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COURSE BROCHURE

Cathodic Protection Design and Survey Advanced Training Course

31 January – 11 February 2027
Muscat

Cathodic Protection Design and Survey Advanced Training Course

Ref: 505_18679 **Date:** 31 January – 11 February 2027 **Location:** Muscat **Fees:** 11700 GBP

Cathodic Protection Design and Survey is a 2-week advanced training course for corrosion engineers, pipeline integrity engineers and maintenance specialists, in which each participant builds a cathodic protection design and survey plan for a pipeline, tank or plant facility. Ageing buried assets, tighter integrity expectations and crowded right-of-way corridors make sound protection design a safeguard against leaks. Jupiter Prime Training delivers Cathodic Protection Design and Survey for asset integrity teams.

Why Cathodic Protection Design and Survey Matters Now

Three pressures shape cathodic protection today: buried steel installed decades ago now outlives its original anode systems, new power lines and electrified rail share corridors with pipelines and create stray current, and integrity managers expect survey records that prove protection rather than assume it. An operator that designs and surveys well extends coating life, avoids external corrosion failures and defends its inspection intervals; one that does not finds holidays only after a leak. The course draws on the cathodic protection practice and education published by the Association for Materials Protection and Performance AMPP and on the equipment standards of the American Petroleum Institute API.

Who Gains Most from Cathodic Protection Design and Survey

- Corrosion specialists who size anode beds, rectifiers and current requirements for new and existing buried structures
- Pipeline integrity specialists who interpret close-interval and coating defect surveys within integrity assessments
- Maintenance and field specialists who inspect test posts, rectifiers and bonds and record potential readings
- Facility specialists responsible for tank bottoms, plant piping, well casings and marine structures
- Electrical specialists who manage transformer-rectifiers, power supplies and AC mitigation on shared corridors

A corrosion section that sends designers, survey crews and integrity analysts together gains most, because readings collected in the field only change decisions when the people who design and assess the system read them the same way.

Cathodic Protection Design and Survey Capabilities

Participants move from electrochemistry to field evidence, sizing systems from soil and coating data and then proving their performance with structured surveys.

- Calculate current demand from coated area, coating breakdown and electrolyte resistivity — anode bed and rectifier sizing
- Weigh sacrificial anode against impressed current schemes for a given structure — capital and maintenance choices
- Design groundbed layouts, cabling and test station spacing for pipelines and tank bottoms — construction and commissioning
- Specify survey methods including close-interval potential and coating defect location — integrity assessment scope
- Assess stray current and AC interference and select mitigation bonds or decoupling — corridor sharing with other utilities
- Build a monitoring schedule with acceptance criteria and data trending — maintenance planning and audit evidence

Key Cathodic Protection Design and Survey Terms

- Cathodic protection — reducing corrosion of a metal surface by making it the cathode of an electrochemical cell through anodes or impressed current.
- Sacrificial anode — a more active metal such as zinc, magnesium or aluminium that corrodes preferentially to supply protective current.
- Impressed current system — a scheme using an external power source, usually a transformer-rectifier, to drive current from inert anodes to the structure.
- Instant-off potential — the structure-to-electrolyte potential measured immediately after current interruption, removing the IR drop error from the reading.
- Close-interval potential survey — a walked measurement of pipe-to-soil potential at short spacing along a pipeline to locate under-protected sections.
- Stray current interference — current from a foreign source that leaves a structure through the electrolyte and causes accelerated corrosion at discharge points.

Cathodic Protection Design and Survey Day by Day

Day 1: Corrosion Mechanisms of Buried and Immersed Steel

- Electrochemical Corrosion Cells — Why Buried Steel Loses Metal at Anodic Sites
- Soil and Water Electrolytes — Resistivity, Chemistry and Corrosivity Ranking
- Microbiologically Influenced Corrosion — Recognising Bacterial Attack on Pipe Surfaces
- Galvanic Series and Dissimilar Metal Couples — Risks at Plant Connections
- Coatings as the First Barrier — How Coating and Protection Share the Load

Day 2: Protection Theory and Acceptance Criteria

- Polarisation and Pourbaix Diagrams — How Cathodic Shift Halts Corrosion
- Reference Electrodes and Potential Measurement — Copper Sulphate and Silver Chloride Cells
- Protection Criteria per AMPP Practice — Instant-Off and Polarisation Shift Thresholds
- IR Drop and Interrupted Readings — Separating True Polarisation From Error
- Overprotection Risks — Coating Disbondment and Hydrogen Embrittlement Limits

Day 3: Design Data and Current Requirements

- Soil Resistivity Surveys With the Wenner Method — Groundbed Location Choices
- Current Density Selection by Coating and Environment — Design Basis Inputs
- Coating Breakdown Factors Over Design Life — Initial and End-of-Life Demand
- Current Requirement Testing on Existing Lines — Retrofit Sizing Evidence
- Design Basis Memorandum — Recording Assumptions for Later Audits

Day 4: Sacrificial Anode System Design

- Anode Alloys and Capacity — Magnesium, Zinc and Aluminium Selection
- Anode Resistance and Output Calculations — Number and Spacing of Anodes
- Anode Life Calculation — Matching Mass to Design Life
- Bracelet Anodes for Subsea Lines and Well Casings — Offshore Applications
- Temporary Protection During Construction — Bridging Installation and Commissioning

Day 5: Impressed Current System Design

- Transformer-Rectifier Rating and Control Modes — Power Supply Selection
- Groundbed Types — Shallow Horizontal, Deep Well and Distributed Anodes
- Mixed Metal Oxide and High-Silicon Iron Anodes — Material Trade-Offs
- Circuit Resistance and Cable Sizing — Voltage Drop and Rectifier Output
- Solar and Remote Power Options — Protection Where Grid Supply Is Absent

Day 6: Pipelines, Tanks and Plant Facilities

- Pipeline Attenuation and Drainage Point Spacing — Long Line Coverage
- Tank Bottom Protection Under API Tank Standards — Grid Anodes and Liners
- Plant Piping and Congested Facilities — Distributed Anode Layouts
- Isolation Joints, Flanges and Casings — Electrical Continuity and Shorts
- Test Station and Bond Box Design — Measurement Access Along the Route

Day 7: Survey Methods and Field Instruments

- Close-Interval Potential Survey With Current Interruption — Locating Weak Protection
- DCVG and ACVG Coating Defect Surveys — Ranking Holidays for Excavation
- Pipeline Current Mapping — Tracing Shorts and Coating Damage
- Data Loggers and GPS Synchronised Interrupters — Field Data Quality
- Survey Interpretation Reports — Linking Readings to Integrity Decisions

Day 8: Interference and Stray Current Control

- DC Stray Current From Foreign Systems and Rail — Detection and Bonding
- AC Interference From Overhead Power Lines — Induced Voltage and Corrosion
- Decoupling Devices and Gradient Control Mats — Mitigation Hardware Selection
- Joint Interference Testing With Neighbouring Operators — Corridor Agreements
- Telluric Current Effects — Correcting Readings in Affected Areas

Day 9: Monitoring, Remote Systems and Records

- Rectifier Inspection and Annual Survey Schedules — Maintenance Calendar Setting
- Remote Monitoring Units and Coupons — Continuous Evidence of Protection
- Trending Potentials and Rectifier Outputs — Spotting Deterioration Early
- Integration With Inline Inspection and Integrity Assessments — Repair Priorities
- Electrical Safety and Hazardous Area Precautions — Safe Rectifier and Survey Work

Day 10: Building a Cathodic Protection Design and Survey Plan for a Pipeline or Facility

- Structure Description and Design Basis — Applying Days 1 to 3 to a Case
- System Selection and Sizing — Applying Days 4 to 6 to the Asset
- Survey Scope and Interference Checks — Applying Days 7 and 8
- Monitoring Schedule and Acceptance Criteria — Applying Day 9 to Operations
- Cathodic Protection Design and Survey Plan — Presenting to an Integrity Panel

Applying Cathodic Protection Design and Survey After the Course

- Lead a review of one pipeline's last close-interval potential survey against instant-off criteria and list the sections needing remedial anodes or rectifier adjustment.
- Run an interference screening of a corridor shared with power lines or foreign pipelines and propose bonds, decoupling devices or joint tests.

Cathodic Protection Design and Survey Questions FAQ

What is cathodic protection design and survey, and why does it matter now?

It is the sizing of anode or impressed current systems and the field surveys that prove they protect buried and immersed steel. Ageing assets, shared corridors and stricter integrity evidence make it central to preventing external corrosion failures.

Which roles gain most from cathodic protection design and survey training?

Corrosion engineers, pipeline integrity engineers, field maintenance staff, facility engineers and electrical specialists gain most. Between them they design systems, run surveys, maintain rectifiers and turn readings into repair decisions.

How does cathodic protection design and survey differ from a general corrosion control course?

It goes deeper into electrical protection alone. A general corrosion course spreads across coatings, inhibitors and materials, while this course concentrates on current requirement calculations, groundbed design, survey techniques, interference and monitoring for pipelines, tanks and plant.

What do you bring back from cathodic protection design and survey training?

You bring back a design and survey plan for one pipeline or facility. It holds the design basis, system sizing, survey scope, interference checks and a monitoring schedule ready for review by your integrity function.

Cathodic Protection Design and Survey: The Way Forward

The cathodic protection design and survey plan gives each participant a documented case for one buried or immersed asset. Its first use is the decision on retrofitting anodes or rectifiers, taken by integrity and maintenance leads. After the first annual survey the current demand and coating breakdown assumptions deserve a fresh look, since field polarisation data often revises the original design basis.