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## Standard Practice

# Performing Close-Interval Potential Surveys and DC Surface Potential Gradient Surveys on Buried or Submerged Metallic Pipelines

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NACE International  
1440 South Creek Drive  
Houston, Texas 77084-4906  
+1 281/228-6200

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## Foreword

This standard practice presents procedures for performing close-interval direct current (DC) structure-to-electrolyte potential surveys, DC surface potential gradient surveys, and hybrid surveys such as trailing-wire direct current voltage gradient (DCVG) surveys or intensive measurement surveys, on buried or submerged metallic pipelines. Cell-to-cell surveys used to evaluate coating effectiveness are described in other NACE publications.<sup>1</sup>

This standard is intended for use by corrosion control personnel involved with operating pipelines, contractors performing close-interval survey (CIS) and other surveys, corrosion professionals interpreting CIS and other survey data, and regulatory agencies. Included are definitions, pre-job considerations, instrumentation and equipment guidelines, methods for IR drop correction, pipe location and marking procedures, survey procedures, hybrid survey procedures, offshore and dynamic stray-current survey procedures, cell-to-cell surface potential gradient surveys, and data validity and post-job considerations.

For accurate and correct application, this standard must be used in its entirety. Using or citing only specific paragraphs or sections can lead to misinterpretation and misapplication of the recommendations and practices presented. Specific practices are not designated for every situation because of the complexity of conditions to which buried or submerged piping systems are exposed.

This standard was prepared by Task Group (TG) 279 on Pipelines: Close-Interval Potential Surveys on Buried or Submerged Metallic Pipelines. TG 279 is administered by Specific Technology Group (STG) 35 on Pipelines, Tanks, and Well Casings, and sponsored by STG 05 on Cathodic/Anodic Protection. This standard is issued by NACE International under the auspices of STG 35.

<p>In NACE standards, the terms <i>shall</i>, <i>must</i>, <i>should</i>, and <i>may</i> are used in accordance with the definitions of these terms in the NACE Publications Style Manual, 4th ed., Paragraph 7.4.1.9. <i>Shall</i> and <i>must</i> are used to state mandatory requirements. The term <i>should</i> is used to state something good and is recommended but is not mandatory. The term <i>may</i> is used to state something considered optional.</p>
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## NACE International Standard Practice

### Performing Close-Interval Potential Surveys and DC Surface Potential Gradient Surveys on Buried or Submerged Metallic Pipelines

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## Section 1: General

### 1.1 Introduction

1.1.1 This standard defines the requirements for performing close-interval potential surveys and DC surface potential gradient surveys on buried or submerged metallic pipelines. For the purposes of this standard, the terms close-interval potential survey (CIPS) and close-interval survey (CIS) are used interchangeably. Procedures for performing hybrid close-interval surveys are given in Section 8. Procedures for performing CIS in marine conditions are given in Section 9. Considerations for dynamic stray current are given in Section 10. Procedures for performing DC cell-to-cell surface potential gradient surveys are given in Section 11. Methods for calculating the net current based on measured voltage drop and pipeline geometry are included in Appendix A (nonmandatory).

### 1.2 Scope

1.2.1 CIS is used to designate a potential survey performed on a buried or submerged metallic pipeline, in order to obtain valid DC structure-to-electrolyte potential measurements at a regular interval sufficiently small to permit a detailed assessment.

1.2.1.1 Types of CIS include data collection prior to application of cathodic protection (CP) (native-state survey), as well as data collection with the CP systems in operation ("on" survey), with the CP current sources synchronously interrupted (interrupted or "on/off" survey), with asynchronous interruption of CP current (waveform analyzer survey), and with CP currents turned off for some time to allow the structure to depolarize (depolarized survey).

1.2.2 A hybrid survey is a CIS combined with other types of measurements such as side drains, lateral potentials, or cell-to-cell surface potential gradients along the pipeline.

1.2.2.1 This standard addresses hybrid survey techniques such as trailing-wire DCVG or intensive measurement surveys (CIS with side drains).

1.2.3 Surface potential gradient surveys are a series of surface potential gradients measured along or normal (perpendicular) to a pipeline.

1.2.3.1 This standard addresses DC cell-to-cell surface potential gradient surveys (e.g., hot-spot surveys, side-drain surveys) used to evaluate the direction of current in the earth and to identify possible anodic areas on a pipeline. AC-voltage gradient surveys (such as ACVG) and cell-to-cell

surveys (such as traditional DCVG) used to evaluate the effectiveness of the coating are described in other NACE publications.<sup>1</sup>

1.2.4 This standard includes procedures to perform these types of surveys along a buried or submerged pipeline. The standard acknowledges that all potential measurements contain error, and includes some guidance to minimize the error in each measurement. The standard does not address interpretation of survey data. A qualified person must determine whether the data contain an acceptable amount of error and can be used to evaluate the level of cathodic protection.

### 1.3 Qualifications

1.3.1 The provisions of this standard should be applied under the direction of competent persons who, by reason of knowledge of the physical sciences and the principles of engineering and mathematics acquired by education and related practical experience, are qualified to engage in the practice of corrosion control on buried or submerged metallic piping systems. Such persons may be registered professional engineers or persons recognized as Corrosion Specialists, CP Specialists, or Corrosion or CP Technologists by NACE if their professional activities include suitable experience in the collection and evaluation of these types of data used to monitor external corrosion control of buried or submerged metallic piping systems.

1.3.2 Persons performing these types of surveys (for the purposes of this standard, called surveyors) must be qualified to understand and follow the applicable procedures contained in this standard or work under the direct supervision of a person that is qualified. Such persons may be recognized as NACE CP Testers, Corrosion or CP Technicians, Technologists, Specialists, or equivalent if their professional activities include suitable experience in performing surveys of buried or submerged metallic piping systems.

### 1.4 Survey Impediments

1.4.1 Certain conditions can make the data from a survey difficult to interpret properly, or make the survey impractical to perform. Examples include:

#### 1.4.1.1 Areas of high contact resistance:

1.4.1.1.1 Pipe located under concrete or asphalt pavement—Contact resistance may be reduced by drilling through the paving to permit electrode contact with the soil (see Paragraph 7.3.2).