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Charting a Course to Energy Independence

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Sustainable High Efficiency Deconstruction

Edward Rau
DHHS-National Institutes of Health

a Building's

Greening the End of Life

through

Sustainable High Efficiency Deconstruction

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U.S. Department of Health & Human Services

Some Definitions
(As Used Here)

Deconstruction – all intentional activities that result in partial or complete alteration or removal of an existing structure.

Decommissioning – assessment and reduction of hazardous intrinsic materials and contaminants in a structure to a level that is equal to or less than that posing a predetermined level of acceptable risk for the next intended use of an area affected by deconstruction.

Risk Taking – deconstruction without first decommissioning.

Introduction

- Today there is great emphasis on sustainable design and construction of new buildings.
- Yet no similar emphasis on sustainable deconstruction.
- This is despite a huge inventory of decaying, obsolete federal buildings and infrastructure.
- Many of these buildings simply cannot be improved enough to meet new mission and sustainability requirements and will have to be demolished.

Barriers to Sustainable Deconstruction

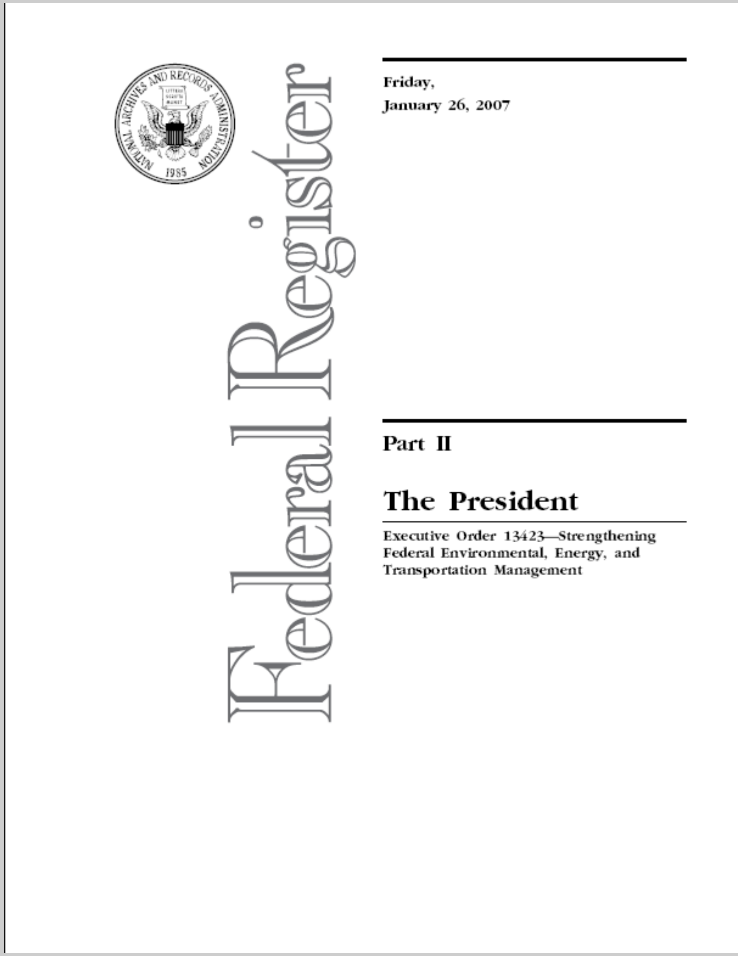
- Older buildings were not designed to facilitate deconstruction.
- Planning for more sustainable renovations and deconstruction is still not considered in most new building designs.
- Federal facilities include many atypical buildings such as laboratories that require frequent renovations and are particularly problematic to deconstruct.
- They often contain a greater variety of potentially hazardous intrinsic materials and contaminants.

New Drivers for Sustainable Deconstruction

Executive Order 13423

Meeting General Mandates:

- Reduced disposal of toxic and hazardous materials
- Cost effective waste prevention and recycling programs
- Compliance with Guiding Principles



Federal Register

Friday,
January 26, 2007

Part II

The President

Executive Order 13423—Strengthening Federal Environmental, Energy, and Transportation Management

Example - GP V: Reduce Impacts of Materials - Construction Waste

New Construction Major Renovations

Where markets or on-site recycling opportunities exist:

- Recycle or salvage at least 50% of non-hazardous demolition and land clearing wastes.
- Provide salvage, reuse and recycling services for wastes from major renovations.

Existing Buildings

Provide salvage, reuse and recycling services for wastes generated by:

- Building operations
- Maintenance
- Repair
- Minor renovations
- Discarded furniture, equipment and property.

New Drivers

Sustainability Rating Credits

- Both the LEED® and Green Globes® sustainability rating systems include credits for decommissioning related aspects of projects – such as construction waste management, brownfields reuse and protection of indoor air.
- These may be relatively easy to obtain compared with to other credits such as those relating to energy.
- Having campus-wide construction waste contracts in place that include data reporting required by the rating systems facilitates crediting.

Old Drivers – Regulations
These are the “Prime Directives”

- Worker Protection – OSHA
- Hazardous Waste Management – EPA & State
  - Prevention of releases
  - Waste characterization and identification
  - On-site management - handling, labeling, storage
  - Off-site management – treatment, storage, recycling, disposal using appropriate technologies
- Transportation of Waste - DOT

History of Decommissioning Protocol Development at NIH

Year	Action
1999	Convened workshop on decommissioning at National Leadership Conference on Biomedical Research and the Environment.
2000	Workshop findings published in *Environmental Health Perspectives*.
2001	Draft NIH decommissioning protocol developed
2003	Full pilot test (NIH Building 3)
2006	Lessons learned applied to major lab demolition project – NIH Building 36 case study (reported here)
2008	AIHA/ANSI issues American National Standard based largely on the NIH protocol.

Protocol Objectives

- Define acceptable long and short term risk → clean-up levels
- Protect workers and environment
- Maximize recycling of debris
- Minimize disposal of debris as waste, especially hazardous
- Control costs by:
  - Streamlining assessment procedures based on data from previous projects
  - Avoiding surprises, downtime
  - Using rapid methods for screening and sorting of debris items
- Ensure site presents acceptable level of risk for its next use.

Protocol Overview

Phases (Flexible)	**Action**
I	INITIAL FACILITY ASSESSMENT Collect historical records, conduct interviews and observations.
II	FACILITY CHARACTERIZATION ASSESSMENT If indicated by initial assessment conduct sampling and analysis and develop remediation plans.
III	DECONTAMINATION, REMEDIATION AND DEMOLITION Processes based on characterization assessment results
IV	FINAL STATUS SURVEY AND DOCUMENTATION

Key Concept: Build on Lessons Learned

- Use assessment data from similar buildings and past projects to develop standardized HAZMAT assessment checklists.
- These can reduce time and costs for redundant surveys, sampling and analysis.
- Less potential for personnel exposure, surprises and project delays.

Example of Decommissioning Checklist for Biomedical Facilities

Updated: May 2008
DEP Decommissioning Guidance - Attachment 1

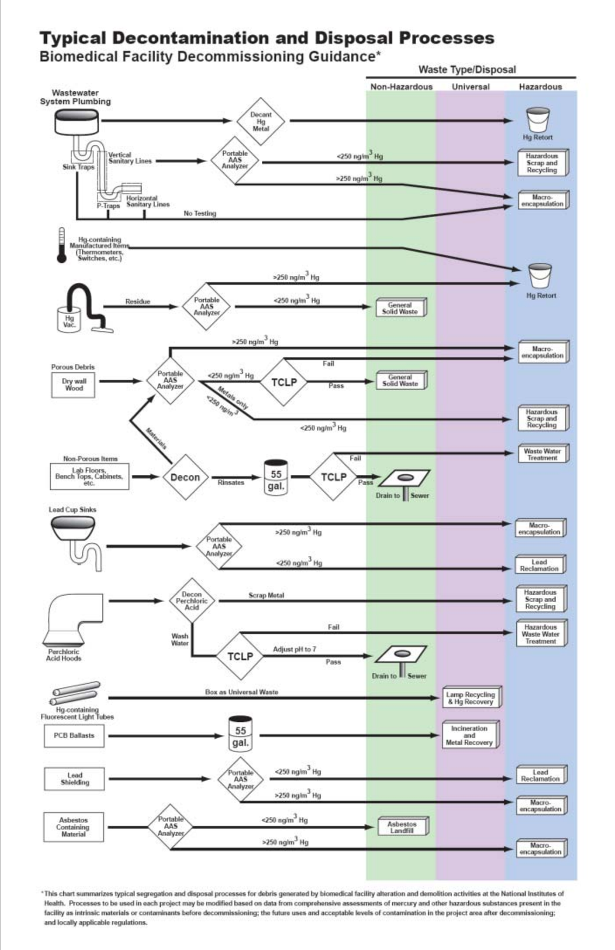
CHECKLIST FOR HAZARDOUS SUBSTANCES THAT MAY BE ENCOUNTERED IN DECOMMISSIONING I

ITEM OR AREA DESCRIPTION	CHEMICAL HAZARDS	Antifreeze compounds	Arsenic compounds	Azides-reactive	Cadmium or its compounds	Chromium compounds	Diethylhexylphthalate (DEHP)	Dioctylphthalate	Fuels - flammable or combustible liquids	Lead metal	Lead compounds	Lead-sulfuric acid battery	Mercury compounds	Mercury metal	Nickel-cadmium (Ni-Cd) batteries	Oils	Ozone depleting substances (CFCs, HFCs, HCFCs)	Perchlorates - reactive	Picrates - reactive	Phosphoric acid	Polychlorinated biphenyls (PCBs)	Selenium compounds	Silver metal and its compounds	Te
Accelerators and cyclotron areas																								
Autoclaves																								
Barometers and manometers														■										
Batteries																								
Alarms and smoke detectors														■										
Emergency lighting												■												
Exit signs					■							■			■									
Cage washers																				□				
Casework														□										
Ceiling tiles																								
Compressors																■	■							
Dental clinics														□										
Shielding										■														
Electrical systems																								
Cables and wiring										■														
Cables, shielded										■														
Cables, oil-filled										■						■					■S			
Capacitors							■			■						■					■S			
DC Watt hour meters														■										
Fuse bases																								
Relays														■							■S			
Switches - tilt, silent, float, industrial														■										
Thermostats														■										
Transformers																					■□S			■
Transformer vaults																					□			
Voltage regulators																					■S			
Electron microscopy areas											□			■□										
Elevators																								
Brakes and clutch facings																								
Pits																□								
Exit signs, self-powered																								

(Full Copies Available on Request)

Building on Lessons Learned

- Use waste characterization data from similar buildings to develop SOPs for:
  - Debris sorting
  - Recycling and disposal
  - Selecting outlets
  - Data reporting
- Reduces risks, saves time = money



Protocol applied to a large biomedical laboratory –

NIH Building 26

CASE STUDY

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Edward Rau

August 9-12, 2009

GOING,

Building decontaminated leaving clean shell. Demolition beginning.

GOING, GOING…

Building demolished. Rubble piles cleared and ready for recycling.

GONE!

Clean site. A new LEED® Gold Certified Laboratory will be constructed on the site.

OUTCOMES

Reduced Impacts of Materials

- Enhanced decontamination and materials clearance procedures allowed virtually 100% of the entire structure to be recycled.
- More than 5,800 tons of debris, primarily concrete and scrap metal were recycled locally as non-hazardous material.
- Recycling and reuse of this material saved significant landfill space.

OUTCOMES

Energy Savings

EPA estimated that by recycling these materials locally the energy savings equivalent to removing nearly 3,300 cars from the roadways for one year was attained.

OUTCOMES

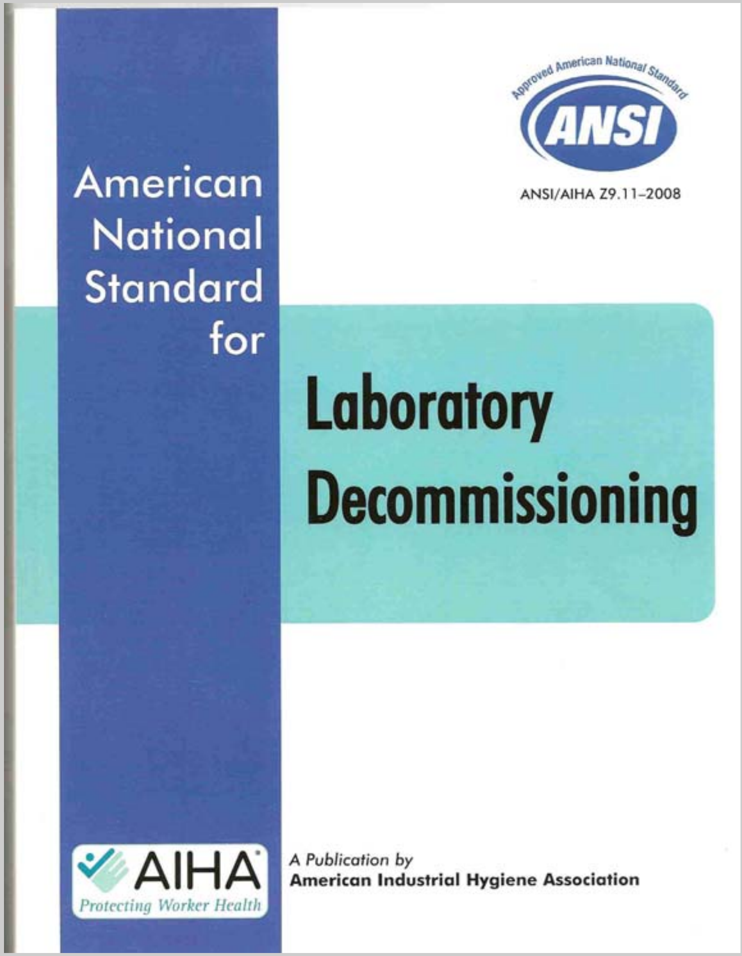
Sustainability Rating Credits

- A new neuroscience research facility will be constructed on the clean site.
- Credits from the decommissioning activity will be applied to design and construction of the new facility, tentatively achieving LEED Gold or Green Globes – Two Globe rating.

OUTCOMES

Applications Outside NIH

- Protocol elements are used by EPA, other agencies and universities.
- A primary basis for the new American National Standard for Laboratory Decommissioning released in 2008.



Challenges Remaining

- Defining clean up standards - how clean is clean?
- Regulatory acceptance of rapid screening methods?
- No federal standards for release of debris materials to recycling outlets.
- How can the protocol be applied to small renovation projects?

OUTCOMES

Awards

2009 Green Champion Award

2009 White House Closing the Circle Award
"Planting the Seeds of Change"