



**SPECIAL PROVISIONS  
FOR  
BEAM END GALVANIC CORROSION PROTECTION**

**Linn County  
MBIN-380-6(552)20--0M-57**

**Effective Date  
March 15, 2016**

**THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**150068.01 DESCRIPTION.**

**A. General.**

The external zinc anodes are used to provide galvanic corrosion protection to reinforced concrete structures. The system is applied to concrete surfaces and connected electrically to the embedded reinforcing steel. Once installed, the zinc anode corrodes preferentially to the surrounding rebar and prestressing strands, thereby providing galvanic corrosion control or cathodic protection to the adjacent reinforcing steel.

**B. References.**

- ACI 222R Protection of Metal in Concrete Against Corrosion
- ASTM B 6 standard Specification for Zinc
- ASTM B 69 Standard Specification for Rolled Zinc
- ICRI 03732 Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

**C. Submittals.**

1. Submit qualifications of National Association of Corrosion Engineers (NACE) - certified Cathodic Protection Technician and certified Cathodic Protection Specialist employed by the corrosion mitigation system company. Qualifications shall include a copy of NACE certifications and documentation verifying experience in the installation and testing of galvanic protection systems for reinforced concrete structures.
2. Submit installation plan including anode layout and spacing, means and methods for rebar and anode connections, and means and methods for testing and correction of electrical discontinuities. Installation plan shall include separate details for monitored locations if required.

**150068.02 MATERIALS.**

**A. Surface Mounted Zinc Sheet System.**

Surface mounted galvanic sheet anodes shall be a pre-manufactured anode unit consisting of a 10 mil thick 99.9% pure zinc sheet with an ionically conductive pressure sensitive acrylic adhesive. Anode supplier shall have a minimum of 10 years of experience in supplying and installing cathodic protection systems for reinforced concrete structures.

**B. Concrete Repair Materials.**

1. Apply Section 2426 of the Standard Specifications. Concrete repair materials shall be compatible with the galvanic anode system as approved by the anode manufacturer. Compatible repair materials shall have a 28 day moist cured electrical resistivity less than 15,000 ohm-cm.
2. Repair materials containing magnesium phosphate, or high levels of supplementary cementitious materials such as silica fume, ground-granulated blast furnace slag or fly ash may not meet this resistivity requirement. Epoxy mortars or bonding agents shall not be permitted except as specifically noted in the plans.

**C. Construction Adhesive.**

Sealant shall be a neutral cure, non-sag, silicone flexible construction adhesive. Three acceptable products meeting these criteria are Dow 888, CSL 342 Joint Sealant, and Crafcro Road Saver Silicone.

**150068.03 CONSTRUCTION.**

**A. Manufacturer Technical Assistance.**

1. The contractor shall enlist and pay for a NACE-qualified Cathodic Protection Technician working under the direction of a NACE-qualified Cathodic Protection Specialist and employed by the corrosion mitigation technology company to provide technical site support during the installation of the galvanic protection system. The Cathodic Protection Technician shall develop and oversee QA/QC procedures for the installation of the galvanic system approved by the Cathodic Protection Specialist. The Cathodic Protection Technician and Cathodic Protection Specialist shall have verifiable experience in the installation and testing of galvanic protection systems for reinforced concrete structures.
2. The work shall be coordinated with the designated Cathodic Protection Technician to allow for site support during project startup and initial anode installation. The technician shall provide training and support for development of application procedures, quality control program, surface preparation, anode installation, reinforcing steel connection procedures, and electrical continuity verification of embedded reinforcing steel.

**B. Electrical Continuity.**

The reinforcing steel and prestressing strands shall be tested for electrical continuity. Connect the test leads to clean reinforcing steel. A voltage difference between the locations of less than 1.0 mV shall be considered confirmation of electrical continuity. In situations where continuity is not confirmed, re-establish continuity by tying reinforcing together with steel tie wire or by other approved means.

**C. Surface Preparation for Anode Installation.**

1. All spalled and delaminated concrete shall be repaired prior to the installation of the galvanic protection system using compatible repair materials. Allow repair materials to cure for a minimum of 28 days or until sufficiently dry to allow good adhesion of the zinc sheet anode.

2. All existing coatings, curing agents, dirt, grease and other materials that will prevent conductivity between the anode and the reinforcing steel should be removed.
3. In locations to receive the zinc sheet, clean the surface of the concrete by sandblasting, wire brushing, water blasting or other approved method.
4. Smooth concrete surfaces are preferred. Maximum surface roughness should be less than or equivalent to ICRI Concrete Surface Profile CSP 6 (Medium Scarification).

#### **D. Reinforcing Steel Connections.**

1. At least one connection to the conventional steel reinforcing and one to the prestressing strands shall be established and there shall be a minimum of two connections per individual beam end protected.
2. Rebar connections can be established at locations where steel is exposed by removal of spalled or delaminated concrete. If no exposed steel exists, locate reinforcing steel with rebar locator and chip out concrete to expose rebar.
3. Rebar connections shall be drilled and tapped or other approved mechanical connection. Welding or brazing is not permitted. Ground wires are to be No. 14 AWG stranded copper wire with HMWPE insulation. Connections shall be sealed with 100% solids non-conductive epoxy paste.
4. Rebar connections should be made prior to application of protective corrosion inhibitor coating on the rebar and prestressing strands. If electrical connections are made following coating application, the area around the connection shall be blasted or ground clean so that connections are made to bare reinforcing steel.
5. Electrical continuity should be verified between existing reinforcing steel in spalled concrete locations with a standard DC multi-meter at a minimum of five locations per 1000 square feet. Readings greater than 1 mV potential between locations indicate discontinuous rebar. Discontinuous steel should be made continuous by installation of a continuity bond using a steel wire tie or other approved means.
6. All concrete spall repair and excavations created for rebar connection shall be repaired with compatible concrete repair material.

#### **E. Galvanic Anode Installation.**

1. Galvanic zinc sheet anodes should be protected from direct water exposure and physical damage before and after installation. Store away from direct sunlight in dry conditions in the original unopened packaging. Avoid extremes of temperature or humidity. Sheets should be installed within one year of manufacture.
2. Apply the zinc sheet anode to the surface of dry, prepared, concrete. Do not apply when the air temperature is below 40°F or above 120°F. Cut the individual sheet to the appropriate length using heavy scissors or tin snips. Pull back a small section of the plastic liner to expose the adhesive and place the edge of the sheet on to the concrete in the proper position. Sheets should be applied with the roll length in the vertical direction. Place the edge of the sheet within 3 inches of the outer perimeter of the area to be protected. Slowly remove the liner and manually press the anode sheet onto the concrete surface, followed by a surface roller or other method that will allow good adhesion of the zinc sheet to the concrete surface. Apply additional sheets at the recommended spacing to achieve the surface coverage as required in the contract documents. Do not exceed a 5 inch gap between adjacent sheets.

3. Install plastic concrete anchors at the corners and along sheet edges at a spacing not to exceed 3 feet. Apply a flexible polyurethane sealant to the entire exposed perimeter of the zinc sheet.
4. If more than one zinc sheet anode is used, connect the sheets together by soldering or approved mechanical connections. Seal all sheet connections with 100% solids epoxy. Run all wires from anode sheets and rebar connections to a junction box in an accessible location. Connect all anode and rebar connection wires.
5. The zinc anode shall be connected to the reinforcing steel at a rate of one connection per 500 square feet with a minimum of two connections per beam end. Connect by soldering or other approved means to provide mechanical and electrical continuity between the reinforcing steel and zinc anode.
6. After the sheet has been electrically connected to the reinforcing steel apply a coating of 100% solids epoxy directly to the zinc sheet/rebar connection.

**F. Coatings.**

Top coat the zinc and concrete surface with a suitable paint system after installation. Use one of the two-coat epoxy/polyurethane paint systems listed in Materials I.M. 482.08. Final color should match the color of dry concrete. Coatings applied to the zinc and concrete surface should be compatible with the surface applied zinc sheet anode. Painting should be in accordance with Article 2509.03, E, of the Standard Specifications.

**150068.04 METHOD OF MEASUREMENT.**

The Engineer will determine the number of beam ends satisfactorily protected by count.

**150068.05 BASIS OF PAYMENT.**

Payment will be the contract unit price for the number of beam ends satisfactorily protected. The unit price bid for Beam End Galvanic Corrosion Protection shall be full compensation for furnishing all material, including adhesive zinc sheets and all equipment and labor, to install the galvanic corrosion protection system in accordance with the contract documents. This payment includes surface preparation, making electrical connections, continuity testing, installing reference electrodes and test boxes, top coating, and all testing and technical assistance.