



August 4, 2017

CITY OF SASKATOON

Asbestos-Containing Building Materials Assessment Report - Avenue W Substation



REPORT

Submitted to:

The City of Saskatoon
1101 Avenue P North
Saskatoon, SK S7L 7K6

Report Number: 1667963

Distribution:

One Copy: City of Saskatoon
One Copy: Golder Associates Ltd.





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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the City of Saskatoon (the Client) to conduct an asbestos-containing building materials assessment of the Avenue W Substation (the Site) located at 114 Avenue W South in Saskatoon, Saskatchewan. This assessment report details our findings, conclusions and recommendations for the Site. A walkthrough of the Site was conducted on June 12, 2017 and the assessment was conducted on June 19, 2017 by Kody Henderson, OHS Project Manager. Asbestos-containing building materials were identified within the Avenue W Substation during the assessment. Further information is provided in Section 3.0.

2.0 SCOPE OF WORK

In accordance with Tender 16-0844, Golder's scope of work included conducting an asbestos-containing building materials assessment of the Site to evaluate the quantities, locations, and conditions of asbestos-containing building materials.

Following the field work, Golder prepared this assessment report that includes laboratory analysis results, findings of the assessment, conclusions, and recommendations.

2.1 Asbestos-Containing Materials

The assessment involved a non-destructive inspection of the Site to assess the type and extent of suspect ACMs in the facility. The systems that were reviewed as part of the inspections included, but were not limited to:

- *Structural* - systems including: insulation between solid webbed joists, fireproofing, building envelope, and interior/exterior caulking around windows and doors;
- *Mechanical* - systems insulation including: hot water and steam system, condensate system, chilled water system, glycol system, domestic hot and cold water, emergency generator exhaust, boiler units, heat exchangers, and asbestos cement piping; and
- *Architectural* - systems including: texture coats, sheet flooring, vinyl floor tile, acoustical spray-applied materials, condensation control applications, ceiling tile, wall board, drywall joint compound, and asbestos sheet products.

Systematic sampling of suspect ACMs was conducted as part of the assessment. Samples were submitted under chain of custody to International Asbestos Testing Laboratory Inc. (IATL) and analyzed for asbestos type and percentage content using Polarized Light Microscopy (PLM) in accordance with EPA methodologies (EPA 600/R-93/116).

Further information related to the assessment and sample collection methods can be found in the Golder document *Golder Asbestos Assessment General Survey Plan and Protocol* provided to the Client.



3.0 RESULTS AND DISCUSSION

The Avenue W Substation consists of one open area and was constructed in 1950. During the assessment, the entire building was treated as one functional space.

- The Laboratory Certificate of Analysis report for the bulk asbestos samples is included in Appendix A.
- Photographs collected during the assessment are provided in Appendix B.
- A room by room spreadsheet outlining the locations, quantities, friability, and condition of identified asbestos-containing materials as well as additional information is provided in Appendix C.
- Floor plans outlining the sample locations and locations of identified asbestos-containing materials is provided in Appendix D.
- Please refer to Sections 4.0 and 6.0 of this report for a summary of the limitations encountered.

3.1 Asbestos-Containing Materials

A total of three (3) samples of building materials were collected and tested for asbestos content during the assessment of the Avenue W Substation. Two (2) of the samples were found to contain asbestos.

Potential asbestos-containing components may be located within the electrical panels on Site.

3.1.1 List of Identified Asbestos-Containing Materials

A list of the identified asbestos-containing materials is provided below.

- Wall Mastic; and
- Texture Coat.

Further information on the identified asbestos-containing materials listed is provided below.

Wall and Ceiling Mastic

One (1) sample of wall and ceiling mastic was collected during the assessment. The sample collected was found to contain 10% Chrysotile asbestos. Asbestos-containing wall mastic (see Photograph 1 in Appendix B) was observed in the following locations:

- Room 100 (approximately 50 ft²).

Additional asbestos-containing mastic is suspected to be located sporadically below the fibreglass panels on the walls and ceilings and within the interior of the doors throughout Room 100.

Texture Coat

One (1) sample of texture coat was collected during the assessment. The sample collected was found to contain 20% Chrysotile asbestos. Asbestos-containing texture coat (see Photograph 2 in Appendix B) was observed in the following locations:

- Doors and Exterior Structural Steel (approximately 200 ft²).



3.1.2 Non Asbestos-Containing Materials

The following materials were sampled during this assessment and were found to not contain asbestos or were observed to be non-suspect materials:

- Brown building caulking; and
- Fibreglass wall and ceiling panels.

4.0 EXCLUDED AREAS AND MATERIALS

The following is a list of the areas and/or materials excluded during the assessment.

- Building materials accessible by a ten foot ladder were assessed by Golder during the assessment. Materials located at heights that were inaccessible from a ten foot ladder were not assessed. If materials at heights are to be removed or impacted by future renovation or demolition activities, additional investigation and sampling of suspect materials may be required.
- The roof and associated components were not assessed by Golder during the assessment as per Tender 16-0844. If the roof and associated components are to be removed or impacted by future renovation or demolition activities, additional investigation and sampling of suspect materials may be required.
- The electrical panels and associated components were not inspected by Golder during the assessment. If the panels are to be removed or impacted by future renovation or demolition activities, additional investigation and sampling of suspect materials may be required.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the visual assessment and the laboratory analytical results, the following project specific conclusions and recommendations are provided.

5.1 Asbestos-Containing Materials

Asbestos was positively identified within the wall and ceiling mastic and texture coat on Site. Asbestos was not identified in the remaining samples collected and analyzed.

If the building is scheduled for renovations that will impact the identified asbestos-containing materials, it must be removed. If additional suspect asbestos-containing building materials are encountered during renovation activities, additional sampling should be undertaken to evaluate asbestos content.

Removal work should be completed by workers that are adequately trained in the hazards and proper methods of working with asbestos. Throughout the abatement activities, appropriate air monitoring and inspections should be conducted by a competent person to document that contamination is contained and that ACM are disposed of appropriately. Ensure asbestos waste is disposed of in accordance with the requirements of the Government of Saskatchewan.

All quantities listed in the report are approximate and are based on the conditions at the time of the assessment. Prior to abatement work it is recommended that a competent person conduct a review of the site to quantify and obtain all measurements of all building materials detailed in this report for cost estimating purposes.

In anticipation of potential abatement, Golder's recommendations for the asbestos-containing materials identified during the assessment are outlined below.



Wall and Ceiling Mastic

If scheduled for impact, asbestos-containing wall and ceiling mastic should be abated following low-risk abatement work procedures as outlined in the *Saskatchewan Asbestos Abatement Manual* (2017). Alternatively, as the wall and ceiling mastic was observed in good condition, and with a priority rating of 5 (please see the room by room spreadsheet provided in Appendix C for a description of the priority ratings), it can be managed in place if not scheduled for impact.

Texture Coat

If scheduled for impact, asbestos-containing texture coat should be abated following high-risk abatement work procedures as outlined in the *Saskatchewan Asbestos Abatement Manual* (2017). The texture coat was observed in good condition, however it is located along the exterior structural steel and within a half-dismantled door. Based upon the exposure to the exterior elements, as well as the intent of having the texture concealed behind the door, a priority rating of 4 (please see the room by room spreadsheet provided in Appendix C for a description of the priority ratings) was assigned to the texture. The texture should be managed in place until it can be scheduled for removal in a reasonable timeframe.

6.0 SURVEY LIMITATIONS

This report is based on data and information collected by Golder during the assessment conducted on June 19, 2017 and is based solely on site conditions encountered at the time of the assessment. Any use of this document or the findings, conclusions or recommendations provided in this report by any person other than the City of Saskatoon is at the sole risk of such user.

The conclusions and recommendations contained in this survey 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 these locations and are subject to the following inherent limitations:

The data and findings presented in this report are valid as of the dates of the investigations. 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. No assurance is made regarding changes in conditions or practices subsequent to the time of the investigation. It was beyond the scope of this assessment to conduct a risk assessment and the potential health risks that may be associated with asbestos exposure for building occupants.

The data reported and the findings, observations and conclusions expressed in this report are limited by the Scope of Work. The Scope of Work was defined by Tender 16-0844 and the initial site walkthrough with the Client, the time and budgetary constraints imposed by the Client, and availability of access to the property.

Because of the limitations stated above, the findings, observations and conclusions expressed by Golder in this report are not, and must 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.

No warranty or guarantee, whether expressed or implied, is made with respect to the data or the reported findings, observations, and conclusions, which are based solely upon site conditions in existence at the time of investigation.



ASBESTOS-CONTAINING BUILDING MATERIALS ASSESSMENT REPORT - AVENUE W SUBSTATION

Golder's assessment reports present professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental laws and regulations, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental laws, rules, regulations or policies of federal, provincial, or local governmental agencies. Any use of the survey report constitutes acceptance of the limits of Golder's liability.

Golder's liability extends only to its client and not to other parties who may obtain this survey report. Issues raised by the report must be reviewed by appropriate legal counsel.

7.0 CLOSURE

We trust the information presented in this report meets your requirements. If you have any questions please contact Kody Henderson at (780) 483-3499 or email at kody_henderson@golder.com. Thank you for the opportunity to be of service. We look forward to working with you again in the future.



Report Signature Page

GOLDER ASSOCIATES LTD.

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Reviewed by:

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OHS Project Manager

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KH/AG/ba

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APPENDIX A

Laboratory Certificate of Analysis Report

CERTIFICATE OF ANALYSIS

Client: Golder Associates Ltd
16820 107 Ave
Edmonton AB T5P 4C3

Report Date: 7/4/2017
Report No.: 539906 - PLM
Project: City of Saskatoon - Avenue W Substation
Project No.: 1667963

Client: GOL572

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6271190
Client No.: A-001
Percent Asbestos:
None Detected

Analyst Observation: Clear Caulk
Client Description: Brown Building Caulking
Percent Non-Asbestos Fibrous Material:
None Detected

Location: Room 100
Facility:
Percent Non-Fibrous Material:
100

Lab No.: 6271191
Client No.: A-002
Percent Asbestos:
None Detected

Analyst Observation: Yellow Mastic
Client Description: Wall Mastic
Percent Non-Asbestos Fibrous Material:
None Detected

Location: Room 100
Facility:
Percent Non-Fibrous Material:
100

Lab No.: 6271191(L2)
Client No.: A-002
Percent Asbestos:
10 Chrysotile

Analyst Observation: Black Mastic
Client Description: Wall Mastic
Percent Non-Asbestos Fibrous Material:
None Detected


Location: Room 100
Facility:
Percent Non-Fibrous Material:
90

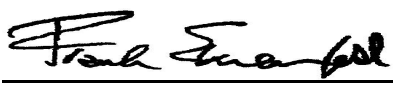
Lab No.: 6271192
Client No.: A-003
Percent Asbestos:
20 Chrysotile

Analyst Observation: Black/Grey Texture
Client Description: Structural Steel Texture
Percent Non-Asbestos Fibrous Material:
None Detected

Location: Exterior
Facility:
Percent Non-Fibrous Material:
80

Analytical Method -US EPA 600, R93-116. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 6/26/2017
Date Analyzed: 07/04/2017
Signature: 
Analyst: Tiffany Lowe

Approved By: 
Frank E. Ehrenfeld, III
Laboratory Director

CERTIFICATE OF ANALYSIS

Client: Golder Associates Ltd
16820 107 Ave
Edmonton AB T5P 4C3

Report Date: 7/4/2017
Report No.: 539906 - PLM
Project: City of Saskatoon - Avenue W Substation
Project No.: 1667963

Client: GOL572

Appendix to Analytical Report

Customer Contact:

Analysis: US EPA 600, R93-116

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com

iATL Office Manager: cdavis@iatl.com

iATL Account Representative: Pete Lesniak

Sample Login Notes: See Batch Sheet Attached

Sample Matrix: Bulk Building Materials

Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and in our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

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

Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

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

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

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB)

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)>

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

CERTIFICATE OF ANALYSIS

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16820 107 Ave
Edmonton AB T5P 4C3

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Project No.: 1667963

Client: GOL572

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique – by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at customerservice@iatl.com.

- 1) Note: No mastic provided for analysis.
- 2) Note: Insufficient mastic provided for analysis.
- 3) Note: Insufficient material provided for analysis.
- 4) Note: Insufficient sample provided for QC reanalysis.
- 5) Note: Different material than indicated on Sample Log / Description.
- 6) Note: Sample not submitted.
- 7) Note: Attached to asbestos containing material.
- 8) Note: Received wet.
- 9) Note: Possible surface contamination.
- 10) Note: Not building material. 1% threshold may not apply.
- 11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
- 12) Note: Asbestos detected but not quantifiable.
- 13) Note: Multiple identical samples submitted, only one analyzed.
- 14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
- 15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.

Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gänge, homogeneous exfoliated books of mica, or mixed mineral composites). Please contact your client representative for pricing and turnaround time options available.

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

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

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional.

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

- 1) **Analytical Step/Method:** Initial Screening by PLM, EPA 600R-93/116
Requirements/Comments: Minimum of 0.1 g of sample. ~0.25% LOQ for most samples.
- 2) **Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.
- 3) **Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.
- 4) **Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.
- 5) **Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only.

LOQ, Limit of Quantitation estimates for mass and volume analyses.

*With advance notice and confirmation by the laboratory.

**Approximately 1 Liter of sample in double-bagged container (~9x6 inch bag of sample).



APPENDIX B

Site Photographs



APPENDIX B
Site Photographs



Photograph 1: Asbestos-Containing Wall and Ceiling Mastic.



Photograph 2: Asbestos-Containing Texture Coat.

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APPENDIX C

Room by Room Spreadsheet

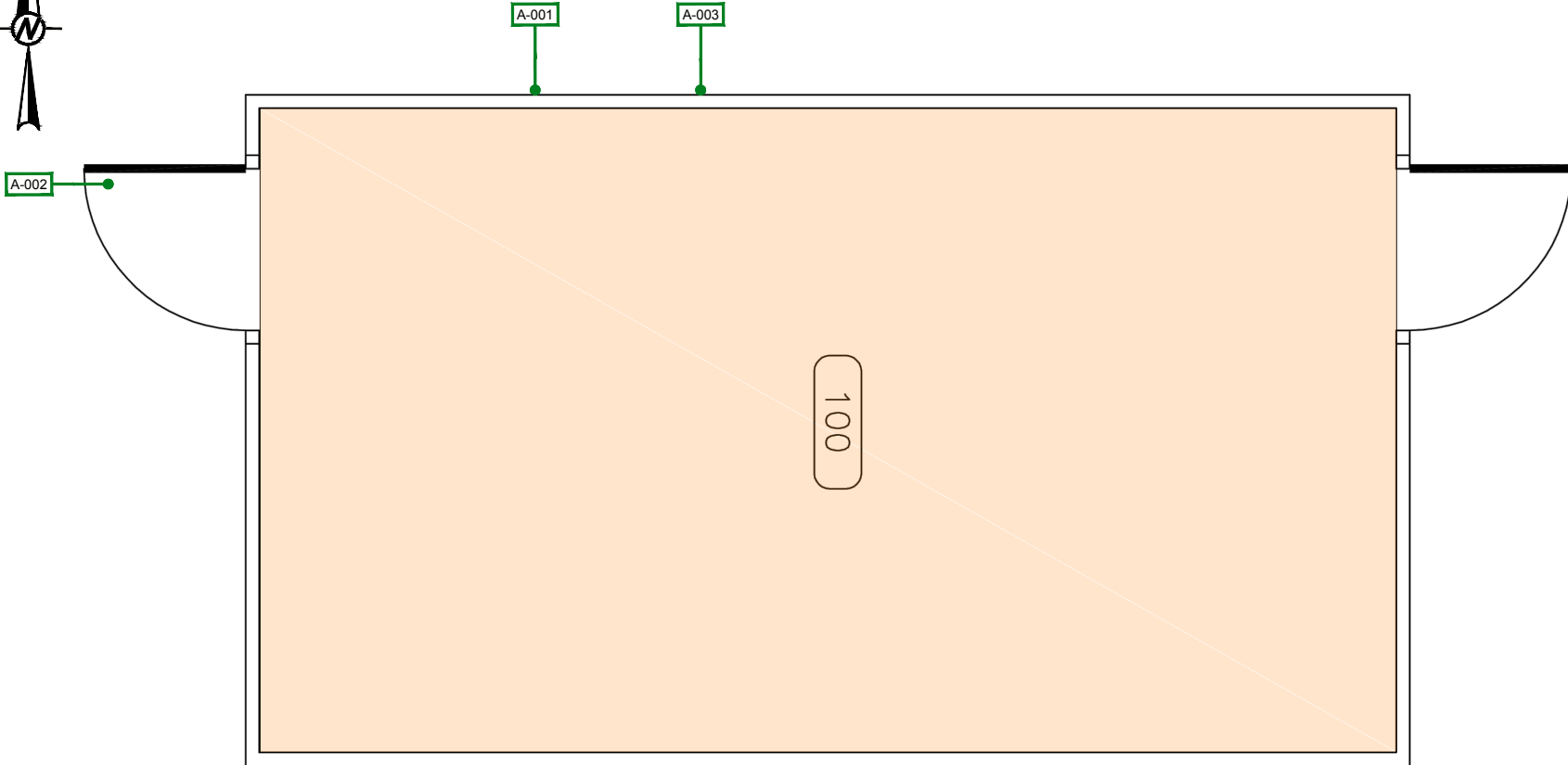
Appendix C
Avenue W Substation
ACM Inventory

| Included/Excluded | Floor | Room # | Area Description | Elements | Subelements | Material Description | Accessibility | Suspect? | Sampled? | Asbestos Containing Material? | Condition | Field Notes | Sample Type | Sample ID | Sample Date | Asbestos Type | ACM Product | % of asbestos | Friable | Sprayed-on | Maintenance | Inspection | Priority | Potential for Disturbance | Recommended Action | Quantity | Photograph ID | Labelling Type | |
|-------------------|-------|----------|------------------|-------------------|----------------------------------|----------------------------------|---------------|----------|----------|-------------------------------|-----------|--|-------------|-----------|-------------|---------------|--------------|---------------|---------|------------|-------------|------------|----------|---------------------------|------------------------------------|---------------------|---------------|----------------|--|
| Included | M | 100 | General Room | Walls | Walls | Fibreglass Panels | High | No | No | No | Good | | | | | | | | | | | | | | | | | | |
| Included | M | 100 | General Room | Floor | Floor | Concrete | High | No | No | No | Good | | | | | | | | | | | | | | | | | | |
| Included | M | 100 | General Room | Ceiling | Ceiling | Fibreglass Panels | High | No | No | No | Good | | | | | | | | | | | | | | | | | | |
| Included | M | 100 | General Room | Walls and Ceiling | Mastic | Mastic | High | Yes | Yes | Yes | Good | Mastic suspected to be located below the fibreglass wall and ceiling panels on Site. | | VS A-002 | | Chrysotile | Mastic | 10% | No | No | N/A | Annually | 5 | Moderate | Manage in Place | Included below. | Photograph 1 | Door Jamb | |
| Included | M | 100 | General Room | Doors | Mastic | Mastic | High | Yes | Yes | Yes | Good | Mastic and Texture Coat located within the interior of the doors on Site. | Bulk | A-002 | 19-Jun-17 | Chrysotile | Mastic | 10% | No | No | N/A | Annually | 5 | Moderate | Manage in Place | 100 ft ² | Photograph 1 | Door Jamb | |
| Included | M | 100 | General Room | Doors | Texture | Texture Coat | High | Yes | Yes | Yes | Good | Mastic and Texture Coat located within the interior of the doors on Site. | | VS A-003 | | Chrysotile | Texture Coat | 20% | Yes | Yes | N/A | Monthly | 4 | Moderate | Manage in Place. Schedule Removal. | 200 ft ² | Photograph 2 | Door Jamb | |
| Included | M | Interior | Storage Area | Electrical | Electrical Panels and Components | Electrical Panels and Components | High | Yes | No | Potential | Good | Not sampled due to safety concerns. | | | | | | | | | | | | | | | | | |
| Included | E | Exterior | Exterior | Structural Steel | Texture | Texture Coat | High | Yes | Yes | Yes | Good | Texture Coat located along the exterior structural steel. | Bulk | A-003 | 19-Jun-17 | Chrysotile | Texture Coat | 20% | Yes | Yes | N/A | Monthly | 4 | High | Manage in Place. Schedule Removal. | Included above. | Photograph 2 | | |
| Included | E | Exterior | Exterior | Walls | Walls | Metal | High | No | No | No | Good | | | | | | | | | | | | | | | | | | |
| Included | E | Exterior | Exterior | Walls | Caulking | Brown Building Caulking | High | No | Yes | No | Good | | Bulk | A-001 | 19-Jun-17 | | | | | | | | | | | | | | |
| Excluded | E | Exterior | Roof | Exterior Roof | Exterior Roof | | | | | | | Not assessed due to scope of work. | | | | | | | | | | | | | | | | | |



APPENDIX D

Floor Plans



LEGEND

| | |
|--|---|
| | ASBESTOS SAMPLE LOCATION |
| | ASBESTOS - CONTAINING MASTIC AND TEXTURE COAT |

NOTE(S)

- ASBESTOS IS A CARCINOGEN. DO NOT BREATHE ASBESTOS DUST.
- ASBESTOS-CONTAINING TEXTURE COAT IS LOCATED ON THE EXTERIOR STRUCTURAL STEEL OF THE SITE.

REFERENCE(S)
 PLAN OBTAINED FROM INFRASTRUCTURE SERVICES DEPARTMENT CITY OF SASKATOON. DATED: 01/12/2016.

CLIENT
 CITY OF SASKATOON

CONSULTANT



| | |
|------------|------------|
| YYYY-MM-DD | 2017-08-04 |
| DESIGNED | KH |
| PREPARED | YW |
| REVIEWED | KH |
| APPROVED | AG |

PROJECT
 ASBESTOS ASSESSMENT
 AVENUE W SUBSTATION
 114 AVENUE W SOUTH

TITLE
MAIN FLOOR

| | | | |
|-------------|--------------|------|--------|
| PROJECT NO. | CONTROL | REV. | FIGURE |
| 1667963 | 1000-HM-0001 | 0 | 1 |

SCHEMATIC ONLY, NOT TO SCALE

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

26 mm

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

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