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Inside

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Dress for Disasters

It has been unfortunate that several opportunities for conservators to test their talents under the stress and strain of emergency response situations have arisen in the past few years. Although well known emergencies like events related to September 11th and Hurricane Katrina dwarf others, there have been many other incidents in which collections were affected by fires, floods, tornadoes, and other incidents. At the AIC Annual meeting in 2006, the AIC Emergency Preparedness Response and Recovery Committee, with assistance from the AIC Health and Safety Committee, presented a "Disaster Assessment and Management Workshop." These two groups are also working on completing a guide to emergency response that will be published in the next *AIC News*.

This article outlines personal protective measures associated with emergency response. Although responding to an emergency may seem to waive many rules and regulations associated with the use of personal protective equipment (PPE), the reality is that ignoring these rules may actually create new hazards or reduce the effectiveness of the PPE. In truth, the same rules and regulations apply in an emergency response scenario, and the only real differences involve the timeframe for the work/tasks and the potential lack of infrastructure.

Ultimately, the conservation professional needs to ensure that the following steps are completed to make decisions about the proper use of PPE:

- Workplace Exposure/Job Hazard Assessment
- Identification of Hazards and Controls
- Implementation of Controls and Procedures

The last step, implementing controls to eliminate the hazard completely or at least mitigate the hazard to an acceptable level of risk, is specific to any given scenario, especially in an emergency situation. As with other situations, occupational safety and health controls can be described as engineering controls, administrative controls, and PPE, and should be considered and implemented in this order. Engineering controls include process changes as well as mechanical designs such as ventilation, physical isolation barriers for machine or personnel, and machine guarding. Administrative controls include actions that may not remove the hazard itself but minimize the impact on the worker, such as worker rotation, training, or policies—including measures to enhance behavior and awareness. While at first glance, engineering and administrative controls may seem difficult in an emergency response situation, they can be implemented with some careful planning and foresight. PPE should be selected when engineering and administrative controls are not feasible.

With the myriad of possible safety issues, it is impossible to predict exactly what personal protective equipment may be necessary for a given hazard, but it would benefit conservators with emergency response responsibilities to brainstorm some possible scenarios. Possible scenarios may require the use of some of the following types of PPE:

- Respiratory Protection
- Eye and Face Protection
- Head Protection
- Foot Protection
- Hearing Protection
- Skin Protection

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The following sections describe these types of PPE and highlight some considerations for emergency response.

Respiratory Protection

When engineering controls or work practices cannot reduce exposures to airborne contaminants sufficiently, the use of a respirator may further reduce exposure. If exposures are determined to be sufficiently high to require the use of a respirator, the use should be part of a complete respiratory protection program.

A respiratory protection program is a formal program that should be established and implemented for any work environment where it has been determined that respiratory protection is required. The program will be specific to the workplace and may need to be modified over time if the materials used and the types of applications change with time. The components of a respiratory protection program are:

- Respirator Selection
- Medical Evaluation
- Fit Testing
- Use
- Maintenance and Care
- Breathing Air Quality and Use
- Training
- Program Evaluation

When a respiratory protection program is required, the employer will also be required to provide respirators, training, and medical evaluations at no cost to the employee. The use of a filtering face piece, a negative pressure respirator that works by having the user draw air through a body of the mask, which is the filter (previously known as dust masks) requires all of the above program elements if the mask is required to establish a safe or acceptable work environment.

For emergency response, all elements of the respiratory protection program are still required. It is essential that staff be pre-selected for inclusion in a respiratory protection program because timing during a response period will probably not allow for completion of all the necessary steps, including training, medical clearance, and fit testing. After considering possible emergency response scenarios for a particular group of people, it will be possible to plan, order, and stock necessary filters and respirators. Different filters can be kept on-hand for various agents, such as particulates, organic vapors, mercury, or other chemicals of concern.

For more detailed information on respiratory protection, please refer to articles previously published in the *AIC News* September 2002, vol. 27 no. 5 by D. Ertel and C. Colton.

Eye and Face Protection

Eye and face protection is required when employees are exposed to flying objects, particles, or other impact hazards; burns from sparks or molten metal; splashes from hazardous liquid chemicals or irritation from gases and vapors; or hazardous light radiation. In emergency response situations, specific eye hazards may be hard to define, but could easily be more pronounced than under more normal circumstances.

Eye and face protectors should meet professional consensus standards (such as International Classification for Standards (ISO) or American National Standards Institute (ANSI)) incorporated through applicable regulations. These performance standards will typically test eye and face protectors for various levels of impact and penetration resistance (using different masses and varying velocities), thickness, degree of light transmittance, flammability, corrosion resistance, cleanability, and ventilation circulation requirements. Examples of face and eye protections include:

- *Safety glasses* typically offer frontal impact protection only, and will not protect the eyes from mists, dusts, gases, vapors, or liquid splashes. The addition of side shields offers limited eye protection from lateral hazards. These glasses are often vented to provide air circulation.
- *Safety goggles* typically the choice for protection against splash or irritation from liquid chemicals, gases, or fine particulates. These glasses are usually not vented to provide a complete physical shield.
- *Face shields*
- *Welding helmets and goggles for optical radiation hazards*
- *Full-face respirators* used in concert to provide respiratory protection and eye and face protection.

Wearing contact lenses in an eye hazard environment does not preclude appropriate eye protection. If contact lenses are worn in a hazardous environment, they must always be accompanied by the use of appropriate safety spectacles or goggles (unless the use of contact lenses in a work situation is prohibited by regulations or medical recommendations). Without such added eyewear protection, dust intrusion under the lens will cause corneal scratching, and soft contact lenses may absorb hazardous gases and vapors. Emergency response scenarios may also have reduced sanitation facilities available with respect to the general care of your eyes and contacts, so extra caution should be taken.

Head Protection

Protective helmets or hard-hats are required when working in areas where there is a potential for injury to the head from impact and/or falling objects. Helmets designed specifically to reduce electrical hazards are necessary where there is a potential to contact exposed electrical conductors or other components. Protective headwear should meet professional consensus standards (such as ISO and ANSI), and their markings will indicate appropriate compliance as such. Hard-hats will be more likely needed on sites associated with emergency responses, as there is a greater potential for objects or building materials within the site to be unstable.

Foot Protection

Protective footwear is required when working where there is a danger of foot injuries through impact, compression, puncture, or electrical hazards associated with unstable, falling or rolling heavy objects, objects piercing the sole or other hazards. Typical foot protection includes as a minimum, a protective toe-box fully integral to the construction of the shoe or boot (steel-toed boots or shoes). Most consensus standards (such as ANSI) do not approve of strap-on type toe or metatarsal guards, although some national regulations might allow for these if the manufacturer provides adequate data attesting to its effectiveness. Other options

Conservators who know that their job responsibilities include the possibility of emergency response should have kits ready with basic PPE, in addition to first aid kits and other tools that may be/are essential while conducting the emergency response.

Common respirators that may be used in emergency response include:

Respirators fitted with chemical cartridges. Air-purifying respirators use chemical cartridges to protect against many gases and vapors. These cartridges contain a porous and/or granular media material, such as activated charcoal for organic vapors. While museum specialists and conservators may most often use organic vapor cartridges, other types are available to protect against acid gases, the combination of organic vapors and acid gases, ammonia, formaldehyde, and mercury vapor.

Particulate respirators: filtering face piece respirators (FFPs). A specific type of particulate respirator that is commonly used is a FFP, which may have been previously referred to as a dust-mask. According to OSHA, a FFP is a "negative pressure particulate respirator with a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium." Or in simpler terms, the FFP, while similar to what used to be referred to as a "dust mask," is slightly more sophisticated. The main difference is that an FFP has been made in a way that the manufacturer can claim a certain level of efficiency and effectiveness of filtration for the FFPs. FFPs are respirators and need to be treated essentially like other negative-pressure, half-face respirators. The FFPs that are most commonly advertised and used are the N95 and P100 models. For each FFP there are a variety of features available on certain models, such as pleats, cushions, nose seals, and exhalation valves.

on safety shoes are steel shanks, steel midsoles and metatarsal protection. Foot protection may need to be incorporated into "rubber-boots" for very wet or slippery conditions, especially when working in areas with recent flooding.

Typically few emergency response operations will be well suited for the use of sandals or sneakers, or other footwear worn for normal daily activities.

Hearing Protection

Hearing protection devices may be required during noise producing tasks or while working in the immediate vicinity of noisy equipment such as generators. Noise levels that are generally and consistently in excess of 85 decibels have the potential to both hinder communication and have an impact on the human ear. While noise conditions can be modified through the use of engineering controls, such as barriers and working at greater distances from the noise source, some additional sound energy reduction may be required through the use of hearing protection. Hearing protectors basically act as barriers to reduce the amount of sound energy transmitted through the ear canal to receptors in the inner ear. Typical hearing protectors include earplugs (inserts) and ear muffs. Sometimes in extremely loud environments, these devices will be used simultaneously. Factors to consider for selection, which may vary between routine situations and emergency response scenarios, include: the convenience of muffs versus plugs in work situations requiring intermittent use and frequent removal, sanitation concerns, as well as comfort concerns related to temperature and humidity.

Skin Protection

Skin protection may be required to limit the potential for exposure to physical, chemical, and biological hazards at various worksites. Gloves, aprons, full-body clothing, and chemical protective clothing (CPC) are worn to protect the skin and prevent contamination of clothing, when exposed to hazards such as:

- Severe cuts, lacerations, abrasions, punctures,
- Harmful temperature extremes and thermal burns, vibration, or some forms of radiation,
- Absorption of harmful chemicals, or infection by biological agents, and
- Chemical irritation and burns.

When evaluating protective clothing with respect to physical hazards, abrasion resistance and puncture strength are very important factors. With respect to biological hazards or infectious agents (from human or animal transmission, waste water, etc.), liquid-resistant clothing and gloves, faceshields, and goggles may all be required. Chemicals in the environment or chemicals used in conservation may also create dermal hazards.

Most emergency response scenarios will require some level of skin protection beyond street clothes. The decision to use full-body suits (either fabric-like disposable protective clothing such as Tyvex (t) suits, coveralls, or full chemical protective suits), aprons, lab coats, or sleeve guards will be made based on the hazards present and the operations conservators will be performing. The tools and techniques of the operation as well as existing conditions will dictate how much consideration is required with respect to the possibility of puncture hazards, splash hazards, or permeation.

Similarly, understanding the potential for puncture hazards and the presence of various chemicals will help determine the appropriate glove selection. Both glove thickness and permeability to certain chemical may need to be considered. Generally, having a sense of the potential chemical hazards that may be faced in your emergency response operations, as well as a familiarity with glove guides and protective clothing guides will enhance your ability to protect yourself in emergency response scenarios.

Summary

The use of specific PPE will be determined by evaluating the potential hazards at any workplace, whether the operation is routine or performed as part of an emergency response. Although an emergency response may require quick assessments of hazards, or excellent planning, the process is essentially the same.

In the event of an emergency response, other professionals will need to address a myriad of concerns such as building stability, electrical hazards, excessive contamination, and other life-safety issues. Just like other professionals participating in an emergency response, a conservator must be aware of general site safety and be able to stop conservation work pending further evaluation or modification to the site environment.

Conservators are never truly first responders to emergencies, but should be competent and confident to utilize basic controls and PPE to protect themselves while participating in emergency response activities. Good luck.

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