

Inspection, Testing, and Maintenance of Fire Alarm Systems—A Key to Life Safety

Dan Finnegan, Manager of Industry Affairs for Siemens Fire Safety and Security

Fire alarm systems are a key component in the 90,000 lives that have been saved in fire-related events since 1970.

Fire alarm systems need to work right the first time—there are no second chances in life safety performance. They are intended to fulfill three essential objectives:

- life safety
- property protection
- continuance of the business mission

Electrical Safety Month is a good time to review the increased reliance on the fire detection and notification systems for life safety and the growing importance on maintaining the predictability of the fire detection system response. The concepts of reliability analysis and prediction form the foundation on which all inspection, testing, and maintenance programs should be based.

Reliability Activates Early, Accurate Alarms

Reliability includes both the ability to detect and correctly respond to a fire, and deliver a fire alarm indication only when a legitimate fire alarm stimulus actually occurs. Simply stated,

early and accurate alarms avoid the concept of “unwanted” alarms, a topic that has recently gained attention.

Based on Murphy’s law (the truism of anything that can go wrong will go wrong), we can conclude that any system will suffer a failure of one of its components at some time during its design lifetime.

The reliability of a fire alarm system, like any electronic system, can be computed using a method developed during WWII by German scientist Robert Lusser, who discovered that the reliability of a system was the product of the reliabilities of the individual components.

Research into the reliability of systems has shown that, for most physical systems, when the failure rate is plotted versus time, a curve of a familiar shape termed the “bathtub” is displayed (see Figure 1). The first curve shows a higher rate of failure on startup, then flattens out over the length of the product life cycle at a very slow rate, and spikes up at the end of life region.

A fire alarm system without a code compliance comprehensive program is every bit as incomplete as a car with only three wheels.

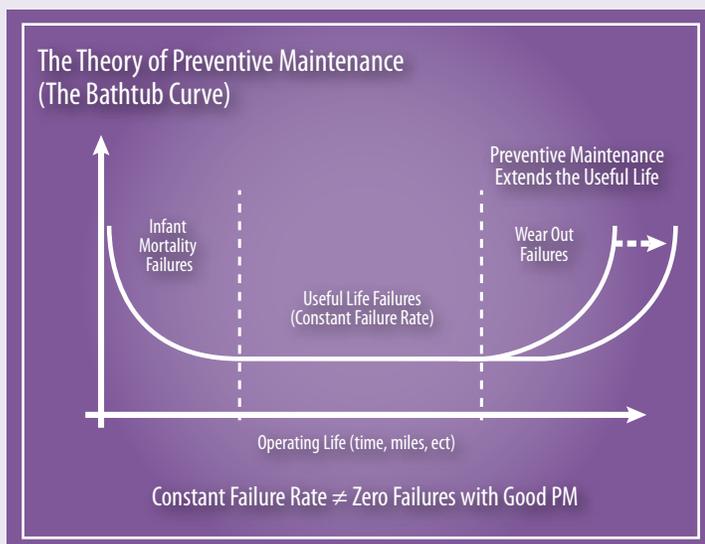


Figure 1. When failure rate is plotted against time, a “bathtub” curve results.

DESIGNING RELIABILITY INTO SYSTEM OBJECTIVES

The driving force behind every inspection, testing, and maintenance program is the need to make system reliability as high as possible. System reliability is the result of four key elements:

- system design
- installation
- equipment
- maintenance program

The initial inspection and testing of the system should identify any problems that are designed into the system so they can be corrected before the system is accepted. For example, it would not be advisable to locate a smoke detector in an area that will normally sense aerosols, such as a cooking area.

The initial inspection and test should also uncover issues with system installation, such as wiring, loose screw terminals, and the correct raceways for the environment/weather.

Fire alarm equipment is very reliable today and is produced under stringent quality assurance programs audited by nationally recognized testing laboratories such as Underwriters Laboratories.

A program of inspection, testing, and maintenance of fire alarm systems is critical to achieving the design objectives of the system. It is through such a program that issues are discovered. Ongoing inspection, testing, and maintenance aid in discovery of changes in the building occupancy/layout and the proper operation of the key system detection, control, and notification components. A fire alarm system without a code-compliant comprehensive program is every bit as incomplete as a car with only three wheels.

Reliability establishes the demand for fire alarm systems to be maintained. NFPA 72 *National Fire Alarm and Signaling Code*¹ establishes the requirement and places the responsibility for the regular inspection, testing, and maintenance on the owner/operator of the site.

¹ NFPA 72 *National Fire Alarm and Signaling Code*, National Fire Protection Association, Revised 2010

An issue often faced in our industry is the enforcement of the codes and standards that outline the frequency, method, and qualifications for inspection, testing, and maintenance of fire alarm systems. Systems that are not properly installed and maintained lead to unwanted alarms and the potential loss of life, property, and business mission.

Sadly Different Outcomes

Here are two recent examples of the impact on life safety when codes and standards are followed; fire alarm and fire protection systems are properly designed and installed; and a testing, inspection, and maintenance program is followed.

Although both occurred in hospitals, they highlight the importance of reliability of fire alarm and fire protection systems in all buildings.

MONTEFIORE MEDICAL CENTER, THE BRONX, NEW YORK

A fire broke out at the Montefiore Medical Center on the afternoon of November 9, 2011, in a basement cogeneration plant. The fuel ignited, causing a tremendous amount of smoke in a short time. Smoke detectors activated properly, and the engineering staff and foam sprinkler system quickly put out the fire. Smoke traveled up a ventilation shaft to exit the hospital at street level, and the hospital's internal ventilation system shut down as it should have when the alarms went off.

› New NEMA Section Website Launched

The NEMA Signaling, Protection and Communication Section membership unveils its Life Safety Solutions Online website this month.

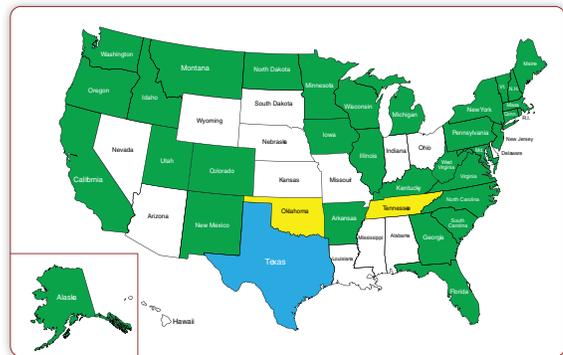
The site provides visitors with key life safety information on:

- carbon monoxide (CO) detection
- life safety regulatory and legislative updates
- industry research papers
- fire safety blogs, videos, podcasts, etc.

Visitors can also access answers to frequently asked questions on a number of pertinent smoke detection and CO detection technology questions.

Visit www.lifesafetysolutionsonline.org

John J. Marcario, Industry Director, NEMA Signaling, Protection, and Communication Section
| john.marcario@nema.org



State Carbon Monoxide Requirements

- **Pending State Legislation**
- **Enacted CO Requirements for Child Day Care Facilities/Group Homes Only**
- **Enacted CO Requirements by Statute, Code or Regulation**
- **Enacted Combination of CO Requirements, including Child Care Facilities/Group Homes**

According to one building engineer, it was “everybody’s worst nightmare, but from an engineering system standpoint, everything couldn’t have worked better.” The adult and pediatric emergency departments had about 150 patients total at the time of the fire, and two intensive care units housed about 20 patients—including five who were on ventilators. There were no serious injuries or deaths in the incident.

AMRI HOSPITAL, KOLKATA, INDIA

On December 10, 2011, 89 persons choked to death at Kolkata’s posh AMRI Hospital when thick smoke from a fire in the basement went through the central air-conditioning ducts and engulfed seven floors. There were 160 persons inside the hospital when the fire began around 3 a.m., many of them were asleep and some too ill even to move.

Reports indicated that the fire alarm system did not function properly. The fire was confined, but not the smoke.

“The mechanism to stop smoke from spreading didn’t work,” said Gopal Bhattacharjee, director of the fire department.

Inspect, Test, Maintain

The objectives of a fire alarm system will be achieved in the event of a fire only if the fire alarm system functions properly. An inspection, testing, and maintenance program is essential for the reliable performance of the fire alarm system.

Our industry needs to promote the enforcement of the provisions within NFPA and building codes that require all fire alarm and fire protection systems be properly maintained. Lives depend on it. ☹

Mr. Finnegan has 38 years of fire life safety experience, and serves on many technical code committees representing Siemens, NEMA, and AFAA.



Is your electrical safety program effective? **HOW DO YOU KNOW?**

Are you prepared to deal with the consequences of an electrical tragedy in your workplace? Take the Electrical Safety Foundation International’s (ESFI) **FREE** electrical safety self-assessment before it’s too late. Visit ESFI’s website for our assessment tool and a variety of additional free resources aimed at preventing electrical fires, injuries, and fatalities.

www.electrical-safety.org



In partnership with

