

## WISCONSIN CONSTRUCTION SPECIFICATION

### 12. CATHODIC PROTECTION

#### 1. SCOPE

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

#### 2. MATERIALS

Anodes shall be of the type and size specified on the drawings. They shall be commercially cast and prepackaged. Each anode shall have a full length core with a #12 AWG or larger insulated copper lead wire attached.

Zinc anodes shall conform to the requirements of ASTM B 418, Type II composition. Unless otherwise specified, the packaged backfill shall be 20-50 percent bentonite and 50-80 percent gypsum.

Magnesium anodes shall have a chemical composition of 5-7 percent aluminum, 2-4 percent zinc, 0.15-0.25 percent manganese, a maximum of 0.7 percent other varied elements, and the balance magnesium. The packaged backfill shall be approximately 75 percent hydrated gypsum, 20 percent bentonite, and 5 percent sodium sulfate.

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 D 1248, Type I, Class C, Grade 5.

Wire for header cable and anode leads shall be #12 AWG copper or larger. Wire for bridging joints shall be #6 AWG copper or larger.

Powder Welding Process shall be of the size, type and composition recommended by the manufacturer for permanently fastening copper wire to copper wire or to 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 shown on the drawings shall be connected or bridged in such a manner that a continuous electrical current can be established through 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.

Welds shall be tested by a sharp rap with a hammer.

After welding, all exposed metal shall be coated as stated in Wisconsin Specification 6, Corrugated Metal Pipe Conduits, or according to the manufacturer's requirements for patching damaged pipe coating.

#### 4. INSTALLING ANODES

Anodes shall be placed as shown on the drawings. They may be placed either horizontally or vertically and shall be deep enough to have at least 3 feet of earth cover. Anodes shall not be placed in fill areas. Anodes shall be placed a minimum distance of 10 feet from the pipe or structure.

Anodes shall not be lifted, carried, or dragged by the lead wire.

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, fine-grained soil with no particles larger than 1 inch placed within 12 inches of the anode. In sandy and gravelly areas, fine-grained materials will be imported for bedding and covering the anodes to a depth of approximately 6 inches. The anode and the surrounding soil shall be thoroughly saturated during placement. Unless otherwise specified, each anode shall be saturated with a minimum of 5 gallons of water after being placed and prior to being backfilled. If necessary, holes shall be punched through the packaging and the chemical backfill after placement to ensure that water reaches the metal anode. 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 6 inches prior to compaction.

#### 5. ATTACHING THE ANODE

Unless otherwise specified, the lead wire from the anode, or from the header wire for multiple anode installations, shall be attached to the pipe or structure by a powder welding process. The area of damaged pipe or structure coating and the weld shall be coated as stated in Wisconsin Construction Specification 6, Corrugated Metal Pipe Conduits, or according to the manufacturer's requirements for patching damaged pipe coatings.

Unless otherwise specified, the lead wires from anodes shall be connected to the header wire by powder welding, brazing, or tin-lead soldering. When the powder weld process is used, a piece of steel (minimum thickness = 16 gage or 0.064 inches thick, approximately 2 inches square) will be used for a base to position the welding gun and wires for the weld. The connection shall be made waterproof and tightly wrapped with three layers of rubber tape and three layers of vinyl electrical tape. The connection shall be thoroughly cleaned to remove all foreign material and moisture before wrapping.

## 6. TESTING STATIONS

A testing station shall be located and installed as shown on the drawings.

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