

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION**

**IA-99 CATHODIC PROTECTION FOR BURIED METAL  
STRUCTURES**

**1. SCOPE**

This work shall consist of furnishing and installing all material necessary to provide cathodic protection for metal structures as shown on the drawings.

**2. MATERIALS**

Anodes shall be the type and size specified on the drawings. They shall be commercially cast and pre-packaged. Each anode shall have a full length core with a #12 AWG or larger insulated lead wire attached. Unless otherwise specified, the packaged backfill for all anodes shall be approximately 70-75 percent hydrated gypsum, 20-25 percent bentonite, and 5 percent sodium sulfate.

**High Potential Magnesium Anodes** shall meet the requirements of ASTM B 843 with a chemical composition of 0.01 percent aluminum, 0.5-1.5 percent manganese, a maximum of 0.15 percent other varied elements, and the balance magnesium.

**Standard Potential Magnesium Anodes** shall meet the requirements of ASTM B 843 with a chemical composition of 5-7 percent aluminum, 2-4 percent zinc, 0.15-0.7 percent manganese, a maximum of 0.5 percent other varied elements, and the balance magnesium.

**Zinc Anodes** shall meet the requirements of ASTM B 418, Type II with a chemical composition of a maximum 0.005 percent aluminum, a maximum 0.003 percent cadmium, a maximum of 0.005 percent other varied elements, and the balance zinc.

**Wire** for header cables, anode leads, and joint bridging shall be a single conductor, stranded, plain annealed copper with a black, high-molecular weight polyethylene insulation and jacket. The polyethylene shall conform to ASTM Designation D 1248, Type I, Class C, Grade 5. The AWG size designation shall be as shown on the drawings.

**Powder Welding Process** shall be of the type and composition recommended by the manufacturer for permanently fastening copper wire to copper wire or to relatively flat steel or cast iron surfaces. The resulting weld shall be a permanent, low resistance copper connection.

**Tin-Lead Solder Process** shall be for very low voltage electrical connections. Manufacturer's instructions shall be followed.

**3. INSTALLING ELECTRICAL BONDING**

All joints, connections, appurtenances, or other items as shown on the drawings shall be connected or bridged in such a manner that a continuous electrical current can be established throughout the entire structure or those portions of the structure designated to be protected by cathodic protection.

The metal structures shall be bridged or bonded using cables or wire attached by powder welding, soldering, or other approved methods.

Except as otherwise specified, metal surfaces that are to receive a welding process shall be clean, bright, and dry. Coatings shall be completely removed from the area to be welded and the surface shall be ground or filed to remove all mill scale, rust, grease, dirt, or other material that will prevent bond of the weld to the metal structure. If present, galvanized coatings need not be completely removed, but must be cleaned as indicated above.

Connecting or bridging cables or wires shall be long enough to provide enough slack such that the joint or connection can be elongated a minimum of 3 inches without producing tensile stresses in the cables or wires. Approximately 3 inches of insulation shall be stripped from the end of cables to be welded.

The weld shall be tested by a sharp rap with a hammer.

After welding, all exposed metal shall be coated as specified for patching damaged pipe coating.

After installation of cathodic protection and backfilling of the structure is complete, the structure shall have a continuous electrical circuit. If a continuous circuit throughout the structure has not been established, the faulty connections shall be located and repaired to establish the required circuit.

#### **4. INSTALLING ANODES**

Anodes shall be placed horizontally in relation to the ground surface and as shown on the drawings. Except as shown on the drawings, anodes shall not be placed in fill areas. Anodes shall be placed a minimum distance of 10 feet from the pipeline or structure.

Anodes shall not be lifted, carried, or dragged by the lead wire. Care shall be taken to insure that the anode package does not get wet prior to it being placed in the trench or hole.

The trench or hole in which the anode is bedded shall be at least 6 inches larger than the anode and its packaging. Prepackaged anodes shall be placed or backfilled with care to insure that the metal anode remains centered in the package. Damaged packages shall be repaired to the original quality or removed from the site.

Anodes shall be bedded in moist, native soil with no particles larger than 1 inch placed within 12 inches of the anode. The anode and the surrounding soil shall be thoroughly saturated during placement. Holes shall be punched through the packaging and the chemical backfill after placement to ensure that water reaches the metal anode. Holes shall be made with a pitchfork or similar type tool. Unless otherwise specified, each anode shall be saturated with a minimum of five (5) gallons of water after being placed and prior to being backfilled. Compaction of the soil backfill around the anodes shall be to the density of the surrounding undisturbed material. Backfill shall be placed in layers not exceeding six (6) inches prior to compaction.

#### **5. ATTACHING ANODE TO PIPE**

The lead wire from the pipe shall be attached to the pipe by a powder welding process.

Unless otherwise specified, the lead wires from anodes shall be connected to the header wire by tin-lead soldering, brazing, or powder welding. Wrap the lead wire around the header wire a minimum of five (5) wraps prior to soldering. The connection shall be made waterproof and tightly wrapped with three layers of rubber tape and three layers of vinyl electrical tape. Prior to wrapping, the connection shall be thoroughly cleaned to remove all foreign material and moisture.

#### **6. TESTING**

A testing station shall be installed for each anode bed installation as shown on the drawings. The test box shall be as shown on the drawings.

#### **7. SPECIAL SPECIFICATIONS**