

Hazardous Materials

*Facilities, End-of-Life: Decommissioning, Abatement
and Demolition Workshop*

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Outline

Introduction

Part 1 – Hazardous Materials Primer

- ⦿ What are hazardous materials?
- ⦿ Safety concerns?
- ⦿ Disposal requirements
- ⦿ Legislation?
- ⦿ Challenges?

Part 2 – Hazardous Materials Management

- ⦿ End of Life Facility Activities
- ⦿ Hazardous Materials Assessment
- ⦿ Hazardous Materials Abatement

Closing and Question Period

End-of-Life Facilities

Decommissioning, Abatement and Demolition

Introduction

*End-of-Life Facilities and
Hazardous Materials*

End-of-Life Facilities

Facilities

- Commercial
- Residential
- Institutional
- Industrial



End-of-Life Facilities



- Chemical Plants
- Industrial Facilities
- Mining Operations



- Oil and Gas Plants
- Field Facilities
 - › Compressor Stations
 - › Meter Stations
 - › Well Sites



End-of-Life Facilities

EOL Activities

1. Facility Shutdown
2. Decommissioning
- 3. Hazardous Materials Assessment and Abatement**
4. Demolition
5. Abandonment and Reclamation



Hazardous Materials Workshop

Activity #1:
What do you
need to
accomplish?

- What is the facility you are responsible for?
- What are the operations or processes?
- When was it constructed?
- Have there been expansions or renovations?
- What are your long-term objectives?
- What are your short-term goals?
- What is your plan?

Facility - Paul's Gas Plant

OPERATIONS

Natural Gas processing plant

Field sites

Sulphur pad

Product sell-off / shipping

Game

plan???

Constructed in 1959

Plant Expansions - 1960's and 1978

Demolish facility safely and on budget

Short Term: decommission plant, remove asbestos and hazmat, plan demolition

End-of-Life Facilities

Decommissioning, Abatement and Demolition

Part 1

Hazardous Materials Primer

What are “Hazardous Materials”?

Why be Concerned with Hazardous Materials?

- ⦿ Regulations
 - Health and Safety
 - Environmental
- ⦿ Efficiency
- ⦿ Responsibility



What are “Hazardous Materials”?

Hazardous Material

- Substance that is:
 - harmful to **human health**
 - Harmful to the **environment**
- **Safe work practices** – required to prevent exposure or injury
- **Proper disposal** – required to prevent contamination or release



What are “Hazardous Materials”?



Federal Legislation

- Hazardous Products Act and Controlled Products Regulations
- Workplace Hazardous Materials Information System (**WHMIS**)

Provincial Legislation

- Occupation Health and Safety Act, Regulation and Code
- Waste Control Regulation

What are “Hazardous Materials”?

What are NOT “Hazardous Materials”

⦿ Controlled Products or Process-Related Substances

- › Raw Product (e.g. Hydrocarbons, Minerals)
- › Process-Related Chemicals (e.g. Ammonia, Glycol)
- › Operational Products (e.g. Oils, Lubes, Treatments)

⦿ Contaminants

- › Benzene
- › Hydrogen Sulphide
- › Poly-Aromatic Hydrocarbons
- › Sulphur
- › Coal Dust



What are “Hazardous Materials”?

TOXIC METALS

- Lead (Pb)
- Mercury (Hg)

RADIOACTIVE MATERIALS

- Naturally Occurring (NORM)

ORGANIC POLLUTANTS

- Ozone-Depleting Substances (ODS)
- Polychlorinated Biphenyls (PCB)

FIBROUS or CRYSTALLINE MINERALS

- Asbestos-Containing Materials (ACM)
- Crystalline Silica (Si)



End-of-Life Facilities

Decommissioning, Abatement and Demolition

Hazardous Materials Primer

TOXIC METALS

Toxic Metals

WHAT ARE “TOXIC METALS”?

- Heavy elemental metals and metalloids
- Typically form **Poisonous**, soluble compounds
- Often **mimic essential minerals** in the body
 - › Accumulate in our bones
 - › Affect our nervous system
 - › No biological value
- Can **bio-accumulate** in the environment

Toxic Metals

Nickel

Arsenic

Cadmium

Lead

Mercury

Chromium

Thallium

Toxic Metals: Lead



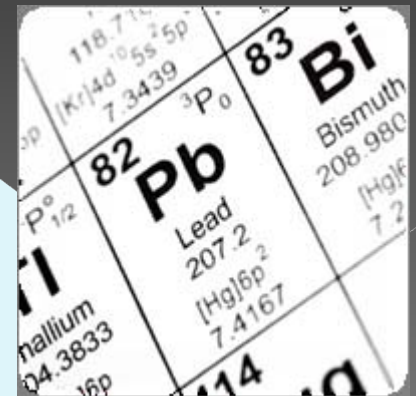
WHAT IS LEAD?

- Soft, malleable metal
- Bluish-white colour that tarnishes to dull grey
- Low melting point
- Poor conductor of electricity
- Very dense

Most commonly known heavy metal

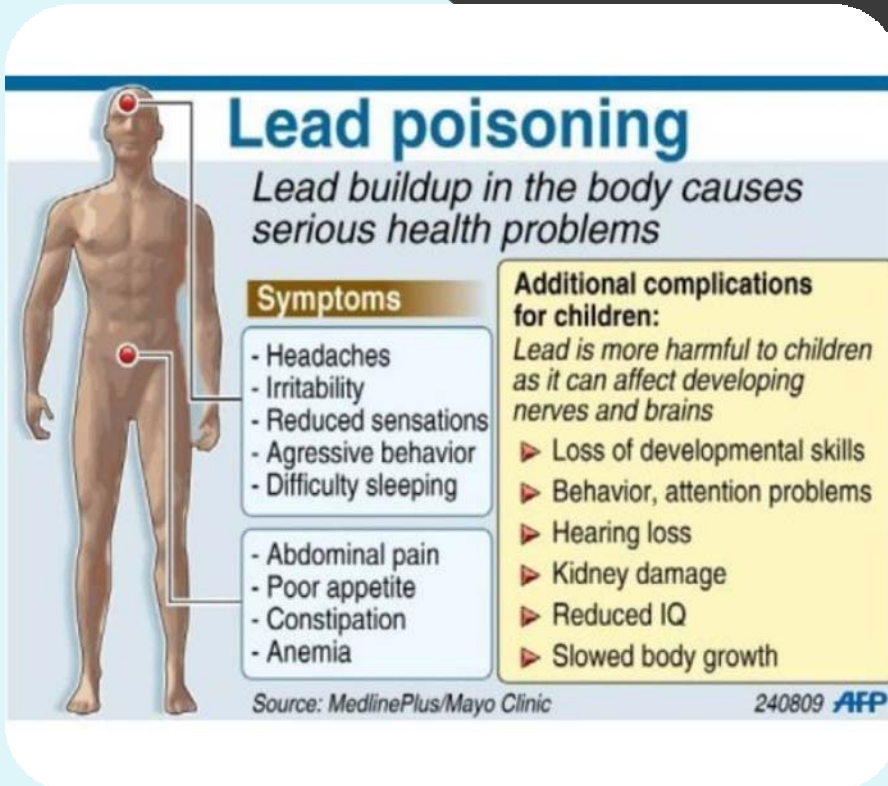
Unique **characteristics**

Many **familiar uses**



82 Pb Lead 207.2 [Hg]6p ² 7.4167	83 Bi Bismuth 208.980 [Hg]6p ³ 7.2
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Toxic Metals: Lead



Lead poisoning
Lead buildup in the body causes serious health problems

Symptoms

- Headaches
- Irritability
- Reduced sensations
- Aggressive behavior
- Difficulty sleeping
- Abdominal pain
- Poor appetite
- Constipation
- Anemia

Additional complications for children:
Lead is more harmful to children as it can affect developing nerves and brains

- ▶ Loss of developmental skills
- ▶ Behavior, attention problems
- ▶ Hearing loss
- ▶ Kidney damage
- ▶ Reduced IQ
- ▶ Slowed body growth

Source: MedlinePlus/Mayo Clinic 240809 AFP

- A well known toxic substance
 - Ancient Greeks, Romans and Chinese
 - Recent movements to limit usage and emissions
- Accumulates in the bones and soft tissue
- Damages the nervous system
- Affects brain function

Toxic Metals: Lead

LEAD-CONTAINING PRODUCTS and MATERIALS

- Lead-Based Paint (LBP)

- Batteries

- Roof flashing

- Cladding

- Ammunition

- Leaded gasoline

- Many metals



Toxic Metals: Lead

LEAD EMISSIONS

- Widespread contaminant
- Release into the environment
 - Historical uses
 - Current uses
- Primary sources
 - Metal processing ~ 50%
 - Waste disposal ~ 15%
 - Fuel combustion ~ 10%



Toxic Metals: Lead

LEAD EXPOSURE

- Lead-Based Paint
 - 1978 (Residential ONLY)
- Tetraethyl Lead
 - 1923 - 1986



Lead exposure

About 310,000 U.S. children ages 1 to 5 have elevated blood lead levels, which can accumulate over months and years and cause serious health problems.

Effects on children

- Kids absorb up to 70 percent of lead, adults about 20 percent
- Often undetected; no obvious symptoms
- Can lead to learning disabilities, behavioral problems, malformed bones, slow growth
- Very high levels can cause seizures, coma, death

Sources

- Lead-based paint, contaminated dust in homes built before 1978
- Drinking water from lead pipes
- Contaminated food
- Soil (lead does not biodegrade, decay)
- Toys*

What parents can do

- Have child screened if there is concern of lead exposure
- Frequently wash child's hands, toys, pacifiers
- Only use cold tap water for drinking, cooking
- Test paint, dust in home if it was built before 1978

*Old toys with lead paint a known risk, but new toys from China now have come under scrutiny

Source: U.S. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services

© 2007 MCT

Toxic Metals: Lead

HEALTH, SAFETY AND ENVIRONMENT

Safe Handling

- › Identification
- › Risk assessment
- › Worker protection
- › Safe work procedures



Disposal

- › Decontamination
- › Leachate Testing
- › Landfill



Toxic Metals: Mercury

WHAT IS MERCURY?

- ◉ Liquid metal at standard temperature and pressure
- ◉ Dense (more than lead)
- ◉ Conducts electricity
- ◉ Resists corrosion
- ◉ Considered a stable element that does not burn or explode under normal conditions



Toxic Metals: Mercury

MERCURY PRODUCTS

- ◉ **Metallic mercury**
 - › Instrumentation
 - › Thermometers
 - › Electrical switchgear
 - › Dental amalgams
 - › Gold mining
 - › Chlorine production
 - › Light bulbs
 - Mercury Vapour
 - Fluorescents



Toxic Metals: Mercury

◉ Inorganic salts

- › Paint pigments
- › Cosmetics
- › Fungicide
- › Insecticide
- › Explosive detonators

◉ Organic compounds

- › Paint preservatives
- › Catalysts
- › Fungicide applications
- › Pastes
- › Antiseptics



Toxic Metals: Mercury

IT'S STABLE, BUT...

- ⦿ Reacts with oxidizing acids to form toxic gas
- ⦿ Dissolves to form amalgams with other metals, particularly aluminum
- ⦿ Vapourizes at room temperature or when heated
- ⦿ “Shatters” into beads and droplets when spilled
- ⦿ Transforms into inorganic and organic compounds
- ⦿ Highly toxic

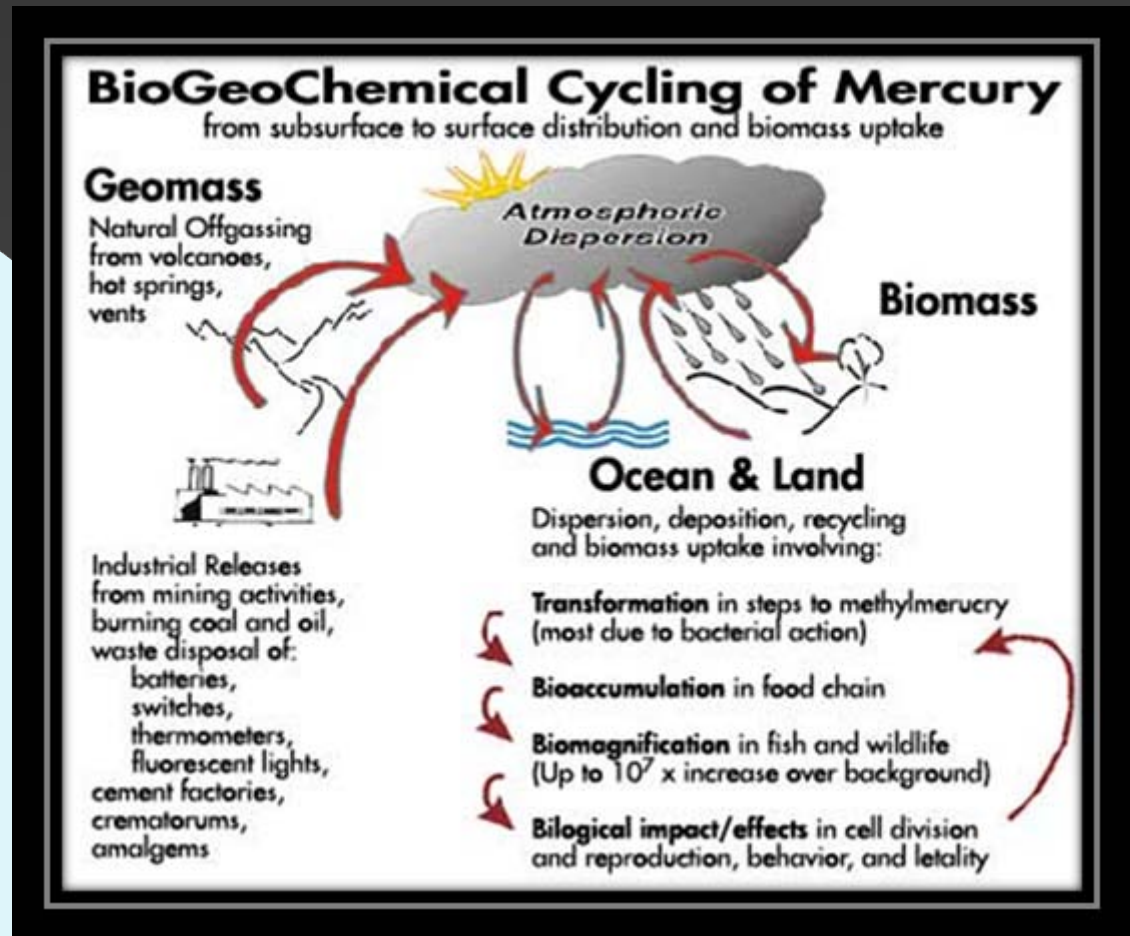
Toxic Metals: Mercury

IN THE ENVIRONMENT

- Natural Sources (half)
- Combustion ~ 65%
- Gold Mining ~ 11%
- Cement ~ 6%
- Waste Disposal ~ 3%

Bio-Accumulates

Migrates



Toxic Metals: Mercury



MERCURY EXPOSURE

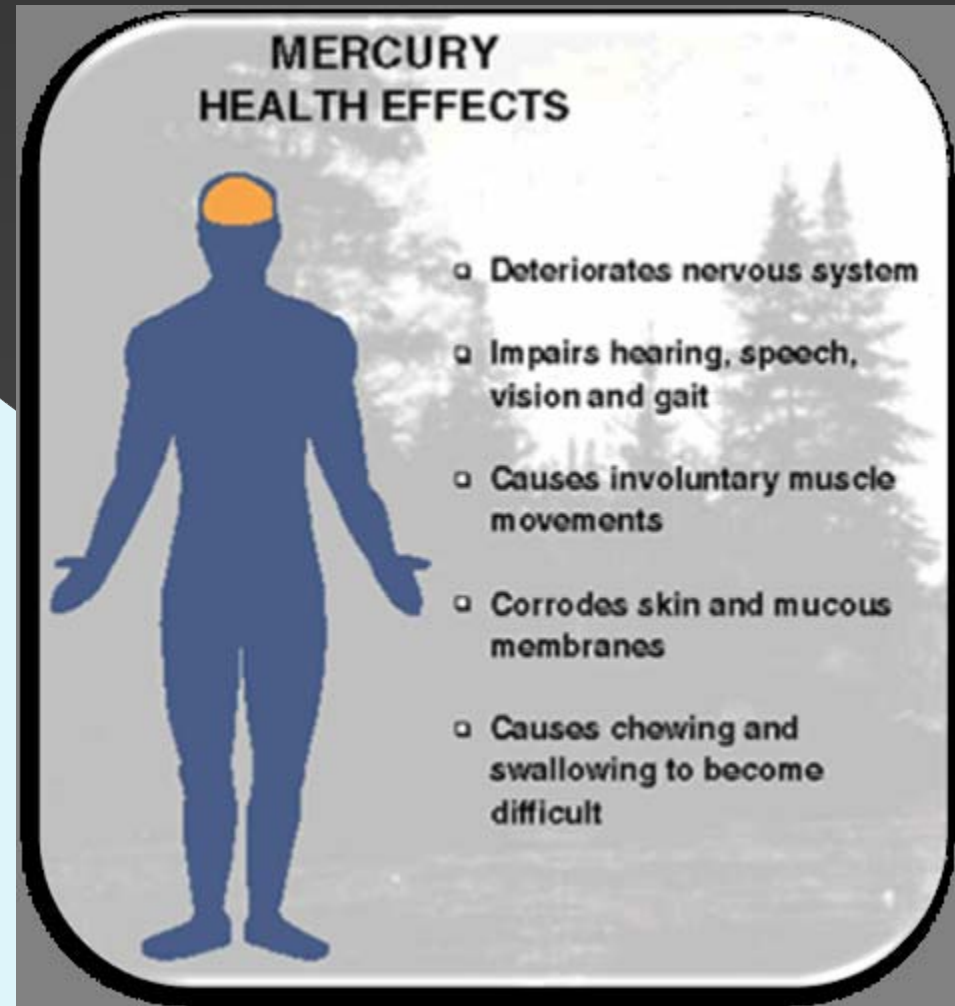
- Skin absorption
- Inhalation of mercury vapour
- Ingestion



Toxic Metals: Mercury

HEALTH EFFECTS

- **Accumulates**
 - › Kidneys
 - › Liver
 - › Brain
- Cleared slowly, half-life of approx. 40-60 days
- **Organic** forms pass to:
 - › Un-born babies
 - › Breast-fed babies



Toxic Metals: Mercury



- 2011** Canada proposes to ban manufacture, import and sale of products containing mercury
- 2006** European Parliament votes to ban mercury in home thermometers
- 1990** The EPA bans mercury from interior latex paint
- 1975** Canada stops production of mercury metal
- 1941** Fur and Felt industries ban mercury recognizing it as a source of occupational poisoning
- 1850s** Dentists begin using mercury in amalgam fillings
- 1750s** "Mad as a Hatter": Hat makers begin to use a mercury compound to cure pelts and gain reputation for neurotic behaviour

MERCURY

Toxic Metals: Mercury

HEALTH AND SAFETY

- Modern workplace controls
- Substitution for non-mercury and non-hazardous materials
- Emergency response necessary for spill response and clean-up



Toxic Metals: Mercury

ENVIRONMENT

- Mercury is regulated as a **hazardous waste**
- Recycling** is a very viable option
 - Liquid mercury
 - Mercury light tubes and bulbs
- Initiatives in Alberta have removed significant amounts of mercury from the waste stream

End-of-Life Facilities

Decommissioning, Abatement and Demolition

Hazardous Materials Primer

RADIOACTIVE MATERIALS

Radioactive Materials

A BRIEF HISTORY OF RADIATION

- ◉ **Uranium**, discovered 1789
- ◉ Named after the planet Uranus, Greek god of the sky, discovered 8 years earlier
- ◉ Used in biblical times as a glass colouring
- ◉ During Middle Ages, uranium was extracted from silver mines in Bohemia (now Czech Republic)
- ◉ In 19th century this remained the only mine for uranium, which was not considered dangerous
- ◉ **Radioactivity** was not discovered until 1896

Radioactive Materials

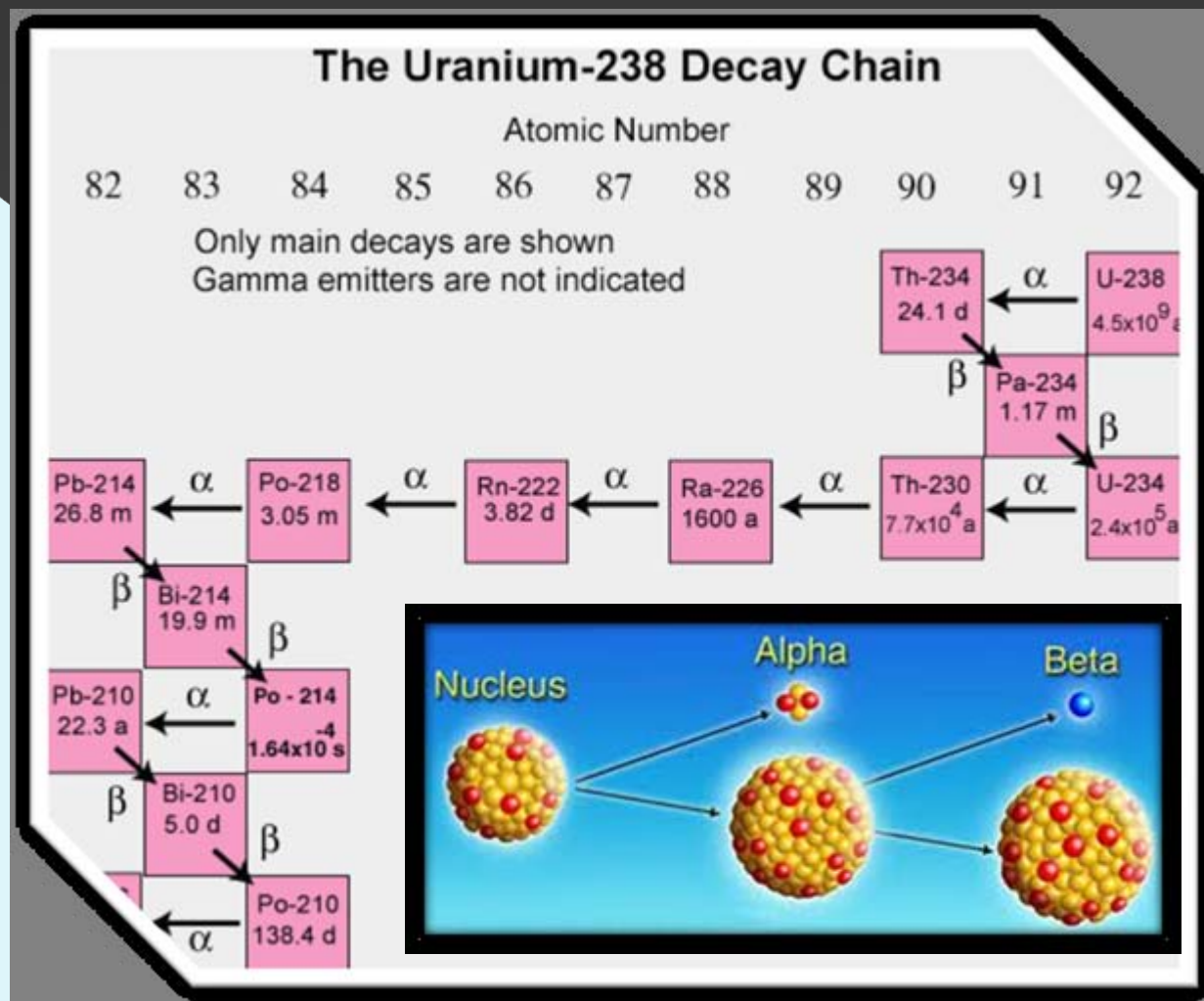
OTHER POINTS OF INTEREST

- ◉ Naturally occurring, formed in supernovae, its decay is thought to be one of the main sources of the earth's heat
- ◉ Historical uses
 - › Fission research
 - › Bombs
 - › Reactors
 - › Contamination (Cold War legacy)
- ◉ Relatively plentiful, more so than mercury or silver
- ◉ Canada mines ~ 20% of the world's uranium

Radioactive Materials

URANIUM DECAY

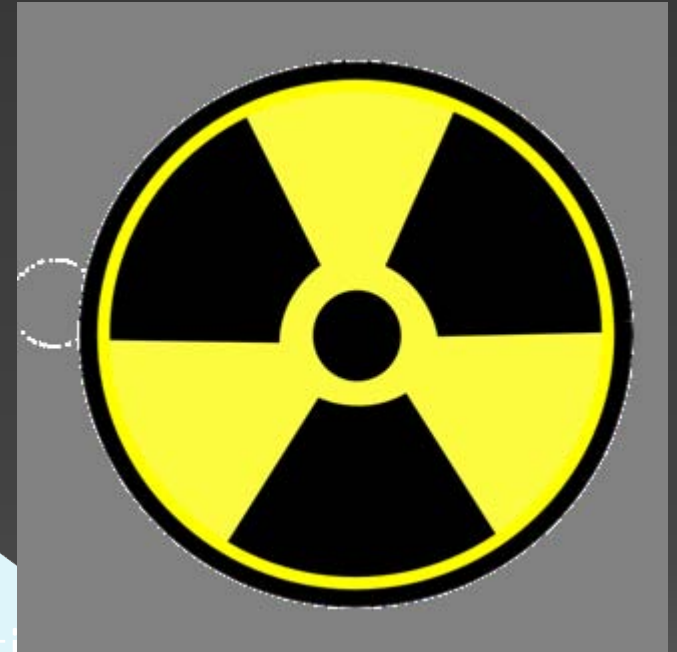
- Uranium-238
 - 4.5×10^9 a
- Radon-226
 - 1600 a
- Lead-210
 - 22.3 a
- Lead-206
 - STABLE



Radioactive Materials

COMMON USES

- ◉ Phosphate fertilizer production
- ◉ Nuclear test facilities
- ◉ Modern battlefields
- ◉ Coal-fired power plants
- ◉ Uranium mines or process facilities
- ◉ Homes above uranium deposits
- ◉ Natural gas processing facilities



Radioactive Materials

NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM)

- Radon gas contamination
- Most associated with Natural Gas Production and homes
- Lead-based scale precipitate forms within process pipes and equipment



Radioactive Materials

EXPOSURE

- ⦿ Elemental uranium is a toxic metal, accumulates in the liver, kidneys, bones and reproductive organs
- ⦿ Exposure occurs through:
 - › Inhalation of radioactive dust
 - › Ingestion of contaminated food and water
 - › Dust or contamination release alpha particles
- ⦿ Alpha particles cannot penetrate the skin, however... internal organs are susceptible

Radioactive Materials

HEALTH, SAFETY AND ENVIRONMENT

- ◎ *"Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM)"*, **Health Canada**, October 2000
- ◎ **Safe Handling**
 - › Identification
 - › Risk Assessment
 - › Worker protection
 - › Safe work procedures
- ◎ **Disposal**
 - › Decontamination
 - › Specialized disposal

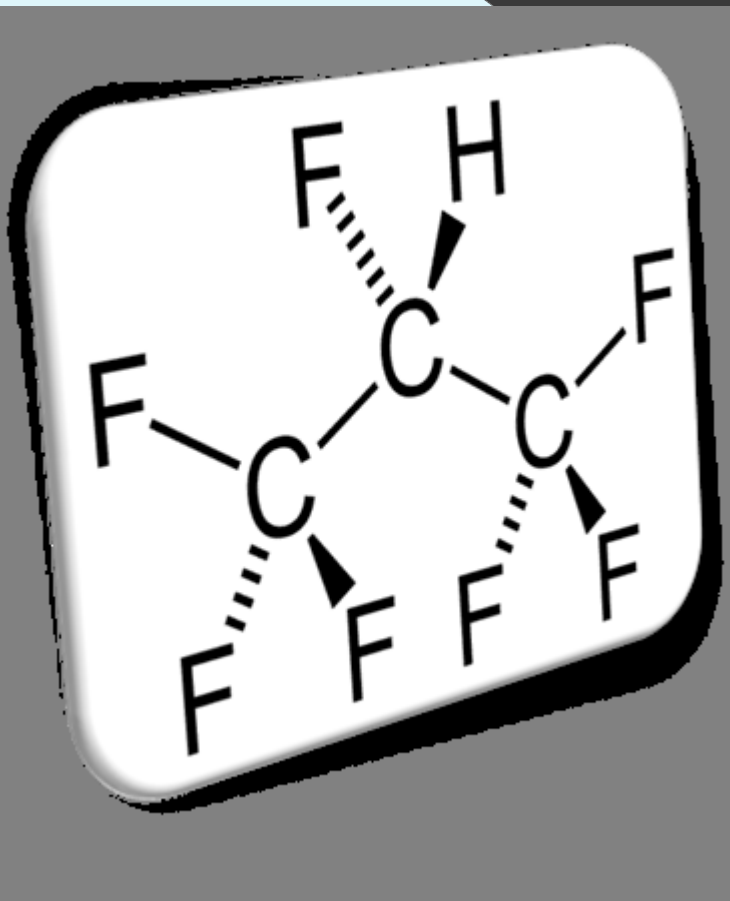
End-of-Life Facilities

Decommissioning, Abatement and Demolition

Hazardous Materials Primer

ORGANIC POLLUTANTS

Organic Pollutants



- Halogenated chemical compounds, i.e. containing **Chlorine, Fluorine, Bromine, or Iodine**
- A long list of chemicals, most are well known for:
 - Toxicity
 - Persistence
 - Bio-accumulation

Organic Pollutants

- ◉ We are primarily concerned with two forms:
 - Ozone-Depleting Substances (ODS)
 - Polychlorinated Biphenyls (PCB)

Organic Pollutants: Ozone-Depleting Substances

WHAT ARE ODS?

- › Chlorofluorocarbons (CFC)
- › Freons
- › Halons
- › Carbon Tetrachloride
- › Trichloroethane
- › Methyl Bromide
- Most are commercial refrigerants, propellants or blowing agents



Organic Pollutants: Ozone-Depleting Substances



DAMAGE TO THE OZONE LAYER

- ◉ Under close scrutiny since the early 1970s
- ◉ Depleted ozone layer
 - > Increased exposure to UV
 - > Vegetation and plankton damage
 - > Cataracts and skin cancer
- ◉ Media coverage of the "ozone hole" in 1985

Ozone-Depleting Substances (ODS)



STOP PRODUCTION

**RECOVER &
DESTROY**

EMISSIONS

- Global concern - release of halogenated hydrocarbons containing chlorine and bromine
- "Montreal Protocol on Substances That Deplete the Ozone Layer"
 - International treaty entered into force in 1989
 - Goal: recover ozone layer by 2050
 - 196 countries have ratified the treaty
 - One of the most successful international treaties in history

Ozone-Depleting Substances (ODS)

EXPOSURE

- ⦿ Primarily concerned with environmental damage
- ⦿ However, exposure a risk for a few that are toxic, causing headaches, tremors and liver damage
 - **Tetrachloride** – Used as a dry cleaning agent and in fire extinguishers as well as a refrigerant
 - **Trichloroethane** – A chlorinated solvent used in industry and production of other chlorinated compounds

Ozone-Depleting Substances (ODS)

HEALTH, SAFETY AND ENVIRONMENT

- ⦿ *"Ozone-Depleting Substances and Halocarbons Regulation"*, **Alberta Regulation** 181/2000
- ⦿ *"Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems"*, **Environment Canada**
- ⦿ *"Federal Halocarbon Regulations"*, 2003
 - › Prohibited charging w/ CFC as of 2005
 - › Will prohibit operation of CFC chillers after 2015

Organic Pollutants: Polychlorinated Biphenyls

WHAT ARE PCB?

- Chlorinated benzene compounds
 - > **Synthetic** organic chemicals
 - > Chemically stable and **inert**
 - > Resistant to fire, thermal breakdown
 - > Resistant to chemicals
 - > Low electrical conductivity
 - > Readily **dissolve** in organic compounds
 - > Increases chemical stability, operational safety and durability



Organic Pollutants: Polychlorinated Biphenyls

COMMON USES

● Additive to oils

- › Dielectric fluids
- › Wet transformers
- › Lamp ballasts
- › Plasticizers
- › Hydraulic fluids

● Other applications

- › Lubricants, cutting oils
- › Caulking, adhesives, sealant
- › Ink solvents
- › Flame retardants



Polychlorinated Biphenyls (PCB)



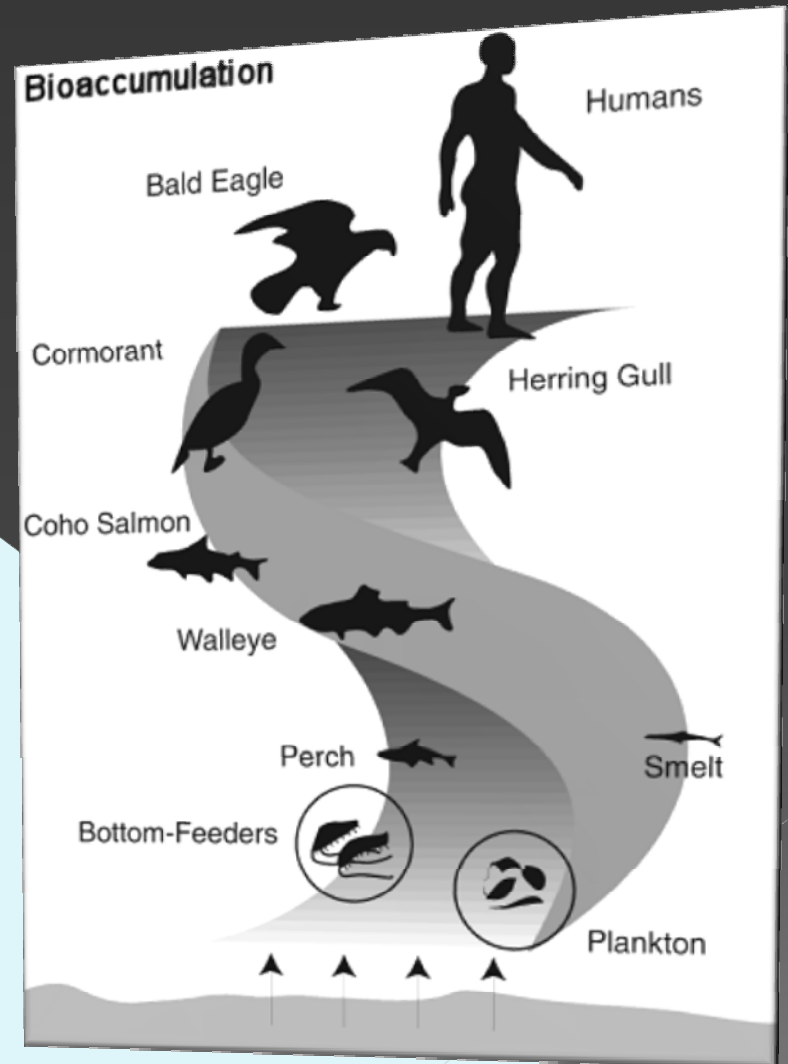
RELEASE AND EXPOSURE

- Accidents
- Poor storage and disposal
- Industrial emissions
- Easily distributed
- Stored in fatty tissues
- Long list of health effects
- Probable human carcinogen

Polychlorinated Biphenyls (PCB)

ENVIRONMENTAL IMPACTS

- Persistent organic pollutant
 - Extremely stable
 - Bio-accumulates
- PCBs and PCB mixtures are toxic – health effects at **low levels of exposure**
- Most **widespread** pollutants
- In our air, water, soil, food



Polychlorinated Biphenyls (PCB)

WORLDWIDE INITIATIVES

- United Nations Environment Program (UNEP)
 - “Guidelines for the Identification of PCBs and Materials Containing PCBs”, UNEP
- One of 12 persistent organic pollutants identified by the UNEP which include:
 - PCBs
 - Dioxins and furans
 - DDT
 - Heptachlor



Polychlorinated Biphenyls (PCB)



REGULATORY CONTROLS

- PCBs in use since the 1940's
- Banned in 1977
- Storage regulations in 1992
- Manufacture of them has ceased, but still exist in storage or use
- Provincial Waste Control and Federal PCB Regulations



Organic Pollutants

HEALTH, SAFETY AND ENVIRONMENT

- ⦿ Prevent release
- ⦿ Identify, manage and eliminated sources
- ⦿ Control spills
- ⦿ Capture
- ⦿ Destroy or recycle



End-of-Life Facilities

Decommissioning, Abatement and Demolition

Hazardous Materials Primer

FIBROUS or CRYSTALLINE MINERALS

Fibrous or Crystalline Minerals

CRYSTALLINE SILICA (Si)

- Carcinogenic substance
- Concrete and ceramics



ASBESTOS-CONTAINING MATERIALS (ACM)

- Carcinogenic substance
- Insulation and building materials



Fibrous or Crystalline Minerals

SAFETY CONCERNS

- Asbestos is #1 cause of occupational disease, accounting for ~ 70% of annual fatalities
- Silica is #3 at ~ 5%
- Well documented causes of permanent lung damage and **fatal disease**
 - Asbestosis and Silicosis
 - Lung Cancer
 - Mesothelioma (**Asbestos Only**)

Fibrous or Crystalline Minerals

Occupational Disease Fatalities Accepted by the WCB, by Source of Disease – Alberta: 2006-2010

Source of Fatality	2006	2007	2008	2009	2010	Number of Fatalities	%
Persons, Plants, Animals or Minerals	48	54	54	40	45	241	82.8%
Asbestos	40	47	48	39	39	213	73.2%
Silica*	4	3	2	1	3	13	4.5%
Coal Dust	1	0	1	0	1	3	1.0%
Grain Dust	2	2	1	0	1	6	2.1%
Other Persons, Plants, Animals or Minerals	1	2	2	0	1	6	2.1%
Chemicals and Chemical Products	4	9	7	7	7	34	11.7%
Smoke and Fumes	3	2	2	1	1	9	3.1%
Other Chemicals	1	7	5	6	6	25	8.6%
Unknown	0	0	2	0	8	10	3.4%
Other	2	0	0	2	2	6	2.1%
Total	54	63	63	49	62	291	100.0%

*Gravel Dust.

Data Source: WCB Data, Prepared by Data Development and Evaluation

Asbestos
~ 70%

Asbestos-Containing Materials

WHAT IS ASBESTOS?

- Natural, fibrous mineral

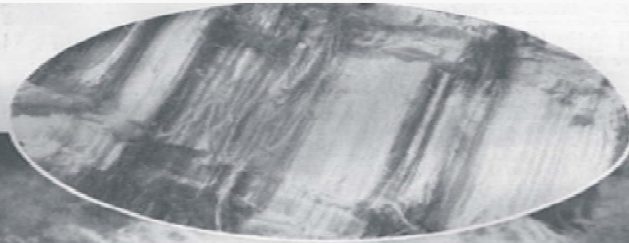


PROPERTIES

- Incombustibility
- Strength
- Flexibility
- Resistant to:
 - Chemicals
 - Electricity

**Binds and Reinforces
Other Materials**

AT THE RIGHT we see asbestos in its original form. This dense, rocklike substance, mined by Johns-Manville, is the raw material for some of the most useful products known to mankind. BELOW is a handful of this same mineral, fluffed out into white, silklike fibres.



*The magic mineral-***ASBESTOS**

Johns-Manville

Controls HEAT, COLD, SOUND, MOTION



Quilted

ASBESTOS MITTS

... they last twice as long

These asbestos mitts for handling hot metal molds and shapes are reversible to fit either hand. Both sides quilted, won't shred or fray on rough, jagged material. Double wear, double life. Wool lined. All seams double stitched. The answer to troublesome problems. \$2.20 a pair. Discounts for quantities. One of 4300 production-speeding, time-saving safety

gloves, aprons, sleeves, spats, etc. Write for *Free* catalog.

INDUSTRIAL GLOVES CO.

6547 Garfield Blvd., Danville, Ill.
(In Canada: Safety Supply Co., Toronto)



MORE SCIENTISTS AND EDUCATORS SMOKE KENT with the Micronite Filter than any other cigarette!

SMOKE COMPARISON BY
INDEPENDENT RESEARCHERS

Brand	tar	nicotine
KENT	11 mg.	0.9 mg.
Winston	12 mg.	1.0 mg.
Camel	13 mg.	1.1 mg.
Marlboro	14 mg.	1.2 mg.
Filter 100	15 mg.	1.3 mg.
Filter 100 Lights	16 mg.	1.4 mg.
Filter 100 Lights	17 mg.	1.5 mg.
Filter 100 Lights	18 mg.	1.6 mg.
Filter 100 Lights	19 mg.	1.7 mg.
Filter 100 Lights	20 mg.	1.8 mg.

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Filter 100 Lights	17 mg.	1.5 mg.
Filter 100 Lights	18 mg.	1.6 mg.
Filter 100 Lights	19 mg.	1.7 mg.
Filter 100 Lights	20 mg.	1.8 mg.

"KENT is my favorite, too."

BOB COUSE
Former All-STAR guard
of the Boston Celtics



Asbestos-Containing Materials

ASBESTOS BUILDING

TYPICAL LOCATIONS FOR THE MOST COMMON ASBESTOS-CONTAINING MATERIALS

KEY

ROOF AND EXTERIOR WALLS

- 1 Roof sheets and tiles
- 2 Guttering and drainpipe
- 3 Wall cladding
- 4 Soffit/fascia boards
- 5 Panel beneath window
- 6 Roofing felt and coating to metal wall cladding

BOILER VESSELS AND PIPEWORK

- 7 Lagging on boiler, pipework, calorifier etc.
- 8 Damaged lagging and associated debris
- 9 Paper lining under non-asbestos pipe lagging
- 10 Gasket in pipe and vessel joints
- 11 Rope seal on boiler access hatch and between cast iron boiler sections
- 12 Paper lining inside steel boiler casing
- 13 Boiler flue

CEILINGS

- 14 Spray coating to ceiling, walls, beams/columns
- 15 Loose asbestos in ceiling/floor cavity
- 16 Tiles, slats, canopies and firebreaks above ceilings
- 17 Textured coatings and paints

INTERIOR WALLS/PANELS

- 18 Loose asbestos inside partition walls
- 19 Partition walls
- 20 Panel beneath window
- 21 Panel lining to lift shaft
- 22 Paneling to vertical and horizontal beams
- 23 Panel behind electrical equipment
- 24 Panel on access hatch to service riser
- 25 Panel lining service riser and floor
- 26 Heater cupboard around domestic boiler
- 27 Panel behind/under heater
- 28 Panel on or inside, fire door
- 29 Bath panel

FLOORING MATERIALS

- 30 Floor tiles, linoleum and paper backing, lining to suspended floor

AIR HANDLING SYSTEMS

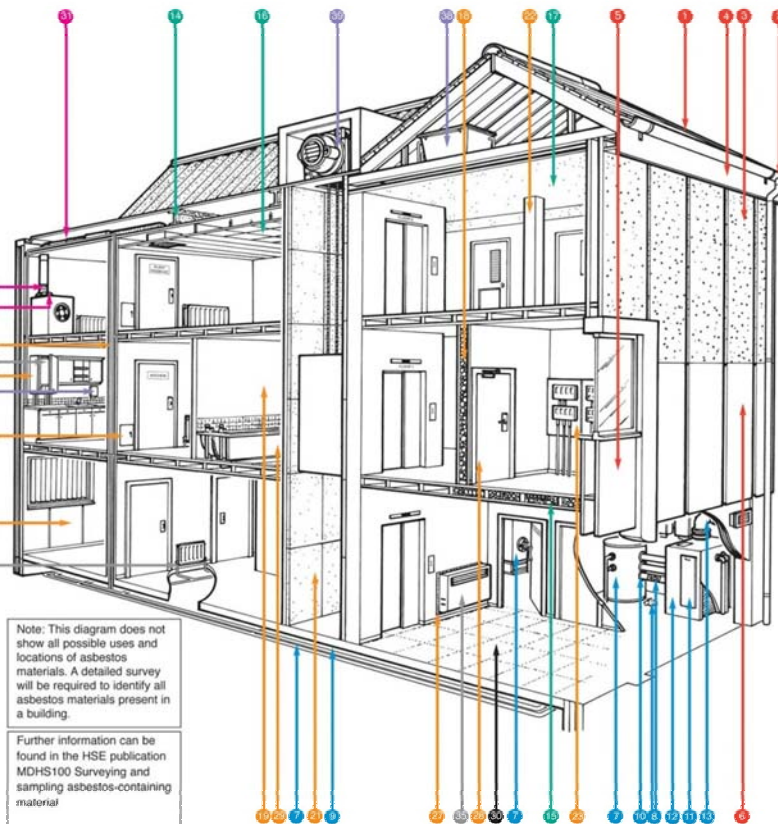
- 31 Lagging
- 32 Gaskets
- 33 Anti-vibration gaiter

DOMESTIC APPLIANCES

- 34 Gaskets, rope seals and panels in domestic boilers
- 35 'Caposil' insulating blocks, panels, paper, string etc in domestic heater
- 36 String seals on radiators

OTHER

- 37 Fire blanket
- 38 Water tank
- 39 Brake/clutch lining



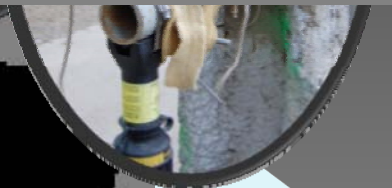
COMMERCIAL AND RESIDENTIAL USES

- Spray-Applied Fireproofing
- Plaster
- Texture Coats
- Drywall Joint Compound
- Mortars
- Vinyl Floor Tiles
- Vinyl Sheet Flooring

Asbestos-Containing Materials

INDUSTRIAL USES

- Pipe and Vessel Insulation
- Insulating Blocks and Cement
- Gaskets
- Mastic and Adhesive
- Conduit Seal Compound
- Tracer Line Wraps



Asbestos-Containing Materials



FRIABLE

- Crumbles by hand
- Easily releases dust
- Serious exposure hazard

NON-FRIABLE

- Resin or polymer binders
- Does not break down
- Minimal exposure risk



Asbestos-Containing Materials

ASBESTOS VIDEOS

Rick Mercer Rant

<http://www.youtube.com/watch?v=ZGBhZLx84uI>

Exporting an Epidemic

<http://www.youtube.com/watch?v=xR60m3ICTUU&feature=related>

Asbestos-Containing Materials

HEALTH, SAFETY AND ENVIRONMENT

◎ Safe Handling

- › Identification and Management
- › Risk assessment
- › Worker protection
- › Safe work procedures and Worker Protection

◎ Disposal

- › Decontamination
- › Packaging and Transport
- › Landfill



Hazardous Materials Workshop

Activity #2: What HazMat will you encounter?

- **Are any of the following at your facility?**
 - Asbestos
 - Lead
 - Mercury
 - Radioactive Materials
 - Ozone-Depleting Substances
 - Polychlorinated Biphenyls
- **Are there any you aren't sure of?**
- **How are these materials currently being managed?**

Asbestos - YES

Mercury??? - Check with electricians

PCBs - Need to check records (Yes)

Lead Paint - likely, check with HSE

ODS - air conditioning, refrigerant systems?

Others??? - **Need HELP**

Current Management

HSE has asbestos management plan

Asbestos Contractor

PCB waste w/ Environmental rep

End-of-Life Facilities

Decommissioning, Abatement and Demolition

Part 2

Hazardous Materials Management

Hazardous Materials Management

PROJECT PLANNING

- ⦿ Planning is an essential component of all phases that cannot be overlooked
- ⦿ Planning for large-scale projects may take years and must involve:
 - › Identifying goals, objectives and challenges
 - › Developing work plans and procedures
 - › Meeting regulatory and permitting requirements
 - › Establishing project teams

Hazardous Materials Management

EOL ACTIVITIES

1. Facility Shutdown
2. Decommissioning
3. **Hazardous Materials Assessment and Abatement**
4. Demolition
5. Abandonment and Reclamation



Hazardous Materials Workshop

Activity #3: EOL Activities

- **What EOL activities will impact your work?**
 - Shutdown
 - Decommissioning
 - Hazardous Materials Assessment and Abatement
 - Demolition
 - Abandonment and Remediation
- **How will these activities be undertaken?**
- **Are stakeholders involved?**

What I Need to DO

IDENTIFY all HazMat

Hire a Qualified Contractor

Tender and Oversee the work

Dispose of waste

Management Team IDEAS?

Operations?

Site Supervisor?

Consultant?

Stakeholder meetings...

...need to be

ORGANIZED

End-of-Life Facilities

Decommissioning, Abatement and Demolition

Hazardous Materials Management

HAZARDOUS MATERIALS ASSESSMENT

Preliminary Steps

INITIAL SITE REVIEW AND ASSESSMENT

- Compile existing or historical data
- Interview key personnel
- Identify and evaluate gaps in information



Preliminary Steps



INTEGRATE WITH PROJECT MANAGEMENT TEAMS

- Hazardous materials during decommission work
 - › Asbestos, Lead, Mercury, ODS, PCB
 - › Controlled products
 - › Process-related substances
 - › Other hazards
 - › Impacts on further assessment
- Schedule and plan for a “**Pre-Demolition Hazardous Materials Survey**”

Pre-Demolition Survey



Identify and **Quantify**

GOALS / OBJECTIVES

- **Asbestos and Non-Asbestos**
 - Insulating materials
 - Other building materials
- **Lead**
 - Lead-based paint
 - Lead flashing and other products

Pre-Demolition Survey

ASBESTOS IDENTIFICATION

- Visual Confirmation
 - **Unreliable**
 - Some exceptions
- Bulk sampling
 - Laboratory analysis required
 - Measured in percent (%) asbestos by weight
 - 1% or more are ACM



Pre-Demolition Survey



Pre-Demolition Survey

LEAD IDENTIFICATION

- X-Ray Fluorescence
 - **Specialized equipment** and training required
 - Instant results
 - Measured in mg / cm²
- Scrape samples
 - Laboratory analysis required
 - Measured in mg / kg



Pre-Demolition Survey



IDENTIFY AND QUANTIFY OTHER MATERIALS

- Mercury
- Naturally Occurring Radioactive Materials (NORM)
- Ozone Depleting Substances (ODS)
- Polychlorinated Biphenyls (PCB)
- Crystalline Silica

Pre-Demolition Survey

OTHER CONSIDERATIONS

◉ Biological Hazards

- › Fungi, Viruses, Bacteria
- › Individuals with suppressed immune systems, elderly or young
- › Can be serious or fatal
- › Exposure can cause sensitization and increased reactions in future



Pre-Demolition Survey

Controlled Products or Process-Related Substances

- › Raw Product (e.g. Hydrocarbons, Minerals)
- › Process-Related Chemicals (e.g. Ammonia, Glycol)
- › Operational Products (e.g. Oils, Lubes, Treatments)

Contaminants

- › Benzene
- › Hydrogen Sulphide
- › Poly-Aromatic Hydrocarbons
- › Sulphur
- › Coal Dust



Pre-Demolition Survey



SURVEY TECHNIQUES

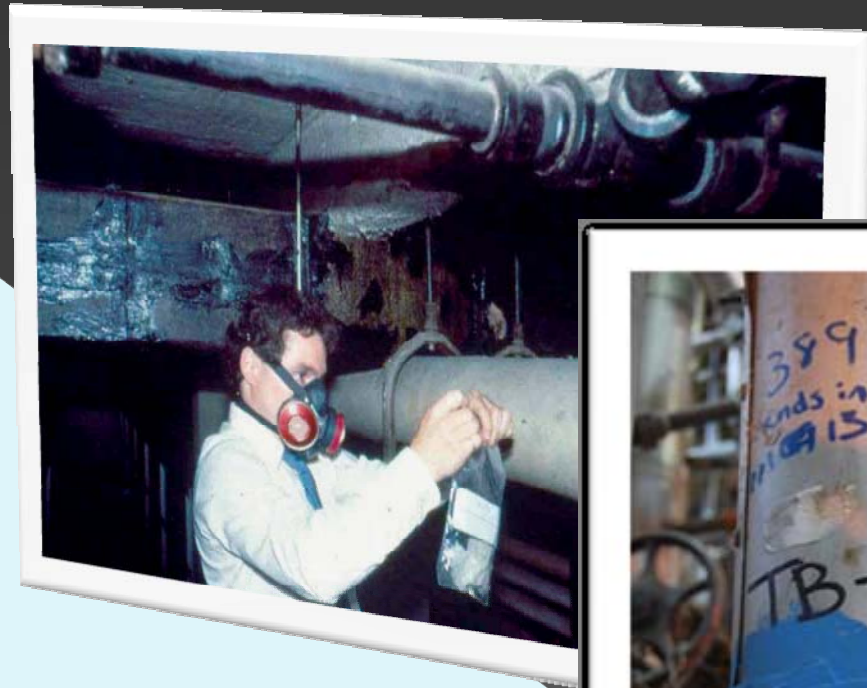
- Working Safely
 - › Assess and control hazards
 - › Isolate the work area
 - › Protect the workers
 - › Minimize disturbance
 - › Ensure proper cleanup



Pre-Demolition Survey

SURVEY ACTIVITIES

- Site inspection
- Documentation
- Numbering
- Labeling
- Sample collection
- Reporting





Hazardous Materials Workshop

Activity #4: Site Survey

- Who can you rely on for:
 - Providing information on existing hazardous materials?
 - Assessing suspect materials?
- What is the current management team?
- When will you schedule the survey?
- What other activities are going on at the time?

SURVEY RESOURCES

- Environmental specialist
- HSE coordinator
- Documents department
- Asbestos Consultant

Other Considerations:

- Site HAZARDS
 - Contaminants
 - Physical conditions
- Weather / Temperature
- Other Contractors or Work

WHEN to
schedule site
survey???

End-of-Life Facilities

Decommissioning, Abatement and Demolition

Hazardous Materials Management

HAZARDOUS MATERIALS ABATEMENT

Preliminary Steps

DEFINE THE SCOPE OF ABATEMENT WORK

- ⦿ Compile assessment information and results
- ⦿ Determine project:
 - > Requirements
 - > Limitations
 - > Specifications
- ⦿ Pre-qualify Contractors
- ⦿ Management Teams



Preliminary Steps



CONTRACTOR SELECTION PROCESS

- Determine evaluation criteria
 - > Price
 - > Safety
 - > Technical
- Tender Documents
- Evaluate and Select
- Execute the contracts

Abatement

ABATEMENT ACTIVITIES

- Mobilize
- Setup of work area
- Removal
- Disposal
- Teardown
- Demobilize



Abatement

WORK PROCEDURES

- ⦿ Isolate the area
- ⦿ Protect workers
- ⦿ Minimize disturbance
- ⦿ Decontaminate







Quality Assurance

SAFE WORK INSPECTIONS

- Adherence to procedures
- Use of protective equipment



AIR MONITORING

- Personal exposures
- Area testing
- Laboratory analysis



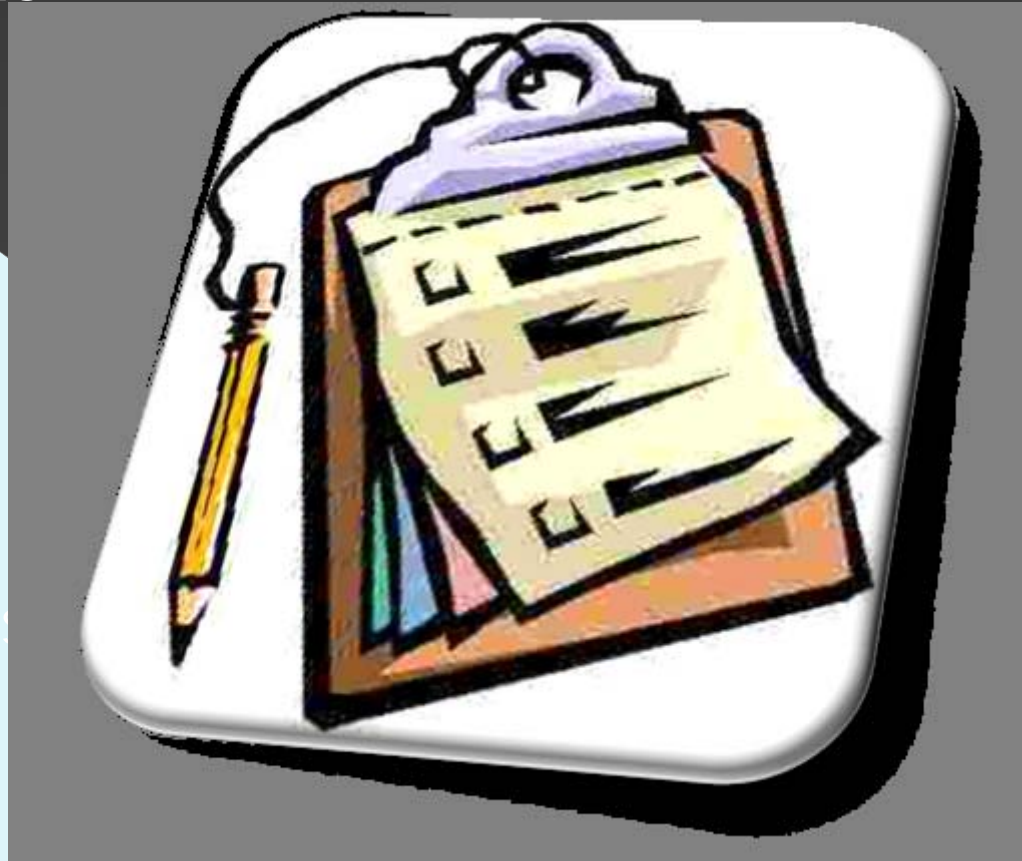
Quality Assurance

MILESTONE INSPECTIONS

- Pre-Contamination
- Clearance
- Completion

REPORTING

- Inspection Results
- Air Monitoring Results
- Final / Completion Report



Hazardous Materials Workshop

Activity #5: Abatement Work

- What is the pre-qualification process for Contractors?
- What Contractors are active in my area?
- Where can I dispose of waste?
- Who will I get to manage, inspect and monitor the work?

Contractors -

Asbestos

Scaffolding

Trucking

Landfill

OPTIONS???

Health and Safety???

Inspections?

Samples??

Lab???

End-of-Life Facilities

Decommissioning, Abatement and Demolition

Closing

EOL Facilities

Workshop

Hazardous Materials Workshop

Activity #6: Process Flow Chart

- **End-of-Life Activities**
- **Planning and Execution**
- **Management Teams**
- **Owner Responsibilities**
- **Contractor Activities**
- **Consultant Inspection / Monitoring**
- **Reporting**



Facility Decommissioning, Abatement and Demolition

QUESTION AND ANSWER PANEL

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