

## 1.0 PURPOSE

- 1.1. This test procedure is used by the Electrical Safety Division to determine if a representative sample of a portable intrinsically safe apparatus meets the drop test requirements of ACRI2001, "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus", Section 9.9.
- 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 portable intrinsically safe apparatus approved or evaluated per 30 CFR Parts 18, 20, 22, and 23. Apparatus not containing battery energy limiting components are not subject to this drop test if intrinsic safety is not dependent on a dust tight enclosure and internal circuit spacing.

## 3.0 REFERENCES

ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus", section 9.9.

## 4.0 DEFINITIONS

- 4.1. Portable Intrinsically Safe Apparatus - Personally worn or carried apparatus that may be moved frequently and is constructed or mounted to facilitate such movement.
- 4.2. Significant Damage - Any breakage, disconnection, short circuit, or similar type of damage that would affect the safety of the intrinsically safe apparatus.
- 4.3. Superficial Damage - Minor damage, chipping of paint, or other similar damage that would not affect the safety of the intrinsically safe apparatus.

## 5.0 TEST EQUIPMENT

- 5.1. Drop test apparatus or other means of dropping the intrinsically safe apparatus in a free-fall, without obstruction. The floor of the drop test apparatus shall be horizontal and constructed of oak planking one-inch ( $\pm$

25%) thick. A nonrestrictive guide may be used to assure a free-fall drop on the impact point to be tested.

- 5.2. Digital Thermometer. Minimum resolution of 0.2 degree Celsius and minimum range from 0 to 40 degrees Celsius (Fluke 2170A).

## 6.0 TEST SAMPLES

One sample of the apparatus with accessories shall be used in its proposed marketable form.

## 7.0 PROCEDURES

- 7.1. Take a photograph of the sample. The photograph can be added to the test sheet as a reference and used for comparison to the after drop photographs.
- 7.2. Before testing, inspect the sample for any significant damage. A sample having significant damage shall be rejected and replaced by an acceptable sample. Superficial damage shall be noted, but not considered cause for rejection. Record a narrative description of superficial damage on the test sheet. Close up photographs showing any damage may be attached to the test sheet.
- 7.3. Conduct the test in an ambient temperature of 25 ( $\pm$  10) °C. Record the ambient temperature on the test sheet.
- 7.4. Adjust the drop test apparatus to drop the sample from a height of 3 feet  $\pm$  1 inch above the oak planking. Measure and record the height on the test sheet.
- 7.5. Select the points on the sample that are to strike the oak platform on initial impact. Points on the sample likely to be damaged by dropping are to be selected. These selected points include corners, parts extending from the enclosure, and parts of the enclosure constructed of a different or thinner material. The sample shall be tested with accessories or detachable components connected if their presence results in a more severe condition for the drop test.
- 7.6. Drop the sample six times, attempting not to impact the same point on the sample more than once.

- 7.7. After each drop, inspect the sample for any significant or superficial damage. Record a narrative description of any superficial damage on the test sheet. Photographs of the damage may be attached to the test sheet.
- 7.8. If a determination of significant damage can not be made by visual inspection, additional testing shall be conducted after the drop test to ensure that intrinsic safety or required performance (including dust-tight integrity) has not been compromised.
- 7.9. Any detachable components of the intrinsically safe apparatus, such as rechargeable battery packs that rely on integral energy limiting components, or accessories where intrinsic safety is dependent on circuit spacing or a dust tight enclosure, shall undergo an additional series of drop tests as detailed in Sections 7.1 through 7.8, above.

## 8.0 TEST DATA

- 8.1. Ambient temperature.
- 8.2. Test equipment identification (e.g. model number, part number, serial number).
- 8.3. Before drop test photographs and after drop test damage photographs (if applicable).
- 8.4. Sample identification (e.g. manufacturer, model number, part number, serial number).
- 8.5. Impact surface. A numbered photograph or pictorial sketch of the test sample may be used to identify where the sample first struck the oak planking.
- 8.6. Results of the visual inspection after each drop. Include an explanation for failure, if applicable.
- 8.7. Determination of whether or not each sample met the acceptance criteria of ACRI2001 Section 9.9.
- 8.8. Any additional information, comments, or observations about the test and the rationale for any additional testing conducted.

**9.0 PASS/FAIL CRITERIA**

- 9.1. No significant damage shall be incurred by any sample tested that would affect the intrinsic safety or required performance of the test sample.
- 9.2. For equipment requiring a dust-tight enclosure to exclude coal dust entry, the enclosure of the sample shall continue to be dust-tight after the drop test.
- 9.3. There shall be no separation or ejection of the battery or batteries from the apparatus.