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Project / Location: Richmond Industrial Fire; Quote ALS-100 Mod. 1

PO Number: Not Provided

ALS Work Order: 23040743

NARRATIVE: Analysis was performed on an FEI Tecnai TEM at 100keV equipped with an EDAX/Ametek Octane T Plus Silicon Drift Detector System and Z2 Analyzer. Morphology, SAED, and EDXA used to determine fiber species. All sample collection is performed independent of ALS and is the sole responsibility of client. If collection or submission deviates from method requirements, then interpretation of the results via the method cannot be made. Samples archived for 60 days, prepared grids archived 3 years. Results apply only to portions of samples analyzed. Raw data validated by analyst. Representative EDXA spectra and/or SAED photomicrographs available upon request for an additional fee.

REPORT LIMITS: NIOSH Method 7402 (Issue 2, 15 August 1994), "The LOD depends on sample volume and quantity of interfering dust, and is <0.01 fiber/cc for atmospheres free of interferences." The AS for this method is based on the detection of one confirmed asbestos fiber in the total area analyzed and is expressed in fibers/mm² which is dependent upon the EFA of the media used and in fibers/cc(mL) which is dependent upon the air volume (L) collected as provided by the client. This method defines a fiber as any particle $>5\mu\text{m}$ long, $>0.25\mu\text{m}$ in diameter and having a length to width aspect ratio $\geq 3:1$. As with any measurement statistically derived uncertainty data as it impacts this method should be considered when interpreting results. Measures of individual analyst and laboratory accuracy and precision are tabulated quarterly and available upon request.

METHOD CODES: "N7402" refers to air samples prepared by the direct transfer method and analyzed by TEM for airborne asbestos and other fibers according to NIOSH Method 7402 protocol. "N7402 IND" refers to samples exhibiting loose material, uneven loading, or overloading ($>50\%$ particulate coverage) which were prepared using an indirect method detailed in ASTM D5755. In either case, a minimum of 6 grid openings are analyzed and analysis is terminated upon completion of the opening containing the 100th fiber or the 40th grid opening, whichever is first. Results are not field blank corrected.

[†]This method calls for calculation of the fraction of optically visible asbestos (FOVA) which may be applied to PCM NIOSH Method 7400 results for the same filter or other filters for which the sample is representative in order to estimate the concentration of asbestos. The fraction reported herein is calculated; f_s/F_s . Where; f_s is the total number of asbestos fibers detected by TEM, and F_s is the combined total of all fibers (asbestos and non-asbestos) detected by TEM.

ALS SOP ID: TEM-SOP-NIOSH-058 Operations; "TEM NIOSH 7402 Analysis"

ACRONYMS: TEM=Transmission Electron Microscope, SAED=Selected Area Electron Diffraction, EDXA=Energy Dispersive X-ray Analysis, LOD=Limit of Detection, AS=Analytical Sensitivity, EFA=Effective Filter Area, NA=Not Applicable, ND=None Detected, NAF=Non-asbestos fiber
ALS is accredited for NIOSH Method 7402 through New York ELAP (Lab#11371).

Pamela M. Hizar

Pamela M. Hizar

ALS Asbestos & Microscopy Technical Lead & Department Manager

SAMPLE IDENTIFICATION

	RIF-PA01-HV-	RIF-PA01-LV-	RIF-PA01-LV-	RIF-PA02-HV-	RIF-PA02-LV-
Client Sample ID:	20230419-a	20230419-a	20230419-b	20230419	20230419
ALS Sample ID:	23040743-01A	23040743-02A	23040743-03A	23040743-04A	23040743-05A
Method:	N7402	N7402	N7402	N7402	N7402
Analyst:	Pamela Hizar	Pamela Hizar	Pamela Hizar	Pamela Hizar	Pamela Hizar
Date:	4/20/2023	4/20/2023	4/20/2023	4/20/2023	4/20/2023
Air Volume (L):	4617.46	1365.06	1392.84	5360.23	1414.73
Fraction Filtered:	NA	NA	NA	NA	NA
Openings:	40	40	40	40	40
Open Area (mm ²):	0.0102	0.0102	0.0102	0.0102	0.0102
AS: Fibers/mm ² :	2.45	2.45	2.45	2.45	2.45
AS: Fibers/cc(mL):	0.0002	0.0007	0.0007	0.0002	0.0007

ASBESTOS COUNT

Chrysotile:	0	0	0	0	0
Amosite:	0	0	0	0	0
Crocidolite:	0	0	0	0	0
Actinolite:	0	0	0	0	0
Tremolite:	0	0	0	0	0
Anthophyllite:	0	0	0	0	0
Total Asbestos:	0	0	0	0	0

ASBESTOS CONCENTRATIONS

Fibers/mm ² :	<AS	<AS	<AS	<AS	<AS
Fibers/cc(mL):	<AS	<AS	<AS	<AS	<AS

NON-ASBESTOS FIBERS (NAF)

Count:	4.5	1.5	0	2.5	0
Fibers/mm ² :	11.03	3.68	<AS	6.13	<AS
Fibers/cc(mL):	0.0009	0.0010	<AS	0.0004	<AS
Dominant NAF:	Mineral	Mineral	ND	Mineral	ND
Prep Comments:	NA	NA	NA	NA	NA
Analysis Comments:	NA	NA	NA	NA	NA

Results Comments:	Biased; fiber counts outside optimal range.	Biased; fiber counts outside optimal range.	Biased; fiber counts outside optimal range.	Biased; fiber counts outside optimal range.	Biased; fiber counts outside optimal range.
FOVA ^T :	0	0	0	0	0

SAMPLE IDENTIFICATION

	RIF-PA03-HV-	RIF-PA03-LV-	RIF-PA04-HV-	RIF-PA04-LV-	RIF-UW01-HV-
Client Sample ID:	20230419	20230419	20230419	20230419	20230419
ALS Sample ID:	23040743-06A	23040743-07A	23040743-08A	23040743-09A	23040743-10A
Method:	N7402	N7402	N7402	N7402	N7402
Analyst:	Pamela Hizar	Pamela Hizar	Pamela Hizar	Pamela Hizar	Pamela Hizar
Date:	4/20/2023	4/20/2023	4/20/2023	4/20/2023	4/20/2023
Air Volume (L):	4536.42	1458.8	4379.48	1317.29	3783.81
Fraction Filtered:	NA	NA	NA	NA	NA
Openings:	40	40	40	40	40
Open Area (mm ²):	0.0102	0.0102	0.0102	0.0102	0.0102
AS: Fibers/mm ² :	2.45	2.45	2.45	2.45	2.45
AS: Fibers/cc(mL):	0.0002	0.0006	0.0002	0.0007	0.0002

ASBESTOS COUNT

Chrysotile:	0	0	0	0	0
Amosite:	0	0	0	0	0
Crocidolite:	0	0	0	0	0
Actinolite:	0	0	0	0	0
Tremolite:	0	0	0	0	0
Anthophyllite:	0	0	0	0	0
Total Asbestos:	0	0	0	0	0

ASBESTOS CONCENTRATIONS

Fibers/mm ² :	<AS	<AS	<AS	<AS	<AS
Fibers/cc(mL):	<AS	<AS	<AS	<AS	<AS

NON-ASBESTOS FIBERS (NAF)

Count:	4	0	1	0	2
Fibers/mm ² :	9.80	<AS	2.45	<AS	4.90
Fibers/cc(mL):	0.0008	<AS	0.0002	<AS	0.0005
Dominant NAF:	Mineral	ND	Mineral	ND	Mineral
Prep Comments:	NA	NA	NA	NA	NA
Analysis Comments:	NA	NA	NA	NA	NA

	<i>Biased; fiber counts</i>	<i>Biased; fiber counts</i>	<i>Biased; fiber counts</i>	<i>Biased; fiber counts</i>	<i>Biased; fiber counts</i>
Results Comments:	<i>outside optimal range.</i>	<i>outside optimal range.</i>	<i>outside optimal range.</i>	<i>outside optimal range.</i>	<i>outside optimal range.</i>
FOVA ^T :	0	0	0	0	0

SAMPLE IDENTIFICATION

	RIF-UW01-LV-20230419	RIF-CA01-HV-20230419	RIF-CA02-HV-20230419	RIF-LB01-ABZ-20230419	RIF-LB01-CBZ-20230419
Client Sample ID:	20230419	20230419	20230419	ABZ-20230419	CBZ-20230419
ALS Sample ID:	23040743-11A	23040743-12A	23040743-13A	23040743-14A	23040743-16A
Method:	N7402	N7402	N7402	N7402	N7402
Analyst:	Pamela Hizar	Pamela Hizar	Pamela Hizar	Pamela Hizar	Pamela Hizar
Date:	4/20/2023	4/20/2023	4/20/2023	4/20/2023	4/20/2023
Air Volume (L):	1512.77	4868.85	4092.48	986.05	1000.99
Fraction Filtered:	NA	NA	NA	NA	NA
Openings:	40	40	40	40	40
Open Area (mm ²):	0.0102	0.0102	0.0102	0.0102	0.0102
AS: Fibers/mm ² :	2.45	2.45	2.45	2.45	2.45
AS: Fibers/cc(mL):	0.0006	0.0002	0.0002	0.0010	0.0009

ASBESTOS COUNT

Chrysotile:	0	0	0	0	0
Amosite:	0	0	0	0	0
Crocidolite:	0	0	0	0	0
Actinolite:	0	0	0	0	0
Tremolite:	0	0	0	0	0
Anthophyllite:	0	0	0	0	0
Total Asbestos:	0	0	0	0	0

ASBESTOS CONCENTRATIONS

Fibers/mm ² :	<AS	<AS	<AS	<AS	<AS
Fibers/cc(mL):	<AS	<AS	<AS	<AS	<AS

NON-ASBESTOS FIBERS (NAF)

Count:	3.5	0	3	0	0
Fibers/mm ² :	8.58	<AS	7.35	<AS	<AS
Fibers/cc(mL):	0.0022	<AS	0.0007	<AS	<AS
Dominant NAF:	Mineral	ND	Mineral	ND	ND
Prep Comments:	NA	NA	NA	NA	NA
Analysis Comments:	NA	NA	NA	NA	NA

Results Comments: *Biased; fiber counts outside optimal range.* *Biased; fiber counts outside optimal range.* *Biased; fiber counts outside optimal range.* *Biased; fiber counts outside optimal range.* *Biased; fiber counts outside optimal range.*

FOVA^T: 0 0 0 0 0

SAMPLE IDENTIFICATION

	Equipment Blank-	Lot Blank-
Client Sample ID:	20230419	2023419
ALS Sample ID:	23040743-17A	23040743-18A
Method:	N7402	N7402
Analyst:	Pamela Hizar	Pamela Hizar
Date:	4/20/2023	4/20/2023
Air Volume (L):	0	0
Fraction Filtered:	NA	NA
Openings:	40	40
Open Area (mm ²):	0.0102	0.0102
AS: Fibers/mm ² :	2.45	2.45
AS: Fibers/cc(mL):	NA	NA

ASBESTOS COUNT

Chrysotile:	0	0
Amosite:	0	0
Crocidolite:	0	0
Actinolite:	0	0
Tremolite:	0	0
Anthophyllite:	0	0
Total Asbestos:	0	0

ASBESTOS CONCENTRATIONS

Fibers/mm ² :	<AS	<AS
Fibers/cc(mL):	NA	NA

NON-ASBESTOS FIBERS (NAF)

Count:	0	0
Fibers/mm ² :	<AS	<AS
Fibers/cc(mL):	NA	NA
Dominant NAF:	ND	ND
Prep Comments:	NA	NA
Analysis Comments:	NA	NA

Biased; fiber counts *Biased; fiber counts*
 Results Comments: *outside optimal range.* *outside optimal range.*
 FOVA^T: 0 0