

## 1.0 PURPOSE

This test procedure is used by the Electrical Safety Division (ESD) to determine if representative samples of cap lamp headpiece designs meet the requirements of 30 CFR 19.7(a).

## 2.0 SCOPE

This Standard Test Procedure (STP) applies to electric cap lamps approved per 30 CFR Part 19. This test procedure shall be conducted on all cap lamp headpieces, even those with bulb safety devices (refer to 7.6) to ensure that all headpiece shells are able to withstand impacts.

## 3.0 REFERENCES

**30 CFR 19.7(a)**: Safety device or design. The headpiece shall have a safety device to prevent the ignition of explosive mixtures of methane and air if the bulb glass surrounding the filament is broken. Alternatively, if the lamp is designed and constructed to prevent the ignition of explosive mixtures of methane and air by protecting the bulb from breakage and preventing exposure of the hot filament, no safety device is required.

## 4.0 DEFINITIONS

- 4.1. Bulb Safety Device: A device, such as a bulb ejection mechanism or a filament quenching device, that prevents the energized filament from being exposed to the ambient atmosphere.
- 4.2. Ejection Mechanism - A device located in the headpiece of a cap lamp, flashlight, or other equipment that disconnects power to the bulb filament(s) when the bulb envelope is broken.
- 4.3. Filament Quenching Device - A device located in the cap lamp headpiece, flashlight, or other equipment that crushes the heated filament when the bulb envelope is broken.

## 5.0 TEST EQUIPMENT

- 5.1. Digital Thermometer. Minimum resolution of 0.20 degree Celsius and minimum range from 0 to 40 degrees Celsius (Fluke 2170A).

- 5.2 Test mass made of hardened steel weighing 8.9 newtons (2.0 lbs), designed within the constraints specified in 5.4 and shaped symmetrically about a vertical axis with a shaft on the top end and a spherically contoured, 25mm (.98 in) diameter impact head on the bottom.
- 5.3 A test apparatus designed within the constraints specified in 5.4, consisting of a base table of hardened steel optionally fitted with a tilt adjustment mechanism, a fixture containing a manually operated quick-release mounting mechanism to hold the test mass vertically at the top of its shaft, and a continuously adjustable mechanism for positioning the mounted test mass to precise vertical locations.
- 5.4 Designs of the test mass and the test apparatus shall be such that when the test mass is mounted in test position its vertical axis shall be perpendicular to the plane of the floor, its impact head shall be its lowest end, and, except for the vertical separation distance, orientation of the test mass to the base table shall not change after the quick release mechanism is tripped and the test mass is in free fall.
- 5.5 A power source, either the specified battery or a power supply, appropriate for the application and coincides with the cap lamp manufacturer's electrical specifications.

## 6.0 TEST SAMPLES

Five (5) samples of the headpiece in its proposed marketable form.

## 7.0 PROCEDURES

- 7.1. Conduct the test in an ambient temperature of  $25^{\circ} \pm 10$  degrees Celsius. Record ambient temperature on test sheet.
- 7.2. Inspect the sample headpieces for any mechanical defects, noting any on test sheet. Verify the operational condition of the cap lamp using a power source.
- 7.3. Note the lens diameter on the test sheet, and take a photograph of the headpiece. This will be used as a reference for the test sheet. Note on the test sheet if the headpiece contains a bulb safety device.
- 7.4. Mount the test mass onto the test apparatus with the impact head facing the base table.

7.5. Position the test weight at the specified vertical distance above the point of impact of the headpiece. The following chart gives the vertical distance values according to the lens diameter and area:

	Lens diameter (inches)	Area (inches squared)	Vertical drop height (inches)
Less than or equal to	4.0	12.5	12.0
Between	4.0 and 5.0	12.5 and 19.6	18.0
Between	5.0 and 6.0	19.6 and 28.2	30.0
Greater than or equal to	6.0	28.2	48.0

7.6 Mount the headpiece in an orientation adjustable apparatus. Check the alignment of the test mass with the desired striking surface. Each of following surfaces of all five (5) samples is to be impacted once:

7.6.1 Headpiece shell 0.25 inches from the termination of the bezel ring threads (if applicable) or 0.5 inches from the lens - top, bottom, right side, and left side

7.6.2 Bezel ring top, bottom, right side, and left side; switch and/or focus knob

7.6.3 Impact the lens center three (3) times. Note: If headpiece contains a bulb safety device DO NOT impact the lens.

7.7 Manually release the weight and inspect the impacted surface after each impact noting any damage on the test sheet. If the headpiece does not stay securely mounted at the moment of impact or if the test weight does not solidly strike the desired surface the test shall be repeated. If a failure is observed document it on the test sheet and discontinue testing.

7.8 Note the operational condition of the cap lamp after the inspection.

7.9 Repeat steps 7.4 - 7.8 for each of the remaining impact surfaces for all five (5) headpieces.

## 8.0 TEST DATA

8.1. Ambient temperature.

- 8.2. Lens diameter or area.
- 8.3. Height of test weight above sample.
- 8.4. Manufacturer and model number of the cap lamp or lamp bulb holder assembly.
- 8.5. Manufacturer and part number of the bulb tested.
- 8.6. Sample number.
- 8.7. Pretest inspection results (7.2).
- 8.8. Surface impacted.
- 8.9. Detail of damage after each impact if applicable.
- 8.10. Post test operational condition (7.8).

## 9.0 PASS/FAIL CRITERIA

A test failure occurs if any of the following conditions are noted:

- 9.1 Cracking or breaking of the bulb envelope.
- 9.2 Cracking or breaking of the headpiece shell.
- 9.3 Cracking or breaking of the lens.
- 9.4 Crack through the entire thickness of any component of the headpiece assembly which would permit an internal accumulation of coal dust.
- 9.5 Displacement of any component that would affect the integrity of the headpiece assembly.
- 9.6 Any impairment to the safe operation of the headpiece.
- 9.7 Exposure of any live metal parts.