PRODUCED BY THE OPERATIONS DIRECTORATE OF ENERGY NETWORKS ASSOCIATION

Technical Specification 43-8

Issue 5 2019

Overhead line clearances

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4 More London Riverside
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Last published, 2016.

Revised, 2019

Amendments since publication

Issue	Date	Amendment
Issue 5	June, 2019	Issue 4 has been subject to a minor revision which includes the following principal technical changes. Clause 2, Normative references: ENA EREC C99 added to reference list. All references to 'Skycradle' removed from document. Note added to definition 3.16 for 'ordinarily accessible'. New definition 3.23.1 added for 'auxiliary wire'. Table 1, Note 4: Cross-reference to Clause 10.2 added. Table 2, Note 2: Amended with respect to 'ordinarily accessible'. Table 2, Note 4: Cross-reference to Clause 11.3 added. Table 3: Clearances for 'Service termination at a building which is ordinarily accessible' deleted. This aspect is now covered by Clause 6.3.4. Deleted clearances for locations where line is ordinarily accessible but not accessible to vehicles. Table 3: New Note 1 added to clarify that the '2.5 m' laneway width does not prohibit the application of 4.3 m ground clearance to wider driveways. Table 3: New Note 2 added to clarify that clearances for LV systems attached to buildings may be determined in accordance with Clause 6.3.4. Table 4: Amended the wording 'Clearance to parts of a building or structure not ordinarily accessible' to 'Clearance to parts of a building or structure not accessible without access equipment' Clause 6.3.4, LV systems attached to buildings: New explanations added under items a) and b). These explanations are intended to steer

		appropriate selection for ground clearance on ‘service flights’. New Clause 8.3, Clearances to crane jibs on railways: New Clause added to capture clearance requirements for crane jibs on railways working under overhead lines. Clause 10.1, Telecommunications: Clarified that ENA TS PO5 applies to all voltages. New Clause 10.2, Auxiliary wires: New Clause added to capture clearance requirements for auxiliary wires installed on overhead supports. Clause 11.2, Horizontal clearances – working near but not underneath overhead lines: Deleted recommendation that the horizontal clearance to steel tower lines should be 15 m and replaced with a NOTE to clarify that some ENAMCs may specify a larger distance than 10 m. Table 7: New Note 2 added to clarify that the ENAMC should be contacted to ensure distances are sufficient. Clause 11.3, Vertical passing clearances – passing underneath overhead lines on work sites: Paragraph 3, wording related to vehicles ‘not of fixed height’ has been removed and replaced with a new ‘Item 2’ in Table 8 for ‘Passing clearance for vehicles NOT of fixed height’. Clause 11.4, Vertical clearances – on sites where work will be undertaken beneath the line: New Commentary added to explain the intent of the minimum vertical clearance. Figure 1 amended - the ladder against the ‘Building’ has been replaced with scaffold. Annex B.2: Items i) and ii) clarified regarding determination of clearance to a laneway. New item iii) added.
Issue 4 + A1	2016	Figure 1 amended. Position of objects altered to improve interpretation of diagram. The ‘Structure’ has been moved and the ladder against the ‘Building’ has been repositioned. Reference to Table 2, Item 1 added.
Issue 4	2015	This issue includes the following principal technical changes. Amendment 1 (Issue 3): This amendment is now removed and the correction incorporated to Clause 11.3.2. Foreword: Major amendment to structure so as to align with recommendations in EREC G0. The previous references are updated. Description of ‘specified maximum conductor temperature’ has been moved to ‘Definitions’. Paragraphs moved from ‘Scope’ describing how the document can be used and who can use the document. New sentence added to introduce GS6. New reference to ENA EREC L44 added. Scope: Major amendment to content. Requirements for effectively insulated conductors have been moved to Clause 6.3. New references for induced voltages added. Various paragraphs moved to ‘Foreword’ including the paragraph stating that ‘ENAMC shall be contacted’ for definitive clearances. Normative References: Numerous references have been updated and those which have been withdrawn or superseded are removed. New references are now included as used in the document. Definitions: New definitions added for ABC, BIL, Skycradle, withstand voltage, ordinarily accessible, laneway, road and vehicles. The definitions for specified maximum conductor temperature and basic electrical clearance have been amended. The reference to ENA TS 43-122 has been removed from the definition of covered conductor. Clause 5: New requirement d) added to capture assessment of laneways.

		Clause 6.1: Table 1 amended with new details for effectively insulated conductors. Notes 1 – 3 in Table 1 have been changed to align with these changes. Table 1 Item 1 for 400 kV has been changed from 7.6 m to 7.3 m to align with ESQCR. Clause 6.2: Table 2 amended with new details for effectively insulated conductors including values for clearances to these conductors. New Notes 1, 3 and 5 added. Amendments existing notes. Clause 6.3: The scope of this clause has been amended to include all effectively insulated conductors up to and including 33 kV. Changes to the wording and some text has been moved from the 'Scope' and 'Definitions' to this clause. Table titles have been changed. Clause 7: New Figure 6 added to replace Note 1 description in Table 5. Clause 8: Minor amendments to terminology to reflect updates to references. Table 6 Item 2 figures have been corrected for accuracy (conversion from feet to metres). Reference added to Minor Railways. Table 6: Note 1 has been deleted and two new paragraphs added beneath the table to describe requirements for use of scaffolds when overhead lines cross railways. Figure 7 has been added to aid the descriptions. New Note 1 added in relation to vertical clearance above minor railways. Clause 10: Title amended and new paragraph added to include requirements for clearances to telecommunications masts. References updated. Clause 11: Major changes to content of entire clause to reflect and align with the latest revision of HSE Guidance Note GS6. This includes incorporating the 10 m clearance from overhead lines stipulated in HSE Guidance Note GS6 and the exclusion zones identified by HSE Guidance Note GS6 when third parties are working underneath an overhead line. Terminology amended to align with HSE Guidance Note GS6. Table column headings have been updated to align with other tables in the document. New Clause 11.4 added to include pertinent points from SHEC004, which has been withdrawn. New Clause 11.5 added to clarify requirements for agricultural work, which is no longer covered by HSE Guidance Note GS6 but is covered by HSE Information Sheet AIS8 instead. Annex A: Reference to BS 7354:1990 has been updated to reflect that it has been superseded and the relevant content is now included in ENA TS 41-38. Annex B: New annex added to explain rationale for overhead line clearances for roads and laneways. Details of all other technical, general and editorial amendments are included in the associated Document Amendment Summary for this Issue (available on request from the Operations Directorate of ENA).

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Foreword

This Technical Specification (TS) is published by the Energy Networks Association (ENA) and comes into effect from date of publication. It has been prepared under the authority of the ENA Engineering Policy and Standards Manager and has been approved for publication by the ENA Electricity Networks and Futures Group (ENFG). The approved abbreviated title of this engineering document is “ENA TS 43-8”.

This Specification is intended to ensure that ENA Member Companies (ENAMC) meet their statutory obligations under the Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR) [N1] with respect to minimum clearances from overhead lines, wires and cables including minimum ground clearance requirements.

This Specification supersedes the following documents, which previously specified requirements for clearances to overhead lines.

a) ENA Engineering Recommendation L11/4.

b) ENA Engineering Recommendation L40/1.

c) ENA Engineering Recommendation G35.

d) Clearances given in ENA TS 43-12 [N6].

e) Issue 4 of this Specification.

This Specification may be of use to the general public and to bodies other than the ENAMC as a general guidance document.

The overhead clearances specified in this Specification have been determined to provide safety to the general public and protection against flashover from the line. Minimum clearances for certain voltage levels are determined from the relevant tables in this document. Where a particular voltage is not listed the next higher voltage in the table will apply, e.g. for 110 kV equipment, 132 kV clearances will apply. In all cases, where definitive clearances are required, contact with the owner of the overhead line will be necessary. This is particularly important where a change in land use is envisaged. An appropriate employee of the ENAMC will then determine the clearance to be adopted for that particular situation, along with any precautions deemed necessary. Statutory clearances are denoted by being underlined in the tables.

Clearances in this Specification are specified in metres (m) and those distances which have previously been specified in feet (ft.) have been converted to metres, rounded up to two decimal places.

For work activities in vicinity to overhead lines, this Specification complements the guidance in HSE Guidance Note GS6 [N3]. It is important to note that the vertical clearances in this document are minimum clearances consistent with the requirements of ESQCR [N1] as opposed to horizontal and vertical safe working clearances described in HSE Guidance Note GS6 [N3].

This Specification can be used to specify clearances to wind turbines mounted on buildings. However, for those involved in the siting of wind farms or wind turbines in the vicinity of overhead lines, reference should be made to ENA EREC L44 [N15].

The wider application of effectively insulated conductors for locations that may be ordinarily accessible has been addressed in this Specification. HV effectively insulated conductors are included to cater for those small number of installations that exist. The application of HV effectively insulated conductors is not expected to be widespread but is intended to be used for a limited number of special situations.

The concept of a ‘laneway’ is covered in Annex B of this Specification. This provides guidance for ENAMC inspectors when assessing those types of accesses that could otherwise be dismissed as not being ‘roads’. In some circumstances, a minimum ground clearance of 5.2 m may not be adequate; this concept requires ENAMC inspectors to assess whether the minimum ground clearance of any overhead line crossing a laneway is adequate given the nature and extent of any vehicles that may use the laneway.

1 Scope

This Specification defines 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.

The clearances specified refer to bare, lightly and effectively insulated line conductors, based on the conductor sag at the specified maximum conductor temperature. 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 may require other measures to be taken such as those described in ENA TS 43-90 [N7]. 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 Annex A useful.

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[1,2].

2 Normative references

The following referenced documents, in whole or part, are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS EN 50341-1:2012, *Overhead electrical lines exceeding AC 1 kV – Part 1: General Requirements – Common specifications*

BS EN 61936-1:2010+A1:2014, *Power installations exceeding 1 kV a.c. – Part 1: Common rules*

BS EN 60071-1:2006+A1:2010, *Insulation co-ordination – Part 1: Definitions, principles and rules*

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[1] Further guidelines on the control of electric and magnetic fields (EMFs) can be found in Power Lines: Control of Microshocks and other indirect effects of public exposure to electric fields [1].

[2] Guidance on the suppression of electrical interface when high voltage lines cross telecommunications power lines is provided in ENA TS PO5 Appendix H [N10].

The following referenced documents, in whole or in part, are generally applied by ENAMCs for the specification of effectively insulated conductors mentioned in this document. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications – effectively insulated conductors at LV

BS 6004, *Electric cables. PVC insulated and PVC sheathed cables for voltages up to and including 300/500 V, for electric power and lighting*

BS 6485, *PVC-covered conductors for overhead power lines*

BS 7870-3.11, *LV and MV polymeric insulated cables for use by distribution and generation utilities. Specification for distribution cables of rated voltage 0.6/1 kV. XLPE insulated combined neutral and earth copper wire concentric cables with copper or aluminium conductors*

NOTE: This Standard relates to single-phase and three-phase combined neutral and earth (CNE) service cables.

BS 7870-3.21, *LV and MV polymeric insulated cables for use by distribution and generation utilities. Specification for distribution cables of rated voltage 0.6/1 kV. XLPE insulated split concentric cables with copper or aluminium conductors*

NOTE 1: This Standard relates to single-phase and three-phase separate neutral and earth (SNE) service cables.

BS 7870-5, *LV and MV polymeric insulated cables for use by distribution and generation utilities. Polymeric insulated aerial bundled conductors (ABC) of rated voltage 0.6/1 kV for overhead distribution*

ENA TS 43-13, *Aerial bundled conductors insulated with cross-linked polyethylene for low voltage overhead distribution*

NOTE 2: ENA TS 43-13 requires conformance with BS 7870-5 subject to a number of specific amendments.

ENA TS 43-122, *XLPE covered-conductors for overhead lines (having rated voltages Uo/U greater than 0.6/1 kV up to and including 19/33kV)*

NOTE 3: XLPE covered-conductors that comply with ENA TS 43-122 are considered to be lightly insulated conductors when used for HV applications.

Standards publications – effectively insulated conductors at HV

There is no single Standard publication that defines requirements for aerial HV cables. Such cables are required to comply with relevant requirements of underground cable Standards, e.g. BS 7870-4.20 and IEC 60502. In general, aerial HV cables are required to be assessed as being suitable for self suspension, incorporating outer sheaths resistant to ultra-violet (UV) radiation, abrasion and the effects of external temperature variations and moisture.

Other publications

[N1] Statutory Instrument 2002 No. 2665, *The Electricity Safety, Quality and Continuity Regulations 2002 (as amended)*[3]

[N2] Statutory Instrument 1989 No. 635, *The Electricity at Work Regulations 1989*

[N3] HSE Guidance Note GS6 (rev 4), *Avoiding danger from overhead power lines.* ISBN 978 0 7176 1348 9

[N4] HSE Agriculture Information Sheet AIS8 (rev 3), *Working safely near overhead electricity power lines*. HSE books 2012

[N5] ENA TS 41-38, *Power installations exceeding 1 kV a.c.: Design of high-voltage open-terminal stations*

[N6] ENA TS 43-12, *Insulated aerial bundled conductors erection requirements for LV overhead distribution systems*

[N7] ENA TS 43-90, *Anti climbing devices and safety signs for HV lines up to and including 400 kV*

[N8] ENA TS 43-103, *Low voltage overhead line shrouding materials*

[N9] ENA TS 43-119, *Design and use of temporary scaffold guards*

[N10] ENA TS PO5, *Protection of telecommunication lines from power lines*

[N11] ENA EREC G39, *Model code of practice covering electrical safety in the planning, installation, commissioning and maintenance of public lighting and other street furniture*

[N12] ENA EREC G55, *Safe tree working in proximity to overhead electric lines*

[N13] ENA EREC G96, *Use of mechanical harvesters in vegetation management*

[N14] ENA EREC EB/TP, *Engineering Recommendation for telecommunication providers and distribution network operators joint use of poles*

[N15] ENA EREC L44, *Separation between wind turbines and overhead lines: Principles of good practice*

[N16] ENA EREC C99, *Guidance for working on cables under induced voltage conditions*

[N17] Railway Master Wayleave Agreement 1961

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[3] In Northern Ireland, the Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012 apply. Some aspects of overhead line clearances in this Specification may not apply retrospectively to existing overhead lines subject to the requirements of Regulation 2(9) with regard to “material alteration”.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
aerial bundled conductor (ABC)
assembly of LV effectively insulated phase and neutral conductors

NOTE: Types of ABC in general use can also include an additional earth conductor.

3.2
application factor
distance (dependent upon working situation) which is added to the safety distance to determine working and access clearance

3.3
basic electrical clearance
smallest permissible clearance in air between live parts or between live parts and earth

[BS EN 61936-1:2010+A1:2014, 6.52]

NOTE: Basic electrical clearances do not include any additions for constructional tolerances, wind effects, etc.

3.4
basic insulation level (BIL)

standard lightning impulse waveform withstand voltage of an insulation device under specified conditions

NOTE: The term BIL is interpreted as lightning impulse withstand voltage in BS EN 60071-1 and is specific to equipment rated above 1 kV.

3.5
cable
conductor, or assembly of conductors, which are effectively insulated and incorporate an earthed metallic screen

3.6
controlled zone
inside of an enclosure efficiently protected against unauthorised access by fencing not less than 2.4 m in height or other means necessary to meet the requirements of ESQCR [N1] Regulation 11 (b)

3.7
covered conductor (CC)
conductor that can be lightly or effectively insulated

NOTE: In the Guidance Notes to the ESQCR [N1], the term ‘BLX conductors’ is used, which is a trade name used in Scandinavia. BLX is interpreted as lightly insulated in this document.

3.8
creep
non-elastic stretch of a conductor

NOTE: This consists of two parts – bedding down of the strands and the long-term stretch of conductor material.

3.9
effectively insulated conductor
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 1: The implication here is that effectively insulated conductors may be placed such that they are ordinarily accessible.

NOTE 2: For a HV conductor to be considered effectively insulated it must have an earthed metallic screen incorporated in its construction.

3.10
jumper connection
connection at a support from a phase conductor to another conductor or to a terminal on transformers, switchgear, fusegear, line taps, etc.

3.11
laneway
defined access between a road and a residential or business address that is suitable for vehicular traffic but which is either not of constructed material or which the public do not have unrestricted access

NOTE: See Annex B for further explanation of a laneway.

3.12
lightly insulated conductor
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.

3.13
line conductor
conductor used, or to be used, for conveying a supply of electricity

NOTE: A line conductor is deemed to include a through jumper.

3.14
normal use of land
type of work or activity which is likely to occur on or over a particular piece of land or water

3.15
object
building, wall, fence, structure, stationary vehicle, tree, vegetation or similar with an elevation above ground level

3.16
ordinarily accessible
capable of being reached by hand from any scaffolding, ladder or other construction erected or placed on, in, against or near to any building or structure

NOTE: Ordinarily accessible is applicable to parts of a building or structure that are reasonably expected to be accessed by persons for the purposes of inspection, maintenance, cleaning and repairs.

[similar to ESQCR [N1] Regulation 18 (6)]

3.17
overhead line
equipment in the open air and above ground level coming within the scope of the ESQCR [N1]

3.18
road
constructed material suitable for vehicular traffic over which the public have access whether by permission or right

NOTE 1: The intention is that high-sided vehicles will have safe passage beneath any overhead line crossing a road.

NOTE 2: Forest roads designed and built for timber transport using road haulage vehicles are classed as roads.

3.19
safety distance
distance maintained from the nearest exposed conductor or from an insulator supporting a conductor to avoid danger

3.20
specified maximum conductor temperature
design maximum temperature of the conductor resulting from a combination of climatic conditions and the rated electrical load under normal operating conditions[4]

3.21
system voltage
nominal r.m.s. phase-to-phase voltage of a three-phase a.c. system

3.22
vehicle
mechanically-propelled vehicle intended or adapted for use on roads and laneways

3.22.1
high load vehicle
vehicle with maximum height exceeding 5 m but not exceeding 6.1 m

[4] 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 interpreted as the 'maximum likely conductor temperature' in accordance with Regulation 17 (1) of ESQCR [N1].

3.22.2
high-sided vehicle
vehicle with maximum height exceeding 4 m but not exceeding 5 m

3.22.3
non high-sided vehicle
vehicle with maximum height not exceeding 4 m

3.23
wire
wire which is not designed to convey electricity but which is attached to a support carrying line conductors

3.23.1
auxiliary wire
wire used for the purposes of control, protection, regulation of supply, or for communication

NOTE 1: An auxiliary wire is not a line conductor.

NOTE 2: In general, an auxiliary wire uses the same supports as intended for the line conductor.

3.24
withstand voltage
value of the test voltage to be applied under specified conditions in a withstand test, during which a specified number of disruptive discharges is tolerated

[BS EN 60071-1:2006+A1:2010,3.22]

4 Derivation of clearances

In general, the clearances stated in this Specification have been derived from the summation of the following.

a) 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.

b) 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.

The summation method has not been applied where this conflicts with statutory requirements or where certain clearances, e.g. to railways, are the subject of agreement with the appropriate companies.

Where the clearance derived by the summation of a) and b) is greater than the statutory clearance, it is this greater clearance which is quoted in this Specification.

NOTE: Annex A clarifies the process used to determine the clearances to objects. Where overhead lines are refurbished, or constructed, so that the BIL exceeds that used in determining the clearances, then the clearances will need 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 need to be taken into consideration when providing clearances to overhead lines.

a) Allowance shall be made for the effects of creep in conductors, as the specified clearance shall be maintained for the life of the conductor.

b) 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.

c) When an overhead line is being erected in proximity to existing objects, the clearances shall allow for future maintenance of the object.

d) The adequacy of overhead line conductor clearances above laneways will be determined by the ENAMC. This may be based on an assessment/and, if necessary, discussion with the landowner/resident, to determine the nature (e.g. maximum height of vehicle) and extent of vehicular traffic requiring access to the laneway.

e) When work is to be carried out, or objects are to be erected in proximity to an existing overhead line, the clearance may need 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 [N3]. If utilised, the clearances provided in Clause 11 will allow the site operator to comply with HSE Guidance Note GS6 [N3].

6 Clearance to ground, roads and objects

6.1 Clearances to ground and roads

The clearances specified in Table 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 1 — Clearances to ground and roads (*1 of 2*)

Item	Description of clearance	Nominal system voltage (kV) Minimum clearance (m)					
		≤ 33 (NOTE 2)		66	132	275	400
		B	EI				
1	Line conductor at any point not over road. (NOTE 3)	5.2	5.2	6.0	6.7	7.0	7.3
2	Line conductor to road surface other than as specified in 3, 4, and 5. (NOTE 4)	5.8	5.8	6.0	6.7	7.4	8.1
3	Line conductor to road surface of designated '6.1 m high load vehicle' routes. (NOTE 5)	6.9	6.9	7.1	7.5	8.5	9.2
4	Line conductor to motorway road surface where scaffolding is to be used on:						
	a) Normal 3 lane motorways.	14.0	14.0	14.2	14.6	15.6	16.3
	b) Elevated 2 lane motorways (NOTE 6 & 7)	11.0	11.0	11.2	11.6	12.6	13.3
5	Bare live metalwork, e.g. transformer terminals, jumper connections, etc. (NOTE 8)	4.3	NA	4.3	Controlled Zone Safety Rules Apply		

Table 1 — Clearances to ground and roads (*2 of 2*)

NOTE 1: Statutory clearances are denoted by being underlined within this table.

NOTE 2: Clearances to effectively insulated conductors are detailed in this table. The column heading codes are: B = Bare conductors and EI = Effectively insulated conductors.

NOTE 3: Clearance for EI conductors could be lower in some cases if the overhead line is not ordinarily accessible. Clause 6.3.2 provides further guidance for clearances in particular situations. Annex B provides information regarding the rationale for definitions of ‘road’ and ‘laneway’.

NOTE 4: The minimum 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 road. The clearances specified allow for the safe passage below the line of a high-sided vehicle. These clearances are based on a vehicle height not exceeding 5 m (except for the 6.1 m high load vehicle routes). See also Clause 10.2.

NOTE 5: 'High load vehicle' routes are roads designated by the Department for Transport, for which the higher load clearance of 6.1 m shall be maintained.

NOTE 6: These clearances allow for the erection of scaffolding/guard netting with the overhead circuits live.

NOTE 7: Should 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. Detailed guidance on the design and construction of temporary scaffolding, including clearances to overhead lines, is contained in ENA TS 43-119 [N9].

NOTE 8: 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. These clearances do not apply to section jumpers.

6.2 Clearances to objects

The clearances specified in Table 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 2 — Clearances to objects (*1 of 2*)

Item	Description of clearance	Nominal system voltage (kV) Minimum clearance (m)					
		≤ 33 (NOTE 1)		66	132	275	400
		B	EI				
1	Line conductor to any object which is ordinarily accessible (including permanently mounted ladders and access platforms) or to any surface of a building. (Note 2 and Figure 1)	3.0	Note 3	3.2	3.6	4.6	5.3
2	Line conductor to any object to which access is not required AND on which a person cannot stand or lean a ladder. (Note 4)	0.8	0.5	1.0	1.4	2.4	3.1
3	Line conductors to that part of a tree under / adjacent to line and:						
	(i) Unable to support ladder/climber.	0.8	0.5	1.0	1.4	2.4	3.1
	(ii) Capable of supporting ladder/climber.	3.0	0.5	3.2	3.6	4.6	5.3
	(iii) Trees falling towards line with conductors hanging vertically only. (Note 5, Note 6 and Figure 2(a))	0.8	0.5	1.0	1.4	2.4	3.1
4	Line conductors to trees in Orchards and Hop Gardens. (Note 7 and Figure 2(b))	3.0	3.0	3.2	3.6	4.6	5.3
5	Line conductors to irrigators, slurry guns and high pressure hoses (Note 8)	30.0	30.0	30.0	30.0	30.0	30.0
6	Line conductor to street lighting standards with:						
	(i) Standard in normal upright position.	1.7	1.0	1.9	2.3	3.3	4.0
	(ii) Standard falling towards line with conductor hanging vertically only.	1.7	0.3	1.9	2.3	3.3	4.0
	(iii) Standard falling towards line. (Note 9, Figure 3 and 4)	0.4	0.3	0.7	0.8	1.4	1.9

Table 2 — Clearances to objects (*2 of 2*)

NOTE 1: Clearances to effectively insulated conductors are detailed in this table. The column heading codes are: B = Bare conductors and EI = Effectively insulated conductors.

NOTE 2: These are the minimum clearances that shall be maintained between an overhead line conductor and a structure or a building (walls, roof, windows etc.) that is ordinarily accessible. They permit a person to stand on or access parts of a structure or building that are ordinarily accessible but only allow for free movement of short hand held objects. Minimum clearances to installed photovoltaic panels shall satisfy these values. Detailed guidance on the avoidance of danger from electric lines on construction sites is contained in HSE Guidance Note GS6 [N3].

NOTE 3: Detailed guidance on supplementary clearances for effectively insulated conductors from objects, excluding LV conductors attached to buildings, is provided in Table 4.

NOTE 4: 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 [N3]. See also Clauses 8.3 and 11.3.

NOTE 5: Clearances to effectively insulated conductors may be lower than the value stated but the conductor must be afforded mechanical protection.

NOTE 6: Clearances quoted in 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 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 during tree work is contained in ENA EREC G55 [N12] and ENA EREC G96 [N13].

NOTE 7: 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.

NOTE 8: 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 should be obtained from the individual ENAMC.

NOTE 9: The clearances quoted in 6 i) assume that maintenance platforms will be positioned such that clearances quoted in Item 1 are maintained. Reduced clearances for LV conductors are indicated in Figure 4. Clearances to effectively insulated conductors may be reduced depending on position as detailed in Figure 4 and Clause 6.3.3. The clearances quoted in 6 iii) can be neglected if the location of the lighting column is such that impact by a vehicle is improbable. ENA EREC G39 [N11] 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 Item 6 i), 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 ii) include additional clearance to allow for the erection of street lighting columns.

6.3 Supplementary clearances for effectively insulated conductors attached to poles

6.3.1 General

Effectively insulated conductors up to and including 33 kV, e.g. Ericsson aerial HV cable, and low voltage conductors, e.g. ABC installed in accordance with ENA TS 43-12 [N6], shall conform with the clearances in Table 3 and Table 4 in addition to those stated in Clauses 6.1 and 6.2.

The clearances specified in Table 3 and Table 4 are minimum clearances and the ENAMC may install HV effectively insulated conductors at a greater height, e.g. above bare LV conductors on the same route. Hence, the ENAMC may specify greater clearances than presented in this clause.

ENAMCs shall provide justification for the use of effectively insulated conductors operating at HV (≤ 33 kV), where they are installed at reduced clearance to ground or objects (see Table 3 and Table 4).

Clearances between line conductors and other power lines and above railways, as detailed in Clauses 7 and 8 and Tables 5 and 6 shall be met.

6.3.2 Supplementary ground clearances to effectively insulated conductors only

Where effectively insulated conductors are used over roads accessible to vehicular traffic, ground clearances shall still conform with Clause 6.1 and Table 1 as stated in Regulation 17 (2) (a) of ESQCR [N1].

However clearances in other locations are provided in Table 3. Such conductors shall be positioned so that they are not likely to cause injury or be damaged by persons going about normal everyday activities.

Table 3 — Reduced ground clearances for effectively insulated lines not accessible to vehicular traffic

Location	Minimum clearance (m)	
	LV	HV (≤ 33 kV)
Along the line of hedgerows, fences and boundary walls etc.	4.0	4.0
Access laneway to a property, with a width of 2.5 m or less which is defined by gateposts, hedges or other fixed features. (NOTE 1)	4.3	4.3
Between buildings, attached to buildings, or locations where the line is safe in the particular circumstance (e.g. over gardens), in addition to there being no vehicular access. (NOTE 2 & 3)	3.5	3.5
NOTE 1: A ground clearance of 4.3 m may also be applied to laneways which are wider than 2.5 m subject to there being a physical restriction(s) prohibiting a high-sided vehicle travelling down the laneway to the point where the line crosses over the laneway. Physical restrictions may include bending radius, trees etc. NOTE 2: Where the LV system is attached to the building(s), such as for a service, then the clearances may be determined in accordance with Clause 6.3.4. NOTE 3: “safe in the particular circumstances” means overhead lines are positioned so that they are not likely to cause injury or be damaged by persons going about normal everyday activities.		

6.3.3 Supplementary clearances to objects for effectively insulated conductors

The clearances in Table 4 do not apply to LV mains or services attached to buildings. In determining clearances the following conditions should be considered as appropriate.

a) Sags at the specified maximum operating temperature of the conductor determined by the ENAMC from data provided by the manufacturer.

b) Line conductor deflected at 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 4 — Supplementary clearance to objects for effectively insulated conductors

Location	Minimum clearance (m) ≤33 kV
Vertical clearance to any surface or structure that is accessible without access equipment (see Figure 5).	3.0
Horizontal distance to any surface of a building or structure which is accessible without access equipment (see Figure 5).	1.0
Clearance to parts of a building or structure not accessible without access equipment (see Figure 5). See NOTE 1.	0.5
Clearance to free-standing apparatus such as street lighting columns, traffic signs, telecommunications provider poles or columns (see Figure 5).	0.3
NOTE 1: This clearance is to prevent mechanical abrasion of the conductor. When connecting an LV effectively insulated conductor to a building it is only necessary to ensure that the attachment route avoids risk of abrasion.	

6.3.4 LV systems attached to buildings

For LV systems attached to buildings consideration needs to be given as to additional protective measures to prevent danger. An on-site assessment may be necessary to determine appropriate clearances.

The appropriate construction system for LV effectively insulated conductors is described in ENA TS 43-12 [N6], which covers the following points.

a) "*Service flights from a pole to a building shall be insulated where they are ordinarily accessible and at a 'suitable height' where they are unlikely to be damaged, or where people going about their everyday activities cannot come into contact with them*."

   The 'suitable height' shall be determined by the ENAMC and will be dependent on the what the conductor is oversailing, i.e. the risk of contact during everyday activities. It would be expected that a minimum clearance of 3.5 m, in accordance with Table 3 of this Specification, might not be satisfied for the service flights from a pole to a building, especially where the building is single storey. However, it would be expected that measures are taken to achieve the minimum clearance of 3.5 m as close as reasonably practicable from the building taking into account the risk of contact with the service flight from the pole to the building. For example: a measure could be to minimise the span length between the terminal pole and the building.

b) If an effectively insulated conductor is attached to a building at any point below 2.4 m, it shall be subject to additional protection.

The additional protection is necessary for the risk of contact and mechanical damage to the conductor.

7 Clearances where power lines cross or are in close proximity to one another

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 with consideration of the ultimate nominal system voltage of the upper or lower line, whichever is greater.

Table 5 — Minimum clearances where power lines cross or are in close proximity to one another (*1 of 2*)

Item	Description of clearance	Nominal system voltage (kV) Minimum clearance (m)						
	conductor or earth wire to:	0.4	11	33	66	132	275	400
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
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
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
4	Support of upper line and any conductor of lower line. (NOTE 2)	7.5	7.5	7.5	7.5	7.5	15.0	15.0

NOTE 1: See Figure 6 for methods of determining clearances that shall be adopted.

NOTE 2: Clearance shall be obtained with the conductor/earth wire at its specified maximum conductor temperature and deflected by any angle up to 45°.

8 Railway crossings

8.1 General

Clearances to railways and their associated lines, buildings and yards are covered by the second schedule (General and Engineering Conditions) of the Railway Master Wayleave Agreement [N17].

Table 6 lists the principal vertical clearances referred to in the Master Agreement [N17]. For horizontal clearances to railway circuits (excluding traction wires) reference should be made to the Master Agreement [N17].

Table 6 — Principal vertical clearance to railways and associated structures

Item	Description of clearance	Nominal system voltage (kV) Minimum clearance* m (ft.)				
		≤33	**66**	**132**	**275**	**400**
1	Ground level.	6.1 (20)	6.1 (20)	6.7 (22)	7.0 (23)	7.6 (25)
2	Ground level at roads or yards where road mobile cranes are likely to be employed.	10.7 (35)	10.7 (35)	11.3 (37)	11.6 (38)	12.2 (40)
3	Rail level. (NOTE 1)	7.3 (24)	7.3 (24)	8.0 (26)	8.2 (26)	8.8 (29)
4	Buildings, gantries or other structures on which a person might stand and to traction wires.	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.

NOTE 1: See Office of Rail Regulation, Railway Safety Publication 5, *Guidance on Minor Railways* [3] for minimum clearance requirements above rail level for minor railways.

8.2 Use of scaffolding across railways

The clearances specified in Table 6 items 3 and 4 do not incorporate any allowances for the use of scaffolding across railway tracks/traction wires during erection/maintenance of overhead lines. To accommodate such scaffolding, the requirements in ENA TS 43-119 [N9] are applicable. Clause 9.2 of ENA TS 43-119 [N9] stipulates a minimum clearance of 4.6 m from scaffolding/catenary wires to railway traction wires or supports. Clearances from scaffolds/catenary wire to overhead lines shall satisfy Table 2 of ENA TS 43-119 [N9]. Figure 7 depicts the clearance requirements for overhead lines, scaffolds and railways.

It is important to note that clearances between overhead lines, scaffolds/catenary wires, railway traction wires, and supports or rails represent the ‘final’ distances to be achieved.

WARNING: Additional clearances and precautions will be necessary to ensure safety during erection of temporary scaffolds.

8.3 Clearances to crane jibs on railways

The operation of railway borne cranes in proximity to overhead lines shall be in accordance with Clause 11, except that the minimum vertical clearance to jibs of railway borne cranes working under overhead lines shall satisfy the distances specified in Table 8 Item 2.

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 and auxiliary wires

10.1 Telecommunications

Vertical and lateral clearances to telecommunication lines shall comply with those clearances specified in ENA TS PO5 [N10] for all voltages.

ENA EREC EB/TP [N14] specifies the clearance requirements for apparatus when poles are jointly used between a telecommunications provider and a DNO.

Where telecommunications masts are constructed adjacent to an existing overhead line, the minimum lateral clearance between the line conductor and the nearest point on the mast shall be 1.5 times the height of the mast or 15.0 m, whichever is the greater.

10.2 Auxiliary wires

Auxiliary wires should be treated as effectively insulated, unless otherwise specified by the ENAMC.

In general, an auxiliary wire is not current carrying and the voltage level is low, i.e. LV. However, the auxiliary wire may be subject to induced voltage from adjacent live conductors – this is particularly the case during network fault events (fault current flowing in adjacent live conductor). An estimate of induced voltage in the auxiliary wire can be determined in accordance with ENA EREC C99 [N16]. Historical practice in the UK electricity industry has been to consider a maximum induced voltage of 5 kV when in proximity to 11/33 kV conductors, and a maximum induced voltage of 15 kV when in proximity to 132/275/400 kV conductors. For the purposes of induced voltage circumstances, an auxiliary wire should be treated as a line conductor ≤33 kV.

NOTE: Safe working methods for, auxiliary wires subject to induced voltage, are not covered by this document but may be as described in ENA EREC C99 [N16] and/or ENAMC specific procedures.

The minimum clearances for an overhead auxiliary wire should be in accordance with those distances in Table 1 and Table 2 of this ENA TS for an effectively insulated line conductor ≤33 kV.

NOTE: In certain situations, the consequence of damage to an auxiliary wire may be detrimental to the safe and efficient operation of the associated network. For this reason, the ENAMC may wish to maintain the same clearance to the auxiliary wire as would be required for the associated line conductor.

11 Work in proximity to overhead lines

11.1 General

The following clauses deal 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 1 and 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. All work near live overhead power lines must be fully justifiable and satisfy all three requirements of Regulation 14 of the Electricity at Work Regulations 1989 [N2].

The HSE provides guidance for the avoidance of danger from overhead lines in their Guidance Note GS6 [N3] (subsequently referred to as GS6 [N3]). 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 site operators.

The requirements and guidance provided in the following clauses of this Specification aim to complement that provided in GS6 [N3].

11.2 Horizontal clearances – working near but not underneath overhead lines

GS6 [N3] recommends that the ENAMC should be contacted for advice for any work within 10 m, measured at ground level horizontally from below the nearest overhead line.

NOTE: Some ENAMCs specify a larger horizontal clearance (up to 15 m) to cater for overhead line swing on longer span lengths.

GS6 [N3] recommends the erection of safety barriers to establish a safety zone parallel to the overhead line to maintain clearance from it. Table 7 details typical minimum values for horizontal separation of the overhead lines and safety barriers.

Table 7 — Horizontal distances to safety barriers

Description	Clearance (m)					
	≤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	6.0	6.0	9.0	12.0	14.0
NOTE 1: 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. NOTE 2: To ensure these distances are sufficient the ENAMC should be contacted to assist with any calculations.						

11.3 Vertical passing clearances – passing underneath overhead lines on work sites

GS6 [N3] specifies the use of passageways where plant or vehicles have to pass underneath the overhead line at the work sites.

Plant or vehicles passing underneath overhead lines must not breach the safety clearance distance. Table 8 details these passing clearances and Annex A provides their derivation.

The vertical clearances given in Table 8 are minimum clearances and must not be infringed under any circumstances.

Table 8 — Vertical passing clearances

Item	Description	Clearance (m)				
		≤33 kV	66 kV	132 kV	275 kV	400 kV
1	Passing clearance fixed height loads	0.8	1.0	1.4	2.4	3.1
2	Passing clearance for vehicles NOT of fixed height (NOTE 1,2)	2.0	2.2	2.6	3.6	4.3
NOTE 1: The distances stated include an allowance of 1.2 m to cater for some variation in the vehicle height e.g. crane jib bounce, abnormal load, uneven ground. NOTE 2: Greater clearance may be required when there is a risk that the height variation may exceed 1.2 m.						

The above clearances shall be used to determine the maximum distance to the underside of the passageway goalpost[5] erected to prevent vehicles or plant from infringing these clearances whilst traversing the line. The maximum height to the underside of the goalpost

[5] The term ‘goalpost’ is referred to in GS6 [N3].

shall be the minimum ground clearance of the line less the specified passing clearance from Table 8.

It is important that the minimum ground clearance of the line is determined at the specified maximum conductor temperature, when specifying the passageway height.

11.4 Vertical clearances – 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 7 or the calculated distance (see NOTE 1 in Table 7) whichever is greater.

GS6 [N3] provides recommendations for working under the line and describes two general cases: ground-level work, and erection of buildings or structures close or underneath an overhead line. Exclusion zones from the overhead line are stipulated for the various voltages.

GS6 [N3] recommends that the ENAMC should be consulted when there is doubt about the use of the exclusion zones. In the cases where the exclusion zone may be breached, it is imperative that the clearances maintained shall satisfy Table 8 Item 1.

COMMENTARY ON: Minimum vertical clearance

The intent of a vertical clearance when working beneath a line is to ensure that the safety distance (see Table 8 item 1 and Table A.1) is maintained as a minimum at all times i.e. prevention of a person breaching the safety distance (see A.1). It is important that an appropriate safe system of work is employed and overseen by experienced and competent persons. The use of an 'application factor' is a relevant consideration, as described in A.2: an allowance of 2.2 m for a person to move their arm whilst holding a short metallic object. Another robust and industry accepted concept is a 'working and access clearance' which is the safety clearance + 0.3 m (as described in the Model Distribution Safety Rules [4]).

11.4.1 Work at ground-level only

Where work is carried out at ground-level the passing clearances specified in Table 8 Item 1 for fixed height loads are permissible, as GS6 [N3] requires that no vehicle, item of plant, ladders or poles shall reach beyond the safe clearance limit. Where plant such as cranes and excavators has the capability to reach into the safe clearance limit it shall be fitted with a physical restraint in order to prevent such action.

GS6 [N3] requires that all such work shall be "directly supervised by someone who is familiar with the risks".

11.4.2 Work on buildings or structures close to or underneath an overhead line

This work includes erection of permanent and temporary structures as specified by GS6 [N3].

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 8, Item 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.

11.5 Safe working of third parties carrying out work in close proximity to live LV overhead conductors which are not effectively insulated

Where third parties, e.g. owner-occupiers or their contractors, carry out work in close proximity to live LV overhead conductors, the requirements of Clauses 11.2, 11.3 and 11.4 are applicable in the first instance.

Where these requirements are not satisfied and in order to prevent inadvertent contact with live conductors or equipment, the ENAMC shall be contacted for advice. The following precautions shall be considered for bare or lightly insulated LV overhead mains and services, excluding undereaves mains, services and all similar means of supply secured to buildings.

a) De-energise the line and take appropriate precautions in accordance with ENAMC procedures.

b) Apply temporary shrouding complying with ENA TS 43-103 [N8].

c) Erect a horizontal physical barrier as described in Clause 11.4.2.

d) Underground the mains/service.

e) Replace bare open conductor services with effectively insulated services, for example ABC, together with the requirements of Clause 6.3.

f) Divert the line.

The procedure adopted shall be recorded and communicated appropriately between the third party and ENAMC.

11.6 Agricultural work

The HSE provide information for persons in agriculture working near overhead lines in Agriculture Information Sheet No 8 [N4]. The information sheet recommends carrying out specified activities at least 10 m from overhead lines.

NOTE: Some ENAMCs specify a larger horizontal clearance (up to 15 m) to cater for overhead line swing on longer span lengths.

Where the above conditions cannot be satisfied for agricultural work, the ENAMC approach shall be adopted.

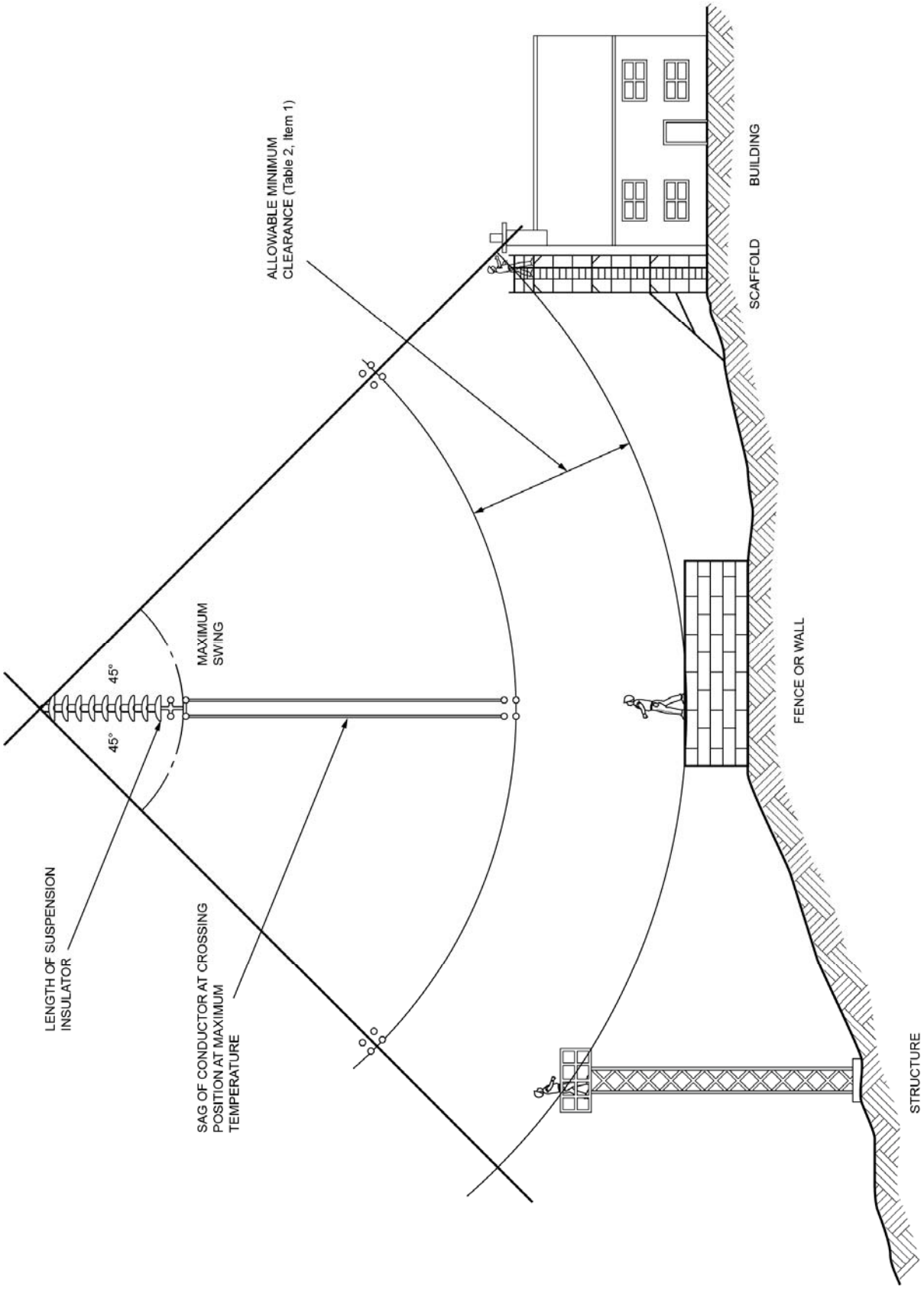


Figure 1 — Clearance to objects (on which a person can stand)

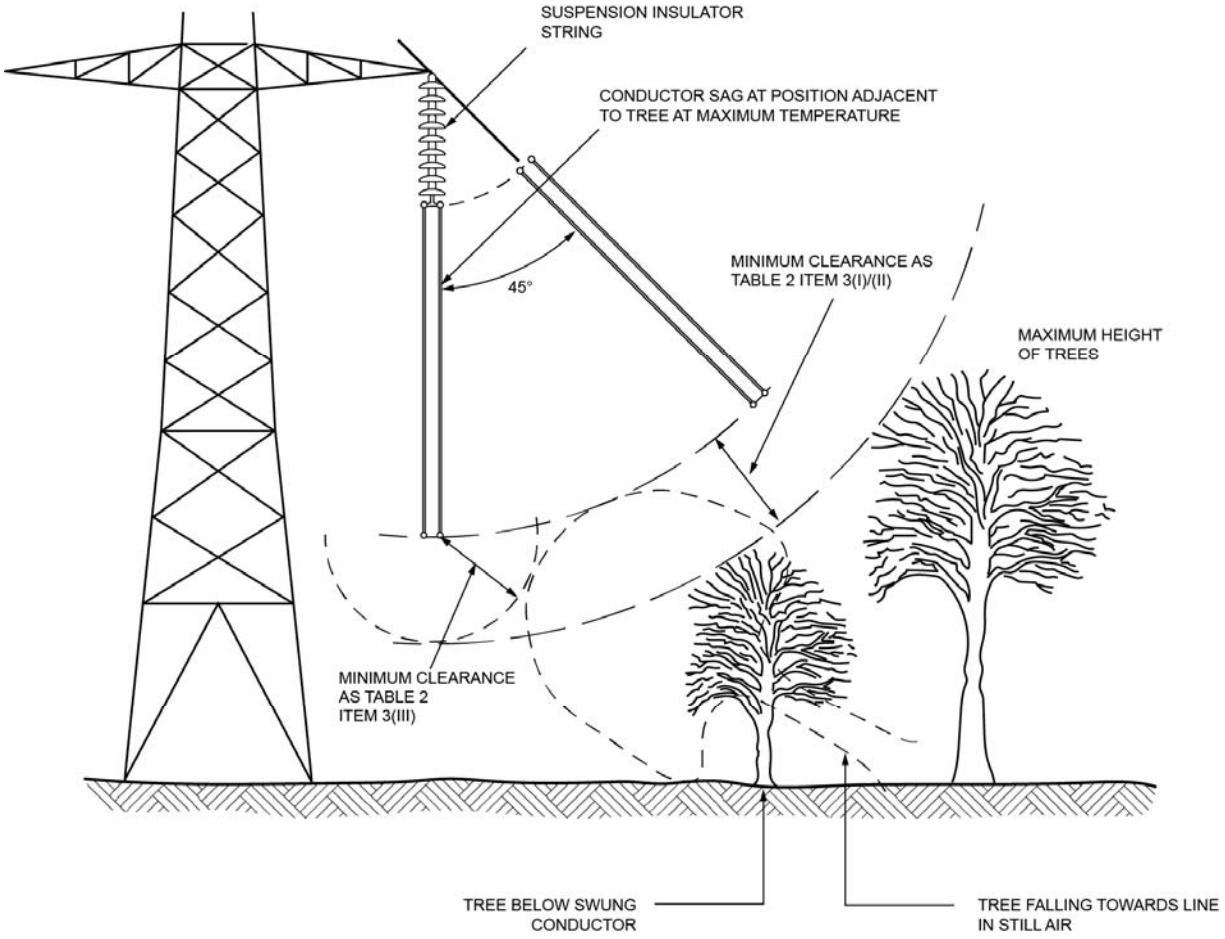
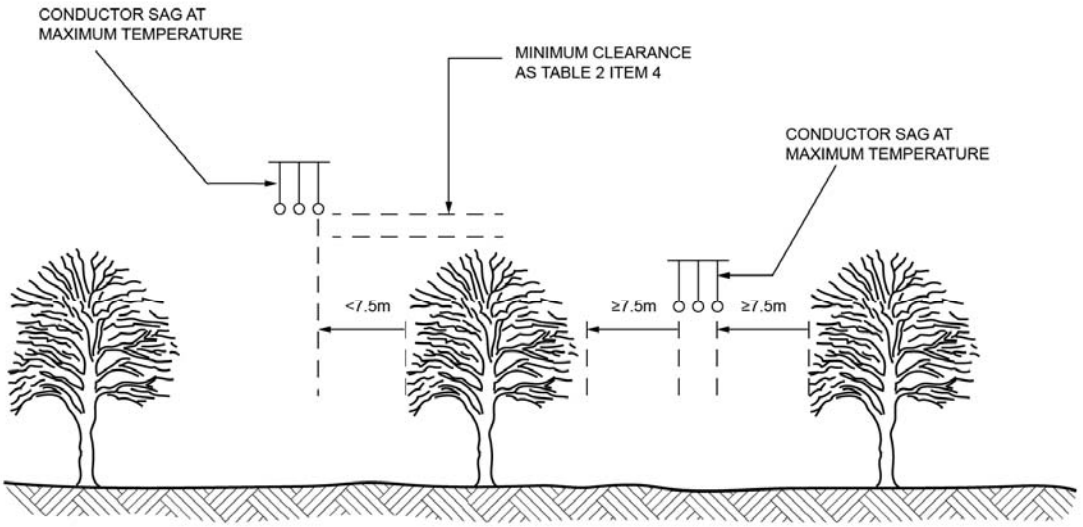


Fig. 2(a) Clearance to trees



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

Figure 2 — Examples of clearance to trees

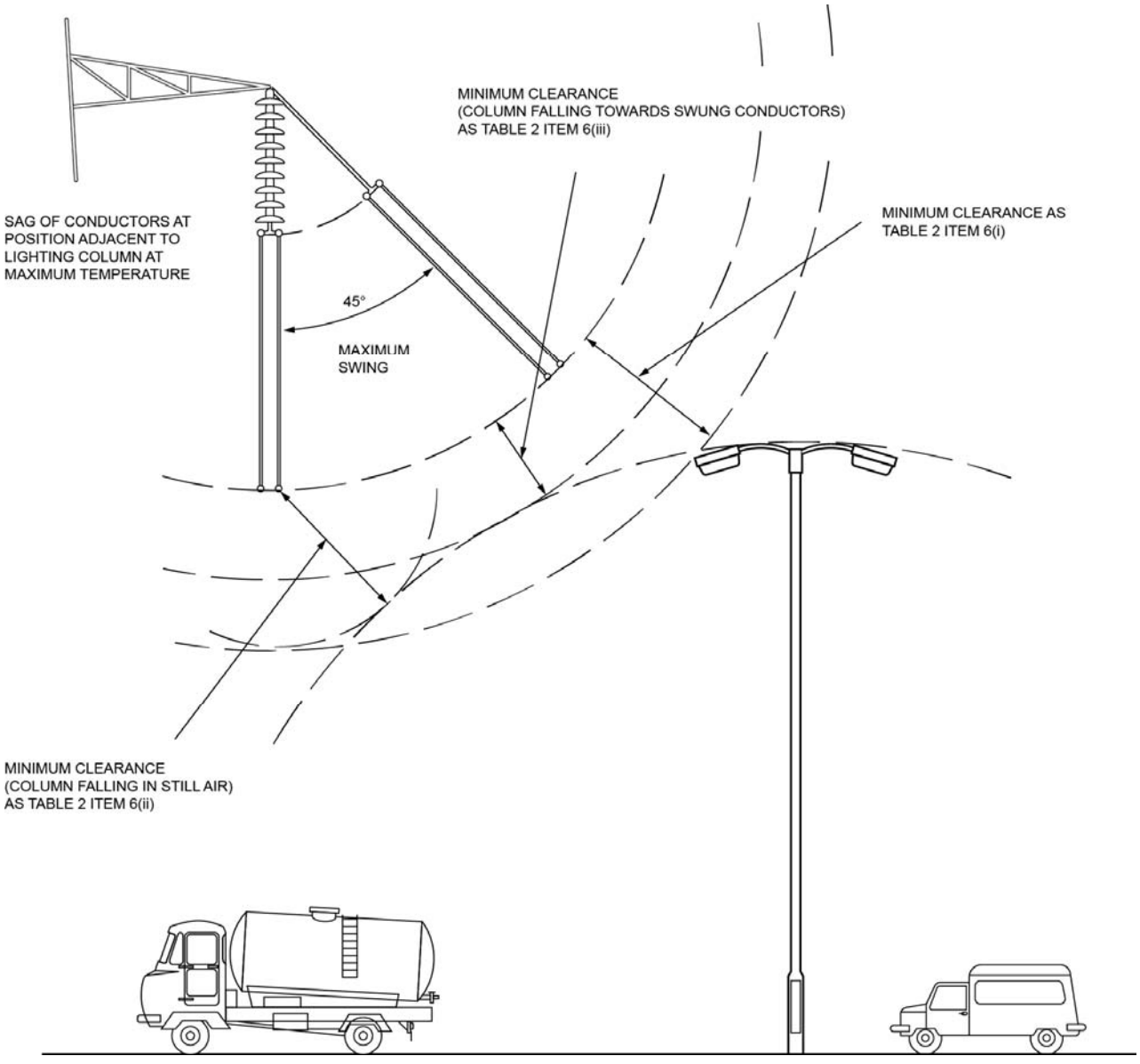
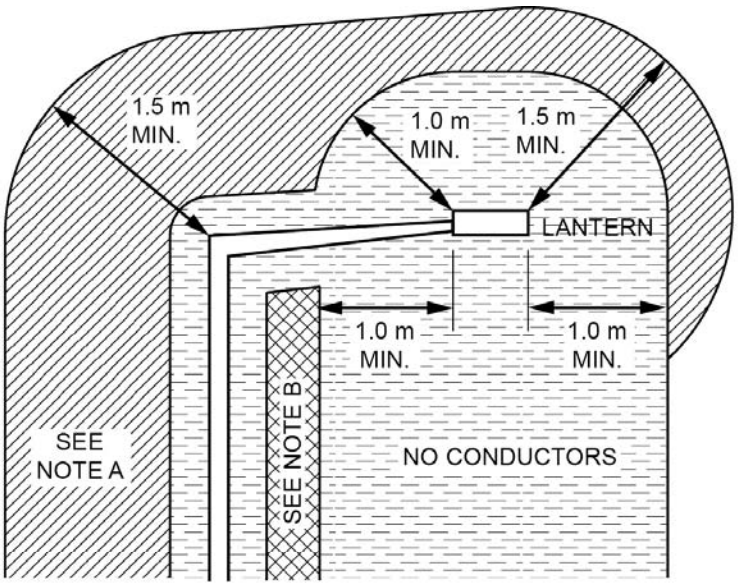
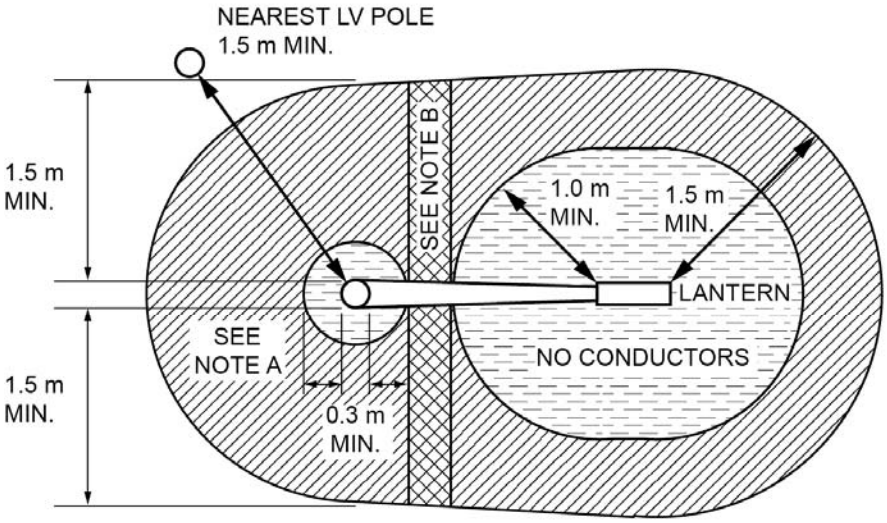


Figure 3 — HV conductor clearance to lighting columns



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.

Figure 4 — LV conductor clearances from lighting columns

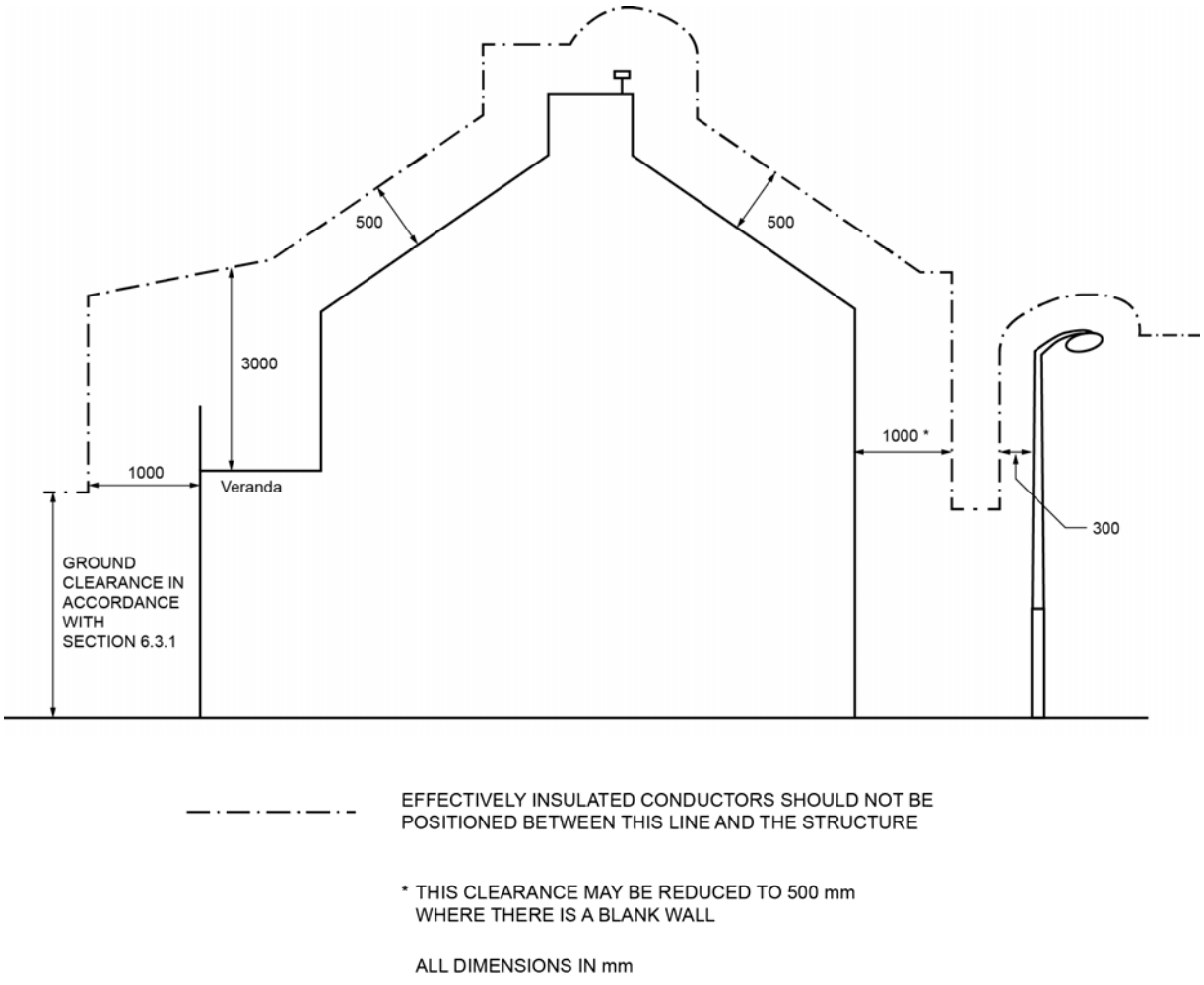


Figure 5 — Clearance between structures and effectively insulated conductors installed on poles

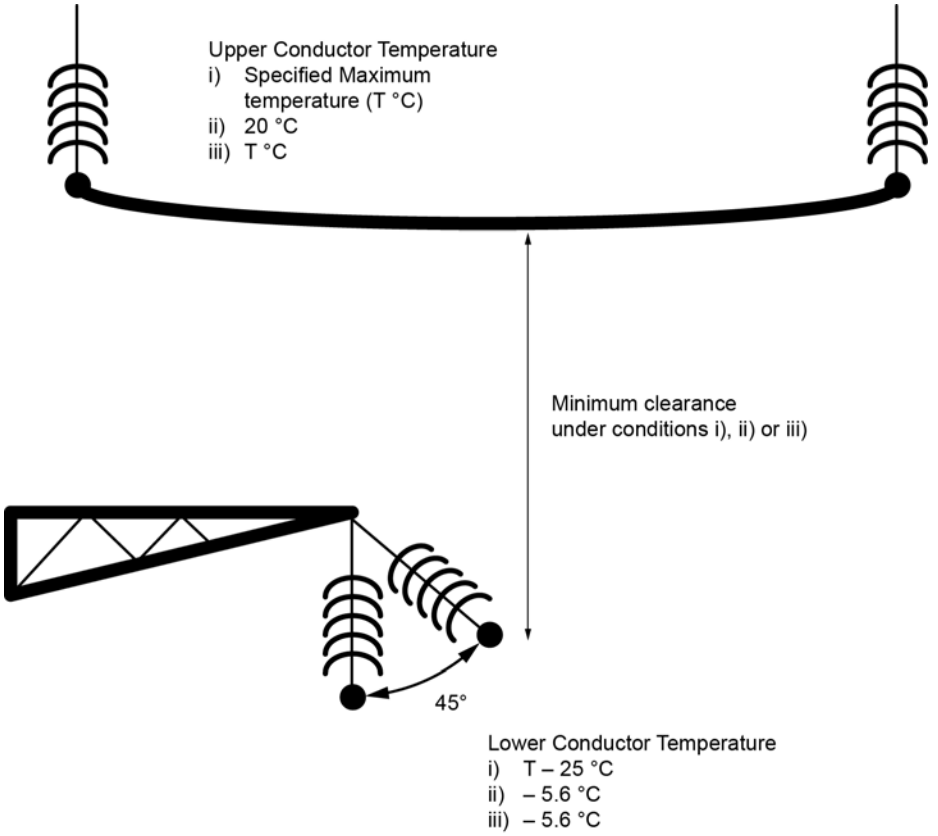


Figure 6 — Clearance between crossing overhead lines

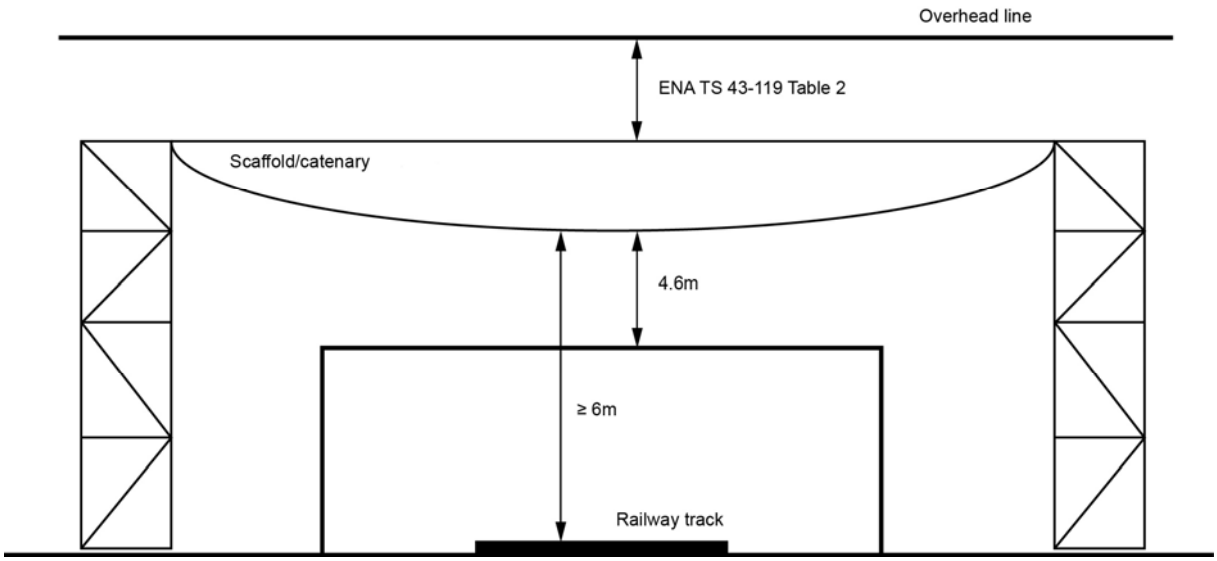


Figure 7 — Vertical clearances between an overhead line, scaffold structure and railway

Annex A
(informative)

Clearances to objects – philosophy

A.1 Introduction

The clearances to objects specified in 6.2 and Table 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 Model Distribution Safety Rules [4], 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 5.5.3 of that document and rounded up. Where past practice[6] employed greater clearances, these have been retained, as indicated Table A.1 [of ENA TS 43-8].

Table A.1 — Derivation of clearances to objects

Description	Distance (m)				
	≤33 kV	66 kV	132 kV	275 kV	400 kV
Safety Distance	0.8	1.0	1.4	2.4	3.1
D_{el} (NOTE 1)	0.6	0.7	1.2	2.1	2.8
D_{el} + 10 % (NOTE 1)	0.66	0.77	1.32	2.31	3.08
Rounded up to (NOTE 1)	0.7	0.8	1.4	2.4	3.1

NOTE 1: For information.

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

[6] Past practice was based on basic electrical clearance originally defined in BS 7354:1990 and now referenced in ENA TS 41-38 Table B.5.2. The values in this tables are increased by 300 mm to allow for the use of hand held tools.

A.2 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.3 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 may be able to stand, 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 shown in Table A.2.

Table A.2 — Derivation of normal and passing clearances

Description	Clearance (m)				
	≤33 kV	66 kV	132 kV	275 kV	400 kV
Normal clearance	3.0	3.2	3.6	4.6	5.3
Passing clearance	0.8	1.0	1.4	2.4	3.1

Annex B
(informative)

Definitions for roads and vehicles – rationale

B.0 Preamble

It is intended that the definitions of ‘road’ and ‘laneway’ will provide improved clarity for ENAMC inspectors, who carry out ESQCR inspections of overhead lines. In particular, these definitions are intended to reduce the number of situations, where ENAMC inspectors may otherwise dismiss some types of access as not being roads but where a minimum ground clearance of 5.2 m may not be adequate. A more detailed assessment of the minimum ground clearance of overhead line crossings is now prescribed in light of vehicles that may use laneways. Laneways are principally concerned with assessment of clearances below existing overhead line crossings, where access have been created that may be used by vehicles but may not be reasonably considered roads.

The definitions of ‘road’ and ‘laneway’ are intended to assist with interpretation of requirements in the ESQCR. Notwithstanding this, it is important to state that the ESQCR provides clear statutory requirements for line clearances above roads, and other ground; the Regulations do not make any reference to reduced clearances over laneways, nor do they make any reference to laneways. Users of this Technical Specification are reminded of the duty to comply with the ESQCR requirements for line clearances.

B.1 Background

Experience of the ENAMC has proven that it is not uncommon for confusion to arise when describing what constitutes a road and what constitutes a vehicle. Indeed, the clearances to an overhead line will depend on the nature of the road and the vehicles using it. It is imperative therefore that persons using this document understand the context for the definition of roads and vehicles when determining whether safe passing clearances for vehicles exist for any particular road in question.

B.2 Roads

The definitions in Clause 3 of the document distinguish between defined ‘roads’ and ‘laneways’, that are required to have safe passing clearance for vehicles and other routes that may be used by vehicles but where adequate safe passing clearance may not exist.

The definition of a ‘road’ is based on section 192 of the Road Traffic Act 1988, which sets down that a 'road' means 'any highway and any other road to which the public have access and includes bridges over which a road passes'. The definition of ‘road’ in this Specification has been amended from that in the Road Traffic Act to reflect roads and other accesses, which are specifically constructed from suitable materials for the purpose of carrying vehicles driven by the public. The definition of ‘road’ is distinct from that of ‘laneway’, which reflects routes principally across agricultural land, that could be inappropriately classed as ‘roads’ by virtue of vehicles, such as off-road vehicles, compacting ground by running over it and making it suitable for vehicles.

It is acknowledged that some accesses from roads to dwellings may not be made of constructed materials but which are the designated access for the resident and members of the public to service that dwelling. To ensure adequate ground clearance exists from overhead lines to routes constituted from stone and other tracks that are legitimately used by residents and other members of the public driving vehicles, e.g. for making deliveries, the term ‘laneway’ is defined. In essence a laneway is the principal access from a road to an addressed property which is used by vehicles visiting that property.

The intention is that the ENAMC will assess whether overhead lines crossing laneways provide adequate ground clearance given the nature and extent of vehicle usage. This will consider whether, in general, an overhead line above a laneway should:

a) provide safe passage for non high-sided vehicles, i.e. Table 1 item 1 clearances are relevant;

b) provide safe passage for high-sided vehicles, i.e. Table 1 item 2 clearances are relevant.

In order to enable the ENAMC to adequately manage the risk moving forwards, suitable means for recording information from the assessment will need to be provided. This may include the use of risk codes and/or a specific classification for laneways. The ENAMC will consider what action is appropriate for managing the risk to the public in accordance with Regulation 3(3) of the ESQCR – in a similar manner to other specific applications and land use, where there is an increased risk of accidental contact with overhead line conductors.

The following examples are typical of the considerations for the assessment of laneways.

i. A stoned-route or other track that crosses agricultural land, that does not have public access and that is not the principal access to an addressed dwelling from a ‘road’. Overhead line clearances to this laneway would not be treated as a ‘road’ according to this Specification i.e. a minimum ground clearance of 5.2 m would be appropriate.

ii. A vehicle access constituted from stone that is the principal access from a ‘road’ to a farm, which is used by tractors towing road legal high-sided trailers. Overhead line clearances to this laneway would be treated as a ‘road’ according to this Specification i.e. a minimum ground clearance of 5.8 m would be appropriate.

iii. A paved drive that is the principal access from a ‘road’ to a property which has a physical restriction(s) (width, tree, bending radius) prohibiting a high-sided vehicle travelling down it. Overhead line clearances to this laneway would not be treated as a ‘road’ according to this Specification. Refer to Clause 6.3.2 when the overhead line is effectively insulated in this situation.

B.3 Vehicles

The definition of a vehicle in section 185(1) of the Road Traffic Act 1988 and section 136(1) of the Road Traffic Regulation Act 1984 is "a mechanically-propelled vehicle, intended or adapted for use on roads". This definition does not distinguish between vehicles of different heights that may use roads and laneways.

The term ‘non high-sided vehicle’ in this Specification defines a vehicle of maximum fixed height not greater than 4 m. This is intended to cover vehicles up to 7.5 tonne box lorries with tail lifts, which typically have a fixed height of 3.6 m. These vehicles could be reasonably expected to use laneways for making deliveries and removals.

It is intended that vehicles greater than 4 m but not greater than 5 m (defined as high-sided vehicles in this Specification) can be expected to use all ‘roads’ and will have adequate passing clearance beneath overhead lines with a minimum ground clearance of 5.8 m. High load vehicles are defined as only being suitable for specified ‘high load vehicle routes’, where the vehicle height exceeds 5 m but not 6.1 m.

Bibliography

Other publications

[1] Department of Energy & Climate Change voluntary code of practice, *Power line: Control of microshocks and other indirect effects of public exposure to electric fields. URN 13D/204.*

[2] Department of Trade and Industry Guidance on Regulations, *Guidance on the Electricity Safety, Quality and Continuity Regulations 2002. URN 02/1544*

[3] Office of Rail Regulation, Railway Safety Publication 5, *Guidance on Minor Railways*

[4] ENA SHE Standard 07, *Model Distribution Safety Rules*

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