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Technical Specification 98-1

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Environmental classification and corrosion protection of structures, plant and equipment

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
1	1997	First issue
2	2014	Major revision of Issue 1 to become a performance specification for corrosion protection based on environmental classifications. This issue includes the following principal technical changes. Update requirements in accordance with BS EN ISO 12944 and BS EN ISO 14713 series of Standards. Clause 4: Added new requirements for environmental classification of plant and equipment for its intended location. Clause 7: New environmental requirements added. Clause 10: Requirements for Type and Routine tests fully revised including adhesion test. Annex A: Self certification conformance declaration added for completion by manufacturers. 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 98-1”.

This issue cancels and replaces Issue 1 1997.

This Specification has been revised with direction from the ENA Standards Leaders Group to ensure environmental classification and protective coating system requirements for the purposes of corrosion protection are standardised across various categories of plant and equipment.

A significant number of British Standards publications referenced in the previous issue of ENA TS 98-1 have now been superseded by equivalent European and International Standards. A key change has been the replacement of BS 5493 with the BS EN ISO 12944 series of Standards for protective paint systems and BS EN ISO 14713 series of Standards for zinc coatings. This Specification should be read in conjunction with both series of Standards.

This issue constitutes a major technical revision, where the structure and technical content of the Specification has been changed to reflect requirements in the latest Standards publications and ENA Technical Specifications for main plant and equipment.

The intention of this document is to set-out functional requirements that ensure corrosion protection measures will perform satisfactorily and will be durable in the intended installation environment whilst allowing the use of a diverse range of protective coatings systems.

This Specification is intended to be applied by manufacturers of main plant and equipment to ensure purchaser requirements for corrosion protection are applied.

The terms ‘corrosion protection system’ and ‘protective coating system’ are intended to be interchangeable in this Specification.

Where the term “shall” or “must” is used in this document it means the requirement is mandatory. Where the term “should” is used in this document it means the provision is 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 requirement.

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Introduction

The surfaces of plant fabricated from steel or similar ferrous metals are subject to corrosion stresses. The nature and rate of corrosion depends on the environment in which the plant is installed. Suitable corrosion protection needs to be applied to these surfaces by manufacturers that will withstand the corrosion stresses expected in the intended environment.

The suitability of corrosion protection requires:

a) purchasers to adequately specify the environmental conditions in which the plant is to be installed and the durability of the corrosion protection required;

b) manufacturers to supply a corrosion protection system that will prevent damage to protected surfaces, when plant is installed in the intended environment, and will avoid the need for remedial work within a minimum period of years from manufacture, consistent with the durability requirements of the purchaser.

BS EN ISO 12944-2 defines a common methodology for classification of environments that purchasers and manufacturers of plant can use to specify suitable corrosion protection systems. This Standard has been adopted in this Specification.

Given the diversity of corrosion protection, including protective coating systems, applied by manufacturers, this Specification is not intended to be prescriptive. It is intended to set out performance requirements and tests that will ensure corrosion protection applied by manufacturers will be durable for the intended environment.

The durability of corrosion protection may well be less than the service life of equipment. In this case, consideration will need to be given by the manufacturer and the purchaser for specification of site-based maintenance and remedial work, which is not specifically addressed in this Specification.

1 Scope

This Specification applies to the classification of environments, indoor and outdoor, in which plant and equipment is intended to be installed by ENA Member Companies[1].

This Specification applies to corrosion protection of new plant and equipment together with associated structures and enclosures, which are purchased by ENA Member Companies for installation on electricity networks. Although the requirements for protective coating systems specifically apply to items fabricated from steel or similar ferrous metals, the same requirements are intended to apply to protection of other metals, where practicable. The requirements apply to both internal and external finishes.

Paint coatings, powder coatings, zinc coatings and combinations of these coating systems are intended to be covered by this Specification.

This Specification is intended to be used in conjunction with ENA Technical Specifications for plant and equipment (see Table 3); requirements in this Specification do not override those in plant and equipment specifications.

This Specification is not intended to apply to remedial work or re-application of corrosion protection to equipment that is installed in its intended environment.

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 381C:1996, *Specification for colours for identification, coding and special purposes*

BS 3900-0:2010, *Methods of test for paints. Index of test methods*

BS 3900-F5:1972, *Methods of test for paints. Determination of light fastness of paints for interior use exposed to artificial light sources*

BS 4800:2011*, Schedule of paint colours for building purposes*

BS EN 13438:2013, *Paints and varnishes. Powder organic coatings for hot dip galvanised or sherardised steel products for construction purposes*

BS EN 13811:2003, *Sherardizing. Zinc diffusion coatings on ferrous products. Specification*

BS EN 60068-1:2014, *Environmental testing. General and guidance*

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[1] This is to ensure manufacturers can apply suitable corrosion protection measures that will withstand the corrosion stresses expected in the intended environment for the service life of the equipment.

BS EN 60296:2012, *Fluids for electrotechnical applications. Unused mineral insulating oils for transformers and switchgear*

BS EN ISO 1461:2009, *Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods*

BS EN ISO 1518-2:2011, *Paints and varnishes. Determination of scratch resistance. Variable-loading method*

BS EN ISO 2063:2005, *Thermal spraying. Metallic and other inorganic coatings. Zinc, aluminium and their alloys*

BS EN ISO 2409:2013, *Paints and varnishes. Cross-cut test*

BS EN ISO 2808:2007, *Paints and varnishes. Determination of film thickness*

BS EN ISO 2812-1:2007, *Paints and varnishes. Determination of resistance to liquids. Immersion in liquids other than water*

BS EN ISO 2812-2:2007, *Paints and varnishes. Determination of resistance to liquids. Water immersion* method

BS EN ISO 2813:2000, *Paints and varnishes. Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°*

BS EN ISO 3231:1998, *Paints and varnishes. Determination of resistance to humid atmospheres containing sulfur dioxide*

BS EN ISO 3668:2001, BS 3900-D1:1998, *Paints and varnishes. Visual comparison of the colour of paints*

BS EN ISO 4628-1:2003, BS 3900-H1:2003, *Paints and varnishes. Evaluation of degradation of coatings. Designation of quantity and size of defects, and of intensity of uniform changes in appearance. General introduction and designation system*

BS EN ISO 6270-2:2005, BS 3900-F21:2005, *Paints and varnishes. Determination of resistance to humidity. Procedure for exposing test specimens in condensation-water atmospheres*

BS EN ISO 6272-1:2011, *Paints and varnishes. Rapid-deformation (impact resistance) tests. Falling-weight test, large-area indenter*

BS EN ISO 8501-1:2007, *Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

BS EN ISO 9001, *Quality management systems. Requirements*

BS EN ISO 9227:2012, *Corrosion tests in artificial atmospheres. Salt spray tests*

BS EN ISO 9717:2013, *Metallic and other inorganic coatings. Phosphate conversion coating of metals*

BS EN ISO 12944-2:1998, *Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Classification of environments*

BS EN ISO 12944-3:1998, *Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Design considerations*

BS EN ISO 12944-4:1998, *Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Types of surface and surface preparation*

BS EN ISO 12944-5:2007, *Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Protective paint systems*

BS EN ISO 12944-6:1998, *Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Laboratory performance test methods*

BS EN ISO 14713-1:2009, *Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures. General principles of design and corrosion resistance*

BS EN ISO 14713-2:2009, *Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures. Hot dip galvanizing*

BS EN ISO 14713-3:2009, *Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures. Sherardizing*

Other publications

[N1] ENA Engineering Recommendation G79, *Procedure for the conformity assessment of plant & products for use by Energy Networks Association Member Companies*

[N2] ENA Technical Specification 35-1, *Distribution transformers*

[N3] ENA Technical Specification 35-2, *Emergency rated system transformers 66/20.5 kV, 66/11.5 kV and 33/11.5 kV delta/star and star/star connected*

[N4] ENA Technical Specification 35-3, *Continuous Maximum Rated (CMR) system transformers (for use on systems up to and including 132 kV)*

[N5] ENA Technical Specification 35-7, *Tap-changers*

[N6] ENA Technical Specification 41-36, *Switchgear for service up to 36 kV (cable and overhead conductor connected)*

[N7] ENA Technical Specification 41-37, *Switchgear for use on 66 kV to 132 kV distribution systems*

[N8] ENA Technical Specification 37-1, *400 V a.c. switchgear, controlgear and fusegear assemblies*

[N9] ENA Technical Specification 37-2, *Public electricity network distribution assemblies*

[N10] ENA Technical Specification 50-18, *Application of ancillary electrical equipment*

3 Terms and definitions

For the purposes of this document Clause 3 of BS EN ISO 12944-1 shall apply as supplemented with the following terms and definitions.

3.1
atmospheric-corrosivity category
category to describe the ability of an environment to cause corrosion taking into account different atmospheric conditions

3.2
enclosure
kiosk or similar housing for plant and equipment

3.3
equipment
items of electrical equipment associated with plant including ancillary equipment

3.4
EREC
Engineering Recommendation

3.5
multi-coat system
multiple layers of coatings, which act together as one system to provide corrosion protection

3.6
panel
section or representative sample of an enclosure

3.7
plant
switchgear, transformer, instrument transformer and similar main plant for use on the electricity network

3.8
structure
prefabricated items designed to be assembled to support plant and/or equipment

4 Classification of environments

4.1 General

For the purpose of determining corrosion behaviour and corrosion rates the following classification of environments shall apply.