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Technical Specification 43-94

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Earth rods and their connectors

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PUBLISHING AND COPYRIGHT INFORMATION

Operations Directorate
Energy Networks Association
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52 Horseferry Rd
London
SW1P 2AF

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Amendments since publication

Issue	Date	Amendment
Issue 5	February, 2012	Minor revision of Issue 4. This issue includes the following principal technical changes. Clause 1, Scope: Amended to include earth rods and connectors for lightning protection systems. Clause 4.2, Dimensional tolerance: New clause permitting dimensional tolerance. Table 5.1, Preferred earth rod dimensions: Amended shank diameter for nominal 9 mm diameter earth rod from “8.9 mm” to “9.5 mm”. Clause 5.2, Driving heads: Amended clause to allow driving heads to be applied via couplers providing force is not through the coupler threads. 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 6	December, 2017	Minor revision to Issue 5. This issue includes the following principal technical changes. Clause 1, Scope: Galvanised earth rods removed from the document scope. Scope extended to cover all voltages. Clause 5.1, Earth rods: This Clause has been split into 4 separate sub-clauses as explained below.

		Clause 5.1.1, Dimensions and selection: Reference to galvanised rods has been removed. Table 1 updated with 19 mm rods. Table 2 added to describe differing soils types. New Clause 5.1.2, Copper bonded earth rods: This clause now captures relevant requirements for copper bonded steel rods. There have been no technical changes as the requirements are taken from Issue 5 Clause 5.1. New Clause 5.1.3, Solid copper earth rods: New requirements inserted. New Clause 5.1.4, Deep driven earth rods: New requirements inserted. Issue 5, Clause 5.4.2, Requirements for Steel Couplers or Couplers for Galvanised Rod: Clause deleted. New Clause 5.6, Exothermically welded connections to earth rods: Option to use exothermically welded earth rods has been inserted. Issue 5, Clause 6.2.2.2, Requirements for Galvanised Rods: Clause deleted. Issue 5, Clause 6.2.2.3, Specific requirements for galvanised couplers and driving tips: Clause deleted Issue 5, Clause 6.2.2.4, Specific requirements for sheradized couplers: Clause deleted. 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).

Contents

Tables

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Foreword

This Technical Specification (TS) is published by the Energy Networks Association (ENA) and comes into effect from the 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 “TS 43-94”.

This Specification provides the technical performance requirements for earth rods and their connectors. The option for using solid copper rods and deep driven rods is explained in this Specification and the option of employing exothermic earthing connection techniques is also covered.

Annex A and Annex B of this Specification include “Self-Certification Conformance Declaration” and “Type Test Conformance Declaration” sheets to enable manufacturers to declare conformance or otherwise, clause by clause, with relevant parts of this Specification.

1 Scope

This Specification defines the requirements for earth rods used for earthing and/or lightning protection. Earth rods covered by this Specification include:

- copper bonded steel rods;
- solid copper rods; and
- deep driven techniques where required.

Galvanised earth rods are not covered by this Specification.

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 4921, *Specification for sherardized coatings on iron or steel*

BS 7884, *Specification for copper and copper-cadmium stranded conductors for overhead electric traction and power transmission systems*

BS EN 1982, *Copper and copper alloys. Ingots and castings*

BS EN 10025-1, *Hot rolled products of structural steels. General technical delivery conditions*

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

BS EN 12163, *Copper and copper alloys. Rod for general purposes*

BS EN 12165, *Copper and copper alloys. Wrought and unwrought forging stock*

BS EN 12449, *Copper and copper alloys. Seamless round tubes for general purposes*

BS EN 13411-5, *Terminations for steel wire ropes. Safety. U-bolt wire rope grips*

BS EN ISO 1461, *Hot dipped galvanised coatings on fabricated iron and steel articles. Specifications and test methods*

PD 970, *Specification for wrought steels for mechanical and allied engineering purposes. Requirements for carbon, carbon manganese and alloy hot worked or cold finished steels*

Other publications

[N1] ENA TS 41-24, *Guidelines for the Design, Installation, Testing and Maintenance of Main Earthing Systems in Substations*

[N2] ENA EREC S34, *A guide for assessing the rise of earth potential at substation sites*

3 Terms and definitions

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

3.1
connector
device to connect electrical conductor(s) to an **earth rod**

3.2
coupler
device to enable rods to be joined together to provide an extensible **earth rod**

3.3
driving head
device used to protect the end of the **earth rod** whilst it is been driven

3.4
driving tip
device used to assist penetration of the **earth rod** into hard ground

3.5
earth rod
metallic rod driven into the ground to provide an electrical connection to earth

3.6
sample tests
test intended to verify the quality of materials or workmanship

3.7
type tests
tests intended to establish the design characteristics of a component. They are normally only made once and only repeated when the design or the material of a component is changed. The results of type tests are recorded as evidence of compliance with design requirements