



EMSL Analytical, Inc.

200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
<http://www.EMSL.com> cinnasblab@EMSL.com

EMSL Order: 041416476
CustomerID: MAXI57
CustomerPO:
ProjectID:

Attn: **Edward Surbrugg**
Tetra Tech
303 Irene Street
Helena, MT 59601

Phone: (406) 443-5210
Fax: (406) 449-3729
Received: 06/12/14 9:16 AM
Analysis Date: 6/30/2014
Collected: 6/5/2014

Project: 10353259


Test Report: Asbestos Analysis via Transmission Electron Microscopy ASTM Method D5755

SAMPLE ID	AREA SAMPLED (cm ²)	ASBESTOS TYPE	ASBESTOS STRUCTURES	Sensitivity (str/cm ²)	CONCENTRATION (str/cm ²)	COMMENTS
BC-ABS-00020 041416476-0005	500	Actinolite Non-Regulated Amphibole	3	971	2910	
BC-ABS-00022 041416476-0007	500	Actinolite Non-Regulated Amphibole	<3	486	<1460	

Concentration included Non-Regulated amphibole.

Analyst(s)

Frank Craig (2)



Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The above report relates only to the items tested. This report may not be reproduced, except in full, without written approval by EMSL Analytical, Inc. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ

Initial report from 06/30/2014 14:29:11



EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/05/2014 08:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312
International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM -
Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00016
EMSL Sample Number: 041416476-0001
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: N/A
Aspect ratio for fiber definition: N/A
Min Length/ Width to be counted (um): N/A
Area of collection filter (mm^2): 385
Result of Chi^2 Test: 0.00
Air volume: N/A
Grid Opening Area: N/A
Grid Openings Analyzed: N/A
Analysis Date: N/A
Analyst: N/A

Analytical Sensitivity: NA Structure/cc Limit of Detection: NA Structure/cc

Table with columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration (Str/cc), Poisson 95 % Confidence Interval (LCL, UCL). Rows include PCMe Structures (Chrys, Amph, NRA), Total PCMe Structures (Regulated, All), PCMe Fibers and Bundles (Chrys, Amph, NRA), Total PCMe Fibers and Bundles (Regulated, All).

Non Asbestos Mineral Structures

Asbestiform Minerals Present: Not Analyzed
Explanation of Results
NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.
PCMe structure (modified) = A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
PCMe Fiber or Bundle (modified) = A Fiber or Bundle of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite
Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles
Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.
NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile
Concentrations and 95% Confidence Intervals are based on a Poissonian distribution. Structure counts above 31 may be better expressed with a Gaussian distribution. EMSL maintains liability limited to the cost of analysis. This report relates only to the samples reported above and may not be reproduced except in full without written approval of EMSL. EMSL is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client.

Comment: Sample not analyzed due to film on filter.

Robyn Denton
Approved Signatory



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Edward Surbrugg
Tetra Tech
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Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/05/2014 10:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00017
EMSL Sample Number: 041416476-0002
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: 10,000
Aspect ratio for fiber definition: 3:1
Min Length/ Width to be counted (um): >5 / 0.25-none
Area of collection filter (mm^2): 385
Result of Chi^2 Test: N/A N/A
Air volume: 600 Liters
Grid Opening Area: 0.0132 mm^2
Grid Openings Analyzed: 49
Analysis Date: 06/12/2014
Analyst: P. Harrison

Analytical Sensitivity: 0.000992 Structure/cc Limit of Detection: 0.002966 Structure/cc

Table with 8 columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration (Str/cc), Poisson 95 % Confidence Interval LCL (Str/cc), UCL (Str/cc). Rows include PCMe Structures (Chrys), PCMe Structures (Amph), PCMe Structures (NRA), Total PCMe Structures (Regulated), Total PCMe Structures (All), PCMe Fibers and Bundles (Chrys), PCMe Fibers and Bundles (Amph), PCMe Fibers and Bundles (NRA), Total PCMe Fibers and Bundles (Regulated), Total PCMe Fibers and Bundles (All), and Non Asbestos Mineral Structures.

Asbestiform Minerals Present: None Detected
Explanation of Results
NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.
PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
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Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.
NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile
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Comment: Samples collected on 0.8um filters.

Robyn Denton
Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy
Bench Sheet Data

Client: Tetra Tech		Scope: JEOL-1200-EX (04-03)	
EMSL Sample ID: 041416476-0002	GO area (mm ²): 0.0132	Mag: 10,000	
Customer Sample: BC-ABS-00017	Grid Box : 0414-Tetra Tech-04: A	Analyst(s): P. Harrison	
Chi ² Test for Uniformity: N/A	Pore Size (micron): 0.8	Analysis Date: 06/20/2014	
Project ID: NDOT NOA / 10353259		Particulate Loading: 10%	

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
A5	A5	None Detected								
A5	B3	None Detected								
A5	C4	None Detected								
A5	B8	None Detected								
A5	C9	None Detected								
A5	E5	None Detected								
A5	E8	None Detected								
A5	F10	None Detected								
A5	G8	None Detected								
A5	G5	None Detected								
A5	G3	None Detected								
A5	G1	None Detected								
A5	J3	None Detected								
A6	J4	None Detected								
A6	J9	None Detected								
A6	I10	None Detected								
A6	I8	None Detected								
A6	I6	None Detected								
A6	H5	None Detected								
A6	H7	None Detected								
A6	H9	None Detected								
A6	G10	None Detected								
A6	G8	None Detected								
A6	G6	None Detected								
A6	F1	None Detected								
A6	F5	None Detected								
A6	F7	None Detected								
A6	F9	None Detected								
A6	E10	None Detected								
A6	E8	None Detected								
A6	E6	None Detected								
A6	E4	None Detected								
A6	D5	None Detected								
A6	D7	None Detected								
A6	D9	None Detected								
A6	C10	None Detected								
A6	C8	None Detected								
A6	C4	None Detected								



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy
Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0002	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00017	Grid Box :	0414-Tetra Tech-04: A	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/20/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	10%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
A6	C2	None Detected								
A6	B5	None Detected								
A6	B7	None Detected								
A6	B9	None Detected								
A6	A8	None Detected								
A6	A4	None Detected								
A6	A1	None Detected								
A7	A5	None Detected								
A7	A7	None Detected								
A7	C7	None Detected								
A7	F7	None Detected								

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Edward Surbrugg
 Tetra Tech
 303 Irene Street
 Helena, MT 59601
 Phone: 406-442-5588

Customer ID: MAXI57
 Customer PO: NA
 Received: 6/12/2014 9:16
 Date Sampled: 06/05/2014 12:00
 EMSL Order: 041416476
 Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-ABS-00018	Air volume:	948	Liters
EMSL Sample Number:	041416476-0003	Grid Opening Area:	0.0132	mm ²
Minimum Level of analysis (chrysotile):	CD	Grid Openings Analyzed:	31	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/ Width to be counted (µm):	>5 / 0.25-none			
Area of collection filter (mm ²):	385	Analysis Date:	06/12/2014	
Result of Chi ² Test:	28.00 Random	Analyst:	P. Harrison	

Analytical Sensitivity:	0.000992	Structure/cc	Limit of Detection:	0.002967	Structure/cc
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Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm ²	Concentration (Str/cc)	Poisson 95 % Confidence Interval	
						LCL (Str/cc)	UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000 -	0.002967
PCMe Structures (Amph)	ADX	3	-	7.33	0.002977	0.000614 -	0.007692
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000 -	0.002967
Total PCMe Structures (Regulated)	CD/ADX	3	-	7.33	0.002977	0.000614 -	0.007692
Total PCMe Structures (All)	CD/ADX	3	-	7.33	0.002977	0.000614 -	0.007692
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000 -	0.002967
PCMe Fibers and Bundles (Amph)	ADX	-	3	7.33	0.002977	0.000614 -	0.007692
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000 -	0.002967
Total PCMe Fibers and Bundles (Regulated)	CD/ADX	-	3	7.33	0.002977	0.000614 -	0.007692
Total PCMe Fibers and Bundles (All)	CD/ADX	-	3	7.33	0.002977	0.000614 -	0.007692
Non Asbestos Mineral Structures	NAM	0	0	-	-	- -	-

Asbestiform Minerals Present: Actinolite

Explanation of Results

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Comment: Samples collected on 0.8µm filters.

Robyn Denton
 Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0003	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00018	Grid Box :	0414-Tetra Tech-04: K	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	28.00-Random	Pore Size (micron):	0.8	Analysis Date:	06/23/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	20%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
K4	J1	None Detected								
K4	J3	None Detected								
K4	J5	None Detected								
K4	J7	None Detected								
K4	I6	None Detected								
K4	I4	None Detected								
K4	I2	None Detected								
K4	H1	None Detected								
K4	H3	None Detected								
K4	H5	None Detected								
K4	H7	None Detected								
K4	G6	None Detected								
K4	G4	None Detected								
K4	G2	None Detected								
K4	F1	None Detected								
K4	F3	None Detected								
K4	F5	None Detected								
K4	F7	None Detected								
K5	J2	F	1	1	16.8	0.25	ADX	Actinolite	4398	
K5	J4	None Detected								
K5	J8	None Detected								
K5	I9	None Detected								
K5	I7	F	2	2	5.4	1.4	ADX	Actinolite		
K5	I5	None Detected								
K5	I3	None Detected								
K5	I1	None Detected								
K5	H2	None Detected								
K5	H8	F	3	3	25.2	2	ADX	Actinolite		
K5	G9	None Detected								
K5	G7	None Detected								
K5	G3	None Detected								



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct
Transfer Transmission Electron Microscopy
Structure Sketch Sheet for Direct Data Entry

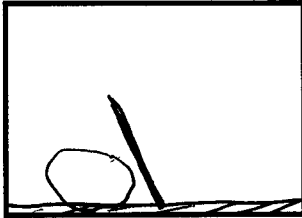
EMSL Order ID: 041416476-0003

Client: Tetra Tech

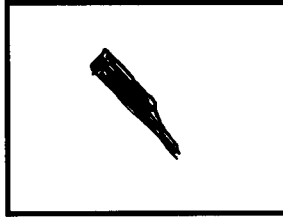
Client Sample: BC-ABS-00018

Page 1 of 1

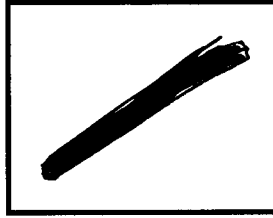
Primary Structure # 1



Primary Structure # 2



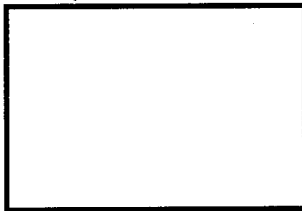
Primary Structure # 3



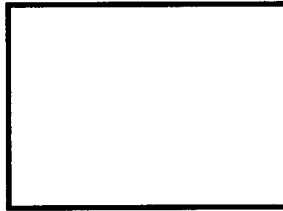
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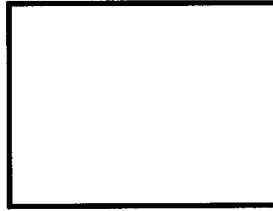
Primary Structure #



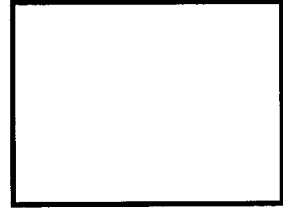
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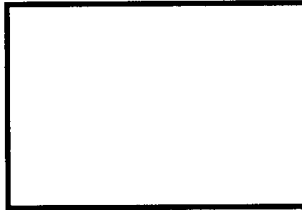
Primary Structure #



Primary Structure #



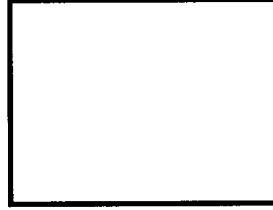
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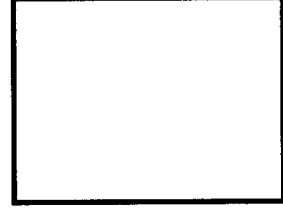
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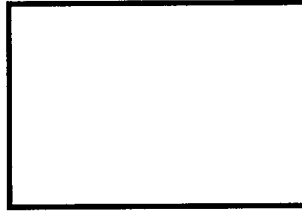
Primary Structure #



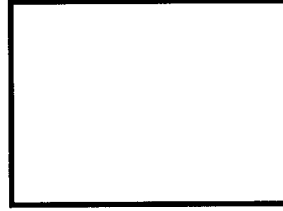
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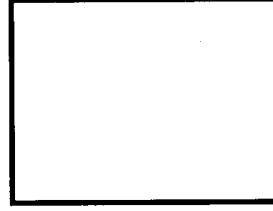
Primary Structure #



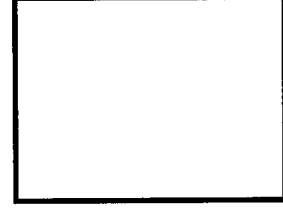
Primary Structure #



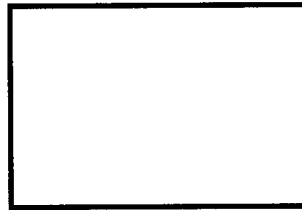
Primary Structure #



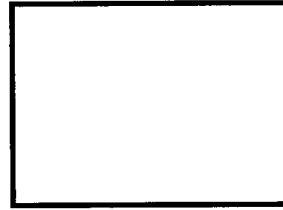
Primary Structure #



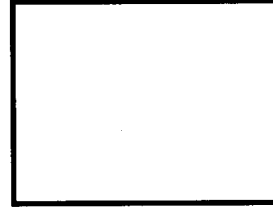
Structure #



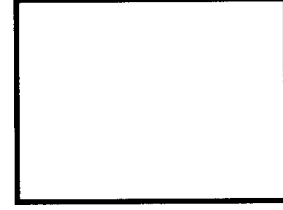
Structure #



Structure #



Structure #



Analyst: [Signature]

Date: 6/23/14

Scope: 04-03



Energy Dispersive X-Ray Analysis

Quantitative Spectra & Data

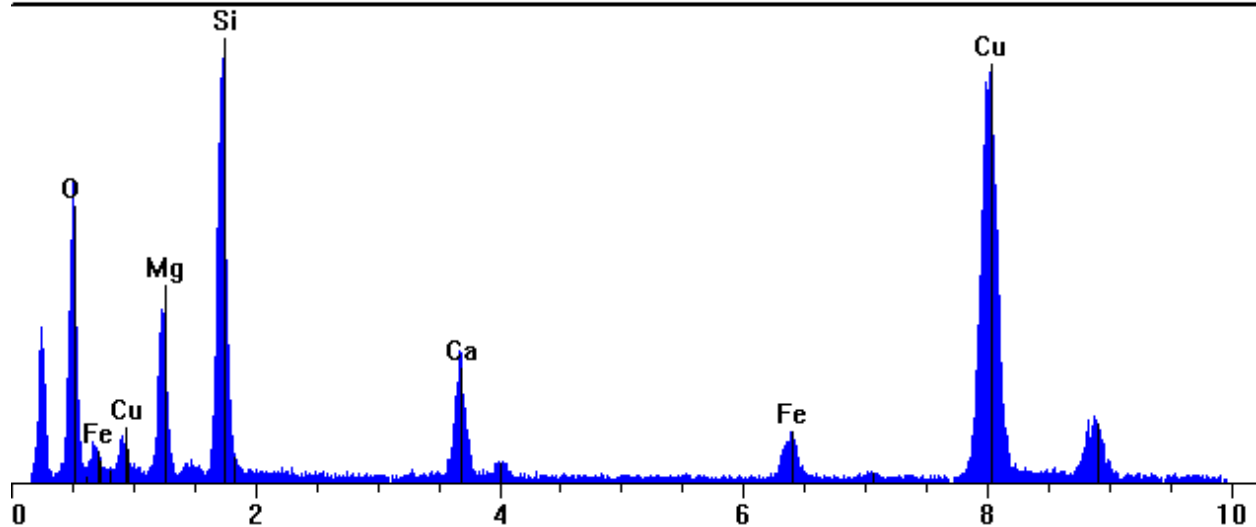
EMSL ANALYTICAL, INC.

File: L:\EDS Spe...Spectra\Scope 04-03\2014\041416476-0003 K5 J2 1 AC.pgt
 Collected: June 23, 2014 08:01:57

Live Time: 86.12 Count Rate: 1381 Dead Time: 14.14 %
 Beam Voltage: 20.00 Beam Current: 2.00 Takeoff Angle: 31.00
 Thickness limit: 26704.15

■ 041416476-0003 K5 J2 1 AC.pgt

FS: 1100



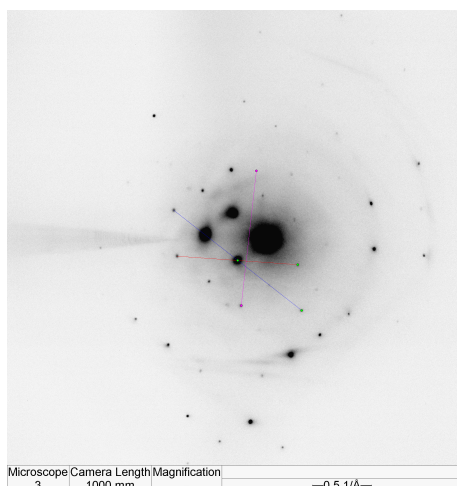
Element	Line	keV	CL Ratio	Wt%	At%	At Prop	Compound	Cmpd Wt%
Mg	KA1	1.254	1.4000	16.41	15.39	7.1	MgO	27.20
Si	KA1	1.740	1.0000	32.18	26.14	12.0	SiO	50.52
Ca	KA1	3.691	1.0500	11.12	6.33	2.9	CaO	15.55
Fe	KA1	6.403	0.9900	5.23	2.14	1.0	FeO	6.73
Cu	KA1	8.046	0.0000	0.00	0.00	0.0		
O	KA1	0.523	0.0000	35.06	50.00	23.0		
Total			0.0000	100.00	100.00	46.0	Total	100.00

Element	Line	Gross (cps)	BKG (cps)	Net (cps)	P:B Ratio
Mg	KA1	66.2	6.3	59.9	9.6
Si	KA1	170.5	6.0	164.6	27.6
Ca	KA1	59.1	4.9	54.1	11.0
Fe	KA1	31.9	4.8	27.0	5.6
Cu	KA1	295.2	7.2	288.0	40.2
O	KA1	90.0	4.2	85.8	20.6

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number:	<u>041416476</u>	Date:	<u>Jun 23, 2014</u>
Image Number:	<u>04398</u>		
Reference / Sample Number:	<u>0003</u>		
Preliminary ID:	<u>ACTINOLITE</u>		
Camera Constant:	<u>1.873e-003</u>	1/A Pixels	
Calibration Reference:	<u>062314-04-03-04397_C</u>		

	Measured	Reference	-5%	+5%
Inter-row Spacing: <input type="checkbox"/> <input type="checkbox"/>	5.253	5.278	5.014	5.542
d2 or hk0 (Camera K/zero row dist.):	1.962	1.965	1.867	2.063
d1 or hkl (Camera K/slant vector dist.):	2.919	2.942	2.795	3.089
Ratio of hk0/hkl:	0.672	0.668	0.635	0.701
Vector Angle:	34.1	33.730	32.043	35.416



From SAED Reference Book, "unknown" diffraction pattern was found to be that of: **ACTINOLITE**

With a Zone Axis of: [**914**]

Preliminary Identification was:

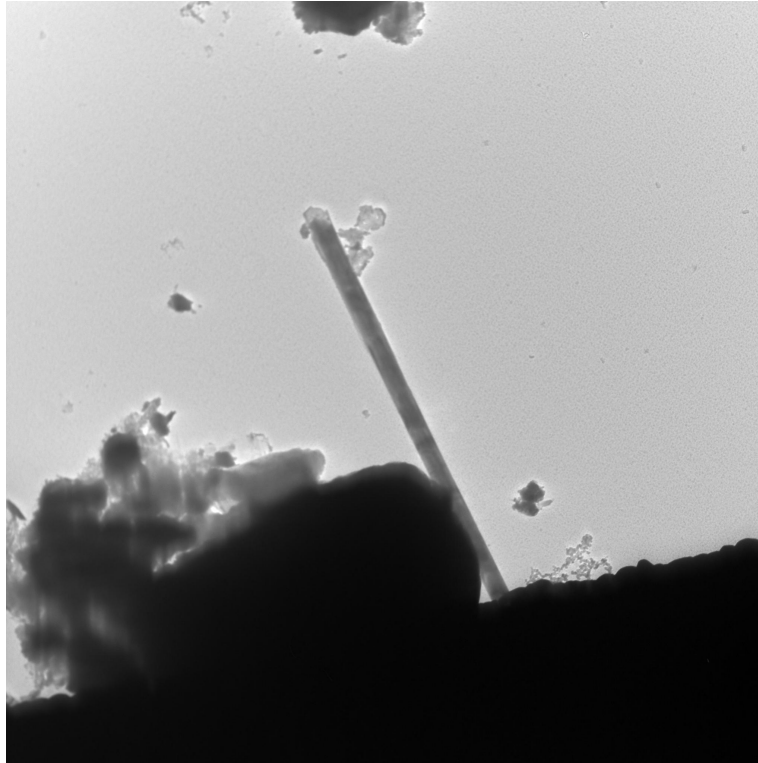
X	CORRECT
	INCORRECT



EMSL ANALYTICAL, INC.

EMSL Analytical, Inc.

Photomicrograph Report



Microscope Camera Length	Magnification	
3	10000 x	—2 μ m—

Micrograph Information

Sample ID:	0003
Order ID:	041416476
Image Number:	04399
Mineral Type:	ACTINOLITE
Date:	6/23/2014
Magnification:	10000
Microscope:	3

**EMSL Analytical, Inc.**

200 Route 130 North
 Cinnaminson, NJ 08077
 856-303-2500
www.EMSL.com

Edward Surbrugg
 Tetra Tech
 303 Irene Street
 Helena, MT 59601
 Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/05/2014 00:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-ABS-00019	Air volume:	960	Liters
EMSL Sample Number:	041416476-0004	Grid Opening Area:	0.0132	mm ²
Minimum Level of analysis (chrysotile):	CD	Grid Openings Analyzed:	31	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/ Width to be counted (µm):	>5 / 0.25-none			
Area of collection filter (mm ²):	385	Analysis Date:	06/12/2014	
Result of Chi ² Test:	N/A N/A	Analyst:	P. Harrison	

Analytical Sensitivity:	0.000980 Structure/cc			Limit of Detection: 0.002930 Structure/cc		
	Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm ²	Concentration (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000 - 0.002930
PCMe Structures (Amph)	ADX	0	-	0.00	0.000000	0.000000 - 0.002930
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000 - 0.002930
Total PCMe Structures (Regulated)	CD/ADX	0	-	0.00	0.000000	0.000000 - 0.002930
Total PCMe Structures (All)	CD/ADX	0	-	0.00	0.000000	0.000000 - 0.002930
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000 - 0.002930
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	0.000000	0.000000 - 0.002930
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000 - 0.002930
Total PCMe Fibers and Bundles (Regulated)	CD/ADX	-	0	0.00	0.000000	0.000000 - 0.002930
Total PCMe Fibers and Bundles (All)	CD/ADX	-	0	0.00	0.000000	0.000000 - 0.002930
Non Asbestos Mineral Structures	NAM	0	0	-	-	- - -

Asbestiform Minerals Present: *None Detected*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 µm with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

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Comment: Samples collected on 0.8µm filters.

Robyn Denton
 Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0004	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00019	Grid Box :	0414-Tetra Tech-04: B	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/20/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	10%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
A6	A1	None Detected								
A6	B2	None Detected								
A6	B6	None Detected								
A6	C5	None Detected								
A6	D6	None Detected								
A6	E5	None Detected								
A6	E2	None Detected								
A6	G2	None Detected								
A6	G5	None Detected								
A6	H8	None Detected								
A6	I6	None Detected								
A6	J4	None Detected								
A6	J7	None Detected								
A7	J5	None Detected								
A7	J3	None Detected								
A7	I2	None Detected								
A7	I4	None Detected								
A7	I6	None Detected								
A7	H5	None Detected								
A7	H3	None Detected								
A7	H1	None Detected								
A7	G2	None Detected								
A7	G4	None Detected								
A7	G6	None Detected								
A7	G8	None Detected								
A7	F5	None Detected								
A7	F3	None Detected								
A7	F1	None Detected								
A7	D1	None Detected								
A7	C5	None Detected								
A7	C7	None Detected								



EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/05/2014 12:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00021
EMSL Sample Number: 041416476-0006
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: 10,000
Aspect ratio for fiber definition: 3:1
Min Length/ Width to be counted (um): >5 / 0.25-none
Area of collection filter (mm^2): 385
Result of Chi^2 Test: N/A N/A
Air volume: 0 Liters
Grid Opening Area: 0.0132 mm^2
Grid Openings Analyzed: 10
Analysis Date: 06/12/2014
Analyst: P. Harrison

Analytical Sensitivity: 7.575758 Structure/ mm^2 Limit of Detection: 22.651515 Structure/ mm^2

Table with 8 columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration Str/ mm^2, LCL Str/ mm^2, UCL Str/ mm^2. Rows include PCMe Structures (Chrys), PCMe Structures (Amph), PCMe Structures (NRA), Total PCMe Structures (Regulated), Total PCMe Structures (All), PCMe Fibers and Bundles (Chrys), PCMe Fibers and Bundles (Amph), PCMe Fibers and Bundles (NRA), Total PCMe Fibers and Bundles (Regulated), Total PCMe Fibers and Bundles (All), and Non Asbestos Mineral Structures.

Asbestiform Minerals Present: None Detected

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Concentrations and 95% Confidence Intervals are based on a Poissonian distribution. Structure counts above 31 may be better expressed with a Gaussian distribution. EMSL maintains liability limited to the cost of analysis. This report relates only to the samples reported above and may not be reproduced except in full without written approval of EMSL. EMSL is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client.

Comment: Samples collected on 0.8um filters.

Robyn Denton

Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy
Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0006	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00021	Grid Box :	0414-Tetra Tech-04: C	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/20/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	<1%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
C3	J6	None Detected								
C3	H5	None Detected								
C3	G7	None Detected								
C3	E5	None Detected								
C3	B7	None Detected								
C4	J4	None Detected								
C4	H3	None Detected								
C4	F5	None Detected								
C4	F3	None Detected								
C4	D4	None Detected								



EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 07:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00023
EMSL Sample Number: 041416476-0008
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: N/A
Aspect ratio for fiber definition: N/A
Min Length/ Width to be counted (um): N/A
Area of collection filter (mm^2): 385
Result of Chi^2 Test: 0.00 N/A
Air volume: N/A
Grid Opening Area: N/A
Grid Openings Analyzed: N/A
Analysis Date: N/A
Analyst: N/A

Analytical Sensitivity: NA Structure/cc Limit of Detection: NA Structure/cc

Table with columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration (Str/cc), Poisson 95 % Confidence Interval (LCL, UCL). Rows include PCMe Structures (Chrys), PCMe Structures (Amph), PCMe Structures (NRA), Total PCMe Structures (Regulated), Total PCMe Structures (All), PCMe Fibers and Bundles (Chrys), PCMe Fibers and Bundles (Amph), PCMe Fibers and Bundles (NRA), Total PCMe Fibers and Bundles (Regulated), Total PCMe Fibers and Bundles (All).

Non Asbestos Mineral Structures

Asbestiform Minerals Present: Not Analyzed
Explanation of Results
NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.
PCMe structure (modified) = A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
PCMe Fiber or Bundle (modified) = A Fiber or Bundle of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite
Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles
Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.
NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile
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Comment: Sample not analyzed due to film on filter.

Robyn Denton
Approved Signatory



EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 08:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00024
EMSL Sample Number: 041416476-0009
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: N/A
Aspect ratio for fiber definition: N/A
Min Length/ Width to be counted (µm): N/A
Area of collection filter (mm²): 385
Result of Chi² Test: 0.00 N/A
Air volume: N/A
Grid Opening Area: N/A
Grid Openings Analyzed: N/A
Analysis Date: N/A
Analyst: N/A

Analytical Sensitivity: NA Structure/cc Limit of Detection: NA Structure/cc

Table with columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm², Concentration (Str/cc), Poisson 95 % Confidence Interval (LCL, UCL). Rows include PCMe Structures (Chrys, Amph, NRA), PCMe Fibers and Bundles (Chrys, Amph, NRA), and Total PCMe Structures (Regulated, All).

Non Asbestos Mineral Structures

Asbestiform Minerals Present: Not Analyzed
Explanation of Results
NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.
PCMe structure (modified) = A fibrous structure of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 µm with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
PCMe Fiber or Bundle (modified) = A Fiber or Bundle of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite
Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles
Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.
NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile
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Comment: Sample not analyzed due to film on filter.

Robyn Denton
Approved Signatory

**EMSL Analytical, Inc.**

200 Route 130 North
 Cinnaminson, NJ 08077
 856-303-2500
www.EMSL.com

Edward Surbrugg
 Tetra Tech
 303 Irene Street
 Helena, MT 59601
 Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 10:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 13794 International Standard for the Determination of Asbestos Fibers - Indirect Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-ABS-00025	Air volume:	600	Liters
EMSL Sample Number:	041416476-0010	Grid Opening Area:	0.0132	mm ²
Minimum Level of analysis (chrysotile):	CD	Grid Openings Analyzed:	76	
Minimum Level of analysis (amphibole):	ADX	Percent of filter ashed:	50	%
Magnification used for fiber counting:	10,000	Suspension volume:	100	mL
Aspect ratio for fiber definition:	3:1	Volume Filtered:	25	mL
Min Length/ Width to be counted (µm):	>5 / 0.25-none	EFA of second filter:	364.9	mm ²
Area of collection filter (mm ²):	385	Analysis Date:	06/12/2014	
Result of Chi ² Test:	75.00 Random	Analyst:	P. Harrison	

Analytical Sensitivity:	0.004850	Structure/cc	Limit of Detection:	0.014501	Structure/cc
--------------------------------	-----------------	---------------------	----------------------------	-----------------	---------------------

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm ²	Concentration (Str/cc)	Poisson 95 % Confidence Interval	
						LCL (Str/cc)	UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000	0.014501
PCMe Structures (Amph)	ADX	1	-	1.00	0.004850	0.000000	0.022988
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000	0.014501
Total PCMe Structures (Regulated)	CD/ADX	1	-	1.00	0.004850	0.000000	0.022988
Total PCMe Structures (All)	CD/ADX	1	-	1.00	0.004850	0.000000	0.022988
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000	0.014501
PCMe Fibers and Bundles (Amph)	ADX	-	1	1.00	0.004850	0.000000	0.022988
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000	0.014501
Total PCMe Fibers and Bundles (Regulated)	CD/ADX	-	1	1.00	0.004850	0.000000	0.022988
Total PCMe Fibers and Bundles (All)	CD/ADX	-	1	1.00	0.004850	0.000000	0.022988
Non Asbestos Mineral Structures	NAM	0	0	-	-	-	-

Asbestiform Minerals Present: Actinolite

Explanation of Results

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Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

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Comment: Samples collected on 0.8µm filters.

Robyn Denton
 Approved Signatory



ISO 13794

International Standard for the Determination of Asbestos Fibers-Indirect Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0010	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00025	Grid Box :	0414-Tetra Tech-05: G	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	75.00-Random	Pore Size (micron):	0.8	Analysis Date:	06/26/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	10%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
G1	C10	None Detected								
G1	C8	None Detected								
G1	D9	None Detected								
G1	D7	None Detected								
G1	D5	None Detected								
G1	E8	None Detected								
G1	E4	None Detected								
G1	F9	None Detected								
G1	F7	None Detected								
G1	F5	None Detected								
G1	F3	None Detected								
G1	G4	None Detected								
G1	G6	None Detected								
G1	G8	None Detected								
G1	G10	None Detected								
G1	H9	None Detected								
G1	H7	None Detected								
G1	H5	None Detected								
G1	H3	None Detected								
G1	I4	None Detected								
G1	I6	None Detected								
G1	I8	None Detected								
G1	I10	None Detected								
G1	J9	None Detected								
G1	J7	None Detected								
G1	J5	None Detected								
G1	J3	None Detected								
G2	A10	None Detected								
G2	A8	None Detected								
G2	A6	None Detected								
G2	A3	None Detected								
G2	B4	None Detected								
G2	B7	None Detected								
G2	B9	None Detected								
G2	C10	None Detected								
G2	C6	None Detected								
G2	C3	None Detected								
G2	D5	None Detected								



ISO 13794

International Standard for the Determination of Asbestos Fibers-Indirect Transfer Transmission Electron Microscopy
Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0010	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00025	Grid Box :	0414-Tetra Tech-05: G	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	75.00-Random	Pore Size (micron):	0.8	Analysis Date:	06/26/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	10%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
G2	D9	None Detected								
G2	E6	None Detected								
G2	E4	None Detected								
G2	F5	None Detected								
G2	F9	None Detected								
G2	G10	None Detected								
G2	G8	None Detected								
G2	G6	None Detected								
G2	G5	None Detected								
G2	G2	None Detected								
G2	H9	None Detected								
G2	I4	None Detected								
G2	J5	None Detected								
G2	J7	None Detected								
G3	I4	None Detected								
G3	I6	None Detected								
G3	H5	None Detected								
G3	G4	None Detected								
G3	G6	None Detected								
G3	F7	None Detected								
G3	F5	None Detected								
G3	F3	None Detected								
G3	E2	None Detected								
G3	D1	None Detected								
G3	D3	None Detected								
G3	D5	None Detected								
G3	D7	F	1	1	14	3	ADX	Actinolite	4402	
G3	D9	None Detected								
G3	C8	None Detected								
G3	C6	None Detected								
G3	C4	None Detected								
G3	C2	None Detected								
G3	B1	None Detected								
G3	B3	None Detected								
G3	B5	None Detected								
G3	B7	None Detected								
G3	B9	None Detected								
G3	A8	None Detected								

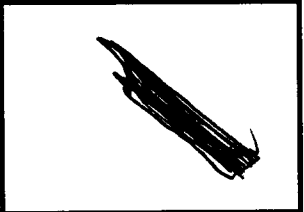


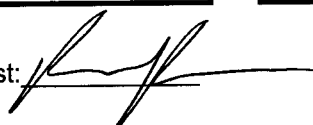
ISO 13794

International Standard for the Determination of Asbestos Fibers-Indirect
Transfer Transmission Electron Microscopy
Structure Sketch Sheet for Direct Data Entry

EMSL Order ID: 041416476-000¹⁰ PH 6/30/14
Client Sample: BC-ABS-0001625

Client: Tetra Tech
Page 1 of 1

Primary Structure # 1 	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Primary Structure #	Primary Structure #	Primary Structure #	Primary Structure #
Structure #	Structure #	Structure #	Structure #

Analyst: 

Date: 6/26/14

Scope: 04-03



Energy Dispersive X-Ray Analysis

Quantitative Spectra & Data

EMSL ANALYTICAL, INC.

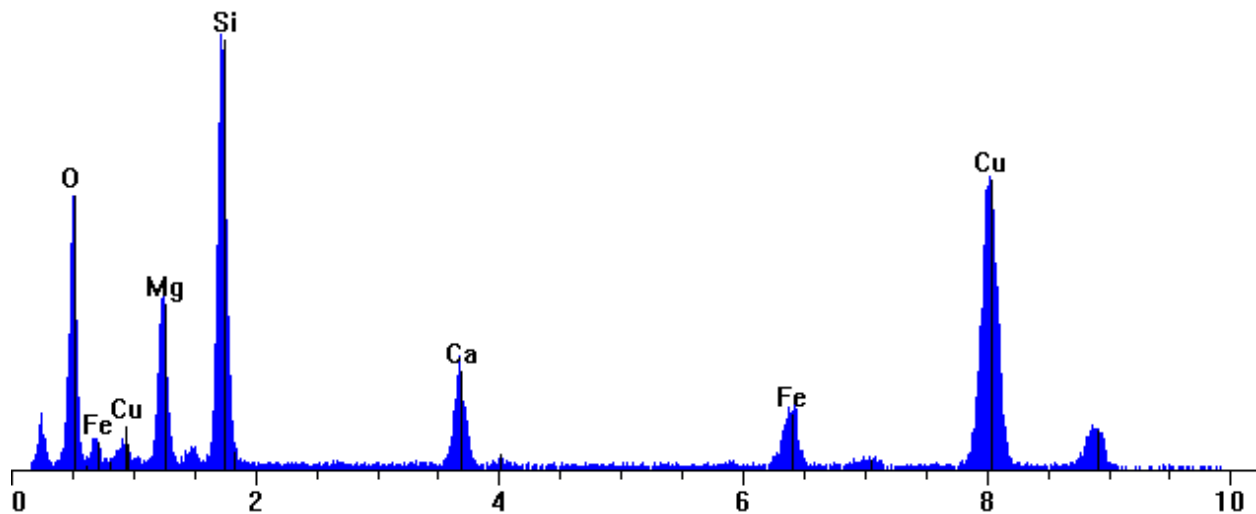
File: L:\EDS Spe...Spectra\Scope 04-03\2014\041416476-0010 G3 D7 1 AC.pgt
 Collected: June 26, 2014 08:14:33

Report: Monday, June 30, 2014

Live Time: 225.33 Count Rate: 270 Dead Time: 2.72 %
 Beam Voltage: 20.00 Beam Current: 2.00 Takeoff Angle: 31.00
 Thickness limit: 27755.67

■ 041416476-0010 G3 D7 1 AC.pgt

FS: 720



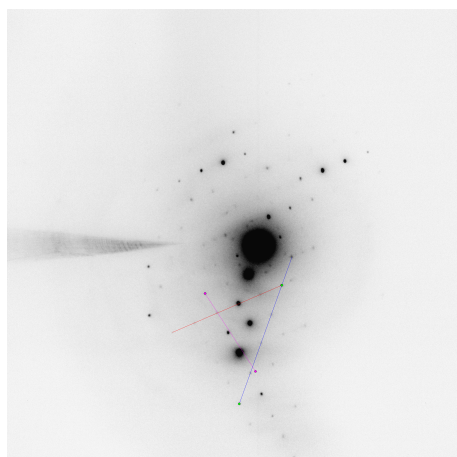
Element	Line	keV	CL Ratio	Wt%	At%	At Prop	Compound	Cmpd Wt%
Mg	KA1	1.254	1.4000	16.02	15.11	7.0	MgO	26.56
Si	KA1	1.740	1.0000	32.38	26.45	12.2	SiO	50.82
Ca	KA1	3.691	1.0500	9.62	5.51	2.5	CaO	13.46
Fe	KA1	6.403	0.9900	7.12	2.92	1.3	FeO	9.16
Cu	KA1	8.046	0.0000	0.00	0.00	0.0		
O	KA1	0.523	0.0000	34.86	50.00	23.0		
Total			0.0000	100.00	100.00	46.0	Total	100.00

Element	Line	Gross (cps)	BKG (cps)	Net (cps)	P:B Ratio
Mg	KA1	16.3	1.4	14.9	10.4
Si	KA1	43.5	1.4	42.1	29.9
Ca	KA1	12.8	0.9	11.9	12.9
Fe	KA1	10.2	0.9	9.4	10.6
Cu	KA1	53.8	1.1	52.7	47.1
O	KA1	21.0	1.0	20.1	20.6

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number:	<u>041416476</u>	Date:	<u>Jun 26, 2014</u>
Image Number:	<u>04402</u>		
Reference / Sample Number:	<u>0010</u>		
Preliminary ID:	<u>ACTINOLITE</u>		
Camera Constant:	<u>1.873e-003</u>	1/A Pixels	
Calibration Reference:	<u>062314-04-03-04397_C</u>		

	Measured	Reference	-5%	+5%
Inter-row Spacing: <input type="checkbox"/> <input type="checkbox"/>	5.119	5.278	5.014	5.542
d2 or hk0 (Camera K/zero row dist.):	4.974	5.099	4.844	5.354
d1 or hkl (Camera K/slant vector dist.):	3.812	3.907	3.712	4.102
Ratio of hk0/hkl:	1.305	1.305	1.240	1.370
Vector Angle:	46.95	48.250	45.837	50.663



From SAED Reference Book, "unknown" diffraction pattern was found to be that of: **ACTINOLITE**

With a Zone Axis of: [**-310**]

Preliminary Identification was:

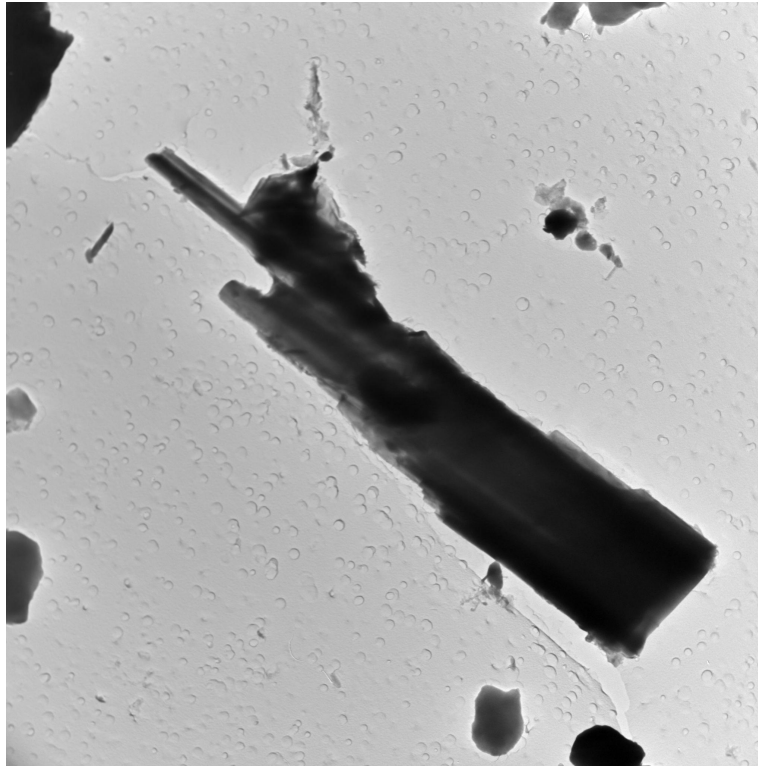
X	CORRECT
	INCORRECT



EMSL ANALYTICAL, INC.

EMSL Analytical, Inc.

Photomicrograph Report



Micrograph Information

Sample ID:	0010
Order ID:	041416476
Image Number:	04403
Mineral Type:	ACTINOLITE
Date:	6/26/2014
Magnification:	10000
Microscope:	3



EMSL Analytical, Inc.

200 Route 130 North
 Cinnaminson, NJ 08077
 856-303-2500
www.EMSL.com

Edward Surbrugg
 Tetra Tech
 303 Irene Street
 Helena, MT 59601
 Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 00:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-ABS-00026	Air volume:	0	Liters
EMSL Sample Number:	041416476-0011	Grid Opening Area:	0.0132	mm ²
Minimum Level of analysis (chrysotile):	CD	Grid Openings Analyzed:	10	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/ Width to be counted (µm):	>5 / 0.25-none			
Area of collection filter (mm ²):	385	Analysis Date:	06/12/2014	
Result of Chi ² Test:	N/A N/A	Analyst:	P. Harrison	

Analytical Sensitivity: 7.575758 Structure/ mm² **Limit of Detection:** 22.651515 Structure/ mm²

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm ²	Concentration Str/ mm ²	Poisson 95 % Confidence Interval	
						LCL Str/ mm ²	UCL Str/ mm ²
PCMe Structures (Chrys)	CD	0	-	0.00	NA	0.000000	22.651515
PCMe Structures (Amph)	ADX	0	-	0.00	NA	0.000000	22.651515
PCMe Structures (NRA)	ADX	0	-	0.00	NA	0.000000	22.651515
Total PCMe Structures (Regulated)	CD/ADX	0	-	0.00	NA	0.000000	22.651515
Total PCMe Structures (All)	CD/ADX	0	-	0.00	NA	0.000000	22.651515
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	NA	0.000000	22.651515
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	NA	0.000000	22.651515
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	NA	0.000000	22.651515
Total PCMe Fibers and Bundles (Regulated)	CD/ADX	-	0	0.00	NA	0.000000	22.651515
Total PCMe Fibers and Bundles (All)	CD/ADX	-	0	0.00	NA	0.000000	22.651515
Non Asbestos Mineral Structures	NAM	0	0	-	-	-	-

Asbestiform Minerals Present: None Detected

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 µm with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

PCMe Fiber or Bundle (modified) = A Fiber or Bundle of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Concentrations and 95% Confidence Intervals are based on a Poissonian distribution. Structure counts above 31 may be better expressed with a Gaussian distribution. EMSL maintains liability limited to the cost of analysis. This report relates only to the samples reported above and may not be reproduced except in full without written approval of EMSL. EMSL is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client.

Comment: Samples collected on 0.8µm filters.

Robyn Denton

Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy
 Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0011	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00026	Grid Box :	0414-Tetra Tech-04: M	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/23/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	<1%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
M1	J6	None Detected								
M1	H5	None Detected								
M1	G2	None Detected								
M1	E5	None Detected								
M1	B6	None Detected								
M2	J4	None Detected								
M2	I1	None Detected								
M2	F7	None Detected								
M2	D6	None Detected								
M2	A4	None Detected								



EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 00:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00027
EMSL Sample Number: 041416476-0012
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: 10,000
Aspect ratio for fiber definition: 3:1
Min Length/ Width to be counted (um): >5 / 0.25-none
Area of collection filter (mm^2): 385
Result of Chi^2 Test: N/A N/A
Air volume: 0 Liters
Grid Opening Area: 0.0132 mm^2
Grid Openings Analyzed: 10
Analysis Date: 06/12/2014
Analyst: P. Harrison

Analytical Sensitivity: 7.575758 Structure/ mm^2 Limit of Detection: 22.651515 Structure/ mm^2

Table with columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration Str/ mm^2, Poisson 95 % Confidence Interval (LCL, UCL). Rows include PCMe Structures (Chrys, Amph, NRA), PCMe Fibers and Bundles (Chrys, Amph, NRA), and Non Asbestos Mineral Structures.

Asbestiform Minerals Present: None Detected

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

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Comment: Samples collected on 0.8um filters.

Robyn Denton

Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy
Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0012	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00027	Grid Box :	0414-Tetra Tech-04: M	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/23/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	<1%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
M4	J5	None Detected								
M4	H6	None Detected								
M4	F4	None Detected								
M4	D6	None Detected								
M4	D3	None Detected								
M5	A6	None Detected								
M5	C8	None Detected								
M5	E10	None Detected								
M5	D6	None Detected								
M5	F5	None Detected								

**EMSL Analytical, Inc.**

200 Route 130 North
 Cinnaminson, NJ 08077
 856-303-2500
www.EMSL.com

Edward Surbrugg
 Tetra Tech
 303 Irene Street
 Helena, MT 59601
 Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 11:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-ABS-00028	Air volume:	936	Liters
EMSL Sample Number:	041416476-0013	Grid Opening Area:	0.0132	mm ²
Minimum Level of analysis (chrysotile):	CD	Grid Openings Analyzed:	32	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/ Width to be counted (µm):	>5 / 0.25-none			
Area of collection filter (mm ²):	385	Analysis Date:	06/12/2014	
Result of Chi ² Test:	N/A N/A	Analyst:	P. Harrison	

Analytical Sensitivity:	0.000974	Structure/cc	Limit of Detection:	0.002912	Structure/cc	
Poisson 95 % Confidence Interval						
Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm ²	Concentration (Str/cc)	LCL (Str/cc) - UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000 - 0.002912
PCMe Structures (Amph)	ADX	0	-	0.00	0.000000	0.000000 - 0.002912
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000 - 0.002912
Total PCMe Structures (Regulated)	CD/ADX	0	-	0.00	0.000000	0.000000 - 0.002912
Total PCMe Structures (All)	CD/ADX	0	-	0.00	0.000000	0.000000 - 0.002912
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000 - 0.002912
PCMe Fibers and Bundles (Amph)	ADX	-	0	0.00	0.000000	0.000000 - 0.002912
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000 - 0.002912
Total PCMe Fibers and Bundles (Regulated)	CD/ADX	-	0	0.00	0.000000	0.000000 - 0.002912
Total PCMe Fibers and Bundles (All)	CD/ADX	-	0	0.00	0.000000	0.000000 - 0.002912
Non Asbestos Mineral Structures	NAM	0	0	-	-	- - -

Asbestiform Minerals Present: *None Detected*

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 µm with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

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Comment: Samples collected on 0.8µm filters.

Robyn Denton
 Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0013	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00028	Grid Box :	0414-Tetra Tech-04: N	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/23/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	10%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
N7	J1	None Detected								
N7	J3	None Detected								
N7	J5	None Detected								
N7	J7	None Detected								
N7	J9	None Detected								
N7	I10	None Detected								
N7	I8	None Detected								
N7	I6	None Detected								
N7	I4	None Detected								
N7	I2	None Detected								
N7	H1	None Detected								
N7	H3	None Detected								
N7	H5	None Detected								
N7	H7	None Detected								
N7	H9	None Detected								
N7	G8	None Detected								
N8	E2	None Detected								
N8	E4	None Detected								
N8	E6	None Detected								
N8	E8	None Detected								
N8	G9	None Detected								
N8	G7	None Detected								
N8	G5	None Detected								
N8	G3	None Detected								
N8	G1	None Detected								
N8	H2	None Detected								
N8	H4	None Detected								
N8	H6	None Detected								
N8	H8	None Detected								
N8	H10	None Detected								
N8	I9	None Detected								
N8	I7	None Detected								



EMSL Analytical, Inc.

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 Cinnaminson, NJ 08077
 856-303-2500
www.EMSL.com

Edward Surbrugg
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 Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 11:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number:	BC-ABS-00029	Air volume:	936	Liters
EMSL Sample Number:	041416476-0014	Grid Opening Area:	0.0132	mm ²
Minimum Level of analysis (chrysotile):	CD	Grid Openings Analyzed:	32	
Minimum Level of analysis (amphibole):	ADX			
Magnification used for fiber counting:	10,000			
Aspect ratio for fiber definition:	3:1			
Min Length/ Width to be counted (µm):	>5 / 0.25-none			
Area of collection filter (mm ²):	385	Analysis Date:	06/12/2014	
Result of Chi ² Test:	31.00 Random	Analyst:	P. Harrison	

Analytical Sensitivity:	0.000974	Structure/cc	Limit of Detection:	0.002912	Structure/cc
--------------------------------	-----------------	---------------------	----------------------------	-----------------	---------------------

Structure Class	Min ID Level	Primary Str.	Total Str.	Density Str/mm ²	Concentration (Str/cc)	Poisson 95 % Confidence Interval	
						LCL (Str/cc)	UCL (Str/cc)
PCMe Structures (Chrys)	CD	0	-	0.00	0.000000	0.000000	0.002912
PCMe Structures (Amph)	ADX	1	-	2.37	0.000974	0.000000	0.004616
PCMe Structures (NRA)	ADX	0	-	0.00	0.000000	0.000000	0.002912
Total PCMe Structures (Regulated)	CD/ADX	1	-	2.37	0.000974	0.000000	0.004616
Total PCMe Structures (All)	CD/ADX	1	-	2.37	0.000974	0.000000	0.004616
PCMe Fibers and Bundles (Chrys)	CD	-	0	0.00	0.000000	0.000000	0.002912
PCMe Fibers and Bundles (Amph)	ADX	-	1	2.37	0.000974	0.000000	0.004616
PCMe Fibers and Bundles (NRA)	ADX	-	0	0.00	0.000000	0.000000	0.002912
Total PCMe Fibers and Bundles (Regulated)	CD/ADX	-	1	2.37	0.000974	0.000000	0.004616
Total PCMe Fibers and Bundles (All)	CD/ADX	-	1	2.37	0.000974	0.000000	0.004616
Non Asbestos Mineral Structures	NAM	0	0	-	-	-	-

Asbestiform Minerals Present: Actinolite

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified) = A fibrous structure of aspect ratio > 3:1, longer than 5 µm, and which has a diameter ≥ 0.25 µm with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

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Comment: Samples collected on 0.8µm filters.

Robyn Denton
 Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0014	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00029	Grid Box :	0414-Tetra Tech-04: F	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	31.00-Random	Pore Size (micron):	0.8	Analysis Date:	06/20/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	10%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
F1	A5	None Detected								
F1	A7	None Detected								
F1	B8	None Detected								
F1	B6	None Detected								
F1	C5	None Detected								
F1	C7	None Detected								
F1	C9	None Detected								
F1	D8	None Detected								
F1	D6	None Detected								
F1	D4	None Detected								
F1	E3	None Detected								
F1	E5	None Detected								
F1	E7	None Detected								
F1	E9	None Detected								
F1	F8	None Detected								
F1	F6	None Detected								
F1	F4	None Detected								
F1	F2	None Detected								
F2	J9	None Detected								
F2	J7	None Detected								
F2	J5	None Detected								
F2	J3	None Detected								
F2	I4	None Detected								
F2	I6	None Detected								
F2	I8	None Detected								
F2	H7	None Detected								
F2	H5	None Detected								
F2	H3	None Detected								
F2	G4	None Detected								
F2	G6	F	1	1	7.8	1.7	ADX	Actinolite	4395	
F2	G8	None Detected								
F2	G10	None Detected								



ISO 10312

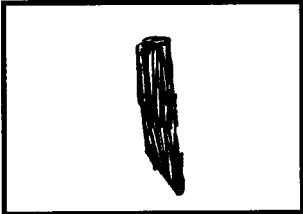
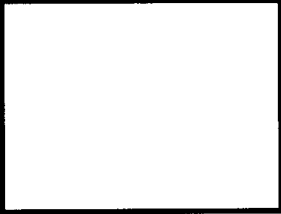

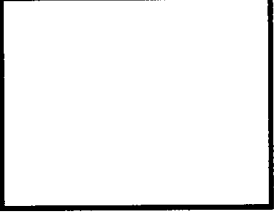
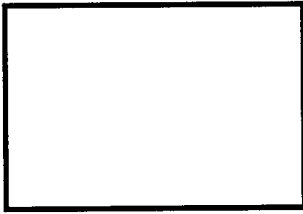
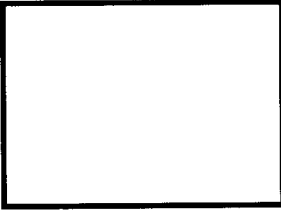
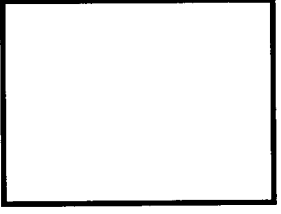
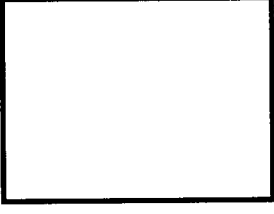
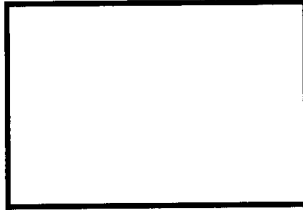
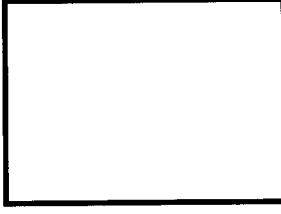
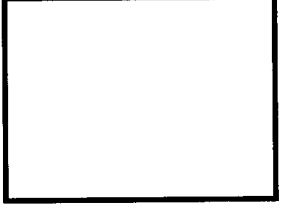
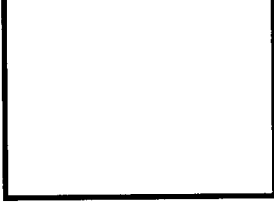

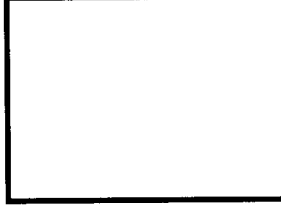
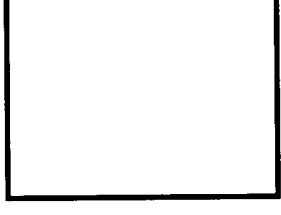


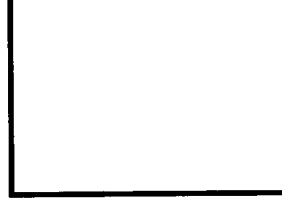

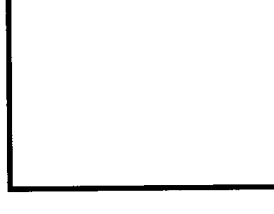
International Standard for the Determination of Asbestos Fibers-Direct
Transfer Transmission Electron Microscopy
Structure Sketch Sheet for Direct Data Entry

EMSL Order ID: 041416476-0014

Client: Tetra Tech

Client Sample: BC-ABS-00029

Page 1 of

Primary Structure # / 	Primary Structure # 	Primary Structure # 	Primary Structure # 
Primary Structure # 	Primary Structure # 	Primary Structure # 	Primary Structure # 
Primary Structure # 	Primary Structure # 	Primary Structure # 	Primary Structure # 
Primary Structure # 	Primary Structure # 	Primary Structure # 	Primary Structure # 
Structure # 	Structure # 	Structure # 	Structure # 

Analyst: [Signature]

Date: 6/20/17

Scope: 04-03



Energy Dispersive X-Ray Analysis

Quantitative Spectra & Data

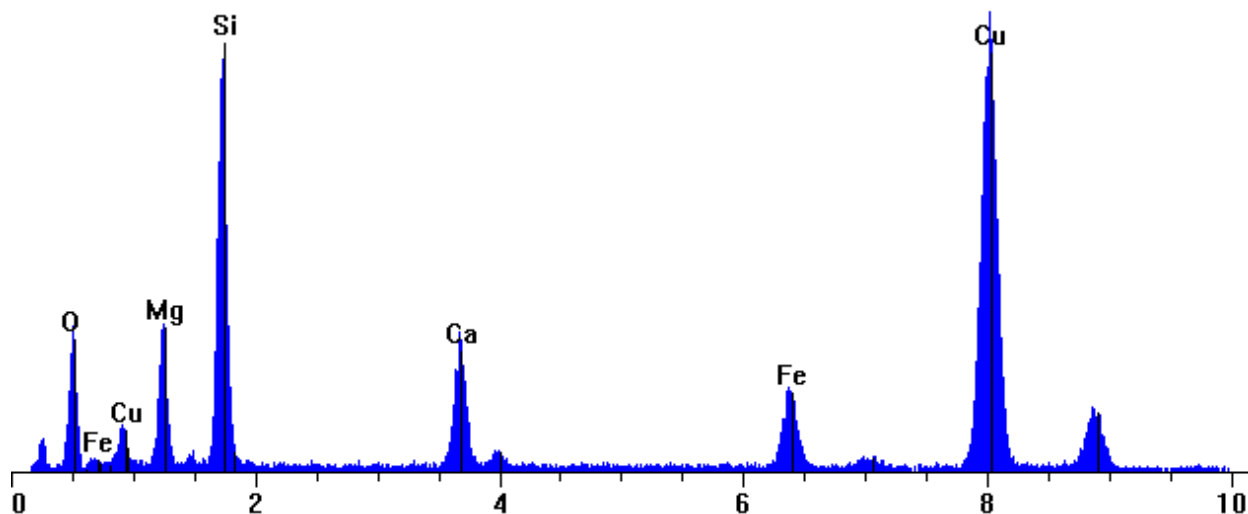
EMSL ANALYTICAL, INC.

File: L:\EDS Spe...Spectra\Scope 04-03\2014\041416476-0014 F2 G6 1 AC.pgt
 Collected: June 20, 2014 07:59:41

Live Time: 81.88 Count Rate: 1293 Dead Time: 12.97 %
 Beam Voltage: 20.00 Beam Current: 2.00 Takeoff Angle: 31.00
 Thickness limit: 25886.65

■ 041416476-0014 F2 G6 1 AC.pgt

FS: 1100



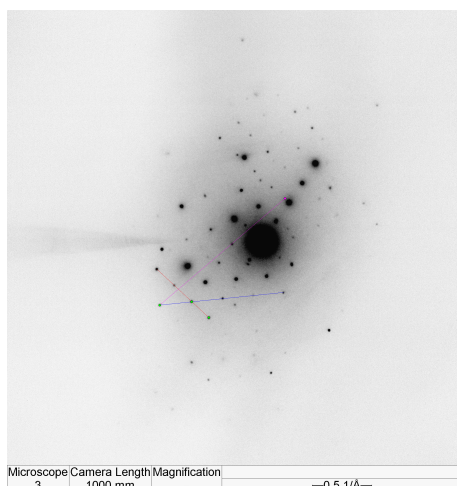
Element	Line	keV	CL Ratio	Wt%	At%	At Prop	Compound	Cmpd Wt%
Mg	KA1	1.254	1.4000	13.43	12.95	6.0	MgO	22.26
Si	KA1	1.740	1.0000	31.14	26.00	12.0	SiO	48.87
Ca	KA1	3.691	1.0500	12.64	7.39	3.4	CaO	17.68
Fe	KA1	6.403	0.9900	8.70	3.65	1.7	FeO	11.19
Cu	KA1	8.046	0.0000	0.00	0.00	0.0		
O	KA1	0.523	0.0000	34.11	50.00	23.0		
Total			0.0000	100.00	100.00	46.0	Total	100.00

Element	Line	Gross (cps)	BKG (cps)	Net (cps)	P:B Ratio
Mg	KA1	56.9	4.4	52.6	12.0
Si	KA1	175.3	4.6	170.6	36.8
Ca	KA1	70.8	4.9	65.9	13.5
Fe	KA1	53.2	5.1	48.1	9.5
Cu	KA1	324.9	5.6	319.4	57.5
O	KA1	45.8	2.1	43.7	21.0

AMPHIBOLE SAED INDEXING FORM

EMSL Order Number:	<u>041416476</u>	Date: <u>Jun 20, 2014</u>
Image Number:	<u>04395</u>	
Reference / Sample Number:	<u>0014</u>	
Preliminary ID:	<u>ACTINOLITE</u>	
Camera Constant:	<u>1.862e-003</u>	1/A Pixels
Calibration Reference:	<u>061714-04-03-04390_C</u>	

	Measured	Reference	-5%	+5%
Inter-row Spacing: <input type="checkbox"/> <input type="checkbox"/>	5.076	5.278	5.014	5.542
d2 or hk0 (Camera K/zero row dist.):	5.038	5.102	4.847	5.357
d1 or hkl (Camera K/slant vector dist.):	3.837	3.880	3.686	4.074
Ratio of hk0/hkl:	1.313	1.315	1.249	1.381
Vector Angle:	48.82	48.570	46.142	50.999



From SAED Reference Book, "unknown" diffraction pattern was found to be that of: **ACTINOLITE**

With a Zone Axis of: [**310**]

Preliminary Identification was:

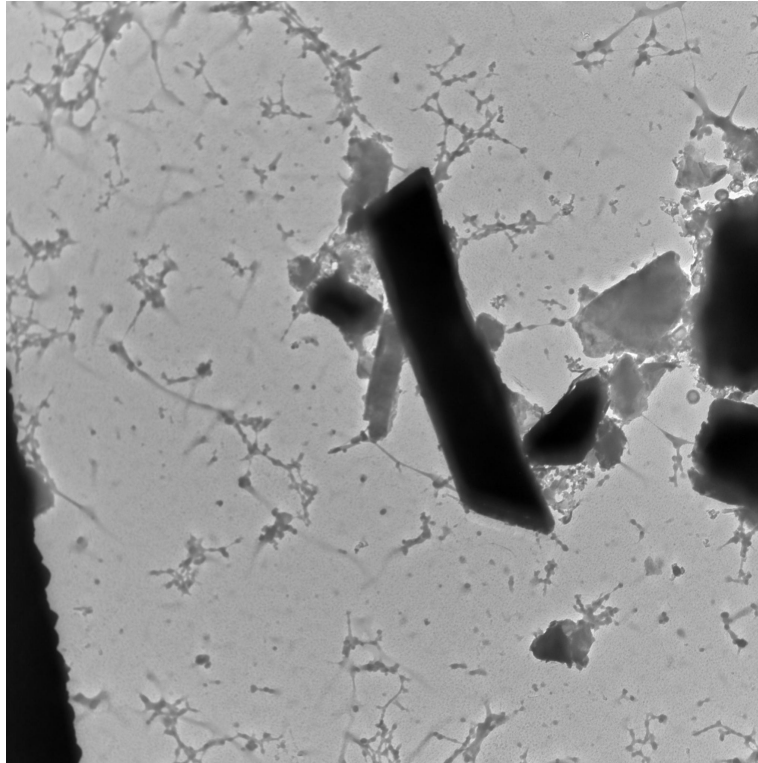
X	CORRECT
	INCORRECT



EMSL ANALYTICAL, INC.

EMSL Analytical, Inc.

Photomicrograph Report



Microscope	Camera Length	Magnification	
3	-	10000 x	—2 μm—

Micrograph Information

Sample ID:	0014
Order ID:	041416476
Image Number:	04396
Mineral Type:	ACTINOLITE
Date:	6/20/2014
Magnification:	10000
Microscope:	3



EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/06/2014 11:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00030
EMSL Sample Number: 041416476-0015
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: 10,000
Aspect ratio for fiber definition: 3:1
Min Length/ Width to be counted (um): >5 / 0.25-none
Area of collection filter (mm^2): 385
Result of Chi^2 Test: N/A N/A
Air volume: 0 Liters
Grid Opening Area: 0.0132 mm^2
Grid Openings Analyzed: 10
Analysis Date: 06/12/2014
Analyst: P. Harrison

Analytical Sensitivity: 7.575758 Structure/ mm^2 Limit of Detection: 22.651515 Structure/ mm^2

Table with 8 columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration Str/ mm^2, LCL Str/ mm^2, UCL Str/ mm^2. Rows include PCMe Structures (Chrys), PCMe Structures (Amph), PCMe Structures (NRA), Total PCMe Structures (Regulated), Total PCMe Structures (All), PCMe Fibers and Bundles (Chrys), PCMe Fibers and Bundles (Amph), PCMe Fibers and Bundles (NRA), Total PCMe Fibers and Bundles (Regulated), Total PCMe Fibers and Bundles (All), and Non Asbestos Mineral Structures.

Asbestiform Minerals Present: None Detected

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Concentrations and 95% Confidence Intervals are based on a Poissonian distribution. Structure counts above 31 may be better expressed with a Gaussian distribution. EMSL maintains liability limited to the cost of analysis. This report relates only to the samples reported above and may not be reproduced except in full without written approval of EMSL. EMSL is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client.

Comment: Samples collected on 0.8um filters.

Robyn Denton

Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0015	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00030	Grid Box :	0414-Tetra Tech-04: N	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/23/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	<1%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
N4	B7	None Detected								
N4	D10	None Detected								
N4	F6	None Detected								
N4	H8	None Detected								
N4	J9	None Detected								
N5	J1	None Detected								
N5	I6	None Detected								
N5	G1	None Detected								
N5	D3	None Detected								
N5	B5	None Detected								



EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077
856-303-2500
www.EMSL.com

Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/09/2014 10:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00031 Air volume: 960 Liters
EMSL Sample Number: 041416476-0016 Grid Opening Area: 0.0132 mm^2
Minimum Level of analysis (chrysotile): CD Grid Openings Analyzed: 31
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: 10,000
Aspect ratio for fiber definition: 3:1
Min Length/ Width to be counted (um): >5 / 0.25-none
Area of collection filter (mm^2): 385 Analysis Date: 06/12/2014
Result of Chi^2 Test: N/A N/A Analyst: P. Harrison

Analytical Sensitivity: 0.000980 Structure/cc Limit of Detection: 0.002930 Structure/cc

Table with 8 columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration (Str/cc), LCL (Str/cc), UCL (Str/cc). Rows include PCMe Structures (Chrys), PCMe Structures (Amph), PCMe Structures (NRA), Total PCMe Structures (Regulated), Total PCMe Structures (All), PCMe Fibers and Bundles (Chrys), PCMe Fibers and Bundles (Amph), PCMe Fibers and Bundles (NRA), Total PCMe Fibers and Bundles (Regulated), Total PCMe Fibers and Bundles (All), and Non Asbestos Mineral Structures.

Asbestiform Minerals Present: None Detected
Explanation of Results
NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.
PCMe structure (modified) = A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite
Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles
Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.
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Comment: Samples collected on 0.8um filters.

Robyn Denton
Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron Microscopy

Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0016	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00031	Grid Box :	0414-Tetra Tech-04: G	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/20/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	15%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
G5	J1	None Detected								
G5	J3	None Detected								
G5	J5	None Detected								
G5	J7	None Detected								
G5	H9	None Detected								
G5	H7	None Detected								
G5	H5	None Detected								
G5	H3	None Detected								
G5	H1	None Detected								
G5	F1	None Detected								
G5	F3	None Detected								
G5	F5	None Detected								
G5	D5	None Detected								
G5	D7	None Detected								
G5	B6	None Detected								
G5	B8	None Detected								
G5	A10	None Detected								
G7	I8	None Detected								
G7	I6	None Detected								
G7	I4	None Detected								
G7	I2	None Detected								
G7	F9	None Detected								
G7	F7	None Detected								
G7	F5	None Detected								
G7	F3	None Detected								
G7	F1	None Detected								
G7	D9	None Detected								
G7	D7	None Detected								
G7	D5	None Detected								
G7	D3	None Detected								
G7	D1	None Detected								



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Cinnaminson, NJ 08077
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www.EMSL.com

Edward Surbrugg
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Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/09/2014 10:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00032
EMSL Sample Number: 041416476-0017
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: 10,000
Aspect ratio for fiber definition: 3:1
Min Length/ Width to be counted (um): >5 / 0.25-none
Area of collection filter (mm^2): 385
Result of Chi^2 Test: N/A N/A
Air volume: 936 Liters
Grid Opening Area: 0.0132 mm^2
Grid Openings Analyzed: 32
Analysis Date: 06/12/2014
Analyst: P. Harrison

Analytical Sensitivity: 0.000974 Structure/cc Limit of Detection: 0.002912 Structure/cc

Table with 8 columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration (Str/cc), Poisson 95 % Confidence Interval LCL (Str/cc), UCL (Str/cc). Rows include PCMe Structures (Chrys), PCMe Structures (Amph), PCMe Structures (NRA), Total PCMe Structures (Regulated), Total PCMe Structures (All), PCMe Fibers and Bundles (Chrys), PCMe Fibers and Bundles (Amph), PCMe Fibers and Bundles (NRA), Total PCMe Fibers and Bundles (Regulated), Total PCMe Fibers and Bundles (All), and Non Asbestos Mineral Structures.

Asbestiform Minerals Present: None Detected
Explanation of Results
NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.
PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.
Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite
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Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.
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Comment: Samples collected on 0.8um filters.

Robyn Denton
Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy
Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0017	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00032	Grid Box :	0414-Tetra Tech-04: H	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/23/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	15%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
H1	J9	None Detected								
H1	J7	None Detected								
H1	J5	None Detected								
H1	J3	None Detected								
H1	J1	None Detected								
H1	I2	None Detected								
H1	I4	None Detected								
H1	I6	None Detected								
H1	I8	None Detected								
H1	I10	None Detected								
H1	H9	None Detected								
H1	H7	None Detected								
H1	H5	None Detected								
H1	H1	None Detected								
H1	G2	None Detected								
H1	G4	None Detected								
H1	G6	None Detected								
H1	G8	None Detected								
H2	A10	None Detected								
H2	A8	None Detected								
H2	A6	None Detected								
H2	A4	None Detected								
H2	B3	None Detected								
H2	B5	None Detected								
H2	B7	None Detected								
H2	B9	None Detected								
H2	C10	None Detected								
H2	C8	None Detected								
H2	C6	None Detected								
H2	C4	None Detected								
H2	C2	None Detected								
H2	D1	None Detected								



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856-303-2500
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Edward Surbrugg
Tetra Tech
303 Irene Street
Helena, MT 59601
Phone: 406-442-5588

Customer ID: MAXI57
Customer PO: NA
Received: 6/12/2014 9:16
Date Sampled: 06/09/2014 10:00
EMSL Order: 041416476
Report Date: 07/01/14

Project: NDOT NOA / 10353259

ISO 10312 International Standard for the Determination of Asbestos Fibers - Direct Transfer TEM - Modified for PCMe Analysis

Customer Sample Number: BC-ABS-00033
EMSL Sample Number: 041416476-0018
Minimum Level of analysis (chrysotile): CD
Minimum Level of analysis (amphibole): ADX
Magnification used for fiber counting: 10,000
Aspect ratio for fiber definition: 3:1
Min Length/ Width to be counted (um): >5 / 0.25-none
Area of collection filter (mm^2): 385
Result of Chi^2 Test: N/A N/A
Air volume: 0 Liters
Grid Opening Area: 0.0132 mm^2
Grid Openings Analyzed: 10
Analysis Date: 06/12/2014
Analyst: P. Harrison

Analytical Sensitivity: 7.575758 Structure/ mm^2 Limit of Detection: 22.651515 Structure/ mm^2

Table with 8 columns: Structure Class, Min ID Level, Primary Str., Total Str., Density Str/mm^2, Concentration Str/ mm^2, LCL Str/ mm^2, UCL Str/ mm^2. Rows include PCMe Structures (Chrys), PCMe Structures (Amph), PCMe Structures (NRA), Total PCMe Structures (Regulated), Total PCMe Structures (All), PCMe Fibers and Bundles (Chrys), PCMe Fibers and Bundles (Amph), PCMe Fibers and Bundles (NRA), Total PCMe Fibers and Bundles (Regulated), Total PCMe Fibers and Bundles (All), Non Asbestos Mineral Structures.

Asbestiform Minerals Present: None Detected

Explanation of Results

NRA = Non-Regulated Amphibole. A suspected mineral fiber that is a member of the Amphibole group, but is currently not regulated by the Federal government as asbestos.

PCMe structure (modified)= A fibrous structure of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 um with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

PCMe Fiber or Bundle (modified) = A Fiber or Bundle of of aspect ratio > 3:1, longer than 5 um, and which has a diameter >= 0.25 microns with no upper width boundary. This definition has been modified from the method to meet the client's project requirements.

Concentration (Reg) = include all federally regulated asbestos types. Currently Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite

Concentration (all) = include all federally regulated asbestos types (Chrysotile, Amosite, Actinolite, Tremolite, Anthophyllite and Crocidolite) and any Non-regulated Amphiboles

Min ID Level = the minimum level of analysis that must have been met to be included in the reportable structure count. If any fibrous structure did not meet the minimum ID level, it would not be included in the concentration.

NAM = Non Asbestos Mineral. A mineral fiber that has been rejected from being either Amphibole or Chrysotile

Concentrations and 95% Confidence Intervals are based on a Poissonian distribution. Structure counts above 31 may be better expressed with a Gaussian distribution. EMSL maintains liability limited to the cost of analysis. This report relates only to the samples reported above and may not be reproduced except in full without written approval of EMSL. EMSL is not responsible for sample collection activities or analytical limitations. Interpretation and use of results are the responsibility of the client.

Comment: Samples collected on 0.8um filters.

Robyn Denton

Approved Signatory



ISO 10312

International Standard for the Determination of Asbestos Fibers-Direct Transfer Transmission Electron
Microscopy
Bench Sheet Data

Client:	Tetra Tech			Scope:	JEOL-1200-EX (04-03)
EMSL Sample ID:	041416476-0018	GO area (mm ²):	0.0132	Mag:	10,000
Customer Sample:	BC-ABS-00033	Grid Box :	0414-Tetra Tech-04: S	Analyst(s):	P. Harrison
Chi ² Test for Uniformity:	N/A	Pore Size (micron):	0.8	Analysis Date:	06/25/2014
Project ID:	NDOT NOA / 10353259			Particulate Loading:	<1%

Grid ID	Grid Opening	Structure Type	Structure Number		Dimensions (µm)		Level of ID	Mineral Type	Image Number	Structure Comments
			Primary	Total	Length	Width				
S2	D3	None Detected								
S2	B6	None Detected								
S2	A7	None Detected								
S3	G3	None Detected								
S3	A1	None Detected								
S4	B8	None Detected								
S4	D9	None Detected								
S4	G9	None Detected								
S4	I7	None Detected								
S4	J10	None Detected								



EMSL ANALYTICAL, INC.
LABORATORY PRODUCTS TRAINING

Asbestos Chain of Custody

EMSL Order Number (Lab Use Only):

041416476

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

Company: TETRA TECH		EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different If Bill to is Different note instructions in Comments**	
Street: 7 West 10th AVE. Ste 102		Third Party Billing requires written authorization from third party	
City: Helenia	State/Province: MT	Zip/Postal Code: 59601	Country: USA
Report To (Name): Ed Surbrugg		Telephone #: 406-441-3296	
Email Address: Edward.Surbrugg@tetratech.com		Fax #: 406-442-7182	Purchase Order:
Project Name/Number: 10393259		Please Provide Results: <input type="checkbox"/> Fax <input checked="" type="checkbox"/> Email <input type="checkbox"/> Mail	
U.S. State Samples Taken: NA		Connecticut Samples: <input type="checkbox"/> Commercial <input type="checkbox"/> Residential	

Turnaround Time (TAT) Options* - Please Check

3 Hour
 6 Hour
 24 Hour
 48 Hour
 72 Hour
 96 Hour
 1 Week
 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air <input type="checkbox"/> Check if samples are from NY <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA PLM - Bulk (reporting limit) <input type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NIOSH 9002 (<1%)	TEM - Air <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input checked="" type="checkbox"/> ISO 10312 <i>Sensitivity to 0.00004</i> TEM - Bulk <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 TEM - Water: EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	TEM - Dust <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) Soil/Rock/Vermiculite <input type="checkbox"/> PLM CARB 435 - A (0.25% sensitivity) <input type="checkbox"/> PLM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - B (0.1% sensitivity) <input type="checkbox"/> TEM CARB 435 - C (0.01% sensitivity) <input type="checkbox"/> TEM Qual. via Filtration Technique <input type="checkbox"/> TEM Qual. via Drop-Mount Technique Other: <input type="checkbox"/>
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Check For Positive Stop - Clearly Identify Homogenous Group Filter Pore Size (Air Samples): 0.8µm 0.45µm

Samplers Name: **BERNARDINO** Samplers Signature: *[Signature]*

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
BL-ABS-00016	ABS-Driving - driver	1500 L	6/5/14 0840
BL-ABS-00017	ABS-Driving - driver	1500 L	6/5/14 1000
BL-ABS-00018	ABS - Hollow Stem Auger - Driller	948 L	6/5/14 1205
BL-ABS-00019	ABS - Hollow Stem Auger - Jumper	960 L	6/5/14 1205
BL-ABS-00020	ABS-Driving - Passenger - microvac	5 L vacuum	6/5/14
BL-ABS-00021	Field Blank	N/A	6/5/14 1205
BL-ABS-00022	ABS-Driving - Driver Passenger - microvac	5 L vacuum	6/6/14
BL-ABS-00023	ABS-Driving - Driver	6000 L	6/6/14 0750

Client Sample # (s): - Total # of Samples: **8**

Relinquished (Client): *[Signature]* Date: **6-9-14** Time: **1800**

Received (Lab): *[Signature]* Date: **6/12/14** Time: **9:16am**

Comments/Special Instructions:





EMSL ANALYTICAL, INC.
LABORATORY PRODUCTS TRAINING

Asbestos Chain of Custody

EMSL Order Number (Lab Use Only):

041416476

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077

PHONE: (800) 220-3675
FAX: (856) 786-5974

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
BL-ABS-00024	ABS-Driving- Driver	600 L	6/6/14 0855
BL-ABS-00025	ABS-Driving- Driver	600 L	6/6/14 1000
BL-ABS-00026	Field Blank	NA	6/6/14
BL-ABS-00027	Lot Blank	N/A	6/6/14
BL-ABS-00028	ABS- Test Pit - backhoe operator	936 L	6/6/14 1110
BL-ABS-00029	ABS- Test Pit - Jumper	936 L	6/6/14 1110
BL-ABS-00030	Field blank	NA	6/6/14 1110
BL-ABS-00031	ABS-Drilling- Driller	960 L	6/9/14 1057
BL-ABS-00032	ABS-Drilling- Sampler	936 L	6/9/14 1058
BL-ABS-00033	Field blank	NA	6/6/14 1058
[The remaining rows of the table are crossed out with a large blue 'X']			

*Comments/Special Instructions:



Smollock, Meghan

From: Surbrugg, Edward <Edward.Surbrugg@tetrattech.com>
Sent: Thursday, June 12, 2014 6:55 PM
To: Smollock, Meghan
Cc: Denton, Robyn; Tisdale, Rob
Subject: RE: Project 10353259 ABS Samples

Meghan: You are right – 0.001 f/cc for the ABS samples. I have copied the stopping rules from the SAP. Thanks for checking.

Stopping Rules for ABS Air Samples

The stopping rules for this TEM analyses are:

1. Examine a minimum of two grid openings from each of two grids.
2. Continue examining grid openings until one of the following is achieved:
 - a. The target analytical sensitivity of 0.001 f/cc is achieved.
 - b. 25 PCME structures have been observed.
 - c. A total filter area of 1.0 mm² has been examined.

J. Edward Surbrugg, Ph.D. | Soil Scientist/Helena Operations Manager
Direct: 406.441.3269 | Main: 406.442.5588 | Fax: 406.442.7182 | Mobile: 406.459.0881

7 West 6th Avenue, Suite 612 | Helena, Montana 59601

Tetra Tech | Complex World, Clear Solutions™ | www.tetrattech.com

From: Smollock, Meghan [<mailto:mamollock@EMSL.com>]
Sent: Thursday, June 12, 2014 9:22 AM
To: Surbrugg, Edward
Cc: Denton, Robyn
Subject: Project 10353259 ABS Samples

Hi Ed,

I am in receipt of the samples listed on the attached chain of custody. Can you please confirm the sensitivity for these samples? I believe it should be 0.001 f/cc since they are ABS samples.

Thank you,



EMSL is going green. All invoices and reports will be delivered electronically, unless you tell us otherwise.



Meghan Smollock | *Special Projects Data Coordinator*

EMSL Analytical, Inc. | 200 Route 130 North | Cinnaminson, NJ 08077

Phone: 856-858-4800 Ext. 2208 | Fax: 856-786-5974 | Toll Free: 800-220-3675

Lab Hours: Mon-Friday 7AM-10PM, Saturday 8AM-5PM, Sunday On-Call

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