the tests, prior to receipt of formal notice of approval.

[Sched. 10C, May 17, 1938, as amended by Supp. 1, 20 FR 2719, Apr. 23, 1955; 43 FR 12314, Mar. 24, 1978; 60 FR 35693, July, 11, 1995; 73 FR 52212, Sept. 9, 2008]

§ 20.6 General requirements.

(a) The lamps shall be durable in construction, practical in operation, and suitable for the service for which they are designed and approved.

(b) The intensity of light, distribution of light, and battery capacity shall be adequate for the use for which the lamp is intended.

(c) Battery terminals and leads therefrom, as well as the battery gas vents, shall be designed to minimize corrosion of the electrical contacts.

(d) Bulbs and other replacement parts of the lamps shall be adequately marked as a means of identification.

§ 20.7 Specific requirements.

Two general classes of electric lamps are recognized in these requirements, namely: Class 1, those that are self-contained and easily carried by hand, and class 2, those that may or may not be self-contained and not so readily portable as the first class.

(a) *Class 1.* Class 1 includes hand lamps, signal lamps, inspection lamps, flashlights, and animal lamps which are operated by small storage batteries or dry cells.

(b) *Class 2.* Class 2 includes lamps such as the pneumatic-electric types and large battery lamps.

§ 20.8 Class 1 lamps.

(a) *Protection against explosion hazards.* Unless properly designed, class 1 lamps present two sources of probable explosion hazards: Ignition of an explosive atmosphere by the heated filament of the bulb in case the bulb glass is accidentally broken, and ignition by electric sparks or arcs from the battery or connections thereto. MSHA's therefore, requires the following safeguards:

(1) *Safety device or design.* The lighting unit 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 of materials that will prevent the ignition of explosive mixtures of methane and air by protecting the bulb from breakage and preventing exposure of the hot filament, no separate safety device is required. Alternative designs will be evaluated by mechanical impact tests, temperature tests and thermal shock tests to determine that the protection provided is no less effective than a safety device.

(2) *Safety device (protection).* The design of the safety device and the housing which protects it shall be such that the action of the safety device is positive; yet the lamp shall not be too readily extinguished during normal service by the unnecessary operation of the device.

(3) *Locks or seals.* For lamps other than flashlights, all parts, such as bulb housing and battery container, through which access may be had to live terminals or contacts shall be adequately sealed or equipped with magnetic or other equally reliable locks to prevent opening by unauthorized persons. For flashlights, provision shall be made for sealing the battery container.

(4) *Battery current restricted.* Unless all current-carrying parts including conductors, are adequately covered and protected by the sealed or locked compartments, the maximum possible current flow through that part shall be limited by battery design, or by an enclosed-type fuse inside the sealed or locked container, to values that will not produce sparks or arcs sufficient to ignite an explosive mixture of methane and air.

(b) *Protection against bodily hazard.* This hazard is chiefly due to the possible burning of the user by electrolyte spilled from the battery. MSHA, therefore, requires that:

(1) *Spilling of electrolyte.* The lamp shall be so designed and constructed that when properly filled the battery will neither leak nor spill electrolyte under conditions of normal use. Lamps passing a laboratory spilling test will be considered satisfactory in this respect, contingent upon satisfactory performance in service.

(2) *Corrosion of battery container.* The material of which the container is