Australian Standard®

Cathodic protection of metals

Part 2: Compact buried structures

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The following interests are represented on Committee MT/14:

Aluminium Development Council
Australasian Corrosion Association
Australian Gas Association
Australian Institute of Steel Construction
Australian Zinc Development Association
Austroads
Bureau of Steel Manufacturers of Australia
Confederation of Australian Industry
Department of Defence
Electricity Supply Association of Australia
Engineering and Water Supply Department, South Australia
Railways of Australia Committee
States Electrolysis Committees
Telecom Australia
University of New South Wales

Additional interests participating in preparation of Standard:

Corrosion consultants
Department of Minerals and Energy, N.S.W.
Gas and Fuel Corporation of Victoria
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PREFACE

This Standard was prepared by the Standards Australia Committee on the Corrosion of Metals under the direction of the Metals Standards Board, at the request of industry, to provide a Standard for the guidance of owners of underground structures which are to be cathodically protected. It is not intended to be a complete cathodic protection design manual and those requiring further information should refer to the other Standards mentioned, to text books on the subject or to appropriate corrosion prevention specialists.

During preparation of this Standard, account was taken of the regulations of the various State Authorities, which differ in their approach to cathodic protection.

This Standard forms one of a proposed series of Standards which cover the cathodic protection of metals. The first in the series is AS 2832.1, *Pipes, cables and ducts*.

Other Standards which are in the course of preparation and provide guidelines on cathodic protection cover compact immersed structures such as offshore platforms and jetties, internal surfaces of items such as water storage tanks, and the design of cathodic protection systems for boats.

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FOREWORD

Corrosion of a metal is an electrochemical reaction between the metal and its environment which results in wastage of the metal. Thus corrosion is a combination of chemical effects with an associated flow of electrical energy (corrosion current).

In many practical situations where it is impossible to change the nature of the environment, corrosion may be prevented by employing cathodic protection. This is achieved by applying an appropriate direct current flowing in opposition to the original corrosion current, thus stopping the natural tendency of the metal to react with its environment. In practice, the electrical potential of the metal at risk is used to judge whether its protection is being adequately achieved.

To employ cathodic protection, a circuit is established by connecting a suitable source of direct current to the structure to be protected.

Two types of cathodic protection system are available:

(a) Galvanic anode systems, which employ buried metallic anodes which sacrifice themselves to provide the source of direct current for protection of the structure.

(b) Impressed current systems, which employ an external electrical power source of direct current for the protection of the structure.

Corrosion control for a structure should be considered at the conceptual design stage. Factors which affect the corrosion of buried or partially buried metallic structures are listed in Paragraph A3 of Appendix A. The practices recommended in this Standard relate to steps that need to be taken following a decision to apply cathodic protection to a structure. These steps are as follows:

(i) Decide whether the structure should be coated. If the decision is to coat, then decide what particular coating system should be employed. If the structure is already installed, a determination should then be made as to whether the nature and quality of the coating are compatible with cathodic protection.

(ii) Design the structure to be compatible with cathodic protection and to include cathodic protection facilities during construction. If the structure is already installed, determine the measures to be taken to apply cathodic protection effectively, and the facilities necessary for cathodic protection monitoring.

(iii) If necessary, design the cathodic protection system to include provisions for the mitigation of stray current effects. If the structure is already installed, the design parameters may be measured and an optimum design provided for the mitigation of stray current effects. If the structure is not installed, a number of assumptions will be required for the estimation of design parameters, and an adequate design for the mitigation of stray current effects may not be possible to achieve.

During the cathodic protection design stage, consideration should be given to the possibility that interference with foreign structures in the area may occur. In some circumstances this interference may only be resolved by field testing subsequent to installation.

(iv) Install the cathodic protection system.

NOTE: Legislation in some States requires that a permit be obtained prior to the installation of a cathodic protection system.

(v) Commission the cathodic protection system after achieving a balance of cathodic protection current, to enable the entire structure to be protected with minimum current, and with as uniform a potential over its surface as is practicable. Equipment installed for the mitigation of stray current effects should be balanced for optimum performance.

Carry out interference testing and satisfy all parties involved that any interference problems have been resolved, giving attention to regulatory requirements (if any) of the State in which the system is installed.

(vi) Monitor cathodic protection at regular intervals, adjusting the conditions of operation as necessary, and maintain complete records of its operation.

STANDARDS AUSTRALIA

Australian Standard
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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard provides guidelines for the cathodic protection of external surfaces of compact buried structures, including tank farms, service station tanks, tower footings, steel pilings (in soil), short well casings, compressor and pump stations and associated pipework.

The Standard specifically covers the following subjects which relate to cathodic protection:

(a) The design of structures requiring cathodic protection.

(b) Coatings for use on buried metal structures.

(c) Criteria for choice of cathodic protection potential.

(d) The design of cathodic protection systems.

(e) The installation of cathodic protection systems.

(f) The control of interference currents on foreign structures.

(g) The cathodic protection of structures subject to stray direct current.

(h) The operation and maintenance of cathodic protection systems.

NOTES:

1 A different approach is required to achieve satisfactory protection of mounded installations to that for installations buried below ground.

2 Guidance on the general use and design of cathodic protection systems, and factors affecting the corrosion of buried metallic structures, are given in Appendix A.

3 This Standard employs positive current flow, and uses the potential sign conventions specified in AS 1852.

1.2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

1020 The control of undesirable static electricity

1076 Code of practice for selection, installation and maintenance of electrical apparatus and associated equipment for use in explosive atmospheres (other than mining applications)

1076.1 Part 1: Basic requirements

1100 Technical drawing

1100.401 Part 401: Engineering survey and engineering survey design drawing

1518 Extruded high density polyethylene protective coating for pipes

1627 Metal finishing—Preparation and pretreatment of surfaces

1627.4 Part 4: Abrasive blast cleaning

1627.7 Part 7: Hand tool cleaning of metal surfaces

1768 Lightning protection

1852 International electrotechnical vocabulary

2043 Coal-tar and synthetic (fast dry) primers for steel pipes

2044 Coal-tar enamel for steel pipes

2045 Materials associated with the coating and lining of steel pipes with coal-tar primer/enamel systems

2046 Code of practice for the coating and lining of steel pipes with coal-tar primer/enamel systems

2239 Galvanic (sacrificial) anodes for cathodic protection

2430 Classification of hazardous areas

2430.1 Part 1: Explosive gas atmospheres

2518 Fusion-bonded low-density polyethylene coating for pipes and fittings

3000 SAA Wiring Rules

3100 Approval and test specification—Definitions and general requirements for electrical materials and equipment