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ASBESTOS LABORATORY REPORT
by Transmission Electron Microscopy

Prepared For

GEM Environmental

Client Project: U of M - McGill Hall Rm's 001A, 001, 005, 19-024

CEI Lab Code: T190299

Test Method: ISO 10312

Date Reported: 01/25/19

TEL: 919-481-1413
www.EurofinsUS.com/CEI

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January 25, 2019

GEM Environmental
P.O. Box 9053
Missoula, MT 59807

CLIENT PROJECT: T190299

Dear Customer:

Enclosed are asbestos analysis results for TEM air samples received at our laboratory on January 25, 2019. The samples were analyzed for PCM equivalent (PCMe) asbestos structures using transmission electron microscopy (TEM) per ISO 10312 method.

Currently, there is no regulatory standard for the airborne asbestos structures using the specified ISO method. The analytical sensitivity for the ISO 10312 method varies with the sample volume and the TEM grid areas analyzed.

Thank you for your business and we look forward to continuing good relations. If you have any questions, please feel free to call our office at 919-481-1413.

Kind Regards,

Tianbao Bai, Ph.D., CIH
Laboratory Director

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ASBESTOS AIR ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

CLIENT:	GEM Environmental	CEI Lab Code:	T190299
	P.O. Box 9053	CEI Sample ID:	T91941
	Missoula, MT 59807	Client Sample ID:	PMC-01
		Date Received:	1/25/2019
		Date Analyzed:	1/25/2019
Project:	U of M - McGill Hall Rm's 001A, 001, 005, 19-024	Date Reported:	1/25/2019

ISO 10312 - International Standards for the Determination of Asbestos Fibers - Direct Transfer TEM

Modified for PCMe Analysis

Minimum Level of Analysis (chry):	CD	Air Volume (L):	1,260
Minimum Level of Analysis (amph):	ADX	Grid Openings Analyzed:	57
Filter Type:	MCE	Average Grid Opening Area:	0.018
Filter Size:	385 mm^2	Area Analyzed:	1.02
Pore Size:	0.8 um	Analytical Sensitivity (str/cc):	0.00030
Magnification:	10,000	Detection Limit (str/cc):	0.00090

	Structure Count				Poisson 95% Confidence Interval	
Structure Class	Primary Structure	Total Structure	Density str/ mm^2	Conc (str/cc)	LCL (str/cc)	UCL (str/cc)
PCMe Strs (chry)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Strs (amph)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb Strs	1		0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Str (All)	1		0.98	<0.00030	<0.00030	0.00090
PCMe F&B (chry)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (amph)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb F&B		1	0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe F&B (All)		1	0.98	<0.00030	<0.00030	0.00090

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ASBESTOS AIR ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

CLIENT:	GEM Environmental	CEI Lab Code:	T190299
	P.O. Box 9053	CEI Sample ID:	T91942
	Missoula, MT 59807	Client Sample ID:	PCM-02
		Date Received:	1/25/2019
		Date Analyzed:	1/25/2019
Project:	U of M - McGill Hall Rm's 001A, 001, 005, 19-024	Date Reported:	1/25/2019

ISO 10312 - International Standards for the Determination of Asbestos Fibers - Direct Transfer TEM

Modified for PCMe Analysis

Minimum Level of Analysis (chry):	CD	Air Volume (L):	1,260
Minimum Level of Analysis (amph):	ADX	Grid Openings Analyzed:	57
Filter Type:	MCE	Average Grid Opening Area:	0.018
Filter Size:	385 mm^2	Area Analyzed:	1.02
Pore Size:	0.8 um	Analytical Sensitivity (str/cc):	0.00030
Magnification:	10,000	Detection Limit (str/cc):	0.00090

	Structure Count				Poisson 95% Confidence Interval	
Structure Class	Primary Structure	Total Structure	Density str/ mm^2	Conc (str/cc)	LCL (str/cc)	UCL (str/cc)
PCMe Strs (chry)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Strs (amph)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Str (All)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (chry)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (amph)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe F&B (All)		0	<0.98	<0.00030	<0.00030	0.00090

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ASBESTOS AIR ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

CLIENT:	GEM Environmental	CEI Lab Code:	T190299
	P.O. Box 9053	CEI Sample ID:	T91943
	Missoula, MT 59807	Client Sample ID:	PCM-03
		Date Received:	1/25/2019
		Date Analyzed:	1/25/2019
Project:	U of M - McGill Hall Rm's 001A, 001, 005, 19-024	Date Reported:	1/25/2019

ISO 10312 - International Standards for the Determination of Asbestos Fibers - Direct Transfer TEM

Modified for PCMe Analysis

Minimum Level of Analysis (chry):	CD	Air Volume (L):	1,260
Minimum Level of Analysis (amph):	ADX	Grid Openings Analyzed:	57
Filter Type:	MCE	Average Grid Opening Area:	0.018
Filter Size:	385 mm^2	Area Analyzed:	1.02
Pore Size:	0.8 um	Analytical Sensitivity (str/cc):	0.00030
Magnification:	10,000	Detection Limit (str/cc):	0.00090

	Structure Count				Poisson 95% Confidence Interval	
Structure Class	Primary Structure	Total Structure	Density str/ mm^2	Conc (str/cc)	LCL (str/cc)	UCL (str/cc)
PCMe Strs (chry)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Strs (amph)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb Strs	1		0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Str (All)	1		0.98	<0.00030	<0.00030	0.00090
PCMe F&B (chry)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (amph)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb F&B		1	0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe F&B (All)		1	0.98	<0.00030	<0.00030	0.00090

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ASBESTOS AIR ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

CLIENT:		CEI Lab Code:	T190299
	GEM Environmental	CEI Sample ID:	T91944
	P.O. Box 9053	Client Sample ID:	PCM-04
	Missoula, MT 59807	Date Received:	1/25/2019
		Date Analyzed:	1/25/2019
Project:	U of M - McGill Hall Rm's 001A, 001, 005, 19-024	Date Reported:	1/25/2019

ISO 10312 - International Standards for the Determination of Asbestos Fibers - Direct Transfer TEM

Modified for PCMe Analysis

Minimum Level of Analysis (chry):	CD	Air Volume (L):	1,260
Minimum Level of Analysis (amph):	ADX	Grid Openings Analyzed:	57
Filter Type:	MCE	Average Grid Opening Area:	0.018
Filter Size:	385 mm^2	Area Analyzed:	1.02
Pore Size:	0.8 um	Analytical Sensitivity (str/cc):	0.00030
Magnification:	10,000	Detection Limit (str/cc):	0.00090

	Structure Count				Poisson 95% Confidence Interval	
Structure Class	Primary Structure	Total Structure	Density str/ mm^2	Conc (str/cc)	LCL (str/cc)	UCL (str/cc)
PCMe Strs (chry)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Strs (amph)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Str (All)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (chry)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (amph)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe F&B (All)		0	<0.98	<0.00030	<0.00030	0.00090

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ASBESTOS AIR ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

CLIENT:	GEM Environmental	CEI Lab Code:	T190299
	P.O. Box 9053	CEI Sample ID:	T91945
	Missoula, MT 59807	Client Sample ID:	PCM-05
		Date Received:	1/25/2019
		Date Analyzed:	1/25/2019
Project:	U of M - McGill Hall Rm's 001A, 001, 005, 19-024	Date Reported:	1/25/2019

ISO 10312 - International Standards for the Determination of Asbestos Fibers - Direct Transfer TEM

Modified for PCMe Analysis

Minimum Level of Analysis (chry):	CD	Air Volume (L):	1,260
Minimum Level of Analysis (amph):	ADX	Grid Openings Analyzed:	57
Filter Type:	MCE	Average Grid Opening Area:	0.018
Filter Size:	385 mm^2	Area Analyzed:	1.02
Pore Size:	0.8 um	Analytical Sensitivity (str/cc):	0.00030
Magnification:	10,000	Detection Limit (str/cc):	0.00090

	Structure Count				Poisson 95% Confidence Interval	
Structure Class	Primary Structure	Total Structure	Density str/ mm^2	Conc (str/cc)	LCL (str/cc)	UCL (str/cc)
PCMe Strs (chry)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Strs (amph)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb Strs	0		<0.98	<0.00030	<0.00030	0.00090
Total PCMe Str (All)	0		<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (chry)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe F&B (amph)		0	<0.98	<0.00030	<0.00030	0.00090
PCMe Non-Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe Asb F&B		0	<0.98	<0.00030	<0.00030	0.00090
Total PCMe F&B (All)		0	<0.98	<0.00030	<0.00030	0.00090

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LEGEND:

chry = chrystotile
mm^2 = square millimeter
um = micrometer or micron
str/cc = structures per cubic centimeter
LCL = lower confidence limit
amph = amphiboles
strs = structures
F&B = fibers and bundles
PCMe = PCM equivalent
UCL = upper confidence limit

METHOD:

ISO 10312
Ambient Air – Determination of Asbestos Fibers – Direct Transfer Transmission Electron Microscopy Method, 1995

Analytical Sensitivity: Varies with the air volume and TEM grid area analyzed

REGULATORY LIMIT: None

EXPLANATION:

PCMe structures = A fiberous structure of aspect ratio ≥ 3:1, longer than 5 um .

PCMe Fibers or Bundle = A fiber or bundle of aspect ratio ≥ 3:1, longer than 5 um

PCMe Non-Asb Strs = A non-asbestos structure of aspect ratio ≥ 3:1, longer than 5 um

PCMe Non-Asb F&B = A non-asbestos fiber or bundle of aspect ratio ≥ 3:1, longer than 5 um

DISCLAIMER:

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by CEI Labs, Inc. CEI Labs makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client.

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CEI (5)

CHAIN OF CUSTODY

LAB USE ONLY:
ECEI Lab Code:
ECEI Lab I.D. Range:

730 SE Maynard Road, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

COMPANY INFORMATION	PROJECT INFORMATION
ECEI CLIENT #:	Job Contact: Christopher Casas
Company: GEM Environmental, Inc.	Email / Tel: chris.casas@gem-environmental.com
Address: P.O. Box 9053	Project Name: U of M - McGill hall Ph's 001A, 001
Missoula, MT 59807	Project ID#: 19-024 005
Email: chris.casas@gem-environmental.com + r.brownell@northern lh.com	PO #:
Tel: 406-370-4139 Fax:	STATE SAMPLES COLLECTED IN: MT

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

ASBESTOS	METHOD	TURN AROUND TIME 4 HR	8 HR	1 DAY	2 DAY	3 DAY	5 DAY
PLM BULK	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (400)	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (1000)	EPA 600	☐	☐	☐	☐	☐	☐
PLM GRAV w POINT COUNT	EPA 600		☐	☐	☐	☐	☐
PLM BULK	CARB 435		☐	☐	☐	☐	☐
PCM AIR*	NIOSH 7400	☐	☐	☐	☐	☐	☐
TEM AIR	EPA AHERA	☐	☐	☐	☐	☐	☐
TEM AIR	NIOSH 7402	☐	☐	☐	☐	☐	☐
TEM AIR (PCME)	ISO 10312	☐	☒	☐	☐	☐	☐
TEM AIR	ASTM 6281-15	☐	☐	☐	☐	☐	☐
TEM BULK	CHATFIELD		☐	☐	☐	☐	☐
TEM DUST WIPE	ASTM D6480-05 (2010)	☐	☐	☐	☐	☐	☐
TEM DUST MICROVAC	ASTM D5755-09 (2014)	☐	☐	☐	☐	☐	☐
TEM SOIL	ASTM D7521-16			☐	☐	☐	☐
TEM VERMICULITE	CINCINNATI METHOD			☐	☐	☐	☐
TEM QUALITATIVE	IN-HOUSE METHOD		☐	☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐

Blanks should be taken from the same sample lot as field samples.

REMARKS / SPECIAL INSTRUCTIONS: ~~w/ Positive Stop~~

☑ Accept Samples
☐ Reject Samples

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	01/24/19	DC	1-25 9:40

By submitting samples, you are agreeing to ECEI's Terms and Conditions.
Samples will be disposed of 30 days after analysis

Version: CCOC.07.18.1/2.LD

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SAMPLING FORM

COMPANY CONTACT INFORMATION	
Company: GEM Environmental, Inc.	Job Contact: Christopher Casas
Project Name: U of M- McGill Hall Rm's 001A, 001, 005	
Project ID #:	Tel: 406-370-4139

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/ AREA	TEST	
PCM-01	Rm 001A - South End of HVAC Trunk	1260	PLM ☐	TEM ☐
PCM-02	Rm-001A - Middle of HVAC Trunk	1260	PLM ☐	TEM ☐
PCM-03	Rm-001A - North End of HVAC Trunk	1260	PLM ☐	TEM ☐
PCM-04	Rm 005 - Middle of Restroom	1260	PLM ☐	TEM ☐
PCM-05	Rm 001 - Kitchen	1260	PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
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			PLM ☐	TEM ☐
			PLM ☐	TEM ☐

TR0299

Allie Peregoy

From: Chris Casas <chris.casas@gem-environmental.com>
Sent: Thursday, January 24, 2019 4:51 PM
To: Allie Peregoy
Cc: Bob Brownell
Subject: RE: Edit a Report

EXTERNAL EMAIL*

Allie,

NIOSH 7400 A rules state " there is no upper limit on the fiber diameter in the counting rules"

ISO 10312 method defines a PCME fiber as "any particle with parallel or stepped sides, greater, longer than 5 um and which has a diameter between .2 and 3.0 um"

Therefore the Method for PCME counting under ISO 10312 method will not provide a count of PCM fibers equivalent under NIOSH 7400 method.

May the CEI analysis for the 10312 be modified to include fibers of all diameters so any PCME fibers are equivalent to PCM fibers under NIOSH 7400 ?

let me know your thoughts, and or recomendations.

Thanks,

-Chris

Christopher E. Casas | Principle Industrial Hygienist & Geologist |

GEM Environmental, Inc. | 201 N. Russel St. Suite 6 | Missoula, MT 59801

Cell: 406-370-4139

---- On Thu, 24 Jan 2019 08:52:15 -0700 **<AlliePeregoy@eurofinsUS.com>** wrote ----

Hey Chris,

Here is a template of what it would look like. Let me know if you need anything else.

Best,

Allie Peregoy