IWS- 35.24
REGION-I

PB81-224685

WALK-THROUGH SURVEY OF

The C.H. Dexter Division of the Dexter Corporation
Windsor Locks, Connecticut

Survey Date

July 16, 1973

Survey Conducted and Report Written By:

John M. Dement
Philip J. Bierbaum

Date of Report

August 23, 1973

Environmental Investigations Branch
Division of Field Studies and Clinical Investigations
National Institute for Occupational Safety and Health
Cincinnati, Ohio

50272-101 NIOSH-00106233

REPORT DOCUMENTATION PAGE	1. REPORT NO. IWS-35.24	2. NA	3. Recipient's Accession No. PB81 224685

4. Title and Subtitle Walkthrough Survey of the C. H. Dexter Division of the Dexter Corporation, Windsor Locks, Connecticut	5. Report Date August 23, 1973
	6. NA
7. Author(s) Dement, J. M., and P. J. Bierbaum	8. Performing Organization Rept. No. NA
9. Performing Organization Name and Address NIOSH, Environmental Investigations Branch, Divison of Field Studies and Clinical Investigations, Cincinnati, Ohio	10. Project/Task/Work Unit No. NA
	11. Contract(C) or Grant(G) No. (C) (G) NA
12. Sponsoring Organization Name and Address Same as Above.	13. Type of Report & Period Covered Walkthrough Survey
	14. NA

15. Supplementary Notes

NA

16. Abstract (Limit: 200 words)

Worker exposures to glass fibers were surveyed at C. H. Dexter Division of the Dexter Corporation (SIC-2621) in Windsor Locks, Connecticut on July 16, 1973. About 565 persons were employed, of which 350 were production workers. Three shifts operated 5 days a week. The factory had no medical facilities. A medical consultant was retained to attend to emergencies and perform examinations. Each worker was given a pre-employment examination and asbestos workers were given chest X-rays and pulmonary function tests. Audiometric tests were also given. The factory had a safety program and committee. Respirators, safety glasses and hearing protection devices were available. One area and three personal samples were collected on membrane filters to determine airborne fibrous glass fiber exposures. Personal samples ranged from 10.6 to 44.1 fibers per milliliter (fibers/ml). The single area sample concentration was 8.9fibers/ml. The authors conclude that a potential respirable glass fiber health hazard existed and recommend engineering controls, good work practices and implementation of respiratory protection and medical surveillance programs for workers in the fibrous glass operations.

17. Document Analysis a. Descriptors

Field-Survey, Paper-mills, Region-1, Mineral-dusts, Airborne-fibers, Air-contaminants, Work-environment, Health-services, Air-quality-control, Air-sampling, Control-methods, Occupational-health-programs

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Available to the Public	NA	19
	20. Security Class (This Page)	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

PLACE VISITED:	The C.H. Dexter Division of the C.H. Dexter Corporation Windsor Locks, Connecticut
DATE OF VISIT:	July 16, 1973
PERSONS MAKING VISIT:	Philip J. Bierbaum John M. Dement
PERSONS CONTACTED:	Mr. Jerry Baker, Plant Safety Director Mr. Paul Murphy, Paper Manufacturing Supervisor
PURPOSE OF VISIT:	To observe the manufacture of filtration paper using small diameter glass fibers and to take preliminary air samples in these operations.

INTRODUCTION AND DESCRIPTION OF THE PLANT

The Division of Field Studies and Clinical Investigations of the National Institute for Occupational Safety and Health has underway an "industrywide" study of the fibrous glass industry. Of particular interest in this study are small diameter, potentially respirable fibers.

On July 16, 1973, Philip Bierbaum and John Dement conducted a walk-through survey of the C.H. Dexter Division of the Dexter Corporation in Windsor Locks, Connecticut. The major purpose for this visit was to observe the manufacture of filtration paper and thermal insulation material using small diameter glass fibers, although a tour was made of the entire facility.

Products of this facility are primarily industrial based papers of many types. A few of the products for which the papers are made include the following:

1. Meat casing paper
2. Home vacuum cleaner bags
3. Lint free wipers
4. Surgical drapes
5. Industrial oil and fuel filters
6. Activated carbon impregnated filters for water purification
7. Glass filter material for high efficiency air filters
8. Cryogenic insulation material
9. Coffee and tea bag paper
10. Beer filters

In addition, this plant has facilities for manufacturing viscose which is used in the paper operations.

This facility has been in continuous operation since 1767 with the fibrous glass operations beginning in 1956. A small amount of the fibrous glass paper has crocidolite asbestos added. The asbestos using operation began in approximately 1970. There are seven paper producing lines in this facility, one of which is used part time for making fibrous glass (3-1/2 - 4 days per week) and fibrous glass-asbestos papers (2-3 days per year).

The entire workforce of this facility is approximately 565 persons with 350 of these persons being production workers. The plant operates on a three-shift basis with most operations operating five days per week. Employees of this facility are not members of any trade union.

MEDICAL, INDUSTRIAL HYGIENE, AND SAFETY PROGRAMS

This facility does not presently have inplant medical facilities. A local general practitioner, Dr. John Kennedy, is retained as a consultant and performs all physical examinations and is available for emergencies.

Pre-employment physical examinations are required of each employee. In addition, persons who are to be employed in the asbestos operation are given a chest x-ray and pulmonary function tests. Annual chest x-rays and pulmonary function tests also are required of persons in the asbestos operations. No annual examinations are required of the other employees; however, the company does have plans to initiate the chest x-ray and pulmonary function programs for those persons involved in the fibrous glass operations.

All persons in this facility recently have been given an audiometric test. Annual tests are planned for those persons employed in noisy areas (as determined by a recent noise study).

This facility presently has an excellent safety program which is the responsibility of Mr. Jerry Baker, Plant Safety Director. Mr. Baker has formulated a complete safety information and training manual which prescribes specific safety procedures for each department including the responsibilities of both the employer as well as the employee. A "Safety Steering Committee" meets monthly and inspections are carried out in each production operation on a monthly basis.

Personal protection programs presently in force at this plant include the use of demand type respirators in those operations involving asbestos, safety glasses in selected areas and hearing protection in noisy areas. Although safety shoes are not required, the company has a program to aid in their purchase. Lockers and change rooms are provided. Workers engaged in the asbestos operations are furnished clothing changes.

This facility does not presently employ a full-time industrial hygienist. Mr. Jerry Baker, in addition to his safety duties, handles many of the industrial hygiene responsibilities. The Liberty Mutual Insurance Company also serves as a consultant and conducts surveys approximately once per year. In November 1972, Liberty Mutual took air samples in the paper operations during the weighing and mixing of crocidolite asbestos (results of survey attached). Due to the very high counts, a respiratory protection program was immediately instigated in this area.

DESCRIPTION OF THE PROCESSES*

Fibrous Glass Paper Operations

Fibrous glass paper is made in this facility using essentially conventional paper forming methods and machinery. In this operation, beatermen first weigh and blend together various grades of fibrous glass bulk fiber (see Table 2), fibrous glass rovings and cellulose binder (1 to 2 percent). These fibers are mixed with water and the ph is adjusted to approximately 3.5 using hydrochloric acid.

After mixing for approximately 15 minutes in the primary beater, the fiber batch is pumped into a storage tank equipped with a mechanical agitator to further blend the fibers and keep them in suspension. From this tank, the mix is pumped to the paper machine where fibers are spread onto a paper forming conveyor and the excess water removed. The paper is next taken over a number of steam heated drier rollers to remove the remaining water.

Filter paper used for cryogenic insulation receives no further treatment and is wound and taken to the finishing area where it is cut to the proper dimensions and packaged for shipment.

---

* Table 1 lists the raw materials used in the various processes at the facility.

Fibrous glass paper from the driers, which is used for high efficiency air filtration, is treated with an acrylic-type binder, using toluene as a solvent. The paper, treated with binder, is dried on another set of steam drier rollers, wound and sent to the finishing area for cutting and packaging.

Other Paper Operations

In addition to the one paper machine for making fibrous glass paper, this facility has six other machines for making the various other paper products (cellulosebase) previously mentioned. The major types of cellulose fibers which are used are kraft and hemp and each must undergo further treatment prior to the paper forming process.

Hemp fiber arrives in bulk form in truck loads. The fiber is first placed in a digester (sodium sulfite and caustic process) where the cellulose fibers are liberated. From the digester, the fibers are sent through a hydrapulper and cleaning screens to eliminate foreign material and break up the fibers. The fibers are finally centrifuged, washed and lapped in preparation for the paper making process.

Kraft fiber also is received in bulk form. These fibers are not digested as are the hemp fibers but undergo a similar series of mechanical fibrillation and cleaning processes.

Paper is formed in this facility using fourdriner machines (with modifications). In this process, the fiber is mixed with water (and binders if necessary) and fed as a wet slurry onto a wire screen thus forming a fibrous mat. The mat passes over a suction box where excess water is removed. The fiber mat is next transferred to a woven felt conveyor where more water is removed. The paper next passes over steam heated drier rollers to remove the remaining water and is wound and sent to the finishing area for cutting and packaging.

Viscose Production

The major raw materials for the production of viscose are cellulose, sodium hydroxide, carbon disulfide and water. Cellulose for this operation is received in the form of sheets which have been prepared by the sulfite process from soft woods. Carbon disulfide is received in drums and is stored under water.

The first step in the production of viscose is a steeping (mercerizing) process. In this facility, steeping is done by a batch method. The cellulose sheets are placed on edge in a soaking tank approximately 20 feet long by 5 feet wide by 3 feet deep. This soaking tank is divided into four inch wide compartments by perforated plates which are mounted on a track for pressing purposes. After this tank has been filled with cellulose sheets, the steeping liquor, containing approximately 19 percent sodium hydroxide, is run in at the bottom of the tank. The sheets are covered and allowed to soak for approximately one hour. Following the steeping period, a drain valve is opened and a hydraulic ram is advanced to press most of the steeping liquor from the cellulose. At this point, the product is known as "alkali cellulose."

Following the steeping process, the alkali cellulose sheets are shredded to separate the fibers into a loose granular mass which contains no residual lumps. The purpose of shredding is to provide uniform access of the alkali cellulose to oxygen during the subsequent aging process and to provide uniform access to carbon disulfide in the dissolving process.

Aging or depolymerization begins as soon as the alkalized cellulose is exposed to oxygen in the air. This consists of oxidative cleavage of the cellulose molecules to form smaller chains. Aging follows the shredding operation and is carried out in steel boxlike containers which are stored for a prescribed time in a room at constant temperature.

Following aging, an operation known as xanthation takes place. In this operation, a batch of alkali cellulose crumb is introduced into a reactor vessel, a vacuum is applied and a prescribed amount of carbon disulfide is drawn in. In this process, sodium cellulose xanthate is formed. After the xanthation process, the crumb is reacted in caustic to make viscose which is an orange colored viscous liquid. Most of the viscose so produced is used in paper operations at this facility, with small quantities being sold as a finished product.

Fibrous Glass Fiber Recovery

Due to the high cost of small diameter fibrous glass fibers, this facility has recently started an operation to recover those fibers from paper scrap generated by the plant operations. In this operation, the paper is fed by hand into a mechanical shredder which is located in an enclosed room. After shredding, the paper is put into an oven where the various organic binders are removed by the intense heat.

INSPECTION OF THE PLANT

Potential Health Hazards

The major potential health hazards observed during this survey were as follows:

1. Respiratory exposure to small diameter fibrous glass.
2. Respiratory exposure to crocidolite asbestos.
3. Respiratory exposure to toluene in the binder application areas.
4. Respiratory exposure to ammonia in binder mixing area.
5. Respiratory exposure to carbon disulfide in the viscose producing area.
6. Respiratory exposure to formaldehyde in areas processing wet-strength paper.
7. Skin exposure to hydrochloric acid and sodium hydroxide in various production areas of the plant.
8. Excessive noise exposure in various areas of the facility.
9. Heat stress in paper drying areas.

VENTILATION AND OTHER CONTROL MEASURES

Very little local exhaust ventilation is provided in this facility. In the paper forming areas, canopy hoods are provided over the steam drier rollers to remove water vapor liberated during the drying process. The area of binder and toluene solvent application is enclosed and vented to the roof.

In the viscose producing operation, extreme care is exercised to prevent worker exposure to carbon disulfide and to prevent related fire hazards. Carbon disulfide is received in drums and stored under water. The empty drums are filled with water and shipped from the facility by the supplier. The carbon disulfide storage area is located in a remote area approximately 25 yards from the closest building and is well marked with warning signs.

Carbon disulfide from the storage area is pumped to the xanthation tank through a well-grounded pumping system. The xanthation tank is located in an enclosed, ventilated room. An air supplied respirator is available for entering this room should a leak result.

In the fibrous glass fiber recovery area, the shredding machine has been placed in an enclosed, ventilated room. A centrifugal fan is used to ventilate this room, with the dispersed dust and fibers then being vented to an inplant bag collector.

This facility has encountered both air and water pollution problems. Toluene vapors from the binder application areas are presently vented directly to the atmosphere. Spent liquor from the paper sulfite digestion tank is presently discharged into the Connecticut River. The Company has plans to install a carbon absorbing system to collect the toluene vapors and a spent sulfite liquor recovery system to produce "molasses" from the spent sulfite liquor which will be sold to companies making animal feeds.

HOUSEKEEPING

In general, housekeeping in this facility appears adequate. Powered vacuum cleaners are extensively used and the use of compressed air was not noted during this visit. In the mixing area when crocidolite asbestos is used, all equipment and floors are washed down with water immediately after the asbestos is used.

As in most paper operations, spots of water are common on the floor of the mixing and forming areas of this facility. However, the concrete floors are acid etched so as to prevent a safety problem.

SURVEY PROCEDURES

The major portion of this visit was devoted to observing the various plant operations. In addition, four air samples (3 personal and 1 stationary) were taken to determine airborne fibrous glass fiber exposures by fiber counts using optical microscopy. These samples were collected on Millipore Type AA 37mm membrane filters at a sampling rate of 2.0 liters/min. The sampling times varied in duration from approximately 16 minutes to 99 minutes.

Analysis of the collected samples for fiber concentration was done by an optical count method similar to that used for asbestos.[1] Due to the presence of very small diameter fibers, these counts were done with an oil immersion phase contrast objective at 1000X magnification. A "Zeiss" positive phase contrast binocular microscope equipped with a 100X acromat oil immersion objective (NA = 1.40), 10X Huygenion eyepieces, and a Zernike condenser (NA = 0.90), was used for all fiber counts. Fiber size distributions (length and diameter) also were determined for each sample. Fiber concentrations are reported as fibers/ml.

RESULTS AND DISCUSSION

Results of the air samples for fiber count and fiber size distribution are shown in Tables 3 through 6. The highest fiber concentration observed was 44.1 fibers/ml from a personal sampler taken on a fiber beaterman during the addition of fibrous glass fibers for a single batch. The next highest concentration of 12.6 fibers/ml also was obtained for a fiber beaterman. A stationary sample in the fiber mixing area, taken during fibrous glass addition to the mixing vat, showed a fiber concentration of 8.9 fibers/ml. A personal sample on a worker cutting and finishing the fiber rolls showed a concentration of 10.6 fibers/ml.

Although the respirability of airborne fibers is not clearly understood, this characteristic is thought to be chiefly diameter dependent and fibers greater than 10μm in diameter certainly have little chance of deep pulmonary penètration. Timbrell's[2] work suggests that the two major mechanisms of fiber deposition in the upper airways (settlement under gravity and inertial deposition) are chiefly dependent upon particle free falling speed and fibers with densities less than 3.5 g/cm and less than 3.5μm in diameter may escape deposition by these two mechanisms and penetrate deeply into the lungs. Timbrell's work further suggests that the limitation on the lengths of fibers which reach the deep pulmonary air spaces is imposed by the nasal hairs and small diameters of the respiratory bronchioles. Timbrell and Skidmore[3] in a more recent inhalation experiment with rats using fibrous glass 0.75-1.5 μm in diameter and lengths up to 100μm, found a few fibers up to 50μm in length in the lungs of rats sacrificed during exposure, although the bulk of all fibers found were less than 20μm in length.

Another study conducted by Gross, et al.,[4] concerned itself with fiber size distributions in the lungs of previous fibrous glass workers. Postmorten examinations were made of lung sections of 20 fiber glass workers who had been exposed to fibrous glass dust between 16 and 32 years. In this study, approximately 95 percent of all fibers observed were less than approximately 40μm in length. Occasionally, fibers 50 to 60μm in length were observed. However, it must be pointed out that these size distributions were made following the lung clearing process; therefore, no statement can be made regarding initial deposition of fibers.

In contrast to the above quoted articles, Murphy[5] reported a case of acute pulmonary involvement following a short fibrous glass exposure. A lower lobectomy was performed and careful pathological studies demonstrated the presence of glass fibers up to 14 µm in diameter and 60 µm in length in the terminal bronchioles. In addition, Balber[6] reports finding fibers 100 µm to 200 µm in length in the alveolar regions of asbestos workers at autopsy.

As can be seen, considerable difference of opinion exists as to the true nature of a respirable fiber. For purposes of this discussion, based on the above cited studies, "potentially" respirable glass fibers shall be defined as those less than 3.5 µm in diameter and less than 50 µm in length. From Tables 3-6, it can be seen that approximately 76 to 97 percent of the airborne fibers in the mixing operation and 86 percent of the airborne fibers in the cutting and finishing operations satisfy this criteria of respirability.

There is presently no data available relating human experience with respirable glass fiber exposures of the magnitude found in these operations. All human experience to date has been with fibers of much larger size and at much lower concentrations[7,8,9,10] and studies of health effects on these workers has produced essentially negative results. However, recent animal studies conducted by Stanton[11] and Friedrichs[12] have demonstrated that small diameter fibrous glass is carcinogenic when injected into the pleural cavity of rats.

CONCLUSIONS AND RECOMMENDATIONS

From the observations made during this visit and the results of the air samples taken, the following conclusions are drawn and recommendations for improvements made:

1. Although only four air samples were taken, it does appear that possibly significant exposures to potentially respirable glass fibers occur in the fiber handling operations. While no data presently exist to indicate respiratory problems due to such exposures, it must be emphasized that human experience with small diameter glass fibers is limited. Every

effort should be directed toward keeping such glass fiber exposures at an absolute minimum by the use of engineering controls and appropriate work practices. This should include the instigation of a respiratory protection program for persons in the fiber blending area. In addition, consideration should be given to applying local exhaust ventilation at the paper cutting and packaging areas.

2. Due to the glass fiber exposures observed during this survey, it appears prudent that a medical surveillance program be initiated for persons in the fibrous glass operations. This program should be the same as that presently used for employees in the asbestos operations.

3. Air samples should be taken in the fibrous glass recovery area to ascertain the effectiveness of control measures in this area.

REFERENCES

1. "Criteria for a Recommended Standard: Occupational Exposure to Asbestos", USDHEW, Public Health Service, National Institute for Occupational Safety and Health, 1972.

2. Timbrell, V., "The Inhalation of Fibrous Dusts". Annals of the New York Academy of Sciences, Volume 132, Art I, pp. 225-253, 1965.

3. Timbrell, V and J. W. Skidmore, "The Effects of Shape on Particle Penetration and Rentention in Animal Lungs". Proc. Third Int. Conf. Inhaled Particles and Vapors, pp. 49-57, Unwin Bros. London (1971).

4. Gross, P., Jiri Tuma and R.T.P. deTreville, "Lungs of Workers Exposed to Fiber Glass: A Study of Their Pathologic Changes and Their Dust Content". Arch. Env. Health, Vol. 23, pp. 67-71, July 1971.

5. Murphy, George B., "Fiber Glass Pneumoconiosis", Arch. Env. Health, Vol. 3, pp. 102-108, December 1961.

6. Balber, J. L., Discussion, Proc. Third International Conference Inhaled Particles and Vapors, p. 57, Unwin Bros., London (1971).

7. Wright, George B., "Airborne Fibrous Glass Particles: Chest Roentgenograms of Persons With Prolonged Exposure". Arch. Environ. Health, Vol. 16, February 1968.

8. Murphy, George B., "Fiber Glass Pneumoconiosis", Arch. Env. Health, Vol. III, December 1961.

9. Nasr, A.N.M., T.M. Ditchek and P. A. Schottens, "The Prevalence of Radiographic Abnormalities in the Chests of Fiber Glass Workers", J. Occup. Med. 13:371-376, 1971.

10. Utidjian, H.M.D. and R.T.P. deTreville, "Fibrous Glass Manufacture and Health: Report of an Epidemiological Study: Part I and II". Read before the 35th annual meeting of the Industrial Health Foundation, Pittsburgh, Pennsylvania, 1970.

11. Stanton, M. F. and C. Wrench, "Mechanisms of Mesothelioma Induction with Asbestos and Fibrous Glass", J. Natl. Cancer Inst. 48:797-821, 1972.

12. Pott, F. and K. H. Friedrichs, "Tumors in Rats After Intraperitoneal Injection of Fibrous Dusts, Die Naturwissenschaften, 59:318, 1972.

TABLE 1

Major Raw Materials

C.H. Dexter Division, Dexter Corporation
Windsor Locks, Connecticut

RAW MATERIAL	RECEIVED
Fibrous Glass Fiber	50 lb. box
Crocidolite Asbestos	50 lb. bag
Hemp Fiber	Bulk
Abbaca Fiber	Bulk
Hydrochloric Acid	Drum
Muriatic Acid	Drum
Viryon Fiber	Bulk
Cotton Linders*	Bale
Cellulose	--
Carbon Disulfide	Drum
Acryloid Binder (toluene solvent)	Drum
Melamine-Formaldehyde Binder	Drum
Sodium Hydroxide	--
Sodium - Sulfite	--
Ammonia	Drum

*Not presently used.

TABLE 2

Fibrous Glass Fiber Diameters Used For Making Filtration

Paper and Cryogenic Insulation

C.H. Dexter Division
Dexter Corporation
Windsor Locks, Connecticut

Fiber Designation	Median Fiber Diameter, µm
102	0.20
104*	0.50
106*	0.75
108	1.6
110*	2.6

*These fibers are the major categories which are used in this facility. The company further breaks these size categories into "X", "Y" and "Z" grades by their own quality and control checks from each fiber batch.

TABLE 3

FIBROUS GLASS SAMPLE DATA

C.H. Dexter Division
C.H. Dexter Corporation
Windsor Locks, Connecticut
July 16, 1973

Sample Number: 1

Sample Type: Personal

Operation: Fibrous Glass Paper, Fiber Blending

Job or Sample Location: Beaterman

Number of Fields Counted: 55

Average Fibers Per Field: 1.91

Air Volume, Liters: 32

Fiber Concentration, Fibers/Milliliter: 44.1

FIBER SIZE DISTRIBUTION: PERCENT OF FIBERS ≤
GIVEN DIAMETER AND LENGTH CATEGORIES

Fiber diameter \ Fiber length	1.00μm	5.4μm	10.9μm	21.7μm	30.7μm	46.1μm
0.50μm	3	39	61	75	79	86
0.75μm		41	64	80	86	93
1.00μm		42	66	82	88	96
1.50μm						97
3.00μm						97
3.80μm						97

Total Fibers Sized: 105

TABLE 4

FIBROUS GLASS SAMPLE DATA

C.H. Dexter Division
C.H. Dexter Corporation
Windsor Locks, Connecticut
July 16, 1973

Sample Number: 2

Sample Type: Stationary

Operation: Fiber Glass Paper, Fiber Blending

Job or Sample Location: 5" From Fiber Mixing Tank

Number of Fields Counted: 42

Average Fibers Per Field: 2.38

Air Volume, Liters: 198

Fiber Concentration, Fibers/Milliliter: 8.9

FIBER SIZE DISTRIBUTION: PERCENT OF FIBERS ≤ GIVEN DIAMETER AND LENGTH CATEGORIES

Fiber diameter \ Fiber length	1.00μm	5.4μm	10.9μm	21.7μm	30.7μm	46.1μm
0.50μm	1	20	40	62	68	75
0.75μm		22		69		
1.00μm				72		
1.50μm						76
3.00μm						76
3.80μm						76

Total Fibers Sized: 100

TABLE 5

FIBROUS GLASS SAMPLE DATA

C.H. Dexter Division
C.H. Dexter Corporation
Windsor Locks, Connecticut
July 16, 1973

Sample Number: 3

Sample Type: Personal

Operation: Fibrous Glass Paper, Fiber Blending

Job or Sample Location: Beaterman

Number of Fields Counted: 33

Average Fibers Per Field: 3.03

Air Volume, Liters: 178

Fiber Concentration, Fibers/Milliliter: 12.6

FIBER SIZE DISTRIBUTION: PERCENT OF FIBERS ≤ GIVEN DIAMETER AND LENGTH CATEGORIES

Fiber diameter \ Fiber length	1.00μm	5.4μm	10.9μm	21.7μm	30.7μm	46.1μm
0.50μm	1	31	46	63	69	74
0.75μm		35	51	69	75	81
1.00μm				70	76	85
1.50μm				72	78	87
3.00μm						87
3.80μm						87

Total Fibers Sized: 100

TABLE 6

FIBROUS GLASS SAMPLE DATA

C.H. Dexter Division
C.H. Dexter Corporation
Windsor Locks, Connecticut
July 16, 1973

Sample Number: 4

Sample Type: Personal

Operation: Fibrous Glass Paper, Cutting and Winding

Job or Sample Location: Winder Operator

Number of Fields Counted: 45

Average Fibers Per Field: 2.27

Air Volume, Liters: 158

Fiber Concentration, Fibers/Milliliter: 10.6

FIBER SIZE DISTRIBUTION: PERCENT OF FIBERS ≤
GIVEN DIAMETER AND LENGTH CATEGORIES

Fiber diameter \ Fiber length	1.00μm	5.4μm	10.9μm	21.7μm	30.7μm	46.1μm
0.50μm	1	15	27	41	44	49
0.75μm		19	33	52	58	66
1.00μm		20	34	59	67	77
1.50μm				60	70	83
3.00μm					73	86
3.80μm						86

Total Fibers Sized: 102

ATTACHMENT

TO: Mr. Ralph Noyes CC:

HAMDEN LOSS PREVENTION

INDUSTRIAL HYGIENE LABORATORY REPORT
for

Dexter Corp., C. H. Dexter & Sons Div., Windsor Locks, Conn.
on

Asbestos in Air

11/29/72
Date

Description of sample(s) received: 4 millipore samples for asbestos in air.

Date sample(s) rec'd: 11/22/72 Date report rec'd: 11/20/72 Date report completed: 11/27/

Person submitting sample(s): R. Noyes

Method of Analysis: Phase-Contrast Microscope

Data and Results:

Sample #	Location	Fibers/ml
1	OBZ - weighing out asbestos fibers and dumping them into beater	407
2	OBZ - weighing out asbestos fibers and dumping them into beater along with fibrous glass	107
3	OBZ - during addition of fibrous glass to 1st beater load and weighing asbestos for 2nd beater load	4.2
4	OBZ - Following changing of 1st beater load and while weighing out and adding asbestos to 2nd load	2.0

Marion A. Kaup, Chemist

Comments:

Ceiling limit of 10 f/cc is exceeded and the TWA is 7.8 f/cc in excess of the OSHA permissible limit. Lets kick this around.

W. R. LaRocque
Director
Industrial Hygiene Training

jh