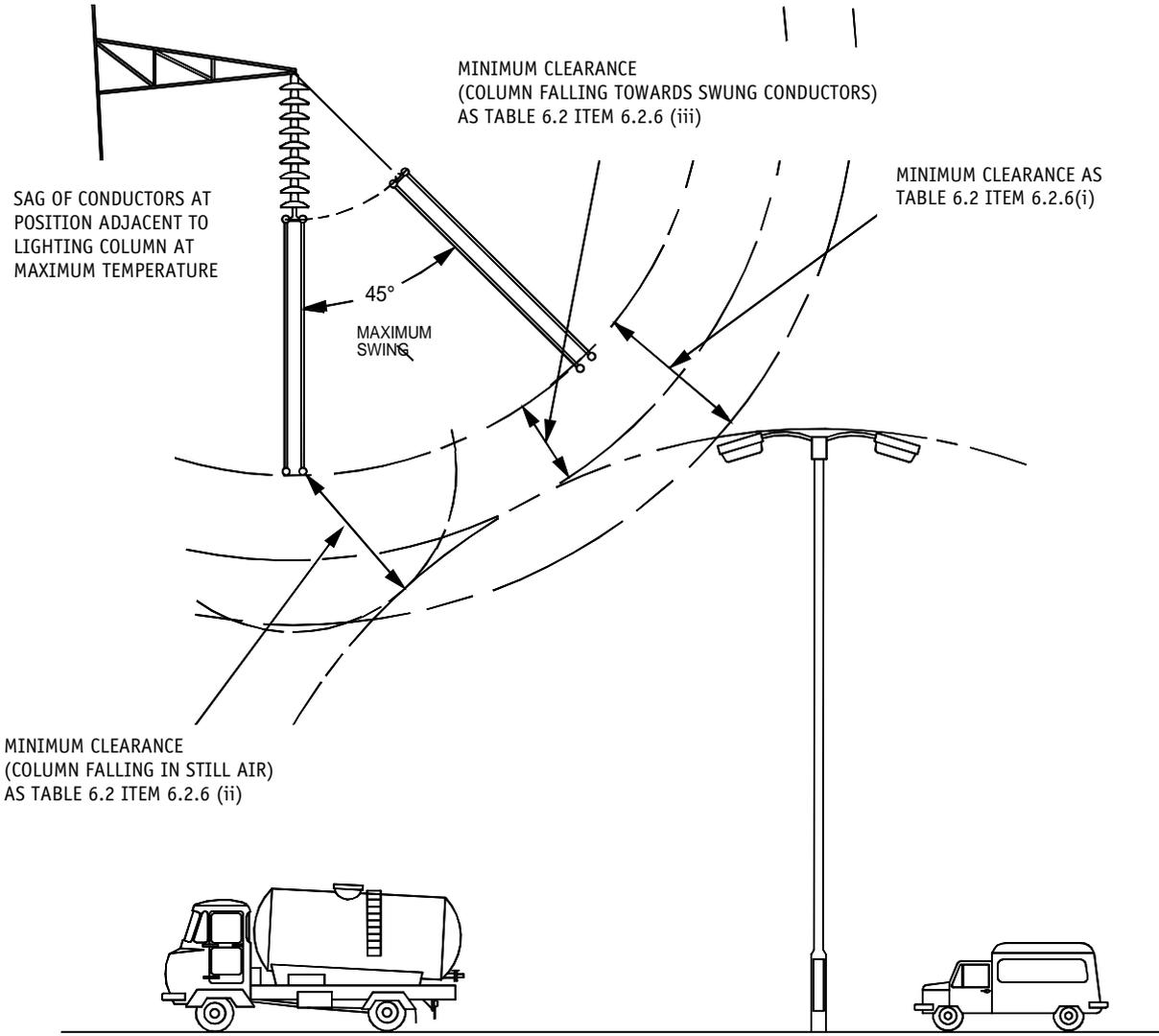
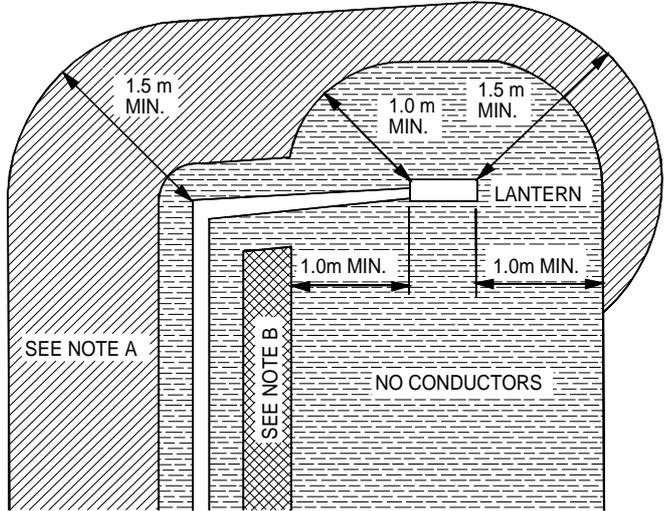
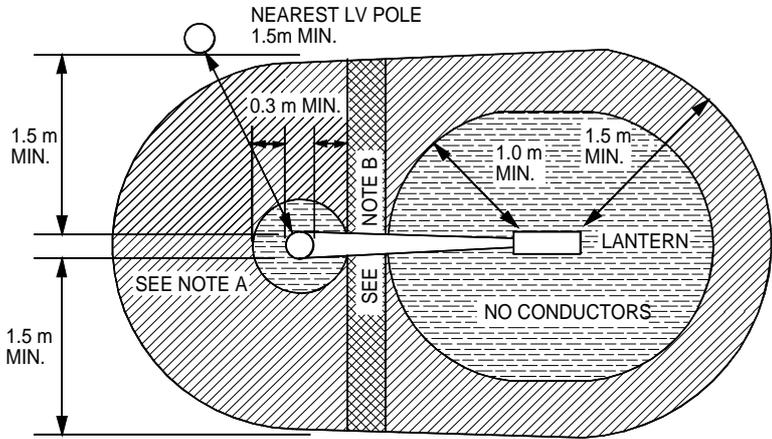


Fig. 3 HV Conductor Clearance to lighting columns



ELEVATION



PLAN

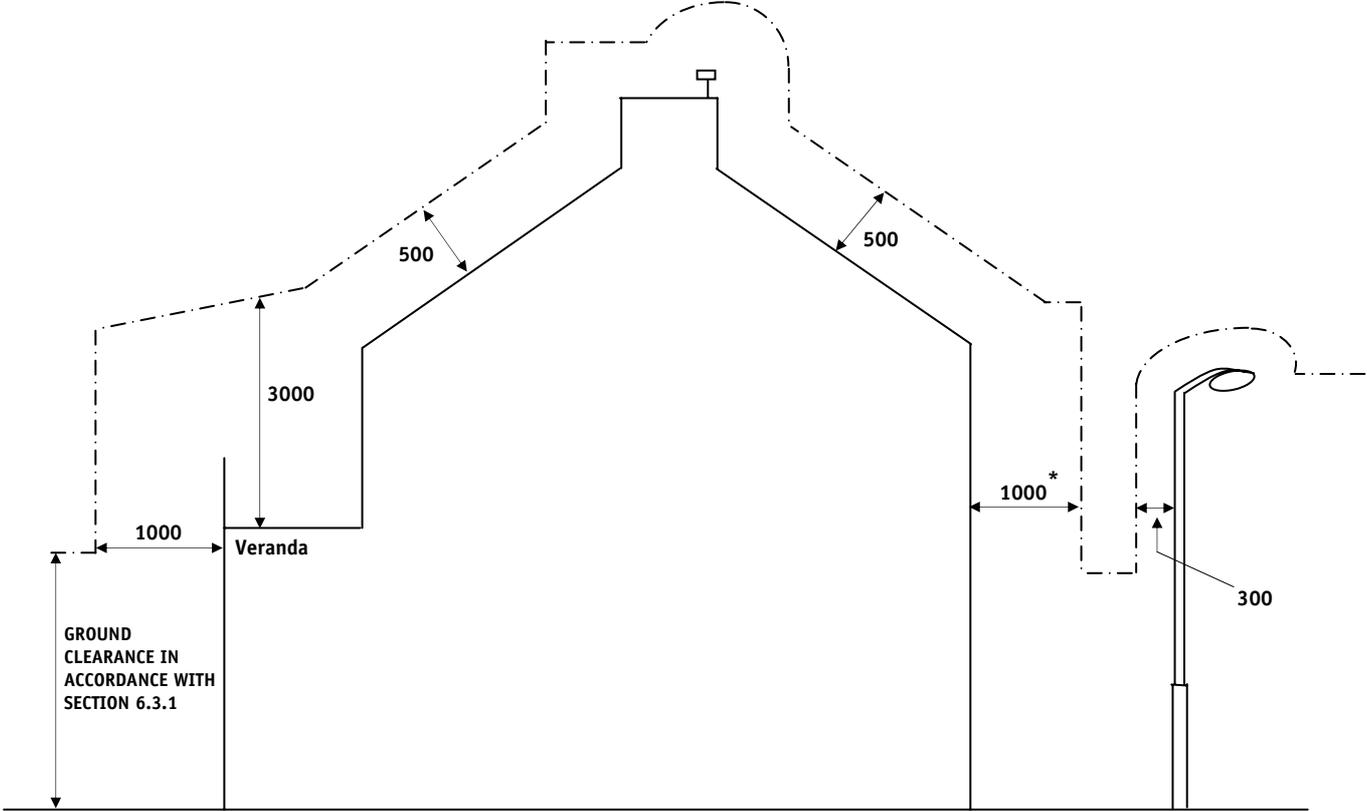


A ALL PHASE AND NEUTRAL AND SWITCHWIRE CONDUCTORS IN THIS AREA SHALL BE EFFECTIVELY INSULATED FOR 1.5m FROM THE COLUMN OR LANTERN



B ALL PHASE AND NEUTRAL AND SWITCHWIRE CONDUCTORS BENEATH THE OVERHANGING ARM OF THE COLUMN SHALL BE INSULATED THROUGHOUT THE SPAN OR EFFECTIVELY INSULATED AS IN 'A' ABOVE BUT WITH SUITABLE CONDUCTOR SPACERS.

Fig. 4 LV Conductor Clearances from lighting columns



----- EFFECTIVELY INSULATED CONDUCTORS SHOULD NOT BE POSITIONED BETWEEN THIS LINE AND THE STRUCTURE

* THIS CLEARANCE MAY BE REDUCED TO 500 mm WHERE THERE IS A BLANK WALL

ALL DIMENSIONS IN mm

Fig. 5 Clearance between structures and effectively insulated conductors installed on poles

APPENDIX A (*Informative*)

CLEARANCES TO OBJECTS - PHILOSOPHY

INTRODUCTION

The clearances to objects specified in 6.2 and Table 6.2 have been computed, in general, using the philosophy set out below.

Clearances to objects shall be maintained such that under no circumstances will the 'safety distance', as quoted in the Distribution Safety Rules, be infringed. This condition shall apply to both fixed objects and to any temporary objects that can be placed on or adjacent to fixed objects, for example a ladder against a building, or a mobile platform adjacent to a street lighting column. Clearances to objects shall be maintained under all likely line conditions, i.e. at maximum and minimum sag and with conductors hanging in still air and deflected due to wind. The two most probable conditions relative to objects are set out below.

These safety distances have been derived from the basic electrical clearance from overhead line to structure or obstacle (D_{el}) in BS EN 50341-1 increased by 10 % in accordance with 5.3.5.3 of that document and rounded up. Where past practice, (which was based on basic electrical clearance as specified in BS 7354 1990, 5.2.3, plus a 300 mm allowance for hand held tools), employed greater clearances, these have been retained, as indicated below.

System Voltage (kV)	Unit	≤33	66	132	275	400
Safety Distance	m	0.8	1.0	1.4	2.4	3.1
For Information						
D_{el}	m	0.6	0.7	1.2	2.1	2.8
$D_{el} + 10\%$	m	0.66	0.77	1.32	2.31	3.08
Rounded up to	m	0.7	0.8	1.4	2.4	3.1

Note: Where overhead lines are refurbished, or constructed, so that the basic impulse level (BIL) exceeds those used in determining the above clearances, then the clearance to obstacles will have to be re-assessed.

A.1 NORMAL CLEARANCE

This is the distance between the conductor at maximum sag hanging vertically or deflected by any angle up to 45° and an object. It is not normal to permit any object to be placed above an electric line. If a person can stand on the object or any temporary object adjacent to it, then the normal clearance shall include an 'application factor' of 2.2 m to allow for the person to move their arm whilst holding a short metallic object. Should it be necessary for a person to move their arm whilst holding a longer object, then this normal clearance may have to be increased by a distance of up to the length of the object.

A.2 PASSING CLEARANCE

This is the minimum distance between the conductor at maximum sag hanging vertically or at an angle of up to 45° towards an object and the object itself when it is moving relative to the line. The passing clearance therefore does not normally require an 'application factor' since it is intended for objects which are moving, and on which no person is standing, relative to the line. This clearance can also be applied to any object when there is no likelihood of any temporary platform being situated adjacent to it.

The Normal and Passing Clearances, which have been derived from the 'safety distances', at the various nominal system voltages are:

Nominal System Voltage	Unit	≤33 kV	66 kV	132 kV	275 kV	400 kV
Normal Clearance	m	3.0	3.2	3.6	4.6	5.3
Passing Clearance	m	0.8	1.0	1.4	2.4	3.1