HYGEIA INC.

March 9, 1989

Richard B. Kirby, Esquire
Richard B. Kirby, P.C.
20 Ashburton Place
Boston, MA 02108

Subject: A. W. Chesterton Company; Testing of Packing and Gasket Materials
HYGEIA INC. Project No. 5617
Ref: CMS5617/RICHARD

Dear Mr. Kirby:

As you had requested last week, I have prepared this preliminary report of our field sampling and analysis for airborne asbestos fiber during the removal of a valve at the A. W. Chesterton Company facility in Woburn, Massachusetts. I have outlined below the methods of air sampling and the results of filter analyses by both phase contrast and analytical transmission electron microscopy. Bulk analyses of the gasket and packing products are also reported.

The methods of air sampling will be illustrated with 35 mm slides at the conference scheduled for next week. Both area and personal samples were collected using high volume pumps having volumetric flow rates in the range of 9.50 to 9.75 liters per minute.

The tests were conducted on a damaged valve fitted to a Cyclotherm steam generator. The item tested was a Walworth gate (main stop) valve fitted to a 6-inch pipe flange. The valve packing Chesterton Style 1722 (size 3/8 inches) and the gasket is also an A. W. Chesterton product. The boiler was taken out of service in July, 1985 and the packing and gasket material had dried and hardened in place. As a consequence, the packing and gasket material had to be removed using a cold chisel and hammer.

Bulk analyses were performed on one sample each of the packing and gasket materials with the following result.

Packing Material, HB2787B, (P-11).
Asbestos (Chrysotile) 50%; Opaque Phases 45%; Vermiculite, 5%; Gypsum/Anhydrite Trace.

303 Bear Hill Road Waltham, MA 02154 Telephone (617) 890-4999 Fax (617) 890-1058

Gasket Material, HB2786B, (G-10).
Asbestos (Chrysotile) 45%; Cellulose Fiber 35%; Opaque Phases 20%.

The bulk samples were analyzed by polarized light microscopy (EPA Interim Method: Appendix A to Subpart F-40 CFR Part 763) at magnifications ranging from 10x to 400x. The estimated phase abundances are provided in weight percent and are accurate to within 10 to 15 percent of the amount reported. This method is sensitive to the detection of asbestos to less than one percent by weight.

Four filters were analyzed using phase contrast microscopy according to the NIOSH 7400 method. This is the procedure followed by OSHA for workplace compliance with the Permissible Exposure Limit standards. The results are as follows. A background sample taken before any activity took place gave a fiber count of less than 0.01 fiber per cubic centimeter (f/cc). During gasket removal the fiber count was 0.01 f/cc. During packing removal the fiber count was less than 0.01 f/cc. Finally, a personal sample collected during the whole operation gave a fiber count of 0.01 f/cc. Note that 0.01 f/cc is the limit of detection by this method. Accordingly, a value reported to be less than 0.01 f/cc means that no fibers were detected. This operation included pulling the gate valve away from the flange, and the removal of both packing and gasket materials using a cold chisel. During this "aggressive" removal, some dust was released into the air. The total elapsed time for this operation was about 20 minutes.

Four air samples were collected for analysis by analytical transmission electron microscopy (ATEM), with the following result. A background sample drawn over a period of 50 minutes gave an asbestos structure count of less than 0.005 structures per cc. That is, no asbestos fiber was found at the limit of detection.

During packing removal, an asbestos count of 0.05 structures per cc was found. During gasket removal, the asbestos count was 0.005 structures per cc. These samples represent airborne fiber concentrations in the area adjacent to the operation. A personal sample collected in the breathing zone of the operator gave a result of 0.035 structures per cc for the duration of the operation.

By way of explanation, we provide the following comments. The term "structures per cubic centimeter" includes individual fibers, fiber bundles, clusters and matrices. Referring to the photographs, we see that the majority of asbestos-containing artifacts found were matrices. Very few single unattached asbestos fibers were found on any of the filters. We were unable to obtain selected area electron diffraction (SAED) patterns on the fibers because they were coated with resin, a finding that may have medical consequences. Fiber identification was made on the basis of morphology and chemistry.

The short duration of the dismantling operation made it necessary to collect the personal samples at a higher volumetric flow rate than is normally used. Also, a far greater number of TEM grids had to be examined in order to attain the detection limit of 0.005 structures per cc. The computer printout attached provides individual measurements of the asbestos fiber matrices. The photographs, we believe, are a good representation of the structures observed (keeping in mind that there were very few of them).

These filter samples were analyzed following the U. S. EPA AHERA protocol which includes only those asbestos fibers having an aspect ratio of 5 or greater and, in addition, a minimum length of 0.5 micrometers.

At this point, I would suggest that the reviewers of this work examine the individual asbestos fiber dimension data given in the computer printout.

Yours sincerely,

HYGEIA INC.

Charles M. Spooner, Ph.D.
Certified Industrial Hygienist
Principal Consultant

CMS/lcr

Enc.

HYGEIA INC.

Report Date: 03/06/89 Page 1

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 01
Sample Location: Boiler Room Background

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3279

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DATA SUMMARY

Sample Volume (liters): 480.0
Sample Collected by: C. Spooner
Filter Type: Millipore
TEM Analyst: W. Cranton
Number of Structures: 1
Grid Openings: 22

Date of Collection: 11/23/88
Filter Diameter: 25 mm.
Date of Analysis: 03/03/89
Grid Opening Area (mm^2): 0.007189
Total Grid Area Analyzed (mm^2): 0.158158

****

SUMMARY OF ANALYSIS

Total Structure Count (s/cc)	0.005
Total Structure Count (s/mm^2)	6.323
Asbestos Structure Count (s/cc)*	ND
Asbestos Structure Count (s/mm^2)*	ND
Asbestos Structure Mass (ng/m^3)*	ND
Asbestos Structure Concentration (s/cc)* for all structures greater than 5 microns in length with an aspect ratio of 5:1 or greater.	ND
Analytical Sensitivity (s/cc)	0.005

*Includes Ambiguous Structures
Ref: TEM/Form1

303 Bear Hill Road Waltham, MA 02154 Telephone (617) 890-4999 Fax (617) 890-1058

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 01
Sample Location: Boiler Room Background

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3279

****

STRUCTURE LISTING

No	Microns Length	Microns Width	Microns Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG SI CA FE NA
Grid #1: No Structures Encountered									
Grid #2: No Structures Encountered									
Grid #3: No Structures Encountered									
Grid #4: No Structures Encountered									
Grid #5:									
1	1.653	0.127	0.000	Cellu.	Fiber	2.10E-2	13		
Grid #6 through Grid #22: No Structures Encountered									

HYGEIA INC.

Report Date: 03/06/89 Page 1

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 03
Sample Location: Gasket Removal

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3280

****

DATA SUMMARY

Sample Volume (liters): 80.8
Sample Collected by: C. Spooner
Filter Type: Millipore
TEM Analyst: M. O'Halloran
Number of Structures: 17
Grid Openings: 135

Date of Collection: 11/23/88
Filter Diameter: 25 mm.
Date of Analysis: 03/01/89
Grid Opening Area (mm^2): 0.007189
Total Grid Analyzed (mm^2): 0.970515

****

SUMMARY OF ANALYSIS

Total Structure Count (s/cc)	0.083
Total Structure Count (s/mm^2)	17.517
Asbestos Structure Count (s/cc)*	0.005
Asbestos Structure Count (s/mm^2)*	1.039
Asbestos Structure Mass (ng/m^3)*	0.414
Asbestos Structure Concentration (s/cc)*. for all structures greater than 5 microns in length with an aspect ratio of 5.1 or greater.	ND
Analytical Sensitivity (s/cc)	0.005

*Includes Ambiguous Structures
Ref: TEM/Form1

303 Bear Hill Road Waltham, MA 02154 Telephone (617) 890-4999 Fax (617) 890-1058

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 03
Sample Location: Gasket Removal

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3280

****

STRUCTURE LISTING

No	Microns Length	Width	Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG SI CA FE NA
Grid #1			No Structures Encountered						
Grid #2:			No Structures Encountered						
Grid #3:									
1	2.263	0.151	0.000	Cellu	Fiber	4.04E-2	15	None	Non Asbestos
Grid #4 through Grid #14:			No Structures Encountered						
Grid #15:									
2	2.369	0.118	0.000	Cellu	Fiber	2.61E-2	20	None	Non Asbestos
Grid #16:			No Structures Encountered						
Grid #17:									
3	0.888	0.059	0.000	NonAsb	Fiber	4.92E-3	15	None	Non Asbestos
Grid #18 through Grid #22:			No Structures Encountered						
Grid #23:									
4	2.665	0.059	0.000	Cellu	Fiber	7.34E-3	45	None	Non Asbestos
Grid #24:			No Structures Encountered						
Grid #25:									
5	3.258	0.237	0.000	NonAsb	Fiber	2.89E-1	14		Non Asbestos
Grid #26 through Grid #28:			No Structures Encountered						

No	Microns Length	Microns Width	Microns Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG SI CA FE NA
Grid #29:									
6	1.481	0.059	0.000	Unknwn	Fiber	8.20E-3	25	None	Non Asbestos
Grid #30:									
7	1.895	0.059	0.000	NonAsb	Fiber	1.05E-2	32	None	Non Asbestos
8	2.665	0.237	0.000	Cellu	Fiber	1.17E-1	11		
Grid #31:									
9	5.330	0.592	0.000	Cellu	Fiber	1.47E00	9		
Grid #32:		No Structures Encountered							
Grid #33:									
10	5.390	0.118	0.000	Cellu	Fiber	5.94E-2	46		
Grid #34 through Grid #38:		No Structures Encountered							
Grid #39:									
11	3.850	0.178	0.000	NonAsb	Fiber	1.92E-1	22		Non Asbestos
Grid #40:		No Structures Encountered							
Grid #41:									
12	1.777	0.118	0.000	NonAsb	Fiber	3.94E-2	15		Non Asbestos
Grid #42 through Grid #67:		No Structures Encountered							
Grid #68:									
13	1.836	0.118	0.000	NonAsb	Fiber	4.07E-2	15		Non Asbestos
Grid #69 through Grid #74:		No Structures Encountered							
Grid #75:									
14	3.317	0.118	0.000	NonAsb	Fiber	7.35E-2	28		Non Asbestos
Grid #76 through Grid #100:		No Structures Encountered							
Grid #101:									
15	3.672	0.592	0.000	NonAsb	1/2Fibr	2.03E00	6		

No	Microns Length	Width	Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG	SI	CA	FE	NA
Grid #102:													
16	4.738	0.118	0.059	Chryso	Bundle	8.44E-2	40	Faint	5	10	0	1	0
Grid #103:				No Structures Encountered									
Grid #104:				No Structures Encountered									
Grid #105:													
17	3.554	0.592	0.000	NonAsb	Fiber	1.97E00	6		Non Asbestos				
Grid #106 through Grid #135:				No Structures Encountered									

Ref: TEM/Form2

FORM ERE-735-0

THE HARTFORD

A.W. CHESTERTON
30 INDUSTRIAL WAY
WOBURN, MA 01801

LOSS CONTROL DEPARTMENT
ENVIRONMENTAL SCIENCES UNIT

AN EVALUATION OF SIMULATED FIELD USE OF VARIOUS ASBESTOS-CONTAINING PACKING MATERIALS

STEPHEN W. CAMPBELL, CSP, CIH
MAY 11, 1983

FORM SHE 735-0

THE HARTFORD	A.W. CHESTERTON 30 INDUSTRIAL WAY WOBURN, MA 01801	LOSS CONTROL DEPARTMENT ENVIRONMENTAL SCIENCES UNIT

TRODUCTION

On May 11, 1983 a series of environmental tests were made at the A.W. Chesterton Research Facility at 30 Industrial Way, Woburn, MA 01801. The purpose of the evaluation was to monitor a simulation of the cutting, installation, and removal of asbestos-containing packing materials. Packings for both valves and pumps were utilized during the simulation.

The study was requested by David Lasnier, General Manager, A.W. Chesterton, and the evaluation were conducted by Stephen W. Campbell, Certified Industrial Hygienist, Hartford Insurance Group, Boston. Special thanks to Jack Santolucito and Bob Leduc for their time and courtesy.

This report represents the conclusions, recommendations, test methods and test ıults of the data obtained on May 11, 1983.

CONCLUSIONS

1. Airborne levels of asbestos measured during the simulation were all well below those limits generally regarded as safe. The sample that was obtained for the entire monitoring period of all six types of packing indicates levels of only 0.03 fibers per cc of asbestos. OSHA's legal limit for an 8-hour exposure to asbestos is 2.0 fibers per cc.
2. The simulation is deemed appropriate for the monitoring of the cutting and installation of asbestos containing packing materials. It should be noted that the removal of these packings from pumps and valves in field use may well pose a somewhat higher risk than that monitored.

The reason for the increased risk is associated with the deteriorated condition of the packings often experienced under normal wear and tear. The packing removed during the simulation was relatively new and intact; thus, the likelihood of generating airborne fibers of asbestos was substantially reduced.

RECOMMENDATIONS

Normal field operations involving the removal, cutting and installation of asbestos packing typically takes between 10-30 minutes. The variability is reportedly largely dependent upon the difficulty in removing the worn asbestos containing packing from valves or pumps. For test data to be truly meaningful, it is necessary to approximate field conditions as closely as possible. What is necessary, then is to obtain samples during removal of asbestos containing packing that has been "abused" under actual conditions of use.

As mentioned previously, the evaluation serves as a useful measure of employee exposure to asbestos during the cutting and installation of asbestos containing packings. Those values listed in the test results section of this report may well understate the actual amount of asbestos experienced by a field person during the removal of worn packing from valves and pumps. Accordingly, the following recommendation is being submitted.

83-A In order to approximate more closely a real field situation, monitoring of asbestos exposure to the removal of worn packing materials should be simulated. If it is possible to provide for several types of packing materials to be tested at one time, The Hartford's Loss Control Department would very much like to conduct this type of testing again.

FORM SRE 735-0

THE HARTFORD	A.W. CHESTERTON 30 INDUSTRIAL WAY WOBURN, MA 01801	LOSS CONTROL DEPARTMENT ENVIRONMENTAL SCIENCES UNIT

TEST METHODS

The purpose of the study was to approximate employee exposure to asbestos during typical field operations for the removal, cutting and installation of various packing materials. A member of A.W. Chesterton's research staff at the Woburn facility assisted by simulating these operations utilizing 3 types of valve packings and 3 types of pump packings. Each of these packing materials was cut to length, installed in the appropriate equipment, momentarily brought up to normal operating conditions, and then removed. The total time for this procedure involved approximately 10-18 minutes.

One sample was taken during the entire procedure involving all 6 types of packing materials. In addition another sample was collected for each of the individual packing materials to measure the exposure created by that one substance.

The entire sampling period involved 97 minutes comprised of 6 separate sampling eriods ranging from 14-18 minutes each. All samples were collected on millipore type AA0.8 micron cellulose acetate filters mounted in 3 piece open faced cassettes attached to the lapel of the operator. Air was drawn through these filters with the use of Mine Safety Appliance Model G Vacuum Pumps set at flow rates approximating 2.0 litres per minute. Analysis of samples was conducted by phase contrast microscopy. This technique measures all fibrous material present on the filter and may tend to overstate the actual presence of asbestos material.

Periodic calibration of all equipment and analysis of all samples takes place at The Hartford's AIHA Accredited Laboratory in Hartford, Connecticut.

FORM SRE 735-0

THE HARTFORD

C.W. CHESTERTON
30 INDUSTRIAL WAY
WOBURN, MA 01801

LOSS CONTROL DEPARTMENT
ENVIRONMENTAL SCIENCES UNIT

TEST RESULTS

All samples were collected on Jack Santolucito as he simulated the cutting, installation and removal of asbestos-containing packing. Sample #30 remained on his left lapel for the entire sampling period, whereas samples #31-37 were changed with each style of packing. The results obtained are all quite low and indicate exposures well below those levels generally regarded as safe.

SAMPLE #	TOTAL TIME (HRS:MIN)	TOTAL VOLUME(L)	TOTAL FIBERS	FIBERS/cc	STYLE PACKING
30	1:37	189	6,000	0.03	All listed below
31	0:16	32	< 3,000	< 0.09	Valve 1000
32	0:15	30	< 3,000	< 0.09	Valve 1500
33	0:14	29	< 3,000	< 0.09	Valve 5010
34	0:14	28	7,000	0.25	Pump 1722 Whitelon
35	0:18	36	3,000	0.08	Pump 320 Blueon*
36	0:18	36	3,000	0.08	Pump 330

OSHA's 8-hour legal limit	2.0
ACGIH TLV - Chrysotile	2.0
ACGIH TLV - Amosite	0.5
ACGIH TLV - Crocidolite	0.2

* Most likely contains crocidolite, whereas all others most likely contain chrysotile asbestos.

FCHW SME 7350

THE HARTFORD

A.P. CHESTERTON
30 INDUSTRIAL WAY
WOBURN, MA 01801

LOSS CONTROL DEPARTMENT
ENVIRONMENTAL SCIENCES UNIT

Hopefully this report has been of assistance to you in your attempt to assess the exposure to airborne asbestos contamination.

Respectfully submitted,

Stephen W. Campbell, CSP, CIH

Certified Industrial Hygienist

SWC/ea

November 7, 1983

THE HARTFORD

Boston Regional Office
Two Center Plaza
Boston, Massachusetts 02108
Telephone: (617) 726-7400

Mr. David Lasnier, General Manager
A.W. Chesterton
9 Forbes Street
Woburn, MA 01801

RE: Loss Control Service
A-690

Dear Dave:

This letter will confirm my visit with Bob LeDuc at Chesterton's Woburn Research Plant on August 30, 1983.

As in the past, purpose of the visit was to collect asbestos samples during the removal of packing material from pumps operating under field conditions. The need for this sampling was documented during previous monitoring when it was decided that to approximate actual operating conditions, sampling would be necessary during removal of packing materials. This latest attempt at determining airborne concentrations of asbestos fiber involved removal of "product A" that had run for approximately 100 hours during a field test situation. As can be seen from the results listed below, no measurable amount of fiber was detected during the samples, and all results indicate exposure concentrations of less than 0.1 fibers per cc of air.

Jack Santolucito and the area to his left (approximately 6" to the left side of the shaft) at the height of the pump were monitored on 8/30/83 during removal of 5 pieces of "product A" packing that had run for approximately 100 hours in a field simulated test. The pump was repacked with "product B".

Name/Area	#	Total Time (minutes)	Volume (L)	Fibers	Fibers/cc
Jack Santolucito	1	15	30	< 3,000	< 0.1
Area to left	2	15	30	< 3,000	< 0.1
OSHA's permissible exposure limit					2.0
OSHA's administrative action level					0.1

The significance of this test is simply that concentrations of asbestos fiber, if present at all, exist at levels below OSHA's administrative action point, and therefore do not constitute a significant threat to health. Future measurements will necessarily need to be made utilizing other materials and under different conditions, and these results will be reported later.

Hopefully this latest attempt has been of assistance to you in your effort to evaluate exposure to airborne asbestos fiber.

Respectfully submitted,

Stephen W. Campbell, C.S.P., C.I.H.
Certified Industrial Hygienist

cc: Horst Berhoth, Plant Engineer
A.W. Chesterton
9 Forbes Street
Woburn, MA 01801

Gregory Smith, Personnel Manager
A.W. Chesterton
9 Forbes Street
Woburn, MA 01801

Frank Boccelli, Insurance Manager
A.W. Chesterton
Middlesex Industrial Park
Stoneham, MA 02180

Edward Bonaccorso, Assistant Vice President
Corroon and Black
99 High Street
Boston, MA 02110

SWC:mhs

FORM FHL 735-0

THE HARTFORD

A. W. CHESTERTON
COMMERCE WAY
WOBURN, MA

LOSS CONTROL DEPARTMENT
ENVIRONMENTAL SCIENCES UNIT

EVALUATION OF AIRBORNE ASBESTOS DURING CUTTING, REMOVAL, AND PACKING OF PUMPS

STEPHEN W. CAMPBELL, CSP, CIH
JUNE 23, 1983
JUNE 28, 1983

FORM SRE 735 C

THE HARTFORD

A. W. CHESTERTON
COMMERCE WAY
WOBURN, MA

LOSS CONTROL DEPARTMENT
ENVIRONMENTAL SCIENCES UNIT

INTRODUCTION

As a result of a previous study and recommendations made at that time, another evaluation of the simulated use of asbestos containing packing materials was conducted at the A. W. Chesterton plant in Woburn, MA. This latest study involved two sets of samples collected on June 23, 1983 and June 28, 1983. The first set involved strictly cutting of four types of asbestos containing packing material for a total of 65 pieces during a period lasting approximately one hour. The second sampling occurred several days later when a pump containing asbestos packing was dismantled, the packing removed, new packing cut, and installed. This procedure lasted only 17 minutes. The survey was conducted by Stephen W. Campbell, Certified Industrial Hygienist, The Hartford Insurance Group, Boston, MA. Special thanks to Jack Santoluccito, Bob LeDuc, and Victor DiDonato r their time and courtesy.

This report represents the conclusions, discussion of findings, test methods and test results of the data obtained on June 23 and 28, 1983.

CONCLUSIONS

All samples collected during the cutting, removal, and repacking of asbestos containing packing materials demonstrate airborne levels of fiber well below those levels generally regarded as safe. In fact, levels were so low that no measurable amount of fiber was able to be detected during the sampling period.

To provide an even more realistic assessment of this simulated exposure, additional tests should be performed during the removal of asbestos containing packing materials from pumps that have run for an extended period of time. Necessarily, such an approach will be ongoing by its nature, and will undoubtedly encompass a period involving several onths.

DISCUSSION OF FINDINGS

Testing conducted on June 23, 1983 involved essentially a blind test. Simply this means that the material cut was known only to the operator and the tester by the code letters A, B, C, and D. In an attempt to obtain as long a sample as possible, and to approximate the absolute "worst case condition", the operator cut packing rings from each of these materials for periods of approximately 14-15 minutes. Depending upon the type of material, the amount available, and the ease of use, between 13-20 rings were cut from each of the unknown samples.

On June 28, 1983 a very brief sampling period was chosen since the operator merely had to remove the packing from a pump that had been run for a period of 14 hours. The removal procedure lasted approximately 10 minutes, following which the operator cut new rings and installed them back into the pump again. This procedure approximates a more realistic assessment of the typical conditions faced in the field. Since the pump was only run for a period of 14 hours, the deterioration of the gaskets was not significant. Consequently, additional testing in the future will hopefully measure exposures found under more severe conditions of use.

TEST METHODS

As in the past asbestos samples were collected by placing a three piece open face cassette onto the lapel of the operator during the processes described. Samples were collected in the three piece open face cassette on a millipore type AA, pore size 0.8 micron, 37 millimeter filter. Air was drawn through this apparatus with the use of a Mine Safety Appliance Model G Vacuum Pump operating at a flow rate of 2.0 liters per minute for the times indicated in the test results section.

In one instance the sampler was placed in an area extremely close to the stuffing box of the pump during the removal of asbestos containing packing material.

Analysis of all samples and the periodic calibration of the vacuum pumps takes place at The Hartford's AIHA Accredited Laboratory in Hartford, Connecticut. Analysis involved the counting of fibers via a phase contrast microscopy technique.

TEST RESULTS - ASBESTOS

All samples were collected on Jack Santoluccito during cutting of 5/16 inch or 10mm packing while cutting on a 50mm shaft on June 23, 1983. To simulate worst case conditions numerous cuts of each type of packing were made and the entire procedure lasted 57 minutes and involved 65 cuts of various packing.

SAMPLE #	TYPE PACKING	TOTAL TIME (HRS:MIN)	VOLUME(L)	FIBERS	FIBERS/CC	TOTAL CUTS
1	A, B, C & D	0:53	106	<3000	<0.03	65
2	A	0:15	30	<3000	<0.10	20
3	B	0:14	28	<3000	<0.11	13
4	C	0:14	28	<3000	<0.11	14
5	D	0:14	28	<3000	<0.11	18

OSHA - 8 Hour Time-Weighted Average Permissible Exposure Limit 2.0 Fibers/cc

The next series of samples were taken during the removal of A. W. Chesterton Model 2022 3/8 inch packing with a model 1722 end ring from a pump that had run for 14 hours. following removal of the six rings and the end ring another series of rings were cut and the pump was again packed for a future test.

FORM SRE 7350

THE HARTFORD

A. W. CHESTERTON
COMMERCE WAY
WOBURN, MA

LOSS CONTROL DEPARTMENT
ENVIRONMENTAL SCIENCES UNIT

This activity took place on June 28, 1983 and the entire procedure lasted 17 minutes. Samples were taken on Jack Santoluccito and to the left side of the drive end of the pump stuffing box.

LOCATION	SAMPLE	TOTAL TIME (HRS:MIN)	VOLUME(L)	FIBERS	FIBERS/CC
Jack	6	0:17	34	<3000	<0.09
Area	7	0:17	34	<3000	<0.09

Hopefully this information has been of assistance to you in your attempt to evaluate field exposures to asbestos containing packing material.

Respectfully submitted,

Stephen W. Campbell, CSP, CIH

Certified Industrial Hygienist

SWC/ea

Galson
Technical Services, Inc.
6601 Kirkville Road
Post Office Box 966
E. Syracuse N.Y. 13057
Tel: (315) 432-0506

LABORATORY ANALYSIS REPORT

Client: A.W. CHESTERTON CO.
Task Number: 86101612
Location: WOBURN PLANT

Job Number: G6025
Date Sampled: 08-OCT-1986

PO Number: 49717 REQ.05220

FIBER COUNT NIOSH 239

Sample ID	Lab ID	VOL (Cm³)	FIB/FILTER	FIBERS/Cm³
W78 A-3980-A	D24280	110,940	<7000	<0.06
W79 A-3976-A	D24281	110,720	<7000	<0.06
W80 A-3989-A	D24282	NA	<7000	NA

Field sampling was not performed by GALSON.

GALSON presents analytical results based on sampling data provided by the Clients.

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not detectable
- - Not specified

Method(s): NIOSH 239
Footnotes:

Submitted by:
Approved by:
Date: 31-OCT-1986

CHESTERTON

OVER 100 YEARS OF WORLD WIDE SERVICE

DATE: May 4, 1987

TO Linda Loreth

☐ A. W. Chesterton Co.

FROM: L.B. Maglin

☐ Chesterton International, Inc.

SUBJECT ASBESTOS TESTING ON PACKING PRODUCTS

Summary

As you are aware, on June 20, 1986 The Occupational Health & Safety Administration (OSHA) published its final rule on Occupational Exposure to Asbestos. This revised standard dropped the Permissible Exposure Limit (PEL) for 8-hour employee exposure for asbestos, tremilite, anthrophyllite, and actinolite to a level of 0.2 fiber/cc, (with 0.1 fiber/cc as the new action limit).

This required product retesting on our part for our products, because of the disclaimer we make on our Material Safety Data Sheets.

The purpose of this evaluation was to monitor the cutting, installation, and removal of asbestos containing packing materials.

Discussion

1. All the samples tested were well below the OSHA PEL. The samples obtained for 9 styles of packing indicates levels of <0.04-<0.06 fibers/cc of asbestos.
2. It should be noted that these tests were done under ideal conditions, with packing being installed according to Chesterton procedures, (packing done by Steve Flanagan), which may not be the case in the field. Also, the material which was used was relatively new and intact; thus, the likelihood of generating airborne fibers of asbestos was low.
3. As the results clearly show, our disclaimer is a true statement as far as our testing demonstrates.

Test Conditions

1. Samples were tested by NIOSH Method #239, using Millipore MAWP037AO, pore size 0.8u, with DuPont Alpha-1 pumps set at flow rates of - 1850 cc/min or Niosh 7400, using Millipore MRWP025AC, pore size 1.2u using same pumps.
2. Samples were taken for 60 min., and approximately 1-6 installations and removals were done in that time for each style.
3. Engineering Samples were run approximately 6" away from the valve being packed. Personnel samples were run in conjunction with the engineering samples.

4. Each packing material was cut to length, installed in the appropriate equipment, brought up to normal operating conditions, and then removed.

5. Analysis of samples was done by Galson Technical Services, Inc. by phase contrast microscopy.

Test Results

NIOSH No.	Sample No.	Style Pking	Personnel/ Engineering	Fibers/ cc	Sampling Time	Int/ Remov
239	T-1	1715	P	<0.06	60 min.	1
239	T-2	1715	E	<0.06	60 min.	1
239	T-3	322	P	<0.06	60 min.	1
239	T-4	322	E	<0.06	60 min.	1
239	T-5	320	P	<0.06	60 min.	3
239	T-6	320	E	<0.06	60 min.	3
239	T-7	1000	P	<0.06	60 min.	3
239	T-8	1000	E	<0.06	60 min.	3
7400	T-12	1500	P	<0.04	60 min.	6
7400	T-13	1500	E	<0.18*	15 min.	2
7400	T-14	326	P	<0.04	60 min.	5
7400	T-15	326	E	<0.04	60 min.	5
7400	T-17	Ambient Air	E	<0.03	90 min.	-
7400	T-18	5010	P	<0.04	60 min.	7
7400	T-19	5010	E	<0.04	60 min.	7
7400	T-20	330	P	<0.04	60 min.	6
7400	T-21	330	E	<0.04	60 min.	6

OSHA PEL (Legal Limit)	0.2
ACGIH (American Conference of Governmental Industrial Hygienists	
Chrysolite	2
Crocidolite	0.2
Amosite	0.5

* Due to low sampling time.

References

Threshold Limit Values and Biological Exposure Indices for 1986-1987 American Conference of Governmental Industrial Hygienists

Federal Register Vol. 51, No. 119, Friday, June 20, 1986 22612-22790

NIOSH MANUAL of Analytical Methods, Method 7400, Issued 2/15/84, Revised 5/15/85

Chesterton Environmental Log #1, Winchester 1,2

LBM/das

Lawrence B. Maglin, CSM

cc A.W. Chesterton, J. Gaucher, C. Howe
G. Moreno, K. O'Brien, G. Smith

CHESTERTON
OVER 100 YEARS OF WORLD WIDE SERVICE

DATE November 10, 1986 Ref. No.2179

TO Richie Dyment

☐ A. W. Chesterton Co.

FROM L.B. Maglin

☐ Chesterton International, Inc.

SUBJECT STYLE #1500 TESTING

Attached are the results of two samples taken on October 8, 1986. This testing is the ongoing study of our asbestos products, to make sure no respirable fiber is generated when the material is cut according to directions. Testing was done using personnel and engineering samples. Results were below the current OSHA Limit of 0.2 fiber/cc.

As we discussed, all products listed on our MSDS's must be tested.

MSDS#	Styles Involved	Done
1003	Style 64	
1011	210,211,225,235 260,270,281,285	
1012	240,250,290	
1016	315,1715	
1017	Style 320	
1018	322,1722,2011,2022	
1020	Style 326	
1022	330,1730	
1023	Style 364-T	
1029	600S,600HO	
1032	1000,1000C	
1033	Style 1500	X
1043	Style 2500	
1044	Style 5010	
1050	Asbestos Gasket for Flat Glass	

Only one style in each MSDS must be done.

Please relay the test results to J. Williamson and call if you have any questions in this matter.

Lawrence B. Maglin, CSM
Sr. Environmental, Health & Safety Coordinator

das

Attachment

cc John Gaucher
Dick Hoyle
L. Loreth
Greg Smith

I would suggest that permanent enclosures be constructed and interlocked so that when the machine is serviced, it will not operate and consequently graphite dust will not be air-borne in the room.

If we may be of further assistance to you in this area, please do not hesitate to contact me through Mr. Ken King of our Lexington Office.

Robert L. Comboy

ROBERT L. COMBOY
Industrial Hygienist
Loss Prevention Dept.

RLC/nw

cc: Mr. Myron Markell

HYGEIA INC.

Report Date: 03/06/89 Page 1

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 05
Sample Location: Packing Removal

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3281

****

DATA SUMMARY

Sample Volume (liters): 108.1
Sample Collected by: C. Spooner
Filter Type: Millipore
TEM Analyst: W. Cranton
Number of Structures: 19
Grid Openings: 99

Date of Collection: 11/23/88
Filter Diameter: 25 mm.
Date of Analysis: 03/02/89
Grid Opening Area (mm^2): 0.007189
Total Grid Area Analyzed (mm^2): 0.711711

****

SUMMARY OF ANALYSIS

Total Structure Count (s/cc)	0.095
Total Structure Count (s/mm^2)	26.696
Asbestos Structure Count (s/cc)*	0.050
Asbestos Structure Count (s/mm^2)*	14.051
Asbestos Structure Mass (ng/m^3)*	25.042
Asbestos Structure Concentration (s/cc)*. for all structures greater than 5 microns in length with an aspect ratio of 5.1 or greater.	0.005
Analytical Sensitivity (s/cc)	0.005

*Includes Ambiguous Structures
Ref: TEM/Form1

303 Bear Hill Road Waltham MA 02154 Telephone (617) 890-4999 Fax (617) 890-1058

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 05
Sample Location: Packing Removal

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3281

****

STRUCTURE LISTING

No	Microns Length	Width	Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG SI CA FE NA
Grid #1 through Grid #6:	No Structures Encountered								
Grid #7:									
1	6.358	0.636	0.064	Ambigu	Clump	5.17E-1	10	None	8 10 0 12 0
Grid #8 through Grid #16:	No Structures Encountered								
Grid #17:									
3	1.006	0.084	0.000	NonAsb	Fiber	1.12E-2	12	None	Non Asbestos
Grid #18:	No Structures Encountered								
Grid #19:									
4	9.921	5.669	0.142	Unknwn	Matrix	1.60E01	2	None	Non Asbestos
Grid #20 through Grid #23:	No Structures Encountered								
Grid #24:									
5	3.185	0.838	0.084	Ambigu	Matrix	4.50E-1	4	None	
Grid #25:	No Structures Encountered								
Grid #26:									
6	1.844	0.084	0.000	NonAsb	Fiber	2.04E-2	22	None	Non Asbestos
Grid #27 through Grid #38:	No Structures Encountered								
Grid #39:									
7	3.436	0.162	0.000	Cellu.	Fiber	7.58E-2	21	None	Non Asbestos

No	Length	Width	Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG	SI	CA	FE	NA
Grid #40:													
8	2.643	0.110	0.000	Chryso	Fiber	6.40E-2	24	None	6	10	0	2	0
Grid #41 through Grid #44:			No Structures Encountered										
Grid #45:													
9	4.405	3.304	0.055	Ambigu	Matrix	1.61E00	1	None					
Grid #46:			No Structures Encountered										
Grid #47:													
10	9.637	0.441	0.000	Cellu	Fiber	1.47E00	22	None	Non Asbestos				
Grid #48:													
11	0.716	0.110	0.000	NonAsb	Fiber	1.37E-2	7	None	Non Asbestos				
12	1.542	0.385	0.000	Ambigu	Fiber	3.62E-1	4	Ambig	2	10	3	3	0
Grid #49 through Grid #51:			No Structures Encountered										
Grid #52:													
13	3.194	0.826	0.055	Chryso	Bundle	3.69E-1	4	None	6	10	0	0	0
Grid #53:													
14	1.211	0.055	0.000	Chryso	Fiber	7.33E-3	22	Faint	6	10	0	0	0
15	1.046	0.110	0.055	Chryso	Bundle	1.61E-2	10	Faint	8	10	1	2	0
16	1.156	0.055	0.000	Unknwn	Fiber	5.54E-3	21	None					
Grid #54 through Grid #66:			No Structures Encountered										
Grid #67:													
17	2.037	0.068	0.000	Chryso	Matrix	1.87E-2	30	None	7	10	0	0	0
Grid #68 through Grid #71:			No Structures Encountered										
Grid #72:													
18	6.790	1.358	0.068	Chryso	Matrix	1.59E00	5	Faint	6	10	0	1	0
Grid #73 through Grid #82:			No Structures Encountered										

No	Microns Length	Width	Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG	SI	CA	FE	NA
Grid #83:													
19	2.444	0.136	0.000	Unknwn	Fiber	7.12E-2	18	None	Non Asbestos				
Grid #84:			No Structures Encountered										
Grid #85:													
20	5.432	2.716	0.068	Unknwn	Fiber	2.01E00	2	None	9	10	0	1	0
Grid #86 through Grid #99:			No Structures Encountered										

HYGEIA INC.

Report Date: 03/06/89 Page 1

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 07
Sample Location: Breathing Zone during hole operations

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3282

****

DATA SUMMARY

Sample Volume (liters): 190.2
Sample Collected by: C. Spooner
Filter Type: Millipore
TEM Analyst: W. Cranton
Number of Structures: 11
Grid Openings: 56

Date of Collection: 11/23/88
Filter Diameter: 25 mm.
Date of Analysis: 03/01/89
Grid Opening Area (mm^2): 0.007189
Total Grid Area Analyzed (mm^2): 0.402584

****

SUMMARY OF ANALYSIS

Total Structure Count (s/cc)	0.055
Total Structure Count (s/mm^2)	27.324
Asbestos Structure Count (s/cc)*	0.035
Asbestos Structure Count (s/mm^2)*	17.388
Asbestos Structure Mass (ng/m^3)*	174.127
Asbestos Structure Concentration (s/cc)*. for all structures greater than 5 microns in length with an aspect ratio of 5.1 or greater.	0.025
Analytical Sensitivity (s/cc)	0.005

*Includes Ambiguous Structures
Ref: TEM/Form1

303 Bear Hill Road Waltham, MA 02154 Telephone (617) 890-4999 Fax (617) 890-1058

Asbestos Analysis by
Transmission Electron Microscopy

Client Name: Richard Kirby
Client Sample I.D.: 07
Sample Location: Breathing Zone during hole operations

HYGEIA Project #5617
HYGEIA Batch 88 Nov 01
HYGEIA ID HT88-3282

****

STRUCTURE LISTING

No	Microns Length	Microns Width	Microns Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG	EDAX SI	EDAX CA	EDAX FE	EDAX NI
Grid #1:			No Structures Encountered										
Grid #2:			No Structures Encountered										
Grid #3:													
1	1.584	0.151	0.000	Cellu	Fiber	2.83E-2	11	None					
Grid #4:			No Structures Encountered										
Grid #5:			No Structures Encountered										
Grid #6:			No Structures Encountered										
Grid #7:													
2	3.017	0.377	0.075	Chryso	Bundle	2.18E-1	8	Faint	7	10	1	1	(
Grid #8:													
3	9.805	2.263	0.075	Chryso	Clump	4.25E00	4	Faint	8	10	1	3	(
Grid #9:													
4	8.296	0.151	0.000	Cellu	Fiber	1.48E-1	55	None					
Grid #10													
55	5.279	0.226	0.000	Cellu	Fiber	2.12E-1	23	None					
Grid #11			No Structures Encountered										
Grid #12:			No Structures Encountered										
Grid #13:													
6	5.759	5.759	0.096	Chryso	Matrix	8.09E00	1	None	5	10	0	2	
Grid #14 through Grid #19:			No Structures Encountered										

No	Length	Width	Thkness	Ident	Form	Mass (Picogm)	Aspect Ratio	SAED	EDAX MG	SI	CA	FE	NA
	----- Microns -----												
Grid #20													
7	10.558	1.440	0.000	NonAsb	Fiber	3.45E01	7	None	Non Asbestos				
Grid #21 through Grid #39:			No Structures Encountered										
Grid #40:													
8	9.642	6.026	0.121	Chryso	Matrix	1.78E01	2	None	6	10	0	2	0
Grid #41 through Grid #43:			No Structures Encountered										
Grid #44:													
9	48.758	0.480	0.048	Chryso	Bundle	2.85E00	102	Faint	8	10	0	1	0
10	9.118	0.960	0.048	Chryso	Bundle	1.07E00	10	None	8	10	0	1	0
11	4.799	0.768	0.048	Ambigu	Matrix	3.55E-1	6	None					
Grid #45 through Grid #56:			No Structures Encountered										