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ADMINISTRATIVE RECORD

# W.R. GRACE VERMICULITE MINE CLOSURE WATER QUALITY DATA REPORT NO. 6 SEPTEMBER, 1994

*Submitted to:*

**Montana Department of State Lands**
**Hard Rock Mining Bureau**
**Helena, Montana**

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*Submitted by:*

**Schafer and Associates**
**Bozeman, Montana**

**February 3, 1995**

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February 3, 1995

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Mr. Pat Plantenberg
Department of State Lands
Hardrock Mining Bureau
1625 Eleventh Avenue
Helena, Montana 59620

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STATE LANDS

Dear Pat:

Enclosed are two copies of Water Quality Data Report No. 6 summarizing the results of the second post-reclamation water sampling data at the W.R. Grace vermiculite mine near Libby. Data for this report was collected September 19, 1994. Please forward one copy of the report to Tom Reid at the Water Quality Bureau for their files.

The data for this report are similar to that we have been reporting in previous reports. If you recall, our last report was the first that showed all data below the values for the drinking water standard including the analyses for asbestos and fluoride, the two components which have historically been above or near the drinking water standard. For the latest sampling, we collected one sample from Lower Rainy Creek with asbestos at about 25.0 million fibers per liter (MFL). The standard is 7 MFL. However, our replicate sample was from this same location and analyzed only 4.6 MFL. The asbestos analysis has always shown less reproducibility between replicate samples than the other analyses but this is poorer agreement than we're used to seeing. So, there is some question regarding the analysis or sampling for this particular sample. In any event, the data does not change any of the basic conclusions we have drawn regarding asbestos in Lower Rainy Creek.

The fluoride analysis was also up slightly in the tailings dam toe drain sample after showing a trend of slowly declining values. However, I note that the drinking water standards were updated in July, 1993 and the standard for fluoride was one of those that changed. The new standard is 4.0 mg/L F. All of our samples have been below this value since we began sampling in 1991.

If you have any questions regarding the report please call. Our next planned sampling event is in the fall of 1995. At that time we would like to review the status of the water quality in the study area to determine whether continued monitoring will be required.

Sincerely,

Tom Hudson

Tom Hudson
Project Manager

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# 1.0 BACKGROUND

The W.R. Grace vermiculite mine near Libby, Montana was closed in the fall of 1990. As part of the reclamation and closure, particularly as it applies to areas around the tailings impoundment, W.R. Grace submitted to the Water Quality Bureau a proposed Water Quality Monitoring Plan in September, 1991 (Schafer and Associates, 1991). The purpose of the Plan was to establish post-closure water quality data as a means of monitoring the performance of facility reclamation measures.

The plan called for water sampling at several locations in the Rainy Creek drainage as shown on Figure 1.1. Contingent sampling on the Kootenai River was proposed if initial data on Rainy Creek indicated a significant potential health concern. Four sampling campaigns were proposed for the first year to characterize pre-reclamation water quality conditions and assess seasonal variations in water quality. Additional annual sampling campaigns for a minimum of three years following closure were also proposed. The first sampling event took place in mid-November, 1991, the second in late March, 1992, the third in early July, 1992 and the fourth in late October, 1992. Results from these pre-reclamation sampling events were reported in Water Quality Data Report No.1, No. 2, No.3 and No. 4, respectively (Schafer and Associates, 1992 a,b,c and 1993). Data from these sampling events indicated that fluoride was slightly above the drinking water standard in effect at that time (2.0 mg/l F) in the tailings dam toe drains. However, drinking water standards were updated in July, 1993 and the standard for fluoride was one of those that was changed. The new standard is 4.0 mg/l F, a value which has never been exceeded in any of the samples taken to date.

Asbestiform fibers were also above drinking water standards in Lower Rainy Creek. Although Carney Creek carried fibers potentially attributable to mine waste dumps and Fleetwood Creek carried fibers which appear to be of natural origin, neither tributary could account for the quantity of fibers found in Lower Rainy Creek. It was concluded that the Lower Rainy Creek streambed was the source of the high asbestiform fiber count and that this was probably the result of old mining practices which discharged tailings directly into the drainage without prior settlement.

Facility demolition and reclamation activities were completed in 1992 and early 1993. In October of 1993 the first of the post-closure water sampling campaigns was completed. That sampling event produced the first occasion for which all samples including fluoride and asbestiform fibers were lower than the drinking water standard. This report is the second of the post-closure water quality reports summarizing data from water samples collected September 19, 1994.

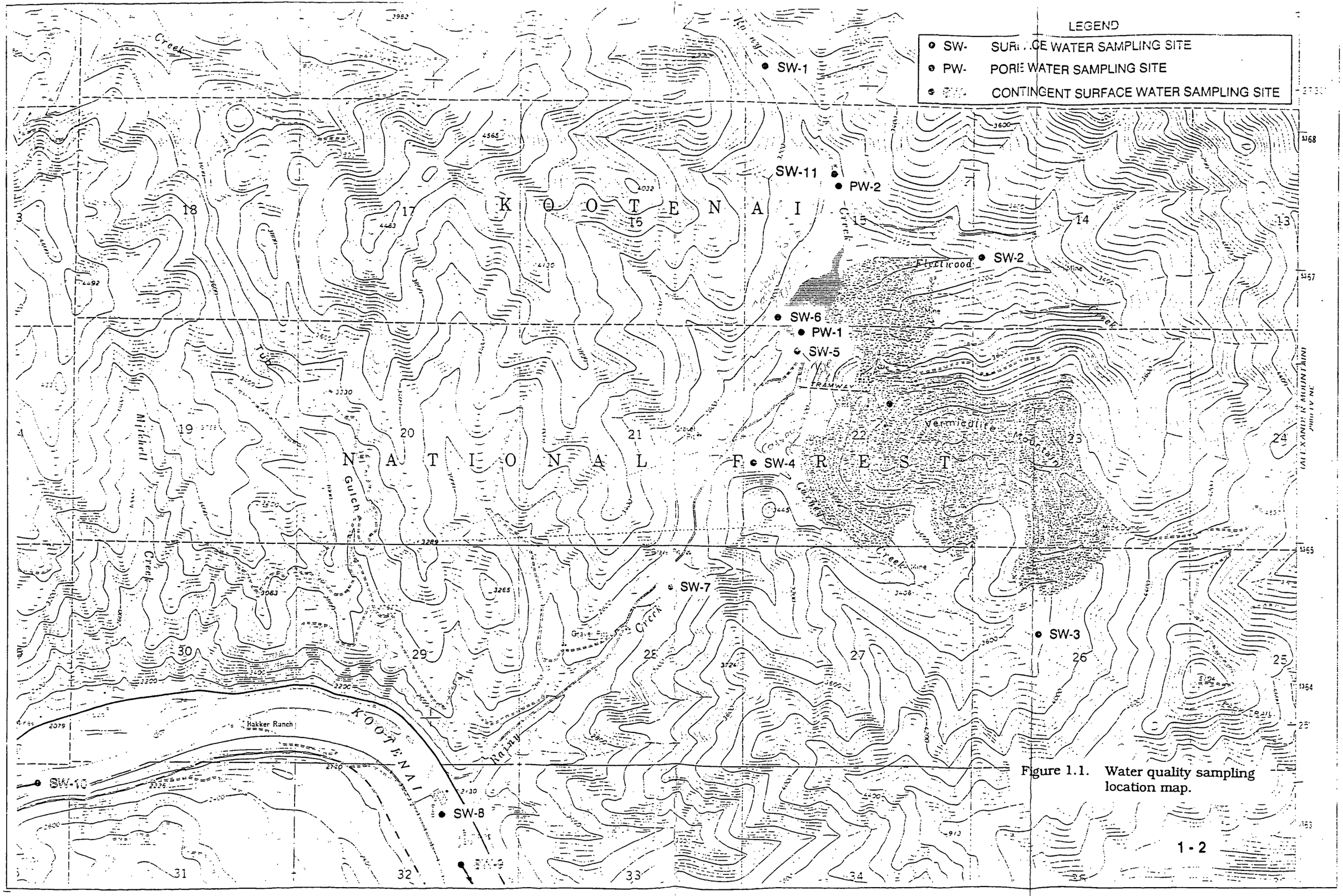


Figure 1.1. Water quality sampling location map.

# 2.0 METHODS

Weather at the time of sampling was partly cloudy and mild. Temperatures ranged from 65° F to 85° F. The tailing pond surface water was restricted to the upper half of the impoundment. At the time of sampling there was no surface water discharge from the impoundment through the new concrete spillway which was built in the spring of 1993. However, W.R. Grace personnel reported that there was sufficient spring runoff for the channel to flow briefly earlier in the year.

Sampling methods were outlined in the Water Quality Monitoring Plan (Schafer and Associates, 1991) submitted in September, 1991 and modified slightly in the field as described in Water Quality Data Report No. 1 (Schafer and Associates, 1992). For the post-closure sampling, modifications were made to the initial plan to reduce the number of samples and the analyses performed on them based on the results of baseline sampling. These changes were outlined in a letter to DSL dated January 13, 1992 accompanying Water Quality Data Report No. 4. The revised sampling plan concentrated on the fluoride and asbestiform fibers in Lower Carney Creek, toe drains and surface discharge from the tailings impoundment, and Lower Rainy Creek. Since elevated metal concentrations were not detected in baseline sampling, metal analyses were removed from the analytical list. DSL agreed to the suggested changes and recommended that annual post-closure sampling take place each year in the fall of the year during base flow.

During the past year the routing of Carney Creek was altered to divert its flow into the small pond below the tailings impoundment. This pond was previously used as a reservoir for a process water pump station. Carney Creek had been flowing into a small sediment trap, then through a culvert into Rainy Creek just below the reservoir. The rerouting required that the sampling location for Lower Carney Creek (SW-4) be relocated upstream about 100 feet.

The preservation techniques and analytical methods used are summarized in Table 2.1. All samples were stored and shipped on ice.

**Table 2.1. Summary of sampling and analytical methods for water samples.**

| Unpreserved Samples | | Field Parameters | |
|---|---|---|---|
| **Component** | **Analytical Method[1]** | **Parameter** | **Method** |
| TDS | EPA 160.1 | Flow | Pygmy current meter/ Baski flume |
| TSS | EPA 160.2 | pH | Field pH meter |
| Asbestiform Fibers | EPA-600/4-83-043 | EC | Field EC meter |
| Hardness | EPA 130.2 | Temperature | Field meter |
| Alkalinity | EPA 310.1 | | |
| $NO_3^{-1}$ | EPA 353.2 | | |
| $SO_4^{-2}$ | EPA 375.3 | | |
| $Cl^{-1}$ | EPA 325.3 | | |
| $F^{-1}$ | EPA 340.2 | | |
| Ca | EPA 215.1/200.7 | | |
| Mg | EPA 242.1/200.7 | | |
| Na | EPA 273.1/200.7 | | |
| K | EPA 258.1/200.7 | | |
| $CO_3^{-2}/HCO_3^{-1}$ | EPA 310.1 | | |

[1] EPA procedures are described in 40 CFR Part 136, Table B. Procedures for asbestiform fibers are described in "Analytical Procedures for Determination of Asbestos Fibers in Water" (EPA-600/4-83-043).

# 3.0 PRESENTATION OF DATA

Results of the September 19, 1994 sampling are summarized in tabular form as follows:

- Table 3.1 is a summary of field parameters including pH, electric conductivity (EC), temperature and flow.
- Table 3.2 is a summary of major cation and anion analyses.
- Table 3.3 is a summary of miscellaneous analyses for various components, alkalinity, hardness, etc.
- Table 3.4 is a summary of asbestiform fiber analyses.

Raw analytical data from Energy Laboratories and EMS Laboratories used to prepare Tables 3.2, 3.3 and 3.4, are included in Appendix A and B, respectively.

**Table 3.1. Field data summary.**

| SITE NO. | DESCRIPTION | pH (su) | EC (mmhos/cm) | TEMP (°C) | FLOW (cfs) |
|---|---|---|---|---|---|
| SW-1 | Upper Rainy Creek above diversion dam | Not Sampled | | | |
| SW-2 | Fleetwood Creek above coarse tails | 8.76 | 0.41 | 15.4 | 0.02[1] |
| SW-3 | Upper Carney Creek at Zook's Dump | Not Sampled | | | |
| SW-4 | Lower Carney Creek above Rainy Creek | 8.60 | 0.58 | 3.0 | 0.13[2] |
| SW-5 | Tailings dam toe drains | 7.21 | 0.53 | 4.1 | 0.64[2] |
| SW-6 | Tailings pond outfall[5] | Not Sampled | | | |
| SW-7 | Lower Rainy Creek leaving mine property | Not Sampled | | | |
| SW-8 | Lower Rainy Creek above Kootenai River | 8.48 | 0.44 | 3.2 | .58[2] |
| SW-9 | Kootenai River above Rainy Creek | Not Sampled[3] | | | |
| SW-10 | Kootenai River below Rainy Creek | Not Sampled[3] | | | |
| SW-11[4] | Rainy Creek flow into tailings pond | 8.29 | 0.33 | 10.3 | 0.02[1] |
| PW-1 | Tailings Pond pore water | Not Sampled | | | |
| PW-2 | Groundwater near SW-11 | Not Sampled | | | |

1 Flows were very small. Visual estimates were made.
2 Flow measurement was with a Pygmy current meter.
3 Samples of the Kootenai River were not taken as discussed in the Water Quality Monitoring Plan.
4 The original Water Quality Monitoring Plan did not include this site.
5 There was no surface flow from the impoundment.

**Table 3.2. Laboratory data summary for major cations and anions.**

| SITE NO. | DESCRIPTION | K (mg/l) | Na (mg/l) | Ca (mg/l) | Mg (mg/l) | $SO_4^{-2}$ (mg/l) | $Cl^{-1}$ (mg/l) | $CO_3^{-2}$ (mg/l) | $HCO_3^{-1}$ (mg/l) |
|---|---|---|---|---|---|---|---|---|---|
| SW-1 | Upper Rainy Creek above diversion dam | Not Sampled | | | | | | | |
| SW-2 | Fleetwood Creek above coarse tails | Not Sampled | | | | | | | |
| SW-3 | Upper Carney Creek at Zook's Dump | Not Sampled | | | | | | | |
| SW-4 | Lower Carney Creek above Rainy Creek | 13 | 9 | 103 | 30 | 21 | 3 | NR | NR |
| SW-5 | Tailings dam toe drains | 11 | 6 | 94 | 25 | 7 | 6 | NR | NR |
| SW-6 | Tailings pond surface water | Not Sampled | | | | | | | |
| SW-7 | Lower Rainy Creek leaving mine property | Not Sampled | | | | | | | |
| SW-8 | Lower Rainy Creek above Kootenai River | 9 | 7 | 84 | 20 | 11 | 9 | NR | NR |
| SW-0 | Blind Control (Replicate of SW-8) | 9 | 6 | 83 | 20 | 15 | 9 | NR | NR |
| SW-9 | Kootenai River above Rainy Creek | Not Sampled | | | | | | | |
| SW-10 | Kootenai River below Rainy Creek | Not Sampled | | | | | | | |
| SW-11 | Rainy Creek flow into tailings pond | Not Sampled | | | | | | | |
| PW-1 | Pore water from tailings | Not Sampled | | | | | | | |
| PW-2 | Groundwater near SW-11 | Not Sampled | | | | | | | |

NR = Not reported. Laboratory report did not speciate carbonate forms.

**Table 3.3. Laboratory data summary for miscellaneous constituents.**

| SITE NO. | DESCRIPTION | TDS (mg/l) | TSS (mg/l) | Hardness (mg/l) | Alkalinity (mg/l) | $NO_3^{-1}$ (mg/l) | $F^{-1}$ (mg/l) |
|---|---|---|---|---|---|---|---|
| SW-1 | Upper Rainy Creek above diversion dam | Not Sampled | | | | | |
| SW-2 | Fleetwood Creek above coarse tails | Not Sampled | | | | | |
| SW-3 | Upper Carney Creek at Zook's Dump | Not Sampled | | | | | |
| SW-4 | Lower Carney Creek above Rainy Creek | 450 | 7 | 378 | 385 | 0.40 | 0.20 |
| SW-5 | Tailings dam toe drains | 404 | 3 | 339 | 344 | <0.05 | 2.40 |
| SW-6 | Tailings pond surface water | Not Sampled | | | | | |
| SW-7 | Lower Rainy Creek leaving mine property | Not Sampled | | | | | |
| SW-8 | Lower Rainy Creek above Kootenai River | 350 | 5 | 292 | 286 | 0.07 | 1.18 |
| SW-0 | Blind Control (Replicate of SW-8) | 351 | <1 | 288 | 293 | 0.06 | 1.11 |
| SW-9 | Kootenai River above Rainy Creek | Not Sampled | | | | | |
| SW-10 | Kootenai River below Rainy Creek | Not Sampled | | | | | |
| SW-11 | Rainy Creek flow into tailings pond | Not Sampled | | | | | |
| PW-1 | Pore water from tailings | Not Sampled | | | | | |
| PW-2 | Groundwater near SW-11 | Not Sampled | | | | | |

**Table 3.4. Laboratory data summary for asbestiform fibers.**

| SITE NO. | DESCRIPTION | DETECTION LIMIT (MFL)* | FIBERS <5µm (MFL)* | FIBERS >5µm (MFL)* | FIBERS >10µm (MFL)* | FIBER MASS (µg/l) |
|---|---|---|---|---|---|---|
| SW-1 | Upper Rainy Creek above diversion dam | Not Sampled | | | | |
| SW-2 | Fleetwood Creek above coarse tails | Not Sampled | | | | |
| SW-3 | Upper Carney Creek at Zook's Dump | Not Sampled | | | | |
| SW-4 | Lower Carney Creek above Rainy Creek | 0.4 | 32.0 | 10.0 | 2.9 | 42 |
| SW-5 | Tailings dam toe drains | 0.7 | ND | ND | ND | ND |
| SW-6 | Tailings pond surface water | Not Sampled | | | | |
| SW-7 | Lower Rainy Creek leaving mine property | Not Sampled | | | | |
| SW-8 | Lower Rainy Creek above Kootenai River | 1.9 | 112.0 | 68.0 | 25.0 | 560 |
| SW-0 | Blind Control (Replicate of SW-8) | 0.6 | 42.0 | 20.0 | 4.6 | 260 |
| SW-9 | Kootenai River above Rainy Creek | Not Sampled | | | | |
| SW-10 | Kootenai River below Rainy Creek | Not Sampled | | | | |
| SW-11 | Rainy Creek flow into tailings pond | Not Sampled | | | | |

* MFL = Million fibers per liter

# 4.0 DATA ANALYSIS

Data for streamflow, fluoride and asbestiform fibers collected during the last four base flow periods is compared in Table 4.1.

Stream flow data in Lower Rainy Creek continues to show a trend of slowly decreasing volume. Some of this volume decrease has been attributed to a reduction in hydrostatic head in the dam footings as pore water slowly drains from unflooded areas of the tailings impoundment. A decrease in flow from the toe drains of about 0.6 cfs has been observed. However, sample collection has been slightly earlier each year as well and this may also be a factor contributing to the trend of decreasing flows. On this latest site visit, very dry conditions prevailed. Flows into the tailings impoundment from Rainy Creek and Fleetwood Creek were only a trickle and were measured by visual estimate.

Initial trends for asbestiform fiber data in Lower Rainy Creek seemed to indicate a decrease in fiber counts since mine operation was ceased. However, the latest analyses in Lower Rainy Creek are higher (25.0 million fibers per liter (MFL) and 560 µg/l). However, a replicate sample was taken at this site and analyzed only 4.6 MFL and 260 mg/l. The 4.6 MFL value is within the requirements of the drinking water standard for asbestos (7.0 MFL) whereas the 25.0 MFL value is not. In the past, although asbestos analyses showed a lower level of reproducibility than other analyses based on the replicate samples, agreement between analyses was usually more consistent than this. Consequently, there is some concern that there is a sampling or analytical error with one of the two samples for asbestos from this site. The essential conclusions which have been drawn regarding asbestos fibers in Lower Rainy Creek remain unchanged:

- Lower Rainy is the area most likely to show the highest levels of asbestiform fibers. The reported values have varied quite a bit but are of the same order of magnitude as the drinking water standard.

- The source of the asbestos fibers is material already in the Lower Rainy Creek drainage. Historic mining practices are thought to be largely responsible for this since, at one time, tailings were discharged directly into the Rainy Creek drainage without settlement and impoundment.

- Considerable fluctuation in asbestos fiber analyses can be expected to continue depending on conditions of stream flow and streambank erosion.

Fluoride analyses in water from the toe drains (Site SW-5) had been steadily declining until this last sampling event. The latest value at SW-5 is 2.4 mg/l F, up from 1.5 mg/l in 1993. However, fluoride in Lower Rainy Creek was only 1.18 mg/l F, slightly lower than reported on earlier sampling dates. These values are near the expected value for saturation with $CaF_2$. Since the new drinking water standard for fluoride is set at 4.0 mg/l F, it is unlikely that this standard will be exceeded as long as there is a significant concentration of calcium in the waters sampled.

**Table 4.1. A comparison of critical water quality parameters in the last four base flow periods.**

| Date | LOWER RAINY CREEK (Site SW-8) | | | | LOWER CARNEY CREEK (Site SW-4) | | | | TAILINGS DAM TOE DRAINS (Site SW-5) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flow (cfs) | Asbestiform Fibers (MFL)[1] | Asbestiform Fibers (µg/l)[2] | Fluoride (mg/l) | Flow (cfs) | Asbestiform Fibers (MFL)[1] | Asbestiform Fibers (µg/l)[2] | Fluoride (mg/l) | Flow (cfs) | Asbestiform Fibers (MFL)[1] | Asbestiform Fibers (µg/l)[2] | Fluoride (mg/l) |
| 11/15/91 | 2.03 | 17. | 240 | 1.6 | 0.24 | 0.1 | 6.4 | 0.28 | 1.22 | 0.3 | 8.8 | 3.1 |
| 10/29/92 | 1.46 | 0.4 | 24 | 1.5 | NM | 1.2 | 23 | 0.20 | 0.69 | ND | 0.1 | 2.6 |
| 10/21/93 | 1.04 | 0.9 | 9.9 | 1.7 | 0.14 | 1.5 | 22 | 0.38 | 0.68 | ND | 0.8 | 1.5 |
| 09/19/94 | 0.77 | 25.0[3] | 560[3] | 1.18 | 0.13 | 2.9 | 42 | 0.20 | 0.58 | ND | ND | 2.4 |

ND = Not Detected
NM = Not Measured
[1] Includes only fibers longer than 10 microns with aspect ratio greater than 3:1.
[2] Includes all fibers with aspect ratio greater than 3:1, regardless of size.
[3] Replicate sample analyses were 4.6 MFL and 260 µg/l, respectively, suggesting that there may be a sampling or analytical error associated with one of these samples. Historically, reproducibility of asbestos analyses has been better than this.

# 5.0 REFERENCES


American Public Health Association, 1985. Standard Methods for the Examination of Water and Wastewater, Part 300: Determination of Metals.

Schafer and Associates, 1991. W.R. Grace Vermiculite Mine Closure Water Quality Monitoring Plan, submitted to Montana Department of Health and Environmental Sciences, Water Quality Bureau.

Schafer and Associates, 1992(a). W.R. Grace Vermiculite Mine Closure Water Quality Data Report No. 1, November 1991, submitted to Montana Department of State Lands, Hard Rock Mining Bureau.

Schafer and Associates, 1992(b). W.R. Grace Vermiculite Mine Closure Water Quality Data Report No. 2, March 1992, submitted to Montana Department of State Lands, Hard Rock Mining Bureau.

Schafer and Associates, 1992(c). W.R. Grace Vermiculite Mine Closure Water Quality Data Report No. 3, July 1992, submitted to Montana Department of State Lands, Hard Rock Mining Bureau.

Schafer and Associates, 1993. W.R. Grace Vermiculite Mine Closure Water Quality Data Report No. 4, October 1992, submitted to Montana Department of State Lands, Hard Rock Mining Bureau.

Schafer and Associates, 1994. W.R. Grace Vermiculite Mine Closure Water Quality Data Report No. 5, October 1993, submitted to Montana Department of State Lands, Hard Rock Mining Bureau.

# APPENDIX A

# ENERGY LABORATORIES DATA REPORTS

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-735-4489

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Tom Hudson
Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

WATER ANALYSIS
**W.R. Grace Mine Near Libby, MT**

| | |
|---|---|
| **Lab No.** | 93-51903 |
| **Sample Identification** | SW0 |
| **Date & Time Sampled** | 10/21/93 @ 1430 |
| **Date Submitted** | 10/26/93 |
| **Date Reported** | 11/19/93 crp |

| Constituent | mg/l (ppm) | Date Analyzed |
|---|---|---|
| Potassium | 10 | 11/04/93 |
| Sodium | 7 | 11/04/93 |
| Calcium | 84 | 11/04/93 |
| Magnesium | 21 | 11/04/93 |
| Sulfate | 14 | 11/08/93 |
| Chloride | 4 | 11/08/93 |
| Carbonate | 0 | 11/01/93 |
| Bicarbonate | 349 | 11/01/93 |
| Total Dissolved Solids @ 180°C | 360 | 11/09/93 |
| Total Suspended Solids | 2 | 10/26/93 |
| Total Hardness as CaCO3 | 295 | 11/04/93 |
| Total Alkalinity as CaCO3 | 286 | 11/01/93 |
| Nitrate plus Nitrite as N | <0.05 | 11/03/93 |
| Fluoride | 1.6 | 11/08/93 |
| Total Acidity as CaCO3 | <1 | 11/01/93 |
| Total Recoverable Iron | <0.03 | 10/28/93 |

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
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Tom Hudson
Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

WATER ANALYSIS
**W.R. Grace Mine Near Libby, MT**

| | |
|---|---|
| **Lab No.** | 93-51904 |
| **Sample Identification** | SW4 |
| **Date & Time Sampled** | 10/21/93 @ 1300 |
| **Date Submitted** | 10/26/93 |
| **Date Reported** | 11/19/93 crp |

| Constituent | mg/l (ppm) | Date Analyzed |
|---|---|---|
| Potassium | 13 | 11/04/93 |
| Sodium | 9 | 11/04/93 |
| Calcium | 94 | 11/04/93 |
| Magnesium | 27 | 11/04/93 |
| Sulfate | 22 | 11/08/93 |
| Chloride | 1 | 11/08/93 |
| Carbonate | 0 | 11/01/93 |
| Bicarbonate | 430 | 11/01/93 |
| Total Dissolved Solids @ 180°C | 424 | 11/09/93 |
| Total Suspended Solids | <1 | 10/26/93 |
| Total Hardness as CaCO3 | 347 | 11/04/93 |
| Total Alkalinity as CaCO3 | 352 | 11/01/93 |
| Nitrate plus Nitrite as N | 0.22 | 11/03/93 |
| Fluoride | 0.38 | 11/08/93 |
| Total Acidity as CaCO3 | <1 | 11/01/93 |
| Total Recoverable Iron | 0.06 | 10/28/93 |

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Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

WATER ANALYSIS
**W.R. Grace Mine Near Libby, MT**

| | |
|---|---|
| **Lab No.** | 93-51905 |
| **Sample Identification** | SW5 |
| **Date & Time Sampled** | 10/21/93 @ 1030 |
| **Date Submitted** | 10/26/93 |
| **Date Reported** | 11/19/93 crp |

| Constituent | mg/l (ppm) | Date Analyzed |
|---|---|---|
| Potassium | 12 | 11/04/93 |
| Sodium | 6 | 11/04/93 |
| Calcium | 90 | 11/04/93 |
| Magnesium | 24 | 11/04/93 |
| Sulfate | 9 | 11/08/93 |
| Chloride | 3 | 11/08/93 |
| Carbonate | 0 | 11/01/93 |
| Bicarbonate | 396 | 11/01/93 |
| Total Dissolved Solids @ 180°C | 379 | 11/09/93 |
| Total Suspended Solids | 2 | 10/26/93 |
| Total Hardness as CaCO3 | 324 | 11/04/93 |
| Total Alkalinity as CaCO3 | 324 | 11/01/93 |
| Nitrate plus Nitrite as N | <0.05 | 11/03/93 |
| Fluoride | 1.5 | 11/08/93 |
| Total Acidity as CaCO3 | <1 | 11/01/93 |
| Total Recoverable Iron | <0.03 | 10/28/93 |

ENERGY LABORATORIES

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Tom Hudson
Schafer & Associates
P.O. Box 6186
Bozeman, MT 59715

WATER ANALYSIS
**W.R. Grace Mine Near Libby, MT**

| | |
|---|---|
| **Lab No.** | 93-51906 |
| **Sample Identification** | SW8 |
| **Date & Time Sampled** | 10/21/93 @ 1430 |
| **Date Submitted** | 10/26/93 |
| **Date Reported** | 11/19/93 crp |

| Constituent | mg/l (ppm) | Date Analyzed |
|---|---|---|
| Potassium | 10 | 11/04/93 |
| Sodium | 7 | 11/04/93 |
| Calcium | 84 | 11/04/93 |
| Magnesium | 21 | 11/04/93 |
| Sulfate | 13 | 11/07/93 |
| Chloride | 4 | 11/07/93 |
| Carbonate | 2 | 11/01/93 |
| Bicarbonate | 343 | 11/01/93 |
| Total Dissolved Solids @ 180°C | 357 | 11/09/93 |
| Total Suspended Solids | <1 | 10/26/93 |
| Total Hardness as CaCO3 | 296 | 11/04/93 |
| Total Alkalinity as CaCO3 | 285 | 11/01/93 |
| Nitrate plus Nitrite as N | <0.05 | 11/03/93 |
| Fluoride | 1.7 | 11/08/93 |
| Total Acidity as CaCO3 | <1 | 11/01/93 |
| Total Recoverable Iron | <0.03 | 10/28/93 |

# APPENDIX B

# EMS LABORATORIES DATA REPORTS

| | |
|---|---|
| DATE: | October 6, 1994 |
| CLIENT: | SCHAFER & ASSOCIATES<br>P. O. Box 6186<br>Bozeman, MT 59715 |
| ATTENTION: | Thomas Hudson |
| REFERENCE: | Letter Dated September 21, 1994 |
| REPORT NO: | 32940 |
| SUBJECT: | ASBESTOS ANALYSIS OF WATER SAMPLES BY TEM |
| ACCREDITED: | National Institute of Standards and Technology through NVLAP (Laboratory No. 1218)<br><br>California Department of Health Services for Asbestos by TEM (Certification No. 1119) |

Four surface water samples were submitted for quantitative asbestos TEM analysis. The samples came from the W. R. Grace mine near Libby, Montana.

The sample were analyzed according to the U.S. EPA method (EPA-600/4-83-043).

The asbestiform which was present in the water samples was from the tremolite/actinolite group of amphiboles.

The results are as follows:

ASBESTOS FIBER LENGTH DISTRIBUTION (MFL)

| Sample No. | <2.5 µm | 2.5 to 4.9 µm | 5.0 to 9.9 µm | >10 µm | D. L. µm |
|---|---|---|---|---|---|
| SW-0 | 18.6 | 23.8 | 15.1 | 4.6 | 0.6 |
| SW-4 | 22.8 | 8.7 | 7.5 | 2.9 | 0.4 |
| SW-5-4 | ND | ND | ND | ND | 0.7 |
| SW-8-4 | 77.5 | 34.9 | 42.6 | 25.2 | 1.9 |

MFL = Millions of Fibers per Liter D. L. = Detection Limit N.D. = None detected

Respectfully submitted,

EMS LABORATORIES, INC.

B. M. Kolk. Laboratory Director

Airborne Asbestos
Asbestos Bulk Sample
Analyses
NVLAP
EMS Laboratories, Inc.
Lab Code: 1218

This report, from a NIST accredited laboratory through NVLAP, must not be used by the client to claim product endorsement by NVLAP or any agency of the Government.

## Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

**EMS No.** 32940 **Client** Schafer & Assoc.

**Sample No.** Chrysotile Std.

**Date Analyzed** 10/4/94

| | | |
|---|---|---|
| Fibers (asbestos) | 10 | MFL |
| Fibers > 5 µm in length (asbestos) | 0.1 | MFL |
| Fibers > 10 µm in length (asbestos) | BDL* | MFL |
| Mass (asbestos) | 0.08 | ug/L |
| More/Less than 5 Fibers in Sample (asbestos) | MORE | |
| Poisson 95% Confidence Interval | 8.2 to 12 | MFL |
| Detection Limit | 0.1 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Particle Size Distribution ( Asbestos )

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 - 4.99 | 5.00 - 9.99 | 10 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 54 | 23 | 10 | 6 | 7 | 1 | 0 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 - .49 | .50 - .99 | 1 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 95 | 6 | 0 | 0 | 0 | 0 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 - 99 | 100 - 199 | 200 & UP |
|---|---|---|---|---|---|---|---|
| 2 | 59 | 18 | 8 | 6 | 7 | 1 | 0 |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Date Analyzed** 9/29/94

**Client** Schafer & Assoc.

**Sample No.** EMS BLANK

| | | |
|---|---|---|
| Fibers (chrysotile) | ND | MFL |
| > 5 Micron length (chrysotile) | ND | MFL |
| Mass (chrysotile) | 0 | ug/L |
| More/Less than 5 Fibers in Sample (chrysotile) | LESS | |
| Sensitivity Level | 0.01 | MFL |

### Particle Size Distribution ( Chrysotile )

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

# TEM ASBESTOS ANALYSIS

Page [redacted]

EMS Lab No. 329410
Client EMS Blank
Sample No. 9-28-94

**RECEIVING**

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☐
- Level III ☐
- AHERA ☐

LENGTHS
- All Sizes (EPA) ☐
- (µm): ≥0.5 ☐
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐ (*≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCE/314 ☐
- MCE/1017 ☑
- Other fc ☐

TYPE OF SAMPLE
- Air ☐ Water ☑
- Soil ☐ Wipe ☐
- Bulk ☐ Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☑
- .22 µm ☐
- Other ☐

G.O. Area (mm²) 0.0070
No. of G.O. to Analyze 20
Filter Lot No. _____

**PREP**

- DIRECT PREP ☑
- INDIRECT PREP ☐

Volume _____ liters
Working Volume 500 ml
Weight _____ grams
Ashed Area _____ %
Date 9-28-94
Prepared By SA

**ANALYSIS**

MICROSCOPE
- Serial No.542-05-06 600A ☐
- Serial No.542-05-13 600B ☑
- HU11E ☐
- HU12SE ☐

GRID
- 1 ☑ 3 ☐
- 2 ☐ 4 ☐

Grid Address 1A
Screen Magnification 17202x
Camera Constant 28.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst S. Ahmed Date 9/29/94

A

| Grid Opening | Structure Number | Structure | Dimension(mm) Width | Length ≥5µm | Thickness | SAED Observation Chrysotile | Amphibole | Ambiguous | Non Asbestos | No Pattern | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NSD | | | | | | | | | | | | | | | | |
| 2 | NSD | | | | | | | | | | | | | | | | |
| 3 | NSD | | | | | | | | | | | | | | | | |
| 4 | NSD | | | | | | | | | | | | | | | | |
| 5 | NSD | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | |
| 7 | NSD | | | | | | | | | | | | | | | | |
| 8 | NSD | | | | | | | | | | | | | | | | |
| 9 | NSD | | | | | | | | | | | | | | | | |
| 10 | NSD | | | | | | | | | | | | | | | | |

15 lines

**OBSERVATIONS:**

| | | | | | |
|---|---|---|---|---|---|
| Clean ☐ | | | | | |
| Debris: ☑ | Very Light ☐ | Light ☑ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |
| Gypsum: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |
| Other ☐ | | | | | |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 32940
Client EMS Blank
Sample No. 9-28-94

Page ___ of ___

RECEIVING

ANALYSIS

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

GRID
1 ☐ 3 ☐
2 ☑ 4 ☐

Grid Address 1B
Screen Magnification 6200 x
Camera Constant 78.3
Accelerating Voltage 100 KV
Beam Current 10 µa

B

Analyst S. Ahmed Date 9/29/94

| Grid Opening | Structure Number | Structure | Dimension (mm) Width | Length ≥5µm | Thickness | SAED Observation Chrysotile | Amphibole | Ambiguous | Non Asbestos | No Pattern | EDS Analysis Na | Mg | Si | Ca | Fe | Al | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NSD | | | | | | | | | | | | | | | | |
| 2 | NSD | | | | | | | | | | | | | | | | |
| 3 | NSD | | | | | | | | | | | | | | | | |
| 4 | NSD | | | | | | | | | | | | | | | | |
| 5 | NSD | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | |
| 7 | NSD | | | | | | | | | | | | | | | | |
| 8 | NSD | | | | | | | | | | | | | | | | |
| 9 | NSD | | | | | | | | | | | | | | | | |
| 10 | NSD | | | | | | | | | | | | | | | | |

15 lines

OBSERVATIONS:

Clean ☑
Debris: ☑ Very Light ☐ Light ☑ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

## Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-0

**Date Analyzed** 9/30/94

| | | |
|---|---|---|
| Fibers (asbestos) | 62 | MFL |
| Fibers > 5 µm in length (asbestos) | 20 | MFL |
| Fibers > 10 µm in length (asbestos) | 4.6 | MFL |
| Mass (asbestos) | 260 | ug/L |
| More/Less than 5 Fibers in Sample (asbestos) | MORE | |
| Poisson 95% Confidence Interval | 50 to 74 | MFL |
| Detection Limit | 0.6 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Particle Size Distribution ( Asbestos )

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 - 4.99 | 5.00 - 9.99 | 10 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 8 | 12 | 11 | 41 | 26 | 8 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 - .49 | .50 - .99 | 1 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 6 | 16 | 22 | 11 | 33 | 15 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 - 99 | 100 - 199 | 200 & UP |
|---|---|---|---|---|---|---|---|
| 23 | 50 | 16 | 9 | 1 | 7 | 1 | 0 |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-0

**Date** 9/30/94

| | | |
|---|---|---|
| Total Asbestos Fibers | 62 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 62 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 20 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 260 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 50 to 74 | MFL |
| Detection Limit | 0.6 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 1 | 8 | 12 | 11 | 75 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 6 | 16 | 22 | 11 | 52 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 23 | 50 | 16 | 9 | 1 | 8 |

# TEM ASBESTOS ANALYSIS

Client [illegible] EMS Lab No. [illegible]
Sample No. SW-0 Page _____ of _____

## RECEIVING

**TYPE OF SAMPLE**
Air ☐ Water ☑
Soil ☐ Bulk ☐
Other _____

**METHOD OF ANALYSIS**
EPA 600/4-83-043 ☑ ISO ☐

**LEVEL OF ANALYSIS**
Chrysotile CD-CDQ
Amphibole ADQ

**ASPECT RATIO**
3:1 ☑ 5:1 ☐

**LENGTHS**
All Sizes (EPA) ☐
(μm) ≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 μm width ≥5.0 μm length)

**FILTER TYPE / AREA (mm ±)**
MCE ☐ 385 ☐
PC ☑ 314 ☐
MCN ☐ 1017 ☑
Other _____

**PORE SIZE**
0.45 μm ☐ 0.8 μm ☐
0.1 μm ☑ 0.22 μm ☐
Other _____

G.O. Area (mm²) 0.0 070
No. of G.O. to Analyze 2.0
Filter Lot No. AE82, AA11B00

Approved By SA Date 9-28

## PREP

DIRECT PREP ☐
INDIRECT PREP ☐
ozonated

Volume _____ liters
Working Volume 50 ml
Weight _____ grams
Ashed Area _____ %

Prepared By SA/FM
Date 9-28-94

## ANALYSIS

**MICROSCOPE**
Serial No. 542-05-06 H600A ☐
Serial No. 542-05-13 H600B ☑

Grid Address 1A
Screen Magnification 19200 X
Camera Constant 23.3
Accelerating Voltage 100 KV
Beam Current 10 μm
K-Factor 1.6

Analyst S. Ahmed Date 9-29-94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 3 | 80 | | | | | | | | | | | | | ✓ | ✓ | | | 2 | 10 | 2 | 2 | EDS#1 Tremolite |
| | 2 | F | 9 | 90 | | | | | | | | | | | | | ✓ | ✓ | | | 3 | 10 | 2 | 1 | EDS#2 " |
| | 3 | F | 5 | 62 | | | | | | | | | | | | | ✓ | ✓ | | | 3 | 10 | 2 | 1 | EDS#3 " |
| | 4 | MD | 4 | 40 | | | | | | | | | | | | | ✓ | ✓ | | | 2 | 10 | 1 | 1 | EDS#4 " |
| | 5 | F | 3 | 55 | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | | | | Tremolite |
| | 6 | F | 4 | 40 | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | | | | " |
| | 7 | F | 2.5 | 350 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 8 | F | 8 | 125 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 9 | F | 7 | 80 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Actinolite |
| | 10 | F | 3 | 35 | | | | | | | | | | | ✓ | ✓ | ✓ | | | | | | | | Tremolite |
| | 11 | F | 20 | 68 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |
| | 12 | F | 9 | 110 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |
| | 13 | F | 2 | 50 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 14 | F | 18 | 180 | | | | | | | | | | | ✓ | ✓ | ✓ | | | | 3 | 10 | 1 | 1 | EDS#14 " |
| | 15 | F | 2 | 74 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

# TEM ASBESTOS ANALYSIS

Client: [illegible] S L No. [illegible]
Sample No. SW-0 Page 2 of [illegible]

Analyst S. Ahmed Date 1/24/[illegible]

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 | F | 4 | 52 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 17 | F | 6 | 70 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 18 | MD | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 19 | F | 5 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 20 | F | 2 | 10 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| 2 | 21 | F | 10 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 22 | F | 2 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 23 | F | 3 | 45 | | | | | | | | ✓ | | | ✓ | | | | | | | | | | Tremolite |
| | 24 | F | 5 | 40 | | | | | | | | | | | | | | | | | | | | | |
| | 25 | F | 10 | 110 | | | | | | | | | | | ✓ | ✓ | | | | | 3 | 10 | 2 | 1 | EDS #25 Tremolite |
| | 26 | F | 2 | 20 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 27 | F | 10 | 78 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 28 | F | 5 | 30 | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 29 | F | 10 | 68 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 30 | F | 3 | 43 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 31 | MD | 3 | 48 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 32 | F | 2 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 33 | F | 6 | 180 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 34 | F | 9 | 200 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 2 | 1 | EDS #34 Tremolite |
| | 35 | MD | 5 | 32 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

C[illegible] [illegible] IS L[illegible] No. [illegible]
Sample No. [illegible] Page 3 of 3

Analyst S. Ahmed Date 7-29-[illegible]

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 36 | F | 9 | 160 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 37 | MD | 3 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 38 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 39 | F | 2.5 | 45 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 40 | MD | 4 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 41 | F | 3 | 60x | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 42 | F | 1 | 80 | | | | | | | | | | | ✓ | | | | | | | | | | " |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

29-Sep-1994 11:32:32

32940-SW-0,A,#01,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 24 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 280. | Mg K , Mg K , Mg K |
| 1.74 | 1186. | Si K , Si K |
| 3.70 | 196. | Ca K , Ca K |
| 6.42 | 233. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 151

29-Sep-1994 11:33:18

32940-SW-0,A,#02,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 10 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 698. | Mg K , Mg K , Mg K |
| 1.75 | 2180. | Si K , Si K |
| 3.71 | 525. | Ca K , Ca K |
| 4.04 | 72. | Sc K , Ca K , Ca K |
| 6.43 | 226. | Fe K , Fe K |
| 7.07 | 46. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 431

29-Sep-1994 11:38:22

32940-SW-0,A,#03,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 513. | Mg K , Mg K , Mg K |
| 1.75 | 1999. | Si K , Si K |
| 3.31 | 94. | K K , K K |
| 3.69 | 307. | Ca K , Ca K |
| 6.43 | 198. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 390

29-Sep-1994 11:40:24

32940-SW-0,A,#04,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 16 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 197. | Mg K , Mg K , Mg K |
| 1.74 | 829. | Si K , Si K |
| 3.69 | 110. | Ca K , Ca K |
| 6.40 | 136. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 114

29-Sep-1994 12:16:42

32940-SW-O,A,#14,SA  Preset= 100 secs
Vert= 200 counts Disp= 1  Elapsed= 28 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 272. | Mg K , Mg K , Mg K |
| 1.75 | 1025. | Si K , Si K |
| 3.71 | 139. | Ca K , Ca K |
| 6.41 | 143. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 150

29-Sep-1994 13:32:36

32940-SW-0, A, #25, SA  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1719. | Mg K , Mg K , Mg K |
| 1.75 | 6373. | Si K , Si K |
| 3.33 | 176. | K K , K K |
| 3.71 | 1075. | Ca K , Ca K |
| 4.06 | 114. | Sc K , Sc K |
| 6.41 | 642. | Fe K , Fe K |
| 7.08 | 57. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 1046

29-Sep-1994 13:38:33

32940-SW-0,A,#34,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1911. | Mg K , Mg K , Mg K |
| 1.74 | 7147. | Si K , Si K |
| 2.31 | 46. | S K , S K |
| 3.35 | 49. | K K , K K |
| 3.70 | 1404. | Ca K , Ca K |
| 4.03 | 172. | Ca K , Ca K |
| 6.41 | 786. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 1235

# TEM ASBESTOS ANALYSIS

C S. pe EM C S L. 0. _____
Sample No. SW-0 Page _____ of _____

H600A B
C·C-30·4
Mg - 19,440

Analyst Radler Date 9/29

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 6 | 95 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 2 | 2 | F | 1 | 60 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 1 | | EDS |
| 3 | 3 | F | 6 | 68 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 4 | 4 | F | 4 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | all amphiboles |
| 5 | 5 | F | 5 | 67 | | | | | | | | | | | ✓ | | | | | | | | | | are tremolite |
| 6 | 6 | F | 6 | 70 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 7 | 7 | IND | 2.5 | 45* | | | | | | | | | | | ✓ | | | | | | | | | | |
| 8 | 8 | F | 3 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 9 | 9 | F | 1 | 50 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 10 | 10 | IND | 2 | 140 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 2 | | EDS |
| 11 | 11 | F | 4 | 150 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 12 | 12 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 13 | 13 | IND | 6 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 14 | 14 | IND | 2 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 15 | 15 | F | 3 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 16 | 16 | F | 10 | 70 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 17 | 17 | F | 3 | 22 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 18 | 18 | F | 2.5 | 160 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 19 | 19 | F | 1.5 | 60 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 20 | 20 | F | 3 | 28 | ✓ | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

C — 2 0 ... 
Sample No. SW-0
Page _____ of _____
H 6W A

Analyst Radla Date 9/29

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 21 | MD | 3 | 55 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 2 | | EDS |
| | 22 | MD | 35 | 125 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 23 | MD | 40 | 350 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 24 | MD | 3 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 25 | F | 1 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 26 | F | 2 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

29-Sep-1994 13:12:17

32940-SW-O,B,#02,RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 50 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 1066. | O K , O K , V L , V L , V L , V L |
| 1.25 | 382. | Mg K , Mg K , Mg K |
| 1.74 | 1358. | Si K , Si K |
| 3.69 | 178. | Ca K , Ca K |
| 6.37 | 175. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 275

29-Sep-1994 13:30:05

32940-SW-O,B,#10,RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 1802. | O K , O K , V L , V L , V L , V L |
| 1.24 | 689. | Mg K , Mg K |
| 1.74 | 2544. | Si K , Si K |
| 3.69 | 517. | Ca K , Ca K |
| 4.03 | 102. | Ca K , Ca K |
| 6.39 | 281. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 531

29-Sep-1994 13:46:16 32940-SW-O, B, #20, RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.50 | 1707. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.00 | 56. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.25 | 894. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 2992. | Si KA1, Si KA2 |
| 2.26 | 72. | S KA1, S KA2 |
| 3.32 | 96. | K KA1, K KA2 |
| 3.70 | 463. | Ca KA1, Ca KA2 |
| 4.07 | 75. | Sc KA1, Sc KA2 |
| 6.39 | 454. | Fe KA1, Fe KA2 |

# TEM ASBESTOS ANALYSIS

Client: [illegible] Safe [illegible] S L No. 724
Sample No. SW-0 Page _____ of _____

C 50ml
H600A
19,400, CC 30.4

Analyst Radla Date 9/30/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 3 | 40 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1.5 | 3 | Tremolite. |
| | 2 | MD | 1.5 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 3 | F | 6 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 4 | F | 1.5 | 32 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 5 | F | 8 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 6 | F | 5 | 28 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 7 | MD | 3 | 38 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 8 | MD | 2 | 58 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 9 | F | 3 | 12 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 10 | F | 10 | 70 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2.0 | | EDS Tremolite |
| | 11 | F | 10 | 340 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 12 | F | 20 | 130 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 13 | F | 9 | 95 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 14 | F | 12 | 92 | | | | | | | | | | | ✓ | | | | | | | | | | all amphiboles |
| | 15 | F | 8 | 75 | ✓ | | | | | | | | | | | | | | | | | | | | are Tremolite. |
| | 16 | F | 10 | 75 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 17 | F | 6 | 120 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 18 | F | 3 | 26 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 19 | F | 18 | 440 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 20 | F | 2 | 25 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 2.4 | | EDS Tremolite. |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

C[illegible] for [illegible]
Sample No. SW-0

[illegible] No. [illegible]
Page 2 of 2

C
H600A

Analyst Radley Date 9/30

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 21 | MD | 1.5 | 55 | | ✓ | | | | | | | | | ✓ | | | | | | | | | | |
| | 22 | F | 3 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | all amphiboles |
| | 23 | MD | 4 | 95 | | | | | | | | | | | ✓ | | | | | | | | | | are [illegible] |
| | 24 | MD | 4 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 25 | MD | 8 | 65 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 26 | MD | 6 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 2 | 27 | F | 10 | 135 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 28 | F | 5 | 200 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 29 | F | 5 | 120 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 30 | MAD | 8 | 280 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2.5 | 3 | EDS |
| | 31 | F | 10 | 72 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 32 | MAD | 2 | 160 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 33 | F | 4 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 34 | MD | 3 | 80 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 35 | MD | 1.5 | 35 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 36 | MD | 8 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 37 | MD | 5 | 42 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 38 | F | 12 | 230 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 39 | MD | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 40 | MD | 6 | 80 | | | | | | | | | | | | | ✓ | | | | 3.5 | 10 | 2.4 | .04 | EDS |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

# TEM ASBESTOS ANALYSIS

[illegible] No. [illegible]
Sample No. SW-0
Page _____ of _____

C
H600A

Analyst Radha Date 9/30

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 41 | MD | 5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 42 | F | 12 | 145 | | | | | | | | | | | ✓ | | | | | | | | | | all amphiboles |
| | 43 | MD | 5 | 95 | | | | | | | | | | | ✓ | | | | | | | | | | are [illegible] |
| | 44 | F | 3 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 45 | F | 3 | 150 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 46 | F | 8 | 190 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 47 | F | 5 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 48 | F | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 49 | F | 15 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 50 | F | 5 | 175 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 24 | 1.5 | EDS |
| | 51 | F | 4 | 55 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 52 | F | 4 | 42 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 53 | F | 6 | 150 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | MD | MD | 3 | 22 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | | MD | 4 | 75 | | | | | | | | | | | ✓ | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

30-Sep-1994 09:27:23

32440, SW-O, C, #01, RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.51 | 1377. | O K , O K , V L , V L , V L , V L |
| 1.25 | 342. | Mg K , Mg K , Mg K |
| 1.74 | 1416. | Si K , Si K |
| 3.69 | 213. | Ca K , Ca K |
| 5.90 | 226. | Mn K , Mn K |
| 6.41 | 436. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 365

30-Sep-1994 09:35:12

32440, SW-O, C, #10, RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 67 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.51 | 796. | O K , O K , V L , V L , V L , V L |
| 1.26 | 336. | Mg K , Mg K , Mg K |
| 1.74 | 966. | Si K , Si K |
| 3.70 | 256. | Ca K , Ca K |
| 6.40 | 133. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 240

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 240

30-Sep-1994 09:49:50

32440, SW-0, C, #20, RS Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 2849. | O K , O K , V L , V L , V L , V L |
| 1.25 | 1423. | Mg K , Mg K , Mg K |
| 1.74 | 4558. | Si K , Si K |
| 3.70 | 1106. | Ca K , Ca K |
| 4.00 | 83. | Ca K , Ca K |
| 6.39 | 351. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 823

30-Sep-1994 10:09:05

32440, SW-O, C, #30, RS  Preset= 100 secs
Vert= 1000 counts  Disp= 1  Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 4078. | O K , O K , V L , V L , V L , V L |
| 1.25 | 1786. | Mg K , Mg K , Mg K |
| 1.74 | 5898. | Si K , Si K |
| 3.33 | 101. | K K , K K |
| 3.69 | 1507. | Ca K , Ca K |
| 4.03 | 190. | Ca K , Ca K |
| 6.40 | 479. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 1173

30-Sep-1994 10:15:52

32440, SW-O, C, #40, RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 48 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 1798. | O K , O K , V L , V L , V L , V L |
| 1.25 | 997. | Mg K , Mg K , Mg K |
| 1.74 | 2841. | Si K , Si K |
| 3.70 | 697. | Ca K , Ca K |
| 6.42 | 118. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 662

# APPENDIX B

# EMS LABORATORIES DATA REPORTS

| | |
|---|---|
| DATE: | October 6, 1994 |
| CLIENT: | SCHAFER & ASSOCIATES<br>P. O. Box 6186<br>Bozeman, MT 59715 |
| ATTENTION: | Thomas Hudson |
| REFERENCE: | Letter Dated September 21, 1994 |
| REPORT NO: | 32940 |
| SUBJECT: | ASBESTOS ANALYSIS OF WATER SAMPLES BY TEM |
| ACCREDITED: | National Institute of Standards and Technology through NVLAP (Laboratory No. 1218)<br><br>California Department of Health Services for Asbestos by TEM (Certification No. 1119) |

Four surface water samples were submitted for quantitative asbestos TEM analysis. The samples came from the W. R. Grace mine near Libby, Montana.

The sample were analyzed according to the U.S. EPA method (EPA-600/4-83-043).

The asbestiform which was present in the water samples was from the tremolite/actinolite group of amphiboles.

The results are as follows:

ASBESTOS FIBER LENGTH DISTRIBUTION (MFL)

| Sample No. | <2.5 µm | 2.5 to 4.9 µm | 5.0 to 9.9 µm | >10 µm | D. L. µm |
|---|---|---|---|---|---|
| SW-0 | 18.6 | 23.8 | 15.1 | 4.6 | 0.6 |
| SW-4 | 22.8 | 8.7 | 7.5 | 2.9 | 0.4 |
| SW-5-4 | ND | ND | ND | ND | 0.7 |
| SW-8-4 | 77.5 | 34.9 | 42.6 | 25.2 | 1.9 |

MFL = Millions of Fibers per Liter D. L. = Detection Limit N.D. = None detected

Respectfully submitted,

EMS LABORATORIES, INC.

B. M. Kolk. Laboratory Director

This report, from a NIST accredited laboratory through NVLAP, must not be used by the client to claim product endorsement by NVLAP or any agency of the Government.

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** Schafer & Assoc.

**Sample No.** Chrysotile Std.

**Date Analyzed** 10/4/94

| | | |
|---|---|---|
| Fibers (asbestos) | 10 | MFL |
| Fibers > 5 µm in length (asbestos) | 0.1 | MFL |
| Fibers > 10 µm in length (asbestos) | BDL* | MFL |
| Mass (asbestos) | 0.08 | ug/L |
| More/Less than 5 Fibers in Sample (asbestos) | MORE | |
| Poisson 95% Confidence Interval | 8.2 to 12 | MFL |
| Detection Limit | 0.1 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Particle Size Distribution ( Asbestos )

**Particle Length - Microns**

| 0 -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 - 4.99 | 5.00 - 9.99 | 10 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 54 | 23 | 10 | 6 | 7 | 1 | 0 |

**Particle Width - Microns**

| 0 - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 - .49 | .50 - .99 | 1 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 95 | 6 | 0 | 0 | 0 | 0 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 - 99 | 100 - 199 | 200 & UP |
|---|---|---|---|---|---|---|---|
| 2 | 59 | 18 | 8 | 6 | 7 | 1 | 0 |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Date Analyzed** 9/29/94

**Client** Schafer & Assoc.

**Sample No.** EMS BLANK

| | | |
|---|---|---|
| Fibers (chrysotile) | ND | MFL |
| > 5 Micron length (chrysotile) | ND | MFL |
| Mass (chrysotile) | 0 | ug/L |
| More/Less than 5 Fibers in Sample (chrysotile) | LESS | |
| Sensitivity Level | 0.01 | MFL |

### Particle Size Distribution ( Chrysotile )

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

# TEM ASBESTOS ANALYSIS

Page ___ of ___

EMS Lab No. 32940
Client EMS Blank
Sample No. 9-28-94

**RECEIVING**

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☐
- Level III ☐
- AHERA ☐

ASPECT RATIO 3:1 ☐ 5:1 ☐

LENGTHS
- All Sizes (EPA) ☐
- (µm): ≥0.5 ☐
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐

*(≥0.25 µm width, ≥5.0 µm length)

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCE/314 ☐
- MCE/1017 ☑
- Other fc ☐

TYPE OF SAMPLE
- Air ☐
- Water ☑
- Soil ☐
- Wipe ☐
- Bulk ☐
- Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☑
- .22 µm ☐
- Other ☐

G.O. Area (mm²) 0.0070
No. of G.O. to Analyze 20
Filter Lot No. _____

**PREP**

- DIRECT PREP ☑
- INDIRECT PREP ☐

Volume _____ liters
Working Volume 500 ml
Weight _____ grams
Ashed Area _____ %
Date 9-28-94
Prepared By SA

**ANALYSIS**

MICROSCOPE
- Serial No.542-05-06 600A ☐
- Serial No.542-05-13 600B ☑
- HU11E ☐
- HU125E ☐

GRID
- 1 ☑
- 2 ☐
- 3 ☐
- 4 ☐

Grid Address 1A
Screen Magnification 19202x
Camera Constant 28.3
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst S. Ahmed Date 9/29/94

A

| Grid Opening | Structure Number | Structure | Dimension (mm) Width | Length ≥5µm | Thickness | SAED Observation Chrysotile | Amphibole | Ambiguous | Non Asbestos | No Pattern | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NSD | | | | | | | | | | | | | | | | |
| 2 | NSD | | | | | | | | | | | | | | | | |
| 3 | NSD | | | | | | | | | | | | | | | | |
| 4 | NSD | | | | | | | | | | | | | | | | |
| 5 | NSD | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | |
| 7 | NSD | | | | | | | | | | | | | | | | |
| 8 | NSD | | | | | | | | | | | | | | | | |
| 9 | NSD | | | | | | | | | | | | | | | | |
| 10 | NSD | | | | | | | | | | | | | | | | |

15 lines

**OBSERVATIONS:**

- Clean ☐
- Debris: ☑ Very Light ☐ Light ☑ Moderate ☐ Heavy ☐ Very Heavy ☐
- Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
- Other ☐

# TEM ASBESTOS ANALYSIS

EMS Lab No. 32940
Client EMS Blank
Sample No. 9-28-94

Page ___ of ___

RECEIVING

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☑ 4 ☐

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

Grid Address 1B
Screen Magnification 6300 x
Camera Constant 28.3
Accelerating Voltage 100 KV
Beam Current 10 µa

B

Analyst S. Ahmed Date 9/29/9?

| Grid Opening | Structure Number | Structure | Dimension (mm) Width | Length ≥5um | Thickness | SAED Observation Chrysotile | Amphibole | Ambiguous | Non Asbestos | No Pattern | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NSD | | | | | | | | | | | | | | | | |
| 2 | NSD | | | | | | | | | | | | | | | | |
| 3 | NSD | | | | | | | | | | | | | | | | |
| 4 | NSD | | | | | | | | | | | | | | | | |
| 5 | NSD | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | |
| 7 | NSD | | | | | | | | | | | | | | | | |
| 8 | NSD | | | | | | | | | | | | | | | | |
| 9 | NSD | | | | | | | | | | | | | | | | |
| 10 | NSD | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

15 lines

**OBSERVATIONS:**

Clean ☐
Debris: ☑ Very Light ☐ Light ☑ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-0

**Date Analyzed** 9/30/94

| | | |
|---|---|---|
| Fibers (asbestos) | 62 | MFL |
| Fibers > 5 µm in length (asbestos) | 20 | MFL |
| Fibers > 10 µm in length (asbestos) | 4.6 | MFL |
| Mass (asbestos) | 260 | ug/L |
| More/Less than 5 Fibers in Sample (asbestos) | MORE | |
| Poisson 95% Confidence Interval | 50 to 74 | MFL |
| Detection Limit | 0.6 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Particle Size Distribution ( Asbestos )

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 - 4.99 | 5.00 - 9.99 | 10 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 8 | 12 | 11 | 41 | 26 | 8 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 - .49 | .50 - .99 | 1 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 6 | 16 | 22 | 11 | 33 | 15 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 - 99 | 100 - 199 | 200 & UP |
|---|---|---|---|---|---|---|---|
| 23 | 50 | 16 | 9 | 1 | 7 | 1 | 0 |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-0

**Date** 9/30/94

| | | |
|---|---|---|
| Total Asbestos Fibers | 62 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 62 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 20 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 260 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 50 to 74 | MFL |
| Detection Limit | 0.6 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 1 | 8 | 12 | 11 | 75 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 6 | 16 | 22 | 11 | 52 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 23 | 50 | 16 | 9 | 1 | 8 |

# TEM ASBESTOS ANALYSIS

nt [illegible] MS No. [illegible]
Sample No. SW-0 Page _____ of _____

## RECEIVING

TYPE OF SAMPLE: Air ☐ Water ☑ Soil ☐ Bulk ☐ Other _____

METHOD OF ANALYSIS: EPA 600/4-83-043 ☑ ISO ☐

LEVEL OF ANALYSIS: Chrysotile CD-CDQ; Amphibole ADQ.

ASPECT RATIO: 3:1 ☑ 5:1 ☐

LENGTHS: All Sizes (EPA) ☐; (μm) ≥0.5 ☑; ≥1.0 ☐; ≥5.0 ☐; ≥10.0 ☐; PCM Range* ☐ (*(≥0.25 μm width ≥5.0 μm length))

FILTER TYPE / AREA (mm±): MCE ☐ 385 ☐; PC ☑ 314 ☐; MCN ☐ 1017 ☑; Other _____

PORE SIZE: 0.45 μm ☐ 0.8 μm ☐; 0.1 μm ☑ 0.22 μm ☐; Other _____

G.O. Area (mm²) 0.0 0.70
No. of G.O. to Analyze 20
Filter Lot No. AE8, AA11B010

Approved By SA Date 9-28

## PREP

DIRECT PREP ☐
INDIRECT PREP ☐
Ozonated

Volume _____ liters
Working Volume 50 ml
Weight _____ grams
Ashed Area _____ %

Prepared By SA/FM
Date 9-28-94

## ANALYSIS

MICROSCOPE: Serial No. 542-05-06 H600A ☐; Serial No. 542-05-13 H600B ☑

Grid Address 1A
Screen Magnification 19200 X
Camera Constant 23.3
Accelerating Voltage 100 KV
Beam Current 10 μm
K-Factor 1.6

Analyst S. Ahmed Date 9-29-94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 3 | 80 | | | | | | | | | | | | | ✓ | ✓ | | | 2 | 10 | 2 | 2 | EDS #1 Tremolite |
| | 2 | F | 9 | 90 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS #2 " |
| | 3 | F | 5 | 62 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS #3 " |
| | 4 | MO | 4 | 40 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 1 | EDS #4 " |
| | 5 | F | 3 | 55 | | | | | | | | | | | ✓ | | ✓ | | | | | | | | Tremolite |
| | 6 | F | 4 | 40 | | | | | | | | | | | ✓ | | ✓ | | | | | | | | " |
| | 7 | F | 2.5 | 350 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 8 | F | 8 | 125 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 9 | F | 7 | 80 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 10 | F | 3 | 35 | | | | | | | | | | | ✓ | | ✓ | | | | | | | | Tremolite |
| | 11 | F | 20 | 68 | | | | | | | | | | | ✓ | | ✓ | | | | | | | | Tremolite |
| | 12 | F | 9 | 110 | | | | | | | | | | | ✓ | | ✓ | | | | | | | | Tremolite |
| | 13 | F | 2 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 14 | F | 18 | 180 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 1 | 1 | EDS #14 " |
| | 15 | F | 2 | 74 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client [illegible] EMS Lab No. [illegible]
Sample No. SW-0 Page 2 of 3

Analyst S. Ahmed Date 9/29/9[illegible]

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 16 | F | 4 | 52 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |
| | 17 | F | 6 | 70 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 18 | MD | 3 | 30 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 19 | F | 5 | 100 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 20 | F | 2 | 10 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| 2 | 21 | F | 10 | 50 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 22 | F | 2 | 100 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Actinolite |
| | 23 | F | 3 | 45 | | | | | | | | ✓ | | | ✓ | ✓ | | | | | | | | | Tremolite |
| | 24 | F | 5 | 40 | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 25 | F | 10 | 110 | | | | | | | | | | | ✓ | ✓ | | | | | 3 | 10 | 2 | 1 | EDS #25 Tremolite |
| | 26 | F | 2 | 20 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |
| | 27 | F | 10 | 78 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 28 | F | 5 | 30 | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 29 | F | 10 | 68 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |
| | 30 | F | 3 | 43 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 31 | MD | 3 | 48 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 32 | F | 2 | 30 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 33 | F | 6 | 180 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 34 | F | 9 | 200 | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | 3 | 10 | 2 | 1 | EDS #34 Tremolite |
| | 35 | MD | 5 | 32 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |

**OBSERVATIONS:** Clean ☐ Other _____

Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client [illegible] EMS Lab No. [illegible]
Sample No. BW-0 Page 3 of 3

Analyst S. Ahmed Date 9-29-[illegible]

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 36 | F | 9 | 160 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | Tremolite |
| | 37 | MD | 3 | 40 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 38 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 39 | F | 2.5 | 45 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 40 | MD | 4 | 55 | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 41 | F | 3 | 60x | | | | | | | | | | | ✓ | ✓ | | | | | | | | | " |
| | 42 | F | 1 | 80 | | | | | | | | | | | | ✓ | | | | | | | | | " |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

29-Sep-1994 11:32:32

32940-SW-0,A,#01,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 24 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 280. | Mg K , Mg K , Mg K |
| 1.74 | 1186. | Si K , Si K |
| 3.70 | 196. | Ca K , Ca K |
| 6.42 | 233. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 151

29-Sep-1994 11:33:18

32940-SW-0,A,#02,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 10 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 698. | Mg K , Mg K , Mg K |
| 1.75 | 2180. | Si K , Si K |
| 3.71 | 525. | Ca K , Ca K |
| 4.04 | 72. | Sc K , Ca K , Ca K |
| 6.43 | 226. | Fe K , Fe K |
| 7.07 | 46. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 431

29-Sep-1994 11:38:22

32940-SW-0,A,#03,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 513. | Mg K , Mg K , Mg K |
| 1.75 | 1999. | Si K , Si K |
| 3.31 | 94. | K K , K K |
| 3.69 | 307. | Ca K , Ca K |
| 6.43 | 198. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 390

29-Sep-1994 11:40:24

32940-SW-0,A,#04,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 16 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 197. | Mg K , Mg K , Mg K |
| 1.74 | 829. | Si K , Si K |
| 3.69 | 110. | Ca K , Ca K |
| 6.40 | 136. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 114

29-Sep-1994 12:16:42

32940-SW-O,A,#14,SA  Preset= 100 secs
Vert= 200 counts  Disp= 1  Elapsed= 28 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 272. | Mg K , Mg K , Mg K |
| 1.75 | 1025. | Si K , Si K |
| 3.71 | 139. | Ca K , Ca K |
| 6.41 | 143. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 150

29-Sep-1994 13:32:36

32940-SW-0, A, #25, SA  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1719. | Mg K , Mg K , Mg K |
| 1.75 | 6373. | Si K , Si K |
| 3.33 | 176. | K K , K K |
| 3.71 | 1075. | Ca K , Ca K |
| 4.06 | 114. | Sc K , Sc K |
| 6.41 | 642. | Fe K , Fe K |
| 7.08 | 57. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 1046

29-Sep-1994 13:38:33

32940-SW-0,A,#34,SA  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1911. | Mg K , Mg K , Mg K |
| 1.74 | 7147. | Si K , Si K |
| 2.31 | 46. | S K , S K |
| 3.35 | 49. | K K , K K |
| 3.70 | 1404. | Ca K , Ca K |
| 4.03 | 172. | Ca K , Ca K |
| 6.41 | 786. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 8 = 1235

# TEM ASBESTOS ANALYSIS

Client Swafe + L. DC. IS L No. -29..
Sample No. SW-0 Page _____ of _____

H600A B
C·C - 30.4
Mg - 19,40

Analyst Radler Date 9/29

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 6 | 95 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 2 | 2 | F | 1 | 60 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 1 | | EDS |
| 3 | 3 | F | 6 | 68 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 4 | 4 | F | 4 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | all amphiboles |
| 5 | 5 | F | 5 | 67 | | | | | | | | | | | ✓ | | | | | | | | | | are tremolite |
| 6 | 6 | F | 6 | 70 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 7 | 7 | IND | 2.5 | 45+ | | | | | | | | | | | ✓ | | | | | | | | | | |
| 8 | 8 | F | 3 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 9 | 9 | F | 1 | 50 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 10 | 10 | IND | 2 | 140 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 2 | | EDS |
| 11 | 11 | F | 4 | 150 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 12 | 12 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 13 | 13 | IND | 6 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 14 | 14 | IND | 2 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 15 | 15 | F | 3 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 16 | 16 | F | 10 | 70 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 17 | 17 | F | 3 | 22 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 18 | 18 | F | 2.5 | 160 | | ✓ | | | | | | | | | ✓ | | | | | | | | | | |
| 19 | 19 | F | 1.5 | 60 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 20 | 20 | F | 3 | 28 | ✓ | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client [illegible] EMS Lab No. [illegible]
Sample No. SW-0 Page _____ of _____
H6W A

Analyst Radla Date 9/29

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | 21 | MD | 3 | 55 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 2 | | EDS |
| | 22 | MD | 35 | 125 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 23 | MD | 40 | 350 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 24 | MD | 3 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 25 | F | 1 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 26 | F | 2 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

29-Sep-1994 13:12:17

32940-SW-O,B,#02,RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 50 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 1066. | O K , O K , V L , V L , V L , V L |
| 1.25 | 382. | Mg K , Mg K , Mg K |
| 1.74 | 1358. | Si K , Si K |
| 3.69 | 178. | Ca K , Ca K |
| 6.37 | 175. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 275

29-Sep-1994 13:30:05

32940-SW-O,B,#10,RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 1802. | O K , O K , V L , V L , V L , V L |
| 1.24 | 689. | Mg K , Mg K |
| 1.74 | 2544. | Si K , Si K |
| 3.69 | 517. | Ca K , Ca K |
| 4.03 | 102. | Ca K , Ca K |
| 6.39 | 281. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 531

29-Sep-1994 13:46:16 32940-SW-O, B, #20, RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.50 | 1707. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.00 | 56. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.25 | 894. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 2992. | Si KA1, Si KA2 |
| 2.26 | 72. | S KA1, S KA2 |
| 3.32 | 96. | K KA1, K KA2 |
| 3.70 | 463. | Ca KA1, Ca KA2 |
| 4.07 | 75. | Sc KA1, Sc KA2 |
| 6.39 | 454. | Fe KA1, Fe KA2 |

# TEM ASBESTOS ANALYSIS

Client Schafer [illegible]
Sample No. SW-0

EMS Lab No. 329
Page _____ of _____

C 50 ml
H600A
19,400, CC 30.4

Analyst Radla Date 9/30/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 3 | 40 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1.5 | 3 | Tremolite. |
| | 2 | MD | 1.5 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 3 | F | 6 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 4 | F | 1.5 | 32 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 5 | F | 8 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 6 | F | 5 | 28 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 7 | MD | 3 | 38 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 8 | MD | 2 | 58 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 9 | F | 3 | 12 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 10 | F | 10 | 70 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2.0 | | EDS Tremolite |
| | 11 | F | 10 | 340 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 12 | F | 20 | 130 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 13 | F | 9 | 95 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 14 | F | 12 | 92 | | | | | | | | | | | ✓ | | | | | | | | | | all amphiboles |
| | 15 | F | 8 | 75 | ✓ | | | | | | | | | | | | | | | | | | | | are Tremolite. |
| | 16 | F | 10 | 75 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 17 | F | 6 | 120 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 18 | F | 3 | 26 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 19 | F | 18 | 440 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 20 | F | 2 | 25 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 2.4 | | EDS Tremolite. |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client Sanford SSC C
Sample No. SW-O

AS I No. 29
Page 2 of 2

C
H600A

Analyst Radley Date 9/30

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 21 | MD | 1.5 | 55 | | ✓ | | | | | | | | | ✓ | | | | | | | | | | |
| | 22 | F | 3 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | all amphiboles |
| | 23 | MD | 4 | 45 | | | | | | | | | | | ✓ | | | | | | | | | | are Tremolite. |
| | 24 | MD | 4 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 25 | MD | 8 | 65 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 26 | MD | 8 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 2 | 27 | F | 10 | 135 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 28 | F | 5 | 200 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 29 | F | 5 | 120 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 30 | MAD | 8 | 280 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2.5 | 1 | EDS |
| | 31 | F | 10 | 72 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 32 | MAD | 2 | 160 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 33 | F | 4 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 34 | MD | 3 | 80 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 35 | MD | 1.5 | 35 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 36 | MD | 8 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 37 | MD | 5 | 42 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 38 | F | 12 | 230 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 39 | MD | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 40 | MD | 6 | 80 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2.4 | .04 | EDS |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

# TEM ASBESTOS ANALYSIS

Client [illegible] EMS [illegible] No. 329
Sample No. SW-0 Page _____ of _____

C
H600A

Analyst Radha Date 9/30

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 41 | MD | 5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 42 | F | 12 | 145 | | | | | | | | | | | ✓ | | | | | | | | | | all amphiboles |
| | 43 | MD | 5 | 95 | | | | | | | | | | | ✓ | | | | | | | | | | are Tremolite |
| | 44 | F | 3 | 19 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 45 | F | 3 | 150 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 46 | F | 8 | 190 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 47 | F | 5 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 48 | F | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 49 | F | 15 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 50 | F | 5 | 175 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 24.5 | | FIBS |
| | 51 | F | 4 | 55 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 52 | F | 4 | 42 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 53 | F | 6 | 150 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | ~~MD~~ | MD | 3 | 22 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | | MD | 4 | 75 | | | | | | | | | | | ✓ | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

30-Sep-1994 09:27:23

32440, SW-O, C, #01, RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.51 | 1377. | O K , O K , V L , V L , V L , V L |
| 1.25 | 342. | Mg K , Mg K , Mg K |
| 1.74 | 1416. | Si K , Si K |
| 3.69 | 213. | Ca K , Ca K |
| 5.90 | 226. | Mn K , Mn K |
| 6.41 | 436. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 365

30-Sep-1994 09:35:12

32440, SW-O, C, #10, RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 67 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.51 | 796. | O K , O K , V L , V L , V L , V L |
| 1.26 | 336. | Mg K , Mg K , Mg K |
| 1.74 | 966. | Si K , Si K |
| 3.70 | 256. | Ca K , Ca K |
| 6.40 | 133. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 240

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 240

30-Sep-1994 09:49:50

32440,SW-O,C,#20,RS Preset= 100 secs
Vert= 1000 counts Disp= 1 Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 2849. | O K , O K , V L , V L , V L , V L |
| 1.25 | 1423. | Mg K , Mg K , Mg K |
| 1.74 | 4558. | Si K , Si K |
| 3.70 | 1106. | Ca K , Ca K |
| 4.00 | 83. | Ca K , Ca K |
| 6.39 | 351. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 823

30-Sep-1994 10:09:05

32440,SW-O,C,#30,RS  Preset= 100 secs
Vert= 1000 counts  Disp= 1  Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 4078. | O K , O K , V L , V L , V L , V L |
| 1.25 | 1786. | Mg K , Mg K , Mg K |
| 1.74 | 5898. | Si K , Si K |
| 3.33 | 101. | K K , K K |
| 3.69 | 1507. | Ca K , Ca K |
| 4.03 | 190. | Ca K , Ca K |
| 6.40 | 479. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 1173

30-Sep-1994 10:15:52

32440,SW-O,C,#40,RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 48 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 1798. | O K , O K , V L , V L , V L , V L |
| 1.25 | 997. | Mg K , Mg K , Mg K |
| 1.74 | 2841. | Si K , Si K |
| 3.70 | 697. | Ca K , Ca K |
| 6.42 | 118. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 662

30-Sep-1994 10:30:35

32440,SW-O,C,#50,RS  Preset= 100 secs
Vert= 200 counts  Disp= 1  Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 609. | O K , O K , V L , V L , V L , V L |
| 1.25 | 315. | Mg K , Mg K , Mg K |
| 1.74 | 978. | Si K , Si K |
| 3.70 | 241. | Ca K , Ca K |
| 6.39 | 153. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 8 = 222

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-4

**Date Analyzed** 10/4/94

| | | |
|---|---|---|
| Fibers (asbestos) | 42 | MFL |
| Fibers > 5 µm in length (asbestos) | 10 | MFL |
| Fibers > 10 µm in length (asbestos) | 2.9 | MFL |
| Mass (asbestos) | 42 | ug/L |
| More/Less than 5 Fibers in Sample (asbestos) | MORE | |
| Poisson 95% Confidence Interval | 34 to 50 | MFL |
| Detection Limit | 0.4 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Particle Size Distribution ( Asbestos )

**Particle Length - Microns**

| 0 -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 - 4.99 | 5.00 - 9.99 | 10 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 12 | 20 | 14 | 9 | 21 | 18 | 7 |

**Particle Width - Microns**

| 0 - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 - .49 | .50 - .99 | 1 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 13 | 17 | 21 | 10 | 30 | 9 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 - 99 | 100 - 199 | 200 & UP |
|---|---|---|---|---|---|---|---|
| 34 | 42 | 10 | 3 | 5 | 5 | 2 | 0 |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-4

**Date** 10/4/94

| | | |
|---|---|---|
| Total Asbestos Fibers | 42 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 42 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 10 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 42 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 34 to 50 | MFL |
| Detection Limit | 0.4 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 12 | 20 | 14 | 9 | 46 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 13 | 17 | 21 | 10 | 40 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 34 | 42 | 10 | 3 | 5 | 7 |

# TEM ASBESTOS ANALYSIS

Client [illegible] MS No [illegible]
Sample No. SW-C1 Page _____ of _____

## RECEIVING

**TYPE OF SAMPLE**
Air ☐ Water ☑
Soil ☐ Bulk ☐
Other _____

**METHOD OF ANALYSIS**
EPA 600/4-83-043 ☑ ISO ☐

**LEVEL OF ANALYSIS**
Chrysotile CD-CDQ
Amphibole ADQ

**ASPECT RATIO**
3:1 ☑ 5:1 ☐

**LENGTHS**
All Sizes (EPA) ☐
(µm) ≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 µm width ≥5.0 µm length)

**FILTER TYPE / AREA (mm±)**
MCE ☐ 385 ☐
PC ☑ 314 ☐
MCN ☐ 1017 ☐
Other _____

**PORE SIZE**
0.45 µm ☐ 0.8 µm ☐
0.1 µm ☑ 0.22 µm ☐
Other _____

G.O. Area (mm²) 0.0 _____
No. of G.O. to Analyze 20
Filter Lot No. AC8CAHIIB10

Approved By S.A. Date 9-28

## PREP

DIRECT PREP ☐
INDIRECT PREP ☐
ozonated

Volume _____ liters
Working Volume 25 ml
Weight _____ grams
Ashed Area _____ %

Prepared By SA/FM
Date 9-28-94

## ANALYSIS

**MICROSCOPE**
Serial No. 542-05-06 H600A ☐
Serial No. 542-05-13 H600B ☐

Grid Address A
Screen Magnification 1924 X
Camera Constant 3.84 3
Accelerating Voltage 100 KV
Beam Current 10 µm
K-Factor 1.6

Analyst Radla Date 10/3/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 10 | 60 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 2 | EDS |
| | 2 | F | 1.5 | 25 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 1 | EDS |
| | 3 | MD | 3 | 45 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS |
| | 4 | F | 8 | 110 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 1 | EDS |
| 2 | 5 | F | 4 | 300 | | | | | | | | | | | ✓ | | | | | | | | | | all amphiboles |
| | 6 | F | 10 | 260 | | | | | | | | | | | ✓ | | | | | | | | | | are Tremolite |
| | 7 | F | 2 | 20 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 8 | F | 4 | 30 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 9 | F | 3 | 170 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 10 | F | 3 | 38 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS |
| | 11 | F | 4 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 12 | F | 8 | 85 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 13 | F | 3 | 48 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 14 | F | 6 | 145 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 15 | MD | 8 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |

**OBSERVATIONS:**
Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client 19d" x 20d" MS No. -94-
Sample No. SW-4 Page 2 of

A
HG00B
19200
28.3

Analyst Radla Date 10/3

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 16 | F | 8 | 48 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 17 | F | 4 | 72 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 18 | F | 2 | 22 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 19 | F | 6 | 35 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 20 | F | 2 | 42 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 21 | F | 1.5 | 16 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS |
| | 22 | F | 1.5 | 48 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 23 | F | 3 | 18 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | ~~24~~ | MD | 3 | 80 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 25 | F | 2 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 26 | F | 3 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 27 | MD | 5 | ~~180~~ | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 28 | F | 5 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 4 | 29 | F | 5 | 60 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 30 | F | 4 | 20 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 31 | F | 12 | 115 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS |
| | 32 | F | 4 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 33 | F | 2 | 20 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 34 | F | 10 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 35 | F | 3 | 130 | | | | | | | | | | | ✓ | | | | | | | | | | |

**OBSERVATIONS:** Clean ☐ Other _____

Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client haf As iate MS No. 32 0
Sample No. SW-4 Page 3 of 3
A

Analyst Radla Date 10-3-94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | Fiber Classification NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 36 | F | 2 | 16 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 37 | F | 5 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 38 | F | 1.5 | 15 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | | EDS |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

3-Oct-1994 08:36:22

32940,SW-4,A,#01,RS  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.88 | 56. | Ni L , Ni L , Ni L , Ni L |
| 1.26 | 374. | Mg K , Mg K , Mg K |
| 1.74 | 1223. | Si K , Si K |
| 3.70 | 308. | Ca K , Ca K |
| 4.03 | 49. | Ca K , Ca K |
| 5.91 | 72. | Mn K , Mn K |
| 6.39 | 184. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 0 = 10323

3-Oct-1994 07:28:34

32940, SW-4, A, #02, RS  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 19 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 479. | Mg K , Mg K , Mg K |
| 1.74 | 2010. | Si K , Si K |
| 2.66 | 56. | Cl K , Cl K |
| 3.70 | 395. | Ca K , Ca K |
| 6.41 | 247. | Fe K , Fe K |
| 7.03 | 54. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 0 = 8975

3-Oct-1994 07:31:02

32940, SW-4, A, #03, RS  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 17 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 827. | Mg K , Mg K , Mg K |
| 1.74 | 2856. | Si K , Si K |
| 3.70 | 450. | Ca K , Ca K |
| 4.00 | 48. | Ca K , Ca K |
| 5.91 | 98. | Mn K , Mn K |
| 6.42 | 326. | Fe K , Fe K |
| 7.04 | 52. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 0 = 11903

3-Oct-1994 07:35:14

32940, SW-4, A, #04, RS  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1049. | Mg K , Mg K , Mg K |
| 1.75 | 3207. | Si K , Si K |
| 2.32 | 53. | S K , S K |
| 3.71 | 360. | Ca K , Ca K |
| 5.40 | 51. | Cr K , Cr K |
| 6.41 | 473. | Fe K , Fe K |
| 7.07 | 68. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral O = 23633

3-Oct-1994 07:50:14

32940, SW-4, A, #10, RS  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 796. | Mg K , Mg K , Mg K |
| 1.74 | 2575. | Si K , Si K |
| 3.70 | 596. | Ca K , Ca K |
| 6.41 | 345. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral O = 13696

3-Oct-1994 07:56:15

32940,SW-4,A,#21,RS  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 919. | Mg K , Mg K , Mg K |
| 1.74 | 2850. | Si K , Si K |
| 3.34 | 77. | K K , K K |
| 3.70 | 607. | Ca K , Ca K |
| 4.03 | 72. | Ca K , Ca K |
| 6.42 | 331. | Fe K , Fe K |
| 7.07 | 84. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 0 = 14635

3-Oct-1994 08:02:43

32940,SW-4,A,#31,RS  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 24 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 791. | Mg K , Mg K , Mg K |
| 1.74 | 2954. | Si K , Si K |
| 3.32 | 78. | K K , K K |
| 3.70 | 557. | Ca K , Ca K |
| 4.02 | 74. | Ca K , Ca K |
| 6.41 | 430. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 0 = 11711

3-Oct-1994 08:10:36

32940, SW-4, A, #38, RS

Vert= 500 counts Disp= 1 Preset= 100 secs

Elapsed= 22 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.68 | 59. | F K , F K , Fe L , Fe L , Fe L , Fe L |
| 1.25 | 754. | Mg K , Mg K , Mg K |
| 1.74 | 2579. | Si K , Si K |
| 3.70 | 800. | Ca K , Ca K |
| 4.05 | 64. | Sc K , Sc K , Ca K , Ca K |

Quantex)

0.000 Range= 10.230 keV

Integral 0 = 10.110

10125

# TEM ASBESTOS ANALYSIS

Client [illegible] EMS Lab No. [illegible]
Sample No. SW-4 Page 1 of 2

Grid: 1-B
Scope: H600B
Mag: 19,200
Cc: 28.3

Analyst [illegible] Date 10/3/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 2 | 35 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS#1; Tremolite |
| | 2 | F | 4 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 3 | F | 2.5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 4 | F | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | ~~Tr~~ Actinolite |
| | 5 | F | 10 | 90 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 6 | F | 6 | 106 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 7 | F | 9 | 58 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 8 | F | 3 | 180 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 9 | F | 2.5 | 20 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| 2 | 10 | F | 7 | 90 | | | | | | | | | | | ~~✓~~ KC | | ✓ | | | | 3 | 10 | 2 | 1 | Tremolite; EDS |
| | 11 | F | 1 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 12 | F | 1.5 | 18 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 13 | F | 4 | 90 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 14 | F | 3 | 115 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 15 | F | 10 | 45 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 16 | F | 8 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| 3 | 17 | F | 2.5 | 28 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 18 | F | 1.5 | 52 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 19 | F | 20 | 190 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 20 | F | 1.5 | 15 | | | | | | | | | | | ~~✓~~ KC | | ✓ | | | | 3 | 10 | 2 | 1.3 | Actinolite; EDS |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

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# TEM ASBESTOS ANALYSIS

Client [illegible] Hau
Sample No. SW-4

EMS Lab No. 32[illegible]0
Page 2 of 2

Analyst Kyeong Date 10/3/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 21 | F | 4 | 24 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 22 | F | 2 | 42 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| 4 | 23 | F | 2.5 | 31 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 24 | F | 4 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 25 | F | 2.5 | 18 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 26 | F | 5 | 25 | | | | | | | | | | | ✓ | | | | | | 3 | 10 | 2 | 1.4 | " ; EDS; SAED #251 |
| | 27 | F | 5 | 220 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 28 | F | 7 | 110 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 29 | B | 8 | 150 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 30 | F | 9 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| 5 | 31 | F | 10 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 32 | F | 3 | 19 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 33 | B | 12 | 50 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 34 | F | 3 | 31 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 35 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 36 | F | 2 | 12 | | | | | | | | | | | ✓ KC | | ✓ | | | | 2 | 10 | 2 | 1 | Tremolite ; EDS |
| | 37 | F | 5 | 82 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 38 | F | 2 | 26 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 39 | F | 5 | 220 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 40 | F | 4 | 50 | ✓ | | | | | | | | | | | | | | | | | | | | |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

3-Oct-1994 11:27:34

32940,SW-4,B,01,KC  Preset= 100 secs
Vert= 200 counts Disp= 1  Elapsed= 32 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 293. | Mg K , Mg K , Mg K |
| 1.74 | 1062. | Si K , Si K |
| 3.70 | 216. | Ca K , Ca K |
| 6.41 | 75. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 8 = 151

3-Oct-1994 12:49:39

32940,SW-4,B,10,KC  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1505. | Mg K , Mg K , Mg K |
| 1.74 | 4821. | Si K , Si K |
| 3.34 | 78. | K K , K K |
| 3.70 | 962. | Ca K , Ca K |
| 4.06 | 78. | Sc K , Sc K |
| 6.42 | 346. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 8 = 678

3-Oct-1994 13:21:02

32940,SW-4,B,20,KC  Preset= 100 secs
Vert= 200 counts  Disp= 1  Elapsed= 42 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 533. | Mg K , Mg K , Mg K |
| 1.74 | 1689. | Si K , Si K |
| 3.70 | 272. | Ca K , Ca K |
| 6.42 | 225. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 224

3-Oct-1994 13:59:11

32940,SW-4,B,26,KC  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.99 | 73. | Zn L , Zn L , Zn L |
| 1.25 | 1005. | Mg K , Mg K , Mg K |
| 1.74 | 4005. | Si K , Si K |
| 3.29 | 92. | K K , K K |
| 3.70 | 746. | Ca K , Ca K |
| 4.02 | 83. | Ca K , Ca K |
| 6.41 | 568. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 627

3-Oct-1994 14:38:18

32940,SW-4,B,36,KC  Preset= 100 secs
Vert= 200 counts Disp= 1  Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 313. | Mg K , Mg K , Mg K |
| 1.74 | 1326. | Si K , Si K |
| 3.70 | 272. | Ca K , Ca K |
| 6.44 | 115. | Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 169

# TEM ASBESTOS ANALYSIS

Client Schafer F.
Sample No. SWH

EMS Lab No. [illegible]
Page 1 of 3

C 2.m

H600A
mag - 19,400
GC - 30.4

Analyst Radle Date 10-4-94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 6 | 65 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 2 | EDS Actinolite |
| | 2 | F | 1.5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 3 | F | 5 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | all others amphibolites |
| | 4 | F | 4 | 20 | | | | | | | | | | | ✓ | | | | | | | | | | are Tremolite. |
| 2 | 5 | F | 5 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 6 | MD | 2 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 7 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 8 | F | 1.5 | 18 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 9 | F | 12 | 52 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 10 | F | 5 | 58 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 4 | 5 | EDS Actinolite. |
| | 11 | MD | 5 | 45 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 12 | F | 4 | 15 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 13 | F | 5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 14 | F | 5 | 220 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 15 | MD | 5 | 95 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 16 | MD | 3 | 50 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 17 | F | 6 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | |
| 3 | 18 | F | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 19 | F | 11 | 140 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 20 | F | 3 | 55 | | | | | | | | | | | | | ✓ | | | | 4 | 10 | 2 | 2 | EDS Actinolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client [illegible] Ass
Sample No. SW-4

EMS No. -294-
Page 2 of 3

C
H600A

Analyst Radha Date 10/4/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 21 | F | 1.5 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 22 | F | 4 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 23 | F | 5 | 18 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 24 | F | 1.5 | 16 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 25 | F | 3 | 32 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 26 | F | 1.5 | 30 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 27 | F | 1.5 | 14 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 4 | 28 | F | 2 | 120 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 29 | F | 5 | 38 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 30 | F | 1.5 | 60 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 31 | MD | 5 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 32 | MD | 2 | 90 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 33 | F | 5 | 60 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 34 | MD | 3 | 55 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 35 | F | 4 | 38 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 5 | 36 | MD | 5 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 37 | F | 3 | 350 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 38 | F | 3 | 35A | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 39 | F | 3 | 220 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 40 | F | 2 | 125 | | | | | | | | | | | ✓ | | | | | | | | | | |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

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# TEM ASBESTOS ANALYSIS

Client Schafer Assoc
Sample No. SW-4

EMS Lab No. 94
Page _____ of _____

C
H600A

Analyst Radla Date 10/4/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 41 | F | 3 | 20 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 42 | F | 1.5 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 43 | F | 8 | 200 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 44 | F | 2 | 35 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 45 | F | 3 | 22 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 46 | MD | 5 | 200 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 47 | F | 1.5 | 18 | | | | | | | | | | | ✓ | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

4-Oct-1994 07:25:15

32940, SW-4. C. #01, RS  Preset= 100 secs
Vert= 1000 counts  Disp= 1  Elapsed= 29 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 1558. | O K , O K , V L , V L , V L , V L |
| 1.25 | 588. | Mg K , Mg K , Mg K |
| 1.74 | 2230. | Si K , Si K |
| 3.32 | 122. | K K , K K |
| 3.69 | 283. | Ca K , Ca K |
| 6.41 | 380. | Fe K , Fe K |
| 7.04 | 75. | Fe K , Fe K |

Quantex>
0.000  Cursor= 1.260 keV  58 counts  10.110
Integral 0 = 11171

4-Oct-1994 07:30:23

32940, SW-4. C. #10, RS  Preset= 100 secs
Vert= 200 counts  Disp= 1  Elapsed= 20 secs
Quantex>

0.000  Range= 10.230 keV  10.110
Integral 0 = 5354

4-Oct-1994 07:31:03

32940, SW-4.C.#10, RS  Preset= 100 secs
Vert= 200 counts  Disp= 1  Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 626. | O K , O K , V L , V L , V L , V L |
| 1.25 | 193. | Mg K , Mg K , Mg K |
| 1.74 | 754. | Si K , Si K |
| 3.69 | 264. | Ca K , Ca K |
| 6.41 | 352. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral O = 5354

4-Oct-1994 07:46:00

32940, SW-4. C. #20, RS  Preset= 100 secs
Vert= 200 counts  Disp= 1  Elapsed= 57 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.49 | 568. | O K , O K , Ti L , V L , Ti L , V L , Ti L , V L , V L , V L |
| 1.25 | 343. | Mg K , Mg K , Mg K |
| 1.74 | 928. | Si K , Si K |
| 3.69 | 219. | Ca K , Ca K |
| 6.38 | 145. | Fe K , Fe K |

Quantex>
0.000  Range= 10.230 keV  10.110
Integral 0 = 6501

## Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-5

**Date Analyzed** 10/3/94

| | | |
|---|---|---|
| Fibers (asbestos) | BDL* | MFL |
| Fibers > 5 µm in length (asbestos) | BDL* | MFL |
| Fibers > 10 µm in length (asbestos) | BDL* | MFL |
| Mass (asbestos) | 0 | ug/L |
| More/Less than 5 Fibers in Sample (asbestos) | LESS | |
| Poisson 95% Confidence Interval | 0 to 2.7 | MFL |
| Detection Limit | 0.7 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Particle Size Distribution ( Asbestos )

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 - 4.99 | 5.00 - 9.99 | 10 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 - .49 | .50 - .99 | 1 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 - 99 | 100 - 199 | 200 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-5

**Date** 10/3/94

| | | |
|---|---|---|
| Total Asbestos Fibers | *BDL | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | *BDL | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | *BDL | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | *BDL | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | LESS | |
| Poisson 95% Confidence Interval | 0 to 2.7 | MFL |
| Detection Limit | 0.7 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

# TEM ASBESTOS ANALYSIS

Client: [illegible] EMS Lab No. [illegible]
Sample No. SW-5 Page ____ of ____

## RECEIVING

**TYPE OF SAMPLE**
Air ☐ Water ☑
Soil ☐ Bulk ☐
Other ____

**METHOD OF ANALYSIS**
EPA 600/4-83-043 ☑ ISO ☐

**LEVEL OF ANALYSIS**
Chrysotile CDQ-CD
Amphibole ADQ

**ASPECT RATIO**
3:1 ☑ 5:1 ☐

**LENGTHS**
All Sizes (EPA) ☐
(μm) ≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 μm width ≥5.0 μm length)

**FILTER TYPE / AREA (mm±)**
MCE ☐ 385 ☐
PC ☑ 314 ☐
MCN ☐ 1017 ☑
Other ____

**PORE SIZE**
0.45 μm ☐ 0.8 μm ☐
0.1 μm ☑ 0.22 μm ☐
Other ____

G.O. Area (mm²) 0.0 070
No. of G.O. to Analyze 20
Filter Lot No. AC8UAH11B010

Approved By S.A. Date 9-28.

## PREP

DIRECT PREP ☐
INDIRECT PREP ☐
ozonated

Volume ____ liters
Working Volume 10 ml
Weight ____ grams
Ashed Area ____ %

Prepared By SA/FM
Date 9-28-94

## ANALYSIS

**MICROSCOPE**
Serial No. 542-05-06 H600A ☐
Serial No. 542-05-13 H600B ☐

Grid Address A
Screen Magnification 19,400 X
Camera Constant 30.4
Accelerating Voltage 100 KV
Beam Current 10 μm
K-Factor 1.6

Analyst Radla Date 10/3

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 1 | F | 2 | 18 | ✓ | | | | | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |

**OBSERVATIONS:**
Clean ☐ Other ____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

3-Oct-1994 13:34:07

32940,SW-5,A,01,RS  Preset= 100 secs
Vert= 200 counts  Disp= 1  Elapsed= 32 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 398. | O K , O K , V L , V L , V L , V L |
| 1.75 | 186. | Si K , Si K |
| 3.68 | 121. | Ca K , Ca K |
| 5.89 | 231. | Mn K , Mn K |
| 6.39 | 464. | Fe K , Fe K |
| 7.04 | 89. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 129

# TEM ASBESTOS ANALYSIS

Client [illegible] ASS[illegible]
Sample No. SW-5

[illegible]IS L[illegible] No. 29[illegible]
Page _____ of _____

13

H600A
C·C 30·4
Mag. 19,400

Analyst Rodha Date 10/3

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | N>D | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | N>D | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | N>D | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | N>D | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | N>D | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | N>D | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | N>D | | | | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐

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# TEM ASBESTOS ANALYSIS

Client [illegible]
Sample No. [illegible]

EMS Lab No. _____
Page 1 of _____

C
Scope: H600B
mag: 19,200
cc: 28.3

Analyst Kyeong Date 10/3/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NSD | | | | | | | | | | | | | | | | | | | | | | | | * this sample contains |
| 2 | NSD | | | | | | | | | | | | | | | | | | | | | | | | many calcium-carbonat |
| 3 | NSD | | | | | | | | | | | | | | | | | | | | | | | | debris * |
| 4 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Other _____
Debris ☑ Very Light ☐ Light ☐ Moderate ☑ Heavy ☑ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

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## Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-8

**Date Analyzed** 10/4/94

| | | |
|---|---|---|
| Fibers (asbestos) | 180 | MFL |
| Fibers > 5 µm in length (asbestos) | 68 | MFL |
| Fibers > 10 µm in length (asbestos) | 25 | MFL |
| Mass (asbestos) | 560 | ug/L |
| More/Less than 5 Fibers in Sample (asbestos) | MORE | |
| Poisson 95% Confidence Interval | 150 to 220 | MFL |
| Detection Limit | 1.9 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Particle Size Distribution ( Asbestos )

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 - 4.99 | 5.00 - 9.99 | 10 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 14 | 15 | 6 | 5 | 18 | 22 | 13 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 - .49 | .50 - .99 | 1 & UP |
|---|---|---|---|---|---|---|---|
| 0 | 12 | 17 | 13 | 14 | 27 | 8 | 0 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 - 99 | 100 - 199 | 200 & UP |
|---|---|---|---|---|---|---|---|
| 29 | 28 | 15 | 4 | 5 | 9 | 2 | 1 |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

**EMS No.** 32940 **Client** SCHAFER & ASSOC.

**Sample No.** SW-8

**Date** 10/4/94

| | | |
|---|---|---|
| Total Asbestos Fibers | 180 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 180 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 68 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 560 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 150 to 220 | MFL |
| Detection Limit | 1.9 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 14 | 15 | 6 | 5 | 53 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 12 | 17 | 13 | 14 | 37 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 29 | 28 | 15 | 4 | 5 | 12 |

# TEM ASBESTOS ANALYSIS

nt [illegible] EMS No. [illegible]
Sample No. VSW-8 Page 1 of 3

## RECEIVING

**TYPE OF SAMPLE**
Air ☐ Water ☑
Soil ☐ Bulk ☐
Other _____

**METHOD OF ANALYSIS**
EPA 600/4-83-043 ☑ ISO ☐

**LEVEL OF ANALYSIS**
Chrysotile CD-CDQ
Amphibole ADQ

**ASPECT RATIO**
3:1 ☐ 5:1 ☐

**LENGTHS**
All Sizes (EPA) ☐
(μm) ≥0.5 ☑
≥1.0 ☐
≥5.0 ☐
≥10.0 ☐
PCM Range* ☐
*(≥0.25 μm width ≥5.0 μm length)

**FILTER TYPE / AREA (mm±)**
MCE ☐ 385 ☐
PC ☑ 314 ☐
MCN ☐ 1017 ☑
Other _____

**PORE SIZE**
0.45 μm ☐ 0.8 μm ☐
0.1 μm ☑ 0.22 μm ☐
Other _____

G.O. Area (mm²) 0.0 070
No. of G.O. to Analyze 20
Filter Lot No. AC84AH11B010

Approved By S.A Date 9-28-94

## PREP

DIRECT PREP ☐
INDIRECT PREP ☐
Ozonated

Volume _____ liters
Working Volume 25 ml
Weight _____ grams
Ashed Area _____ %

Prepared By SA/FM
Date 9/28/94

## ANALYSIS

**MICROSCOPE**
Serial No. 542-05-06 H600A ☐
Serial No. 542-05-13 H600B ☒

Grid Address A
Screen Magnification 19,200 X
Camera Constant 28.3
Accelerating Voltage 100 KV
Beam Current 10 μm
K-Factor 1.6

Analyst Kycong Date 9/3/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 6 | 20 | ✓ | | | | | | | | | | | | | | | | | | | | EDS |
| | 2 | F | 8 | 130X | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS; Tremolite |
| | 3 | F | 5 | 20 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 2 | EDS; Actinolite |
| | 4 | F | 7 | 140X | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 5 | F | 4 | 46 | | | | | | | | | | | | | ~~✓~~ KC | ✓ | | | 3 | 10 | 3 | 1 | EDS; ~~Actinolite~~ Tremolite KC; SAED 252 |
| | 6 | F | 6 | 55 | ✓ | | | | | | | | | | | | | | | | | | | | Mg, Al, Si, Fe |
| | 7 | F | 4 | 115 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 8 | F | 2 | 24 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 9 | F | 2 | 13 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 10 | F | 5 | 27 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 11 | F | 2 | 26 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 12 | F | 10 | 120 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 13 | F | 4 | 70 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS; Tremolite |
| | 14 | F | 2.5 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 15 | B | 13 | 113 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☑ Very Light ☐ Light ☐ Moderate ☐ Heavy ☑ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

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# TEM ASBESTOS ANALYSIS

Client [illegible] EMS Lab No. "294"
Sample No. SW-8 Page 2 of 3

Analyst Kyeong Date 10/3/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 16 | F | 3 | 27 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 17 | F | 6 | 58 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 18 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 19 | F | 2 | 61 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 20 | F | 4 | 36 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 21 | B | 6 | 270 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 22 | F | 2 | 61 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 23 | B | 5 | 240 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 24 | F | 1 | 20 | | | | | | | | | | | | | ✓ | | | | 2.5 | 10 | 2.5 | 1 | Tremolite ; EDS |
| | 25 | B | 8 | 960 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 26 | B | 18 | 250 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 27 | F | 3 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 28 | F | 2 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 29 | F | 4 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 30 | F | 2.5 | 135 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 31 | F | 2 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 32 | F | 1 | 13 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 33 | F | 8 | 62 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | Tremolite ; EDS |
| | 34 | F | 3 | 168 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 35 | F | 7 | 159 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client [illegible] Assoc.
Sample No. SW-8

EMS Lab No. [illegible]
Page 3 of 3

Analyst Kyeong Date 10/3/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | Fiber Classification NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 36 | F | 2 | 13 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 37 | F | 6 | 120 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 38 | F | 3 | 17 | | | | | | | | | | | ✓ | | | | | | | | | | " |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

03-Oct-1994 16:12:25 32940,SW-8,A,01,KC

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.00 | 177. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 1500. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 5616. | Si KA1, Si KA2 |
| 3.31 | 162. | K KA1, K KA2 |
| 3.71 | 662. | Ca KA1, Ca KA2 |
| 4.03 | 77. | Ca KB1, Ca KB3 |
| 5.43 | 72. | Cr KA1, Cr KA2 |
| 6.42 | 1141. | Fe KA1, Fe KA2 |
| 7.08 | 155. | Fe KB1, Fe KB3 |

3-Oct-1994 16:15:58

32940,SW-8,A,02,KC Preset= 100 secs
Vert= 500 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1068. | Mg K , Mg K , Mg K |
| 1.74 | 3582. | Si K , Si K |
| 3.32 | 107. | K K , K K |
| 3.70 | 738. | Ca K , Ca K |
| 4.02 | 75. | Ca K , Ca K |
| 5.93 | 49. | Mn K |
| 6.41 | 400. | Fe K , Fe K |
| Quantex) | 66. | Fe K , Fe K |

0.000 Range= 10.230 keV 10.110

Integral 8 = 922

3-Oct-1994 16:26:00

32940,SW-8,A,03,KC  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 23 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1459. | Mg K , Mg K , Mg K |
| 1.74 | 5135. | Si K , Si K |
| 3.70 | 1414. | Ca K , Ca K |
| 4.03 | 160. | Ca K , Ca K |
| 5.93 | 62. | Mn K |
| 6.41 | 777. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 8 = 756

3-Oct-1994 16:28:48

32940,SW-8,A,05,KC  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1134. | Mg K , Mg K , Mg K |
| 1.74 | 3697. | Si K , Si K |
| 3.33 | 56. | K K , K K |
| 3.70 | 1033. | Ca K , Ca K |
| 4.03 | 90. | Ca K , Ca K |
| 5.90 | 65. | Mn K , Mn K |
| 6.42 | 436. | Fe K , Fe K |
| Quantex) | 56. | Fe K , Fe K |

0.000 Range= 10.230 keV  10.110
Integral 8 = 685

3-Oct-1994 16:40:43

32940,SW-8,A,13,KC  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1347. | Mg K , Mg K , Mg K |
| 1.74 | 4669. | Si K , Si K |
| 3.31 | 101. | K K , K K |
| 3.70 | 1043. | Ca K , Ca K |
| 4.04 | 118. | Sc K , Ca K , Ca K |
| 6.41 | 529. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 676

3-Oct-1994 17:26:08

32940,SW-8,A,24,KC  Preset= 100 secs
Vert= 200 counts Disp= 1  Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 247. | Mg K , Mg K , Mg K |
| 1.75 | 1008. | Si K , Si K |
| 3.71 | 247. | Ca K , Ca K |
| 6.40 | 113. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 8 = 170

3-Oct-1994 18:19:47

32940,SW-8,A,33,KC  Preset= 100 secs
Vert= 500 counts  Disp= 1  Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 977. | Mg K , Mg K , Mg K |
| 1.74 | 3592. | Si K , Si K |
| 3.32 | 127. | K K , K K |
| 3.70 | 542. | Ca K , Ca K |
| 4.02 | 63. | Ca K , Ca K |
| 6.40 | 431. | Fe K , Fe K |
| 7.05 | 74. | Fe K , Fe K |

Quantex)
0.000  Range= 10.230 keV  10.110
Integral 8 = 492

# TEM ASBESTOS ANALYSIS

Client [illegible] EMS Lab No. [illegible]
Sample No. [illegible] Page _____ of _____

B

H600B
May 1920
CC 283

Analyst Rodly Date 10/4/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 5 | 60 | | | | | | | | | | | | | ✓ | ✓ | | | 3 | 10 | 3 | 1 | Tremolite |
| | 2 | F | 2 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 3 | F | 3 | 200 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 4 | F | 18 | 500 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 5 | MD | 6 | 160 | | | | | | | | | | | ✓ | | | | | | | | | | " " |
| | 6 | MD | 5 | 60 | | | | | | | | | | | ✓ | | | | | | | | | | " " |
| | 7 | MD | 4 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 8 | F | 1 | 55 | ✓ | | | | | | | | | | | | | | | | | | | | all other amphibolites |
| | 9 | F | 5 | 150 | | | | | | | | | | | ✓ | | | | | | | | | | are Tremolite |
| | 10 | F | 1.5 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 11 | F | 1 | 18 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 12 | F | 3 | 15 | | | | | | | | | | | ✓ | | ✓ | ✓ | | | 3 | 10 | 2 | 5 | Actinolite |
| | 13 | F | 1.5 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 14 | F | 3 | 20 | ✓ | | | | | | | | | | | | | | | | | | | | Actinolite |
| | 15 | MD | 1.5 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | ↓ |
| | 16 | F | 15 | 200 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 17 | MD | 4 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 18 | F | 15 | 160 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 19 | MD | 6 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 20 | F | 1.5 | 35 | | | | | | | | | | | ✓ | | ✓ | | | | 3 | 10 | 3 | 4 | Tremolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client [illegible] ASC
Sample No. SW-8

EMS Lab No. [illegible]
Page [illegible] of [illegible]

B

Analyst Padla Date 10/4

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 21 | F | 1 | 15 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 22 | F | 4 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 23 | F | 5 | 62 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 24 | F | 3 | 125 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 25 | F | 5 | 16 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 26 | MD | 5 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 27 | MD | 1.5 | 18 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 28 | MD | 2 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 29 | MD | 1.5 | 100 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 30 | F | 6 | 105 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1.4 | Actinolite |
| | 31 | F | 1.5 | 100 | ✓ | | | | | | | | | | ✓ | | | | | | | | | | |
| | 32 | MD | 5 | 250 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 33 | MD | 4 | 170 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 34 | F | 10 | 640 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 35 | F | 1.5 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 36 | F | 4 | 190 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 37 | F | 1.5 | 25 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 38 | F | 4 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 39 | F | 1.5 | 16 | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 40 | F | 1.5 | 16 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 2 | Actinolite |

**OBSERVATIONS:** Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

...nt [illegible] MS No. [illegible]
Sample No. SW-8 Page _____ of _____

1+600/3 B

Analyst Radla Date 10/4

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 41 | MD | 8 | 60 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 42 | F | 10 | 590 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 43 | F | 3 | 88 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 44 | F | 5 | 90 | | | | | | | | | | | ✓ | | | | | | | | | | " |

OBSERVATIONS: Clean ☐ Other _____
Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

4-Oct-1994 10:46:24

32940, SW-8, B, #01, RS  Preset= 100 secs
Vert= 1000 counts  Disp= 1  Elapsed= 19 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 2669. | Mg K , Mg K , Mg K |
| 1.75 | 8905. | Si K , Si K |
| 2.29 | 80. | S K , S K |
| 3.33 | 170. | K K , K K |
| 3.70 | 2611. | Ca K , Ca K |
| 4.05 | 203. | Sc K , Sc K , Ca K , Ca K |
| 6.42 | 869. | Fe K , Fe K |
| Quantex) | 152. | Fe K , Fe K |

0.000  Range= 10.230 keV  10.110
Integral 0 = 37760

4-Oct-1994 11:19:52

32940, SW-8, B, #12, RS  Preset= 100 secs
Vert= 1000 counts  Disp= 1  Elapsed= 12 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 2095. | Mg K , Mg K , Mg K |
| 1.74 | 6814. | Si K , Si K |
| 3.31 | 172. | K K , K K |
| 3.70 | 1453. | Ca K , Ca K |
| 4.05 | 171. | Sc K , Sc K , Ca K , Ca K |
| 5.92 | 45. | Mn K , Mn K |
| 6.41 | 756. | Fe K , Fe K |
| Quantex> | 111. | Fe K , Fe K |

0.000  Range= 10.230 keV  10.110
Integral 0 = 21403

04-Oct-1994 11:34:01 32940, SW-8, B, #20, RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.25 | 1930. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 6050. | Si KA1, Si KA2 |
| 2.34 | 49. | S KA1, S KA2 |
| 3.35 | 68. | K KA1, K KA2 |
| 3.70 | 1662. | Ca KA1, Ca KA2 |
| 4.03 | 186. | Ca KB1, Ca KB3 |
| 4.54 | 59. | Ti KA1, Ti KA2 |
| 5.89 | 53. | Mn KA1, Mn KA2 |
| 6.41 | 291. | Fe KA1, Fe KA2 |
| 7.06 | 46. | Fe KB1, Fe KB3 |

04-Oct-1994 11:49:15 32940, SW-8, B, #30, RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.65 | 24. | F KA1, F KA2, Mn LA1, Mn LA2, Mn LB1, Mn LG1 |
| 0.99 | 35. | Zn LA1, Zn LA2, Zn LB1 |
| 1.25 | 1100. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 3765. | Si KA1, Si KA2 |
| 2.31 | 24. | S KA1, S KA2 |
| 3.30 | 118. | K KA1, K KA2 |
| 3.71 | 677. | Ca KA1, Ca KA2 |
| 4.04 | 93. | Sc KA2, Ca KB1, Ca KB3 |
| 5.44 | 48. | Cr KA1, Cr KA2 |
| 5.91 | 81. | Mn KA1, Mn KA2, Cr KB1, Cr KB3 |
| 6.41 | 548. | Fe KA1, Fe KA2 |
| 7.07 | 77. | Fe KB1, Fe KB3 |

04-Oct-1994 13:00:51 32940, SW-8, B, #40, RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.01 | 32. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 1214. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 3911. | Si KA1, Si KA2 |
| 3.31 | 125. | K KA1, K KA2 |
| 3.70 | 652. | Ca KA1, Ca KA2 |
| 4.02 | 80. | Ca KB1, Ca KB3 |
| 5.87 | 54. | Mn KA1, Mn KA2 |
| 6.41 | 611. | Fe KA1, Fe KA2 |
| 7.06 | 72. | Fe KB1, Fe KB3 |

# TEM ASBESTOS ANALYSIS

Client Schafer Assoc.
Sample No. SW-8

EMS Lab No. 294
Page 1 of 2

RECEIVING

ANALYSIS

MICROSCOPE
Serial No. 542-05-06 H600A ☐
Serial No. 542-05-13 H600B ☒

Grid Address C
Screen Magnification 19,200 X
Camera Constant 28.3
Accelerating Voltage 100 KV
Beam Current 10 μm
K-Factor 1.6

Analyst Kyeong Date 10/4/94

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 5 | 27 | | | | | | | | | | | ✓ | | | | | | ? | | | | Actinolite |
| | 2 | F | 9.5 | 820 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1 | EDS; Tremolite |
| | 3 | F | 6 | 62 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 4 | F | 2.5 | 21 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 5 | F | 2 | 37 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 6 | F | 4 | 80 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 7 | F | 4 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 8 | F | 9.5 | 523 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 9 | F | 2 | 70 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 10 | B | 13 | 52 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 11 | F | 4 | 95 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1.4 | EDS; Actinolite |
| | 12 | F | 7 | 70 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 13 | F | 4 | 60 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 14 | F | 3 | 28 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 15 | B | 22 | 110 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |

OBSERVATIONS: Clean ☐ Other _____
Debris ☒ Very Light ☐ Light ☐ Moderate ☐ Heavy ☒ Very Heavy ☐
Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

# TEM ASBESTOS ANALYSIS

Client [illegible] AS
Sample No. SW-8

AS L[illegible] No. 27
Page 2 of 2

C

Analyst Kyeong Date 10/4/84

| Grid Opening | Structure Number | Structure | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 16 | F | 3 | 40 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 17 | B | 25 | 150 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 18 | F | 8 | 63 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 19 | F | 3 | 11 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 20 | F | 4 | 35 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 21 | F | 2 | 25 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | EDS; Tremolite |
| | 22 | F | 2.5 | 99 | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 23 | F | 3 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 24 | F | 2 | 19 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 25 | F | 1.5 | 42 | ✓ | | | | | | | | | | | | | | | | | | | | |
| | 26 | F | 2 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | Actinolite |
| | 27 | F | 2 | 13 | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 28 | F | 2 | 18 | | | | | | | | | | | ✓ | | | | | | | | | | " |

OBSERVATIONS: Clean ☐ Other _____

Debris ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

EMS LABORATORIES 117 West Bellevue Drive ☐ Pasadena, California 91105-2503 ☐ (818) 568-4065

4-Oct-1994 14:08:39

32940,SW-8,C,#02,KC  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 15 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1483. | Mg K , Mg K , Mg K |
| 1.74 | 4595. | Si K , Si K |
| 3.31 | 110. | K K , K K |
| 3.70 | 1226. | Ca K , Ca K |
| 4.05 | 108. | Sc K , Sc K , Ca K , Ca K |
| 6.41 | 547. | Fe K , Fe K |
| 7.06 | 78. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 0 = 24721

4-Oct-1994 14:32:31

32940,SW-8,C,#11,KC  Preset= 100 secs
Vert= 500 counts Disp= 1  Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 810. | Mg K , Mg K , Mg K |
| 1.74 | 2672. | Si K , Si K |
| 3.71 | 692. | Ca K , Ca K |
| 4.04 | 92. | Sc K , Ca K , Ca K |
| 6.42 | 375. | Fe K , Fe K |
| 7.06 | 60. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV  10.110
Integral 0 = 14334

4-Oct-1994 15:11:23

32940,SW-8,C,#21,KC  Preset= 100 secs
Vert= 200 counts Disp= 1  Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 361. | Mg K , Mg K , Mg K |
| 1.74 | 1371. | Si K , Si K |
| 3.71 | 224. | Ca K , Ca K |
| 6.39 | 157. | Fe K , Fe K |

Quantex)
0.000 Range= 10.230 keV 10.110
Integral 0 = 6758

## ANALYSIS OF WATER BY TEM (EPA-600/4-83-043)

LAB NO: 32940
CLIENT: Schafer & Assoc.

| Laboratory I.D. | Client I.D. | FILTER MEDIA DATA Type | Diameter mm | Effective Area mm^2 | No. of G.O. | Analyzed Area, mm^2 | Sample Volume (ml) |
|---|---|---|---|---|---|---|---|
| 32940-0 | SW-0 | PC | 47 | 1017 | 5 | 0.035 | 50 |
| 32940-4 | SW-4 | PC | 47 | 1017 | 14 | 0.098 | 25 |
| 32940-5 | SW-5 | PC | 47 | 1017 | 20 | 0.14 | 10 |
| 32940-8 | SW-8 | PC | 47 | 1017 | 3 | 0.021 | 25 |

## INDIVIDUAL ANALYTICAL RESULTS

| Laboratory I.D. | Client I.D. | No. of Asbestos Str | >5 | >10 | Detection Limit (MFL) | CONCENTRATION ( MFL ) Str | Str >5um | Str >10um |
|---|---|---|---|---|---|---|---|---|
| 32940-0 | SW-0 | 107 | 34 | 8 | 0.6 | 62 | 20 | 4.6 |
| 32940-4 | SW-4 | 101 | 25 | 7 | 0.4 | 42 | 10 | 2.9 |
| 32940-5 | SW-5 | N.D. | N.D. | N.D. | 0.7 | N.D. | N.D. | N.D. |
| 32940-8 | SW-8 | 93 | 35 | 13 | 1.9 | 180 | 68 | 25 |

The analysis was carried out to the approved TEM method. This laboratory is in compliance with the quality specified by the method.

B M Koll

Authorized Signature

ADMINISTRATIVE RECORD

5-Dec-1991 07:54:45
Execution time = 6 seconds
22965,4,B,#02,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 416. | O K , O K , V L , V L , V L , V L |
| 1.26 | 323. | Mg K , Mg K , Mg K |
| 1.74 | 994. | Si K , Si K |
| 2.60 | 80. | Cl K , Cl K |
| 3.69 | 196. | Ca K , Ca K |
| 6.39 | 136. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7601

5-Dec-1991 07:58:49
Execution time = 6 seconds
22965,4,B,#03,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 19 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.51 | 932. | O K , O K , V L , V L , V L , V L |
| 1.25 | 621. | Mg K , Mg K , Mg K |
| 1.74 | 1801. | Si K , Si K |
| 3.29 | 41. | K K , K K |
| 3.69 | 419. | Ca K , Ca K |
| 4.03 | 43. | Ca K , Ca K |
| 6.40 | 173. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9992

05-Dec-1991 07:53:08 22965,4,B,#04,RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 3228. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.00 | 231. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.25 | 2170. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 6813. | Si KA1, Si KA2 |
| 3.31 | 279. | K KA1, K KA2 |
| 3.69 | 1135. | Ca KA1, Ca KA2 |
| 4.03 | 141. | Ca KB1, Ca KB3 |
| 6.40 | 761. | Fe KA1, Fe KA2 |
| 7.07 | 132. | Fe KB1, Fe KB3 |

```
 5-Dec-1991 08:00:42
Execution time =     6 seconds
22965,4,B,#05,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        21 secs
   Energy  Counts     X-Ray Lines

   0.52      581.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.24      405.    Mg K  , Mg K

   1.73     1110.    Si K  , Si K

   3.70      284.    Ca K  , Ca K

   6.40      104.    Fe K  , Fe K


Quantex
      0.160     Range=    10.230 keV                        10.230
                                          Integral 0  =         6535
 5-Dec-1991 08:03:15
Execution time =     5 seconds
22965,4,B,#06,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        27 secs
   Energy  Counts     X-Ray Lines

   0.53       78.    O  K  , O  K  , V  L  , Cr L  , V  L  ,
                     Cr L  , V  L  , V  L  , Cr Ll , Cr L

   1.74      173.    Si K  , Si K

   3.68       90.    Ca K  , Ca K


Quantex>
      0.160     Range=    10.230 keV                        10.230
                                          Integral 0  =         4079
```

05-Dec-1991 08:05:10 22965,4,B,#07,RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 895. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.02 | 139. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.25 | 576. | Mg KA1, Mg KA2, Mg KB1 |
| 1.73 | 2353. | Si KA1, Si KA2 |
| 2.27 | 104. | S KA1, S KA2 |
| 2.63 | 294. | Cl KA1, Cl KA2 |
| 3.34 | 109. | K KA1, K KA2 |
| 3.69 | 239. | Ca KA1, Ca KA2 |
| 6.39 | 570. | Fe KA1, Fe KA2 |
| 7.06 | 88. | Fe KB1, Fe KB3 |

5-Dec-1991 08:08:16
Execution time = 8 seconds
22965,4,B,#08,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 45 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.51 | 257. | O K , O K , V L , V L , V L , V L |
| 1.25 | 170. | Mg K , Mg K , Mg K |
| 1.73 | 524. | Si K , Si K |
| 3.70 | 119. | Ca K , Ca K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7693

```
 5-Dec-1991 08:11:12
Execution time =     6 seconds
22965,4,B,#09,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        23 secs
   Energy  Counts    X-Ray Lines

   0.52      427.   O  K  , O  K  , V  L  , V  L  , V  L  ,
                    V  L

   1.24      279.   Mg K  , Mg K

   1.73      936.   Si K  , Si K

   3.69      292.   Ca K  , Ca K

   6.38       60.   Fe K  , Fe K


Quantex>
      0.160    Range=   10.230 keV                        10.230
                                          Integral 0  =        5619
 5-Dec-1991 08:21:12
Execution time =     6 seconds
22965,4,B,#10,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        30 secs
   Energy  Counts    X-Ray Lines

   0.52      339.   O  K  , O  K  , V  L  , V  L  , V  L  ,
                    V  L

   1.25      262.   Mg K  , Mg K  , Mg K

   1.74      752.   Si K  , Si K

   3.69      211.   Ca K  , Ca K


Quantex>
      0.160    Range=   10.230 keV                        10.230
                                          Integral 0  =        5966
```

```
 5-Dec-1991 08:23:10
Execution time =     7 seconds
22965,4,B,#1ϕ,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        19 secs
   Energy  Counts     X-Ray Lines

   0.51      538.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.25      324.    Mg K  , Mg K  , Mg K

   1.73     1000.    Si K  , Si K

   3.69      197.    Ca K  , Ca K

   6.38      108.    Fe K  , Fe K



Quantex>
      0.160     Range=    10.230 keV                          10.230
                                          Integral 0  =          5826
 5-Dec-1991 08:31:51
Execution time =     6 seconds
22965,4,B,#19,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        14 secs
   Energy  Counts     X-Ray Lines

   0.52      843.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.26      751.    Mg K  , Mg K  , Mg K

   1.74     1720.    Si K  , Si K

   3.35       58.    K  K  , K  K

   3.68      397.    Ca K  , Ca K

   4.01       63.    Ca K  , Ca K

   6.40      116.    Fe K  , Fe K
Quantex>
      0.160     Range=    10.230 keV                          10.230
                                          Integral 0  =          9282
```

```
 5-Dec-1991 08:52:49
Execution time =     8 seconds
22965,4,B,#27,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        59 secs
   Energy  Counts    X-Ray Lines

   0.51      325.   O  K  , O  K  , V  L  , V  L  , V  L  ,
                    V  L

   1.25      147.   Mg K  , Mg K  , Mg K

   1.74      574.   Si K  , Si K

   3.67      103.   Ca K  , Ca K

   6.41       96.   Fe K  , Fe K


Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =        13852
 5-Dec-1991 08:59:43
Execution time =     7 seconds
22965,4,B,#36,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        28 secs
   Energy  Counts    X-Ray Lines

   0.51      220.   O  K  , O  K  , V  L  , V  L  , V  L  ,
                    V  L

   1.26      139.   Mg K  , Mg K  , Mg K

   1.74      412.   Si K  , Si K

   3.67       75.   Ca K  , Ca K

   6.38       66.   Fe K  , Fe K


Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =         4775
```

5-Dec-1991 09:10:46
Execution time = 6 seconds
22965,4,B,#43,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 18 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 840. | O K , O K , V L , V L , V L , V L |
| 0.99 | 72. | Zn L , Zn L , Zn L |
| 1.25 | 622. | Mg K , Mg K , Mg K |
| 1.74 | 2022. | Si K , Si K |
| 3.69 | 501. | Ca K , Ca K |
| 4.05 | 68. | Sc K , Sc K , Ca K , Ca K |
| 6.38 | 160. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9727

EM ASBESTOS ANALYSIS

MS Lab No. 22965

mple No. SW-3-4 (50ml)

RECEIVING

ANALYSIS

GRID 1 ☑ 2 ☐ 3 ☐ 4 ☐

Grid Address C

Screen Magnification 19,400 x

Camera Constant 30.5

Accelerating Voltage 100 KV

Beam Current 10 µa

Analyst Kyeong

Date 12/27/91

MICROSCOPE 600A ☐ 600B ☑ HU11E ☐ HU125E ☐

C

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | Fiber Classification NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 2.5 | 15 | | | | | | | | | | | | | | ✓ | | | 3 | 10 | 3 | - | | SAED #3620; Tremo |
| | 2 | F | 4 | 58 | | | | | | | | | | | | | ✓ | | | | See EDS | | | | | Tremolite |
| | 3 | F | 2 | 20 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 4 | F | 2.5 | 13 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 2 | | Tremolite |
| | 5 | F | 3 | 44 | | | | | | | | ✓ | | | | | | | | | | | | | | In debris |
| | 6 | F | 2.5 | 16 | | | | | | | | ✓ | | | | | | | | | | | | | | In debris |
| 2 | 7 | F | 1.5 | 51 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | | | Tremolite |
| | 8 | F | 2 | 15 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | | | Tremolite |
| | 9 | F | 4 | 85 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | Tremolite |
| | 10 | F | 3 | 75 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 2 | | Tremolite |
| | 11 | F | 8.5 | 110 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | Tremolite |
| | 12 | F | 2.5 | 50 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | Tremolite |
| | 13 | F | 5 | 65 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | Tremolite |
| | 14 | F | 2.5 | 60 | | | | | | | | | | | | | | ✓ | | | 3 | 10 | 2 | 1 | | SAED #3621; Tremo |
| | 15 | F | 3 | 35 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | Tremolite |
| | 16 | F | 2 | 16 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 17 | F | 1.5 | 31 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 18 | F | 3 | 17 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 0.5 | | Tremolite |
| | 19 | F | 5 | 118 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1 | | Tremolite |
| | 20 | F | 5.5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS: Clean ☐ Debris: ☒ Gypsum: ☐ Very Light ☐ Very Light ☐ Light ☐ Light ☐ Moderate ☒ Moderate ☐ Heavy ☐ Heavy ☐ Very Heavy ☐ Very Heavy ☐

27-Dec-1991 10:52:27
Execution time = 6 seconds
22965 SW-3-4,C,01,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 54 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 539. | Mg K , Mg K , Mg K |
| 1.76 | 1603. | Si K , Si K |
| 3.71 | 459. | Ca K , Ca K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 12374

27-Dec-1991 10:33:18
Execution time = 208 seconds
22965, SW-3-4, C, O2, Tony
Preset= Off
Vert= 2000 counts Disp= 1 Comp= 3 Elapsed= 83 secs

| Lines of interest | Intensity (cts/sec) | 2-sigma error (relative) | Standard spectrum | K-ratio |
|---|---|---|---|---|
| Na KA | 7.06 | 0.0592 | | |
| Mg KA | 67.73 | 0.0142 | | |
| Si KA | 246.89 | 0.0071 | | |
| Ca KA | 74.82 | 0.0130 | | |
| Fe KA | 30.82 | 0.0213 | | |

CHI-SQUARED: 2.1112

Quantex>

0.000 Range= 10.230 keV 10.110
Integral O = 20010

27-Dec-1991 10:35:08
Execution time = 5 seconds
22965, SW-3-4, C, O2, Tony
Preset= Off
Vert= 2000 counts Disp= 1 Comp= 3 Elapsed= 83 secs

| ELEMENT & LINE | WEIGHT PERCENT | OXIDE PERCENT | PRECISION 2 SIGMA | INTENSITIES | NO. OF CATIONS |
|---|---|---|---|---|---|
| Na K | 1.81 | 2.44 | 0.14 | 7.06 | 0.643 |
| Mg K | 12.83 | 21.28 | 0.32 | 67.73 | 4.313 |
| Si K | 27.52 | 58.87 | 0.47 | 246.89 | 8.006 |
| Ca K | 8.34 | 11.67 | 0.16 | 74.82 | 1.700 |
| Fe K | 4.47 | 5.74 | 0.13 | 30.82 | 0.653 |
| O * | 45.03 | | | | |
| TOTAL | | 100.00 | | | 15.316 |

NUMBER OF CATIONS CALCULATED ON BASIS OF 23 OXYGEN ATOMS
* - Determined by stoichiometry
Quantex>
0.000 Range= 10.230 keV 10.110
Integral O = 20010

27-Dec-1991 11:08:38
Execution time = 7 seconds
22965,SW-3-4,C,04,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 37 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 415. | Mg K , Mg K , Mg K |
| 1.75 | 1662. | Si K , Si K |
| 3.70 | 264. | Ca K , Ca K |
| 6.40 | 334. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9862

27-Dec-1991 11:27:34
Execution time = 6 seconds
22965,SW-3-4,C,07,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 143. | Mg K , Mg K , Mg K |
| 1.75 | 533. | Si K , Si K |
| 3.73 | 129. | Ca K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 4227

27-Dec-1991 11:33:16
Execution time = 7 seconds
22965,SW-3-4,C,08,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 40 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 272. | Mg K , Mg K , Mg K |
| 1.75 | 860. | Si K , Si K |
| 3.70 | 190. | Ca K , Ca K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6876

27-Dec-1991 11:35:18
Execution time = 6 seconds
22965,SW-3-4,C,09,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 464. | Mg K , Mg K , Mg K |
| 1.75 | 1742. | Si K , Si K |
| 3.71 | 385. | Ca K , Ca K |
| 6.41 | 174. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7927

27-Dec-1991 11:38:04
Execution time = 7 seconds
22965,SW-3-4,C,10,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 468. | Mg K , Mg K , Mg K |
| 1.75 | 2231. | Si K , Si K |
| 3.30 | 75. | K K , K K |
| 3.69 | 357. | Ca K , Ca K |
| 6.40 | 450. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral O = 9104

27-Dec-1991 11:39:23
Execution time = 7 seconds
22965,SW-3-4,C,11,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 9 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 550. | Mg K , Mg K , Mg K |
| 1.75 | 2121. | Si K , Si K |
| 3.32 | 68. | K K , K K |
| 3.69 | 400. | Ca K , Ca K |
| 4.03 | 48. | Ca K , Ca K |
| 6.42 | 232. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral O = 6953

27-Dec-1991 11:41:58
Execution time = 6 seconds
22965,SW-3-4,C,12,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 59 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 376. | Mg K , Mg K , Mg K |
| 1.74 | 1923. | Si K , Si K |
| 3.70 | 253. | Ca K , Ca K |
| 6.41 | 468. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 11671

27-Dec-1991 11:45:24
Execution time = 7 seconds
22965,SW-3-4,C,13,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 463. | Mg K , Mg K , Mg K |
| 1.76 | 1527. | Si K , Si K |
| 3.70 | 349. | Ca K , Ca K |
| 6.41 | 181. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7189

27-Dec-1991 11:51:35
Execution time = 7 seconds
22965,SW-3-4,C,14,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 416. | Mg K , Mg K , Mg K |
| 1.76 | 1470. | Si K , Si K |
| 3.73 | 366. | Ca K |
| 6.43 | 150. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7905

27-Dec-1991 11:53:43
Execution time = 6 seconds
22965,SW-3-4,C,15,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 550. | Mg K , Mg K , Mg K |
| 1.75 | 2149. | Si K , Si K |
| 3.70 | 463. | Ca K , Ca K |
| 6.40 | 222. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9071

27-Dec-1991 11:59:50
Execution time = 7 seconds
22965,SW-3-4,C,18,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 24 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 314. | Mg K , Mg K , Mg K |
| 1.75 | 1237. | Si K , Si K |
| 3.70 | 307. | Ca K , Ca K |
| 6.43 | 66. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6180

27-Dec-1991 12:02:00
Execution time = 6 seconds
22965,SW-3-4,C,19,KK Preset= Off
Vert= 200 counts Disp= 1 Comp= 3 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 542. | Mg K , Mg K , Mg K |
| 1.75 | 1765. | Si K , Si K |
| 3.72 | 466. | Ca K , Ca K |
| 4.03 | 69. | Ca K , Ca K |
| 6.40 | 142. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7674

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| TM | - | Tubular Morphology not sufficiently characteristic for classification as chrysotile |
| CM | - | Characteristic Chrysotile Morphology |
| CD | - | Chrysotile SAED pattern |
| CQ | - | Chrysotile composition by Quantitative EDXA |
| CMQ | - | Chrysotile Morphology and composition by Quantitative EDXA |
| CDQ | - | Chrysotile SAED pattern and composition by Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| UF | - | Unidentified Fiber |
| AD | - | Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing) |
| AX | - | Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole |
| ADX | - | Amphibole by random orientation SAED and Qualitative EDXA |
| AQ | - | Amphibole by Quantitative EDXA |
| AZ | - | Amphibole by one Zone Axis SAED |
| ADQ | - | Amphibole by random orientation SAED and Quantitative EDXA |
| AZQ | - | Amphibole by one Zone Axis SAED pattern and Quantitative EDXA |
| AZZ | - | Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle |
| AZZQ | - | Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

| | | | |
|---|---|---|---|
| EMS No. | 22965 | Client | SCHAFER & ASSOC. |
| Sample No. | SW-4-4 | | |
| Date | 12/27/91 | | |

| | | |
|---|---|---|
| Total Asbestos Fibers | 4 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 4 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 1.1 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 6.4 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 3 to 5.2 | MFL |
| Detection Limit | 0.07 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 9 | 5 | 5 | 5 | 30 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 4 | 14 | 9 | 6 | 21 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 18 | 22 | 8 | 3 | 2 | 1 |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. SW-4-4

Page ___ of ___

MICROSCOPE
600A ☐
600B ☑
HU11E ☐
HU125E ☐

RECEIVING

100 ml

ANALYSIS

GRID
1 ☑ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 19,500 x
Camera Constant 28.4
Accelerating Voltage 100 KV
Beam Current 10 µa

A

Analyst F.M. Date 12/27

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01 | F | 9 | 43 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Tremolit |
| | 02 | F | 5 | 70 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 1 | 1 | | EDS |
| | 03 | F | 8 | 60 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 04 | F | 2 | 24 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 2 | 1 | | EDS Tremolit |
| | 05 | F | 5 | 22 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 2 | 06 | F | 7 | 60 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 1 | 1 | | EDS Tremolit |
| | 07 | F | 1 | 15 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 08 | F | 2.5 | 150 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 1 | 2 | | EDS Tremolit |
| | 09 | F | 2 | 17 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 10 | F | 3 | 14 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 3 | 11 | FX | 3 | 46 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 12 | F | 15 | 160 | | | | | | | | | | | | ✓ | | | | 1 | 3 | 10 | 1 | 2 | | EDS Tremolit |
| | 13 | F | 10 | 150 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 3 | 1 | | Tremolite E |
| | 14 | F | 6 | 155 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Tremolite |
| 4 | 15 | F | 4 | 65 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 16 | F | 1 | 18 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 17 | F | 2.5 | 23 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| 5 | 18 | FX | 15 | 150 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Tremolit |
| | 19 | F | 1 | 18 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 20 | F | 2.5 | 50 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 21 | F | 4 | 105 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| 6 | 22 | F | 3 | 17 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 23 | F | 3 | 55 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 24 | F | 2.5 | 28 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |

OBSERVATIONS:

Clean ☐

| | | | | | |
|---|---|---|---|---|---|
| Debris: ☑ | Very Light ☐ | Light ☑ | Moderate ☑ | Heavy ☐ | Very Heavy ☐ |
| Gypsum: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |
| Other ☐ | | | | | |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22868

Sample No. SW-4-4



RECEIVING

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ µa

Analyst _____ Date _____

| Grid opening | Str # | Str | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Na | EDS Mg | EDS Si | EDS Ca | EDS Fe | EDS Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 25 | F | 2 | 65 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 26 | F | 5 | 52 | | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 27 | F | 9 | 100 | | | | | | | | | | | | ✓ | | | | 0.5 | 2 | 10 | | 4 | | EDS Crocidolite |
| | 28 | F | 5 | 150 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Tremolite |
| | 29 | F | 5 | 70 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| 7 | 30 | F | 2 | 30 | | | | | | | | | | | | ✓ | | | | | | | | | | " |
| | 31 | F | 1 | 45 | | | | | | | | | | | | ✓ | | | | | | | | | | " |

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

EMS LABORATORIES

27-Dec-1991 16:22:51 22965,SW-8-4,A,01,FM

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.02 | 112. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.27 | 2342. | Mg KA1, Mg KA2, Mg KB1 |
| 1.76 | 8840. | Si KA1, Si KA2 |
| 3.34 | 314. | K KA1, K KA2 |
| 3.71 | 1641. | Ca KA1, Ca KA2 |
| 4.06 | 135. | Sc KA1, Sc KA2 |
| 4.99 | 91. | V KA1 |
| 5.45 | 354. | Cr KA1, V KB1, V KB3 |
| 6.41 | 928. | Fe KA1, Fe KA2 |
| 7.09 | 113. | Fe KB1, Fe KB3 |

27-Dec-1991 16:26:30
Execution time = 6 seconds
22965,SW-8-4,A,02,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 337. | Mg K , Mg K , Mg K |
| 1.75 | 1374. | Si K , Si K |
| 3.70 | 147. | Ca K , Ca K |
| 6.42 | 162. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8618

27-Dec-1991 16:33:58
Execution time = 6 seconds
22965,SW-8-4,A,04,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 520. | Mg K , Mg K , Mg K |
| 1.75 | 1850. | Si K , Si K |
| 3.70 | 499. | Ca K , Ca K |
| 6.40 | 165. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9734

27-Dec-1991 16:39:25
Execution time = 6 seconds
22965,SW-8-4,A,06,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1553. | Mg K , Mg K , Mg K |
| 1.75 | 6106. | Si K , Si K |
| 3.70 | 743. | Ca K , Ca K |
| 4.05 | 74. | Sc K , Sc K , Ca K , Ca K |
| 6.40 | 524. | Fe K , Fe K |
| 7.07 | 68. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 21020

27-Dec-1991 16:44:44
Execution time = 6 seconds
22965,SW-8-4,A,0β,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.02 | 112. | Na K , Na K , Na K , Zn L , Zn L , Zn L , Zn L |
| 1.26 | 775. | Mg K , Mg K , Mg K |
| 1.75 | 2945. | Si K , Si K |
| 3.69 | 295. | Ca K , Ca K |
| 6.41 | 625. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 13850

27-Dec-1991 16:54:17 22965,SW-8-4,A,12,FM

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.02 | 109. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.27 | 2373. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 8627. | Si KA1, Si KA2 |
| 3.34 | 368. | K KA1, K KA2 |
| 3.71 | 786. | Ca KA1, Ca KA2 |
| 4.10 | 94. | Sc KA1, Sc KA2 |
| 6.41 | 1387. | Fe KA1, Fe KA2 |
| 7.07 | 220. | Fe KB1, Fe KB3 |

27-Dec-1991 16:57:36 22965,SW-8-4,A,13,FM

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.74 | 122. | Fe LA1, Co LA1, Fe LA2, Co LA2, Fe LB1, Fe LG1 |
| 1.26 | 1087. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 4098. | Si KA1, Si KA2 |
| 3.34 | 95. | K KA1, K KA2 |
| 3.70 | 1030. | Ca KA1, Ca KA2 |
| 4.03 | 93. | Ca KB1, Ca KB3 |
| 6.43 | 405. | Fe KA1, Fe KA2 |
| 7.02 | 128. | Fe KB1, Fe KB3 |

27-Dec-1991 17:04:35
Execution time = 7 seconds
22965,SW-8-4,A,14,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 34 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1502. | Mg K , Mg K , Mg K |
| 1.75 | 5193. | Si K , Si K |
| 3.33 | 144. | K K , K K |
| 3.70 | 926. | Ca K , Ca K |
| 4.03 | 98. | Ca K , Ca K |
| 6.40 | 443. | Fe K , Fe K |
| 7.05 | 91. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 22791

27-Dec-1991 17:14:25
Execution time = 7 seconds
22965,SW-8-4,A,18,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 1627. | Mg K , Mg K , Mg K |
| 1.75 | 5446. | Si K , Si K |
| 3.32 | 152. | K K , K K |
| 3.71 | 889. | Ca K , Ca K |
| 6.42 | 684. | Fe K , Fe K |
| 7.03 | 76. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 20279

27-Dec-1991 17:31:10
Execution time = 7 seconds
22965,SW-8-4,A,~~18~~ 27,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.02 | 324. | Na K , Na K , Na K , Zn L , Zn L , Zn L , Zn L |
| 1.25 | 1281. | Mg K , Mg K , Mg K |
| 1.75 | 7251. | Si K , Si K |
| 4.95 | 126. | V K , V K |
| 6.41 | 2458. | Fe K , Fe K |
| 7.07 | 330. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 24439

27-Dec-1991 17:35:08
Execution time = 6 seconds
22965,SW-8-4,A,28,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 498. | Mg K , Mg K , Mg K |
| 1.74 | 1679. | Si K , Si K |
| 3.70 | 252. | Ca K , Ca K |
| 6.40 | 235. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8109

EM ASBESTOS ANALYSIS

MS Lab No. 2965

ample No. #4

RECEIVING

ANALYSIS

GRID 1 ☐ 2 ☒ 3 ☐ 4 ☐

MICROSCOPE 600A ☒ 600B ☐ HU11E ☐ HU125E ☐

Grid Address 1 B

Screen Magnification 19300

Camera Constant 30.5

Accelerating Voltage 100 KV

Beam Current 10 pa

Analyst Radha Singh Date 12/1/

B

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 5 | 38 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 2 | N>0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 1 | | 5 | 53 | ✓ | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 2 | | [illegible] | 112 | | | | | | | | | ✓ | | | | ✓ | | | | 3.6 | 10 | 1.3 | 1.3 | | Tremolite |
| | 3 | | 5 | 30 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4 | | 6 | 75 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| 5 | 5 | | 3 | 80 | ✓ | | | | | | | | | | | | | | | | 3.5 | 10 | 1.8 | 0.9 | | Tremolite |
| | 6 | | 3 | 18 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 7 | | 8 | 72 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 8 | | 1.5 | 12 | ✓ | | | | | | | | | | | | | | | | 2 | 10 | 3.9 | 3.3 | | |
| | 9 | | 3 | 60 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 10 | | 12 | 230 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| 6 | 11 | | 5 | 32 | | | | | | | | | | | | | ✓ | | | | 3.2 | 10 | 1.4 | 1.3 | | Tremolite |
| | 12 | | 3 | 18 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 7 | 13 | | 5 | 185 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 14 | | 15 | 122 | | | | | | | | | | | | | ✓ | | | | 3.6 | 10 | 2 | 0.5 | | Tremolite |
| | 15 | | 4 | 68 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | .8 | | Tremolite |
| | 16 | | 10 | 72 | ✓ | | | | | | | ✓ | | | | | | | | | 4.7 | 10 | 1.4 | 1.3 | | Tremolite |
| | 17 | | 3 | 66 | | | | | | | | | | | | | ✓ | | | | | | | | | |

OBSERVATIONS: Clean ☐ Debris: ☐ Gypsum: ☐ Very Light ☐ Very Light ☐ Light ☐ Light ☐ Moderate ☒ Moderate ☐ Heavy ☐ Heavy ☐ Very Heavy ☐ Very Heavy ☐

```
17-Dec-1991 08:55:50
Execution time =     6 seconds
22965,4,B,#02,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        28 secs
   Energy  Counts     X-Ray Lines

   0.52      713.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.25      498.    Mg K  , Mg K  , Mg K

   1.75     1374.    Si K  , Si K

   3.69      175.    Ca K  , Ca K

   6.40      173.    Fe K  , Fe K


Quantex>
      0.160     Range=    10.230 keV                        10.230
                                          Integral 8  =          232
17-Dec-1991 08:58:13
Execution time =     6 seconds
22965,4,B,#03,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        34 secs
   Energy  Counts     X-Ray Lines

   1.74      124.    Si K  , Si K


Quantex>
      0.160     Range=    10.230 keV                        10.230
                                          Integral 8  =            8
```

17-Dec-1991 09:04:58
Execution time = 5 seconds
22965,4,B,#04,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 290. | O K , O K , V L , V L , V L , V L |
| 1.26 | 215. | Mg K , Mg K , Mg K |
| 1.75 | 602. | Si K , Si K |
| 3.69 | 108. | Ca K , Ca K |
| 6.41 | 52. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 97

17-Dec-1991 09:10:09 22965,4,B,#07,RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 647. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.03 | 95. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 214. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 1325. | Si KA1, Si KA2 |
| 3.70 | 514. | Ca KA1, Ca KA2 |
| 6.41 | 441. | Fe KA1, Fe KA2 |

17-Dec-1991 09:15:25
Execution time = 7 seconds
22965,4,B,#10,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 28 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 652. | O K , O K , V L , V L , V L , V L |
| 1.26 | 455. | Mg K , Mg K , Mg K |
| 1.74 | 1411. | Si K , Si K |
| 3.28 | 57. | K K , K K |
| 3.70 | 244. | Ca K , Ca K |
| 4.03 | 51. | Ca K , Ca K |
| 6.41 | 177. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 348

```
17-Dec-1991 09:19:45
Execution time =     5 seconds
22965,4,B,#11,RS                                    Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        21 secs
   Energy  Counts     X-Ray Lines

   0.52      292.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.26      137.    Mg K  , Mg K  , Mg K

   1.75      620.    Si K  , Si K

   6.41      173.    Fe K  , Fe K



Quantex>
      0.160     Range=    10.230 keV                          10.230
                                                Integral 8  =          99
17-Dec-1991 09:24:02
Execution time =     8 seconds
22965,4,B,#12,RS                                    Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        31 secs
   Energy  Counts     X-Ray Lines

   0.52      582.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.26      395.    Mg K  , Mg K  , Mg K

   1.74     1095.    Si K  , Si K

   3.69      220.    Ca K  , Ca K

   6.39       77.    Fe K  , Fe K



Quantex>
      0.160     Range=    10.230 keV                          10.230
                                                Integral 8  =         411
```

```
17-Dec-1991 09:26:50
Execution time =     7 seconds
22965,4,B,#14,RS                                    Preset=  Off
Vert=      500 counts  Disp= 1                      Elapsed=        28 secs
   Energy  Counts     X-Ray Lines

   0.52      678.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.25      496.    Mg K  , Mg K  , Mg K

   1.74     1586.    Si K  , Si K

   3.70      333.    Ca K  , Ca K

   6.41      133.    Fe K  , Fe K


Quantex>
      0.160     Range=    10.230 keV                          10.230
                                          Integral 8  =          418
17-Dec-1991 09:29:26
Execution time =     6 seconds
22965,4,B,#15,RS                                    Preset=  Off
Vert=      500 counts  Disp= 1                      Elapsed=        20 secs
   Energy  Counts     X-Ray Lines

   0.51      366.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.25      258.    Mg K  , Mg K  , Mg K

   1.74      553.    Si K  , Si K

   3.71       80.    Ca K  , Ca K

   6.40       73.    Fe K  , Fe K


Quantex>
      0.160     Range=    10.230 keV                          10.230
                                          Integral 8  =          112
```

```
17-Dec-1991 09:36:56
Execution time =     6 seconds
22965,4,B,#16,RS                                  Preset=  Off
Vert=      500 counts  Disp= 1                    Elapsed=        18 secs
   Energy  Counts    X-Ray Lines

   0.51     1128.   O  K  , O  K  , V  L  , V  L  , V  L  ,
                    V  L

   1.26     1386.   Mg K  , Mg K  , Mg K

   1.49       51.   Al K  , Al K

   1.74     1739.   Si K  , Si K

   2.64       55.   Cl K  , Cl K

   6.40      115.   Fe K  , Fe K


Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 8  =          368
17-Dec-1991 09:38:57
Execution time =     6 seconds
22965,4,B,#17,RS                                  Preset=  Off
Vert=      500 counts  Disp= 1                    Elapsed=        29 secs
   Energy  Counts    X-Ray Lines

   0.51      462.   O  K  , O  K  , V  L  , V  L  , V  L  ,
                    V  L

   1.25      227.   Mg K  , Mg K  , Mg K

   1.74      878.   Si K  , Si K

   6.40      136.   Fe K  , Fe K



Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 8  =          127
```

EM ASBESTOS ANALYSIS

MS Lab No. 22965

ample No. 4

RECEIVING

ANALYSIS

GRID: 1 ☐ 2 ☐ 3 ☐ 4 ☑

Grid Address 1-D

Screen Magnification 18,300 x

Camera Constant 30.4

Accelerating Voltage 100 KV

Beam Current 10 µa

Analyst F. M.

Date 12/18/9

Page 01

MICROSCOPE: 600A ☑ 600B ☐ HU11E ☐ HU125E ☐

C

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | LF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01 | F | 1.5 | 22 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | | 2 | | EDS Rutile |
| | 02 | F | 2 | 14 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 2 | 2 | | EDS Tremolite |
| 2 | 03 | F | 6 | 35 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Tremolite |
| | 04 | F | 5 | 36 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 1 | 2 | | EDS Tremolite |
| 3 | 05 | F | 2.5 | 23 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Tremolite |
| | 06 | F | 3 | 70 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| | 07 | F | 3 | 35 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| 4 | 08 | F | 1.5 | 12 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| | 09 | F | 4 | 115 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| | 10 | F | 2 | 80 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| 5 | 11 | F | 1 | 16 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 12 | F | 3 | 19 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 1 | | | EDS Tremolite |
| | 13 | F | 1.5 | 17 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| | 14 | F | 3 | 45 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| 6 | 15 | F | 3 | 50 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 16 | F | 2 | 15 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| | 17 | F | 2.5 | 13 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 1 | 1 | | EDS Tremolite |
| | 18 | F | 3 | 110 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| 7 | 19 | F | 15 | 200 | | | | | | | | | | ✓ | | | | | | | | | | | | |
| | 20 | F | 4 | 40 | | | | | | | | | | ✓ | | | | | | | | | | | | |

OBSERVATIONS:

Clean ☐

Debris: ☑ Very Light ☐ Light ☑ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

18-Dec-1991 15:21:00
Execution time = 6 seconds
22965,4,1-D,01,F.M. Preset= Off
Vert= 100 counts Disp= 1 Elapsed= 13 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 80. | Mg K , Mg K , Mg K |
| 1.75 | 324. | Si K , Si K |
| 6.40 | 58. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 3175

18-Dec-1991 15:23:03
Execution time = 6 seconds
22965,4,1-D,02,F.M. Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 32 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 279. | Mg K , Mg K , Mg K |
| 1.75 | 1151. | Si K , Si K |
| 3.70 | 190. | Ca K , Ca K |
| 6.40 | 209. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 8597

18-Dec-1991 15:28:38
Execution time = 6 seconds
22965,4,1-D,03,F.M. Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.28 | 493. | Mg K , Mg K , Mg K |
| 1.77 | 1785. | Si K , Si K |
| 3.72 | 272. | Ca K , Ca K |
| 6.42 | 262. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral O = 12140

18-Dec-1991 15:31:43
Execution time = 7 seconds
22965,4,1-D,04,F.M. Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 28 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.28 | 288. | Mg K , Mg K , Mg K |
| 1.76 | 1416. | Si K , Si K |
| 3.34 | 79. | K K , K K |
| 3.71 | 144. | Ca K , Ca K |
| 6.42 | 259. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral O = 11718

18-Dec-1991 15:38:27
Execution time = 6 seconds
22965,4,1-D,05,F.M. Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 34 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 269. | Mg K , Mg K , Mg K |
| 1.76 | 1055. | Si K , Si K |
| 3.72 | 200. | Ca K , Ca K |
| 6.40 | 164. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 9889

18-Dec-1991 16:07:10
Execution time = 6 seconds
22965,4,1-D,12,F.M. Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 324. | Mg K , Mg K , Mg K |
| 1.75 | 1368. | Si K , Si K |
| 3.71 | 179. | Ca K , Ca K |
| 6.40 | 242. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 9128

18-Dec-1991 16:23:01
Execution time = 6 seconds
22965,4,1-D,17,F.M. Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 28 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1245. | Mg K , Mg K , Mg K |
| 1.75 | 4690. | Si K , Si K |
| 3.33 | 238. | K K , K K |
| 3.71 | 583. | Ca K , Ca K |
| 6.42 | 459. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 19672

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| TM | - | Tubular Morphology not sufficiently characteristic for classification as chrysotile |
| CM | - | Characteristic Chrysotile Morphology |
| CD | - | Chrysotile SAED pattern |
| CQ | - | Chrysotile composition by Quantitative EDXA |
| CMQ | - | Chrysotile Morphology and composition by Quantitative EDXA |
| CDQ | - | Chrysotile SAED pattern and composition by Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| UF | - | Unidentified Fiber |
| AD | - | Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing) |
| AX | - | Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole |
| ADX | - | Amphibole by random orientation SAED and Qualitative EDXA |
| AQ | - | Amphibole by Quantitative EDXA |
| AZ | - | Amphibole by one Zone Axis SAED |
| ADQ | - | Amphibole by random orientation SAED and Quantitative EDXA |
| AZQ | - | Amphibole by one Zone Axis SAED pattern and Quantitative EDXA |
| AZZ | - | Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle |
| AZZQ | - | Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

| | | | |
|---|---|---|---|
| EMS No. | 22965 | Client | SCHAFER & ASSOC. |
| Sample No. | SW-5-4 | | |
| Date | 12/20/91 | | |

| | | |
|---|---|---|
| Total Asbestos Fibers | 1.5 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 1.5 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 0.6 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 8.8 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | LESS | |
| Poisson 95% Confidence Interval | 0.5 to 3.5 | MFL |
| Detection Limit | 0.3 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 3 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 2 | 0 | 3 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 1 | 3 | 0 | 0 | 0 | 1 |

# TEM ASBESTOS ANALYSIS

Page ___ of ___

EMS Lab No. 22965
Client Schafer & Associates
Sample No. SW-5-4

**RECEIVING**

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☐
- Level III ☐
- AHERA ☐

LENGTHS
- All Sizes (EPA) ☐
- (µm): ≥0.5 ☐
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐ *(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCN/960 ☐
- MCE/960 ☑
- Other ☐

TYPE OF SAMPLE
- Air ☐ Water ☑
- Soil ☐ Wipe ☐
- Bulk ☐ Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☑
- .22 µm ☐
- Other ☐

G.O. Area (mm²) 0.0 062
No. of G.O. to Analyze 20
Filter Lot No. _____

**PREP**

DIRECT PREP ☑
INDIRECT PREP ☐

Volume _____ liters
Working Volume 25 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

**ANALYSIS**

GRID
1 ☒ 3 ☐
2 ☐ 4 ☐

Grid Address 1-A
Screen Magnification 1930 x
Camera Constant 30.4
Accelerating Voltage 100 KV
Beam Current 10 µa

MICROSCOPE
- 600A ☒
- 600B ☐
- HU11E ☐
- HU125E ☐

**A**

Analyst Radha Sijh Date 12/20/91

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | Fiber Classification NAM | TM | CM | CD | CQ | CMQ | CDQ | LF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F | | 3 | 42 | | | | | | | | | ✓ | | | | | | | | 2 | 10 | 2 | 1 | 0 | Tremolite |
| 2 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | 5 | 35 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 5 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |

**OBSERVATIONS:**

| | | | | | |
|---|---|---|---|---|---|
| Clean ☐ | | | | | |
| Debris: ☐ | Very Light ☐ | Light ☐ | Moderate ☒ | Heavy ☐ | Very Heavy ☐ |
| Gypsum: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |
| Other ☐ | | | | | |

20-Dec-1991 09:37:23
Execution time = 6 seconds
22965,5-4,A,#01,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 129. | Mg K , Mg K , Mg K |
| 1.75 | 650. | Si K , Si K |
| 3.72 | 143. | Ca K , Ca K |
| 6.41 | 68. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 104

20-Dec-1991 09:34:59 22965,5-4,A,#02,RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.00 | 127. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 2.01 | 526. | P KA1, P KA2 |
| 2.31 | 184. | S KA1, S KA2 |
| 2.63 | 414. | Cl KA1, Cl KA2 |
| 3.31 | 121. | K KA1, K KA2 |
| 3.69 | 371. | Ca KA1, Ca KA2 |
| 5.91 | 115. | Mn KA1, Mn KA2 |
| 6.41 | 377. | Fe KA1, Fe KA2 |

EM ASBESTOS ANALYSIS

MS Lab No. 22465

ample No. SW-5-4

RECEIVING

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☒ 4 ☐

Grid Address 1B
Screen Magnification 19500x
Camera Constant 28.4
Accelerating Voltage 100 KV
Beam Current 10 µa

MICROSCOPE
600A ☐
600B ☒
HU11E ☐
HU125E ☐

B

Analyst S. Ahmed Date 12/20/9

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | Fiber Classification NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | L | F | 10 | 190 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #1 |
| 2 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS:

| | | | | | |
|---|---|---|---|---|---|
| Clean ☐ | | | | | |
| Debris: ☒ | Very Light ☐ | Light ☒ | Moderate ☒ | Heavy ☐ | Very Heavy ☐ |
| Gypsum: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |

7-Jan-1992 14:49:35
Execution time = 6 seconds
22965-5-4,B.#01,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1336. | Mg K , Mg K , Mg K |
| 1.74 | 5021. | Si K , Si K |
| 3.70 | 1215. | Ca K , Ca K |
| 4.03 | 135. | Ca K , Ca K |
| 6.40 | 565. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 23194

EM ASBESTOS ANALYSIS

MS Lab No. 22965

ample No. SW-5-4

RECEIVING

ANALYSIS

GRID
1 [X] 3 [X]
2 [ ] 4 [X]

Grid Address 1C

Screen Magnification 1930 x

Camera Constant 30.4

Accelerating Voltage 100 KV

Beam Current 10 pa

MICROSCOPE
600A [X]
600B [ ]
HU11E [ ]
HU125E [ ]

C

Analyst ..... Date .....

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | Fiber Classification NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | F | 10 | 680 | | | | | | | | | ✓ | | | | | | | | 3 | 10 | 2 | 1 | | EDS Tremo. |
| 4 | | | 3 | 58 | | | | | | | | | ✓ | | | | | | | | 3 | 10 | 2 | 2 | | EDS Tremo. |
| 5 | | | 10 | 38 | | | | | | | | | ✓ | | | | | | | | 3 | 10 | 2 | 1 | | EDS Tremo. |
| 6 | | | 3 | 480 | ✓ | | | | | | | | | | | | | | | | | | | | | EDS |
| 7 | NSD | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 4 | 45 | ✓ | | | | | | | | | | | | | | | | | | | | | EDS |

OBSERVATIONS:

Clean [ ]
Debris: [ ] Very Light [ ] Light [ ] Moderate [X] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

20-Dec-1991 10:15:22
Execution time = 7 seconds
22965,5-4,B,#01,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 19 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 850. | Mg K , Mg K , Mg K |
| 1.75 | 2846. | Si K , Si K |
| 3.33 | 70. | K K , K K |
| 3.70 | 502. | Ca K , Ca K |
| 4.02 | 50. | Ca K , Ca K |
| 6.42 | 250. | Fe K , Fe K |
| 7.09 | 52. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 389

20-Dec-1991 10:19:54
Execution time = 7 seconds
22965,5-4,B,#02,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 31 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 256. | Mg K , Mg K , Mg K |
| 1.76 | 855. | Si K , Si K |
| 3.70 | 133. | Ca K , Ca K |
| 6.40 | 151. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 122

```
20-Dec-1991 10:30:10
Execution time =     6 seconds
22965,5-4,C,#03,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        19 secs
   Energy  Counts    X-Ray Lines

   1.27      614.   Mg K  , Mg K  , Mg K

   1.75     1895.   Si K  , Si K

   3.70      350.   Ca K  , Ca K

   6.41      161.   Fe K  , Fe K



Quantex>
      0.000    Range=   10.230 keV                          10.110
                                          Integral 8  =          236
20-Dec-1991 10:34:09
Execution time =     6 seconds
22965,5-4,C,#04,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        24 secs
   Energy  Counts    X-Ray Lines

   1.25      131.   Mg K  , Mg K  , Mg K

   1.75      470.   Si K  , Si K

   3.71       88.   Ca K  , Ca K



Quantex>
      0.000    Range=   10.230 keV                          10.110
                                          Integral 8  =           64
```

20-Dec-1991 10:48:21
Execution time = 6 seconds
22965,5-4,C,#05,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 34 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 105. | Mg K , Mg K , Mg K |
| 1.75 | 487. | Si K , Si K |
| 6.42 | 153. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 8 = 68

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| TM | - | Tubular Morphology not sufficiently characteristic for classification as chrysotile |
| CM | - | Characteristic Chrysotile Morphology |
| CD | - | Chrysotile SAED pattern |
| CQ | - | Chrysotile composition by Quantitative EDXA |
| CMQ | - | Chrysotile Morphology and composition by Quantitative EDXA |
| CDQ | - | Chrysotile SAED pattern and composition by Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| UF | - | Unidentified Fiber |
| AD | - | Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing) |
| AX | - | Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole |
| ADX | - | Amphibole by random orientation SAED and Qualitative EDXA |
| AQ | - | Amphibole by Quantitative EDXA |
| AZ | - | Amphibole by one Zone Axis SAED |
| ADQ | - | Amphibole by random orientation SAED and Quantitative EDXA |
| AZQ | - | Amphibole by one Zone Axis SAED pattern and Quantitative EDXA |
| AZZ | - | Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle |
| AZZQ | - | Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

| | | | |
|---|---|---|---|
| EMS No. | 22965 | Client | SCHAFER & ASSOC. |
| Sample No. | SW-6-4 | | |
| Date | 1/7/92 | | |

| | | |
|---|---|---|
| Total Asbestos Fibers | 27 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 27 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 5.1 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 52 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 20 to 36 | MFL |
| Detection Limit | 0.6 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 3 | 8 | 1 | 4 | 32 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 2 | 11 | 6 | 7 | 22 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 21 | 12 | 5 | 7 | 1 | 2 |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. Schafer & Associates SW-6-4

10 ml

Page [ ] of [ ]

MICROSCOPE
600A [ ]
600B [ ]
HU11E [ ]
HU125E [ ]

RECEIVING

ANALYSIS

GRID
1 [X] 3 [ ]
2 [ ] 4 [ ]

Grid Address 1-A
Screen Magnification [illegible] x
Camera Constant 3
Accelerating Voltage 100 KV
Beam Current [illegible] µa

Analyst [illegible] Date [illegible]

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | Fiber Classification NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | | 2 | 30 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 2 | | 4 | 18 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS Tremo |
| | 3 | | 2 | 60 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | EDS " |
| | 4 | | 5 | 40 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 2 | | " |
| | 5 | | 4 | 100 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 0 | | EDS " |
| | 6 | | 4 | 30 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 2 | | EDS " |
| | 7 | | 3 | 110 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS " |
| 2 | 8 | | 2.5 | 22 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | EDS " |
| | 9 | | 2 | 16 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 0 | 2 | | EDS (No calcium) |
| | 10 | | 2 | 22 | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 11 | | 3 | 150 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS Tremo. |
| | 12 | | 2 | 14 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 4 | 13 | | 4 | 22 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| 5 | 14 | | 10 | 68 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | [illegible] EDS Tremo. |
| | 15 | | 2 | 12 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| 6 | 16 | | 10 | 330 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 1 | | [illegible] Tremo. |
| | 17 | | 1.5 | 22 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 18 | | 3 | 132 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| 7 | 19 | | 1 | 65 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 20 | | 2 | 60 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 21 | | 8 | 40 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | EDS Tremo |
| | 22 | | 3 | 25 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 23 | | 2 | 75 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 24 | | 3 | 60 | | | | | | | | | | | | ✓ | | | | | | | | | | |

OBSERVATIONS:

Clean [ ]
Debris: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Other [ ]

EMS LABORATORIES 117 West Bellevue Drive / Pasadena, CA [illegible]

# TEM ASBESTOS ANALYSIS

Page ___ of ___

EMS Lab No. _____

Sample No. _____

_____

RECEIVING

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

Grid Address _____
Screen Magnification _____ x
Camera Constant _____
Accelerating Voltage 100 KV
Beam Current _____ µa

Analyst _____ Date _____

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | Fiber Classification NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 25 | | 3 | 56 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1 | | Tremo |
| | 26 | | 4 | 22 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremo |
| | | | 3 | 45 | ✓ | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS:

Clean ☐

Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

Other ☐

3-Jan-1992 08:03:31
Execution time = 6 seconds
22965,6,A,#01,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 507. | Mg K , Mg K , Mg K |
| 1.74 | 1942. | Si K , Si K |
| 3.69 | 456. | Ca K , Ca K |
| 4.00 | 61. | Ca K , Ca K |
| 6.38 | 112. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9926

3-Jan-1992 08:06:35
Execution time = 6 seconds
22965,6,A,#03,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 111. | Mg K , Mg K , Mg K |
| 1.73 | 492. | Si K , Si K |
| 3.69 | 97. | Ca K , Ca K |
| 6.38 | 100. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8313

3-Jan-1992 08:08:22
Execution time = 8 seconds
22965,6,A,#04,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.24 | 459. | Mg K , Mg K |
| 1.74 | 1823. | Si K , Si K |
| 3.69 | 479. | Ca K , Ca K |
| 6.40 | 238. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9853

3-Jan-1992 08:09:26
Execution time = 6 seconds
22965,6,A,#05,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 19 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 335. | Mg K , Mg K , Mg K |
| 1.74 | 1274. | Si K , Si K |
| 3.69 | 213. | Ca K , Ca K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7653

3-Jan-1992 08:10:26
Execution time = 6 seconds
22965,6,A,#06,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 22 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 239. | Mg K , Mg K , Mg K |
| 1.74 | 986. | Si K , Si K |
| 3.68 | 157. | Ca K , Ca K |
| 6.39 | 159. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7233

3-Jan-1992 08:11:45
Execution time = 6 seconds
22965,6,A,#07,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 318. | Mg K , Mg K , Mg K |
| 1.73 | 1116. | Si K , Si K |
| 3.70 | 226. | Ca K , Ca K |
| 6.39 | 157. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8693

3-Jan-1992 08:14:57
Execution time = 6 seconds
22965,6,A,#08,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 168. | Mg K , Mg K , Mg K |
| 1.75 | 850. | Si K , Si K |
| 3.69 | 73. | Ca K , Ca K |
| 6.41 | 177. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7900

3-Jan-1992 08:16:06
Execution time = 7 seconds
22965,6,A,#09,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 63. | Mg K , Mg K , Mg K |
| 1.74 | 320. | Si K , Si K |
| 6.44 | 59. | Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7414

```
 3-Jan-1992 08:28:58
Execution time =     6 seconds
22965,6,A,#11,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        26 secs
   Energy  Counts    X-Ray Lines

   1.26      559.   Mg K  , Mg K  , Mg K

   1.74     1914.   Si K  , Si K

   3.69      440.   Ca K  , Ca K

   6.42       90.   Fe K  , Fe K



Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =        10947
 3-Jan-1992 08:35:30
Execution time =     7 seconds
22965,6,A,#14,RS                                  Preset=  Off
Vert=      500 counts  Disp= 1                    Elapsed=        20 secs
   Energy  Counts    X-Ray Lines

   1.25     1220.   Mg K  , Mg K  , Mg K

   1.74     4173.   Si K  , Si K

   3.30      103.   K  K  , K  K

   3.69      926.   Ca K  , Ca K

   4.05      134.   Sc K  , Sc K  , Ca K  , Ca K

   6.40      469.   Fe K  , Fe K


Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =        21604
```

```
 3-Jan-1992 08:38:47
Execution time =     6 seconds
22965,6,A,#16,RS                                    Preset=  Off
Vert=      500 counts  Disp= 1                      Elapsed=        24 secs
   Energy  Counts     X-Ray Lines

   0.99      119.    Zn L   , Zn L   , Zn L

   1.25     2102.    Mg K   , Mg K   , Mg K

   1.74     8007.    Si K   , Si K

   3.31      379.    K  K   , K  K

   3.69     1008.    Ca K   , Ca K

   4.03       83.    Ca K   , Ca K

   6.40      867.    Fe K   , Fe K

Quantex>     117.    Fe K   , Fe K
      0.160     Range=    10.230 keV                          10.230
                                          Integral 0  =        36914
 3-Jan-1992 09:09:34
Execution time =     7 seconds
22965,6,A,#21,RS                                    Preset=  Off
Vert=      500 counts  Disp= 1                      Elapsed=        20 secs
   Energy  Counts     X-Ray Lines

   1.25     1363.    Mg K   , Mg K   , Mg K

   1.74     5881.    Si K   , Si K

   3.30      316.    K  K   , K  K

   3.70      501.    Ca K   , Ca K

   6.40     1395.    Fe K   , Fe K

   7.04      176.    Fe K   , Fe K


Quantex>
      0.160     Range=    10.230 keV                          10.230
                                          Integral 0  =        24649
```

3-Jan-1992 09:11:53
Execution time = 8 seconds
22965,6,A,#21,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 22 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 277. | Mg K , Mg K , Mg K |
| 1.73 | 871. | Si K , Si K |
| 3.31 | 36. | K K , K K |
| 3.70 | 235. | Ca K , Ca K |
| 6.37 | 120. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8839

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. SW-6-4

Page [redacted] of [redacted]

RECEIVING

ANALYSIS

GRID: 1 [ ] 2 [X] 3 [ ] 4 [ ]

MICROSCOPE: 600A [X] 600B [ ] HU11E [ ] HU125E [ ]

Grid Address 1A

Screen Magnification 19300 x

Camera Constant 30

Accelerating Voltage 100 KV

Beam Current 70 µa

Analyst S. Ahmed Date 1/7/91

**B**

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 2 | 100 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #1 Tremo |
| | 2 | F | 2 | 62 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #2 " |
| | 3 | F | 25 | 25 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #3 " |
| | 4 | F | 13 | 370 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #4 " |
| 2 | 5 | F | 2 | 62 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #5 " |
| | 6 | F | 2 | 25 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #6 " |
| 3 | 7 | F | 13 | 170 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #7 " |
| 4 | 8 | F | 6 | 40 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #8 " |
| | 9 | F | 5 | 70 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #9 " |
| | 10 | MD | 6 | 55 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #10 " |
| | 11 | MD | 8 | 85 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #11 " |
| | 12 | F | 5 | 35 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 5 | 13 | F | 4 | [illegible] | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #13 Tremo |
| 6 | 14 | F | 6 | 50 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #14 " |
| | 15 | F | 2 | 55 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #15 Actinol |
| | 16 | F | 2 | 60 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #16 Actinol |

OBSERVATIONS:

Clean [ ]

Debris: [X] Very Light [ ] Light [ ] Moderate [X] Heavy [ ] Very Heavy [ ]

Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

Other [ ]

7-Jan-1992 13:57:32
Execution time = 6 seconds
22965-6-4,B,#01,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 50 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 434. | Mg K , Mg K , Mg K |
| 1.74 | 2213. | Si K , Si K |
| 3.31 | 151. | K K , K K |
| 3.70 | 134. | Ca K , Ca K |
| 6.40 | 467. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 16544

7-Jan-1992 14:00:20
Execution time = 7 seconds
22965-6-4,B,#02,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 59 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 357. | Mg K , Mg K , Mg K |
| 1.74 | 1407. | Si K , Si K |
| 3.67 | 185. | Ca K , Ca K |
| 6.38 | 182. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 14094

```
 7-Jan-1992 14:07:06
Execution time =     7 seconds
22965-6-4,B,#03,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        21 secs
Quantex>ID/AU/TY
```

```
      0.160     Range=    10.230 keV                          10.230
                                                Integral 0  =        11852
 7-Jan-1992 14:07:18
Execution time =     6 seconds
22965-6-4,B,#03,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        21 secs
   Energy  Counts     X-Ray Lines

   1.26      702.    Mg K  , Mg K  , Mg K

   1.74     2091.    Si K  , Si K

   3.70      531.    Ca K  , Ca K

   6.41      222.    Fe K  , Fe K
```

```
Quantex>
      0.160     Range=    10.230 keV                          10.230
                                                Integral 0  =        11852
 7-Jan-1992 14:07:54
Execution time =     7 seconds
22965-6-4,B,#04,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        34 secs
   Energy  Counts     X-Ray Lines

   1.26      452.    Mg K  , Mg K  , Mg K

   1.74     1589.    Si K  , Si K

   3.69      401.    Ca K  , Ca K

   6.41      209.    Fe K  , Fe K
```

7-Jan-1992 14:09:11
Execution time = 7 seconds
22965-6-4,B,#05,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 31 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 268. | Mg K , Mg K , Mg K |
| 1.73 | 1053. | Si K , Si K |
| 3.70 | 235. | Ca K , Ca K |
| 6.40 | 151. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9160

7-Jan-1992 14:11:59
Execution time = 9 seconds
22965-6-4,B,#06,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 453. | Mg K , Mg K , Mg K |
| 1.73 | 1034. | Si K , Si K |
| 2.63 | 29. | Cl K , Cl K |
| 3.67 | 53. | Ca K , Ca K |
| 6.38 | 60. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 10883

7-Jan-1992 14:12:44
Execution time = 6 seconds
22965-6-4,B,#07,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 23 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1163. | Mg K , Mg K , Mg K |
| 1.74 | 4629. | Si K , Si K |
| 3.33 | 118. | K K , K K |
| 3.69 | 432. | Ca K , Ca K |
| 4.51 | 75. | Ti K , Ti K |

Quantex>

0.160 Range= 10.230 keV 10.230

Integral 0 = 10883

7-Jan-1992 14:12:44

Execution time = 6 seconds

22965-6-4,B,#07,SA Preset= Off

Vert= 200 counts Disp= 1 Elapsed= 23 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1163. | Mg K , Mg K , Mg K |
| 1.74 | 4629. | Si K , Si K |
| 3.33 | 118. | K K , K K |
| 3.69 | 432. | Ca K , Ca K |
| 4.51 | 75. | Ti K , Ti K |
| 6.39 | 423. | Fe K , Fe K |
| 7.07 | 76. | Fe K , Fe K |

Quantex>

0.160 Range= 10.230 keV 10.230

Integral 0 = 19993

7.07 76. Fe K , Fe K

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 19993
7-Jan-1992 14:15:19
Execution time = 8 seconds
22965-6-4,B,#08,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 31 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.98 | 85. | Zn L , Zn L |
| 1.26 | 583. | Mg K , Mg K , Mg K |
| 1.73 | 2379. | Si K , Si K |
| 3.32 | 134. | K K , K K |
| 3.68 | 201. | Ca K , Ca K |
| 6.41 | 379. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 17267
7-Jan-1992 14:17:25
Execution time = 6 seconds
22965-6-4,B,#09,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 755. | Mg K , Mg K , Mg K |
| 1.74 | 2801. | Si K , Si K |
| 3.30 | 189. | K K , K K |
| 3.69 | 353. | Ca K , Ca K |
| 6.40 | 428. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 18095

7-Jan-1992 14:18:08
Execution time = 8 seconds
22965-6-4,B,#10,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 464. | Mg K , Mg K , Mg K |
| 1.74 | 1604. | Si K , Si K |
| 3.30 | 90. | K K , K K |
| 3.70 | 231. | Ca K , Ca K |
| 6.42 | 287. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 18411

7-Jan-1992 14:18:55
Execution time = 7 seconds
22965-6-4,B,#11,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 34 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 420. | Mg K , Mg K , Mg K |
| 1.74 | 1670. | Si K , Si K |
| 3.29 | 78. | K K , K K |
| 3.71 | 186. | Ca K , Ca K |
| 6.40 | 224. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 15640

```
 7-Jan-1992 14:24:27
Execution time =     7 seconds
22965-6-4,B,#13,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        32 secs
   Energy  Counts    X-Ray Lines

   1.26      654.   Mg K  , Mg K  , Mg K

   1.74     2129.   Si K  , Si K

   3.71      355.   Ca K  , Ca K

   6.41      219.   Fe K  , Fe K



Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =        13164
 7-Jan-1992 14:29:25
Execution time =     6 seconds
22965-6-4,B,#14,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        25 secs
   Energy  Counts    X-Ray Lines

   1.25     1034.   Mg K  , Mg K  , Mg K

   1.74     4222.   Si K  , Si K

   3.31       86.   K  K  , K  K

   3.69     1038.   Ca K  , Ca K

   4.03      125.   Ca K  , Ca K

   6.41      463.   Fe K  , Fe K


Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =        19291
```

7-Jan-1992 14:33:06
Execution time = 6 seconds
22965-6-4,B,#15,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 22 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 899. | Mg K , Mg K , Mg K |
| 1.74 | 3961. | Si K , Si K |
| 2.63 | 77. | Cl K , Cl K |
| 3.70 | 380. | Ca K , Ca K |
| 6.39 | 983. | Fe K , Fe K |
| 7.05 | 143. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 19120

7-Jan-1992 14:33:58
Execution time = 6 seconds
22965-6-4,B,#16,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 18 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 451. | Mg K , Mg K , Mg K |
| 1.74 | 2263. | Si K , Si K |
| 3.69 | 209. | Ca K , Ca K |
| 4.05 | 48. | Sc K , Sc K , Ca K , Ca K |
| 6.40 | 525. | Fe K , Fe K |
| 7.05 | 103. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 13472

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. Schafer Associate SW-6-4

RECEIVING

ANALYSIS

GRID 1 [ ] 2 [X] 3 [X] 4 [ ]

Grid Address 1-B

Screen Magnification 1430 x

Camera Constant 35

Accelerating Voltage 100 KV

Beam Current 10 µa

Analyst Radha Sijh Date 12/30

Page of

MICROSCOPE 600A [X] 600B [ ] HU11E [ ] HU125E [ ]

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | EDS Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | | 1 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 2 | | 1 | 15 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 2 | 3 | | 5 | 116 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 4 | | 6 | 55 | ✓ | | | | | | | | | | | | | | | | 2 | 0 | 2 | 1 | | EDX (HI-1) |
| | 5 | | 5 | 24 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 3 | 1 | | " |
| | 6 | | 10 | 74 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1 | | " |
| 3 | 7 | | 7 | 92 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | " (loaded) |
| | 8 | | 3 | 390 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 4 | 9 | | 10 | 140 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 10 | | 10 | 112 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 2 | | EDS |
| | 11 | | 12 | 300 | | ✓ | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | " |
| 5 | 12 | | 1 | 56 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 13 | | 5 | 60 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS |
| | 14 | | 4 | 10 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS |
| | 15 | | 8 | 55 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1 | | EDS |
| 6 | 16 | | 3 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 17 | | 12 | 80 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS |
| | 18 | | 14 | 45 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 2 | | EDS |
| | 19 | | 3 | 45 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 7 | 20 | | 8 | 68 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | EDS |

OBSERVATIONS:

Clean [ ]

Debris: [ ] Very Light [ ] Light [ ] Moderate [X] Heavy [ ] Very Heavy [ ]

Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

Other [ ]

30-Dec-1991 10:07:25
Execution time = 7 seconds
22965,6,C,#04,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 128. | Mg K , Mg K , Mg K |
| 1.44 | 80. | Al K , Al K |
| 1.75 | 677. | Si K , Si K |
| 2.63 | 118. | Cl K , Cl K |
| 3.70 | 130. | Ca K , Ca K |
| 6.42 | 71. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7796

30-Dec-1991 10:10:14
Execution time = 7 seconds
22965,6,C,#05,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 22 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 418. | Mg K , Mg K , Mg K |
| 1.75 | 1798. | Si K , Si K |
| 3.71 | 555. | Ca K , Ca K |
| 6.43 | 143. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9685

30-Dec-1991 10:13:09
Execution time = 7 seconds
22965,6,C,#06,RS Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1708. | Mg K , Mg K , Mg K |
| 1.75 | 5819. | Si K , Si K |
| 2.65 | 79. | Cl K , Cl K |
| 3.33 | 112. | K K , K K |
| 3.71 | 1545. | Ca K , Ca K |
| 4.03 | 132. | Ca K , Ca K |
| 6.42 | 599. | Fe K , Fe K |
| Quantex> | 67. | Fe K , Fe K |

0.160 Range= 10.230 keV 10.230
Integral 0 = 21624

30-Dec-1991 10:17:36 22965,6,C,#07,RS

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.55 | 49. | O KA1, O KA2, V LA1, Cr LA1, V LA2, Cr LA2, V LB1, Cr LB1, V LB3, V LB4, V LG1, Cr LG1 Cr LN |
| 1.26 | 1239. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 4192. | Si KA1, Si KA2 |
| 2.31 | 132. | S KA1, S KA2 |
| 3.35 | 131. | K KA1, K KA2 |
| 3.70 | 920. | Ca KA1, Ca KA2 |
| 4.02 | 79. | Ca KB1, Ca KB3 |
| 4.98 | 108. | V KA1, V KA2 |
| 5.42 | 811. | Cr KA1, Cr KA2, V KB1, V KB3 |
| 5.96 | 98. | Cr KB1, Cr KB3 |
| 6.41 | 462. | Fe KA1, Fe KA2 |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 4418
30-Dec-1991 10:35:12
Execution time = 6 seconds
22965,6,C,10,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 522. | Mg K , Mg K , Mg K |
| 1.75 | 2001. | Si K , Si K |
| 3.70 | 215. | Ca K , Ca K |
| 6.41 | 392. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8305

30-Dec-1991 10:37:33
Execution time = 6 seconds
22965,6,C,11,RS*
Vert= 200 counts Disp= 1
Preset= Off
Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 466. | Mg K , Mg K , Mg K |
| 1.74 | 1878. | Si K , Si K |
| 3.32 | 110. | K K , K K |
| 3.70 | 150. | Ca K , Ca K |
| 6.40 | 299. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7719

30-Dec-1991 12:53:40
Execution time = 7 seconds
22965,6,C,#13,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 339. | Mg K , Mg K , Mg K |
| 1.74 | 1303. | Si K , Si K |
| 3.68 | 297. | Ca K , Ca K |
| 6.39 | 96. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6491

30-Dec-1991 12:55:13
Execution time = 6 seconds
22965,6,C,#14,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 29 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.24 | 348. | Mg K , Mg K |
| 1.73 | 1278. | Si K , Si K |
| 3.69 | 269. | Ca K , Ca K |
| 6.39 | 174. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7000

30-Dec-1991 13:04:02
Execution time = 6 seconds
22965,6,C,#15,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 513. | Mg K , Mg K , Mg K |
| 1.74 | 1962. | Si K , Si K |
| 3.69 | 509. | Ca K , Ca K |
| 6.40 | 178. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9184

30-Dec-1991 13:11:10
Execution time = 7 seconds
22965,6,C,#17,RS Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 23 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 677. | Mg K , Mg K , Mg K |
| 1.74 | 2641. | Si K , Si K |
| 3.31 | 118. | K K , K K |
| 3.69 | 408. | Ca K , Ca K |
| 6.39 | 329. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 10977

30-Dec-1991 13:16:37
Execution time = 7 seconds
22965,6,C,#18,RS Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 64 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 746. | Mg K , Mg K , Mg K |
| 1.74 | 2982. | Si K , Si K |
| 3.69 | 248. | Ca K , Ca K |
| 6.41 | 474. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 14105

30-Dec-1991 13:23:27
Execution time = 6 seconds
22965,6,C,#20,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 244. | Mg K , Mg K , Mg K |
| 1.75 | 1115. | Si K , Si K |
| 3.67 | 141. | Ca K , Ca K |
| 6.39 | 292. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 5548

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| TM | - | Tubular Morphology not sufficiently characteristic for classification as chrysotile |
| CM | - | Characteristic Chrysotile Morphology |
| CD | - | Chrysotile SAED pattern |
| CQ | - | Chrysotile composition by Quantitative EDXA |
| CMQ | - | Chrysotile Morphology and composition by Quantitative EDXA |
| CDQ | - | Chrysotile SAED pattern and composition by Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| UF | - | Unidentified Fiber |
| AD | - | Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing) |
| AX | - | Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole |
| ADX | - | Amphibole by random orientation SAED and Qualitative EDXA |
| AQ | - | Amphibole by Quantitative EDXA |
| AZ | - | Amphibole by one Zone Axis SAED |
| ADQ | - | Amphibole by random orientation SAED and Quantitative EDXA |
| AZQ | - | Amphibole by one Zone Axis SAED pattern and Quantitative EDXA |
| AZZ | - | Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle |
| AZZQ | - | Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

## Analysis of Water by Transmission Electron Microscopy
## (EPA-600/4-83-043)

| | | | |
|---|---|---|---|
| EMS No. | 22965 | Client | SCHAFER & ASSOC. |
| Sample No. | SW-7-4 | | |
| Date | 1/11/92 | | |

| | | |
|---|---|---|
| Total Asbestos Fibers | 130 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 130 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 37 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 140 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 100 to 160 | MFL |
| Detection Limit | 1.5 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 11 | 9 | 12 | 10 | 44 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 5 | 15 | 23 | 13 | 30 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 29 | 24 | 18 | 7 | 1 | 7 |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965
Client Schaefer
Sample No. SW-7-4

**RECEIVING**

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☒
- Level III ☐
- AHERA ☐

ASPECT RATIO 3:1 ☐ 5:1 ☐

LENGTHS
- All Sizes (EPA) ☐
- (µm): ≥0.5 ☐
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐ (*≥0.25 µm width, 25.0 µm length)

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCN/960 ☒
- MCE/960 ☐
- Other ☐

TYPE OF SAMPLE
- Air ☐ Water ☒
- Soil ☐ Wipe ☐
- Bulk ☐ Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☐
- .22 µm ☒
- Other ☐

G.O. Area (mm²) 0.0 0.62
No. of G.O. to Analyze 21
Filter Lot No. _____

**PREP**

- DIRECT PREP ☐
- INDIRECT PREP ☐

Volume _____ liters
Working Volume 5 ml
Weight _____ grams
Ashed Area _____ %
Prepared By _____

**ANALYSIS**

GRID
- 1 ☒ 3 ☐
- 2 ☐ 4 ☐

Grid Address 1A
Screen Magnification 19500 x
Camera Constant 28.4
Accelerating Voltage 100 KV
Beam Current 10 µa
Analyst S. Ahmed Date 1/9/91

MICROSCOPE
- 600A ☐
- 600B ☒
- HU11E ☐
- HU125E ☐

A

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | MF | 4 | 60 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #1 Possible Tre |
| | 2 | F | 5 | 135 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 1 | | EDS #2 " |
| 2 | 3 | F | 2.5 | 65 | | | | | | | | | | | | | ✓ | | | | 4 | 10 | 2 | 1 | | EDS #3 " |
| 3 | 4 | F | 2 | 39 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1 | | EDS #4 " |
| | 5 | F | 2 | 35 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #5 " |
| | 6 | F | 3.5 | 60 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #6 " |
| | 7 | F | 2.5 | 42 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #7 " |
| 4 | 8 | F | 5 | 330 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #8 " |
| 5 | 9 | F | 2 | 120 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #9 " |
| | 10 | F | 3 | 320 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 1 | | EDS #10 " |
| | 11 | F | 3 | 135 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #11 " |
| | 12 | F | 2 | 105 x | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS #12 " |
| 6 | 13 | F | 3 | 80 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 3 | | EDS #13 Possible As |
| | 14 | F | 2 | 70 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 3 | | EDS #14 " |
| 7 | 15 | F | 4 | 280 | x | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 3 | | EDS #15 " |
| | 16 | F | 4 | 375 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 3 | | EDS #16 " |
| | 17 | F | 11 | 330 | | | | | | | | | | | | | ✓ | | | | | | | | | ~~EDS #17~~ Tremolite |
| | 18 | | 3 | 140 | | | | | | | | | | | | | ✓ | | | | | | | | | ~~EDS #18~~ Tremol |

**OBSERVATIONS:**

Clean ☐

| | | | | | |
|---|---|---|---|---|---|
| Debris: ☒ | Very Light ☐ | Light ☐ | Moderate ☒ | Heavy ☐ | Very Heavy ☐ |
| Gypsum: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |

Other ☐

09-Jan-1992 12:24:15 22965-7-4,A,#01,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 872. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 0.99 | 50. | Zn LA1, Zn LA2, Zn LB1 |
| 1.26 | 530. | Mg KA1, Mg KA2, Mg KB1 |
| 1.49 | 94. | Al KA1, Al KA2 |
| 1.75 | 1791. | Si KA1, Si KA2 |
| 2.61 | 44. | Cl KA1, Cl KA2 |
| 3.70 | 344. | Ca KA1, Ca KA2 |
| 3.99 | 38. | Ca KB1, Ca KB3 |
| 5.84 | 29. | Mn KA2 |
| 6.40 | 216. | Fe KA1, Fe KA2 |
| 7.05 | 46. | Fe KB1, Fe KB3 |

09-Jan-1992 12:28:17 22965-7-4,A,#02,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 1260. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.02 | 105. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 836. | Mg KA1, Mg KA2, Mg KB1 |
| 1.49 | 130. | Al KA1, Al KA2 |
| 1.74 | 2510. | Si KA1, Si KA2 |
| 2.62 | 97. | Cl KA1, Cl KA2 |
| 3.30 | 83. | K KA1, K KA2 |
| 3.70 | 318. | Ca KA1, Ca KA2 |
| 6.41 | 335. | Fe KA1, Fe KA2 |

09-Jan-1992 12:32:31 22965-7-4,A,#02,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.51 | 1397. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.26 | 917. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 2479. | Si KA1, Si KA2 |
| 3.31 | 104. | K KA1, K KA2 |
| 3.69 | 490. | Ca KA1, Ca KA2 |
| 4.00 | 63. | Ca KB1, Ca KB3 |
| 6.42 | 221. | Fe KA1, Fe KA2 |

09-Jan-1992 12:33:20 22965-7-4,A,#04,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 1505. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.26 | 955. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 2849. | Si KA1, Si KA2 |
| 3.32 | 98. | K KA1, K KA2 |
| 3.70 | 535. | Ca KA1, Ca KA2 |
| 6.40 | 252. | Fe KA1, Fe KA2 |

09-Jan-1992 12:34:12 22965-7-4,A,#05,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 1421. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.25 | 926. | Mg KA1, Mg KA2, Mg KB1 |
| 1.48 | 104. | Al KA1, Al KA2 |
| 1.74 | 2666. | Si KA1, Si KA2 |
| 3.31 | 116. | K KA1, K KA2 |
| 3.70 | 477. | Ca KA1, Ca KA2 |
| 4.02 | 52. | Ca KB1, Ca KB3 |
| 6.41 | 225. | Fe KA1, Fe KA2 |

9-Jan-1992 12:36:13
Execution time = 7 seconds
22965-7-4,A,#06,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 575. | O K , O K , V L , V L , V L , V L |
| 1.26 | 310. | Mg K , Mg K , Mg K |
| 1.74 | 1161. | Si K , Si K |
| 3.70 | 209. | Ca K , Ca K |
| 6.39 | 160. | Fe K , Fe K |

Quantex>
0.480 Range= 10.230 keV 10.230
Integral 0 = 5948

```
 9-Jan-1992 12:37:10
Execution time =     7 seconds
22965-7-4,A,#07,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        34 secs
   Energy  Counts     X-Ray Lines

   0.52      802.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.26      416.    Mg K  , Mg K  , Mg K

   1.74     1414.    Si K  , Si K

   3.71      273.    Ca K  , Ca K

   6.40      174.    Fe K  , Fe K


Quantex>
      0.480     Range=    10.230 keV                          10.230
                                          Integral 0  =          7511
 9-Jan-1992 12:39:09
Execution time =     6 seconds
22965-7-4,A,#08,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        29 secs
   Energy  Counts     X-Ray Lines

   0.51      706.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.25      476.    Mg K  , Mg K  , Mg K

   1.75     1304.    Si K  , Si K

   3.70      263.    Ca K  , Ca K

   6.41      177.    Fe K  , Fe K


Quantex>
      0.480     Range=    10.230 keV                          10.230
                                          Integral 0  =          6291
 9-Jan-1992 12:40:25
Execution time =     7 seconds
22965-7-4,A,#09,SA                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        38 secs
   Energy  Counts     X-Ray Lines

   0.52     1004.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                     V  L

   1.02      226.    Na K  , Na K  , Na K  , Zn L  , Zn L  ,
                     Zn L  , Zn L

   1.26      482.    Mg K  , Mg K  , Mg K

   1.74     2071.    Si K  , Si K
```

Quantex>

0.480 Range= 10.230 keV 10.230

Integral 0 = 6291

9-Jan-1992 12:40:25

Execution time = 7 seconds

22965-7-4,A,#09,SA Preset= Off

Vert= 200 counts Disp= 1 Elapsed= 38 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 1004. | O K , O K , V L , V L , V L , V L |
| 1.02 | 226. | Na K , Na K , Na K , Zn L , Zn L , Zn L |
| 1.26 | 482. | Mg K , Mg K , Mg K |
| 1.74 | 2071. | Si K , Si K |
| 3.34 | 99. | K K , K K |
| 3.69 | 121. | Ca K , Ca K |
| | 328. | Fe K , Fe K |

Quantex>

0.480 Range= 10.230 keV 10.230

```
   3.34      99.    K  K  , K  K

   3.69     121.    Ca K  , Ca K

Quantex>    328.    Fe K  , Fe K
     0.480    Range=   10.230 keV                          10.230
                                          Integral 0  =        9504
 9-Jan-1992 12:42:01
Execution time =     8 seconds
22965-7-4,A,#10,SA                                Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        26 secs
   Energy  Counts    X-Ray Lines

   0.52     687.    O  K  , O  K  , V  L  , V  L  , V  L  ,
                    V  L

   1.26     489.    Mg K  , Mg K  , Mg K

   1.74    1237.    Si K  , Si K

   3.70     335.    Ca K  , Ca K

   6.40     171.    Fe K  , Fe K


Quantex>
     0.480    Range=   10.230 keV                          10.230
                                          Integral 0  =        7564
```

09-Jan-1992 12:45:34 22965-7-4,A,#11,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 916. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.00 | 68. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.25 | 632. | Mg KA1, Mg KA2, Mg KB1 |
| 1.74 | 1835. | Si KA1, Si KA2 |
| 3.31 | 61. | K KA1, K KA2 |
| 3.70 | 427. | Ca KA1, Ca KA2 |
| 4.01 | 74. | Ca KB1, Ca KB3 |
| 6.40 | 225. | Fe KA1, Fe KA2 |

09-Jan-1992 12:54:38 22965-7-4

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 3818. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.02 | 363. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 2356. | Mg KA1, Mg KA2, Mg KB1 |
| 1.48 | 375. | Al KA1, Al KA2 |
| 1.74 | 7489. | Si KA1, Si KA2 |
| 3.32 | 375. | K KA1, K KA2 |
| 3.69 | 878. | Ca KA1, Ca KA2 |
| 6.40 | 698. | Fe KA1, Fe KA2 |
| 7.06 | 112. | Fe KB1, Fe KB3 |

Quantex>

0.480 Range= 10.230 keV 10.230

Integral 0 = 16628

9-Jan-1992 12:59:26

Execution time = 6 seconds

22965-7-4,A,#13,SA Preset= Off

Vert= 500 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 681. | Mg K , Mg K , Mg K |
| 1.75 | 3095. | Si K , Si K |
| 3.69 | 131. | Ca K , Ca K |
| 6.41 | 670. | Fe K , Fe K |
| 7.08 | 95. | Fe K , Fe K |

Quantex>

0.480 Range= 10.230 keV 10.230

Integral 0 = 16628

09-Jan-1992 13:01:55 22965-7-4,A,#14,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.01 | 205. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 1020. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 5451. | Si KA1, Si KA2 |
| 2.34 | 78. | S KA1, S KA2 |
| 3.33 | 74. | K KA1, K KA2 |
| 3.72 | 220. | Ca KA1, Ca KA2 |
| 4.09 | 49. | Sc KA1, Sc KA2 |
| 4.45 | 71. | Sc KB1, Sc KB3 |
| 6.41 | 1108. | Fe KA1, Fe KA2 |
| 7.06 | 159. | Fe KB1, Fe KB3 |

09-Jan-1992 13:03:12 22965-7-4,A,#15,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.60 | 222. | Cr LA1, Mn LA1, Cr LA2, Mn LA2, Cr LB1, Mn LB1, Cr LG1, Mn LN |
| 0.99 | 72. | Zn LA1, Zn LA2, Zn LB1 |
| 1.25 | 540. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 2603. | Si KA1, Si KA2 |
| 2.28 | 462. | S KA1, S KA2 |
| 3.30 | 63. | K KA1, K KA2 |
| 3.72 | 141. | Ca KA1, Ca KA2 |
| 6.41 | 584. | Fe KA1, Fe KA2 |
| 8.57 | 350. | Zn KA2 |

09-Jan-1992 13:04:08 22965-7-4,A,#16,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.26 | 287. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 1552. | Si KA1, Si KA2 |
| 3.70 | 132. | Ca KA1, Ca KA2 |
| 4.08 | 110. | Sc KA1, Sc KA2 |
| 6.41 | 320. | Fe KA1, Fe KA2 |

5.1

# GM ASBESTOS ANALYSIS

AS Lab No. 22965

mple No. Schafer #7

Page ___ of ___

MICROSCOPE
600A [X]
600B [ ]
IIU11E [ ]
IIU12SE [ ]

B

ANALYSIS

GRID
1 [ ] 3 [ ]
2 [X] 4 [ ]

Grid Address 1-B
Screen Magnification 19300 x
Camera Constant 36.2
Accelerating Voltage 100 KV
Beam Current 10 pa

Analyst RS

Date 1-8-91

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | | 8 | 22 | | | | | | | | | | | | | ✓ | | | | 10 | 3 | 1 | | | Tremolite |
| | 2 | | 2 | 18 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 0 | | " |
| | 3 | | 4 | 28 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | " |
| | 4 | | 5 | 122 | | | | | | | | | | | | | ✓ | | | | 1 | 10 | 1 | 1 | | " |
| 2 | 5 | | 3 | 42 | | | | | | | | | | | | | ✓ | | | | 1 | 10 | 1 | 2 | | " |
| | 6 | | 5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 7 | | 5 | 10 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 2 | | " |
| | 8 | | 3 | 35 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 2 | | " |
| | 9 | | 3 | 18 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 2 | | " |
| | 10 | | 3 | 78 | | | | | | | | | ✓ | | | | | | | | 3 | 10 | 2 | 1 | | " |
| | 11 | | 3 | 22 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 12 | | 1.5 | 210 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 13 | | 4 | 30 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 14 | | 5 | 125 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| 3 | 15 | | 2 | 60 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 1 | | Tremo |
| | 16 | | 5 | 60 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 17 | | 8 | 16 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 18 | | 5 | 24 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 19 | | 2 | 38 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 20 | | 5 | 20 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 21 | | 5 | 48 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 22 | | 3 | 42 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| 4 | 23 | | 2 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 24 | | 3 | 24 | | | | | | | | | ✓ | | | | | | | | | | | | | " |

OBSERVATIONS: Clean [ ] Debris [ ] Very Light [ ] Light [ ] Moderate [X] Heavy [ ] Very Heavy [ ]

QM ASBESTOS ANALYSIS

IS Lab No. 22965

mple No. #7

ANALYSIS

GRID: 1 ☐ 3 ☐ 2 ☒ 4 ☐

Grid Address _____

Screen Magnification _____ x

Camera Constant _____

Accelerating Voltage 100 KV

Beam Current _____ µa

Analyst RJ

MICROSCOPE: 600A ☒ 600B ☐ HU11E ☐ HU12SE ☐

B

Date _____

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 25 | | 4 | 18 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 1 | | TYPO |
| | 26 | | 3 | 65 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 27 | | 8 | 20 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 28 | | 15 | 500 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 29 | | 3 | 22 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 30 | | 3 | 25 | | | | | | | | | ✓ | | | | | | | | | | | | | TYPO |
| | 31 | | 3 | 12 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 32 | | 4 | 110 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 33 | | 5 | 80 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 34 | | 5 | 40 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 35 | | 8 | 55 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | TYPO |
| 6 | 36 | | 5 | 105 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 37 | | 3 | 58 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 38 | | 5 | 140 | | | | | | | | | ✓ | | | | | | | | | | | | | TYPO |
| | 39 | | 8 | 42 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| 7 | 40 | | 4 | 22 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 41 | | 4 | 120 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 42 | | 5 | 200 | | | | | | | | | ? | | | | | | | | | | | | | " |
| | 43 | | 10 | 42 | | | | | | | | | ✓ | | | | | | | | | | | | | " |
| | 44 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 45 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 46 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 47 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 48 | | | | | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS: Clean ☐

Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐

9-Jan-1992 12:53:07
Execution time = 8 seconds
22965-7-4,B,#01,RS
Vert= 500 counts Disp= 1

Preset= Off
Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 875. | Mg K , Mg K , Mg K |
| 1.75 | 2971. | Si K , Si K |
| 3.70 | 817. | Ca K , Ca K |
| 4.02 | 135. | Ca K , Ca K |
| 6.40 | 333. | Fe K , Fe K |
| 6.96 | 42. | Co K |

Quantex>
0.480 Range= 10.230 keV 10.230
Integral 0 = 19637

9-Jan-1992 12:56:43
Execution time = 7 seconds
22965-7-4,B,#02,RS Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.50 | 458. | O K , O K , V L , V L , V L , V L |
| 1.27 | 117. | Mg K , Mg K , Mg K |
| 1.75 | 428. | Si K , Si K |
| 3.69 | 77. | Ca K , Ca K |

Quantex>
0.480 Range= 10.230 keV 10.230
Integral 0 = 8819
9-Jan-1992 12:58:49
Execution time = 6 seconds
22965-7-4,B,#03,RS Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 20 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 681. | Mg K , Mg K , Mg K |
| 1.75 | 3095. | Si K , Si K |
| 3.69 | 131. | Ca K , Ca K |
| 6.41 | 670. | Fe K , Fe K |
| 7.08 | 95. | Fe K , Fe K |

```
 9-Jan-1992 13:09:14
Execution time =     6 seconds
22965-7-4,B,#04,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        19 secs
   Energy  Counts    X-Ray Lines

   1.02       72.    Na K  , Na K  , Na K  , Zn L  , Zn L  ,
                     Zn L  , Zn L

   1.27      367.    Mg K  , Mg K  , Mg K

   1.76     1830.    Si K  , Si K

   2.66      131.    Cl K  , Cl K

   3.33      108.    K  K  , K  K

   3.73      101.    Ca K

   6.43      391.    Fe K  , Fe K
Quantex>
      0.480    Range=   10.230 keV                          10.230
                                          Integral 0  =        11661
 9-Jan-1992 13:10:23
Execution time =     7 seconds
22965-7-4,B,#05,RS                                  Preset=  Off
Vert=      200 counts  Disp


 9-Jan-1992 13:10:39
Execution time =     7 seconds
22965-7-4,B,#05,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        15 secs
   Energy  Counts    X-Ray Lines

   1.23      134.    Mg K  , Mg K

   1.74      868.    Si K  , Si K

   2.64       65.    Cl K  , Cl K

   3.31       46.    K  K  , K  K

   3.69       80.    Ca K  , Ca K

   6.39      198.    Fe K  , Fe K

   7.07       57.    Fe K  , Fe K
```

```
      0.480     Range=    10.230 keV                          10.230
                                                Integral 0  =        8105


 9-Jan-1992 13:13:03                                  -WARNING-
Execution time =     6 seconds
22965-7-4,B,#07,RS                                    Preset=  Off
Vert=      200 counts  Disp= 1                        Elapsed=        18 secs
   Energy  Counts     X-Ray Lines

   1.27      332.    Mg K  , Mg K  , Mg K

   1.75     1519.    Si K  , Si K

   2.65       60.    Cl K  , Cl K

   3.34       55.    K  K  , K  K

   3.70      214.    Ca K  , Ca K

   6.40      240.    Fe K  , Fe K


Quantex>
      0.480     Range=    10.230 keV                          10.230
                                                Integral 0  =        8869
 9-Jan-1992 13:14:51
Execution time =     6 seconds
 9-Jan-1992 13:15:00                                  et=  Off
Execution time =     6 seconds
22965-7-4,B,#08,RS                                    Preset=  Off
Vert=      200 counts  Disp= 1                        Elapsed=        18 secs
   Energy  Counts     X-Ray Lines

   1.25      240.    Mg K  , Mg K  , Mg K

   1.75      954.    Si K  , Si K

   3.70      167.    Ca K  , Ca K

   6.41      130.    Fe K  , Fe K


Quantex>
      0.480     Range=    10.230 keV                          10.230
                                                Integral 0  =        7024
```

9-Jan-1992 13:16:08
Execution time = 8 seconds
22965-7-4,B,#09,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 31 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 341. | Mg K , Mg K , Mg K |
| 1.75 | 1238. | Si K , Si K |
| 3.71 | 199. | Ca K , Ca K |
| 6.42 | 183. | Fe K , Fe K |

Quantex>
0.480 Range= 10.230 keV 10.230
Integral 0 = 12005

9-Jan-1992 13:17:47
Execution time = 6 seconds
22965-7-4,B,#10,RS Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 24 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 214. | Mg K , Mg K , Mg K |
| 1.75 | 790. | Si K , Si K |
| 3.70 | 202. | Ca K , Ca K |
| 6.42 | 121. | Fe K , Fe K |

Quantex>
0.480 Range= 10.230 keV 10.230
Integral 0 = 7340

```
 9-Jan-1992 13:53:58
Execution time =     6 seconds
22965,7,A,#15,RS                                  Preset=  Off
Vert=      500 counts  Disp= 1                    Elapsed=        16 secs
   Energy  Counts    X-Ray Lines

   1.01       69.    Na K  , Na K  , Zn L  , Zn L  , Zn L  ,
                     Zn L

   1.26      931.    Mg K  , Mg K  , Mg K

   1.75     3823.    Si K  , Si K

   3.71      523.    Ca K  , Ca K

   4.03       60.    Ca K  , Ca K

   6.41      506.    Fe K  , Fe K

   7.08       67.    Fe K  , Fe K
Quantex>
      0.480    Range=   10.230 keV                          10.230
                                          Integral 0  =        19004
 9-Jan-1992 13:58:03
Execution time =     6 seconds
22965,7,A,#25,RS                                  Preset=  Off
Vert=      200 counts  Disp= 1                    Elapsed=        18 secs
   Energy  Counts    X-Ray Lines

   1.26      433.    Mg K  , Mg K  , Mg K

   1.75     1488.    Si K  , Si K

   3.70      374.    Ca K  , Ca K

   4.03       59.    Ca K  , Ca K

   6.41      130.    Fe K  , Fe K



Quantex>
      0.480    Range=   10.230 keV                          10.230
                                          Integral 0  =         9897
```

EM ASBESTOS ANALYSIS

MS Lab No. 22965

mple No. #7

5 mf

Page 1 of

MICROSCOPE
600A ☑
600B ☐
HU11E ☐
HU125E ☐

ANALYSIS

GRID
1 ☐ 3 ☑
2 ☐ 4 ☐

Grid Address 1-C
Screen Magnification 19,300 x
Camera Constant 30.2
Accelerating Voltage 100 KV
Beam Current 10 μa

C

Analyst F.M. Date 1/11/92

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01 | F | 3 | 105 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1 | 1 | | EDS Photo # 3632 Trem |
| 2 | 02 | F | 5 | 135 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 2 | | EDS Photo 3633 Trem |
| | 03 | F | 6 | 20 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Trem |
| | 04 | F | 5 | 35 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 1 | 2 | | EDS |
| | 05 | F | 12 | 150 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS |
| | 06 | F | 3 | 65 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 07 | F | 10 | 50 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| 3 | 08 | F | 1.5 | 16 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 09 | F | 4 | 135 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 10 | F | 2 | 35 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| 4 | 11 | F | 1.5 | 44 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 12 | F | 3 | 70 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 13 | F | 3 | 45 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 14 | F | 2 | 40 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 15 | F | 2 | 16 | | | | | | | | | ✓ | | | | ✓ | | | | 4 | 10 | 1 | 1 | | EDS |
| | 16 | F/D | 2.5 | 30 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| 5 | 17 | F | 1.5 | 18 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 18 | F | 4 | 30 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 19 | F | 5 | 37 | | | | | | | | | ✓ | | | | | | | | | | | | | Photo 3634 |
| | 20 | F | 1.5 | 42 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 21 | F | 3 | 110 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 22 | F | 4 | 35 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 23 | F | 2.5 | 16 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| 6 | 24 | F | 3 | 15 | | | | | | | | | ✓ | | | | | | | | | | | | | |

OBSERVATIONS:

| | | | | | |
|---|---|---|---|---|---|
| Clean ☐ | | | | | |
| Debris: ☑ | Very Light ☐ | Light ☑ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |
| Gypsum: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |

EPA ASBESTOS ANALYSIS

MS Lab No. 22965

Sample No. #7

5 mf

Page 2

MICROSCOPE
- 600A ☑
- 600B ☐
- HU11E ☐
- HU125E ☐

ANALYSIS

GRID
- 1 ☐
- 2 ☐
- 3 ☑
- 4 ☐

Grid Address 1-C

Screen Magnification 19,300 x

Camera Constant 30.2

Accelerating Voltage 100 KV

Beam Current 10 µa

Analyst F.M.

Date 1/11/92

| Grid opening | Str # | Str | Dimensions (mm) Width | Dimensions (mm) Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 25 | F | 4 | 57 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 2 | | EDS [illegible] |
| | 26 | F | 6 | 120 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 27 | F/D | 3 | 55 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 28 | F | 3 | 50 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 29 | F | 2.5 | 22 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 30 | F | 1.5 | 15 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| 7 | 31 | F | 3 | 60 | | | | | | | | | ✓ | | | | | | | | | | | | | |
| | 32 | F | 3 | 30 | | | | | | | | | ✓ | | | | | | | | | | | | | |

OBSERVATIONS:

| | | | | | |
|---|---|---|---|---|---|
| Clean ☐ | | | | | |
| Debris: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |
| Gypsum: ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |

11-Jan-1992 15:48:07
Execution time = 7 seconds
22965,7,1-C,01,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 39 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.00 | 101. | Na K , Na K , Zn L , Zn L , Zn L , Zn L |
| 1.27 | 1039. | Mg K , Mg K , Mg K |
| 1.75 | 4057. | Si K , Si K |
| 3.34 | 148. | K K , K K |
| 3.70 | 490. | Ca K , Ca K |
| 6.41 | 566. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 17621

11-Jan-1992 15:51:49
Execution time = 7 seconds
22965,7,1-C,02,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 42 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 458. | Mg K , Mg K , Mg K |
| 1.75 | 1638. | Si K , Si K |
| 3.71 | 300. | Ca K , Ca K |
| 6.42 | 268. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 10389

11-Jan-1992 15:54:48
Execution time = 6 seconds
22965,7,1-C,03,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 610. | Mg K , Mg K , Mg K |
| 1.75 | 2263. | Si K , Si K |
| 3.70 | 511. | Ca K , Ca K |
| 6.42 | 144. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 10238

11-Jan-1992 15:58:28
Execution time = 8 seconds
22965,7,1-C,04,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.75 | 199. | Co L , Co L , Co L , Co L |
| 1.26 | 828. | Mg K , Mg K , Mg K |
| 1.74 | 3115. | Si K , Si K |
| 3.33 | 146. | K K , K K |
| 3.72 | 350. | Ca K , Ca K |
| 6.42 | 387. | Fe K , Fe K |
| 7.04 | 143. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 13211

11-Jan-1992 16:00:43
Execution time = 6 seconds
22965,7,1-C,05,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 39 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 530. | Mg K , Mg K , Mg K |
| 1.74 | 2132. | Si K , Si K |
| 3.70 | 379. | Ca K , Ca K |
| 6.41 | 155. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 10361

11-Jan-1992 16:03:23
Execution time = 6 seconds
22965,7,1-C,15,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 41 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 546. | Mg K , Mg K , Mg K |
| 1.75 | 1520. | Si K , Si K |
| 3.70 | 203. | Ca K , Ca K |
| 6.40 | 182. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 9562

11-Jan-1992 16:06:36
Execution time = 6 seconds
22965,7,1-C,25,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 40 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 378. | Mg K , Mg K , Mg K |
| 1.75 | 1401. | Si K , Si K |
| 3.71 | 230. | Ca K , Ca K |
| 6.40 | 286. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 8986

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| TM | - | Tubular Morphology not sufficiently characteristic for classification as chrysotile |
| CM | - | Characteristic Chrysotile Morphology |
| CD | - | Chrysotile SAED pattern |
| CQ | - | Chrysotile composition by Quantitative EDXA |
| CMQ | - | Chrysotile Morphology and composition by Quantitative EDXA |
| CDQ | - | Chrysotile SAED pattern and composition by Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| UF | - | Unidentified Fiber |
| AD | - | Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing) |
| AX | - | Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole |
| ADX | - | Amphibole by random orientation SAED and Qualitative EDXA |
| AQ | - | Amphibole by Quantitative EDXA |
| AZ | - | Amphibole by one Zone Axis SAED |
| ADQ | - | Amphibole by random orientation SAED and Quantitative EDXA |
| AZQ | - | Amphibole by one Zone Axis SAED pattern and Quantitative EDXA |
| AZZ | - | Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle |
| AZZQ | - | Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

## Analysis of Water by Transmission Electron Microscopy
(EPA-600/4-83-043)

| | | | |
|---|---|---|---|
| EMS No. | 22965 | Client | SCHAFER & ASSOC. |
| Sample No. | SW-8-4 | | |
| Date | 12/27/91 | | |

| | | |
|---|---|---|
| Total Asbestos Fibers | 170 | MFL |
| Chrysotile Fibers | *BDL | MFL |
| Amphibole Fibers | 170 | MFL |
| > 5 Micron length (chrysotile) | *BDL | MFL |
| > 5 Micron length (amphibole) | 45 | MFL |
| Mass (Chrysotile) | *BDL | µg/L |
| Mass (amphibole) | 240 | µg/L |
| More/Less than 5 Chrysotile Fibers in Sample | LESS | |
| More/Less than 5 Amphibole Fibers in Sample | MORE | |
| Poisson 95% Confidence Interval | 140 to 210 | MFL |
| Detection Limit | 1.9 | MFL |

* BDL : Below Detection Limit; MFL: Million Fibers per Liter

### Size Distribution (Chrysotile and Amphibole)

**Particle Length - Microns**

| O -0.49 | 0.50 - 0.99 | 1.00 - 1.49 | 1.50 - 1.99 | 2.00 - 2.49 | 2.5 & UP |
|---|---|---|---|---|---|
| 0 | 3 | 14 | 12 | 9 | 52 |

**Particle Width - Microns**

| O - .04 | .05 - .09 | .1 - .14 | .15 - .19 | .2 - .24 | .25 & UP |
|---|---|---|---|---|---|
| 0 | 9 | 18 | 18 | 13 | 32 |

**Aspect Ratio L/W**

| 0 - 9.9 | 10 - 19.9 | 20 - 29.9 | 30 - 39.9 | 40 - 49.9 | 50 & UP |
|---|---|---|---|---|---|
| 28 | 28 | 17 | 8 | 0 | 9 |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. SW-8-4

vol- 5 ml.
g-o- .0062

Page [redacted] of [redacted]

RECEIVING

ANALYSIS

GRID
1 [X] 3 [ ]
2 [ ] 4 [ ]

Grid Address 1A
Screen Magnification 19500 x
Camera Constant 28.4
Accelerating Voltage 100 KV
Beam Current 10 µa

MICROSCOPE
600A [ ]
600B [X]
HU11E [ ]
HU125E [ ]

A

Analyst S. Ahmed Date 12/19/91

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 2.5 | 70 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #1 Possible Tr |
| | 2 | F | 1 | 50 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #2 " |
| | 3 | F | 4 | 240 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #3 " |
| | 4 | F | 3 | 65 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #4 " |
| | 5 | F | 2 | 20 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #5 " |
| 2 | 6 | F | 12 | 80 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #6 " |
| | 7 | F | 5 | 600 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #7 " |
| | 8 | F | 3 | 85 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #8 " |
| | 9 | F | 3 | 65 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #9 " |
| | 10 | F | 3 | 35 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #10 " |
| | 11 | F | 8 | 70 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 12 | F | 3 | 70 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 13 | MD | 2 | 65 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| 3 | 14 | F | 1.5 | 40 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 15 | F | 3.5 | 40 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #15 |
| | 16 | F | 2 | 22 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| 4 | 17 | F | 11 | 370 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 18 | F | 9 | 110 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 19 | F | 4 | 150 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| 5 | 20 | F | 1.5 | 24 | ✓ | | | | | | | | | | | | ✓ | | | | | | | | | EDS #20, Possible Tr |
| | 21 | F | 8 | 80 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #21 " |
| | 23 | F | 12 | 120 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #22 " |
| | 24 | F | 5 | 105 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS #23 " |
| | 25 | F | 3 | 85 | | | | | | | | | | | | | ✓ | | | | | | | | | |

OBSERVATIONS:

Clean [ ]

| | | | | | |
|---|---|---|---|---|---|
| Debris: [X] | Very Light [ ] | Light [ ] | Moderate [X] | Heavy [ ] | Very Heavy [ ] |
| Gypsum: [ ] | Very Light [ ] | Light [ ] | Moderate [ ] | Heavy [ ] | Very Heavy [ ] |

Other [ ]

# EM ASBESTOS ANALYSIS

MS Lab No. 22965
lient Schafer & Associates
ample No. SW-8-4

Page ___ of ___

**RECEIVING**

METHOD OF ANALYSIS
- EPA Yamate Level I ☐
- Level II ☐
- Level III ☐
- AHERA ☐

LENGTHS
- All Sizes (EPA) ☐
- (µm):≥0.5 ☐
- ≥1.0 ☐
- ≥5.0 ☐
- ≥10.0 ☐
- PCM Range* ☐ *(≥0.25 µm width, ≥5.0 µm length)

ASPECT RATIO 3:1 ☐ 5:1 ☐

Approved By _____ Date _____

FILTER TYPE/AREA (mm²)
- MCE/385 ☐
- MCN/960 ☐
- MCE/960 ☒
- Other ☐

TYPE OF SAMPLE
- Air ☐ Water ☒
- Soil ☐ Wipe ☐
- Bulk ☐ Other ☐
- Dust/Microvac ☐

PORE SIZE
- 0.45 µm ☐
- 0.8 µm ☐
- .1 µm ☒
- .22 µm ☐
- Other ☐

G.O. Area (mm²) 0.0 062
No. of G.O. to Analyze 20
Filter Lot No. _____

**PREP**

DIRECT PREP ☒
INDIRECT PREP ☐

Volume _____ liters
Working Volume 5 ml
Weight _____ grams
Ashed Area _____ %

Prepared By FG

**ANALYSIS**

GRID
1 ☒ 3 ☐
2 ☐ 4 ☐

Grid Address 1A
Screen Magnification 19500 x
Camera Constant 28.4
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst S. Ahmed Date 12/19/91

MICROSCOPE
- 600A ☐
- 600B ☒
- HU11E ☐
- HU125E ☐

A

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 25 | F | 4 | 75 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 26 | F | 10 | 55 | | | | | | | | | | | | | ✓ | | | | | | | | | EDS# 26 Tremoli |
| | 27 | F | 4 | 30 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| 7 | 28 | F | 2 | 24 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 29 | F | 2.5 | 140 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 30 | F | 5 | 55 | | | | | | | | | | | | | ✓ | | | | | | | | | |
| | 31 | F | 2 | 40 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 32 | F | 1.5 | 25 | ✓ | | | | | | | | | | | | | | | | | | | | | |

**OBSERVATIONS:**
- Clean ☐
- Debris: ☒ Very Light ☐ Light ☐ Moderate ☒ Heavy ☐ Very Heavy ☐
- Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
- Other ☐

```
20-Dec-1991 08:51:23
Execution time =     5 seconds
22965,8-4,A,#01,SA                                  Preset=  Off
Vert=      500 counts  Disp= 1                      Elapsed=        45 secs
   Energy  Counts    X-Ray Lines

   0.52    2771.   O  K  , O  K  , V  L  , V  L  , V  L  ,
                   V  L

   1.25    1560.   Mg K  , Mg K  , Mg K

   1.49     163.   Al K  , Al K

   1.74    4933.   Si K  , Si K

   3.31     177.   K  K  , K  K

   3.70     968.   Ca K  , Ca K

   6.40     428.   Fe K  , Fe K
Quantex>
      0.000    Range=   10.230 keV                          10.110
                                          Integral 8  =          903
```

7-Jan-1992 11:41:58
Execution time = 6 seconds
22965-8-4,A,#02,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 34 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1315. | Mg K , Mg K , Mg K |
| 1.74 | 4724. | Si K , Si K |
| 3.69 | 1274. | Ca K , Ca K |
| 4.04 | 106. | Sc K , Ca K , Ca K |
| 6.39 | 349. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 691

7-Jan-1992 11:43:56
Execution time = 6 seconds
22965-8-4,A,#03,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 19 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 744. | Mg K , Mg K , Mg K |
| 1.74 | 2429. | Si K , Si K |
| 3.69 | 581. | Ca K , Ca K |
| 4.02 | 61. | Ca K , Ca K |
| 6.39 | 225. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 360

7-Jan-1992 11:45:54
Execution time = 7 seconds
22965-8-4,A,#04,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 38 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 826. | Mg K , Mg K , Mg K |
| 1.74 | 3345. | Si K , Si K |
| 3.34 | 117. | K K , K K |
| 3.69 | 474. | Ca K , Ca K |
| 6.41 | 327. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 488

20-Dec-1991 09:15:38
Execution time = 7 seconds
22965,8-4,A,#05,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 1638. | O K , O K , V L , V L , V L , V L |
| 1.00 | 103. | Na K , Na K , Zn L , Zn L , Zn L , Zn L |
| 1.25 | 837. | Mg K , Mg K , Mg K |
| 1.74 | 2628. | Si K , Si K |
| 3.33 | 107. | K K , K K |
| 3.69 | 569. | Ca K , Ca K |
| Quantex> | 184. | Fe K , Fe K |

0.000 Range= 10.230 keV 10.110
Integral 8 = 499

7-Jan-1992 12:36:20
Execution time = 7 seconds
22965-8-4,A,#06,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 31 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1147. | Mg K , Mg K , Mg K |
| 1.74 | 4185. | Si K , Si K |
| 3.69 | 964. | Ca K , Ca K |
| 4.03 | 112. | Ca K , Ca K |
| 6.39 | 311. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 573

7-Jan-1992 12:38:18
Execution time = 5 seconds
22965-8-4,A,#07,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1457. | Mg K , Mg K , Mg K |
| 1.74 | 5234. | Si K , Si K |
| 3.30 | 142. | K K , K K |
| 3.69 | 991. | Ca K , Ca K |
| 4.02 | 98. | Ca K , Ca K |
| 6.40 | 428. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 744

7-Jan-1992 12:39:53
Execution time = 6 seconds
22965-8-4,A,#08,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 21 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1126. | Mg K , Mg K , Mg K |
| 1.74 | 4110. | Si K , Si K |
| 3.31 | 217. | K K , K K |
| 3.69 | 582. | Ca K , Ca K |
| 4.06 | 77. | Sc K , Sc K |
| 6.40 | 432. | Fe K , Fe K |
| 7.02 | 50. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 650

7-Jan-1992 12:42:19
Execution time = 6 seconds
22965-8-4,A,#09,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 58 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 353. | Mg K , Mg K , Mg K |
| 1.74 | 1634. | Si K , Si K |
| 3.69 | 251. | Ca K , Ca K |
| 6.41 | 214. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 235

7-Jan-1992 12:43:33
Execution time = 6 seconds
22965-8-4,A,#10,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 37 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 1154. | Mg K , Mg K , Mg K |
| 1.74 | 4046. | Si K , Si K |
| 3.29 | 158. | K K , K K |
| 3.69 | 811. | Ca K , Ca K |
| 4.05 | 110. | Sc K , Sc K , Ca K , Ca K |
| 6.39 | 275. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 655

7-Jan-1992 12:49:14
Execution time = 8 seconds
22965-8-4,A,#15,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 54 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 202. | Mg K , Mg K , Mg K |
| 1.74 | 675. | Si K , Si K |
| 3.68 | 186. | Ca K , Ca K |
| 6.42 | 113. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 8 = 145

7-Jan-1992 12:51:35 LN Testng

Execution time = 8 seconds

22965-8-4,A,#20,SA Preset= Off

Vert= 200 counts Disp= 1 Elapsed= 63 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 441. | Mg K , Mg K , Mg K |
| 1.74 | 1786. | Si K , Si K |
| 3.70 | 312. | Ca K , Ca K |
| 6.40 | 185. | Fe K , Fe K |

Quantex>

0.160 Range= 10.230 keV 10.230

Integral 8 = 325

19-Dec-1991 11:28:08 22965-8-4,A,#2~~1~~,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 8476. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 1.02 | 855. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 5850. | Mg KA1, Mg KA2, Mg KB1 |
| 1.49 | 486. | Al KA1, Al KA2 |
| 1.74 | 17010. | Si KA1, Si KA2 |
| 3.32 | 997. | K KA1, K KA2 |
| 3.70 | 1998. | Ca KA1, Ca KA2 |
| 4.03 | 261. | Ca KB1, Ca KB3 |
| 6.40 | 1341. | Fe KA1, Fe KA2 |
| 7.04 | 172. | Fe KB1, Fe KB3 |

19-Dec-1991 11:31:38
Execution time = 6 seconds
22965-8-4,A,#22,SA Preset= Off
Vert= 1000 counts Disp= 1 Elapsed= 51 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 1524. | O K , O K , V L , V L , V L , V L |
| 1.25 | 853. | Mg K , Mg K , Mg K |
| 1.49 | 144. | Al K , Al K |
| 1.74 | 2807. | Si K , Si K |
| 3.70 | 539. | Ca K , Ca K |
| 6.41 | 244. | Fe K , Fe K |

Quantex>
0.000 Range= 10.230 keV 10.110
Integral 0 = 12312
19-Dec-1991 11:31:41
Execution time = 6 seconds
22965-8-4,A,#22,SA Preset= Off
Vert= 1000 counts Disp= 1 Elapsed= 51 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 0.52 | 1524. | O K , O K , V L , V L , V L , |

7-Jan-1992 12:54:15
Execution time = 6 seconds
22965-8-4,A,#23,SA Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 52 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 530. | Mg K , Mg K , Mg K |
| 1.74 | 2026. | Si K , Si K |
| 3.69 | 337. | Ca K , Ca K |
| 6.38 | 192. | Fe K , Fe K |

Quantex)
0.160 Range= 10.230 keV 10.230
Integral 8 = 298

19-Dec-1991 11:45:45 22965-8-4,A,#26,SA

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 0.52 | 1615. | O KA1, O KA2, V LA1, V LA2, V LB1, V LG1 |
| 0.75 | 66. | Co LA1, Co LA2, Co LB1, Co LG1 |
| 1.02 | 91. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 950. | Mg KA1, Mg KA2, Mg KB1 |
| 1.49 | 105. | Al KA1, Al KA2 |
| 1.74 | 3398. | Si KA1, Si KA2 |
| 3.70 | 458. | Ca KA1, Ca KA2 |
| 4.01 | 63. | Ca KB1, Ca KB3 |
| 6.41 | 593. | Fe KA1, Fe KA2 |
| 7.07 | 108. | Fe KB1, Fe KB3 |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. 8-4

5 wet

RECEIVING

ANALYSIS

GRID
1 [ ] 3 [ ]
2 [✓] 4 [ ]

Grid Address 1-B
Screen Magnification 19300 x
Camera Constant 30.4
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst E.M. Date 12/28-9

MICROSCOPE
600A [✓]
600B [ ]
HU11E [ ]
HU125E [ ]

**B**

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | EDS Analysis Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01 | F | 1.5 | 110 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 2 | 1 | | EDS Tremolite |
| | 02 | F | 1 | 35 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS — " — |
| | 03 | F | 1 | 28 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 2 | 1 | | EDS — " — ? |
| | 04 | F | 2 | 50 | | | | | | | | | | | | ✓ | | | | | 2 | 10 | 2 | 1 | | EDS — " — |
| | 05 | F | 2.5 | 32 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 3 | 1 | | EDS — " — |
| | 06 | F | 1.5 | 22 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 07 | F | 5 | 35 | | | | | | | | | | | | ✓ | | | | 1 | 2 | 10 | 1 | 3 | | EDS — " — ? |
| | 08 | F | 7 | 75 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 2 | | EDS — " — |
| | 09 | F | 6 | 35 | | | | | | | | | | | | ✓ | | | | | | | | | | |
| | 10 | F | 2 | 230 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| 2 | 11 | F | 13 | 115 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 12 | F | 4 | 200 | | | | | | | | | | | | ✓ | | | | 1 | 3 | 10 | 1 | 2 | | EDS — " — |
| | 13 | F | 1.5 | 25 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 14 | F | 4 | 30 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 15 | F | 3 | 85 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 16 | F | 3 | 23 | | | | | | | | | | | | ✓ | | | | | | | | | | Tr — " — |
| 3 | 17 | F | 3 | 63 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 3 | 1 | | EDS — " — |
| | 18 | F | 3 | 19 | | | | | | | | | | | | ✓ | | | | | | | | | | Tr |
| | 19 | F | 5 | 23 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 20 | F | 5 | 55 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 21 | F | 4 | 35 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 22 | F | 4 | 45 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 23 | F | 18 | 120 | | | | | | | | | | | | ✓ | | | | 1 | 2 | 10 | 1 | 2 | | EDS — " — |
| | 24 | F | 1.5 | 55 | ✓ | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS:

Clean [ ]

Debris: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]

Other [ ]

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. 8-4

5 mf

RECEIVING

ANALYSIS

GRID
1 [ ] 3 [ ]
2 [ ] 4 [ ]

MICROSCOPE
600A [ ]
[ ]
[ ]
125E [ ]

Grid Address
Screen Magnificatio
Camera Constant
Accelerating Voltage /
Beam Current µa

**B**

Analyst _____ Date _____

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CQ | CMQ | CDQ | UF | AD | AX | ADX | AQ | ADQ | AZQ | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | F | 4 | 45 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| 4 | 26 | F | 2 | 125 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 27 | F | 6 | 48 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 28 | F | 3 | 60 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 29 | F | 20 | 100 | | | | | | | | | | | | ✓ | | | | 1 | 3 | 10 | 1 | 2 | | EDS |
| | 30 | F | 4 | 60 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 31 | F | 2 | 15 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 32 | F | 2.5 | 110 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| 5 | 33 | F | 6 | 280 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 34 | F | 1.5 | 43 | | | | | | | | | | | | ✓ | | | | 1 | 2 | 10 | 1 | 1 | | EDS Tremolite |
| | 35 | F | 12 | 150 | | | | | | | | | | | | ✓ | | | | | | | | | | Tremolite |
| | 36 | F | 10 | 200 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| 6 | 37 | F | 2 | 22 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 38 | F | 4 | 47 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 39 | F | 3 | 28 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 40 | F | 9 | 60 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 41 | F | 8 | 300 | | | | | | | | | | | | ✓ | | | | | 3 | 10 | 2 | 1 | | EDS Tremolite |
| | 42 | F | 3 | 70 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 43 | F | 14 | 140 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| 7 | 44 | F | 2.5 | 32 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 45 | F | 8 | 90 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |
| | 46 | F | 4 | 73 | | | | | | | | | | | | ✓ | | | | | | | | | | — " — |

OBSERVATIONS:

Clean [ ]
Debris: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Gypsum: [ ] Very Light [ ] Light [ ] Moderate [ ] Heavy [ ] Very Heavy [ ]
Other [ ]

26-Dec-1991 16:09:49
Execution time = 6 seconds
22965,#8-4,B,01,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 33 secs

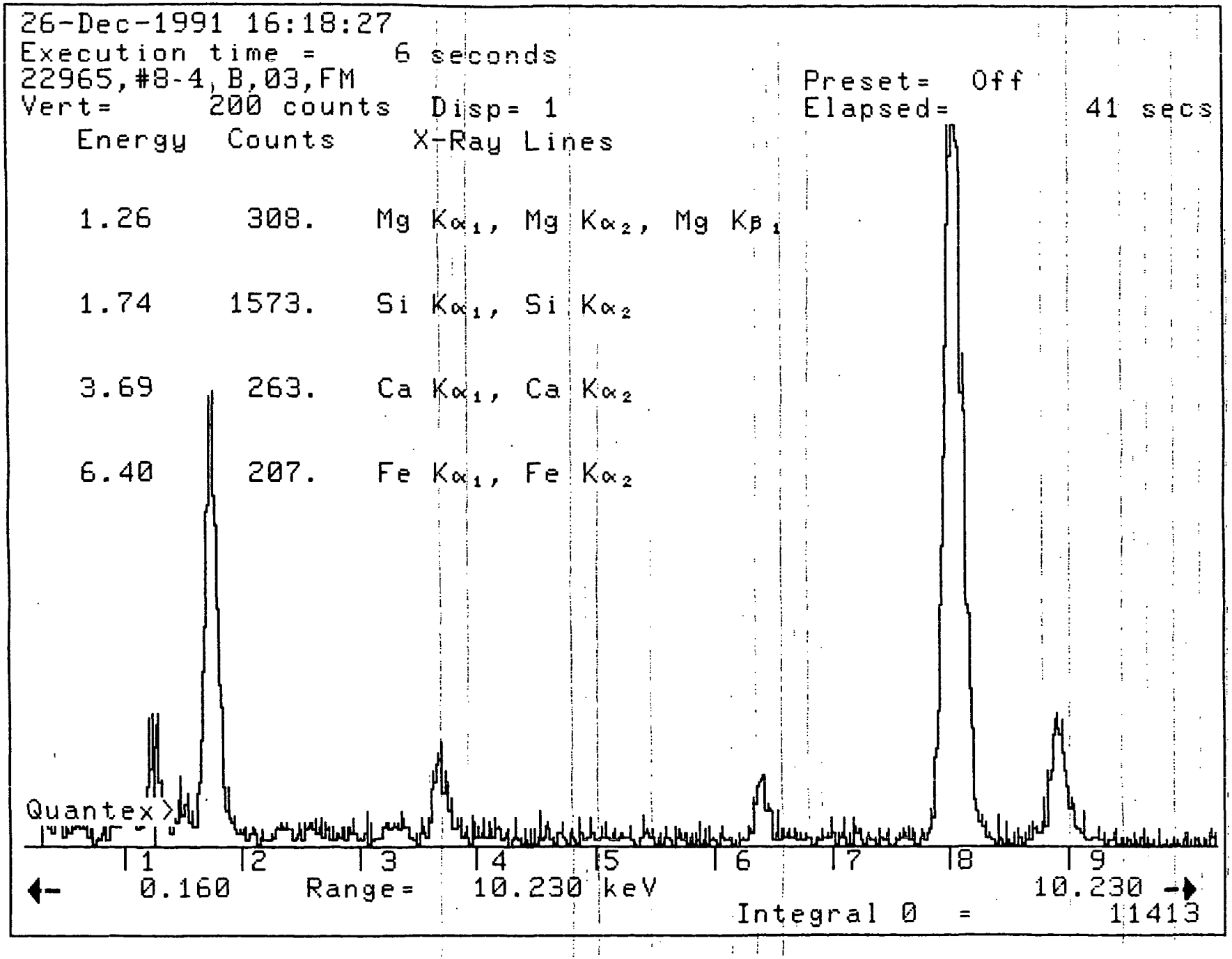
| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 263. | Mg K , Mg K , Mg K |
| 1.75 | 1301. | Si K , Si K |
| 3.70 | 259. | Ca K , Ca K |
| 6.41 | 168. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8370

26-Dec-1991 16:13:58
Execution time = 6 seconds
22965,#8-4,B,02,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 33 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 344. | Mg K , Mg K , Mg K |
| 1.74 | 1242. | Si K , Si K |
| 3.70 | 268. | Ca K , Ca K |
| 6.39 | 103. | Fe K , Fe K |

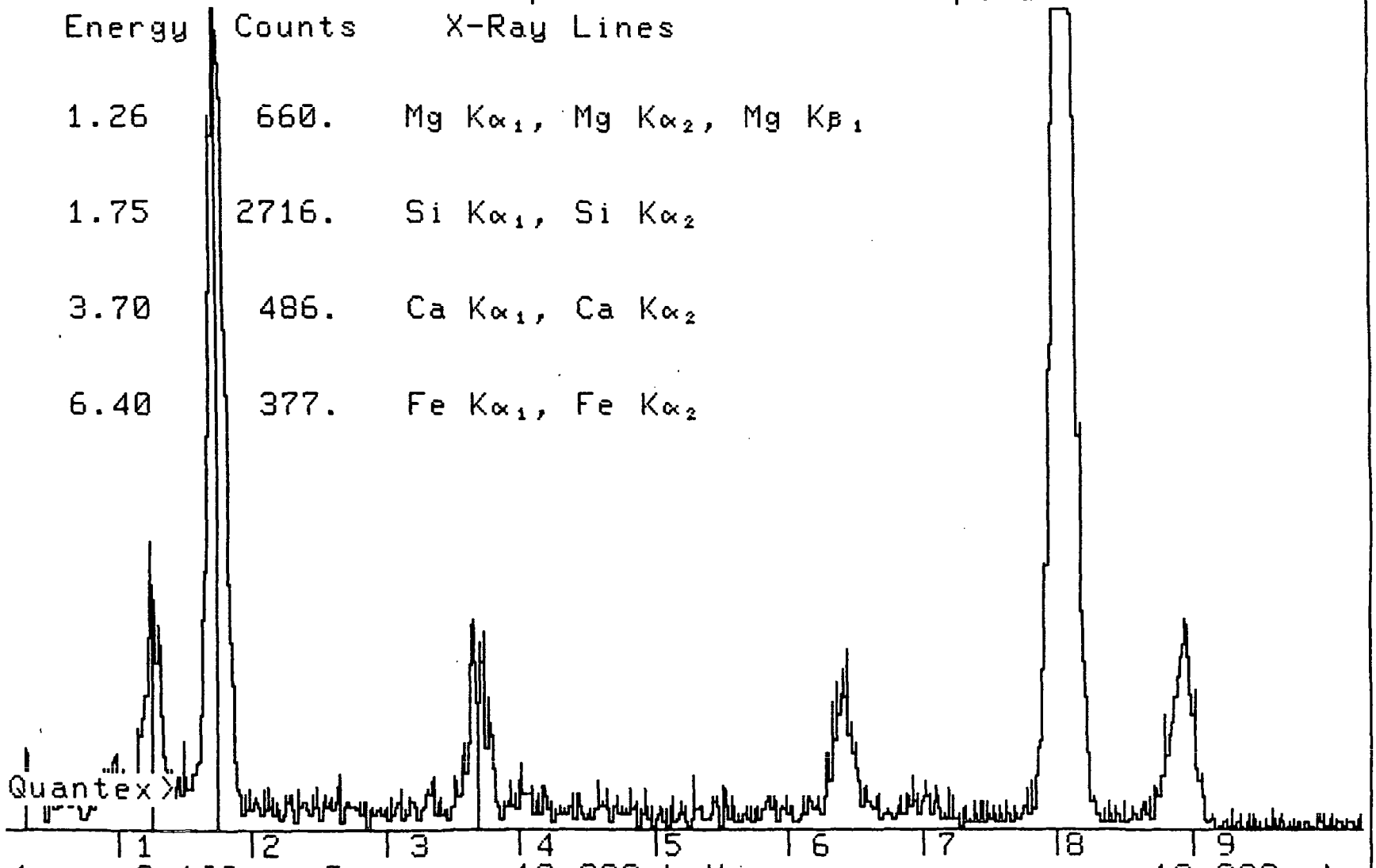
Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8426


26-Dec-1991 16:18:27
Execution time = 6 seconds
22965,#8-4,B,03,FM
Vert= 200 counts Disp= 1
Preset= Off
Elapsed= 41 secs
Energy Counts X-Ray Lines
1.26 308. Mg Kα1, Mg Kα2, Mg Kβ1
1.74 1573. Si Kα1, Si Kα2
3.69 263. Ca Kα1, Ca Kα2
6.40 207. Fe Kα1, Fe Kα2
Quantex>
1 2 3 4 5 6 7 8 9
0.160 Range= 10.230 keV 10.230
Integral 0 = 11413

26-Dec-1991 16:26:23
Execution time = 7 seconds
22965,#8-4,B,04,FM
Vert= 200 counts Disp= 1

Preset= Off
Elapsed= 53 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 660. | Mg $K\alpha_1$, Mg $K\alpha_2$, Mg $K\beta_1$ |
| 1.75 | 2716. | Si $K\alpha_1$, Si $K\alpha_2$ |
| 3.70 | 486. | Ca $K\alpha_1$, Ca $K\alpha_2$ |
| 6.40 | 377. | Fe $K\alpha_1$, Fe $K\alpha_2$ |




← 0.160 Range= 10.230 keV 10.230 →

Integral 0 = 17466

```
26-Dec-1991 16:30:32
Execution time =     7 seconds
22965,#8-4,B,05,FM                                  Preset=  Off
Vert=      200 counts  Disp= 1                      Elapsed=        21 secs
   Energy  Counts    X-Ray Lines

   1.26      739.   Mg K  , Mg K  , Mg K

   1.75     2578.   Si K  , Si K

   3.70      733.   Ca K  , Ca K

   4.03      111.   Ca K  , Ca K

   6.40      217.   Fe K  , Fe K



Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =        10364
26-Dec-1991 16:35:34
Execution time =     7 seconds
22965,#8-4,B,07,FM                                  Preset=  Off
Vert=      500 counts  Disp= 1                      Elapsed=        31 secs
   Energy  Counts    X-Ray Lines

   1.02      196.   Na K  , Na K  , Na K  , Zn L  , Zn L  ,
                    Zn L  , Zn L

   1.27     1171.   Mg K  , Mg K  , Mg K

   1.75     6372.   Si K  , Si K

   3.32      140.   K  K  , K  K

   3.69      429.   Ca K  , Ca K

   6.41     1502.   Fe K  , Fe K

   7.06      196.   Fe K  , Fe K
Quantex>
      0.160    Range=   10.230 keV                          10.230
                                          Integral 0  =        24884
```

26-Dec-1991 16:39:54
Execution time = 7 seconds
22965,#8-4, B,08,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 30 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 2051. | Mg K , Mg K , Mg K |
| 1.75 | 7131. | Si K , Si K |
| 3.32 | 200. | K K , K K |
| 3.70 | 1251. | Ca K , Ca K |
| 4.03 | 167. | Ca K , Ca K |
| 6.41 | 1017. | Fe K , Fe K |
| 7.05 | 117. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 26266

26-Dec-1991 16:54:43
Execution time = 6 seconds
22965,#8-4, B,12,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 36 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.01 | 108. | Na K , Na K , Zn L , Zn L , Zn L , Zn L |
| 1.26 | 1489. | Mg K , Mg K , Mg K |
| 1.75 | 5348. | Si K , Si K |
| 3.32 | 191. | K K , K K |
| 3.70 | 735. | Ca K , Ca K |
| 6.41 | 759. | Fe K , Fe K |
| 7.08 | 111. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 22972

26-Dec-1991 17:06:29
Execution time = 6 seconds
22965,#8,4,B,17,FM Preset= Off
Vert= 1000 counts Disp= 1 Elapsed= 29 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 2502. | Mg K , Mg K , Mg K |
| 1.75 | 9190. | Si K , Si K |
| 3.34 | 140. | K K , K K |
| 3.71 | 2428. | Ca K , Ca K |
| 4.04 | 229. | Sc K , Ca K , Ca K |
| 6.41 | 577. | Fe K , Fe K |
| 7.05 | 83. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 34537

26-Dec-1991 17:17:48 22965,#8-4 B,23,FM

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.01 | 269. | Na KA1, Na KA2, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 3049. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 13347. | Si KA1, Si KA2 |
| 3.32 | 422. | K KA1, K KA2 |
| 3.70 | 929. | Ca KA1, Ca KA2 |
| 4.02 | 88. | Ca KB1, Ca KB3 |
| 4.51 | 149. | Ti KA1, Ti KA2 |
| 6.41 | 2653. | Fe KA1, Fe KA2 |
| 7.07 | 329. | Fe KB1, Fe KB3 |

22965, #3-4, B, 21, FM

| | | |
|---|---|---|
| 1.03 | 232. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 2958. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 11820. | Si KA1, Si KA2 |
| 3.32 | 568. | K KA1, K KA2 |
| 3.70 | 1426. | Ca KA1, Ca KA2 |
| 4.03 | 219. | Ca KB1, Ca KB3 |
| 4.52 | 133. | Ti KA1, Ti KA2 |
| 6.41 | 1945. | Fe KA1, Fe KA2 |
| 7.06 | 236. | Fe KB1, Fe KB3 |

26-Dec-1991 17:44:55
Execution time = 7 seconds
22965,#8-4, B,34,FM Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 38 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 841. | Mg K , Mg K , Mg K |
| 1.75 | 3531. | Si K , Si K |
| 3.31 | 219. | K K , K K |
| 3.69 | 338. | Ca K , Ca K |
| 6.42 | 505. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 16144

26-Dec-1991 17:53:50
Execution time = 6 seconds
22965,#8-4,B,41,FM Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 27 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 1074. | Mg K , Mg K , Mg K |
| 1.75 | 3696. | Si K , Si K |
| 3.70 | 834. | Ca K , Ca K |
| 4.06 | 113. | Sc K , Sc K |
| 6.41 | 299. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 14682

ASBESTOS ANALYSIS

MS Lab No. 22065

mple No. SW-8-4 (5 ml)

MICROSCOPE
600A ☒
600B ☐
HU11E ☐
HU12SE ☐

GRID
1 ☒ 3 ☐
2 ☐ 4 ☐

Grid Address C
Screen Magnification 19,400 x
Camera Constant 30.5
Accelerating Voltage 100 KV
Beam Current 10 µa

Analyst Kyeong Date 12/27/91

C

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | LF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | F | 4 | 20 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 2 | F | 2 | 13 | ✓ | | | | | | | | | | | | | | | | | | | | | EDS#2 |
| | 3 | F | 2 | 50 | | ✓ | | | | | | | | | | | ✓ | | | | 3 | 10 | 1.3 | 1.4 | | EDS#3; Tremolite |
| | 4 | F | 1.5 | 10 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 5 | F | 1.5 | 25 | | ✓ | | | | | | | | | | | ✓ | | | | 3 | 10 | 1.4 | 1.6 | | EDS#5; Tremolite |
| | 6 | F | 1.5 | 27 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 7 | F | 6 | 120 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1.4 | 1.4 | | EDS#7; Tremolite |
| | 8 | F | 3 | 60 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 0.7 | | EDS#8; Tremolite |
| | 9 | F | 1 | 45 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 10 | F | 1 | 15 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 11 | F | 9 | 109 | | | | | | | | | | | | | ✓ | | | 0.3 | 3 | 10 | 1.3 | 0.8 | | EDS#11; Tremolite |
| | 12 | F | 2 | 60 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 1 | | EDS#12; Tremolite |
| 2 | 13 | F | 3 | 21 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 14 | F | 5.5 | 150 | ✓ | | | | | | | | | | | | | | | | | | | | | Al presents |
| | 15 | F | 2.5 | 23 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 1 | | EDS#15; Tremolite |
| | 16 | F | 1 | 11 | ✓ | | | | | | | | | | | | | | | | | | | | | EDS#16 |
| | 17 | F | 3 | 17 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 1 | | EDS#17; Tremolite |
| | 18 | F | 5 | 44 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 1 | | EDS#18; Tremolite |
| | 19 | F | 10 | 35 | | | | | | | | ✓ | | | | | | | | | | | | | | EDS#19 |
| | 20 | F | 3 | 95 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 0.7 | | EDS#20; Tremolite |
| | 21 | F | 4 | 20 | | | | | | | | ✓ | | | | | | | | | | | | | | EDS#21 |
| | 22 | F | 2 | 15 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 23 | F | 9.5 | 56 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 1 | 2 | | EDS#23; Tremolite |
| | 24 | F | 3.5 | 27 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 3 | 0.6 | | Tremolite |

OBSERVATIONS:

| | | | | | |
|---|---|---|---|---|---|
| Clear ☐ | | | | | |
| Debris ☒ | Very Light ☐ | Light ☐ | Moderate ☒ | Heavy ☐ | Very Heavy ☐ |
| Gypsum ☐ | Very Light ☐ | Light ☐ | Moderate ☐ | Heavy ☐ | Very Heavy ☐ |

# TEM ASBESTOS ANALYSIS

EMS Lab No. 22965

Sample No. SW-8-4

Page ___ of ___

RECEIVING

ANALYSIS

GRID
1 ☐ 3 ☐
2 ☐ 4 ☐

MICROSCOPE
600A ☐
600B ☐
HU11E ☐
HU125E ☐

Grid Address ___
Screen Magnification ___ x
Camera Constant ___
Accelerating Voltage 100 KV
Beam Current ___ µa

C

Analyst Kyleney

Date 12/27

| Grid opening | Str # | Str | Dimensions (mm) Width | Length | NAM | TM | CM | CD | CO | CMO | CDO | UF | AD | AX | ADX | AO | ADO | AZO | AZZ | Na | Mg | Si | Ca | Fe | Id | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 25 | F | 6.5 | 48 | | | | | | | | | | | | | ✓ | | | | 2 | 10 | 2 | 0.6 | | EDS#25; Tremolite |
| | 26 | F | 2 | 37 | ✓ | | | | | | | | | | | | | | | | | | | | | |
| | 27 | F | 4.5 | 35 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1.4 | 0.7 | | EDS#27: Tremolite |
| | 28 | F | 3.5 | 30 | | | | | | | | | | | ✓ | | | | | | | | | | | Tremolite |
| | 29 | F | 3 | 53 | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 2 | 1 | | EDS#29; Tremolite |
| | 30 | F | 2.5 | 35 | | | | | | | | | | | ✓ | | | | | | | | | | | Tremolite |
| | 31 | F | 3 | 216X | | | | | | | | | | | | | ✓ | | | | 3 | 10 | 1.4 | 1.3 | | Tremolite; EDS#31 |
| | 32 | F | 1.5 | 10 | ✓ | | | | | | | | | | | | | | | | | | | | | |

OBSERVATIONS:

Clean ☐
Debris: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Gypsum: ☐ Very Light ☐ Light ☐ Moderate ☐ Heavy ☐ Very Heavy ☐
Other ☐

27-Dec-1991 13:49:53
Execution time = 6 seconds
22965,SW-8-4,C,02,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 40 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.75 | 270. | Si K , Si K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 5807

27-Dec-1991 13:51:28
Execution time = 6 seconds
22965,SW-8-4,C,03,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 23 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 550. | Mg K , Mg K , Mg K |
| 1.75 | 1725. | Si K , Si K |
| 3.31 | 77. | K K , K K |
| 3.71 | 220. | Ca K , Ca K |
| 6.41 | 237. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8956

27-Dec-1991 13:56:11
Execution time = 7 seconds
22965,SW-8-4,C,05,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 304. | Mg K , Mg K , Mg K |
| 1.74 | 1044. | Si K , Si K |
| 3.71 | 146. | Ca K , Ca K |
| 6.41 | 169. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6425

27-Dec-1991 14:02:36
Execution time = 6 seconds
22965,SW-8-4,C,07,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 16 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 469. | Mg K , Mg K , Mg K |
| 1.74 | 1668. | Si K , Si K |
| 3.32 | 74. | K K , K K |
| 3.69 | 241. | Ca K , Ca K |
| 6.42 | 241. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6984

27-Dec-1991 14:05:37
Execution time = 6 seconds
22965,SW-8-4,C,08,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 664. | Mg K , Mg K , Mg K |
| 1.75 | 2597. | Si K , Si K |
| 3.70 | 632. | Ca K , Ca K |
| 4.03 | 83. | Ca K , Ca K |
| 6.43 | 189. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 12157

27-Dec-1991 14:15:37
Execution time = 6 seconds
22965,SW-8-4,C,11,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 22 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.01 | 67. | Na K , Na K , Zn L , Zn L , Zn L , Zn L |
| 1.26 | 637. | Mg K , Mg K , Mg K |
| 1.75 | 2064. | Si K , Si K |
| 3.32 | 134. | K K , K K |
| 3.69 | 259. | Ca K , Ca K |
| 6.41 | 167. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 8741

27-Dec-1991 14:17:58
Execution time = 6 seconds
22965,SW-8-4,C,12,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 23 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 238. | Mg K , Mg K , Mg K |
| 1.74 | 1017. | Si K , Si K |
| 3.69 | 152. | Ca K , Ca K |
| 6.39 | 132. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 5823

27-Dec-1991 14:28:53
Execution time = 6 seconds
22965,SW-8-4,C,15,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 29 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 290. | Mg K , Mg K , Mg K |
| 1.75 | 1248. | Si K , Si K |
| 3.33 | 92. | K K , K K |
| 3.71 | 151. | Ca K , Ca K |
| 6.37 | 136. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6633

27-Dec-1991 14:32:55
Execution time = 7 seconds
22965,SW-8-4,C,16,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 17 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 200. | Mg K , Mg K , Mg K |
| 1.49 | 90. | Al K , Al K |
| 1.76 | 435. | Si K , Si K |
| 6.41 | 74. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 3690

27-Dec-1991 14:36:24
Execution time = 6 seconds
22965,SW-8-4,C,17,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 25 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 401. | Mg K , Mg K , Mg K |
| 1.75 | 1636. | Si K , Si K |
| 3.32 | 87. | K K , K K |
| 3.69 | 133. | Ca K , Ca K |
| 6.42 | 161. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7002

27-Dec-1991 14:41:56
Execution time = 6 seconds
22965,SW-8-4,C,18,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 16 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 245. | Mg K , Mg K , Mg K |
| 1.76 | 1097. | Si K , Si K |
| 3.34 | 72. | K K , K K |
| 3.71 | 182. | Ca K , Ca K |
| 6.42 | 127. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 5589

27-Dec-1991 14:48:17
Execution time = 7 seconds
22965,SW-8-4,C,19,KK Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 26 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.02 | 116. | Na K , Na K , Na K , Zn L , Zn L , Zn L , Zn L |
| 1.26 | 648. | Mg K , Mg K , Mg K |
| 1.74 | 3615. | Si K , Si K |
| 3.33 | 90. | K K , K K |
| 5.41 | 72. | Cr K , Cr K |
| 6.41 | 1054. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 13450

27-Dec-1991 14:50:14
Execution time = 6 seconds
22965,SW-8-4,C,20,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 24 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 357. | Mg K , Mg K , Mg K |
| 1.74 | 1173. | Si K , Si K |
| 3.71 | 249. | Ca K , Ca K |
| 6.41 | 85. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 5503

27-Dec-1991 14:52:26 22965,SW-8-4,C,21,KK

| ENERGY | COUNTS | X-RAY LINES |
|---|---|---|
| 1.02 | 195. | Na KA1, Na KA2, Na KB1, Zn LA1, Zn LA2, Zn LB1, Zn LG1 |
| 1.26 | 771. | Mg KA1, Mg KA2, Mg KB1 |
| 1.75 | 4372. | Si KA1, Si KA2 |
| 3.29 | 89. | K KA1, K KA2 |
| 4.95 | 235. | V KA1, V KA2 |
| 5.41 | 86. | Cr KA1, Cr KA2, V KB1, V KB3 |
| 6.41 | 998. | Fe KA1, Fe KA2 |
| 7.04 | 132. | Fe KB1, Fe KB3 |

27-Dec-1991 14:54:29
Execution time = 6 seconds
22965,SW-8-4,C,23,KK Preset= Off
Vert= 500 counts Disp= 1 Elapsed= 14 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 623. | Mg K , Mg K , Mg K |
| 1.74 | 2902. | Si K , Si K |
| 3.33 | 105. | K K , K K |
| 3.70 | 356. | Ca K , Ca K |
| 6.39 | 456. | Fe K , Fe K |
| 7.06 | 56. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 9440

27-Dec-1991 14:56:51
Execution time = 6 seconds
22965,SW-8-4,C,24,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 16 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.25 | 327. | Mg K , Mg K , Mg K |
| 1.74 | 1108. | Si K , Si K |
| 3.70 | 319. | Ca K , Ca K |
| 4.03 | 58. | Ca K , Ca K |
| 6.43 | 67. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 4837

27-Dec-1991 15:03:49
Execution time = 6 seconds
22965,SW-8-4,C,25,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 16 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 268. | Mg K , Mg K , Mg K |
| 1.74 | 1263. | Si K , Si K |
| 3.70 | 305. | Ca K , Ca K |
| 6.42 | 86. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 5231

27-Dec-1991 15:08:27
Execution time = 7 seconds
22965,SW-8-4,C,27,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 19 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 551. | Mg K , Mg K , Mg K |
| 1.75 | 1779. | Si K , Si K |
| 3.32 | 98. | K K , K K |
| 3.70 | 242. | Ca K , Ca K |
| 6.40 | 123. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 7024

27-Dec-1991 15:10:35
Execution time = 6 seconds
22965,SW-8-4,C,29,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 29 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.27 | 222. | Mg K , Mg K , Mg K |
| 1.75 | 825. | Si K , Si K |
| 3.70 | 173. | Ca K , Ca K |
| 6.41 | 99. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 5842

27-Dec-1991 15:12:50
Execution time = 6 seconds
22965,SW-8-4,C,31,KK Preset= Off
Vert= 200 counts Disp= 1 Elapsed= 15 secs

| Energy | Counts | X-Ray Lines |
|---|---|---|
| 1.26 | 408. | Mg K , Mg K , Mg K |
| 1.75 | 1601. | Si K , Si K |
| 3.32 | 47. | K K , K K |
| 3.71 | 220. | Ca K , Ca K |
| 6.41 | 215. | Fe K , Fe K |

Quantex>
0.160 Range= 10.230 keV 10.230
Integral 0 = 6402

TABLE 3. CLASSIFICATION OF FIBERS WITH TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| TM | - | Tubular Morphology not sufficiently characteristic for classification as chrysotile |
| CM | - | Characteristic Chrysotile Morphology |
| CD | - | Chrysotile SAED pattern |
| CQ | - | Chrysotile composition by Quantitative EDXA |
| CMQ | - | Chrysotile Morphology and composition by Quantitative EDXA |
| CDQ | - | Chrysotile SAED pattern and composition by Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |

TABLE 4. CLASSIFICATION OF FIBERS WITHOUT TUBULAR MORPHOLOGY

| | | |
|---|---|---|
| UF | - | Unidentified Fiber |
| AD | - | Amphibole by random orientation SAED (shows layer pattern of 0.53 nm spacing) |
| AX | - | Amphibole by qualitative EDXA. Spectrum has elemental components consistent with amphibole |
| ADX | - | Amphibole by random orientation SAED and Qualitative EDXA |
| AQ | - | Amphibole by Quantitative EDXA |
| AZ | - | Amphibole by one Zone Axis SAED |
| ADQ | - | Amphibole by random orientation SAED and Quantitative EDXA |
| AZQ | - | Amphibole by one Zone Axis SAED pattern and Quantitative EDXA |
| AZZ | - | Amphibole by two Zone Axis SAED patterns with consistent inter-axial angle |
| AZZQ | - | Amphibole by two Zone Axis SAED patterns, consistent inter-axial angle and Quantitative EDXA |
| NAM | - | Non-Asbestos Mineral |