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 requirements of 30 CFR 19.9(b) for bulb life and 19.9(c)(2) for bulb uniformity.

2.0 SCOPE

This Standard Test Procedure (STP) applies to miners cap lamp assemblies submitted for approval under 30 CFR Part 19.

3.0 REFERENCES

3.1. ***30 CFR 19.9(b):*** The average life of the bulbs shall be not less than 200 hours, and at least 92 percent of the bulbs shall have a life of 150 hours. The life of a bulb is the number of hours its main filament will burn in the cap lamp or its equivalent.

3.2. ***30 CFR 19.9(c)(2):*** The current consumption of at least 94 percent of the bulbs shall not exceed the average current by more than 6 percent. The candlepower (s.cp.) of at least 90 percent of the bulbs shall not fall short of the average candlepower by more than 30 percent.

4.0 DEFINITIONS

4.1. **Bulb Life -** number of hours the bulb's main filament will burn in the cap lamp or its equivalent. The life of a bulb having main filaments in parallel is considered ended when the first filament ceases to burn; the life of a bulb having independent main filaments is considered ended when the last filament ceases to burn.

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

4.3. **Bulb –** Any light producing device (e.g. incandescent, LED, etc.) that is electrically powered.

5.0 TEST EQUIPMENT

5.1. Voltmeter. Minimum resolution of 0.01 volts.

5.2. Ammeter. Minimum resolution of 0.01 ampere.

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

5.4. Bulb discharge rack (supplied by the cap lamp manufacturer) for testing of the bulbs at their nominal operating voltage.

Note: It is recommended that the bulb discharge rack have the capability to energize fifty (50) bulbs simultaneously. Also, the voltage drop across all of the bulbs shall be the nominal voltage ±0.1 volts.

5.5. D.C. power supply(ies) with sufficient power to operate the bulb discharge rack.

5.6. Data Recorder.

5.7. Resistor (0.001 Ohm with a sufficient power rating for the total current draw of the bulb discharge rack).

6.0 TEST SAMPLES

At least fifty-five (55) samples of each bulb type proposed for use with the cap lamp. (Note: Fifty (50) samples of each bulb type shall be tested.)

7.0 PROCEDURES

7.1. Test shall be conducted in an ambient temperature of 25° Celsius(C) ±10° C.

7.2. Energize the bulb discharge rack, with the power supply set to the nominal cap lamp battery voltage, and record the time and date.

7.3. Measure and record the light output of each bulb sample, using a photometer, after 24 hours from initial energization of the bulb discharge rack. If a photometer is not calibrated in candlepower, record the unit of measurement and calculate the 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(feet)^2 from the bulb filament to the photometer sensor

7.4. Record the current consumption by each individual light bulb after 24 hours from the initial energizing of the bulb discharge rack.

7.5. Visually check each lamp bulb for illumination every 24 hours during the test. If a decrease in the light intensity of the sample is observed, the light output of that bulb will be measured and recorded using a photometer. If during the testing, it is determined that the candlepower has decreased below the average candlepower by more than 30 percent for greater than 10 percent of the bulbs, the test will be terminated and the bulb type being tested will have failed the test.

Note: If one of the bulb filaments of a dual filament type bulb burns out, the other filament of the bulb shall be connected to the power source and the test extended for that bulb sample an additional 24 hours.

7.6. After 150 hours (6 days, 6 hours) from the initial start of the test, note any burned out bulbs on the test sheet.

7.7. Terminate the test after a total of 248 hours (10 days, 8 hours). Note any burned out bulbs on the test sheet.

7.8. Repeat steps 7.1 through 7.7 until a total of fifty bulb samples have been tested.

7.9. If more than one type of bulb is specified, repeat steps 7.1 through 7.8 for each bulb type.

Note: A data recorder and a shunt resistor with a sufficient power rating may be used to monitor the total current consumption of the bulb discharge rack.

8.0 TEST DATA

8.1. Manufacturer and part number/drawing number of the bulbs tested.

8.2. Sample number.

8.3. Bulb life for each bulb sample.

8.4. Bulb current consumption for each sample after 24 hours.

8.5. Average current consumption of all the samples after 24 hours.

8.6. Light output (candlepower) of each bulb after 24 hours.

8.7. Average candlepower of all the samples after 24 hours.

8.8. Average lamp bulb life of all the samples.

8.9. Percentage of bulbs with a life of 150 hours or more.

8.10. Percentage of the bulbs exceeding 6 percent of the average current consumption.

8.11. Percentage of the bulbs with less than 30% of the average candlepower.

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

8.13. Ambient temperature.

8.14. Test voltage.

9.0 PASS/FAIL CRITERIA

9.1. The average life of the bulbs shall be not less than 200 hours (8 days, 8 hours) and at least 92 percent of the bulbs shall have a life of 150 hours (6 days, 6 hours).

9.2. The current consumption of at least 94 percent of the bulbs shall not exceed the average current by more than 6 percent.

9.3. The candlepower (s.cp.) of at least 90 percent of the bulbs shall not fall short of the average candlepower by more than 30 percent