



Engineering Recommendation C46

Issue 2 2014

Measures necessary to minimise corrosion damage to buried metallic structures by neighbouring cathodic protection installations

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**Operations Directorate
Energy Networks Association
6th Floor, Dean Bradley House
52 Horseferry Rd
London
SW1P 2AF**

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Issue 1 published 1981.

Amendments since publication

Issue	Date	Amendment
Issue 2	December 2014	<p>Major revision of Issue 1 to reflect that the main reference, BS Code of Practice CP 1021 (1973), has been withdrawn. The technical guidance previously taken from CP 1021 has been updated to meet current BS EN Standards. The purpose and technical intent of EREC C46 remains unchanged.</p> <p>This issue includes the following principal technical changes.</p> <p>Document title amended by replacing "...to prevent corrosion damage.." with "...to minimise the likelihood of corrosion damage..." since prevention of corrosion damage may not be possible.</p> <p>Clause 2 BS CODE OF PRACTICE CP 1021 'CATHODIC PROTECTION' Clause deleted as being obsolete due to CP 1021 being withdrawn.</p> <p>Clause 3.1 (re-numbered 4.1):</p> <p>(i) Text referring to CP 1021 deleted and new text added providing guidance on notification requirements, referring to procedures given in BS EN 50162.</p> <p>(ii) Text added to emphasise the obligations in BS EN 50162 regarding notification to 3rd parties.</p> <p>Clause 3.2 (re-numbered 4.2) Amended the reference to <i>Public Utilities Street Works Act</i> to <i>New Roads and Street Works Act</i>.</p> <p>Clause 4 (re-numbered 5):</p> <p>(i) Para 4; Guidance on pipe coatings updated by reference to current practice in National Physical Laboratory <i>Good Practice Guide No. 121</i>.</p> <p>(ii) Para 7; Reference to CP 1021 replaced by a footnote to explain that although withdrawn the guidance in CP 1021 remains valid.</p>

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	<p>(iii) Additional paragraph noting that the organisation installing the cathodic protection will be carrying out initial tests, as per BS EN 12594 Clause 9. Liaison and possible involvement will be advantageous.</p> <p>Clause 5 (re-numbered 6):</p> <p>(i) Para 1; Reference to CP 1021 section 8.3.2, relating to methods for measurement of corrosion interaction, replaced with reference to BS EN 50162 Clause 5.2.</p> <p>(ii) Para 1, last sentence; Reference to CP 1021 deleted.</p> <p>(iii) Para 2; Text deleted and replaced with reference to BS EN 13509 Annex A and Annex H.</p> <p>(iii) Para 3; Reference to CP 1021 sections 9.3.2.2, relating to the placing of electrodes, replaced with reference to BS EN 13509 Annex A.</p> <p>(iv) Para 4, 1st sentence; Reference to CP 1021 sections 9.3.2.2, relating to the importance of correctly placing of reference electrodes, replaced with reference to BS EN 13509 Annex A.</p> <p>(v) Para 4, last sentence; Reference to CP 1021 Figure 17 replaced with reference to BS EN 50162 Appendix E.</p> <p>Clause 6 (re-numbered 7):</p> <p>(i) Clause 7.1; Added Clause giving description of anodic interference.</p> <p>(ii) Clause 7.1.1; Clause replacing reference to CP 1021 Clauses 8.3.3.1 & 8.3.3.2. Guidance amended and reference to Table 1 of BS EN 50162 replacing CP 1021 for criteria to adopt in relation to the likelihood of anodic interference for structures without cathodic protection. Note added on need for judgement where potentials are rapidly fluctuating.</p> <p>(iii) Clause 7.1.2; Additional clause with guidance and reference to Table 1 of BS EN 12594 for criteria to adopt in relation to the likelihood of anodic interference for structures without cathodic protection.</p> <p>(iv) Clause 7.2; Clause replacing reference to CP 1021 for criteria to adopt in relation to the likelihood of cathodic interference using reference to Table 1 of BS EN 12594 and guidance given in BS EN 50162.</p> <p>Clause 7.1 (re-numbered 9.1):</p> <p>(i) Para 2, 1st sentence; Reference to guidance in CP 1021 Clause 8.3.4 replaced by reference to BS EN 12594 Clauses 7 and 8.</p> <p>(ii) Para 2, 2nd sentence; Reference to guidance in CP 1021 Clause 8.3.5 replaced by reference to BS EN 12594 Clause 8.</p> <p>(iii) List items (1) to (5); text amended to align with BS EN 12594.</p> <p>(iv) Para 4; Wording of the guidance on bonding to cable (in a new Clause 9.1.1) amended to remove reference to CP 1021.</p> <p>(v) Para 5; Wording of the guidance on bonding to cable (in a new Clause 9.1.1) amended for improved clarity.</p> <p>Clause 7.2 (re-numbered 9.1):</p> <p>(i) Para 1, 1st sentence; Reference to CP 1021 deleted and guidance enhanced for interpreting the test results where bonding between structures has been employed by including information from BS EN 50162.</p> <p>(ii) Para 1, 2nd sentence; Guidance enhanced for interpreting the test results where a galvanic anodic has been deployed by including information from BS EN 50162.</p> <p>(iii) Para 2; Guidance enhanced for interpreting the test results where additional coatings have been applied by including information from BS EN 50162.</p> <p>Clause 8: Wording amended to replace reference to CP 1021 by BS EN 50162. Additional guidance that, if subsequently unacceptable levels of corrosion are occurring as result of the operation of the cathodic protection, the operator may be requested to take remedial action.</p>
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		<p>Clause 9 (re-numbered 10): Clause revised.</p> <p>(i) Para 1: Reworded reference to the principles established under the auspices of the Joint Committee for the Co-ordination of the Cathodic Protection of Buried Structures.</p> <p>(ii) List of organisations and text of the principles moved verbatim to (new) Annex C to be retained as useful information.</p> <p>(iii) Final paragraph retained of recommendations to continue to use the principles. Updated names of bodies involved and reference to <i>Public Utilities Street Works Act</i> to <i>New Roads and Street Works Act</i>.</p> <p>Clause 10 (re-numbered 11): Wording amended to reflect changes in the naming and structure of the bodies involved.</p> <p>Clause 11 (re-numbered 12) Wording amended to reflect changes in the naming and structure of the bodies involved.</p> <p>Appendix A (re-numbered Annex A):</p> <p>(i) Amended the reference to Public Utilities Street Works Act to New Roads and Street Works Act, in Annex A.1 title and the specimen letters, as necessary.</p> <p>(ii) Specimen letters; Retained the wording of the specimen letters except for references to the bodies amended to reflect changes in naming.</p> <p>(iii) Specimen letters; Replaced reference to CP 1021 by BS EN 50162, as necessary.</p> <p>Appendix B (re-numbered Annex B):</p> <p>(i) Amended reference to 'Department of Energy' to 'a government department', in Annex B.1 & B.2 titles and the specimen 'forms of indemnity', as necessary.</p> <p>(ii) Specimen Forms of indemnity; Retained the wording of the specimen 'forms of indemnity' except for references to the bodies amended to reflect changes in naming.</p> <p>Original Appendix C: Deleted as obsolete since CP 1021 has been withdrawn.</p> <p>New Annex C added 'Principles for cooperation and practice agreed by the Joint Committee for the Co-ordination of the Cathodic Protection of Buried Structures'. Text from (old) Clause 10 'Negotiation with other bodies' added verbatim to retain the useful information contained therein.</p> <p>Bibliography: 2 references added of useful background documents.</p>
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Foreword

This Engineering Recommendation 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 "EREC C46".

This document replaces and supersedes Engineering Recommendation C46 Issue 1 1981 (re-published in 2003).

The cathodic protection of many kinds of buried metallic plant is normal practice. The resulting current flowing in the soil can cause the corrosion of unprotected buried plant. This is referred to as 'corrosion interaction'. Procedures for assessing corrosion interaction and the measures to be taken when tests show that it might occur are given in various British Standards and other documents, as described in this Engineering Recommendation.

This Engineering Recommendation provides guidance on steps to be followed whenever a Network Operator's plant is likely to be damaged by the use of cathodic protection by other parties, or when a Network Operator is applying cathodic protection to their own buried plant.

For information on the impact of stray currents that emanate from Light Rapid Transit Systems, reference should be made to ENA Engineering Technical Report 123.

Where the term "shall" or "must" is used in this document it means the requirement is mandatory. The term "should" is used to express a recommendation. The term "may" is used to express permission.

NOTE: Commentary, explanation and general informative material is presented in smaller type, and does not constitute a normative element.

1 Scope

This document provides guidance on steps that should be taken by Network Operators, where their plant is likely to be damaged by the use of cathodic protection by other parties, or when Network Operators apply cathodic protection to their own buried plant.

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 12954:2001, *Cathodic protection of buried or immersed metallic structures. General principles and application for pipelines*

BS EN 13509:2003, *Cathodic protection measurement techniques*

BS EN 13636:2004, *Cathodic protection of buried metallic tanks and related piping*

BS EN 50162:2004, *Protection against corrosion from stray current from direct current systems*

Other publications

[N1] New Roads and Street Works Act 1991 (NRSWA) c. 22. The Stationery Office. ISBN: 9780105422914

[N2] National Physical Laboratory (NPL) Good Practice Guide No. 121, *Corrosion control for buried pipelines*, September 2011. ISSN 1368-6550

[N3] ENA EREP 123, *Guidelines for managing the interfaces between utility services and light rapid transit systems*

[N4] ENA EREC G12, *Requirements for the application of protective multiple earthing to low voltage networks*

[N5] ENA EREC C55, *Insulated sheath power cable systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Clause 3 of BS EN 12954 is applicable with the following additions.

3.1

anode

electrode through which direct current enters an electrolyte

3.2

cathode

electrode through which direct current leaves an electrolyte

3.3

cathodic protection

means of rendering a metal immune from corrosive attack by causing direct current to flow from its electrolytic environmental into the metal