

*Connecting to Collections Care
Webinar Series
May 3, 2016 1:30pm-3:00pm EDT*

Arsenic and Old Lace: **Controlling Hazardous Collection Materials**

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Presentation Outline

- Identifying Hazardous Materials
- Developing a Hazardous Materials Management Plan
- Sample Case Studies
- Finding Health and Safety Specialists
- Resources

IDENTIFYING HAZARDS

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*

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.

INHERENTLY HAZARDOUS PROPERTIES

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



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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



Arma95 (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

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.

ACQUIRED HAZARDOUS PROPERTIES

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



American. Looking Glass, ca. 1710. Glass, walnut, 28 1/4 x 18 1/2 in. (71.8 x 47 cm). Brooklyn Museum, 23.260.
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Until the early 20th century, glass mirrors were produced using a tin-mercury amalgam, which releases mercury liquid and vapor as it deteriorates

ACQUIRED HAZARDOUS PROPERTIES

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



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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

AN IMPORTANT DISTINCTION! HAZARD vs. RISK

HAZARD

Basic property of a material.

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*

AN IMPORTANT DISTINCTION! HAZARD vs. RISK

Handling: Formaldehyde

- High Hazard
- High Risk without proper safety protocols
- Potentially Low Risk with safety protocols in place and used properly by trained staff.



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AN IMPORTANT DISTINCTION! HAZARD vs. RISK

Usage: Vermilion/Cinnabar

Mercury Droplets forming on Cinnabar



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

- High Hazard
- High Risk 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 (<http://creativecommons.org/licenses/by-sa/2.5>)], via Wikimedia Commons

Carved Cinnabar



By Peach State Button Club (<http://www.buttoncountry.com/index.htm>) [CC-BY-3.0 (<http://creativecommons.org/licenses/by/3.0>)], via Wikimedia Commons

AN IMPORTANT DISTINCTION! HAZARD vs. RISK

What about the Rosary Pea?

- High Hazard
- High Risk even with proper safety protocols



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AN IMPORTANT DISTINCTION! HAZARD vs. RISK

What about the Rosary Pea?

- High Hazard
- High Risk even with proper safety protocols

Understanding Routes of Exposure and Dose

- Ingestion
- Inhalation
- Dermal Contact



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QUESTIONS?

DEVELOPING A SAFETY PLAN

WHY DO WE NEED SAFE COLLECTIONS?

✓ Safe Collection = Safe Staff

A moral and legal argument to be made to management

✓ Accessibility

Collection is available for research or display

✓ Commitment

Evidence that the collection matters to management

✓ RESULTS!

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

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.

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

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

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.

RISK MANAGEMENT PLAN HAZARD IDENTIFICATION

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

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

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)



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)

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

RISK MANAGEMENT PLAN EXPOSURE ASSESSMENT

SAMPLING FOR RISK

EXPOSURE

the opportunity for the body to receive a dose
substantial enough to result in an adverse health effect

Inhalation

Ingestion

Absorption

Air Samples

Wipe Samples

Bio-Monitoring

DETECTION

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

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

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

- Collection items, 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/

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

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>)

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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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 may be needed in addition to other safety precautions but never as your first and only choice!

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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RISK MANAGEMENT PLAN HAZARD COMMUNICATION

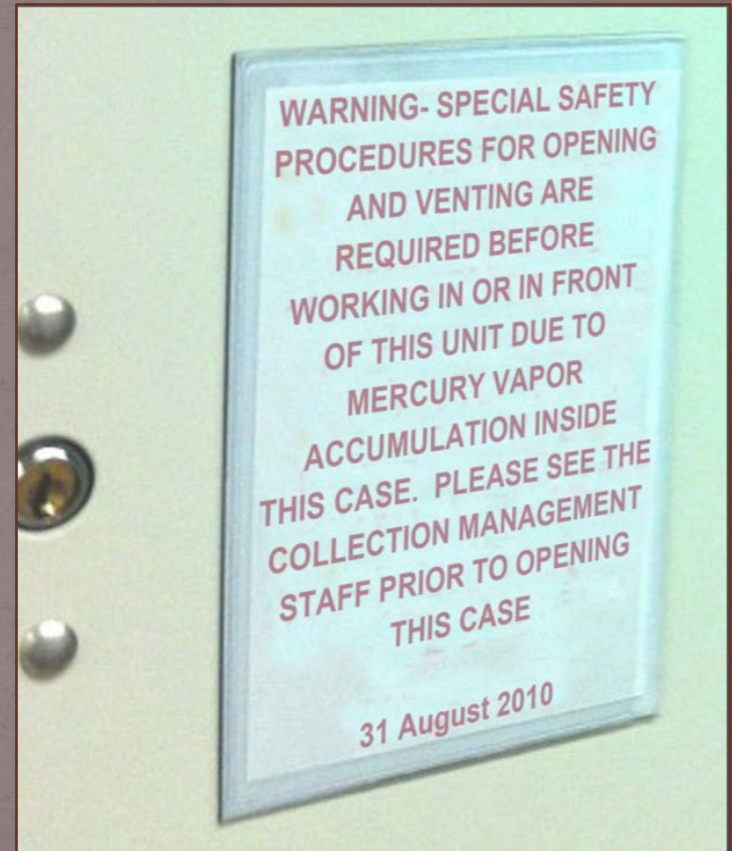
COLLECTION & STORAGE

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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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 paper work and arrangements from collectors

Special training for Registrars responsible for shipping

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

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

SAMPLE CHECKLIST FOR RESIDUAL PESTICIDES 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

QUESTIONS?

GOT HAZARDS... NOW WHAT?

ADMINISTRATOR REGISTRAR COLLECTION MANAGER

- Historical Research
- Personal Protective Equipment
- Isolation/Rehousing
- Hazard Communication
- Sampling
- Basic Housekeeping/Spills
- Basic Environmental Monitoring (Dosimetry Badges, Indicator Powders/Strips)
- Collection Policy

CONSERVATOR PRESERVATION SPECIALIST

- Object Treatment
- Sampling
- Testing
- Isolation/Rehousing
- Identification
- Object Surveys
- Replicas
- Removal of Hazardous Components

HEALTH & SAFETY PROFESSIONAL

- Lead, Asbestos, Radiation
- Ambient Environmental Monitoring
- Exposure Assessments, Training and Control Recommendations
- Hazardous Material Disposal
- Fit testing
- Building & Life Safety Codes
- Fire Protection/Prevention



The Society For The Preservation of Natural History Collections (<http://www.spnch.org>)

- Topographical Map
- Two OSHA Inspections in Museums
- Smoke Damage after Fire
- Exposure Assessment while Working with Contaminated Collections
- Air Monitoring of PDB and Naphthalene
- Removing Mercury from a Lighthouse Lens
- Cleaning Asbestos Contaminated Materials
- Chemicals in Collections
- Photographic Materials
- Ethnobotanical Objects
- Mold Abatement in a Mammal Collection
- Removal of Bird Droppings
- Cleaning Dinosaurs and Dioramas
- Uranium Glass, Glazes and Enamels
- Radioactive Fossils
- Recovery of Objects from 9-11-01
- Mercury Mirrors
- NAGRA Pesticide Testing
- Lead Abatement on a Calder
- Modern Art Installations (Damien Hirst)
- Exhibitions interfering with building facilities

SAMPLE CASE STUDY: URANIUM GLASS & RADIATION

“Uranium in Glass, Glazes, and Enamels”

Donna Strahan, *Health & Safety for Museum Professionals*, p. 456



- Uranium colorants in red/orange fiestaware, vaseline/uranium glass, dark green and black colors
- Amount of radiation varies
- Can be detected with Geiger counter, UV light or photographic film
- Dispersing radioactive materials throughout collection reduces “hot spots”
- Radiation can effect other objects
- Regulations regarding man-made vs. naturally occurring radioactive materials

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SAMPLE CASE STUDY: HAZARDOUS MATERIALS: LEAKS & SPILLS

“Modern Art Installation: Managing Hazards”

Pamela Hatchfield, *Health & Safety for Museum Professionals*, p. 613



- 2004 Damien Hirst Installation at Museum of Fine Arts Boston
- Preventative measures to prevent leaks and spills
- Local monitoring
- Evacuation and disaster plans
- Professional hazardous material handling

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SAMPLE CASE STUDY: EXHIBITIONS AND BUILDING FACILITIES

“Show the Dealer Your Cards”

Mike Frigon, *Health & Safety for Museum Professionals*, p. 631



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- Traveling exhibition of tents installed the Science Museum of Minnesota
- Tents obstructed fire suppression systems and disoriented visitors
- Unexpected and unintended hazardous materials
- Working with instead of around safety authorities

RESOURCES FOR FINDING A CONSERVATOR

Referrals

Individuals, Museums, Galleries, Local Conservation Guilds

American Institute for Conservation

Find a Conservator

www.conservation-us.org/membership/find-a-conservator

Other organizations

Art Care

www.art-care.com

CCAHA Consultant and Specialist Database

www.ccaha.org/publications/consultant-specialist-database

RESOURCES FOR FINDING A SAFETY SPECIALIST

- **Occupational safety** (CSP, Certified Safety Professional)
- **Fire protection** (PE, Professional Engineer)
- **Industrial hygiene** (CIH, Certified Industrial Hygienist)
- **Health physics** (CHP, Certified Health Physicist)
- **Occupational medicine** (Board Certified -Occupational Medicine)
- **Environmental science/health/protection** (minimum B.S. degree in environmental science, environmental or public health; States may require licensure for certain activities, such as radon monitoring).

RESOURCES FOR FINDING A SAFETY SPECIALIST

- **Some services may be of little or no cost:**
 - local fire departments,
 - county environmental protection agencies (e.g., for hazardous waste disposal questions),
 - your facility's insurance company.
- Free OSHA On-Site Consultation assistance for program development, exposure sampling, and training.

www.osha.gov/dcsp/smallbusiness/consult.html

RESOURCES FOR FINDING A SAFETY SPECIALIST

Facilities with Environmental, Health and Safety staff:

Governmental units (such as National Park Service, Dept. of Energy, Dept. of Defense or Smithsonian Institution) with historical parks and displays, galleries, and museums

Academic institutions (e.g., state universities) with archives, libraries, onsite museums and collecting units in their teaching departments

Are you affiliated with a college for collection reasons already?

RESOURCES FOR FINDING A SAFETY SPECIALIST

Public health and safety regulatory agencies in countries around the world also offer complete program development and worker training resources:

- U.S. Occupational Safety and Health Administration
- National Institute for Occupational Safety and Health
- Canadian Centre for Occupational Health and Safety
- UK Health and Safety Executive.

RESOURCES FOR FINDING A SAFETY SPECIALIST

Professional organizations world-wide with technical information and listings for consultants, experts and clinicians, include:

Industrial/Occupational Hygiene:

- American Industrial Hygiene Association
www.aiha.org/publications-and-resources/Pages/Consultants-Listing.aspx
- International Occupational Hygiene Association
- Canadian Registration Board of Occupational Hygienists

RESOURCES FOR FINDING A SAFETY SPECIALIST

Occupational Safety:

- American Society of Safety Engineers
www.assedirectory.org
- US National Safety Council
- UK Institution of Occupational Safety and Health
- Board of Canadian Registered Safety Professionals

RESOURCES FOR FINDING A SAFETY SPECIALIST

- International Network of Safety and Health Practitioner Organizations

Radiation Safety:

- Health Physics Society

Occupational Medicine Clinics and Practitioners:

- American College of Occupational and Environmental Medicine
- Association of Occupational and Environmental Clinics

Be Prepared to Explain:

- Your specific work activities, materials, tools and methods.
- Detailed description of task duration and frequency (i.e., how many hours per work day, how intermittent the work is during a day, and how often per week is the work performed).
- Safety Data Sheets (SDS) or records of past treatment chemicals or inherent hazards .

Be Prepared to Explain:

- Any suspected exposures, symptoms or findings of concerns you may have.
- Preventive measures in place, fume hoods, HEPA vacuums, PPE, work area & storage cleaning schedules.
- Previous work, home (hobbies) and environmental exposures (particularly important to physicians).
- Any available analytical data, such as x-ray fluorescence or radiation surveys.

Be Prepared to Dialogue:

- If testing of the object or specimen is necessary to identify the presence of chemical, radiological, or biological hazard in a collection, the IH must be asked to detail the methods and materials they plan to use so that any restrictions can be resolved.

RESOURCES

- OSHA Job Hazard Analysis Pamphlet
www.osha.gov/Publications/osh3071.pdf
- U.S. Department of the Interior (USDIO), National Park Service, Museum Management Program. 2015.
www.nps.gov/museum
- Smithsonian Institution (SI). 2012. Facility Design Standards, Contract Specifications, Fire Protection and Life Safety Design Manuals. Architect-Engineer Center, Office of Facilities Engineering and Operations.
www.ofeo.si.edu/ae_center/index.asp
- Smithsonian Institution (SI) Safety Manual. www.ofeo.si.edu/safety_health/Safety_manual/safety_manual_toc.asp

AIC HEALTH & SAFETY COMMITTEE

Website

www.conservation-us.org/healthandsafety

Wiki

www.conservation-wiki.com/wiki/Health&Safety

Email

HealthandSafety@www.conservation-us.org