AABC Commissioning Group

AIA Provider Number 50111116

Decommissioning: What You Need to Know in the Absence of Standards

Course Number: CXENERGY 1829

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April 26, 2018

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Background

Rogeh Alnajjar

- 35 years of experience in the HVAC industry
- Inaugurated Alpha Commissioning Engineers, Inc. circa 2014
- Licensed Professional Engineer
- PhD in Mechanical Engineering
- Carries many professional certifications
- A corresponding member of the commissioning committee at ASHRAE
- An active member of ASHRAE, ACG, ISPE & NSPE

Mina Alnajjar

- A Loyola University Alum
- Began her career in the HVAC industry four years ago
- An active member for the USGBC - Illinois chapter Community Engagement Committee
- Has a LEED AP in building design and construction
- An advocate for sustainability and enhanced IAQ for new and existing buildings.

Course Description

Decommissioning has been around for as long as commissioning, yet not many engineers know about the benefits we can obtain and the risks we can avoid through this practice. We will preview a case study that investigates the exterior and interior of a school, identifying risks and findings with over ten (10) hazardous material categories that will help engineers create a more ideal demolition. This study will include all aspects of making sure an efficient decommissioning process is performed. Finally, this presentation will create a template for engineers to use in practice since decommissioning does not have universal guidelines set by any national associations.

Learning Objectives

By the end of this course, participants will be able to:

1. Learn what Decommissioning is and how it started in the HVAC industry.

2. Understand how decommissioning works and the measures it uses to create a safer and more efficient demolition process.

3. Learn how decommissioning helps identify risks and findings for a multitude of hazardous materials and how to distinguish between them.

4. Our examples and findings are based on real life projects and will allow our audience to leave feeling well-informed on a rather unspoken about topic.

What is Decommissioning?

- Decommissioning requires that technical actions be taken to allow the removal of some or all of the regulatory controls from a facility. In doing so, buildings can be ensured that a safe and efficient demolition will take place.

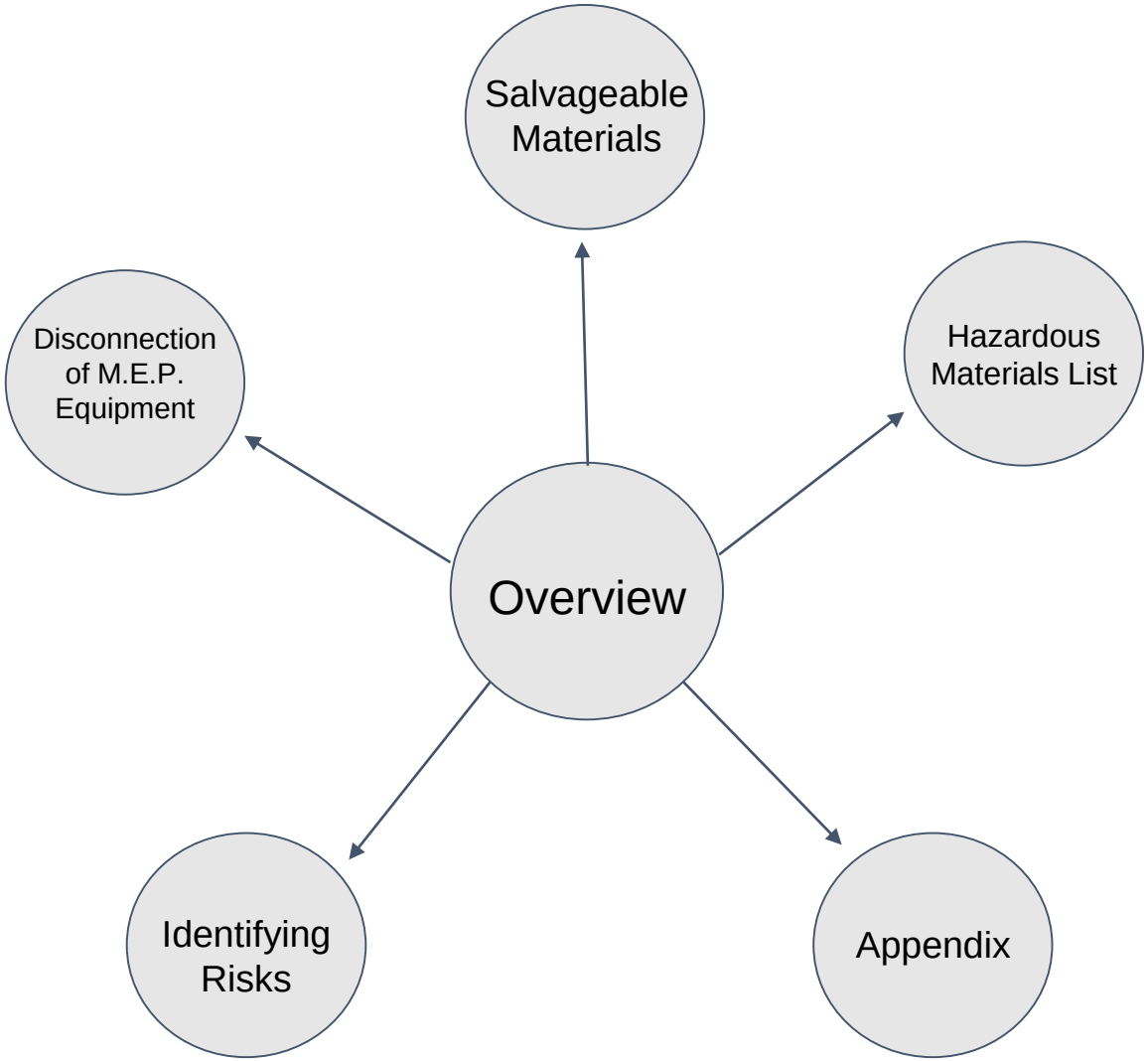
Why Decommissioning?

- Identifies and prevents possible risks during the demolition process.
- Provides engineers & contractors with the best procedures and recommendations to safely demolish a building.
- The economic, environmental, and safety factors that are accounted for when commissioning a project also apply to decommissioning.

Types of Decommissioning

- There are two (2) common strategies when it comes to decommissioning:
  - Immediate Dismantling
  - Deferred Dismantling

A combination of both of these strategies can also be referred to as *phased decommissioning*, which consists of periods of active dismantling interspersed with safe enclosure phases.


Salvageable Materials
Disconnection of M.E.P. Equipment
Hazardous Materials List
Overview
Identifying Risks
Appendix

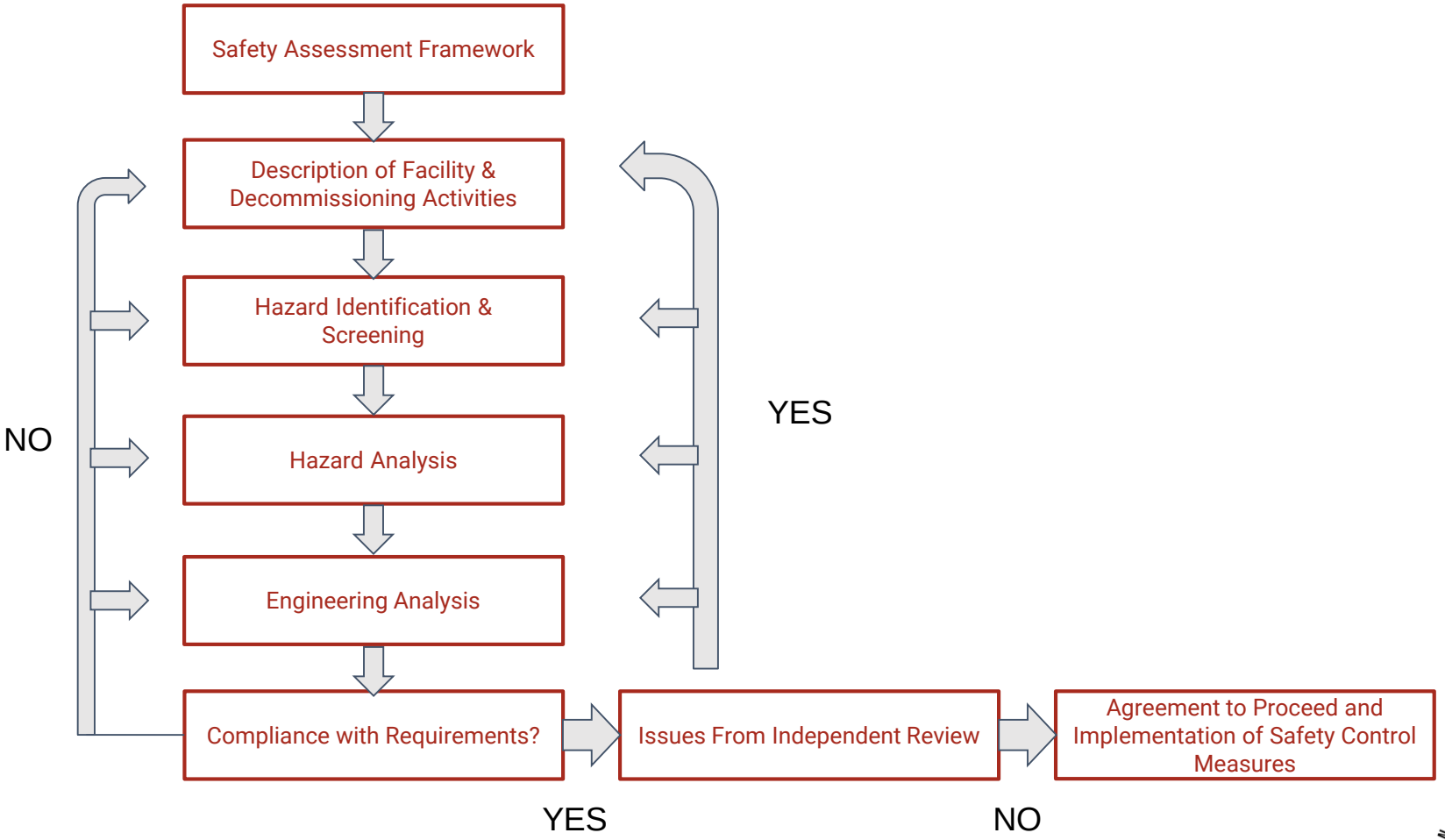
Inventory Mapping as Part of the Decommissioning Project

01	CONCEPTUALIZE	• Material Breakdown
		  ○ Document Review
		  ○ Removal Concepts
		  ○ Environmental Impact Assessment
		  ○ Safety Assessment Process
		  ○ Decommissioning Program

02	DEFINE	• Hazardous Materials
		  ○ Offshore Survey & Samplings
		  ○ Risk Assessment
		  ○ Engineering Down Procedures
		  ○ Work Instructions

03	EXECUTE	• Waste Definition
		  ○ Onshore Intrusive Sampling
		  ○ Waste Hierarchy Compliance
		  ○ Environmental Accounting
		  ○ Close Out Reporting

Safety Assessment Process



Classifying Hazardous Materials

- A hazardous material is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.
- Hazardous materials, if not properly controlled, present a potential hazard to human health and safety, infrastructure and/or their means of transport.
- Regulatory frameworks incorporate comprehensive classification systems of hazards to provide a taxonomy of dangerous goods. Classification of dangerous goods can be broken down into nine (9) categories according to the type of dangerous materials or items present. These categories are listed below as follows:
    1. Asbestos
    2. Explosives
    3. Gases
    4. Flammable Liquids & Solids
    5. Oxidizing substances
    6. Toxic & Infectious Substances
    7. Radioactive material
    8. Corrosives
    9. Miscellaneous Dangerous Goods

Classifying Hazardous Materials

Asbestos:

- Asbestos refers to six naturally occurring fibrous minerals that have the ability to resist heat, fire and electricity.
- Before any alterations can be made to a structure, whether it is demolition, renovation or regeneration, all asbestos needs to be identified and managed. This will often result in asbestos removal. This is important because when the material is disturbed and fibres are scattered into the air it becomes incredibly hazardous. The asbestos should be removed under the most careful conditions, by licensed specialists, ensuring those handling it are wearing the correct PPE and in the correct controlled conditions. Once removed the material needs to be packed and disposed of safely.

Classifying Hazardous Materials

Explosives:

- Explosives are materials or items which have the ability to rapidly conflagrate or detonate as a consequence of chemical reaction.
- All plant and equipment used for explosives must be rendered free from explosives as part of the decommissioning process before disposal of the plant and equipment.
- Plant and equipment used for explosives manufacturing must be decommissioned to the extent that the systems and capabilities are inoperable and cannot be reinstated.
- License holders should ensure the decommissioning and disposal processes have been included in their Safety Management System.

Classifying Hazardous Materials

Gases:

- Typical activities during the decommissioning/reclamation phase include closure of all production and **injection wells**; removal of aboveground components and gravel from **well pads**, **access roads** (not maintained for other uses), and other ancillary facility sites; recontouring the surface; and **revegetation**. Potential impacts from these activities are presented below, by the type of affected resource.
- Commonly transported gases: aerosols, compressed air, hydrocarbon gas-powered devices, fire extinguishers, gas cartridges, fertilizer ammoniating solution, insecticide gases, refrigerant gases, lighters.

Classifying Hazardous Materials

Flammable Solids & Liquids:

- Flammable liquids are defined by dangerous goods regulations as liquids, mixtures of liquids or liquids containing solids in solution or suspension which give off a flammable vapour at temperatures of not more than 60-65°C, liquids offered for transport at temperature at or above their flash point or substances transported at elevated temperatures in a liquid state and which give off a flammable vapor at a temperature at or below the maximum transport temperature.
- Flammable liquids are capable of posing serious hazards due to their volatility, combustibility and potential in causing or propagating severe conflagrations.
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Classifying Hazardous Materials

Oxidizing Substances

- Oxidizers are defined by dangerous goods regulations as substances which may cause or contribute to combustion, generally by yielding oxygen as a result of a redox chemical reaction.
- Reasons for regulation:
  - Oxidizers, although not necessarily combustible in themselves, can yield oxygen and in so doing cause or contribute to the combustion of other materials.

Classifying Hazardous Materials

Toxic & Infectious Substances

- Toxic substances are those which are liable either to cause death or serious injury or to harm human health if swallowed, inhaled or by skin contact. Infectious substances are those which are known or can be reasonably expected to contain pathogens.
- Dangerous goods regulations define pathogens as microorganisms, such as bacteria, viruses, parasites and fungi, or other agents which can cause disease in humans or animals.

Classifying Hazardous Materials

Radioactive Material

- Dangerous goods regulations define radioactive material as any material containing radionuclides where both the activity concentration and the total activity exceeds certain predefined values. Whilst undergoing radioactive decay radionuclides emit ionizing radiation, which presents potentially severe risks to human health.

Classifying Hazardous Materials

Corrosives

- Corrosives are substances which by chemical action degrade or disintegrate other materials upon contact.
- Corrosives cause severe damage when in contact with living tissue or, in the case of leakage, damage or destroy surrounding materials.
- Commonly transported corrosives:
  - Acids/acid solutions
  - Batteries
  - Battery Fluid
  - Paints
  - Sulphides
  - Chlorides

Classifying Hazardous Materials

Miscellaneous Dangerous Goods

- Miscellaneous dangerous goods are substances and articles which during transport present a danger or hazard not covered by other classes. This class encompasses, but is not limited to, environmentally hazardous substances, substances that are transported at elevated temperatures, miscellaneous articles and substances, genetically modified organisms and micro-organisms and (depending on the method of transport) magnetized materials and aviation regulated substances.

What Systems and Equipment are Decommissioned?

Systems

- Life Safety
- Building Envelope
- HVAC
- Electrical Power
- Lighting Controls
- Plumbing & Gas
- Etc

Areas

- Masonry
- Finish Carpentry
- Plastic Fabrications
- Building Insulation
- Roofing
- Joint Sealers
- Wood & Plastic Doors
- Windows
- Skylights
- Glazed Curtain Wall
- Gypsum Board
- Tile
- Acoustical Ceilings
- Resilient Flooring
- Carpet
- Wall Coverings
- Paints & Coatings
- Toilet Compartments
- Loading Dock Equipment
- Office Equipment
- Furnishing & Accessories
- Renewable Energy Equipment
- Elevators
- Plumbing Fixtures and Equipment
- HVAC Equipment
- Lighting Equipment

Priority Products for Sustainable Acquisition

- Adhesives
- Boilers
- Carpet
- Ceiling Tile - Acoustical
- Central AC
- Chillers - Air Cooled or Water Cooled
- Concrete
- Gypsum Panels
- Flooring
- Heat Pumps
- Insulation
- Lighting: LED Commercial
- Paint
- Roof Coating
- Urinals
- Water Heater

Salvageable Materials

Example of materials that could be salvaged and repurposed include but are not limited to:

- Windows, including leaded and stained glass
- Doors, including pocket doors
- Door and cabinet hardware
- Ornate wood trims and casings (i.e. window and door casings, crown molding, etc.)
- Stair newel posts, handrails, banisters, columns, etc.
- Left behind wooden furniture, desks, etc. that have been removed
- Light fixtures
- Plumbing fixtures, water heaters
- Cast iron radiators, HVAC grilles/grates

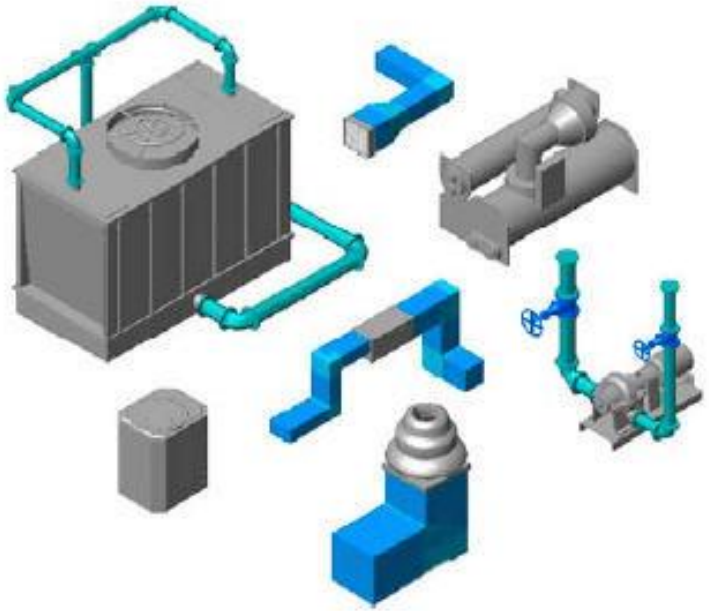
Salvageable Materials Cont.

Example of items that could be recycled to reduce environmental impact include but are not limited to:

- Easily removable metallic items (ductwork, piping, conduit, panels, gutters/downspouts, etc.)
- Cardboard and papers left behind
- Concrete (sidewalks, basement slab, etc.)
- Asphalt (sidewalks, pavement)

Disconnection of M.E.P. Equipment

- HVAC
- Electrical
- Domestic Water
- Natural Gas
- Sanitary Sewer Service Feed
- Storm Drainage and Sediment Water Control



Structural Integrity & Demolition

- Must have an interior evaluation of the building.
- Evacuate all personnel.
- Test for asbestos and hazardous materials.

Decommissioning Guidelines & Certification Programs

- Currently, no guidelines for Decommissioning have been created by ASHRAE or any other entity.
- The International Atomic Energy Agency (IAEA) has created their own safety standards for Decommissioning of Facilities.
- Their standards outline 8 major Decommissioning phases:
  - Protection of People & Protection of the Environment
  - Responsibilities Associated with Decommissioning
  - Management of Decommissioning
  - Decommissioning Strategy
  - Financing of Decommissioning
  - Planning for Decommissioning During the Lifetime of the Facility
  - Conduct of Decommissioning Actions
  - Completion of Decommissioning Actions & Termination of the Authorization for Decommissioning

IAEA Decommissioning Safety Standards

Appendix

- The appendix of your report should include the following:
  - Photographic evidence of your findings.
  - A description of your photos.
  - The identifiable risk associated with each photo.
  - A note explaining how the issue should be resolved.

Project Sample

- We at Alpha Commissioning Engineers, Inc. recently completed a decommissioning project at Meadowview Elementary School in Atlanta, GA.
- Our findings at this school will be presented here to show a step-by-step procedure on how to write a decommissioning report.
- You will also get to see what it really takes to decommission a project.

Decommissioning Tasks

The following contains our Decommissioning Task List:

1. Prepare the Decommissioning Plan
2. Inspecting the interior and exterior of the building to identify the existence of any hazardous materials or possible safety risks.
3. Inspecting the building to identify any useful, salvageable, mechanical, electrical and plumbing equipment.
4. Inspecting the following: HVAC, Electrical, Natural Gas, Domestic Water, Sanitary and Storm Drainage Systems for disconnection before demolition.
5. Submitting the final Decommissioning Report.

Preparing for Decommissioning

Any materials or equipment, which are being demolished or removed, must go through the equipment demolition and removal sign-off checklist process, if any of the following criteria are met:

1. Any equipment with a HEX ID or any equipment associated with it.
2. Any equipment and machinery involving:
    a. Hazardous Production Materials (HPM)
    b. Equipment electrically hardwired
    c. Ionizing or non-ionizing radiation
    d. Mechanical guarding
    e. Thermal hazards
    f. Robotics or Automation
    g. Safety interlocks
    h. Nanomaterials
    i. TGMS equipment
    j. Chambers

Findings

- Exterior walls: The exterior walls of the building were constructed from brick and concrete blocks, which were still in good shape and thus advised to be either recycled or re-used.

Findings

- Interior Walls: All interior walls were constructed from concrete blocks and advised to be recycled.

Findings

- Exterior Doors and Windows: All exterior doors and windows were constructed from metal and glass and advised to be either recycled or reused.

Findings

- Interior Flooring: Main entrance and all corridors are Terrazzo flooring (Man-Made Stone Flooring). All other areas have Vinyl tiles. We recommended all the Terrazzo flooring materials to be disposed while all the other materials to be recycled.

Findings

- Interior Ceiling: Ceiling was made from metal grids and drop ceiling tiles. It was advised that all the materials were to be recycled or disposed.

Disconnection of all M.E.P. Services

Mechanical

- Boiler, Pumps, Fan Coil Units, Cooling Tower, Exhaust Fans, Make-Up Air Unit, Window-Type A/C, Etc. were all non-salvageable and should be included in the demolition of the structure.

Disconnection of all M.E.P. Services

Electrical

- Prior to demolition activities, disconnection of the primary electrical service feed to the school should be coordinated with the power utility company in the area. If site demolition includes excavation work, an underground utility location survey should be conducted to lower the risk of striking unidentified live utilities.

Disconnection of all M.E.P. Services

- Plumbing
  - Prior to demolition activities, disconnection of the primary domestic water service feed to the school should be coordinated with the county services. If site demolition includes excavation work, an underground utility location survey should be conducted to lower the risk of striking unidentified live utilities.

Disconnection of all M.E.P. Services

- Natural Gas
  - Prior to demolition activities, disconnection of the primary natural gas service feed to the school should be coordinated with the gas utility company in the area. If site demolition includes excavation work, an underground utility location survey should be conducted to lower the risk of striking unidentified live utilities.

Disconnection of all M.E.P. Services

- Sanitary
  - Prior to demolition activities, the primary sanitary sewer service feed to the school should be capped off at the point of entry. If site demolition includes excavation work to remove underground piping, an underground utility location survey should be conducted to lower the risk of accidental disruption of unidentified live utilities.

Hazardous Materials

LISTING OF SUSPECT HAZARDOUS MATERIALS

Suspect Material	Hazardous Material Type	Remarks
Acoustic Ceiling Tile (2 ft x 2 ft)	ACM	
Drywall Materials	ACM	Including Joint Compound
Vinyl Floor Tile	ACM	Various colors of 12x12 tile
Adhesive behind Wood Paneling	ACM	Found generally in Main Office, Principal Office, and Vice Principal Office
Ceramic Sink Undercoating	ACM	
Carpeting Adhesive	ACM	
Fire Doors	ACM	
Thermal System Insulation	ACM	Including Pipe Elbows and Packings
Chalkboards in Classrooms	ACM	Including the Chalkboards and Black Mastic behind Chalkboards
Adhesive behind Wood Book Shelves	ACM	
Adhesive for Vinyl Base Molding	ACM	
Acoustic Ceiling Tile (1 ft x 1 ft)	ACM	
Adhesive for Grip Tape on Stairs & Ramps	ACM	
Roofing Materials	ACM	Including Sealants, Caulking and Any Fibrous Material
Fluorescent Light Bulbs	LB	4 ft long & 2 ft U-Shaped Bulbs
Halogen Bulb Fixtures	LB	Single and double lamp fixtures
Ballasts for All Lighting Fixtures	LB	
Central A/C Units	AC	Carrier Brand Units with Refrigerant 22
Window A/C Units	AC	
Refrigerators	AC	
Water Fountains	AC	
Smoke Detectors	BATT	
Video Cameras	BATT	
Motion Detectors	BATT	
Emergency Exit Signs	BATT	
Computer Servers & Backup Batteries	BATT	
Telephone System	BATT	May have backup batteries
Computer Monitors	MISC	Contain Picture Tubes
Televisions	MISC	Contain Picture Tubes
Misc. Electronics Devices/Accessories	MISC	Computer Keyboards, Microphones, Audio Equipment, Headphones
Mercury-Containing Thermostats	MISC	
Compressed Helium Tank	MISC	

ACM: Asbestos-Containing Material; LB: Light Bulbs; AC: Air Conditioning/Refrigerants; BATT: Batteries; MISC: Miscellaneous

Identified Risks

- Risk #1: Public Safety
  - The physical limits of demolition should be identified and fenced off.
  - Post “Danger No Trespassing” signs on site fencing every 75 feet.
  - Seek the assistance of a professional asbestos abatement company to perform a site evaluation and remove all asbestos and hazardous materials before starting any demolition.
  - Prior to any demolition, the school should be cleared from any personnel.
  - Disconnect all the electrical, gas and water lines before starting any demolition.

Identified Risks

- Risk #2: Erosion Control
  - Protect all the surrounding residential drainage systems.
  - Drainage from the site into the surrounding creeks in the area require research prior to demolition.

Recommendation for Demolition

The following are the list of tasks that must be taken before starting any demolition or removal work:

1. Notify affected personnel in the area.
2. Post signs in appropriate areas.
3. Ensure alarms are disconnected
4. Advise ERT.
5. Removal of all chemical inventories
6. All hazardous materials should be surveyed and abated in accordance with all applicable Federal and State regulations.
7. Drain, flush and purge all process lines/equipment (Tag condition as cleaned and verified or indicate potential residual contamination).
8. Document information on expected contaminants.
9. Disconnect all utilities at OSBL.
10. Maintain yellow binder in the area with 3 current emergency contacts.
11. Assure emergency equipment in the area continues to be inspected.

What's Next?

- We recommend that AABC Commissioning Group (ACG) set and lead universal guidelines for decommissioning as it proves to contain vital environmental, economic, and safety factors for buildings and their surrounding areas.

THANK YOU!

Q & A

This concludes The American Institute of Architects
Continuing Education Systems Course

Contact Information