



Exploration & Production

GENERAL SPECIFICATION

CORROSION

GS EP COR 112

External cathodic protection of Onshore deep well casing

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1. Scope

This specification covers the rules applicable to cathodic protection systems for the anticorrosion protection ([ISO 8044](#)) of the external surface of deep well casing used for hydrocarbon, gas or water deep wells. It covers the minimum requirements for the design, installation and commissioning of such external cathodic protection systems.

Should such well casing be located in restricted areas such as plants, stations, treatment or storage centres, cathodic protection system shall be designed considering not only this specification but also General Specification [GS EP COR 111](#) related to cathodic protection of onshore facilities.

Similarly, possible interferences with buried flowlines or pipelines shall be studied according to General Specification [GS EP COR 110](#) related to cathodic protection of pipelines.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. In the case of conflict between this General Specification and the requirements of these documents, the requirements of this General Specification shall apply. Similarly, in the case of conflict between the documents below, [NACE RP 0186](#) shall apply before [EN 15112](#). Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
BS 1377 (Parts 3; 9)	Methods of tests for soils for civil engineering purposes – (Parts 3; 9)
BS 7361-1	Cathodic protection – Part 1: Code of Practice for land and marine applications
EN 13509	Cathodic protection measurement techniques
EN 14505	Cathodic protection of complex structures
EN 15112	External cathodic protection of well casings
EN 12954	Cathodic protection of buried or immersed metallic structures - General principles
IEC 227	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V
IEC 502	Characteristics and constitution of cables
IEC 529	Degrees of protection provided by enclosures (IP code)
IEC 79	Electrical apparatus for explosive gas atmospheres
ISO 8044	Corrosion of metals and alloys - Basic terms and definition

**Professional Documents**

Reference	Title
NACE RP 0186	Application of cathodic protection for external surfaces of steel well casings
NACE TM 0497	Measurement techniques related to criteria for cathodic protection on underground or submerged metallic piping systems
NACE RP 0169	Control of external corrosion on underground or submerged metallic piping systems
NACE RP 0177	Mitigation of alternating current and lightning effects on metallic structures and corrosion control systems
NACE RP 0286	The electrical isolation of cathodically protected pipelines
NACE RP 0572	Design, installation, operation and maintenance of impressed current deep ground beds

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

**Total General Specifications**

Reference	Title
GS EP COR 110	Design of cathodic protection of buried pipelines
GS EP COR 111	External cathodic protection of onshore facilities
GS EP COR 210	Monolithic insulating joints
GS EP ELE 031	Design of earthing and bonding systems
GS EP ELE 051	Design and installation of lightning protection
GS EP ELE 079	Electrical apparatus for explosive gas atmosphere
GS EP ELE 141	Power Transformers
GS EP PLR 420	Site welding of carbon steel pipelines to API 1104 and DNV-OS-F101 (sweet service)
GS EP PLR 421	Site welding of carbon steel pipelines to API 1104 and DNV-OS-F101 (mild, intermediate and severe sour service)

3. General requirements

3.1 Qualification and Certification

Design of cathodic protection systems to be installed on facilities shall be carried out exclusively by competent specialised personnel. Qualification of each of the specialists working for such a design shall be demonstrated by Contractor to Company before commencement of the work. Therefore the verification of the formal Certification of the individuals shall comply with the following requirements:

- Conventional design work, supervision of installation and pre-commissioning to be carried out by certified personnel at level 2 for all Certification schemes except for NACE International where it shall be level 3
- Complex design work, verification or commissioning to be carried out by certified personnel at level 3 for all Certification schemes except for NACE International where it shall be level 4.

Accepted Certification schemes are AFAQ AFNOR Competence (Land Application Sector), APCE (Land Application Sector), Institute of Corrosion, NACE International. Any other Certification scheme shall be approved by Company.

Any use of non certified personnel for cathodic protection design shall be subject to the approval of Company on a case by case basis (demonstration of competence through detailed curriculum vitae and description of experience) or even interviews.

3.2 Sub-contractors

If Contractor intends to subcontract all or part of the scope of work, its sub-contractor shall be approved by Company.

In any case, Contractor remains fully responsible for the successful completion of the cathodic protection project.

In the case of complex installations or for any reason calling for the simultaneous intervention of several Contractors, Contractor shall ensure coordination and compatibility of the various cathodic protection studies, the standardisation of equipment, interface management, the preparation of an overall start-up and commissioning plan, and the issue of a common final report.

3.3 Definition of tasks

Unless the contract specifies otherwise, a cathodic protection project shall include all of the tasks listed below.

3.3.1 Study

The study comprises:

- The collection of all documents and information with regards to the design of the wells to be protected, and the characteristics which are likely to influence the design of the cathodic protection system, such as but not limited to:
 - Drawing of geological cross section of the field
 - Detailed map showing wells location
 - Work Over schedule
 - Wells summary with all necessary information (type, age, depth, location)
 - Quality of cementing
 - Well integrity
 - Casing drawings for a selection of representative wells
 - Report on wells & flowline cathodic protection status.
- The site survey which shall collect all relevant information and measurements required for the cathodic protection design (see § 4).
- The collection of all documents and information with regards to the work area: presence of nearby metallic structures whether cathodically protected or not, presence of works likely to generate stray currents, presence of high voltage cables or transmission lines, electric power stations, transformer stations, etc., which may impact cathodic protection efficiency or, if faulty, may damage the installation.
- The collection of all information with regards to the availability of electrical power for the supply of cathodic protection installations.
- The preparation of a detailed report comprising:
 - An analysis of all information gathered and measurements taken, and an estimate of corrosion risks
 - Justified design hypotheses
 - The list, areas and nature of the structures to be protected and considered as DC consumers

- The technical requirements to be followed by other disciplines (civil works, piping, electricity) for electrical continuity and/or discontinuity of metallic structures
- A technical and cost evaluation of power supply options (solar, TEG, AC availability, etc.)
- Design notes justifying the sizing and layout of equipment: anodes, transformers-rectifiers, cables, etc. Unless otherwise specified, the cathodic protection system will be designed for a service life of 20 years minimum
- A list of materials, including assembly accessories, and the corresponding technical specifications
- A list of potential suppliers
- Schematics of the proposed system
- Detailed equipment drawings.
- Detailed installation drawings, indicating:
 - The location of insulating joints if any
 - Electrical bonding or insulation to be installed
 - The layout of different types of equipment and the relevant installation procedure
 - Wiring diagram for electrical equipment.
- Installation instructions indicating all precautions to be taken. Particular emphasis shall be placed on the construction of:
 - Ground beds
 - Connections on anode circuits
 - Insulations between protected and non protected items
 - Insulations between items protected by different systems
 - Insulations between items protected by the same system, which must be separated temporarily for various operational reasons
 - Influence correctors between the work to be protected and neighbouring works
 - Reference electrode installations at fixed points.
- Instructions for checks and inspection during the works and testing upon completion during start-up.

The location of DC power equipment (rectifier, drain point, current distribution, anodes, interconnection and insulating joint boxes) shall be outside of hazardous areas to allow permanent access.

3.3.2 Equipment supply

Unless otherwise specified, supply of all equipment shall be the responsibility of Contractor. Contractor shall also supply the spare parts recommended by the Vendor for a two year operating period.

Contractor shall also supply all spare parts which are required for start-up of the installation.