

*Conscientious Conservation:
Sustainable Choices in Collection Care*
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Controlling Hazardous Collection Materials

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Questions or comments, please contact: HealthandSafety@conservation-us.org

Conservators should consider their own health and safety to be equally as important as the health and safety of the collections in their care.

This presentation focuses on creating a risk management plan for hazardous collection materials. While health and safety planning should be a part of the larger risk management program of your collection, we will be focusing on the human element and not the risk to the objects themselves.

WHAT ARE HAZARDOUS COLLECTION MATERIALS?



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- ✓ Any material that has the potential to cause injury, illness, or death; cause damage or loss; or inhibit operations
- ✓ Chemical, biological or physical hazards can be *inherent* and/or *acquired*

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What exactly are hazardous collection materials?

A material is considered hazardous if it has the potential to: cause injury, illness, or death; cause damage to or loss of equipment, property or collections; or inhibit operations.

Let's examine the range of hazards that may be found in collections and how they can be inherent and/or acquired.

INHERENTLY HAZARDOUS PROPERTIES

- Nature of the Object or Intrinsic to Design
 - Toxic Plants (Ethnobotany Objects)
 - Heavy Metal Minerals
 - Radioactive Minerals
 - Chemistry Sets or Pharmaceuticals



Rob Lavinsky, iRocks.com – CC-BY-SA-3.0, via Wikimedia Commons

Natural mineral cinnabar
composed of red
mercuric sulfide.

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Many objects are hazardous by nature or design. The hazard is often not apparent and may require specific knowledge, such as that of mineral or botanical collections.

These include: toxic plants specimens, heavy metal based mineral specimens, radioactive minerals and chemical or medicinal sets

INHERENTLY HAZARDOUS PROPERTIES

- Physical Nature

- Extremely Sharp Shells, Corals, Glass, Weapons
- Heavy Sculptures
- Flammable Preservative Fluids



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Objects can also cause *physical* harm by their nature. These include objects that are heavy, sharp or breakable, such as large stone or metal sculpture, spiny shells, and corals and flammable materials such as alcohol-based preservatives. This also includes installations with vision or hearing hazards.

These hazards are often very apparent, even to someone with limited collection experience. However, because the hazard is so often assumed, they may be overlooked. For example, heavy objects stored high on shelves may seem stable, but could become dislodged during an earthquake.

INHERENTLY HAZARDOUS PROPERTIES

- Nature of the Object
- Intentional Incorporation during Production
 - Firearms & Explosives
 - Curare-Tipped Spears
 - Radioluminous Dials
 - Arsenic or Lead Weighted Silk
 - Mercury-Treated Felt Hats
 - Liquid Mercury in Thermometers
 - Cadmium, Lead and Chrome-Based Pigments



Armag5 (Own work) [CC-BY-SA-3.0] (<http://creativecommons.org/licenses/by-sa/3.0>), via Wikimedia Commons

Some instruments have will “radium” written on the dial, indicating that the dials and numbers were painted with radioactive material

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Hazardous materials can be deliberately incorporated into an object during production—usually to capitalize on properties related to their hazardous nature. These hazards can be easily anticipated with some advanced knowledge of production techniques.

These include: weaponry such as rifles, hand grenades, or gun powder; radioluminous dials; arsenic weighted silks; mercury treated felt hats; liquid mercury in thermometers; and cadmium, lead and chrome-based pigments, which can be found in pigment collections as well as incorporated into textiles, paintings and ethnographic objects.

Pigments also belong to the next group since some were known to be toxic and others were not.

INHERENTLY HAZARDOUS PROPERTIES

- Nature of the Object
- Intentional Incorporation during Production
- **Unintentional Incorporation during Production**
 - Asbestos Art Plasters
 - Uranium/Vaseline Glass
 - Fiesta ware (Radioactive Uranium Ore)



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By the late 19th century, asbestos was commonly used in cements and decorative wall plasters, like those used in the construction of exhibition dioramas.

Sometimes, at the time of manufacture the hazardous nature of the material was not known and has only become apparent through recent study and health assessments.

These include: asbestos added to art plasters used for decorative works as well as in exhibit dioramas or taxidermy mounts; or uranium added to specialty glasses, cloisonné jewelry and certain glazes on Fiesta ware

These are often hidden hazards, for example, materials containing asbestos were widely used, rarely documented and difficult to identify by sight.

ACQUIRED HAZARDOUS PROPERTIES

- **Deterioration of Components**
 - Tin-mercury Amalgam Mirrors
 - Nitrocellulose Film
 - Asbestos Art Plaster
 - Medicinals, Chemicals
 - Powdering of Lead/Cadmium Paints
 - Ammunition



Looking Glass, 1997.150.25, Brooklyn Museum

Until the early 20th century, glass mirrors were produced using a tin-mercury amalgam, which releases mercury liquid and vapor as it deteriorates

Deterioration or damage can result in materials becoming more toxic or unstable. For example, the tin-mercury amalgam in historic mirrors is not hazardous until the deterioration process begins and nitrocellulose film becomes extremely flammable upon decay.

Other materials, which are hazardous by nature, can become more dangerous as they deteriorate. Any movement or dismantling of already crumbly and friable asbestos art plaster can release airborne fibers. Medicinal and chemical collections can change with age, altering their chemical and biological properties; creating highly reactive or explosive mixtures, or off-gassing toxic materials. Again, some pigmented paints can powder over time and pose inhalation and ingestion hazards. And ammunition can become unstable. For example, grenades *form* (highly explosive) peroxides as they degrade.

These processes are often unpredictable, can occur without any warning signs, and require more in-depth knowledge of collections and production techniques in order to identify.

ACQUIRED HAZARDOUS PROPERTIES

- Deterioration of Components
- Acquired through Treatments
 - Pesticides
(Arsenic, Naphthalene)
 - Preservatives
(Formaldehyde, Ethanol)



Gossipguy (Own work) [GFDL
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Objects can acquire toxicity through treatment. These kinds of hazards require specialized knowledge to identify, since even those well-versed in the collection may not be aware of historical and modern treatment techniques.

Some pesticides will leave residues or may have a characteristic odor; some organics like naphthalene will sublime and then recrystallize on surfaces of objects and cases. But many other organic pesticides are not obvious, yet pose serious inhalation risks. Sometimes you can be forewarned that an organic object has been treated when it is in pristine condition, especially if other objects in the collection suffer from pest damage.

Toxic chemicals are also used as preservatives.

ACQUIRED HAZARDOUS PROPERTIES

- Deterioration of Components
- Acquired through Treatments
- **Environmental contaminants**
 - Mold
 - Asbestos
 - Lead Paint
 - Insect Frass
 - Bird Droppings
 - Soot



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Sculpture stored under sprayed
asbestos insulation

Objects can also acquire toxicity through environmental contamination. These hazards can sometimes be predicted such as mold following a flood or leak or soot after a fire. This category also includes particulate contamination from storage or building materials like asbestos-containing insulation or plaster. Also, debris from pest infestation such as carcasses, casings, frass and bird droppings can cause severe allergic reactions as well as certain lung disorders.

AN IMPORTANT DISTINCTION! HAZARD vs. RISK

HAZARD

Inherent condition of a material to cause harm

RISK

Probability that the hazard will cause harm and the degree to which it affects your system

You may not be able to change the nature of the *hazard*,
but you can control *risks*

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Up to this point we have discussed that the identification of hazards requires various levels of knowledge of the collection, environmental conditions, and production techniques. However, determining the hazard is not the same as knowing the health or safety risk--this is an important distinction!

A **hazard** is a material's basic property. **Risk** is the degree to which that hazard affects your body's systems through illness or trauma. Understanding workplace risk involves understanding how the work will be performed with the hazardous condition. A highly hazardous material may not pose a high risk if proper safety controls are in place. Inherent hazards may be difficult to change, but the risk from working with that hazard may be controlled.

Staff working with these objects should be aware of the hazards and risks and be able to assist in providing a safe environment to anyone who may come in contact with them.

AN IMPORTANT DISTINCTION! HAZARD vs. RISK

Handling: Formaldehyde

- High Hazard
- High Risk without proper safety protocols
- Low Risk with proper safety protocols



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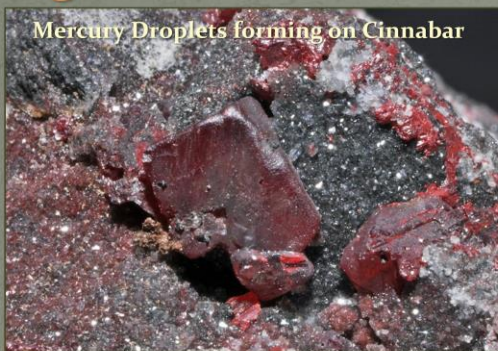
Let's take a look at some collections based examples of hazard vs. risk.

Materials that are inherently hazardous can have various levels of risk depending on how they are used and the kinds of safety protocols that are implemented.

Formaldehyde, used as a preservative, can be extremely hazardous; however, with proper health and safety protocols (such as Personal Protective Equipment and proper ventilation and storage), formaldehyde poses a low health risk. In the majority of cases, prudent health and safety measures can significantly reduce, if not eliminate risk.

AN IMPORTANT DISTINCTION! HAZARD vs. RISK

Usage: Vermilion/Cinnabar



Parent Géry (Own work) [CC-BY-SA-3.0
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- High Hazard
- High Risk as without proper safety protocols
- Lower Risk with binder as a paint or Asian lacquer
- Higher Risk as a pigment, under bound ethnographic paint, mineral specimen, or carved decorative arts

Carved Lacquer



Brooklyn Museum [CC-BY-SA-2.5
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Carved Cinnabar



By Peach State Button Club
(<http://www.buttoncountry.com/index.htm>) [CC-BY-3.0
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In the case of a pigment like vermilion or cinnabar, a sulfide of mercury, the material itself is high hazard. How it is used in the art object or artifact, however, can alter the associated risk.

In most paintings or as a colorant in Asian lacquers, it will be mixed with a proper binder significantly reducing the risk. Unless the surface is severely degraded or damaged, the likelihood of it affecting anyone's health and safety is very low even if no safety precautions are taken. However, there is higher risk when it is found under-bound or deteriorated or as a carved or raw mineral specimen. Proper safety controls become more critical to controlling risk. Even then, loose pigment or mercury droplets can easily be transferred to gloves or storage areas.

AN IMPORTANT DISTINCTION! HAZARD vs. RISK

What about the Rosary Pea?

- High Hazard
- High Risk even with proper safety protocols



Steve Hurst @ USDA-NRCS PLANTS Database (USDA) [Public domain], via Wikimedia Commons

Then there is the rosary pea. Some items remain high risk no matter what precautions are taken when handling them. The rosary pea is often made into jewelry in a variety of cultures, but it is highly toxic if the outer coating is punctured. The toxin causes total bodily system shut down—and is therefore extremely high hazard. Even with proper warning labels and safety protocols, rosary peas remain high risk; even the smallest exposure can cause death. In some cases, limiting access is an appropriate step in risk management.

WHY DO WE NEED SAFE COLLECTIONS?

✓ Safe Collections = Safe Staff

A moral and legal argument to be made to management

✓ Accessibility

Collections are available for research or display

✓ Commitment

Evidence that collections matter to management

✓ RESULTS!

- Collections that will attract top notch researchers and the best employees (who will go elsewhere if the collections are known to be compromised)
- Collections that will attract donors and tour groups that will not be made ill when opening treated and uncared for cases

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The rosary pea is an extreme example of why collections should be safe, but often the question is raised “Why is it important?” or “Is it really worth the expense or time or resources?”

Managers are responsible to both their staff and the visiting public for providing a safe, healthy, and enjoyable work and educational experience. Management that provides a pro-active safety culture realizes that safe collections equal safe staff. Collections with uncontrolled safety risks are inaccessible for research or display. Once the commitment is made to create a safety program, the technologies of hazard control are well-developed, often inexpensive, and easily accessible.

How then can we reduce the health and safety risks associated with these materials? Just like creating a comprehensive disaster plan for your lab or institution, by defining policies and procedures one can create an easily accessible reference for addressing hazardous collection materials.

REDUCING RISK THROUGH SAFETY POLICY & PROTOCOLS

Facility Overall Occupational Health and Safety Plan

Management endorsed action plan designed to prevent accidents and occupational diseases for a lab or organization. Typically based on OSHA regulations.

Specific (Collection) Risk Management Plan

Foresees risks, establishes procedures to control adverse impacts, audits effectiveness.

Includes: Job Hazard Analysis

A technique to identify the dangers of *specific tasks* in order to reduce the risk of injury to workers.

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A safe work environment should have a number of safety programs, not only to ensure the health and safety of workers but also to be in compliance with OSHA standards.

Every workplace should have an Occupational Health and Safety Plan, which outlines general safety policies. Under the umbrella of the Occupational Health and Safety Plan, there are numerous programs for dealing with specific hazards and tasks such as chemicals, machinery, or hazardous materials. A Collections-Based Risk Management Plan will identify specific hazards in your collection. It will quantify the health and safety risks of how staff works with these hazards and then establish accepted procedures for controlling the risk.

Development of the risk management plan can also rely on other safety procedures. A Job Hazard Analysis, for example, is a technique that uses a step-by-step, work, task chart to list the elements of a hazardous task. The Health and Safety Committee provides examples of JHAs on our website and wiki.

While all of these programs are important, during this talk we're going to focus on Risk Management Plans.

BENEFITS FOR CREATING A RISK MANAGEMENT PLAN

A clearly communicated Health and Safety Plan:

- Defines the hazards and their associated risks
- Outlines safe work practices
- Creates uniform institutional policy that increases productivity
- Provides management with a prioritized list for budgeting resources
- Satisfies the legal requirements to provide a safe environment

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A written and clearly communicated Risk Management Plan will have elements that benefit the collections, workers and institution.

- Firstly, hazards can be systematically identified in order to lower the risk to staff and visitors.
- By formalizing safety practices that may already be in place, it ensures that *everyone* in the institution is following them.
- Worker efficiency is increased by not having to process the handling of a hazard every time that hazard arises or there is a change in staff.
- It allows for the systematic or planned budgeting of resources. A plan may not be implemented overnight, but a well-justified list of priorities can be presented during budget discussions.
- Injuries and illnesses are reduced, boosting productivity and saving the institution legal costs, worker compensation costs and fines.

These policies protect workers from occupational hazards, their assets from fire and life safety hazards, and the environment from pollution due to facility operation.

ELEMENTS OF A RISK MANAGEMENT PLAN

1. Assignment of Responsibilities
2. Hazard Identification
3. Exposure Assessment
4. Health & Safety Risk Controls
5. Hazard Communication & Training

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To assist you in creating a collections-based risk management plan, the Health & Safety Committee has outlined the following procedures.

A plan must include these five elements:

- 1) A clear definition of responsibilities for both supervisors and staff,
- 2) An outline of practices to identify hazards,
- 3) Protocols for how to determine risks, including how to consult with health and safety professionals,
- 4) Identification of ways to minimize risk and methods for how to implement and re-evaluate those techniques, and
- 5) A comprehensive system of training and hazard communication. Staff should be trained on how follow all the procedures outlined in the previous steps.

Keep in mind this plan does not have to be extensive or elaborate to meet these criteria. It simply needs to serve as a plan of action for the safe handling and care of both the objects and the individuals

RISK MANAGEMENT PLAN ASSIGNING RESPONSIBILITY

Senior Management and Supervisors

- Must lead by example: establish, enforce, evaluate & improve.
- Provide Hazard Communication to staff & users.
- Consult with local fire, safety, environmental professionals (or hire a safety manager).

Conservators, Interns, Volunteers and Consultants

- Be proactive in their own safety and that of their co-workers.
- Always ask about whether work materials can be harmful and about the controls available to protect themselves from harm.
- Follow safe work practices as trained.
- Alert others to dangerous situations, or any illness or injury possibly associated with their work.

Registrars & Shipping Offices

- Ensure collections received or shipped are accompanied by appropriate hazard warnings.

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Let's look at these elements in more detail. A good plan starts with outlining roles and responsibilities. Managers and supervisors lead by example, and should demonstrate commitment to safety and health in their operations. Smart supervisors make sure that safety precautions are factored into their budgets and project deadlines. Safety is another cost of doing business--not something burdensome that can be overlooked due to pressure of an exhibit opening.

Anyone who may come in contact with hazardous materials needs to feel comfortable reporting and discussing their concerns as well as their suggestions on how to do a task more safely. If the facility does not have a professional safety consultant on staff or contract, then someone on staff should be assigned as safety officer.

Don't forget that a contractor or temporary worker in your workplace needs to be included in all safety related training and discussions, and must alert others to any risks their own work brings to the studio.

RISK MANAGEMENT PLAN HAZARD IDENTIFICATION

- Knowledge of Materials
- Historical Record Keeping
- Understand the Environment
- Scientific Testing

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The presence of hazardous conditions can be identified through a variety of ways. Begin by knowing your materials and when to expect hazards. Research the materials before beginning treatments. Safety Data Sheets and container labels are manufacturer-specific for each product and are an obvious source of OSHA required hazard communication. Understand how the information is being presented from these sources as well as the limitations.

Second, review archival records and original collector's notes. Knowledge of past and current preservation methods within the institution can reveal hazards that might otherwise be unknown.

Also, understand your building's construction, how your collections are housed and handled, and your environmental conditions. Hazards on or within collections can easily cross-contaminate untreated objects or leave residues in surrounding areas. Look into the construction of cases to determine if asbestos materials or lead-based paint was involved. Be aware of the areas that are likely to leak, flood or attract pests.

And, then, confirm your suspicions with analytical testing, such as x-ray fluorescence, radiation surveys, and environmental analyses.

RISK MANAGEMENT PLAN HAZARD IDENTIFICATION

Sample for Identification NOT Exposure Risk

Testing methods should be:

- Applicable to objects
- Common to conservation science
- Non-destructive sampling

Surface concentrations do not estimate risk. Why?

- Unknown transfer rate to humans
- Unknown uniformity of contamination
- Random sampling may miss or get worst-case

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There are various testing methods that can be applied to objects to identify hazards--all are available to both the environmental and conservation scientist, and none involves destructive sampling. While some of these can be used by conservators and collections staff, we recommend that you also consult safety professionals or a laboratory certified to perform these analyses.

These methods test for the presence of a substance and **not** for risk. Without knowing the transfer rate of a substance (which in a museum environment can be quite variable), the surface concentration of a hazardous substance does not translate to a quantifiable health hazard.

Furthermore, surface readings may not reflect the actual hazard. For example you may be sampling pesticides that have been unevenly applied, that have migrated unevenly to the surface, or that were selectively applied in the first place.

RISK MANAGEMENT PLAN HAZARD IDENTIFICATION

Particulate and Organic Residues:

- Filter Wipes
- Micro-Vacuuming onto Filter Cassette
- Spot Tests/Indicator Papers
- Gas Chromatography-Mass Spectrometry (GC-MS)
- Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)
- Portable X-Ray Fluorescence (XRF)



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A surface wipe is the most common method for sampling particulate residues such as heavy metal or organic pesticides. Sampling should be conducted in a consistent pattern, and using media selected for the type of particulate being collected and the object surface. Media includes filter paper, gauze or cotton swabs, typically moistened with water, alcohol or other solvent selected for the task.

If you cannot physically sample an object, a standard sampling pump can be used to vacuum across the surface of an object. This method creates less damage from pressure, although the airflow may pick up other surface features just like a wipe sample will. These samples can then be analyzed depending on the suspected contaminant.

Spot tests and indicator papers can be purchased commercially, or simple chemical reactions can be conducted on-site. GC/MS can be used for complex organics and ICP-MS for metals. Samples can also be analyzed using Portable X-ray Fluorescence or XRF can be used directly on the object to identify elements.

RISK MANAGEMENT PLAN HAZARD IDENTIFICATION

Vapor:

- Direct-Reading Instrumentation
- Evacuated Canister/Bag Samples, Ambient Air
- Indicator Papers/Powders

Radiation:

- Geiger Counter
- Indicator Papers/Film
- Ultraviolet Light



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Mercury Vapor Analyzer
(Jerome 431X)

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For vapor, the most practical portable instrument may be a mercury vapor analyzer, which has a wand attachment to easily measure vapor concentrations within cabinets or individually bagged objects.

Collection of permanent gases (such as oxygen, nitrogen, or methane), reduced sulfur compounds (such as hydrogen sulfide), and volatile organic compounds (such as naphthalene), can be accomplished through collecting a whole air sample in a sample bag or canister. These samples can be sent out to commercial labs. There are also indicator papers and powders that will detect certain vapors.

Radiation can be detected with Geiger Counters. If one is not available radioactive materials will expose indicator papers and film. Also, certain materials such as uranium glass with have a characteristic fluorescence under UV light.

RISK MANAGEMENT PLAN EXPOSURE ASSESSMENT

GET PROFESSIONAL HELP

- Safety Specialist or Industrial Hygienist
 - Exposure Surveys
- Healthcare Professional
 - Personal Health Assessment
 - Testing/Biological Monitoring for Exposure

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Moving on to exposure assessment. Since simply identifying the hazard cannot determine risk, occupational exposure surveys should be conducted. We are often tempted to skip over this step and go right to implementing controls. This can result in situations that are overly restrictive and cautious, or under controlled because of false assumptions of low risk. Investing time and money upfront on good exposure assessments may save you lots of money by putting the risk of your actual work methods into perspective.

The survey should be conducted by a qualified safety specialist or industrial hygienist. An industrial hygienist profiles exposure risks through personal monitoring while you are performing work tasks. This may include physical, chemical, radiological or biological evaluations and will focus on the potential for injury, trauma or illness.

Also, get to know your healthcare professional and tell them what you do and what kind of chemicals and materials you come in contact with. Understand the exposure parameters of the hazards you are encountering and how to contact your physician if you need to diagnose exposure—you may have a limited time frame to be tested for exposure. Health effects can be immediate or take months or years to develop. These professional can help you understand your actual risk or developing health effects from you actual exposure.

When discussing your situation with these professionals, it is important to recognize that your unique exposure scenarios are not familiar to most safety experts. Clear dialogue is necessary to best describe museum operations and conservation tasks and to discuss how specific test methods can be used without damaging collections.

RESOURCES FOR FINDING A SAFETY SPECIALIST

OSHA On-Site Consultation Program

<https://www.osha.gov/dcsp/smallbusiness/consult.html>

AIHA Industrial Hygienist Consultants Listing

<https://www.aiha.org/publications-and-resources/Pages/Consultants-Listing.aspxIHA>

Local University EHS Departments

Are you affiliated with a college for collection reasons already?

AIC Health & Safety Committee

www.conservation-us.org/healthandsafety

HealthandSafety@conservation-us.org

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Ideally, a safety specialist or industrial hygienist is available through your institution, but you can seek out professional help through numerous public health and safety resources.

OSHA's On-site Consultation Program offers free and confidential advice to small and medium-sized businesses in all states across the country. On-site Consultation services are separate from enforcement and do not result in penalties or citations. Industrial Hygiene, safety, and fire consultants from state agencies or universities work with employers to identify workplace hazards, conduct exposure sampling, provide advice on compliance with OSHA standards, and assist in establishing injury and illness prevention programs.

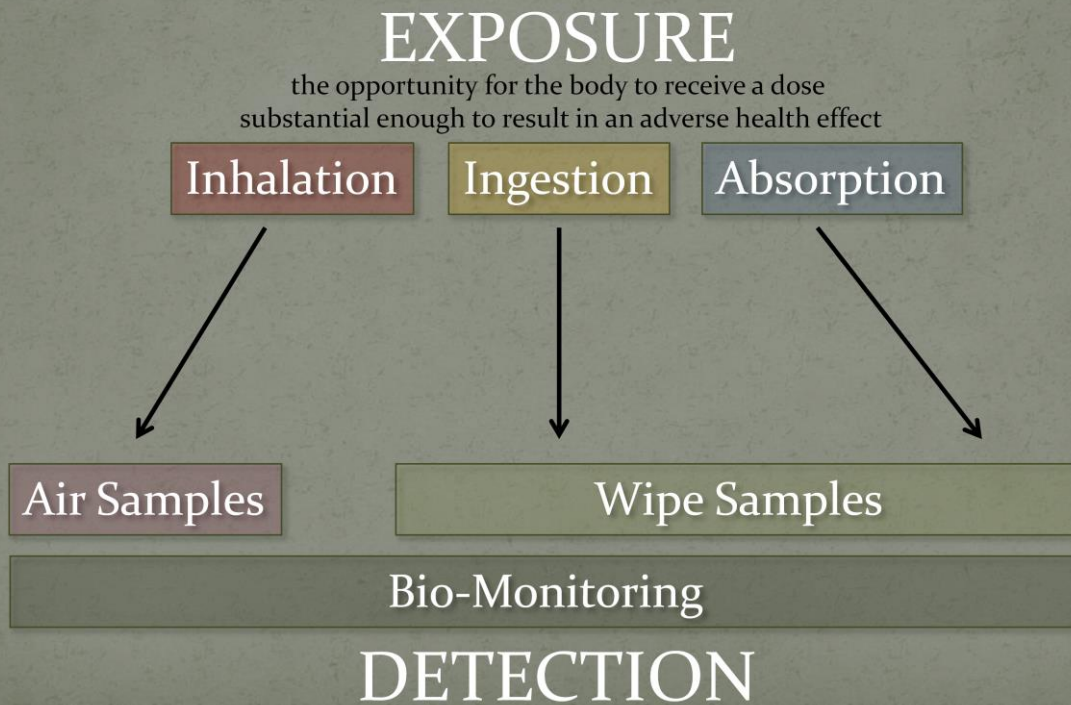
The American Industrial Hygiene Association maintains a list for industrial hygiene safety and environmental consultants in every state. Proposal visits should be at no charge and the bid may be less expensive and more helpful than you think.

If you are already allied with a local college or university, consider calling their environmental health and safety office for some pro-bono help. As busy as they are, the promise of the "behind-the-scenes" tour is very likely to do the trick!

And of course, please contact the Health and Safety Committee and we can assist you in finding the appropriate resources.

RISK MANAGEMENT PLAN EXPOSURE ASSESSMENT

SAMPLING FOR RISK



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What should you expect from your exposure assessment? Exposure is defined as the opportunity for the body to receive a dose substantial enough to result in an adverse health effect. The job of the industrial hygienist is to measure and control that exposure and reduce that dose.

Exposure can be measured in a variety of ways depending on the possible routes of entry into the body and an understanding of how a specific contaminant will be encountered. Possible routes of entry include inhalation, ingestion, or absorption through skin, eyes, or mucous membranes.

Inhalation dose can be measured via an air sample in the person's "breathing zone", which is considered a radius of 1-2 feet around the subject's head. Dermal wipes or patch tests can estimate exposure dose of absorption either through the skin or ingestion. An experienced industrial hygienist will then evaluate the results against regulatory standards,

Significant exposure through routes of entry other than inhalation may require biological monitoring (typically blood, urine, or exhaled breath). These are markers of exposure, not health effect. Biological monitoring, however, can help the physician assess total body burden from all three routes of entry.

The results of these surveys along with your Job Hazard Analyses will help you decide feasible ways to remediate or control your exposures. This is the most critical element of an effective risk management plan.

Once the hazard and its associated risks have been assessed, an appropriate plan of action for reducing risks must be developed.

RISK MANAGEMENT PLAN HEALTH & SAFETY RISK CONTROLS

Preferred hierarchy of controls:

1. Permanent Removal or Substitution
2. Isolating the Hazard
3. Reliance on Safe Work Practices

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This three step preferred hierarchy of controls is designed in order to minimize the possibility of exposure due to human error.

The first and best line of defense is removal. If the object or the hazardous components can be removed from the collections, there is no longer a risk of exposure. Next, isolate hazards using engineering controls or enclosures and then the final defense is the reliance on safe work habits and modifying behavior.

All of these measures must be planned with respect to preserving the integrity of the collection and following good collection care practices.

RISK MANAGEMENT PLAN HEALTH & SAFETY RISK CONTROLS

1. Permanent removal or substitution



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- Properly dispose of hazardous or violently reactive contents
- Rapidly process incoming collections/specimens
- Decontaminate objects
- Use scavenger products
- Replicate, digitize or replace

Determine if the collection can retain its historical significance if hazardous contents are properly removed. If not, rapid processing of incoming objects can remove contaminated shipping and packing materials and prevent cross-contamination of work areas or other objects.

Decontaminate objects using a HEPA-vacuum for dust suppression or wash to remove contaminants. Be aware that this can reduce the amount of hazardous material, but may not eliminate the risk and could create additional hazardous waste. Placing scavenger products within storage cabinets can remove vaporous contaminants.

Also, consider using replacements or replicas such as digital copies of photographs, paper and books or modern replica mirrors in place of mercury-containing glasses.

All hazardous or potentially contaminated materials may be considered Regulated Hazardous Waste.

- Collections, storage materials, any spill or leak or contaminated wash water
- Miscellaneous work materials (e.g., contaminated gloves, interleaving papers, swabs or other conservation materials)
- Consult your state Environmental Management Department for determination and licensed Disposal Contractors

www.epa.gov/epawaste/

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Be aware that objects and any materials used for storage, treatment or transport may require disposal as hazardous waste. Your local or state environmental regulation departments will know the specific tests and regulations for proper disposal, and any licensing your facility may require. More information on hazardous waste disposal is available on the EPA website.

RISK MANAGEMENT PLAN

HEALTH & SAFETY RISK CONTROLS

2. Isolating the Hazard

- Enclose in well-sealed containers or bags, under acrylic drawer tops, or in vitrines
- Ventilation engineering controls, such as fume hoods, down draft tables or snorkel trunk capture hoods

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In many cases, objects cannot be completely decontaminated and should be isolated to prevent contamination of surrounding areas and objects. Enclose hazardous materials in well-sealed containers or sheeting, under acrylic drawer tops, or in vitrines, or behind appropriate shielding for radioactive objects. Fume hoods, down draft tables, or snorkel trunk capture hoods, enclose the hazard source and exhaust the contaminant away from the person's breathing zone.

RISK MANAGEMENT PLAN HEALTH & SAFETY RISK CONTROLS

3. Reliance on Safe Work Practices

- Housekeeping & Handling
- Personal Protective Equipment
- Treatment & Collection Management Protocols



American Institute for Conservation (<http://www.conservation-us.org>)

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Safe work practices need to be developed that meet the needs of the collection or program as well as control the specific hazards and risks identified. Prevent contamination through diligent housekeeping and proper handling of materials, the use of personal protective equipment and thoughtful decisions regarding choosing and/or altering treatments and collection policies.

RISK MANAGEMENT PLAN HEALTH & SAFETY RISK CONTROLS

3. Reliance on Safe Work Practices

- Housekeeping & Handling
 - Minimize dust and hazardous particulates
 - Clean storage containers
 - Cover surfaces with removable and/or disposable materials
 - Segregate hazardous materials to prevent cross-contamination
 - Transport in closed containers
 - Minimize travel distances and agitation during handling



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Prudent housekeeping reduces pests, dust, debris and hazardous residues as well as the possibility of contaminating the storage bins, cases or flooring. Reduce dust by positioning collections under a laboratory fume hood, and vacuuming with HEPA-filtered vacuum cleaners. Storage containers and work surfaces should be cleaned before reuse or covered with removable or disposable materials. Try to segregate hazardous collections from non-hazardous, if possible, and use closed containers or coverings for short-distance transport of objects.

RISK MANAGEMENT PLAN

HEALTH & SAFETY RISK CONTROLS

3. Reliance on Safe Work Practices

- Housekeeping & Handling
- Personal Protective Equipment
 - Select to match the hazard
 - Respirators (Require Fit Testing)
 - Gloves
 - Goggles
 - Lab Coats/Tyvek Suits
 - PPE should be your last line of defense after all other safety precautions

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Personal Protective Equipment must be selected to match the work task hazards identified. Respirators should be fit tested annually and are specific to the hazard as are the materials for gloves and protective clothing such as lab coats or Tyvek clothing and eye protection.

Personal hygiene practices are habits with which we are all familiar. Things like taking off gloves inside out to prevent skin contamination and not reusing them; washing hands after completing tasks; not eating, drinking, smoking, applying cosmetics or storing food in contaminated areas; and avoiding touching your eyes, nose, or mouth.

Personal Protective Equipment is your last line of defense and, remember, your task may have more than one hazard that require different types of protective equipment.

RISK MANAGEMENT PLAN HEALTH & SAFETY RISK CONTROLS

3. Reliance on Safe Work Practices

- Housekeeping & Handling
- Personal Protective Equipment
- Treatment & Collection Management Protocols
 - Alter treatment proposals to reduce risk and contaminated waste
 - Determine how hazardous materials can be exhibited and shipped safely
 - Specialized storage facilities or techniques may be required



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Once hazards have been identified, it may affect how the objects can or should be treated or exhibited. A pesticide contaminated object requested for loan may have to be reconsidered if it cannot be treated, shipped or displayed safely or special shipping and exhibition mounts and protective wraps may have to be constructed.

Try to select treatments that reduce hazards and risks. For example, a robust Integrated Pest Management program with non-toxic pest treatment methods reduces or negates the need for chemical pest controls.

Protocols for exhibition, loan and storage should also be adapted to address risks. For exhibitions, consider health and safety issues related not only to the objects, but case and building construction. Test dioramas and old mounts for asbestos, lead paint, and other possible toxins prior to demolition. Clearly document any hazardous objects included in current exhibitions to protect workers during future de-installations. Hands-on displays with “hand-me-downs” can be a real danger; there should be clearly outlined policies for how these objects are handled by the public.

Storage protocols can range from simple to complex. Guns and explosives should never be assumed to be unloaded or inactivated. Facing guns toward an exterior wall of the storage area, so no one ever walks in front of them, is a simple and effective method of risk management. On the other hand, collections containing specimens preserved in flammable liquids require specially-designed storage areas with fire detection and prevention controls.

RISK MANAGEMENT PLAN HAZARD COMMUNICATION

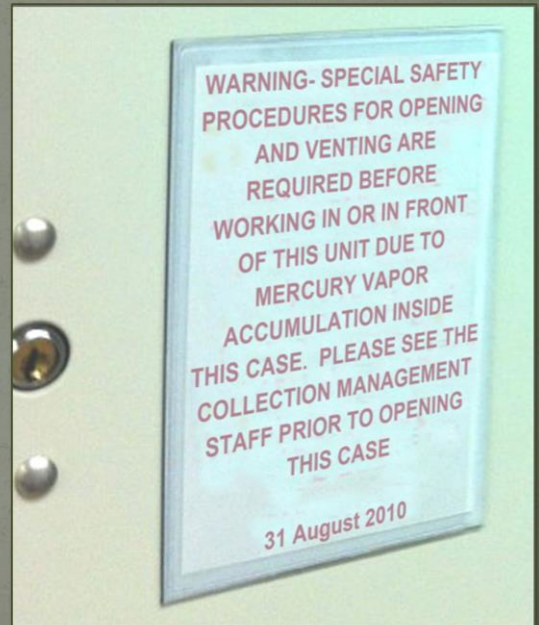
COLLECTIONS & STORAGE

Hazard & Safe Practice Alerts to all staff and visiting researchers

Warning signs and labels on objects, storage rooms doors and/or shelves

Update catalogue records for newly acquired objects and newly identified hazards on already accessioned materials

Access restrictions for cases or storage areas that may require special ventilation or other pre-retrieval measures



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Once all of the previous steps have been completed there should be a clear and concise protocol for communicating all of these conditions.

- All collection users should be provided written fact sheets about the known or suspected hazards.
- Warning signs and labels should be posted on storage room doors or shelves; Hazard disclosures should be entered into collections records for new acquisitions as well as newly identified or suspected hazards on already accessioned objects.
- Access restrictions should be posted on each case or storage area that requires special ventilation or other pre-retrieval measures.

RISK MANAGEMENT PLAN HAZARD COMMUNICATION SHIPMENTS

Loan and accession documentation *must* disclose known or suspected hazardous materials.

Hazard disclosure *from* lenders should be included in loan paperwork and arrangements from collectors

Special training for Registrars responsible for shipping

- Department of Transportation Hazardous Materials Transport
- International Air Transport Association Dangerous Goods Training

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Any collection items shipped, loaned, surplused or deaccessioned must be accompanied by documentation disclosing known or suspected hazardous materials; this is a requirement of the federal OSHA Hazard Communication Standard. Staff responsible for shipping and receiving are also required to take USDOT Hazardous Materials Transport courses and/or International Air Transport Association Dangerous Goods Training. These are provided through private training vendors.

Requesting hazard disclosure *from* lenders should be part of your standard loan paperwork. Do not assume because you don't see the disclosure that their collections are safe; ask them if they've tested their collections for pesticides.

RISK MANAGEMENT PLAN HAZARD COMMUNICATION

TRAINING

Occupational Health Plan

Everyone who enters the workspace

Risk Management Plan

Any one who comes in contact with hazardous materials should receive proper handling, disposal and treatment protocols

Keep your Health & Safety Protocols Up-to-Date!

Training should be repeated regularly to reflect changes in protocol and/or regulatory standards

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All collection users (from employees to visiting researchers to docents to interns to contractors), must be trained on your Occupational Health and Safety and Risk Management Plans. If you don't receive safety training at your new job, internship, or contract ask your supervisor about safety procedures. This includes periodic safety training updates--For example, everyone should have had OSHA-required training for the new Hazard Communication Standards that were implemented in 2013.

SAMPLE CHECKLIST FOR PESTICIDE RESIDUES RISK MANAGEMENT PLAN

ROLES & RESPONSIBILITIES

Name, contact information and responsibilities for:

- ✓ Individuals trained to identify hazards (i.e., registrar, curator, conservator, art handler)
- ✓ Person to notify when a hazard is identified
- ✓ Person in charge of safety protocols and training, including
 - Implementation
 - Enforcement
 - Review and Updating
- ✓ Safety specialist and/or Industrial Hygienist
- ✓ Individuals allowed to have contact with contaminated objects

EXPOSURE IDENTIFICATION

- ✓ Types of collections that may have been treated (ethnographic, botanic, taxidermied)
- ✓ Institutional history of using specific treatments
- ✓ Types of testing available for identification
- ✓ Testing protocols
 - When and how objects should be tested (before treatment, before loan, random survey)
- ✓ Identify individuals allowed to conduct testing
- ✓ Information on obtaining test materials and suppliers

EXPOSURE ASSESSMENT

- ✓ Types of risk associated with specific hazard (inhalation, absorption, ingestion)
- ✓ Results of surveys
- ✓ Survey protocols (who, what, where, when and why)

RISK CONTROLS

- ✓ Protocols for treatment
- ✓ Protocols for exhibition and loan
- ✓ Protocols for collection policy
- ✓ Types of materials to use for isolation (exhibition, storage, during treatment)
- ✓ Equipment and materials for decontamination/remediation
- ✓ How and where to dispose of waste
- ✓ Personal hygiene protocols and PPE types and sources

HAZARD COMMUNICATION

Outline procedures for:

- ✓ Labeling objects and storage areas
 - Types of labels
 - Label information (type of pesticide, date of test, person testing, date of treatment)
- ✓ Restricting access
- ✓ Repatriation
- ✓ Loans, shipping and receiving
- ✓ Accessions
- ✓ Who receives training and how often

Here is a sample checklist for a risk management plan for residual pesticides. While it is specific to pesticide contaminated objects, it can be used as a general outline for other hazardous collection materials. The checklist is available for download from the Health & Safety Committee website: www.conservation-us.org/healthandsafety

AIC HEALTH & SAFETY COMMITTEE

Website

www.conservation-us.org/healthandsafety

Wiki

[www.conservation-wiki.com/
wiki/Health&Safety](http://www.conservation-wiki.com/wiki/Health&Safety)

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*AIC Health and Safety Committee and Executive Staff
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Indigo Arts Alliance*

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The Health and Safety Committee is here to serve you. It is our mission to provide resources for the AIC membership on health and safety topics related to conservation. We have relationships with a network of health professionals that are familiar with dealing with our kind of occupational hazards.

So please contact us if you have any questions or concerns about your work or need help creating these kinds of safety documents. Lots of information can be found on our wiki and website and we also recommend this great text--Health and Safety for Museum Professionals.

Health & Safety for Museum Professionals. Catharine A Hawks; Susan H Butts; Society for the Preservation of Natural History Collections.; et al. New York: Society for the Preservation of Natural History Collections ; [S.l.] : Health & Safety Committee of the American Institute for Conservation of Historic & Artistic Works, 2011.