Health and Safety

Getting Prepared

As I write this, Hurricane Katrina struck the Louisiana, Alabama, and Mississippi coast a week ago. One hopes, as you read this now, the news has improved. One also hopes, this fiasco will drive home the importance of preparation for disasters – Federal, State, local and individual.

For those who have volunteered to help with the cleanup

First, we need to remember that conservators are not first responders. We shouldn't have to take any major risks to do our jobs. Lives are not at stake. After art and historic artifacts have been sitting around for a month or more, a few days or even weeks to make sure that everything is safe for us won't make that much difference in the outcome of which works can be salvaged.

If you might be called upon to work in the area post disaster, you need to begin preparations immediately. As soon as possible, see your physician and get the first Hepatitis A vaccine, a Tetanus booster[1], and have yourself medically certified for wearing a respirator. Discuss other medical problems you have with your health care provider, as well. If you have a compromised immune system or chronic medical condition, like asthma, you should probably not participate in the initial phase of cleanup.

Shots

Because the water was commingled with sewage, you should get a Hepatitis A vaccination[2]. The immunization is a course of two injections. The first shot should be taken four weeks before potential exposure to the pathogen for maximum protection. The second is taken 6 to 12 months after the first. After both injections, immunization should last for at least 8 years, possibly 20 years and perhaps for the rest of your life.

If you haven't received a Tetanus[3] booster in the last 5 years (or 5-10 years, according to some), you should get that immunization bolstered before coming in contact with the mud and muck.

As events unfold and diseases break out, there may be some further prophylactic precautions to add to the list. But, by all means, get those first shots immediately.

Getting the Hepatitis A vaccine can be a little difficult. Most doctors' offices don't have it on hand. Try a public health department or get a referral to a hospital from your doctor. I got both shots (Hep A and Tetanus) for the cost of the shots ($109 after a 10% discount for disaster volunteers) from the hospital recommended by my doctor. I also checked at a closer hospital and they wanted $135 for a consult plus the cost of the shots. (None of this is covered by insurance.) Beverly Perkins (past WAAC President) got her shots at a county health clinic for $87.

Personal Protection

The minimal respiratory protection against mold and mold spores is HEPA filtration. In respirators, that corresponds to cartridges/masks designed to filter particulates with a 100-series designation, most commonly P100 or N100.

I would recommend, however, getting the new Multi-Contaminant cartridges (designed for first responders) that combine P100 filtration with filtration for organic vapors, sulfur dioxide, chlorine, hydrochloric acid, ammonia, formaldehyde, hydrogen fluoride, and hydrogen sulfide (for escape only) among others. I would think that these would remove any disturbing odors that would easily pass through the P100 HEPA filtration.

Often, when we wear respirators, it is to avoid nuisance exposure like a bit of stinky solvent. These may be situations where a respirator is not legally required. However, in the cleanup of the aftermath of Katrina, (and, as should have been the requirement after 9/11) solid respiratory protection is needed. This means that wearers must be trained in the use of the respirator and that respirators must be fit tested. Before getting a fit test, a conservator must receive medical clearance to wear a respirator from a medical professional.

If you are going to volunteer, it would be easiest to get your medical approval well in advance when you get your shots. Getting fit tested in advance would be good, too, but I would hope that that could be done on site.

The fit test[4] for a respirator includes these components: Medical certification to wear a respirator. Education on respirators: how they function, what protection they can and cannot provide, how to put them on and take them off, how to clean them, etc. And the, finally, the actual fit test, to make sure that the respirator you are wearing fits your face properly and can provide the protection it is designed to provide.

The Medical certification process is quite simple. There is a form for the respirator user to complete provided by OSHA (the US Occupational Safety and Health Admin istration), technically the "OSHA Respirator Medical Evaluation Questionnaire (Mandatory). - 1910.134 App C." (A pdf version of this form can be downloaded from the AIC website from http://aic.stanford.edu/health/guides/OSHA_Med.html.) The completed form is taken to your PLHCP (government-ese for "physician or other licensed health care provider") who reviews the information you have provided. The PLHCP may ask additional questions or recommend additional tests (such as spirometry) and either agrees that you are medically fit to wear a respirator or decide that the burden on your body would be too great for you to wear one safely.

The AIC Health and Safety committee has created a form for your PLHCP to fill out stating that you are medically fit to wear a respirator. That way you don't have to disclose your personal health information to anyone after your PLHCP has given the OK. This form is an additional form to the OSHA form, and effectively serves as a cover sheet or summary form, and is available on the AIC website at: http://aic.stanford.edu/health/guides/POLHCP.html.

What type of respirator should you use?
Conservators are most familiar with the half-mask respirator (which covers just the nose and mouth). If this is your choice, you must wear eye protection when working in the cleanup environment.

There is the famous tale of Kathryn Hepburn falling into a canal in Venice for a scene in the movie *Summertime* and spending the rest of her life with a recurring eye infection. (Thanks AIC H&S committee member Mary Ballard for this.)

So, it is critical that eye protection be used. The greatest risk is probably inadvertently rubbing your eyes with a contaminated (gloved) hand. I would recommend goggles that are indirectly vented and held on the head with a strap. These can be worn over glasses. The goggles also have to be designed to work with half-mask respirators.

Because we want eye protection, as well as respiratory protection, we might want to consider other options. Either a full-face respirator or powered air purifying respirators (PAPR) might be a better solution for decontamination. The full-face respirator is the less expensive option, but is only an option if you don't wear eye glasses.

Full-face respirators cover the entire face (duh!). They are configured such that air is drawn in through the appropriate cartridges, into the face plate (to help prevent fogging and make for a more comfortable experience) then into a nose/mouth cup and on into the lungs. On exhalation, the air is discharged through a valve on the nose/mouth cup (similarly to a half-mask respirator). Valves on the nose/mouth cup prevent the exhaled air from entering the face portion of the mask.

The full-face respirator is held securely on the head with five straps – two on each side and one on the top. It's not as uncomfortable as it looks and sounds, but it isn't like a day at the spa, either.

I've written about the 3M PAPR system in a previous column (*Newsletter* 26/1 (January 2004), p. 8). In short, this consists of a blower unit and battery that is worn on a belt. The blower pulls air through the appropriate cartridges and blows it through a tube running up your back to the head piece. I am most familiar with the helmeted head piece with face shield. (It looks something like an Imperial Storm Trooper from *Star Wars*.)

The filtered air is blown up over your head (offering a modicum of cooling comfort) down across you face and to you breathing zone. Enough air is supplied that even when inhaling, there is positive pressure behind the face shield. The face shield is fitted to the face with Tyvek and elastic gussets.

The PAPR and helmet offer a number of advantages and disadvantages. The major disadvantage is that they are expensive. Their advantages are: they can be used with beards or facial hair that would not otherwise allow a good fit with a half-mask or full-face respirator. They are the respirator of last resort for people that can't get a good fit with other types of respirator. They can also be used with glasses. The helmet offers the same protection as a hard hat. The face shield protects the face as well as eyes. However, the helmet and face plate impede close visual inspection and preclude the wearing of a magnifier (like an Opti-Visor).

Boots

All responders should bring appropriate foot wear to the task. Rubber boots are a must. You can use either rubber overboots over conventional work boots (with steel toes and shanks) or use over-the-sock rubber boots that have steel toes and shanks. This is the minimum for decontamination work.

Cathy Hawks, ex-officio AIC H&S committee, sent this bit of advice: "The rubber boots are not for wading in water, they are to protect your skin from parasites, etc. in mud and debris. If you wade in any standing water, it is prudent to carry a long, wooden stick. Prod before you step. It is also prudent to be wearing a life vest. Hopefully, no one will be wading anywhere, but wherever they go, no one doing salvage should assume that their tennies will protect their feet."

Depending on the depth, you might need hip waders. Some of these are designed with an extra features to prevent the mud from pulling the boots off of your feet as you walk.

Another thought: Since you are buying these special boots, you might want to pick-up a pair with the additional safety feature of being electrically insulating (the boots are yellow). A conservator should not be working in an area where there is a risk of electrocution, but it might be worth buying this type of boot anyway. (Thanks to Jane Hutchins, another former Board member, for this suggestion.)

Gloves

I would recommend having both a box or two of thin nitrile gloves and a pair or two of heavier gloves. I would avoid the use of latex gloves. There will be plenty of allergens taxing you system. Why add latex to the mix?

Wearing double (one pair on top of the other) thin nitrile gloves gives better protection than a single glove and is still not as bul ky as heavier gloves.

More things to bring with

Cathy Hawks sent out this list of items to bring to a disaster:

1. A copy of your immunization records.
2. A supply of all prescription medicines you take or might need.
3. A first aid kit. (Bring your own - don't be a burden!)
4. Gloves – see above.
5. Safety goggles – see above.
6. Rubber boots – see above.
7. A fit tested respirator and appropriate cartridges – see above.
8. A hard hat – unless using a PAPR with helmet.
9. Various means to purify water – see below.
10. Antibacterial wipes or hand-cleaning solutions and creams. (Those that pass as cosmetics will not raise questions during travel on planes.)
11. Antibacterial shampoo and soap.
12. DEET based insect repellant and sunscreen.
13. A list of suppliers of H&S equipment.

Drinking Water

For conservators to do their work, I would hope that there will be a good supply of water for cleaning. The water will have to be filtered at the very least, preferably, deionized.

However, this does not mean the water is potable. Unless told by public health officials that water is safe to drink, all water must be treated before consumption. Boiling water to sterilize it or treating it with bleach or iodine pills are the most common emergency treatments. There are also the newer personal filtration devises used by campers and world travelers.

Each has advantages and disadvantages. All must start with fresh water that is not contaminated with dissolved toxins. Nothing short of distillation (or reverse osmosis) can remove salt from sea water or dissolved toxins from tainted water.

Always start with clear water. If it is not clear, strain or decant the water before anything else.

Boiling water (rolling boi1, minute at sea level, 3 minutes at elevation) will kill bacteria, viruses, and parasites[5]. It will also remove volatile organic contaminants. (It also can concentrate non-volatile contaminants and salts.) Allow the water to cool completely before drinking. Pouring the water back and forth between two clean containers after it has cooled will re-oxygenate the water and make it taste better.

Iodine pills and chlorine disinfecting methods kill many, probably most, but not all water based pathogens. Cysts can survive either treatment, and there is a small chance that you could become seriously ill from a parasitic infection. Chemical disinfection of water is truly an emergency measure and should be available but not relied upon by the disaster responders. By all means bring a bottle of iodine pills, but one hopes you won't need to use them. Iodine generally works better than chlorine. However, people allergic to iodine or shellfish or who are pregnant or have thyroid problems should avoid this method[6]. (Adding a small amount of vitamin C to iodine treated water makes it taste much better. Only do this after the water has finished the purification cycle with the iodine.)

Filtration removes contaminants based on their particle size. There are a number of camping filter systems commercially available. These work best against cysts, and the better ones also eliminate bacteria. Something more is required to remove or kill viruses, however. This can be done by passing the filtered water though a bed of Iodized resin, or treating the filtered water with a chlorine based disinfectant to kill any viruses present. MSR, a mainstay in backpacking gear, makes the SweetWater Purifier System that includes a pump and filter system and the chlorine based purifier solution[7] (about $75).

I've used the First Need Deluxe Water Purifier (manufactured by General Ecology, Inc.) for hiking. This unit has a proprietary filter that has been shown to be effective against cysts, bacteria, and viruses[8]. It uses a non-chemical system and also incorporates a charcoal filter to remove "aesthetic" contaminants. The deluxe purifier system costs just under $90.00. A replacement filter costs about $40.00.

To summarize, if you wish to help in the salvage operations you should do the following. In the short term, volunteer by emailing info@aic-faic.org. Get your vaccines. Get medical approval to wear a respirator. Talk with your doctor. Make a monetary donation to help the victims and a donation to help with the preservation efforts. In the month that follows, prepare. Gather materials. Find what sort of respirator is recommended and think about your own personal preferences. Also entering into the equation is what type of work you would volunteer be doing. One presumes that there will be teams removing cultural materials and teams working at makeshift treatment and triage facilities. Assemble your supplies both for treatment and those listed above. Even if you are not called upon to help in person, it is a good idea to have all of these materials on hand.

Personally, I've already sent an email. I've had the shots. I've already got my medical ok for wearing a respirator and have been fit tested (at the AIC Meeting) for a half mask respirator as well as a full-face respirator (read on below). I also have access to the PAPR helmeted system I mentioned. I'm going to buy a new cartridge for my First Need Water Purifier and order some more gloves. If I'm asked to help, I'll order the boots.

Now For Something Almost Different – Full Containment

Conservators are not often required to work under full containment conditions. However, I think we may be called upon to work in these conditions more and more in the future. What follows are my experiences and observations following a recent full containment project.

Donna Williams (yet another former Board member) and I were asked to clean a mural and stained glass window in a contaminated space. The contaminant was a know human carcinogen so fairly stringent entry and exit requirements were established by the industrial hygienists (IHs) responsible for the project. The site management, work plans and IH management were developed by Mack Zardkoohi, and others, at Forensic Analytical (www.forensica.com).

The nature of the contamination was such that a team of IH professionals had to establish a fully isolated environment, and workers were required to use extensive personal protection and decontaminatio n procedures to ensure their safety. Because of a non-disclosure agreement, I can't discuss any specifics. However, I would like to share some of the oddities of working on this sort of project.

We were required to wear full-face respirators, full body Tyvek suits (with booties and hoods), and gloves. The gloves were to be taped to the Tyvek suit with duct tape. Entry to the space was through a polyethylene sheet airlock. The entire space was under negative pressure thanks to a battery of air scrubbers which filtered the interior air of both particulates and organic vapors and exhausted the clean air to the outside. Leaving the space required we follow a specific procedure for removing our personal protective equipment and a decontamination shower. We obtained our medical screening from our own doctors (and used the AIC form, mentioned above, to convey their approval) and were fit tested on site by an IH there.

Suiting up

Because anything worn into the contaminated space needed to be washed before exit, we were instructed to wear only Speedo type swimsuits and washable beach shoes on our person. (Me in a little blue Speedo is not a pretty picture.)

We then donned our Tyvek suits. Feet first, then arms, then zip up the front. We found that wearing a too large suit was good to allow greater freedom of movement. However, in a too large suit, the crotch tends to drop down too low, risking tears when climbing scaffolding. A bit of duct tape on the sides of the suit solved this problem – either by taping around a gathered handful of suit, fashioning a belt, or making mini- side-suspenders. If you use a duct tape belt, make sure that it is easy to open when un-suiting later.

We also found the zipper under the chin to be very uncomfortable. Again, duct tape to the rescue. First make a tab by folding the end of the tape onto itself then tear off a short piece of tape. Tape from the inside of the suit over the zipper with the tab outward. This was much more comfortable and also prevented the zipper from creeping down.

At this point, we tore some strips of duct tape, about a foot and a half long, folded one end over to make a tab, and put these somewhere for easy access later.

Next we fitted fresh respirator cartridges to our full-face respirators, donned the respirators and performed the two leak tests: Inhalation – block the filter inlets with your hands, inhale and make sure that air does not leak into the mask. Exhalation – block the exhalation port and gently exhale to make sure that the mask pushes away from your face without leaking. (This procedure is reviewed when the respirator is fit tested.)

We then pulled the Tyvek hood over the respirator.

Last, we put on the gloves. We eventually found that two pairs of thin nitrile gloves were the best protection and still offered the dexterity to do our work. The first pair of gloves are put on, and those strips of tape we prepared earlier are used to tape the glove to the sleeve of the Tyvek suit. This is tricky as the tape can stick to the glove. It was best if someone else does it. One also does not want to wrap the tape too tightly – fingers turning blue is to be avoided. Keep the tab on the end of the tape handy. This will really help when disrobing.

If you are in a wet area, you want the sleeve to cover the glove. If you are immersing your hands in liquid, you want the glove to cover the sleeve. In our situation, it didn't really matter but I think I preferred having the sleeve cover the glove.We then put on our second gloves. I also found it useful to have a few extra gloves in a zip-loc bag taped to the outside of the Tyvek suit.

All Dressed Up and Only One Place to Go

So, we entered the work area. Completely covered. No drinks of water. No potty breaks. No mopping the sweet from our brows (or rather getting it off my nose as it came dripping down my face – of course this all happen ed in the hottest week of the summer).

Once inside the contained area, most workers donned work boots over their Tyvek booties. We just padded around in our booties (with the water shoes underneath). A tip which I learned after the fact is to place a strip of duct tape over the soles of the Tyvek suit.

I couldn't wear my glasses under the full-face respirator. Fortunately, I'm near sighed so I could see what I was doing. I just couldn't tell what I had done when I stood back.

This is a very odd experience. Communication is difficult. It's somewhat difficult to climb scaffolding in this get up. It is easy to get over heated, disoriented, and to feel claustrophobic. You might even face a bit of a panic attack the first time you enter a site dressed like this. Take it easy while working.

Decontamination

After we had marinated for as long as we could take it, were thirsty, and had to go, we could finally leave the containment area.

After cleaning up our worksite (all tools stayed in the (contained area), we exited the contained area through polyethylene sheet air locks. For reasons of modesty, males and females went through decontamination separately.

In the first room, the contaminated side, one first removed the tape securing the gloves to the Tyvek suit followed by the tape at the top of the zipper. Pulling back the hood you make a point to turn the Tyvek suit inside out as you unzip and slip out of the sweet soaked rag that was your Tyvek suit. The suit is discarded. The cartridges are removed from the respirator while still wearing it and are discarded. Next the gloves come off, turning them inside out and disposing of them in the trash, too.

With the respirator still being worn, but without cartridges, one steps into the decontamination shower. The IHs had specified the soap and shower procedure. First you soap up your head and the exterior of the respirator. After rinsing, the respirator is removed and you wash your head again and the rest of your body, including the Speedo and water shoes and rinse.

You step out of the shower and into another portion of the airlock system to dry off. Disposable wipes are used to dry off oneself and the respirator. The used wipes are passed through the shower into the contaminated side of the air lock and gingerly discarded with the other contaminated waste.

Then you emerge, drink fluids, use the restroom, and thankfully contemplate the fact that you don't do this everyday.

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Footnotes

1. Document from Department of the Interior – source: email from AIC office 9/7/05.
2. The CDC is currently not recommending the Hepatitis A vaccine (see www.bt.cdc.gov/disasters/hurricanes/katrina/immunizationqa.asp). My opinion: CDC is not recommending the vaccine in part because it takes 2 weeks for the vaccination to have any effect and 1 month for it to have full protection. This is impractical for first responders. However, conservators will be coming later and will likely be handling materials that may be contaminated with untreated sewage. Consult with your doctor to see if they recommend this vaccination.
3. Tetanus and diphtheria toxoid (receipt of primary series, and Td booster within 10 yr.s) per CDC www.bt.cdc.gov/disasters/hurricanes/responderimmun.asp.
4. See US Department of Labor - Regulations (Standards - 29 CFR) Respiratory Protection. - 1910.134
5. CDC "Keep Food and Water Safe after a Natural Disaster or Power Outage" www.bt.cdc.gov/disasters/pdf/foodwater.pdf (accessed 9/14/05)
6. www.cdc.gov/travel/water_treatment.htm
7. Manufacturer's website: www.msrcorp.com/filters/sweet_system.asp
8. Gerba,C.P. and Naranjo, J.E.; Microbiolocical water purification without the use of chemical disinfection", Wilderness and Environmental Medicine, 11, 12-16 (2000). from website: www.generalecology.com/wemedmag.pdf (accessed 9/14/05)