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Prepared By: Engineering Staff

Approved By: J.F. Wunderlin

CORROSION CONTROL MATERIALS

Tubular Anodes

1. SCOPE

This specification covers the tubular type cast iron anodes used in anode bed installations with impressed current cathodic protection stations.

2. APPLICABLE DOCUMENTS

2.1 SWG Material Specification L-10, "Underground Wire and Cable."

2.2 ASTM International (ASTM) A518M-99 (2003), "Standard Specification for Corrosion-Resistant High-Silicon Iron Castings."

2.3 United States Department of Transportation (DOT), Code of Federal Regulations (CFR), Title 49, Part 192, "Transportation of Natural and Other Gas by Pipeline; Minimum Safety Standards."

NOTE: Unless otherwise specified, the editions of the above documents incorporated by DOT 49 CFR 192 are applicable. Documents not incorporated by DOT 49 CFR 192 will be the most recent edition.

3. TERMINOLOGY

3.1 General

3.1.1 "Southwest Gas," "Southwest" or "SWG" wherever used in this specification and other related documents will refer exclusively to Southwest Gas Corporation.

3.1.2 The terms "approved," "as approved," "satisfactory," "as directed," "or equal" or other similar terms wherever used in this specification and other related documents will mean "as determined by Southwest Gas," unless specifically stated otherwise.

3.1.3 "Product Information Package" or "PIP" wherever used in this specification and other related documents will mean the required information that a manufacturer must submit to SWG to determine if the product is suitable for use by SWG, unless specifically stated otherwise.



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4. MATERIALS AND MANUFACTURE

4.1 Composition:

4.1.1 The tubular cast iron portion of the anode is to have the following chemical analysis:

Substance	Percent
Silicon	14.0 to 15.0
Chromium	3.25 to 5.0
Carbon	0.7 to 1.1
Manganese	1.5 Max.
Copper	0.50 Max.
Molybdenum	0.20 Max.
Iron	Balance

TABLE L-19.1

4.1.2 The cast iron portion of the anode is not to be porous. It is to be constructed so that water will not permeate through or into the filled center portion of the cast iron anode.

4.1.3 The mastic is to be Ozite "B" or equal and the Durcon epoxy is to be Durco D164 or equal. (See Appendix A)

4.2 Cable:

4.2.1 Each anode is to have single continuous length of cable attached. The cable will be No. 6 AWG or No. 8 AWG size single conductor, stranded copper with splice free high molecular weight polyethylene (HMWPE) insulation suitable for direct burial and should meet the requirements of M.S. L-10.

4.2.2 The size of anode lead cable attached to the anode shall be based on the length of cable required. The following is provided:

- No. 8 AWG HMWPE: 350 ft. or less
- No. 6 AWG HMWPE: 351 ft. or more



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4. MATERIALS AND MANUFACTURE (Cont'd)

4.3 Cable Connection:

4.3.1 The internal cable connection to the tubular anode is to be positioned and assembled as shown in Appendix A. This is to be a wedge type fit between the cable connector assembly and the tubular portion of the anode.

4.4 Types:

4.4.1 The tubular portion of the anode is to conform to the following requirements:

Type No.	Length	I.D Inches Minimum	O.D. Inches (Minimum)	Exterior Surface Area Minimum	Weight (Lbs.) Minimum
1	7' - 2"	1.37"	2.18"	4.0 Ft. ²	46
2	7' - 2"	1.84"	2.65"	4.9 Ft. ²	63

TABLE L-19.2

5. PERFORMANCE REQUIREMENTS

- 5.1 The resistance of the anode-cable construction is not to exceed 0.004 Ohm excluding the cable resistance which is approximately 0.007 Ohm/ft.
- 5.2 The mastic and epoxy materials are to be non-soluble in water, adhere to the internal surface of the anode and to the polyethylene insulation of the cable preventing migration of water (moisture) into the cable-anode connection.

6. INSPECTION

- 6.1 Successful review of the Product Information Package (PIP), as well as any future reference by SWG to the Seller's part number or internal code number in any future contract or purchase, will mean only that no conflict with the specification was found and will not relieve the Seller from meeting all the requirements of this specification.
- 6.2 SWG retains the option to inspect the manufacture and testing of any and all materials, products or systems supplied to this specification at the manufacturer's facility.



SOUTHWEST GAS CORPORATION

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MATERIAL SPECIFICATION

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6. INSPECTION (Cont'd)

6.3 Southwest will have the right, at their option, to reject any material, which fails to conform to this specification. Any such rejection may take place at the manufacturer's facility; the supplier's warehouse or any subsequent delivery location, before or after Southwest assumes possession. Notice of the rejection will be made promptly to the supplier by SWG. The defective product will be replaced or returned for credit at the manufacturer's expense.

6.4 Any changes in the manufacturing of previously approved products described in this material specification must be approved by Southwest Engineering Staff. **Failure to obtain SWG's approval may be cause for rejection and disqualification as an approved supplier.**

7. CERTIFICATION

The manufacturer's or supplier's certification shall be furnished to Southwest. This certification shall state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that requirements have been met. When requested or specified in the purchase order or contract, a report of test results will be provided.

Upon the request of Southwest, the certification of an independent third party indicating conformance to the specification may be considered at Southwest's expense.

8. MATERIAL SAFETY DATA SHEETS

In accordance with law, the Seller will supply Material Safety Data Sheets for all applicable items supplied under this specification to the following:

- The Receiving Location
- Engineering Staff
- Southwest Gas Corporation
Corporate Safety
Mail Station LVA-120
P.O. Box 98510
Las Vegas, NV 89193-8510



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9. PACKAGING AND PACKAGE MARKING

- 9.1 All products covered in this specification will be packaged in a manner to prevent damage during transportation and storage.
- 9.2 Length will be indicated in the purchase order.

10. STOCK CLASS DESCRIPTION

ANODE, TUBULAR, ____ FT. x ____ IN., ____ LBS.

ANODE, SCI TUBULAR, ____ LBS., ____ INCH Ø x ____ Ft. LONG W/ ____ FT. OF NO. ____ AWG HMWPE LEAD CABLE.



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11. APPROVED MANUFACTURERS

The purchase of Tubular Anodes is coordinated by Southwest's Corporate Purchasing and Engineering Staff Departments.



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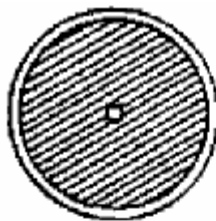
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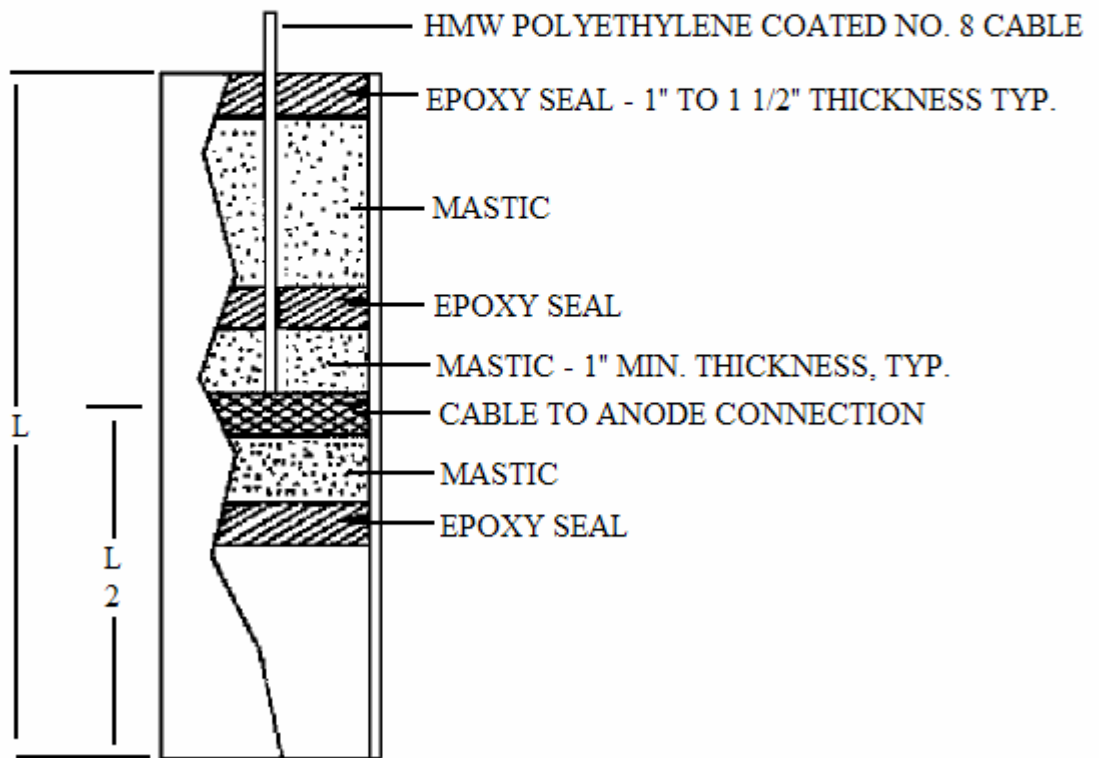
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APPENDIX A
TUBULAR ANODE



TOP VIEW



SIDE VIEW