

## 1.0 PURPOSE

This test procedure is used by the Electrical Safety Division (ESD) to determine if representative samples of a miner's cap lamp assembly meet the light distribution requirements of 19.6(b) and light output requirements of 30 CFR 19.6(d).

## 2.0 SCOPE

This Standard Test Procedure (STP) applies to Miner's cap lamp assemblies submitted for approval, extension of approval, and changes to approved products (RAMPs) under 30 CFR Part 19.

## 3.0 REFERENCES

3.1. **30 CFR 19.6(b)**: MSHA recommends that the angle of the light beam be at least 130 degrees horizontally ..., however, ... MSHA will approve lamps giving a minimum beam angle of 120 degrees.

3.2. **30 CFR 19.6(d)**: Light distribution, photometric.

3.2.1. (1) Excepting special headpieces for inspection purposes, the maximum candlepower of the light beam shall not be greater than 25 times the average or mean candlepower of the beam.

3.2.2. (2) The minimum candlepower of the beam based upon readings at the design voltage of the bulb shall not be less than 1.

3.3. APOL2202 "Cap Lamp Assembly Test Protocol"

3.4. ASAP2029 "Processing Revised Approval Modification Program (RAMP) Applications"

## 4.0 DEFINITIONS

4.1. **Beam Angle** - The field of light between the left horizontal axis and the right horizontal axis.

4.2. **Maximum Candlepower** - The maximum candlepower of the light beam at the nominal design voltage of the cap lamp taken at the angles shown in Section 7.8.

4.3. **Mean Candlepower** - The average candlepower of the light beam at the nominal design voltage of the cap lamp taken at the angles shown in Section 7.8.

4.4. **Photometer** - A device used to measure light luminance intensity.

## 5.0 TEST EQUIPMENT

5.1. Photometer. Minimum resolution of 0.001 foot-candles (FC) [Tektronix Model J17 photometer].

5.2. D.C. power supply with sufficient capacity to power the bulb.

5.3. Voltmeter. Minimum resolution of 0.01 volts.

5.4. Interconnecting wires.

5.5. Device capable of rotating the headpiece through a horizontal angle of rotation of 130° (measured 65° to the left of the center axis through 65° to the right of the center axis).

## 6.0 TEST SAMPLES

Five headpiece and cable assemblies in their proposed marketable form. Two samples shall not have undergone any potentially destructive mechanical tests. The three remaining samples shall have undergone the "Headpiece Drop Test".

## 7.0 PROCEDURES

7.1. Conduct the test in a dark room. Ensure anti-reflective curtains surround the light source allowing no reflected light from the walls to influence the photometer readings.

7.2. Mount the headpiece to the rotation device.

7.3. Mount the photometer's light sensor on a horizontal plane level with the bulb filament at a distance of 2 feet ( $\pm 1$  inch) from the bulb.

7.4. Adjust the power supply to the nominal design voltage of the cap lamp and connect it to the headpiece cable assembly.

7.5. Turn on the headpiece and adjust it for a spot beam.

Note: If the unit under test has a dual filament bulb, use the filament giving the narrower beam angle.

- 7.6. Rotate the headpiece to determine the left portion of the beam at 65°.
- 7.7. Measure and record light output using the photometer. If the photometer is not calibrated in candlepower, record the unit of measurement and calculate candlepower.

Note: The Tektronix Model J17 Photometer used in the ESD laboratory displays intensity in foot-candles (FC) that can be converted to candlepower using the formula:

Candlepower = FC x (distance in feet)<sup>2</sup>  
distance is from the bulb filament to the photometer sensor.

- 7.8. Continue rotating the headpiece until light output measurements have been recorded for each of the following angles:
- 7.8.1. Left: 65°, 60°, 55°, 50°, 45°, 40°, 35°, 30°, 25°, 20°, 15°, 14°, 13°, 12°, 11°, 10°, 9°, 8°, 7°, 6°, 5°, 4°, 3°, 2°, 1°, and 0°.
- 7.8.2. Right: 1°, 2°, 3°, 4°, 5°, 6°, 7°, 8°, 9°, 10°, 11°, 12°, 13°, 14°, 15°, 20°, 25°, 30°, 35°, 40°, 45°, 50°, 55°, 60°, and 65°.
- 7.9. Calculate the mean candlepower of the unit.
- 7.10. Repeat steps 7.1 through 7.9 on the four remaining samples of the cap lamp.

## 8.0 TEST DATA

- 8.1. Sample number.
- 8.2. Candlepower of the light beam at the specified beam angles in Section 7.8.
- 8.3. Maximum candlepower for each bulb.
- 8.4. Mean candlepower for each bulb.
- 8.5. Manufacturer and model number of the cap lamp.
- 8.6. Manufacturer and part number of the bulb.

8.7. Test equipment used in conducting the test with the calibration due dates.

## 9.0 PASS/FAIL CRITERIA

- 9.1. The measured beam angle of the light beam shall be at least 120° with a minimum beam intensity of 1 candlepower (0.25 FC).
- 9.2. Excepting special headpieces for inspection purposes, the maximum candlepower of the light beam shall not be greater than 25 times the average or mean candlepower of the beam.