Designation: G19 – 04

Standard Test Method for Disbonding Characteristics of Pipeline Coatings by Direct Soil Burial[1]

This standard is issued under the fixed designation G19; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes the determination of the relative disbonding characteristics of damaged coatings on steel pipe by cathodic protection potentials in direct soil burial. This test method is intended to apply to the testing of all types of nonmetallic pipeline coatings and tapes including thermoplastics, thermoset, and bituminous materials.

1.2 Results may vary widely when test sites are in different geographical areas of the country, and even in different localities.

1.3 This test method is limited to nonconducting, or nonmetallic pipe coatings and is not applicable to conducting materials such as zinc coatings on steel pipe.

1.4 The values stated in SI units to three significant decimals are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

G12 Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel

G62 Test Methods for Holiday Detection in Pipeline Coatings

3. Summary of Test Method

3.1 Apparatus and materials are described whereby protective coatings on steel pipe are subjected to disbonding by an electrical stress. Specimens with intentionally damaged areas are buried in soil at an outdoor site and electrically connected to a magnesium anode. After test, the disbonded coating is removed, the exposed area measured, and comparisons are made to other specimens similarly exposed.

4. Significance and Use

4.1 Coated pipe is seldom, if ever, buried without some damage to the coating. Hence, an actual soil-burial test can contribute significant data, provided the method of testing is controlled and the test specimen monitored and the relationship between the area disbonded, the current demand, and the mode of failure is fully understood.

4.2 Means are provided for measuring and following the electrical potential and current flow and relating these data to the final measurement of disbonded area.

5. Apparatus

5.1 *Anode*—A standard packaged magnesium anode, minimum 4.082 kg (9 lb), with a factory-sealed, 4107 cmil (14 gage Awg) minimum, insulated copper wire shall be used. A solution potential of not less than − 1.45 V with respect to a copper-copper sulfate reference electrode is required. Use sufficient anodes to maintain required potential.

5.2 *Connectors*—The wiring circuit from anode to test specimen and from specimen to reference electrode should be 4107 cmil (14 gage Awg) minimum insulated copper wire. Attach the wires to the test specimen as shown in Fig. 1 by soldering or brazing at the air-exposed end, and coat the place of attachment with insulating material. A junction box is optional for connecting the resistor in series between the anode and the test specimen.

5.3 The instruments used shall include the following:

5.3.1 *Voltmeter*, a suitable instrument such as a high impedance (>10mΩ) analog multimeter having a sensitivity of 50 000Ω/ V minimum and a multiple range from 0.01 to 2 V for direct current is used for measuring the potential between specimen and the reference electrode,[3] current between specimen and anode, and the resistance of the circuit. The same instrument shall be used for measuring current between specimen and anode. Alligator clips on the leads are permissible.

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[1] This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.48 on Durability of Pipeline Coating and Linings.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] A pipe-to-soil Voltmeter-Ammeter, Agra Engineering Co., Tulsa, Okla., has been found suitable for this test.

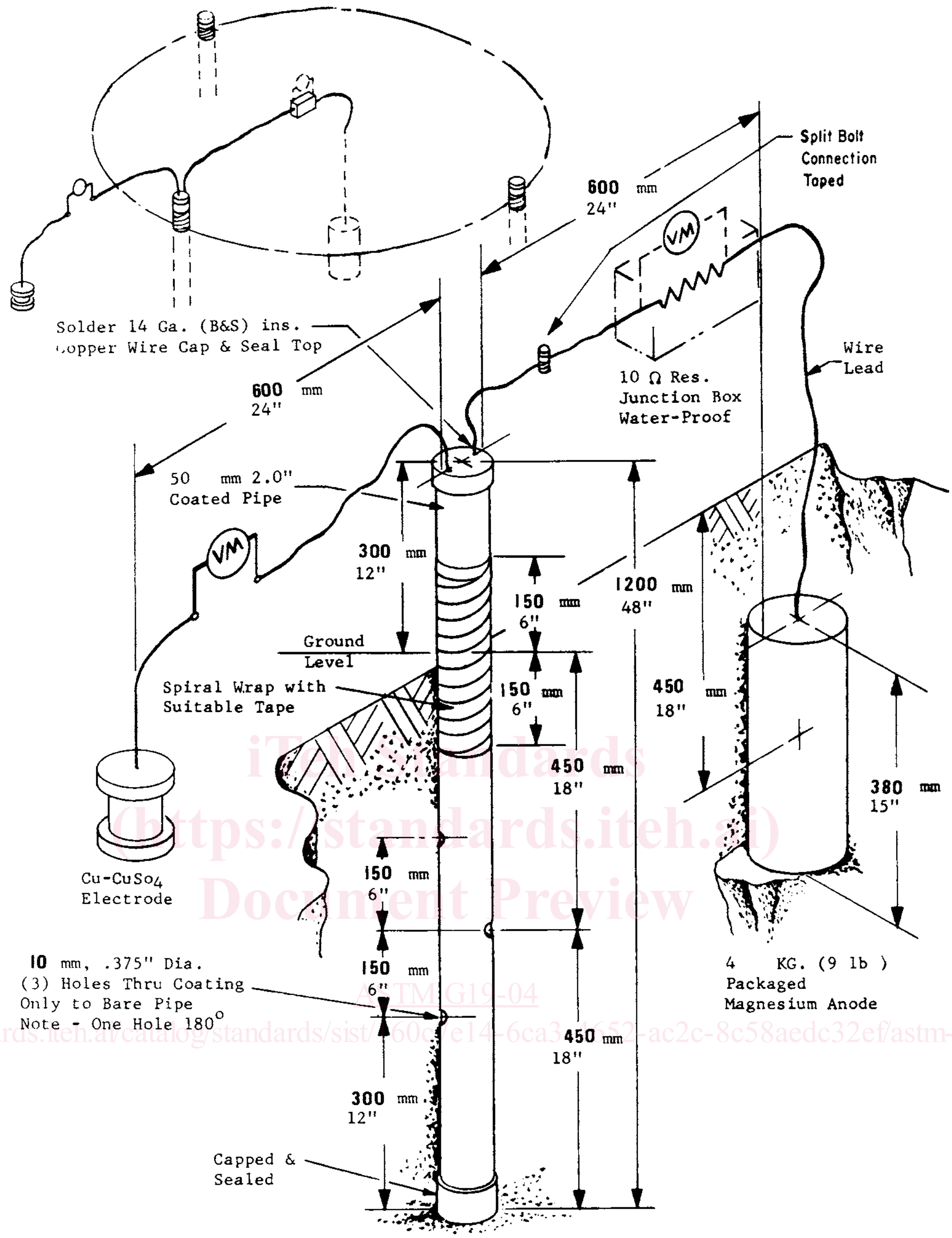

FIG. 1 Three Specimens in a Circle with a Common Anode

5.3.2 *Volt-Ohm-Meter* for measuring resistance of the circuit.

5.3.3 *Reference Electrode*, consisting of a copper-copper sulfate half cell in a conventional glass or plastic tube with porous plug construction, but preferably not over 19.05 mm (¾ in.) in diameter, having a potential of – 0.316 V with respect to a standard hydrogen electrode. A calomel electrode may be used, but measurements made with it should be converted to the copper-copper sulfate reference electrode for reporting, by adding – 0.092 V to the observed reading.

5.3.4 A suitable instrument is used to measure the soil resistivity using the four-pin method.[4] Pins should be spaced 762 mm (30 in.) apart.

5.3.5 *Thickness Gages*, to be used in accordance with Test Method G12.

5.3.6 *Holiday Tools*—Holidays in the specimen are made with conventional drills of the required diameter. A 9.525-mm

[4] A Vibroground instrument, Associated Research Inc., 3758 Belmont Ave., Chicago, Ill., has been found suitable for measuring soil resistivity.