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WHEN EVERYTHING IS PRESENT: RECOVERY OF OBJECTS FROM 9-11-01

Linda Edquist, Kathryn Makos and James Oakley

Abstract

The Smithsonian Institution's National Postal Museum and National Museum of American History were centrally involved with the recovery of objects of historic interest from the 2001 World Trade Center disaster site, Pentagon and Shanksville crash site. Environmental studies conducted on behalf of regulatory agencies identified numerous hazardous materials in the settled debris created from the collapse and subsequent fires of the WTC. Recovered objects slated for public display, loans or accession by the Smithsonian first underwent surface contamination identification, and decontamination by methods adapted from abatement industry standard practices. Evaluation of decontamination methods by statistical analysis of clearance samples proven to be effective in reducing available airborne concentrations of asbestos fibers (as the benchmark particulate contaminant) to below recognized clearance standards. Collections decontamination methods were developed by a team of experienced industrial hygienists, collections managers and conservators to satisfy the unique handling requirements of collections. Personal protective equipment and safe work practices were implemented in accordance with regulatory requirements and abatement industry best practices as well as measures necessitated by the unique nature of collecting for museums. The work completed on the objects collected and donated from the World Trade Center, Pentagon and Shanksville was a joint effort of museum curators, collection specialists, conservators and importantly an industrial hygienist at the Smithsonian to create a safe working environment for the staff handling these pieces now and in the future.

Introduction

Handling and processing collections have always been associated with certain health & safety risks, depending on whether hazardous materials were inherent to the object, or had been acquired during post-production treatment with pesticides or preservatives. In other instances, objects might have been contaminated as a result of building material deterioration, such as delaminating asbestos-containing sprayed-on ceiling insulation or lead-based paint, or contaminated in the aftermath of a natural or man-made disaster. Over the last several years, recovery of objects after such disasters has brought new challenges to the museum community.

In response to these challenges, the Smithsonian Institution (SI) has explored many related questions, such as: How do we document these historic events? What artifacts will best document the history to present and future generations? How can we define our role in the grieving and healing process? And just as importantly, what protocols can be developed to protect the collections and the staff handling them?

Background and initial on-site response

The Smithsonian Institution's National Museum of American History, Behring Center (NMAH) and National Postal Museum (NPM) were centrally involved with the recovery of objects of historic interest from the 2001 World Trade Center (WTC) and Pentagon disaster sites and Shanksville crash site. In the emotional aftermath of the Congressional mandate to use SI as the repository for artifacts from these sites, there was an initial lack of coordination among all parties involved. Some recovery occurred without the appropriate precautionary safeguards that were later instituted. The authors therefore would like to suggest considerations for other institutions and individuals who are now tasked, or may be confronted in the future, with the handing of objects from similar tragic events.

The focus of this article will be on those objects recovered from the WTC (Fig. 1), the Federal Building that housed the Church Street Post Office/mail sorting stations for the WTC buildings (Figs. 2, 3), and Pentagon.

Figure 1. Image of WTC, Ground Zero 11/19/01 from the roof of the Federal Building, Church Street Post Office building. Photo: L. Edquist.

In October of 2001, NPM was one of the first museums to be on site at the WTC. The NPM curator worked with the Postal Inspection Service to enter the Church Street Post Office and identify objects that were permitted to be collected. At this time, the work at Ground Zero was in the early stages of transition from rescue to recovery. The U.S. Occupational Safety and Health Administration (OSHA) had not yet secured the site for proper control of the potential hazards, the internal SI procedures for such a visit had not yet been established, and the Postal Inspection Service had not yet established requirements for cleaning and proper handling. Postal inspectors allowed selected objects to be removed by the curator and/or secured for later shipment.

When NPM collections management staff returned with the curator on November 19th, 2001, Ground Zero had been secured and material could not be removed from the site without the proper precautions required by OSHA By then, environmental studies conducted on behalf of regulatory agencies identified numerous hazardous materials in the settled debris created from the collapse and subsequent fires of the WTC. Materials with potential for significant adverse health risk included asbestos, fiberglass, cement and drywall dust, silica, heavy metals, dioxins and other organic particulate debris from burning plastic. This second visit with the Postal Service required that SI staff wear appropriate personal protective equipment (PPE) for a site

visit. At this time, the building was sealed and in the process of being decontaminated by a licensed company.

Figure 2. Curator Jeff Brodie inside of the sorting room in the Church Street Post Office. Photo: L. Edquist.

Figure 3. The interior of the sorting room in the Church Street Post Office. Photo: L. Edquist.

Between the October and November visits, several objects had been removed from Ground Zero to another Postal Service facility before decontamination was done. It was decided that the first step would be to conduct a preliminary cleaning of visible debris on-site in New York City prior to shipment to the SI, where the objects could be safely isolated and subjected to more thorough decontamination and testing. Wearing a half-mask, air-purifying respirator with P100 filters, full-body Tyvek coveralls, shoe covering, and nitrile gloves, Edquist used a HEPA-vacuum and wet-wipes to clean the interior and exterior of visible debris (Fig. 4).

After this preliminary cleaning, the objects were wrapped in multiple layers of 6-mil polyethylene for shipment. All PPE and wet-wipes (with the exception of the respirator), were bagged, labeled, and left at the site for disposal as hazardous waste by the Postal Service. (One cannot transport hazardous waste off the site of generation, and certainly not across state lines.)

Figure 4. Cleaning the Church Street mailbox before shipment to SI. Photo: SI, J. Brodie

Contaminant assessment

Upon return to SI facilities, the objects were carefully isolated, and the process of identifying the actual range of contaminants on these specific objects was begun, by the SI's Office of Safety, Health and Environmental Management, and HP Environmental, Inc, a consulting firm hired by the SI to assess the effectiveness of various cleaning protocols to be used (Fig. 5). Various techniques, including sample collection of bulk debris, wipe sampling and micro-vacuuming (collection of surface material onto a filter using a small battery-powered sampling pump) were used. Collections staff and conservators worked closely with the industrial hygienists involved with the project, as well as the curators, to determine if the sampling methods proposed might adversely impact the object or the exhibit intent for the object. For example, bulk debris might

Figure 5. Sample of the debris from the exterior of the Church Street mailbox. Photo: SI, NPM.

contain materials, shards, etc, that should remain as part of the object for historical reasons, or would be desirable for display to add to the impact of the story. Wipe samples typically require

a liquid solvent be added to the filter or cotton wipe. It is therefore necessary to specify whether water, alcohol or other solvents will be harmful to the object or its markings. Wipes and micro-vacuum samples also require surface contact and a bit of pressure. The preference may be to use bulk sampling if possible for an initial evaluation of what may be present. Without the data, it is necessary to make conservative assumptions about the degree and type of contamination, based on historical knowledge of the site identification.

Decisions on how these objects would be handled by staff or safely put on public display were based on an initial determination of contaminants present and the degree to which they could be released into the air or pose a skin hazard. For public display a test was made to stimulate air flow within a gallery, by creating an ambient air test chamber around the object. The test results would simulate if surface contaminants were present and could be made airborne. If so, then the object could not be installed in a public gallery in an open display, but would need to be safely enclosed.

Two object groups will be discussed to illustrate the processes and considerations involved in this type of recovery effort.

1. Objects which could be cleaned, based on health, conservation and curatorial concerns. Examples are the Postal Service outdoor receiving street mailbox from 90 Church Street, and a K-9 collar & harness (Fig. 6), which the conservators allowed to be altered and vigorously cleaned, and the industrial hygienists felt were capable of being thoroughly cleaned (i.e., objects of non-porous and robust material).

2. Objects which the curators did not want cleaned, e.g., a paper hole punch (Fig. 7), briefcase and doll (Fig. 9) from WTC; or could not be effectively cleaned.

Figure 6. K-9 dog collar from the Pentagon. Photo: SI, NMAH.

Figure 7. Paper hole punch from the WTC. Photo: SI, NMAH.

Bulk sample analysis from inside the Church Street receiving mailbox revealed the presence of chrysotile asbestos, crystalline silica, fibrous glass, cellulose, cadmium, lead, and zinc. Bulk sample analysis of the Rescue K-9 gear revealed a slightly different mix: asbestos, carbonates and soot, fibrous glass, plaster, glass shards, plant fragments, cotton fibers, insect parts, diatoms, fungus, pollen, and soil minerals. The only metals indicated on the bulk samples of the K-9 items were aluminum, iron and magnesium. Clearly most of these have potential for not only inhalation health risk, but object damage from a conservation point of view. The K-9 rescue items were also contaminated with a variety of semi-volatile organic phthalates, presumably as residual combustion products.

Treatment of objects that could withstand vigorous cleaning

Cleaning chambers were constructed according to standard abatement industry protocols, using multiple layers of 6-mil polyethylene, duct tape and spray adhesive (Fig. 8). Standard procedure for removing asbestos or lead-paint from a room interior would require room containment, with air exhausted through HEPA-filtered negative pressure air machines and an elaborate system of interlocked, multi-chambered entrances and exits. Smaller areas (such as steam pipes) might be enclosed in a polyethylene glove bag, exhausted through a HEPA-filtered vacuum cleaner. Objects to be cleaned, along with the required cleaning tools, were placed inside an oversized glove-box chamber. A HEPA-vacuum was inserted at the other end for filtered exhaust, with small make-up air intake slits made at the front to ensure that the containment would not collapse during use.

Figure 8. Cleaning chamber set up at SI. Photo: K. Makos

Once cleaning was completed, compressed air from a can (already inside the enclosure) was aggressively sprayed on the objects to loft any particles that remained (simulating any possible release during normal handling), and a sampling pump was activated to collect a specified amount of air from within the chamber (with the collecting filter media inside the chamber, connected by tubing to the pump outside the chamber)..

Results of asbestos clearance monitoring for the two Postal Service containment chambers indicated zero and 30 asbestiform structures (fibers or fiber bundles) respectively, per square millimeter of filter, identified by Transmission Electron Microscopy in accordance with

EPA/AHERA Method Appendix A to Subpart E, 40 CFR Part 763. According to 40 CFR Part 763 (primarily affecting abatement in schools), an asbestos abatement action is considered complete if air samples analyzed by the aforementioned method are less than 70 structures per square millimeter. Our samples met this criterion.

Cleaning and enclosure for objects that could not to be altered

For the objects that could not be altered, limited surface sampling was allowed, with results being similar to those described above for the other objects (asbestos and soot being of the greatest hazard concern). An uncleaned briefcase from the WTC was also covered with a variety of PCBs and polyaromatic hydrocarbon residues with dermal hazard potential, as well as a wide range of metal residues including aluminum, barium, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, and silver. It was therefore recommended that PPE, including respirator and chemical-protective gloves, be used at all times for future handling.

The briefcase was tested in the chamber, with low-velocity air passed over the surface to see if residual asbestos fibers could be lofted. Under conditions of gentle air flow, the resulting chamber air measurements did not detect any airborne asbestiform fibers. However, in the absence of more aggressive air testing (as specified in the standard AHERA method), it was still recommended that uncleaned objects (or objects that could not be aggressively cleaned and sampled), be displayed only in cases or enclosures. Other examples of objects which could not be cleaned are the paper punch in Fig. 7, and the doll in Fig. 9, both of which are displayed inside suitable enclosures.

Figure 9. Doll found at Fresh Kills site. Photo: SI, NMAH.

Maintaining the historical significance of an artifact has been an important ethical principle in conservation. The safety of those charged with object preservation must also be a part of the decision on the 'historic appearance' that may be desired. The decision was made that, if an object could not be vigorously and directly cleaned, and pass clearance testing with industry

referenced standards, then the object would have to be stored and displayed in an enclosure or some protected manner.

In addition to discrete protection, the object case itself needs to be appropriately labeled to alert future handlers of the potential for harm. This should include a notation in the accession records for the object.

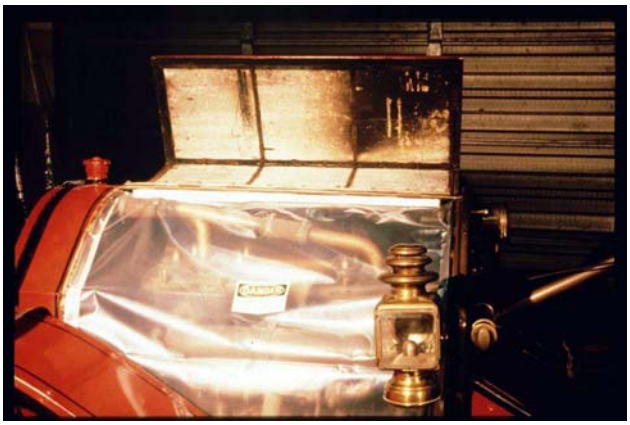

Figure 10. Truck engine covered and labeled as containing hazardous materials. SI, NMAH

Further discussion

What if you don't have access to environmental or regulatory resources and information? Much information will be available from the recovery site, through contractors, regulatory agencies such as the U.S. Environmental Protection Agency and OSHA, and local agencies with hazardous material regulatory responsibilities. The Project Manager should request all available information before any conservation recovery work is done.

In addition, before handling post-disaster objects purported to have been cleaned, the name of the company performing the decontamination should be obtained, as well as the clearance papers from the hazardous materials abatement contractor and their environmental monitoring consultants. Contracts with these companies normally specify that a report be provided.

Among the essential information would be the processes and regulatory (or state-of the-art) technical criteria used to clean and test the objects, whether further decontamination is needed, and whether special PPE precautions are still required for handling the material. All this information should then be included with the accession records.

A major lesson for cultural institutions in the wake of 9/11 and other disaster incidents is the absolute need for museums to expand emergency plans to include provisions for the safe recovery and decontamination of museum collections. Adequate response to such events requires two levels of training. The first level would be a limited number of staff possessing the training and equipment to safely enter contaminated emergency sites, not as first responders, but after the facility has been stabilized and the potential for chemical or biological exposures characterized.

This team would be responsible for planning and executing appropriate conservation actions, including oversight of contractors, cleaning of objects to be salvaged, and interaction with local authorities in the selection of effective decontamination methods posing the least hazard to the collections themselves.

There will then be a need for a team to continue with "post-emergency" response activities such as routine cleaning and restoration after the objects have been properly contained and removed from the emergency site to a controlled cleaning area. At this task level, staff would receive training in the handling of hazardous materials and the use of various types of personal protective equipment. This training is important for the safe handling of objects but it must be noted that the actual decontamination must be done by licensed and certified hazardous materials abatement workers with specialized training in hazardous materials removal and environmental surveillance.

The collection of artifacts that are to serve as the national remembrances of the tragic events of September 11, 2001, offered a challenge to the Smithsonian staff involved. The collecting was wrought with emotional and technical trials that had to be resolved to move forward as an institution. The authors hope that the lessons learned will benefit other institutions and individuals should they be unfortunate enough to have to document such a tragic event.

The most important lesson learned since 2001 was the necessity for all those involved in the recovery, care and display of these artifacts to work closely together for the protection of both the objects and the staff. Teams of curators, safety and industrial hygienists, conservators and collections managers must work cooperatively to develop procedures that will preserve the objects, protect the staff, and offer to the public a meaningful and lasting cultural heritage.

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