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Technical Specification 43-9

Issue 3 2013

132 kV steel tower transmission lines:

Specification L7(c)

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
1	2002	First issue
2	February, 2008	Revision
3	November, 2013	Minor revision of Issue 2 to reflect changes in the Standards documents referenced and to check that the technical basis for analysis of the L7(c) supports remains valid. The technical content of TS 43-9 remains largely unchanged with some revisions to the wording and to update references to revised Standards. This issue includes the following principal technical changes. Foreword. Paragraph added regarding use of Power Line Systems Inc. 'Tower' software. It has been concluded that there have been no changes in the design standards or work practices that would require a re-analysis using later versions of 'Tower' and the results using the Version 6 software remain valid. Clause 2. Normative references amendments: BS EN 10025 expanded to refer to all three parts of the Standard, BS EN 10113 deleted (replaced by BS EN 10025-3) and 'Electricity Safety, Quality and Continuity Regulations' added. 'Terms and definitions' Clause added (Clause 3) to include definitions for 'deterministic design basis', 'probabilistic design basis', 'partial load factor', 'partial strength factor' and 'reliability level'. Clause 9.6 (re-numbered 10.6). Para 2, 1st sentence: Reference to "ML-1" amended to be "National Grid Company Manual M1".

		Clause 10.1 Partial strength factors (renumbered 11.1). Para 1 - added the following sentence to align with TS 43-7: “If higher partial strength factors are used, the users of this Specification are responsible for undertaken their own re-analysis of the supports.” Clause 10.2 (re-numbered 11.2). Para 1: Note added that reference to BS 8100 is retained, although superseded by BS EN 1993-3-1, because BS 8100 is used as the basis of the simplified procedure adopted. Appendix A4.1 (re-numbered Annex B4.1). Missing diagram of wind angles added. Appendix A4.2 (renumbered Annex B4.2). Table A4.2a: Diagram showing temporary guy attachments mentioned in Note 1] added. Appendix A5.1 (renumbered Annex B5.1). Table B5.1a Case 3a: Corrected value from “6 467” to “646”. Appendix A5.3 (renumbered Annex B5.3). Cross reference to Table A2.1 corrected to Table A5.1 (renumbered Table B5.1: Diagram showing temporary guy attachments mentioned in Note 1] added. Appendix B.7.1 (renumbered C.7.1). In Table for Reliability level 2 corrected error found in Case for Extn M3 and added NOTE below table. Appendix F (renumbered Annex G). Renamed title and added “(normative)”. Bibliography Clause added. Documents referenced in the text, but not listed previously, added. 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 43-9”.

This document replaces and supersedes Technical Specification 43-9 Issue 2 2008.

This Technical Specification has been prepared to ensure that overhead lines constructed with L7(c) lattice steel supports are compliant with the requirements of the Electricity Safety, Quality & Continuity Regulations 2002 (as amended), BS EN 50341-1 and BS EN 50341-3-9.

The analysis in Issue 2 was undertaken using Power Line Systems Inc ‘Tower’ software Version 6. The software has been updated subsequently and the current release of the software is Version 12. An assessment has concluded that there have been no changes in the design standards or work practices that would require a re-analysis using later versions of ‘Tower’ and the results using the Version 6 software remain valid.

1 Scope

This Specification is applicable to new overhead lines constructed with L7(c) lattice steel supports and may be applied to maintenance, re-conductoring, tee-offs, extensions or diversions to existing overhead lines as required.

The extent of the application of BS EN 50341-1(subsequently referred to as Part 1) in the United Kingdom, is defined in BS EN 50341-3-9 (subsequently referred to as Part 3-9). Guidance on the application of Part 1 and Part 3-9 is given in the ENA Technical Specification 43-125 [N4].

Reference should be made to Part 1, Part 3-9, the Project Specification and where appropriate to ENA TS 43-125 [N4] for details of design, manufacture, installation and testing of all other components for the overhead line, including the fabrication and installation of the supports.

Only specific tower types or ranges of extensions have been re-analysed for compliance with Part 1 and Part 3-9 based on a defined set of generic loading conditions etc. Details of the generic loading conditions are given in the main body of text and Annexes B.1 to B.7 and C.1 to C.8. For severe climatic loading conditions a separate re-analysis has been undertaken, details of the specific conditions considered are given in Annexes D, E and F.

Where loading conditions, tower types or extensions are outside the parameters quoted, the users of this Specification are responsible for undertaking their own specific checks.

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 10025-1:2004 *Hot rolled products of structural steels. General technical delivery conditions*

BS EN 10025-2:2004 *Hot rolled products of structural steels. Technical delivery conditions for non-alloy structural steels*

BS EN 10025-3:2004 *Hot rolled products of structural steels. Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels*

BS EN 50341-1:2012 *Overhead electrical lines exceeding AC 1 kV. General requirements. Common specifications*

BS EN 50341-3-9:2005 *Overhead electrical lines exceeding AC 45 kV. Set of National Normative Aspects*

Other publications

[N1] Electricity Safety, Quality and Continuity Regulations 2002 (and Amendments)

[N2] ENA Technical Specification 43-9, Issue 1: 1986, *132 kV Steel Tower transmission Lines, Specification L7(c)*

[N3] ENA Technical Specification 43-90, *Anti-Climbing Measures and Safety Signs for High Voltage Overhead Lines*

[N4] ENA Technical Specification 43 -125, *Overhead Lines Above 45 kV (AC)*

[N5] National Grid Company Linesman's Manual M1, 132, 275 and 400 kV Overhead Lines ('Dead Line' Working)

NOTE: Manual M1 has been withdrawn and replaced by National Grid Company Work Specifications, which are for internal use only.

3 Terms and definitions

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

3.1
deterministic design basis
consideration of the effects of fixed set of loadings and weather conditions on the overhead line to ensure that the stress in each tower component is limited to be within the yield stress or ultimate tensile strength by a factor described as the factor of safety

3.2
probabilistic design basis
consideration of the effects of random variability of loadings and weather conditions on the overhead line to ensure that risk of failure of each tower component is acceptably low but using an assumption of a small probability of failure instead of using a factor of safety

3.3
partial load factor
factor dependent on the selected reliability level, used to modify the calculated loads, taking in account the possibility of unfavourable deviations from the characteristic values of the loads, inaccurate modelling and uncertainties in the effects of the loads

[BS EN 50341-1 modified]

3.4
partial strength factor
factor used to modify the mechanical strength of a component covering unfavourable deviations from the characteristic values of material properties, inaccuracies in applied conversion factors and uncertainties in geometric properties and the structural resistance model

[BS EN 50341-1 modified]

3.5
reliability level
classification denoting the selected values for wind and ice actions corresponding to a theoretical time period for return of those climatic actions

NOTE: Three different reliability levels corresponding to specific return periods of the climatic conditions are specified in BS EN 50341-1. The specific return periods quoted are 50, 150 and 500 years, although lesser return periods and hence reliability may be used for temporary loading conditions and temporary construction [N4].

4 The Electricity Safety, Quality & Continuity Regulations 2002

Overhead lines constructed using lattice steel supports in accordance with this Specification shall comply with the Electricity Safety, Quality & Continuity Regulations 2002 with either one or both circuits erected.