FIBERQUANT ANALYTICAL SERVICES

Polarized Light Microscope (PLM) Analysis for Asbestos in Bulk Sample

JobNumber:	**201905771**

Client: **SALT RIVER PROJECT**

EMPLOYEE SAFETY SVCS
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 # Samples: 3 PLM **Rec:** 6/18/2019 **Method:** EPA 600/R-93/116 The "New" Method; see below
Client Job: West Valley Switch Gear **PO Number:** 4500090968
Report Date: 6/21/2019 **Date Analyzed:** 6/21/2019 **Routing Number:** -

Method and Analysis Information: **Fiberquant Internal SOP:** PLMn

Each bulk sample is first dissected under a 7-30x magnification stereo-microscope. This examination is used to determine the general type of sample, how many and what type of layers it has, and initial estimates of fiber types and quantities. Second, liquid media mounts are made of each layer - such mounts may be of selected fibers (used solely for identification purposes) or may be representative of the layer as a whole (used for quantitation purposes). The mounts may be made in a synthetic Canadian balsam, one of several solvents, or in refractive index oils (media of known refractive index). Generally, a variety of different mounts are made: some optimized for fiber visibility, some optimized for fiber identification, and some optimized for fiber quantitation. The mounted slides are then examined at 50-400x magnification on a Nikon Labphot-pol microscope. Optical characteristics are used to identify each observed fiber type; the optical data are contained for each sample on its detail analysis sheet, attached.

Current EPA and NESHAP regulations designate a result of <=1 % asbestos as "negative" and >1 % asbestos as "positive". Samples containing layers that have been determined to be "positive" may have to be handled differently during a renovation or demolition than samples whose layers have been determined to be "negative."

The method of fiber identification and quantitation is the "Standard Operating Procedures for the Analysis of Asbestos in Bulk Samples using Polarized Light Microscopy", Chapter 7 of the Quality Assurance and Management Manual. This SOP and its associated reporting have been designed to satisfy all requirements in both EPA Method 600/M4-82-020 (The Interim Method) and EPA Method 600/R-93/116 (The New Method). The Interim Method is the required method for AHERA (US EPA 40 CFR Pt. 763), but this method calls for the reporting of composited results of multi-layered samples that is no longer an acceptable reporting practice in most circumstances. Current EPA rules, such as NESHAP (US EPA 40 CFR Pt. 61), as well as NVLAP accreditation policies, call for separate reporting for each layer of multi-layered samples. The New Method contains the same procedures for identification and quantification of asbestos as does the Interim Method, except that multi-layered samples are reported to comply with the latest US EPA rule. Fiberquant not only reports the asbestos content of each layer of multi-layered samples separately (satisfying current EPA and NVLAP reporting requirements), but Fiberquant also reports what percentage of the sample each layer comprises. Therefore, the results may be arithmetically composited to satisfy the reporting requirements of the Interim Method. The method of fiber quantitation is an estimation technique in which the analysts quantitation is routinely calibrated by reference quantitation standards, and which has been shown to be equivalent in precision and accuracy to point counting. Friability is estimated for the purposes of deciding when to point count. Friabilities determined in the field take precedence over those determined in the laboratory. Those sample layers which are friable and estimated by the analyst to contain <= 1% asbestos are point counted using 400 points. Such point counting is required by NESHAP (National Emission Standards for Hazardous Air Polutants, Nov. 1990) in order to rely on analytical results that are <= 1%. The coefficient of variation for the estimation quantitation technique is 100% in the range 0-5%. This means that PLM analysis is not capable of conclusively determining whether a layer containing close to 1% asbestos is actually "positive" or "negative". For this reason, Fiberquant refers to results where asbestos was detected but <= 1% as "borderline negative", and results where asbestos was >1 % but <= 2% as "borderline positive" to indicate the uncertainty in assigning a "positive" or "negative" label. In the sample summary, "ND" means that no asbestos was detected during the analysis. A "Tr" or "Trace" of asbestos reported is defined for our purposes as the detection of several asbestos fibers during the analysis; this level would be right at the limit of detection for the method. Trace is only reported on the analysis detail - in the summary a trace would be reported as <=1%. The limit of detection (the smallest % of asbestos that can be detected) varies greatly depending on the matrix in which the asbestos is found. As little as 0.001% asbestos can be detected in favorable samples, while detection in unfavorable samples may approach the detection limit of 1% stated in the method. During the analysis, the analyst, for Fiberquant identification purposes only, determines the "apparent sample type" and "apparent layer types." It must be emphasized that these types are only what is apparent. Often, different materials appear similar or identical after sampling, so the analyst may assign a type other than what was sampled.

Floor tiles present a special problem for PLM asbestos analysis. Floor tile can contain chrysotile fibers so thin that they cannot be resolved by optical methods. In such a case, we may observe a percentage of asbestos which is lower than the actual percentage, or not observe asbestos at all when some is present. For this reason, floor tiles reported as negative should be confirmed to be negative using transmission electron microscope (TEM) analysis. Likewise, vermiculite insulation materials containing traces of asbestiform asbestos present a problem for routine PLM analysis - the amphiboles are sometimes present in trace amounts inhomogeneously distributed. For this reason, loose vermiculite samples reported as negative should be confirmed to contain no amphibole using hydroseparation techniques.

The samples were analyzed under the following ongoing quality assurance program: Blank samples are routinely analyzed to maintain contamination-free materials. Each analyst has at least a bachelor's degree in physical science, and has also completed extensive training specific to asbestos analysis for 1-3 months before being allowed to analyze client samples. Qualitative reference samples are routinely analyzed to assure that analysts can identify asbestos and asbestos-look-alike fibers. Quantitative reference samples are routinely analyzed to calibrate and characterize the

estimation procedure. Microscope alignment is checked each day. Refractive index oils are calibrated at least quarterly. At least 10% of client samples are re-analyzed from scratch by a different analyst than the original, and any discrepancies are resolved for the sample and similar sample types before the results are reported. All quality checks performed for these samples were in control except as detailed in the "Analytical Notes" below. All analysts participate in interlab round robins and proficiency testing to assure competence. Fiberquant is accredited by NVLAP (Lab code #101031) for the analysis of bulk samples for asbestos using PLM. Accreditation does not imply endorsement by the EPA, any other United States governmental agency or any private agency or association. Each lab analysis refers only to the sample tested, and may not, due to the sampling process, be representative of the material sampled. This report may not be reproduced except in full, without the approval of Fiberquant Analytical Services.

Some results may have been calculated using client supplied data, such as volume or area sampled, for which Fiberquant assumes no liability for accuracy.

Job Analysis Notes:

"Analyze Until Positive Found" criteria were followed where requested by the client on the chain of custody.

PLM Analysis Summary: **Job Number: 201905771** West Valley Switch Gear

Sample Number / Layer	Color	Apparent Layer Type *	Lab Number / *Asbestos Results*	Apparent Sample Type *	Positive Layer Yes or No
Sample # **WVSC-061219-1**			2019-05771- 1	Miscellaneous	Positive Layer? No
Layer # 1	tan	panel	*no asbestos detected*		
Sample # **WVSC-061219-2**			2019-05771- 2	Miscellaneous	Positive Layer? No
Layer # 1	tan	panel	*no asbestos detected*		
Sample # **WVSC-061219-3**			2019-05771- 3	Miscellaneous	Positive Layer? No
Layer # 1	tan	panel	*no asbestos detected*		

* Apparent Sample Types and Apparent Layer Types are as they appeared to the analyst. Since many types of materials appear similar after sampling damage, the apparent type of material may not be the actual type of material.

Sample WVSC-061219-1 **Lab Number** 2019-05771- 1 **Sampled:** 6/12/2019 **Condition:** acceptable
Analyzed By RAM 6/21/2019 **An?** OK **Apparent Smp Type** Miscellaneous Fibrous Mat
Homogeneous Yes **# Layers** 1 **Pos Layer?** No
Non-Fibrous Components (in approx. decreasing order): polymer, filler,

Layers

#	Layer Type	%	Color	Friability	Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	panel	100	tan	1	60-70%	-	-	-	-	-
	Total %	100		**Overall %**	60-70%	-	-	-	-	-
				Fiber Identification:	glass fiber					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	glass fiber	CL	D	Y									
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample WVSC-061219-2 **Lab Number** 2019-05771- 2 **Sampled:** 6/12/2019 **Condition:** acceptable
Analyzed By RAM 6/21/2019 **An?** OK **Apparent Smp Type** Miscellaneous Fibrous Mat
Homogeneous Yes **# Layers** 1 **Pos Layer?** No
Non-Fibrous Components (in approx. decreasing order): polymer, filler,

Layers

#	Layer Type	%	Color	Friability	Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	panel	100	tan	1	60-70%	-	-	-	-	-
	Total %	100		**Overall %**	60-70%	-	-	-	-	-
				Fiber Identification:	glass fiber					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	glass fiber	CL	D	Y									
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample WVSC-061219-3 **Lab Number** 2019-05771- 3 **Sampled:** 6/12/2019 **Condition:** acceptable
Analyzed By RAM 6/21/2019 **An?** OK **Apparent Smp Type** Miscellaneous Fibrous Mat
Homogeneous Yes **# Layers** 1 **Pos Layer?** No
Non-Fibrous Components (in approx. decreasing order): polymer, filler,

Layers

#	Layer Type	%	Color	Friability	Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	panel	100	tan	1	60-70%	-	-	-	-	-
	Total %	100		**Overall %**	60-70%	-	-	-	-	-
				Fiber Identification:	glass fiber					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	glass fiber	CL	D	Y									
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Fr=Friability: 1=very non-friable; 2= non-friable; 3=friable; 4=highly friable
Colors: B=black;BL=blue;BR=brown;CL=clear;G=Green;GY=gray;OR=orange;OW=off-white;PN=pink;PU=purple;R=red;TN=tan;W=white;Y=yellow;V=various
Fiber Morphology: A=fine fibers/bundles, white, sinewy, flexible; B=fine fibers/bundles, w-br, straight, broomed ends; C=fine fibers/bundles, blue, straight, broomed ends; D=fine to coarse fibers, CL-B, brittle; E=coarse fibers,CL or dyed, striated; F=coarse fibers or splinters, W-BR, ribbon-like; G=lath-like or shards, low aspect ratio, may taper
Iso=isotropism - may be yes or no; Pleo=pleochroism - may be yes or no; Bi=birefringence - may be None, Low, Medium or High
Elg=sign of elongation - may be +, - or B (both); Ext=extinction - may be Parallel, Oblique, None or Undulating; Oil=medium used to for dispersion staining
Col Par=dispersion staining colors parallel to the fiber (fiber/halo): b/w=black/white; dg/py=dark gray/pale yellow; vg/y=violet gray/yellow; db/ly=dark blue/lemon yellow; vb/g= vivid blue/gold; sb/o=sky blue/orange; pb/r=pale blue/red; gb/dr=gray blue/dark red; w/b=white/black. Col Perp=same only perpendicular to fiber.
RI Par=refractive index parallel to fiber; RI Perp=refractive index perpendicular to fiber

Analyst: ROBERT A. McCORMICK

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Larry S. Pierce, Approved Accreditation Signatory

FIBERQUANT ANALYTICAL SERVICES

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Analysis Request/Chain-of-Custody Form

Submitted by (Company)	SALT RIVER PROJECT ESS/Facilities Dept
Address	PO BOX 52025 PAB 342
City, State, Zip Code	Phoenix, AZ 85072
Phone	((602) 236-8124 FAX
Email	

Invoice to (Company)	USE SRP9
Address	
City, State, Zip Code	
Phone	FAX

Contact (print)	Randi Korte Aaron Baldwin
Sampled by (signature)	
Job Number or Project Name	West Valley Switchyard
PO Number	4500090968

<Analysis Method Requested> ONLY ONE METHOD per COC			Turn-around-time (circle one) Rush		Norm	Ext.
Asbestos by PLM	Method > (Improved) Interim		Urgent Rush <3 hrs	<6 hrs	1-3 days	15-30 days
	Analyze > All (ATPF)					
	If ATPF then > by Layer by Sample					
	Single Layer Protocol > Yes No					
Fibers by PCM	Method > 7400 (Area) ORM (Personal)		<4 hrs		24 hrs	-
Asbestos by TEM	in Air > AHERA Mod. AHERA		<6 hrs		24 hrs	3-5 days
	in Water* > Water Sludge		1-2 days		3-5 days	N/A
	in Bulk (Annex2) > Chatfield Full Quant.					
	in Dust > ASTM D5755		3-5 days		5-10 days	N/A
Pb by FLAA	Analyte > Pb Other		<6 hrs		2-3 days	N/A
	Matrix > Filter > MCE FG					
	Paint > by Area (mg/cm²) by Weight (ppm)					
	Soil >					
	Wipe >					
	Initial here certifying wipes used are ASTM E1792 compliant ____					
Fungi	Air Sample > Zefon Aller Other		<6 hrs		1-2 days	N/A
	Bulk > Sample Swab					
	Tape Lift > Qualitative (% & type)					
	Quantitative (type/cm2)					
Soot	ASTM D6602-03b	Optical	<6 hrs		1-2 days	N/A
		Optical & TEM	1-2 days		3-5 days	N/A
Other			Call		Call	

Sample # (1 per line)	Description/Location	Sample Date	Sample Time	Vol. or Area
1) WVSC-061219-1	Fiberglass Board	6-12-19		
2) -2	"	"		
3) -3	"	"		
4)				
5)				
6)				
7)				
8)				
9)				
10)				
11)				
12)				
13)				
14)				
15)				
16)				
17)				
18)				
19)				
20)				

1)Relinquished by:	Date: 6/18/19	Time: 1:25pm	3)Relinquished by:	Date:	Time:
2)Received by:	Date: 6/18/19	Time: 1:25pm	4)Received by:	Date:	Time:
* TEM Water: Sampler's Name Required by State of Arizona	Print Name		Fiberquant assigned Job Number>	20190577 1	
Review of Analysis Request (Initials):				Page of	

Important: By signing above you as Fiberquant's customer are agreeing to payment within 30 days unless other arrangements are made in writing.
Note: Data completed by client (including number and identity of samples) is assumed to be correct until it is verified at time of sample preparation.