

Title/Subject: Standard Test Procedure - Force Test of Encapsulated Electrical Assemblies		
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## 1.0 PURPOSE

- 1.1 This test procedure is used by the Electrical Safety Division (ESD) to determine if a representative sample of an encapsulated electrical assembly meets the force test requirements of ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus", Section 9.13.1.
- 1.2 To provide a person knowledgeable in the appropriate technical field with a written procedure that will assure consistent repeatable test data and results independent of the person conducting the test.

## 2.0 SCOPE

This Standard Test Procedure (STP) applies to the testing of encapsulated electrical assemblies that are used as components of intrinsically safe equipment approved, certified, or evaluated per 30 CFR Parts 18, 19, 20, 22, 23, and 27.

## 3.0 REFERENCES

- 3.1 ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus", Section 9.13.1.
- 3.2 30 CFR Part 18 "Electric Motor-Driven Mine Equipment and Accessories"
- 3.3 30 CFR Part 19 "Electric Cap Lamps"
- 3.4 30 CFR Part 20 "Electric Mine Lamps other than Standard Cap Lamps"
- 3.5 30 CFR Part 22 "Portable Methane Detectors"
- 3.6 30 CFR Part 23 "Telephones and Signaling Devices"
- 3.7 30 CFR Part 27 "Methane-Monitoring Systems"

#### 4.0 DEFINITIONS

**Encapsulated Electrical Assembly** - An assembly that has been completely enclosed within a homogeneous high resistance insulating material, "encapsulant", thereby sealing the electrical components from exposure to the ambient atmosphere.

#### 5.0 TEST EQUIPMENT

5.1 A test mass made of solid hard metallic material that weighs 30 newtons (approximately 3.06 kilograms) with its total mass uniformly distributed about the vertical axis and a flat circular "contact surface", 6 mm in diameter and orthogonal to the vertical axis.

5.2 A test fixture that is equipped with:

5.2.1 a mounting bracket that can hold the test mass in place in a plumb position;

5.2.2 an adjustment mechanism to precisely set the elevation of the mounting bracket; and

5.2.3 a quick release mechanism that, when engaged, locks the test mass to the mounting bracket and, when disengaged, permits the test mass to move downward under the force of gravity.

The mounting bracket shall not impede the downward motion of the test mass when the quick release mechanism is actuated, while simultaneously maintaining plumb the axis of the test mass over one inch of downward travel. The test fixture shall be mounted on a flat base table.

5.3 A stopwatch with one second resolution.

#### 6.0 TEST SAMPLES

One sample of the encapsulated electrical assembly in its proposed marketable form.

#### 7.0 PROCEDURES

7.1 Perform a pre-test inspection. Inspect the surfaces of the encapsulated assembly. Reject the sample for any surface deformations or faults which defeat the sealing property or protection provided by the encapsulant. Replace the rejected sample.

- 7.2 Select a test point in a weak area such as a corner or edge on an unprotected encapsulated surface of the sample. If the sample has no determinable weak areas, select a point at random.
- 7.3 Mount the test mass onto the mounting bracket.
- 7.4 Place and secure the test sample onto the base table. Position the test sample so that the axis of the test mass is perpendicular to the encapsulated surface.
- 7.5 Lower the mounting bracket until the test mass just contacts the encapsulated surface without applying the weight of the test mass.
- 7.6 Actuate the quick release mechanism.
- 7.7 Start the stopwatch.
- 7.8 After ten seconds, remove the test mass from the encapsulant.
- 7.9 Perform a post-test inspection. Visually inspect the surfaces of the tested encapsulated assembly for any damage, including permanent encapsulated surface deformation or other damage that impairs the sealing property or protection provided by the encapsulant.
- 7.10 Select a different test point on the same encapsulated surface and repeat Sections 7.3 through 7.9 until the number of points tested equals four.
- 7.11 Repeat Sections 7.2 through 7.10 for the remaining unprotected encapsulated surfaces of the sample.

## 8.0 TEST DATA

- 8.1 The manufacturer of the encapsulated electrical assembly.
- 8.2 The manufacturer's model or part number of the encapsulated electrical assembly.
- 8.3 The manufacturer of the encapsulating material.
- 8.4 The manufacturer's type number of the encapsulating material.
- 8.5 The pre-test inspection results for every rejected assembly. Photographs may be attached to the test sheet.
- 8.6 Diagrams that identify the sample, tested surfaces, and test points.

8.7 The post-test inspection results, pass or fail, for the tested assembly. Include the reason(s) for failure, if applicable. Photographs may be attached to the test sheet.

#### 9.0 PASS / FAIL CRITERIA

A test sample shall be failed for any permanent surface deformation or other damage (denting, cracking, chipping, breaking, indentation, etc.), regardless of the size, shape or extent, that would impair the sealing property or protection provided by the encapsulant.