

(ii) That extends from the top of the room or locker to at least 3 ft. (1 m) above the top of the room or locker;

(iii) That is at an angle of 45 degrees or less from the vertical; and

(iv) That has no appliances, such as flame arresters, that impede free passage of air or gas mixtures; or

(3) A duct from the top of the room or locker to an exhaust ventilation duct.

(e) *Deck boxes.* Except for a deck box for a small battery installation, each deck box must have a duct from the top of the box to at least 4 ft. (1.2 m) above the box ending in a gooseneck or mushroom head that prevents entrance of water. Holes for air must be on at least two parallel sides of each box.

(f) *Weathertight.* Each deck box must be weathertight.

(g) *Boxes for small battery installations.* Each box for a small battery installation must have openings near the top to allow escape of gas. If the installation is in a non-environmentally-controlled location, the installation must prevent the ingress of water.

[CGD 74-125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94-108, 61 FR 28278, June 4, 1996]

#### § 111.15-20 Conductors.

(a) Each conductor penetration to a battery room must be made watertight.

(b) The termination of each cable must be sealed to prevent the entrance of electrolyte by spray or creepage.

(c) Each connecting cable must have sufficient capacity to carry the maximum charging current or maximum discharge current, whichever is greater, while maintaining the proper voltage at the load end.

[CGD 94-108, 61 FR 28278, June 4, 1996, as amended at 62 FR 23908, May 1, 1997]

#### § 111.15-25 Overload and reverse current protection.

(a) An overload protective device must be in each battery conductor, except conductors of engine cranking batteries and batteries with a nominal potential of 6 volts or less. For large storage battery installations, the overcurrent protective devices must be next to, but outside of, the battery room.

(b) Except when a rectifier is used, the charging equipment for all batteries with a nominal voltage more than 20 percent of line voltage must protect automatically against reversal of current.

#### § 111.15-30 Battery chargers.

Each battery charger enclosure must meet § 111.01-9. Additionally, each charger must be suitable for the size and type of battery installation that it serves. Chargers incorporating grounded autotransformers must not be used. Except for rectifiers, chargers with a voltage exceeding 20 percent of the line voltage must be provided with automatic protection against reversal of current.

[CGD 94-108, 61 FR 28278, June 4, 1996; 61 FR 36787, July 12, 1996]

### Subpart 111.20—Transformer Construction, Installation, and Protection

#### § 111.20-1 General requirements.

Each transformer winding must be resistant to moisture, sea atmosphere, and oil vapor, unless special precautions are taken, such as enclosing the winding in an enclosure with a high degree of ingress protection.

[CGD 94-108, 61 FR 28278, June 4, 1996]

#### § 111.20-5 Temperature rise.

(a) The temperature rise, based on an ambient temperature of 40 degrees C, must not exceed the following:

- (1) For Class A insulation, 55 degrees C.
- (2) For Class B insulation, 80 degrees C.
- (3) For Class F insulation, 115 degrees C.
- (4) For Class H insulation, 150 degrees C.

(b) If the ambient temperature is higher than 40 degrees C, the transformer must be derated so that the total temperature stated in this section is not exceeded. The temperature must be taken by the resistance method.

#### § 111.20-10 Autotransformers.

An autotransformer must not supply feeders or branch circuits.