MARKETING WHITE PAPER

Subject: Considerations for Effective Emergency Alarm Systems in Industrial Facilities
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An emergency evacuation of their workplace is not something most employees consider as they go about their usual day. Yet when events do arise requiring evacuation or other emergency action, employees must be able to recognize the emergency situation and follow the established procedures that result in the quick and orderly response that assures the safest possible outcome. Since such emergencies are relatively rare and not top of mind for most people, an effective employee emergency alarm system is critical because it is relied upon as the primary means of notifying employees of an emergency and directing their course of action.

Due to the critical importance of emergency alarm systems, OSHA has developed a Standard addressing them specifically. Compliance with OSHA regulations regarding Employee Emergency Response Plans (29 CFR 1910.38 and 1910.120) requires that an alarm system must be installed which complies with 29 CFR 1910.165 "Employee Alarm Systems." This Standard serves as the guide to safety and health professionals as they consider their facility's systems.

Three keys to an effective alarm system are coverage, consistency, and automation. Coverage assures that emergency notification can reach all of the occupants in and around an entire facility. Consistency assures that the occupants recognize and understand in a unified way the meaning of a given emergency signal. And automation supplies the systematic means by which emergency communication is implemented. This article, written with these three concepts and Standard 1910.165 in mind, presents some considerations for designing an effective employee alarm system.

Within Standard 1910.165, the General Requirements section (b)(1) states, "The employee alarm system shall provide warning for necessary emergency action as called for in the emergency action plan, or for reaction time for safe escape of employees from the workplace or the immediate work area, or both." Gaining a clear understanding of the scope of the workplace is the first consideration in the design of an effective alarm system. All plants and facilities are different in terms of both their physical layout and the comings and goings of their occupants. Facilities might have multiple buildings, multiple levels, outdoor break areas, parking lots, conference rooms, recreation areas, rest rooms,

and, sometimes, isolated workspaces. Employees move around and there are often temporary employees or visitors in the facility who have not been trained in its emergency procedures. The design of the alarm system must take into account the many workplace variables to assure that all occupants are properly notified and directed during an emergency.

Ensuring that all employees are notified and properly directed in times of emergency can be a challenge as people move from place to place within a building, or from indoors to outdoors. Complete coverage can be achieved by integrating all warning devices, including outdoor signaling, into a single system. Warnings should also reach even the most isolated areas in a facility, including areas that go unused most of the time, such as basements and substations.

In terms of consistency, communication methods used for emergencies -- such as tones, lights, horns, bells, or pre-recorded voice messages -- should be understood by all employees as emergency signaling. Ideally, the emergency signaling used in an office area should be the same as that used in the plant, on the loading dock, or in the parking lot. Consistency simplifies emergency response training.

The ambient noise and light levels within a facility are very important to consider when designing an alarm system. The General Requirements section (b)(2) of Standard 1910.165 states, "The employee alarm shall be capable of being perceived above ambient noise or light levels by all employees in the affected portions of the workplace. Tactile devices may be used to alert those employees who would not otherwise be able to recognize the audible or visual alarm." Since noise and light levels can vary significantly throughout a facility, special care needs to be taken to assure that emergency signaling is always noticed and understood but in a way that is appropriate to its immediate surroundings. Noise levels should be measured throughout the facility to assess the acoustical environment in which the alarm system will operate.

In terms of audible alarm signaling, devices of varying output can be used throughout a facility, and a specification of 10dB over ambient noise level is a good rule of thumb to use. Varying the audible output relative to the noise level in a given workspace assures the alarm will be heard while not posing problems, such as signaling that is overly loud in quiet office settings or inadequately low in vast outdoor spaces.

In environments where hearing protection is used due to high ambient noise levels, as is often the case in manufacturing and processing plants, alarm devices must overcome the hearing protection. Visual devices can be used either as emergency signals themselves or as a means to call attention to an audible signal. Care should be taken to make sure such visual signals are dedicated to the employee alarm system, because if they are also used to signal non-emergency events, they may not be heeded in times of emergency.

The General Requirements section (b)(3) of Standard 1910.165 states, " The employee alarm shall be distinctive and recognizable as a signal to evacuate the work area or to

perform actions designated under the emergency action plan." Typically, an emergency action plan will take into account the fact that emergencies are not all alike, and it will specify different responses depending on the type of emergency. For instance, a tornado would call for a warning directing employees to an indoor safe-area, where a gas leak would call for an evacuation to the outdoors. For this reason the most effective emergency alarm systems utilizes multiple tones or messages to differentiate events. If the number of potential emergencies is limited, tones are useful. However, more than a few tones can be confusing and pre-recorded digital voice messages may be used to signal specific emergency events and the required response. In environments where PA announcements are frequent and considered normal, the use of an "emergency tone" in combination with a voice message is advisable to assure that the emergency message is clearly differentiated from routine broadcasts.

How emergencies are reported and alarm systems activated should be thoroughly explored as an emergency alarm system is being designed. According to the General Requirements section (b)(4) of Standard 1910.165, "The employer shall explain to each employee the preferred means of reporting emergencies, such as manual pull box alarms, public address systems, radio or telephones. The employer shall post emergency telephone numbers near telephones, or employee notice boards, and other conspicuous locations when telephones serve as a means of reporting emergencies. *When a communication system also serves as the employee alarm system, all emergency messages shall have priority over non-emergency messages.*" [Italics added]

Although PA systems can be used as a method of communicating emergency warnings in an employee alarm system, special care must be taken when doing so. When using a facility's standard PA system for emergency warning, it can be difficult to assure emergency messages have priority over non-emergency messages because most PA systems can be accessed from many points at any time by many employees. Problems can arise if PA messages are routed to specific individuals, such as security guards or receptionists. In those cases for instance, the alarm system could fail if the individuals are incapacitated in the emergency or do not receive important details. In short, emergency systems that rely heavily on people interfacing with a general PA system are faced with risks not inherent in dedicated emergency alarm systems.

The most reliable employee alarm system is one that is isolated from the general PA system with dedicated initiation devices and alarm signals throughout the facility. A dedicated system eliminates confusion and assures that a clear line is available during times of emergency. Furthermore, by fully automating a dedicated alarm system, health and safety managers can more easily facilitate very comprehensive emergency action plans. Regardless of the number of emergency situations covered in a plan, an automated system provides assurance that proper emergency notification and direction will always be clear and precise.

The critical nature of employee alarm systems requires that great attention be given to their design and function. With OSHA Regulations Standard 29 CFR 1910.165 as the

guideline, health and safety professionals should understand and address the many variables that come into play when developing an industrial alarm system. The ultimate goal of an employee emergency alarm system is to capture the attention of everyone, and communicate the desired response without creating confusion. The most effective systems are designed and installed with particular consideration given to the concepts of coverage, consistency, and automation.

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