

 **PINCHIN & AFFILIATES**

- A leader in engineering, environmental health & safety solutions
- Multi-disciplinary approach by highly qualified, experienced professionals
- Established in 1981; over 300 employees
- Part of the Pinchin Group of Companies, a national network of over 35 offices with over 700 staff



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WHAT'S NEW IN: HAZARDOUS MATERIALS?



- British Columbia lowered the ACM limit from 1% to 0.5% (2012)
- Nova Scotia issued revised Guidelines for Assessment, Management and Removal of Asbestos (late 2013)
- Quebec issued a **major** change to asbestos regulations requiring management surveys and pre-construction surveys (2013)
- Ontario MOL and the MOE are more active in enforcement of regulations (charges for lack of reassessments, demolition without removing all ACM, work on ceiling tiles, improper disposal of ACM)
- Ontario MOL have issued orders regarding lead using Health Canada Recommended level of 90 ppm (0.009%). Unknown level of enforcement. This level has recently been adopted in BC



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WHAT'S NEW IN: MOULD & IAQ



- Decreased residential coverage and limits for mould caused by water leaks or rising water. Homeowners beware!
- Greatly increased concern over Legionella in cooling towers and potable water
- Regulations or bylaws issued by Quebec and Hamilton related to cooling tower maintenance
- PWGSC and several national clients are performing Legionella Risk Assessments or developing management programs
- Several Canadian laboratories now accredited by the US Centers for Disease Control for Legionella (ELITE)



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WHAT'S NEW IN: RADON

- Radon in buildings is the 2nd leading cause of lung cancer
- Health Canada and WHO reduced exposure limits by 4-8 times. Many more buildings will exceed the new levels
- Radon now covered by Tarion Warranty for new homes
- Quebec - mandatory testing of all school rooms (many US states have radon testing programs)
- Certification program for Radon Measurement and Mitigation via Canadian Association of Radon Scientists and Technologists (CARST)



WHAT'S NEW IN: OCCUPATIONAL HEALTH & SAFETY



- Working at Heights mandatory training introduced. Training service provider standard currently under review
- Worker and Supervisor Health and Safety Awareness Training mandatory by July 2014. Available free on-line, takes about one hour
- No major changes but the Ontario Confined Space Regulation amendments have made Confined Space programs difficult to establish and maintain BUT has more clearly defined these spaces (eliminating many from the inventory)



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WHAT'S NEW IN: EMISSIONS & REGULATORY COMPLIANCE



- Toxics Reduction Act – Bulk of planning is now complete. Ongoing progress reporting and plan updates
- MOE very active with inspections. Targeting companies that reported to NPRI but missed toxics
- New air standards and emission models coming - 2016 and 2020. Time to assess compliance is now
- New Environmental Activity and Sector Registry (EASR) legislation expected this year. Changes will greatly benefit building owners and property managers – little relief for industry
- Residential infill and rezoning creating problems for industry. Must act before rezoning complete. First one there is irrelevant



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WHAT'S NEW IN: ENVIRONMENTAL DUE DILIGENCE & REMEDIATION



- Ontario Brownfield Regulation has significantly reduced the allowable contaminant concentrations in soil and water for some sites (namely Table 3 – non-potable groundwater)
- This has led to a significant increase in Risk Assessments (rather than attempting to totally clean the site to these new standards). Biggest impact in Toronto
- New regulation has also changed some sensitive sites to non-sensitive sites (which actually raised the acceptable standards)
- Risk Assessments and Records of Site Condition now being accepted by most lenders



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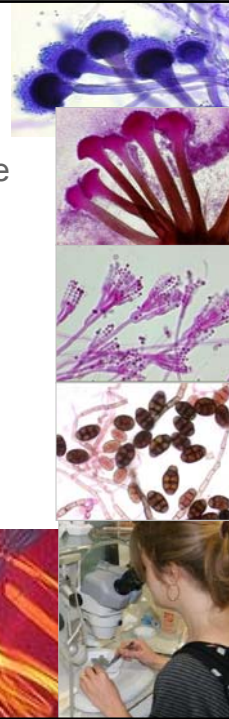
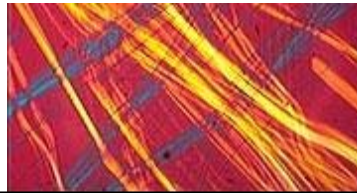
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STATE-OF-THE-ART LABORATORIES

Reliable, confidential results in our lab or on site

- NVLAP accreditation for asbestos (1 of only 6 Canadian labs)
- AIHA accreditation for moulds & bacteria
- Lead in paint, air & bulk samples
- Legionella – CDC ELITE certification
- MOE Approved Odour Lab



WHAT'S NEW IN: BUILDING SCIENCE

- Quebec regulation (2013) requires extensive testing of parking garages and building cladding subsequent to initial construction and on an ongoing basis
- Significant increase in change of use conversions (i.e. storage basements, malls and warehouses converted to office or residential) which pose additional building science challenges
- Building Optimization - Re/Retro/New Construction – Commissioning more common (primarily in government) and has started to include static testing of the building envelope
- OBC, 2012 – Greater emphasis on thermal bridging and glazing for improved Energy Efficiency



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TRAINING SERVICES

- Custom-designed or open training courses on wide variety of EHS topics: training by experts
- At Pinchin or in-service sessions at your office
- Complimentary breakfast sessions



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CONTINUING EDUCATION POINTS FOR THIS COURSE

- CEU points granted by:
 - American Board of Industrial Hygiene
 - Board of Canadian Registered Safety Professionals
 - Canadian Registration Board of Occupational Hygienists
 - Registered Insurance Brokers of Ontario
 - Canadian Institute of Public Health Inspectors
 - Institute of Inspection, Cleaning & Restoration Certification (IICRC)



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TRAINING OUTLINE

- Introduction
- Uses of lead and sources of contamination
- Health effects
- Regulations & Guidelines



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Four Faces of Lead in Buildings





1. DAILY MANAGEMENT OF LEAD PAINT IN OLDER BUILDINGS

- Building paints contained high levels of lead prior to 1940's. Government, residential, commercial
- Now a concern in older buildings for protection of children, strong US regulations (HUD/EPA)
- Canadian landlords of older housing may wish to protect occupants to US regulations
- May be a concern in restoration of historic buildings



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2. CONSTRUCTION DISTURBANCE OF LEAD PAINT OR OTHER LBMS

- Lead architectural paint in offices, homes, institutions
- Rust-resistant coatings in factories, structural steel, etc.
- May also be present as lead sheeting, in mortar, etc.
- The Manitoba Guideline for Working With Lead is currently under review by Manitoba Workplace Safety and Health
- Ontario Ministry of Labour has issued guidelines for disturbance on construction projects
- Abrasive blasting is an especially risky operation
- Detailed US OSHA regulation



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3. CLEAN-UP OF LEAD IN BROWNFIELD FACILITIES

- Clean-up of factories that had used lead, firing ranges, etc.
- Combination of cleaning and encapsulating



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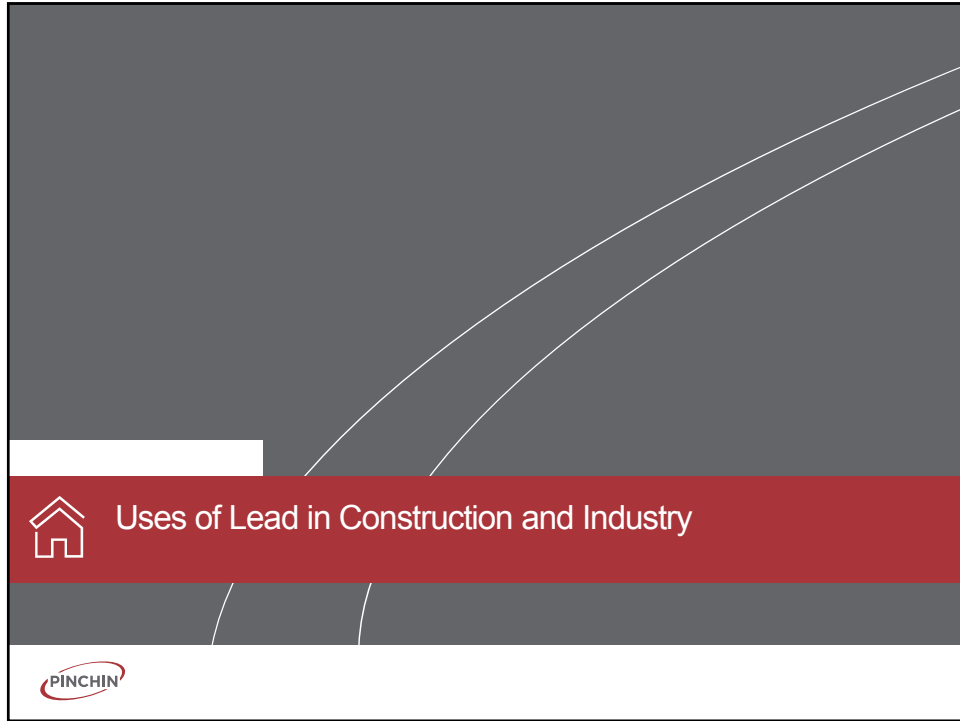
4. INDUSTRIAL HYGIENE LEAD SERVICES

- Control of worker safety in lead-using industries (soldering, firing ranges, metal working, foundries, etc.)



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PROPERTIES OF LEAD, PB

- One of the most abundant heavy metals in earth's crust
- An element, cannot be created or destroyed
- Dense (about 11 times heavier than water)
- Water-resistant
- Malleable, ductile
- Low-melting (327 °C, 621 °F)
- Electrochemically protects iron from corrosion
- Known as a poison since ancient Roman times



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HISTORIC ARCHITECTURAL PAINTS

- 1880's to 1940's, US and Canada, lead oxide present in paint as hyde (opacity of paint), also to improve rot resistance
- Some lead in paint until 1976, for colour
- Hazard if in poor condition or during renovations
- Children and fetus at greatest risk
- Very detailed US Housing and Urban Development (HUD) and EPA regulations



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CANADIAN LIMITS ON LEAD IN PAINT

- 1976: Canada limited lead in interior consumer paint to 0.5%. No restriction on exterior, industrial, commercial paint
- 1991: Canadian Paint and Coatings Association initiated voluntary program to limit all Canadian manufacturers of consumer paints, to 0.06%. Over 90% of paint sold to consumers in Canada at that time came from CPCA member firms
- 2005: Health Canada's *Surface Coating Materials Regulations* limited lead in consumer paints, enamels and other surface coating materials to 0.06%
- Still no restriction on industrial and commercial coatings. Check the SDS

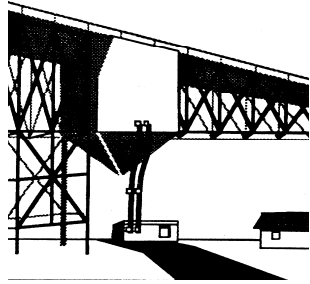


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RUST-INHIBITING PAINTS



- 10-40% in paint on automobiles, bridges, water towers, industrial equipment, marine
- Still in limited production
- Abrasive blasting, flame-cutting, etc. can produce very high exposures
- Environmental protection important during paint removal to minimize spread to surrounding surfaces
- Strong US OSHA regulations
- US Society for Protective Coatings (SSPC) is lead trade association



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INDUSTRIAL USES OF METALLIC LEAD

- Solder (electronics & electricity, tin cans until 1980's, eavestroughs, body filler, etc.)
- Sheetting for acoustic insulation
- Corrosion-resistant coatings in industrial vessels
- Bullets, pellets, fishing sinkers
- Ballast
- Radiation shielding
- Masonry plugs for fasteners
- Glazes, ceramics



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POINTING MORTAR

- Pointing mortar:
 - 5-10% lead, added to whiten mortar, common trade practice
 - 45% crystalline silica
- Restoration work (cutting, grinding, chisel removal of mortar) can produce very high lead and silica exposures and contaminate the surrounding area



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LEADED GASOLINE

- Tetraethyl lead added as anti-knock ingredient until Canada began to phase out in 1980's
- Resulted in widespread contamination of air, soil, in cities. For example, in 1975, airborne dust in Windsor averaged 2% or 20,000 ppm lead
- Not unusual to find in older buildings, settled dust lead concentrations of 1,000 – 3,000 $\mu\text{g}/\text{ft}^2$, without any interior source being present




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HEALTH EFFECTS OF LEAD EXPOSURE

- Understanding the Routes of Entry
- How lead poisoning can affect the body
- Signs and symptoms of lead poisoning
- How lead is measured in the body

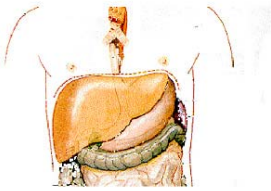


ROUTES OF ENTRY

Lead predominantly enters the body in two ways...




It can be inhaled (inhalation)



It can be swallowed (ingestion)

It can also enter the body through....?



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INHALATION

- Manitoba Occupational Exposure Limit and ACGIH TLV for airborne lead exposure for adults is $50 \mu\text{g}/\text{m}^3$, averaged over 8 hours
- Inhalation not a concern from household contact, even contact with very dirty surfaces. Not readily airborne once deposited on a surface
- However, very high levels during welding, cutting, abrasive blasting (up to 1000X limit)



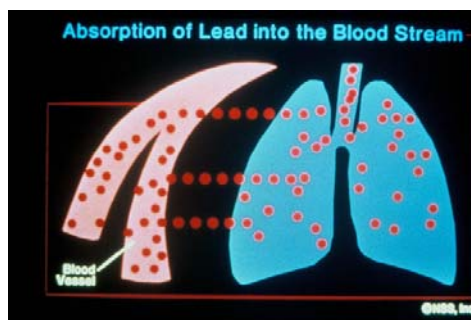
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ABSORPTION FROM INHALATION

- Body absorbs ~50% of airborne lead dust particles
- However, 90% of finely divided dust and lead fume (dust produced by heat) is absorbed



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INGESTION

- The body absorbs and transports lead like calcium
- Major route of entry for children in household contact. Children eat ~ 200 mg of dust per day and absorb 50% of ingested lead
- Adults absorb 10% of ingested lead dust (still eat ~100 mg per day!)
- Pregnant women absorb 50% of ingested lead dust



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POTENTIAL WORKER EXPOSURE FROM POOR HYGIENE

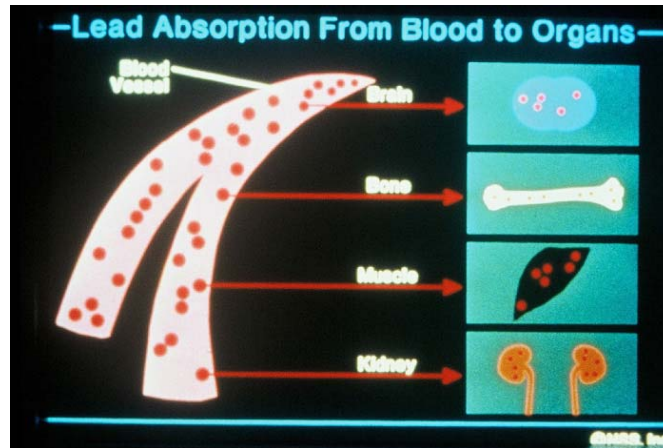


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ABSORBED LEAD CIRCULATES TO VARIOUS ORGAN SYSTEMS



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STORAGE OF LEAD

- Bones: 94% of body burden, stored for 27 years
- Blood: 4% of body burden, stored for 27-36 days
- Soft tissues: 2% of body burden, stored for 30-40 days



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LEAD POISONING IN ADULTS

- Nervous system
 - Permanent nerve damage, tremors, irritability, depression, death
- Marrow
 - Anemia, high blood pressure
- Kidneys
 - Kidney damage, kidney failure
- Male and female reproductive health
 - Infertility, spontaneous abortion, birth defects, sexual dysfunction



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SIGNS AND SYMPTOMS OF LEAD POISONING

- Tiredness or fatigue
- Dizziness
- Irritability
- Headaches
- Forgetfulness
- Numbness of limbs
- Depression
- Difficulty concentrating
- Sleep deprivation
- Nervousness
- Wrist or foot drop
- Weakness
- Clumsiness
- Joint and muscle pain
- Vomiting
- Loss of appetite
- Stomach aches
- Constipation
- Metallic taste in the mouth
- Reproductive problems



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MEASURING LEAD IN THE BODY

- Blood tests show how much lead the worker has absorbed over the last 6 - 8 weeks. Blood testing will not tell how much lead the body has absorbed in the long term (i.e. body burden) but does indicate how much is circulating at that time
- Results are expressed in terms of micromoles per litre ($\mu\text{mol/L}$) in Canada, micrograms per 100 cc ($\mu\text{g/dL}$) in US regulations
- Current maximum acceptable blood level: 1.5 $\mu\text{mol/L}$ (30 $\mu\text{g/dL}$), set by American Conference of Governmental Industrial Hygienists (ACGIH). This is the limit recognized in the Manitoba Guidelines



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Regulatory Requirements





CANADIAN FEDERAL ACTS AND REGULATIONS

Many environmental regulations to prevent discharge of lead into waterways or the air. Important for lead paint projects that might impact the natural environment (i.e., outdoor blasting)

- ENVIRONMENT PROTECTION ACT
- NAVIGABLE WATER PROTECTION ACT
- FISHERIES ACT
 - “Depositing or permitting the deposit of a deleterious substance into waters frequented by fish or in an area where such a substance may enter any such water is prohibited.”



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PROVINCIAL REGULATIONS & GUIDELINES

- Workplace Safety and Health Act W210
- Workplace Safety and Health Regulation 217/2006
- A Guideline for Working With Lead (August 2002)



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APPLICATION

- Regulation applies to every employer and worker at a work place where lead is present, processed, used, handled or stored **and** at which a worker is likely to inhale, ingest or absorb lead



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DUTIES OF EMPLOYER

- Take every measure so that airborne lead concentrations do not exceed occupational exposure limit (OEL) of 50 $\mu\text{g}/\text{m}^3$, or in the case of tetraethyl lead, 100 $\mu\text{g}/\text{m}^3$
- Respirators can only be used to limit exposures to below the OEL when:
 - An emergency exists, or
 - Measures to limit exposure are unavailable or reasonable for the length of or frequency of exposure, or
 - Measures are not available due to temporary breakdown



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DUTY TO ASSESS

- When concentrations of lead are, or are believed to be, above an action level of $25 \mu\text{g}/\text{m}^3$, an employer is required to implement monitoring of airborne lead concentration or implement control measures to ensure that an average of $50 \mu\text{g}/\text{m}^3$ is not surpassed



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POSSIBLE ELEMENTS OF LEAD CONTROL PROGRAM

- Engineering controls, work practices, hygiene practices and facilities, respiratory protection
- Periodic air monitoring
- Medical surveillance program
- Worker records



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MANITOBA DEPARTMENT OF LABOUR POLICY ON LEAD IN PAINT

- The Manitoba Workplace Safety and Health Division follows US OSHA's position that there is no safe level of lead in paint. Any concentration of lead in paint may represent a risk of excessive airborne lead exposure, depending on the means of disturbance
 - In one Pinchin project, interior sand blasting of 0.1% lead in paint resulted in airborne exposures 10X to 100X OEL
 - Cutting of ductwork contaminated with lead dust (solder grinding booth), 100X OEL



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US REGULATIONS

- HUD, EPA: Assessment of housing, abatement standards, licensing of contractors, consumer education, training, labs, etc.
- US OSHA: Lead in construction regulation, 29 CFR 1926.62 (1993)
 - Very detailed procedures
 - Extensive preamble
 - Have issued a number of compliance guidelines



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POSSIBLE ELEMENTS OF LEAD CONTROL PROGRAM

- Engineering controls (ventilation, isolation, etc.)
- Work practices
- Hygiene practices and facilities
- Respiratory protection
- Periodic air monitoring
- Medical surveillance program
- Worker records



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Work Control Procedures for Lead





CLASSIFICATION OF LEAD WORK

(Ontario Ministry of Labour Guidelines - Lead on Construction Projects)

- Based on anticipated levels of exposure, compared to Ministry of Labour time-weighted average exposure limit (TWAEEL) of 50 micrograms of lead per cubic metre of air
 - Lead Type 1: Levels should always be < OEL
 - Lead Type 2a: Levels of 1-10X OEL
 - Lead Type 2b: Levels of 10X-50X OEL
 - Lead Type 3a: Levels of 25X-500X OEL
 - Lead Type 3b; Levels of > 500X OEL



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PRECAUTIONS APPLICABLE TO TYPE 1, 2 AND 3 LEAD WORK

1. Washing facilities should be provided and used
2. Workers should not eat, drink, chew gum or smoke in area
3. Place drop sheets below operations that might produce dust, chips or debris
4. Clean dust and waste with HEPA filtered vacuum
5. Clean-up after each operation
6. Place dust and waste into dust tight container, labelled as lead waste, removed regularly
7. Inspect work area at least daily to ensure kept clean
8. Do not use compressed air or dry sweeping for cleaning work areas or clothes



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TYPE 1 LEAD OPERATIONS - ALL AIRBORNE EXPOSURES SHOULD BE UNDER EXPOSURE LIMIT

1. Applying lead-based paint (LBP) with brush or roller
2. Removal of LBP with chemical gel or paste
3. Removal of LBP using power tool with effective HEPA filtered dust collection
4. Installation or removal of lead-containing sheet metal, packing, anchors, babbitt or similar material
5. Removal of LBP using non-powered hand tools, other than manual scraping or sanding
6. Soldering



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TYPE 2A LEAD OPERATIONS

1. Welding or hot cutting of LBP coated materials outdoors. (Only a Type 2a operation if short term, not repeated, and if LBP has been stripped prior to hot operation. Otherwise, consider a Type 3a operation)
2. Removal of LBP by scraping or sanding using non-powered hand tools
3. Manual demolition of lead-painted plaster walls or building components by striking a wall with sledgehammer or similar tool



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TYPE 2B LEAD OPERATIONS

1. Spray application of lead-containing coatings



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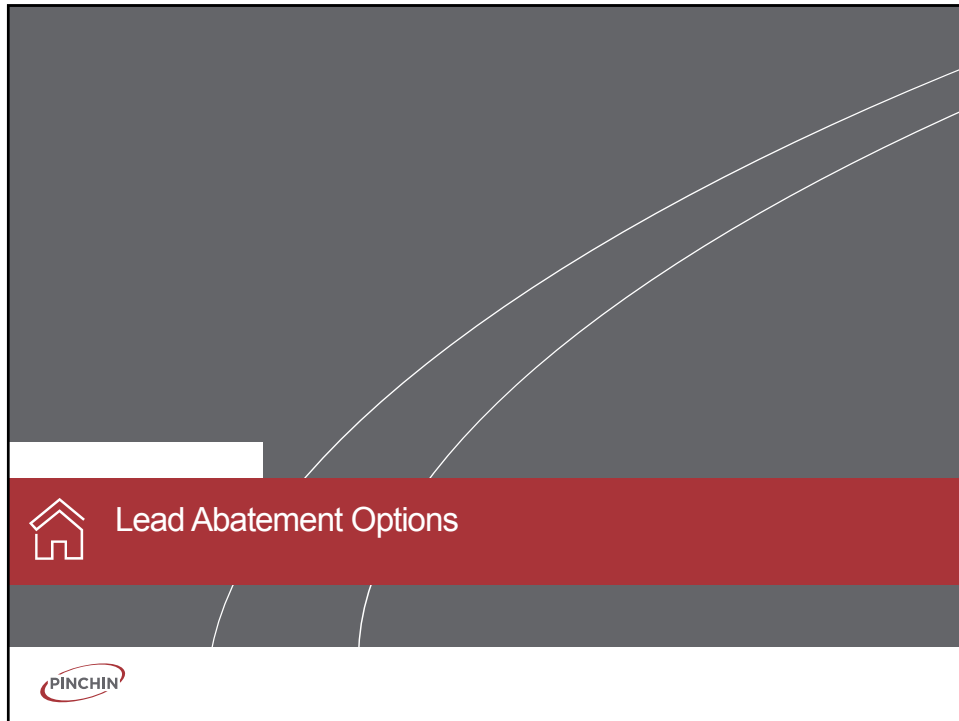
TYPE 3 LEAD OPERATIONS

1. Welding or high temperature cutting of LBP on materials indoors or in a confined space
2. Burning of a surface containing lead
3. Dry removal of lead-containing mortar using electric or pneumatic cutting device
4. Removal of LBP using power tools without effective HEPA dust control
5. Removal or repair of ventilation system used to control lead exposures
6. Demolition or clean-up of a facility where lead-containing materials were manufactured
7. An operation that may expose a worker to lead, but is not classified as Type 1 or 2



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LEAD-BASED PAINT ABATEMENT

- Building paint abatement (all require PPE and some level of containment, careful cleaning at completion)



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1. COMPONENT REMOVAL

- Type 1 operation
- Remove the painted element
- Carpenter's skills and tools
- Half-facepiece respirators (optional), coveralls, moderate dust containment. Air monitoring may allow respiratory protection to be relaxed. Hygiene precautions still required for ingestion risk
- Careful vacuuming and washing. Ledizolv is a proprietary, effective cleaner of lead dust



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2. SCRAPING OF PAINT

- Type 2a operation
- Historic restoration work may require wood to stay in place
- Various restoration tools to remove paint
- Half-facepiece respirators, coveralls, moderate containment



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3. CHEMICAL PAINT REMOVAL

- Several systems available. Do not use methylene chloride based strippers
- Chemical pastes applied to woodwork, often with polyethylene shroud to keep wet while softening paint
- Very little airborne dust, Type 1 operation
- Mess to clean-up, wood will require repeated rinses with some strippers, before finish applied
- Work can also be done offsite for some building elements



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4. DUST CONTROLLED POWER TOOLS

- Needle guns or scabblers with HEPA filtered dust shrouds
- Effective for localized removal of lead paint from steel surfaces
- Type 1 operation, if effective dust collection
- Slow, noisy



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5. ABRASIVE BLASTING

- Chief method for structural steel, tanks, other metal surfaces, partly due to surface prep needs
- Potentially, very high dust exposures for workers and dust release to environment
- See US SSPC (The Society for Protective Coatings) guidelines and training
- Air tight containments, large ventilation systems, air supplied Type CE respirators, wash stations, shower trailers, medical surveillance, ambient air monitoring, soil monitoring



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OPTIONS FOR LEAD DUST CLEAN-UP

- Vacuuming
- Wet wiping or power washing
- Encapsulation with suitable paint. Dirty sites are very difficult to meet HUD level clearances without painting, always true on semi-rough or rough surfaces
- Someone's postulate:
 - *For something to get clean, something else has to get dirty. Corollary is not necessarily true. **You can make everything dirty and nothing clean***



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THANK-YOU. QUESTIONS?

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