NSP/004/011 - Guidance on Overhead Line Clearances

1. Purpose

The purpose of this document is to specify the minimum clearances between overhead lines at all voltages up to and including 132kV and ground, general obstacles, railway and waterways property and other overhead lines.

This document has been updated to represent current practice and the specific requirements of The Electricity Safety, Quality and Continuity Regulations (ESQCR).

This document supersedes the following documents, all copies of which should be destroyed;

Document Reference	Document Title	Version	Published Date
NSP/004/011	Guidance on Overhead Line Clearances	5.0	Jan 2020

2. Scope

Clearances given in this document are applicable to all new overhead lines and need not be applied retrospectively to existing lines. However if a “material alteration” is made to the line e.g. pole, conductor or crossarm change then the new clearances shall be applied.

Clearances specified in this document refer to bare, lightly and effectively insulated line conductors based on the conductor sag at the specified maximum conductor temperature. The wider application of effectively insulated LV conductors for locations that may be ordinarily accessible has also been addressed in this Specification.

The overhead clearances specified in this Specification have been determined to provide safety to the general public and protection against flashover from 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 may require other measures to be taken such as those described in ENA TS 43-90 – “Anti climbing devices and safety signs for HV lines up to and including 400 kV”. All clearances shall therefore be determined by Northern Powergrid, considering the circumstances in which the line is used and having regard to the use of the surrounding land.

For work activities in vicinity to overhead lines, this Specification complements the guidance in HSE Guidance Note GS6. It is important to note that the vertical clearances in this document are minimum clearances consistent with the requirements of ESQCR 2002 (as amended) as opposed to horizontal and vertical safe working clearances described in HSE Guidance Note GS6.

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.

The concept of a ‘laneway’ is covered in Annex B of this Specification. This provides guidance 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 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.

2.1. Table of Contents

3. Overhead Line Clearances

3.1. Introduction

All clearances quoted are those listed in ENA TS 43-08 Issue 5 – "*Overhead Line Clearances*". A direct comparison can be made to the source document ENA TS 43-08 by removing the first digit (3) from all section referencing.

Clearances which are **bold and underlined** are statutory and clearances referring to 275kV and 400kV lines have been retained in the tables 1,2,5,6,7 & 8 for information purposes only but shaded to confirm that they do not form any part of the Northern Powergrid system.

3.2. Siting of Overhead Lines

In siting an overhead line, special consideration should be given to the existing or future use of the land, buildings or structures over which the line is to be erected.

In such cases, a reasonable and responsible attitude must be taken towards any danger which might arise. In order to prevent danger, increased ground clearances or the use of insulated or HV covered conductors may be necessary, as appropriate to the situation. Guidance in the identification of high risk locations can be found by making reference to NSP/004/012 – *"Guidance on the Risk Assessment of Overhead Lines".*

3.3. Allowance for Creep

Allowance must be made for the effects of creep in conductors and setting out errors as the specified clearance must be maintained for the life of the conductor. This allowance shall be as follows:

Conductor Type	Additional Clearance Required
Copper	450mm
Aluminium Alloy	600mm
ACSR	600mm

3.4. Derivation of Clearances

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

a) Basic electrical clearance, as specified in BS EN 50341-1 – "*Overhead electrical lines exceeding AC 1 kV – Part 1: General Requirements – Common specifications*", 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 code of practise.

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.

3.5. Application of Clearances

The following factors require 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 max potential 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 Northern Powergrid. 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 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 clause 3.11 will allow the operator to comply with HSE Guidance Note GS6.

3.6. Clearances to Ground and Roads and Objects

3.6.1. 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. **Additional creep values detailed in clause 3.3 shall be added to these values.**

Table 1 - Clearances to Ground and Roads (1 of 2)

Item	Description	Nominal System voltage Minimum Clearance (m)					
		≤33 (Note 2)		66	132	275	400
		B	EI				
1	Line conductor at any point not over a road (See Notes 3 & 9)	5.2	5.2	6.0	6.7	7.0	7.3
2	Line conductor to road surface other than as specified in item 3, 4 and 5. (See note 4)	5.8	5.8	6.0	6.7	7.4	8.1
3	Line conductor to road surface of designated 6.1m "High Load vehicle" routes (See 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: (1) Normal 3 Lane motorways. (2) Elevated 2 Lane motorways (See note 6 & 7)	 14.0 11.0	 14.0 11.0	 14.2 11.2	 14.6 11.6	 15.6 12.6	 16.3 13.3
5	Bare live metalwork, e.g. transformer terminals, jumper connections, etc. (See note 8)	4.3	NA	4.3	Controlled Zone - Safety Rules apply.		

Notes on Table 1 – Clearance to ground and roads (2 of 2)

1. *Statutory clearances are denoted by being underlines within this table.*
2. *Clearances to effectively insulated conductors are detailed in this table. The column heading codes are: B = Bare conductors and EI = effectively insulated conductors.*
3. *Clearance for EI conductors could be lower in some cases if the overhead line is not ordinarily accessible. Clause 3.6.3.2 provides further guidance for clearances in particular situations. Annex B provides information regarding the rationale for definitions of 'road' and 'laneway'.*
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 clause 3.10.2*
5. *'High load' routes are roads designated by the Department for Transport, for which the higher load clearance of 6.1m shall be maintained.*
6. *These clearances apply for the erection of scaffolding/guard netting with the overhead circuits live.*
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 "Design and use of Temporary Scaffold Guards".*
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 or 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*
9. *Where lines are being planned over agricultural land, and it is known that large machinery is utilised in these locations, an additional 0.3m clearance shall be added to item 1 in Table 1.*

3.6.2. 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.

When an overhead line is to be erected in proximity to existing obstacles or objects the clearances should allow for future maintenance of the obstacle or object.

Table 2 - Clearance 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 normally accessible (including permanently mounted ladders and access platforms) or to any surface of a building. (See notes 2 and Figure 1) and notes 10 & 11	4.3 (3.0)	Note 3	4.3 (3.2)	4.3 (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 the line and: (i) Unable to support ladder/climber (ii) Capable of supporting ladder/climber. (iii) Trees falling towards line with conductors hanging vertically only. (See note 5, Note 6 and Figure 2 (a))	 0.8* 3.0* 0.8	 0.5 0.5 0.5	 1.0 3.2 1.0	 1.4 3.6 1.4	 2.4 4.6 2.4	 3.1 5.3 3.1
4	Line conductors to trees in orchards and Hop Gardens (See 7 and fig 2b)	3.0	3.0	3.2	3.6	4.6	5.3
5	Line conductor to irrigators, slurry guns and high pressure hoses (See 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 ii. Standard falling towards line with conductor hanging vertically only. iii. Standard falling towards line. (see note 9 fig 3 and 4)	 1.7 1.7 0.4	 1.0 0.3 0.3	 1.9 1.9 0.7	 2.3 2.3 0.8	 3.3 3.3 1.4	 4.0 4.0 1.9

Notes on Table 2 – Clearances to objects (2 of 2)

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

2. *The **(figures in brackets)** are the minimum clearances that shall be maintained between an overhead line conductor and a structure or surface of a building (walls, roof, windows etc.) that is ordinarily accessible. They permit a person to stand on or against these structures but only allow for free movement of short hand held objects. Minimum clearances in relation to installed photovoltaic panels shall satisfy these values and the additional guidance provided in note 11 of this clause. Detailed guidance on the avoidance of danger from electric lines on construction sites is contained in HSE Guidance Note GS6.*

   *The (**figures in brackets**) are taken directly from ENA TS 43-8 and relate to the clearances to buildings where the actual clearances have been established by carrying out a full instrument survey to the object taking into account the conductor sag at the time of the observation and then extrapolating this reading into a new tension/sag of where the conductor will be when it is operating at its maximum design temperature. The new conductor created from this calculation shall be used to produce a swing envelope drawing in PoleCad to ensure that the stated minimum clearance can be achieved with the conductor hanging vertically in still air or deflected at any angle up to 45° from the vertical towards the object.*

   Where clearances to buildings or objects comply with this minimum clearance we would not propose to divert overhead lines just to achieve the 4.3m clearances.

   The 4.3m clearance figure was created as a practical guide and good practice clearance figure that would normally be applied to the placement of new overhead lines. However it may also be used as a quick method

for confirming that existing HV lines have adequate clearance to buildings as it can be applied without the need for a full instrument survey.

It is only when this figure is infringed that we need to carry out the full survey method to confirm the statutory minimum figures.

Note 66/132kV lines shall always be subjected to a full instrument survey for clearance enquiries followed by the production of swing envelope drawings in PoleCad as these spans can be significantly larger than those allowed for HV lines and typically employ the use of suspension insulators which allow greater conductor movement towards buildings.

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

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. See also clauses 3.8.3 and 3.11.3*

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

6. *Clearances quoted in item 3 i) and ii) are the minimum acceptable clearances but in practice, larger clearances will be necessary to take account of the growth rates of trees and of the swaying of trees/branches in the wind.*

   Clearances quoted in item 3 iii) are recommended in order to protect lines from falling trees but due to wayleave considerations will not always be attainable.

   See MNT/013/001 "Code of practice for the avoidance of danger from Overhead Electric Lines" which is based on ENA EREC G55 and ENA EREC G96 for details of the vicinity zone clearances applied to vegetation which ensure the trees clearances can be maintained with the circuits live without entering into the live zone.

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.*

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 Policy and Standards Engineer.*

9. *The clearances quoted in item 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 3.6.3.3. The clearances quoted in item 6 iii) can be neglected if the location of the lighting column is such that impact by a vehicle is improbable. ENA EREC G39 "Model code of practice covering electrical safety in the planning, installation, commissioning and maintenance of public lighting and other street furniture " 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 1 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 item 6 ii) include additional clearance to allow for the erection of street lighting columns.

10. *Wind turbines shall be positioned such that the minimum horizontal distance from the worst-case pivot point of the wind turbine and the overhead line conductors hanging in still air is the greater of:*
    - *The tip height of the turbine (Ht) + 10%*

- *The tip height of the turbine (Ht) + plus the electrical safety distance (Lc), applicable to the voltage of the overhead line given in Table 2 item 6 (ii)*
- *However all turbines situated within 3 rotor diameters of the overhead lines must be separately accessed using the methodology given in ENA Engineering Recommendation L44 "Separation between wind turbines and overhead lines: Principles of good practice" before the approval for the placement of the turbine can be given.*

11. *Clearances to Solar Farms*

Northern Powergrid is increasingly being requested to consider the placement of Photovoltaic panels/solar farms directly below or adjacent to existing overhead line routes. In dealing with these requests, designers shall request that apparatus be established outside of the "minimum horizontal distances to safety barriers" table 7, in line with the HSE guidance note GS6 for work in proximity to overhead lines. Where this cannot be achieved and it is practical to make the line dead during the construction phase then the minimum safety clearance shall be as detailed in table 2, item 1, using the clearance appropriate to the operating voltage of the adjacent line.

3.6.2.1. Proximity of Overhead Lines to High Risk Localities

An overhead line route which crosses or is in proximity to a high risk locality shall be given special consideration. Reference shall be made to NSP/004/012 *'Guidance on the Risk Assessment of Overhead Lines'* for guidance in the correct identification and recommended minimum mitigating measures.

Where practical all new overhead lines will be routed to avoid the need to pass in close proximity to high risk localities. However where lines are specifically identified as being in close proximity to fishing or high amenity areas, new or existing bare conductors shall be replaced with "effectively insulated conductors" e.g. ABC on LV lines or the use of "Lightly insulated conductors" e.g. XLPE covered conductors on HV lines.

3.6.3. Supplementary Clearances for Effectively Insulated Conductors Attached to Poles

3.6.3.1. General

Effectively insulated conductors for example LV Aerial Bundled Conductors (ABC) installed in accordance with NSP/004/041 "*Code of Practice for the construction of LV ABC Overhead Lines*" or NSP/004/041/001 "*Code of Practise for the renovation of existing open wire networks to ABC*" shall comply with the clearances in Table 3 and Table 4 in addition to those stated in clause 3.6.1 and 3.6.2

The clearances specified in Table 3 and Table 4 are minimum clearances, greater clearances may be appropriate depending upon site conditions.

Clearances between line conductors and other power lines and above railways, as detailed in Clauses 3.7 and 3.8 and Tables 5 and 6 shall be met.

In addition to the above, the following list of common conductor types also comply with the term "Effectively Insulated Conductors"

a) Double insulated conductors

b) Hybrid CNE or SNE service conductors

Both of which are described in more detail in NSP/004/043 –"Code of Practise for Overhead Services, Surface Wiring and Eaves Wall Mains"

Note:-

PVC single insulated phase and neutral conductors used for service spans and covered conductors are not classed as "Effectively insulated" and hence must use table 2

3.6.3.2. Supplementary Ground Clearances to Effectively Insulated Conductors Only

Where effectively insulated conductors are used over roads accessible to vehicular traffic, ground clearances shall still comply with Clause 3.6.1 and Table 1 as stated in Regulation 17 (2) (a) of ESQCR "Statutory Instrument 2002 No. 2665, *The Electricity Safety, Quality and Continuity Regulations 2002 (as amended)"*.

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 (≤ 33kV)
Along the line of hedgerows, fences and boundary walls etc.	4.0	4.0
Access laneways to a property with a width of 2.5m or less which is defined by gateposts, hedges or other fixed features. (Note1)	4.3	4.3
Between buildings, attached to buildings, or locations where the line is safe in the particular circumstances (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 4.3m may also be applied to laneways which are wider than 2.5m 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 3.6.3.4* *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.*		

3.6.3.3. 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 as detailed in NSP/004/043 - Specification for Overhead Services, Surface Wiring and Eaves Wall Main

b) Line conductor deflected at 30° and 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) ≤ 33kV
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) and 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
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.*	

3.6.3.4. 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 Northern Powergrid Code of Practise *NSP/004/041 - Code of Practice for the Construction of LV ABC Overhead Lines, NSP/004/041/001 - Specification for the renovation of existing LV O/H Lines and NSP/004/043 - Specification for Overhead Services, Surface Wiring and Eaves Wall Mains* 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 Northern Powergrid and will be dependent on what the conductor is oversailing, i.e. the risk of contact during everyday activities. It would be expected that a minimum clearances of 3.5m, 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 3.5m 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.*

3.7. 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 by the ultimate nominal system voltage of the upper or lower line, whichever is the greater.

Table 5 - Minimum Clearances where Power Lines Cross or are In Close Proximity to One Another

Item	Description of Clearance Conductor or earth wire to:	Nominal System Voltage (kV) Minimum Clearance (m) 0.4	11	20*	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	2.0	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	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	3.0	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	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°.

3.7.1. Minimum Clearances to Other Power Lines (protection against induced voltages form Parallel lines

Where lines are routed parallel to existing power lines the following minimum clearances shall be provided between the centre line of the existing line and the proposed line in table 5a

Table 5a – Parallel lines - Protection from induced voltages

Nominal System Voltage (kV)	Minimum Clearance (m)
Wood Pole and Steel Mast Lines up to and including 66kV	18.0
66kV Double Circuit Tower Lines	30.0
66/132kV Double Circuit Tower Lines	45.0
275kV Double Circuit Tower Lines	60.0
400kV Double Circuit Tower Lines	76.0

In cases where it is impractical to comply with the above, guidance shall be sought from the Policy and Standards Section.

3.8. Clearances to Railway Crossings

3.8.1. 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.

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

Note:-

All access to Network Rail infrastructure by Northern Powergrid staff is now detailed within NSP/005/001 – "Access Arrangements to Network Rail Infrastructure".

The company's staff are not authorised to access Network Rail property without escort. In Emergency situations the company's staff shall contact the Network Rail National helpline on 0345 7114141 and ask to be forwarded to LNE Control. At this point LNE Control will arrange for the Network Rail Local Operations Manager to make contact with the company's site engineer to agree access and working arrangements on the Network Rail property.

In Planned situations the company's staff shall contact the London North Eastern Asset Protection Manager on telephone number 07922 019905, AssetProtectionEastern@networkrail.co.uk, who will then arrange a site meeting and agree method statements etc. to allow the required planned work to proceed.

Table 6 - 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
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)	11.2 (37)	11.5 (38)	12.2 (40)
3	Rail Level (See note 1)	7.3 (24)	7.3 (24)	8.0 (26)	8.2 (27)	8.8 (29)
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.*

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

3.8.2. 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 are applicable. Clause 9.2 of ENA TS 43-119 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. 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

3.8.3. 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.

3.9. Waterway Crossings

Clearances to waterways are not subject to a single national Agreement but are dealt with by agreement with the appropriate Authority. Statutory ground clearances shall form the basis of negotiations but additional clearances may be agreed for navigable waterways. For information, the following minimum clearances are usually stipulated by the Waterways Board in the Yorkshire licensed area.

Item	Description	Clearance (m)		
	Lowest conductor (line or earth) to Towpath level or adjacent bank	0.433 Kv	66kV	132kV
1	River Trent	18.3	19.2	19.8
2	River Ouse	23.2	23.2	23.8
3	Aire & Calder Canal	14.3	15.2	15.9
4	Sheffield & South Yorkshire canal	14.3	15.2	15.9
5	Calder & Hebble Canal	14.3	15.2	15.9
6	Other Canals	11.3	15.2	15.9
7	Reservoirs	12.3	15.2	15.6

3.10. Telecommunication Lines and Auxiliary Wires

3.10.1. Telecommunication

Vertical and lateral clearances to telecommunication lines shall comply with those clearances specified in ENA TS PO5 -"*Protection of Telecommunication Lines from Power Lines*".

It is essential to recognise that lightly insulated covered HV conductors i.e. XLPE covered conductors installed to NSP/004/044 do not provide a sufficient level of insulation to give protection between the power line and the TP line when interpreting the requirements of crossings and proximities.

ENA EREC EB/TP – "'*Engineering Recommendation for Telecommunication Providers and Distribution Network Operators Joint use of Poles*", 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.

3.10.2. Auxiliary Wires

Auxiliary wires should be treated as effectively insulated, unless otherwise specified within this document

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. "*Guidance for working on cables under induced voltage conditions*" 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.

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, Northern Powergrid may wish to maintain the same clearance to the auxiliary wire as would be required for the associated line conductor.

3.11. Work in Proximity to Overhead Lines

3.11.1. 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

The HSE provides guidance for the avoidance of danger from overhead lines in their Guidance Note GS6.

Northern Powergrid shall 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 Northern Powergrid and the site operators.

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

3.11.2. Horizontal Clearances – working near but not underneath overhead lines (Where there will be no work or passage of plant under lines).

HSE Guidance Note GS6 recommends that the DNO should be contacted for advice for any work within 10 m, measured at ground level horizontally from below the nearest overhead line. **This code of practise requires that for steel tower overhead lines or lines with spanning in excess of 170m, a larger horizontal clearance of 15 m shall be adhered to.**

Where there will be no work or passage of machinery or equipment under the line, the risk of accidental contact is reduced by the erection of ground-level barriers to establish a safety zone. This area must not be used to store materials or machinery. Suitable barriers can be constructed out of large steel drums filled with rubble, concrete blocks, wire fence earthed at both ends, and earth banks marked with posts.

If steel drums are used, highlight them by painting them with, for example, red and white horizontal stripes.

If a wire fence is used, put red and white flags on the fence wire.

Make sure the barriers can be seen at night, perhaps by using white or fluorescent paint or attaching reflective strips.

Table 7 details typical minimum values for horizontal separation of the lines and safety barriers.

Table 7 - Horizontal Distances to Safety Barriers

Voltage Type	All Wood Pole lines	66 & 132kV Tower Lines	275kV Tower Lines	400kV Tower Lines
Minimum horizontal distances to safety barriers. (Edge of exclusion zone)	6.0m	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 Northern Powergrid should be contacted to assist with any calculations.

Note 3: Where permission is sought to work within the exclusion zone, Northern Powergrid staff shall recognise the requirements of the Operational Practice Manual, ***Section AD - Proximity Work*** *and the Model Distribution Safety Rules,* ***Appendix D - Working and Access Clearances***

3.11.3. Vertical Passing Clearances – passing underneath overhead lines on work sites.

GS6 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. Greater vertical clearances shall be specified for vehicles which may not be of fixed height by virtue of: ground level variability; the nature of the load and the operations carried out by the vehicle.

If equipment or machinery capable of breaching the safety clearance distance has to pass underneath the overhead line, a passageway shall be created through the barriers, as illustrated in below.

In this situation:

- Keep the number of passageways to a minimum.
- Define the route of the passageway using fences and erect goalposts at each end to act as gateways using a rigid, non-conducting material, e.g. timber or plastic pipe, for the goalposts, highlighted with, for example, red and white stripes; If steel drums are used, highlight them by painting them with, for example, red and white horizontal stripes.
- If the passageway is too wide to be spanned by a rigid non-conducting goalpost, a tensioned steel wire, earthed at each end, or plastic ropes with bunting attached may be utilised. These should be positioned further away from the overhead line to prevent them being stretched and the safety clearances being reduced by plant moving towards the line.
- Ensure the surface of the passageway is levelled, formed-up and maintained to prevent undue tilting or bouncing of the equipment.
- Erect warning notices at either side of the passageway, on or near the goalposts and on approaches to the crossing giving the crossbar clearance height and instructing drivers to lower jibs, booms, tipper bodies etc. and to keep below this height while crossing.

- Illumination of the notices and crossbar at night or in poor weather conditions may be required, to ensure they are visible supplemented by the use of white or fluorescent paint or attaching reflective strips.
- Ensure that the barriers and goalposts are maintained.

The clearances given in Table 8; Item 1 are for vehicles with fixed height loads travelling on un-metalled roads.

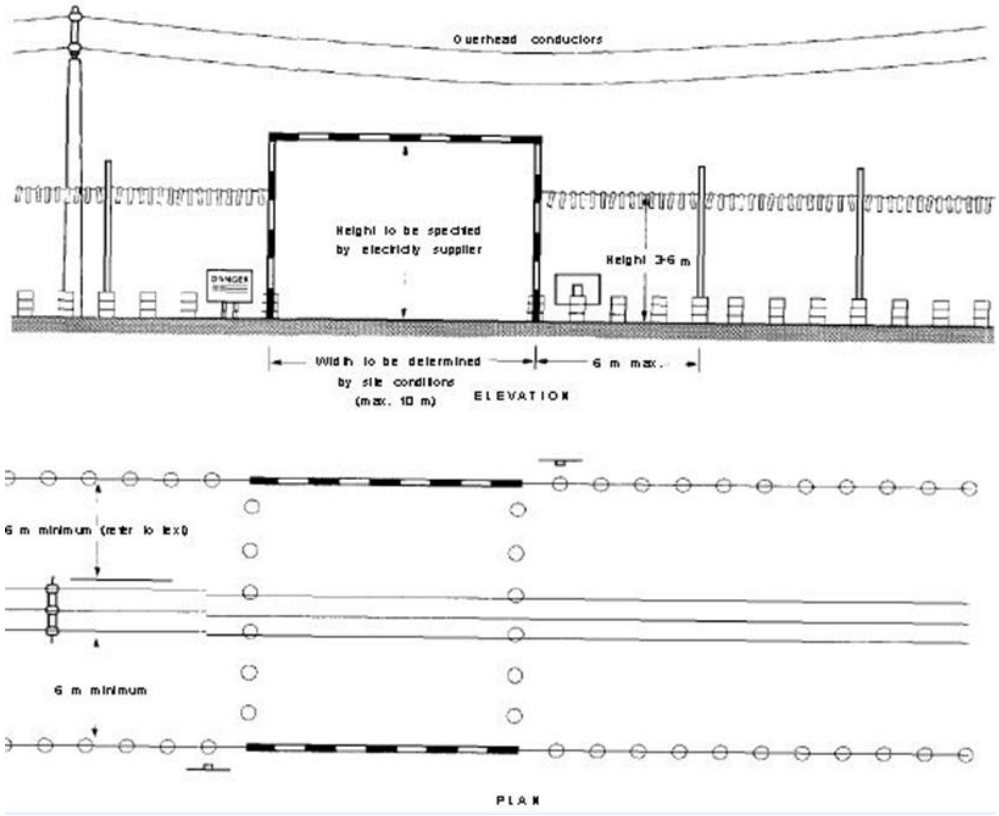
Where the load carried by vehicles is variable then the vertical passing clearance shall be increased. These clearances are given in Table 8, Item 2.

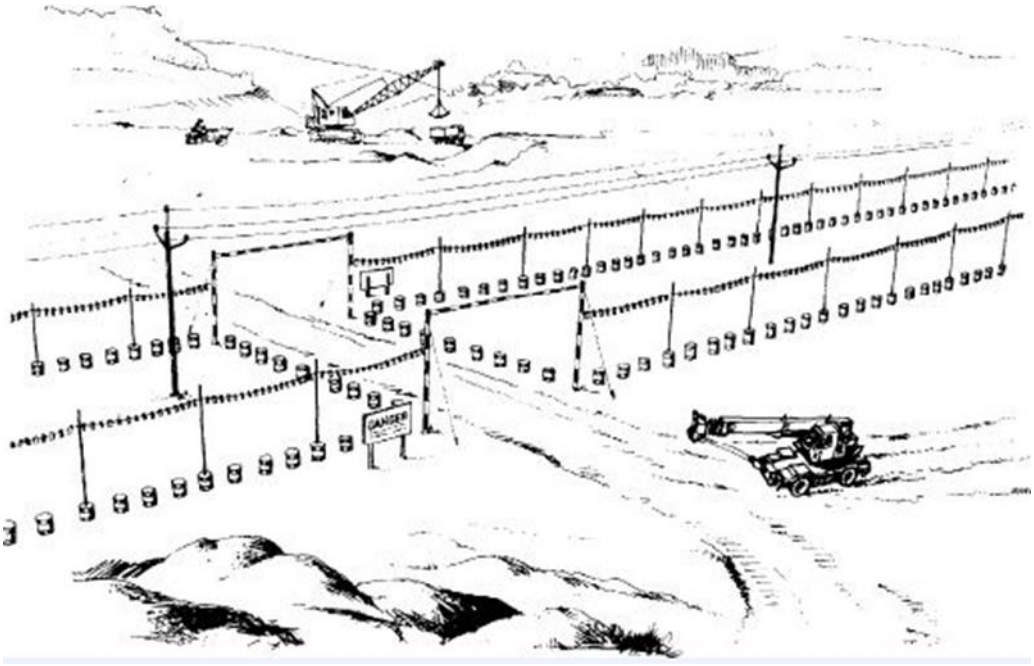
Table 8 - Vertical Passing Clearances

Item No.	Nominal System Voltage		≤33 kV	66kV	132kV	275kV	400kV
1	Passing Clearance fixed height loads	(m)	0.8	1.0	1.4	2.4	3.1
2	Passing Clearance Variable height loads	(m)	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 crossbar/rope barriers erected to prevent vehicles or plant from infringing these clearances whilst traversing the line. The maximum height to the underside of the barrier shall be the minimum ground clearance of the line as detailed in Table 1 less the specified passing clearance in 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.




DANGER

3.11.4. 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 7 or the calculated distance (see note 1 in table 7) whichever is greater.

HSE Guidance Note GS6 provides recommendations for working under the line and uses two cases. "*Ground-level work (for example pipe laying)"* and "Erection of buildings or structures underneath an overhead line". Exclusion zones from the overhead line are stipulated for the various voltages.

HSE Guidance Note GS6 recommends that the DNO 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.

Notes

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).

Northern Powergrid staff shall recognise the requirements of the Operational Practice Manual (OPM), ***Section AD - Proximity Work*** *and the Model Distribution Safety Rules (DSR),* ***Appendix D - Working and Access Clearances for work beneath a live overhead line***

3.11.4.1. Work at Ground-Level Only.

Where work is carried out at ground-level only the passing clearances specified in Table 8 Item1 for fixed height loads are permissible, as HSE Guidance Note GS6 requires that no vehicle, or 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.

HSE Guidance Note GS6 requires that all such work shall be "directly supervised by someone who is familiar with the risks".

3.11.4.2. Work on Buildings or Structures Underneath an Overhead Line

This work includes erection of permanent and temporary structures as specified by HSE Guidance Note GS6.

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.

3.11.5. 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 3.11.1, 3.11.2, 3.11.3 and 3.11.4 are applicable in the first instance.

Where these requirements are not satisfied and in order to prevent inadvertent contact with live conductors or equipment, Northern Powergrid 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 Northern Powergrid procedures.

b) Apply temporary shrouding in accordance with the guidance available in NSP/004/129 "*Guidance on the Installation of Overhead Line Low Voltage Proximity Shrouding*" which complies with ENA TS 43-103 – "*Low voltage overhead line shrouding materials"*

c) Erect a horizontal physical barrier as described in Clause 3.11.3.2.

d) Underground the mains/service.

e) Replace bare open wire services with ABC together with the requirements of Clause 3.6.3.

f) Divert the line.

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

3.11.6. Agricultural Work

The HSE provide information for persons in agriculture working near overhead lines in Agriculture Information Sheet No 8 "HSE Agriculture Information Sheet AIS8 (rev 3), Working safely near overhead electricity power lines. HSE books 2012". The information sheet recommends carrying out specified activities at least 10 m from overhead lines.

This code of practise recommends, for steel tower overhead lines, a larger distance of 15.0 m is adhered to for such activities.

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

3.12. Clearance of Unsupported Jumper Loops

Item	Description	Clearance (m)				
		11kV	20kV	33kV	66kV	132kV
1	Unsupported jumper loop to any part of a support or stay.	0.3	0.45	0.5	0.7	0.9

These clearances shall apply:-

- On unearthed supports with the conductors in still air.
- On earthed supports with the jumper swung at any angle up to 30º towards the support.

4. References

4.1. External Documentation

Reference	Title
BS 6004	Electric cables. PVC insulated and PVC sheathed cables for voltages up to and 86 including 300/500 V, for electric power and lighting
BS 6485	PVC-covered conductors for overhead power lines
BS 7354:1990	Code of practice for design of high-voltage open-terminal stations
BS EN 50341-1	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 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 EN 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 combined neutral and earth copper wire concentric cables with copper or aluminium conductors *NOTE: This Standard relates to single-phase and three-phase separate neutral and earth (SNE) service cables.*
BS EN 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
BSEN 60071-1:2006	Insulation co-ordination – Part 1: Definitions, principles and rules
DSR	Distribution Safety Rules
EB/TP3	'Engineering Recommendation for Telecommunication Providers and Distribution Network Operators Joint use of Poles.
ENA EREC C/99	Guidance for working on cables under induced voltage conditions
ENA EREC EB/TP	'Engineering Recommendation for Telecommunication Providers and Distribution Network Operators Joint use of Poles
ENA EREC G96	Use of mechanical harvesters in vegetation management
ENA TS 41-38	Power installations exceeding 1kV a.c. – Design of high-voltage open-terminal stations
ENA TS 43-08	Overhead Line Clearances
ENA TS 43-103	Low voltage overhead line shrouding materials
ENA TS 43-119	Design and use of temporary scaffold guards
ENA TS 43-122	XPLE covered conductors for overhead lines (having rated voltages Uo/U greater than 0.6/1 kV up to and including 19/33kV) *NOTE: XLPE covered conductors that comply with ENA TS 43-122 are considered to be lightly insulated conductors when used for HV applications*
ENA TS 43-13	Aerial bundled conductors insulated with cross-linked polyethylene for low voltage overhead distribution NOTE: ENA TS 43-13 requires conformance with BS 7870-5 subject to a number of specific amendments.
ENA TS 43-90	Anti-climbing devices and safety signs for HV lines up to and including 400 *kV*
ENAMC	Energy Network Association Member Company
EREC L44	Separation between wind turbines and overhead lines: Principles of good practice

ESQCR	Statutory Instrument 2002 No. 2665, The Electricity Safety, Quality and Continuity Regulations 2002 and the 2006 Amendment
G39/2	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'.
G55/3	Engineering Recommendation G55/3, 'Safe Tree Working in Proximity to Overhead Electric Lines.'.
GS6	HSE guidance note GS6 (Fourth Edition) 'Avoiding danger from overhead power lines' See www.hse.gov.uk.pubns/gs6.htm
OPM	Northern Powergrid (OPM) Operational Practice Manual
PO5/3	Protection of Telecommunication Lines from Power Lines
Road Traffic Act 1984 and 1988	Road Traffic Act 1984 & 1988 - is an Act of Parliament in the United Kingdom, which provided powers to regulate or restrict traffic on UK roads

4.2. Internal Documentation

Reference	Title
MNT/013/001	Code of Practice for Avoidance of Danger from Overhead Electric Lines during Vegetation Management Activities
NPS/001/007	Technical Specification for Overhead Line Conductors
NSP/004/012	Guidance on the Risk Assessment of Overhead Lines
NSP/004/041	Code of Practice for the Construction of LV ABC Overhead Lines
NSP/004/041/001	Specification for the renovation of existing LV O/H Lines
NSP/004/043	Specification for Overhead Services, Surface Wiring and Eves Wall Mains
NSP/004/044	Specification for HV Wood Pole Lines of Compact Covered Construction up to and including 33kV
NSP/004/129	Guidance on the Installation of Overhead Line Low Voltage Proximity Shrouding.
NSP/005/001	Access Arrangements to Network Rail Infrastructure

4.3. Amendments from Previous Version

Reference	Description
3.9	Correction in table for 132kV conductors over 'Other Canals' (previously 12.8m)

5. Definitions

Term	Definition
Aerial bundled conductor (ABC)	Assembly of LV effectively insulated phase and neutral conductors provided in accordance with ENA TS 43-13 NOTE: Types of ABC in general use can also include an additional earth conductor.
Application Factor	The distance (dependent upon working situation) which is added to the safety distance to determine working and access clearances
Basic Electrical Clearances	Smallest permissible clearance in air between live parts or between live parts and earth as detailed in BS EN 61936-1:2010+A1:2014 *NOTE: Basic electrical clearances do not include any additions for constructional tolerances, wind effects, etc.*
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.*
Cable	A conductor or assembly of conductors, which are effectively insulated and incorporate an earthed metallic screen.
CNE	Combined Neutral & Earth
Controlled Zone	The inside of an enclosure efficiently protected by fencing not less than 2.4m in height or means necessary to meet the requirements of ESQCR 2002 regulation 11(b)
Covered Conductor	A design of conductor that can be lightly or effectively insulated and may be manufactured in accordance with ENA TS 43-122. (In ESQC guidance notes this is often referred to as BLX). *Note – The type of covered conductor currently used in Northern Powergrid is classified as lightly insulated.*
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.
DNO	Distribution Network Operator
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 effectively insulated conductors may be placed such that they are ordinarily accessible.* *For a HV conductor to be considered effectively insulated it must have an earthed metallic screen incorporated in its construction.*
High load vehicle	vehicle with maximum height exceeding 5 m but not exceeding 6.1 m
High-sided vehicle	vehicle with maximum height exceeding 4 m but not exceeding 5 m
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.
Laneway	A laneway is a 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.*
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. *Note: A line conductor is deemed to include a through jumper.*
LV	Low Voltage. Voltage up to and including 1000V.

Non high-sided vehicle	vehicle with maximum height not exceeding 4 m
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.
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: similar to ESQCR Regulation 18 (6)
Overhead Line	Apparatus in the open air and above ground level coming within the scope of ESQCR 2002.
PoleCad	Overhead Line Profiling Design software used to determine the required support height and conductor ground clearance
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.*
Safety Distance	distance maintained from the nearest exposed conductor or from an insulator supporting a conductor to avoid danger
SNE	Separate Neutral & Earth
Specific Maximum conductor temperature	The likely maximum temperature of the conductor resulting from a combination of climatic conditions and the related electrical load under normal operating conditions. *Note: For overhead lines which are designed using probabilistic thermal rating concepts which allows a defined conductor temperature to exceed then the 'specified maximum conductor temperature' shall be interpreted as the 'maximum likely conductor temperature' in accordance with Regulation 17 (1) of ESQCR 2002.*
System Voltage	The nominal RMS phase to phase voltage of a three phase AC system
The Company	Northern Powergrid
TP	Telecommunication Provider, replacement term for BT which was formally the only telecommunication provider.
Vehicle	mechanically propelled vehicle intended or adapted for use on roads and laneways
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, ADSS fibre optic cable
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 as detailed in BS EN 60071-1:2006+A1:2010

6. Authority for Issue

6.1. CDS Assurance

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

		Date
Liz Beat	Governance Administrator	24/08/2022

6.2. Author

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

Review Period - This document should be reviewed within the following time period;

Standard CDS review of 3 years?	Non Standard Review Period & Reason	
Yes	**Period:** N/A	**Reason:** N/A
Should this document be displayed on the Northern Powergrid external website?		Yes

		Date
Ged Hammel	Senior Policy & Standards Engineer	24/08/2022

6.3. Technical Assurance

I sign to confirm that I am satisfied with all aspects of the content and preparation of this document and submit it for approval and authorisation.

		Date
Steve Salkeld	Policy & Standards Engineer	24/08/2022
Joe Helm	Policy & Standards Manager	29/09/2022

6.4. Authorisation

Authorisation is granted for publication of this document.

		Date
Paul Black	System Engineering Manager	30/09/2022

Appendix 1

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

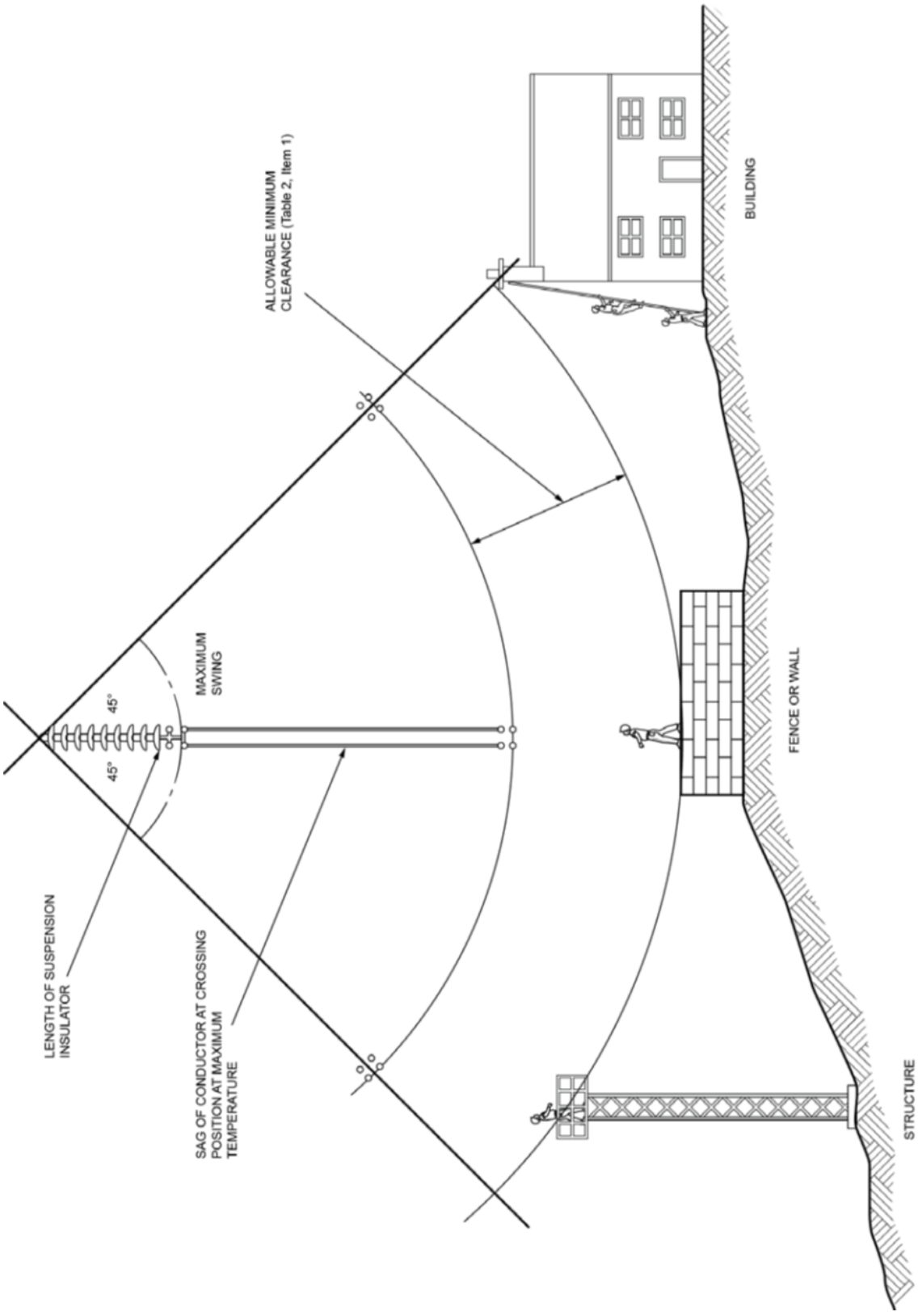


Figure 2 — Examples of Clearance to Trees

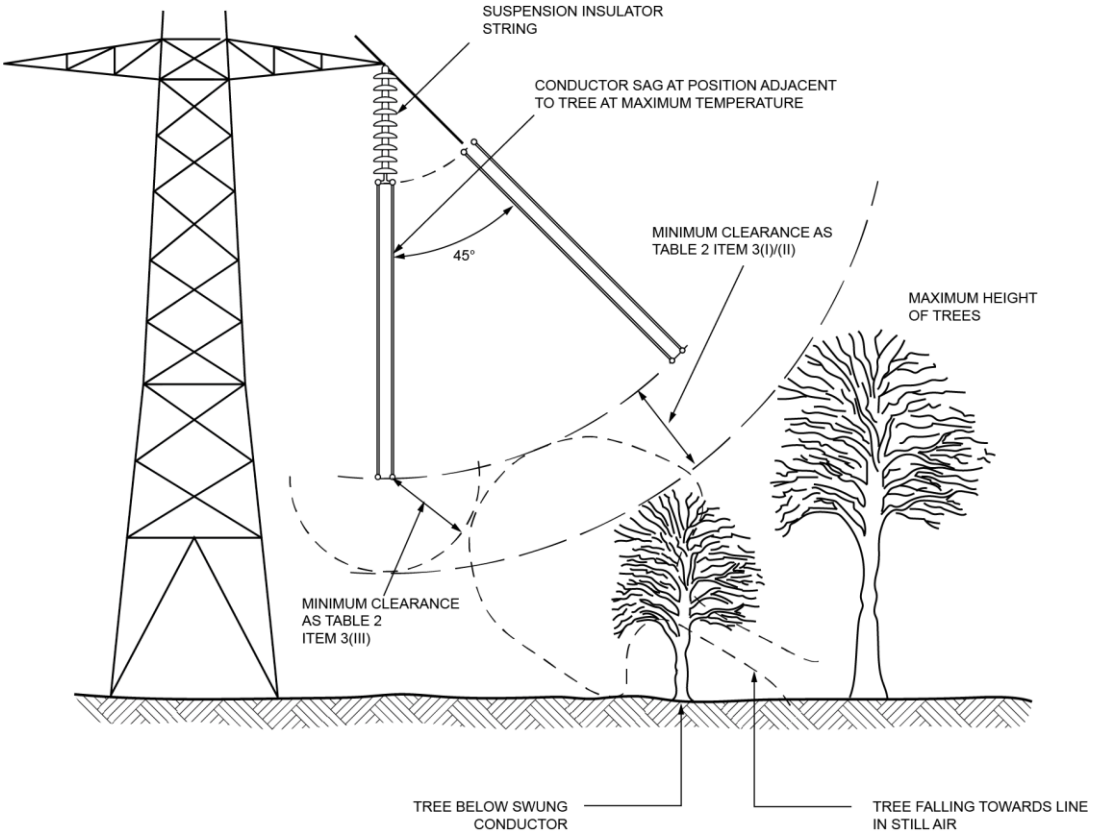
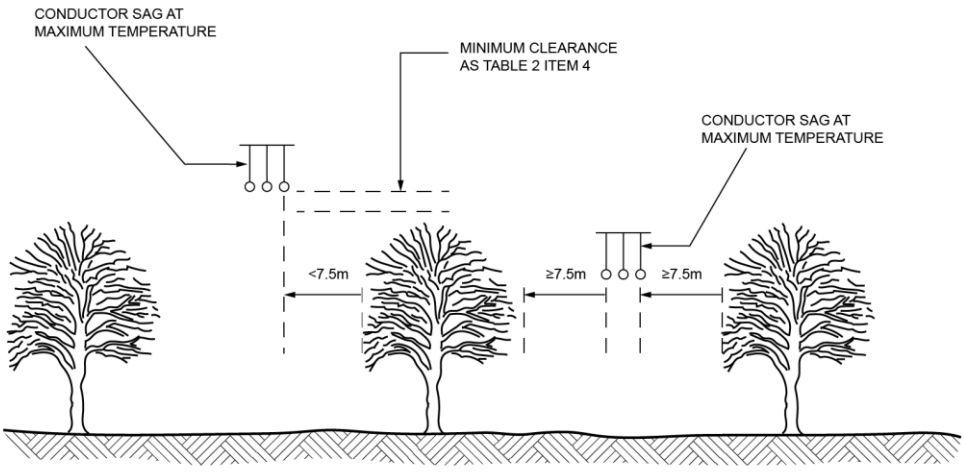


Fig. 2(a) Clearance to trees



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 3 — HV Conductor Clearance to Lighting Columns

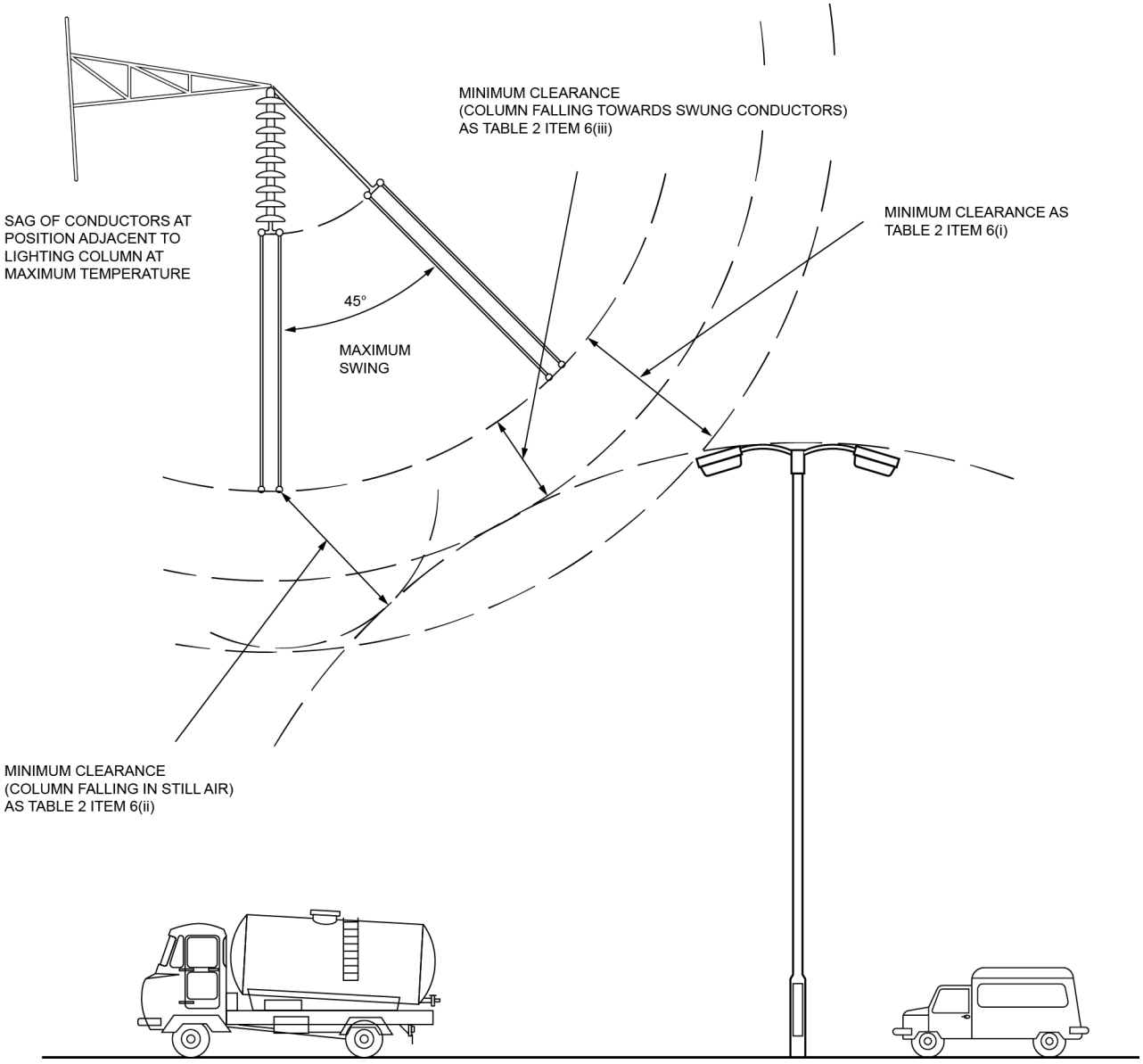
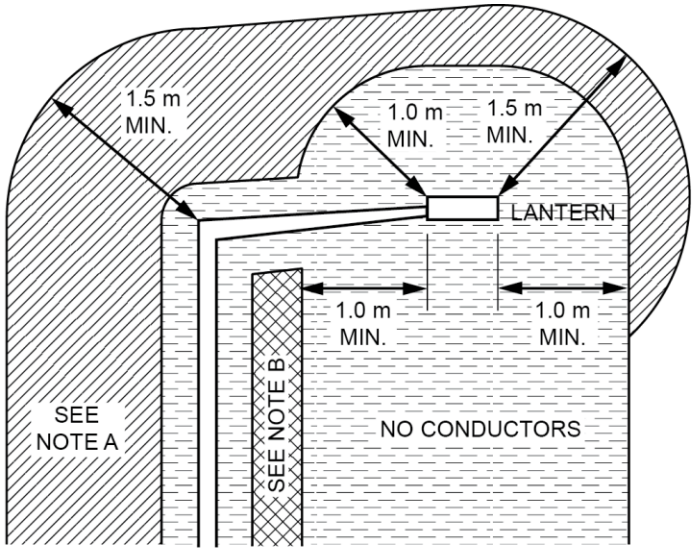
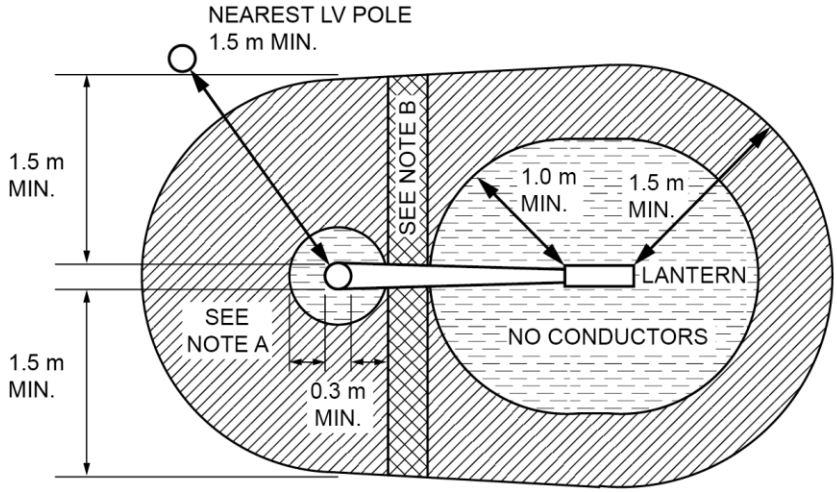


Figure 4 — LV Conductor Clearances from Lighting Columns



ELEVATION

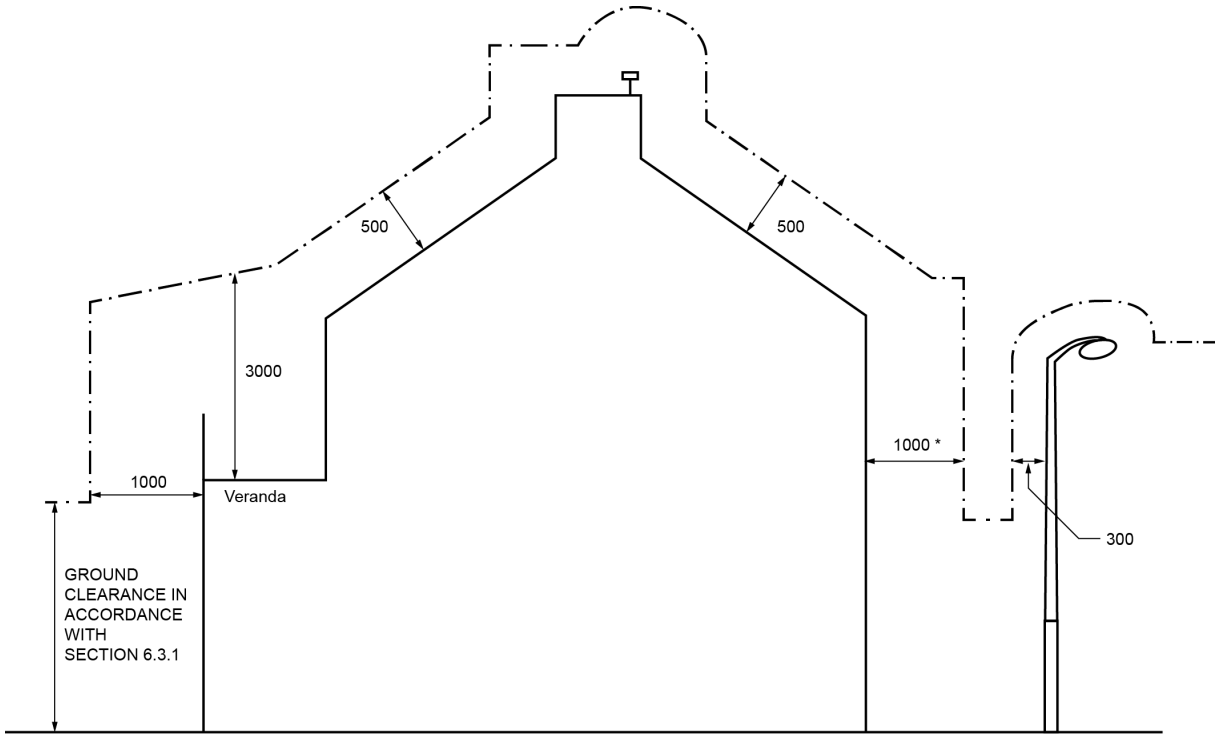


PLAN

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 5 — Clearance between Structures and Effectively Insulated Conductors Installed on Poles



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

Figure 6 — Clearance between Crossing Overhead Lines

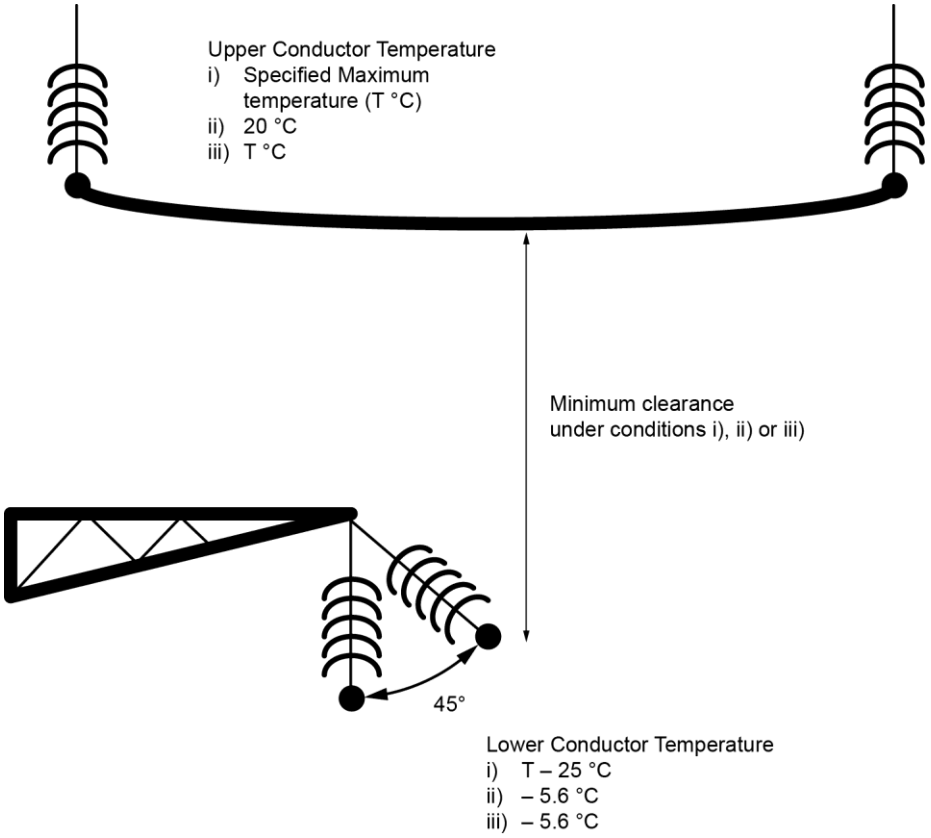
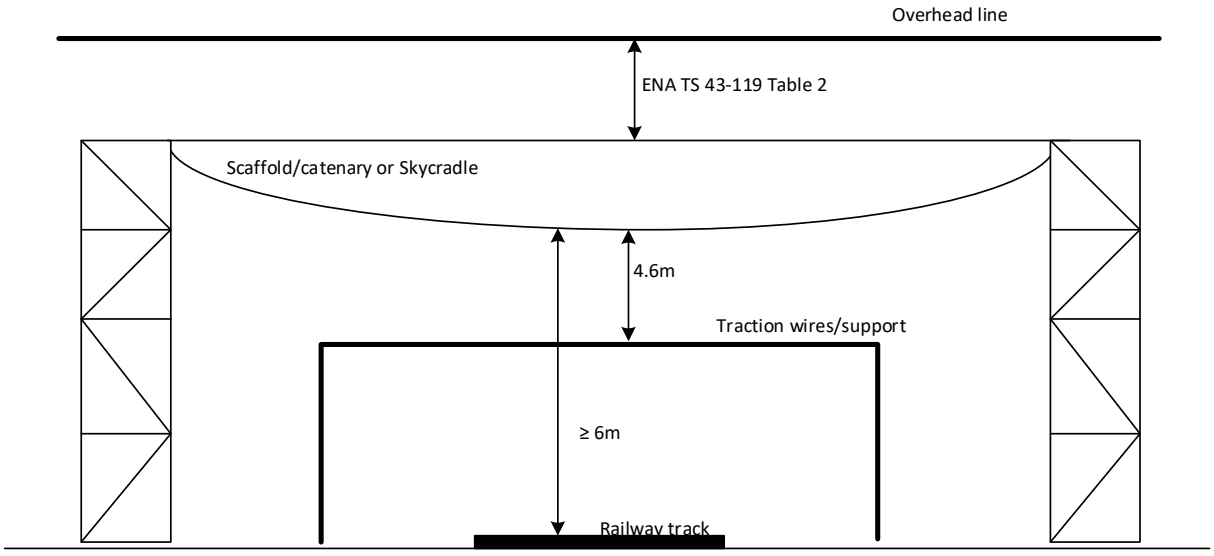


Figure 7 — Vertical Clearances between an Overhead Line, Scaffold Structure and Railway



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 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 5.5.3 of that document and rounded up. Where past practice[1] 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.					

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.

[1] 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 the table are increased by 300 mm to allow for the use of hand held tools.

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 code of practise 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 those 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 code of practise 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:

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

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 or roads.

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' would not be treated as a 'road' according to this code of practise and any overhead line crossing would require to have a minimum ground clearance of 5.2 m.

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, would be treated as a 'road' according to this code of practise and any overhead line crossing would require to have a minimum ground clearance of 5.8 m.

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 code of practise 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 code of practise) 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.