

Hazardous Materials Assessment Report Fish Culture Centre Mactaquac, NB

Project No. NB0499

Prepared for:

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Maritimes Region
531 Brandy Cove Road
St. Andrews, NB***

***Attention:
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August 28, 2015



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EXECUTIVE SUMMARY

ALL-TECH Environmental Services Limited was contracted by the Department of Fisheries and Oceans to perform a Hazardous Materials Assessment at the Main Salmon Hatchery and Early Rearing Facility, located at the Fish Culture Centre in Mactaquac, New Brunswick. The assessment was conducted on July 13, 16, and 22, 2015. This report updates our report sent July 29, 2015, based on information requested on August 25, 2015.

The purpose of the Hazardous Materials Assessment was to identify hazardous materials which may require safe handling procedures in accordance with their applicable regulations.

One aspect of the assessment was to identify asbestos-containing materials (ACM) which may require safe handling procedures in accordance with New Brunswick Regulation 92-106 – *A Code of Practice for Working with Materials Containing Asbestos in New Brunswick* (the Code) under the Occupational Health and Safety Act Environmental Protection Act, New Brunswick. This code of practice specifies that any material that contains one percent (1%) or greater asbestos by volume is defined as asbestos-containing. The Code was developed based on potential health effects of airborne asbestos. According to Health Canada, depending on several factors, *“asbestos fibres can cause asbestosis (a scarring of the lungs which makes breathing difficult), mesothelioma (a rare cancer of the lining of the chest or abdominal cavity) and lung cancer.”*

During the assessment, samples were collected of suspect asbestos containing materials throughout the site. Additionally, representative paint samples were collected for lead analysis in the Rearing Pond areas.

Based on the findings from the Hazardous Materials Assessment, the following assessment findings are presented below:

Hazardous Materials identified through sampling and identification were:

- Asbestos Containing Materials (ACM) (>1% asbestos)
- Paint Containing Lead (>0.1%)

Asbestos-Containing Materials (ACM)

A total of twenty-six (26) samples were collected for determination of asbestos content during this assessment. Four (4) of these samples were shown to contain 1% or greater asbestos by volume according to the laboratory results. These samples are therefore defined as asbestos-containing materials (ACM) according to the Code.

Friable ACM

Friable asbestos material refers to material that when dry, can be crumbled, pulverized or reduced to a powder by hand pressure thus releasing fibres into the air. This type of asbestos material is hazardous due to its potential to become airborne if damaged or disturbed. Friable asbestos building products that are known to have been used in the past in North America include sprayed acoustic & fire protection insulations, ceiling/wall finishes, drywall joint compounds, mechanical insulations on pipes, tanks, boilers, vessels, etc.

Twenty-one (21) bulk samples of friable material were collected for determination of asbestos content during this assessment. Two (2) of the samples of friable materials collected during the assessment was identified by the laboratory results as containing 1% or greater asbestos by volume.

Sample ID	Material Design (Friable)	Asbestos Content	Sample/Item Locations
06, 23	Drywall Joint Compound (Walls / Ceilings)	1.5-1.8% Chrysotile	<ul style="list-style-type: none"> • Sampled throughout site • 2 of 8 samples taken in Admin Building contains asbestos; all joint compound in this building should be treated as asbestos unless records of renovations become available • All other buildings only have non-ACM joint compound samples • See Appendices for rooms with ACM joint compound, and for more information on the determination of locations

Note: Please refer to Appendix 1A for laboratory results, and Appendix 4 for quantities. All quantities are approximate.

Non-Friable ACM

Non-friable building products that are known to have been used in the past in North America were vinyl floor tiles, gaskets, transite panels, and transite shingles. Non-friable materials if handled improperly during removal or renovations, such as cutting transite panels with an electrical tool, can cause high fibre release. Also, non-friable asbestos products can become friable if damaged through years of aging (water damage, general deterioration of materials, etc.).

Five (5) bulk samples of non-friable material were collected for determination of asbestos content during this assessment. Two (2) samples of non-friable materials collected during the assessment were identified by the laboratory results as containing 1% or greater asbestos by volume.

Sample ID	Material Design (Non-Friable)	Asbestos Content	Sample/Item Locations
14	Transite Panels Under and Over Exterior Windows	10% Chrysotile	<ul style="list-style-type: none"> • Sampled on front of Admin Building adjacent Room 101 • Located under/over most exterior windows of Admin Building
17	Floor 12"X12" Floor Tiles With Beige Streaks	4.2% Chrysotile	<ul style="list-style-type: none"> • Sampled in Office above Main Garage • Also located at top of stairs adjacent the Office

Note: Please refer to Appendix 1A for laboratory results, and Appendix 4 for quantities. All quantities are approximate.

Materials Containing Lead

It was determined, based on sample analysis during this assessment, that all four (4) paint samples contained greater than the current NB Department of Environment's Lead Paint Guideline of 1000mg/kg (0.1%).

Sample ID	Description	Lead Content	Sample Locations
LP-01	Off-White Paint on Structure	0.75%	<ul style="list-style-type: none">• Left Wing of Rearing Ponds
LP-02	Green Paint on Structure	0.40%	<ul style="list-style-type: none">• Left Wing of Rearing Ponds
LP-03	Red-Brown Paint on Structure	3.3%	<ul style="list-style-type: none">• Right Wing of Rearing Ponds
LP-04	Off-White Paint on Structure	0.76%	<ul style="list-style-type: none">• Right Wing of Rearing Ponds

Note: The complete list of lead paint results can be found in Appendix 1B.

Also, batteries in emergency lighting and exit signs observed throughout the building may contain lead. See Section 6.0 for more information.

This summary should not be used alone. The report must be read in its entirety.



Ryan Floyd, P. Tech., Chem. Tech.
Environmental Project Consultant

ALL-TECH Environmental Services Limited

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1.0 INTRODUCTION

ALL-TECH Environmental Services Limited (ALL-TECH) was contracted by the Department of Fisheries and Oceans to perform a Hazardous Materials Assessment of the Main Salmon Hatchery and Early Rearing Facility, located at the Fish Culture Centre in Mactaquac, New Brunswick. The assessment was conducted by ALL-TECH employees Pierre Theriault and Ryan Floyd on July 13, 16, and 22, 2015. This report updates our report sent July 29, 2015, based on information requested on August 25, 2015.

The purpose of the Hazardous Materials Assessment was to identify potential hazardous building materials which may require safe handling procedures in accordance with their applicable regulations.

Included in this Hazardous Materials Assessment was an Asbestos Assessment of all buildings on the two sites, the purpose of which was to identify asbestos-containing materials (ACM) which may require safe handling procedures in accordance with New Brunswick Regulation 92-106 – A Code of Practice for Working with Materials Containing Asbestos in New Brunswick under the Occupational Health and Safety Act Environmental Protection Act, New Brunswick (the Code). The Code was developed due to asbestos being defined as hazardous to health, as airborne fibres may potentially cause asbestosis (scarring of the lungs), mesothelioma (which effects the lining of several organs), and lung cancer.

It should be noted that, aside from the Asbestos Assessment, other hazardous materials requested for assessment included an assessment for lead in paint only in the Rearing Ponds areas adjacent the Administration Building; no other areas were requested for the lead paint assessment and no other hazardous materials were requested for assessment.

During the assessment, samples were collected of suspect asbestos containing materials as well as representative paint samples for lead analysis.

2.0 REGULATIONS & GUIDELINES

A summary table (Table 1) is provided for the applicable regulations, policies, codes, and / or guidelines of hazardous materials assessed for the purpose of this report. This information was used as reference to assess suspect hazardous materials and make recommendations based on the findings.

Table 1
Summary of Regulatory Framework

Asbestos	<ul style="list-style-type: none">• New Brunswick Regulation 92-106 – A Code of Practice for Working with Materials Containing Asbestos in New Brunswick under the Occupational Health and Safety Act• Environmental Protection Act, New Brunswick• Disposal of Friable Asbestos, Province of New Brunswick
Lead	<ul style="list-style-type: none">• Disposal of Lead Paint & Lead Painted Materials, Province of New Brunswick• Guideline Lead on Construction Projects, Province of Ontario

Asbestos

For the purposes of management of asbestos containing materials (ACM) during building maintenance, renovation or demolition the owner must conduct an assessment of suspect materials for the determination of asbestos content. Under regulatory guidelines ACM is defined as a material which contains 1% or more by volume of asbestos. An assessment report must be made available in writing which identifies materials for the management and safe handling of the ACM as well as identifying the responsibilities of the owners, employers and employees.

Asbestos materials can be found in one of two forms; friable asbestos or a non-friable type. Friable

asbestos material refers to material that when dry, can be crumbled, pulverized or reduced to a powder by hand pressure. This type of asbestos material is hazardous due to its potential to become airborne, if damaged or disturbed.

Friable asbestos building products that are known to have been used in the past in North America include sprayed acoustic and fire protection insulation which were installed on mechanical room ceilings, building structures, ceiling finishes, etc., and mechanical insulation on piping, tanks, boilers, vessels, etc.

Non-friable materials if handled improperly during removal or renovations, such as cutting transite panels with an electrical tool, can cause high fibre releases. Some non-friable building products that are known to have been used in the past in North America are vinyl acoustic floor tiles, gaskets, transite panels, piping and shingles.

Asbestos containing materials can be properly managed and left in place depending on their location and friability. Non-friable materials receive less attention than friable materials due to the fact that the asbestos fibres in the non-friable material are bound or held tightly together. This makes the non-friable products safer and easier to manage.

Disposal of Asbestos-Containing Materials

The Department of the Environment and Local Government States that friable asbestos may only be disposed of in the approved landfills listed in Appendix 5 (New Brunswick Department of Environment and Local Government, April 2014).

Materials Containing Lead

The Department of the Environment and Local Government states in the Disposal of Lead Paint & Lead Painted Materials that: "In order to dispose of an object that is known (or suspected) to contain lead paint, a leachate extraction test must be completed on a representative sample (or samples) of the paint to determine its leachable lead concentration.

The leachate extraction test must be done using the Toxicity Characteristic Leaching Procedure, Method 1311 that appears in the United States Environmental Protection Agency Publication SW-846 entitled "Test Method for Evaluating Solid Waste, Physical/Chemical Methods", as amended from time to time, or an equivalent test method approved by the department.

For consideration of an object containing lead paint to be disposed of at C&D Site, the concentration of lead in the paint must also be determined".

Disposal of Lead-Contaminated Materials

The Department of the Environment and Local Government States that: "If the results of a leachate extraction test are above 5 mg/L for lead then the object in question is considered leachable toxic and therefore must be disposed through the services of an approved hazardous waste disposal company. Disposal at a C&D Site, Municipal Transfer Station or a Regional Solid Waste Landfill is not permitted.

If it has been determined that the object containing lead paint is not leachable toxic, then it may be disposed of at a Regional Sanitary Landfill or taken to a Municipal Transfer Station if appropriate.

If it has been determined that the lead paint contains a total lead concentration of less than 1000 mg/kg (ppm) then the object may also be disposed of at a C&D Site approved by the Department of Environment and Local Government. However this only applies to objects containing lead paint that is that is tightly bound to the matrix it is covering (i.e. not flaking, chipping or peeling). Regardless of test results, no lead painted objects that are flaking, chipping or peeling may be disposed of at a C&D Site". (New Brunswick Department of Environment and Local Government, August 2014).

3.0 METHODOLOGY

3.1 Observations / Background

The scope of work for the assessment was to visually identify controlled hazardous materials located throughout the building. Where visual identification of asbestos containing materials was suspected but unable to be determined, samples were collected and sent to the laboratory for analysis. In addition, representative paint samples were collected for the analysis of lead content.

Some destructive testing was performed during the assessment. Where accessible, areas above ceiling cavities were visually assessed to identify potentially concealed hazardous materials.

3.2 Asbestos

Using standard bulk sampling methodologies, representative suspect asbestos containing materials were sampled from floor coverings and building finish materials throughout the building. Samples were placed in sealed plastic bags, labelled and a chain of custody form completed to be forwarded to the laboratory via courier for analysis.

The asbestos assessment involved a visual investigation of representative building structures, wall & ceiling finishes, and floors for the presence of asbestos containing materials. If these materials were suspected to contain asbestos, a bulk sample was collected of the representative material if not previously identified.

Materials may be identified as ACM (or non-ACM) without further sampling if they are determined to be visually similar to a homogeneous material previously sampled and identified as ACM (or non-ACM) in another area of the building. For example, if Sample 27 is a 12"X12" blue floor tile in Room 001 which contains 2.7% chrysotile asbestos, and the same size and colour tile is observed in Room 002, it can be said that the tiles in Room 002 likely have the same asbestos content without the necessity for additional sampling.

Additionally, materials that are unable to be sampled but are suspected to contain asbestos based on our experience may be visually identified as ACM. These materials should be sampled before renovations or demolition that may disturb them (where possible) to determine the asbestos content.

Some items may have been determined to be non-asbestos-containing based on their age. For example, the client may have building records indicating the age of the renovation area where new materials have been identified. Additionally, visual identification would include such items as new-style fibreglass pipe insulation and vinyl sheet flooring with welded seams.

Under the current New Brunswick regulations (92-106 Code of Practice), materials containing less than 1% asbestos are considered not to be ACM. Lab results will often report samples as containing Trace asbestos, specifying "...that asbestos was detected but is not quantifiable..." according to the lab. In other words, the analyst identified asbestos, but not enough fibres were present to determine an actual accurate number; the material is therefore not an ACM.

It should be noted that asbestos containing materials may be present behind unrevealed areas of exterior foundation, walls, ceilings, columns, shafts, etc. During demolition of these materials, precautions should be taken such as the use of personal protective equipment (as discussed in the Code) in the event of exposing concealed asbestos materials. If suspect materials are revealed, they are to be tested immediately.

3.3 Lead

During the assessment, four (4) representative suspect lead-based paints were sampled from surfaces. Where practical, all layers of paint were removed and placed in sealed plastic bags, labelled and a chain of custody form completed to be forwarded to IATL Laboratory via courier for analysis.

4.0 ASSESSMENT FINDINGS

4.1 Asbestos Containing Materials (ACM)

During the assessment a total of twenty-six (26) samples were collected of suspect ACMs. Four (4) of the samples analyzed taken for this assessment were found to contain asbestos greater than 1% by volume (see laboratory results – Appendix 1A). These materials are identified in Table 2 – Summary of Friable ACM and Table 3 – Summary of Non-Friable ACM below.

Asbestos materials can be found in one of two forms; friable asbestos or a non-friable type. Asbestos containing materials can be properly managed and left in place depending on their location, condition, and friability. Non-friable materials receive less attention than friable materials due to the fact that the asbestos fibres in the non-friable material are bound or held tightly together, reducing the chance of fibres becoming airborne. This makes the non-friable products safer and easier to manage.

Friable ACM

Twenty-one (21) bulk samples of friable material were collected for determination of asbestos content during this assessment. Two (2) of the samples of friable materials collected during this assessment was identified by the laboratory results as containing 1% or greater asbestos by volume, and is listed below.

**Table 2
 Summary of Friable ACM**

Sample ID	Material Design (Friable)	Asbestos Content	Sample/Item Locations
06, 23	Drywall Joint Compound (Walls / Ceilings)	1.5-1.8% Chrysotile	<ul style="list-style-type: none"> • Sampled throughout site • 2 of 8 samples taken in Admin Building contains asbestos; all joint compound in this building should be treated as asbestos unless records of renovations become available • All other buildings only have non-ACM joint compound samples • See Appendices for rooms with ACM joint compound, and for more information on the determination of locations

Note: Please refer to Appendix 1A for laboratory results, and Appendix 4 for quantities. All quantities are approximate.

Non-Friable ACM

Five (5) bulk samples of non-friable material were collected for determination of asbestos content during this assessment. Two (2) of the samples of non-friable materials collected during this assessment were identified by the laboratory results as containing 1% or greater asbestos by volume, and are listed below.

Table 3
Summary of Non-Friable ACM

Sample ID	Material Design (Non-Friable)	Asbestos Content	Sample/Item Locations
14	Transite Panels Under and Over Exterior Windows	10% Chrysotile	<ul style="list-style-type: none"> • Sampled on front of Admin Building adjacent Room 101 • Located under/over most exterior windows of Admin Building
17	Floor 12"X12" Floor Tiles With Beige Streaks	4.2% Chrysotile	<ul style="list-style-type: none"> • Sampled in Office above Main Garage • Also located at top of stairs adjacent the Office

Note: Please refer to Appendix 1A for laboratory results, and Appendix 4 for quantities. All quantities are approximate.

4.2 Lead

Lead is a naturally-occurring metal that is present throughout the environment in rocks, soil, water and air. It has been used as a pigment in many paints for centuries as well as with old pipes and plumbing solders. In some applications it is still used today. From the occupational health standpoint, intact dry lead paint or particles poses little hazard. But a serious hazard can be created when lead coatings or materials are disturbed.

Based on the age of the building, representative paint samples were collected during the assessment and sent for analysis for lead content. A total of four (4) samples were tested and it was determined based on sample analysis that all four (4) of the paint samples contained lead in excess of 0.1% (1000 mg/kg / 1000 ppm) (see laboratory results – Appendix 1B).

Table 4
Summary of Lead-Containing Paint

Sample ID	Description	Lead Content	Locations
LP-01	Off-White Paint on Structure	0.75%	<ul style="list-style-type: none"> • Left Wing of Rearing Ponds
LP-02	Green Paint on Structure	0.40%	<ul style="list-style-type: none"> • Left Wing of Rearing Ponds
LP-03	Red-Brown Paint on Structure	3.3%	<ul style="list-style-type: none"> • Right Wing of Rearing Ponds
LP-04	Off-White Paint on Structure	0.76%	<ul style="list-style-type: none"> • Right Wing of Rearing Ponds

Note 1: The complete list of lead paint results can be found in Appendix 1B.

Note 2: An assessment for lead in paint was requested only for the Rearing Ponds areas.

Additionally, several emergency lights and exit signs were observed in the building; lead-acid batteries may be present within but could not be accessed to confirm. See Section 6.0 for more information.

5.0 MATERIALS AND AREAS NOT ASSESSED

Due to the limited destructive testing of this assessment, certain items that may contain asbestos or other hazardous materials could not be assessed and/or tested (see Recommendations for more information). Materials and areas not assessed include, but are not limited to:

- **Electrical components, such as wire covering and transite within electrical panels**
- **Interior components of mechanical items, such as generators and metal-clad tanks**
- **Gaskets on mechanical items and pipe systems**
- **Roof components such as roofing tar and felt**
- **Elevator shafts**

- **Interior components of walls, such as vermiculite within exterior cinderblock walls**

12”X12” wood fibre ceiling tiles were observed in the office above the main garage. These tiles do not contain asbestos, but could also be held in place by adhesive, which could not be sampled without damaging the tiles. This type of adhesive sometimes contains asbestos, and should be sampled previous to any renovations/demolition.

Limited access above ceiling tiles was noted in several rooms in the Administration Building. This included conditions such as:

- Elements such as wires, sprinklers or lighting preventing removal of ceiling tiles and/or limiting vision in the ceiling space
- Unmoveable/heavy floor-level furniture or stairs preventing placement of a ladder
- Small gaps between the ceiling tiles and ceiling structure or fixed ceiling

Ceiling spaces between ceiling tiles and ceiling structure / roof could contain such ACM as pipe insulation and duct insulation based on observations on other sites.

Fixed ceilings (plywood, drywall, plaster, fixed 12”X12” ceiling tiles, plastic) were observed in the following rooms, with no access above:

- Administration Building Rooms 101, 101A, 102, 108, 110-113, 115, 121-123, and 128.
- About half of the Main Garage Building
- Office on top floor of Main Garage Building
- Broodstock Facility washrooms
- Most of Incubation Building (conference room, office, two washrooms, and a closet)

Other items noted with limited or no access:

- A plywood bulkhead was observed at floor level in Administration Building Room 110. It appears to be newer, but could not be accessed to determine the contents.
- One vermiculite sample was collected from a cinderblock wall in the Administration Building; although this sample did not contain asbestos we recommend sampling in more locations if any other cinderblock walls are to be demolished in any of the sites’ buildings.

6.0 CONCLUSIONS & RECOMMENDATIONS

Based on the findings from the Hazardous Materials Assessment, the following conclusions and recommendations are presented:

Hazardous Materials identified through sampling and identification were:

- Asbestos Containing Materials (friable and non-friable materials)
- Paint Containing Lead (**See notes below regarding lead paint disposal**)

A summary of the findings have been tabled in Section 4, Assessment Findings and in the applicable appendices.

In addition to the scope of work for the handling and / or removal of hazardous materials, the following regulations and guidelines must be carried out:

- Follow pertinent regulations and guidelines laid out by WorkSafe NB (*92-106 Code of Practice for Working with Asbestos Containing Materials in New Brunswick*) (the Code), such as Section 4, which states “Where it has been established by inspection and bulk sample analysis that material containing asbestos has been used in a building, an owner/employer shall ensure that an asbestos management program is developed in writing and maintained while the asbestos-containing materials remain in the workplace”, and “inspect the asbestos material at reasonable intervals in order to determine its condition”. (Note: all ACM discovered in this assessment was reported in Good Condition.)
- Provide air monitoring and inspection during the removal of asbestos containing materials, to

- ensure that all government guidelines/regulations are followed during the removal. (WorkSafe NB (92-106 Code of Practice for Working with Asbestos Containing Materials in New Brunswick)).
- Pursuant to Section 5.0, Materials and Areas Not Assessed, if a renovation is to take place the abatement contractor(s) should be given this report and/or an Asbestos Management Plan to review before work begins. All contractors should be aware that ACM were found at this site. All suspect ACM discovered during any renovations that were not sampled for this report should be sampled as per Section 3 of the Code to determine whether or not they contain asbestos. If they do contain asbestos, and are exposed but not planned to be removed, they could be retained if they are in good condition, and must be added to the Asbestos Management Plan.
 - Other provincial and municipal regulations must be adhered to, such as asbestos disposal (Appendix 5).
 - Ensure that the abatement contractor is a reputable contractor and has proper training in the removal of asbestos products.
 - **The five following bullets refer to all non-asbestos materials with lead paint.**
 1. All lead paint identified within the facility will be required to be removed prior to demolition and disposed of as per NB Department of Environment's Disposal of Lead Paint & Lead Painted Materials.
 2. Under NB Department of Environment's Disposal of Lead Paint & Lead Painted Materials all lead waste must pass Leachate Testing prior to disposal. Please refer to Appendix 7.
 3. As stated in Appendix 7, **"If it has been determined that the object containing lead paint is not leachable toxic, then it may be disposed of at a Regional Sanitary Landfill or taken to a Municipal Transfer Station if appropriate."** It also states that, **"Regardless of test results, no lead painted objects that are flaking, chipping or peeling may be disposed of at a C&D Site"**. Therefore, previous to removal of lead-painted materials, it is recommended for the abatement contractor to scrape loose lead-containing paint from all surfaces using appropriate removal guidelines, and dispose of as lead-containing material.
 4. Currently, no guidelines exist for the removal of lead based paints in the Province of New Brunswick. It is recommended that contractors removing lead based paint follow *The Guideline for Lead on Construction Projects, Province of Ontario*. Please refer to Appendix 6.
 5. Lead containing metal items such as doors / door frames can be recycled as per Appendix 7.
 - Regarding the above five bullets, the lead-containing paint sampled from the metal structure in the Rearing Pond area was observed to be flaking/chipping/peeling in many locations (most likely due to age and exposure to weather/temperature). Good Condition lead paint can be retained long-term without danger to employees, but not much of the metal structure was observed to have Good Condition paint. If the metal structure is being replaced soon, the abatement contractor must scrape the loose paint (which would be disposed of as a lead-containing material) and then the metal could go for recycling. However, if this metal structure is planned to be retained long-term, it is recommended to have an abatement contractor scrape the loose paint to limit the chances of exposure. The structure should then be re-painted so that the exposed rust/edges do not cause the paint to continue to lift.
 - Emergency lighting and exit signs were observed throughout the site, which have a potential for lead-containing batteries. Batteries may be retained with a negligible risk for exposure unless damage or leaking is observed. However, any removed for disposal should be considered lead-containing materials unless they are tested or have a label stating that the batteries contain no lead.
 - Due to the age of the buildings, other hazardous materials may exist on this site. Buildings of this age are often observed to house PCB-containing ballasts, mercury-containing vials in thermostats, and lead-containing paint on many types of surfaces. Additionally, fluorescent lighting contains mercury vapour. This assessment did not address these potential hazardous materials. Identification of these hazardous materials (visual identification and sampling), plus removal and disposal procedures/guidelines/regulations, should be considered previous to any planned renovations that may affect these items.

7.0 DISCLAIMER

This report was prepared by ALL-TECH Environmental Services Limited for the sole benefit of our client, the Department of Fisheries and Oceans. The information in the report is based on information provided or obtained by ALL-TECH for the requested survey areas and hazardous materials requested to be assessed. The report is based on ALL-TECH's best judgement of the information provided at the time of the assessment. Any use of this report by a third party, is the responsibility of that third party. ALL-TECH accepts no liability and/or damages occurred by any third party which uses information obtained in this report.

Should you have any questions or have any other information to disclose concerning this report, please contact our office at (506)658-1058.



Ryan Floyd, P. Tech., Chem. Tech.
Environmental Project Consultant

ALL-TECH Environmental Services Limited

Appendix 1A
Laboratory Analysis Reports - Asbestos

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/20/2015
Report No.: 368775
Project: DFO-Mactaquac Salmon Hat
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5684808 **Description / Location:** White/Tan Ceiling Tile,2x4
Client No.: 01 Room 122

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	35	Cellulose	30
		35	Fibrous Glass	

Lab No.: 5684809 **Description / Location:** White Plaster
Client No.: 02 Room 122

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684809 **Description / Location:** Grey Plaster **Layer No.:** 2
Client No.: 02 Room 122

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684810 **Description / Location:** Grey Insulation
Client No.: 03 Room 122

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	20	Fibrous Glass	80
		Trace	Cellulose	

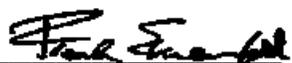
Accreditations: NIST-NVLAP No. 101165-0 NY-DOH No. 11021 AIHA-LAP, LLC No. 100188

*This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government
This report shall not be reproduced except in full, without written approval of the laboratory.*

Analytical Method: US EPA 600/R-93/116 by Polarized Light Microscopy, (ELAP 198.1 where applicable)

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Approved By: 

Date: 7/20/2015

Frank E. Ehrenfeld, III
Laboratory Director

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/20/2015
Report No.: 368775
Project: DFO-Mactaquac Salmon Hat
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5684811 **Description / Location:** White Joint Compound
Client No.: 04 Room 122

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684812 **Description / Location:** White/Tan Floor Tile, 12x12
Client No.: 05 Room 102

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684812 **Description / Location:** Black Mastic **Layer No.:** 2
Client No.: 05 Room 102

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684813 **Description / Location:** Tan Joint Compound
Client No.: 06 Room 106

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
PC 1.8	Chrysotile	None Detected	None Detected	PC 98.2

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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This report shall not be reproduced except in full, without written approval of the laboratory.*

Analytical Method: US EPA 600/R-93/116 by Polarized Light Microscopy, (ELAP 198.1 where applicable)

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/20/2015

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/20/2015
Report No.: 368775
Project: DFO-Mactaquac Salmon Hat
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5684814 **Description / Location:** Grey Vinyl Sheet Flooring
Client No.: 07 Room 110

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684814 **Description / Location:** Yellow Mastic **Layer No.:** 2
Client No.: 07 Room 110

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/20/2015

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/20/2015
Report No.: 368775
Project: DFO-Mactaquac Salmon Hat
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5684815 **Description / Location:** Grey Vinyl Sheet Flooring
Client No.: 08 Room 101

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684815 **Description / Location:** Yellow Mastic **Layer No.:** 2
Client No.: 08 Room 101

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684815 **Description / Location:** Grey Vinyl Sheet Flooring **Layer No.:** 3
Client No.: 08 Room 101

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	20	Cellulose	80

Lab No.: 5684816 **Description / Location:** Off-White Joint Compound
Client No.: 09 Room 119

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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Analytical Method: US EPA 600/R-93/116 by Polarized Light Microscopy, (ELAP 198.1 where applicable)

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/20/2015

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Env'l Services Ltd. 885 Bayside Drive Saint John, NB E2R 1A3	Report Date:	7/20/2015
		Report No.:	368775
		Project:	DFO-Mactaquac Salmon Hat
		Project No.:	NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.:	5684817	Description / Location:	White/Tan Sheetrock Room 122	
Client No.:	10			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	15 Trace	Cellulose Fibrous Glass	85

Lab No.:	5684818	Description / Location:	Tan Vermiculite Insulation Room 128, In Cinder Block Wall Cavity	
Client No.:	11			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	Trace	Cellulose	100

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gänge, homogeneous exfoliated books of mica, or mixed mineral composites).

IATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of the vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004). Please call for more information and pricing.

Lab No.:	5684819	Description / Location:	Grey Vinyl Sheet Flooring Room 127 (Left Wing)	
Client No.:	12			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: NIST-NVLAP No. 101165-0 NY-DOH No. 11021 AIHA-LAP, LLC No. 100188

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Analytical Method: US EPA 600/R-93/116 by Polarized Light Microscopy, (ELAP 198.1 where applicable)

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/20/2015

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/20/2015
Report No.: 368775
Project: DFO-Mactaquac Salmon Hat
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5684820 **Description / Location:** Off-White Mastic
Client No.: 13 Room 127 (Left Wing)

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684821 **Description / Location:** Grey Transite
Client No.: 14 Admin. Building Exterior, Under Windows

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
10	Chrysotile	None Detected	None Detected	90

Lab No.: 5684822 **Description / Location:** White Caulk
Client No.: 15 Admin. Building Exterior, Window

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	Trace	Fibrous Glass	100

Lab No.: 5684823 **Description / Location:** White Joint Compound
Client No.: 16 Garage, At Stairs To Office

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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Analytical Method: US EPA 600/R-93/116 by Polarized Light Microscopy, (ELAP 198.1 where applicable)

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/20/2015

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Env'l Services Ltd.	Report Date:	7/20/2015
	885 Bayside Drive	Report No.:	368775
	Saint John, NB E2R 1A3	Project:	DFO-Mactaquac Salmon Hat
		Project No.:	NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.:	5684824	Description / Location:	Tan Floor Tile, 12x12	
Client No.:	17		Garage Upstairs Office	
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
PC 4.2	Chrysotile	None Detected	None Detected	PC 95.8

Lab No.:	5684824	Description / Location:	Black Mastic	Layer No.:	2
Client No.:	17		Garage Upstairs Office		
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>	
None Detected	None Detected	None Detected	None Detected	100	

Lab No.:	5684825	Description / Location:	Off-White Joint Compound	
Client No.:	18		Adult Sorting Facility Electric Room	
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.:	5684826	Description / Location:	Off-White Joint Compound	
Client No.:	19		Broodstock Facility Washrooms	
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: NIST-NVLAP No. 101165-0 NY-DOH No. 11021 AIHA-LAP, LLC No. 100188

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Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/20/2015

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/20/2015
Report No.: 368775
Project: DFO-Mactaquac Salmon Hat
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5684827 **Description / Location:** Off-White Joint Compound
Client No.: 20 Incubation Building,Adj. Office

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5684828 **Description / Location:** Off-White Joint Compound
Client No.: 21 Incubation Building,Adj. Closet

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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Analytical Method: US EPA 600/R-93/116 by Polarized Light Microscopy, (ELAP 198.1 where applicable)

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/20/2015

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/27/2015
Report No.: 369336
Project: DFO-Mactaquac Salmon Hatchery
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5691196 **Description / Location:** Off-White Joint Compound
Client No.: 22 Room 105; Exterior Wall

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5691197 **Description / Location:** Tan Joint Compound
Client No.: 23 Room 107; Exterior Wall

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
PC 1.5	Chrysotile	None Detected	None Detected	PC 98.5

Lab No.: 5691198 **Description / Location:** Off-White Joint Compound
Client No.: 24 Room 104; Exterior Wall

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 5691199 **Description / Location:** White Joint Compound
Client No.: 25 Room 109; Interior Wall

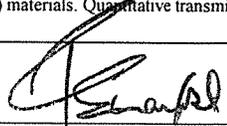
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: NIST-NVLAP No. 101165-0 NY-DOH No. 11021 AIHA-LAP, LLC No. 100188
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Analytical Method: US EPA 600/R-93/116 by Polarized Light Microscopy, (ELAP 198.1 where applicable)

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Approved By: 

Date: 7/27/2015

Frank E. Ehrenfeld, III
Laboratory Director

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/27/2015
Report No.: 369336
Project: DFO-Mactaquac Salmon Hatchery
Project No.: NB0499

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 5691200
Client No.: 26

Description / Location: Off-White Joint Compound
Electrical Room; Interior Wall

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 7/27/2015

Chain of Custody

– Bulk Asbestos –

Contact Information	
Client Company: <u>ALL-TECH Environmental</u>	Project Number: <u>NB0499</u>
Office Address: <u>885 Bayside Drive</u>	Project Name: <u>DFO - Mactaquac Salmon Hat.</u>
City, State, Zip: <u>Saint John NB E2R 1A3</u>	Primary Contact: <u>Ryan Floyd</u>
Fax Number: _____	Office Phone: <u>506-658-1058</u>
Email Address: <u>rfloyd@toalltech.com</u>	Cell Phone: _____

PLM Instructions:	
<input checked="" type="checkbox"/> PLM: Bulk Asbestos Building Materials EPA 600 R-93/116, 1993	
<input type="checkbox"/> PLM: Bulk Asbestos Building Materials EPA 600 M-4/82-020, 1982	
<input type="checkbox"/> PLM: Bulk Asbestos Building Materials NIOSH 9002, 1985	
<input type="checkbox"/> PLM: Bulk Asbestos Building Materials NYSDOH-ELAP 198.1, 2002	
<input type="checkbox"/> PLM: Bulk Asbestos Building Materials NYSDOH-ELAP 198.6, 2010	
<input type="checkbox"/> TEM: Bulk Asbestos Building Materials NYSDOH-ELAP 198.4, 2009	
<input type="checkbox"/> PLM: Point Counting	<input type="checkbox"/> PLM: Analyze Until Positive (Positive Stop)
<input type="checkbox"/> PC: via ELAP 198.1	<input type="checkbox"/> AUP: by Homogenous Area as Noted
<input type="checkbox"/> PC: 400 Points	<input type="checkbox"/> AUP: by Material Type as Noted
<input type="checkbox"/> PC: 800 Points *	<input type="checkbox"/> PLM: NOB via 198.6
<input type="checkbox"/> PC: 1600 Points *	<input type="checkbox"/> PLM: Friable via EPA 600 2.3
<input type="checkbox"/> PLM: Instructions for Multi-Layered Samples	<input type="checkbox"/> If <1% by PLM, to TEM via 198.4 *
<input type="checkbox"/> Analyze and Report All Separable Layers per EPA 600	<input type="checkbox"/> If <1% by PLM, Hold for Instructions
<input type="checkbox"/> Report Composite for Drywall Systems per NESHAP	<input type="checkbox"/> PLM: Non-Building Material ^{***} (Dust, Wipe, Tape)
<input type="checkbox"/> Report All Layers and Composite Where Applicable	<input type="checkbox"/> Soil or Vermiculite Analysis [*]
<input type="checkbox"/> Only Analyze and Report Specifically Noted Layer	<input type="checkbox"/> CARB 435
Special Instructions: <u>Brian Fraser bafrazer@toalltech.com, Patti Anglin panglin@toalltech.com</u>	
<u>Pierre Theriault ptheriault@toalltech.com, Tyler DeRoche tderoche@toalltech.com</u>	
<small>* Additional charge and turnaround may be required ** Alternative Method (ex: EPA 600/R-04/004) may be recommended by Laboratory</small>	

Turnaround Time	
Preliminary Results Requested Date: _____	<input type="checkbox"/> Verbal <input checked="" type="checkbox"/> Email <input type="checkbox"/> Fax
Specific date / time	
<input type="checkbox"/> 10 Day <input type="checkbox"/> 5 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input type="checkbox"/> 1 Day* <input type="checkbox"/> 12 Hour** <input type="checkbox"/> 6 Hour** <input checked="" type="checkbox"/> RUSH**	
<small>* End of next business day unless otherwise specified. ** Matrix Dependent. ***Please notify the lab before shipping***</small>	

Chain of Custody			
Relinquished (Name/Organization): <u>Ryan Floyd</u>	Date: <u>July 24, 2015</u>	Time: <u>4:30 pm</u>	RECEIVED
Received (Name / iATL): _____	Date: _____	Time: _____	
Sample Login (Name / iATL): _____	Date: <u>7/27/15</u>	Time: _____	
Analysis(Name(s) / iATL): <u>PC/ELAP</u>	Date: <u>7/27/15</u>	Time: _____	
QA/QC Review (Name / iATL): _____	Date: _____	Time: _____	JUL 27 2015
Archived / Released: _____	QA/QC InterLAB Use: _____	Date: _____	Time: _____

LABORATORY
[Handwritten Signature]

Appendix 1B
Laboratory Analysis Report – Lead Paint

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Env'l Services Ltd.
885 Bayside Drive
Saint John, NB E2R 1A3

Report Date: 7/20/2015
Report Number: 368760
Project: DFO Mactaquac Salmon Hatch
Project No.: NB0499

LEAD PAINT SAMPLE ANALYSIS SUMMARY

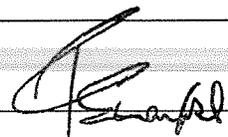
<u>Lab No.</u>	<u>Client No.</u>	<u>Location / Description</u>	<u>Concentration Lead By Weight (%)</u>
5684761	LP-01	Off-White Paint On Structure Left Wing	0.75
5684762	LP-02	Green Paint On Structure Left Wing	0.40
5684763	LP-03	Red/Brown Paint On Structure Right Wing	3.3
5684764	LP-04	Off-White Paint On Structure Right Wing	0.76

Accreditations: **NATIONAL LEAD LABORATORY ACCREDITATION PROGRAM (NLLAP)**
AIHA-LAP, LLC No. 100188 NYSDOH-ELAP No. 11021

Analytical Methods: ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry"
EPA SW846-(3050B:7000B) "Standard Method To Test For Low Concentrations Of Lead In Soils, Sludges and Sediments By AAS"

Comments: Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation. All results are based on the samples as received at the lab. IATL assumes that appropriate sampling methods have been used and the data upon which these results are based have been accurately supplied by the client. Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Appendix B. Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies. LSD=0.2 ppm MDL=0.0044% by weight. RL= 0.010% by weight (based upon 100 mg sampled). * Insufficient sample provided to perform QC reanalysis (<200 mg) ** Not enough sample provided to analyze (<50 mg) *** Matrix / substrate interference possible. Sample results are not corrected for contamination by field or analytical blanks. This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any government agency. This report shall not be reproduced except in full, without written approval of the laboratory.

Date Received: 7/20/2015
Date Analyzed: 7/20/2015
Analyst: C. Shaffer

Approved By: 
Frank E. Ehrenfeld, III
Laboratory Director

Chain of Custody

– Environmental Lead –

Contact Information

Client Company: <u>ALL-TECH Environmental</u>	Project Number: <u>NB0499</u>
Office Address: <u>885 Bayside Drive</u>	Project Name: <u>DFO Mactaquac Salmon Hatch</u>
City, State, Zip: <u>Saint John NB E2R 1A3</u>	Primary Contact: <u>Ryan Floyd</u>
Fax Number: _____	Office Phone: <u>506-658-1058</u>
Email Address: <u>rfloyd@toalltech.com</u>	Cell Phone: _____

iATL is accredited by the National Lead Laboratory Accreditation Program (NLLAP) to perform analytical testing of environmental samples for lead (Pb). The accreditation is through AIHA-LAP, LLC and several other nationally recognized state programs.

Matrix/Method:

- Paint by AAS: ASTM D3335-85a, 2009
- Wipe/Dust by AAS: SW 846: 3050B: 700B, 2010
- Air by AAS: NIOSH 7082, 1994
- Soil by AAS: EPA SW 846 (Soil)
- Water by AAS-GF: ASTM D3559-03D, USEPA 40CFR 141.11B, 2010
- Other Metals (Cd, Zn, Cr) by AAS
- Toxicity Characteristic Leaching Procedure (TCLP) by AAS: USEPA 1311
- Other _____

Special Instructions:

Brian Fraser bafraaser@toalltech.com
Pierre Theriault ptheriault@toalltech.com , Tyler DeRoche tderoche@toalltech.com

E-MAILED
 1/27/2015

Turnaround Time

Preliminary Results Requested Date: _____ Verbal Email Fax

Specific date / time

10 Day
 5 Day
 3 Day
 2 Day
 1 Day*
 12 Hour**
 6 Hour**
 RUSH**

* End of next business day unless otherwise specified. ** Matrix Dependent. ***Please notify the lab before shipping***

See attached

Chain of Custody

Relinquished (Name/Organization): <u>Ryan Floyd</u>	Date: <u>July 17, 2015</u> Time: <u>4:28 pm</u>
Received (Name / iATL): _____	Date: _____ Time: _____
Sample Login (Name / iATL): _____	Date: <u>7/20/15</u> Time: _____
Analysis(Name(s) / iATL): _____	Date: _____ Time: _____
QA/QC Review (Name / iATL): <u>PRY</u>	Date: _____ Time: <u>20 2015</u>
Archived / Released: _____ QA/QC InterLAB Use: _____	Date: _____ Time: _____

RECEIVED
 IATL - BV

DAILY QUALITY CONTROL DATA

LEAD SAMPLE ANALYSIS

(DATE: 07/20/15)

Standard	Total Lead (mg)	Percent Recovery **
Reagent Blank	0.000	< LOQ
Blank Spike	0.500	97
Lab Control Std	1.580	93
Matrix Spike - LBP *	0.27	110
Matrix Spike - Wipe *	0.28	93
Matrix Spike - Soil *	0.282	99
Matrix spike - Air *	0.050	100
2.5 ppm Standard	0.25	98
10.0 ppm Standard	1.0	102
40.0 ppm Standard	4.0	97

AIHA-LAP, LLC No. 100188

NYSDOH-ELAP No. 11021

Analysis Method: ASTM D3335-85A
NIOSH 7082
EPA SW846 3050B 7000B

Comments: IATL assumes that all sampling complies with accepted methods.
All client supplied sampling data is assumed to be correct when calculating results.
Detection limit based upon 0.2 mg/L reporting limit and sample size.
* NIST Traceable.
** 80-120% acceptable limits.

Analyzed By: R. Chad Shaffer
R. Chad Shaffer

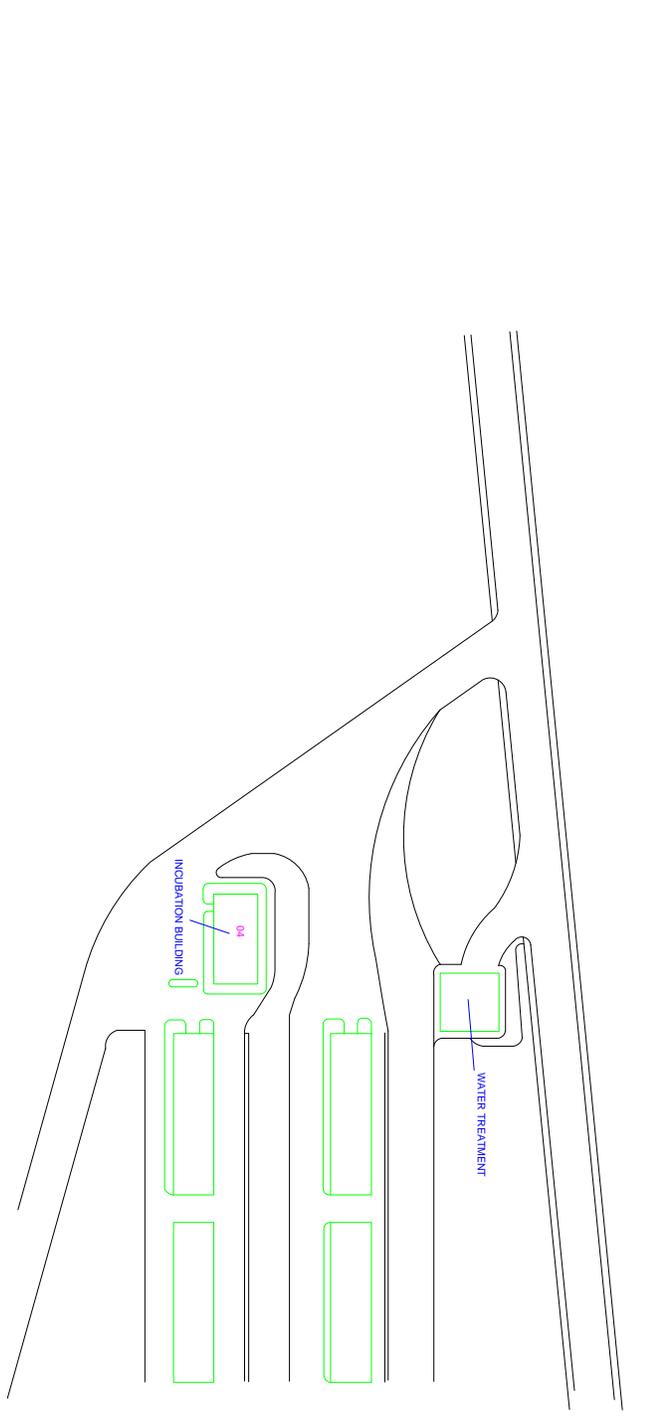
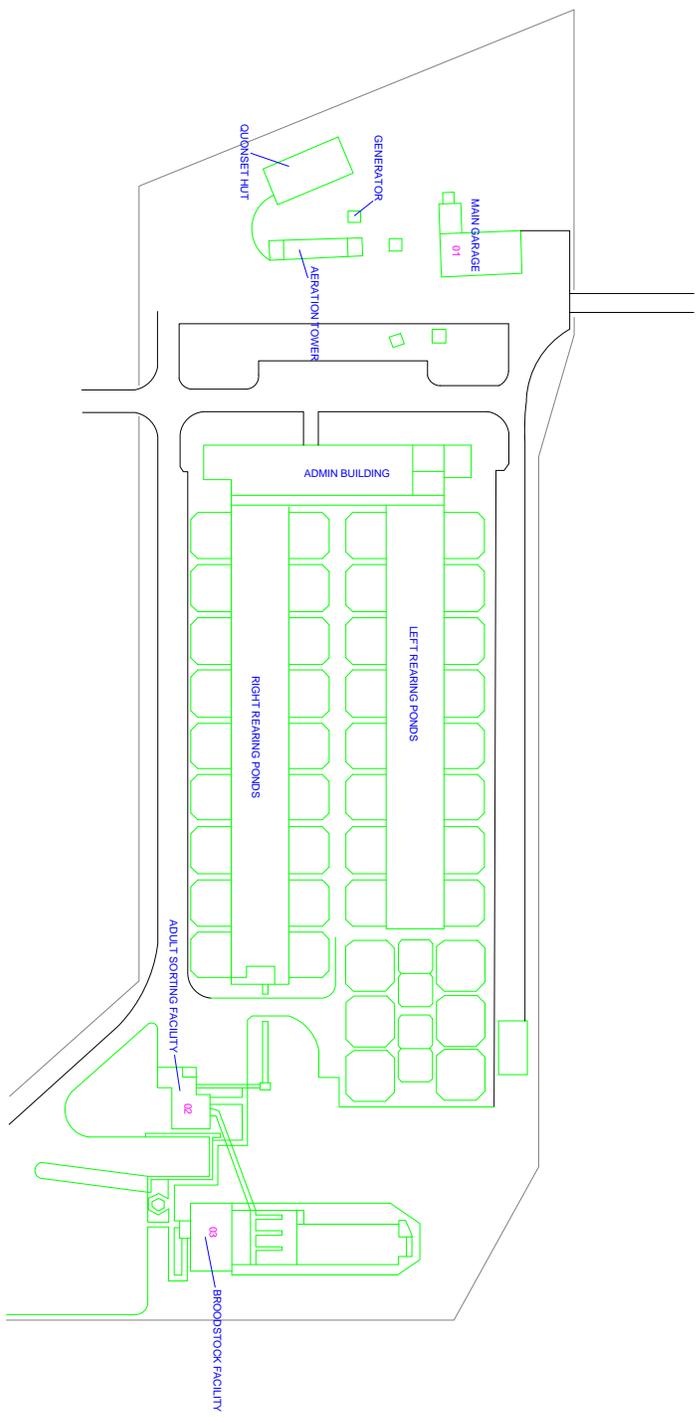
Date: 7/20/15

Approved By: Frank E. Ehrenfeld, III
Frank E. Ehrenfeld, III
Laboratory Director

Appendix 2
Site Drawings with Sample Locations

ALL-TECH ENVIRONMENTAL
ASBESTOS CONTAINING MATERIAL SAMPLE INDEX

SAMPLE #	BUILD #	MATERIAL DESCRIPTION	ASBESTOS PRESENT
16	01	JOINT COMPOUND	NO
17	01	FLOOR TILE	YES
18	02	JOINT COMPOUND	NO
19	03	JOINT COMPOUND	NO
20	04	JOINT COMPOUND	NO
21	04	JOINT COMPOUND	NO



NOTE 1: This drawing has been produced from a sketch and is not to scale. The room sizes and their locations are only approximations of the as-built dimensions.

NOTE 2



885 Boyds Dr
Sault Ste. Marie, N.B.
TEL : (506) 656-1058
FAX : (506) 652-7998

KEY PLAN

ASBESTOS LEGEND

- = CEILING
- = FLOOR
- = CEILING AND FLOOR
- = UNSUPERVEYED AREA
- = APPLIANCE
- = MECHANICAL
- = PIPE MATERIAL
- = DUCT WORK
- = ELECTRICAL
- = WALL

PROJECT
HAZARDOUS MATERIALS
ASSESSMENT
DFO SALMON HATCHERY
MACTAQUAC

SITE
DFO SALMON HATCHERY
MACTAQUAC

DRAWN BY: I. PARROCHE DATE: 24-07-15
CHECKED BY: DATE:
APPROVED BY: DATE:
SCALE: NOT TO SCALE

HAZARDOUS MATERIALS
ASSESSMENT
DFO MACTAQUAC

SITE PLAN

DRAWING NO.	SHEET NO.	REV.
	1 of 2	0

ALL-TECH ENVIRONMENTAL ASBESTOS CONTAINING MATERIAL SAMPLE INDEX			
SAMPLE #	ROOM #	MATERIAL DESCRIPTION	ASBESTOS PRESENT
01	122	CEILING TILE	NO
02	122	PLASTER	NO
03	122	SPRAY FIBERGLASS	NO
04	122	JOINT COMPOUND	NO
05	102	FLOOR TILE	NO
06	106	JOINT COMPOUND	YES
07	110	VINYL SHEET FLOORING	NO
08	101	VINYL SHEET FLOORING	NO
09	119	JOINT COMPOUND	NO
10	122	PLASTER	NO
11	128	VERMICULITE	NO
12	127	VINYL SHEET FLOORING	NO
13	127	MASTIC ON STRUCTURE	NO
14	EXT	TRANSITE PANEL	YES
15	EXT	WINDOW CALKING	NO
22	105	JOINT COMPOUND	NO
23	107	JOINT COMPOUND	YES
24	104	JOINT COMPOUND	NO
25	109	JOINT COMPOUND	NO
26	120	JOINT COMPOUND	NO



NOTE 1: This drawing has been produced from a sketch and is not to scale. The room sizes and their locations are only approximations of the as-built dimensions.

NOTE 2:

8855 Boyside Dr
Scottsboro, ALB
TEL : (506) 656-1058
FAX : (506) 652-7998

KEY PLAN

ASBESTOS LEGEND

- = CEILING
- = FLOOR
- = CEILING AND FLOOR
- = UNSURVEYED AREA
- = APPLIANCE
- = MECHANICAL
- = PIPE MATERIAL
- = DUCT WORK
- = ELECTRICAL
- = WALL

PROJECT
HAZARDOUS MATERIALS
ASSESSMENT
DFO SALMON HATCHERY
MACTAQUAC

SITE
DFO SALMON HATCHERY
MACTAQUAC

DRAWN BY: T. DORRICH DATE: 24-07-15
CHECKED BY: SWS
APPROVED BY: DATE:

SCALE: NOT TO SCALE

A = CEILING
 B = FLOOR
 C = CEILING AND FLOOR
 D = UNSURVEYED AREA
 E = APPLIANCE
 F = MECHANICAL
 G = PIPE MATERIAL
 H = DUCT WORK
 I = ELECTRICAL
 J = WALL

HAZARDOUS MATERIALS
ASSESSMENT
DFO MACTAQUAC

SPANNED TITLE
ADMINISTRATION
BUILDING

DRAWING NO.	SHEET NO.	TOTAL
	2 of 2	0

Appendix 3
Site Photographs



Figure 1 - Off-white paint on the metal structure in the Rearing Ponds areas is lead-containing (Samples LP-01 and LP-04) and is peeling in many locations.



Figure 4 - Transite panels were observed under and over exterior windows of the Administration Building. This material contains asbestos according to Sample 14.



Figure 2 - Green paint on metal structure in the Rearing Ponds areas also contains lead (Sample LP-02) and is peeling in some locations.



Figure 5 - The 12"X12" floor tiles in the office on the 2nd floor of the Main Garage Building contain asbestos (Sample 17).



Figure 3 - Red-Brown metal structure paint was also observed in the Rearing Ponds areas, also contains lead according to Sample LP-03, and was also observed to be peeling in several locations.



Figure 6 - Another view of the ACM floor tiles in the Garage Office.

Appendix 4
Estimated Quantities of Identified Asbestos Containing
Materials

Estimated Quantities of Asbestos-Containing Materials (ACM)
Main Salmon Hatchery and Early Rearing Facility, Mactaquac, NB
July 13, 16, and 22, 2015

Note: limited or no access in certain areas including rooms listed below; also refer to main report

Sample Numbers	Material Design (Friable)	Observed Locations, Conditions, And Approximate Amounts
06, 23	Drywall Joint Compound (DWJC) (Walls / Ceilings)	<ul style="list-style-type: none"> • Sampled throughout surveyed areas of the site. • To attempt to determine the location of ACM drywall joint compound (DWJC), eight (8) samples were collected in the Admin Building, two (2) of which contained asbestos. However, the location of the ACM samples could not be used in conjunction with site observations, floor plans, site interviews, and other available data to accurately specify where ACM or non-ACM DWJC exists in the building. There are several possible reasons for the existing mixture of ACM and non-ACM DWJC, most likely one of the three following explanations: 1) the original building was constructed with ACM DWJC and renovations used non-ACM DWJC; 2) the original DWJC was non-ACM and renovations were done in the 1970's while ACM DWJC was still being used; or 3) the DWJC during the original construction and/or renovations was mixed on-site, which leads to different concentrations of asbestos in different places. However, if records of any renovations to specific walls done after about 1985 become available, it could be possible to determine where newer (non-ACM) walls are versus walls with ACM DWJC. • For the time being, all DWJC in the Admin Building should be treated as ACM. • Observed mostly in Good Condition, except for in Room 119 at Sample 09, which does not contain asbestos. • Walls located in all rooms except 114-118 and 127-130; a total of approximately 9000 ft² of ACM walls. • Ceilings located in Rooms 101, 101A, 102, 108, 110, 111, 112, 121, 122, and 123; a total of approximately 1300 ft² of ACM ceilings. • All other buildings only have non-ACM joint compound samples.

Sample Numbers	Material Design (Non-Friable)	Observed Locations, Conditions, And Approximate Amounts
14	Transite Panels Under and Over Exterior Windows	<ul style="list-style-type: none"> • Sampled on front of Admin Building adjacent Room 101 • Located under/over most exterior windows of Admin Building • Approximately a total of 20 panels, each is about 6 ft², in Good Condition
17	Floor 12"X12" Floor Tiles With Beige Streaks	<ul style="list-style-type: none"> • Sampled in Office above Main Garage • Also located at top of stairs adjacent the Office • Approximately 400 ft² of floor tiles in Good Condition

Appendix 5
Disposal of Friable Asbestos
NB Department of Environment and Local Government

Department of Environment and Local Government

Disposal of Friable Asbestos

Friable (crumbly) asbestos waste is defined as friable waste material containing asbestos fibre or asbestos dust in a concentration greater than 1% by weight.

Friable asbestos waste can become airborne and inhaled. Therefore, extreme care must be taken during the removal, transportation and disposal of this material. The most common form of friable asbestos includes the sprayed-on or plastered material used for insulating, fireproofing, or decorative purposes.

Asbestos which is tightly bound, and is not easily crumbled by the hands does not require special disposal. Following these instructions will keep you compliant with our provincial environmental legislation.

Disposal

- Follow WorkSafe New Brunswick's "A Code of Practice for Working with Materials Containing Asbestos in New Brunswick" (<http://www.worksafenb.ca/asbestos.htm>)
- Asbestos waste can only be disposed of at the following landfills **by appointment**:
 - **Regional Service Commission 11** (formerly Fredericton Region Solid Waste Commission)
 - **Regional Service Commission 9** (formerly Fundy Region Solid Waste Commission)
 - **Regional Service Commission 1** (formerly Commission de gestion Enviro-Ressource du Nord-Ouest (COGERNO))
 - **Regional Service Commission 10** (formerly South West Solid Waste Commission)
 - **Regional Service Commission 7** (formerly Westmorland-Albert Solid Waste Corporation)
 - **Regional Service Commission 3** (formerly Nepisiguit-Chaleur Solid Waste Commission)
- Only asbestos waste generated within New Brunswick shall be disposed in the landfills.
- Asbestos waste must be wetted, placed in either double-bagged 6 mil polyethylene bags securely tied or in a single 6 mil polyethylene bag securely tied and placed in either a drum or in a standard size cardboard box with all seams securely taped.
- Each bag, cardboard box and drum must be clearly labelled "WASTE ASBESTOS UN 2590" or "DÉCHETS D'AMIANTE UN2590".
- If the bags are punctured, the contents must be wetted and repackaged prior to landfilling.
- The personnel handling the asbestos waste must wear the proper respirators and clothing during the unloading and disposal of the asbestos waste.
- Unloading of the vehicle will be done by the driver or helper.

Appendix 6
Guideline – Lead on Construction Projects
Government of Ontario

GUIDELINE

**LEAD ON CONSTRUCTION
PROJECTS**

An electronic copy of this publication is available on the Ministry of Labour website at www.labour.gov.on.ca

A hardcopy of this publication can be ordered:

Online at: <http://www.publications.serviceontario.ca>

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- 1 800 268-7095 TTY Toll-free across Canada

Published September 2004
Revised April 2011

© Queen's Printer for Ontario, 2011

ISBN 978-1-4435-6225-6 (Print)
ISBN 978-1-4435-6227-0 (PDF)
ISBN 978-1-4435-6226-3 (HTML)

Le présent document est aussi disponible en français sous le titre - « Directives concernant l'exposition au plomb sur les chantiers de construction ».

GUIDELINE

**LEAD ON CONSTRUCTION
PROJECTS**

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Foreword

This Guideline has been prepared to assist persons, such as employers, construction project owners, constructors, contractors and subcontractors, who have duties under the Occupational Health and Safety (OHSA) and its regulations to protect workers from exposure to lead. It should not be taken to be a statement of the law or what is necessary to comply with the law. A person with legal duties may or may not agree with the Guideline and there is no legal requirement to follow the Guideline. It is for each such person to decide what is necessary to comply with the OHSA and its regulations.

A person who needs assistance in determining what constitutes compliance should consult with his or her legal advisor. Ministry inspectors will assess workplace situations against the relevant provisions of the OHSA and its regulations but they do not enforce the Guideline, although they may refer to it in determining whether the relevant laws have been complied with.

1.0 INTRODUCTION

Scope

Employers have a duty to protect their workers from lead exposure on construction projects. This guideline has been prepared to raise the awareness of employers and workers in the construction industry of the hazards posed by lead in construction and the measures and procedures that should be taken to control those hazards.

For the purpose of this guideline, lead refers to inorganic lead.

Lead in Construction

Lead is a heavy metal that has been in industrial use for thousands of years. It is pale silvery grey when freshly cut but it darkens on exposure to air. It is heavy, malleable, and a poor conductor of electricity. Lead may be used in its pure elemental form or combined chemically with other elements to form lead compounds. Inorganic lead compounds are used in pigments, paints, glasses, plastics and rubber compounds.

Lead can be present on construction projects in two distinct ways:

- It can be found in construction materials, such as paints, coatings, mortar, concrete, solder, and sheet metal.
- It can be present at a construction site in existing structures, building components, and where lead was previously used in a manufacturing process.

Construction activities of particular concern include:

- abrasive blasting of structures coated with lead-based paints
- application or removal of lead-containing paints
- welding, burning, or high temperature cutting of lead-containing coatings or materials
- removal of lead-containing dust using an air mist extraction system
- removal of lead-containing mortars using an electric or pneumatic cutting device.

2.0 LEGAL REQUIREMENTS

Occupational Health and Safety Act (the OHSA)

The OHSA sets out, in very general terms, the duties of employers and others to protect workers from health and safety hazards on the job. These duties include:

- taking all reasonable precautions to protect the health and safety of workers [clause 25(2)(h)]
- ensuring that equipment, materials and protective equipment are maintained in good condition [clause 25(1)(b)]
- providing information, instruction and supervision to protect worker health and safety [clause 25(2)(a)]
- acquainting a worker or a person in authority over a worker with any hazard in the work and in the handling, storage, use, disposal and transport of any article, device, equipment or a biological, chemical or physical agent [clause 25(2)(d)].

In addition, section 30 of the OHSA deals with the presence of designated substances on construction projects. Since lead is a designated substance (O. Reg. 490/09), compliance with the OHSA and its Regulations will require some action to be taken where there is a lead hazard on a construction project.

Section 30 requires the owner of a project to determine if lead is present on a project and, if it is, to so inform all potential contractors as part of the bidding process. In a similar way, contractors who receive this information are to pass it onto other contractors and subcontractors who are bidding for work on the project. If the owner or any contractor fails to comply with this requirement, they will be liable for any loss or damages that result from a contractor subsequently discovering that lead is present.

Workplace Hazardous Materials Information System (WHMIS) Regulation, R.R.O. 1990, Reg. 860

The WHMIS Regulation applies to all workplaces covered by the OHSA. Any employer or constructor who uses WHMIS controlled products is required to comply with the WHMIS Regulation (Reg. 860) regarding the requirements for labels, material safety data sheets, and worker education and training.

The Ministry of Labour is responsible for the administration and enforcement of both federal and provincial WHMIS legislation.

Regulation for Construction Projects. O. Reg. 213/91

The Regulation for Construction Projects, O. Reg. 213/91, applies to all construction projects. Although lead is not mentioned specifically, the following sections of the O. Reg. 213/91 would apply to situations where there is the potential for workers to be exposed to lead:

- Clause 14 (5) A competent person shall perform tests and observations necessary for the detection of hazardous conditions on a project.
- Section 21 (1) A worker shall wear such protective clothing and use such personal protective equipment or devices as are necessary to protect the worker against the hazards to which the worker may be exposed.
- (2) A worker's employer shall require the worker to comply with subsection (1).
- (3) A worker required to wear personal protective clothing or use personal protective equipment or devices shall be adequately instructed and trained in the care and use of the clothing, equipment or device before wearing or using it.
- Section 30 Workers who handle or use...substances likely to endanger their health shall be provided with washing facilities with clean water, soap and individual towels.
- Section 46 (1) A project shall be adequately ventilated by natural or mechanical means,
- (a) if a worker may be injured by inhaling a noxious...dust or fume;
- (2) If it is not practicable to provide natural or mechanical ventilation in the circumstances described in clause (1)(a), respiratory protective equipment suitable for the hazard shall be provided and be used by the workers.
- Section 59 If the dissemination of dust is a hazard to a worker, the dust shall be adequately controlled or each worker who may be exposed to the hazard shall be provided with adequate personal protective equipment.

Regulation for Designated Substances, O. Reg. 490/09

The Ministry's Designated Substance Regulation, O. Reg. 490/09, specifies occupational exposure limits (OELs) for 11 designated substances including lead, and requires assessment and a control program to ensure compliance with these OELs. The OEL for inorganic lead is 0.05 milligrams per cubic metre (mg/m³) of air as an 8-hour daily or 40-hour weekly time-weighted average limit.

Although O. Reg. 490/09 and the OEL for lead do not apply to an employer on a construction project or to their workers at the project, employers still have a responsibility to protect the health of their workers and to comply with the OHSA and other applicable regulations. Section 25(2)(h) of the OHSA requires that employers take "every precaution reasonable in the circumstances for the protection of a worker".

3.0 HEALTH EFFECTS

How lead enters the body – what are the routes of entry?

Two routes of entry are of major concern: inhalation and ingestion. Airborne lead particles in the form of fumes, dusts and mists can be inhaled deeply into the lungs if they are small enough, less than five micrometres (μm), i.e., five one-millionths of a meter. Larger particles are trapped in the upper respiratory tract, cleared from the lungs, and subsequently swallowed. You can also swallow lead dust if it gets in your food or drinks, or if you eat or smoke without washing your hands first.

What happens when lead enters the body – what are the health effects?

Shortly after lead is inhaled or ingested, it can enter the bloodstream and travel to soft tissues (such as the liver, kidneys, lungs, brain, spleen, muscles, and heart). After several weeks, most of the lead moves into your bones and teeth and can be stored there for a long time. Therefore, exposure to small amounts of lead can build up over time, and the more lead you have in your body, the more likely it is that you will experience health problems.

Early signs of lead poisoning include:

- tiredness
- irritability
- muscle and joint pain
- headaches
- stomach aches and cramps.

Harmful effects can follow a high exposure over a short period of time (**acute poisoning**), or long-term exposure to lower doses (**chronic poisoning**). Symptoms of acute lead poisoning include a metallic taste in the mouth and gastrointestinal symptoms such as vomiting, abdominal cramps, constipation, and diarrhea. Symptoms of chronic lead poisoning are more difficult to recognize because they are similar to many common complaints. However, severe chronic poisoning can lead to more characteristic symptoms, such as a blue line on the gums, wrist drop (the inability to hold the hand extended), severe abdominal pain and pallor.

Lead can also cause serious damage to a number of systems in the body. Overexposure to lead can affect:

Blood: Lead can interfere with the body's ability to manufacture hemoglobin, the molecule in red blood cells responsible for carrying oxygen to the tissues. This may lead to anemia.

Kidneys: Kidneys purify blood before it is distributed for use by the rest of the body. However, kidneys are not effective in filtering lead from the bloodstream. In addition, lead can damage the kidneys and reduce its ability to filter waste from the bloodstream.

Gastrointestinal System: Lead poisoning may result in abdominal pain, loss of appetite, vomiting, nausea, constipation or diarrhea.

Nervous System: Lead poisoning can cause peripheral nerve damage that results in muscle weakness. It may also lead to behavioural changes and to impairment of vision and hearing. At very high levels, lead can affect the brain, causing convulsions, coma, and even death.

Reproductive System: Lead may harm the developing fetus because of the shared blood supply between a mother and her fetus. Exposure of pregnant women to excessive lead may result in miscarriages and stillbirths. Overexposure to lead in men can impair sperm production.

Bones and Teeth: Absorbed lead can be deposited and stored in mineralizing tissues (bones and teeth) for a long period of time. Under certain circumstances, the release of stored lead increases and can re-enter the blood and target other systems in the body. The release of stored lead increases during periods of pregnancy, lactation, menopause, physiologic stress, chronic disease, hyperthyroidism, kidney disease, broken bones, and advanced age, and is exacerbated by calcium deficiency.

Although there are many possible symptoms, they should not be relied upon to warn of a lead-exposure problem because some changes take a long time to develop and workers may not notice a change in their health. If workers carry lead-containing dust home on their clothes, footwear, skin or hair, their family can be exposed to lead too. Children in particular are more susceptible to the harmful effects of lead. Even low-level exposures may harm the intellectual development, behaviour, size and hearing of infants. The best approach in preventing lead poisoning is to ensure that proper lead-exposure controls are in place before any health problems are noted.

4.0 CONTROLLING THE LEAD HAZARD

Lead may affect the health of workers if it is in a form that may be inhaled (i.e. airborne particles) or ingested. In order for lead to be a hazard by inhalation, lead particles that are small enough to be inhaled must get into the air. There are three types of particles: dust, fume and mist. Lead dust consists of solid particles created through processes such as blasting, sanding, grinding, and electric or pneumatic cutting. Lead fumes are produced when lead or lead-contaminated materials are heated to temperatures above 500 °C, such as welding, high temperature cutting, and burning operations. The heating causes a vapour to be given off and the vapour condenses into solid fume particles. Mists are made up of liquid droplets suspended in air. The spray application of lead-based paint can generate a high concentration of lead-containing mist.

The strategy for controlling airborne lead hazard can therefore be broken down into three basic approaches:

- prevent lead from getting into the air
- remove lead present in the air
- if present in the air, prevent workers from inhaling it.

To prevent the ingestion of lead, workers should exercise good work and hygiene practices.

To avoid the ingestion, inhalation and unintentional transfer of lead from contaminated areas, it is essential to have the following control methods in place:

- engineering controls
- work practices and hygiene practices
- protective clothing and equipment
- training.

Even with appropriate measures to control lead, some workers may still be affected. For this reason, periodic medical examinations are important for determining if the control measures in place are effective and if workers are suffering from the effects of lead exposure. This is known as medical surveillance (see Appendix 1) and can be considered to be a method for early detection and prevention of lead poisoning.

4.1 Engineering Controls

Workplace parties, which include owners, constructors, contractors, supervisors and workers, involved in construction projects that may expose workers to lead should:

-
- Substitute lead-containing coatings and materials with lead-free coatings and materials (e.g. substitute lead-containing paints with non-lead based paints). This may also apply to those who develop specifications.
 - Select methods and equipment for the removal or installation of lead-containing coatings and materials that will reduce dust generation (e.g. wet methods, such as wet sweeping and shovelling, reduce dust generation and should be used whenever practicable). This may also apply to those who develop the specifications.
 - General mechanical ventilation should be provided to remove contaminated air from the workplace, and filtered air should be provided to replace the exhausted air.
 - Local mechanical ventilation should be provided to remove contaminants at the source. This is the most effective method. Power tools that can generate lead-containing dust should be equipped with effective dust collection systems.

4.2 Work Practices and Hygiene Practices

Work practices and hygiene practices are on-the-job activities that reduce the exposure potential. Lead-containing material can accumulate on the hands, clothing and hair. From there it can be disturbed, re-suspended in air and inhaled or ingested. Workers should therefore be able to wash and shower at the end of each shift. The specific washing and decontamination facilities that should be provided for the most hazardous work are described in Section 6 of this guideline. For all work involving lead exposure, there should be no smoking, eating, drinking or chewing in contaminated areas. Food and beverages should be stored in an uncontaminated area.

An effective housekeeping program requires the regular cleanup removal of lead-containing dust and debris. Surfaces should be kept clean by washing down with water or vacuuming with a vacuum equipped with a high efficiency particulate air (HEPA) filter. Containers of lead-containing waste should be kept tightly covered to prevent dust from becoming airborne. Cleaning with compressed air or dry sweeping should be avoided.

4.3 Protective Clothing and Equipment

Personal protective clothing and equipment should be provided where workers may be exposed to lead. Appropriate personal protective clothing and equipment to prevent skin contamination, include but are not limited to coveralls or full-body work clothing; gloves, hats, and footwear or disposable coverlets; and safety glasses, face shields or goggles. Respirators should be provided to prevent the inhalation of lead where engineering controls and work practices do not control the concentration of lead to below the OEL.

Protective Clothing

The purpose of protective clothing is to prevent skin exposure and the contamination of regular clothing. All clothing and equipment that has been worn in a lead-contaminated area must be

removed at the end of each shift and be decontaminated. Under no circumstances should these be taken home. When handling lead-contaminated clothing avoid shaking, as this can be a significant source of exposure to lead dust. Lead-contaminated clothing and equipment should be placed in sealed impermeable plastic bags with proper labels indicating lead contamination. Washing facilities and procedures must be suitable for handling lead contaminated laundry.

Respirators

Where engineering controls and work practices do not control the concentration of lead to below the OEL, workers should wear respirators. If respirators are used, a respirator program should be implemented. The program should be developed in consultation with the joint health and safety committee or health and safety representative, if there is one, and should include written procedures for the selection, use, care and maintenance of personal respiratory protective equipment. Workers should be instructed and trained on the care and use of personal protective equipment before using it. Some workers may have a medical condition that causes them to have difficulty breathing when wearing a respirator. If such workers have written medical proof of their condition, they should not be required to do work that requires a respirator.

Respirator selection

Where respirators are provided, they should be appropriate in the circumstances for the anticipated concentrations of airborne lead. Respirators should be selected in accordance with the U.S. National Institute for Occupational Safety and Health (NIOSH) assigned protection factors (APF).

Use, Care, and Maintenance of Respirators

The following general use, care, and maintenance procedures should be followed whenever respirators are required:

- respirators should be used and maintained in accordance with the manufacturer's specifications
- storage of respirators should be in a convenient, clean and sanitary location and in a manner that does not subject them to damage or distortion
- respirators assigned for the exclusive use of one worker, should be cleaned, disinfected and inspected after each shift on which they are used
- respirators used by more than one worker, should be cleaned, disinfected and inspected after each use
- any respirator parts that are damaged or that have deteriorated should be replaced before the respirator is used
- please refer to CSA standard Z94.4-02 for additional information of the use and care of respirators.

Ideally respirators should be assigned for the exclusive use of one worker. But before a decision is made for a respirator to be shared by more than one worker, the following factors should be considered:

- the fit of the equipment
- the health and safety risk to the worker that supplying non-exclusive use equipment would cause
- any undue economic hardship to the employer that supplying exclusive use equipment would cause.

Respirators with a tight-fitting face-piece, must be fitted to the worker in such a way that there is an effective seal between the equipment and the worker's face. Each worker must be fitted for each type of respirator to be worn.

4.4 Training

Training is an important component in preventing worker exposure to lead. Control methods, measures and procedures can only be as effective as the workers carrying them out. It is therefore essential for training to cover the following:

- WHMIS training,
- the hazards of lead, including health effects and symptom recognition,
- personal hygiene, respirator requirements, and work measures and procedures, and
- the use, cleaning and disposal of respirators and protective equipment;

Instruction and training should be provided by a competent person. This could be the employer or someone hired by the employer. A competent person is defined under the OHS Act as a person who:

- is qualified because of his/her knowledge, training and experience to organize and carry out the work safely;
- is familiar with the provisions of the act and the regulations that apply to the work; and
- has knowledge of any potential health and safety hazards in the workplace.

The health and safety representative or the representative of a joint health and safety committee should be advised about when and where the training and instruction is to be carried out.

4.5 Medical Surveillance

Medical surveillance can be used as a preventive measure. By providing regular medical examinations and biological monitoring (i.e. blood-lead tests) on workers exposed to lead, subsequent adverse health effects can be detected. The examining physician can then alert the

worker, the employer and the joint health and safety committee to exposure problems in the workplace that might otherwise go unrecognized

Workers working with lead on a regular basis should have pre-placement medical examinations that include blood-lead tests, followed by periodic medical examinations. Blood-lead tests should be taken every six months, or more frequently at the discretion of a physician. Additional information of the medical surveillance program for lead exposed workers can be found in Appendix 1.

5.0 CLASSIFICATION OF WORK

A key feature of this guideline is the classification of work. It is the classification of the work that determines the appropriate respirators, measures and procedures that should be followed to protect the worker from lead exposure. In this guideline, lead-containing construction operations are classified into three groups, Type 1, Type 2, and Type 3 operations, and can be thought of as being of low, medium and high risk. Some groups, Type 2 and Type 3, are further subdivided. From Type 1 to Type 3 operations, the corresponding respirator requirements, and measures and procedures become increasingly stringent.

The classification of typical lead-containing construction tasks is based on presumed airborne concentrations obtained from the U.S. Occupational Safety and Health Administration (OSHA), the Ontario Ministry of Labour, and published research studies. The classification of Type 1, Type 2, or Type 3 operations are grouped based on the following concentrations of airborne lead:

TYPE 1 OPERATIONS	TYPE 2 OPERATIONS		TYPE 3 OPERATIONS	
	Type 2a	Type 2b	Type 3a	Type 3b
< 0.05 mg/m ³	> 0.05 to 0.50 mg/m ³	> 0.50 to 1.25 mg/m ³	> 1.25 to 2.50 mg/m ³	> 2.50 mg/m ³

TYPE 1 OPERATIONS

- Application of lead-containing coatings with a brush or roller.
- Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap.
- Removal of lead-containing coatings or materials using a power tool that has an effective* dust collection system equipped with a HEPA filter.
- Installation or removal of lead-containing sheet metal.
- Installation or removal of lead-containing packing, babbitt or similar material.
- Removal of lead-containing coatings or materials using non-powered hand tools, other than manual scraping or sanding.
- Soldering.

* Effective implies that the dust collection system should be capable of controlling airborne lead concentration levels to below 0.05 mg/m³. Employers should follow manufacturer's recommendations and maintenance specifications for optimal function.

TYPE 2 OPERATIONS

TYPE 2a OPERATIONS

- Welding or high temperature cutting of lead-containing coatings or materials outdoors. This operation is considered a Type 2a operation only if it is short-term, not repeated, and if the material has been stripped prior to welding or high temperature cutting. Otherwise, it will be considered 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 building components by striking a wall with a sledgehammer or similar tool.

TYPE 2b OPERATIONS

- Spray application of lead-containing coatings.

TYPE 3 OPERATIONS

TYPE 3a OPERATIONS

- Welding or high temperature cutting of lead-containing coatings or materials indoors or in a confined space.
- Burning of a surface containing lead.
- Dry removal of lead-containing mortar using an electric or pneumatic cutting device.
- Removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter.
- Removal or repair of a ventilation system used for controlling lead exposure.
- Demolition or cleanup of a facility where lead-containing products were manufactured.
- An operation that may expose a worker to lead dust, fume or mist that is not a Type 1, Type 2, or Type 3b operation.

TYPE 3b OPERATIONS

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

Employers, supervisors, and workers should be able to recognize and classify lead-containing operations in order to provide appropriate respirators, measures and procedures. Respirator requirements are listed in Table 1 for Type 1, Type 2, and Type 3 operations.

TABLE 1: RESPIRATOR REQUIREMENTS

Operations	Required Respirator
<p>Type 1 (0 - 0.05 mg/m³)</p>	
<ul style="list-style-type: none"> • Application of lead-containing coatings with a brush or roller. • Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap. • Removal of lead-containing coatings or materials using a power tool that has an effective dust collection system equipped with a HEPA filter. • Installation or removal of lead-containing sheet metal. • Installation or removal of lead-containing packing, babbitt or similar material. • Removal of lead-containing coatings or materials with a non-powered hand tool, other than manual scraping and sanding. • Soldering. 	<p>Respirators should not be necessary if the general procedures listed in Section 6.1 are followed and if the level of lead in the air is less than 0.05 mg/m³. However, if the worker wishes to use a respirator, a half-mask particulate respirator with N-, R- or P-series filter, and 95, 99 or 100% efficiency should be provided.</p>
<p>Type 2a (0.05 to 0.50 mg/m³)</p>	<p>NIOSH APF = 10</p>
<ul style="list-style-type: none"> • Welding or high temperature cutting of lead-containing coatings or materials outdoors. This operation is considered a Type 2a operation only if it is short-term, not repeated, and if the material has been stripped prior to welding or high temperature cutting. Otherwise, it will be considered 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 building components by striking a wall with a sledge hammer or similar tool. 	<p>Half-mask particulate respirator with N-, R- or P-series filter, and 95, 99 or 100% efficiency.</p>
<p>Type 2b (0.50 mg/m³ to 1.25 mg/m³)</p>	<p>NIOSH APF = 25</p>
<ul style="list-style-type: none"> • Spray application of lead-containing coatings. 	<p>Powered air purifying respirator equipped with a hood or helmet, and any type of high efficiency filter.</p> <p>Supplied air respirator equipped with a hood or helmet and operated in a continuous flow mode.</p>

Operations	Required Respirator
Type 3a (1.25 to 2.50 mg/m ³)	NIOSH APF = 50
<ul style="list-style-type: none"> • Welding or high temperature cutting of lead-containing coatings or materials indoors or in a confined space. • Burning of a surface containing lead. • Dry removal of lead-containing mortar using an electric or pneumatic cutting device • Removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter. • Removal or repair of a ventilation system used for controlling lead exposure. • Demolition or cleanup of a facility where lead-containing products were manufactured. • An operation that may expose a worker to lead dust, fume or mist that is not a Type 1, Type 2 or Type 3b operation. 	<p>Full-facepiece air-purifying respirator with N-, R- or P-series filter, and 100% efficiency.</p> <p>Tight-fitting powered air-purifying respirator with a high efficiency filter.</p> <p>Full-facepiece supplied-air respirator operated in demand mode.</p> <p>Half-mask or full-facepiece supplied air respirator operated in continuous-flow mode.</p>
Type 3b (more than 2.50 mg/m ³)	NIOSH APF ≥ 1000
<ul style="list-style-type: none"> • Abrasive blasting of lead-containing coatings or materials. 	Type CE abrasive-blast supplied respirator operated in a positive pressure mode with a tight-fitting half-mask facepiece.
<ul style="list-style-type: none"> • Removal of lead-containing dust using an air mist extraction system. 	Full-facepiece supplied-air respirator operated in pressure-demand or other positive-pressure mode.

* NIOSH APF = National Institute of Occupational Safety and Health Assigned Protection Factor

Note: It is recommended that compressed air used to supply air respirators should meet the breathing air purity requirement of CSA Standard Z180.1-00. Where an oil-lubricated compressor is used to supply breathing air, a continuous carbon monoxide monitor/alarm must be provided.

6.0 MEASURES AND PROCEDURES FOR WORKING WITH LEAD

Protective measures and procedures should be implemented when working with lead. Specific measures and procedures will depend on how the work is classified. This section of the guideline outlines general measures and procedures for all work with lead, followed by specific recommendations for Type 1, Type 2, and Type 3 operations.

6.1 General Measures and Procedures for Type 1, Type 2, and Type 3 Operations

The following is a list of general measures and procedures that should be followed for **all** work with lead:

- washing facilities consisting of a wash basin, water, soap and towels should be provided and workers should use these washing facilities before eating, drinking, smoking or leaving the project;
- workers should not eat, drink, chew gum or smoke in the work area;
- drop sheets should be used below all lead operations which produce or may produce dust, chips, or debris containing lead;
- dust and waste should be cleaned up and removed by vacuuming with a HEPA filter equipped vacuum;
- clean-up after each operation should be done to prevent lead contamination and exposure to lead;
- dust and waste should be cleaned up at regular intervals and placed in a container that is:
 - dust tight
 - identified as containing lead waste
 - cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before being removed from the work area
 - removed from the workplace frequently and at regular intervals;
- the work area should be inspected daily at least once to ensure that the work area is clean; and
- compressed air or dry sweeping should not be used to clean up any lead-containing dust or waste from a work area or from clothing.

6.2 Measures and Procedures for Type 1 Operations

Respirators should not be necessary if the general procedures (above) are followed. However, any worker who requests a respirator should be provided with a half-mask particulate respirator with N-, R- or P-series filter, and 95, 99 or 100% efficiency.

6.3 Measures and Procedures for Type 2 Operations

Preparation of the Work Area

For all Type 2 operations, signs should be posted in sufficient numbers to warn of the lead hazard. There should be a sign, at least, at each entrance to the work area. The signs should display the following information in large, clearly visible letters:

1. There is a lead dust, fume or mist hazard.
2. Access to the work area is restricted to authorized persons.
3. Respirators must be worn in the work area.

Personal Protective Clothing and Equipment

Suitable protective clothing and equipment, as recommended in Section 4.3, should be worn by every worker who enters the work area.

Where lead-containing paints or coatings are being applied by spraying, all workers in the work area should wear a powered air purifying respirator equipped with a hood or helmet and a high efficiency filter, or a supplied air respirator equipped with a hood or helmet and operated in a continuous flow mode should be adequate.

For all other Type 2 operations, a half-mask particulate respirator with N-, R- or P-series filter, and 95, 99 or 100% efficiency should be adequate.

6.4 Measures and Procedures for Type 3 Operations

6.4.1 Preparation of the Work Area

Warning signs should be provided for all Type 3 operations. Signs should be posted in sufficient numbers to warn of the lead hazard, and at least at each entrance of the work area. The signs should display the following information in large, clearly visible letters:

1. There is lead dust, fume or mist hazard.
2. Access to the work area is restricted to authorized persons.
3. Respirators must be worn in the work area.

6.4.2 Barriers, Partial Enclosures and Full Enclosures

Barriers, partial enclosures, and full enclosures are used to separate the work area from the rest of the project, and in some cases, to prevent lead exposure to other workers not directly involved in the operation. Partial and full enclosures can also prevent or reduce the dispersion of lead into the surrounding work area and environment. Barriers should only be used where full and partial enclosures are not practicable.

Barriers

Ropes or barriers do not prevent the release of contaminated dust or other contaminants into the environment. However, they can be used to restrict access of workers who are not adequately protected with proper PPE, and also prevent the entry of workers not directly involved in the operation. Ropes or barriers should be placed at a distance far enough from the operation that allows the lead-containing dust to settle. If this is not achievable, warning signs should be posted at the distance where the lead-containing dust settles to warn that access is restricted to persons wearing PPE. For example, the removal of mortar and cutting operations, ropes or barriers should be located at least 10 metres away. All workers within the barrier or warning sign zone must be adequately protected.

Partial Enclosures

Partial enclosures allow some emissions to the atmosphere outside of the enclosure. Partial enclosures may consist of vertical tarps and floor tarps so long as the tarps are overlapped and securely fixed together at the seams. A partial enclosure is not a recommended containment system if significant dust is being generated.

Full Enclosures

Full enclosures are tight enclosures (with tarps that are generally impermeable and fully sealed joints and entryways). Full enclosures allow minimal or no fugitive emissions to reach the outside environment. For full enclosures, 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
- the escape of abrasive and debris from the enclosure should be controlled, at air supply points, by the use of baffles, louvers, flap seals and filters
- general mechanical ventilation should be provided to remove contaminated air from the enclosure and filtered air should be provided to replace the exhausted air
- equipment venting such air should be equipped with filters adequate to control vented air to provincial environmental standards
- the air velocity within the enclosure should provide an average minimum cross-draft or down-draft past each worker during abrasive blasting operations as follows:
 - cross-draft velocity of 0.5 m/sec (100 ft/min)
 - down-draft velocity of 0.25 m/sec (50 ft/min)

Indoor Operations

- For Type 3a operations conducted indoors, barriers, partial enclosures, or full enclosures should be provided.
- For Type 3b operations (abrasive blasting, removal of lead-containing dust using an air mist extraction system) conducted indoors, full enclosures should be provided.

Outdoor Operations

- For Type 3a and 3b operations conducted outdoors, barriers, partial enclosures, or full enclosures should be provided.
- For dry abrasive blasting conducted outdoors, full enclosures should be provided.

6.4.3 Decontamination Facility

A decontamination facility should be made available for workers carrying out for the following Type 3 operations:

Type 3a Operations

- removal of lead-containing coatings and 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 were manufactured

Type 3b Operations

- abrasive blasting of lead-containing coatings or materials
- removal of lead-containing dust using an air mist extraction system

The decontamination facility should be located as close as practicable to the work area and should consist of:

- a room suitable for changing into protective clothing and for storing contaminated protective clothing and equipment
- a shower room as described below
- a room suitable for changing into street clothes and for storing clean clothing and equipment

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

The shower room in the decontamination facility should be provided with the following:

- hot and cold water or water of a constant temperature that is not less than 40° Celsius or more than 50° Celsius

-
- individual controls inside the room to regulate water flow and, if there is hot and cold water, temperature
 - clean towels.

Prior to each shift in which a decontamination facility is being used, a competent person should inspect the facility to ensure that there are no defects that would allow lead-containing dust to escape. Defects should be repaired before the facility is used. The decontamination facility should be maintained in a clean and sanitary condition.

Workers using the decontamination facility should do the following in the order shown:

- decontaminate protective clothing that will be reused on site by vacuuming with a HEPA-filter-vacuum or by damp wiping
- remove the decontaminated protective clothing
- place protective clothing that will not be reused on site in a container suitable for lead-containing dust and waste
- shower without removing the respirator
- remove and clean the respirator

6.4.4 Dust Control Measures

General and Local Mechanical Ventilation

Where the work area is enclosed, general mechanical ventilation should be provided. The air exhausted from an enclosed work area should pass through a dust collector effective for capturing the size of particulate matter being generated and for the volume and velocity of air moving through the enclosure.

Where a dust generating operation is carried out, local mechanical ventilation should be provided to remove dust at the source. Local mechanical ventilation is highly recommended for welding, burning, and high temperature cutting of lead-containing coatings and materials, and for the removal of lead-containing coatings and materials using power tools. Where local mechanical ventilation is used, the following should be met:

- Air velocity at any point in front of or at the opening of the ventilation hood should be sufficient to overcome opposing air currents and capture the contaminated air by causing it to flow into the hood.
- Air velocity at the source should be at least 0.5 m/sec (100 ft/min)
- Air discharged from the local mechanical ventilation system should pass through a HEPA filter and be routed out of the workplace in a way that will prevent the return of contaminants to the workplace.

If local ventilation is not practicable, an appropriate respirator (as listed in Table 1) should be provided. However, the decision that local ventilation is not practicable should not be made without first consulting the joint health and safety committee or health and safety representative, if any, and without considering the following:

- any undue economic hardship to the employer that providing a local ventilation system would cause
- the frequency and duration of the operation
- any potential risks to the workers by not providing a local ventilation system.

Wet Methods

Wet methods should be incorporated in the operation to reduce dust generation. Examples of wet methods include wetting surfaces, wet scraping, and wet shovelling.

Wetting should not be used if it would create a hazard or could cause damage to equipment or to the project. Power tools should be equipped with a shroud, and the shroud should be kept flush with the surface.

6.4.5 Personal Protective Equipment

Protective Clothing

Every worker who enters a Type 3 operation work area should wear protective clothing (see Protective Clothing in Section 4.3).

Respirators

For most Type 3 operations, workers should wear a respirator with a NIOSH approved assigned protection factor of 50 (see Respirator Requirements in Table 1). Where the operation is abrasive blasting, the operator should wear a Type CE abrasive blast supplied air respirator operated in a pressure demand or positive pressure mode with a tight-fitting half-mask or tight-fitting full-facepiece.

It is recommended that compressed air used to supply supplied air respirators meet the breathing air purity requirements of CSA Standard Z180.1-00. Where an oil-lubricated compressor is used to supply breathing air, a continuous carbon monoxide monitor/alarm should be provided.

6.4.6 Clean-Up

Dust and waste should be cleaned up and removed by vacuuming with a HEPA filter equipped vacuum, wet sweeping and/or wet shovelling. Clean-up after each operation should be encouraged to prevent lead contamination and exposure to lead.

When abrasive blasting is finished, cleanup and removal of lead-containing dust and waste should take place.

APPENDIX 1: Medical Surveillance Of Lead-Exposed Workers

Where construction workers are exposed to airborne lead, measures and procedures to control their exposure should be implemented. This guide has outlined (in Section 4) the types of controls that should be in place for various work activities. But to ensure that these controls are effective they should be periodically evaluated. One way of doing this is by establishing a medical surveillance program. A medical surveillance program refers to the systematic collection, analysis, and evaluation of health data in the workplace to identify cases, patterns, or trends suggesting an adverse effect on workers' health. It is highly recommended that employers establish and maintain a medical surveillance program in their workplace.

The essential features of a lead medical surveillance program are outlined below.

Medical Surveillance Program

Purpose

The objective of a medical surveillance program is to protect the health of workers by:

- ensuring their fitness for exposure to lead
- evaluating their absorption of lead
- enabling remedial action to be taken when necessary
- providing health education.

Program

The medical surveillance program should include the following:

- pre-employment and pre-placement medical examinations
- periodic medical examinations
- clinical tests
- health education
- record keeping.

Medical Examinations

The medical examination should include the following:

History

The initial medical and occupational history should include enquiries about the worker's previous exposure to lead (both occupational and non-occupational), personal habits

(smoking and hygiene), and history of present or past gastrointestinal, hemopoietic, renal, reproductive, endocrine, or nervous disorders.

At subsequent examinations, the history should be updated to include:

- information on the frequency and duration of exposure to lead since the previous examination;
- the occurrence of signs and symptoms that may be an early indication of lead intoxication, e.g., abdominal pain, constipation, vomiting, asthenia, paraesthesia and psychological change.

Physical Examination

Medical surveillance should include a general physical examination. Particular attention should be directed to those systems that may be affected by lead. Personal hygiene should also be noted.

Biological Monitoring

Biological monitoring refers to the collection and assessment of bodily fluids or tissue, to evaluate occupational exposure to chemical hazards. The concentration of lead in a worker's blood is a good indicator of lead absorption by that individual. It does not indicate the total body burden of lead, but it is useful in the assessment of a worker's fitness for continued exposure to lead. As such, determining the blood lead levels in lead-exposed workers is highly recommended.

The concentration of lead in the blood can be used to determine:

- When a worker should be removed from lead exposure;
- When an enquiry regarding work practices and personal hygiene should be made;
- When further test(s) should be made; and,
- When a worker may be permitted to return to work.

The determination of whether a worker is fit, fit with limitations or unfit for exposure to lead should only be made by a physician. In addition, a physician should determine the required frequency for biological monitoring on an individual basis.

If symptoms or signs of lead intoxication are present the worker should be removed from lead exposure regardless of blood lead level.

In addition, it is recommended that a pre-placement blood-lead test be taken to establish a baseline for each worker that is exposed to lead.

APPENDIX 2: Respirator Requirements & Other Measures and Procedures for Type 1, 2, and 3 Lead-Containing Operations

OPERATIONS	REQUIRED RESPIRATOR	OTHER MEASURES & PROCEDURES
<p>TYPE 1</p> <ul style="list-style-type: none"> • Application of lead-containing coatings with a brush or roller. • Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap. • Removal of lead-containing coatings or materials using a power tool that has an effective dust collection system equipped with a HEPA filter. • Installation or removal of lead-containing sheet metal. • Installation or removal of lead-containing packing, babbit or similar material • Removal of lead-containing coatings or materials using non-powered hand-held tools, other than manual scraping or sanding. • Soldering. 	<p>Respirators should not be necessary if general procedures listed in Section 6.1 of the Guideline are followed and if the levels of lead in air are less than 0.05 mg/m³. However, if the worker wishes to use a respirator, a half-mask particulate respirator with N-, R- or P-series filter, and 95, 99 or 100% efficiency should be provided.</p>	<ul style="list-style-type: none"> • Washing facilities consisting of wash basin, water, soap and towels should be provided and workers should use these washing facilities before eating, drinking, smoking or leaving the project; • Workers should not eat, drink, chew gum or smoke in the work area; • Dust and waste should be cleaned up at regular intervals and placed in a container that is: <ul style="list-style-type: none"> - dust tight - identified as containing lead waste - cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before being removed from the work area - removed from the workplace frequently and at regular intervals; • Drop sheets should be used below all lead operations which produce or may produce dust, chips, or debris containing lead; • Cleanup after each operation is encouraged to prevent lead contamination and exposure to lead; • Work area should be inspected at least daily to ensure that the work area is clean; • Compressed air or dry sweeping should not be used to clean up any lead-containing dust or waste from a work area or from clothing.

OPERATIONS	REQUIRED RESPIRATOR	OTHER MEASURES & PROCEDURES
TYPE 2		
TYPE 2a		
<ul style="list-style-type: none"> Welding or high temperature cutting of lead-containing coatings or materials outdoors. This operation is considered a Type 2a operation only if it is short-term, not repeated, and if the material has been stripped prior to welding or high temperature cutting. Removal of lead-containing coatings or materials by scraping or sanding using non-powered hand tools Manual demolition of lead-painted plaster walls or building components by striking a wall with a sledge hammer or similar tool 	Half-mask particulate respirator with N-, R-, or P-series filter and 95, 99 or 100 percent efficiency.	<p>(In addition to Type 1 measures and procedures.)</p> <ul style="list-style-type: none"> Signs should be posted in sufficient numbers to warn of the lead hazard. There should be a sign, at least, at each entrance to the work area. The signs should display the following information in large, clearly visible letters: <ul style="list-style-type: none"> - There is a lead dust, fume or mist hazard. - Access to the work area is restricted to authorized persons. - Respirators must be worn in the work area. Suitable protective clothing and equipment should be worn by every worker who enters the work area (refer to Section 4.3 of the guideline).
TYPE 2b		
<ul style="list-style-type: none"> Spray application of lead-containing coatings. 	Powered air purifying respirator equipped with a hood or helmet, and a high efficiency filter. OR Supplied air respirator equipped with a hood or helmet and operated in a continuous flow mode.	

OPERATIONS	REQUIRED RESPIRATOR	OTHER MEASURES & PROCEDURES
<p>TYPE 3</p> <p>TYPE 3a</p> <ul style="list-style-type: none"> • Welding or high temperature cutting of lead-containing coatings or materials indoors or in a confined space. • Burning of a surface containing lead. • Dry removal of lead-containing mortar using an electric or pneumatic cutting device. • Removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter. • Removal or repair of a ventilation system used for controlling lead exposure. • Demolition or cleanup of a facility where lead-containing products were manufactured. • An operation that may expose a worker to lead dust, fume or mist that is not a Type 1, Type 2, or Type 3b operation. 	<p>Full-facepiece air-purifying respirator equipped with N-, R-, or P-series filter and 100% efficiency.</p> <p>OR</p> <p>Tight-fitting PAPR with a high efficiency particulate filter.</p> <p>OR</p> <p>Half-mask or full-facepiece supplied air respirator operated in a continuous flow mode.</p> <p>OR</p> <p>Half-mask supplied air respirator operated in pressure-demand or other positive-pressure mode.</p>	<p>(In addition to Type 1 and Type 2 measures and procedures.)</p> <ul style="list-style-type: none"> • For Type 3a operations conducted indoors or outdoors, enclosures should be provided in the form of barriers, partial enclosures, or full enclosures. • For Type 3b operations conducted indoors, full enclosures should be provided. • With the exception of dry abrasive blasting conducted outdoors, enclosures provided for all other Type 3b operations conducted outdoors should be in the form of barriers, partial enclosures, or full enclosures. For dry abrasive blasting outdoors, full enclosures should be provided. • Where there is an enclosure, general mechanical ventilation should be provided. • A decontamination facility (refer to 6.4.3 of the guideline) should be made available for workers carrying out the following operations: <ul style="list-style-type: none"> - abrasive blasting of lead-containing coatings or materials - the removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter - removal of lead-containing dust using an air mist extraction system - demolition or cleanup of a facility where lead-containing products were manufactured. • When abrasive blasting is finished, dust and waste should be cleaned up and removed by vacuuming with a HEPA filter equipped vacuum, wet sweeping and/or wet shovelling. • Where a dust generating operation is carried out, local exhaust ventilation should be provided to remove dust at the source. Wet methods should also be incorporated in the operation to reduce dust generation.
<p>TYPE 3b</p> <ul style="list-style-type: none"> • Abrasive blasting of lead-containing coatings or materials. • Removal of lead-containing dust using an air mist extraction system 	<p>Type CE abrasive-blast supplied air respirator operated in a positive-pressure mode with a tight-fitting half-mask facepiece.</p> <p>Type CE abrasive-blast supplied air respirator operated in a pressure-demand or positive pressure mode with a tight-fitting full-facepiece</p> <p>Supplied air respirator equipped with a tight-fitting half-mask or full-facepiece and operated in pressure demand or positive pressure mode.</p>	<p>operations:</p> <ul style="list-style-type: none"> - abrasive blasting of lead-containing coatings or materials - the removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter - removal of lead-containing dust using an air mist extraction system - demolition or cleanup of a facility where lead-containing products were manufactured. <p>• When abrasive blasting is finished, dust and waste should be cleaned up and removed by vacuuming with a HEPA filter equipped vacuum, wet sweeping and/or wet shovelling.</p> <p>• Where a dust generating operation is carried out, local exhaust ventilation should be provided to remove dust at the source. Wet methods should also be incorporated in the operation to reduce dust generation.</p>

ISBN 978-1-4435-6225-6 (Print)
ISBN 978-1-4435-6227-0 (PDF)
ISBN 978-1-4435-6226-3 (HTML)

April 2011

Appendix 7

Disposal of Lead Paint & Lead Painted Materials
NB Department of Environment and Local Government

Department of Environment and Local Government

Disposal of Lead Paint & Lead Painted Materials Guideline

The following guideline is intended to provide direction for the disposal of dried lead paint and lead painted objects in New Brunswick.

Background

There are 6 regional solid waste landfills in New Brunswick. These landfills must operate according to the terms and conditions of an Approval to Operate issued by the Department of Environment and Local Government. The landfills are responsible for the disposal of all solid waste generated in the Province, unless a landfill's Approval to Operate prohibits the waste from being disposed of at the landfill.

New Brunswick also has permitted construction and demolition debris disposal sites (C&D Sites) that hold a valid Approval to Operate issued by the Department of Environment and Local Government to accept for disposal inert debris associated with the construction, renovation or demolition of a building or structure.

The Department of Environment and Local Government recognizes the potential negative impact that lead can have on the environment and human health. Consequently, the department wishes to minimize potential pathways that may reintroduce lead back into the environment. Therefore, the Department of Environment and Local Government has established disposal guidelines to help ensure that lead painted items are disposed of appropriately.

Testing Criteria

In order to dispose of an object that is known (or suspected) to contain lead paint, a leachate extraction test must be completed on a representative sample (or samples) of the paint to determine its leachable lead concentration.

The leachate extraction test must be done using the Toxicity Characteristic Leaching Procedure, Method 1311 that appears in the United States Environmental Protection Agency Publication SW-846 entitled "Test Method for Evaluating Solid Waste, Physical/Chemical Methods", as amended from time to time, or an equivalent test method approved by the department.

For consideration of an object containing lead paint to be disposed of at C&D Site, the concentration of lead in the paint must also be determined.

Disposal Options

If the results of a leachate extraction test are above 5 milligrams per litre (mg/L) for lead then the object in question is considered leachable toxic and therefore must be disposed through the services of an approved hazardous waste disposal company. Disposal at a C&D Site, Municipal Transfer Station or a Regional Solid Waste Landfill is not permitted.

If it has been determined that the object containing lead paint is not leachable toxic, then it may be disposed of at a Regional Sanitary Landfill or taken to a Municipal Transfer Station if appropriate.

If it has been determined that the lead paint contains a total lead concentration of less than 1000 milligrams per kilogram (mg/kg or ppm) then the object may also be disposed of at a C&D Site approved by the Department of Environment and Local Government. However this only applies to objects containing lead paint that is tightly bound to the object it is covering (i.e. not flaking, chipping or peeling). Regardless of test results, no lead painted objects that are flaking, chipping or peeling may be disposed of at a C&D Site.

Recycling

The Department encourages recycling of materials whenever practically possible. Lead-painted steel (for example) may be taken to a licensed salvage yard.

Contact

For more information, a list of approved C&D Sites, municipal solid waste transfer stations, municipal solid waste landfills, or approved hazardous waste disposal companies in your area or to inquire whether this is the most recent version of the guideline, please contact the Department of Environment and Local Government – Impact Management Branch at (506) 453-7945.

Appendix 8
A Code of Practice
For Working with Materials Containing Asbestos
In New Brunswick

**A Code of Practice for
Working with
Materials Containing Asbestos
in New Brunswick**

referenced in

New Brunswick
Regulation 92-106

under the

Occupational Health and Safety Act

A Code of Practice for Working with Materials Containing Asbestos in New Brunswick

For further information contact the:

New Brunswick Occupational Health and Safety Commission

500 Beaverbrook Court,

P.O. Box 6000

Fredericton, N.B.

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March 19, 1992

Publisher:

Queen's Printer for New Brunswick

ISBN 1-55048-943-7

Printed in New Brunswick

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INTRODUCTION

Asbestos is a general term which is used to describe a group of fibrous mineral silicates.

The three main types of asbestos include: chrysotile (white asbestos), amosite (brown asbestos) and crocidolite (blue asbestos).

Commercially, asbestos has been used in such applications as fireproofing, textiles, friction products, reinforcing materials (i.e. cement pipes and structures) and insulation, both thermal and acoustical. Its properties, such as non-combustibility, high tensile strength, chemical resistance and flexibility contributed to its wide use.

A variety of lung diseases and cancer have been associated with exposure to airborne asbestos fibres. As a result, the use of asbestos has been restricted in many jurisdictions. Where asbestos products are still in use, a concerted effort has been made to minimize exposure of those individuals handling the product and of the general public.

This *Code of Practice* has been developed to provide safe handling procedures to minimize exposure to asbestos-containing materials.

Many different types of work activities can be undertaken when dealing with asbestos-containing materials. The potential exposure of employees to airborne asbestos fibres, and the risks involved, will vary greatly with the type of work done.

Thus, for the purposes of this *Code of Practice*, asbestos-related work has been classified under three different classes (Class 1, 2 and 3) depending on the degree of risk of exposure, and the controls that are required to keep the exposure as low as possible.

Where a dispute arises as to the classification of an operation under this *Code of Practice*, any party to the dispute may notify an officer, who shall investigate, and deliver a decision in writing to the parties before further work is done.

Sections 5, 6 and 7 deal with Classes 1, 2 and 3 respectively. Section 8 deals with instruction and training.

SECTION 1

DEFINITIONS

"amended water" means water to which a wetting agent has been added;

"approved" means approved by an officer appointed under the *Occupational Health and Safety Act*;

"asbestos" means any of the following fibrous silicates: chrysotile, amosite, crocidolite, actinolite, anthophyllite, or tremolite;

"asbestos-containing material" means material, including fireproofing, friction products, textiles, insulation or reinforcing materials, which contains one per cent or more by volume of asbestos;

"building" includes a structure, and without restricting the generality of the foregoing, includes electrical, plumbing, heating and air handling equipment, and rigid duct work;

"competent" means

(a) qualified, because of such factors as knowledge, training and experience, to do assigned work in a manner that will ensure the health and safety of persons,

(b) knowledgeable about the provisions of the Act and the regulations that apply to the assigned work, and

(c) knowledgeable about potential or actual danger to health or safety connected with the assigned work;

"Class 1, Class 2, or Class 3" means an operation and procedure described in Sections 5, 6 and 7 respectively;

"fibre" means a fibre of asbestos that is more than five micrometres in length and that has a length-to-width ratio of not less than three to one as viewed in a phase-contrast optical microscope at four to five hundred magnification;

"fibre/cm³" means fibres of asbestos per cubic centimetre of air;

"friable material" means material that, when dry, can be or has been crumbled, powdered or pulverized by hand pressure;

"HEPA filter" means a High Efficiency Particulate Aerosol filter that is at least 99.97 per cent efficient in collecting a 0.3 micrometre aerosol;

"NIOSH" means National Institute of Occupational Safety and Health of the U.S. Department of Health and Human Services;

"officer" means an occupational health and safety officer appointed under section 5 of the *Occupational Health and Safety Act*, Chapter O-0.2;

"waste material" means any removed asbestos containing material not intended for reuse and asbestos contaminated material that cannot be cleaned adequately for reuse and includes disposable clothing and personal protective equipment;

"wetting agent" means any product that when added to water will lower the water viscosity and help to penetrate the asbestos material.

SECTION 2

APPLICATION

2.1 This *Code of Practice* applies to every place of employment within the jurisdiction of the *Occupational Health and Safety Act*.

2.2 An owner/employer to whom this *Code of Practice* applies shall take every precaution reasonable in the circumstances, to ensure that every employee who is not an employee of the owner/employer, and who has access to the workplace, is protected, and every such employee shall comply with the requirements of this *Code of Practice*.

SECTION 3

INSPECTION AND DETERMINATION OF ASBESTOS

The inspection, sampling and analysis of suspected asbestos-containing material is extremely important. Visual inspection, and checking of the building's records, may not be adequate to establish the presence of asbestos. Suspect material could contain glass fibres, cellulose or other non-asbestos mineral fibres.

It is critical, therefore, that bulk sampling of suspected materials in buildings be carried out properly, and that laboratory analyses are performed accurately.

3.1 Before performing the demolition, alteration or repair of machinery or equipment, or of a building, aircraft, locomotive, railway car, vehicle or ship, or any part known to contain, or suspected of containing, asbestos, the owner/employer shall inspect and carry out bulk sample analysis to establish whether or not any material that is likely to be handled, dealt with, disturbed or removed contains asbestos.

3.2 For the purposes of this *Code of Practice*, an acceptable procedure for establishing whether asbestos is present in material is as follows:

- (a) One sample should be taken from each room or area containing the same material.
- (b) Separate samples should be taken where there is a difference in the texture or color of the material.
- (c) A small container should be used, such as a plastic 35 mm film canister, or a small wide-mouth glass jar with a screw-on lid. The container should be dried and cleaned.
- (d) The material from which the sample is drawn should not be otherwise disturbed or damaged.
- (e) The area around where the sample is collected should be sprayed with a light mist of water to prevent further damage and fibre release during collection.
- (f) The open end of the container should be gently twisted into the material. A core of the material should fall into the container. A sample can also be taken by using a knife to cut out or scrape off a small piece of material, and then place it into the container. Be sure to penetrate any protective coating and all the layers of material.
- (g) The sample container should be tightly closed. The exterior of the container should be wiped with a damp cloth to remove any material which may have adhered to it.
- (h) The container lid should be taped to prevent the accidental opening of the container during shipment or handling.
- (i) The sample container shall be labelled to identify the location and date the sample was taken, and bear a unique identification number.
- (j) A written record of each sample shall be made by noting the date the sample was taken, the location of the material sampled, the area or room sampled, and the identification number.
- (k) The bulk sample(s) obtained shall be analyzed in a laboratory which has the experience and training to conduct analyses with precision and accuracy.
- (l) The request for analysis shall specify:
 - (i) Classification of the type of asbestos,
 - (ii) Per cent composition by volume of asbestos in the sample.

3.3 Where, upon inspection and bulk sampling, any material has been found to contain asbestos, the owner/employer shall prepare an inspection report in writing containing:

- (a) the type and content of asbestos and,
- (b) drawings, plans and specifications, as appropriate, to show the location of the asbestos material.

SECTION 4

ASBESTOS MANAGEMENT PROGRAM

4.1 Where it has been established by inspection and bulk sample analysis that material containing asbestos has been used in a building, an owner/employer shall ensure that an asbestos management program is developed in writing and maintained while the asbestos-containing materials remain in the workplace.

4.2 The owner/employer shall:

- (a) Inform the Joint Health and Safety Committee (if any) or the Health and Safety Representative (if any) of the findings;
- (b) ensure that the damaged asbestos-containing material is cleaned up and removed using the appropriate procedures detailed in sections 5, 6 and 7;
- (c) repair, seal, remove or permanently enclose the asbestos-containing material where it is readily apparent that the material will continue to deteriorate;
- (d) prepare and maintain on the premises a record of the location of the asbestos material;
- (e) notify in writing any employers who may be at or adjacent to the location of the asbestos material;
- (f) ensure that employees who may be working close to the asbestos are warned not to disturb it;
- (g) identify where practicable the asbestos-containing material by the use of color coding, labels, placards or any other mode of identification;
- (h) inspect the asbestos material at reasonable intervals in order to determine its condition.

4.3 The owner/employer shall also:

- (a) institute and maintain a program, in consultation with the Joint Health and Safety Committee or the Health and Safety Representative, for the training and instruction of every worker employed in the building by the owner/employer who is likely to work in close proximity to and may disturb the asbestos material. This training and instruction shall include, but not necessarily be limited to:
- (i) the hazards of asbestos exposure;
 - (ii) the use, care and maintenance of protective equipment and clothing to be used and worn;
 - (iii) the work practices and procedures to be used in doing the work as prescribed by this *Code of Practice*;
 - (iv) the disposal procedures for asbestos-contaminated materials; and
 - (v) personal hygiene.

SECTION 5

CLASS 1 — OPERATIONS AND PROCEDURES

5.1 Class 1 — Operations

For the purposes of this *Code of Practice*, operations under Class 1 are:

- (a) the installation or removal of manufactured products containing asbestos, including products such as vinyl or acoustic tiles, gaskets, seals, packing, friction products, or asbestos cement products;
- (b) the cutting, drilling or shaping of a product mentioned in paragraph (a) by the use of hand operated tools;
- (c) the use of power tools having a dust collection device equipped with a HEPA filter to cut, grind, or abrade a product mentioned in paragraph (a);
- (d) the removal of drywall where asbestos joint-filling compounds have been used;
- (e) the opening of ceiling tiles for inspection purposes;
- (f) the clean-up of small quantities of friable asbestos debris that has detached from insulation;
- (g) the opening of brake drums, and replacement or repair of brake pads; and

- (h) repair or replacement of clutches.

5.2 Class 1 — Procedures

An employer shall ensure that the following procedures applying to Class 1 operations are complied with:

- (a) before beginning work, visible dust is removed with a damp cloth or a vacuum equipped with a HEPA filter, from any surface in the work area, including the surface to be worked on, if the dust on that surface is likely to be disturbed;
- (b) the spread of asbestos dust from the immediate work area is controlled by measures appropriate to the work to be done, including the use of drop sheets of polyethylene or other suitable material;
- (c) in the case of an operation mentioned in paragraphs 5.1(b), (c) and (d), the product is to be wetted, unless wetting creates a hazard or causes damage;
- (d) frequently and at regular intervals during the work and immediately upon completion of the work;
- (i) dust and waste containing asbestos is cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping;
- (ii) drop sheets that will be re-used are cleaned using a vacuum equipped with a HEPA filter or by damp wiping;
- (e) compressed air hoses are not used to disperse the dust;
- (f) NIOSH-approved disposable respirators suitable for asbestos (or better) are made available for the use of employees;
- (g) waste material is discarded according to the requirements of the New Brunswick Department of the Environment; and

(h) waste material is transported in accordance with the *Transportation of Dangerous Goods Act*.

SECTION 6

CLASS 2 — OPERATIONS AND PROCEDURES

6.1 Class 2 — Operations

For the purposes of this *Code of Practice*, operations classified under Class 2 are:

- (a) the removal of a false ceiling, or part of it, to obtain access to a work area, where a significant quantity of friable material containing asbestos is likely to be lying on the surface of the false ceiling;
- (b) the minor removal or minor disturbance (less than 30 square feet of surface area) of friable material containing asbestos during the repair, alteration, maintenance or demolition of a building, aircraft, ship, locomotive, railway car or vehicle or any machinery or equipment, or part thereof, or where the minor removal or disturbance is not a Class 1 operation;
- (c) the application of tape or a sealant or other covering to pipe or boiler insulation containing asbestos;
- (d) the removal of pipe insulation containing friable asbestos with the help of a commercial containment bag (glove bag);
- (e) the enclosure of asbestos-containing material;
- (f) the use of a power tool not having a dust collection device equipped with a HEPA filter to cut, grind or abrade a product mentioned in paragraph 5.2(a); and
- (g) any operation not mentioned in paragraphs (a) to (e) that may cause exposure of an employee to asbestos, and that is not classified as a Class 1 or a Class 3 operation.

6.2 Class 2 — Procedures

6.2.1 The employer shall ensure that

- (a) amended water is used to control the spread of asbestos dust, unless wetting creates a hazard or causes damage;
- (b) eating, drinking, chewing or smoking is not permitted in the work area;
- (c) only persons wearing protective clothing and proper respiratory protection enter a work area that has been designated as Class 2;
- (d) every employee who enters the work area is provided with respiratory protective equipment, and that
 - (i) respirators are NIOSH approved, reusable, air purifying dust respirators (or better), for protection against asbestos;
 - (ii) when not in use, reusable respirators are maintained and stored in a clean and sanitary location which is easily accessible;
 - (iii) proper-fitting respirators are provided to the employee;

- (iv) where practicable, the respirator is assigned to workers for their exclusive use; and
- (v) respirators are cleaned, disinfected and inspected after each shift during which they are used, if issued for the exclusive use of one employee, or after each use when used by more than one employee;
- (e) protective clothing is provided to every employee who enters the work area, and that
 - (i) the protective clothing consists of full body covering, including head covering, with snug-fitting cuffs at the wrists, ankles and neck, (disposable protective coveralls are strongly recommended), and footwear; and
 - (ii) it is repaired if torn;
 - (iii) it is left inside the work area, or is decontaminated using a vacuum equipped with a HEPA filter before leaving the contaminated work area; and
 - (iv) it is discarded as asbestos-contaminated material, (or washed if reusable), upon completion of the removal project;
- (f) facilities for washing hands and face are made available to an employee, and are used by every employee, when leaving the work area;
- (g) the work area is identified by clearly visible signs warning of the asbestos-dust hazard;
- (h) compressed air is not used to clean up or remove asbestos-dust from any surface;
- (i) before commencing work that is likely to disturb friable material containing asbestos that is crumbled, pulverized or powdered, and that is lying on any surface, the friable material is cleaned up and removed by damp-wiping, or by using a vacuum equipped with a HEPA filter;
- (j) the spread of asbestos-dust from the work area is prevented, where practicable, by
 - (i) an enclosure of polyethylene or other suitable material thick enough to withstand wear and tear where walls do not enclose the work area;
 - (ii) the use of drop-sheets; or
 - (iii) disabling the mechanical ventilation system serving the work area, and by sealing the ventilation ducts to and from the work area;
- (k) frequently and regularly during the work, and immediately upon completion,
 - (i) dust and waste containing asbestos is cleaned up and removed by damp-mopping, and placed in a suitably lined container or a six mil polyethylene bag or by using a vacuum equipped with a HEPA filter;
 - (ii) drop sheets and barriers that are to be reused are thoroughly cleaned;
 - (l) drop sheets and barriers that are to be discarded are considered and treated as asbestos-contaminated material; and
 - (m) waste materials, including discarded polyethylene sheeting, sealing tape, cleaning materials, protective clothing, vacuum bags, and other contaminated materials, are

- (i) placed in a six mil polyethylene bag, labelled as containing asbestos;
- (ii) secured against unauthorized removal or damage;
- (iii) transported in accordance with the *Transportation of Dangerous Goods Act*; and
- (iv) discarded according to the requirements of the New Brunswick Department of the Environment.

6.2.2 An employee shall:

- (a) wear and use the equipment;
- (b) cooperate in attaining an effective fit of the respirator, and be as clean shaven as is necessary to ensure an effective facial seal;
- (c) perform qualitative fit-testing on his respirator, as described in the manufacturers instructions, before each use.

SECTION 7

CLASS 3 — OPERATIONS AND PROCEDURES

7.1 Class 3 — Operations

For the purposes of this *Code of Practice*, operations classified under Class 3 are:

- (a) the removal, other than the minor removal, of material containing asbestos during the repair, alteration, maintenance or demolition of a building, aircraft, ship, locomotive, railway car or vehicle, or any machinery or equipment or part thereof;
- (b) the spray application of a sealant to friable material containing asbestos;
- (c) the cleaning or removal of air-handling equipment, including rigid ducting, in a building that has sprayed-fireproofing containing asbestos;
- (d) an outdoor operation involving the removal or stripping of friable asbestos-containing materials; and,
- (e) the repair, alteration or demolition of a kiln, metallurgical furnace or similar device or part thereof, made in part of refractory materials containing asbestos.

7.2 Class 3 — Procedures

7.2.1 Preparation

The employer shall ensure that:

- (a) signs are posted around the perimeter of the removal area to restrict access;
- (b) the signs required in paragraph (a) are posted in sufficient numbers to warn of the hazard, and state in large clearly visible letters that

- (i) there is an asbestos-dust hazard; and
- (ii) access to the work area is restricted to persons wearing protective clothing and respiratory protective equipment;
- (c) respiratory protection is worn by all employees on-site during the preparation of work areas for asbestos removal, where any disturbance of the material may occur;
- (d) that the respiratory protection has a minimum protection factor of 10, and is approved by NIOSH for protection against asbestos;
- (e) the protective device is fitted so that there is an effective seal between the respirator and the employee's face;
- (f) where practicable, a respirator is assigned to an employee for the employee's exclusive use;
- (g) respirators are used in accordance with the procedures specified by the equipment manufacturer;
- (h) reusable respirators are cleaned, disinfected and inspected after use, at least once each shift, when issued for the exclusive use of one employee, or after each use when used by more than one employee;
- (i) when not in use, reusable respirators are maintained and stored in a clean and sanitary location;
- (j) the mechanical ventilation system serving the work area is disabled to prevent contamination and fibre dispersal to other areas, by
 - (i) switching off the system where possible; and
 - (ii) sealing the ventilation ducts to and from the work area; or
 - (iii) where the ventilation system cannot be switched off, blanking off the main ventilation duct to the area with rigid impervious material such as metal or wood;
- (k) all moveable equipment and material is removed from the work area;
- (l) floors, walls and any items remaining in the room are sealed with polyethylene sheeting, and that
 - (i) any damage to the polyethylene sheeting that occurs as the work proceeds is repaired immediately; and
 - (ii) the polyethylene sheeting has a minimum thickness of six mil;
- (m) drop-sheets are used during outdoor removal operations;
- (n) every precaution is taken to avoid electric shock, including disconnection of electric power to permanent fixtures, except that temporary connections may be made for illumination purposes and for the operation of asbestos-removal equipment;
- (o) the only electrical equipment used in wet removal operations is
 - (i) battery operated;
 - (ii) double insulated;

- (iii) bonded to ground, extra low voltage, not exceeding 30 volts and 100 volt-amperes; or
- (iv) bonded to ground, and equipped with a ground fault circuit interrupter of the Class A type, which is tested before each use;
- (p) a decontamination area is set up adjacent to the work area;
- (q) the decontamination area consists of
 - (i) a clean changing room suitable for changing into clean protective clothing or street clothes, and for storing clean clothing and equipment;
 - (ii) a shower room as described in paragraph (s);
 - (iii) a room suitable for donning reusable protective clothing, and for storing contaminated protective clothing and equipment;
- (r) "air lock doors" are provided and used between the different rooms, and that
 - (i) they consist of layers of polyethylene with at least a three foot overlap,
 - (ii) these sheets are weighted at the bottom to keep the flaps closed,
 - (iii) they are arranged in sequence, and
 - (iv) they are constructed so as to prevent the spread of asbestos dust;
- (s) the shower room in the decontamination facility
 - (i) is located between the contaminated change room and the clean change room,
 - (ii) is provided with hot and cold water, or water of a constant temperature that is not less than 40° Celsius or more than 50° Celsius,
 - (iii) has an individual control inside the room to regulate water flow, and, if there is hot and cold water, individual controls inside the room to regulate the temperature,
 - (iv) is capable of providing adequate supplies of hot water to maintain a water temperature of at least 40° Celsius, and
 - (v) is provided with clean towels;
- (t) adequate toilet facilities exist in the work area, or that where such facilities do not exist in the work area, employees go through the proper decontamination sequence before going to the toilet facilities.

An employee shall ensure that:

- (a) he cooperates in attaining an effective fit of the respirator, and is as clean shaven as is necessary to ensure an effective facial seal;
- (b) fit tests and adjustments are made in the clean change room;

(c) respirators are cleaned, disinfected and inspected after use at least once on each shift, when issued for the exclusive use of one employee, or after each use when used by more than one employee; and

(d) when not in use, reusable respirators are maintained and stored in a clean and sanitary location.

7.2.2 Asbestos Removal

An employer shall ensure that:

(a) negative air pressure is established inside the work area before removal of any asbestos-containing material is begun;

(b) the exhaust unit(s) are equipped with HEPA filters;

(c) they are operated on a 24-hour basis;

(d) a minimum of four air changes per hour is maintained in the removal area,

(e) where practicable, the air is exhausted to the outdoors; and

(f) the integrity of the enclosure and the adequacy of the negative air pressure is maintained by

(i) conducting smoke tests, and

(ii) a daily visual inspection of the enclosure;

(g) personal protective clothing

(i) is provided by the employer, and worn by every employee who enters the work site,

(ii) consists of full body covering, including head covering, with snug fitting cuffs at the wrists, ankles and neck, (Disposable coveralls are strongly recommended),

(iii) is replaced or repaired if torn,

(iv) includes suitable footwear, which must not be taken from the work site unless covered adequately while on the work site,

(v) is worn by all employees involved in, or watching, the asbestos stripping or clean-up,

(vi) is donned in the clean changing room, and that street clothes are left in the clean changing room, preferably in individual lockers,

(vii) is removed when leaving the work site and is stored, or discarded in the first change room, as defined in subparagraph 7.2.1(q)(iii);

(h) personal respiratory protection

(i) consists of Powered Air Purifying Respirators (PAPR) fitted with NIOSH approved cartridges for asbestos, or HEPA filters, for the wet removal of chrysotile, amosite or crocidolite,

- (ii) consists of a NIOSH approved airline respirator for any dry removal,
- (iii) is worn by all employees involved in, or watching, the asbestos stripping or clean-up,
- (iv) is worn in the manner described in the manufacturer's instructions,
- (v) filters are changed at least as frequently as the manufacturer recommends,
- (vi) is properly fitted on employees;
- (i)* special precautions are taken for employees inside the removal area, and that
 - (i) eating, drinking or smoking inside the change room, shower room, hall ways, storage room(s) or removal area are strictly prohibited,
 - (ii) complete decontamination is required prior to eating, drinking or smoking,
 - (iii) respiratory protective equipment is not removed inside the asbestos removal area,
 - (iv) employees take coffee breaks and have lunch in some area completely separate from the asbestos removal area;
- (j)* when an area is being stripped,
 - (i) only authorized personnel are permitted to enter the area,
 - (ii) wet methods are employed in all cases except where electrical conductors or electrical equipment cannot be de-energized, in which case permission must be obtained from an officer before proceeding with dry stripping,
 - (iii) amended water is used for soaking asbestos-containing materials,
 - (iv) amended water is sprayed with airless spray equipment, and with the equipment set at the lowest operable pressure,
 - (v) asbestos-containing material is thoroughly sprayed with amended water, left untouched for several hours, and re-sprayed immediately prior to beginning removal, in order to assure that the material has been saturated, (fallen material should be wet enough that water can easily be squeezed from it by hand),
 - (vi) removal is done in small sections, i.e. about 30 square feet, and that after stripping, fallen material is placed in a six mil (or thicker) polyethylene bag;
- (k)* after removal has begun, all persons leaving the work area, perform personal decontamination, and that
 - (i) work clothes are removed and left in the work area, or in the room between the work area and the shower room,
 - (ii) respiratory protection is only removed as the employee enters the shower,
 - (iii) after thorough showering the employee proceeds to the clean change room,

(iv) where the protective clothing (including work boots) will be reused, it is decontaminated using a vacuum equipped with a HEPA filter or by damp wiping prior to removing,

(v) where the protective clothing will not be reused, it is discarded in the same manner as asbestos-contaminated material.

NOTE: In the case of serious injury to a person in the work area, and in this case only, decontamination procedures may be waived in the interests of obtaining medical aid.

7.2.3 Cleanup of Removal Area

An employer shall ensure that

(a) following removal of asbestos, the entire area, including the decontamination area, is wet cleaned and vacuumed with HEPA filters to remove all visible residue;

(b) the equipment used during the removal is

(i) wet wiped,

(ii) washed and wrapped in polyethylene, or

(iii) placed in plastic bags, and

(iv) that brooms are discarded or sealed in plastic bags;

(c) a sealant is then applied to the entire area and to the remaining plastic, and that

(i) the sealant is sprayed-on using an airless spray which is used in accordance with the manufacturer's recommendations, and

(ii) a negative pressure is maintained inside the enclosure during this process;

(d) employees involved in clean-up use personal protective equipment and respiratory protection such as described in paragraph 7.2.2(c);

(e) employees involved in the cleanup follow the same personal decontamination procedure as described in paragraph 7.2.2(f);

(f) the showers are dismantled and removed last, in order that they can be used by employees engaged in the clean-up procedures;

(g) waste materials, including discarded polyethylene sheeting, sealing tape, cleaning materials, protective clothing, vacuum bags, and other contaminated materials, are:

(i) placed in a six mil polyethylene bag, labelled as containing asbestos,

(ii) secured against unauthorized removal or damage,

(iii) transported in accordance with the *Transportation of Dangerous Goods Act*, and

(iv) discarded according to the requirements of the New Brunswick Department of the Environment.

7.2.4 Clearance Sampling

- (a) Clearance sampling is compulsory for all class 3 projects where the project site is to be re-occupied (except for outdoor operations);
- (b) A guideline value for clearance sampling is 0.05 fibre/cm³.

7.2.5 Encapsulation

An employer shall ensure that:

- (a) the preparation of a work area is conducted as for the removal of asbestos-containing material (Class 3), i.e. subsection 7.2.1;
- (b) personal protective clothing is used as described in paragraph 7.2.2(g);
- (c) personal respiratory protective equipment is used as described in paragraph 7.2.2(h);
- (d) the special precautions outlined in paragraph 7.2.2(i) are taken during these procedures;
- (e) the personal decontamination procedures used are as described in paragraph 7.2.2(k);
- (f) encapsulant (either the bridging or the penetrating type) is applied over the surface of the asbestos-containing material using airless spray equipment at low pressure setting;
- (g) the clean-up procedures are as described in subsection 7.2.3; and
- (h) a liquid sealant or encapsulant is not applied to friable material that contains asbestos, if the friable material has deteriorated, or if there is insufficient strength and adhesion to support the weight of the sealant and the friable materials.

SECTION 8

INSTRUCTION AND TRAINING

An employer shall ensure that

- (a) instruction and training is provided by a competent person to every employee working in a Class 1, Class 2, or Class 3 operation
 - (i) in the hazards of asbestos exposure,
 - (ii) in personal hygiene and work practices and,
 - (iii) in the use, cleaning and disposal of respirators and protective clothing;
- (b) the instruction and training related to respirators addresses

- (i) the limitations of the equipment,
- (ii) the inspection and maintenance of the equipment,
- (iii) the fitting of the equipment, and
- (iv) the disinfecting of the equipment.

SECTION 9

NOTIFICATION OF CLASS 2 OR CLASS 3 PROJECTS

- (a) Before commencing any Class 2 or Class 3 project, the contractor, in the case of a project, and the employer, in any other case, shall notify an officer at the nearest office of the Occupational Health and Safety Commission;
- (b) The contractor or the employer shall supply the following information:
 - (i) the name, address and telephone number of the person giving the notice;
 - (ii) the name, address and telephone number of the owner of the place where the work will be carried out;
 - (iii) the municipal address or other description of the place where the work will be carried out;
 - (iv) a description of the work that will be carried out;
 - (v) the starting date and expected duration of the work;
 - (vi) the name and telephone number of the supervisor in charge of the work;
 - (vii) the total number of employees involved in the removal of asbestos.

SECTION 10

PROHIBITIONS

- (a) No person shall apply, or install by spraying, any material which contains more than one per cent by volume of asbestos that can become friable.
- (b) No person shall apply or install, as pipe or boiler insulation, material which contains more than one per cent by volume of asbestos that can become friable.

March 19, 1992