Although it is seen as a potential threat to public health, avian flu may be even more threatening to employees of poultry farms especially those involved in the initial culling of the birds, other farm workers and animal handlers. According to OSHA’s “Guidance for Protecting Workers Against Avian Flu,” these same people may (ironically) be the first line of defense for both the protection of human health and the reduction of large loses in the agricultural industry because they are most likely to recognize an infected bird or animal.

Employees of wild game preserves are also at risk. On the medical front, laboratory workers, medical transport workers, and doctors and nurses are also at risk. In its Avian Influenza FAQs (www.who.int/csr/disease/avian_influenza/avian_faqs/en/), World Health Organization (WHO) notes that:

in an agricultural setting, animal manure containing influenza virus can contaminate dust and soil, causing infection when the contaminated dust is inhaled. Contaminated farm equipment, feed, cages, or shoes can carry the virus from farm to farm. The virus can also be carried on the bodies and feet of animals, such as rodents. The virus can survive, at cool temperatures, in contaminated manure for at least three months. In water, the virus can survive for up to four days at 72º F and more than 30 days at 32º F. For the highly pathogenic form (of influenza A), studies have shown that a single gram of contaminated manure can contain enough virus to infect one million birds.

In a food handling/preparation setting, there is also some concern that avian influenza could be

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transmitted from uncooked birds or bird products. WHO has also reported a study that found avian influenza A (H5N1) in imported frozen duck meat. Eggs from infected poultry could also be contaminated with the virus.

OSHA’s worker protection guidance document observes that there are other federal agencies and international organizations which have further resources on avian flu. These include:

- Centers for Disease Control and Prevention (CDC), which has established avian flu public hotlines (888) 246-2675 (English); (888) 246-2857 (Spanish); and a clinician hotline (877) 246-4625. CDC has additional online resources at www.cdc.gov/flu/avian/index.htm.
- WHO has information on avian flu at www.who.int/csr/disease/avian_influenza/en.
- Physicians, employers and employees should contact their state or local health department (www.cdc.gov/mmwr/interational/relre.html) to notify them of any symptomatic employees or suspected exposure incidents.

**Understanding Avian Flu**

In recent months, the news has been filled with reports on influenza, shortage of influenza vaccine and stories about the possibility of avian flu pandemic worldwide. The author conducted a literature search to learn what WHO and the U.S. Dept. of Health and Human Services (DHHS) scientists and experts are doing to prevent the spread of avian flu.

According to WHO, avian flu is an infectious disease of birds caused by type A strains of the influenza virus. Although avian flu outbreaks have been reported in China, Vietnam, Thailand and some parts of Europe in recent years, the disease (avian flu) was first identified in Italy more than 100 years ago, and it occurs worldwide.

All birds are thought to be susceptible to infection with avian influenza, although some species are more resistant to infection than others. Infection causes a wide spectrum of symptoms in birds, ranging from mild illness to a highly contagious and rapidly fatal disease that may result in severe epidemics. The latter is known as “highly pathogenic avian influenza.” This type of disease is characterized by sudden onset, severe illness and rapid death, with a mortality that can result in 100 percent.

Recent research has shown that viruses of low pathogenicity can mutate into highly pathogenic viruses after circulation for short periods in a poultry population. In the 1983-84 epidemic in the U.S., the H5N2 virus initially caused low mortality, but within six months became highly pathogenic, with a mortality rate of 90 percent in the poultry population. Control of the outbreak required destruction of more than 17 million birds at a cost of nearly $65 million.

An epidemic of H5N2 avian influenza, which began in Mexico in 1992, started with low pathogenicity, evolved to the highly fatal form and was not controlled until 1995. During the 1999-01 epidemic in Italy, the H7N1 virus, initially of low pathogenicity, mutated within nine months to a highly pathogenic form. More than 13 million birds died or were destroyed to control further infections in the poultry populations in Italy.

**Infection Control at Farms**

The quarantining of infected farms and destruction of infected or potentially exposed flocks are standard control measures aimed at preventing spread to other farms and eventual establishment of the virus in a country’s poultry population. Apart from being highly contagious, avian influenza viruses are readily transmitted from farm to farm by mechanical means, such as by contaminated equipment, vehicles, feed, cages, shoes and clothing. Highly pathogenic viruses can survive for long periods in the environment, especially when temperatures are low. Stringent sanitary measures on farms can achieve some degree of protection.

In the absence of prompt control measures backed by good surveillance, epidemics can last for years. For example, the epidemic of H5N2 avian influenza that began in Mexico in 1992 was not controlled until 1995.

Avian influenza A (H5N1) viruses usually affect wild birds but have infected and caused serious disease among poultry, such as chickens, in Asia and Europe. Human infections with H5N1 viruses are rare, but were reported in 2003 to 2005 in Vietnam, Thailand, Cambodia, Indonesia and China.

Most cases of H5N1 infection in humans are thought to have occurred from direct contact with infected poultry in the affected countries in Asia.

The threat of new influenza subtypes such as influenza A (H5N1) will be greatly increased if the virus gains the ability for sustained spread from one human to another. Such transmission has not yet been observed. However, a few cases of probable person-to-person spread of H5N1 viruses have been reported, with no instances of transmission continuing beyond one person. For example, one case of probable person-to-person transmission associated with close contact between an ill child and her mother is thought to have occurred in Thailand in September 2004.

H5N1 infections in humans can cause serious disease and death. Currently there is no commercially available vaccine to protect people against the H5N1 virus that is being seen in Asia and Europe. However, vaccines are being developed. Research studies to test a vaccine to protect people against the H5N1 virus began in April 2005 and a series of clinical trials is under way. For more information about vaccine development, visit the National Institutes of Health website.

When possible, care should be taken to avoid contact with poultry that has no apparent symptoms, as well as with sick or dead poultry and any surfaces which may have been contaminated by poultry or their feces or secretions. Transmission of H5N1 viruses to two persons through consumption of uncooked duck blood may also have occurred in Vietnam in 2005. Therefore, uncooked poultry or poultry products, including blood, should not be consumed.

**Disease Management**

Although the scientific community has made remarkable strides during the past century in preventing and curing diseases, it is constantly challenged by new strains of multidrug resistant microbes—viruses, bacteria, protozoa and fungi that are forever changing and adapting themselves to the human host and the defenses which humans create.

Likewise, the influenza viruses are notable for their resilience and adaptabili-
ty. While science has been able to develop highly effective vaccines and treatments for many infectious diseases that threaten public health, developing an effective treatment medium is an ongoing challenge with the influenza virus. Changes in the genetic makeup of the virus require pharmaceutical companies and scientists to develop new vaccines on an annual basis and forecast which strains are likely to predominate.

The H5N1 viruses currently infecting birds in Asia and Europe and some humans in Asia are resistant to amantadine and rimantadine, two antiviral medications commonly used for influenza. The H5N1 viruses are susceptible in a laboratory setting to the antiviral medications oseltamivir and zanamivir, although the effectiveness of these drugs when used for treatment of H5N1 virus infection is unknown. For more information about influenza antiviral drugs, visit www.cdc.gov/flu/professionals/treatment.

Each year, when people receive influenza vaccinations, questions arise whether the vaccination will prevent influenza of all types. The challenge is that all type A influenza viruses, including those that regularly cause seasonal epidemics of influenza in humans, are genetically labile and well adapted to elude host defenses. Influenza viruses lack mechanisms for the “proofreading” and repair of errors that occur during replication. As a result of these uncorrected errors, the genetic composition of the viruses changes as they replicate in humans and animals, and the existing strain is replaced with a new antigenic variant. These constant, permanent, and usually small changes in the antigenic composition of influenza A viruses are known as antigenic “drift,” which is commonly described as mutation of the virus.

Influenza viruses have a second characteristic of great public health concern: influenza A viruses, including subtypes from different species, can swap or “reassort” genetic materials and merge. This reassortment process, known as antigenic “shift,” results in a novel subtype different from both parent viruses. As populations will have no immunity to the new subtype, and as no existing vaccines can confer protection, antigenic shift has historically resulted in highly lethal pandemics. For this to occur, the novel subtype must have genes from human influenza viruses that make it readily transmissible from person to person for a sustainable period, according to WHO and CDC.

The tendency of influenza viruses to undergo frequent and permanent antigenic changes necessitates constant monitoring of the global influenza situation and annual adjustments in the composition of influenza vaccines. Both activities have been a cornerstone of WHO’s Global Influenza Program and DHHS.

Conditions favorable for the emergence of antigenic shift have long been thought to involve humans and working in close proximity to domestic poultry and pigs. Because pigs are susceptible to infection with both avian and mammalian viruses, including human strains, they can serve as a “mixing vessel” for the scrambling of genetic material from human and avian viruses, resulting in the emergence of a novel subtype. Recent events, however, have identified a second possible mechanism. Evidence is mounting that for at least some of the 15 avian influenza virus subtypes circulating in bird populations humans themselves can serve as the mixing vessel.

**Risk Factors for Avian Influenza in Humans**

Avian influenza viruses do not normally infect species other than birds and pigs. According to WHO, the first documented infection of humans with an avian influenza virus occurred in Hong Kong in 1997, when the H5N1 strain caused severe respiratory disease in 18 humans, six of whom died. The infection of humans coincided with an epidemic of highly pathogenic avian influenza, caused by the same strain, in Hong Kong’s poultry population.

Extensive investigation by WHO of the outbreak determined that close contact with live infected poultry was the source of human infection. Studies at the genetic level further determined that the virus had jumped directly from birds to humans. Limited transmission to healthcare workers occurred, but did not cause severe disease.

WHO reported that a rapid destruction (within three days) of Hong Kong’s entire poultry population, an estimated 1.5 million birds, reduced opportunities for further direct transmission to humans and may have averted a pandemic.

The 1997 Hong Kong Flu alarmed public health authorities worldwide, as it marked the first time that an avian influenza virus was transmitted directly to humans and caused severe illness with high mortality. Concerns were raised again in February 2003, when an outbreak of H5N1 avian influenza in Hong Kong caused two cases and one death in members of a family who had recently traveled to southern China. Another child in the family died during that visit, but the cause of death was not known.

Two other avian influenza viruses have recently caused illness in humans. An outbreak of highly pathogenic H7N7 avian influenza, which began in the Netherlands in February 2003, caused the death of one veterinarian two months later, and mild illness in 83 other humans. Mild cases of avian influenza H9N2 in children occurred in Hong Kong in 1999 (two cases) and in mid-December 2003 (one case). H9N2 is not highly pathogenic in birds, according to WHO.

The most recent cause for alarm occurred in January 2004 when laboratory tests confirmed the presence of H5N1 avian influenza virus in human cases of severe respiratory disease in the northern part of Vietnam.

**H5N1: Of Particular Concern**

Of the 15 avian influenza virus subtypes, H5N1 is of particular concern based on the following characteristics:

1) H5N1 mutates rapidly and has a documented propensity to acquire genes from viruses infecting other animal species.
2) H5N1 can cause severe disease in humans, as has now been documented on two occasions.
3) Laboratory studies have demonstrated that isolates from this virus have a high pathogenicity and can cause severe disease in humans. Birds that survive infection excrete virus for at least 10 days, orally and in feces, thus facilitating further spread at live poultry markets and by migratory birds.
4) The epidemic of highly pathogenic

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avian influenza caused by H5N1, which began in mid-December 2003 in the Republic of Korea and is now being seen in other Asian countries, is, therefore, of particular public health concern.


6) The spread of infection in birds increases the opportunities for direct infection of humans. If more humans become infected over time, the likelihood also increases that humans, if concurrently infected with human and avian influenza strains, could serve as the mixing vessel for the emergence of a novel subtype with sufficient human genes to be easily transmitted from person to person. Such an event would mark the start of an influenza pandemic.

**Influenza Pandemics: Can They Be Prevented?**

Pandemics happen when a new type or mutation of influenza virus emerges that infects and is efficiently transmitted between humans. Animals are the most likely reservoir for these emerging viruses; avian viruses played a role in the last three influenza pandemics. Two of these pandemic-causing viruses remain in circulation and are responsible for the majority of influenza cases each year.

As noted, pandemics have occurred intermittently over centuries. The last three pandemics, in 1918, 1957 and 1968, killed approximately 40 million, two million and one million people worldwide, respectively. Although the timing cannot be predicted, history and science suggest that we will face one or more pandemics in this century.

The current pandemic threat stems from an unprecedented outbreak of avian influenza in Asia and Europe, caused by the H5N1 strain. To date, the virus has infected birds in 16 countries and has resulted in the deaths, through illness and killing, of approximately 200 million birds across Asia. While traditional control measures have been attempted, the virus is now endemic in southeast Asia, present in long-range migratory birds and unlikely to be eradicated soon.

A notable and worrisome feature of the H5N1 virus is its ability to infect a wide range of hosts, including birds and humans. According to DHHS, the virus is known to have infected more than 121 people in four countries, resulting in 62 deaths over the past two years. Although the virus has not yet shown an ability to transmit efficiently between humans, as is seen with the annual influenza virus, there is concern that it will acquire this capability through genetic mutation or exchange of genetic material with a human influenza.

As a result, and despite annual vaccinations, the U.S. faces a burden of influenza that results in approximately 36,000 deaths and more than 200,000 hospitalizations each year. In addition to this human toll, influenza is annually responsible for a total cost of more than $10 billion in the U.S., according to DHHS.

A pandemic, or worldwide outbreak of a new influenza virus, could enhance this impact by overwhelming the nation’s health and medical capabilities, potentially resulting in hundreds of thousands of deaths, millions of hospitalizations, and hundreds of billions of dollars in direct and indirect costs. To control the pandemic, DHHS has published national strategy guidelines for preparedness and response activities to mitigate that impact in the U.S.

The national strategy guidelines are based on preparedness and response to an influenza pandemic with the intent of 1) stopping, slowing or otherwise limiting the spread of a pandemic to the U.S.; 2) limiting the domestic spread of a pandemic, and mitigating disease, suffering and death; and 3) sustaining infrastructure and mitigating impact to the economy and the functioning of society.

The strategy is a guiding document to provide a framework for future U.S. government planning efforts that is consistent with the National Security Strategy and the National Strategy for Homeland Security. This document clearly recognizes that preparing for and responding to a pandemic cannot be viewed as a purely federal responsibility, and that the nation must have a system of plans at all levels of government and in all sectors outside of government which can be integrated to address the pandemic threat. It is guided by the following principles:

1) Preparedness and Communication: This encompasses activities that should be undertaken before a pandemic to ensure preparedness, and the communication of roles and responsibilities to all levels of government, segments of society and individuals.

2) Surveillance and Detection: Domestic and international systems that provide continuous “situational awareness” to ensure the earliest warning possible to protect the population.

3) Response and Containment: Actions to limit the spread of the outbreak and to mitigate the health, social and economic impacts of a pandemic.

This strategy reflects the federal government’s approach to the pandemic threat. While it provides strategic direction for the
departments and agencies of the U.S. government, it does not attempt to catalog and assign all responsibilities to the federal government. The implementation of the strategy and specific responsibilities remains to be developed and communicated.

**Pillar One: Preparedness & Communication**

Preparedness is the underpinning of the entire spectrum of activities, including surveillance, detection, containment and response efforts. In accordance with this plan, the federal government through DHHS will support pandemic planning efforts, and clearly communicate expectations to individuals, communities and governments, whether overseas or in the U.S., recognizing that all share the responsibility to limit the spread of infection in order to protect populations beyond their borders.

A critical element of pandemic planning is ensuring that people and entities not accustomed to responding to health crises understand the actions and priorities required to prepare for and respond to a pandemic. Those groups include political leadership at all levels of government, nonhealth components of government and members of the private sector. Essential planning also includes the coordination of efforts between human and animal health authorities. To accomplish this, the following plan of action is essential:

**Communicating Expectations & Responsibilities**

1) Ensure clear, effective and coordinated risk communication, domestically and internationally, before and during a pandemic. This includes identifying credible spokespersons at all levels of government to effectively coordinate and communicate helpful, informative messages in a timely manner.

2) Provide guidance to the private sector and critical infrastructure entities on their role in the pandemic response, and considerations necessary to maintain essential services and operations despite significant and sustained worker absenteeism.

3) Provide guidance to individuals on infection control behaviors they should adopt pre-pandemic, and the specific actions they will need to take during a severe influenza season or pandemic, such as self-isolation and protection of others if they themselves contract influenza.

4) Provide guidance and support to poultry, swine and related industries on their role in responding to an outbreak of avian influenza, including ensuring the protection of animal workers, and initiating or strengthening public education campaigns to minimize the risks of infection from animal products.

**Producing & Stockpiling Vaccines, Antivirals & Medical Material**

In combination with traditional public health measures, vaccines and antiviral drugs form the foundation of national infection control strategy. Vaccination is the most important element of this strategy, but we acknowledge that a two-pronged strategy incorporating both vaccines and antivirals is essential. To establish production capacity and stockpiles in support of our containment and response strategies, the following measures need to be implemented:

1) Encourage nations to develop production capacity and stockpiles to support their response needs, to include pooling of efforts to create regional capacity.

2) Encourage and subsidize the development of state-based antiviral stockpiles to support response activities.

3) Ensure that our national stockpile and stockpiles based in states and communities are properly configured to respond to the diversity of medical requirements presented by a pandemic, including personal protective equipment, antibiotics and general supplies.

4) Establish domestic production capacity and stockpiles of countermeasures to ensure:
   - sufficient vaccine to vaccinate frontline personnel and at-risk populations, including military personnel;
   - sufficient vaccine to vaccinate the entire U.S. population within six months of the emergence of a virus with pandemic potential;
   - antiviral treatment for those who contract a pandemic strain of influenza.

5) Facilitate appropriate coordination of efforts across the vaccine manufacturing sector.

6) Address regulatory and other legal barriers to the expansion of our domestic vaccine production capacity.

7) Expand the public health recommendations for domestic seasonal influenza vaccination and encourage the same practice internationally.

8) Expand the domestic supply of avian influenza vaccine to control a domestic outbreak of avian influenza in bird populations.

**Establishing Distribution Plans for Vaccines & Antivirals**

It is essential to prioritize the allocation of countermeasures (vaccines and antivirals) that are in limited supply and define effective distribution modalities during a pandemic. Thus, it is important to:

1) develop credible countermeasure distribution mechanisms for vaccine and antiviral agents prior to and during a pandemic;

2) prioritize countermeasure allocation before an outbreak, and update this prioritization immediately after the outbreak begins based on the at-risk populations, available supplies and the characteristics of the virus.

**Advancing Scientific Knowledge & Accelerating Development**

Research and development of vaccines, antivirals, adjuvants and diagnostics represents the best defense against a pandemic. To realize the goal of next-generation countermeasures against influenza, we must make significant and targeted investments in promising technologies. Thus, it will be necessary to:

1) ensure that there is maximal sharing of scientific information about influenza viruses between governments, scientific entities and the private sector;

2) work with international partners to ensure that we are all leveraging the most advanced technological approaches available for vaccine production;

3) accelerate the development of cell culture technology for influenza vaccine production and establish a domestic production base to support vaccination demands;

4) use innovative investment strategies to advance the development of next-generation influenza diagnostics and countermeasures, including new antivirals, vaccines, adjuvant technologies and countermeasures that provide protection across continued on page 6
multiple strains and seasons of the influenza virus.

**Pillar Two: Surveillance & Detection**

Early warning of a pandemic and our ability to closely track the spread of avian influenza outbreak is critical to being able to rapidly deploy resources to contain the spread of the virus. An effective surveillance and detection system will save lives by allowing us to activate our response plans before the arrival of a pandemic virus to the U.S., activate additional surveillance systems and initiate vaccine production and administration.

**Ensuring Rapid Reporting of Outbreaks**

To support the need for “situational awareness,” both domestically and internationally, it will be necessary to:

1. corroborate with the International Partnership on Avian and Pandemic Influenza, as well as through other political and diplomatic channels such as the United Nations and the Asia-Pacific Economic Cooperation forum, to ensure transparency, scientific cooperation and rapid reporting of avian and human influenza cases;
2. support the development of the proper scientific and epidemiologic expertise in affected regions to ensure early recognition of changes in the pattern of avian or human outbreaks;
3. support the development and sustainment of sufficient U.S. and host nation laboratory capacity and diagnostic reagents in affected regions and domestically, to provide rapid confirmation of cases in animals or humans;
4. advance mechanisms for “real-time” clinical surveillance in domestic acute-care settings such as emergency departments, intensive care units and laboratories to provide local, state and federal public health officials with continuous awareness of the profile of illness in communities, and leverage all federal medical capabilities, both domestic and international, in support of this objective;
5. develop and deploy rapid diagnostics with greater sensitivity and reproducibility to allow onsite diagnosis of pandemic strains of influenza at home and abroad, in animals and humans, to facilitate early warning, outbreak control and targeting of antiviral therapy;
6. expand the domestic livestock and wildlife surveillance activities to ensure early warning of the spread of an outbreak to the U.S.

**Using Surveillance to Limit Spread**

Although influenza does not respect geographic or political borders, entry to and egress from affected areas represent opportunities to control or at the very least slow the spread of infection. In parallel to our containment measures, it will be necessary to:

1. develop mechanisms to rapidly share information on travelers who may be carrying or may have been exposed to a pandemic strain of influenza, for the purposes of contact tracing and outbreak investigation;
2. develop and exercise mechanisms to provide active and passive surveillance during an outbreak, both within and beyond our borders;
3. expand and enhance mechanisms for screening and monitoring animals that may harbor viruses with pandemic potential;
4. develop screening and monitoring mechanisms and agreements to appropriately control travel and shipping of potentially infected products to and from affected regions if necessary, and to protect unaffected populations.

**Pillar Three: Response & Containment**

We recognize that a virus with pandemic potential anywhere represents a risk to populations everywhere.

**Containing Outbreaks**

The most effective way to protect the American population is to contain an outbreak beyond the borders of the U.S. While we work to prevent a pandemic from reaching the U.S., we recognize that slowing or limiting the spread of the outbreak is a more realistic outcome and can save many lives. In support of our containment strategy, it will be necessary to:

1. work through the international partnership to develop a coalition of strong partners to coordinate various actions to limit the spread of a virus with pandemic potential beyond the location where it is first recognized in order to protect U.S. interests abroad;
2. where appropriate, offer and coordinate assistance from the U.S. and other members of the international partnership;
3. encourage all levels of government, domestically and globally, to take appropriate and lawful action to contain an outbreak within the borders of their community, province, state or nation;
4. use governmental authorities, where appropriate, to limit non-essential movement of people, goods and services into and out of areas where an outbreak occurs;
5. provide guidance to all levels of government on the range of options for infection-control and containment, including those circumstances where social distancing measures, limitations on gatherings, or quarantine authority may be an appropriate public health intervention;
6. emphasize the roles and responsibilities of the individual in preventing the spread of an outbreak, and the risk to others if infection-control practices are not followed;
7. provide guidance for states, localities and industry on best practices to prevent the spread of avian influenza in commercial, domestic and wild birds, and other animals.

**Leveraging National Medical & Public Health Surge Capacity**

Rather than generating a focal point of casualties, the medical burden of a pandemic is likely to be distributed in communities across the nation for an extended period of time. To save lives and limit suffering, the following steps will be necessary.

1. Implement state and local public health and medical surge plans, and leverage all federal medical facilities, personnel and response capabilities to support the national surge requirement.
2. Activate plans to distribute medical countermeasures, including non-medical equipment and other material, from the strategic national stockpile and other distribution centers to federal, state and local authorities.
3. Address barriers to the flow of public health, medical and veterinary personnel across state and local jurisdictions to meet local shortfalls in public health, medical and veterinary capacity.
4) Determine the spectrum of public health, medical and veterinary surge capacity activities that the U.S. military and other government entities may be able to support during a pandemic, contingent upon primary mission requirements, and develop mechanisms to activate them.

**Sustaining Infrastructure, Essential Services & the Economy**

Movement of essential personnel, goods and services, and maintenance of critical infrastructure are necessary during an event that spans months in any given community. The private sector and critical infrastructure entities must respond in a manner that allows them to maintain the essential elements of their operations for a prolonged period of time in order to prevent severe disruption of life in our communities. To ensure this, it will be necessary to:

1) encourage the development of coordination mechanisms across American industries to support the above activities during a pandemic;

2) provide guidance to activate contingency plans to ensure that personnel are protected, that the delivery of essential goods and services is maintained, and that sectors remain functional despite significant and sustained worker absenteeism;

3) determine the spectrum of infrastructure-sustainment activities that the U.S. military and other government entities may be able to support during a pandemic, contingent upon primary mission requirements, and develop mechanisms to activate them.

**Ensuring Effective Risk Communication**

Effective risk communication is essential to inform the public and mitigate panic. It requires the following actions:

1) Ensure that timely, clear, coordinated messages are delivered to the American public from trained spokespersons at all levels of government and help the governments of affected nations to do the same.

2) Work with state and local governments to develop guidelines to assure the public of the safety of the food supply and mitigate the risk of exposure from wildlife.

**Roles & Responsibilities**

Because of its unique nature, responsibility for preparedness and response to a pandemic extends across all levels of government and all segments of society. No single entity can prevent or mitigate the impact of a pandemic.

**The Federal Government**

While the federal government plays a critical role in elements of preparedness and response to a pandemic, the success of these measures is predicated on actions taken at the individual level and in states and communities. Federal responsibilities include the following:

1) Advance international preparedness, surveillance, response and containment activities.

2) Support the establishment of countermeasure stockpiles and production capacity by:
   - facilitating the development of sufficient domestic production capacity for vaccines, antivirals, diagnostics and personal protective equipment to support domestic needs, and encouraging the development of production capacity around the world;
   - advancing the science necessary to produce effective vaccines, therapeutics and diagnostics;
   - stockpiling and coordinating the distribution of necessary countermeasures, in concert with states and other entities.

3) Ensure that federal departments and agencies, including federal healthcare systems, have developed and exercised preparedness and response plans which take into account the potential impact of a pandemic on the federal workforce, and are configured to support state, local and private-sector efforts as appropriate.

4) Facilitate state and local planning through funding and guidance.

5) Provide guidance to the private sector and public on preparedness and response planning, in conjunction with states and communities.

6) Lead departments have been identified for the medical response (DHHS), veterinary response (Dept. of Agriculture), international activities (State Dept.) and the overall domestic incident management and federal coordination (Dept. of Homeland Security). Each department is responsible for coordination of all efforts within its authorized mission, and departments are responsible for developing plans to implement this strategy.

**States & Localities**

Communities are on the front lines of a pandemic and will face many challenges in maintaining continuity of society in the face of widespread illness and increased demand on most essential government services. State and local responsibilities include the following:

1) Ensure that all reasonable measures are taken to limit the spread of an outbreak within and beyond the community’s borders.

2) Establish comprehensive and credible preparedness and response plans that are exercised on a regular basis.

3) Integrate nonhealth entities into the planning for a pandemic, including law enforcement, utilities, city services and political leadership.

4) Establish state and community-based stockpiles and distribution systems to support a comprehensive pandemic response.

5) Identify key spokespersons for the community, ensuring that they are educated in risk communication and have coordinated crisis communications plans.

6) Provide public education campaigns on pandemic influenza and public and private interventions.

**The Private Sector & Critical Infrastructure Entities**

The private sector represents an essential pillar because of the essential goods and services that it provides. Moreover, it touches the majority of the population on a daily basis, through an employer-employee or vendor-customer relationship. For these reasons, it is essential that the U.S. private sector be engaged in all preparedness and response activities for a pandemic.

Critical infrastructure entities also must be engaged in planning for a pandemic because of society’s dependence on their services. Both the private sector and critical infrastructure entities represent essential underpinnings for the functioning of American society.

Responsibilities of the U.S. private sector and critical infrastructure entities include the following.

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1) Establish an ethic of infection control in the workplace that is reinforced during the annual influenza season, to include, if possible, options for working offsite while ill, systems to reduce infection transmission and worker education.

2) Establish contingency systems to maintain delivery of essential goods and services during times of significant and sustained worker absenteeism.

3) Where possible, establish mechanisms to allow workers to provide services from home if public health officials advise against nonessential travel outside the home.

4) Establish partnerships with other members of the sector to provide mutual support and maintenance of essential services during a pandemic.

**Individuals & Families**

The critical role of individuals and families in controlling a pandemic cannot be overstated. Modeling of the transmission of influenza vividly illustrates the impact of one individual’s behavior on the spread of disease, by showing that an infection carried by one person can be transmitted to tens or hundreds of others. For this reason, individual action is perhaps the most important element of pandemic preparedness and response.

Education on pandemic preparedness for the population should begin before a pandemic; should be provided by all levels of government and the private sector; and should occur in the context of preventing the transmission of any infection, such as the annual influenza or the common cold. Individual and families have several responsibilities:

1) Take precautions to prevent the spread of infection to others if an individual or a family member has symptoms of influenza.

2) Be prepared to follow public health guidance that may include limitation of attendance at public gatherings and nonessential travel for several days or weeks.

3) Keep supplies of materials at home, as recommended by authorities, to support essential needs of the household for several days if necessary.

**International Partners**

The international partnerships and corroboration with the United Nations, international organizations and private nonprofit organizations will be engaged a multilateral and bilateral basis. The international effort to contain and mitigate the effects of an outbreak of pandemic influenza is a central component of this overall strategy.

Based on historical patterns, influenza pandemics can be expected to occur, on average, three to four times each century when new virus subtypes emerge and are readily transmitted from person to person. However, the occurrence of influenza pandemics is unpredictable. Experts do agree though that another influenza pandemic is inevitable and possibly imminent. Most influenza experts also agree

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**OSHA’s Guidance Document Recommendation Summary**

According to OSHA’s guidance document, exposure to infected poultry and their feces or dust contaminated with feces has been associated with human infection; however, this is rare. The following summarizes recommendations developed by CDC and WHO because human infections have occurred in Asia during the current poultry epidemic.

1) All persons who have been in close contact with the infected animals, contact with contaminated surfaces, or after removing gloves, should wash their hands frequently. Hand hygiene should consist of washing with soap and water for 15 to 20 seconds or the use of other standard hand-disinfection procedures as specified by state government, industry or USDA outbreak-response guidelines.

2) All workers involved in the culling, transport or disposal of avian-influenza-infected poultry should be provided with appropriate PPE:

   - protective clothing capable of being disinfected or disposed, preferably coveralls plus an impermeable apron or surgical gowns with long cuffed sleeves plus an impermeable apron;
   - gloves capable of being disinfected or disposed; gloves should be carefully removed and discarded or disinfected and hands should be cleaned;
   - respirators: the minimum recommendation is a disposable particulate respirator (e.g., N95, N99 or N100) used as part of a comprehensive respiratory protection program (as described in 29 CFR 1910.134); workers should be fit-tested for the model and size respirator they wear and be trained to fit-check for facepiece to face seal;
   - goggles;
   - boots or protective foot covers that can be disinfected or disposed.

3) Environmental clean-up should be carried out in areas of culling, using the same protective measures as above.

4) Unvaccinated workers should receive the current season’s influenza vaccine to reduce the possibility of dual infection with avian and human influenza viruses.

5) Workers should receive an influenza antiviral drug daily for the duration of time during which direct contact with infected poultry or contaminated surfaces occurs. The choice of antiviral drug should be based on sensitivity testing when possible. In the absence of sensitivity testing, a neuraminidase inhibitor (oseltamivir) is the first choice since the likelihood is smaller that the virus will be-resistant to this class of antiviral drugs than to amantadine or rimantadine.

6) Potentially exposed workers should monitor their health for the development of fever, respiratory symptoms and/or conjunctivitis for one week after last exposure to avian-influenza-infected or exposed birds, or to potentially avian-influenza-contaminated environmental surfaces. Individuals who become ill should seek medical care and, before arrival, notify the healthcare provider that they may have been exposed to avian influenza.

When cases of avian influenza in humans occur, information on the extent of influenza infection in animals as well as humans and on circulating influenza viruses is urgently needed to aid the assessment of risks to public health and to guide the best protective measures. Thorough investigation of each case is also essential. While WHO and the members of its global influenza network, together with other international agencies, can help with many of these activities, the successful containment of public health risks also depends on the epidemiological and laboratory capacity of affected countries and the adequacy of surveillance systems already in place.

OSHA also notes that highly pathogenic avian influenza A (H5N1) is classified as a select agent and must be worked with under biosafety level (BSL) 3+ laboratory conditions. Furthermore, all employers processing biologic specimens suspected of being infected with influenza A (H5N1) must ensure that their employees comply with all provisions of 29 CFR 1910.1030 for employee protection against bloodborne pathogens.

While all these activities can reduce the likelihood that a pandemic strain will emerge, the question of whether another influenza pandemic can be averted cannot be answered with certainty.
that the prompt culling of Hong Kong’s entire poultry population in 1997 probably averted a pandemic.

**Influenza Exposure Control Plan**
The following measures can help minimize the global public health risks that could arise from large outbreaks of highly pathogenic H5N1 avian influenza in birds. An immediate priority is to halt further spread of epidemics in poultry populations. This strategy works to reduce opportunities for human exposure to the virus. Vaccination of persons at high risk of exposure to infected poultry, using existing vaccines effective against currently circulating human influenza strains, can reduce the likelihood of co-infection of humans with avian and influenza strains and, thus, reduce the risk that genes will be exchanged. Workers involved in the culling of poultry flocks must be protected and, therefore, hopefully reduce the likelihood of illness or gene swapping or mutation. These workers should also receive antiviral drugs as a prophylactic measure.

**Clinical Course & Treatment of Human Cases of H5N1 Avian Influenza**
Published information about the clinical course of human infection with H5N1 avian influenza is limited to studies of cases in the 1997 Hong Kong outbreak. In that outbreak, patients developed symptoms of fever, sore throat and cough and, in several fatal cases, severe respiratory distress secondary to viral pneumonia. Previously healthy adults and children, and some with chronic medical conditions, were affected.

Tests for diagnosing all influenza strains of animals and humans are rapid and reliable. Many laboratories in the WHO global influenza network have the necessary high-security facilities and reagents to perform these tests as well as considerable experience. Rapid bedside tests for the diagnosis of human influenza are also available, but do not have the precision of the more extensive laboratory testing that is currently needed to fully understand the most recent cases and determine whether human infection is spreading, either directly from birds or from person to person.

Antiviral drugs, some of which can be used for both treatment and prevention, are clinically effective against influenza A virus strains in otherwise healthy adults and children, but have some limitations. Some of these drugs are also expensive and supplies are limited.

Experience in the production of influenza vaccines is also considerable, particularly as vaccine composition changes each year to match changes in circulating virus due to antigenic drift. However, at least four months would be needed to produce a significant quantities of a new vaccine capable of conferring protection against a new virus subtype.

**Conclusion**
Communities, workplaces and individuals should take the following actions.

1. Everyone should develop preparedness plans as you would for other public health emergencies.
2. Participate in and promote public health efforts in your state and community.
3. Participate in influenza vaccination programs annually, especially if at high risk of acquiring influenza infections.
4. Healthcare workers, school teachers, those who work to protect public safety or with prisoners, emergency responders, should participate in annual health promotion programs to prevent airborne, bloodborne, waterborne, food borne and contact types of diseases and infections.
5. Talk with local public health officials and healthcare providers who can supply information about the signs and symptoms of a specific disease outbreak.
6. Implement prevention and control actions recommended by public health officials and providers.

7. Adopt business/school practices that encourage sick employees/students to stay home.
8. Anticipate how to function with a significant portion of the workforce/school population absent due to illness or caring for ill family members.
9. Practice good health habits, including eating a balanced diet, exercising daily and getting sufficient rest.
10. Take these common-sense steps to stop the spread of germs:
   - Wash hands frequently with soap and water.
   - Wash hands before eating, drinking and before applying cosmetics and lip balm to prevent accidental ingestion of pathogens.
   - Eat only cooked meats and poultry.
   - Cover coughs/sneezes with tissues.
   - Stay away from others as much as possible if you are sick.
   - Stay informed about pandemic influenza and be prepared to respond.
   - Use national and local pandemic hotlines that will be established in the eventuality of a global influenza outbreak.
   - Listen to radio and television and read media stories about pandemic flu.
   - Consult www.pandemicflu.gov for updates on pandemic influenza.

Aruna Vadgama, RN, MPA, CSP, CPE, COHN-S, CPHQ, CHRM, SRN, is director of quality resources at the Menninger Clinic in Houston. She is Administrator of ASSE’s Healthcare Practice Specialty. She can be contacted at avadgama@menninger.edu.

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Educating the SH&E Generalist: Curriculum Development

By Sharon M. D’Orsie, Ph.D., CSP, CIH

T

he SH&E generalist is an evolving professional resulting from the plethora of SH&E regulations and requirements that have grown out of the larger public environmental movement initiated in the late 1960s (Fiore, 2003; Vick, 2001).

Many employers hire these people. The industrial sector hires in manufacturing; the service industry hires in healthcare and restaurants; the construction industry hires in both commercial and residential development; the entertainment industry hires in theme parks and casinos; the government sector hires at all levels, in all disciplines.

The SH&E generalist, often practicing solo or in a small group, serves as a “utility player,” fielding every ball thrown to him/her on issues ranging from indoor air quality to disposal of hazardous waste. S/he serves much like a general practitioner in medicine. Once the patient presents, the general practitioner makes the first assessment of the problem, then decides a course of treatment or action based on his/her experience, skills and training. Sometimes, the general practitioner can make an easy diagnosis and prescribe an easy solution. Often, the general practitioner must consult references, conduct tests and refer the patient to a specialist for consultation.

An SH&E generalist works in much the same way; just substitute the words “environmental or safety problem” for “patient.” Like the general practitioner, the SH&E generalist never knows on any given day what will happen or when his/her pager will sound during the middle of the night. This fast-paced variety makes a career as an SH&E generalist a challenge to best prepare a student for this career in a brief four-year period. Unfortunately, there is no generally accepted model. Historically, these persons emerged from on-the-job experiences following degrees in engineering, nursing, chemistry, biochemistry and biology. Additional training was generally acquired at the graduate level.

Today, employers are calling for a bachelor’s-level SH&E generalist. As noted by George (2004), “the days of the narrowly focused specialist with expertise in only one of these technical areas is rapidly giving way to the era of the broad-based generalist whose duties encompass the entire gamut of SH&E issues.” Much like medicine, the SH&E career path does allow for graduate specialities in areas such as air pollution control and industrial hygiene.

In designing a program for the SH&E generalist, two major themes emerge as critical to success:

1) A program must deliver appropriate content strongly based in traditional science and engineering principles.

2) A program must teach students how to access and evaluate worthwhile sources of data and information (ABET, 2003).

The revised SH&E degree track in the newly re-formed Dept. of Environmental Science in the School of Applied Science, Engineering and Technology at the University of Southern Maine has attacked these challenges by revising its curriculum and by using effective teaching methods other than lecture.

Devising an Appropriate Curriculum

Regulatory compliance and employers’ desires to use industry “best practices” has resulted in the need for knowledge of laws, regulations, ordinances, codes and consensus standards. For example, more than 30 federal environmental or safety/health laws have been passed; thousands of regulations have resulted (EPA, 2004). Although knowledge of the requirements of EPA and OSHA are the keystones, additional information must be gathered and assessed.

Unfortunately, this information is not in one place. Therefore, the SH&E generalist must learn to think broadly.

This concept is best illustrated by an example. Assume that Suzy is the SH&E generalist for a small manufacturer of unfinished furniture. The owner comes to Suzy, and says, “I’d like to expand the product line to include painted furniture—a line of red, white and blue painted furniture. Therefore, I would like to build a paint spray booth. What do I need to worry about from an environmental, safety and health perspective?”

To be of best service to her employer, Suzy needs the skills to address three basic questions: 1) “What problem am I trying to solve?” 2) “What pieces of information do I need to locate to solve this problem?” 3) “How can I locate these pieces?” Her thought process must be both open and disciplined in order to identify not only the requirements, but also the time and effort needed to assemble the pieces and “work the regulatory system.” She’ll need to know not only what to do, but how to do it, then when to do it as manifested in a timeline. She will need to organize and research in many directions as illustrated by these sample topics.

• Community: What are the community restraints/requirements in reference to land use and zoning?

• Air pollution control: Will we need a construction permit and/or operating permit from the state and/or from the town? Do the state and/or federal government have design specifications as to its construction? What are the emission limitations? What must be included in the design to measure emissions to ensure compliance? What sort of ongoing monitoring program will be required? How do we report this information annually?

• Water pollution control: Will this addition change the wastewater discharge from our property? Will a permit modification be needed?

• Solid and hazardous waste: What kind of paint/finishes will be used? What will...
we use to clean the lines between colors? How can we dispose of the paint cans, sludges, rags and other waste? Will these materials be classified as a hazardous waste? What must we do to be a compliant hazardous waste generator?

- Safety: Do any consensus standards (such as those from National Fire Protection Assn. or ANSI) provide “best practice” guidelines on construction and operation of a paint booth to minimize fire hazard and adequate ventilation? What OSHA standards apply?

- Health: How will we ensure adequate ventilation? What type of protective equipment is necessary for the workers? What type of paint and varnish will we use? What procedures will we use to clean the lines? How do we select the best respirators? Can we use the same respirator to paint and clean? What is required under the respiratory protection standard? What worker training is required?

The depth and breadth of these questions illustrate the challenge of training this professional, especially when tomorrow’s questions will be completely different. Tomorrow, a worker may ask, “How does the dust in our current building affect my pregnancy?”

Curriculum Content
Combining two smaller university programs into a larger, more comprehensive group “officially” formed the new Dept. of Environmental Science on July 1, 2004. When a student enrolls in environmental science, s/he selects a track after completing a core set of environmental requirements. The student may specialize in environmental policy and planning, environmental science, or environmental safety and health (the SH&E generalist.) As part of the degree requirements, the student must also complete the university requirement of distribution of studies, which includes coursework in the social sciences and humanities.

Many factors were considered in forming the curriculum for the SH&E generalist. Other university programs were examined. This effort was frustrating because other college and university programs have a definite emphasis (in safety, industrial hygiene or traditional environmental studies) that didn’t match our goals. Their emphasis follows the historic pattern of educating students in a more narrow discipline (Anderson, et al, 2004). The acknowledged advantage of this historic approach is that post-graduate certification exams emphasize one of the three disciplines: the CIH (ABIH, 2004), CSP (BCSP, 2004) or qualified environmental professional (QEP) (IPEP, 2004).

University of Southern Maine’s degree track is different. Those involved also looked at the American Board of Engineering and Technology program accreditation requirements for safety and industrial hygiene (ABET, 2002).

Lastly, the existing curricula were criticized and the faculty of the new department met extensively to debate the content of the revised tracks. Immense help came from the external Environmental Science Advisory Committee, a group of 15 practicing SH&E professionals representing industry, consulting, government and the nonprofit sector. The resulting curriculum, although still viewed as a work-in-progress, captures the combined efforts.

The SH&E generalist curriculum requires coursework in chemistry, biology, fundamentals of environmental science, environmental regulations, ecology, research methodology, statistics, impact assessment, toxicology, fire safety and emergency planning, hazardous waste management, occupational health, occupational safety and industrial hygiene. Numerous electives are available to fulfill student interest in areas such as ergonomics, oceanography, air quality and physics.

One advantage of the consultation with the Advisory Committee is that we obtained input on course content that will allow us to partner more effectively with the Maine community college system (specifically, Central Maine Community College and Southern Maine Community College). Because these institutions offer associate’s degrees in related fields (for example, Central Maine Community College offers a degree in occupational safety and health, and Southern Maine Community College offers a degree in fire science technology), the University of Southern Maine’s SH&E track will be able to articulate more smoothly with the community college graduates seeking four-year degrees. This relationship also provides students with more course options by providing the flexibility of taking certain courses at the community college partner campuses.

Teaching Critical Thinking
Delivering an SH&E generalist curriculum presents the opportunity to teach students to become critical thinkers and problem solvers. Foremost are the guiding questions: “What problem am I trying to solve?” “What pieces of information do I need to locate to solve this problem?” “How can I locate these pieces?”

To achieve the goal of structured thinking, the faculty uses the following tools: rubrics, guided computer practice, role playing, internships, and unstructured interactions with practicing professionals.

Rubrics are used to structure students’ thinking. In understanding how a heavy metal affects a person (a topic in applied toxicology), the instructor presents a rubric that asks specific questions. Each section of the rubric is assigned points; the student is graded on the completeness of the answer. Here’s an example: For your assigned metal (e.g., mercury):

- What are the chemical forms of mercury?
- Do different forms provide different toxic responses? If so, discuss.
- How can (each form) of mercury enter the body?
- What is the toxic response of the body?
- What are the signs and symptoms of exposure/overexposure?
- How much mercury exposure is allowed for a worker?
- How does one measure mercury in the environment (sampling and analysis)?

The questions go on. A rubric allows a student to think in a practical, applied way, eliminating extraneous, off-target work. The rubric requires careful thinking and requires clarity in written presentation. (Kellough and Kellough, 1999). However, in all fairness, it does take instructor care to grade; sometimes, the instructor must go directly into the literature to confirm or clarify a student’s statement and give feedback. However, the guided effort is invaluable in teaching a variety of SH&E issues because students practice the location and assessment of data.

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Guided computer practice is a luxury not all teachers can enjoy. Fortunately, University of Southern Maine has several classrooms equipped with student computers and Internet access that allow direct, hands-on instruction on how to find critical pieces of information. This technique provides the skills of “peeling the regulatory onion.” EPA has a great website, but it takes hands-on practice to navigate to find answers. One must look at several places to find complete answers, and one must be careful to follow-up on all appropriate cross references. A good example of doing a guided computer practice is to have students find answers to questions involving asbestos. Asbestos is addressed in several different sets of nonrelated EPA regulations. This process is difficult for students initially. A student cannot merely “Google” a keyword and have the answer appear.

Role playing, a method of cooperative learning, is a fun way to get students to think in a probing manner and to actually listen to the words people say (Orlich, et al, 1998). This technique is especially effective when teaching accident/incident investigation, which is like solving a mystery. The instructor prepares a scenario, complete with simplified equipment diagrams, and writes roles for two students: one is the accident victim and one is an employee who was in the area.

It is a delight to watch the interviewers’ (the non-role-playing students) questions evolve. For example, in one scenario, a student “victim” was asked: “Was the power shut off to the machine?” He cleverly answered, “Sure, it’s always turned off.” It took the student interviewers 20 minutes of following false paths before one thought to ask, “How do you know the power really was shut off? What procedures did you follow to ensure that the equipment was dead?” (Of course, the scenario had provided that a housekeeper accidentally activated the power; this clue was vital in solving the case.)

Internships are required of all students in the Dept. of Environmental Science. These real-world experiences under the guidance of a practicing SH&E professional provide vital practice in using the skills and content learned in the classroom (Marshall, 1999).

The most valuable learning in “how to think” likely comes from the interaction with practicing SH&E professionals. This interaction occurs in several ways besides the internship. Fortunately, the SH&E track at the University of Southern Maine has outstanding support from the local community, including ASSE’s Maine Chapter and AIHA’s Down East Section. Every course has at least one guest speaker during the semester who participates in the area of study. Each speaker encourages students to call with questions and for help with problem-solving activities both in and out of the classroom. Business cards are distributed and ample time is provided for questions and answers.

At least once a year (twice if possible), a professional meeting is substituted for a regular class. A year-end potluck supper among students from the University of Southern Maine and Central Maine Community College and the ASSE and AIHA chapters provides a great opportunity for networking.

Lastly, once a year the SH&E students are invited to a seated dinner at a professor’s house called “Dinner with the Experts.” An equal number of practicing SH&E professionals join the students for an evening of “getting to know you.” The only rule is that each student must sit between two SH&E professionals. All of these efforts reinforce the mantra: “SH&E professionals help each other; someone has had this problem before. Don’t spin your wheels—make a call.”

This combination of curriculum content and emphasis on how to think—specifically, how to access and evaluate information—allows the SH&E program at the University of Southern Maine to produce SH&E generalists ready for the workplace.

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Sharon M. D’Orsie, Ph.D., CSP, CIH, is an assistant professor of environmental safety and health, University of Southern Maine, Gorham.
Designing for Construction Worker Safety
By John W. Mroszczyk, Ph.D., P.E., CSP

The construction industry stands out from others as having one of the highest worker injury and fatality rates. Construction comprises a small percentage of the overall workforce. Yet, the incidence rate for nonfatal injuries and illnesses exceeds that of many other industries. The construction industry has the most fatalities of any other industry sector (Bureau of Labor Statistics, 2004). Some studies have shown that a fairly large percentage of construction accidents could have been eliminated, reduced or avoided by making better choices in the design and planning stages of a project (Hecker, 2005). Addressing construction safety in the design and planning phase, therefore, can have a substantial impact on reducing injuries and the cost associated with safety related project delays.

The Contractors’ Role in Construction Site Safety
Construction safety (the intermediate phase between a finished design and a completed building) is largely the responsibility of the contractors and other site professionals. The success of a project depends on the intricate planning and decisions that are made on site. Most construction accidents result from basic root causes such as lack of proper training, deficient enforcement of safety, unsafe equipment, unsafe methods or sequencing, unsafe site conditions, not using the safety equipment that was provided and a poor attitude towards safety (Toole, 2002). Often, the role of the various contractors is unclear as some contractors may try to transfer responsibility for safety to others. The most common construction project arrangement is that of general (prime) contractor/subcontractor.

Under OSHA 1926.16, the prime contractor has overall responsibility for job site safety (compliance with OSHA regulations). General (prime) contractors have the highest level of influence on site safety because they monitor, coordinate and direct the work of the subcontractors. General contractors frequently provide equipment that is shared by multiple subcontractors. There may be one or more prime contractors in some cases. Subcontractors provide the labor and tools to complete their work. Under OSHA 1926.16, subcontractors are responsible for the safety of their employees with regard to their portion of the work. If a subcontractor creates a hazard, the subcontractor must protect its own employees as well as others who might be exposed.

The Role of Design Professionals in Influencing Construction Site Safety
The role of the design professional has traditionally been to design a building, facility or structure so that it conforms with accepted engineering practices and local building codes, and is safe for the public. The safety of construction workers is left up to the contractors.

However, design professionals can influence construction safety by making better choices in the design and planning stages of a project. This would result in fewer decisions that have to be made at the site by contractors and workers which can lead to accidents.

Research presented by Behm (Behm, 2005) suggests that designers can, in fact, have a strong influence on construction safety. In 1985, the International Labor Office recommended that designers give consideration to the safety of workers who will be involved in erecting buildings. In 1991, the European Foundation for the Improvement of Living and Working Conditions concluded that about 60 percent of fatal accidents in construction are the result of decisions made before the site work begins. In 1994 a study of the U.K.’s construction industry found a causal link between design decisions and safe construction.

Behm referenced work from Szymberski. The ability to influence construction safety versus time is depicted in Figure 1 (see pg. 14). The ideal time to influence construction safety is during the concept and design phase. As the curve shows, the ability to influence safety diminishes as the schedule moves from concept toward start-up. Unfortunately, in the U.S., safety is usually not addressed until construction begins.

Perhaps the clearest example as to how design professionals can influence safety is in the design of a parapet wall. The International Building Code paragraph 704.11.1 requires that a parapet wall be at least 30 inches high. OSHA 1926 Subpart M requires a 42-inch guardrail or other fall protection when working at elevated heights. This means that if the parapet wall were designed to be between 30 inches and 42 inches, a temporary guardrail at a height of 42 inches or other fall protection would have to be used during construction and future roof maintenance. A decision would have to be made at the site concerning fall protection. This leaves open the possibility of a fall injury if inadequate fall protection is used, workers are not trained or if fall protection is not used at all. However, if the designer specifies a 42-inch-high parapet wall, not only does the design comply with the building code (safe for the public), the risk of a fall injury during the lifetime of the structure is eliminated because fall protection would not be required.

Designing for Construction Worker Safety (DFCS)
Designing for safety (DFS) is the formal process that incorporates hazard analysis at the beginning of a design (Hagan). This process starts with identifying the hazard(s). Engineering measures are then applied to eliminate the hazard(s) or reduce the risk. The hierarchy of design measures starts with eliminating the hazard(s) by engineering design. If the hazard(s) cannot be eliminated by engineering design, then safety device(s) are incorporated. If the risk of injury cannot be eliminated by engineering design or reduced by incorporating a safety device, then warnings, instruction and training are the last resort. This process

continued on page 14
has been applied to the design of products, equipment, machines, facilities, buildings and job tasks. Manufacture, assembly and maintenance are considered during the design process.

Designing for construction worker safety (DfCS) is an extension of the DFS process to construction projects. The DfCS process applies to the design of a permanent building, facility or structure. The process does not address methods to make construction safer, but how to make a project safer to build.

For example, the use of fall protection systems is not part of the DfCS process. Where DfCS would come into play is to influence design decisions that could eliminate or significantly reduce the need for fall protection systems during construction and maintenance. It requires the ability to identify potential hazards associated with construction and maintenance workers in the design stage of a project. The skill of the design professional is then applied to eliminate the hazard (or significantly reduce the risk) by incorporating the appropriate design features.

The involvement of design professionals, specifically engineers, is not new to construction safety. Many of the OSHA construction regulations currently require an “engineer” or “engineering controls.” Subpart P (excavations), Subpart L (scaffolds), Subpart R (steel erection), Subpart N (cranes, derricks, hoists, elevators and conveyors), Subpart Q (concrete and masonry construction) and Subpart M (fall protection) all make reference to engineering services. DfCS takes the skill of the design professional one step further. Rather than designing temporary structures and systems for construction, design expertise would be extended to include the safety aspects of permanent structures, including maintenance.

Figure 2 depicts the typical DfCS process. The key feature of this process is the input of site safety knowledge into design decisions. Several progress reviews would ensure that safety is considered throughout the design process. The end product, the design documents, would not look any different than they do now. The only difference is that the drawings and specifications would reflect a
Design that is safer to build and maintain. Table 1 (see pg. 15) is a sample listing of DfCS design details.

**Tools for Design Professionals**

Several design aids are available to design professionals. The Construction Industry Institute has developed more than 400 design suggestions that could be used by design professionals. These practices have been incorporated into a computer design toolbox that can be purchased from CII (www.construction-institute.org).

The Health and Safety Executive in the U.K. has developed several documents that aid designers in designing for safety. These documents are available at www.hse.gov.uk/construction/designers/index.htm.

SH&E professionals in Australia have created a tool called Construction Hazard Assessment Implication Review (CHAIR). Its goal is to identify risks in a design as soon as possible. Visit the CHAIR website at www.workcover.nsw.gov.au/Publications/OHS/SafetyGuides/chairsafetyindesigntool.htm.

Information can also be found at the DfCS website—www.designforconstruction.safety.org.

**OSHA Support for DfCS**

DfCS is actively supported by OSHA’s alliance program through workshops being held in Washington, DC. Workshop participants include representatives of OSHA’s Office of Outreach Services and Alliances, OSHA’s Office of Construction services, ASSE, ASCE, the Washington Group, the Construction Management Association of America, Belfor USA, the Independent Electrical Contractors, the Sealing, Waterproofing and Restoration Institute, the Laborers Health and Safety Fund of North America, the International Association of Foundation Drilling, and the International Safety Equipment Association. A generic PowerPoint DfCS has been developed; it can be modified to suit the needs of any organization. Both a 2- to 4-hour and 10-hour training course for design professionals is being developed. For more information, contact Jess McCluer, mccluer.jess@dol.gov or Lee Anne Jillings, Jillings.LeeAnne@dol.gov.

**Conclusions/Recommendations**

DfCS is an extension of the DFS process to construction projects. The potential to reduce construction accidents by addressing construction safety in the design and planning phase is an incentive for moving forward with this concept.

Plan to attend the Designing for Construction Worker Safety workshop (Session #750) during Safety 2006 in Seattle.

**Table 1**

<table>
<thead>
<tr>
<th>Suggestion</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design prefab units that can be built on the ground and erected in place.</td>
<td>Reduce worker exposure to falls and being struck by falling objects.</td>
</tr>
<tr>
<td>Design underground utilities to be placed using trenchless technologies.</td>
<td>Eliminate safety hazards associated with trenching.</td>
</tr>
<tr>
<td>Allow adequate clearance between structure and power lines.</td>
<td>Overhead power lines are hazardous when operating cranes.</td>
</tr>
<tr>
<td>Design 42” parapet walls.</td>
<td>Eliminate need for fall protection.</td>
</tr>
<tr>
<td>Design permanent anchorage points.</td>
<td>Provide fall protection anchorage during construction and future maintenance.</td>
</tr>
<tr>
<td>Specify primers, sealers, and other coatings that do not emit noxious fumes.</td>
<td>Reduce noxious fumes.</td>
</tr>
<tr>
<td>Design permanent anchorage points in residential roofs</td>
<td>Provide fall protection anchorage for roofing contractors during future maintenance.</td>
</tr>
<tr>
<td>Design cable type lifeline system for tower structures.</td>
<td>Allows workers to hook onto the structure and move up and down during future maintenance.</td>
</tr>
<tr>
<td>Design Window Sills to be 42 inches above floor.</td>
<td>Eliminate need for fall protection during construction and future maintenance.</td>
</tr>
<tr>
<td>Design permanent guardrails around skylights.</td>
<td>Prevent workers from falling through skylight.</td>
</tr>
</tbody>
</table>

Sources: Weinstein (2005); Gambatese (1997); Behm (2005).

**References**


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John W. Mroszczyk, Ph.D., P.E., CSP, is president of Northeast Consulting Engineers Inc., Danvers, MA. He is a past administrator of the Engineering Practice Specialty. Mroszczyk is currently ASSE’s representative on OSHA’s Designing for Safety Committee and he is a member of ASSE’s Greater Boston Chapter.
If You Build It, They Might Come
Eleven Tips for Beginning Consultants

By Linda Tapp, CSP, ACLM

S

o you have taken that giant step and decided to start your own company. You’ve ordered business cards, placed an ad in the phone book and rented office space. Now the phone will start ringing off the hook, right? Wrong.

If you have already been through this beginning stage, you know that much more planning and effort is required to bring clients to your door. Unless you have a specific niche market, have no competition or left your previous employer with a few clients already in tow, you will likely have to work hard to get those first few jobs.

Following are my personal 11 tips for starting out right. They probably aren’t the same 11 you would get from someone else. A few experienced consultants may even disagree, so take these tips for what they are—guidelines based on personal experience.

Tip 1: Don’t Undercharge
Just because you’re only starting out and may be desperate, do not undercharge. Suppose it is the first month on your own and you have no work lined up yet. You are getting nervous when a local company calls and asks you to conduct a training class. You practically jump through the phone to accept and even set the dates and times. At the end of the call, the company asks about your fee and you name a figure. The company representative says he has budgeted about half that amount and will have to look elsewhere. Feeling the job slipping through your fingers, you agree to work for the lower fee.

Do not ever do this. Whether the caller could hear your desperation or simply didn’t have a realistic number of how much a training class would cost, do not sell yourself short. Before stating a price to the customer, you had some idea of what a class would cost in your area. If you are easily persuaded to cut the price by 50 percent, the client may take advantage in other ways as well. One key principle to keep in mind: Never come down in price without taking something away. For example, if you say you can train 10 employees for eight hours for $1,000 and the client only wants to pay $500, then you could reply that you can do the project for $500 but it will only be a four-hour class. Alternatively, you could reply, “Sure, I can do it for $500. What would you like for me to take out?” This is just an example but hopefully you get the picture. You can work within any budget but what the client gets for the budgeted amount may change.

Tip 2: Don’t Try to Be All Things to All People
When starting a firm, a consultant may be tempted to take any SH&E-related project that comes along. She might be sampling for asbestos fibers one day, writing a standard operating procedure another day, performing an ergonomic analysis the next, then assisting with a process hazard analysis. While some consultants have expertise in all of these areas, many do not. Provide consulting only in your areas of expertise. If you really need the project and don’t want to pass it up, at least consider teaming with another consultant who truly has experience in the project area.

Tip 3: Don’t Skimp on Important Items Such as Insurance
Professional insurance can be an expensive start-up cost for consultants but one that should not be overlooked. You may believe that the chances of getting sued are slim because of the type of consulting you intend to do. No matter what type of SH&E consulting work you perform, business insurance is a necessity. Don’t forget to update your auto and home insurance as well if necessary (talk to your insurance agent to be sure).

Tip 4: Don’t Forget to Make a Plan and Stick to It
More than a few veteran SH&E professionals working in industry have a plan such as this: “When I retire in a few years, I will form an SH&E consulting company, then work as much or as little as I like wherever and whenever I choose.”

This type of informal plan may be fine for retirees looking to consult occasionally to make some extra money. For individuals hoping to spend many years as a full-time consultant, however, detailed planning is essential. Many sources and classes on business planning are available—many for free.

Other areas—such as marketing and insurance—need to be planned for as well. Think of it this way. Most people have trouble traveling to new places without a map; without one, they will most definitely get “somewhere” but probably not where they wanted to be. Business plans are like directions and maps for your consulting business. Without plans, you may get lost.

Tip 5: Don’t Burn Any Bridges
Even though it might feel good to tell your employer or that horrible manager in accounting or engineering what you really think of him/her when you are leaving a job, bite your tongue. A previous employer could well be your first client. These connections are important.

Additionally, try to maintain strong relationships with competitors. Suppose a competitor wins a job using what you consider less-than-fair tactics. Don’t start an argument with the lost client or the competitor. Both could need your services in the future.

Tip 6: Don’t Hesitate to Work as a Subcontractor for Established Consultants
Some new consultants get so wrapped up in the idea of being their own boss that they hesitate to work as a subcontractor. Sometimes, this is the best way to
1) make money when no other work is available; 2) build relationships with other consultants who you may need to hire in the future; and 3) learn more about consulting in general.

If the prime contractor (consultant) doesn’t ask you to sign a noncompete agreement, you should still be professional and not pursue that client with the intent of making them your client. If you signed a contract, you may have a legal battle on your hands. If you didn’t have any type of prior agreement not to work directly for the client, you might not have a legal battle, but your reputation among other SH&E consultants will be known, and other subcontracting jobs or referrals will likely not come your way.

Tip 7: Don’t Skimp on Marketing Materials
Some people might say that money should not be spent on business cards, letterhead or similar materials when just starting out. I disagree. Often, your business card is the first and last piece of marketing information (and yes, your business card is definitely marketing material) that a potential client receives from you. The self-made, self-printed punch out type of business cards may be cheap and quick to produce but they look that way, too. Everything about your company that comes into the public view reflects on your company. When someone receives a poor-quality card, what type of image does that project? You can get 500 cards made professionally at your local printer for under $100. Several online sources (such as www.iprint.com) do an excellent job inexpensively as well.

Although website design issues could fill a book in itself, I will point out one key issue related to this tip. If you are going to have a web presence, make sure the site looks good. This may mean paying someone to do it or at least using a professional template. How it looks is important to the image you project.

Tip 8: Don’t Overspend on Office Equipment & Space
Although a nice professional office suite with shared secretary and T-1 lines might be nice, most SH&E consultants will rarely have visitors and do not need to spend the extra money on such a set up, especially in the beginning. Many SH&E consultants work from home offices. There is nothing wrong with this—although some will say that a home address or a P.O. box is a dead giveaway that someone is not an established consultant.

In cases where working from home is not a viable option, you may need to rent space. Some office suite centers offer a very basic package that is not too expensive. Also consider unusual rental spaces (such as above an existing retail store). Since most consultants do not have “street traffic,” out-of-the-way locations may work fine. You can also approach small businesses that lease a floor or a building but have an empty office or two that they would consider renting to you.

Tip 9: Don’t Let Account Receivables Fall Behind
While you are working, collecting the money owed for services rendered may become a lower priority. The key is to get paid quickly in the first place (see Phyllis Micahnik’s article in The Advisor, Vol. 2, No. 1). If you have not taken the proactive steps described in that article, start making documented steps to collect your money frequently. The longer an invoice goes unpaid, the less likely you are to collect. If payment of an invoice is two months late, but you don’t want to upset the client for fear of losing future work, you must realize that this might not be an ideal client for you. If you upset the client and they never call again, it is probably not a bad thing since you would have to go through the same time-consuming efforts and stress each time an invoice is due.

Tip 10: Strive to Keep Work in the Pipeline
You might be busy now, but when those projects end, you should have worked lined up to keep you going. This can be tricky because some clients are not able to wait for a few months for you to be available. In this situation, try working with someone who can cover this job for you instead of passing up the work.

How are you supposed to do all this billable work and market at the same time? The answer is pure and simple—a lot of work. One of the best ways to keep projects lined up is through networking, which requires time. Attending industry meetings, especially those where you are likely to be the only SH&E consultant, is essential. After a long day, you may not feel like going to a three-hour dinner meeting, but this is important. Continuing to offer your services as a speaker and writing articles also takes time but these are necessities for consultants. It is also important to try to meet other consultants in your area. This gives you the opportunity to let others know that you are available for projects which they may not be able to handle or for subcontracting work.

Tip 11: Don’t Give Up on a Lead
If you have been in the corporate world, you know how busy SH&E professionals and other managers are today. If your call or e-mail is not returned, try again in a few days. If it is still not answered, wait and try again. Do not give up—especially if the potential client called you first. You know they need your services. They may just be too busy to get back to you. Be persistent without being a pest.

It is important to note that by following up on leads I do not mean cold-calling. To clarify, cold-calling is picking up the phone and calling complete strangers and trying to sell your services. This technique is usually highly unsuccessful and is not recommended.

If after several attempts, your potential client is still not returning calls or messages, ease up on your persistence, but still keep the contact on your mailing list. Whether you send out a newsletter, e-zine, occasional postcards with company announcements or any other informational pieces, make sure you send this elusive contact your info as well.

Starting a consulting business can be risky business and it is definitely not for everyone. Most people will make mistakes. But if you learn from mistakes, you can get a jump-start at success. Hopefully, these 11 tips will help you to make 11 fewer mistakes than you otherwise would.

Linda Tapp, CSP, ACLM, is Administrator of the Consultants Practice Specialty. She is president of her own consulting firm, Crown Safety LLC, Cherry Hill, NJ.
Is Your Sprinkler System Protecting You? Recalled Sprinklers Abound!

By David A. de Vries, P.E., CSP

Automatic fire sprinkler systems have a highly enviable record in providing protection of property and safety to life from fire. In the 130 years since the first automatic sprinkler was developed, National Fire Protection Assn. (NFPA) has tracked and documented the success of sprinkler systems in the U.S. (McKinnon 14-4-5; Rohr i-ii). More than 100 years ago, when NFPA’s predecessor organization published its first handbook of fire protection, the record showed that most fires were extinguished or controlled by the operation of three or fewer sprinklers (Crosby 145). A few years later, this success record was highlighted in the first edition of a widely recognized engineering handbook with the statement, “Automatic sprinklers are one of the best safeguards for human life in high buildings; the record of some 13,000 fires in sprinkled buildings, covering a period of 16 years, shows an efficiency of 95.1 percent in fire extinguished or held in check” (Marks 1384).

To this day, NFPA reports that there has never been a documented fire that killed more than two people in a building fully protected by an operational sprinkler system, except in the case of catastrophic fire, such as an explosion or flash fire, or where fire brigade members or employees were killed in firefighting operations (Cote 10-187).

That said, under some circumstances, a fire sprinkler system can fail to operate correctly and control or extinguish a fire. These include:

- water supply shut off;
- incomplete installation of sprinklers;
- sprinklers loaded with debris or blocked by construction or storage;
- system inadequately designed for the fire hazards present;
- mechanical failure of the sprinklers to operate and discharge water.

Based on available data, the first four are among the common causes of sprinkler system failure (McKinnon 14-4-5; Rohr 29-30), but because of the timeliness of known sprinkler failures, this article addresses the latter.

Sprinkler System Operation

All sprinkler systems have some common elements, such as an automatic water supply, a network of piping to deliver water to sprinklers in the area of the fire and sprinklers connected to the piping that discharge water onto the fire. Automatic sprinklers have a heat-sensitive operating element that keeps a cap in place and prevents water from flowing from the sprinkler until heat, typically from a fire, causes the element to operate, releasing water to discharge onto the fire. Automatic sprinklers connected to the piping that discharge water onto the fire. Automatic sprinklers have a heat-sensitive operating element that keeps a cap in place and prevents water from flowing from the sprinkler until heat, typically from a fire, causes the element to operate, releasing water to discharge onto the fire.

The most common type of sprinkler system in use is known as the wet pipe system, because the piping is normally filled with water at all times. As such, as soon as the sprinkler operates, water begins to discharge onto the fire.

The second most common type of system is the dry pipe system, which is normally filled with compressed air. A mechanical device, known as dry pipe valve, holds back the water until the loss of air from one or more open sprinklers causes the pressure in the piping to drop to a pre-set point, allowing the valve to open and fill the piping with water. Such a system is used to protect unheated buildings, such as warehouses, or portions of buildings, such as loading docks, subject to freezing temperatures.

A third type of sprinkler system that is also normally dry is the pre-action system, which typically requires a means of fire detection other than just the operation of sprinklers to cause the system’s valve to open, as well as operation of one or more sprinklers, to discharge water. Pre-action systems are often used in locations that are particularly vulnerable to water damage, such as refrigerated warehouses.

The last type in regular use is a deluge system for the protection of specialized equipment. Again, another means of fire detection is required, but once activated all sprinklers discharge, since they are normally open.

The water pressure in the sprinkler system depends on the source, which may be a public water supply or a private supply from a storage tank, lake or river. In either case, the available pressure from the source may be supplemented by one or more fire pumps. Typical system water pressures range from 15 to 175 psi. In dry pipe systems, the air pressure is usually one fifth the available water pressure plus 10 to 15 psi.

Automatic Sprinklers

Sprinklers in the wet pipe, dry pipe and pre-action systems are normally closed and only open when exposed to elevated temperatures, such as from a fire. Each operates independently of the others, and in a properly designed and maintained system, only those in the immediate area of the fire operate. The operating temperature of the sprinkler is selected based on the ambient temperature of its location and the type of fire hazard being protected. In most commercial buildings that are heated and air-conditioned, “ordinary temperature” sprinklers are used with an operating temperature of 135 to 170°F. (Bryan 166-189; Cote 10-171-183).

Two common types of operating elements in automatic sprinklers are fusible links and glass bulbs. The fusible link element consists of two pieces of metal held together in tension by a low-melting point eutectic metal solder. The link contacts and holds the cap in place via levers, such that when the eutectic metal begins to melt, the two pieces of the link separate and the levers, link pieces and cap are pushed aside by the flow of water from the piping through the waterway of the sprinkler.

The glass bulb type element consists of a hollow glass cylinder, sealed at the ends, that holds the cap in place under compres-
plastic, that fits under the cap of the or more years ago was typically a rela-
operating area (NFPA 13-2002, Section 14.4.4.8.1).

Another design, known as the Belleville spring seal, came into use about that time and is widely used in sprinklers today.

**Sprinkler Failures**

Over the last 10 years, several instances of sprinklers failing to open when intend-
ed have been documented (CPSC 99-008; CPSC 01-201). The first two reported instances occurred in a hotel in Michigan and in a VA Medical Center in New York where fires grew large enough for the sprinkler fusible element to operate, yet no water discharged (NFSA Special Issue). The manufacturer of the sprinkler involved, local fire officials and the Consumer Product Safety Commission (CPSC) initiated investigations into the cause of the failure (NRC).

Testing found a failure rate as high as 45 percent, including some failures of uninstalled, off-the-shelf sprinklers. Testing by Underwriters Laboratories of sprinklers that had been removed from field installa-
tions found that 20 percent failed to operate at 40 psi and 31 percent failed to operate at 5 psi (“UL Classifies”). The partic-
lar model involved in these incidents with a trade name of Omega was first man-
ufactured in 1983 by the Central Sprinkler Co. (Central) and used the O-ring style of seal (Photos 1 and 2).

As reported by Central, the apparent cause was that the EPDM material of the O-ring reacted with cutting oil or other trace chemicals in the sprinkler system, swelled and seized such that a higher than normal pressure was required for the sprinkler to operate (NRC). In 1996, Central switched the O-ring material to a silicone rubber and reportedly the prob-
lem was solved (“UL Establishes”). Civil litigation and administrative enforcement action by CPSC was initiated against Central, resulting in a consent agreement that required Central to recall all of the Omega sprinklers—numbering more than eight million—including those manufactu-
tured after May 1996 with the silicone O-rings (NFSA “Special Issue”).

CPSC also initiated an investigation into other sprinklers that used O-ring seals, pri-
marily those manufactured by Central Sprinkler Co. from 1989 until 2000, design-
ated model GB (Photo 3) using a glass bulb operating element (CPSC 01-201).

Testing by Underwriters Laboratories (UL) similarly found that a much higher than normal pressure (greater than 60 psi) was required for some installed sprinklers to operate; that seven percent did not operate at 40 psi; that 20 percent did not operate at 7 psi and that 26 percent did not operate at 5 psi (UL NR042401). UL also found that those same sprinklers tended to develop a slow leak, fostering corrosion around the cap and seat, further complicating the actuation of the sprinklers.

CPSC successfully persuaded Central and its new parent Tyco Fire Products LP to recall those models of sprinklers (CPSC 01-201). The program, designated by Central as a voluntary replacement pro-
gram, was initiated in 2001 and continues to this date. Approximately 33 million of the GB sprinklers were covered by this recall. Also covered by this recall are approximately two million dry sprinklers of various model designations manufact-
tured by Central from the 1970s through 2001. Tyco also purchased the Grimmell Co. and Star Sprinkler Inc., manufacturers of Gem and Star sprinklers, respectively. Some of the Gem and Star sprinklers that also used the O-ring seal design are subject to the same recall program.

In 1999, UL began to notice a propen-
sity for dry sprinklers removed from the field for routine testing to fail to operate (“UL Urges”). UL solicited samples of dry sprinklers of various ages and found that many required a much-higher-than-
specified minimum system pressure of 7 psi to operate. Testing found that 20 per-
cent did not operate at 40 psi and 49 per-
cent did not operate at 7 psi. Most dry sprinklers manufactured over the prior 30 years used O-ring seals (Photo 4).

One model, Star or Star ME-1, which was manufactured by various companies from 1961 through 1998, was specifically identified as problematic, and was recalled by order of CPSC (CPSC 03-116). This sprinkler model was manufactured by Mealone Corp. from 1961 to 1976; by Chemetron Corp., a subsidiary of American Household Inc., between 1977 and 1982; by Sprinkler Corp. of

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Milwaukee Inc. (formerly known as Star Sprinkler Corp.) between 1983 and 1995; and by Central Sprinkler Co. between 1996 and 1998 (NFSA undated). Sprinkler Corp. of Milwaukee/Star Sprinkler Corp. is no longer in business, has no assets and is unable to provide compensation for replacement of its Star ME-1 sprinklers (NFSA “Important”). Sunbeam Corp., the current owner of American Household, filed for bankruptcy protection in 2001, but agreed to provide up to $1 million toward replacement of its sprinklers for claims filed by Sept. 29, 2005 (CPSC 03-116).

**Recall Results**

Of the models involved in the recall and replacement programs (generically, recall programs of recalled sprinklers), more than 45 million sprinklers were manufactured. Based on the in-service testing or replacement requirement, the typical life expectancy of a sprinkler, unless damaged in normal use or acted by a fire or other cause, is 50 or more years (NFPA 25-2002, Section 5.3.1). Some of those recalled sprinklers have been removed and destroyed in the process of demolition and renovation of buildings, but most would be expected to still be in place at the time the recall programs started.

Sprinkler manufacturers typically sell their products to distributors of fire protection products and to installing contractors, but rarely to the end user. This creates a logistical problem in reaching the end users, which to a large extent is overcome by notification to other interested parties, such as fire officials, sprinkler contractors, building and fire code developers and insurance carriers, who are often in a position to notify the end users. Direct notice was also provided to end users in key industries, such as healthcare and lodging. Finally, notice was widely distributed by CPSC, NFPA and sprinkler trade organizations on their websites and in their publications.

Despite these efforts, the author is aware of building owners and management firms that did not know of the recall, yet had recalled sprinklers present in their buildings. These instances included apartment buildings, a university classroom building, hotels, residential treatment facilities for disabled adults, a manufacturing plant, movie theaters and a parking structure. Despite periodic inspections of all of these facilities by fire officials, sprinkler contractors and/or insurance loss control representatives, none of the owners or managers was aware of the recalled sprinklers present, prior to notification by the author.

With the help of the manufacturers, CPSC has compiled the results of the recall programs (CPSC/NASFM). In a report dated July 7, 2004, CPSC indicated the following:

- 5.59 million Omega sprinkler claims submitted and processed out of 8.4 to 10 million manufactured;
- 22,812 Mealane Corp. Star dry sprinkler claims submitted and processed out of an estimated one million manufactured;
- 14.09 million Central/Gem/Star O-ring sprinkler claims submitted and confirmed out of 35.167 million manufactured.

No information is available regarding the SCM/Star dry sprinklers and information about the Chemetron/American Household Inc./Sunbeam Corp. Star ME-1 dry sprinklers is not available for publication.

In total, of the more than 45 million recalled sprinklers manufactured, only about half have been confirmed as replaced or are in process to be replaced.

**Fire Protection Standards**


Beginning with that first edition, and continuing to the current 2002 edition, NFPA 25 has required that “the owner or occupant shall promptly correct or repair deficiencies, damaged parts or impairments found while performing the inspection, test and maintenance requirements of this standard” (NFPA 25-1992, Section 4.3 and NFPA 25-2002, Section 4.1.4). That general provision requires replacement of recalled sprinklers, but to ensure the intent was clear, the 2002 edition added an annex note: “Recalled products should be replaced or remedied.” In addition, the notes states, “A recalled product is a product subject to a statute or admin-
capabilities of the sprinkler system and other fire protection equipment, water or air pressure within the sprinkler system and the number of sprinklers in a single room or compartment.

A greater risk accrues to occupants who are restrained, physically or mentally disabled, sleeping, under the influence of depressants or alcohol, and at extremes of age, because of an inability to detect and respond appropriately to a developing fire. Such an inability can be offset somewhat if responsible building personnel and emergency responders are able to receive prompt notice of a fire and respond immediately. Prompt notification depends on the type of fire detection equipment in the area of the fire.

Generally, waterflow devices on sprinkler systems must be either monitored by a fire alarm system or connected to a bell or horn that can provide prompt notification, if the sprinklers in the area of the fire operate correctly. Other systems, or local smoke alarms, may be installed that detect smoke or other signature from a fire and alert persons in the immediate area, building personnel and/or emergency responders.

Where fires are likely to develop rapidly due to the nature and/or quantity of combustible materials in the area, risk is greater to occupants in both the immediate area and adjoining areas. A sprinkler failure allows the fire to develop, possibly to the point of full involvement of all combustibles in the room (i.e., flashover) and an increased propensity to overwhelm the sprinkler system in adjoining areas.

The failure rate of sprinklers identified with these cited operational problems is inversely proportional to the available pressure within the system at the sprinkler. Thus, systems with a normally high static pressure are more likely to cause an otherwise defective sprinkler to open, whereas systems with just the minimal operating pressure will likely have a higher rate of failure to open the sprinklers. It should be noted that UL's testing found a significant percentage of the recalled sprinklers failed to operate at minimum system operating pressure of 7 psi pressure and seven percent or more failed at 40 psi.

Related to the prompt notification factor is the number of sprinklers in the room or compartment where a fire starts. If only a single sprinkler is present in that room or compartment, its failure will likely result in a more rapidly developing fire and in a delay in notification of building personnel because of a lack of waterflow in the sprinkler system and associated alarm. If multiple sprinklers are in the room of origin, it is more likely that at least one will operate and cause notification. The adverse notification aspect of this condition can be offset by other fire detection and alarm equipment.

Tying the above factors together, the greatest risk to a building occupant from the failure of sprinklers to operate would likely be to an occupant who is sleeping, restrained or otherwise limited in capability to respond; who is within a room with only a single sprinkler and no other fire detection equipment; and where the sprinkler system is at the low end of operating pressure. Conversely, the risk is substantially lower where the occupants are alert, awake and capable of self-evacuation; where there is other automatic fire detection and notification equipment installed; and where the sprinkler system operating pressure is high.

**Identifying Recalled Sprinklers**

A few simple questions as outlined in the Sprinkler Recall Decision Tree can be used for a preliminary screening (Figure 1). By following this process, many sprinklers can be screened as unlikely candidates for recall. Although intervening events following the original installation, or installation of older stock, could cause

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a false negative result, a follow-up at the time of your next annual inspection can confirm the initial result. This follow-up should be performed by a qualified contractor or in-house personnel, and should also be used to determine the age and type of the sprinklers so that required sampling and testing can be performed in accordance with NFPA 25-2002.

Some important issues in working through the decision tree include:

- Is your system wet (normally filled with water) or dry (has a dry pipe valve or deluge valve controlling the water to the system)? (Note: You may have both, particularly if your building is generally heated, but you have portions like an attic, loading dock or other unheated areas subject to freezing temperatures.)

- If your building is normally heated, are any building areas subject to freezing temperatures, such as walk-in coolers, attics or loading docks that are supplied by sprinklers connected to piping within the heated area of the building?

- When were the sprinklers installed? (This may be during new construction, renovation or substantial replacement, or some combination.)

- What kind of operating element do the sprinklers have: fusible link, glass bulb or internal capsule with one to three flat, round disc heat collectors? (These characteristics can usually be seen from the floor with the assistance of a strong flashlight.)

- Are any sprinklers in your dry pipe or pre-action system installed in the pendant position (i.e., pointing down from the piping to which they are attached)?

Where the result of the decision tree points to a possibility that some or all sprinklers checked may be subject to recall, compile information from the following sources:

- Annual inspection reports (hopefully done by a qualified contractor or in-house personnel);

- Original contractor shop drawings and/or as-built drawings of the sprinkler system (architectural/engineering drawings usually are not detailed enough to be helpful);

- Contractor’s test and material certificate (provided to the owner upon successful completion and testing of the original installation);

- Samples of sprinklers in the spare sprinkler cabinet.

Annual inspection reports may have already identified some or all sprinklers that are subject to recall and this notation was simply overlooked. Both the shop drawings or as-built drawings and the contractor’s test and material certificate should identify the quantity of each sprinkler installed and the key information for each—make, model and type—if dry.

In addition, the certificate should also identify the date of manufacture of the sprinklers. The spare sprinkler cabinet, which is usually found in the fire pump room or other sprinkler system control equipment room, should include sprinklers from the original installation and any subsequent renovations. Examine the sprinklers in the cabinet and record the key information. Rarely are dry sprinklers provided and stocked as spares, since they are often custom fabricated, so the absence of spare dry sprinklers does not mean that you have none.

If none of these sources of information is readily available or if the spare sprinklers do not appear to match those installed, it will be necessary to examine the installed sprinklers closely. This will probably require a step ladder or high lift to get to the ceiling. You will probably also need a rag, soft brush, flashlight, magnifying class and inspection mirror (Photo 5). A camera may help simplify the identification.

Remember that the sprinkler system is under pressure and that operation of a sprinkler will produce flying parts, potentially including glass fragments, so wear safety glasses. Use other PPE, such as a hard hat and fall protection equipment, appropriate to the circumstances.

Once you have accessed representative sprinklers, gently clean any dust and record all information on the sprinkler. This must include make, model and date of manufacture. Such information may be cast into the frame of the sprinkler and/or stamped into the deflector or fusible element. If the sprinkler shows signs of leakage, it has been painted, or is so covered with debris that it cannot be cleaned with a rag or brush, it may not operate correctly and should be replaced even if not recalled (NFPA 25-2002, Section 5.2.1.1.2).

Additionally, if you have concluded that the sprinklers may be of the dry type, you must confirm this. Common characteristics of these types include the fact that the body of the sprinkler is typically galvanized or anodized iron pipe, and extends from the frame and operating parts of the sprinkler to the fitting in which the body is screwed. Dry sprinklers are typically four to 48 inches in length. The actual connection to the pipe fitting may be brass or other metal rather than galvanized or anodized iron.

The cap under the fusible element of a dry type sprinkler has a hole or slot in it to allow seepage from the piping to drain out. If the sprinkler appears to be a dry type, check it for its date of manufacture and for the name “Star” and/or the model designation “ME-1.”

With your information in hand, including photographs if taken, compare your sprinklers to the descriptions and pictures of the recalled sprinklers. These can be found at:

- www.omegarecall.com for the Omega sprinklers.
- www.star-recall.com, for the Star dry sprinklers made by Mealane from 1961 to 1976.
- www.starme1recall.com, for the Star dry sprinklers made by Chemetron/AHI/Sunbeam Corp.

Other information about recalled sprinklers can be found at www.cpsc.gov.

If you have identified some or all of your sprinklers as recalled, plan for their replacement. If they are subject to a current recall, such as the Central/Gem/Star O-ring sprinklers or some of the dry type sprinklers, follow the instructions found at the cited websites to initiate a claim.
If replacement is not covered by an ongoing recall program, such as the Omega sprinklers or the 1977 to 1995 vintage Star ME-1 sprinklers, contact a qualified contractor or qualified in-house personnel to arrange for their replacement. You will be fully responsible for the cost and arrangements for their replacement. If you find dry-type sprinklers older than 10 years, or wet sprinklers older than 50 years, plan for sampling and testing, or replacement. The urgency with which you pursue replacement should be assessed using the criteria in the “Analysis & Perspective” section. If all of this exceeds your availability or capability, contact a qualified contractor or fire protection engineer for assistance.

References

Underwriters Laboratories (UL). “UL Classifies Retrofit Kit for Omega Sprinkler Models, Continues Testing continued on page 24
Sediment Stew in NOLA

By Judy L. Freeman

Response to the environmental concerns brought about by hurricanes Katrina and Rita continues to be focused on assessment in New Orleans and throughout the Gulf Coast area affected. Initial floodwater and air samples revealed serious chemical contamination in specific hot spots. From the beginning, EPA predicted that the majority of contamination would settle in sediments, primarily in the areas near chemical releases, once floodwaters receded. Thus, much of its efforts have concentrated in these areas. Many of the study areas were identified in the Fall 2005 issue of EnviroMentor.

Sediments of varying depths up to four inches were deposited by floodwaters, particularly in areas impacted by levee breaches. Sediment from flood water is defined by EPA as residuals deposited by receding flood waters which may include historical sediment from nearby water bodies, soil from yards, road and construction debris, and other material.

Sediment samples were collected by EPA at 430 sites in the streets and public areas of Jefferson, Orleans, Plaquemines and St. Bernard parishes from Sept. 10 through Oct. 14. Sampling procedures specified that efforts were to be made to bias the samples toward areas which were more likely to contain elevated levels of contamination, such as areas that contained oily sediment or large stains. Each sample was tested for fecal coliform bacteria and about 200 different chemicals including volatile organic compounds (VOC), semivolatile organic compounds (SVOC), metals, pesticides, herbicides, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH).

According to EPA, the most frequently detected chemicals included heavy metals, petroleum hydrocarbons and PAHs, and to a lesser extent, pesticides. EPA’s assessment is that for the most part, the levels are similar to the historical levels found in these parishes before Katrina and to other urban areas throughout the nation.

Of the sediment samples studied, approximately 145 exhibited chemical concentrations that exceeded both the Louisiana Dept. of Environmental Quality’s (LDEQ) Risk Evaluation/Corrective Action Program (RECAP) and EPA’s risk criteria for long-term (30-year) residential exposure. Their data revealed that some localized areas exhibited elevated levels of arsenic, PAHs and diesel and oil range organics. The levels of polycyclic aromatic hydrocarbons in the sediments also exceeded health-screening values. However, these levels are expected to naturally decrease over time.

Those areas that exceeded the risk evaluation criteria were revisited by those agencies on Nov. 10. Resampling criteria included sampling of those areas with a sediment depth of at least 0.5 inches. Sediments of sufficient depth were found at 14 locations, and these were resampled to determine current conditions.

Samples were analyzed for the same chemical constituents as was performed in the Sept. 10 to Oct. 14 sampling. With some exceptions, it was determined by EPA that “chemicals tested for are not present in the sediment at levels of concern.” Levels of arsenic were similar to background soil levels, and “lead and TPH were found to be present at levels below the long-term health-based standard for residential areas within the exception of two locations.”

Leakage of toxic substances was not yet been released.

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Review of the data indicates that arsenic was found at levels of 12 ppm to 17.6 ppm, with one sample at 78 ppm. Clean-up action levels are at 0.39 ppm. Benzo(a)pyrene, which has a RECAP limit of 0.33 ppm, was identified in at least one sample at levels of 0.77 ppm.

Diesel range organics, with RECAP limits of 650 ppm were found in the sediments at 2100 ppm. EPA believes that the diesel range organic values derive from the Murphy Oil Refinery spill in St. Bernard Parish. A separate sampling study is being carried out on the Murphy Oil Refinery spill. Remediation at this site is being addressed by the company and EPA. Other chemical and oil spills for which the source can currently be identified are also receiving the focus of investigators.

On Dec. 1, National Resources Defense Council (NRDC) released its study on sediment samples it had taken and has characterized the results as “dramatically high.” Contaminates from these studies included DDT, dieldrin and heptachlor epoxide. Releases of banned pesticides were identified as coming from an abandoned factory. Floodwaters carried the material to nearby residential neighborhoods.

On Dec. 16, EPA released the results of its own studies on long-term health exposures. It indicated that a “limited number of sample results” showed concentrations of “arsenic, diesel range organic hydrocarbons, oil range organic hydrocarbons, chlordane, dieldrin, aldrin, lead and Indeno(1,2,3-cd) pyrene above RECAP values.” According to EPA, “where chemical concentrations exceed RECAP standards, EPA and LDEQ are working together to determine next steps.”

Air quality monitoring data has also been released for areas of Louisiana and Mississippi. Results are below EPA’s health-based screening levels for most chemicals. Elevated levels of acrolein were identified at the Stennis Space Center in Mississippi, in Gulfport, MS, and in Pascagoula, LA, and Jefferson Parish, LA. Formaldehyde was found in Pascagoula.

Mold continues to be a concern to residents returning to their homes and addressing clean-up activities. NRDC took air samples in 14 locations throughout the New Orleans area from Oct. 17 to Oct. 19. Results of these outdoor air samples were as high as 77,000 spores per cubic meter in one site, 81,000 in another. Indoor counts were as high as 645,000 spores per cubic meter.

There also was some concern regarding the impact of pumping untreated floodwater directly into Lake Ponchartrain. According to EPA, “Toxicity testing of the pump water discharge showed no reason for concern for toxicity to aquatic animals or adverse affect on the health of Lake Ponchartrain.” Results from more than 100 bacteria samples taken at more than 50 stations in the Lake Ponchartrain area during September and October by USGS and LDEQ indicate very low concentrations in Lake Ponchartrain—within recreational standards.

As of Oct. 11, 2005, the floodwaters were removed from the area and, thus, no longer serve as a source of exposure to residents returning to impacted areas.

As noted in the initial article about the Hurricane Katrina and now later Hurricane Rita disasters, lessons learned from these catastrophes are proving difficult. It will be years before all of the problems have been adequately assessed and even longer for them to be solved. The EnviroMentor will continue to track information as it becomes available and bring it to you.

Judy L. Freeman is special projects director, Gabriel Environmental Services Inc., Chicago. She is Newsletter Editor for the EnviroMentor.

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**Noise Exposure Monitoring in the Workplace: Thorough Planning Is Key to Success**

By David Kudlinski, CSP, CIH

“The safety and health auditor from corporate headquarters just issued his report. He found a deficiency during our OSHA safety audit,” the plant manager remarks. “The audit said we should have issued earplugs to forklift drivers in the warehouse. Didn’t we test there?”

“I’m pretty sure we did,” you reply. “Then you need to respond to corporate by Friday,” your boss instructs.

The question is will you, as the plant safety manager, adequately address the warehouse noise issue to your boss and in your response to corporate? Or will you have doubts whether the potential noise hazard has been adequately assessed?

Obviously, this is not the most opportune time to recognize technical errors and insufficient sampling data in noise exposure monitoring reports. When exposure monitoring must be rushed to fill gaps in existing data by a deadline, it often results in increased cost.

If noise exposure monitoring failed to achieve its objectives in the scenario described, odds are the monitoring was flawed long before the testing began. Most failures of noise exposure monitoring to reach objectives occur because of decisions made in the planning stage. Reviewing these 16 suggestions before monitoring noise exposure should help to reduce the chance of your plant’s noise monitoring program being called into question.

**Suggestion 1: Select Exposure Criterion**

Before planning the sampling strategy, gather input from management (or the client) as to which exposure criterion will be used. The impetus for initial sampling may be regulatory compliance, or the employer may intend to meet or exceed industry guidelines. Be sure to determine whether OSHA requirements and American Conference of Governmental Industrial Hygienists (ACGIH) guidelines will be the criteria. Also, determine to what degree, if any, occupational exposure limits (OELs) will be reduced for longer than...
eight-hour shifts. For example, 83.4 dBA (decibels on the A-weighted scale) is the 10-hour OSHA action level (AL) and 82.7 dBA is the 12-hour AL.

**Suggestion 2: Decide Which Dosimeter(s) to Use**
The dosimeter should meet ANSI S1.25-1978. Given the learning curve associated with most monitoring instruments, many users will feel comfortable with the specific make and model of dosimeters with which they are proficient. One needs to determine whether a dosimeter will do what is required. Computer downloading capability and simultaneous measurement of noise at three or more different settings is the current industry standard. Computer analysis of an employee’s daily noise exposure can indicate peak exposure times and identify which tasks contribute the most to the overall noise exposure average.

**Suggestion 3: Determine How Many Dosimeters Are Needed**
A good rule of thumb: Up to 10 employees per shift can be monitored by one industrial hygienist (IH). Remember, careful observation of employees and documentation is critical. It is difficult, if not impossible, for one IH to track 15 or 20 dosimeter-wearers scattered throughout a large plant. The IH may be called on to explain readings potentially associated with litigation, so s/he must be able to refer to documentation describing each employee’s job duties and working conditions.

**Suggestion 4: Divide Employees into Similar Exposure Groups (SEGs)**
SEGs are groupings of workers, usually by job title, with similar noise exposures. A potential source of error is to make SEGs too large. For example, one might sample all factory production workers as one SEG, when in fact each area or production line within the factory has a different exposure profile.

**Suggestion 5: Establish the Method for Statistical Data Analysis Before Sampling**
A Strategy for Assessing and Managing Occupational Exposures by AIHA is a prime resource for exposure assessment. A good rule of thumb: A minimum of six samples per SEG is recommended to establish exposure statistics. Ultimately, one should strive for greater than 95 percent upper tolerance that any given exposure will be below the OEL (or protection factor of the hearing protectors).

If all results of noise exposure monitoring are far below (<5 dBA) the OEL of choice for a SEG, then that round of monitoring is likely completed; however, if the mean or average of the measurements is just below OEL, or if the range or fluctuation of measurements is wide, numerous (or even an astronomical number of) measurements may be required to establish the desired statistical confidence. In these cases, a decision must be made whether to resample, redefine the SEG or assume that a significant amount of SEG exposures are above the OEL.

**Suggestion 6: Get Familiar with the Equipment**
It’s usually more cost-effective to buy equipment that will be used frequently. If equipment will be rented, arrange to have dosimeters on hand days before the assessment. If unaccustomed to the equipment, run it for a few minutes in the office. After a short test run, scroll through the various measurement parameters and make sure they all make sense. Make sure all connections are tight and that the dosimeter does not malfunction after some jostling of the unit and the microphone wire. It is not recommended to open a box of unfamiliar dosimeters minutes before employee testing.

**Suggestion 7: Meticulously Check All Instrument Settings**
The last IH to use a particular dosimeter may have reprogrammed it for specialized testing. For instance, if OSHA hearing conservation program requirements are at issue, verify 5 decibel doubling rate, 80 decibel threshold and 90 decibel criterion. Remember, the determination of whether the OSHA permissible exposure limit (PEL) is exceeded and hearing protection is required should be measured with a 90 dBA threshold instead of 80 dBA. Some instrument settings may be undesirable, i.e., incorrect date or time, or automatic shut-off at eight hours. Always verify that the instrument’s calibration setting matches the decibel output of the calibrator. Return dosimeters and calibrators to the manufacturer as recommended for maintenance and calibration checks.

**Suggestion 8: Use Fresh Batteries & Have Plenty of Batteries Available**
Microphone windscreens are essential, so make sure there is one for each dosimeter and a few to spare. An extra dosimeter or two in reserve may be needed in the case of equipment malfunctions or newly recognized SEGs.

**Suggestion 9: Talk with the Production Supervisor Both a Week Before & the Afternoon After the Assessment**
The first thing Monday morning may not be the optimum time for testing, especially if extended set-up time is necessary after the weekend. The production supervisor should help by defining SEGs, selecting employees in an SEG with the highest potential exposures, and rallying employees at designated locations to collect and return dosimeters.

**Suggestion 10: If Feasible, Tour the Work Area Before Testing to Identify Noisy Areas**
Perhaps all the instantaneous and area noise levels are so low (80 dBA) that dosimeter testing for OSHA compliance is unnecessary. Seemingly peripheral details, such as the plant’s security and PPE requirements, or the location of visitor parking and the proper entrance gate, are better determined in advance to avoid frustrating and embarrassing morning delays.

**Suggestion 11: Arrive 30 Minutes Before the Shift So that Dosimeters Are Calibrated & Ready to Use**
To maintain efficiency and organization, establish an office or conference room as the rally point for employees to be issued dosimeters at the beginning of the work shift and to return them at the end of the day.

**Suggestion 12: Value Effective Communication with Dosimeter Wearers**
In the manufacturing environment, employees may be under stress to reach production quotas and perceive the dosimeter as an unwelcome encumbrance. Emphasize the importance of the employee’s role in exposure testing as it relates to hearing protection. Reassure anxious wearers that the dosimeter does not
OHSAS 18001: The Emerging International Safety & Health Management System

By Norm Keith, B.A., LL.B., CRSP

Over the past generation, factors such as the globalization of world economies, concerns over safety and health issues, increased regulatory complexity and the general acceptance of ISO 9000 as an operating standard for quality management systems have had a profound effect on both corporate environmental, corporate safety and health management fields. While this process is essentially “settled” for environmental and quality systems, ISO 14001 and 9001, respectively, the process for safety and health is not fully resolved. Many attempts have been made to develop universally acceptable standards for safety and health, yet none has achieved the level of acceptance of either of the well-known ISO standards. This article discusses the emerging international occupational safety and health (OSH) management system standard, OHSAS 18001.

OHSAS 18001 (officially known as OHSAS 18001, Occupational Health and Safety Management Systems: Specification) is one of newest and most significant international occupational safety and health management systems (OSH-MS) standards. It was developed in 1999 by the British Standards Institute (BSI) as a successor to BS 8800, predominantly to parallel its framework to that of ISO 14001. Estimates reflect that more than 2,000 sites have registered to OHSAS 18001, but no exact figures are available. Typically, organizations and worksites registering to OHSAS 18001 have previously registered to ISO 9001 and/or ISO 14001 and are looking for an OSH-MS standard that is fully compatible with those international standards (Roig and Ruble).

OHSAS 18001 is not an international standard in the same respect as the ISO standards. While ISO standards undergo a development process involving input continued on page 28

David Kadlinski, CSP, CIH, is a senior consultant with Clayton Group Services in Downers Grove, IL. He is responsible for providing safety and industrial hygiene consulting services, and he manages several national accounts. Kadlinski received an M.S. in Occupational Health from the Medical University of Ohio.
OHSAS 18001 has 17 elements (in the form of clauses in the standard) of safety and health management organized under the broad rubrics of: safety and health policy, planning, implementation and operation, checking and corrective action, and management review (Figure 1). These elements are designed to parallel similar elements in ISO 14001, the international environmental management standard. OHSAS 18001 requirements have been designed so that they may be impartially audited during a certification process. OHSAS 18001 is the only specification standard in the OHSAS 18000 series; that is, it is the only standard intended to be used for third-party certification. A guide to help organizations employ an OHSAS 18001 compliant program has been published as OHSAS 18002.

The initial certification assessment characteristically consists of the following seven steps:

1) **Identification of scope and OSH-MS implementation.** The organization seeking certification will identify the site and scope of the certification effort. The organization will conduct an initial review of its current practices, processes and procedures to evaluate initial level of conformance with respect to OHSAS 18001. When the organization feels it has successfully implemented an OSH-MS that meets OHSAS 18001 requirements, it will begin the certification process by submitting an application to the selected certification body.

2) **Application submittal.** The application submitted by the organization to the certification body must identify the rights and obligations of both the certification body and the organization. The application should address confidentiality issues, the right to appeal and dispute assessment findings, and instructions for use of the certificate of registration.

3) **Document review.** Existing documentation relating to the OSH-MS to be certified will be gathered and reviewed by the certification body in advance of the actual on-site assessments. Some certification bodies conduct the document review on site, but this is not typical.

4) **Pre-assessment or pre-audit.** The pre-assessment is an on-site assessment that allows the certification body to gain an initial understanding of the operations at the organization to be certified and have an initial look at the functioning of the OSH-MS. The two main purposes of the pre-assessment are to prepare the involved parties for the ensuing process by providing a broad overview of operations and the audit process, and to determine the overall readiness of the system for a comprehensive assessment.

5) **Assessment or audits.** Once it has been determined that the existing system is at an adequate level to be audited, an assessment team visits the organization. The assessment team will typically be comprised of a lead auditor and one or two support auditors. During the assessment, the auditors will verify that the organization’s OSH-MS conforms to OHSAS 18001 requirements through interviews with key personnel, site inspections and review of system documentation.

6) **Certification.** Three results are possible from the process.

   • Approval: The organization’s OSH-MS has demonstrated acceptable conformance with the requirements of the OHSAS 18001 standard.

   • Conditional or provisional approval: The organization’s OSH-MS has minor nonconformances that can be easily rectified and reassessed within a specified time frame.

   • Disapproval: The organization’s OSH-MS has not demonstrated conformance with OHSAS 18001. Disapproval is typically issued in cases where basic elements of the standard, such as auditing or corrective action, have not been addressed. If an organization’s OSH-MS is disapproved, the organization must correct the deficiencies before the certification body conducts a reassessment.

7) **Surveillance.** To ensure that the organization’s OSH-MS continues to be in conformance after the initial assessment, the certification body will conduct periodic surveillance audits. Surveillance audits are typically conducted on a semi-annual or annual basis, depending on the specific requirements of the certification body (Roig and Ruble).

**Self-Declaration under OHSAS 18001**

OHSAS 18001 also applies to organizations wanting to “make a self-determination and self-declaration of conformance with this international standard.” This statement in the standard enables an organization to implement an OSH-MS, internally assess its conformance to the OHSAS 18001 standard, then declare that its system coincides with the requirements of OHSAS 18001, all without the involvement of certification bodies.

The OHSAS 18001 standard provides no official guidance on the self-declaration process, nor any details about the kind of statement an organization can make. Third-party assessment would usually provide a more objective evaluation, and the worry of losing OHSAS 18001 certification, once obtained, may act as an incentive to an organization in adhering
to OSH-MS requirements. Self-assessment provides an organization with a deeper knowledge of its own practices, processes and procedures in the evaluation process, and is less expensive than undergoing certification.

What Gets Certified under OHSAS?

It is the organization’s OSH-MS that undergoes the certification process, not the organization or the facility itself. This impacts marketing and promoting OHSAS 18001 certification. For example, if your facility produces product X and your OSH-MS has been OHSAS 18001 certified, you cannot claim that product X is OHSAS 18001 certified since the standard does not certify products—it only certifies the OSH-MS involved with the production of the product. Similarly, you cannot technically claim that your facility is OHSAS 18001 certified. The standard makes it clear that it is the facility’s OSH-MS that is certified, not the facility itself.

Key Elements of OHSAS 18001

Clause 4.2 of OHSAS 18001 requires the organization to have a written statement that establishes fundamental corporate goals, and guides decision making with respect to OSH issues specific to its activities, products and services. The policy statement is meant to be a guide; it is not a rigid rule, so it can be amended. The OSH policy has several purposes directed both within and outside the corporation. Internally, the policy statement serves to focus on OSH issues associated with the organization’s activities, products and services. Externally, the OSH policy serves as the organization’s public commitment to tackle its OSH issues and continually improve its OSH performance.

Clause 4.3.2 requires the organization to have procedures to identify and have access to OSH requirements and to communicate information on these legal requirements to its employees and other interested parties. This clause addresses legal requirements as well as other requirements such as corporate OSH policies and procedures or voluntary industry standards of practice that apply to its operations (Roig and Ruble). Legal requirements refers to all the legal constraints imposed on an organization to provide a safe and healthful workplace. These include federal, state (or provincial), and local laws and regulations and any technical standards or conventions that may be cited as requirements by such laws and regulations.

Clause 4.3.2 also requires the organization to keep the information on legal and other requirements current and to “communicate relevant information on legal and other requirements to its employees and other relevant interested parties.” Other parties may include contractors working on the site, corporate management, the board of directors, shareholders, suppliers and other vendors, local emergency response organizations and local community organizations.

Clause 4.4.1 requires the organization to align its organizational structure to support effective OSH management by establishing clear and documented roles, responsibilities and authorities. Top management must allocate sufficient resources for this effective management and select one of its members to supervise the OSH management system and report on its performance (Roig and Ruble).

Clause 4.4.2 requires organizations to have procedures in place to ensure that its employees are competent with respect to tasks which may impact OSH in the workplace and that they are aware of their assigned roles and responsibilities within the OSH management system and the consequences of their work activities (Roig and Ruble). Employees should have a basic understanding of the OSH issues associated with the organization’s operations and the benefits of improved personal performance. Any employee whose work may directly affect OSH performance must perform his/her assigned tasks competently. The definition of competence takes into consideration factors such as appropriate education, training and/or experience.

Clause 4.5.1 requires organizations to develop procedures for monitoring and measuring their regulatory compliance and the extent to which they achieve their OSH objectives. This is achieved through the development of mechanisms to monitor the organization’s performance in 1) controlling accidents, illnesses and incidents; 2) verifying compliance with as well as the effectiveness of operational controls; 3) tracking progress toward fulfilling OSH objectives; 4) measuring regulatory compliance; 5) regulating and maintaining monitoring equipment; and 6) recording data in order to make correction and prevention possible.

Benefits of OHSAS 18001

Organizations that have implemented OHSAS 18001 report several benefits, both internal and external.

Internal benefits include:
• improved health and safety compliance and reduced incidents and liability;
• efficiency and cost reduction;
• improved performance;
• improved corporate culture.

External benefits include:
• third-party assurance and recognition;
• regulatory relief;
• expression of due diligence;
• positive public image and community relations;
• financial markets.

OHSAS 18001 is the leading international OHS management system standard. It complements the structure and auditing requirements of ISO standards. In North America, it is facing recent competition from ANSI Z10-2005 and CSA Z1000-2006.

The ultimate universality and acceptance of OHSAS 18001 will likely depend on two factors: 1) its adoption as an ISO standard and 2) its acceptance/demand in the marketplace. These factors have more to do with perception and politics than international relevance and reliability.

References


Norm Keith, B.A., LL.B., CRSP, is a partner in the Canadian law firm Gowling, Lafleur, Henderson, Toronto, Ontario. He is the only practicing lawyer in Canada to achieve the designation of a Canadian registered safety professional (CRSP). Keith is a member of ASSE’s International Practice Specialty. He can be reached at (866) 862-5699; norm.keith@gowlings.com.
Executive Safety Leadership
By Robert Pater

Most SH&E professionals believe that active support from their company’s executive leadership is critical for achieving a strong safety culture and safety program performance. Yet, many professionals are also frustrated in their efforts to activate their executives toward a higher level of safety leadership.

From my experience, the positive news is that it is possible to more successfully reach the executives in your organization, raise executive awareness of the value of safety’s broader organizational role, support safety efforts and influence senior managers to become more successful safety leaders.

I’ve had the opportunity to work with and present to executives in one-on-one consultations and at numerous conferences in a wide range of companies in several countries (although most of my experience is in the private sector with larger companies). Clearly, there are always exceptions to any “rule.” But the principles discussed here have proven effective with numerous executives.

What Executives Say about Safety
In the last decade, I’ve seen an executive alchemical shift from perceiving safety as a time or resource-waster to be delegated out—something the company was forced to implement—into a critical resource for organizational performance improvement. For that perspective, following are some comments I’ve heard senior executives—mostly CEOs, presidents and vice presidents—make about the importance of safety.

• “To achieve operational excellence, we need to have SHE excellence and everyone has to be involved.”
• “Customers aren’t willing to pay for a company’s SH&E mistakes—they’ll go elsewhere.”
• “SH&E should be the first subject of every operational review.”
• “We want to run our company independently—accidents and environmental incidents get government regulators involved and they’ll tell us how to run our business.”
• “The first thing we look for in a potential acquisition is SH&E record; this indicates how well a company is managed.”
• “In plants where leaders make a real commitment to safety, employees make extraordinary breakthroughs.”
• “Any manager who can’t manage SH&E just can’t manage.”
• “I don’t treat safety as a separate entity; to me, it’s part of all work we do.”
• “You’ll see safety deteriorate long before other operations do. On the other side, if you can improve safety, you can realize significant improvements in operations.”
• “Safety doesn’t improve unless people are focused. At the end of the day, safety is about what people do this minute, hour and day on this particular task. If for five minutes I believe I don’t have to focus on what I’m doing, I am set up to have an accident.”
• “We would rather see workers’ comp claims than off-work medical claims.”
• “Ninety percent of things to improve safety are positive. To get another one percent improvement now is about us, our people and our culture.”

Many executives are under significant pressure to keep their companies competitive and profitable by cutting costs. In publicly traded companies, there is often great pressure to show continuously rising quarter-to-quarter improvements, all the while with an aging and thinned-down workforce (many of whom are working much harder than they were decades earlier). This can lead to a “make-it-so” approach, often borne out of a combination of management desperation and of not understanding safety change dynamics. Have you heard executives say things like, “I don’t want to see any more injuries?” Not conducive to the near-hit and catch-it-early reporting valued by many SH&E professionals.

On top of this, many executives are uncomfortable with safety. I’ve seen top managers who were confident and smooth presenters—until it came time to talk about safety. Many then stiffly reverted to either an empty “you can do it” talk or a dry discussion of incidence rates, neither the best thing to focus on with line staff.

Someone said that it is critical to communicate about workers’ personal safety, not about their safety record. Statistical discussions about safety are most appropriate for managers and SH&E professionals, not line staff. I’ve frequently heard workers say, “If our injury rate goes down, will you pay me more?” Much better to focus on the personal benefits safety brings.

Regarding influencing executives, Dee Hock, CEO Emeritus of VISA International, wrote that strong leaders should spend 40 percent of their time on managing themselves and 30 percent of their time on managing up.

Becoming more influential with senior managers can not only heighten safety exposure in a company, it may also have positive effects on your own credibility and career. Safety is a nexus point, the one aspect of organizational life everyone agrees—at least verbally—is important. Focusing on boosting safety also helps encourage employee receptivity to change, helps attract and retain desired workers, affects smoother flow of operations, boosts involvement, heightens trust (at a time where this is highly needed) and can give the company a market edge in other ways as well.

At a seminar for senior executives of a Fortune 500 manufacturing company, an operational vice president asked, “We need some do’s and don’ts for leading safety.” So I provided 10 do’s and don’ts for senior managers to more effectively lead safety. In a similar vein, following are several suggested do’s and don’ts for SH&E professionals to help senior managers more actively and effectively lead safety within their company.

Seven Key Safety Person Do’s
1) Know when to be invisible. Lao Tsu wrote, “The worst leader, the people fear and hate. The next best leader, the people love and respect. The best leader, when
the job is done, the people will say, “We
did this ourselves.”’”

Focus on giving credit to executives and
thanking them for the support they provided that resulted in any safety gains.
This could include providing funds for interventions, allowing release of workers
for safety training, being willing to have pilot approaches tried in select areas. By
thanking and crediting executives—sincerely—you help foster identification
with safety successes and lead the way to buy-in for future endeavors.

Also, know when to bring someone
else in to work with executives. This can
be another person in your company, a fel-
low professional or an outsider. Some-
times, you gain credibility by having
another voice of reason support your
points. Be sure to screen in advance who-
ever you bring in to represent you.

2) Develop a strategic recognition
system. In addition to thanking execu-
tives, develop a system for recognizing
the positive impacts brought to safety by
middle managers, supervisors, bargaining
unit leadership, other departments and
line staff.

Know the key issues and values of
senior executives, both personally and
organizationally. For example, some man-
agers take pride in their company being
recognized as a “best employer.” Others
think of themselves as leaders in their
field. Some want to know they are out-
pacing their competitors. Show how safety
leadership can further the most
cherished objectives of top managers.

3) Systematically chart and publicize
successes. This does not mean blowing
your own horn or causing shoulder dam-
age from patting yourself on the back. In
fact, my experience with executives is
that calm confidence results in more cre-
dence than brash talk.

Provide coming attractions of new
interventions. Refer to past processes
you’ve instituted that have resulted in dif-
ferent levels of success. Show tie-ins
between past safety efforts and current
states. Go beyond statistical results to
focus on improvements in morale, reports
of personal use of methods, improvements
in communications, changes in actions,
etc. Be sure to highlight system consisten-
cy and trends of continued progress.

4) Nurture (at least one) executive
relationship. Make sure to foster a posi-
tive relationship with a leader as high up
in the organization as possible. This per-
son can help promote your efforts and
requests to the senior command, while
you can offer vital but confidential feed-
back from line staff that can make the dif-
fERENCE in how the executive’s decisions
will be accepted and carried out. Many
senior managers are disconnected from
what’s really going on in the company,
know it and will relish “vital intelligence”
(remember, you will serve as their feed-
back mechanism, not as a spy).

Motivational psychologist Frederick
Herzberg wrote that many executives suf-
fer from “productivity burnout.” That is,
they spend so much time in meetings,
planning, focusing ahead and outward
that they are often disconnected from
their company and employees.

Help reconnect them. Offer to alert
your “bonds” if one of their proposed
actions might unintentionally backfire.
Bring them early employee overall reac-
tions. Ask their help in influencing their
peers indirectly toward safety leadership.

It might be a good idea to develop two
such relationships among “noncompeting”
executives. One never knows when a
manager might leave the company.

5) Develop a detection and report sys-
tem. Safety implementations typically
generate at least some mixed messages.
Ferret these out. Don’t avoid them or wait
for veiled or angry reports to come to you.

Invite resisters and others—which
should include several in the management
ranks—to seek out and report any mixed
messages in the safety realm. Be sure you
receive these reports with a positive
demeanor (no matter the tone in which
they may be delivered) and report back to
people as to what actions were taken.

Whether you invite mixed-message
sightings or not, people will notice these.
Don’t really lose anything by solicit-
ing reports, as long as you preface your
request with a statement that you will do
what you can, but don’t have the power to
change everything. Also be sure to get
back to people in a timely manner. Done
well, this process can serve as a vehicle
for boosting involvement in safety, help
turn around resisters and generate higher-
quality information from the point of
view of those you are trying to influence.

By soliciting managers’ concerns in
advance (at an appropriate time), you can
redirect weakness into strength. This can
also provide positive public relations for
safety and your efforts. Preface all requests
for information with a statement to this
effect. “We value being as consistently
effective as possible. I welcome your help
in letting us know about any inconsistenc-
ies you see or find regarding safety. We’ll
do whatever’s feasible to reduce blockages
to high-level safe performance.”

If you listen carefully, you will also
get a bead on specific executives’ motiv-
ations, objections and concerns about safe-
ty. This information can help in later
persuasion efforts.

6) Be action-oriented and foster
“doable” interventions. Avoid unrealistic
interventions that might request execu-
tives or anyone else to “drop everything
for safety.”

Steer clear of communications or poli-
cies that are likely to backfire, such as
telling managers who are rarely separated
from their briefcases to “never carry on
stairs.” Such communications only create
conflict or further mixed messages—and
might lead to your being seen as a safety
“geek,” out of touch with organizational
realities.

Think “execution.” Be sure to set clear,
realistic timetables for actions and com-
municate expectations of levels of returns
from interventions you set in motion.

Change with change. Don’t stick
unyieldingly to preset plans. Will Rogers
said, “Planning gets you into things. Hard
work gets you out of them.” Watch how
external and internal forces affect your
interventions and plans. Think regular
observation, recalibrating and readjusting,
rather than waiting for the bad news that
a pet project has failed.

7) Make it easy for executives to lead.
Provide them with knowledgeable ex-
sposure to safety plans and interventions as
compactly as possible.

Invite select top managers to sponsor
each intervention. Solicit their help in set-
ting leading indicators for measurement
and quality control.

Offer to ghostwrite executive inter-
views, monthly safety letters, safety talks,
presentations, script introductions, etc. If

continued on page 32
persuasive writing is not a strong skill, recruit someone else to handle this. In the meantime, continue to develop your writing abilities (critical for influential e-mails, reports and other communications).

Encourage executives to send safety recognition or thank you notes home to workers and their families. Offer to arrange for any needed logistics.

Keep senior managers in the loop. Provide them with coming attractions of new interventions. Be sure to make these brief and exciting, replete with visuals and demonstrations.

You might create a one-page (or shorter) set of action keys from which they can select. For example, for our strain/sprain, slip/trip/fall, hand injury interventions, we first focus on creating executive enthusiasm. Then, invite them to take action, such as providing input in selecting the best peer instructor-catalysts; considering becoming a leadership sponsor or supporting whoever else is the leadership sponsor; setting high expectations with chosen peer instructor-catalysts and meeting with them briefly prior to their initial training; dropping in for a few minutes during the initial training; participating in planning for the process rollout to all workers; debriefing newly-trained peer instructor-catalysts soon after initial training week; supporting and encouraging others to support releasing peer instructor-catalysts and workers for training; coaching and reinforcement follow-up; and more.

If many executives are more seriously abord the safety train, why do SH&E professionals still have some difficulty getting their attention, and securing requested support and resources?

Clearly some obstacles exist, such as disconnects between executive safety philosophy and actual practice. To effectively persuade executives, it is important to understand what, for them, might get in the way of their actively embracing safety. In my experience, these include:

• Concerns about cost-effectiveness. “Sure safety’s important, but is there a real return on the resources you’re requesting? Yes, I’ve heard all the statistics on payback, but these are general or from other companies. How do we know we’ll also realize these returns?”
• Suspicion. “I think carpal tunnel syndrome is a contagious disease. And I seriously wonder about these back injuries and falls as well.”

• Motivation issue. “Maybe they just need to be held more accountable for not getting hurt?”

• Can of worms. “If we bring this up, it will just open the gates.”

• Previously expended resources. “We’ve already spent money on equipment and back belts. Is this just another example of throwing good money after bad?”

• Not thinking cumulatively. “We put in a back injury prevention program last month and still had several reports this month.”

• High expectations (without providing adequate support). “I expect you to cut injuries by 50 percent in the next year; by the way, because of these being tight times, we’re cutting your staff and budget by 40 percent.”

• Unrealistic perceptions based on hot trends. “I’ve read about this new incentive program that says it will reduce all injuries. That’s what we need to focus on.”

• Instant/short-term results. “I expect we will achieve significant reductions in injury costs within six months.”

While there is not enough room in this article to address all these issues, it is important to not exacerbate these. Bear in mind the following list of don’ts.

**Key Safety Person Don’ts**

1) Don’t position safety only as avoidance. Steer clear of others only associating safety with negatives (getting blamed, embarrassed, etc.). Focus instead on positive outcomes and actions to be taken, rather than just those to be avoided.

Enlist positive motivation whenever possible. To prepare these, ask yourself what will executives get from actively supporting safety beyond less injuries or lowered costs? These might include: greater credibility, higher morale and dedication, peace of mind (knowing you’ve done what you can to prevent injuries, lawsuits, public relations fiascos, etc), recognition as strongly community-minded and more. All “benefits” should be customized to specific executives’ warm spots.

Don’t do anything—and suggest this to executives as well—that encourages hiding accidents, hazards, near-hits (such as the statement I heard from a trans-
To start, listen to the words repeatedly used by those executives you wish to influence. Read what they read. Scope out what is in their office—golf club? picture of them in a sports car? Use this information to make effective metaphors in your persuasion process. This is much the same way sales staff of an international organization that provides services to major oil companies are trained to read and employ information gleaned from the office decor of target executive clients.

Don’t get too attached or overzealous about safety. Many executives likely see this as part of their overall picture of organizational performance, not as the main show. Reduce “safety talk” to executives. Unless you are dealing with engineering-oriented executives, opt away from too-technical discussions. Instead, reflect on and refer to their organizational and leadership themes and objectives in lieu of discussion of lost-time injury/illness rates and other safety jargon.

5) Don’t continue to bring up the same old things. Most executives have already heard the standard reasons they should support safety (e.g., avoid injuries, costs). It is easy to ignore or disregard what you think you already know. Consider different and new approaches to get managers’ attention.

Don’t let yourself be seen as too wedded to the past—whether it is in your communications, attitude or interventions. Continue to try new approaches and processes. Make sure you do something unique in each safety briefing you make to executives.

Certainly, avoid being seen as a safety curmudgeon. Read the crest of changes in your company and industry and stay ahead of the wave.

6) Don’t fail to employ leverage. Rather than trying to be the lone ranger for safety, find others you can bring in to present safety to executives. I’ve seen significant results in many levels of safety performance from instituting a system of workers becoming activated as safety catalysts for change. These catalysts have often done exceptional jobs of reaching senior management (who often had not expected sophisticated communications and presentations from hourly workers).

Think mission first. Don’t let yourself become too attached to a set way of doing things or of expecting to be “the one” who turns around executives.

7) Don’t fail to fully prepare to communicate with executives. I have heard SH&E professionals question the efficacy of spending numerous hours to prepare for a 10-minute executive briefing. But it is not just 10 minutes. A short presentation to senior managers is a highly leveraged event. In that 10 minutes, it is possible to simultaneously reach many leaders who, in turn, can affect the actions of a large number of people company-wide, over a significant time period.

One of the best ways to communicate with executives is through making powerful presentations and briefings. You can use your presentations to create a sense of value and urgency for safety improvements. Be sure to continue to work on improving your skills in this area. Following are some proven keys for presenting to executives.

**Executive Presentation Keys**

- Show respect for their time. If you are given 10 minutes, make sure you can end within that time period. Of course, it is a good sign if they ask further questions or ask you continue. Be prepared for that eventuality—over-prepare for the time slot, anticipating requests for more information.
- Communicate as a leader, not as a technician. Employ leadership talk, not safety jargon.
- Let executives know that your purpose is to support their leadership efforts.
- Initially provide them with a big picture view with few details.
- Reconnect them with line employees. You can serve a vital role by helping them better understand what line staff are thinking (always maintaining confidentiality) so they can be more effective as leaders.
- Provide a balanced view. Don’t come across one-sided, which only invites executive wariness. Always offer potential downsides of any proposed intervention. Of course, from your perspective, you might comment that the benefits to a proposed intervention seem to significantly outweigh the costs.
- Acknowledge that they will make final choices. Remember that many executives are used to taking control and usually do not want to be told what to do. Consider offering two alternative actions—either of which would be acceptable to you—and invite them to direct the route to take.

- Invite their input and support, making it easy for them to do so with as little time commitment on their part as possible (see “Key Safety Person Do’s” number 7).
- Request their support at the right time. I suggest waiting until you can see a reasonable amount of nonverbal receptivity before asking for their go-ahead. Even so, consider phrasing this in a way where you acknowledge that they have choices (“Should you see value in this intervention, there are some actions you can take that would require minimal time and could result in a major impact,” etc.).
- Remember to enlist the four steps in a successful persuasion process.

1) Get their attention. This can be done in many ways—citing a recent issue in the news, what competitors are doing, a window of significant opportunity, etc.

2) Elicit their interest. Offer benefits to them as both leaders and for the organization.

3) Build their trust by fully preparing, showing your commitment to support their leadership, providing straight talk, giving them choices and respecting their time.

4) Invite their commitment, the small actions they can take that can make a real difference. Carefully and respectfully remind them of their critical role as models, trendsetters and leaders.

These strategies and methods are only the tip of the iceberg. Many other actions can be taken to activate stronger executive safety leadership. Much of this is as much art as science—reading others, timing, developing contact and more.

Be sure to customize anything that might be of interest in this article to your company’s unique concerns and culture. Significant results in performance and culture are generated when executives demonstrate sincere and strong safety leadership. By honing our abilities to persuade senior managers, we can greatly boost our mission and company safety effectiveness.

By Dennis K. Neitzel, CPE

MSHA is responsible for the inspection and enforcement of the federal Mine Safety and Health Act of 1977, and the associated parts of CFR Title 30, Parts 1 through 199, Mineral Resources. These regulations deal with all aspects of mine safety, including electrical safety. MSHA has the authority to issue citations and levy civil penalties for the violation of mine safety regulations. MSHA’s mission is to “enforce compliance with mandatory safety and health standards as a means to eliminate fatal accidents, to reduce the frequency and severity of non-fatal accidents, to minimize health hazards and to promote improved safety and health conditions in the nation’s mines.”

In addition to the electrical safety regulations developed by MSHA for the mining industry, OSHA has developed and issued requirements for electrical safety for all industries. National Fire Protection Association (NFPA) also provides direction concerning electrical safety in NFPA 70E, Standard for Electrical Safety in the Workplace. Although NFPA 70E does not apply directly to electrical installations in underground mines or to self-propelled mobile surface mining machinery and trailing cables, it does apply to all other electrical installations in the mining industry.

The MSHA and OSHA regulations, along with NFPA 70E, have been developed to help employers protect employees who work on, near, or with electrical equipment and systems. These regulations and standards address electrical hazards analysis, safe work practices and procedures, and PPE required to protect employees from the hazards of electricity. To better understand why safe work practices and PPE are required, a brief description of the hazards of electricity is provided.

**Hazards of Electricity**

All of the studies reviewed have revealed three major hazards of electricity: 1) electrical shock; 2) electrical arc flash; and 3) electrical arc blast. Each of these is addressed briefly in the following discussion, including a review of the physiological effects on the human body.

**Electrical Shock**

It takes a very low value of current flowing through the human body to cause death or serious physical harm. Many studies have been performed in this area with different values of current that causes each effect. Table 1 illustrates average values of current and the effects as reported in the published studies.

<table>
<thead>
<tr>
<th>Current</th>
<th>Effect</th>
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</thead>
<tbody>
<tr>
<td>1 mA</td>
<td>Barely perceptible</td>
</tr>
<tr>
<td>1-3 mA</td>
<td>Perception threshold (most cases)</td>
</tr>
<tr>
<td>3-9 mA</td>
<td>Painful sensations</td>
</tr>
<tr>
<td>9-25 mA</td>
<td>Muscular contractions (can’t let go)</td>
</tr>
<tr>
<td>25-60 mA</td>
<td>Respiratory paralysis (may be fatal)</td>
</tr>
<tr>
<td>60 mA or more</td>
<td>Ventricular fibrillation (probably fatal)</td>
</tr>
<tr>
<td>4 A or more</td>
<td>Heart paralysis (fatal)</td>
</tr>
<tr>
<td>5 A or more</td>
<td>Tissue burning (fatal if vital organ)</td>
</tr>
</tbody>
</table>

TABLE 1

According to the National Electrical Code, a qualified person is “one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.”

**Electrical Arc Flash**

This hazard encompasses two different issues—the arc temperature and the incident energy. The main concern with the arc temperature is the flash-flame and ignition of clothing. At approximately 203 °F for 1/60 of a second (six cycles), the skin is rendered incurable (in other words, a third-degree burn). At only 1.2 cal/cm² of incident energy, a person could receive a second-degree burn. It does not take a very high temperature or very much energy to cause extreme pain and discomfort or death to the worker.

The wearing of many synthetic fabrics, such as acetate, nylon, polyester and rayon (either alone or in blends) is prohibited by OSHA where an electrical arc might occur, unless the employer can demonstrate that the fabric has been treated to withstand the conditions which may be encountered. When exposed to flames or electric arcs, these materials can ignite and continue to burn, and will generally melt and adhere to the skin, increasing the extent of the injury.

In some cases, 100% cotton will suffice; however, in most cases involving electric arcs, clothing must be made of a flame-resistant (FR) material in order to provide more complete protection. Incident energy is a radiant energy that can pass through the clothing fabric (even if it is FR material) and could ignite underneath or burn the skin. The flash hazard analysis required by NFPA 70E must be performed in order to determine the level of hazard and the appropriate PPE for the available incident energy. As with the shock hazard, PPE should be the last option. The best practice is to engineer out the hazards.
Considerations for engineering out the hazard include:

1) Perform a complete lockout/tagout, test and ground if necessary. (PPE is required while performing these functions but can be removed once these procedures are completed.)

2) Install electrical equipment that will either contain or properly vent the arc flash and blast pressure.

3) Use current-limiting devices such as current-limiting reactors or current-limiting fuses to limit the available short circuit current in the electrical system.

4) Use remote operating controls for circuit breakers so that the operator does not have to stand at the equipment to open or close it.

5) Use extensions on the racking mechanism of circuit breakers that extends through the cubicle door so the breaker can be racked in and out with the door securely latched closed.

Electrical Arc Blast

The pressures developed by an electrical arc can be extremely high. One study noted that copper, when vaporized, expands at a factor of 67,000 times, which one expert stated was the same expansion as dynamite.

Doors or covers must be securely latched before operating a switch or circuit breaker. Technicians or operators must place their body in the safest position before operating the equipment. Flash suits will protect against the flash/flame and incident energy hazards of the arc flash, but they may not protect against the pressures of the arc blast.

There are several areas to consider with an electrical arc flash and arc blast:

1) Copper expanding when vaporized is similar to dynamite releasing.
   - Dynamite releases energy in microseconds.
   - Arc releases energy in milliseconds.
   - 1 MW of power = 1 stick of dynamite (1/3 lb of TNT).

2) An electrical arc is a multihazard event:
   - electrical arc: flash/flame temperature, incident energy;
   - electrical blast (explosion): fragmented metal, molten metal, vaporized metal (plasma), pressure.

Several engineering considerations must be taken into account with arc flash and arc blast hazards. These include up-to-date electrical protective device coordination studies, up-to-date short-circuit analysis and flash hazard analysis, and regularly scheduled preventive and predictive maintenance and testing programs for the electrical protective devices.

Preventive Measures & Equipment

By far, the safest way to work on electrical equipment and circuits is to de-energize, lock and tag the equipment. In fact MSHA and OSHA clearly indicate that this is their preference. Energized work is to be performed only as a last resort, when it is not feasible to de-energize. OSHA 29 CFR 1910.331-.335 (Electrical Safety-Related Work Practices) addresses the requirements for working on, near or with exposed energized electrical circuits or equipment that is energized at 50 volts or more to ground. OSHA defines energized work as “work performed on exposed live parts (involving either direct contact or contact by means of tools or materials) or near enough to them for employees to be exposed to any hazards they present.”

With regard to de-energized work, MSHA 30 CFR 56.12017 states, “Power circuits shall be de-energized before work is done on such circuits unless hot-line tools are used. Suitable warning signs shall be posted by the individuals who are to do the work. Switches shall be locked out or other measures taken, which shall prevent the power circuits from being energized without the knowledge of the individuals working on them. Such locks, signs or preventative devices shall be removed only by the person who installs them or by authorized personnel.”

Working on or near exposed energized circuits and equipment can be extremely dangerous if proper safe work practices are not used. Energized work should be performed only after all other avenues that would allow the work to be done de-energized have been exhausted.

That said, one must recognize that in some cases, it may be more hazardous to de-energize than to work on the system while it is energized. Such circumstances could include shutting down an emergency alarm system, shutting down the ventilation system to a hazardous location, shutting down systems for life support equipment or turning off the lights to a process area. Energized work would also be required for diagnostic testing or troubleshooting. Under these conditions, the work must be performed by qualified persons only, using proper safe work practice procedures, PPE and protective measures in order to perform the work safely.

MSHA does not address specific electrical protective equipment for performing energized work; however, it does require protective equipment to be used for all hazardous conditions. MSHA 30 CFR 56 and 57.15006 require that “special protective equipment and special protective clothing shall be provided, maintained in a sanitary and reliable condition and used whenever hazards of process or environment, chemical hazards, radiological hazards or mechanical irritants are encountered in a manner capable of causing injury or impairment.” Note that this requirement is intended to cover situations where normal and ordinary work clothing and safety equipment is not adequate.

OSHA has similar requirements for protective clothing and equipment in 29 CFR 1910.132(d), which requires a hazard assessment and equipment selection:

1) The employer shall assess the workplace to determine if hazards are present or are likely to be present, which necessitate the use of personal protective equipment (PPE). If such hazards are present or likely to be present, the employer shall: (i) select and have each affected employee use the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment; (ii) communicate selection decisions

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to each affected employee; and (iii) select PPE that properly fits each affected employee.

2) The employer shall verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated, the person certifying that the evaluation has been performed, the date(s) of the hazard assessment and which identifies the document as a certification of hazard assessment.

Both MSHA’s and OSHA’s requirements are fairly generic with regard to hazard assessments and PPE selection. OSHA 29 CFR 1910.335 (Safeguards for Personal Protection) is somewhat more specific with regard to the electrical hazards and PPE requirements. OSHA makes several statements in 1910.335 with regard to protecting employees from electrical hazards. These statements are as follows:

“Employees working in areas where there are potential electrical hazards shall be provided with and shall use electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.”

“Employees shall wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.”

“Employees shall wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.”

“When working near exposed energized conductors or circuit parts, each employee shall use insulated tools or handling equipment if the tools or handling equipment might make contact with such conductors or parts.”

“Fuse handling equipment, insulated for the circuit voltage, shall be used to remove or install fuses when the fuse terminals are energized.”

“Ropes/handlines used near exposed energized parts shall be nonconductive.”

“Protective shields, protective barriers or insulating materials shall be used to protect each employee from shock, burns, or other electrically related injuries while that employee is working near exposed energized parts, which might be accidentally contacted or where dangerous electric heating or arcing might occur.”

All of these quotes address protecting employees from the hazards of electricity. NFPA 70E further breaks this down into specific requirements for a shock hazard analysis and a flash hazard analysis, along with the appropriate PPE and safe work practices required to protect employees from these hazards.

**Conclusion**

To address electrical hazards in the mining industry, a path must be followed that will lead to a comprehensive analysis of the problems and hazards which exist or may exist, and provide a quantified value to ensure the selection of appropriate PPE and clothing as well as safe work practices and procedures. An analysis of all three hazards—electrical shock, electrical arc flash and electrical arc blast—must be completed and steps taken to prevent injuries and fatalities.

Regulatory agencies and standards organizations have long recognized the need to analyze the hazards of electrical work and plan accordingly to mitigate the hazards. Unfortunately, many in the electrical industry have chosen to “take their chances,” largely because nothing bad has happened yet. As more information becomes available on the economic and human costs of electrical accidents, it is hoped that more in the industry will recognize the need for systematic hazard analysis and an electrical safe work program that emphasizes hazard identification and abatement.

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**Dennis K. Neitzel, CPE, is the director of AVO Training Institute Inc., Dallas, TX. Neitzel is a principal committee member of NFPA 70E, Standard for Electrical Safety in the Workplace; is co-author of the Electrical Safety Handbook; He is also the working group chair for the revision of IEEE Standard 902, IEEE Guide for Maintenance, Operation and Safety of Industrial and Commercial Power Systems.**

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**Using Collateral Duty Safety Representatives in Your Safety Program**

**By Fred Fanning, CST**

Many public organizations use collateral duty safety representatives. In addition, as more public organizations downsize, they may switch from full-time SH&E personnel to collateral duty safety representatives. The key to making this transition successful is to implement a logical process to select, train and support those representatives. This article examines the best way to achieve that.

The decision to use collateral duty SH&E representatives alone or to supplement a full-time staff should be based on the best way to conduct a safety program. The decision should also consider cost, professional standards and return on investment. The author’s experience is that collateral safety representatives are being used and many are not properly selected, trained or supported. If their use increases, this trend will continue or perhaps increase as well.

**Organizational Responsibilities**

The OSH Act 1970 gives the requirements to prevent needless accidents and injuries in the workplace. Section 5(a)(1) says that “each employer shall furnish to each employee employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.” Section 19 of the act says that federal agency heads will implement a safety and health program. Although this act does not apply to state or municipal governments, nearly every
state has its own standard covering public employees. This means that public organizations must prevent accidents by recognizing and eliminating hazards in the workplace. However, how the program is staffed is not as important as its effectiveness in preventing accidents.

Resources
The public manager and his/her human resource manager must identify resource needs and justify them in the budget processes. The following ratios will aid in that process and are based on the author’s experience. Collateral duty safety representatives should be used at a ratio of one for every 500 employees. This assumes eight hours a week on safety duties. For operations that work three shifts, the collateral duty safety representative ratio should be one per shift instead of by the number of employees. If full-time SH&E personnel are used, the ratio should be one for every 3,500 employees. If a mixture of collateral and full-time SH&E personnel are used, the ratio should be a full-time safety person at the headquarters level with collateral duty safety representatives assigned at a ratio of one for every 1,000 employees.

The safety budget must include the salaries of collateral or full-time safety personnel. The time they spend on safety is time they are not doing their primary job of production or service. This cost should be equal to or less than the amount management budgeted. This cost is often overlooked. In addition to salaries, management should budget $0.24 per employee per month to cover the purchase of promotional items, safety awards, standards, regulations and awareness material (e.g., posters, flyers, stickers, pins and banners about specific hazards).

Selection
If collateral duty safety representatives will be employed, the first step is to select the right person. Collateral duty safety representatives used alone or to support a full-time staff are spread throughout the organization and focus on providing services to their section. If the second duty assigned is related to safety—such as engineering, environmental protection, facility management or nursing—the duties complement each other. The normal safety duties include the following:

- Serve as management’s representative on all aspects of safety.
- Interpret safety policies and procedures.
- Conduct periodic surveys and inspections.
- Conduct follow-up hazard abatement.
- Maintain records of surveys and inspections.
- Assist supervisors in investigating accidents.
- Follow up with the director on injuries and property damage.
- Collate reports.
- Provide information to line organizations.
- Coordinate with the personnel office on the OSHA log and worker’s compensation reports.
- Coordinate an early return-to-work program.

Table 1: Major Duties of the Additional or Collateral Duty Safety Representative as Outlined in Scope & Functions of the Professional Safety Position, ASSE form SF-10/M-M-2/96

| Serve as management’s representative on all aspects of safety. |
| Interpret safety policies and procedures. |
| Conduct periodic surveys and inspections. |
| Conduct follow-up hazard abatement. |
| Maintain records of surveys and inspections. |
| Assist supervisors in investigating accidents. |
| Follow up with the director on injuries and property damage. |
| Collate reports. |
| Provide information to line organizations. |
| Coordinate with the personnel office on the OSHA log and worker’s compensation reports. |
| Coordinate an early return-to-work program. |

Table 2: Areas of Safety Science
Career Guide to the Safety Profession

| Chemistry | Psychology | Sociology |
| Biology | Physiology | Geology |
| Physics | Biomechanics | Business Management |
| Ergonomics | Medicine | Economics |
| Engineering |

Table 3: Excerpts from OSH Training Institute Course Catalog

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<tr>
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<tr>
<td>510</td>
<td>Occupational Safety and Health Standards for the Construction Industry</td>
</tr>
<tr>
<td>511</td>
<td>Occupational Safety and Health Standards for General Industry</td>
</tr>
<tr>
<td>1020</td>
<td>Basic Accident Investigation</td>
</tr>
<tr>
<td>1050</td>
<td>Introduction to Safety Standards for Safety Officers</td>
</tr>
<tr>
<td>1410</td>
<td>Inspection Techniques and Legal Aspects</td>
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<td>Machinery and Machine Guarding Standards</td>
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<td>Fire Protection and Life Safety</td>
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<td>2080</td>
<td>Cranes and Materials Handling for General Industry</td>
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<td>Industrial Noise</td>
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<td>6000</td>
<td>Collateral Duty Course for Other Federal Agencies</td>
</tr>
<tr>
<td>6010</td>
<td>Occupational Safety and Health Course for Other Federal Agencies</td>
</tr>
</tbody>
</table>

• Serve as management’s representative on all aspects of safety.
• Interpret safety policies and procedures.
• Conduct periodic surveys and inspections.
• Conduct follow-up hazard abatement.
• Maintain records of surveys and inspections.
• Assist supervisors in investigating accidents.
• Follow up with the director on injuries and property damage.

continued on page 38
• Collate reports.
• Provide information to line organizations.
• Coordinate with the personnel office on the OSHA log and workers’ compensation reports.
• Coordinate an early return-to-work program (ASSE “Scope and Functions”).

When collateral duty representatives are appointed, they rarely are told what their new duties are or where to get assistance. Several books can help. For example, Career Guide to the Safety Professional, published jointly by Board of Certified Safety Professionals (BCSP) and ASSE, outlines the knowledge of a safety person (ASSE/BCSP). If possible, management should select a person with knowledge of chemistry, biology, physics, ergonomics, economics, psychology, physiology, biomechanics, medicine, engineering, sociology, geology, business and management. If no one in the organization has these knowledge areas, they should select a person who is able to learn them.

Training
Management must train the collateral duty safety representative as well. Management must be familiar with the person’s duties, and the functions and scope of the organizational safety program, and must know how to help the collateral safety representative determine the training and skills s/he possesses. Training may be provided through local colleges, an OSHA-approved regional training center or private companies. Each knowledge area cited can be learned in a one- to five-day course. Several may be learned simultaneously in a single course. Table 1 is excerpted from OSHA’s course catalog that is available at www.osha.gov/pls/oti/oti_schedule.html. This serves as an outline of the courses that exist to prepare the organization’s personnel.

Support
Once the individual is selected and trained, management must support him/her. According to Boylston, “managing safety and health programs is one of management’s most important responsibilities” (Boylston). First the manager should meet with the collateral-duty safety representative and his/her supervisor. The manager tells them where management thinks the safety program should go, how much time should be spent on safety duties, reporting chain for safety issues, duties of the position and how those duties will be measured for performance evaluations. Management should also amend the individual’s job description.

Management must give the collateral duty safety representative access to senior managers. The senior manager must sign a policy memorandum and make sure that other managers and supervisors buy in to the program. Boylston also says that “the ranking manager must set the proper example by his or her actions and must demand a similar commitment form the entire line organization” (Boylston). If the program belongs to the collateral-duty safety representative, it is doomed to fail. S/he cannot do it alone—management must do its part.

Conclusion
Many public organizations use collateral-duty safety representatives. Because of today’s fiscal realities, many public organizations may need to cut full-time personnel and use collateral-duty representatives. After making this decision, management should implement a logical process to select, train and support the person appointed. If the areas outlined in this article are given proper attention, the safety program within a public organization can prevent needless accidents and the costs associated with them. If you use collateral duty safety representatives in your public organization, ask yourself whether you use a logical process to select, train and support them.

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Fred Fanning, CST, is a senior safety officer with the Dept. of the Army, Safety.
Fire & EMS Vehicle Accidents: Their Impact on Financial, Human & Service Delivery

By William F. Jenaway, Ph.D., CFOD, CFPS

The issue of financial, human and service delivery affects caused by accidents involving fire and emergency medical services (EMS) vehicles is not new. These accidents have been occurring for years. Unfortunately, until cost impacts and service delivery become negative impacts on organizations, municipal budgets or communities, the issue receives little attention. However, when you can’t respond because vehicles are out or service, staff are injured, and medical bills as well as vehicle replacement and repair costs are escalating, it is too late.

Year after year, approximately 25 percent of the firefighters killed in the line of duty are responding to or returning from incidents, with the majority of the fatalities caused by vehicle crashes. This represents the second-leading cause of firefighter fatalities—second only to heart attacks.

Additionally, many firefighters have died after being struck by vehicles while working at incident scenes. In 2003, five firefighters died from this cause; six were killed in 2002; and three in 2001.

Although the most devastating, death is only one area of concern. Collisions cause injuries, which can be more costly than death in terms of long-term pain, suffering and expense. These issues affect operations of an emergency service organization (ESO). In the case of volunteer operations, no one joins the ESO to have a collision that causes disability or death, or costs the community more money than it would to buy vehicles. Therefore, the volunteer has a personal responsibility in the safe operation of emergency vehicles.

The U.S. Fire Administration (USFA), the National Fallen Firefighters Foundation (NFFF) and the National Volunteer Fire Council (NVFC) are committed to mitigating the fatalities, injuries, costs and reduced efficiency associated with vehicle crashes. NFFF’s Life Safety Initiatives of 2004, titled “Everyone Goes Home,” focuses on the fact that each individual can make a difference by getting back to basics.

The premise is simple; it is the duty and responsibility to make every day a training day, so that everyone goes home safe and healthy. One specific initiative speaks to vehicle safety. It is captioned, “Drive with care—everyone wears a seatbelt, everyone.” It also highlights concerns related to speeding and stopping at red lights, as well as the need to protect the roadway/scene.

The other four initiatives are no less important to saving lives and reducing injuries and damage. However, these strike at the heart of the emergency-vehicle-related causes that claim more than 25% of the firefighter fatalities each year.

Municipal & Emergency Service Organization Joint Actions

Developing a working relationship between the public entity and emergency response teams is an important management function of local government. In many cases, emergency responders are not directly employed by or under the direction of local government. Since they are subcontractors, it is even more important to develop working relationships and an understanding of expectations of services to be provided, controls and establishment of performance activities, such as fleet safety management.

Development of this agreement or expectations forms the basis of developing a strategic approach to vehicle management and vehicle safety. Next cover the identification of the program, issues and related best practices to enhance performance and safety. In fact, while some operational differences may exist between emergency vehicles and other municipal equipment, many basic safe operational practices are the same.

Strategic Approach to Vehicle Safety

Reducing emergency vehicle near-hits, incidents, injuries, deaths, related property damage and operational impacts starts with the identification of a core set of best practices. These practices need to be implemented and evaluated locally to match the needs and culture of the local emergency service organization. To be effective in the change, the organization’s culture must be receptive to and accept the changes. The workplace does not have to like it, but must understand the necessity. If the organization is not ready for the change, it will not be successful.

The organization’s leaders must first work at changing the attitude of the members, then implement the changes.

These best practices were developed from a series of emergency-service-based issues and programs; however, they fit into a more global approach driven by safety engineering principles. These include a four-step safety engineering approach to limit incidents and losses.

They are listed in order of impact and magnitude of results:

1) Engineer out the problem.
2) Implement loss reduction techniques.
3) Implement administrative controls.
4) Train personnel on how to use the proper safety devices and to do the job correctly.

These are illustrated as follows:

1) Engineer out the problem: Rollover prevention built into fire apparatus.
2) Implement loss reduction techniques: Seatbelts installed and used.
3) Implement administrative controls: Standard operating procedures/standard operating guidelines implemented and enforced.
4) Train personnel to use the proper safety devices and to do the job correctly: Actually drive the vehicle over-the-road before responding to incidents.

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By now, it should be clear why it is necessary to discuss and act on this issue:

- The injuries, deaths, property damage and operational costs are staggering.
- It is estimated that 93% of the driving public exhibits poor driving habits.
- There is a lack of understanding of physical and dynamic forces affecting emergency service vehicles.
- There is a general lack of focus on personal safety in the emergency service community.

**Best Practices in Emergency Vehicle Safety Self Assessment**

The result of this work effort is a series of “Best Practices in Emergency Vehicle Safe Operation” that can be evaluated by ESOs and implemented as they deem necessary and appropriate. ESOs should not ignore the most obvious risk and must take the steps to prevent loss.

Best practices are defined as certain themes that have emerged in recent years which help characterize a situation. Generally these include acquiring knowledge obtained by experience; solving of a problem; being a meaningful initiative; an in-depth inquiry of a specific issue; and being related to independent learning.

This is further confirmed as being evidence-based (leave emotions at the door); connecting organizational decisions to improve overall organizational success; and very specific intervention and theories to provide a plan to solve a specific problem.

**Best Practices Are Quality Improvement Initiatives**

As we identify the best practices in emergency vehicle safety, we find 10 key practices. These practices couple known loss exposures, practical tools and techniques to manage risk and loss in an ESO. The 10-point program represents business and emergency service and management applications known to work to manage investments and loss dollars. They work together and require coordination, but more importantly demonstrate management commitment to the program.

**Best Practice #1: Responsible Person**

Any effective program starts with the commitment from management. A person must be assigned (or elected) to lead the program. This individual must have interest in seeing the program succeed. S/he then should advocate to the organization for the program, and have the necessary authority and responsibility for the program and must drive behaviors to ensure that losses are minimized.

In business, this responsible person often has the responsibility for losses that adversely affect the organization and affects its ultimate income. In the volunteer service, if funding has to be spent on vehicle issues instead of incentives, proactive equipment or other needs, the responsible person loses stature and value to the organization.

**Questions for Review**

1) Recognizing that a fleet management program for emergency vehicles is no different than one for other municipal vehicles, what can be done in your organization to enhance this concept of proactive involvement of financial, human and service delivery impacts of fire and EMS vehicle accidents in your community?

2) Ten best practices were identified. Which would be the highest priority in your organization and why?

3) What types of benchmarks could be set in your organization to embrace and quantify this issue of financial, human and service delivery affects of fire and EM?

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- There is a general lack of focus on personal safety in the emergency service community.

**Best Practice #2: Collision Investigation**

Investigating collisions and near-hit incidents provides a way to identify what caused a collision and what actions must be taken to prevent the collision from recurring. These investigations are not conducted to fix blame, but to identify direct and indirect causes to prevent the incident from recurring. Positive attitudes focused on this problem minimize emotional impact.

**Best Practice #3: Loss Analysis**

Periodically, but no less than annually, all losses, incidents and near-hits need to be analyzed to identify trends. The trend identification will help determine loss prevention needs, program type needs and appropriate action plans, which hopefully will prevent future incidents. In addition, this type of activity will enable you to develop benchmarks against which you can establish objectives and comparison of future progress. Recordkeeping is imperative to ensure quality loss analysis.

**Best Practice #5: Training**

Training is the important first step to understanding the requirements of any best practice. Over time, the members must be trained in various issues and at multiple levels, but it should all be motivated by the expectations set by the officers—the best practices standard operating procedures/guidelines. Training should be identified, developed and implemented to ensure that drivers know their duties and that they are expected to be as efficient and safe as possible when operating the ESO’s equipment.

This includes basic and periodic refresher training, including a specific emergency vehicle operations course, a review of standard operating procedures/guidelines affecting vehicle operation and personal accountability. As the drivers/operators, they must understand each vehicle’s design, operation and limitations. A special course should be provided for each new vehicle placed into service by the ESO.

Over time, the instruction should integrate classroom, hands-on and simulation (if available), as well as an over-the-road test. These multiple training initiatives suggest the need for a comprehensive driver training program.

**Best Practice #6: Loss Prevention Practices**

To best manage the impact of loss, an organization must develop and implement...
Policy enforcement is imperative.ologi interlocked to ensure that the vehicle making sure seat belts are used and if possible, enforcement of rules positively changes driving practices. This monitoring and driver and identifying any unacceptable behavior. This can be accomplished in several ways:

- officer and peer monitoring/review;
- periodic checking of motor vehicle records;
- enforcement of SOP/SOGs;
- using award programs to recognize positive driving behaviors.

In every situation, if no action is taken when poor driving behaviors are observed, the driver/operator will continue those habits.

Best Practice #8: Hot Topics
“Hot topics” occur periodically, usually emanating from unique situations, losses, new regulations, deaths or serious injury, any of which requires a timely communication of specific information. Generally, these topics are communicated via e-mail, newsletters, faxes or training programs. Current initiatives in emergency services include personally owned vehicle safe operation, use of seatbelts, intersection safety, rollover safety, operating safely at incidents on highways and collisions of other ESOs. The concept of highway safety has achieved significant exposure resulting in NIOSH safety criteria, expanding advanced warning, ANSI protective equipment and fleet operation standards, and more to limit injuries and save lives.

Best Practice #9: Report Incidents
Timely reporting of incidents is a critical component of the loss management sequence to ensure that the injured are treated and that details are not forgotten. This includes both a process and employee training component to teach drivers what to do when an incident occurs. This ensures that the injured parties are treated promptly and properly, fairly and compassionately, and directed to a physician or facility with the same interest in ensuring quality care with the least amount of inconvenience and cost.

Best Practice #10: Apparatus/ Vehicle Design & Construction
ESOs are quick to try to design unique apparatus for their community. Unfortunately, few ESO personnel are design engineers who truly understand the impact of their requests for what a piece of apparatus can do or what it can hold. Once you have developed the tasks and performance demands the vehicle will have, inform the design engineers of your requirements and let them tell you what the vehicle will be like. Place the responsibility for the design and construction on the manufacturer—do not assume that responsibility yourself or for your organization. In recent years, vehicles have become bigger, faster, heavier and easier to maneuver. Without the proper understanding of the differences in stopping distance, center of gravity (and rollover potential) and safe maneuvering practices, an incident is highly probable.

Vehicle Safety Requires Proactive Involvement
Now that you understand the financial, human and service delivery affects of accidents involving fire and EMS vehicles, what can you do? You can evaluate the 10 best practices detailed and determine how they apply to your situation, how they can be used to enhance performance and safety, and reduce to the lowest-possible level, the financial, human and service delivery effects of fire and EMS vehicle accidents in your community.

William F. Jenaway, Ph.D., CFOD, CFPS, is executive vice president of VFIS, the largest insurer of emergency service organizations. He is chair of the Fire and Rescue Services Board for Upper Merion Township, PA. As chief of the King of Prussia Volunteer Fire Company, he was named “Volunteer Fire Chief of the Year” by Fire Chief magazine in 2001, and the King of Prussia Volunteer Fire Company became the first (and to this point only) volunteer fire and rescue services agency to become accredited by the Commission on Fire Accreditation International.

Jenaway has written seven textbooks and more than 200 articles, and has delivered more than 200 presentations in the fire and safety discipline. He is also president of the Congressional Fire Services Institute and chairs National Fire Protection Association’s Committee on Emergency Service Risk Management and its committee on Providing Emergency Services to the Public. As an adjunct faculty at St. Joseph’s University, he lectures on risk analysis, risk management and disaster planning. He also was a member of the Gilmore Commission, which was authorized by Presidents Clinton and Bush, to assess America’s readiness to deal with terrorist incidents involving weapons of mass destruction. In addition, Jenaway is chair of the Pennsylvania Senate Resolution 60 Commission that has been assessing the fire and EMS delivery system in the Commonwealth of Pennsylvania.
Pandemic Versus Preparedness

By Scott A. Mugno, J.D.

Editor's Note: As many of you have seen and read recently, the possibility of an avian flu outbreak in the U.S. is becoming more likely, at least to some extent. Although some readers may think this potential is an odd topic for TransActions, the author works for FedEx and there is concern within his company as there is within many businesses, especially those with a global presence. Rather than providing an in-depth analysis of avian flu, Mugno provides resources for businesses and SH&E professionals. As he notes, transportation is a fast-paced and ever-changing industry, and he reminds the reader of the SARS epidemic of just a few years ago.

We all have emergency, continuity or preparedness plans. They are required by regulation, law, industry best practices or just sound business practice. Over the last 5 years, many businesses have learned how effective those plans were—Sept. 11, 2001, anthrax, SARS and various natural disasters, including the catastrophic Hurricane Katrina.

Even if your plans, teams and operations fared well in these recent real-world situations, there is a yet another on the horizon. The magnitude of a worldwide influenza pandemic is a challenge not known to this generation or present-day economy. We may have had a preview with the 2003 SARS outbreak. But such an event’s full impact would be felt globally and could challenge the best prepared among us.

Is It Hype?

It is hard to miss the media coverage on avian influenza or “bird flu.” In the worst scenarios, accounts read more like a Hollywood movie script. Consider the following.

A novel animal virus mutates and begins to infect humans. The virus mutates again and human-to-human transmission occurs by coughing and sneezing. People are contagious before the onset of symptoms, which takes an average of two days. Lab tests and official notifications take time as people go about their normal daily lives. Specifically, global commerce and travel continue.

Then, the first case of efficient human-to-human transfer is confirmed in a country. The virus is like none seen before. There is no known vaccine and not likely to be one for months. Antivirals, where available, slow it but do not stop it.

Then more cases are reported, in more countries and at an alarming rate. Predicted infections are one-third to two-thirds of the world population. Predicted deaths are in the millions.

Fear is spreading faster than the virus. Healthcare systems are overwhelmed. Medical equipment and supplies are depleting quickly. All nonessential healthcare services stop. Death management is becoming an issue. There is a run on all daily essentials, shortages occur amazingly fast and prices rise. Businesses and entire industries begin to shut down, mandatory and voluntary social distancing (quarantine) starts occurring. In those businesses open or trying to stay open, absenteeism is 30 to 50%. With national economic boundaries blurred and supply chains dependent on just-in-time deliveries, national economies start to decline—and in some cases crash.

In fairness to any such scenario writer, there are many reasonable uncertainties concerning the current avian influenza, both it becoming a pandemic influenza, then resulting in a pandemic. As a result, many predictions and projections are coming from many notable reputable sources. So, if directed to be on your organization’s pandemic preparedness team, what do you rely on?

What You Need to Know

To begin, a pandemic occurs three to four times a century (World Health Organization—which is the source of most information in this section). The last was the “Hong Kong Flu” in 1968. Pandemics occur when a new influenza virus emerges and starts spreading as easily as normal or seasonal influenza - by coughing and sneezing. Because the virus is new, the human immune system will have no pre-existing immunity. This makes it likely that people who contract pandemic influenza will experience more serious disease than that caused by normal or seasonal influenza.

A pandemic influenza is different from avian influenza. Avian influenza refers to a large group of different influenza viruses that primarily affect birds. On rare occasions, these bird viruses can infect other species, including pigs, cats and humans. Most avian influenza viruses do not infect humans.

However, avian H5N1 influenza has pandemic potential, since it might ultimately adapt into a strain that is contagious among humans. Should this occur, it will no longer be a bird virus—it will be a human influenza virus.

At the time this was written, 39 countries had confirmed cases of birds infected with the avian H5N1 influenza. Seven countries have confirmed cases of humans infected with the avian H5N1 influenza. The cumulative number of the World Health Organization’s (WHO) confirmed human cases of avian H5N1 influenza in 2006 is 31 cases, with 19 resulting in death. The total since 2003 is 175 cases, 95 resulting in death. The world is presently in Phase 3 of WHO’s six phases of pandemic alert, with six being a pandemic. Phase 3 is defined as a new influenza virus subtype causing disease in humans but not yet spreading efficiently and sustainably among humans.

Here are some other quick facts from the Trust for America’s Health. Unlike normal or seasonal influenza, pandemic influenza can occur in any season. All age groups, not just at-risk groups may be at risk for infection. Based on patterns of previous pandemics, otherwise-fit adults could be at relatively greater risk. While a vaccine is currently being developed based on an avian H5N1 influenza strain isolated last year, new strains of the virus must be accurately identified and an effective vaccine produced for it. So, a vaccine against pandemic influenza may not be available at the start of a pandemic and could take six or more months to be sup-
plied to medical facilities/personnel. Antiviral drugs may be in limited supply and their effectiveness will only be known definitively once a pandemic is underway.

According to Dr. Michael T. Osterholm, director of the Center for Infectious Disease Research and Policy, associate director of the Department of Homeland Security’s National Center for Food Protection and Defense, and professor in the School of Public Health, University of Minnesota, “pandemic influenza is not a matter of if, just when, where and how.”

No one can predict if, when or where avian H5N1 influenza will change, causing a pandemic influenza. Recent research has uncovered chilling similarities between the current avian H5N1 influenza and the 1918 “Spanish Flu” H1N1 influenza. Current human cases and case clusters are telling but not defining. If a pandemic occurs, 98 percent of people should survive their infection, but care for the infected will be a significant issue. Finally, given global flyways of migratory birds, expect more countries and continents to report infected birds.

**Preparedness Planning**

In November 2005, the U.S. Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) issued a 2-page “Business Pandemic Influenza Planning Checklist,” which is available at www.cdc.gov/flu/pandemic. It is divided into six sections:

- Plan for the impact of a pandemic on your business;
- Plan for the impact of a pandemic on your employees and customers;
- Establish policies to be implemented during a pandemic;
- Allocate resources to protect employees and customers during a pandemic;
- Communicate to and educate your employees;
- Coordinate with external organizations and help your community.

Each section lists three to nine important specific activities a business or organization can take now to prepare. If nothing else, they are an excellent collection of thought-provoking reminders, recommendations or suggestions to initiate your team’s planning effort.

While the CDC checklist is a good start, it is only that. To be effective, pandemic preparedness planning must include an honest assessment on specifically how a pandemic could impact or harm an operation. Fortunately, some focused or industry-specific reminders, recommendations or suggestions are beginning to be published. Of course, several reputable business continuity consultant services available as well.

A document worth reviewing is the Food Industry QRT Pandemic Analysis: An Analysis of the Potential Impact of the H5N1 Avian Flu Virus (August 2005). It is available free at www.cidrap.umn.edu/index.html. Although this 19-page white paper and template was prepared for the food industry, many parts are applicable to other industry sectors. Several of its key recommendations are covered in the HHS/CDC checklist, but the reader will find some additional useful comments and suggestions, including:

- Establish a set of trigger points that can be invoked as the pandemic takes hold and as it waves/phases pass; each trigger needs a set of well defined checklists with clear responsibilities.
- Encourage industry or trade groups to begin preparing for this potential crisis; in addition to helping the industry prepare, they should represent the industry before various government officials in implementing a number of actions needed to assist the industry during a pandemic.
- Analyze your service lists to determine likely demand shifts during a pandemic.
- Prepare a media point person for the H5N1 pandemic.
- Implement a companywide analysis of essential and nonessential functions during a pandemic.
- Develop an emergency corporate chain of command so that no matter which executive becomes ill, leadership is well understood.
- Develop essential contacts and relationships with governmental agencies (now); understand and document which agencies will be making which decisions.
- Consider increasing security for warehouses and vehicles.
- Develop procedures for all aspects of your operation to minimize human contact.

• Develop alternative routing that may reduce opportunities for human contact.
• Develop plans to minimize the high potential for a fuel shortage in a pandemic.
• Develop policies to address drivers/operators who refuse routes into certain areas.
• Investigate the potential to secure housing for critical employees who prefer to stay away from their family while working in a pandemic.
• Develop cooperative arrangements with suppliers of critical parts and supplies required to keep equipment running.

In February 2006, the University of Minnesota’s Center for Infectious Disease Research and Policy along with the U.S. Chamber of Commerce and Minnesota Chamber of Commerce held a 2-day “Business Planning for Pandemic Influenza: A National Summit” in Minneapolis. In addition to current appraisals from some top experts on the risks and potential impact of an avian H5N1 influenza outbreak, the summit addressed what measures businesses can pursue to protect their employees and to ensure the continuity of their operations in a pandemic. Articles from and about the summit can be found at www.cidrap.umn.edu/index.html.

Briefly, here are key messages or recommendations from the summit (based on the author’s notes as an attendee):

• Employees are the leading critical asset.
• Clear, accurate communication is essential now and throughout a pandemic.
• Leadership should be cross-cutting; involve government and business leaders.
• Regulatory relief will likely be needed; both business and government should use existing trade and professional associations in this regard.
• Reconsider the just-in-time model for obtaining materials; there will be neither time nor availability when the pandemic is already here.
• Build a value proposition for supporting employees’ ability to work from home; weigh the expense of doing this with that of not doing it.
• Develop systematic and proactive shut down and restart procedures, and how such procedures will work for multinational companies.

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• Develop worker training programs; cross training, replacement training, recall and train retirees, keep workforce running in light of 25 to 40% loss.

• Manage client expectations in advance.

• Who will be in charge? If the CEO is sick, who steps in? If first in line is out sick or doesn’t show up, who steps in then? Name specific individuals in each line of responsibility—no committees.

• Identify businesses on which you depend; ask what they are doing to prepare? You are only as strong as our weakest link.

• Plan that today’s just-in-time model will be disrupted.

• How will you care for employees and how will you maintain operations without them (due to death, illness or caring for sick family members)?

• Do not depend on the federal government as evidenced by Hurricane Katrina; contact groups such as trade organizations, National Guard and public health officials.

• Engage in any and all activities to convince the government that the issue of pandemic is very important.

• Start now.

Industry sector breakout sessions during the summit included the transportation and warehouse sector. The key strategies stressed were maintaining at least minimal workers to keep the operation running, maintaining or obtaining a fuel supply, and maximizing efficiency by relaxing existing work rules so services could continue with fewer workers.

Dr. Osterholm provided this piece of advice: Too often in disaster planning people try to take on the whole world. He encouraged summit participants to begin with small bites—one step at a time.

Another article worth reviewing is “Avian Flu: What to Expect and How Companies Can Prepare for It” from Knowledge@Wharton (www.wharton.upenn.edu). Some of the article’s key messages include:

• While important that organizations assess how a pandemic can harm their operations and to take preventive measures, experts say they should actually be planning for all sorts of risks and include efforts to prepare for a possible flu pandemic within that broader strategic plan.

• The concern is not simply with people getting sick and staying out of work; it has to do with a fairly substantial breakdown in infrastructure.

• The hardest-hit companies in any industry likely to be those with worldwide operations, global supply chains and/or international customers; these companies specifically are creating task forces combining their strategic planning, operations—continuity procedures, human resources and health services to adopt event-specific measures in anticipation of a pandemic.

• Some local, state and national government agencies are setting in place plans to curtail travel, close schools, quarantine individuals and communities, and ban public gatherings.

• Planning for a pandemic should be just one component of an organization’s overall approach to risk management; take steps that could have a lot of other planning benefits for any number of risks—terrorism or natural disasters, etc.

• Independent of the threat, the outcome is going to affect four areas—people, technology and processing, their physical environment, and their relationships.

Conclusion
Given our fast-paced, ever-changing transportation industry, following is the executive summary for all you need to know and do concerning the possibility of an influenza pandemic—prepare now.

Still need convincing? Consider Toronto’s experience with SARS in 2003. In Toronto, the virus infected only 252 people and resulted in 44 deaths. That was sufficient to trigger quarantine of 15,000 people. Toronto hospitals filled up and were forced to stop all non-essential health services. WHO advised against traveling to Toronto. The advisory was misunderstood and people didn’t travel to any location in Canada. Air Canada went bankrupt. According to Dr. Sherry Cooper, global economic strategist and executive vice president, Harris Bank and BMO Financial Group, Toronto, it took 2 years for that economy to recover.

Pandemics are a real threat with a historic track record. It is not another Y2K—a threat that turned out to be a nonevent. Pandemics do approach with many uncertainties or unknowns. However, waiting to prepare while waiting for facts will be too late. Once confirmed, an organization will be hard-pressed to catch up to the speed in which the risks and fear of a pandemic will start occurring. We have all received the equivalent of football’s 2-minute warning. The question is—what will you do with it?

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Scott A. Mugno, J.D., is the managing director of corporate safety, health and fire prevention at FedEx Express in Memphis, TN. He is a member of ASSE’s Transportation Specialty Practice.