NACE Standard RP0387-99
Item No. 21036
$18 List, $14 NACE Members

Standard
Recommended Practice

Metallurgical and Inspection Requirements for Cast Galvanic Anodes for Offshore Applications

This NACE International standard represents a consensus of those individual members who have reviewed this document, its scope, and provisions. Its acceptance does not in any respect preclude anyone, whether he has adopted the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not in conformance with this standard. Nothing contained in this NACE International standard is to be construed as granting any right, by implication or otherwise, to manufacture, sell, or use in connection with any method, apparatus, or product covered by Letters Patent, or as indemnifying or protecting anyone against liability for infringement of Letters Patent. This standard represents minimum requirements and should in no way be interpreted as a restriction on the use of better procedures or materials. Neither is this standard intended to apply in all cases relating to the subject. Unpredictable circumstances may negate the usefulness of this standard in specific instances. NACE International assumes no responsibility for the interpretation or use of this standard by other parties and accepts responsibility for only those official NACE International interpretations issued by NACE International in accordance with its governing procedures and policies which preclude the issuance of interpretations by individual volunteers.

Users of this NACE International standard are responsible for reviewing appropriate health, safety, environmental. and regulatory documents and for determining their applicability in relation to this standard prior to its use. This NACE International standard may not necessarily address all potential health and safety problems or environmental hazards associated with the use of materials, equipment, and/or operations detailed or referred to within this standard. Users of this NACE International standard are also responsible for establishing appropriate health, safety, and environmental protection practices, in consultation with appropriate regulatory authorities if necessary, to achieve compliance with any existing applicable regulatory requirements prior to the use of this standard.

CAUTIONARY NOTICE: NACE International standards are subject to periodic review, and may be revised or withdrawn at any time without prior notice. NACE International requires that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of initial publication. The user is cautioned to obtain the latest edition. Purchasers of NACE International standards may receive current information on all standards and other NACE International publications by contacting the NACE International Membership Services Department, P.O. Box 218340, Houston, Texas 77218-8340 (telephone +1 [281]228-6200).

Revised 1999-06-24
Reaffirmed April 1990
Approved June 1987
NACE International
P.O. Box 218340
Houston, Texas 77218-8340
+1 (281)228-6200

ISBN 1-57590-081-5

Foreword

The purpose of this standard recommended practice is to set minimum physical quality and inspection standards for cast galvanic anodes for offshore applications. The objectives of this standard are (1) to standardize an industry-wide practice that can be used by consultants, manufacturers, and users to define the physical requirements of cast galvanic anodes; and (2) to be specific enough to assist the inspection authority in its task of confirming that cast galvanic anodes comply with the physical requirements.

This standard is complementary to NACE Standard RP0176, "Corrosion Control of Steel Fixed Offshore Platforms Associated with Petroleum Production,"[1] and with respect to its limited offshore content, the British Standards Institution (BSI)(1) 7361, Part 1.[2]

The manufacturer should have a documented quality plan for the manufacture and inspection of cast galvanic anodes. The content and development of the quality plan and associated documentation is outside the scope of this standard.

This standard was originally prepared in 1987 by NACE Task Group T-7L-5, a component of Unit Committee T-7L on Cathodic Protection, in association with a working group of the Corrosion Control Engineering Joint Venture (CCEJV), sponsored by NACE International and the Institute of Corrosion Science and Technology (ICorr).(2) This standard was reaffirmed in 1990 and revised in 1999, and is issued by NACE International under the auspices of Group Committee T-7 on Corrosion by Waters.

In NACE standards, the terms *shall*, *must*, *should*, and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual*, 3rd. ed., Paragraph 8.4.1.8. *Shall* and *must* are used to state mandatory requirements. *Should* is used to state that which is considered good and is recommended but is not absolutely mandatory. *May* is used to state that which is considered optional.

(1) British Standards Institution, 389 Chiswick High Road, London W4 4AL, United Kingdom.
(2) Institute of Corrosion Science and Technology (ICorr), P.O. Box 253, Leighton Buzzard, Bedfordshire LU7 7WB, United Kingdom.

NACE International
Standard
Recommended Practice

Metallurgical and Inspection Requirements for Cast Galvanic Anodes for Offshore Applications

Contents

Section 1: General

1.1 This standard defines minimum physical quality and inspection standards for cast galvanic anodes for offshore applications.

1.2 This standard is applicable to typical offshore platform anode configurations, and although some aspects of the standard may be relevant to all galvanic anodes, it is not intended to apply to bracelet, tank, pipeline, or extruded anodes, or generally to anodes below 50 kg (110 lb) net weight.

1.3 This standard is applicable to cast galvanic anodes used on offshore structures, e.g., cast galvanic anodes with circular or trapezoidal cross-sections, with length substantially greater than width, and generally of a "stand-off" (having extensions to the steel insert to achieve stand-off) or flush-mounted configuration.

1.4 The manufacturer shall be responsible for meeting the quality levels specified in this standard. The user may determine the extent of inspection to be conducted to prove compliance with the quality specified.

Section 2: Definitions

Batch: A group of anodes produced before, between, or after a significant interruption of the casting sequence of a heat of anodes.

Cast Galvanic Anode: A metal that provides sacrificial protection to another metal that is more noble when electrically coupled in an electrolyte. This type of anode is the electron source in one type of cathodic protection.

Certificate of Conformity: A written statement made by the representative (executive) of the manufacturer and endorsed by a representative of the user that the anodes listed comply with the requirements of the purchase order.

Cold Lap: Horizontal discontinuity caused by solidification of the meniscus of a partially cast anode as a result of interrupted flow of the molten metal, following which the solidified meniscus is covered with molten metal when the flow resumes. Cold laps can occur along the length of an anode.

Cold Shut: Horizontal surface discontinuity caused by solidification of a portion of a meniscus during the progressive filling of a mold, which is later covered with more solidifying metal as the molten metal level rises. Cold shuts generally occur at corners remote from the point of pour.

Cracking: Fracture of metal along an irregular path producing a discontinuity similar to a ragged edge. It can occur during the solidification of an anode (hot cracking), during the contraction of an anode after solidification, or under externally applied loads. Hot cracking may be associated with the shrinkage depression that can occur in open-topped molds.

Electrochemical Properties: Those properties of potential and current capacity that characterize a galvanic anode and that can be assessed by quantitative tests.

Heat: The product that is cast to a planned procedure in one melting operation in one furnace, without significant interruption. It is also called a melt and defines the molten metal and identifies the anodes cast from it.

Insert: The form over which the anode is cast and that is used to connect the anode to the structure requiring protection. It is sometimes referred to as a core.

Low-Carbon Steels: Steels having less than 0.30% carbon and no intentional alloying additions.

Nonmetallic Inclusions: Particles of oxides and other refractory materials entrapped in liquid metal during the melting or casting sequences.

Porosity: Generally distributed fine holes caused by gas bubbles, shrinkage (formed by the starvation of eutectic material within the dendrite arms during "unfed" solidification), or a combination of the two mechanisms when hydrogen in solution diffuses into the lower-pressure shrinkage voids.

Protrusion: Extraneous material on the anode surface. It may interfere with the anode-to-structure fit, appear unattractive, and be a safety hazard if there are sharp edges. Protrusions can be formed by careless filling of the mold or the flash from imperfect fitting of mold sections.

Rimming (Rimmed) Steels: Incompletely deoxidized steels. (See ASM[3] Handbook[3] for a comprehensive definition.)

Rust Discoloration: A brown bloom of iron oxide.

Sample: A representative specimen.

[3] ASM International (formerly American Society for Metals), 9639 Kinsman Rd., Materials Park, OH 44073.