Building Renovation and Demolition: Identifying, Characterizing and Managing Hazardous Materials in Buildings

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Abstract

Many older buildings contain hazardous materials that require special handling when renovated or demolished. Inappropriate handling of these materials can result in injuries to employees and the public, adverse environmental impacts, regulatory fines, negative impacts on public opinion, and unanticipated costs which exceed the project budget. The FSU Department of Environmental Health and Safety (EHS) jointly participates with Facilities project managers prior to and during building renovation and demolition projects to identify, characterize, and manage hazardous materials in a safe and environmentally responsible manner. EHS has also established mechanisms for identifying projects not managed by its Facilities project managers. Through active participation with Facilities project managers and other departments, losses associated with mismanagement of hazardous materials are minimized or eliminated.

Introduction of the Organization

Florida State University (FSU) is a comprehensive, national graduate research university with over 40,000 students and 10,000 employees, and is the oldest site of continuing higher education in the State of Florida. There are 15 colleges offering over 300 undergraduate, graduate, doctoral, professional and specialist degree programs, including medicine and law. FSU has generated more than $190 million in external grant support in the fiscal year ending June 2006. Its library holdings rank among the top 30 public universities in the United States based on 2003-04 data.

Established in 1851, FSU actively maintains more than 300 buildings and structures. The age of many of these facilities is more than 30 years old. As buildings age they require repair or replacement of various system components such as mechanical and electrical systems, roofs, and interior finishes such as ceiling tiles, floor tiles etc. Modifications to building use and occupancy change over time requiring renovations to accommodate alternate uses.

Through active participation with Facilities project managers and other departments, losses associated with mismanagement of hazardous materials are minimized or eliminated.

Statement of Problem

Many older buildings contain hazardous materials that require special handling when renovated or demolished. Inappropriate handling of these materials can result in injuries to employees and the public, adverse environmental impacts, regulatory fines, negative impacts on public opinion, and unanticipated costs which exceed the project budget. The FSU Department of Environmental Health and Safety (EHS) jointly participates with Facilities project managers

prior to and during building renovation and demolition projects to identify, characterize, and manage hazardous materials in a safe and environmentally responsible manner. EHS has also established mechanisms for identifying projects not managed by its Facilities project managers.

Of the 300 buildings and structures FSU maintains, many are more than 30 years old and the vast majority contain hazardous materials. Renovation or demolition of these buildings results in the generation of hazardous waste that has been left behind after a building has been vacated or is created due to renovation or demolition activities. These hazardous materials have the potential to be harmful to human health and the environment. It is important that the composition of waste streams generated from renovation and demolition projects be identified so hazardous materials can be segregated and handled in a safe and environmentally responsible manner.

Typical renovation and demolition construction waste streams consist of debris and materials such as bulky, heavy items that include:

- Concrete
- Gypsum (the main component of drywall)
- Bricks
- Wood asphalt roofing shingles
- Metal
- Glass

The waste stream usually contains many hazardous materials such as:

- Asbestos-containing materials
- Lead-Based Paint
- EPA regulated metals
- Lead containing building material
- PCB containing equipment
- Mercury-containing devices
- Chemicals and solvents
- Flammable materials
- Underground storage tanks
- Aboveground storage tanks
- Freon or other ozone depleting refrigerants
- Radioactive materials
- Biological materials
- Pesticides
- Used oil
- Contaminated water and wastewater

Design

Hazardous materials are highly regulated, therefore, the first step in developing this Best Management Practice was to identify and conduct a thorough review of applicable federal, state and local regulations, existing guidelines, and existing best practices. Once the review was complete a detailed inspection checklist was developed. A multidisciplinary team of subject experts was used to develop the checklist. After development of the checklist and in conjunction with Facilities, use of the checklist was initiated. Although the checklist is only a tool, it is a critical component of this Best Management Practice. It provides a frame work for necessary actions needed to handle and control hazardous materials.

The financial cost was marginal as environmental consultants, engineers and architects both in-house or already under contract where used by for the collection and synthesis of information.

EHS initiated outreach efforts to educate Facilities maintenance personnel, Housing maintenance personnel and other potential affected departments throughout the University.

Implementation

FSU is proactive in its approach to renovation and demolition projects. Projects proceed systematically to reduce or eliminate the potential for mismanagement of hazardous materials. EHS is involved during the planning stage and until the hazardous materials have been safely removed. The overall goal is to minimize impacts to the project schedule and budget while achieving regulatory compliance. All activities needed to address hazardous materials are factored into the budget and scheduling process along with typical construction activities. EHS attends construction meetings to keep abreast of the projects progress and schedule so proper control, removal, and final disposition of hazardous materials is assured. Throughout the

duration of the project, lines of communication are kept open to all involved parties. Once all the hazardous materials are removed, EHS continues monitoring the project for unforeseen problems until final completion.

The initial step when implementing this Best Management Practice is for the Project manager or Department initiating the project to contact EHS and provide copies of construction documents. EHS reviews the construction documents as well as historical and as built drawings. Review of historical and as built drawings is a critical component in identifying hazardous materials. EHS also reviews existing files including asbestos surveys, laboratory closeout reports, and any other actions that have been performed to address hazardous materials such as lead based paint, polychlorinated biphenyls, fuels, radioactive material, and laboratory chemicals. A careful review of building equipment is performed to identify other hazardous materials. Equipment types may include transformers, switching gear and associated electrical systems and components, underground and above ground storage tanks, septic systems, emergency generators, boiler & chillers, furnaces, gas supply lines, and fume hoods. All have unique requirements for handling and/or disposal.

Once a comprehensive review of existing files is complete, the next step is to conduct a field inspection of the facility and surrounding property impacted by the project. To facilitate this process EHS uses the detailed checklist. The field inspection is conducted by a team of subject matter experts from EHS (Industrial Hygienist, Biosafety Officer, and Chemical Safety Officer) and outside consultants as needed to confirm the location of all known hazardous materials and identify previously unknown or suspected hazardous materials. Samples are often collected to confirm the presence of or characterize suspected hazardous materials. Another critical step is to identify all materials that can be recycled or reused.

Upon completion or the inspection, EHS prepares a detailed inspection report. The report provides a summary of the hazardous materials that were identified and their locations and recommendations on handling, removal, and disposal. In many circumstances EHS will remove and/or facilitate the removal of certain materials such as chemicals and universal waste (used oils, florescent lamps, batteries, electronic components including computers) which result in cost savings to the project. Copies of the report are provided to the FSU Project Manager or department representative. Depending on the complexity of the actions required, EHS will meet with the Project Managers or department representative to provide detailed instruction for addressing the hazardous materials. These instructions may include selection of appropriate consultants and contractors depending on the materials present. After instructions are provided to the Project Manager the inspection findings are distributed to the environmental consultant and construction manager. As project schedules are established, the removal of the hazardous materials is initiated at the appropriate project stage. During removal activities EHS closely monitors progress and provides technical direction. The project is also closely monitored for the occurrence of unforeseen hazardous circumstances or the discovery of additional hazardous materials. Following the removal of hazardous materials, EHS completes the field inspection checklist indicating the final disposition of all hazardous materials identified during the inspection process. The checklist is maintained as permanent documentation for regulators or other interested parties to review.

EHS is contacted by the Purchasing department when a department within the University independently initiates a renovation project where materials such as ceiling components, floor tiles, carpeting, and drywall which may contain asbestos are involved. Once notified, EHS

notifies the department to ensure the process described above is implemented. This avoids inadvertent exposure to building occupants and costly improper handling of hazardous materials.

Below is an example of the EHS final inspection checklist with recommended actions, the action taken, and the documentation of the final disposition.

Action Recommended	**Action**	**Final Disposition**
1) Remove all mercury vapor fluorescent lamps. Reuse or recycle.	Have electric shop or contractor remove mercury vapor fluorescent lamps.	Mercury vapor fluorescent lamps, were removed by maintenance and recycled.
2) Deliver cleaning supplies to Building Services and use for intended purposes.	Access custodial closets and make assessment.	Cleaning supplies removed and stored by Building Services for use in other buildings.
3) Recover Freon.	Have A/C shop remove Freon.	Freon removed by AC Shop.
4) Salvage generator and transformers. Store oils or send to recycler. Salvage elevator if possible.	1) Recycle elevator hydraulic oil. 2) Store Generator Diesel Oil inside tank at Maintenance Shop for future use. 3) Electric Shop - remove two transformers for Future use	1) Elevator hydraulic fluid removed by Elevator Contractor. 2) Maintenance transferred diesel to Mendenhall Storage Tank 3) Electric Shop removed both

	(Non-PCB Oil).	transformers. Will Use as replacements as needed.
5) Kitchen not used since grease trap was drained. Have city inspector confirm it's clean.	Some suspect grease remained. Pump our tank and close out through department of health.	Grease trap pumped out by Contractor. It was then crushed and disposed in accordance with regulatory disposal guidelines.
6) Salvage all smoke detectors, control panels, horns, fire extinguishers, etc.	EHS Fire Safety will salvage all smoke detectors, control panels, horns, fire extinguishers, etc.	EHS salvaged all equipment not damaged.
7) Remove regulated asbestos containing material. Dispose non friable, non regulated, asbestos containing material according to EPA NESHAPS and OSHA asbestos regulations using wet demo and asbestos competent person. Asbestos consultant	Hire licensed asbestos consultant and contractor to remove regulated asbestos containing material.	Regulated asbestos containing material removed by Asbestos Contractor under oversight by LAC. Building demolished following NESHAPS & OSHA protocol

should oversee demolition activities.		
8) Have city disconnect natural gas. Purge all natural gas from systems.	City disconnected natural gas. Gas purged prior to demolition.	Building successfully demolished without natural gas combustion / explosion issue.
9) Incorporate chiller well into new construction or closeout well through city.	Well was not closed out. Central Utilities Plant plans on using well in new construction without having to obtain a new permit.	Well capped for future use.
10) Oil found in automatic door closing hardware.	Salvage doors for future use or recycle oil.	Facilities Construction Shop collected doors and / or door hardware for reuse in Off Grid Building project

Benefits

There are numerous benefits of implementing this Best Management Practice but they are difficult to measure. There have been minor incidents that have occurred over the years. To date there has been no significant mismanagement of hazardous materials. If EHS had not developed this Best Management Practice or a similar approach, the cost of improper management of hazardous materials would likely result in construction worker and employee exposures, negative environmental impacts, regulatory fines, negative impact on public perception, and significant

cost increases to projects. Examples of hazards that have been avoided as a result of the use of this Best Management Practice include fires and explosions, toxic chemical releases to the environment, employee and public exposure, and regulatory fines.

Two minor examples of situations where this process was not implemented that resulted in significant costs and employee exposure were an asbestos fiber release episode and an uncontrolled release of lead based paint dust. The first instance was when an employee (who was trained in asbestos awareness) was making modifications to a fire door that had been taken from a historical building. There were no labels indicating that the door was a fire door. Modifications to the door resulted in an asbestos fiber release episode. The cost for decontamination of the facility where the release occurred was approximately $30,000 and the employee was exposed to asbestos fibers. Had the employee relied on his training and went through proper channels this would have been averted. The second instance was when an employee was refurbishing handrails that contained lead based paint. The employee was using a hand grinder that resulted in an inhalation exposure of lead based paint dust. The work was immediately halted and the project completion was delayed. Although both of these instances were isolated it demonstrates the problems that can arise when this Best Management Practice is not implemented.

Retrospect

Over the years FSU has been diligent in modifying its policies and procedures to avoid mismanagement of hazardous materials. The most important aspect of this Best Management Practice is to communicate the process to all affected parties. In response to minor incidents EHS has expanded training to larger groups within the University. It is easy to manage Major

and Minor projects since there are established mechanism the Facilities project managers adhere to. The problems arise when individual departments act on their own accord without the involvement of Facilities. To remedy these occurrences certain activities departments initiate are flagged by purchasing for EHS approval. Had this process been implemented sooner, it is possible that some minor incidents that have occurred may have been averted.