

June 4, 2018



TESSERACT
ENVIRONMENTAL CONSULTING INC.

Limited Designated Substances Survey



Lower Fort Garry National Historic Site
Saint Andrews, Manitoba

Submitted to:

Mr. Gustavo Lecman
Architecture 49 Inc.
Winnipeg, Manitoba

DESIGNATED SUBSTANCES



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- Appendix A – Laboratory Certificate of Analysis – Asbestos**
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1.0 EXECUTIVE SUMMARY

A limited investigation for hazardous materials has been undertaken to provide a complete understanding of pre-renovation remedial actions that may be required throughout the Lower Fort Garry National Historic Site located in Saint Andrews, Manitoba. Before any work can take place, it is required under Manitoba Regulation 217/2006, Parts 36 and 37 that all hazardous materials that will be affected by these activities be removed or managed in a manner that does not create a risk to the health and safety of any person.

Several of the paint colours found on building exteriors and trimming were determined to be lead containing, with particularly high concentrations observed in the trim colours. Generally, the areas of most significant damage were found to not contain significant concentrations of lead, consistent with modern applications. The poor condition of these materials were consistent with the application of water based latex paint applications over older possibly oil based applications.

Friable asbestos containing textured plaster was found in the basement bathrooms of the museum building. This material may be safely removed following **Type 2** or **Type 3** precautions, dependent on removal quantity.

Non-friable asbestos containing caulking was found on windows throughout the site. This material may be safely removed following **Type 1** precautions.

Abatement activities should only be undertaken by a qualified abatement contractor. All workers should be appropriately trained and fit-tested for the necessary personal protective equipment before being permitted to conduct asbestos removal activities.

2.0 INTRODUCTION

Tesseract Environmental Consulting Inc. (TEC) was retained by the Architecture 49 Inc. (the Client) to complete a limited Designated Substances Survey (DSS) within the Lower Fort Garry National Historic Site in Saint Andrews, Manitoba (the Site). The assessment was conducted on May 15, 2018 by Mr. Trevor Bage of TEC.

The Site assessment was performed with the objective of identifying hazardous materials that may require abatement or repairs prior to scheduled renovations on Site. TEC understands that the Client will provide this report to contractors or staff who will be performing any maintenance, demolition, renovations, or alterations at the Site.

As TEC understands it, scheduled renovations are expected to impact roofing material, windows, and doors of most buildings, as well as a renovation of the basement bathrooms in the museum building.

This report has been compiled to assist the Client in meeting the requirements of Section 4 – Duties of Employers, of Chapter W210 10/02 The Workplace Safety and Health Act as amended, Manitoba Regulation 217/2006 Part 37, and the Manitoba documents, entitled *The Guide for Asbestos Management (May 2017)*.

3.0 SCOPE OF WORK

The Scope of Work for this project was limited to the following:

- Conduct a building-by-building visual assessment of the Site to determine the location and condition of potentially asbestos-containing materials, suspect lead-containing paints, and airborne fungal spores.



- Conduct representative bulk sampling of materials suspected to contain lead or asbestos to supplement observations at the Site.
- Submit the bulk samples collected to an accredited lab, under chain of custody protocol, for analysis.
- Provide a report outlining our findings, and provide recommendations regarding the removal of the identified substances in accordance with planned remediation activities at the Site building.

4.0 REGULATIONS AND GUIDELINES

The regulations, guidelines and standards relevant to hazardous building materials include the Manitoba Workplace Health and Safety Regulation (M.R. 217/2006), the Manitoba guidance document entitled *The Guide for Asbestos Management* (May 2017), and the Manitoba Dangerous Goods Handling and Transportation Act.

Part 36 of M.R. 217/2006 prescribes airborne occupational exposure limits to chemical and biological substances based on Threshold Limit Values (TLV's) established by the American Conference of Governmental Industrial Hygienists (ACGIH). The TLVs for a contaminant represents conditions to which it is believed that nearly all workers may be exposed, day after day, over a working lifetime, without adverse health effects.

Part 37 of M.R. 217/2006 prescribes the overall requirements of a building owner or operator with respect to asbestos-containing materials in the workplace, as well as responsibilities prior to renovation or demolition of all or part of a workplace.

4.1 Asbestos-Containing Materials

Manitoba Regulation 217/2006 defines asbestos substances that may be present within buildings and prescribes requirements regarding their control or removal. Specifically, control or removal of asbestos and other hazardous substances are prescribed under Parts 33 and 37 of M.R. 217/2006, the purpose of which is to limit or prevent occupational exposures prior to any demolition activities. Specific minimum requirements concerning the handling, removal, and disposal of asbestos within a Manitoba workplace are outlined in the document entitled *The Guide for Asbestos Management* (May 2017). This document clearly outlines monitoring exposure limits, notification and training requirements, personal protection, removal procedures, and general information concerning the safe and effective removal of all asbestos-containing materials (ACM).

4.2 Lead

Lead is regulated under M.R. 217/2006, Parts 36 and 33, among others. Generally, removal of lead-containing paint is not required unless work performed on lead-containing materials is likely to produce airborne lead dust or fumes (e.g. during welding, torch cutting, sanding and sandblasting). If these operations are likely to occur during building renovation or alteration, it is recommended that the removal of lead-containing paint be carried out in accordance with M.R. 217/2006; Section 33.3, which states:

An employer must ensure that the demolition work is ... conducted in such a way as to ensure that, so far as is reasonably practicable, workers and other persons are not exposed to risks to their safety and health in connection with the demolition work.



Lead was used as a pigment and drying agent in alkyd oil-based paints. The Surface Coating Materials Regulations (SOR/2005-109) made under the Canada Consumer Product Safety Act restricts the lead content of paints and other liquid coatings on new furniture, household products, children's products, industrial surfaces and exterior and interior surfaces to 90 mg/kg by weight. The Canadian Paint and Coatings Association (CPCA), the national trade association for Canada's paint manufacturers recommended that the Canadian paint industry voluntarily stop using any lead compounds in consumer paints by the end of 1990. Over the years, the amount of lead in paint has continued to decrease, due to the co-operative efforts of government and industry.

Similarly, lead and other heavy metals were commonly used in ceramic tile glaze, and for decorative finishing on other types of glassware.

M.R.217/2006 currently does not prescribe a defining threshold for a quantitative classification of lead-based paint. As such, TEC considers any paint with a detectable presence over 90 mg/kg of lead to be lead-containing paint.

4.3 Airborne Fungal Spores

Currently, no numerical regulatory exposure standards exist for airborne fungal matter. Thus, indoor bioaerosol levels must be compared to outdoor levels or to an asymptomatic reference area. Results of sampling for airborne fungal spores should be evaluated for potential toxigenic microorganism or microorganisms which emit volatile organic compounds. The presence of certain indicator species, regardless of their concentrations, and especially if not also detected in the outdoor ambient sample(s), may indicate the presence of an interior fungal amplification site which may require further investigation and/or remediation.

The persistent presence, demonstrated on repeated sampling, of significant numbers of potentially toxigenic fungi (i.e. *Stachybotrys*, *Aspergillus*, *Penicillium*, and *Fusarium* genera) indicates that remediation should be considered in the areas of concern. The Manitoba Workplace Safety and Health document, titled *Investigation, Assessment, & Remediation of Mould in Workplaces*, outlines the technical procedures to be used for remediation of visible mould growth.

5.0 METHODOLOGY

The surveyor investigated the Site for suspected asbestos-containing materials and lead-containing paints. The site was also assessed for airborne mold spores, as well as any visible fungal contamination. The survey was conducted in such a fashion as to limit damage where possible. As such, the surveyor performed non-intrusive inspection and testing, and assessment of materials in concealed locations (i.e. ceiling spaces or wall cavities) was conducted only where access was readily available.

5.1 Asbestos-Containing Materials

The site was visually inspected on a building-by-building basis to confirm the locations of suspect ACM. Where necessary, bulk samples were collected of materials suspected of containing asbestos for confirmation purposes.

Homogeneous materials sampling was utilized during the investigation. Specifically, bulk material sampling was completed on homogeneous materials that are uniform in color, texture, and installation or construction date.



Representative samples of suspected ACM were submitted to Crisp Analytical Laboratories, LLC in Carrollton, Texas, USA for analysis to determine asbestos type and percentage content by polarized light microscopy (PLM), in accordance with U.S. Environmental Protection Act (USEPA) Method EPA/600/R-93/116.

5.2 Lead

Systematic sampling and visual identification of the most commonly applied colours of suspected lead-containing paints were completed as part of the survey. A visual review for other suspect lead-containing building materials was undertaken and noted if observed.

Samples of suspected lead-containing paints were submitted to ALS Environmental in Winnipeg, Manitoba for CALA Accredited analysis to determine the lead content by Inductively Coupled Plasma Mass Spectrometry (ICP-MS), in accordance with the Method EPA 200.2/6020A.

5.3 Airborne Fungal Spores

Samples of total airborne mould spores were collected using Air-o-Cell cassettes and a pre-calibrated high-flow pump. Samples were collected for ten minutes in duration at a flow-rate of 15 liters per minute (L/min) with a total sampling volume of 150 litres (L) of air. Sampling for airborne fungal spores was conducted in various locations on all floors of the building, including specific areas of concern noted by facility management. An outdoor ambient sample was also collected and used for comparison purposes. The samples were sent for analysis, under chain of custody protocols, to Crisp Analytical Labs, an AIHA-accredited laboratory participating in the AIHA Environmental Microbiology Proficiency Analytical Testing program

6.0 ENVIRONMENTAL SERVICES

TEC collected twenty (20) suspect ACM samples, twelve (12) suspect lead-containing paints and twelve (12) airborne mould samples from various locations throughout the Site.

Representative samples of suspected ACMs were submitted to the AIHA Accredited Industrial Hygiene Laboratory Crisp Analytical Laboratories, LLC (Crisp) in Carrollton, Texas, USA for analysis to determine asbestos type and percentage content by polarized light microscopy (PLM), in accordance with U.S. Environmental Protection Act (USEPA) Method EPA/600/R-93/116).

Representative sample(s) of suspected lead-containing paints were submitted to the CALA Accredited ALS Environmental in Winnipeg, Manitoba for analysis by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS), in accordance with U.S. Environmental Protection Act (USEPA) Method EPA/200.

Air-o-cell cassettes used for the collection of airborne mold samples were sent for analysis, under chain of custody protocols, to Crisp Analytical Labs, an AIHA-accredited laboratory participating in the AIHA Environmental Microbiology Proficiency Analytical Testing program

7.0 RESULTS AND OBSERVATIONS

7.1 Asbestos

Select photographs of the Site areas that were sampled for ACM have been included in **Appendix D – Photo Index**. Full laboratory analytical results for all samples have been included in **Appendix A – Laboratory Certificate of Analysis – Asbestos**.



TABLE 1: Analytical Results of Suspect Asbestos-Containing Materials Collected throughout the Site

Sample Number	Description	Asbestos Content
LFG-01	Men's House – Wall Plaster	None Detected
LFG -02	Bake House – Window Caulk	None Detected
LFG -03	Warehouse – Wall Plaster	None Detected
LFG -04	Big House – Window Caulk	2% Chrysotile
LFG -05	Museum Building – Basement Bathroom Ceiling – Textured Plaster	2% Chrysotile
LFG -06	Museum Building – Basement Bathroom Ceiling – Textured Plaster	2% Chrysotile
LFG -07	Museum Building – Basement Bathroom Ceiling – Textured Plaster	2% Chrysotile
LFG -08	Museum Building – Basement Bathroom - Grout	None Detected
LFG -09	North-East Bastian – Exterior Mortar	None Detected
LFG -10	Ross Cottage – East Wall Plaster	None Detected
LFG -11	Ross Cottage – North Wall Plaster	None Detected
LFG -12	Ross Cottage – Window Caulk	2% Chrysotile
LFG -13	Ross Cottage – Exterior Stucco	None Detected
LFG -14	Big House Annex – Exterior Stucco	None Detected
LFG -15	Men's House Exterior Stucco	None Detected

Based on the results presented in the above table, as well as visual assessments during the Site visit, the following observations can be made with regards to the ACMs found within the Site building:

WALL AND CEILING FINISHES

Walls and ceilings throughout the site were generally observed to be finished with non-suspect wood, concrete, or brick.

Plaster walls were observed in some locations throughout the site, and samples from the Men's House (LFG-1), the Warehouse (LFG-3) and the Ross Cottage (LFG-10, and LFG-11) were found to contain no detectable levels of asbestos.

Within the basement bathrooms of the Museum Building, grout and ceramic tile was observed on the walls. A sample of the grout (LFG-8) was found to contain no detectable levels of asbestos. The ceilings of the basement bathrooms were observed to have a textured plaster applied to them, and samples of the plaster (LFG-5, LFG-6 and LFG-7) **were found to contain 2% Chrysotile asbestos.**

EXTERIOR FINISHES

Majority of the site buildings were observed to be non-suspect wood or brick.

Stucco was observed on the exterior of multiple buildings, and samples from the Ross Cottage (LFG-13), the Big House Annex (LFG-14) and the Men's House (LFG-15) were found to contain no detectable levels of asbestos.

The north-east Bastian was observed to be concrete, with mortar patching. A sample of the mortar (LFG-09) was found to contain no detectable levels of asbestos.

Roofing materials on buildings throughout the site were observed to be cedar-shake shingles. No felt paper was observed underneath this material. However, this material is commonly found beneath cedar shake shingles and should be presumed to contain asbestos if uncovered.

FLOORING

Flooring throughout the site was observed to be wood or concrete.

A brown 9" vinyl floor tile was observed in the museum building. This material has been previously identified and is in generally good condition. This material is not expected to be impacted by the scheduled renovations.

MECHANICAL INSULATION

All mechanical lines and ducting, where observable, were uninsulated or were non-suspect materials.

Any hidden mechanical line materials are possibly still ACM, are considered friable, and their condition is unknown. All insulated mechanical lines, if uncovered in hidden spaces, should be presumed to contain asbestos until testing can confirm otherwise.

MISCELLANEOUS ACMs

Windows were observed to be wood paned with caulking applied at the seams. Samples of the caulking from the Big House (LFG-4) and the Ross Cottage (LFG-12) **were found to contain 2% Chrysotile asbestos**. A third sample from the bakehouse (LFG-4) was found to contain no detectable levels of asbestos. Although not all samples of caulking were confirmed to contain asbestos, all window caulking should be presumed to contain asbestos.

VERMICULITE & OTHER THERMAL WALL INSULATION

Where attic hatches were observed, heat sensors were affixed to them. Site representative advised not opening these hatches as it could put the sensor into alarm. However, from a visual assessment of the ceilings in these buildings, TEC was able to see through ceiling boards and can loosely confirm that vermiculite is not present. If, during renovations vermiculite is uncovered it is to be treated as an asbestos containing material.

7.2 Lead

Full results of the laboratory analysis for suspected lead-containing paints can be found in **Appendix B: Laboratory Certificate of Analysis – Lead**. Results of the suspected lead containing paints are provided below in Table 2.1: Analytical Results of Suspected Lead-Containing Paints. Results of the lead leachate test can be found below in Table 2.2: Analytical Results of Lead Leachate Testing. Select photographs have been included in **Appendix D – Photo Index**.



TABLE 2.1: Analytical Results of Suspected Lead-Containing Paints

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	LEAD IN PAINT (mg/kg)	TREAT AS LEAD CONTAINING?
LFG-LP-1	Men's House Ceiling	White	2.29	No
LFG-LP-2	Men's House Walls	Beige	4.26	No
LFG-LP-3	Bake House Trim	Dark Green	28400	Yes
LFG-LP-4	Doctors Office Exterior	White	13.8	No
LFG-LP-5	Big House Exterior	White	39500	Yes
LFG-LP-6	North East Bastian Roof	Red	2450	Yes
LFG-LP-7	Museum Building Trim and Doors	Green	10800	Yes
LFG-LP-8	Museum Building Exterior	White	12900	Yes
LFG-LP-9	Furloft Trim	Dark Brown	433	Yes
LFG-LP-10	Ross Cottage Trim	Light Brown	555	Yes
LFG-LP-11	Big House Basement Window Wells	Grey	155	Yes

As outlined in section 4.2 above, TEC considers any paint with a detectable presence over 90 mg/kg of lead to be lead-containing paint. As such, lead precautions may be required where airborne dusts cannot be limited or prevented, and cutting, grinding, sanding, or other dust creating activities should be avoided during renovations or maintenance.

TABLE 2.2: Analytical Results of Lead Leachate Results

SAMPLE NUMBER	SAMPLE LOCATION	DESCRIPTION	Final PH	Total Metals (mg/L)
LFG-LL-1	Doctor's Office Exterior	White	5.18	<0.50

In an effort to conduct lead leachate testing, a paint colour with the most coverage throughout the site was selected. As most buildings throughout the site were white in exterior colour, white was selected for this analysis. The analysis results may not demonstrate an overall view of the lead paints on-site, as the paint selected was generally non-lead containing.

If further analyses are desired, TEC can conduct additional leachate testing using a sample of paint that has been determined to be lead containing to illustrate this better.

7.3 Airborne Mould Spores

Full results of laboratory analysis for airborne mold spores can be found in Appendix C: Laboratory Certificate of Analysis – Mold.

Generally, all samples collected show no anomalous spores, or elevated spore counts when compared with the outdoor reference sample. Due to the nature of the site and the doors being open, making the buildings open to the surrounding outdoor air, unless mold growth is extremely prevalent, it is unlikely that elevated mold spore presence would be detected.

Site representative directed TEC to the areas where fungal growth had been an issue in previous years. One area, in the Dane’s Quarters of the Big House, was noted to have minor green staining on the wall. Site representative informed TEC that this area is extremely humid, and that wall is cleaned regularly. Another area in the Men’s House was observed to be in generally in good condition, minor water staining and paint peeling was observed.

8.0 RECOMMENDATIONS

8.1 Asbestos-Containing Materials

Friable asbestos-containing drywall joint compound was found on walls throughout all areas, and limited amounts on ceilings, or are visually indistinguishable from confirmed materials. This material was in generally good condition and can be safely managed in place until planned renovations. If minor disturbance or repair is required, if less than one square meter of textured plaster is disturbed, these materials can be handled safely under **Type 2** precautions. If more than three hours of work are required, or much larger than one square meter of disturbance is anticipated, the precautions should be raised to **Type 3**.

Non-friable asbestos containing caulking was applied to windows throughout the site. All impacted caulking must be removed following **Type 1** precautions.

8.2 Lead

All lead containing paint finishes may pose a health risk if grinding, sanding and other demolition activities are used that will result in the paint releasing airborne lead-containing dust. These activities should be minimized or avoided if possible. If unable to be avoided, special precautions, similar to asbestos precautions with respect to ventilation and containment, as well as safe work procedures, must be employed. Generally, the use of hand tools and wet handling techniques to repair any areas of damage on the smaller areas of external trim will be sufficient protection.

Additional leachate testing may be required if large areas of trim material may be removed and disposed.

8.3 Airborne Mold Spores

Airborne mold was generally a non-issue at the time of assessment as no anomalous spores or elevated spore counts were observed.

9.0 LIMITATIONS

This report was prepared for the exclusive use of Architecture 49 Inc. (the “Client”). This report is based on data and information collected during site visit conducted by Tesseract Environmental Consulting (TEC) and is based

solely on site conditions encountered at the time of the site visit. Any use which a third party makes of this report, or any reliance on or discussion to be made based on it, are the sole responsibility of the third party.

The conclusions and recommendations contained in this report are based upon professional opinions with regard to the subject matter. These opinions are in accordance with currently accepted environmental assessment standards and practices applicable to this location and are subject to the following inherent limitations:

- The data and findings presented in this report are valid as of the date of the investigation. The passage of time, manifestation of latent conditions or occurrence of future events may warrant further exploration at the properties, analysis of the data, and re-evaluation of the findings, observations, and conclusions expressed in this report.
- Additional hazardous building materials not identified in this report may become evident during renovation or demolition activities. Should additional information become available, TEC requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.
- The findings, observations and conclusions expressed by TEC in this report are not, and should not be considered, an opinion concerning compliance of any past or present owner or operator of the Site with any federal, provincial or local laws or regulations.
- TEC will not be responsible for any real or perceived decrease in a property value, its saleability or ability to gain financing through the reporting of information in this report.
- TEC report presents professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental and occupational health & safety laws and regulations, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental and occupational health & safety laws, rules, regulations or policies of federal, provincial, or local government agencies. Any use of this assessment report constitutes acceptance of the limits of TEC liability. TEC liability extends only to its client and not to other parties who may obtain this assessment report. Issues raised by the report should be reviewed by appropriate legal counsel.
- In evaluating the Site conditions, TEC has relied in good faith on information provided by others. We accept no responsibility for any deficiency, misstatements or inaccuracies contained in this report as a result of omissions, misinterpretations or fraudulent acts of the persons involved.
- Any quantities of identified designated substances noted herein are estimated quantities for reporting purposes, and this report is limited in that regard. In the event that designated substances are scheduled to be removed in the future, it is solely the responsibility of the “abatement contractor” to confirm the exact quantities of designated substances to be removed, prior to their removal.

10.0 CLOSURE

If you have any questions regarding the information presented in this report, or require further assistance with environmental health and safety issues related to this, or any other Site, please feel free to contact the undersigned at (204) 801-9358. Thank you for the opportunity to offer our services.

TESSERACT ENVIRONMENTAL CONSULTING INC.

Prepared By:



Trevor Bage

HEALTH AND SAFETY FIELD TECHNICIAN

Reviewed By:



Ann McEachern

OCCUPATIONAL HYGIENE TECHNICIAN

Attachments:

Appendix A – Laboratory Certificate of Analysis – Asbestos

Appendix B – Laboratory Certificates of Analysis – Lead

Appendix C – Laboratory Certificate of Analysis – Mold

Appendix D – Photo Index



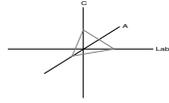
TESSERA CT
ENVIRONMENTAL CONSULTING INC.

APPENDIX A

Laboratory Certificate of Analysis - Asbestos

CA Labs
Dedicated to
Quality

Crisp Analytical, L.L.C.
1929 Old Denton Road
Carrollton, TX 75006
Phone 972-242-2754
Fax 972-242-2798



CA Labs, L.L.C.
12232 Industriplex, Suite 32
Baton Rouge, LA 70809
Phone 225-751-5632
Fax 225-751-5634

Materials Characterization - Bulk Asbestos Analysis

Laboratory Analysis Report - Polarized Light

Tesseract Environmental Consulting

179 McDermot Avenue Suite 111
Winnipeg, Mb R3B 0S1

Customer Project: 18-A49-0035 SPT-1000, Lower Fort Garry
Reference #: CAL18053383AF Date: 5/25/2018

Analysis and Method

Summary of polarized light microscopy (PLM / Stereomicroscopy bulk asbestos analysis) using the methods described in 40CFR Part 763 Appendix E to Subpart E (Interim and EPA 600 / R-93 / 116 (Improved)). The sample is first viewed with the aid of a stereomicroscope. Numerous liquid slide preparations are created for analysis under the polarized microscope where identifications and quantifications are performed. Calibrated liquid refractive oils are used as liquid mounting medium. These oils are used for identification (dispersion staining). A calibrated visual estimation is reported, should any asbestiform mineral be present. Other techniques such as acid washing are used in conjunction with refractive oils for detection of smaller quantities of asbestos. All asbestos percentages are based on calibrated visual estimation traceable to NIST standards for regulated asbestos. Traceability to measurement and calibration is achieved by using known amounts and types of asbestos from standards where analyst and laboratory accuracy are measured. As little as 0.001% asbestos can be detected in favorable samples, while detection in unfavorable samples may approach the detection limit of 0.50% (well above the laboratory definition of trace).

Discussion

Vermiculite containing samples may contain trace amounts of actinolite/tremolite. When not detected by PLM, these samples should be analyzed using TEM methods and / or water separation techniques. Suspected actinolite/vermiculite presence will be indicated through the sample comment section of this report.

Fibrous talc containing samples may contain a regulated asbestos fiber known as anthophyllite. Under certain conditions the same fiber may actually contain both talc and anthophyllite (a phenomenon called intergrowth). Again, TEM detection methods are recommended. CA Labs PLM report comments will denote suspected amounts of asbestiform anthophyllite with talc, where further analysis is recommended.

Some samples (floor tiles, surfacings, etc.) may contain fibers too small to be detectable by PLM analysis and should be analyzed by TEM bulk protocols.

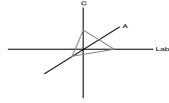
A "trace asbestos" will be reported if the analyst observes far less than 1% asbestos. CA Labs defines "trace asbestos" as a few fibers detected by the analyst in several preparations and will indicate as such under these circumstances.

Since allowable variation in quantification of samples close to 1% is high, <1% may be reported. Such results are ideal for point counting, and the technique is mandatory for friable samples (NESHAP, Nov. 1990 and clarification letter 8 May 1991) under 1% percent asbestos or "trace asbestos". **In order to make all initial PLM reports issued from CA Labs NESHAP compliant, all <1% asbestos results (except floor tiles) will be point counted at no additional charge.**

Qualifications

CA Labs is accredited by the National Voluntary Accreditation Program (NVLAP) for selected test methods for airborne fiber analysis (TEM), and for bulk asbestos fiber analysis (PLM). CA Labs is also accredited by AIHA LAP, LLC. in the PLM asbestos field of testing for Industrial Hygiene. All analysts have completed college courses or hold a degree in a natural science (geology, biology, or environmental science). Recognition by a state professional board in one these disciplines is preferred, but not required. Extensive in-house training programs are used to augment the educational background of the analyst. The Laboratory Director and Quality Manager have received supplemental McCrone Research training for asbestos identification. Analysis performed at Crisp Analytical Labs, LLC 1929 Old Denton Road Carrollton, TX 75006

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235
AIHA LAP, LLC Laboratory #102929



Polarized Light Asbestiform Materials Characterization

Customer Info: Attn: Tesseract Environmental Consulting 179 McDermot Avenue Suite 111 Winnipeg, Mb R3B 0S1	Customer Project: 18-A49-0035 SPT-1000, Lower Fort Garry	CA Labs Project #: CAL18053383AF
Phone # 204-801-9358 Fax # 204-480-4348	Turnaround Time: 5 Days	Date: 5/25/2018 Samples Received: 5/18/18 10:30am Date Of Sampling: None Given Purchase Order #: 18-A49-0035 SPT-1000

Sample #	Com ment	Layer #	Analysts Physical Description of Subsample	Homo-geneous (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
LFG-1		1-1	Plaster/ tan surfaced white finishing plaster	n	None Detected		100% qu,bi,ca
LFG-2		2-1	Caulking/ green surfaced white caulking	n	None Detected		100% qu,bi,ca
LFG-3		3-1	Plaster/ white surfaced white finishing compound	n	None Detected		100% qu,bi,ca
		3-2	white plaster	y	None Detected		100% qu,ca
LFG-4		4-1	Caulking/ white surfaced tan caulking	n	2% Chrysotile		98% qu,bi,ca
LFG-5		5-1	Textured Plaster/ white surfaced white plaster	n	2% Chrysotile		98% qu,bi,ca
LFG-6		6-1	Textured Plaster/ white surfaced white plaster	n	2% Chrysotile		98% qu,bi,ca

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gy - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastonite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

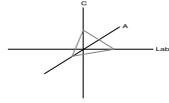
Tanner Rasmussen
Analyst

Technical Manager
Tanner Rasmussen

Senior Analyst
Julio Robles

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



Polarized Light Asbestiform Materials Characterization

Customer Info:	Attn:	Customer Project:	CA Labs Project #:
Tesseract Environmental Consulting			CAL18053383AF
179 McDermot Avenue Suite 111		18-A49-0035 SPT-1000, Lower	
Winnipeg, Mb R3B 0S1		Fort Garry	Date: 5/25/2018
		Turnaround Time:	Samples Received: 5/18/18 10:30am
Phone # 204-801-9358		5 Days	Date Of Sampling: None Given
Fax # 204-480-4348			Purchase Order #: 18-A49-0035 SPT-1000

Sample #	Com ment	Layer #	Analysts Subsample	Physical Description of	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
LFG-7		7-1		Textured Plaster/ white surfaced white plaster	n	2% Chrysotile		98% qu,bi,ca
LFG-8		8-1		Grout/ white grouting	y	None Detected		100% qu,ca
LFG-9		9-1		Mortar/ white plaster	y	None Detected		100% qu,ca
LFG-10		10-1		Plaster/ white surfaced white finishing compound	n	None Detected		100% qu,bi,ca
		10-2		white plaster	y	None Detected		100% qu,ca
LFG-11		11-1		Plaster/ white surfaced white finishing compound	n	None Detected		100% qu,bi,ca
		11-2		white plaster	y	None Detected		100% qu,ca

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gy - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastonite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

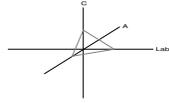
Tanner Rasmussen
Analyst

Technical Manager
Tanner Rasmussen

Senior Analyst
Julio Robles

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



Polarized Light Asbestiform Materials Characterization

Customer Info:	Attn:	Customer Project:	CA Labs Project #:
Tesseract Environmental Consulting			CAL18053383AF
179 McDermot Avenue Suite 111		18-A49-0035 SPT-1000, Lower	
Winnipeg, Mb R3B 0S1		Fort Garry	Date: 5/25/2018
		Turnaround Time:	Samples Received: 5/18/18 10:30am
Phone # 204-801-9358		5 Days	Date Of Sampling: None Given
Fax # 204-480-4348			Purchase Order #: 18-A49-0035 SPT-1000

Sample #	Com ment	Layer #	Analysts Subsample	Physical Description of	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
LFG-12		12-1		Caulking/ white surfaced white caulking	n	2% Chrysotile		98% qu,bi,ca
LFG-13		13-1		Stucco/ white finishing compound	y	None Detected		100% qu,ca
		13-2		white plaster	y	None Detected		100% qu,ca
LFG-14		14-1		Stucco/ white finishing compound	y	None Detected		100% qu,ca
		14-2		white plaster	y	None Detected		100% qu,ca
LFG-15		15-1		Stucco/ white finishing compound	y	None Detected		100% qu,ca
		15-2		white plaster	y	None Detected		100% qu,ca

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.
Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gy - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastonite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Tanner Rasmussen
Analyst

Technical Manager
Tanner Rasmussen

Senior Analyst
Julio Robles

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



TESSERACT
ENVIRONMENTAL CONSULTING INC.

APPENDIX B

Laboratory Certificate of Analysis - Lead



Tesseract Environmental Consulting Inc.
ATTN: TESSERACT ENVIRONMENTAL
111 - 179 McDermot Avenue
Winnipeg MB R3B 0S1

Date Received: 17- MAY- 18
Report Date: 25- MAY- 18 07:35 (MT)
Version: FINAL

Client Phone: 204- 801- 9358

Certificate of Analysis

Lab Work Order #: L2096597

Project P.O. #: NOT SUBMITTED
Job Reference: 18- A49- 0035 SPT - 1000
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 1329 Niakwa Road East, Unit 12, Winnipeg, MB R2J 3T4 Canada | Phone: +1 204 255 9720 | Fax: +1 204 255 9721
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2096597-1 LFG-LP-1 MENS HOUSE CEILING - WHITE Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint Metals Lead (Pb)	2.29		0.20	mg/kg	18-MAY-18	18-MAY-18	R4049048
L2096597-2 LFG-LP-2 MENS HOUSE WALL - BEIGE Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint Metals Lead (Pb)	4.26		0.20	mg/kg	18-MAY-18	18-MAY-18	R4049048
L2096597-3 LFG-LP-3 BAKEHOUSE - DARK GREEN TRIM Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint Metals Lead (Pb)	28400		20	mg/kg	18-MAY-18	18-MAY-18	R4049048
L2096597-4 LFG-LP-4 DOCTOR'S OFFICE - WHITE EXTERIOR Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint Metals Lead (Pb)	13.8		0.20	mg/kg	18-MAY-18	18-MAY-18	R4049048
L2096597-5 LFG-LP-5 BIG HOUSE - WHITE EXTERIOR WINDOW TRIM Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint Metals Lead (Pb)	39500		20	mg/kg	18-MAY-18	18-MAY-18	R4049048
L2096597-6 LFG-LP-6 NORTH EAST BASTIAN - RED ROOF Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint Metals Lead (Pb)	2450		0.20	mg/kg	18-MAY-18	18-MAY-18	R4049048
L2096597-7 LFG-LP-7 MUSEUM BUILDING - GREEN TRIM AND DOORS Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint Metals Lead (Pb)	10800		20	mg/kg	18-MAY-18	18-MAY-18	R4049048
L2096597-8 LFG-LP-8 MUSEUM BUILDING - WHITE EXTERIOR Sampled By: CLIENT on 17-MAY-18 Matrix: PAINT Lead In Paint							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
LTIS	Limited sample was available for TCLP or SPLP inorganics & semi-volatiles extraction (<100 grams). Extraction fluid volume &/or other elements of the method were scaled down proportionately to permit analysis. Test results from modified leach procedures may be unsuitable for regulatory purposes.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-200.2-MS-WP	Soil	Metals	EPA 200.2/6020A

Samples for analysis are homogenized, dried at 60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve, and a representative subsample of the dry material is weighed. The sample is then digested by block digester (EPA 200.2). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may become "environmentally available." By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

MET-TCLP-MS-WP	Waste	Total Metals by ICP-MS	U.S. EPA 200.8-T
----------------	-------	------------------------	------------------

Total Metals by ICP-MS: This analysis is carried out using sample preparation procedures adapted from Standard Methods for the examination of Water and Wastewater Method 3030E and analytical procedures adapted from U.S EPA Method 200.8 for analysis of metals by inductively coupled-mass spectrometry.

PREP-TCLP-INORG-WP	Waste	Leachate prep TCLP	EPA SW846 1311
--------------------	-------	--------------------	----------------

The TCLP leachate method is used to characterize material based on the ability of contaminants to partition or leach into a simulated landfill solution. The leachate is designed to determine the mobility of contaminants present in liquid, solid and multiple phase samples under acidic conditions. This method may be applied to liquid samples, multiple phase samples and solid materials.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

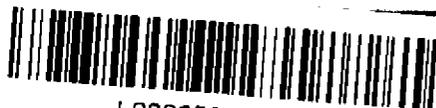
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



www.alsglobal.com

Chain of C

Canada



L2096597-COFC

LS barcode label here (lab use only)

COC Number: 14 -

Page 1 of 1
L2096597

Report To		Report Information			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
Company: Tesseract Environmental Consulting Inc.		Select Report Format: <input checked="" type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)			R <input type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)												
Contact:		Quality Control (QC) Report with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address: 110/111 - 179 McDermot Avenue Winnipeg, MB R3B 0S1		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT												
Phone: (204)801-9358		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
		Email 1 or Fax info@tesseractenviro.com			Specify Date Required for E2, E or P:												
		Email 2 amceachem@tesseractenviro.com			Analysis Request												
Invoice To		Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below												
Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX															
Copy of Invoice with Report <input type="checkbox"/> Yes <input type="checkbox"/> No		Email 1 or Fax info@tesseractenviro.com															
Company:		Email 2															
Contact:																	
Project Information				Oil and Gas Required Fields (client use)								Lead In Paint Lead Leachate		Number of Containers			
ALS Quote #:				Approver ID:				Cost Center:									
Job #: 18-A49-0035 SPT-1000				GL Account:				Routing Code:									
PO / AFE: Lower Fort Garry - Lead				Activity Code:													
LSD:				Location:													
ALS Lab Work Order # (lab use only)				ALS Contact: Judy				Sampler:									
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)				Date (dd-mmm-yy)		Time (hh:mm)		Sample Type								
1	LFG-LP-1 Mens House Ceiling - White										R						
2	LFG-LP-2 Mens House Walls - Beige										R						
3	LFG-LP-3 Bakehouse - Dark Green Trim										R						
4	LFG-LP-4 Doctor's Office - White Exterior										R						
5	LFG-LP-5 Big House - White Exterior Window Trim										R						
6	LFG-LP-6 North East Bastian - Red Roof										R						
7	LFG-LP-7 Museum Building - Green Trim and Doors										R						
8	LFG-LP-8 Museum Building - White Exterior										R						
9	LFG-LP-9 Furloft - Dark Brown Trim										R						
10	LFG-LP-10 Ross Cottage - Light Brown										R						
11	LFG-LP-11 Big House Basement - Old Staff Lounge - Grey Window Wells										R						
12	LFG-LL-1 Doctors Office - White Exterior										R						
Drinking Water (DW) Samples (client use)				Special Instructions / Specify Criteria to add on report (client Use)								SAMPLE CONDITION AS RECEIVED (lab use only)					
Are samples taken from a Regulated DW System? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No												Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>					
Are samples for human drinking water use? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No												Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>					
												Cooling initiated <input type="checkbox"/>					
												INITIAL COOLER TEMPERATURES °C: 23.4					
												FINAL COOLER TEMPERATURES °C:					
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)								FINAL SHIPMENT RECEPTION (lab use only)					
Released by:		Date:		Time:		Received by: <i>ALZ</i>		Date: 17/05/18		Time: 2:55		Received by:		Date:		Time:	

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0028e-001 Form 04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



TESSERACT
ENVIRONMENTAL CONSULTING INC.

APPENDIX C

Laboratory Certificate of Analysis - Mold

Crisp Analytical Labs, L.L.C / C.A. Labs, L.L.C.

Client: Tesseract Environmental Consulting Allergenic Particle Report
 Address: 179 McDermot Avenue Suite 111
 Winnipeg, MB R3B 0S1
 Attn: Sample media : Air-o-cell / Cyclex D (airborne)

CA Lab Project #: CAL18053391AG Date: 5/23/2018
 Project name: 18-A49-0035 SPT-1000, Lower Fort Garry

Analysis: Light Microscopy identificaton of pollen/fungal spore (ASTM 7391-09)

Sample #	1-25749021			2-25917271			3-25749008			4-25749020			5-25917272			6-25749018		
	Men's House			NW Bastian- Bakehouse			Doctor's Office			Warehouse			SW Bastian			Museum Building Bsmnt		
Location	150			150			150			150			150			150		
Volume	Acceptable			Acceptable			Acceptable			Acceptable			Acceptable			Acceptable		
Condition	Acceptable			Acceptable			Acceptable			Acceptable			Acceptable			Acceptable		
<i>Alternaria</i>	22	144	17.1	18	120	12.5	29	192	16.3	43	288	16.9	25	168	12.7	4	24	3.6
Ascospores	25	168	20.0	22	144	15.0	14	96	8.2	18	120	7.0	22	144	10.9	7	48	7.1
Basidiospores	7	48	5.7				7	48	4.1	11	72	4.2	4	24	1.8			
<i>Chaetomium</i>	4	24	2.9	11	72	7.5	18	120	10.2	32	216	12.7	7	48	3.6			
<i>Cladosporium</i>	61	408	48.6	72	480	50.0	79	528	44.9	122	816	47.9	115	768	58.2	86	576	85.7
<i>Curvularia</i>																		
<i>Dreschlera/Bipolaris</i> -like	4	24	2.9	4	24	2.5				11	72	4.2	7	48	3.6			
<i>Penicillium/Aspergillus</i> -like																		
Smuts/Myxo/ <i>Periconia</i>	4	24	2.9	14	96	10.0	14	96	8.2	11	72	4.2	11	72	5.5			
<i>Stachybotrys/Memnoniella</i>																		
<i>Ulocladium/Pithomyces</i>							14	96	8.2				7	48	3.6	4	24	3.6
Epicoccum				4	24	2.5				7	48	2.8						
unIdentifiable Spores																		
Skin Cells	Present- Low			Present- Low			Present- Low			Present- Low			Present- Low			Present- Low		
Pollen	Present- Low			Present- Low			Present- Low			Present- Low			Present- Low			Present- Low		
Hyphal fragments	130	864		162	1,080		220	1,464		252	1,680		223	1,488		29	192	
Particulate Rating (0-5)	4			3			4			4			3			2		
	126	840		144	960		176	1,176		256	1,704		198	1,320		101	672	
Total	Cnts./	Per-	Total	Cnts./	Per-	Total	Cnts./	Per-	Total	Cnts./	Per-	Total	Cnts./	Per-	Total	Cnts./	Per-	
Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent	

Crisp Analytical Labs, LLC 1929 Old Denton Rd. Carrollton, TX 75006

Stanley Massett - Technical Manager
 Carolyn Fox - Analyst

Crisp Analytical Labs, L.L.C / C.A. Labs, L.L.C.

Client: Tesseract Environmental Consulting Allergenic Particle Report
 Address: 179 McDermot Avenue Suite 111
 Winnipeg, MB R3B 0S1
 Attn: Sample media : Air-o-cell / Cyclex D (airborne)

CA Lab Project #: CAL18053391AG Date: 5/23/2018
 Project name: 18-A49-0035 SPT-1000, Lower Fort Garry

Analysis: Light Microscopy identification of pollen/fungal spore (ASTM 7391-09)

Sample #	7-25917277			8-25917274			9-25748979			10-25917280			11-25748997			12-25917278		
	Furlott Basement			Ross Cottage			Farm Manager's House			Big House- Dane Quarters			Big House- Old Staff Lounge			Outdoor Reference		
Location	150			150			150			150			150			150		
Volume	Acceptable			Acceptable			Acceptable			Acceptable			Acceptable			Acceptable		
Condition																		
<i>Alternaria</i>	11	72	4.4				4	24	1.9	11	72	6.4	18	120	7.8	18	120	4.2
Ascospores	25	168	10.3	25	168	14.3	8	52	4.1	14	96	8.5	22	144	9.4	22	144	5.1
Basidiospores	29	192	11.8	14	96	8.2	18	120	9.4	22	144	12.8	4	24	1.6	162	1,080	38.1
<i>Chaetomium</i>	14	96	5.9	18	120	10.2	29	192	15.0	4	24	2.1	4	24	1.6	4	24	0.8
<i>Cladosporium</i>	158	1,056	64.7	104	696	59.2	104	696	54.5	112	744	66.0	158	1,056	68.8	130	864	30.5
<i>Curvularia</i>																		
<i>Dreschlera/Bipolaris</i> -like				7	48	4.1	4	24	1.9	4	24	2.1	4	24	1.6	14	96	3.4
<i>Penicillium/Aspergillus</i> -like																		
Smuts/Myxo/ <i>Periconia</i>	7	48	2.9	4	24	2.0	11	72	5.6	4	24	2.1	14	96	6.3	58	384	13.6
<i>Stachybotrys/Memnoniella</i>																7	48	1.7
<i>Ulocladium/Pithomyces</i>													4	24	1.6	11	72	2.5
Epicoccum				4	24	2.0	14	96	7.5				4	24	1.6			
unIdentifiable Spores																		
Skin Cells	Present- Low			Present- Low			Present- Low			Present- Low			Present- Low			Present- Low		
Pollen	Present- Low			Present- Low			Present- Low			Present- Low			Present- Low			Present- Low		
Hyphal fragments	126	840		173	1,152		101	672		187	1,248		180	1,200		439	2,928	
Particulate Rating (0-5)	3			3			3			3			3			3		
	245	1,632		176	1,176		191	1,276		169	1,128		230	1,536		425	2,832	
Total	Cnts./	Per-		Total	Cnts./	Per-	Total	Cnts./	Per-	Total	Cnts./	Per-	Total	Cnts./	Per-	Total	Cnts./	Per-
	Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent	Cnts.	m3	cent

Crisp Analytical Labs, LLC 1929 Old Denton Rd. Carrollton, TX 75006

 Stanley Massett - Technical Manager
 Carolyn Fox - Analyst

INDOOR AIR QUALITY ALLERGENIC PARTICLE LABORATORY ANALYSIS REPORT

Tesseract Environmental Consulting
179 McDermot Avenue Suite 111
Winnipeg, MB R3B 0S1
phone: 204-801-9358

reference number: CAL18053391AG
Turnaround Time: 5 days
PO #: 18-A49-0035 SPT-1000, Lower Fort Garry

Date Analyzed: 5/23/2018
Date Received: 5/18/18 10:30AM
Date Sampled: 5/15/2018

Analytical Method:

The categorization and quantification methodology for airborne fungal structures presented in ASTM D7391-09 has been utilized for the enclosed analyses. Per the requirements of the methodology, as applied to linear slit impactors, greater than 20% of the trace (36.67%; 16 traverses) has been analyzed with all spore category enumeration conducted at 600x magnification (magnification/resolution 2). Under these counting conditions minimum reporting limits for all spore categories are as follows:

<u>Volume:</u>	<u>Minimum Reporting Limit:</u>
75 L	48 fs/m3
150 L	24 fs/m3

Bias:

Bias is present in all types of spore trap cassettes by particle size, capture, spread and counting procedure used. In particular, samples with a particulate/debris rating of 2-4 are subject to negative bias due to spores being obscured by other particles. Particulate/debris ratings of 5 will result in a sample being reported as "Overloaded."

Note:

This test report relates only to items tested. These results are submitted pursuant to CA Labs' current terms and condition of sale, including the company's standard warranty and limitation of liability provisions and no responsibility or liability is assumed for the manner in which the results are used or interpreted. If there are concerns about health aspects of known allergens, consult a physician. Pollen and spore types identified are all naturally occurring and may grow anywhere in a natural environment where water is present. While it is normal for fungi to be present inside buildings from outside sources, growth occurs in humid conditions. Fungi cannot spread from building to building, as it is always present, but may not be growing. To control allergens in an area, drying and use of HEPA filters are recommended. Quantification is susceptible to a standard deviation of 100%, dependent on loading. Unless notified in writing to return samples covered by this report, CA Labs will store the samples for thirty (30) days before discarding. A shipping and handling fee may be assessed for the return of any samples. This method is not covered by the scope of NVLAP or AIHA LAP, LLC accreditations, and the report does not imply endorsement by any government agency. This report may not be reproduced except in full, without written permission from CA Labs.

Analysis performed at Crisp Analytical Labs 1929 Old Denton Rd. Carrollton, TX 75006. Phone (972) 242-2754 Fax (972) 242-2798: TDSHS mold analysis #LAB1038
This report is intended for the recipient, only. Please notify us if you have received this document in error. (we will advise you to destroy or return this document.)



TESSERACT
ENVIRONMENTAL CONSULTING INC.

APPENDIX D

Photo Index

Appendix D – Photo Index



Photo 1: Lead containing green trim on the bakehouse



Photo 2: Heat sensor fixed to the attic hatch in the Ross Cottage. Attic area was not examined as a result.

Appendix D – Photo Index



Photo 3: Previously confirmed 9" vinyl floor tile. This material was generally in good condition.



Photo 4: Exterior of the big house. White paint on the trim was found to be lead containing

Appendix D – Photo Index



PROJECT:

Lower Fort Garry National Historic Site, Planned Site Renovations

PROJECT INFORMATION

1. The Contractor is responsible to confirm, for their own purposes, all quantities of hazardous materials identified by the Consultant in the identified work areas. Refer to the drawings for additional details.
2. The abatement must meet the schedule provided by the Building Owner and the Architect.

SCOPE OF WORK – HAZARDOUS MATERIALS ABATEMENT:

Remove and dispose, if required or if disturbed during planned renovations, all hazardous materials, including asbestos-containing materials and lead surface coatings, as detailed below. The corresponding specification section reference is provided detailing the procedures for abatement.

Table 1 – Asbestos-containing Materials Identified

Hazardous Material	Location(s)	Approximate Quantities	Specification Reference
Asbestos-Containing Textured Plaster	Museum Building – Men’s and Women’s Basement Bathrooms	160m ² per bathroom	Type 2 <1m ² AND <3hrs Work 02 83 33.02 Type 3 >1m ² OR >3hrs Work 02 83 33.03
Asbestos-Containing Caulking	All Existing Windows	Not Estimated	Type 1 Section 02 82 13.19

Table 2 – Lead Containing Paints over 5000 mg/kg Concentration

Hazardous Material	Location(s)	Lead in Paint (mg/kg)	Specification Reference
Lead Containing Paint – Dark Green Trim	Bakehouse	28,400	Lead Paint Remediation 02 83 19
Lead Containing Paint – White Trim	Big House and Similar	39,500	

Hazardous Material	Location(s)	Lead in Paint (mg/kg)	Specification Reference
Lead Containing Paint – Green Trim and Doors	Museum Building	10,800	Lead Paint Remediation 02 83 19
Lead Containing Paint – White Exterior	Museum Building	12,900	

SCOPE OF WORK – NOTES

Additional materials may be present in areas not described in the table above. If similar materials are discovered during renovations, work should be halted to confirm asbestos content and removal procedures.

END OF SECTION

GENERAL

- .1 General Requirements
 - .1 Conform to the requirements of the related specifications for this project.
 - .2 Related Work
 - .1 02 82 00 – Hazardous Materials Abatement – Summary of Work
 - .2 02 82 33.02 – Type 2 Asbestos Removal
 - .3 02 82 33.03 – Type 3 Asbestos Removal
 - .4 02 83 19 – Lead Paint Remediation & Exposure Precautions
 - .3 Comply with the requirements of this section when performing the following work, as outlined in Section 02 82 00 – Hazardous Materials Abatement Summary of Work, and to confirm locations and approximate quantities of asbestos materials.
 - .1 Remove and dispose of any interior and exterior caulking on impacted windows prior to their removal as general waste.
 - .2 The scope of work is to include, but not be limited to, materials identified during the site walkthrough, Summary of Work, architectural drawings, and as directed by the Owner or Consultant.

The Contractor is responsible for all final quantity determinations.
 - .3 All work will be subject to visual inspection inside and outside the asbestos work area(s) by the Environmental Consultant. Any contamination of the surrounding areas, indicated by visual inspection, shall necessitate complete cleanup of affected areas by the Contractor, at no cost to the Owner. The contractor recognizes that time is of the essence in remedying any noted contamination or other deficiencies.
 - .4 The Contractor shall ensure that supervisory personnel, that has successfully undergone a minimum three-day asbestos abatement course approved by Manitoba Workplace Health and Safety, is present on site during all removal activities.
 - .5 The Contractor shall ensure that all abatement personnel have successfully undergone a minimum two-day asbestos abatement course approved by Manitoba Workplace Health and Safety.
 - .6 The Contractor must notify the Environmental Consultant 24-hours prior to requiring a final visual inspection for all Type 1 work areas.
 - .7 The Contractor will be responsible for all costs incurred for the completion of additional final visual inspections or air clearance monitoring, if requested, if the first inspection or air clearance tests fail.
 - .8 Owner: Parks Canada
-

- .9 Architect: Architecture 49 Inc.
- .10 Prime Contractor: To be determined.
- .11 Asbestos Removal Contractor: To be determined.
- .12 Environmental Consultant: Tesseract Environmental Consulting Inc.

.4 Definitions

- .1 HEPA Filter: High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.
- .2 Non-friable Material: Material that when dry cannot be easily crumbled, pulverized or powdered by hand pressure.
- .3 Polyethylene Sheeting: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with taped seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.
- .4 Authorized Visitor(s): The Prime Consultant, the Environmental Consultant, or person(s) representing regulatory agencies, and person(s) authorized by them.
- .5 Asbestos Work Area(s): Area(s) where work takes place which will, or may, disturb asbestos-containing material, including overspray and fallen material, or settled dust that may contain asbestos.
- .6 DOP Test: A testing method employing dioctyl phthalate aerosol or polyalpha olefin for the purpose of leak-testing HEPA vacuums and negative air cabinets.
- .7 Maximum Use Concentration: Assigned Protection Factor for the respirator in use times the OEL.

.5 Regulations

- .1 Comply with Federal, Provincial (Manitoba Workplace Health and Safety Regulation 217/2006), and local requirements pertaining to asbestos, provided that in any case of conflict among these requirements or with these specifications the more stringent requirement shall apply.
 - .2 Comply with the requirements of Part 36 of M. Reg. 217/2006 (Chemical and Biological Substances) as part of the abatement work.
 - .3 Handle and dispose of contaminated waste as required under M. Reg. 217/2006 and the appropriate Guideline document(s) in force at the time of abatement.
 - .4 Contractor shall ensure that:
 - .1 Measures and procedures prescribed under the M. Reg. 217/2006 are carried out.
-

- .2 Every employee and every worker on the project complies with the applicable Manitoba Workplace Health and Safety Act (W210), and M. Reg. 217/2006.
- .3 The health and safety of workers and the public is to be protected.
- .4 All material handling, and associated equipment must conform with and be operated in accordance with "Workplace Hazardous Materials Information System" (WHMIS).
- .5 Advise Owner whenever work is expected to be hazardous to employees and/or the public.
- .6 Contractor may be requested to provide information on their health and safety record.

.6 Quality Assurance

- .1 Ensure work proceeds on schedule, and meets all the requirements of this Section. Perform work so that airborne asbestos, asbestos waste, or water runoff do not contaminate areas outside the asbestos work areas.
- .2 Pay the cost to the Owner for the inspection and air monitoring performed as result of failure to perform work satisfactorily regarding quality, safety, or the schedule.
- .3 Use only skilled and qualified workers for all the trades required for this work.

.7 Submittals

- .1 Before commencing work:
 - .1 Obtain and submit all the necessary permits for transporting and disposal of asbestos waste. Submit verification to the Prime Contractor and the Consultant that the removed asbestos materials will be disposed of as asbestos waste in an approved landfill.
 - .2 Submit proof to the Consultant of documentation that all employees have completed an asbestos training course in accordance with M. Reg. 217/2006.
 - .3 Submit proposed schedule to the Prime Contractor showing the phasing and proposed workforce for the required segregated work areas.
 - .4 Laws of the province of Manitoba shall govern this work. Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, and duties as may be required. Likewise, it is the responsibility of the contractor to comply with the Workers' Compensation and Workplace Safety and Safety Acts.
 - .5 Submit to the Prime Contractor, in writing, confirmation of good standing with the Workers' Compensation Board.
 - .6 Submit to the Consultant documentation of Employee respirator fit testing.
-

.8 Worker and Visitor Protection

- .1 Instructions: Before entering an asbestos work area, instruct workers and visitors in the use of respirators, dress, entry and exit from asbestos work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by a competent person as defined by the Workplace Safety and Health Act.
 - .2 Respirators:
 - .1 At a minimum, half-face respirators equipped with P100 filters shall be used for all Type 1 work. Provide respiratory equipment for all persons within asbestos work area including authorized visitors.
 - .2 Respirators shall be acceptable to the Consultant. Provide proper instruction to workers and visitors in use of respirators, including qualitative fit testing. No supervisor, worker or authorized visitor shall have facial hair that affects the seal between respirator and face. Maintain respiratory protection equipment in proper function and clean condition, or remove from site.
 - .3 Protective Clothing: Provide workers and visitors in asbestos work areas, one suit with full body coveralls with integral hoods, to be worn if there is a risk of contamination. Once coveralls are worn in asbestos work area, treat and dispose of as asbestos contaminated waste. Workers and visitors shall also wear other protective apparel required by the Workplace Safety and Health Act and Regulations.
 - .4 Before entering asbestos work area(s) in a clean area, put on respirator with new or tested filters, one pair of clean coveralls with head covers and boot covers before entering the asbestos work area. Store street clothes, uncontaminated footwear, towels etc. in clean area.
 - .5 Persons leaving asbestos work area(s) shall remove gross contamination from clothing and remove outer layer of clothing before leaving the asbestos work area; place the contaminated work suits in the receptacles for disposal with other asbestos contaminated materials; leave footwear, clothing, hardhats, protective eye wear, etc., in the equipment and access area to dry for later use; still wearing a respirator proceed to the clean area. Clean the respirator and any exposed skin to ensure that visible contamination is removed. Remove the filters and dispose of in the container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary.
 - .6 Store the respirators in a fashion to allow them to be put on prior to entering asbestos work area at the start of the next shift without contaminating the clean area. If re-entry to the asbestos work area is to take place after having left for eating, drinking, or smoking, follow procedures in paragraph 1.8.4.
 - .7 Do not eat, drink, smoke or chew gum or tobacco at the work site or in the asbestos work areas.
 - .8 Be fully protected as specified herein when the possibility of disturbance of asbestos exists.
-

2 PRODUCTS

.1 Materials

- .1 Polyethylene: 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.
- .2 Rip-Proof Polyethylene: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.
- .3 Tape: Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions. Nashua 398 Duct Tape or approved equivalent.
- .4 Wetting Agent: Non-foaming surfactant, mixed with water in concentration to provide thorough wetting of asbestos fibre: Asbestos-Wet, or equivalent.
- .5 Amended Water: Water with wetting agent added.
- .6 Asbestos Waste Receptors: Two separate containers of which one shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or fibre drum or wood box. Other container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. Containers must be acceptable to disposal site selected.
- .7 Sealer: Sealer for purpose of trapping residual fibre debris. Product must have flame spread and smoke development ratings both less than 25. Product shall leave no stain when dry. Childers CP-240 Childers Products Company or equivalent. Follow manufacturer's instructions with regards to the proper use, handling and application of the sealer.
- .8 Ground Fault Panel: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work areas. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. All GFCI equipment to be installed by a licensed electrician.
- .9 HEPA Vacuum: Vacuum with all necessary fittings, tools and attachments. Air must pass through HEPA filter before discharge.
- .1 Airless Sprayer: Graco Maxi-wetter or equivalent.

3 EXECUTION

.1 Preparation

- .1 Isolate the asbestos work area(s) using asbestos hazard banner tape.
 - .2 Move equipment, tools, furnishings, and stored materials which can be moved without disturbing asbestos-containing materials.
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- .3 Maintain emergency and fire exits from asbestos work area, or establish alternative exits satisfactory to authorities having jurisdiction.
 - .4 Provide a fire extinguisher at each emergency exit. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.
 - .2 Worker Decontamination Area
 - .1 Designate a worker decontamination area at the entrance to each low-risk work area. Worker decontamination area shall comprise of a designated area of sufficient size to allow storage for workers' street clothes and personal belongings, storage for clean protective clothing and respiratory equipment. Maintain a hand-wash device complete with water and soap for all workers. Minimum size 3 square meters (30 sq. ft.). The worker decontamination area shall be adjacent to the asbestos abatement work area.
 - .3 Maintenance of Work Areas
 - .1 Maintain work areas in a tidy condition.
 - .2 Visually inspect work areas at beginning and end of each working period.
 - .4 Do Not Commence Asbestos Removal Work Until:
 - .1 Arrangements have been made for disposal of waste.
 - .2 Asbestos work areas and decontamination work areas (and parts of building required to remain in use) are effectively segregated.
 - .3 Tools, equipment and materials waste receptors are on hand.
 - .4 Arrangements have been made for work area security.
 - .5 Signs are displayed in conspicuous areas where access to sealed asbestos work area is possible. Signs shall read:

CAUTION
Asbestos Hazard Area
No Unauthorized Entry
Wear assigned protective equipment
Breathing asbestos dust may cause serious bodily harm.
 - .5 Removal
 - .1 Remove and dispose of the asbestos-containing materials as described in this Section, Abatement Summary of Work, and as directed by the Environmental Consultant.
 - .2 Place asbestos waste in asbestos waste receptors. If drums are used for waste disposal, drums shall be sealed and cleaned in waste decontamination areas. If double plastic bags are used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer plastic bag in asbestos work area immediately prior to transfer from Site.
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- .3 Treat all materials removed or exposed to asbestos, as asbestos-contaminated waste unless such materials are specified to be reused.
 - .4 Ensure that all horizontal surfaces within the work area are wet wiped and HEPA vacuumed of all loose visible debris.
- .6 Clean-Up
- .1 Clean surfaces from which asbestos has been removed with a HEPA vacuum, or wet-wiping techniques to remove visible dust and debris.
 - .2 Remove sealed and labelled asbestos waste receptors and dispose of at an authorized disposal area in accordance with requirements of disposal authority.
 - .3 After vacuuming and wet-wiping to remove visible asbestos, wet clean entire asbestos work area including equipment and access area, polyethylene sheeting and equipment used in process. Floor and wall surfaces, ducts, and similar items not covered with polyethylene sheeting must be wet cleaned.
 - .4 Request visual inspection and acceptance. Following inspection and acceptance, apply one coat of slow drying sealer to all surfaces from which asbestos has been removed.
- .7 Tear Down of Protection
- .1 Only when favorable visual assessment results are communicated by the Consultant, remove all polyethylene sheeting. Wear half face P100 HEPA filtered respirator and disposable coveralls during removal of sheeting. HEPA vacuum any visible debris.
 - .2 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in asbestos waste receptors for disposal. Remove any debris with a HEPA vacuum.
 - .3 Clean asbestos work area(s), equipment and access area, washing room, and other work areas that may have been contaminated during work.
 - .4 Clean asbestos waste receptors and equipment used in work and remove from asbestos work area(s) via drum and equipment decontamination area, at the appropriate time in sequence.
 - .5 A final visual inspection may be carried out by the Environmental Consultant to ensure that no dust or debris remains.
- .8 Inspection
- .1 From commencement of work until completion of clean-up operations, the Environmental Consultant may be present periodically or on a full-time basis, both inside and outside asbestos work area(s) as requested by the Owner or Architect.
 - .2 If asbestos work area(s) or adjacent areas, are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to the Owner.
-

- .3 Pay cost to provide re-inspection of work found not in accordance with these specifications and requirements of authorities having jurisdiction.
- .9 Waste Transport and Disposal
- .1 Conform to the requirements of the document entitled “*Guide for Asbestos Management*” made pursuant to M. Reg. 217/2006 for transport and disposal.
 - .2 Confirm with the Municipal Sanitary facilities to determine what types of waste containers are acceptable.
 - .3 Ensure shipment of containers to the landfill is taken by waste hauler licensed to transport asbestos waste. Submit documentation to this effect.
 - .4 Each load requires completion of bill of lading showing type and weight of waste being transported.
 - .5 Ensure that the landfill operator is fully aware of hazardous material being landfilled.

END OF SECTION

1 GENERAL

.1 General Requirements

- .1 Conform to the requirements of the related specifications for this project.

.2 Related Work

- .1 02 82 00 – Hazardous Materials Abatement – Summary of Work
 - .2 02 82 13.19 – Type 1 Asbestos Removal
 - .3 02 82 33.03 – Type 3 Asbestos Removal
 - .4 02 83 19 – Lead Paint Remediation & Exposure Precautions
 - .3 Comply with the requirements of this section when performing the following work, as outlined in Section 02 82 00 – Abatement Summary of Work, and the Architectural Drawings to confirm locations and approximate quantities of asbestos materials.
 - .1 Remove and dispose of impact areas, less than 1m² each of asbestos-containing textured plaster ceilings within the men's and women's bathroom in the basement of the Museum Building.
 - .2 The scope of work is to include, but not be limited to, materials identified during the site walkthrough, scope of work document, Architectural Drawings and as directed by the Consultant.
 - .3 The Contractor is responsible for all final quantity determinations.
 - .4 Perform asbestos removal by the full enclosure Type 2 as outlined in this specification.
 - .5 Seal surfaces with sealer in all areas from which asbestos has been removed, and surfaces potentially contaminated with asbestos.
 - .6 All work will be subject to inspection and air monitoring inside and outside the asbestos work area(s) by the Consultant. Any contamination of the surrounding areas, indicated by visual inspection or air monitoring, shall necessitate complete cleanup of affected areas by the Contractor, at no cost to the Owner. The contractor recognizes that time is of the essence in remedying any noted contamination or other deficiencies.
 - .7 The Contractor shall ensure that supervisory personnel, that has successfully undergone a minimum three-day asbestos abatement course approved by Manitoba Workplace Health and Safety, is present on site during all removal activities.
 - .8 The Contractor shall ensure that all abatement personnel have successfully undergone a minimum two-day asbestos abatement course approved by Manitoba Workplace Health and Safety.
 - .9 The Contractor must notify the Manitoba Department of Workplace Safety and Health 5-days prior to commencement of contaminated work.
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- .10 The Contractor must notify the Environmental Consultant 24-hours prior to requiring a pre-contamination or final visual inspection.
 - .11 Relocate, suspend or secure and protect any equipment, materials, or items within the work area to prevent contamination.
 - .12 The Asbestos Removal Contractor will be responsible for all costs incurred for the completion of additional final visual inspections or air clearance monitoring if the first inspection or air clearance tests fail.
 - .13 Owner: Parks Canada
 - .14 Architect: Architecture 49 Inc.
 - .15 Prime Contractor: To be determined.
 - .16 Asbestos Removal Contractor: To be determined.
 - .17 Environmental Consultant: Tesseract Environmental Consulting Inc.
- 4 Definitions
- .1 HEPA Filter: High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.
 - .2 Friable Material: Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
 - .3 Polyethylene Sheeting: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with taped seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.
 - .4 Authorized Visitor(s): The Owner, the Consultant, or person(s) representing regulatory agencies, and person(s) authorized by them.
 - .5 Asbestos Work Area(s): Area(s) where work takes place which will, or may, disturb asbestos-containing material, including overspray and fallen material, or settled dust that may contain asbestos.
 - .6 Curtained Doorway: Device to allow ingress or egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of polyethylene sheeting (2 sheets of polyethylene per flap) attached to head and one jamb of existing or temporarily constructed door frame. Secure vertical edge of one (1) flap along one (1) vertical side of door frame and vertical edge of other flap along opposite vertical side of door frame. Reinforce free edges of polyethylene with duct tape.
 - .7 Negative Pressure: Reduced pressure within asbestos work area(s) established by extracting air directly from work area, and discharging it directly to exterior of building. Discharged air first passes through HEPA filter. Extract sufficient air to ensure constant reduced pressure at perimeter of work area with respect to surrounding areas.
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- .8 DOP Test: A testing method employing dioctyl phthalate aerosol or polyalpha olefin for the purpose of leak-testing HEPA vacuums.

.5 Regulations

- .1 Comply with Federal, Provincial (Manitoba Workplace Health and Safety Regulation 217/2006), and local requirements pertaining to asbestos, provided that in any case of conflict among these requirements or with these specifications the more stringent requirement shall apply.
- .2 Comply with the requirements of Part 36 of M. Reg. 217/2006 (Chemical and Biological Substances) as part of the abatement work.
- .3 Handle and dispose of contaminated waste as required under M. Reg. 217/2006 and the appropriate Guideline document(s) in force at the time of abatement, made pursuant to M. Reg. 217/2006.
- .4 Not later than 5-days before commencing asbestos work on this project, notify in writing the Manitoba Workplace Safety and Health Division that a hazardous asbestos work area will exist.
- .5 Contractor shall ensure that:
 - .1 Measures and procedures prescribed under the M. Reg. 217/2006 are carried out.
 - .2 Every employee and every worker on the project complies with the applicable Manitoba Workplace Health and Safety Act (W210), and M. Reg. 217/2006.
 - .3 The health and safety of workers, other contractors on site and the public is to be protected.
 - .4 Policies and procedures of the Owner's Health and Safety program are to be complied with.
 - .5 All material handling, and associated equipment must conform with and be operated in accordance with "Workplace Hazardous Materials Information System" (WHMIS).
- .6 Advise Owner whenever work is expected to be hazardous to employees and/or the public.
- .7 Contractor may be requested to provide information on their health and safety record.

.6 Quality Assurance

- .1 Ensure work proceeds on schedule, and meets all the requirements of this Section. Perform work so that airborne asbestos, asbestos waste, or water runoff do not contaminate areas outside the asbestos work enclosure.
 - .2 Pay the cost to Owner for the inspection and air monitoring performed as result of failure to perform work satisfactorily regarding quality, safety, or the schedule.
 - .3 Use only skilled and qualified workers for all the trades required for this work.
-

.7 Submittals

.1 Before commencing work:

- .1 Obtain and submit all the necessary permits for transporting and disposal of asbestos waste. Submit verification to the Prime Contractor and the Consultant that the removed asbestos materials will be disposed of as asbestos waste in an approved landfill.
- .2 Submit the name(s) of the supervisory personnel who will be responsible for the asbestos work area(s). One of these supervisors must remain on site at all times that asbestos removal or clean-up is occurring.
- .3 Submit proof to the Consultant that supervisory personnel have attended an approved training course on asbestos control and have performed supervisory function on at least two other asbestos removal projects of similar size to this project.
- .4 Submit documentation that all employees have had instruction on: the potential health hazards of asbestos exposure; on the use, fitting and maintenance of respirators; on the use of protective dress; on the use of entry and exit procedures from work areas; and on all aspects of work safety procedures and protective measures to be utilized on this project. The instruction of workers must follow that which is outlined in M. Reg. 217/2006 and the appropriate Guideline document(s) in force at the time of abatement. All asbestos removal workers on this project must have proof of completion of an approved asbestos-training course. A copy of all of the asbestos removal workers' training certificates must be provided to the Consultant. All asbestos removal workers on this project must provide evidence the medical monitoring requirement are met. A copy of this evidence must be provided to the Consultant.
- .5 Submit proposed schedule to the Prime Contractor showing the phasing and proposed workforce for the required segregated work areas.
- .6 Laws of the province of Manitoba shall govern this work. Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, and duties as may be required. Likewise, it is the responsibility of the contractor to comply with the Workers' Compensation and Workplace Safety and Safety Acts.
- .7 Submit to the Prime Contractor, in writing, confirmation of good standing with the Workers' Compensation Board.
- .8 Submit to the Consultant documentation of Employee respirator fit testing.
- .9 Submit documentation to the Consultant of In-Place Filter Testing (DOP) for HEPA-rated vacuums must be provided prior to project commencement.

.8 Worker and Visitor Protection

- .1 Instructions: Before entering an asbestos work area, instruct workers and visitors in the use of respirators, dress, entry and exit from asbestos work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by a competent person as defined by M. Reg. 217/2006.
- .2 Respirators:
 - .1 At a minimum, a half-face respirator equipped with P100 filters shall be used for all Type 2 work. Provide respiratory equipment for all persons within asbestos work area including authorized visitors.
 - .2 Respirators shall be acceptable to Manitoba Workplace Safety and Health. Provide proper instruction to workers and visitors in use of respirators, including qualitative fit testing. No supervisor, worker or authorized visitor shall have facial hair that affects the seal between respirator and face. Maintain respiratory protection equipment in proper function and clean condition, or remove from site.
- .3 Protective Clothing: Provide workers and visitors in asbestos work areas, two suits with full body coveralls with integral hoods. Once coveralls are worn in asbestos work area, treat and dispose of as asbestos contaminated waste. Workers and visitors shall also wear other protective apparel required by Manitoba Workplace Safety and Health.
- .4 Before entering asbestos work area(s) in the clean room, put on respirator with new or tested filters, two pairs of clean coveralls with head covers and boot covers before entering equipment and access areas or asbestos work area. Store street clothes, uncontaminated footwear, towels etc. in clean change room.
- .5 Persons leaving asbestos work area(s) shall remove gross contamination from clothing and remove outer layer of clothing before leaving the asbestos work area; proceed to equipment and access area and remove remaining clothing except respirator; place the contaminated work suits in the receptacles for disposal with other asbestos contaminated materials; leave footwear, clothing, hardhats, protective eye wear, etc., in the equipment and access area to dry for later use; still wearing a respirator proceed to the clean area. Clean the respirator and any exposed skin to ensure that visible contamination is removed. Remove the filters and dispose of in the container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary. Upon completion of asbestos removal, dispose of footwear as contaminated waste or clean before removing from the equipment and access area, or carry in sealed plastic bag to next contaminated site.
- .6 Store the respirators in a fashion to allow them to be put on prior to entering asbestos work area at the start of the next shift without contaminating the clean area. If re-entry to the asbestos work area is to take place after having left for eating, drinking, or smoking, follow procedures in paragraph 1.8.4.
- .7 Do not eat, drink, smoke or chew gum or tobacco at the work site or in the enclosure.
- .8 Be fully protected as specified herein when the possibility of disturbance of asbestos exists.

2 PRODUCTS

- .1 Materials
-

- .1 Polyethylene: 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.
 - .2 Rip-Proof Polyethylene: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.
 - .3 Tape: Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions. Nashua 398 Duct Tape or approved equivalent.
 - .4 Wetting Agent: Non-foaming surfactant, mixed with water in concentration to provide thorough wetting of asbestos fibre: Asbestos-Wet, or equivalent.
 - .5 Amended Water: Water with wetting agent added.
 - .6 Asbestos Waste Receptors: Two separate containers of which one shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or fibre drum or wood box. Other container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. Containers must be acceptable to disposal site selected.
 - .7 Sealer: Sealer for purpose of trapping residual fibre debris. Product must have flame spread and smoke development ratings both less than 25. Product shall leave no stain when dry. Use Childers CP-240 Childers Products Company or equivalent. Follow manufacturer's instructions with regards to the proper use, handling and application of the sealer.
 - .8 Ground Fault Panel: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. All GFCI equipment to be installed by licensed electrician.
 - .9 HEPA Vacuum: Vacuum with all necessary fittings, tools and attachments. Air must pass through HEPA filter before discharge.
 - .10 Protective Coveralls: Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or nonwoven material Kleenguard by Kimberley Clark, or equivalent.
 - .11 Flexible ducting: Metal reinforced flexible ductwork, 12" diameter minimum.
 - .12 Airless Sprayer: Graco Maxi-wetter or equivalent.
 - .13 Negative Air Unit: Portable air handling system which extracts air directly from asbestos work area and discharges air outside of the building. Unit shall be fitted with pre-filter and HEPA final filter. Air shall pass through a HEPA filter before discharge. Unit shall have pressure differential gauge to monitor filter loading. Unit shall have auto shut-off and warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps
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to retain filter in place. Unit shall be equipped with a smoke detector auto shut-off. Exhaust filtered air outside of the building.

3 EXECUTION

.1 Preparation

- .1 Enclose Asbestos Work Area(s).
 - .2 Move equipment, tools, furnishings, and stored materials which can be moved without disturbing asbestos-containing materials.
 - .3 Seal off openings such as doorways, windows, vents, service holes in walls and grilles to non-operating ducts with polyethylene sheeting sealed with tape or with polyurethane foam as appropriate.
 - .4 Cover all horizontal and vertical surfaces that cannot be properly decontaminated, with a single layer of 6 mil polyethylene sheeting.
 - .5 Establish negative pressure in asbestos work area. Negative pressure units shall have total rated capacity with filters in place sufficient to provide minimum one (1) air change every 15 minutes. Volume of air shall be sufficient to ensure airflow is maintained from clean areas into asbestos work area. Vent air from work area to outside of building via flexible ducting from negative air units. Do not discharge air into building interior without obtaining approval from the Consultant. Leak test all negative air units to be used on the project, in operating position at project, using an approved in-place filter test (DOP) method. Venting of exhaust air through occupied area shall be via rigid or flexible airtight ductwork. Seal the enclosure at the end of every shift while negative air unit is not operational.
 - .6 Replace pre-filters as necessary to maintain airflow. Maintain negative air pressure of 5 Pascal (0.02 inches of water column) pressure reduction within asbestos enclosure with respect to surrounding areas.
 - .7 Maintain emergency and fire exits from asbestos work area, or establish alternative exits satisfactory to authorities having jurisdiction.
 - .8 Ensure existing power supply to asbestos work area is isolated and disconnected where necessary. Do not disrupt power supply to remaining areas of building. Provide ground fault electrical system where application of amended water is required for wetting asbestos-containing materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.
 - .9 Provide a fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.
 - .10 Post proof that the Project Notification has been issued and received, and post site- specific safe work procedures on the site.
 - .11 Provide temporary lighting in the asbestos work area to levels that will permit work to be done safely, and as required by Specifications.
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- .12 Contractor shall be responsible for supply of temporary power to execute the scope of work.
 - .2 Worker Decontamination Enclosure System
 - .1 Construct worker a decontamination enclosure at entrance to each Type 2 work area. Worker decontamination enclosure system shall comprise an interconnecting room. Provide a set of curtained doorways between each room, and at both the dirty and clean entrances to enclosure systems. The rooms are as follows:
 - .1 Equipment and Access Room: Build a room between the clean room and the asbestos work area. Install waste receptor, and storage facilities for workers' shoes and any protective clothing to be re-worn in asbestos work area. Equipment and access room shall be large enough to accommodate specified facilities, and other equipment needed, and allowing sufficient space for at least one worker to undress comfortably. (Minimum size 5 square metres (50 ft²).)
 - .2 Clean Room: Build a room between the equipment and access room and the clean areas outside of enclosures. Provide hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Minimum size 3 square metres (30 sq. ft.).
 - .3 Construction of Decontamination Enclosures
 - .1 Floor: Prior to erecting wall framing, lay one sheet of rip-proof polyethylene over floor area to be covered by enclosures. Turn 600 mm (24") of rip-proof polyethylene up outside of enclosure, overlapping with polyethylene sheeting covering perimeter walls. Provide second layer of rip-proof polyethylene to all floors, extending 600 mm up inside of enclosure walls.
 - .2 Walls: Walls of the Decontamination Unit must be appropriately supported. Use wood framing or telescopic poles as required. Cover both sides of walls with polyethylene sheeting.
 - .3 Roof: The polyethylene roof of the Decontamination Unit must be appropriately supported. Use wood framing or telescopic poles as required.
 - .4 Doorways: Build curtain doorways designed so that when workers or drums and equipment move through doorway, one of two barriers comprising doorway always remains closed.
 - .4 Maintenance of Enclosures
 - .1 Maintain enclosures in a tidy condition.
 - .2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
 - .3 Visually inspect enclosures at beginning and end of each working period.
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- .5 Do Not Commence Asbestos Removal Work Until:
- .1 Arrangements have been made for disposal of waste.
 - .2 Asbestos work areas and decontamination enclosures are effectively segregated.
 - .3 Negative pressure equipment is operating continuously and is checked to ensure that required pressure differential is obtained.
 - .4 Tools, equipment and materials waste receptors are on hand.
 - .5 Arrangements have been made with the Owner for work area security.
 - .6 Signs are displayed in areas where access to sealed asbestos work area is possible. Signs shall read:

CAUTION
Asbestos Hazard Area
No Unauthorized Entry
Wear assigned protective equipment
Breathing asbestos dust may cause serious bodily harm.
 - .7 Post Proof of the Project Notification has been issued and received, and post site-specific safe work procedures on the site.
 - .8 The Consultant has been notified of intention to proceed and has reviewed enclosures, equipment and procedures.
- .6 Contaminated Preparation for Asbestos Work Area
- .1 Before performing any contaminated work, prepare site as described in section 3.1.
 - .2 Promptly seal holes or penetrations in structure above ceiling, ducts, etc. to provide airtight enclosure around asbestos work area(s).
- .8 Removal
- .1 Remove and dispose of all asbestos-containing materials as specified in this Section, Summary of Work, and Architectural Drawings.
 - .2 Place asbestos waste in asbestos waste receptors. If drums are used for waste disposal, drums shall be sealed and cleaned in waste decontamination enclosures. If double plastic bags are used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer plastic bag in container cleaning room immediately prior to transfer from Site.
 - .3 Treat all materials removed to expose asbestos, as asbestos-contaminated waste unless such materials are specified to be reused.
 - .4 Ensure that all horizontal surfaces within the work area are wet wiped and HEPA vacuumed of all loose visible debris.
- .8 Clean-Up
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- .1 Clean surfaces from which asbestos has been removed with HEPA vacuum, or wet-wiping techniques to remove visible dust and debris.
 - .2 Remove sealed and labelled asbestos waste receptors and dispose of at authorized disposal area in accordance with requirements of disposal authority.
 - .3 After vacuuming and wet-wiping to remove visible asbestos, wet clean entire asbestos work area including equipment and access area, polyethylene sheeting and equipment used in process. Floor and wall surfaces, ducts, and similar items not covered with polyethylene sheeting must be wet cleaned.
 - .4 Request visual inspection and acceptance. Following inspection and acceptance, apply one coat of slow drying sealer to all surfaces from which asbestos has been removed.
- .9 Tear Down of Protection
- .1 If air sampling by the Consultant shows that levels in asbestos work area do not exceed 0.01 fibres/cc as determined by NIOSH 7400, proceed with dismantling of enclosures.
 - .2 Remove polyethylene sheeting exposed during contaminated work including upper surfaces plus any underlying sheeting contaminated by water leaks, rips, tears, or exposed by failure of upper layer. Wear half face P100 HEPA filtered respirator and disposable coveralls during removal of sheeting. Carefully roll sheeting away from walls to center of asbestos work area. As sheeting is rolled away from walls and corners, HEPA vacuum visible debris.
 - .3 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in asbestos waste receptors for disposal. Remove any debris fallen behind sheeting with HEPA vacuum.
 - .4 Clean asbestos work area(s), equipment and access area, washing room, and other enclosures that may have been contaminated during work.
 - .5 Clean asbestos waste receptors and equipment used in work and remove from asbestos work area(s) via drum and equipment decontamination enclosure system, at the appropriate time in sequence.
 - .6 Remove hoardings, temporary lighting, equipment and facilities provided for work.
 - .7 A final review will be carried out by the Consultant to ensure that no dust or debris remains.
- .10 Air Monitoring
- .1 The Consultant will arrange for air samples to be taken daily from commencement of work until completion of cleaning operations, inside (if required) and outside of asbestos work area(s) enclosures in accordance with NIOSH 7400. Air sample results will be made available daily during asbestos removal.
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- .2 Co-operate with the Consultant in collection of air samples, including requiring workers to wear sampling pumps (if required) for up to half shift periods. Workers shall exercise care not to damage air sampling equipment.
 - .3 If perimeter air monitoring levels exceed 10% of the OEL of 0.1 fibres/cc, work practices will be reviewed, at no cost to the Owner.
 - .4 If perimeter air monitoring levels exceed 50% of the OEL of 0.1 fibres/cc, work shall be immediately stopped, work practices will be reviewed and cleanup shall be completed by HEPA vacuum and/or wet methods, at no cost to the Owner.
 - .5 Cost of all air monitoring is to be carried by the Prime Contractor.
 - .6 Clearance level for enclosed Type 2 is 0.01 fibres/cc.
- .11 Inspection
- .1 From commencement of work until completion of clean-up operations, the Consultant will be present periodically or on a full-time basis, both inside and outside asbestos work area(s).
 - .2 If asbestos work area(s) or adjacent areas, are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to the Owner.
 - .3 Pay cost to provide re-inspection of work found not in accordance with these specifications and requirements of authorities having jurisdiction.
- .12 Waste Transport and Disposal
- .1 Handle and dispose of contaminated waste as required under M. Reg. 217/2006 and the appropriate Guideline document(s) in force at the time of abatement.
 - .2 Confirm with the Municipal Sanitary facilities to determine what type of waste containers are acceptable.
 - .3 Ensure shipment of containers to the dump is taken by waste hauler licensed to transport asbestos waste. Submit documentation to this effect.
 - .4 Each load requires completion of bill of lading showing type and weight of hazardous waste being transported.
 - .5 Co-operate with the Authorities having jurisdiction to carry out instructions for remedial work at dump to maintain environment, at no additional cost to Owner.
 - .6 Ensure that the dump operator is fully aware of hazardous material being dumped.

END OF SECTION

GENERAL

- .1 General Requirements
 - .1 Conform to the requirements of the related specifications for this project.
 - .2 Related Work
 - .1 02 82 00 – Hazardous Materials Abatement – Summary of Work
 - .2 02 82 13.19 – Type 1 Asbestos Removal
 - .3 02 82 33.02 – Type 2 Asbestos Removal
 - .4 02 83 19 – Lead Paint Remediation & Exposure Precautions
 - .3 Comply with the requirements of this section when performing the following work, as outlined in Section 02 82 00 – Abatement Summary of Work, and the Architectural Drawings to confirm locations and approximate quantities of asbestos materials.
 - .1 Remove and dispose of impact areas, greater than 1m² each of asbestos containing textured plaster ceilings within the men's and women's bathrooms in the basement of the Museum Building.
 - .2 The scope of work is to include, but not be limited to, materials identified during the site walkthrough, scope of work document, Architectural Drawings and as directed by the Consultant.
 - .3 The Contractor is responsible for all final quantity determinations.
 - .4 Perform asbestos removal by the full enclosure Type 3 method as outlined in this specification.
 - .5 Seal surfaces with sealer in all areas from which asbestos has been removed and surfaces potentially contaminated with asbestos.
 - .6 All work will be subject to inspection and air monitoring inside and outside the asbestos work area(s) by the Consultant. Any contamination of the surrounding areas, indicated by visual inspection or air monitoring, shall necessitate complete cleanup of affected areas by the Asbestos Removal Contractor, at no cost to the Owner. The contractor recognizes that time is of the essence in remedying any noted contamination or other deficiencies.
 - .7 The Asbestos Removal Contractor shall ensure that all workers have successfully completed an approved asbestos abatement course approved by Manitoba Workplace Safety and Health.
 - .8 Protect surfaces that cannot be easily decontaminated, this may include fabric and items remaining within asbestos work area. Temporarily relocate, cover/crate, and replace existing furnishings (desks, chairs, bookcases, electronic equipment, etc.) or other materials potentially impacted by or otherwise affecting work.
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- .9 The Abatement Contractor will supply power, hot and cold running water. Supply all labour, tools and fittings to access the supplied services.
 - .10 Notify the Consultant 24-hours prior to requiring a pre-contamination or final visual inspection.
 - .11 The Contractor will be responsible for all costs incurred for the completion of additional final visual inspections or air clearance monitoring if the first inspection or air clearance tests fail.
 - .12 Owner: Parks Canada
 - .13 Architect: Architecture 49 Inc.
 - .14 Prime Contractor: To be determined.
 - .15 Asbestos Removal Contractor: To be determined.
 - .16 Environmental Consultant: Tesseract Environmental Consulting Inc.
- .4 Definitions
- .1 HEPA Filter: High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.
 - .2 Friable Material: Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
 - .3 Polyethylene Sheeting: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with taped seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.
 - .4 Authorized Visitor(s): Consultant or person(s) representing regulatory agencies and person(s) authorized by them.
 - .5 Asbestos Work Area(s): Area(s) where work takes place which will, or may, disturb asbestos-containing material, including over spray and fallen material, or settled dust that may contain asbestos.
 - .6 Curtained Doorway: Device to allow ingress or egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of polyethylene sheeting (2 sheets of polyethylene per flap) attached to head and one jamb of existing or temporarily constructed door and vertical edge of other flap along opposite vertical side of doorframe. Re-enforce free edges of polyethylene with duct tape.
 - .7 Negative Pressure: Reduced pressure within asbestos work area(s) established by extracting air directly from work area, and discharging it directly to the exterior of the building. Discharged air first passes through HEPA a filter. Extract sufficient air to ensure
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constant reduced pressure at perimeter of work area with respect to surrounding areas acceptable to the Consultant.

- .8 DOP Test: Documentation of In-Place Filter testing (DOP) for HEPA-rated negative air units and vacuums must be provided prior to project commencement.
- .9 Maximum Use Concentration: Assigned Protection Factor for the respirator in use times the OEL.

.5 Regulations

- .1 Comply with Federal, Provincial (Manitoba Workplace Safety and Health Regulation 217/2006), and local requirements pertaining to asbestos, provided that in any case of conflict among these requirements or with these specifications the more stringent requirement shall apply.
 - .2 Comply with the requirements of Part 36 of M. Reg 217/2006 (Chemical and Biological Substances) as part of the abatement work.
 - .3 Handle and dispose of contaminated waste as required under M. Reg 217/2006 and the document entitled "*Guidelines for Working With Asbestos - 2008*", made pursuant to M. Reg 217/2006.
 - .4 Not later than 1 week before commencing asbestos work on this project, notify in writing the Manitoba Workplace Safety and Health Division that a hazardous asbestos work area will exist.
 - .5 Contractor shall ensure that:
 - .1 Measures and procedures prescribed under the M. Reg 217/2006 are carried out.
 - .2 Every employee and every worker on the project complies with the applicable Manitoba Workplace Safety and Health Act (W210), and M. Reg 217/2006.
 - .3 The health and safety of workers, other contractors on site and the public is to be protected.
 - .4 Policies and procedures of the Owner's Health and Safety program are to be complied with.
 - .5 All material handling, and associated equipment must conform with and be operated in accordance with "Workplace Hazardous Materials Information System" (WHMIS).
 - .6 Advise the Owner whenever work is expected to be hazardous to employees and/or the public.
 - .7 Contractor may be requested to provide information on their health and safety record.
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.6 Quality Assurance

- .1 Ensure work proceeds on schedule, and meets all the requirements of this Section. Perform work so that airborne asbestos, asbestos waste, or water runoff does not contaminate areas outside the asbestos work enclosure.
- .2 Pay the cost to the Owner for the inspection and air monitoring performed as result of failure to perform work satisfactorily regarding quality, safety, or the schedule.
- .3 Use only skilled and qualified workers for all the trades required for this work.

.7 Submittals

.1 Before commencing work:

- .1 Obtain and submit all the necessary permits for transporting and disposal of asbestos waste. Submit verification that the removed asbestos materials have been disposed of as asbestos waste in an approved landfill.
- .2 Submit proof of documentation that all employees have completed an approved asbestos training course required by M. Reg 217/2006 and the Manitoba document entitled "Guidelines for Working with Asbestos – 2008". A copy of all of the asbestos removal workers proof of training must be provided to the Consultant prior to the worker coming on site.
- .3 Submit proposed schedule showing the phasing and proposed workforce for full enclosure asbestos work area(s).
- .4 Submit proposed containment layout, placement of viewing windows, placement of negative air units and negative air calculations.
- .5 Laws of the province of Manitoba shall govern this work. Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, and duties as may be required. Likewise, it is the responsibility of the contractor to comply with the Workers' Compensation and Occupational Health and Safety Acts.
- .6 Submit, in writing, confirmation of good standing with the Workers' Compensation Board.
- .7 Submit documentation of In-Place Filter Testing (DOP) for HEPA-rated negative air units and vacuums.
- .8 Submit documentation of Employee fit testing.

.8 Worker and Visitor Protection

- .1 Instructions: Before entering an asbestos work area, instruct workers and visitors in the use of respirators, dress, showers, entry and exit from asbestos work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by a competent person as defined by the Manitoba Workplace Safety and Health Act.
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- .2 Respirators: Powered Air Purifying Respirators (PAPR) equipped with HEPA filters shall be used for all high-risk asbestos work. Provide respiratory equipment for all persons within asbestos work area including authorized visitors.
 - .1 Respirators shall be acceptable to Manitoba Workplace Safety and Health. Provide proper instruction to workers and visitors in use of respirators, including qualitative fit testing. No supervisor, worker or authorized visitor shall have facial hair that affects the seal between respirator and face. Maintain respiratory protection equipment in proper function and clean condition, or remove from site.
 - .3 Protective Clothing: Provide workers and visitors in full-enclosure suits with full body coveralls with integral hoods. Once coveralls are worn in an asbestos work area, treat and dispose of them as asbestos contaminated waste. Workers and visitors shall also wear other protective apparel required by Occupational Health and Safety Regulations.
 - .4 Before entering full-enclosure asbestos work area(s) remove street clothes in the clean change room and put on respirator with new or tested filters, clean coveralls and head covers before entering equipment and access areas or asbestos work area. Store street clothes, uncontaminated footwear, towels etc. in clean change room.
 - .5 Persons leaving full-enclosure asbestos work area(s) shall remove gross contamination from clothing before leaving the asbestos work area; proceed to equipment and access area and remove all clothing except respirator; place the contaminated work suit in the receptacles for disposal with other asbestos contaminated materials; leave footwear, clothing, hardhats, protective eye wear, etc., in the equipment and access area to dry for later use; still wearing a respirator proceed naked to the showers and clean the respirator to ensure that visible contamination is removed. After having thoroughly washed hair and body with shampoo and soap, remove the respirator. Remove the filters and dispose of in the container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary. Store respirators and respirator accessories on the clean side of shower room away from clean room. Wet clean inside of the respirator. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean before removing from the equipment and access area, or carry in sealed plastic bag to next contaminated site.
 - .6 Following showering, proceed to the clean change room, dry off and dress in street clothes. Store the respirators in a fashion to allow them to be put on prior to entering asbestos work area at the start of the next shift without contaminating the clean area. If re-entry to the asbestos work area is to take place after having left for eating, drinking, or smoking, follow procedures in paragraph 1.8.4.
 - .7 Removal of waste and equipment from the holding room of the waste decontamination enclosure system shall be performed by workers entering from outside. These workers shall wear clean coveralls and half-face, asbestos approved respirator as specified in paragraph 1.8.3. No worker shall use this system as means to leave or enter the asbestos work area.
 - .8 Do not eat, drink, smoke or chew gum or tobacco at the work site or in the enclosure.
 - .9 Be fully protected as specified herein when the possibility of disturbance of asbestos exists.
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2 PRODUCTS

.1 Materials

- .1 Polyethylene: 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.
 - .2 Rip-Proof Polyethylene: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.
 - .3 Tape: Duct Tape suitable for sealing polyethylene to surface encountered, under wet conditions using amended water, and dry conditions. Nashua 398 Duct Tape or approved equivalent.
 - .4 Wetting Agent: Non-foaming surfactant, mixed with water in concentration to provide thorough wetting of asbestos fibre: Asbestos-Wet, or equivalent.
 - .5 Amended Water: Water with wetting agent added.
 - .6 Asbestos Waste Receptors: Two separate containers of which one shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or fibre drum or wood box. Other container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. Containers must be acceptable to disposal site selected.
 - .7 Sealer: Sealer for purpose of trapping residual fibre debris. Product must have flame spread and smoke development ratings both less than 25. Product shall leave no stain when dry. Use Childers CP-240 Childers Products Company or equivalent. Follow manufacturer's instructions with regards to the proper use, handling and application of the sealer.
 - .8 Ground Fault Panel: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. All GFCI equipment to be installed by licensed electrician.
 - .9 HEPA Vacuum: Vacuum with all necessary fittings, tools and attachments. Air must pass through a HEPA filter before discharge.
 - .10 Protective Coveralls: Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material (Tyvek by Dupont) or nonwoven material (Kleenguard by Kimberley Clark), or equivalent.
 - .11 Flexible ducting: Metal reinforced flexible ductwork, 12" diameter minimum.
 - .12 Airless Sprayer: Graco Maxi-wetter or equivalent
 - .13 Negative Air Unit: Portable air handling system which extracts air directly from asbestos work area and discharges air outside of the building. Unit shall be fitted with pre-filter and HEPA final filter. Air shall pass through a HEPA filter before discharge. Unit shall have
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pressure differential gauge to monitor filter loading. Unit shall have auto shut-off and warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps to retain filter in place. Unit shall be equipped with a smoke detector auto shut-off.

3 EXECUTION

.1 Preparation

- .1 Enclose Asbestos Work Area(s).
 - .2 Move equipment, tools, furnishings, and stored materials which can be moved without disturbing asbestos-containing materials.
 - .3 Seal off openings such as doorways, windows, vents, service holes in walls and grilles to non-operating ducts with polyethylene sheeting sealed with tape or with polyurethane foam as appropriate.
 - .4 Cover all horizontal and vertical surfaces that cannot be properly decontaminated, with a single layer of rip-proof polyethylene sheeting.
 - .5 Cover with rip-proof polyethylene sheeting, all gauges, motors, heating units, fire apparatus, door closer, fans, benches, shelving, storage racks, valves, taps, controllers, lights, and other fixtures and furnishings which are not being removed from asbestos work area and which could be damaged and/or which cannot be readily cleaned at completion of this work. Pre-clean surfaces potentially contaminated with asbestos with HEPA vacuum or damp cloth prior to installing protection.
 - .6 Establish negative pressure in asbestos work area. Negative pressure units shall have total rated capacity with filters in place sufficient to provide minimum one (1) air change every 15 minutes. Volume of air shall be sufficient to ensure airflow is maintained from clean areas into asbestos work area. Vent air from work area to outside of building via flexible ducting from negative air units. Do not discharge air into building interior without obtaining approval from the Consultant. Leak test all negative air units to be used on the project, in operating position at project, using an approved in-place filter test (DOP) method. Venting of exhaust air through occupied area shall be via rigid airtight ductwork. Seal the enclosure at the end of every shift if negative air unit is not operational.
 - .7 Replace pre-filters as necessary to maintain airflow. Maintain minimum negative air pressure of 5 Pascal (0.02 inches water column) pressure reduction within asbestos enclosure with respect to surrounding areas.
 - .8 Maintain emergency and fire exits from asbestos work area, or establish alternative exits satisfactory to authorities having jurisdiction.
 - .9 Provide ground fault electrical system where application of amended water is required for wetting asbestos-containing materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.
 - .10 Provide temporary lighting in the asbestos work area to levels that will permit work to be done safely, and as required by Specifications.
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- .11 Provide a fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.
 - .2 Worker Decontamination Enclosure System
 - .1 Construct worker decontamination enclosure inside each asbestos work area. The decontamination facility shall be constructed to provide proper support to workers working on top of the enclosure. Worker decontamination enclosure system shall comprise three interconnecting rooms as follows:
 - .1 Provide a set of curtained doorways between each room, and at both the dirty and clean entrances to enclosure systems.
 - .2 Equipment and Access Room (Dirty Room): Build a room between the shower room and the asbestos work area. Install waste receptor, and storage facilities for workers' shoes and any protective clothing to be re-worn in asbestos work area. Equipment and access room shall be large enough to accommodate specified facilities, and other equipment needed, and allowing sufficient space for at least one worker to undress comfortably. (Minimum size 5 square metres (50 ft²).
 - .3 Shower Room: Build a room between the clean room and the equipment and access room. Provide constant separate supplies of hot and cold water. Provide valves controllable at shower(s) to regulate water temperature. Provide rigid piping with watertight connections and connect to water sources and drains. Provide soap, shampoo, clean towels and appropriate containers for disposal of used respirator filters. Direct filtered wastewater to sanitary sewer drains. Install ground fault protected power supply, and hooks and shelves for storage and charging of PAPR, if applicable.
 - .4 Clean Room: Build a room between the shower room and the clean areas outside of enclosures. Provide hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install water heater, if required. (Minimum size 5 square metres (50 ft²).
 - .3 Waste and Equipment Decontamination Enclosure System
 - .1 Construct a system comprised of three linked rooms: Purpose of this system is to provide means to decontaminate drums, scaffolding, materials containers, vacuum and spray equipment, and other tools and equipment for which worker decontamination system is not suitable. Provide curtain doorways between rooms, and at both dirty and clean entrances to Enclosure System.
 - .2 Staging Area: Build a staging area in the asbestos work area for gross removal of dust and debris from waste containers and equipment, labelling and sealing of waste containers, and temporary storage pending removal to container cleaning room.
 - .3 Container Cleaning Room: Build a container cleaning room between the staging area and the holding room. Room shall be of sufficient size to allow proper washing of equipment and drums or double bagging of asbestos waste. Treat wash water as asbestos contaminated waste.
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- .4 Holding Room: Build a holding room between the container cleaning room and the uncontaminated area. The holding room shall be of sufficient size to accommodate largest item of equipment used and ten waste containers.

- .4 Construction of Decontamination Enclosures
 - .1 Floor: Prior to erecting wall framing, lay one sheet of rip-proof polyethylene over floor area to be covered by enclosures. Turn 600 mm (24") of rip-proof polyethylene up outside of enclosure, overlapping with polyethylene sheeting covering perimeter walls. Provide second layer of rip-proof polyethylene to all floors, extending 600 mm up inside of enclosure walls.
 - .2 Walls: Walls of the Decontamination Unit must be appropriately supported. Use wood framing or telescopic poles as required. Cover both sides of walls with polyethylene sheeting.
 - .3 Roof: The polyethylene roof of the Decontamination Unit must be appropriately supported. Use wood framing or telescopic poles as required.
 - .4 Doorways: Build curtain doorways designed so that when workers or drums and equipment move through doorway, one of two barriers comprising doorway always remains closed.

- .5 Maintenance of Enclosures
 - .1 Maintain enclosures in a tidy condition.
 - .2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
 - .3 Visually inspect enclosures at beginning and end of each working period.

- .6 Do Not Commence Asbestos Removal Work Until:
 - .1 Arrangements have been made for disposal of waste.
 - .2 Asbestos work areas and decontamination enclosures (and parts of building required to remain in use are effectively segregated.
 - .3 Negative pressure equipment is operating continuously and is checked to ensure that required pressure differential is obtained.
 - .4 Tools, equipment and materials waste receptors are on hand.
 - .5 Arrangements have been made for work area security.
 - .6 Signs are displayed in areas where access to sealed asbestos work area is possible. Signs shall read:

CAUTION
Asbestos Hazard Area

No Unauthorized Entry
Wear assigned protective equipment
Breathing asbestos dust may cause serious bodily harm

- .7 Proof of Notification of Project to Manitoba Workplace Safety and Health has been submitted and the acknowledgment receipt received and posted on site.
 - .8 Consultant has been notified of intention to proceed and has reviewed enclosures, equipment and procedures.
 - .7 Contaminated Preparation for Full-Enclosure Asbestos Work Area
 - .1 Before performing any contaminated work, prepare site as described in section 3.1.
 - .2 Promptly seal holes or penetrations in structure above ceiling, ducts, etc. to provide airtight enclosure around asbestos work area(s).
 - .3 Protect electrical, communication, life safety and control systems to remain in place in asbestos work area with polyethylene and tape.
 - .8 Removal
 - .1 Remove asbestos-containing materials, while maintaining all exposed surfaces of insulation in a wet condition.
 - .2 Place asbestos waste in asbestos waste receptors. If drums are used for waste and placed in a clean 6 mil outer plastic bag in container cleaning room immediately prior to transfer from work site.
 - .3 Treat all materials removed to expose asbestos, as asbestos-contaminated waste unless such materials are specified to be reused.
 - .9 Clean-Up
 - .1 Clean surfaces from which asbestos has been removed with brushes, HEPA vacuum or wet sponge to remove visible dust and debris.
 - .2 Remove sealed and labelled asbestos waste receptors and dispose of at authorized disposal area in accordance with requirements of disposal authority.
 - .3 After brushing and wet sponging to remove visible asbestos, wet clean entire asbestos work area including equipment and access area, polyethylene sheeting and equipment used in process. Floor and wall surfaces, ducts, and similar items not covered with polyethylene sheeting must be wet cleaned.
 - .4 Request visual inspection and acceptance. Following inspection and acceptance, apply heavy coat of slow drying sealer to all surfaces from which asbestos has been removed. Apply thinned coat (sufficient to coat all surfaces) to other surfaces in asbestos work area including all polyethylene sheeting and surfaces scheduled for demolition. Allow
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minimum of 12 hours with no disturbance of asbestos work area prior to conducting clearance air monitoring tests.

.10 Tear Down of Protection

- .1 If air sampling by Consultant shows that levels in asbestos work area do not exceed 0.01 fibres/cc as determined by NIOSH 7400, proceed with dismantling of enclosures.
- .2 Remove polyethylene sheeting exposed during contaminated work including upper surfaces plus any underlying sheeting contaminated by water leaks, rips, tears, or exposed by failure of upper layer. Wear half face respirator and disposable coveralls during removal of sheeting. Carefully roll sheeting away from walls to center of asbestos work area. As sheeting is rolled away from walls and corners, HEPA vacuum visible debris.
- .3 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in asbestos waste receptors for disposal. Remove any debris fallen behind sheeting with HEPA vacuum.
- .4 Clean asbestos work area(s), equipment and access area, shower room, and other enclosures that may have been contaminated during work.
- .5 Clean asbestos waste receptors and equipment used in work and remove from asbestos work area(s) via drum and equipment decontamination enclosure system, at an appropriate time in sequence.
- .6 Remove hoardings, temporary lighting, equipment and facilities provided for work.
- .7 A final review will be carried out by Consultant to ensure that no dust or debris remains.

.11 Air Monitoring

- .1 Consultant will arrange for air samples to be taken prior to commencement of asbestos removal to be used as a baseline indicator.
 - .2 Consultant will arrange for air samples to be taken daily from commencement of work until completion of cleaning operations, inside (if required) and outside of asbestos work area(s) enclosures in accordance with NIOSH 7400. Air sample results will be made available daily during asbestos removal.
 - .3 Co-operate with the Consultant in collection of air samples, including requiring workers to wear sampling pumps (if required) for up to half-shift periods. Workers shall exercise care not to damage air sampling equipment.
 - .4 If levels exceed 0.01 fibres/cc outside the enclosure work shall be stopped and work practices will be reviewed. As deemed necessary by the Consultant, areas outside of the enclosure shall be cleaned, wet wiped, and HEPA vacuumed at no cost to the Owner.
 - .5 If levels inside the enclosure exceed 50% of the applicable maximum use concentration, for the respiratory protection in use, work shall be immediately stopped, work practices will be reviewed and cleanup shall be completed by HEPA vacuum and/or wet methods, at no cost to the Owner.
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- .6 .5 Cost of all air monitoring is to be carried by the Prime Contractor.
- .7 Clearance level is 0.01 fibres/cc.
- .12 Inspection
 - .1 From commencement of work until completion of clean-up operations, Consultant will be present periodically or on a full-time basis, both inside and outside asbestos work area(s).
 - .2 If asbestos work area or adjacent areas are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to the Owner.
 - .3 Pay cost to provide re-inspection of work found not in accordance with these specifications and requirements of authorities having jurisdiction.
- .13 Waste Transport and Disposal
 - .1 Conform to the requirements under the document entitled “Guidelines for Working With Asbestos” published by Manitoba Workplace Safety and Health.
 - .2 Confirm with the Municipal sanitary facilities to determine what type of waste containers are acceptable.
 - .3 Ensure shipment of containers to the landfill is taken by waste hauler licensed to transport asbestos waste. Submit documentation to this effect.
 - .4 Each load requires completion of bill of lading (manifest) showing type and weight of hazardous waste being transported. A copy of the bill of lading must be provided to the Consultant immediately following disposal.
 - .5 Co-operate with the authorities having jurisdiction to carry out instructions for remedial work at landfill to maintain environment, at no additional cost to Owner.
 - .6 Ensure that the landfill operator is fully aware of hazardous material being disposed.

END OF SECTION

GENERAL

.1 General Requirements

.1 Conform to the requirements of the related specifications for this project.

.2 Comply with the requirements of this section when performing the following work, as outlined in the Hazardous Materials Abatement Summary of Work. Prior to commencement of work, Contractor shall confirm locations of lead-containing paint materials.

.1 Remove and dispose of loose lead-containing paint, as required.

.2 Avoid excess dust creation or disturbance to painted surfaces remaining in place.

.2 The scope of work is to include, but not be limited to, materials identified during the site investigation, and as directed by Accommodation Services Division, their Prime or Environmental Consultant.

The Contractor is responsible for all final quantity determinations.

.3 All work will be subject to inspection inside and outside the lead work area(s) by the Environmental Consultant. Any contamination of the surrounding areas, indicated by visual inspection shall necessitate complete cleanup of affected areas by the Contractor, at no cost to the Owner. The contractor recognizes that time is of the essence in remediating any noted contamination or other deficiencies.

.4 The Contractor shall ensure that an outside person, that has successfully undergone lead remediation training course approved by Manitoba Workplace Safety and Health, is present on site during all removal activities.

.6 The Contractor will be responsible for all costs incurred for the completion of additional final visual inspections, air clearance monitoring, if required, or additional surface wipe sampling if the first inspection or clearance tests fail.

.7 Owner: Parks Canada

.8 Architect: Architecture 49 Inc.

.9 Hazardous Materials Removal Contractor: To be determined.

.10 Environmental Consultant: Tesseract Environmental Consulting Inc.

.3 Definitions

.1 Abatement: Any set of measures designed to permanently eliminate lead-containing paint hazards in accordance with standards established. Such term includes:

a. The removal of lead-containing paint and lead-contaminated dust, the permanent containment or encapsulation of lead-based paint, the replacement of lead-painted surfaces or fixtures, and the removal or covering of lead contaminated soil; and,

b. All preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.

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- .2 Competent Person: As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current federal, Provincial, and local regulations.
 - .3 HEPA Filter: High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.
 - .4 Lead: Metallic lead, lead-containing inorganic compounds, lead-containing organic compounds, lead-contaminated dust or waste.
 - .5 Lead-Containing Paints: Paint or other surface coating that contains lead in excess of 90 mg/kg and less than 5000 mg/kg.
 - .6 Lead Control Area: A system [of control methods] to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.
 - .7 Polyethylene Sheeting: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness.
 - .8 Polyethylene Enclosure: Erected structure, covered with 6-mil sheeting, with taped seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.
 - .9 Lead Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter ($0.05\text{mg}/\text{m}^3$) of air as an 8-hour time weighted average. If an employee is exposed for more than eight hours in a workday, the PEL shall be determined by the following formula: $\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day}$
 - .10 DOP Test: A testing method employing dioctyl phthalate aerosol or polyalpha olefin for leak-testing HEPA filtered vacuums.
 - .11 Maximum Use Concentration: Assigned Protection Factor for the respirator in use, multiplied by the OEL.
- .4 Regulations
- .1 Comply with Federal, Provincial (Manitoba Workplace Safety and Health Regulation 217/2006), and local requirements pertaining to lead, provided that in any case of conflict among these requirements or with these specifications the more stringent requirement shall apply.
 - .2 Comply with the requirements of Part 36 of M. Reg 217/2006 (Chemical and Biological Substances) as part of the abatement work.
 - .3 Handle and dispose of contaminated waste as required under M. Reg 217/2006.
 - .4 Contractor shall ensure that:
 - .1 Measures and procedures prescribed under the M. Reg 217/2006 are carried out.
 - .2 Every employee and every worker on the project complies with the applicable Manitoba Workplace Health and Safety Act (W210), and M. Reg 217/2006.
 - .3 The health and safety of workers and the public is to be protected.
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- .4 All material handling, and associated equipment must conform with and be operated in accordance with "Workplace Hazardous Materials Information System" (WHMIS) or the "Global Harmonized System" (GHS).
 - .5 Advise Owner whenever work is expected to be hazardous to employees and/or the public.
 - .6 Contractor may be requested to provide information on their health and safety record.
- .5 Quality Assurance
- .1 Ensure work proceeds on schedule and meets all the requirements of this Section. Perform work so that airborne lead dust, lead-contaminated waste, or water runoff do not contaminate areas outside the work areas.
 - .2 Pay the cost to the Owner for the inspection and air monitoring performed as result of failure to perform work satisfactorily regarding quality, safety, or the schedule.
 - .3 Use only skilled and qualified workers for all the trades required for this work.
- .6 Submittals
- .1 Before commencing work:
 - .1 Submit proof of documentation that all employees have completed a training course pertaining to working with lead, in accordance with M. Reg 217/2006.
 - .2 Submit proposed schedule showing the phasing and proposed workforce for the required segregated work areas.
 - .3 Laws of the province of Manitoba shall govern this work. Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, and duties as may be required. Likewise, it is the responsibility of the contractor to comply with the Workers' Compensation and Workplace Safety and Safety Acts.
 - .4 Submit, in writing, confirmation of good standing with the Workers' Compensation Board.
 - .5 Submit Health and Safety program and documentation of Employee respirator fit testing.
 - .2 Upon completion of work:
 - .1 Submit verification that the removed lead materials have been disposed of in an approved landfill, or hazardous waste facility.
- .7 Worker and Visitor Protection
- .1 Instructions: Before entering a lead removal work area, instruct workers and visitors in the use of respirators, dress, entry and exit from work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by a competent person as defined by the Workplace Safety and Health Act.
 - .2 Respirators:
 - .1 **At minimum, half-face respirators equipped with P100 filters shall be used for all low-risk work.** Provide respiratory equipment for all persons within work area including authorized visitors.
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- .2 Respirators shall be acceptable to the Environmental Consultant. Provide proper instruction to workers and visitors in use of respirators, including qualitative fit testing. No supervisor, worker or authorized visitor shall have facial hair that affects the seal between respirator and face. Maintain respiratory protection equipment in proper function and clean condition or remove from site.
- .3 Protective Clothing: Provide workers and visitors in lead removal work areas, one suit with full body coveralls with integral hoods. Once coveralls are worn in work area, treat and dispose of as lead contaminated waste. Workers and visitors shall also wear other protective apparel required by the Workplace Safety and Health Act.
- .4 Before entering work area(s) in a clean area, put on respirator with new or tested filters, one pair of clean coveralls with head covers and boot covers before entering the work area. Store street clothes, uncontaminated footwear, towels etc. in clean area.
- .5 Persons leaving lead removal work area(s) shall remove gross contamination from clothing and remove outer layer of clothing before leaving the work area; place the contaminated work suits in the receptacles for disposal with other lead contaminated materials; leave footwear, clothing, hardhats, protective eye wear, etc., in the equipment and access area to dry for later use; still wearing a respirator proceed to the clean area. Clean the respirator and any exposed skin to ensure that visible contamination is removed. Remove the filters and dispose of in the container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary.
- .6 Store the respirators in a fashion to allow them to be put on prior to entering work area at the start of the next shift without contaminating the clean area. If re-entry to the work area is to take place after having left for eating, drinking, or smoking, follow procedures in paragraph 1.8.4.
- .7 Do not eat, drink, smoke or chew gum or tobacco at the work site or in the work areas.
- .8 Be fully protected as specified herein when the possibility of lead contamination exists.

2 PRODUCTS

- .1 Materials
 - .1 Polyethylene: 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.
 - .2 Tape: Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions. Nashua 398 Duct Tape or approved equivalent.
 - .3 Waste Receptors: May be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or fibre drum or wood box. Container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. Containers must be acceptable to disposal site selected.
 - .4 HEPA Vacuum: Vacuum with all necessary fittings, tools and attachments. Air must pass through HEPA filter before discharge.
 - .5 Protective Coveralls: Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or non-woven material Kleenguard by Kimberley Clark, or equivalent.
 - .6 Flexible ducting: Metal reinforced flexible ductwork, 12" diameter minimum.
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- .7 Negative Air Unit: Portable air handling system which extracts air directly from lead work area and discharges air outside of the building. Unit shall be fitted with pre-filter and HEPA final filter. Air shall pass through a HEPA filter before discharge. Unit shall have pressure differential gauge to monitor filter loading. Unit shall have auto shut-off and warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps to retain filter in place. Unit shall be equipped with a smoke detector auto shut-off.
- .8 Sealant: Latex or acrylic based paint or lagging compound capable of sealing edges of removal areas. Serpi Systems Barrier Coat II Lead Encapsulant Coating, or equivalent.

3 EXECUTION

.1 Preparation

- .1 Enclose Lead Work Area(s) – For the purposes of **NON-ABATEMENT** work that may impact lead-containing paints, this may include caution tape and appropriate signage rather than elaborate containments.
- .2 Pre-clean and move equipment, tools, furnishings, and stored materials which can be moved without disturbing lead-containing materials.
- .3 Seal off openings such as doorways, windows, vents, service holes in walls and grilles to non-operating ducts with double layers of polyethylene sheeting sealed with tape or with polyurethane foam as appropriate.
- .4 Cover all horizontal and vertical surfaces which may be exposed to dust or debris, and that cannot be properly decontaminated, with a single layer of 6 mil polyethylene sheeting.
- .5 Maintain emergency and fire exits from work area or establish alternative exits satisfactory to authorities having jurisdiction.
- .6 Provide a fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.
- .7 Post site-specific safe work procedures on the site.

.2 Worker Decontamination Area

- .1 Designate a worker decontamination area at the entrance to each work area. Worker decontamination area shall comprise of a designated area of sufficient size to allow storage for workers' street clothes and personal belongings, storage for clean protective clothing and respiratory equipment. Maintain a hand-wash device complete with water and soap for all workers. The worker decontamination area shall be adjacent to the work area, and isolated with tape barriers or other barriers posted with notices marking the area as an lead removal area.

.3 Maintenance of Work Areas

- .1 Maintain work areas in a tidy condition.
- .2 Visually inspect work areas at beginning and end of each working period.

.4 Do Not Commence Lead Removal or Disturbance Work Until:

- .1 Arrangements have been made for disposal of waste, if applicable.
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- .2 Work areas and decontamination work areas (and parts of building required to remain in use) are effectively segregated.
- .3 Tools, equipment and materials waste receptors are on hand.
- .4 Arrangements have been made for work area security.
- .5 Signs are displayed in conspicuous areas near the entry to the basement, or where access to sealed lead work area is possible. Signs shall read:

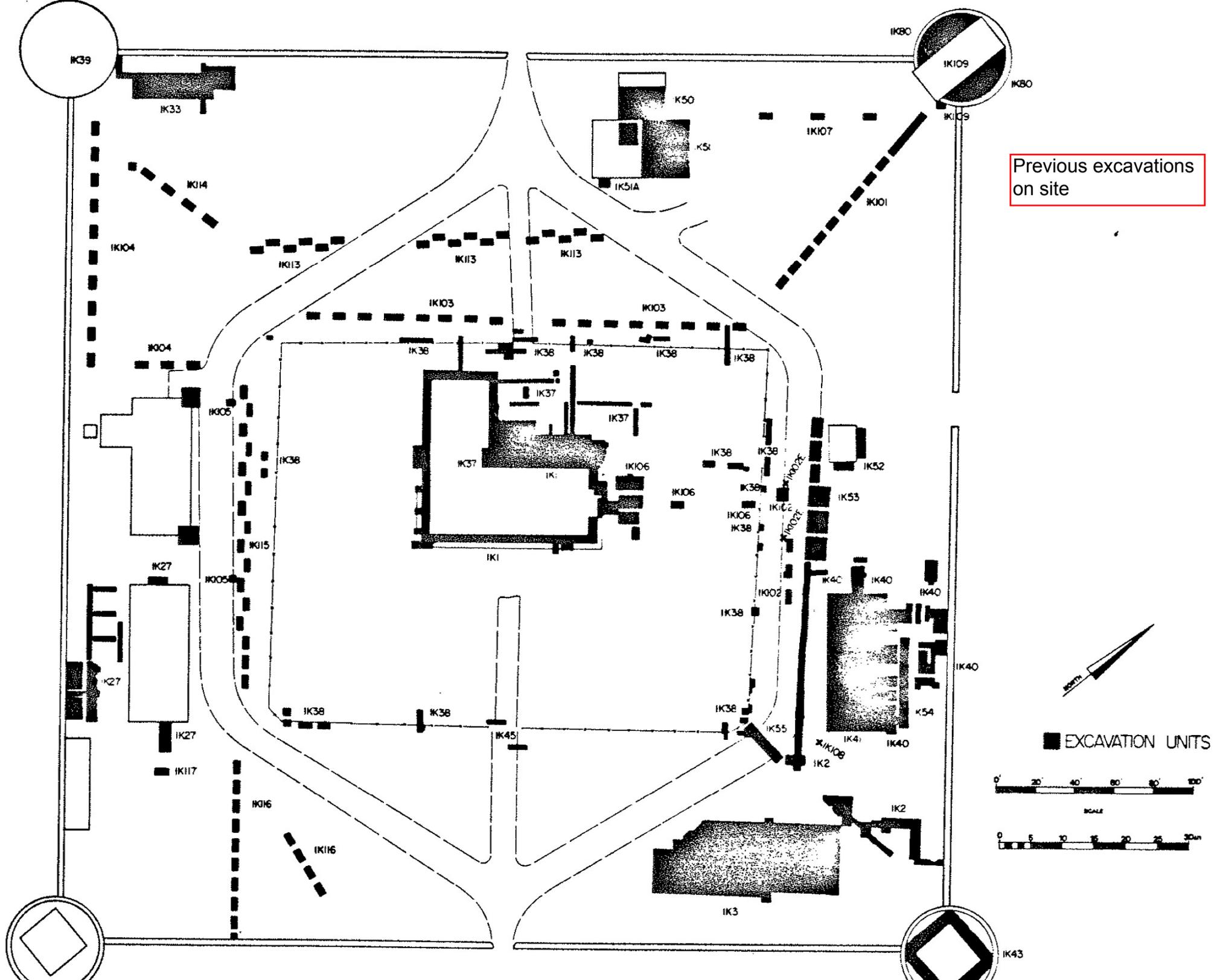
**CAUTION
LEAD WORK AREA - POISON
NO UNAUTHORIZED ENTRY
RESPIRATORS REQUIRED**

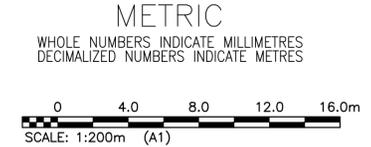
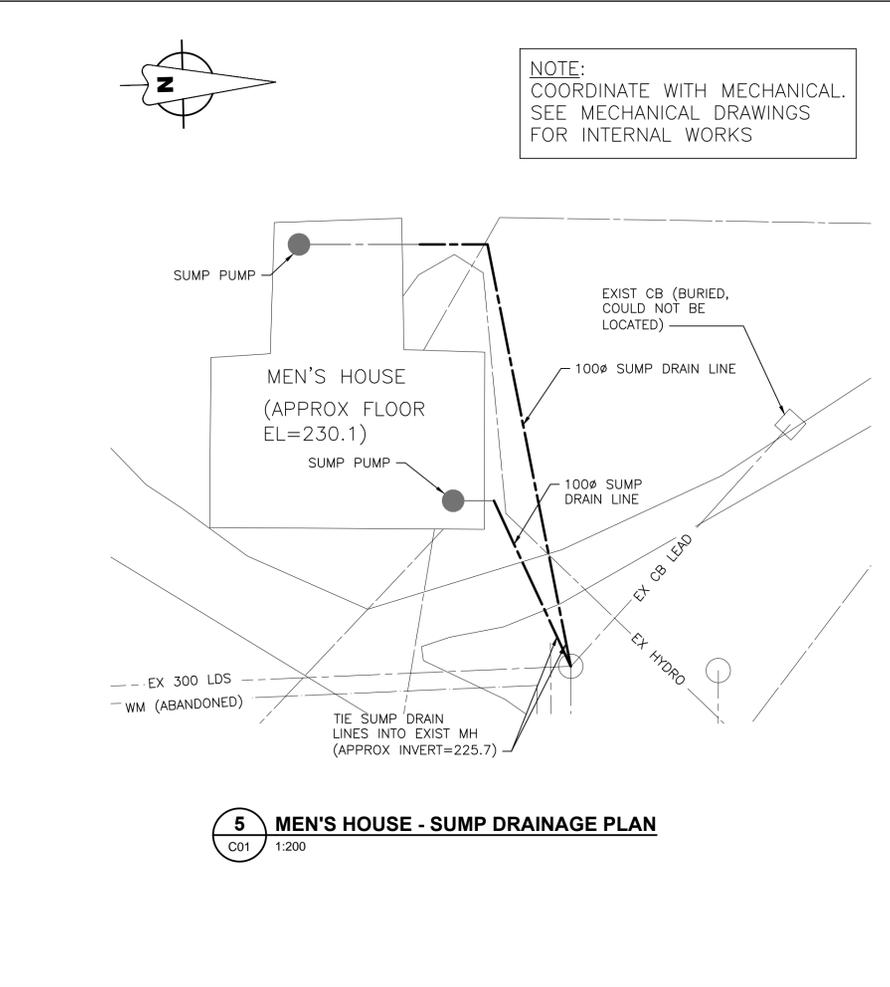
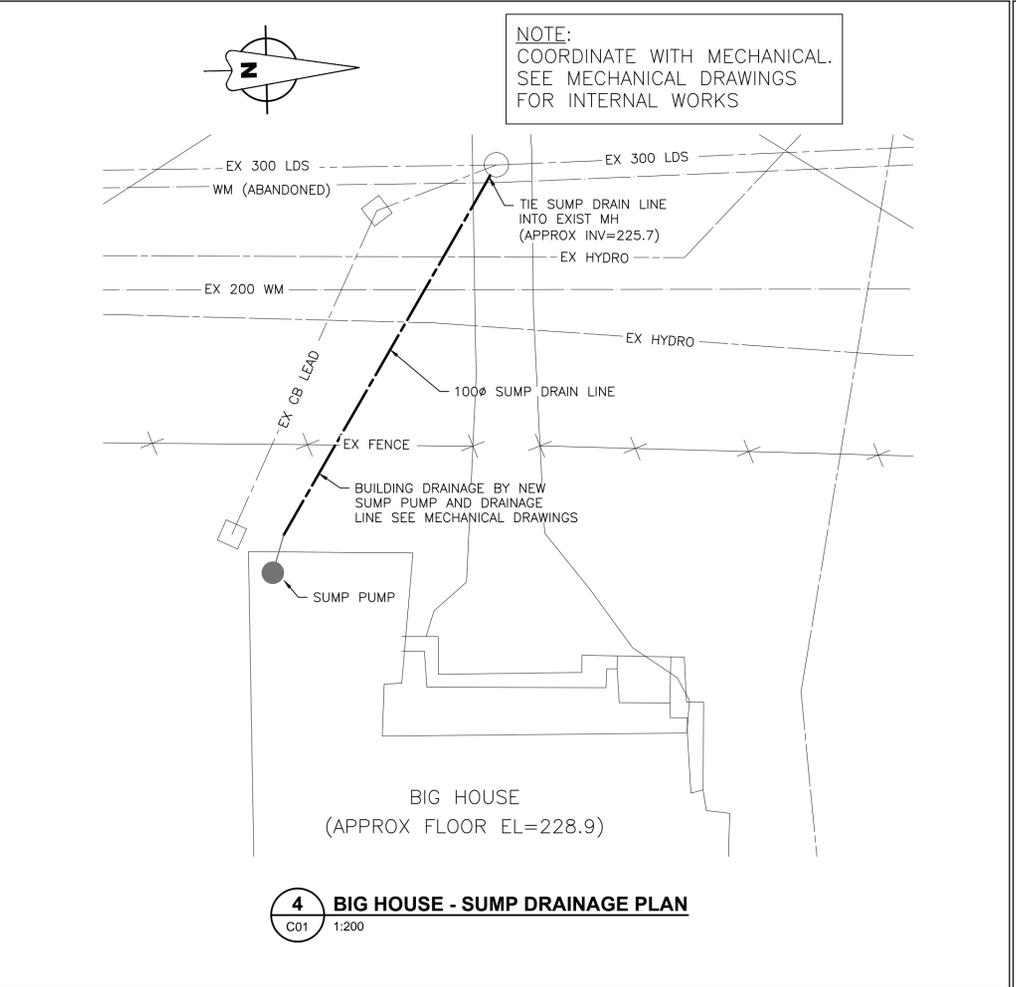
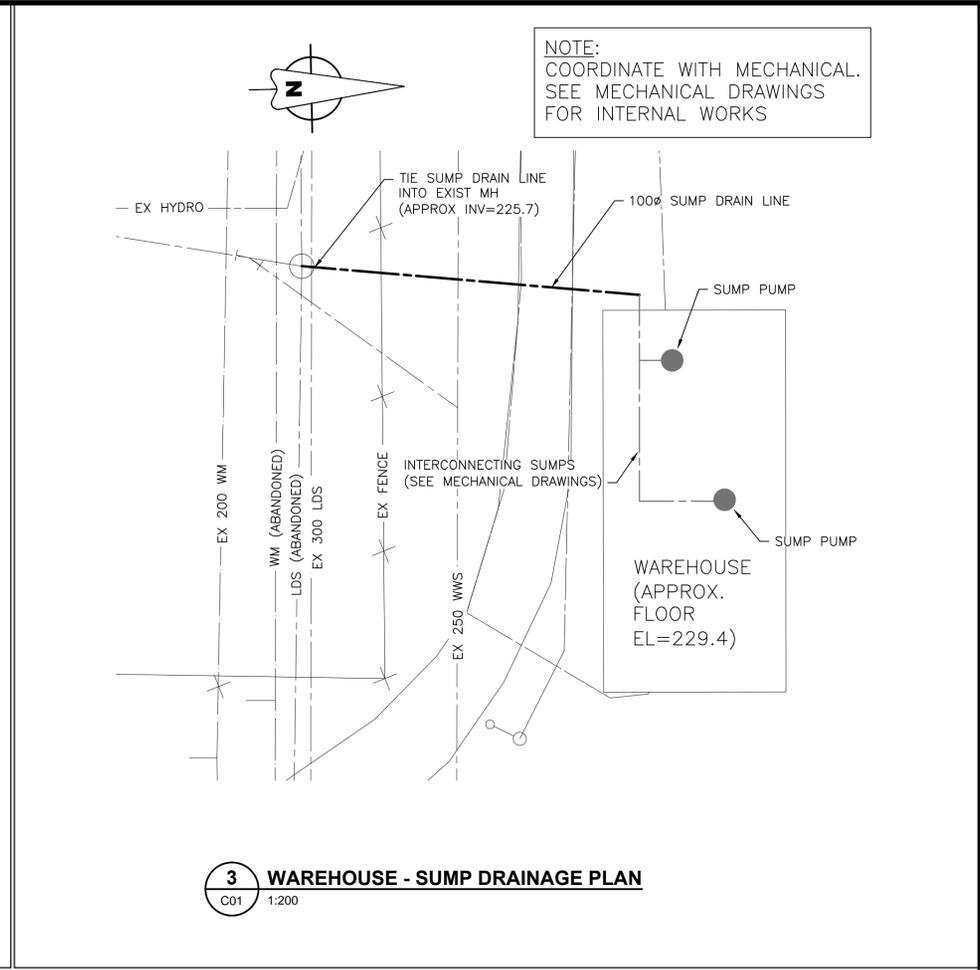
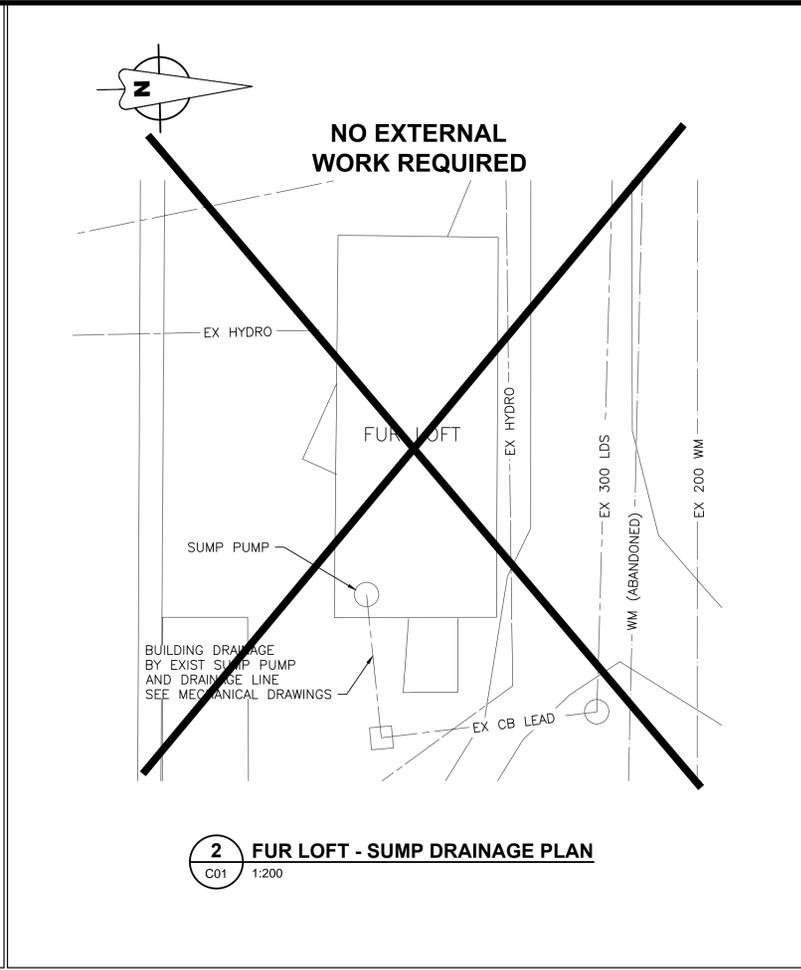
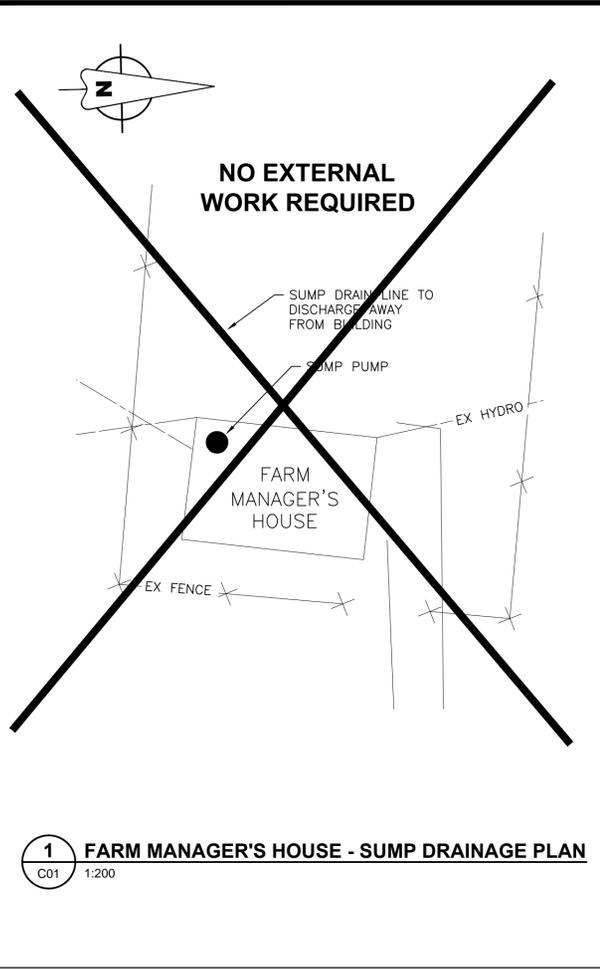
- .6 The Environmental Consultant has been notified of intention to proceed and has reviewed work areas, equipment and procedures.
- .5 Removal
- .1 Remove and dispose of the damaged or loose lead-containing materials as described in this specification, or as directed by the Environmental Consultant.
 - .2 Place lead-contaminated waste in waste receptors. If drums are used for waste disposal, drums shall be sealed and cleaned in waste decontamination areas. If double plastic bags are used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer plastic bag in work area immediately prior to transfer from Site.
 - .3 Treat all materials removed or exposed to lead, as lead-contaminated waste unless such materials are specified to be reused.
 - .4 Ensure that all horizontal surfaces within the work area are wet wiped and HEPA vacuumed of all loose visible debris.
- .6 Clean-Up
- .1 Clean surfaces from which lead-containing paint has been removed with a HEPA vacuum, or wet-wiping techniques to remove visible dust and debris.
 - .2 Remove sealed and labelled waste receptors and dispose of at an authorized disposal area in accordance with requirements of disposal authority.
 - .3 After vacuuming and wet-wiping to remove visible paint debris, wet clean entire work area including equipment and access area, polyethylene sheeting and equipment used in process. Floor and wall surfaces, ducts, and similar items not covered with polyethylene sheeting must be wet cleaned.
 - .4 Request visual inspection and acceptance. Following inspection and acceptance, apply one coat of appropriate sealant or lagging to all surfaces from which lead-containing paint has been removed, and still exists. Consideration for heat rating and mould resistance should be made. Appropriate colour choice may be made and painted over the appropriate sealer, as needed.
- .7 Clearance Dust Sampling or Air Monitoring
- .1 If air sampling by the Consultant is required, which shall only be conducted upon request if material removal has been executed using aggressive sanding or grinding techniques, shows that levels in
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lead work area do not exceed Occupation Exposure Level of 5 µg/m³ of air as determined by NIOSH 7082 Atomic Absorption Method, proceed with dismantling of enclosures.

- .2 If inspection and dust sampling of the work area and surrounding areas show that lead-containing dust does not remain on area surfaces in excess of 40 ug/m², as determined by ASTM method 1792.
- .8 Tear Down of Protection
- .1 Only when favorable inspection results are communicated by the Consultant or appropriate representative of the Owner, remove all polyethylene sheeting. Wear half face P100 HEPA filtered respirator and disposable coveralls during removal of sheeting. HEPA vacuum any visible debris.
 - .2 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in appropriate waste receptors for disposal. Remove any debris with a HEPA vacuum.
 - .3 Clean lead work area(s), equipment and access area, washing room, and other work areas that may have been contaminated during work.
 - .4 Clean lead waste receptors and equipment used in work and remove from work area(s) via drum and equipment decontamination area, at the appropriate time in sequence.
 - .5 A final visual inspection will be carried out by the Environmental Consultant to ensure that no dust or debris remains.
- .9 Inspection
- .1 From commencement of work until completion of clean-up operations, the Environmental Consultant will be present periodically or on a full-time basis, both inside and outside lead work area(s).
 - .2 If lead work area(s) or adjacent areas, are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to the Owner.
 - .3 Pay cost to provide re-inspection of work found not in accordance with these specifications and requirements of authorities having jurisdiction.
- .10 Waste Transport and Disposal
- .1 Conform to the requirements of the M. Reg 217/2006 for transport and disposal.
 - .2 Confirm with the City of Winnipeg Sanitary facilities to determine what types of waste containers are acceptable, and that accommodation is possible.
 - .3 Ensure shipment of containers to the landfill is taken by waste hauler licensed to transport lead waste. Submit documentation to this effect.
 - .4 Each load requires completion of bill of lading showing type and weight of waste being transported.
 - .5 Ensure that the landfill operator is fully aware of hazardous material being landfilled.

END OF SECTION





1	2018/06/05	ISSUED FOR ADDENDUM 1	DMW	
0	2018/04/27	ISSUED FOR CONSTRUCTION	DMW	
No.	Date	Description	Drawn by Dessiné par	Approved Approuvé

Revision / Révision

Linear dimensions
in millimetres

Dimensions linéaires
en millimètres

Eng. Stamp
Sceau de l'ingénieur

Consultant's Name
Nom de l'expert-conseil

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Strategic Asset Management, Western and Northern Region / Gestion Stratégique des Biens, Région de l'Ouest et du Nord

Architecture49 Project No. 189-00014-00
Sub Consultant Project No. 18-0051-001

Sub Consultant
KGS GROUP CONSULTING ENGINEERS

Project title/Titre du projet
LOWER FORT GARRY CONSERVATION OF BUILDINGS AND GROUNDS

Drawing title/Titre du dessin
CIVIL DETAILS

Surveyed by/Arpenté par SH	Drawn by/Dessiné par DMW	Date 2018/02/21
Designed by/Concept par SH	Reviewed by/Revisé par	Scale/Echelle AS NOTED
Client Acceptance/Acceptation du client		Approved by/Approuvé par

Project No./N° du projet 1603	Asset No./N° du bien	Sheet No./N° de la feuille C-002
Drawing Set No./N° de série du dessin 18-0051-001-C02		

Filename: U:\FMS\18-0051-001\18-0051-001_CALL - Tab:c-002 Plotted By: dweber 18/06/05 [Tue 12:40pm]