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Technical Specification 43-8

Issue 4 2015 + Amendment 1 2016

Overhead line clearances

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
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 Normative References: Numerous references have been updated and those which have been withdrawn or superseded are removed.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).
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.

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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 3 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 document 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 document 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 have been included in this issue to cater for those small number of installations that exist but that were not previously acknowledged. 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.

In this issue, the concept and definition of ‘laneway’ has been introduced to provide improved 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] 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