

Part 1 General

1.1 SUMMARY

- .1 This Section includes furnishing all labor, tools, materials, equipment and services necessary to properly install embedded galvanic anodes.
- .2 Embedded galvanic anodes are designed to provide localized corrosion protection. When placed at the appropriate spacing along the perimeter of concrete patches or along the interface between new/existing concrete, the anodes mitigate active corrosion and the formation of new corrosion sites in the existing concrete in adjacent areas.

1.2 RELATED SECTIONS

- .1 Section 03 20 00 – Concrete Reinforcing.
- .2 Section 03 91 10 – Surface Preparation for Concrete Delamination Repair.
- .3 Section 03 92 10 – Top Surface Repairs
- .4 Section 03 93 30 – Form and Pour.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 546R-14, Concrete Repair Guide.
 - .2 ACI 562-19, Code Requirements for Evaluation, Repair and Rehabilitation of Concrete Buildings
 - .3 ACI RAP-8, Installation of Embedded Galvanic Anodes.
- .2 Canadian Standards Association (CSA)
 - .1 CSA- S448.1-10(R2020), Repair of Reinforced Concrete in Buildings.
- .3 International Concrete Repair Institute (ICRI)
 - .1 ICRI concrete Repair Terminology (2010 Edition).
 - .2 ICRI Guideline No. 120.1–2009, Guidelines and Recommendations for Safety in the Concrete Repair Industry.
 - .3 ICRI Guideline No. 130.1R–2009, Guide for Methods of Measurement and Contract Types for Concrete Repair Work (formerly No. 03735).
 - .4 ICRI Guideline No. 310.1R–2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly No. 03730).
 - .5 ICRI Guideline No. 310.2–1997, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (formerly No. 03732).

1.4 MEASUREMENT PROCEDURES

- .1 Patches to receive galvanic anodes, and frequency of installation, will be identified by the Contract Administrator.
- .2 The unit price submitted will apply to supply and installation of one (1) galvanic anode.

1.5 QUALITY ASSURANCE

- .1 Field Mock-up:

- .1 Install field mock-up at Project site or pre-selected area of building or location approved by Contract Administrator. Install material in accordance with this Section.
- .2 Field mock-up will be standard for judging workmanship on remainder of Project.
- .3 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .2 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
- .3 Keep materials in manufacturer's original, unopened containers and packaging until installation.
- .4 Protect materials during storage, handling, and application to prevent contamination or damage.

Part 2 Products

2.1 MATERIALS

- .1 Embedded galvanic anodes shall meet the following requirements:
 - .1 A highly alkaline cementitious shell.
 - .2 Contain no added constituents corrosive to reinforcing steel or detrimental to concrete, e.g. chloride, bromide, sulfates, etc.
 - .3 Anode units shall be alkali-activated and supplied with solid zinc core cast around integral unspliced, uncoated, non-galvanized double loop steel tie wires.
 - .4 Anode units shall be supplied with integral non-galvanized, unspliced tie wires such that the zinc anode is connected to the reinforcement with a continuous, unspliced wire
 - .1 Acceptable Product: Galvashield XP4 by Vector Corrosion Technologies.
- .2 Repair materials:
 - .1 Concrete and bonding agents shall be Portland cement-based materials. Non-conductive repair materials such as epoxy, urethane, or magnesium phosphate shall not be permitted. Insulating materials such as epoxy bonding agents shall not be used unless otherwise noted.
 - .2 Anodes used with repair materials having saturated bulk resistivity of 50,000 ohm-cm or greater, shall be embedded in manufacturer approved mortar to create a conductive bridge to the substrate prior to repair material installation.

Part 3 Execution

3.1 PREPARATION

- .1 Complete concrete delamination repairs and surface preparation to Section 03 91 10.

3.2 INSTALLATION

- .1 Install anode units and repair material immediately following preparation and cleaning of the steel reinforcement.

- .2 Install galvanic anodes in patch repair locations identified by the Contract Administrator. Install along the perimeter of the repair or interface as follows:
 - .1 Along the perimeter of full depth and through-slab repairs.
 - .2 At a maximum spacing of 18" on centre along beam and slab top surface repairs.
 - .3 Anode spacing will vary with changes in the reinforcing steel density, the level of chloride in the structure and the corrosivity of the local environment, etc.
- .3 Provide sufficient clearance between anodes and substrate to allow repair material to encase anode.
- .4 Secure the galvanic anodes as close as possible to the patch edge using the anode tie wires.
- .5 The tie wires shall be wrapped around the cleaned reinforcing steel and twisted tight to allow little or no free movement.
 - .1 If less than 1 inch (25 mm) of concrete cover is expected, place anode beside or beneath the bar and secure to clean reinforcing steel.
 - .2 If sufficient concrete cover exists, the anode may be placed along a single bar or at the intersection between two bars and secured to each clean bar.
- .6 If repair materials with resistivity greater than 50,000 ohm-cm are to be used or the resistivity is unknown, create a conductive grout bridge between the anode and the substrate. Pack manufacturer approved mortar to cover minimum area of 4 in (100mm) in diameter between the anode and the substrate concrete ensuring no voids exist.
- .7 Electrical Continuity
 - .1 Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm, Ω) or potential (mV) with a multi-meter.
 - .2 Electrical connection is acceptable if the DC resistance measured with multi-meter is less than 1 Ω or the DC potential is less than 1 mV.
 - .3 Confirm electrical continuity of the exposed reinforcing steel within the repair area. If necessary, electrical continuity shall be established with steel tie wire.
 - .4 Electrical continuity between test areas is acceptable if the DC resistance measured with multi-meter is less than 1 Ω or the potential is less than 1 mV.

3.3 CONCRETE OR MORTAR PLACEMENT

- .1 Pre-wet the concrete surface and the anode units to achieve a saturated surface dry condition, and then complete the repair according to the appropriate Section.
- .2 Do not soak the anode units for greater than 20 minutes.
- .3 Repair materials with significant polymer modification and/or silica fume content may have high resistivity. Similarly, if bonding agents are used, they shall have suitable conductivity. Do not use insulating materials such as epoxy bonding agents.
- .4 Following normal concrete repair procedures complete the repair with the repair material, taking care not to create any air voids around the anode.

END OF SECTION