

# Special Specification Item 4158

## Cathodic Protection Monitoring System



### 1. DESCRIPTION

Furnish all labor, tools, materials, equipment, and services necessary to convert the existing 18 bent cap manual test stations to remote monitoring systems. Includes installation of permanent reference electrodes, monitoring equipment, software, and user manuals or instructions.

### 2. MATERIALS

**Remote Monitoring Equipment Requirements:** Provide equipment specifically intended for remote monitoring of cathodic protection (CP) systems and meeting the requirements outlined below.

2.1. **Reference Electrodes:** provide one of the following solid state silver-silver chloride (Ag-AgCl) electrodes intended for buried and concrete applications listed below. Include #14 RHW (minimum) lead wires of sufficient length to avoid splices. Provide reference electrodes with a minimum design life of 25 years.

- Stealth 6 manufactured by Borin Manufacturing, Inc.
- Model CM manufactured by Electrochemical Devices, Inc.
- WE100 by Silvion
- Approved equal

Provide concrete patch material meeting electrical conductivity requirements of reference electrode manufacturer and without polymer additives.

2.2. **Remote Monitoring System:** Provide system intended for marine reinforced concrete applications capable of making the following measurements at time increments selected or adjusted remotely by the Department:

- Current over a shunt
- Structure-to-electrolyte potential measurements using installed reference electrode(s)
- Temperature
- Automated or manual polarization decay testing in general accordance with Test Method 2 of NACE TM0497 (with adjustable test durations)

2.2.1. Sensors and System:

- Adjustable sample rates
- Minimum of four channels
- Battery powered with a minimum life of 4 years before replacement is required
- Low battery warning

2.2.2. Communication:

- Data wirelessly transmitted via cellular or satellite transmissions
- Web-based portal for viewing and processing obtained data
- Full remote control
- Customizable alerts based on data thresholds (e.g. reference potential below a certain value) and system performance (e.g. low battery)

2.2.3. Use one of the following manufacturers:

- Elecsys Corporation

- Mobiltex Data Ltd.
- Vector Corrosion Services
- Approved equal

### 2.3. Submittals

Reference Electrodes: Manufacturer's literature and technical data for selected reference electrodes.

Shop Drawings showing installation methods and concrete repair details for reference electrodes. Include manufacturer's literature and technical data for concrete patch material used for installation of reference electrodes, with electrical conductivity test data in accordance with ASTM C1760.

Remote Monitoring System Information: Manufacturer's literature and technical data for remote monitoring system selected. Submitted data should include:

- System features and capabilities
- Equipment installation and operation instructions
- Method of connection to the structure
- Tutorial or instructions to navigate web-based portal (and mobile applications, if applicable)

Manufacturer's Warranty: Provide a manufacturer's warranty including the coverage summarized below for each individual product used as part of the remote monitoring system.

- Repair or replacement of parts that do not comply with requirements; defective components; that does not remain watertight; that fails in general durability; or that deteriorates in a manner not clearly specified by the manufacturer's data as an inherent quality of the product for the application intended.
- Replacement of the defective or deteriorating products.
- Warranty does not cover damage caused by individuals, boaters, or other outside agents.
- Warranty does not cover malfunctioning of systems due to improper installation.
- Warranty Period for Products: 3 years from date of substantial completion
- Warranty Period for Batteries: 1 year from date of substantial completion

#### 2.3.1. Installer's Warranty: Provide a System installer workmanship warranty including the coverage summarized below:

- Repair or replacement of a system that is installed in a different manner than that in the manufacturer's literature, shop drawings, and/or engineering drawings and/or is malfunctioning due to defective installation.
- Labor and products to perform warranty Work and repair any malfunctioning systems to as-designed functionality.
- Warranty does not cover damage caused by individuals, boaters, or other outside agents.
- Warranty does not cover system malfunctioning due to defective or deteriorating products.
- Warranty Period for Workmanship: 1 year from date of substantial completion

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## 3. CONSTRUCTION

**Installer Qualifications:** Provide installers certified or trained by remote monitoring system manufacturer. Engage a NACE-qualified cathodic protection technician (CP-2 qualification or higher) to perform electrical testing and commissioning of the cathodic protection monitoring system. Provide a manufacturer's technical representative to be on-site during commissioning and testing of each installation.

**Installation:** Comply with manufacturer installation instructions and requirements.

- Ensure that work performed under other Items is complete and ready for remote monitoring system installation.

- Notify Engineer in writing of conditions which may adversely affect installation or performance of remote monitoring systems and recommend corrections.
- Do not proceed with remote monitoring system installation Work until adverse conditions have been corrected and reviewed by manufacturer.
- Install remote monitoring system following the system manufacturer's recommendations.

**Commissioning:** Confirm, using the Manufacturer representative, proper installation and functioning of all 18 cathodic protection remote monitoring systems. Perform the following tests on each cathodically protected member after completed installation and present findings in a written report:

- Electrical continuity between negative connections
- Electrical short testing
- Current Output
- Potential measurements
- Polarization decay and polarization development

**Training and Instruction.** Provide training or instruction in the use of web-based or mobile application based platforms for system monitoring and control. Provide written instructions and procedures for department records.

#### 4. MEASUREMENT

This item will be measured as Lump Sum.

#### 5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under *Measurement* will be paid for at the unit price bid for *Cathodic Protection Monitoring System*. This price is full compensation for installing reference electrodes, wiring, junction boxes, and system components; testing and commissioning of the systems, instructing Department personnel on system operation; and equipment, labor, tools, and incidentals.