



**Standard Operating Procedures
for the Control of Lead
During Building Maintenance and Construction Activities**

Type 1 Lead Operations

Lead is a heavy metal that has and continues to be widely used in industry for many years. Lead comes in different forms including its elemental state or combined chemically with other elements to form lead compounds. Inorganic lead compounds are commonly used in pigments, paints, glasses, plastics and rubber compounds. Lead is also a component in many metal alloys.

Health effects from overexposure to lead have been well-documented. Lead overexposure may result in damage to the blood-producing system, kidneys, gastrointestinal system, nervous system and reproductive system. Therefore, adherence to protective measures is important for the protection of workers.

The procedures were developed to meet the general duty clauses (Sections 23, 25(2)(h) and 27) under the *Occupational Health and Safety (OHS) Act of Ontario*, the *Designated Substance Regulations* (O. Reg. 490/09) as it pertains to lead and the *Regulation for Construction Projects* (O. Reg. 213/91). This document is also designed to conform to the *Guideline – Lead on Construction Projects* (2011) from the Ontario Ministry of Labour.

1.0 APPLICATION

1.1 This procedure applies to all Type 1 maintenance and construction activities in all buildings, structures, machinery and equipment owned, occupied or operated by the University of Toronto at all campuses and other locations. It applies to all employees and students of the University, to contractors, to occupants of University buildings and to external organizations who may come into contact with or disturb lead-containing material in University buildings.

1.2 Type 1 operations:

- Removal of lead-containing coatings with a chemical gel, paste and fibrous laminated cloth
- Removal of lead-containing coatings or materials, using a power tool that has a dust collection system equipped with HEPA
- Removal of lead-containing coatings with a heat gun or high-pressure water jet
- Application of lead-containing paints and surface coatings with a brush, roller or sponge
- Installation or removal of lead-containing sheet metal
- Installation or removal of lead-containing packing, babbitt or similar material
- Drilling into lead-lined drywall or walls with lead-containing paint
- Removal of lead-containing coatings or materials using non-powered hand tools, other than manual scarping or sanding
- Soldering
- High Voltage (HV) Lead Cable Splicing

2.0 DEFINITIONS

2.1 *Work Areas:* Where actual work activity takes place.

2.2 *Damp Wiping:* A cleaning process for removing residual contamination using damp-cloths, sponges or mops.

3.0 MATERIALS AND EQUIPMENT

3.1 *HEPA Vacuum:* Vacuum cleaner equipped with a High Efficiency Particulate Arresting (HEPA) Filter, fitted with appropriate tools. The vacuum equipment shall have a filtering system capable of collecting and retaining fibres greater than 0.3 microns in diameter at 99.97% efficiency.

3.2 *Polyethylene Sheeting:* 6 mil. thickness, in largest sheet size available to minimize seams.

3.3 *Portable local exhaust system:* Portable local exhaust systems should be used in confined spaces during HV Cable Splicing to reduce exposure to lead fumes during this task.

3.4 *Respirator:* Respirators are not necessary. However, if workers would like to wear a respirator, a half-face respirator with N-, R- or P-series filter and 95, 99 or 100% efficiency may be used.

3.5 *Thermostat:* For HV Cable Splicing, a thermostat should be used to maintain the temperature of the lead pot to <500°F. Over-heating unnecessarily increases worker exposure to lead fumes during this task.

3.6 *Waste water pail:* Water used for cleaning lead-contaminated surfaces will contain lead. University of Toronto employees should contact the Environmental Protection Services group at the University (416-978-3000) to obtain a pail for collecting this waste water. See section 10 for more information.

4.0 IDENTIFICATION OF LEAD AND OTHER HAZARDS

4.1 Lead is a Designated Substance under the Occupational Health and Safety Act (OHSA). Under the OHSA, owners are responsible for informing contractors of the presence of designated substance during the tendering process and prior to signing a binding agreement. This notification should be given in writing, such as a designated substance report or a pre-construction survey, and should be provided in the tender.

4.2 If the presence of lead is suspected/likely but not confirmed, the owner or constructor of the work must treat the work as a lead operation unless proven otherwise. For the St. George Campus, testing for lead shall be coordinated by the Manager, Hazardous Construction Materials Group, Utilities, F&S. For the Mississauga and Scarborough Campuses, testing shall be coordinated by the Office of Environmental Health and Safety. It is recommended that the owner of the work contact the respective departments one month before the commencement of the work for such testing to take place (this would allow sufficient turnaround time from the lab).

4.3 If the presence of lead be suspected or confirmed, only qualified lead remediation/abatement contractors will be engaged to remove the lead-containing materials before work can be performed by general contractors.

5.0 TRAINING AND COMMUNICATION OF UOFT REQUIREMENTS FOR UOFT WORKERS AND EXTERNAL CONTRACTORS INVOLVED IN LEAD REMEDIATION OR ABATEMENT

5.1 All UofT workers must have received training on lead and, if applicable, respiratory protection. NOTE: respiratory fit-testing must be repeated at least every 2 years.

5.2 For lead work that is contracted out, the owner of the work is responsible for ensuring that contractors who perform lead work receive a current copy of the UofT Lead Management Program and Lead SOPs.

6.0 PERSONAL PROTECTION

6.1 *Respirators:* Respirators are not necessary. However, if workers would like to wear a respirator, a half-face respirator with N-, R- or P-series filter and 95, 99 or 100% efficiency may be used.

6.1.1 Where respirators are used, all respiratory equipment shall be individually assigned respirators and disposable single-use type respirators are not permitted.

- 6.1.2 Where respirators are used, all respirators shall meet the design and usage requirements of the National Institute for Occupational Safety & Health (NIOSH).
- 6.1.3 Where respirators are used, thoroughly wash respirators between uses.
- 6.2 *Facilities:* Provide facilities for washing hands and face which shall be used by every worker upon leaving the work area.
- 6.3 *Practice:* Workers shall not eat, drink, smoke or chew while in work areas.

7.0 PREPARATION – WORK AREAS

- 7.1 Clear immediate work areas of all moveable furnishings or equipment. Any furnishings or equipment not removed shall be adequately covered and sealed using 6 mil polyethylene and duct tape.
- 7.2 Lay down polyethylene sheeting in the work area. Seal seams with duct tape.
- 7.3 Ensure that dust tight waste containers are available in the work area for handling / waste.
- 7.4 For HV Cable Splicing in confined space, set up portable local exhaust ventilation to exhaust away from the work area or other occupied areas. Maintain the lead pot at temperatures <500°F. Avoid overheating the pot as this will result in unnecessary exposure to lead fumes.

8.0 EXECUTION

- 8.1 Where applicable, follow manufacturer instructions for equipment and tools and review SDS (Safety Data Sheet) before commencing work.
- 8.2 Where applicable, continually wet the work surface to reduce the amount of lead dust generated.
- 8.3 Do NOT use compressed air to clean up lead dust.
- 8.4 Frequently and at regular intervals during the work and immediately upon completion of the work, remove dust and waste from the workplace by HEPA vacuuming or damp-wiping, mopping or wet sweeping.
- 8.5 Before exiting the work area, damp wipe or HEPA vacuum clothing, exposed skin and any tools, equipment or re-usable PPE used in the work area. Polyethylene sheets should also be cleaned by damp wiping or HEPA vacuuming, then sprayed with an adhesive spray to lock down any residual lead-containing dust and then disposed of as hazardous waste. Clothes and rags used for cleaning should also be disposed of as hazardous waste.
- 8.6 For HV Cable Splicing, maintain the lead pot at temperatures <500°F. Avoid overheating the pot as this will result in unnecessary exposure to lead fumes.

9.0 WASTE TRANSPORT AND DISPOSAL

- 9.1 Lead waste (including water used for cleaning lead-contaminated surfaces) should be disposed of as Hazardous Waste as per the University of Toronto Laboratory Hazardous Waste Management Manual and according to applicable municipal by-laws and/or provincial regulations.
- 9.2 Waste water generated by UofT employees is collected in pails provided by UofT Environmental Protection Services (EPS). When the work is complete, contact EPS at 416-978-7000 to collect the pails
- 9.3 External contractors/consultants must arrange their own transport and disposal, and this must also be done in accordance with applicable municipal and provincial by-laws and/or regulations. This includes waste water used for cleaning lead-contaminated surfaces. External contractors/consultants should follow UofT's manifesting procedures (contact UofT Environmental Protection Services at 416-978-7000).



**Standard Operating Procedures
for the Control of Lead
During Building Maintenance and Construction Activities**

Type 2 Lead Operations

Lead is a heavy metal that has and continues to be widely used in industry for many years. Lead comes in different forms including its elemental state or combined chemically with other elements to form lead compounds. Inorganic lead compounds are commonly used in pigments, paints, glasses, plastics and rubber compounds. Lead is also a component in many metal alloys.

Health effects from overexposure to lead have been well-documented. Lead overexposure may result in damage to the blood-producing system, kidneys, gastrointestinal system, nervous system and reproductive system. Therefore, adherence to protective measures is important for the protection of workers.

The procedures were developed to meet the general duty clauses (Sections 23, 25(2)(h) and 27) under the *Occupational Health and Safety (OHS) Act of Ontario*, the *Designated Substance Regulations* (O. Reg. 490/09) as it pertains to lead and the *Regulation for Construction Projects* (O. Reg. 213/91). This document is also designed to conform to the *Guideline – Lead on Construction Projects* (2011) from the Ontario Ministry of Labour.

1.0 APPLICATION

1.1 This procedure applies to all Type 2a and 2b maintenance and construction activities in all buildings, structures, machinery and equipment owned, occupied or operated by the University of Toronto at all campuses and other locations. It applies to all employees and students of the University, to contractors, to occupants of University buildings and to external organizations who may come into contact with or disturb lead-containing material in University buildings.

1.2 Type 2 lead operations are:

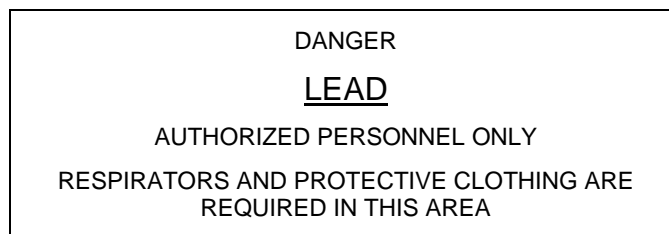
- Welding or high temperature cutting of lead-containing coatings or materials outdoors (CONDITIONS: < 1 hr and the material has been stripped prior). If none of these conditions are met, then it is a Type 3a operation.
- Removal of lead-containing coatings or materials by scraping or sanding using non-powered hand tools.
- Manual demolition of lead-painted plaster walls or buildings components by striking a wall with a sledge hammer or similar tool.
- Burning of a surface containing lead for < 1 hr consecutively.
- Removal of lead-containing coatings or materials using power tools WITHOUT an effective dust collection system equipped with a HEPA filter < 1 hr consecutively.
- Work in the former Hart House shooting range that does not involve clean up but may result in incidental contact with lead (Demolition or clean-up of a facility where lead-containing products were manufactured is a Type 3a operation)

2.0 **DEFINITIONS**

- 2.1 *Work Areas:* Where actual work activity takes place.
- 2.2 *Damp Wiping:* A cleaning process for removing residual contamination using damp-cloths, sponges or mops.

3.0 **MATERIALS AND EQUIPMENT**

- 3.1 *HEPA Vacuum:* Vacuum cleaner equipped with a High Efficiency Particulate Arresting (HEPA) Filter, fitted with appropriate tools. The vacuum equipment shall have a filtering system capable of collecting and retaining fibres greater than 0.3 microns in diameter at 99.97% efficiency.
- 3.2 *Polyethylene Sheeting:* 6 mil. thickness, in largest sheet size available to minimize seams.
- 3.3 *Personal Protective Equipment (PPE):* Refer to the “Personal Protection” section.
- 3.4 *Signage:* Warning of lead hazard in the work area. An example is shown below.



- 3.5 *Waste water pail:* Water used for cleaning lead-contaminated surfaces will contain lead. University of Toronto employees should contact the Environmental Protection Services group at the University (416-978-3000) to obtain a pail for collecting this waste water. See section 10 for more information.

4.0 **IDENTIFICATION OF LEAD AND OTHER HAZARDS**

- 4.1 Lead is a Designated Substance under the Occupational Health and Safety Act (OHSA). Under the OHSA, owners are responsible for informing contractors of the presence of designated substance during the tendering process and prior to signing a binding agreement. This notification should be given in writing, such as a designated substance report or a pre-construction survey, and should be provided in the tender.
- 4.2 If the presence of lead is suspected/likely but not confirmed, the owner or constructor of the work must treat the work as a lead operation unless proven otherwise. For the St. George Campus, testing for lead shall be coordinated by the Manager, Hazardous Construction Materials Group, Utilities, F&S. For the Mississauga and Scarborough Campuses, testing shall be coordinated by the Office of Environmental Health and Safety. It is recommended that the owner of the work contact the respective departments one month before the commencement of the work for such testing to take place (this would allow sufficient turnaround time from the lab).
- 4.3 If the presence of lead be suspected or confirmed, only qualified lead remediation/abatement contractors will be engaged to remove the lead-containing materials before work can be performed by general contractors.

5.0 **TRAINING AND COMMUNICATION OF UOFT REQUIREMENTS FOR UOFT WORKERS AND EXTERNAL CONTRACTORS INVOLVED IN LEAD REMEDIATION OR ABATEMENT**

- 5.1 All UofT workers must have received training on lead and, if applicable, respiratory protection. NOTE: respiratory fit-testing must be repeated at least every 2 years.
- 5.2 For lead work that is contracted out, the owner of the work is responsible for ensuring that lead remediation/abatement contractors receive a current copy of the UofT Lead Management Program and Lead SOPs.

6.0

7.0 **PERSONAL PROTECTION**

7.1 *Respirators:* Half-face respirator with N-, R- or P-series filter and 95, 99 or 100% efficiency.

7.1.1 All respiratory equipment shall be individually assigned and identified.

7.1.2 Disposable single-use type respirators are not permitted.

7.1.3 All respirators shall meet the design and usage requirements of the National Institute for Occupational Safety & Health (NIOSH).

7.1.4 Thoroughly wash respirators between uses.

7.2 *Clothing:* Full body disposable coverall, with attached hood and elasticized at the cuffs and hood, made of material that does not permit penetration of lead dust. Appropriate glove and eye protection should be used.

7.3 *Facilities:* Provide facilities for washing hands and face which shall be used by every worker upon leaving the work area.

7.4 *Practice:* Workers shall not eat, drink, smoke or chew while in work areas.

8.0 **PREPARATION – WORK AREAS**

8.1 Clear immediate work areas of all moveable furnishings or equipment. Any furnishings or equipment not removed shall be adequately covered and sealed using 6 mil polyethylene and duct tape.

8.2 For

- Welding or high temperature cutting of lead-containing coatings or materials outdoors (CONDITIONS: < 1 hr and the material has been stripped prior). If none of these conditions are met, then it is a Type 3a operations
- Burning of a surface containing lead for < 1 hr consecutively.
- Removal of lead-containing coatings or materials using power tools WITHOUT an effective dust collection system equipped with a HEPA filter < 1 hr consecutively.

The following additional procedures apply:

- Seal all ventilation openings with polyethylene sheets and duct tape.
- Erect enclosure (partial and full) to separate work area from surrounding areas.

8.3 Post signage with at least one sign at each entrance of the work area and use barrier tape to demarcate off the work area. The signs should indicate:

- There is a lead dust, fume or mist hazard
- Access is restricted to authorized persons
- Respirators should be worn in the area

8.4 Ensure that dust tight waste containers are available in the work area for handling / waste.

9.0 **EXECUTION**

9.1 Where applicable, follow manufacturer instructions for equipment and tools and review SDS (Safety Data Sheet) before commencing work.

- 9.2 Where applicable, continually wet the work surface to reduce the amount of lead dust generated.
- 9.3 The work area should be inspected once per shift for work exceeding more than 1 shift. The inspection should be conducted by a person (e.g. supervisor, occupational hygiene consultant) who is knowledgeable of the work activity taking place and on the requirements of the UofT Lead Management Program and this SOP.
- 9.4 The inspection should be documented in writing. A sample inspection form is provided in Appendix IV of the UofT Lead Management Program. This form should be retained by the UofT person authorizing the work.
- 9.5 Do NOT use compressed air.
- 9.6 Frequently and at regular intervals during the doing of work and immediately upon completion of the work, remove dust and waste from the workplace by HEPA vacuuming or damp-wiping, mopping or wet sweeping.
- 9.7 Before exiting the work area, damp wipe or HEPA vacuum clothing, exposed skin and any tools, equipment or re-usable PPE used in the work area. Polyethylene sheets should also be cleaned by damp wiping or HEPA vacuuming, then sprayed with an adhesive spray to lock down any residual lead-containing dust and then disposed of as hazardous waste. Clothes and rags used for cleaning should also be disposed of as hazardous waste.

10.0 WASTE TRANSPORT AND DISPOSAL

- 10.1 Lead waste (including water used for cleaning lead-contaminated surfaces) should be disposed of as Hazardous Waste as per the University of Toronto Laboratory Hazardous Waste Management Manual and according to applicable municipal by-laws and/or provincial regulations.
- 10.2 Waste water generated by UofT employees is collected in pails provided by UofT Environmental Protection Services (EPS). When the work is complete, contact EPS at 416-978-7000 to collect the pails
- 10.3 External contractors/consultants must arrange their own transport and disposal, and this must also be done in accordance with applicable municipal and provincial by-laws and/or regulations. This includes waste water used for cleaning lead-contaminated surfaces. External contractors/consultants should follow UofT's manifesting procedures (contact UofT Environmental Protection Services at 416-978-7000).



**Standard Operating Procedures
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Type 3a Lead Operations

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The procedures were developed to meet the general duty clauses (Sections 23, 25(2)(h) and 27) under the *Occupational Health and Safety (OHS) Act of Ontario*, the *Designated Substance Regulations* (O. Reg. 490/09) as it pertains to lead and the *Regulation for Construction Projects* (O. Reg. 213/91). This document is also designed to conform to the *Guideline – Lead on Construction Projects* (2011) from the Ontario Ministry of Labour.

1.0 APPLICATION

1.1 This procedure applies to all Type 3a maintenance and construction activities in all buildings, structures, machinery and equipment owned, occupied or operated by the University of Toronto at all campuses and other locations. It applies to all employees and students of the University, to contractors, to occupants of University buildings and to external organizations who may come into contact with or disturb lead-containing material in University buildings.

1.2 Type 3a operations are:

- Welding or high temperature cutting of lead-containing coatings or materials INDOORS or in a CONFINED SPACE.
- Burning of a surface containing lead for > 1 hr consecutively.
- Removal of lead-containing coatings or materials using power tools WITHOUT an effective dust collection system equipped with a HEPA filter > 1 hr consecutively.
- Dry removal of lead-containing mortar using an electric or pneumatic cutting device.
- Removal or repair of a ventilation system used for controlling lead exposure.
- Demolition or clean up of a facility where lead-containing products were manufactured.

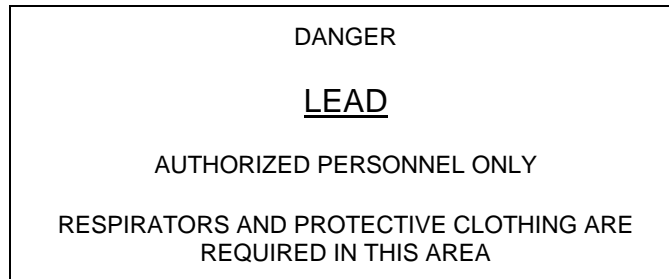
2.0 DEFINITIONS

2.1 *Work Areas:* Where actual work activity takes place.

2.2 *Damp Wiping:* A cleaning process for removing residual contamination using damp-cloths, sponges or mops.

3.0 MATERIALS AND EQUIPMENT

- 3.1 *HEPA Vacuum:* Vacuum cleaner equipped with a High Efficiency Particulate Arresting (HEPA) Filter, fitted with appropriate tools. The vacuum equipment shall have a filtering system capable of collecting and retaining fibres greater than 0.3 microns in diameter at 99.97% efficiency.
- 3.2 *Polyethylene Sheeting:* 6 mil. thickness, in largest sheet size available to minimize seams.
- 3.3 *Personal Protective Equipment (PPE):* Refer to the “Personal Protection” section.
- 3.4 *Signage:* Warning of lead hazard in the work area. An example is shown below.



- 3.5 *Waste water pail:* Water used for cleaning lead-contaminated surfaces will contain lead. University of Toronto employees should contact the Environmental Protection Services group at the University (416-978-3000) to obtain a pail for collecting this waste water.

4.0 IDENTIFICATION OF LEAD AND OTHER HAZARDS

- 4.1 Lead is a Designated Substance under the Occupational Health and Safety Act (OHSA). Under the OHSA, owners are responsible for informing contractors of the presence of designated substance during the tendering process and prior to signing a binding agreement. This notification should be given in writing, such as a designated substance report or a pre-construction survey, and should be provided in the tender.
- 4.2 If the presence of lead is suspected/likely but not confirmed, the owner or constructor of the work must treat the work as a lead operation unless proven otherwise. For the St. George Campus, testing for lead shall be coordinated by the Manager, Hazardous Construction Materials Group, Utilities, F&S. For the Mississauga and Scarborough Campuses, testing shall be coordinated by the Office of Environmental Health and Safety. It is recommended that the owner of the work contact the respective departments one month before the commencement of the work for such testing to take place (this would allow sufficient turnaround time from the lab).
- 4.3 If the presence of lead be suspected or confirmed, only qualified lead remediation/abatement contractors will be engaged to remove the lead-containing materials before work can be performed by general contractors.
- 4.4 Where confined space entry is required, the requirements of the UofT Confined Space Program must be followed.

5.0 COMMUNICATION

- 5.1 The owner of the work should provide notification of the work reasonably prior to the commencement of the work.
- 5.2 For the St. George Campus, the owner of the work should provide notification to:
- The Manager, Hazardous Construction Materials Group (F&S);

- The Director, Property Management for areas involving the building fabric;
- The Director, Utilities & Building Operations for areas under the control of Utilities & Building Operations;
- The Director, Occupational Health and Safety, (EHS)
- Local building occupants.

5.3 For the Mississauga Campus, the owner of the work should provide notification to:

- The Director, Facilities Management and Planning;
- Occupational Health and Safety, (EHS)
- Local building occupants.

5.4 For the Scarborough Campus, the owner of the work should provide notification to:

- The Director, Facilities Management;
- Occupational Health and Safety, (EHS)
- Local building occupants.

6.0 TRAINING AND COMMUNICATION OF UOFT REQUIREMENTS FOR UOFT WORKERS AND EXTERNAL CONTRACTORS INVOLVED IN LEAD REMEDIATION OR ABATEMENT

6.1 All UofT workers must have received training on lead and, if applicable, respiratory protection. NOTE: respiratory fit-testing must be repeated at least every 2 years.

6.2 For lead work that is contracted out, the owner of the work is responsible for ensuring that lead remediation/abatement contractors receive a current copy of the UofT Lead Management Program and Lead SOPs.

7.0 ENCLOSURES

7.1 Where feasible, full enclosures should be used over partial enclosures. Full enclosures are more effective in controlling the spread of air contaminants.

7.2 Where full enclosures are used, the following requirements should be met:

- The enclosure should be made of windproof materials that are impermeable to dust.
- The enclosure should be supported by a secure structure.
- All joints in the enclosure should be fully sealed.
- Entrances to the enclosure should be equipped with overlapping tarps or air locks.
- Baffles, louvers, flap seals and filters should be used at air supply points into the enclosure to prevent the escape of abrasive and debris from inside the enclosure.
- The general mechanical ventilation requirements are detailed in the Ventilation section.

7.3 Partial enclosures should not be used if significant airborne dust is being generated.

7.4 Partial enclosures may be used for OUTDOOR removal of lead-containing dust using an air mist extraction system.

7.5 Partial enclosures may consist of vertical tarps and floor tarps if they overlap and are secured together at the seams.

8.0 DECONTAMINATION FACILITIES

8.1 Decontamination facilities should be provided for the following Type 3a operations:

- Removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter
- Demolition or clean up of a facility where lead containing products are manufactured.

8.2 Decontaminations facilities should be located as close as practical to the work area.

8.3 Decontamination facilities should consist of a room for changing into protective clothing and for storing contaminated protective clothing and equipment, a shower room and a room for changing into street clothes and for storing clean clothing and equipment.

8.4 The decontamination rooms should be arranged in sequence and constructed so as to prevent the spread of lead dust.

8.5 The shower room should provide hot and cold water or water that is 40-50°C, individual controls inside the room to regulate water flow if there is hot and cold water and clean towels.

9.0 VENTILATION

9.1 Review building general ventilation plans and identify air exhaust and air intake locations in the work area. Contact the appropriate Manager, Operations & Maintenance, to arrange for shut down or isolation of the general ventilation in the work area. Seal air intake and exhaust in the work area with polyethylene and duct tape.

9.2 For full enclosures, maintain a negative air pressure of 0.02 inches of water by means of a HEPA-filtered exhaust unit.

9.3 Local mechanical ventilation should be provided for welding, burning and high temperature cutting of lead-containing coatings and materials and for the removal of lead-containing coatings and materials with power tools without a [HEPA] dust collection system.

- Local ventilation should be designed to capture airborne lead dust or fumes at the source.
- Air velocity at the source should be at least 0.5 m/s (100ft/min). Air velocity should be verified at least once by a qualified person (e.g. occupational hygiene consultant) using a velometer.
- Air velocity at any point in front of or at the opening of the ventilation hood should be sufficient to overcome opposing air currents. This should be verified at least once using a smoke tube (smoke should be captured by the local ventilation) by a qualified person.

9.4 Exhausted air should be passed through a HEPA filter and routed out of the workplace in a way that will prevent the return of contaminants in the workplace. The workplace includes adjacent work areas as well as the work area where the lead operation is taking place.

10.0 PERSONAL PROTECTION

10.1 *Respirators:* Suitable respiratory protection are:

- Full-face air purifying respirator with N-, R- or P-series filter and 100% efficiency (HEPA); OR,
- Full-face powered air purifying respirator with a high efficiency particulate filter; OR,
- Half-face or full-face piece supplied air respirator operated in continuous flow mode; OR
- Full-face supplied-air respirator operated in demand mode; OR

- Half or full-face supplied air respirator operated in pressure-demand or other positive pressure mode.
- 10.1.1 All respiratory equipment shall be individually assigned and identified.
 - 10.1.2 Disposable single-use type respirators are not permitted.
 - 10.1.3 All respirators shall meet the design and usage requirements of the National Institute for Occupational Safety & Health (NIOSH).
 - 10.1.4 Thoroughly wash respirators between uses.
 - 10.2 *Clothing:* Full body disposable coverall, with attached hood and elasticized at the cuffs and hood, made of material that does not permit penetration of lead dust. Appropriate glove and eye protection should be used.
 - 10.3 *Decontamination Facilities:* Provide facilities for washing hands and face which shall be used by every worker upon leaving the work area. Also see Section 8 if applicable.
 - 10.4 *Practice:* Workers shall not eat, drink, smoke or chew while in work areas.

11.0 PREPARATION – WORK AREAS

- 11.1 Clear immediate work areas of all moveable furnishings or equipment. Any furnishings or equipment not removed shall be adequately covered and sealed using 6 mil polyethylene and duct tape.
- 11.2 Shut down or isolate all ventilation serving the work area. Seal all ventilation openings with polyethylene sheets and duct tape.
- 11.3 Erect enclosure (partial or full)
- 11.4 Erect decontamination facilities (if applicable – See Decontamination Facilities Section)
- 11.5 Post signage with at least one sign at each entrance of the work area and use barrier tape to demarcate off the work area.
- 11.6 Ensure that dust tight waste containers are available in the work area for handling / waste.

12.0 EXECUTION

- 12.1 Where applicable, continually wet the work surface to reduce the amount of lead dust generated.
- 12.2 The work area should be inspected once per shift for work exceeding more than 1 shift. The inspection should be conducted by a person (e.g. supervisor, occupational hygiene consultant) who is knowledgeable of the work activity taking place and on the requirements of the UofT Lead Management Program and this SOP.
- 12.3 The inspection should be documented in writing. A sample inspection form is provided in Appendix IV of the UofT Lead Management Program. This form should be retained by the UofT person authorizing the work.
- 12.4 Do NOT use compressed air to clean up lead dust.
- 12.5 Frequently and at regular intervals during the work and immediately upon completion of the work, remove dust and waste from the workplace by HEPA vacuuming or damp-wiping, mopping or wet sweeping.
- 12.6 Before exiting the work area, damp wipe or HEPA vacuum clothing, exposed skin and any tools, equipment or re-usable PPE used in the work area. Polyethylene sheets should also be cleaned by damp wiping or HEPA vacuuming, then sprayed with an adhesive spray to lock down any residual

lead-containing dust and then disposed of as hazardous waste. Clothes and rags used for cleaning should also be disposed of as hazardous waste.

- 12.7 Where decontamination facilities are provided, workers using the decontamination facility should following these steps in the order shown:
- Decontaminate protective clothing that will be reused by HEPA vacuum or by damp wiping
 - Remove decontaminated protective clothing and place disposable (not reused) clothing in waste contains for lead dust and waste.
 - Following the above, shower without removing the respirator.
 - Following the above, remove and clean the respirator.

13.0 WASTE TRANSPORT AND DISPOSAL

- 13.1 Lead waste (including water used for cleaning lead-contaminated surfaces) should be disposed of as Hazardous Waste as per the University of Toronto Laboratory Hazardous Waste Management Manual and according to applicable municipal by-laws and/or provincial regulations.
- 13.2 Waste water generated by UofT employees is collected in pails provided by UofT Environmental Protection Services (EPS). When the work is complete, contact EPS at 416-978-7000 to collect the pails
- 13.3 External contractors/consultants must arrange their own transport and disposal, and this must also be done in accordance with applicable municipal and provincial by-laws and/or regulations. This includes waste water used for cleaning lead-contaminated surfaces. External contractors/consultants should follow UofT's manifesting procedures (contact UofT Environmental Protection Services at 416-978-7000).

**Standard Operating Procedures
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During Building Maintenance and Construction Activities**

Type 3b Lead Operations

Lead is a heavy metal that has and continues to be widely used in industry for many years. Lead comes in different forms including its elemental state or combined chemically with other elements to form lead compounds. Inorganic lead compounds are commonly used in pigments, paints, glasses, plastics and rubber compounds. Lead is also a component in many metal alloys.

Health effects from overexposure to lead have been well-documented. Lead overexposure may result in damage to the blood-producing system, kidneys, gastrointestinal system, nervous system and reproductive system. Therefore, adherence to protective measures is important for the protection of workers.

The procedures were developed to meet the general duty clauses (Sections 23, 25(2)(h) and 27) under the *Occupational Health and Safety (OHS) Act of Ontario*, the *Designated Substance Regulations* (O. Reg. 490/09) as it pertains to lead and the *Regulation for Construction Projects* (O. Reg. 213/91). This document is also designed to conform to the *Guideline – Lead on Construction Projects* (2011) from the Ontario Ministry of Labour.

1.0 APPLICATION

1.1 This procedure applies to all Type 3b maintenance and construction activities in all buildings, structures, machinery and equipment owned, occupied or operated by the University of Toronto at all campuses and other locations. It applies to all employees and students of the University, to contractors, to occupants of University buildings and to external organizations who may come into contact with or disturb lead-containing material in University buildings.

1.2 Type 3b operations are:

- Abrasive blasting of lead-containing coatings or materials.
- Removal of lead-containing dust using an air mist extraction system.

2.0 DEFINITIONS

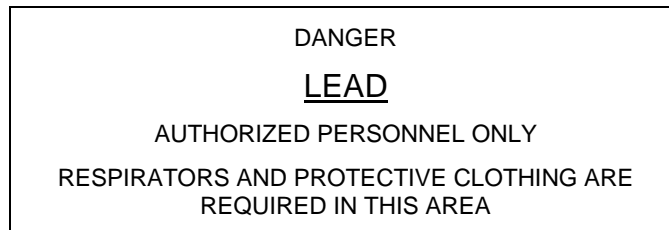
2.1 *Work Areas:* Where actual work activity takes place.

2.2 *Damp Wiping:* A cleaning process for removing residual contamination using damp-cloths, sponges or mops.

3.0 MATERIALS AND EQUIPMENT

3.1 *HEPA Vacuum:* Vacuum cleaner equipped with a High Efficiency Particulate Arresting (HEPA) Filter, fitted with appropriate tools. The vacuum equipment shall have a filtering system capable of collecting and retaining fibres greater than 0.3 microns in diameter at 99.97% efficiency.

- 3.2 *Polyethylene Sheeting*: 6 mil. thickness, in largest sheet size available to minimize seams.
- 3.3 *Personal Protective Equipment (PPE)*: Refer to the “Personal Protection” section.
- 3.4 *Signage*: Warning of lead hazard in the work area. An example is shown below.



- 3.5 Waste water pail: Water used for cleaning lead-contaminated surfaces will contain lead. University of Toronto employees should contact the Environmental Protection Services group at the University (416-978-3000) to obtain a pail for collecting this waste water.

4.0 IDENTIFICATION OF LEAD AND OTHER HAZARDS

- 4.1 Lead is a Designated Substance under the Occupational Health and Safety Act (OHSA). Under the OHSA, owners are responsible for informing contractors of the presence of designated substance during the tendering process and prior to signing a binding agreement. This notification should be given in writing, such as a designated substance report or a pre-construction survey, and should be provided in the tender.
- 4.2 If the presence of lead is suspected/likely but not confirmed, the owner or constructor of the work must treat the work as a lead operation unless proven otherwise. For the St. George Campus, testing for lead shall be coordinated by the Manager, Hazardous Construction Materials Group, Utilities, F&S. For the Mississauga and Scarborough Campuses, testing shall be coordinated by the Office of Environmental Health and Safety. It is recommended that the owner of the work contact the respective departments one month before the commencement of the work for such testing to take place (this would allow sufficient turnaround time from the lab).
- 4.3 If the presence of lead be suspected or confirmed, only qualified lead remediation/abatement contractors will be engaged to remove the lead-containing materials before work can be performed by general contractors.

5.0 COMMUNICATION

- 5.1 The owner of the work should provide notification of the work reasonably prior to the commencement of the work.
- 5.2 For the St. George Campus, the owner of the work should provide notification to:
- The Manager, Hazardous Construction Materials Group (F&S);
 - The Director, Property Management for areas involving the building fabric;
 - The Director, Utilities & Building Operations for areas under the control of Utilities & Building Operations;
 - The Director, Occupational Health and Safety, Office of Environmental Health and Safety (EHS);
 - Local building occupants.
- 5.3 For the Mississauga Campus, the owner of the work should provide notification to:
- The Director, Facilities Management and Planning;
 - The Director, Occupational Health and Safety, (EHS)
 - Local building occupants.

5.4 For the Scarborough Campus, the owner of the work should provide notification to:

- The Director, Facilities Management;
- The Director, Occupational Health and Safety, (EHS) and,
- Local building occupants.

6.0 TRAINING AND COMMUNICATION OF UOFT REQUIREMENTS FOR UOFT WORKERS AND EXTERNAL CONTRACTORS INVOLVED IN LEAD REMEDIATION OR ABATEMENT

6.1 All UofT workers must have received training on lead and, if applicable, respiratory protection. NOTE: respiratory fit-testing must be repeated at least every 2 years.

6.2 For lead work that is contracted out, the owner of the work is responsible for ensuring that lead remediation/abatement contractors receive a current copy of the UofT Lead Management Program and Lead SOPs.

7.0 ENCLOSURES

7.1 Where feasible, full enclosures should be used over partial enclosures. Full enclosures are more effective in controlling the spread of air contaminants:

- Full enclosures should be used for abrasive blasting operations.
- Full enclosures should be use for INDOOR removal of lead-containing dust using an air mist extraction system.
- Partial enclosures may be used for OUTDOOR removal of lead-containing dust using an air mist extraction system.

7.2 Where full enclosures are used, the following requirements should be met:

- The enclosure should be made of windproof materials that are impermeable to dust.
- The enclosure should be supported by a secure structure.
- All joints in the enclosure should be fully sealed.
- Entrances to the enclosure should be equipped with overlapping tarps or air locks.
- Baffles, louvers, flap seals and filters should be used at air supply points into the enclosure to prevent the escape of abrasive and debris from inside the enclosure.
- The general mechanical ventilation requirements are detailed in the Ventilation section.

7.3 Partial enclosures should not be used if significant airborne dust is being generated.

7.4 Partial enclosures may be used for OUTDOOR removal of lead-containing dust using an air mist extraction system.

7.5 Partial enclosures may consist of vertical tarps and floor tarps if they overlap and are secured together at the seams.

8.0 DECONTAMINATION FACILITIES

8.1 Decontamination facilities should be provided for all Type 3b operations.

8.2 Decontaminations facilities should be located as close as practical to the work area.

- 8.3 Decontamination facilities should consist of a room for changing into protective clothing and for storing contaminated protective clothing and equipment, a shower room and a room for changing into street clothes and for storing clean clothing and equipment.
- 8.4 The decontamination rooms should be arranged in sequence and constructed so as to prevent the spread of lead dust.
- 8.5 The shower room should provide hot and cold water or water that is 40-50°C, individual controls inside the room to regulate water flow if there is hot and cold water and clean towels.

9.0 VENTILATION

- 9.1 Review building general ventilation plans and identify air exhaust and air intake locations in the work area. Contact the appropriate Manager, Operations & Maintenance, to arrange for shut down or isolation of the general ventilation in the work area. Seal air intake and exhaust in the work area with polyethylene and duct tape.
- 9.2 For full enclosures, maintain a negative air pressure of 0.02 inches of water by means of a HEPA-filtered exhaust unit.
- 9.3 Local mechanical ventilation should be provided for welding, burning and high temperature cutting of lead-containing coatings and materials and for the removal of lead-containing coatings and materials with power tools without a [HEPA] dust collection system.
- Local ventilation should be designed to capture airborne lead dust or fumes at the source.
 - Air velocity at the source should be at least 0.5 m/s (100ft/min). Air velocity should be verified at least once by a qualified person (e.g. occupational hygiene consultant) using a velometer.
 - Air velocity at any point in front of or at the opening of the ventilation hood should be sufficient to overcome opposing air currents. This should be verified at least once using a smoke tube (smoke should be captured by the local ventilation) by a qualified person.
- 9.4 Exhausted air should be passed through a HEPA filter and routed out of the workplace in a way that will prevent the return of contaminants in the workplace. The workplace includes adjacent work areas as well as the work area where the lead operation is taking place.

10.0 PERSONAL PROTECTION

10.1 *Respirators:*

- *Abrasive blasting:* Type CE abrasive-blast supplied air respirator operated in a positive pressure mode with a tight-fitting half face piece; OR, Type CE abrasive-blast supplied air respirator operated in a pressure-demand or positive pressure mode with a tight fitting full-face piece
 - *Removal of lead-containing dust using an air mist extraction system:* Supplied air respirator equipped with a tight-fitting half-face or full-face piece and operated in pressure demand or positive pressure demand mode. All respiratory equipment shall be individually assigned and identified.
- 10.1.1 Disposable single-use type respirators are not permitted.
- 10.1.2 All respirators shall meet the design and usage requirements of the National Institute for Occupational Safety & Health (NIOSH).
- 10.1.3 Thoroughly wash respirators between uses.
- 10.2 *Clothing:* Full body disposable coverall, with attached hood and elasticized at the cuffs and hood, made of material that does not permit penetration of lead dust. Appropriate glove and eye protection should be used.
- 10.3 *Decontamination Facilities:* See section 8.

10.4 *Practice:* Workers shall not eat, drink, smoke or chew while in work areas.

11.0 PREPARATION – WORK AREAS

11.1 Clear immediate work areas of all moveable furnishings or equipment. Any furnishings or equipment not removed shall be adequately covered and sealed using 6 mil polyethylene and duct tape.

11.2 Shut down or isolate all ventilation serving the work area. Seal all ventilation openings with polyethylene sheets and duct tape.

11.3 Erect enclosure (partial or full)

11.4 Erect decontamination facilities.

11.5 Post signage with at least one sign at each entrance of the work area and use barrier tape to demarcate off the work area.

11.6 Ensure that dust tight waste containers are available in the work area for handling / waste.

12.0 EXECUTION

12.1 Where applicable, continually wet the work surface to reduce the amount of lead dust generated.

12.2 The work area should be inspected once per shift for work exceeding more than 1 shift. The inspection should be conducted by a person (e.g. supervisor, occupational hygiene consultant) who is knowledgeable of the work activity taking place and on the requirements of the UofT Lead Management Program and this SOP.

12.3 The inspection should be documented in writing. A sample inspection form is provided in Appendix IV of the UofT Lead Management Program. This form should be retained by the UofT person authorizing the work.

12.4 Do NOT use compressed air to clean up lead dust.

12.5 Frequently and at regular intervals during the doing of work and immediately upon completion of the work, remove dust and waste from the workplace by HEPA vacuuming or damp-wiping, mopping or wet sweeping.

12.6 Before exiting the work area, damp wipe or HEPA vacuum clothing, exposed skin and any tools, equipment or re-usable PPE used in the work area. Polyethylene sheets should also be cleaned by damp wiping or HEPA vacuuming, then sprayed with an adhesive spray to lock down any residual lead-containing dust and then disposed of as hazardous waste. Clothes and rags used for cleaning should also be disposed of as hazardous waste.

12.7 Workers using the decontamination facility should following these steps in the order shown:

- Decontaminate protective clothing that will be reused by HEPA vacuum or by damp wiping
- Remove decontaminated protective clothing and place disposable (not reused) clothing in waste contains for lead dust and waste.
- Following the above, shower without removing the respirator.
- Following the above, remove and clean the respirator.

13.0 CLEARANCE SAMPLING

13.1 Clearance wipe sampling provides analytical confirmation that an area has been adequately cleaned. Table 1 lists the minimum number of clearance wipe samples to be collected and Table 2 lists Clearance Criteria:

13.2

Table 1: Minimum Number of Clearance Wipe Samples

Area of Work or Cleaned Surface(s)	Minimum Number of Wipe Samples*
1 square meter or less	1
Greater than 1 square meter but less than 10 square meters	2
Greater than 10 square meter but less than 100 square meters	3
Every additional 100 square meters	1
If present, inside the clean room entrance/exit to the work area	1

*At least one (1) filed blank shall be collected for each clearance wipe sampling event. There shall be at least one field blank for every 10 field samples.

Table 2; Wipe Sampling Clearance Criteria

Area or Surface to be Tested	µg/100cm²	µg/100ft²
Exterior concrete and rough surfaces	86.1	800
Interior concrete, window troughs, rough surfaces	43	400
Interior window sills	26.9	250
Firing ranges and work places where lead is used	21.5	200
Floors and other surfaces: Non-Residential	21.5	200
Floors and other surfaces: Residential	4.3	40
Child care facilities, primary schools, food preparation, food processing and all surfaces routinely accessible by occupants or used in food processing.	4.3	40

If wipe sampling results are above the values in Table 2, the owner of the work is responsible for notifying EHS and HCMG (St. George campus only) and determine follow up actions if any.

14.0 WASTE TRANSPORT AND DISPOSAL

- 14.1 Lead waste (including water used for cleaning lead-contaminated surfaces) should be disposed of as Hazardous Waste as per the University of Toronto Laboratory Hazardous Waste Management Manual and according to applicable municipal by-laws and/or provincial regulations.
- 14.2 Waste water generated by UofT employees is collected in pails provided by UofT Environmental Protection Services (EPS). When the work is complete, contact EPS at 416-978-7000 to collect the pails
- 14.3 External contractors/consultants must arrange their own transport and disposal, and this must also be done in accordance with applicable municipal and provincial by-laws and/or regulations. This includes waste water used for cleaning lead-contaminated surfaces. External contractors/consultants should follow UofT’s manifesting procedures (contact UofT Environmental Protection Services at 416-978-7000).