MAINTENANCE OF BATTERY-OPERATED EMERGENCY LIGHTS

Introduction

In order to meet both federal certification and state licensure requirements, health care facilities must provide emergency lighting for all exits and designated portions of the exit access and exit discharge [see NFPA 101(12), Sections 18.2.9/19.2.9 and 7.9; MSFC (15), Sections 1006 and 1104.5]. "Designated portions of the exit access and exit discharge" include stairs, aisles (in rooms or spaces that require two or more means of egress), corridors, ramps, escalators and passageways. Emergency lighting outside the building must be provided to either a public way or a distance away from the building that is considered safe (typically defined as 50 ft. away from the building), whichever is closest. A minimum of 90 minutes of illumination is required (the MSFC only requires 30 minutes of illumination in existing buildings).

Emergency lighting can be supplied by storage batteries, unit equipment or an on-site generator. This guide is only intended to cover unit equipment (also known as battery-operated emergency lights) and EXIT signs provided with a battery-operated emergency illumination source.

Testing requirements

To help ensure their reliability, battery-operated emergency lights must undergo periodic testing [see NFPA 101(12), Sec. 7.9.3; MSFC(15), Sec. 604.5.2].

NFPA 101(12), Sec. 7.9.3.1, offers three options for testing of emergency lighting systems:

1. Functional testing [see NFPA 101(12), Sec. 7.9.3.1.1]
    a. A functional test is required to be conducted monthly, with a minimum of 3 weeks and a maximum of 5 weeks between tests, for not less than 30 seconds (the 3- to 5-week leeway in the test interval is the code's way of allowing a facility to accommodate such things as weekends and holidays). The code allows the test interval to be extended beyond 30 days with proper technical justification and the approval of the AHJ.
    b. A functional test is required to be conducted annually for a minimum of 90 minutes.
    c. The emergency lighting equipment is required to be fully operational for the duration of these tests.

2. Self-testing/self-diagnostic equipment [see NFPA 101(12), Sec. 7.9.3.1.2]
    a. Self-testing/self-diagnostic battery-operated emergency lighting equipment must automatically perform a test for not less than 30 seconds and a diagnostic routine not less than once every 30 days.
    b. The equipment must be capable of indicating failures by a status indicator.
    c. The equipment must be visually inspected monthly.
    d. A functional test must be conducted annually for a minimum of 90 minutes. The equipment is required to be fully operational for the duration of the test.

3. Computer-based, self-testing/self-diagnostic equipment [see NFPA 101(12), Sec. 7.9.3.1.3]

a. Computer-based, self-testing/self-diagnostic battery-operated emergency lighting equipment must automatically perform a test for not less than 30 seconds and a diagnostic routine not less than once every 30 days.
b. The equipment must automatically perform an annual test for a minimum of 90 minutes.
c. The emergency lighting equipment is required to be fully operational for the duration of these tests.

4. These requirements also apply to EXIT signs provided with a battery-operated emergency illumination source [see NFPA 101(12), Sec. 7.10.9.2].

MSFC(15), Sec. 604.5 requires a monthly 30-second test and an annual test for a minimum of 30 minutes.

Battery-powered lighting units in operating rooms

The question commonly comes up about what kind of testing is required for the battery-operated lighting found in operating rooms. The answer to that question can be found in NFPA 99(12), Sec. 6.3.2.2.11.5 – these lighting units must be tested monthly for 30 seconds and annually for 30 minutes.

Test methods

Manufacturers' documentation should include instructions for proper maintenance and testing of their equipment. That said, there are several ways to perform the required tests:

1. Many battery-operated emergency lights and EXIT signs are equipped with a test switch or test button that simulates a power outage and activates the battery. The downside of using this method, however, is that, on older lighting units, the circuitry that's supposed to interrupt the normal AC power can fail. In such cases, the use of the test switch or test button really only serves to test the lamps, but does not serve as a valid test of the batteries.

2. The *Electrical Code* allows flexible cord-and-plug connections for battery-operated emergency lights, provided the cord doesn't exceed 3 feet in length. Testing of this kind of installation can be performed by simply unplugging the unit for the required amount of time. Obviously, care needs to be taken to ensure that the units are plugged in again immediately after the test, so as to avoid what's called a "deep discharge" of the batteries (i.e. a discharge below 80% of the batteries' initial rated voltage), which can be damaging to the life of the batteries.

3. Another option is to shut off the breaker controlling the normal AC power to the emergency lights and/or EXIT signs. While probably the most effective way to test both the lamps and batteries, the downside here is obvious – throwing the breaker will also cut power to everything else on that circuit.

While holding a test switch or test button for 30 seconds isn't much of a problem, holding it for 90 minutes is a completely different matter. This has led to inquiries about whether or not it's acceptable to install a switch at each individual light that can be used to interrupt the normal AC

power for the required 90 minutes. The simple answer is **no**, installation of such a switch would be a violation of the *Electrical Code*. Some things to keep in mind include:

1. The *Electrical Code* requires that the branch circuit feeding unit equipment be the same circuit as that serving the normal lighting in the area *and that it be connected ahead of any local switches*. For example, units located in a corridor or stair enclosure must be connected to the branch circuit supplying the normal corridor or stair enclosure lighting ahead of, or on the line side of, any switches. If power is lost to the branch circuit for any reason, the batteries automatically take over and restore illumination to the corridor or stair enclosure.

2. It must be further noted that it is **not** acceptable to provide a separate branch circuit for unit equipment. This is because, in the example given above, failure of the normal corridor or stair enclosure branch circuit wouldn't necessarily affect the unit equipment, leaving the corridor or stair enclosure in darkness.

3. That leaves it up to facility personnel to devise a way to hold the test switch/button in the test position for the required 90-minute test period. It is recommended that the equipment manufacturer be contacted for guidance on acceptable ways to accomplish this without damaging the equipment.

Batteries

Like automobile batteries, which are continually discharged and recharged during normal vehicle operation, proper testing extends the life of batteries serving emergency lights or EXIT signs. Still, it must be remembered that these batteries have a limited service life. Because there are many factors that affect battery life (e.g. changing temperatures), it's not possible to set a hard and fast rule on how long a specific battery should last.

The two most commonly used battery types for emergency lighting are lead acid and nickel cadmium. While the equipment manufacturer would be the best source for information on battery life, a maintenance-free lead acid battery might be expected to have a service life somewhere between 5 – 10 years and a maintenance-free nickel cadmium battery an estimated service life of between 10 – 15 years.

It is important to note that some dimming of the lamps may occur during testing. However, the minimum lighting levels specified in the code [see NFPA 101(12), Sec. 7.9.2.1 or MSCFC(15), Sec. 1006.3.1] must be maintained for a minimum of 90 minutes.

DOCUMENT your tests and battery replacements

NFPA 101(12), Sections 7.9.3.1.1(5) and 7.9.3.1.2(7) require that written records of the testing of your battery-operated emergency lights and EXIT signs be kept for inspection by the AHJ. NFPA 101(12), Sec. 7.9.3.1.3(5) requires that computer-based systems be capable of providing a history of tests and failures at all times.

MSFC(15), Sections 604.5.1.1 and 604.5.2.1 require that records of the tests of emergency lighting equipment be maintained on the premises for a minimum of 3 years and submitted to the fire code official upon request. The record must, at a minimum, include the following:

- The location of the emergency lighting tested
- Whether the unit passed or failed
- The date of the test
- The name of the person completing the test

Obviously, in order to ensure that all emergency lights in your building are inspected and tested as required, you need to know where they are…and you may be asked to prove that at time of survey. One way to do this is to have an inventory of all of your emergency lighting units.

You should have logs on which to record the required inspections and testing. In addition to the information required by MSFC(15), Sections 604.5.1.1 and 604.5.2.1, the logs should indicate the date of initial installation for each piece of equipment, the date of battery replacement, and a space to identify any problems found and what was done to correct them. The reason the date of installation is important is because it serves as the baseline used to confirm that the testing is being performed within required timeframes.

It is important that at least two people in your facility know where your logs are kept to increase the likelihood that they can be readily provided if requested during an inspection. It is recommended that these logs be maintained on the premises for at least three years to meet MN State Fire Code requirements.