

013000 - 013999 -

013413

Drilling Specialties Company

TECHNICAL SERVICES DIVISION • BARTLESVILLE, OKLAHOMA 74004

DRISPAC
DRISPAC SUPERLO
DRISCOSE CMC
SOLTEX
DESCO
FLOSAL
DIASEAL M

DIACEL D
DIACEL LWL
DIACEL A

RECOMMENDED WORK PRACTICES

for

FLOSAL® DRILLING MUD ASBESTOS

INTRODUCTION

The following recommended work practices are intended as general guides respecting the handling of Flosal® drilling mud grade asbestos (hereafter referred to as DMA). We believe this booklet will be helpful to engineers, superintendents, contractors, foremen, and drilling crews in understanding and explaining such procedures. Field tests conducted to date indicate that the recommended work practices set forth in this booklet, if followed, should result in an employee's 8-hour time-weighted average (TWA) exposure being below 0.1 fibers per cubic centimeter (f/cc) of air. (Such exposure would be well below OSHA's currently prescribed limits of two fibers longer than five micrometers per cubic centimeter of air as an 8-hour TWA exposure and 10 fibers longer than five micrometers per cubic centimeter of air, as a ceiling concentration.) However, since field conditions do vary, these recommended work practices do not purport to be exclusive, and adherence to these recommended work practices does not guarantee an exposure level (8-hour TWA) the same as that shown by the aforementioned field tests, nor compliance with applicable federal, state or local health and/or safety laws or regulations.

On October 11, 1978, OSHA issued Program Directive #300-16, which provides uniform inspection and compliance procedures for medical examination requirements of the asbestos standard. The principal actions taken by OSHA in this directive were to clarify the term "exposed to airborne concentrations of asbestos fibers," and to indicate the scope and applicability of medical examination requirements under the asbestos standards as follows:

- a. The term "...exposed to airborne concentrations of asbestos fiber..." is administratively interpreted to mean "exposed to a minimum of 0.1 asbestos fibers longer than five micrometers per cubic centimeter of air..."
- b. Medical examinations will be required for any 7 to 8-hour TWA concentration of 0.1 f/cc, or for a greater concentration.

We believe that if the following work practices are followed, one might reasonably expect 8-hour TWA exposure levels to be below those specified by OSHA Program Directive #300-16. If, however, there is reasonable cause to believe that airborne asbestos concentrations exceed 0.1 f/cc greater than five microns on an 8-hour TWA basis, or have peak levels above 0.5 f/cc greater than five microns based on 15-minute sample periods, then the site should be monitored for airborne asbestos, and appropriate action taken as required by applicable safety or health laws and/or regulations.

PRODUCTS AND OPERATIONS

DMA is furnished in flake form.

Operations to which these work practices apply include:

Shipping, receiving, handling, warehousing, and storage.

Additions of DMA to the mud.

Handling of empty sacks.

Disposing of empty sacks.

Disposing of mud.

SHIPPING, RECEIVING, HANDLING, WAREHOUSING, AND STORAGE

DMA is furnished in loose or palletized sacks. (With palletized DMA, the pallets are sometimes shrink-wrapped.) The sealed, unopened sacks should be handled by normal warehouse practices.

Precautions must be taken if a sack is broken, torn or punctured. The sack should be sealed with heavy duty tape or placed in a slip-over sack (over-sized, open-mouthed bag) to prevent spillage. The slip-over sack should be securely sealed, preferably by a twist wire. Any spillage should be cleaned up with a vacuum sweeper equipped with a disposable bag. Unless additional protection is required under applicable federal or other regulations, a certified, reusable single-use air-purifying respirator should be worn by the person cleaning up. DO NOT BLOW MATERIAL WITH COMPRESSED AIR, NOR DRY-SWEEP. The material in broken or damaged sacks should be used first. In storing DMA, it is recommended that it be stacked no more than 10 sacks high.

ADDITIONS OF DMA TO THE MUD

DMA should be added to the mud in the same manner as other dry mud additives. The DMA should be added directly to the mud system, preferably by emptying the sack at a uniform rate into the hopper of a cone-type jet mixer (eductor system, Figure 1).

Other systems in use are also suitable for the addition of DMA, such as an eductor with suction hose attached to withdraw the DMA directly from the sack, or from a drum into which several sacks have been emptied (Figure 2). Care should be used in pouring the DMA into another container to reduce the amount of "fines" generated when air is displaced from the receiving hopper or drum.

In adding DMA to the mud, it is a recommended practice to position oneself so that any air currents present are moving from the individual's back toward the receiving container, rather than blowing into the face. A light weight streamer or "air sock" above the hopper may be used to determine wind direction (Figure 3).

HANDLING OF EMPTY SACKS

After a sack is emptied, it should be discarded in accordance with current Federal Regulations. Normally, sacks of all types should be carried away for disposal as soon as time permits.

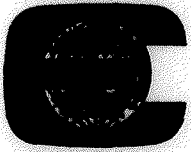
DISPOSING OF EMPTY SACKS

When an adequate precipitator is attached to the incinerator, onshore burial or incineration is the preferred method of disposing of empty DMA sacks from offshore sites. DO NOT BURN DMA SACKS WITHOUT A PRECIPITATOR. The empty sacks should be accumulated in sealed impermeable bags until a sufficient number is on hand to require burning or burial.

It is preferable to bury empty DMA sacks onshore. DMA sacks are biodegradable. An incinerator with an adequate precipitator can be used. DO NOT BURN DMA SACKS WITHOUT A PRECIPITATOR.

DISPOSING OF MUD

When a well is finished, there is usually little or no DMA left in the mud. Any accepted method of storing the mud for reuse, or disposing of it, can be used.



TEXAS EMPLOYERS' INSURANCE ASSOCIATION

P. O. BOX 6000 | MIDLAND, TEXAS 79701 | MIDLAND AIR TERMINAL | TEL. 563-1590

November 13, 1979

Montello
P. O. Box 130
Sand Springs, Oklahoma 74083

Dear Sirs:

As a safety engineer for an industrial insurance carrier on a policyholder's oil well drilling rig I saw a number of sacks of your company's SUPER-VISBESTOS and read the warning sign you have on each sack of the material.

Also noted was your offer to send for a copy of the field study on the safe use of asbestos in drilling operations. If I may, I would like to obtain a copy of the information in order that we may help our mutual customer see that he uses your product in the way that you recommend. Your help in providing the information will be greatly appreciated.

Sincerely,

R. H. Williams

Rayburn H. Williams
District Engineering Manager

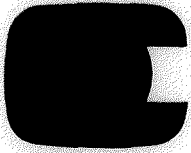
RHW:vvv

*Dec. 12, 1979
Perhaps my letter did not reach you or
your reply got lost as I haven't received the
information requested.
If you will send me the information you offer
your customers, I'll sure appreciate your help!*

*Thanks,
Ray Williams.*

EMPLOYERS INSURANCE OF TEXAS:

Texas Employers' Insurance Association | Employers Casualty Company | Employers National Insurance Company | Employers National Life Insurance Company

**TEXAS EMPLOYERS' INSURANCE ASSOCIATION**

P. O. BOX 6000 | MIDLAND, TEXAS 79701 | MIDLAND AIR TERMINAL | TEL. 563-1590

November 13, 1979

Montello
P. O. Box 130
Sand Springs, Oklahoma 74083

Dear Sirs:

As a safety engineer for an industrial insurance carrier on a policyholder's oil well drilling rig I saw a number of sacks of your company's SUPER-VISBESTOS and read the warning sign you have on each sack of the material.

Also noted was your offer to send for a copy of the field study on the safe use of asbestos in drilling operations. If I may, I would like to obtain a copy of the information in order that we may help our mutual customer see that he uses your product in the way that you recommend. Your help in providing the information will be greatly appreciated.

Sincerely,

Rayburn H. Williams
District Engineering Manager

RHW:vvv

W. DOUGLAS BROWN
District Engineer

12/12/79

EMPLOYERS CASUALTY CORPORATION
EMPLOYERS NATIONAL INSURANCE CORPORATION
EMPLOYERS NATIONAL LIFE INSURANCE COMPANY
2520 Northwest Expressway / Oklahoma City / 946-0761

EMPLOYERS INSURANCE OF TEXAS:

Texas Employers' Insurance Association | Employers Casualty Company | Employers National Insurance Company | Employers National Life Insurance Company

Montello

013418

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

March 27, 1979

Mr. Jim Walker
Louisiana Mud Company
P. O. Box 540
Crowley, Louisiana 70526

Dear Mr. Walker:

Many thanks for your time by phone last week. We've enclosed a file folder containing monitoring results for the past several years covering the use of Super Visbestos. Please let us know if there are further questions.

Mr. Walker, we appreciate your business very much. Please pass on my personal best regards to Ronald the next time you see him, and give us a call whenever we can be of service in any way.

Sincerely,

MONTELLO, INC.



Kenneth N. Campbell

KNC:kb

Encl: (1)

Jim Walker - 013419
- La Mad Co. -

Orly Wold Rig 3
318 + 783 - 4363

Box 540 →

→ Crowley, La 70526
→ Jim Walker -

OSHA File Folder
~~La. Mad Co.~~

Montello

013420

6106 EAST 32ND PLACE,
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

April 27, 1978

Mr. Robert Schneider
Employer's Insurance of Wausau
4150 South Danville
Suite #6
Abilene, Texas 79605

Dear Bob:

Thanks for your call to us yesterday. As promised, we have enclosed a folder containing information about the use of asbestos in the drilling industry. We have also included copies of literature covering respirators.

Please let us know if you have additional questions.

Sincerely,

MONTELLO



Kenneth N. Campbell

KNC/jkp:

enclosure

Montello

013421

6106 EAST 32ND PLACE,
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

May 3, 1978

Mr. Bill Schones
United Well Fluid Service Company
249 Cherry Street
Abilene, Texas 79605

Dear Bill:

In a talk with Taylor Davis yesterday, he asked that we send you a folder of our OSHA information relative to Super Visbestos. We've enclosed one for your use.

It is a compilation of the many field monitoring studies done over the years. All were carried on jointly with Union Carbide. Also included is a single page flyer, which points out some of the things which make drilling rig operations unique as a "workplace".

Please let us know if you have any questions, and thanks for your interest.

Sincerely,

MONTELLO

Kenneth N. Campbell

KNC/jkp:

enc (1)

Ken
—
Montello

013422

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

July 20, 1978

Mr. Lloyd Smith
Mud Supply Company
P.O. Box 52866
Lafayette, Louisiana 70505

Dear Mr. Smith:

We appreciate your call of earlier today regarding Super Visbestos. As promised, we have enclosed a file folder of monitoring information based upon the OSHA regulations. You will notice that all counts are well below the regulated limits.

To our knowledge, there has never yet been an OSHA citation in the drilling industry, which was supported by monitoring evidence of excessive air-entrained fibers. Medical evidence is largely composed of individual exposures to very high concentrations (beyond the present regulated limits), for prolonged periods of time (i.e. 10, 20 and 30 years).

As far as any short term effects, (a few days, weeks or months) there simply are none. The material has no acute toxicity.

Again, thanks for your call. Please let us know whenever we can be of service in any way.

Sincerely,

MONTELLO, Inc.

Kenneth N. Campbell

KNC/jkp

enc (folder)

IMPORTANT MESSAGE

FOR Ken or Allen

DATE 2/20 TIME 9:30

A.M.
P.M.

WHILE YOU WERE AWAY

M Lloyd Smith

OF Med. Supply in Lafayette

PHONE No. 318-232-4646

AREA CODENUMBEREXTENSION

TELEPHONED	☒	PLEASE CALL	☒
CALLED TO SEE YOU	☐	WILL CALL AGAIN	☐
WANTS TO SEE YOU	☐	RUSH	☐
RETURNED YOUR CALL	☐		☐

MESSAGE Wants info on the
hazardous conditions of
asbestos.
(Driver complaining
SIGNED about throat).

LITHO IN U. S. A.

Lloyd Smith

Sup 11:5

T/L ex Calif.

Open float

No broken bags

at time of unloading - (save throat
(pot smoker) & eyes)

Mud Supply Co.
Box 52866

LeMay. 70505

Mr. Lloyd Smith

Let **Montello**

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 685-1170 / TWX 910-845-2396

013425

July 28, 1978

Mr. Harry Pierce
Employer's Insurance Company of Wausau
7700 Carpenter Freeway
Dallas, Texas 75247

Dear Mr. Pierce:

Harry Wyatt has asked that we send you a folder of the several field monitoring reports on Super Visbestos. One is enclosed for your files. As you may be aware, Union Carbide is the manufacturer of the product, and all field testing has been in cooperation with them.

Please let us know if there are further questions, or whenever we can be of service.

Sincerely,

MONTELLO, Inc.

Kenneth N. Campbell

KNC/jkp:

enc

27
Montello

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

November 28, 1978

Mr. Frank V. Freeman
Staff Drilling Engineer
Delta Drilling Company
P.O. Box 2012
Tyler, Texas 75710

Dear Mr. Freeman:

We have your letter of November 22nd to our Mr. Johnson, requesting what we call our "OSHA file folder". One is enclosed for your use. It is composed of the results from field monitoring by Union Carbide. A comparative description of the "workplace" at the rig, and a recap of the monitoring data, are also included.

We appreciate your interest in Super Visbestos, and hope you will contact us whenever we can be of service in any way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jkp:

cc: Allen Johnson

enc.

DELTA DRILLING COMPANY

013427

Box 2012 TELEPHONE 214 595-1911

TYLER, TEXAS 75710

November 22, 1978

Mr. Allen Johnson
Montello, Inc.
6106 East 32 Place
Tulsa, OK 74135

Dear Mr. Johnson:

Montello's Technical Bulletin, August, 1973, mentions a study conducted on Super Visbestos® to determine compliance with OSHA regulations on asbestos concentrations. If possible, I would appreciate receiving a copy of this study.

Thank you for your assistance.

Sincerely,



Frank V. Freeman
Staff Drilling Engineer

kew

The purpose of this bulletin is to provide certain background information on the use of Super Visbestos in the drilling industry. Existing OSHA regulations cover all commercial applications of asbestos. A reading of these regulations makes it appear that the total range of workplace environments was intended. A more careful study, however, enables us to characterize the concept of "workplace" in some detail. Implicit are the assumptions of fixed places of employment; of regular, day-to-day exposure; of exposure on essentially a full shift basis; of comparatively large asbestos tonnages being involved; of specific individuals being exposed with little relief; of enclosed or nearly enclosed work spaces. Even in those references to irregular workplaces, such as in construction, the inference is of specific workers, exposed for nearly a full shift, on a day-to-day basis, in at least partially enclosed surroundings.

Exposure to asbestos in the drilling industry is of a substantially different type. Asbestos is added to the drilling fluid through a mud hopper. Venturi action of the fluid rushing through the bottom of this hopper creates a suction, which pulls the dry product into the liquid stream. Additions to the system are made only occasionally, typically occurring no more often than once per shift. The amounts added are small, rarely exceeding 500 pounds at a time. With three eight hour shifts per day and eight to ten men per shift, assignments are exchanged frequently, with the same worker rarely performing the job of adding materials for more than a few shifts and then only for a small part of the shift. Dumping rates are slow, averaging an hour or so for 500 pounds. In dumping, the worker cuts the end of the 50 pound bag and allows the asbestos to fall into the suction end of the hopper, where the material becomes part of the liquid drilling fluid seconds later. The hopper itself is typically located in the open.

Montello

(Continued on
other side --)

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

A totally enclosed mixing area is a rare exception.

With enactment of the regulations in 1972, Union Carbide Corporation and Montello, Inc. began a series of drillsite monitoring tests, in accordance with the procedures established by OSHA. A substantial body of data has been accumulated from all parts of the U.S. Many different locations (including rigs and warehouses) have been evaluated, and we believe the widely varying conditions inherent in the drilling industry have been fairly included. The results show a consistent pattern of readings which are substantially below both the maximum ceiling limit (10 fibers/cc >5 μ and the time weighted average (2 fibers/cc >5 μ) prescribed in the regulations.

In more than 4 years since the asbestos regulations became law, we have no knowledge of any OSHA citation having been issued, based on corroborating monitoring data to establish the existence of excess air-borne fiber concentrations. In fact, where such tests have been run by compliance officers, no basis has been found for citation. (In September of 1974, a compliance office for the State of Utah carried on field monitoring tests at one of our customer's locations. After analysis, a ruling of "In Compliance" was handed down.)

In addition to the continuing program of field monitoring, Union Carbide and Montello are carrying on basic research with the aim of improving both the cleanliness and the field performance of Super Visbestos. Outgrowths of this research are the high density, crushed pellet form of the product; and the introduction of individually shrink filmed bags to minimize handling and storage problems. With Union Carbide, we will continue to work toward the highest possible standards of quality and safety.



013430

August 23, 1977

Mr. Preston Champagne
Loffland Brothers Company
P. O. Box 459
New Iberia, Louisiana 70560

Dear Mr. Champagne:

Thank you for your time by phone earlier today. As promised, we have enclosed a folder of information regarding field monitoring on our product, Super Visbestos. We hope you will find it useful.

Please let us know if we can be of further assistance. We'll be happy to answer any questions which may come up.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc.

montello

BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

Presford Chapman
318 + 364 - 4531
013431

Mr. Van Harty said call him.
Me call @ 9 AM.

Terry Burtway (54011 Q.I.)
ordered 5.15. -
didn't want it on rig.

Box 459
N. I. + N. 70560

Five - - - he wants it

(Reported call to records
on 8/23/77) -

K-11



013432

January 5, 1977

Mr. Robert Hailey
Texland Drilling Corporation
P. O. Box 3037
Abilene, Texas 79604

Dear Mr. Hailey:

Please refer to our recent phone conversation about the field monitoring tests on Super Visbestos. After the individual reports, we felt it might be useful to collect all the scattered data into a single recap format. We also prepared an updated bulletin giving general background on the use of Super Visbestos in the drilling industry. We hope you will find the contents of this updated presentation both helpful and informational.

A second folder is enclosed for your lawyer, as requested. Under separate cover we have also sent a copy to Mr. Don Dyer of Safety Consultants in Odessa. We have spoken with our Union Carbide people in Niagara Falls about the possibility of initiating a field monitoring series in your area of activity, as soon as practical. As always, they are pleased to cooperate and we plan to coordinate the "whens and wheres" with Mr. Dyer. Will keep you advised as the program develops.

Thanks for your continuing interest in Super Visbestos. Please let us know whenever we can be of service in any way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd
Enc. (2)

P.S. We have received the citation copy you mailed, and appreciate having it.

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

K&H

013433



January 5, 1977

Mr. Don Dyer
Safety Consultants, Inc.
P. O. Box 6564
Odessa, Texas 79762

Dear Mr. Dyer:

We spoke to Mr. Robert Hailey of Texland Drilling recently, about the OSHA regulations on asbestos. He suggested that we send you a duplicate of information which we furnished him. The presentation is enclosed. We hope you will find it both informational and helpful.

We have spoken to our people with Union Carbide in Niagara Falls about the possibility of initiating a series of monitoring tests in West Texas, as a part of our ongoing program. Mr. Hailey had indicated his interest and willingness to cooperate in such a series, assuming a convenient time frame could be established. Is it possible that you might have other clients who would be similarly interested?

Depending upon the distance between locations, it is generally possible to run two or three monitoring tests per day. The series are generally designed to last about three days. Union Carbide furnishes the professional person and equipment to perform the tests. They also do the phase contrast counting on the resulting samples. Reports are prepared for each location, and copies forwarded to all participants.

We will take the liberty of contacting you shortly, in the hope that some one with your company might be willing to assist in working out the logistics for such a series. In the meantime, please let us know whenever we can be of any help.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell
KNC/jd
Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

K 217



013434

January 5, 1977

Mr. Van Harry
Loffland Brothers Company
P. O. Box 459
New Iberia, Louisiana 70560

Dear Mr. Harry:

Please refer to our recent phone conversation about the OSHA regulations on asbestos, and our product Super Visbestos. After gathering the individual reports, we felt it might be useful to collect all the scattered data into a single recap format. We also prepared an updated bulletin giving what we hope will be a useful "overall" view of Super Visbestos in the drilling industry. All this is in the enclosed file folder.

As requested, we have also included a half dozen extra business cards, along with the disposable respirator information discussed. We will be happy to supply extra copies of any or all of the enclosures. Many thanks for your interest in our products, and please let us know whenever we can be of further service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

cc: Mr. Charlie Reeves
Enc. (3)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

Ken



013435

January 5, 1977

Mr. Leo Dean
Sharp Drilling Company
First National Bank Building
Midland, Texas 79701

Dear Mr. Dean:

Mr. Bud Tucker called us recently and asked that we send you information on Super Visbestos, in the context of the OSHA regulations which cover asbestos. The enclosed file folder contains an updated presentation of this data. We hope you will find it useful and informative. At Bud's request, we've sent a duplicate to Mr. Leroy Cargile.

Many thanks for your interest in our products. Please let us know whenever we can be of service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

Kim

013436



January 5, 1977

Mr. Leroy Cargile
Sharp Drilling Company
P. O. Box 182
Stanton, Texas 79782

Dear Mr. Cargile:

Mr. Bud Tucker phoned us recently and asked that we send information to you on Super Visbestos in the context of the OSHA regulations covering the use of asbestos. This information is enclosed. We hope you'll find it helpful. At Bud's request, we've sent the same presentation to Mr. Leo Dean in Midland.

We appreciate your interest in our products, and hope you will contact us whenever we can be of service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013437



January 5, 1977

Mr. Taylor Davis
American Mud Company
P. O. Box 555
Abilene, Texas 79604

Dear Taylor:

We spoke to Bob Hailey earlier about the OSHA/Super Visbestos matter. Our form of presentation has been brought up to date, and we've sent him copies. At his request, we've also copied Don Dyer of Safety Consultants in Odessa with the same presentation.

Enclosed is a similar copy for your files. We're working out a program to carry on a series of field monitoring tests in West Texas soon. Will keep you advised as the plans take shape.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661 / TWX 910-840-3007

K & H

013438



January 5, 1977

Mr. Bud Tucker
3710 Stanolind St.
Midland, Texas 79701

Dear Bud:

Many thanks for your call the other day. We've updated our presentation on the OSHA matter, and have sent copies to Mr. Leo Dean and Mr. Leroy Cargile of Sharp Drilling. As requested, we're enclosing two copies for your use.

We appreciate your help on this one. Please let us know whenever we can help.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (2)

Montello

Packets of OSHA info:

013439 Jan. '77

- ① ✓ Mr. Robert Hailey
Texland Drilling Corporation

2 copies
(1 for lawyer)
field monitor
entire citation

P.O. Box 3037
Abilene, Texas -- 79604
— also requested —

- ✓ Mr. Don Dyer 915-333-4127
Safety Consultants, Inc.
P.O. Box 6564
Odessa, Texas -- 79762

1 copy

- ② ✓ Send copy to Taylor Davis, too
American Mud - Box 555 - Abilene, Tex. - 79604

- ③ ✓ Mr. Van Harry (He'll forward copies)
~~George Lottland~~ Lottland Brothers
P.O. Box 459 Company
New Iberia, La. -- 70560

copy
- 4 extra cards
respirator flyer

- ④ ✓ Mr. Jerry Todd Also - Wayne Shields
Dresser Tehran ✓ Dresser - Tehran
P.O. Box 1170
Ahwaz, Iran
- also -

1 copy

- ✓ Send duplicate package to
Rob Moseley in Houston.

1 copy

- ⑤ ✓ Mr. Leo Dean (Dir. Supt.)
Sharp Drilling Company
1st National Bank Building
Midland, Texas -- 79701
- and -

1 copy

- ✓ Mr. Leroy Cargile (Asst. Dir. Supt.)
Sharp Drilling Company
P.O. Box 182
Stanton, Texas -- 79782

1 copy

Box 3037 - Abilene 79604
Texland Drilling Corporation.
Robert Taylor - D.B. Drilling Co.
Abilene - 915-672-2841
(17 rigs/operating full time/all on S.V.s.)
Taylor says it's his biggest user

013441

1. Talked with Taylor Davis at
American Mud. (We supply S.V.s.)

2. Understand you received a cita
tion and fine.

- Have large body of data on
field monitoring tests.

- Like to send complete folder

to you. If any questions, glad
to talk further. Believe the
information will be helpful.

3. Also, Ucar has been very help
ful in the past. Particularly

in providing professionals to
run field monitoring and
report data. (Might arrange
series in your area for
specific analysis of your
rigs.)

4. Questions, if you don't mind

- Date of citation and where.

will send copy wording of citation/amt. fine

are protested Time given for answer (protest

- Field Comp. Ord. out of Lubbock?

Asbestos only, or other items?

Yes - Possible to send us a copy?

"waste scrap, debris, clothing
consigned for disposal"

Taylor Davis - 12/16/76 013442

D. B. Drilling Co. -

Cited & Fined -

Mr. Robert ~~H. D.~~ Hailey

915 + 672 - 2841

Abilene -

They've got 17 rigs
around the clock

Use S. Vis on every
single hole.

[He's gonna' fight ~~at~~
it in court.

3 rigs constant ave.
Bud Tucker - (Tiger Mud Serv)
uses lots of S. Vis. r

wind by
Pioneer Oil.

Sharp Drilling Co. - 013443

OSHA -

- Leo Dean Drlg. Supv. -

→ Leroy Cargile (Asst. Drlg Supv.)

Box 182 - Stanton, Tex.
79782

→ 1st Natl Bank Bldg.

Midland 79701

Send \$ ea to Bud's address.

694-3849

3710 Stanolind St.

Harry - 12/28/74 -

1. B. Tucker call

→ 2. Sign D Thur. contracts

* ③ Call this afternoon - Villalobos.

* 4. Buy bike CK DSU & OK

* 5. Doug Fox. - 2 additions and
sign doc's - lunch Wed (noon)?

6. Rec'd. Hercal. Dr. estimate.

7. Tay. Davis call.

8. Price lists out (mailing labels)

013444

1/18/77
from the desk of...

Ken Campbell

Tom McCollum - atty.
P.O. Box 1552
Odessa, Texas

(works with safety
consult. outfit in
W. Texas)

Harry sent OSHA
folder to him to-
day.

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063

013445



January 14, 1977

Mr. Rob Moseley
Petroleum & Minerals Group
Safety and Environmental Control
Dresser Industries, Inc.
P. O. Box 6504
Houston, Texas 77005

Dear Rob:

Enclosed are copies of letters just sent to two of your people in Iran. We sent them the updated package of information on our OSHA files. I've also enclosed two copies for you, since they include some new information.

We always appreciate the opportunity to work with you, Rob. Please give us a call whenever we can be of service.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (4)

Montello

Kem

013446

April 25, 1977

Mr. George Ross, Drilling Superintendent
Amoco Production Company
P. O. Box 3092
Houston, Texas 77001

Dear Mr. Ross:

We spoke earlier today with Mr. A. R. Reed, and he has asked that we contact you directly. One of the products which we distribute is Super Visbestos. This asbestos product is manufactured to our specifications by Union Carbide Corporation. Super Visbestos has been widely used for many years as a mechanical viscosifier for drilling fluids.

OSHA regulations covering the use of asbestos, were enacted back in 1972. Since that time Ucar and Montello have joined in a continuing program of field monitoring to establish a data base indicative of the air entrained fiber counts associated with the use of Super Visbestos in drilling fluids. We have enclosed a folder containing the results of this continuing program. We make this information freely available to all interested parties, including operators, contractors, service companies and OSHA personnel. The presentation has been useful in demonstrating the relatively low exposure levels inherent in the drilling industry.

We and Ucar would welcome the opportunity to discuss this matter with you or your people further. Please feel free to contact us on this, or any of our many other products, whenever we can be of service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

*Mud Eng - Gary Massie
calls us 5/2/77 - 1:20 PM
713-652-5468*

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

4/25/77 713 + 652 - 5222 (direct)
Amoco - Asbestos 05/21/77
013447

- From Bob Hall (Amoco W. Tex.)
Asst. to Rowland Hook (bas.)
- Got letter from A.R. Reed
Amoco - Houston.
"Div. Prod. Mgr."
- Says - "No more asbestos".
- Me call him (our W. Tex. man indic.)
letter out killing Asb.
 - Discuss situation
 - Send OSHA packets
 - Feel him out.
 - W. Tex. was last area checked.
 - Amoco was 1st participant

Ken Pates

Would be interested

Geo. Ross Dir. Supr.
Box 3092
Houston 77001

Have had good experience
with the product. (But simply
felt pressure from OSHA precluded use)

Sending d.ile would be a
"place to start".

Offered our help & assist.

Me F/U call to Ross 1st of week
for parenthetical notes.

013448



March 28, 1977

Mr. Joe Henderson
Southwest Drilling Mud, Inc.
P. O. Box 2477
Midland, Texas 79702

Dear Joe:

Harry asked that we send you five copies of our current information folder relative to the OSHA asbestos regulations. We understand you plan to pass them on to those who cooperated in the most recent monitoring tests. Please accept and extend our most sincere thanks for all the help.

The requested copies are enclosed for your use. Please call us whenever we can be of assistance in any way.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (5) - OSHA Folders

montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

KES

013449



March 29, 1977

Mr. Cack Roller
Well Fluids
3000 West Kentucky
Midland, Texas 79701

Dear Mr. Roller:

Harry has asked that we send you five copies of our most recent folder covering Super Visbestos and the OSHA regulations. They are enclosed, and we hope you will find them useful.

We appreciate your continuing interest in our products. Please let us know whenever we can be of service in any way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (5) OSHA Folders

montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

KCN

013450



March 18, 1977

Mr. Taylor Davis
American Mud Company
P. O. Box 555
Abilene, Texas 79604

Dear Taylor:

Appreciate the time by phone earlier today. As promised, we've sent you five copies of the updated OSHA presentation. Understand you will distribute some of them to the appropriate participants in the recent test program.

Taylor, we appreciate your help on this. Please let us know if you need any further copies.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013451



March 17, 1977

Mr. Leo Dean
Sharp Drilling Company
First National Bank Building
Midland, Texas 79701

Dear Mr. Dean:

Since our communication with you in early January, a series of field monitoring tests has been completed in the Permian Basin covering the use of our Super Visbestos. This new information has been included in our current information folder. A copy is enclosed for your consideration.

We appreciate your continuing interest in our products, and hope you will contact us whenever we can be of service. We have taken the liberty of sending the same updated folder to Mr. Leroy Cargile, and to our mutual friend Mr. Bud Tucker.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013452



March 17, 1977

Mr. Don Dyer
Safety Consultants, Inc.
P. O. Box 6564
Odessa, Texas 79762

Dear Don:

The results of the recent field monitoring tests on Super Visbestos in the Permian Basin have now been incorporated into our regular information folder. We've enclosed a copy for your use.

Special thanks to you for your help in organizing this program. After your talk with Mr. John Taff of the Lubbock Area OSHA office, he called us to ask for a copy of our presentation. We were delighted to cooperate with him, and have filled his request. He seemed very impressed with the low fiber counts typical of our applications, and indicated a desire to help in establishing a better educated, more consistent and rational approach to the matter of field compliance. We sincerely hope this will be the result. Will appreciate hearing from you if you detect any signs of improvement in relations with Mr. Taff and the other compliance officers.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013453



March 17, 1977

Mr. Robert Hailey
Texland Drilling Corporation
P. O. Box 3037
Abilene, Texas 79604

Dear Mr. Hailey:

Since our last mailing to you in early January, a series of field monitoring tests has been run in the Permian Basin involving our Super Visbestos. This program was due in no small way to your help in getting us with Mr. Don Dyer of Safety Consultants in Odessa.

We appreciate your cooperation very much, and have enclosed a newly updated folder, which includes the results from the testing program. Please let us know whenever we can be of any assistance, and accept our thanks for your continuing interest in our products.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013454



March 17, 1977

Mr. Leroy Cargile
Sharp Drilling Company
P. O. Box 182
Stanton, Texas 79782

Dear Mr. Cargile:

Since our mailing to you in early January, a series of field monitoring tests has been run on Super Visbestos in the Permian Basin. We've enclosed a copy of our OSHA information folder, which has been updated to include this new data.

We appreciate your continuing interest in our products, and hope you will call us whenever we can be of service. We've taken the liberty of sending the same updated folder to Mr. Leo Dean and to our mutual friend Mr. Bud Tucker.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007



013456

March 17, 1977

Mr. Bud Tucker
3710 Stanolind Street
Midland, Texas 79701

Dear Bud:

Since writing you last January, we've completed a number of field monitoring tests on Super Visbestos in the Permian Basin. Our presentation folder has been updated to include these new results, and we've enclosed a copy for your use.

Also took the liberty of sending the new folder to Mr. Leo Dean and Mr. Leroy Cargile of Sharp Drilling. Please let us know any time we can be of service.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013456



March 17, 1977

Mr. B. C. Davis
2724 St. Nick
New Orleans, Louisiana 70114

Dear Mr. Davis:

Our representative in your area is Mr. Charlie Reeves. He has asked that we send you an updated file from our growing OSHA records. It is enclosed for your use.

Please contact Charlie, or our office whenever we can be of service in any way. Many thanks for your interest.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

cc: Mr. Charlie Reeves

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

Ken



013458

May 23, 1977

Mr. Chester D. Mouser
OSHA Area Office
1425 West Pioneer Drive
Central Place Building
Suite 230
Irving, Texas 75061

Dear Mr. Mouser:

Thank you for your time by telephone earlier today. As promised, we have enclosed a file folder containing the results of monitoring tests run during the past several years. We hope you will find it of interest.

Please let us know if we can be of further service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

KEM



013459

May 25, 1977

Dr. Harrison B. Rhodes
Union Carbide Corporation
P. O. Box 579
Niagara Falls, New York 14302

Dear Harry:

Here is a copy for your files of the communication just received from Tryon Lewis. In spite of the fact that the citation was a direct quote from the regs on disposal, they apparently didn't think they would prevail. The question of course, is "why". Perhaps it was lack of documentation.

I've talked with Mr. Mouser, of the Ft. Worth area office, as promised. He seemed pleased with our offer of the field monitoring file folder, and a copy of our short cover letter is enclosed. Plan to follow up with him in about 10 days to go over the point where shrink filmed bags came on the scene.

Best regards to all,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (2)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

Allen
(Summary - as
distributed)

SUMMARY OF
AIR MONITORING RESULTS
DURING USE OF "UNIVIS"
(AN OIL-WETTED ASBESTOS PRODUCT)
December 7, 1979

013460

This report provides a brief summary of the overall results from several drilling sites. A copy of the full report is available upon request.

PLEASE NOTE: The companies which cooperated in the tests discussed herein are customers of Montello, Inc. and permitted such tests in order to ascertain whether their use of UNIVIS complies with Federal Occupational Safety and Health Act regulations. Results of these tests are made available to other companies solely for their use in making their own evaluations of the appropriate procedures to be followed in using UNIVIS.

SAMPLES WERE COLLECTED AND EVALUATED

By F. L. Smith & B. L. Ingalls
of

UNION CARBIDE CORPORATION
Metals Division
Niagara Falls, New York

This report is a brief summary of two separate air monitoring test series conducted during the use of UNIVIS. UNIVIS is an oil-wetted pelletized asbestos product developed to minimize airborne dust during its use as a viscosifier in drilling fluids. The tests were conducted to determine the effectiveness of the oil treatment in reducing dust.

Test Series I involved seven different drilling sites and was conducted to determine the amount of airborne fibers generated under varying weather and other external conditions. Test Series II involved only one drill site but under extended conditions where asbestos was used on a daily basis.

The conditions under which the tests were conducted are described in the following reports. The airborne asbestos fiber counts reported are not necessarily representative of those which may be found at different locations or under different conditions. Anyone using UNIVIS or any other asbestos product should be aware of the health and safety problems associated with asbestos and with pertinent regulatory requirements. Appropriate literature and other materials concerning the above are available upon request.

DISCUSSION

The results of two separate series of air monitoring tests during the use of UNIVIS are discussed in this report. All tests to date have shown that the proper use of an oil-wetted pellet can result in extremely low airborne emissions of asbestos fiber. Air monitoring was conducted prior to any use of UNIVIS or other asbestos product to determine a "background" level of fibers. Based on the test data before and during the use of UNIVIS and considering the limitations of the overall test procedure, it appears that airborne fiber levels during the use of UNIVIS are essentially indistinguishable from background.

TEST SERIES I

Environmental and personal airborne samples were obtained at seven drilling sites located in the area of Graham, Texas, during the period June 11-22, 1979. Samples were collected at each location on the day prior to using UNIVIS and no asbestos was handled on the sites during the pre-control days. These samples were obtained in continuous sequence for durations of 2-1/2 to 5 hours. Sampling on days when UNIVIS was used represented the major portion of an 8-hour work shift. Weather conditions were hot and humid with winds of 5 to 20 mph. Rigs were operating at depths up to 4000 feet.

Of nearly 250 samples evaluated, the highest ceiling value during the handling and dumping of UNIVIS was 0.186 fibers/cc of air; although a higher count, 0.307 f/cc, was obtained on a personal sample prior to dumping. All other ceiling values were below 0.1 f/cc, except for one pre-control day count of 0.143, f/cc.

Although ceiling value measurements are necessary for regulatory compliance, time-weighted average (TWA) exposures to asbestos fibers are more pertinent for safety and health considerations. The following table summarizes and compares the TWA values measured the day before and during the use of UNIVIS:

SUMMARY OF TIME-WEIGHTED AVERAGES

<u>Location</u>	<u>Sample Type</u>	<u>CALCULATED TWA, f/cc</u>	
		<u>Day prior to Use of UNIVIS</u>	<u>Day of use of UNIVIS</u>
Henrietta	Personal	0.041	0.028
	Environmental	0.0-0.009	0.007-0.010
Jacksboro	Personal	0.023	0.043
	Environmental	0.003-0.009	0.002-0.005
Graham #1	Personal	0.002	0.008
	Environmental	0.0-0.004	0.008-0.013
Graham #2	Personal	0.010	0.005
	Environmental	0.0-0.006	0.004-0.017
Newport	Personal	0.004	0.010
	Environmental	0.012-0.019	0.010
Caddo	Personal	0.013	0.006
	Environmental	0.003-0.008	0.006-0.013
Cundiff	Personal	0.009	0.009
	Environmental	0.0-0.005	0.002-0.005

The highest personal TWA during the use of UNIVIS was 0.043 f/cc and the range was 0.005 to 0.043. The range during pre-control days was 0.002 to 0.041. Considering the limitations of the tests, there was little or no difference in the results.

During this test series, a significant number of samples were found to contain fibrous materials other than asbestos, the majority of which were organic. In most instances the extraneous fiber was readily distinguishable from chrysotile and excluded from counting. However, some fibrous material exhibited properties sufficiently similar to chrysotile that it could be counted as such, particularly by an inexperienced microscopist. To avoid any confusion, two distinct categories of fiber were counted: that which, in the operator's opinion, was chrysotile, and "other fiber" that was similar enough that it might be counted as chrysotile. (None of the fiber counted as "other fiber" was considered to be chrysotile by the microscopist.)

Several of the samples were also observed with polarized light to enhance detection accuracy. In the writers' opinion, a considerable amount of the chrysotile fiber counts reported are not in fact chrysotile. However, it is virtually impossible to make any definitive analytical judgment based solely on phase contrast counting techniques. As such, the chrysotile counts reported are most likely higher than actual fiber concentrations existing at the time of tests. This is further substantiated by comparison of TWA results obtained on pre-control and trial days. The mean values for TWA's based on the total fiber counts (chrysotile plus "other fiber") obtained at the seven test sites are shown in the next Table. As illustrated, there is essentially no difference in the overall fiber counts between precontrol and trial days.

MEAN VALUES OF TWA'S OBTAINED AT THE SEVEN TEST SITES
BASED ON TOTAL FIBER COUNTS (CHRYSTILE PLUS OTHER FIBER)
(Fibers/cc)

<u>Personal</u>		<u>Environmental</u>	
<u>Precontrol</u>	<u>Trial</u>	<u>Precontrol</u>	<u>Trial</u>
0.075	0.070	0.021	0.025
*(.020-.332)	(.017-.184)	(.007-.040)	(.014-.042)

*(Minimum-maximum range of TWA's)

TEST SERIES II

During the week of September 16, 1979, air monitoring was performed at a single drilling site in Andrews County, Texas. The purpose of these tests was to determine the airborne asbestos concentrations over an extended period while UNIVIS was being used on a daily basis. Air samples were collected prior to the use of UNIVIS to determine background data.

The highest ceiling value during the handling and dumping of UNIVIS was 0.103 fibers/cc of air; although a higher count, 0.144 fibers/cc, was obtained on a personal sample prior to bag dumping. All other counts were below 0.1 fibers/cc.

The following table compares the time-weighted average (TWA) exposures on the pre-control day with data for the five days on which UNIVIS was used:

013464

SUMMARY OF TIME-WEIGHTED AVERAGES

<u>Day</u>	<u>Pounds of UNIVIS Added</u>	<u>Type Sample</u>	<u>TWA, f/cc</u>
9/17/79	None	Personal Environmental	0.019 0.0
9/18/79	200	Personal Environmental	0.019 0.005
9/19/79	250	Personal Environmental	0.016 0.002-0.004
9/20/79	250	Personal Environmental	0.016 0.003-0.005
9/21/79	250	Personal Environmental	0.010 0.005-0.006

As in previous tests with UNIVIS, there is little or no difference between results before and during the use of UNIVIS.

CONDITIONS AND LIMITATIONS

1. Any use of or reliance by Montello or any third-parties upon the information, data, analysis and conclusions set forth herein shall be at their sole risk and without any recourse to or liability on the part of Union Carbide.
2. The air monitoring samples herein were collected under weather and other conditions which may not be typical of those conditions under which UNIVIS will be used. In any case, the results set forth herein may not be representative of results in different locations or found under different weather or other external conditions at the same or different locations.
3. In compiling its report Union Carbide followed a testing procedure which it believes to be accurate and reliable but there may be other methods for evaluating fiber emissions which may produce different results.
4. Any use of products containing asbestos may be hazardous to health and the breathing of asbestos dust may cause serious bodily harm. Union Carbide makes no warranty or guarantee, either express or implied, that the results set forth in its report bear upon any health risks associated with the use of UNIVIS. It shall be the responsibility of any user of UNIVIS to determine that he is exercising a reasonable standard of care in its use and that he is complying with all applicable governmental regulations as to the asbestos contained therein.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, based on NIOSH Analytical Method P&CAM 239 and OSHA methods; reference- Occupational Safety and Health Administration Methods, W. C. Dixon, pp 431, NBS special publication No. 506, U.S. Department of Commerce, November 1978.

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Results are reported for each sample as:

1. Chrysotile Asbestos - Any fiber having an aspect ratio ≥ 3 and a length $\geq 5\mu$ that is in the operator's judgment chrysotile. In the event of doubt and in the absence of further information, any fiber having the above physical dimensions will also be counted as chrysotile.
2. Other Fiber - Any fiber having an aspect ratio ≥ 3 and a length $\geq 5\mu$ which could be mistaken for chrysotile due to its having similar properties.

COMMENTS

013466

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA where

C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

Montello

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

- - INTRODUCING - -U N I V I S

Universal viscosifier for
all aqueous drilling fluids.

Montello is very proud to introduce you to a new product - -
UNIVIS - - and the story behind its development.

More than two years ago, Union Carbide and Montello began a joint effort to develop a truly "dust controlled" asbestos product. Our Super Visbestos has been a leader in performance and economy for many years, and its high density, crushed pellet structure results in very low airborne fiber counts. However, our goal is to offer you a product which under usual conditions and with reasonable care will result in counts below 0.1 fibers/cc on a 7 or 8 hour time weighted average (TWA) basis. This level (0.1 fibers/cc) is important from an OSHA compliance standpoint for anyone using asbestos since it may permit an employer to avoid certain monitoring, medical examination and other OSHA requirements.

After laboratory and field evaluations, documented by monitoring at several on-site locations, we are pleased to announce UNIVIS. With reasonable care in housekeeping and application, airborne fiber counts should be below 0.1/fibers/cc TWA and indistinguishable from background concentrations.

The key to dust control with UNIVIS is the carefully metered addition of a specially selected oil to a unique 1/8 inch diameter pellet of presheared asbestos. Although more expensive than adding water, our tests indicate that the oil is much more effective and reliable in suppressing dust. This is especially true when accidental spills or bag breakage occur. The oil wet material retains substantially all of its dust control properties up to several weeks. The water treated material on the other hand, begins drying out almost immediately, with a commensurate decline in dust control properties. Since spills and bag breakage are sometimes unavoidable we decided not to utilize the less dependable protection of water for vital dust control.

Of course an oil wet material posed packaging problems. The solution was found in the same kind of polypropylene lined multiwall kraft paper bag that has proven to be capable of withstanding diesel oil treated fertilizer packaged for certain explosives applications.

Another question arose as to the possible difficulty of adding UNIVIS to the aqueous drilling fluid. Would the oil coated surface adversely affect dispersion of the asbestos pellets into the system? Lab tests and field tests have revealed that just the reverse is true. By softening and lubricating the surface of the pellets, the oil actually enhances the rate of dispersion.

In order to evaluate dust controlled UNIVIS, a monitoring program was undertaken at several on-site locations. The first commercially produced truckload of UNIVIS was shipped to north central Texas, where seven rig locations were selected for evaluation. The locations were premonitored for several hours the day before UNIVIS was used to establish an accurate background count. During monitoring nearly 250 filter samples were collected and airborne concentrations were determined in accordance with OSHA requirements. A subsequent test was conducted at a single site for an extended period to determine the possible cumulative effect on airborne asbestos fibers during successive daily use of UNIVIS.

- The monitoring results are contained in a lengthy report which includes complete descriptions of the test sites and conditions, analysis data, and time-weighted average (TWA) calculations. The highest TWA was less than one-half the level of 0.1 fibers/cc over the 7-8 hour period which OSHA deems significant for the purposes of employee medical examinations. Our goal of developing a dust controlled asbestos has been realized - - - - and not just for standard handling, but for the occasional and unavoidable spill. However, in your use of UNIVIS you will still want to be aware of the health and safety problems associated with asbestos and the pertinent OSHA regulations, particularly if you have any cause to believe that any exposure in excess of permissible levels may result. We will make available to you at no charge appropriate materials on these matters.

A summary of the foregoing report is available at no charge. Please contact us for a copy, or if you want any further information. We'll gladly accept your collect calls at 918/665-1170.

Harry
(Summary distributed.) - as

013469

SUMMARY OF
AIR MONITORING RESULTS
DURING USE OF "UNIVIS"
(AN OIL-WETTED ASBESTOS PRODUCT)
December 7, 1979

This report provides a brief summary of the overall results from several drilling sites. A copy of the full report is available upon request.

PLEASE NOTE: The companies which cooperated in the tests discussed herein are customers of Montello, Inc. and permitted such tests in order to ascertain whether their use of UNIVIS complies with Federal Occupational Safety and Health Act regulations. Results of these tests are made available to other companies solely for their use in making their own evaluations of the appropriate procedures to be followed in using UNIVIS.

SAMPLES WERE COLLECTED AND EVALUATED

By F. L. Smith & B. L. Ingalls
of

UNION CARBIDE CORPORATION
Metals Division
Niagara Falls, New York

This report is a brief summary of two separate air monitoring test series conducted during the use of UNIVIS. UNIVIS is an oil-wetted pelletized asbestos product developed to minimize airborne dust during its use as a viscosifier in drilling fluids. The tests were conducted to determine the effectiveness of the oil treatment in reducing dust.

Test Series I involved seven different drilling sites and was conducted to determine the amount of airborne fibers generated under varying weather and other external conditions. Test Series II involved only one drill site but under extended conditions where asbestos was used on a daily basis.

The conditions under which the tests were conducted are described in the following reports. The airborne asbestos fiber counts reported are not necessarily representative of those which may be found at different locations or under different conditions. Anyone using UNIVIS or any other asbestos product should be aware of the health and safety problems associated with asbestos and with pertinent regulatory requirements. Appropriate literature and other materials concerning the above are available upon request.

DISCUSSION

The results of two separate series of air monitoring tests during the use of UNIVIS are discussed in this report. All tests to date have shown that the proper use of an oil-wetted pellet can result in extremely low airborne emissions of asbestos fiber. Air monitoring was conducted prior to any use of UNIVIS or other asbestos product to determine a "background" level of fibers. Based on the test data before and during the use of UNIVIS and considering the limitations of the overall test procedure, it appears that airborne fiber levels during the use of UNIVIS are essentially indistinguishable from background.

TEST SERIES I

Environmental and personal airborne samples were obtained at seven drilling sites located in the area of Graham, Texas, during the period June 11-22, 1979. Samples were collected at each location on the day prior to using UNIVIS and no asbestos was handled on the sites during the pre-control days. These samples were obtained in continuous sequence for durations of 2-1/2 to 5 hours. Sampling on days when UNIVIS was used represented the major portion of an 8-hour work shift. Weather conditions were hot and humid with winds of 5 to 20 mph. Rigs were operating at depths up to 4000 feet.

Of nearly 250 samples evaluated, the highest ceiling value during the handling and dumping of UNIVIS was 0.186 fibers/cc of air; although a higher count, 0.307 f/cc, was obtained on a personal sample prior to dumping. All other ceiling values were below 0.1 f/cc, except for one pre-control day count of 0.143, f/cc.

Although ceiling value measurements are necessary for regulatory compliance, time-weighted average (TWA) exposures to asbestos fibers are more pertinent for safety and health considerations. The following table summarizes and compares the TWA values measured the day before and during the use of UNIVIS:

SUMMARY OF TIME-WEIGHTED AVERAGES

<u>Location</u>	<u>Sample Type</u>	<u>CALCULATED TWA, f/cc</u>	
		<u>Day prior to Use of UNIVIS</u>	<u>Day of use of UNIVIS</u>
Henrietta	Personal	0.041	0.028
	Environmental	0.0-0.009	0.007-0.010
Jacksboro	Personal	0.023	0.043
	Environmental	0.003-0.009	0.002-0.005
Graham #1	Personal	0.002	0.008
	Environmental	0.0-0.004	0.008-0.013
Graham #2	Personal	0.010	0.005
	Environmental	0.0-0.006	0.004-0.017
Newport	Personal	0.004	0.010
	Environmental	0.012-0.019	0.010
Caddo	Personal	0.013	0.006
	Environmental	0.003-0.008	0.006-0.013
Cundiff	Personal	0.009	0.009
	Environmental	0.0-0.005	0.002-0.005

The highest personal TWA during the use of UNIVIS was 0.043 f/cc and the range was 0.005 to 0.043. The range during pre-control days was 0.002 to 0.041. Considering the limitations of the tests, there was little or no difference in the results.

During this test series, a significant number of samples were found to contain fibrous materials other than asbestos, the majority of which were organic. In most instances the extraneous fiber was readily distinguishable from chrysotile and excluded from counting. However, some fibrous material exhibited properties sufficiently similar to chrysotile that it could be counted as such, particularly by an inexperienced microscopist. To avoid any confusion, two distinct categories of fiber were counted: that which, in the operator's opinion, was chrysotile, and "other fiber" that was similar enough that it might be counted as chrysotile. (None of the fiber counted as "other fiber" was considered to be chrysotile by the microscopist.)

Several of the samples were also observed with polarized light to enhance detection accuracy. In the writers' opinion, a considerable amount of the chrysotile fiber counts reported are not in fact chrysotile. However, it is virtually impossible to make any definitive analytical judgment based solely on phase contrast counting techniques. As such, the chrysotile counts reported are most likely higher than actual fiber concentrations existing at the time of tests. This is further substantiated by comparison of TWA results obtained on pre-control and trial days. The mean values for TWA's based on the total fiber counts (chrysotile plus "other fiber") obtained at the seven test sites are shown in the next Table. As illustrated, there is essentially no difference in the overall fiber counts between precontrol and trial days.

MEAN VALUES OF TWA'S OBTAINED AT THE SEVEN TEST SITES
BASED ON TOTAL FIBER COUNTS (CHRYSTILE PLUS OTHER FIBER)
(Fibers/cc)

<u>Personal</u>		<u>Environmental</u>	
<u>Precontrol</u>	<u>Trial</u>	<u>Precontrol</u>	<u>Trial</u>
0.075	0.070	0.021	0.025
*(.020-.332)	(.017-.184)	(.007-.040)	(.014-.042)

*(Minimum-maximum range of TWA's)

TEST SERIES II

During the week of September 16, 1979, air monitoring was performed at a single drilling site in Andrews County, Texas. The purpose of these tests was to determine the airborne asbestos concentrations over an extended period while UNIVIS was being used on a daily basis. Air samples were collected prior to the use of UNIVIS to determine background data.

The highest ceiling value during the handling and dumping of UNIVIS was 0.103 fibers/cc of air; although a higher count, 0.144 fibers/cc, was obtained on a personal sample prior to bag dumping. All other counts were below 0.1 fibers/cc.

The following table compares the time-weighted average (TWA) exposures on the pre-control day with data for the five days on which UNIVIS was used:

SUMMARY OF TIME-WEIGHTED AVERAGES

<u>Day</u>	<u>Pounds of UNIVIS Added</u>	<u>Type Sample</u>	<u>TWA, f/cc</u>
9/17/79	None	Personal Environmental	0.019 0.0
9/18/79	200	Personal Environmental	0.019 0.005
9/19/79	250	Personal Environmental	0.016 0.002-0.004
9/20/79	250	Personal Environmental	0.016 0.003-0.005
9/21/79	250	Personal Environmental	0.010 0.005-0.006

As in previous tests with UNIVIS, there is little or no difference between results before and during the use of UNIVIS.

CONDITIONS AND LIMITATIONS

1. Any use of or reliance by Montello or any third-parties upon the information, data, analysis and conclusions set forth herein shall be at their sole risk and without any recourse to or liability on the part of Union Carbide.
2. The air monitoring samples herein were collected under weather and other conditions which may not be typical of those conditions under which UNIVIS will be used. In any case, the results set forth herein may not be representative of results in different locations or found under different weather or other external conditions at the same or different locations.
3. In compiling its report Union Carbide followed a testing procedure which it believes to be accurate and reliable but there may be other methods for evaluating fiber emissions which may produce different results.
4. Any use of products containing asbestos may be hazardous to health and the breathing of asbestos dust may cause serious bodily harm. Union Carbide makes no warranty or guarantee, either express or implied, that the results set forth in its report bear upon any health risks associated with the use of UNIVIS. It shall be the responsibility of any user of UNIVIS to determine that he is exercising a reasonable standard of care in its use and that he is complying with all applicable governmental regulations as to the asbestos contained therein.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, based on NIOSH Analytical Method P&CAM 239 and OSHA methods; reference- Occupational Safety and Health Administration Methods, W. C. Dixon, pp 431, NBS special publication No. 506, U.S. Department of Commerce, November 1978.

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Results are reported for each sample as:

1. Chrysotile Asbestos - Any fiber having an aspect ratio ≥ 3 and a length $\geq 5\mu$ that is in the operator's judgment chrysotile. In the event of doubt and in the absence of further information, any fiber having the above physical dimensions will also be counted as chrysotile.
2. Other Fiber - Any fiber having an aspect ratio ≥ 3 and a length $\geq 5\mu$ which could be mistaken for chrysotile due to its having similar properties.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA where

C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

SURVEY AIA-4: DRILLING MUD ADDITIVES

The AIA-4 study covered the operations involved with the use of fibrous asbestos as an additive to the circulating muds of an oil drilling rig. The work onsite was performed by one worker, and air samples were collected both outdoors and inside of a small trailer that housed the mud hopper.

The trailer was approximately 20 feet long by 8 feet wide with two open doors on opposite sides, each about 4 feet wide and extending from floor to ceiling. The mud hopper consisted of a 30-gallon drum open at the top with a suction hose connected at the bottom. The task of the worker was to slowly pour the asbestos material (dry) from a 50-pound bag into the drum. The material is fed into the drilling mud by the venturi action of the mud as it flows past the hose opening to the drum. Generally, four to six 50-pound bags of material are used during each addition and approximately 100 bags of material are used per drilling site in the area. The asbestos material is packaged in 50-pound paper bags that are sealed in a thick plastic outer covering. After the bag has been emptied, it is usually stored in a pile outside and disposed of either by burning or burial in a landfill at the site.

Conditions during the sampling varied. Generally, the wind was gusting slightly through the open doors of the trailer for both the first and second set of samples taken while the worker was pouring the product into the hopper. During the first pouring, the material fed smoothly into the hopper and six bags were poured in a 23.5-minute time interval. Some difficulty was experienced during the second pouring as the hopper

appeared to be clogged and only two bags were fed over the next 23 minutes. Considerable dusting was observed during both pourings.

Results for the nine air samples collected during this survey are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 Micron</u>
OCO-1	General air, center of trailer, approximately 6.5 feet above floor and 4 feet from dumping operation, during dumping of 6 bags	28	0.95
OCO-2	Worker exposure, pouring 6 bags of asbestos fiber into mud hopper	23.5	2.4
OCO-3	General air, directly over mud hopper, 6.5 feet above floor, during pouring of 6 bags	28.5	0.75
OCO-4	General air, background, approximately 50 feet upwind of trailer	50	0.016
OCO-5	General air (same location as OCO-1), no operations performed in trailer	43	0.090
OCO-6	General air (same location as OCO-3), no operations performed in trailer	43	0.036
OCO-7	General air (same location as OCO-1), during dumping of 2 bags	22.5	1.7
OCO-8	General air (same location as OCO-3), during pouring of 2 bags	20	2.9
OCO-9	Worker exposure, during dumping of 2 bags, hopper appeared to be clogged	23	7.0

Time-Weighted Averages

<u>Worker Type</u>	<u>TWA</u>
Mud hopper operator	0.51

013479

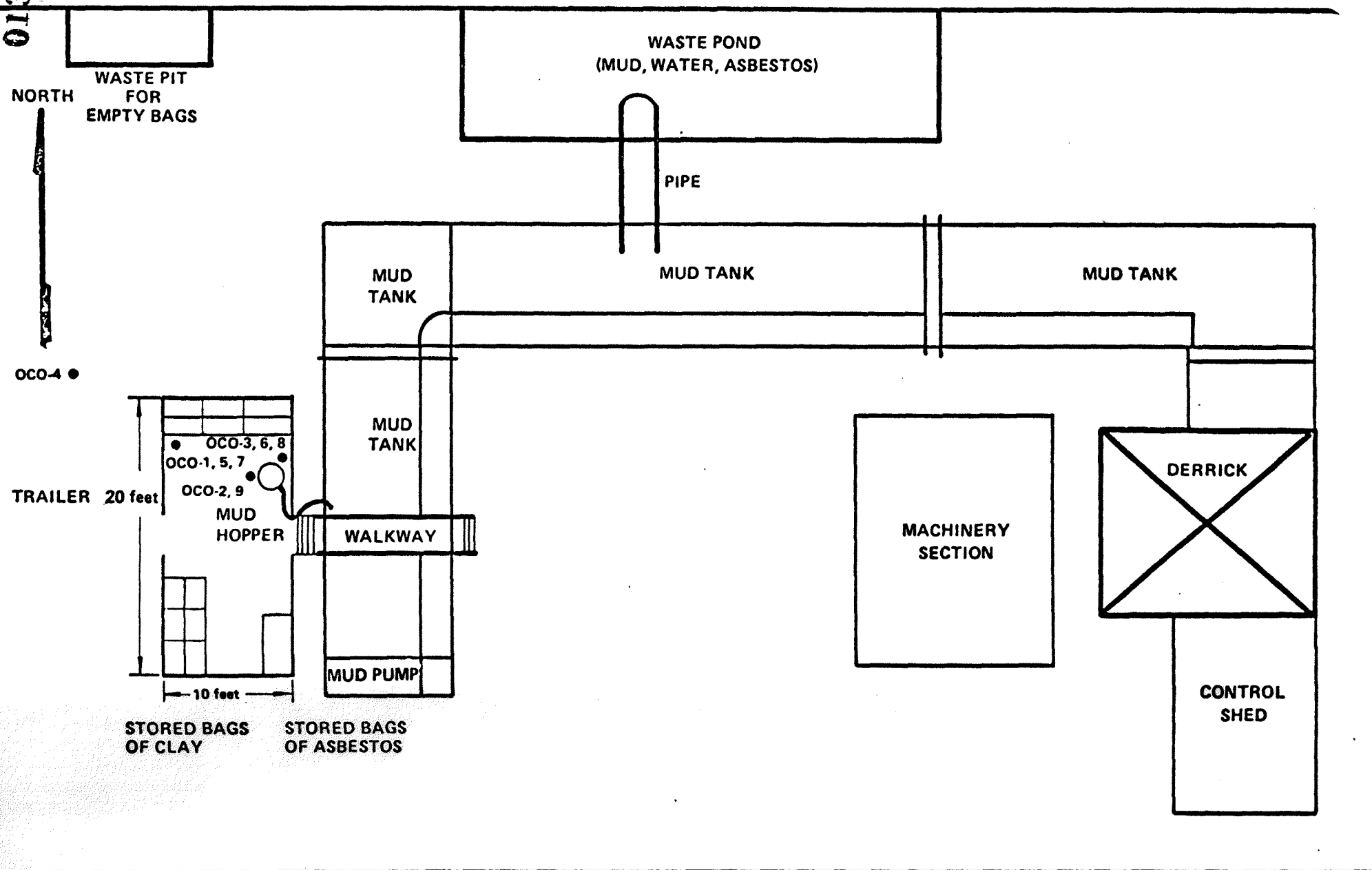


Figure 4. Work area diagram including sampling locations for survey AIA-4.

013430

AIRBORNE FIBER COUNTS
for
Shell Oil Company
At Various Locations Near Traverse City, Michigan

November 18, 1974

Samples Collected And Analyzed By:

E. J. Kleber
Union Carbide Corporation

Union Carbide Corporation
Mining and Metals Division
Niagara Falls, New York

OBJECTIVES

Determine the concentrations of airborne asbestos fiber generated during the use of New Granular Supervisbestos at a number of Shell Oil Company drilling rigs.

OPERATIONS MONITORED

Air Samples were collected September 24, 1974 at three drilling sites on Shell Oil properties known as Cactus #16, Cactus #21, and Cedco #37. 25 sacks weighing 50 pounds each were dumped at each location.

DESCRIPTION OF LOCATIONS AND SAMPLES COLLECTED

1. Cactus #16 - This location featured a mixing hopper with top about 3-1/2 ft. above the ground. Sacks were transported from the back of a truck located approximately 20 ft. from the hopper (Figure 1). Nine air samples were collected at this location; environmental (stationary) samples located 3-1/2 ft. off the ground, 7 ft. downwind from the hopper, were taken before the test, during the first dumping operation, between operations, during the second dump, and after the tests were complete. Personal breathing zone samples were collected from both operators during each of the two dumping operations. Sampling time included transportation of the sacks from truck to hopper, a distance of approximately 20 ft. 12 sacks were dumped in the first operation and 13 in the second.

2. Cactus #21 - The drilling rig operation was essentially similar to Cactus #16 with one exception. Asbestos was added to a hopper which was located in a mud house approximately 7 ft. x 7 ft. x 6 ft. The mud house was open on three sides, however, and the breeze was blowing throughout the test (Figure 2). Eight samples were collected at this location. Environmental (stationary) samples were collected 3 ft. from the hopper in the mud house during the first dumping operation; one between operations, one during the second dump and one after the completion of the operation. Personal breathing zone samples were collected from both operators during each dump. As in Cactus #16, sampling time included transportation of the sacks from truck to hopper, a distance of approximately 30 ft. 12 sacks were dumped in the first operation, and 13 in the second.

3. Cedco #37 - The drilling operation was essentially to Cactus #16 in that the hopper was outside and entirely exposed to the elements (Figure 3). One major difference in this test was that all 25 sacks were dumped at once. Three samples were collected at this rig. An environmental, located over the hopper, was collected upon completion of dumping. One had been attempted during dumping, but mud "blow back" spurted up from the hopper and destroyed the filter. Personal breathing zone samples were collected from both operators during the dump. All 25 sacks were dumped at one time in this operation and, again, sampling time included sack transportation, a distance of approximately 20 ft.

GENERAL CLIMATIC CONDITIONS

The test at Cactus #16 was marred by a sporadic light rain. The day improved slowly to scattered clouds by the time the tests ended. Temperatures hovered around 50° all day with a very gusty wind 10-25 mph.

EQUIPMENT AND PROCEDURE

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.93a, using the Bayer, Zummalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type) calibrated to 2 liters per minute were used to collect personal breathing zone and environmental samples on millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Vicker's phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

Reported as fibers greater than 5 microns in length per cubic centimeter of air sampled. A fiber is defined as a material having an aspect ratio greater than 3:1.

INTERPRETATION

The OSHA regulations have been established with a limit of 5 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes

time-weighted average where C = fiber count in fibers/cc and T = time.

The 8-hour time-weighted averages calculated below have been based on the assumption that New Granular Supervisbestos will be dumped only once a day. Also, due to a lack of sampling time available, environmental samples have been used in place of the normal personal breathing zone samples. They are noted and explained in each calculation.

1. Cactus #16

Calculations based on two personal breathing zones samples for each operator (M-9 and M-24 for David Kniss and M-8 and M-23 for Carl Wind) and two environmental samples (M-7 and M-20). Sample M-20, taken after completion of the test, was used to approximate the exposure during the bulk of the day.

A) David Kniss

$$\frac{(3.7)(5) + (0.4)(15) + (2.2)(6) + (0.2)(454)}{480}$$

$$= 0.27 \text{ fibers/cc TWA}$$

B) Carl Wind

$$\frac{(5.7)(5) + (0.4)(15) + (3.9)(6) + (0.2)(454)}{480}$$

$$= 0.31 \text{ fibers/cc TWA}$$

013483

2. Cactus #21

Calculations based on two personal breathing zone samples for each operator (M-16 and H-8 for Don Gustafson and M-22 and D-45 for Mike Jewett) and two environmental samples (M-18 and I-8). Sample I-8, taken after completion of the test, was used to approximate the exposure during the bulk of the day.

A) Don Gustafson

$$\frac{(6.7)(9) + (0.3)(20) + (2.1)(9) + (0.3)(442)}{480}$$

$$= 0.45 \text{ fibers/cc TWA}$$

B) Mike Jewett

$$\frac{(8.3)(9) + (0.3)(20) + (2.3)(9) + (0.3)(442)}{480}$$

$$= 0.49 \text{ fibers/cc TWA}$$

3. Cedco #37

Calculations based on one personal breathing zone sample for each operator (I-37 for Donald Thompson and J-23 for George Arnott) and one environmental sample (M-21) which was used as exposure for the bulk of the day.

A) Donald Thompson

$$\frac{(1.9)(15) + (0.4)(465)}{480}$$

$$= 0.45 \text{ fibers/cc TWA}$$

B) George Arnott

$$\frac{(0.7)(15) + (0.4)(465)}{480}$$

$$= 0.41 \text{ fibers/cc TWA}$$

SUMMARY OF FIBER COUNTS

013484

<u>Sample No.</u>	<u>Sampling Time</u>	<u>Description</u>	<u>Fibers/cc</u> <u>>5μ</u>
<u>Cactus #16</u>			
M-14	13 min.	Environmental - Located 3-1/2 ft. off ground, 7 ft. downwind from hopper prior to test.	0.1
M-9	5 min.	Personal - Operator (David Kniss) transporting 6 bags of New Granular Super-visbestos (NGSV) from truck to hopper and dumping them in.	3.7
M-8	5 min.	Personal - Operator (Carl Wind) transporting 6 sacks of NGSV from truck to hopper and dumping them in. Sample run simultaneously with M-9.	1.4
M-5	6 min.	Environmental - Located in same position as M-14 during first test (M-8 and M-9).	1.8
M-7	5 min.	Environmental - Located in same position as M-14 between runs.	0.4
M24	6 min.	Personal - Operator (David Kniss) transporting 6 sacks NGSV from truck to hopper and dumping. Sampling time includes transporting empty sacks to pit, a distance of about 30 ft.	2.2
M-23	6 min.	Personal - Operator (Carl Wind) transporting 7 sacks NGSV from truck to hopper and dumping. Sampling time includes transporting empty sacks to pit, a distance of about 30 ft. Sample run simultaneously with M-23.	3.9
M-25	7 min.	Environmental - Same location as M-14 during second test (M-23 and M-24).	1.3
M-20	13 min.	Environmental - Same location as M-14 after test.	0.2
<u>Cactus #21</u>			
M-16	9 min.	Personal - Operator (Don Gustafson) transporting 6 sacks NGSV from truck to mud house and dumping them in.	6.7
M-22	9 min.	Personal - Operator (Mike Jewett) transporting 6 sacks NGSV from truck to mud house and dumping. Sample run simultaneously with M-16.	8.3

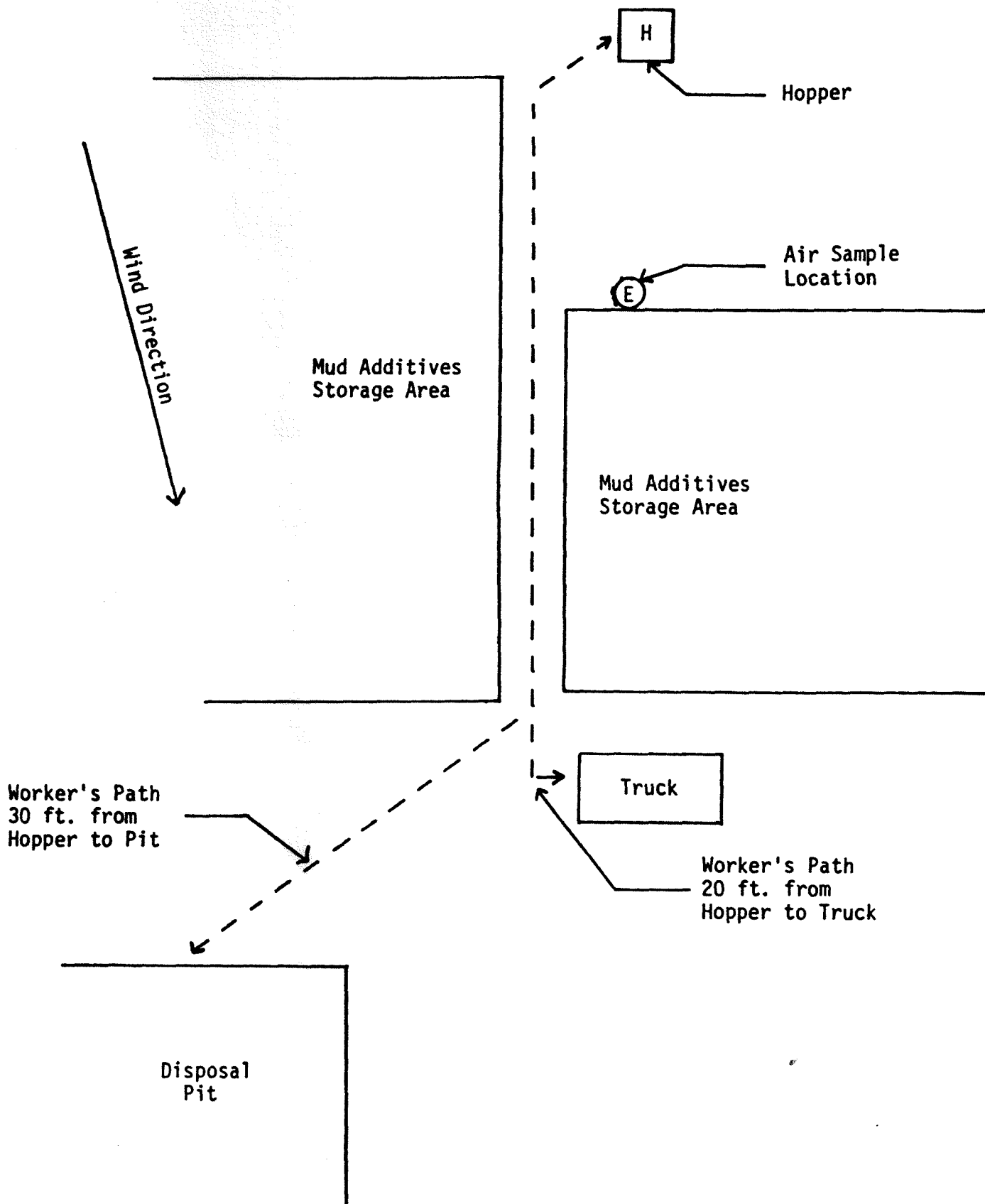
Summary of Fiber Counts - Continued

013485

<u>Sample No.</u>	<u>Sampling Time</u>	<u>Description</u>	<u>Fibers/cc</u> <u>>5μ</u>
M-17	10 min.	Environmental - Located in mud house, 5-1/2 ft. off floor, 3 ft. from hopper during test (M-22 and M-16).	0.4
M-18	20 min.	Environmental - Same location as M-17 between tests.	0.3
H-8	9 min.	Personal - Operator (Don Gustafson) transporting 7 sacks NGSV to mud house and dumping.	2.1
D-45	9 min.	Personal - Operator (Mike Jewett) transporting 6 sacks NGSV to mud house and dumping. Sample run simultaneous with H-8.	2.3
K-11	8 min.	Environmental - Same position as M-17 during test (D-45 and H-8).	1.6
I-8	13 min.	Environmental - Same position as M-17 after test.	0.3
<u>Cedco #37</u>			
I-37	15 min.	Personal - Operator (Donald Thompson) hauling 13 sacks NGSV from truck to hopper and dumping.	1.9
J-23	15 min.	Personal - Operator (George Arnott) hauling 12 sacks NGSV from truck to hopper and dumping.	0.7
M-21	13 min.	Environmental - Located directly over the hopper, after test.	0.4

FIGURE 1

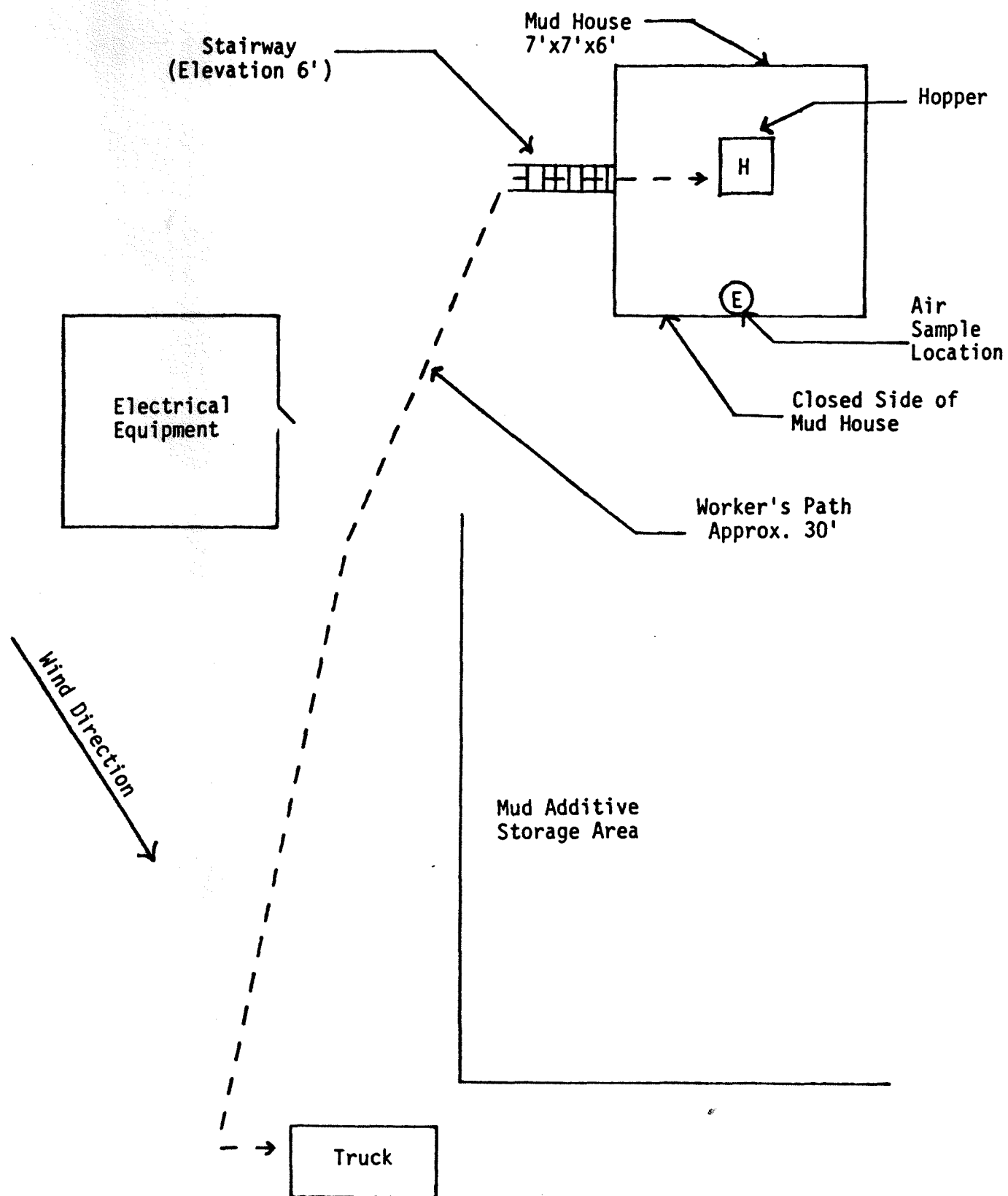
013486



CACTUS 16

FIGURE 2

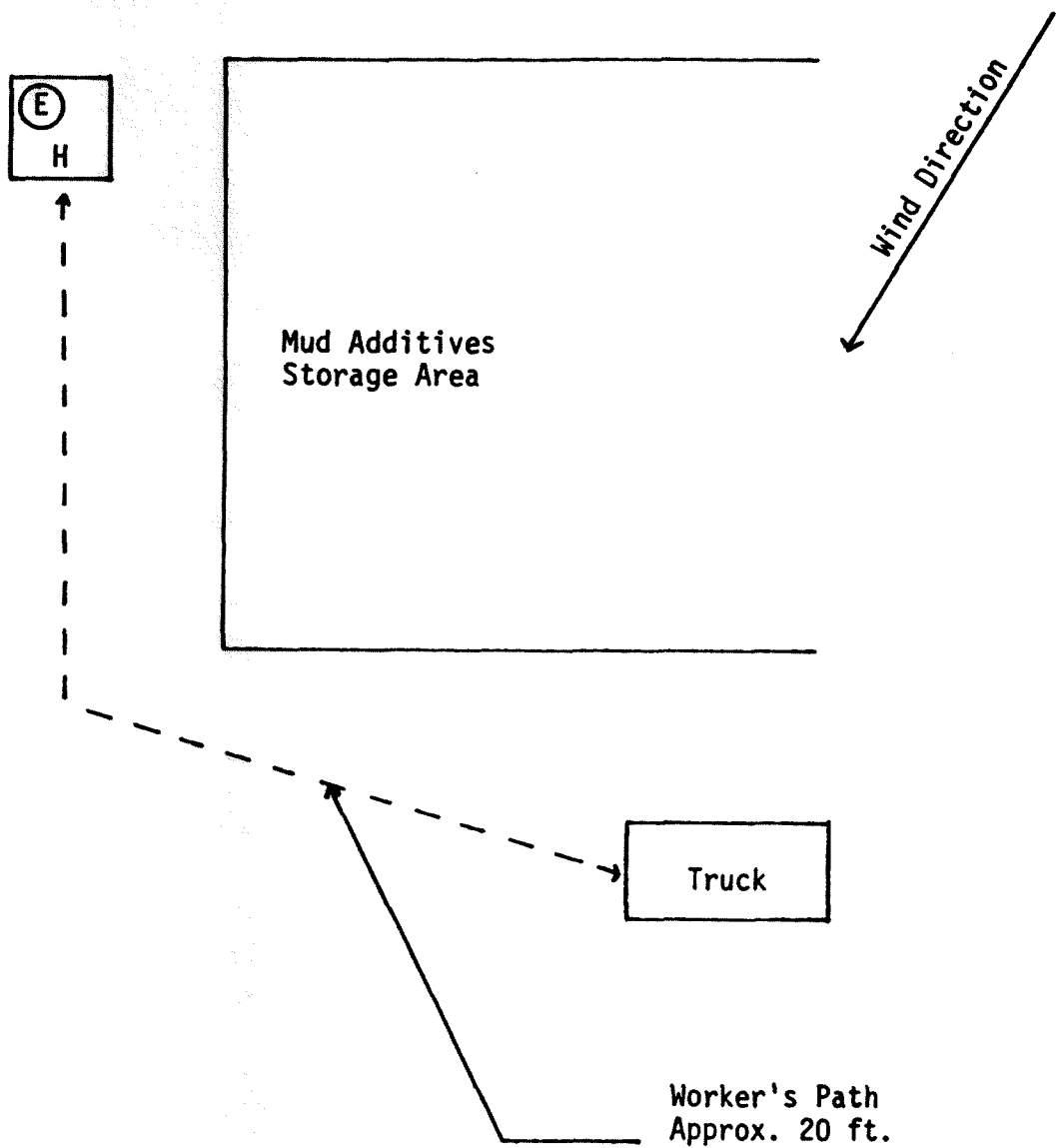
013487



CACTUS 21.

FIGURE 3

013488



CEDCO 37

013489

Unedited Shell
tests -
Names deleted.

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063

013490

AIRBORNE FIBER COUNTS

for

At Various Locations Near Traverse City, Michigan

November 18, 1974

Samples Collected And Analyzed By:

**E. J. Kleber
Union Carbide Corporation**

**Union Carbide Corporation
Mining and Metals Division
Niagara Falls, New York**

OBJECTIVES

Determine the concentrations of airborne asbestos fiber generated during the use of New Granular Supervisbestos at a number of [REDACTED] drilling rigs.

OPERATIONS MONITORED

Air Samples were collected September 24, 1974 at three drilling sites on [REDACTED] properties known as Cactus #16, Cactus #21, and Cedco #37. 25 sacks weighing 50 pounds each were dumped at each location.

DESCRIPTION OF LOCATIONS AND SAMPLES COLLECTED

1. Cactus #16 - This location featured a mixing hopper with top about 3-1/2 ft. above the ground. Sacks were transported from the back of a truck located approximately 20 ft. from the hopper (Figure 1). Nine air samples were collected at this location; environmental (stationary) samples located 3-1/2 ft. off the ground, 7 ft. downwind from the hopper, were taken before the test, during the first dumping operation, between operations, during the second dump, and after the tests were complete. Personal breathing zone samples were collected from both operators during each of the two dumping operations. Sampling time included transportation of the sacks from truck to hopper, a distance of approximately 20 ft. 12 sacks were dumped in the first operation and 13 in the second.

2. Cactus #21 - The drilling rig operation was essentially similar to Cactus #16 with one exception. Asbestos was added to a hopper which was located in a mud house approximately 7 ft. x 7 ft. x 6 ft. The mud house was open on three sides, however, and the breeze was blowing throughout the test (Figure 2). Eight samples were collected at this location. Environmental (stationary) samples were collected 3 ft. from the hopper in the mud house during the first dumping operation; one between operations, one during the second dump and one after the completion of the operation. Personal breathing zone samples were collected from both operators during each dump. As in Cactus #16, sampling time included transportation of the sacks from truck to hopper, a distance of approximately 30 ft. 12 sacks were dumped in the first operation, and 13 in the second.

3. Cedco #37 - The drilling operation was essentially to Cactus #16 in that the hopper was outside and entirely exposed to the elements (Figure 3). One major difference in this test was that all 25 sacks were dumped at once. Three samples were collected at this rig. An environmental, located over the hopper, was collected upon completion of dumping. One had been attempted during dumping, but mud "blow back" spurted up from the hopper and destroyed the filter. Personal breathing zone samples were collected from both operators during the dump. All 25 sacks were dumped at one time in this operation and, again, sampling time included sack transportation, a distance of approximately 20 ft.

GENERAL CLIMATIC CONDITIONS

The test at Cactus #16 was marred by a sporadic light rain. The day improved slowly to scattered clouds by the time the tests ended. Temperatures hovered around 50° all day with a very gusty wind 10-25 mph.

013492

EQUIPMENT AND PROCEDURE

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.93a, using the Bayer, Zummalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type) calibrated to 2 liters per minute were used to collect personal breathing zone and environmental samples on millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Vicker's phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

Reported as fibers greater than 5 microns in length per cubic centimeter of air sampled. A fiber is defined as a material having an aspect ratio greater than 3:1.

INTERPRETATION

The OSHA regulations have been established with a limit of 5 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\sum T}$ describes

time-weighted average where C = fiber count in fibers/cc and T = time.

The 8-hour time-weighted averages calculated below have been based on the assumption that New Granular Supervisbestos will be dumped only once a day. Also, due to a lack of sampling time available, environmental samples have been used in place of the normal personal breathing zone samples. They are noted and explained in each calculation.

1. Cactus #16

Calculations based on two personal breathing zones samples for each operator (M-9 and M-24 for [REDACTED] and M-8 and M-23 for [REDACTED]) and two environmental samples (M-7 and M-20). Sample M-20, taken after completion of the test, was used to approximate the exposure during the bulk of the day.

A) [REDACTED]

$$\frac{(3.7)(5) + (0.4)(15) + (2.2)(6) + (0.2)(454)}{480}$$

= 0.27 fibers/cc TWA

B) [REDACTED]

$$\frac{(5.7)(5) + (0.4)(15) + (3.9)(6) + (0.2)(454)}{480}$$

= 0.31 fibers/cc TWA

2. Cactus #21

Calculations based on two personal breathing zone samples for each operator (M-16 and H-8 for Don Gustafson and M-22 and D-45 for Mike Jewett) and two environmental samples (M-18 and I-8). Sample I-8, taken after completion of the test, was used to approximate the exposure during the bulk of the day.

A) Don Gustafson

$$\frac{(6.7)(9) + (0.3)(20) + (2.1)(9) + (0.3)(442)}{480}$$

$$= 0.45 \text{ fibers/cc TWA}$$

B) Mike Jewett

$$\frac{(8.3)(9) + (0.3)(20) + (2.3)(9) + (0.3)(442)}{480}$$

$$= 0.49 \text{ fibers/cc TWA}$$

3. Cedco #37

Calculations based on one personal breathing zone sample for each operator (I-37 for [REDACTED] and J-23 for [REDACTED]) and one environmental sample (M-21) which was used as exposure for the bulk of the day.

A) [REDACTED]

$$\frac{(1.9)(15) + (0.4)(465)}{480}$$

$$= 0.45 \text{ fibers/cc TWA}$$

B) [REDACTED]

$$\frac{(0.7)(15) + (0.4)(465)}{480}$$

$$= 0.41 \text{ fibers/cc TWA}$$

SUMMARY OF FIBER COUNTS

013494

<u>Sample No.</u>	<u>Sampling Time</u>	<u>Description</u>	<u>Fibers/cc</u> <u>>5μ</u>
<u>Cactus #16</u>			
M-14	13 min.	Environmental - Located 3-1/2 ft. off ground, 7 ft. downwind from hopper prior to test.	0.1
M-9	5 min.	Personal - Operator () transporting 6 bags of New Granular Super-visbestos (NGSV) from truck to hopper and dumping them in.	3.7
M-8	5 min.	Personal - Operator () transporting 6 sacks of NGSV from truck to hopper and dumping them in. Sample run simultaneously with M-9.	1.4
M-5	6 min.	Environmental - Located in same position as M-14 during first test (M-8 and M-9).	1.8
M-7	5 min.	Environmental - Located in same position as M-14 between runs.	0.4
M24	6 min.	Personal - Operator () transporting 6 sacks NGSV from truck to hopper and dumping. Sampling time includes transporting empty sacks to pit, a distance of about 30 ft.	2.2
M-23	6 min.	Personal - Operator () transporting 7 sacks NGSV from truck to hopper and dumping. Sampling time includes transporting empty sacks to pit, a distance of about 30 ft. Sample run simultaneously with M-23.	3.9
M-25	7 min.	Environmental - Same location as M-14 during second test (M-23 and M-24).	1.3
M-20	13 min.	Environmental - Same location as M-14 after test.	0.2
<u>Cactus #21</u>			
M-16	9 min.	Personal - Operator (Don Gustafson) transporting 6 sacks NGSV from truck to mud house and dumping them in.	6.7
M-22	9 min.	Personal - Operator (Mike Jewett) transporting 6 sacks NGSV from truck to mud house and dumping. Sample run simultaneously with M-16.	8.3

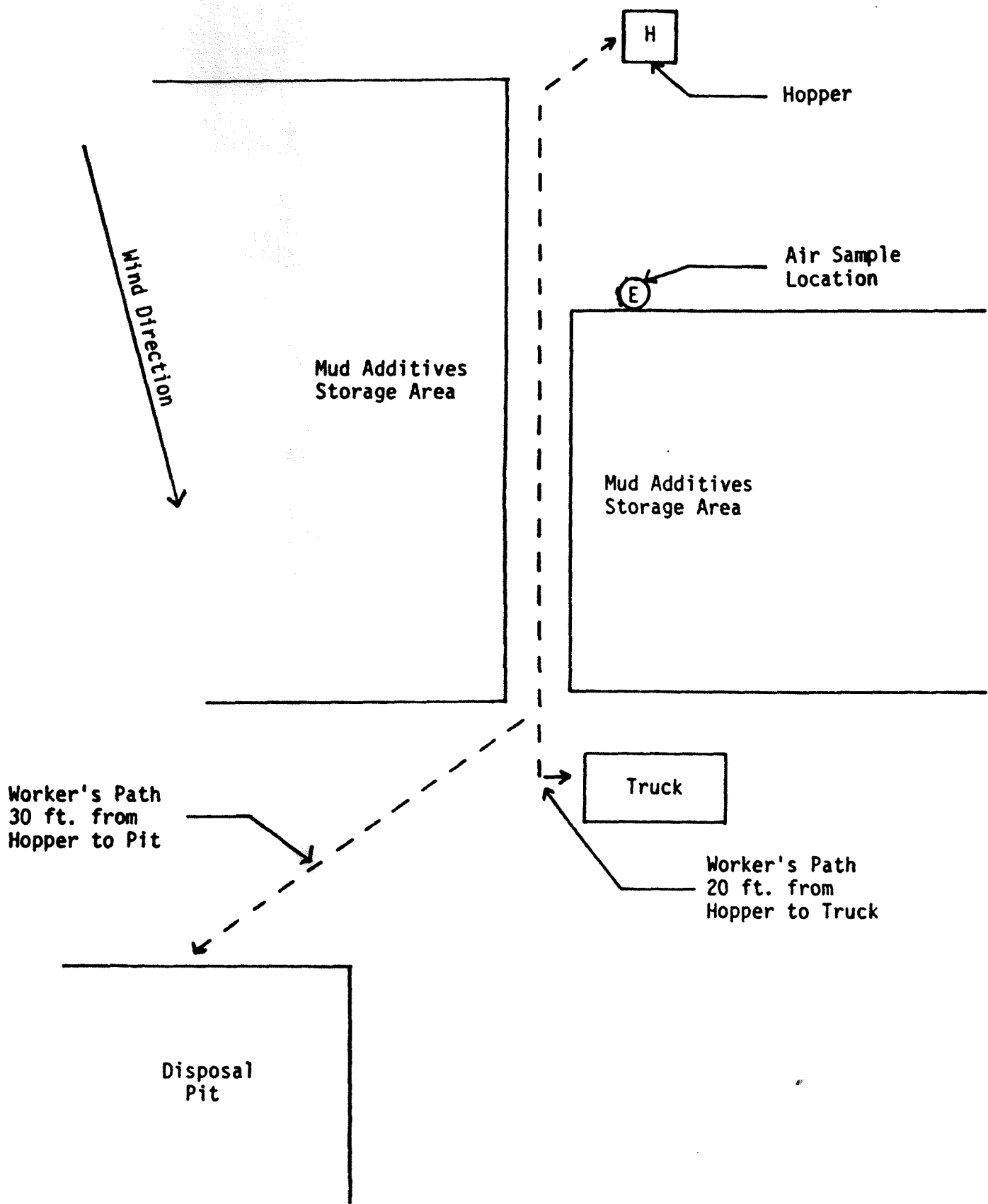
Summary of Fiber Counts - Continued

013495

<u>Sample No.</u>	<u>Sampling Time</u>	<u>Description</u>	<u>Fibers/cc</u> <u>> 5 μ</u>
M-17	10 min.	Environmental - Located in mud house, 5-1/2 ft. off floor, 3 ft. from hopper during test (M-22 and M-16).	0.4
M-18	20 min.	Environmental - Same location as M-17 between tests.	0.3
H-8	9 min.	Personal - Operator (Don Gustafson) transporting 7 sacks NGSV to mud house and dumping.	2.1
D-45	9 min.	Personal - Operator (Mike Jewett) transporting 6 sacks NGSV to mud house and dumping. Sample run simultaneous with H-8.	2.3
K-11	8 min.	Environmental - Same position as M-17 during test (D-45 and H-8).	1.6
I-8	13 min.	Environmental - Same position as M-17 after test.	0.3
<u>Cedco #37</u>			
I-37	15 min.	Personal - Operator () hauling 13 sacks NGSV from truck to hopper and dumping.	1.9
J-23	15 min.	Personal - Operator () hauling 12 sacks NGSV from truck to hopper and dumping.	0.7
M-21	13 min.	Environmental - Located directly over the hopper, after test.	0.4

FIGURE 1

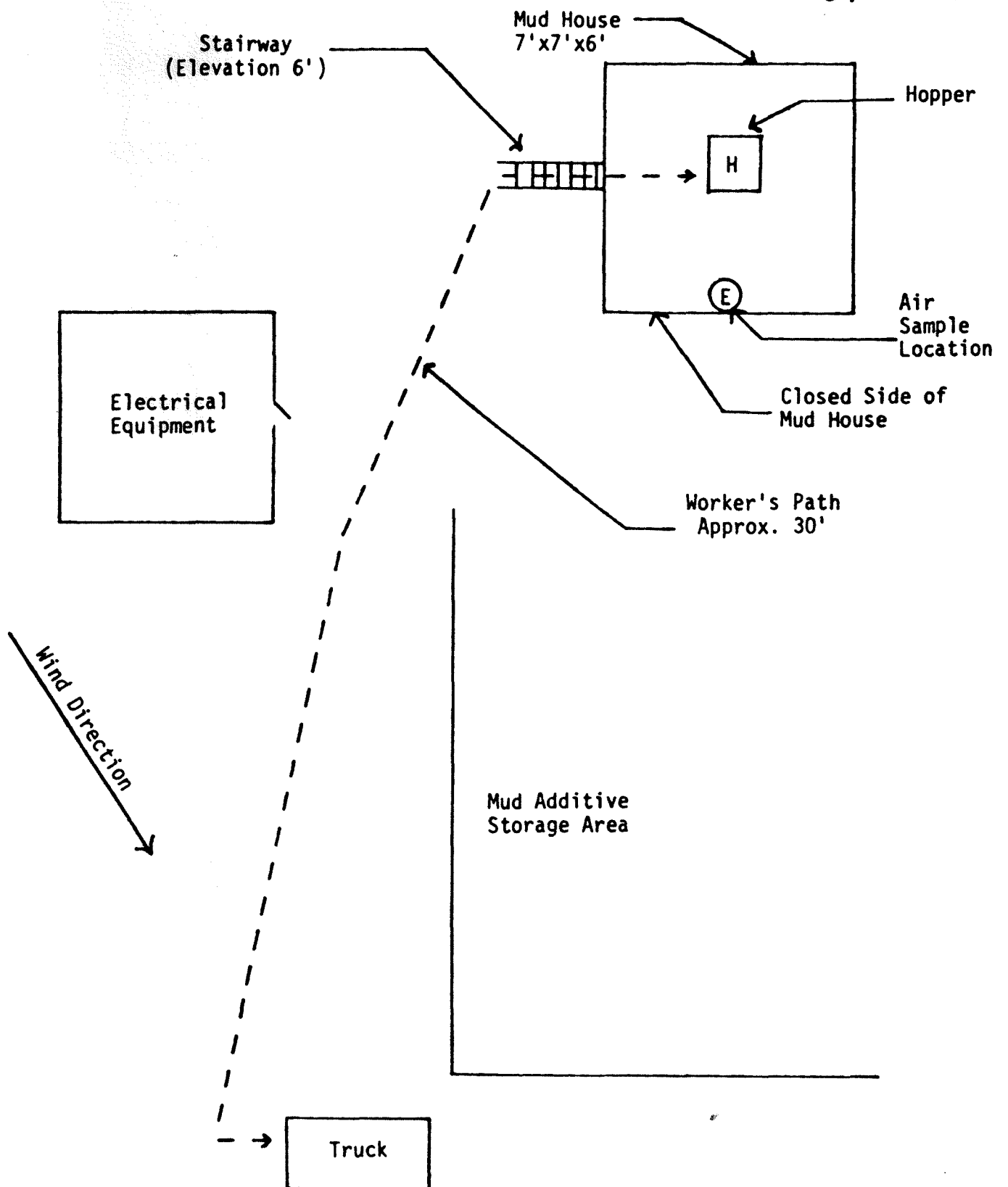
013496



CACTUS 16

FIGURE 2

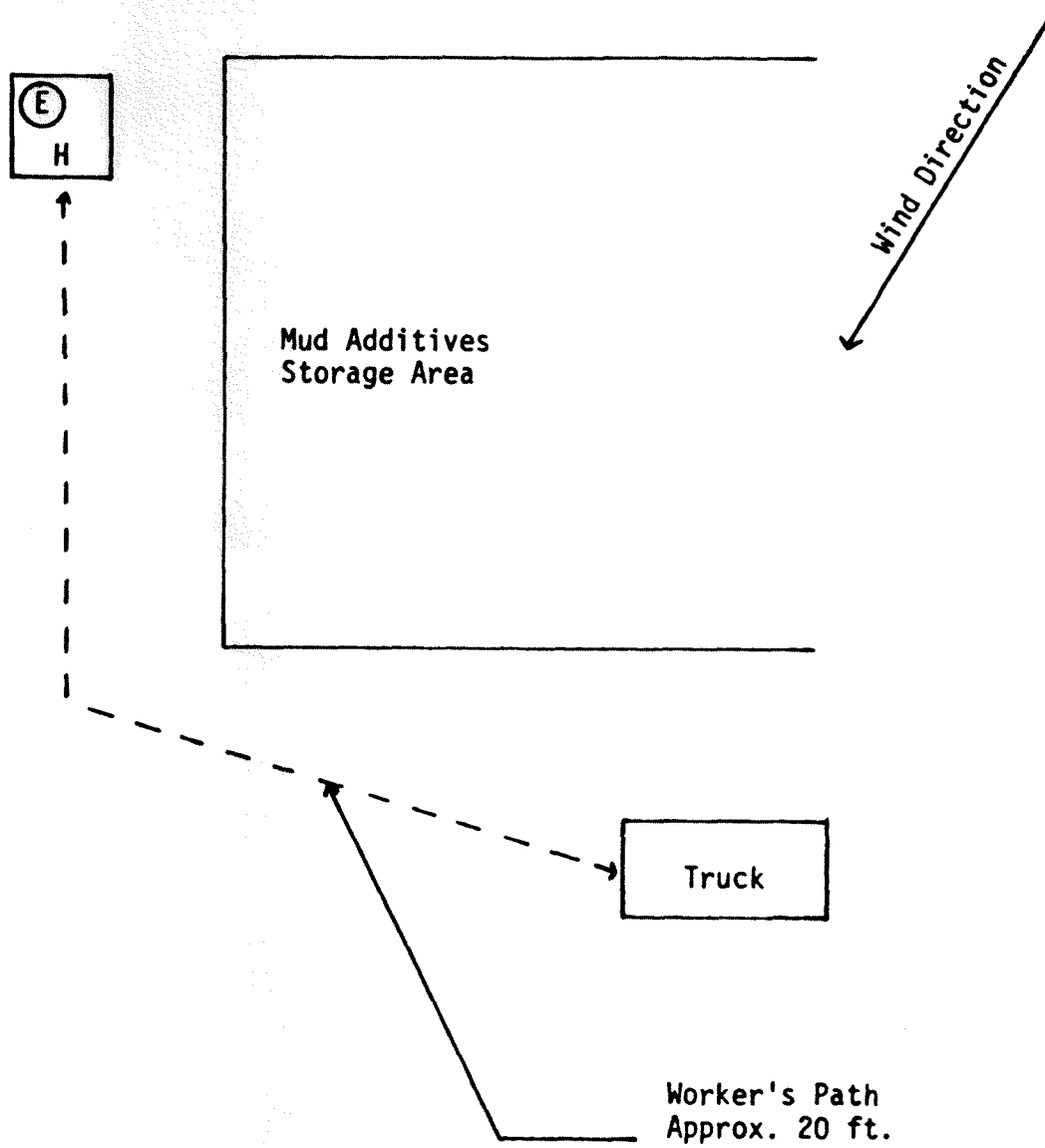
013497



CACTUS 21.

FIGURE 3

013498



CEDCO 37

013499



THE DISCOVERY COMPANY

Calidria ASBESTOS

UNION CARBIDE CORPORATION • MINING & METALS DIVISION • P.O. BOX 579 • NIAGARA FALLS, N. Y. 14302 • TEL: 716-278-3376

December 17, 1974

Mr. Kenneth N. Campbell
Montello, Inc.
P. O. Box 130
Sand Springs, OK 74063

Dear Ken:

Listed below are the results of our air sampling tests conducted at Kinnco's Warehouse, Kalkaska, Michigan, September 24, 1974. As you can see, one sample just squeezed over the 10 fiber/cc ceiling concentration limit. Since Shell's Industrial Hygienist did not express any interest in the results of the warehouse fiber counts, we chose not to include them in the main report. The fiber counts follow:

Sample No	Sampling Time	Description	Fibers/cc 754
M-11	13 Min.	Environmental - Located in warehouse, 5 ft. off floor, attached to Super Visbestos Pallet. No activity in warehouse.	0.4
M-12	4 Min.	Personal - Operator (J. McDowell) removing bags of New Granular Super Visbestos from pallets and handing them to men in truck.	10.2
M-4	4 Min.	Personal - Operator (L. Kinney) taking bags from J. McDowell and placing in truck.	3.6

If you need any more information on these tests, please let me know.

If we do not get the opportunity to speak before Christmas, please accept my sincere wishes for a Happy Holiday Season.

Best Regards,

E. J. Kleber
Customer Service Representative

cc: Dr. H. B. Rhodes
/ds



013500



THE DISCOVERY COMPANY

UNION CARBIDE CORPORATION • MINING & METALS DIVISION • P.O. BOX 579 • NIAGARA FALLS, N. Y. 14302 • TEL: 716-278-3376

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If you need any more information on these tests, please let me know.

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E. J. Kleber
Customer Service Representative

cc: Dr. H. B. Rhodes
/ds

SHELL OIL COMPANY

DATE OCTOBER 31, 1974

TO WESTERN E & P REGION
MID-CONTINENT DIVISION
MICHIGAN OPERATIONS - MANAGER

FROM INDUSTRIAL HYGIENIST
DEPARTMENT OF OCCUPATIONAL
SAFETY AND HEALTH - WOOD RIVER

SUBJECT GRANULAR ASBESTOS SURVEY

Personal sampling tests were made on September 24 at three drilling sites to evaluate workers' exposure to airborne concentrations of asbestos fibers during mud mixing operations, using the Montello New Granular Super Visbestos pelleted product. Mr. E. J. Kleber, Customer Service Representative, Union Carbide Corporation, took samples concurrently along with these. The purpose of the tests was to compare the exposures using this product with those taken on June 3 and 4 using the Montello Super Visbestos material (the same asbestos in a loose fluffy form).

At each of the sites, 25 bags of asbestos were carried from a truck to the hopper, opened and mixed, and with the exception of Cactus Rig #21 the empty bags were carried to a dump site. Handling conditions at each of these and the June sites were different; these tests involved sampling times of about 12 to 18 minutes with 25 bags; the June tests involved about 5 minutes with 6 bags.

The table below shows the average exposure for each man for the total sampling time involved, and his time-weighted average as calculated for an 8-hour shift with an assumed background concentration of 0.2 fibers/ml for the balance of the shift not involved in the sampling period. This arbitrary background figure weighs heavily on the 8-hour average, due to the short actual exposure times, but would not be considered an excessive estimate for the purpose of these evaluations. The first three sites are the September tests, the last two are the June tests, evaluated the same way for ease of comparison.

<u>Location</u>	<u>Name</u>	<u>Total Sampling Time (Minutes)</u>	<u>Average Fibers/ml</u>	<u>8-Hour Average with Background</u>
(September: New Granular Super Visbestos)			<u>Ceiling</u>	<u>TWA</u>
Cactus	C. Wind	11.8	3.40	0.28
Rig #16	D. Kniss	11.8	6.34	0.35
Cactus	D. Gustafson	18.2	6.37	0.43
Rig #21	M. Jewett	18.2	2.72	0.30
Cedco	D. Thompson	16.3	0.60	0.21
Rig #37	G. Arnott	16.3	0.58	0.21
(June: Super Visbestos)				
Cactus	J. Jensen	5.25	11.64	0.33
Rig #21	M. Porter	5.25	1.07	0.21
Chapman	E. Minnie	5.0	1.99	0.22
Rig #8	D. Reinwater	5.0	0.67	0.20

		(1) <u>Total Count</u> <u>on Filter</u>	(2) <u>Air,</u> <u>Liters</u>	(3) <u>Fibers</u> <u>per ml</u>
	<u>Designation</u>			
Wind	EPT-07	21,800	10.0	2.18
Kniss	EPT-08	36,000	10.0	3.60
Wind	EPT-09	58,500	13.6	4.30
Kniss	EPT-10	113,600	13.6	8.35
Gustafson	EPT-11	154,000	19.0	8.10
Jewett	EPT-12	71,000	19.0	3.74
Gustafson	EPT-13	78,000	17.4	4.48
Jewett	EPT-14	27,800	17.4	1.60
Thompson	EPT-15	19,600	32.6	0.60
Arnott	EPT-16	18,800	32.6	0.58

The last two samples (15,16) are somewhat unusual in having an extremely large number of sub-micron particles that give a grey appearance to the filter. This fact does not, of course, influence the fiber count.

1. Add Total Count (1) for 2 runs.
2. Add equiv. liters (2) & divide into above.
3. Result is "Ave. F./ml" on first page.

SHELL OIL COMPANY

013503

DATE JULY 17, 1974

TO WESTERN E & P REGION
MID-CONTINENT DIVISION
MICHIGAN OPERATIONS - MANAGER

FROM INDUSTRIAL HYGIENIST
DEPARTMENT OF OCCUPATIONAL
SAFETY AND HEALTH - WOOD RIVER

SUBJECT ASBESTOS SURVEY

Personal sampling tests were conducted at the Cactus Rig No. 21 on June 3 and Chapman Rig No. 8 on June 4, to evaluate workers' exposure to airborne concentrations of asbestos fibers during mud mixing operations. The six sampling sheets and Bellaire report on fiber counts is enclosed for your files (Enclosure 1).

At Cactus Rig No. 21, Mike Porter tossed eight bags of Super Visbestos over a stack of bags to Jack Jensen, and Jensen poured six bags into the hopper with Porter's assistance. Wind conditions were light. The hopper was at a level sufficiently high enough to place the bag opening about a foot from Porter's face while pouring the asbestos. The total time involved 5-1/4 minutes. The combined value of the two samples on ^{Jensen}Porter (1 and 3) is 11.64 fibers per cubic centimeter. ^{Porter's}Jensen's samples (2 and 4) combined to give 1.07 fibers/cc.

On the Chapman Rig No. 8 site, Emerson Minnie carried six bags of Super Visbestos to the hopper and assisted Dennis Reinwater, who poured the material into the hopper. The wind was strong, blowing across the hopper towards the men. This hopper was about waist high, placing the bag opening about two feet from Reinwater's face. The total time of the operation was five minutes. Minnie's exposure (sample 5) was 1.99 fibers/cc, and Reinwater's (6) was 0.67 fibers/cc.

Designation	Total Count on Filter	Air, Liters	Fibers/ml Air
Jensen - 1 EPT-01	25,800	8.0	3.2
Porter - 2 EPT-02	6,700	8.0	0.8
Jensen - 3 EPT-03 (1st count)	112,000	2.5	44.8
Jensen - 3 EPT-03 (2nd count)	81,000	2.5	32.4
Porter - 4 EPT-04	4,500	2.5	1.8
M. Miller - 5 EPT-05	19,900	10.0	2.0
Remington - 6 EPT-06	6,700	10.0	0.7

1-3 (Jensen) recap: - He caught Bags

$$25,800 + 112,000 = 137,800 \div 10.5 = 13.17$$

$$25,800 + 81,000 = 106,800 \div 10.5 = 10.17$$

$$23.29 \div 2 = \textcircled{11.64}$$

SHELL OIL COMPANY

013505

DATE OCTOBER 31, 1974

TO WESTERN E & P REGION
MID-CONTINENT DIVISION
MICHIGAN OPERATIONS - MANAGER

FROM INDUSTRIAL HYGIENIST
DEPARTMENT OF OCCUPATIONAL
SAFETY AND HEALTH - WOOD RIVER

SUBJECT GRANULAR ASBESTOS SURVEY

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Thompson	EPT-15	19,600	32.6	0.60
Arnott	EPT-16	18,800	32.6	0.58

The last two samples (15,16) are somewhat unusual in having an extremely large number of sub-micron particles that give a grey appearance to the filter. This fact does not, of course, influence the fiber count.

SHELL OIL COMPANY

013507

DATE JULY 17, 1974

TO WESTERN E & P REGION
MID-CONTINENT DIVISION
MICHIGAN OPERATIONS - MANAGER

FROM INDUSTRIAL HYGIENIST
DEPARTMENT OF OCCUPATIONAL
SAFETY AND HEALTH - WOOD RIVER

SUBJECT ASBESTOS SURVEY

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EPT-03 (1st count)	112,000	2.5	44.8
EPT-03 (2nd count)	81,000	2.5	32.4
EPT-04	4,500	2.5	1.8
EPT-05	19,900	10.0	2.0
EPT-06	6,700	10.0	0.7

013509

AIRBORNE FIBER COUNTS

for

**Shell Oil Company
At Various Locations Near Traverse City, Michigan**

November 18, 1974

Samples Collected And Analyzed By:

**E. J. Kleber
Union Carbide Corporation**

**Union Carbide Corporation
Mining and Metals Division
Niagara Falls, New York**

OBJECTIVES

Determine the concentrations of airborne asbestos fiber generated during the use of New Granular Supervisbestos at a number of Shell Oil Company drilling rigs.

OPERATIONS MONITORED

Air Samples were collected September 24, 1974 at three drilling sites on Shell Oil properties known as Cactus #16, Cactus #21, and Cedco #37. 25 sacks weighing 50 pounds each were dumped at each location.

DESCRIPTION OF LOCATIONS AND SAMPLES COLLECTED

1. Cactus #16 - This location featured a mixing hopper with top about 3-1/2 ft. above the ground. Sacks were transported from the back of a truck located approximately 20 ft. from the hopper (Figure 1). Nine air samples were collected at this location; environmental (stationary) samples located 3-1/2 ft. off the ground, 7 ft. downwind from the hopper, were taken before the test, during the first dumping operation, between operations, during the second dump, and after the tests were complete. Personal breathing zone samples were collected from both operators during each of the two dumping operations. Sampling time included transportation of the sacks from truck to hopper, a distance of approximately 20 ft. 12 sacks were dumped in the first operation and 13 in the second.

2. Cactus #21 - The drilling rig operation was essentially similar to Cactus #16 with one exception. Asbestos was added to a hopper which was located in a mud house approximately 7 ft. x 7 ft. x 6 ft. The mud house was open on three sides, however, and the breeze was blowing throughout the test (Figure 2). Eight samples were collected at this location. Environmental (stationary) samples were collected 3 ft. from the hopper in the mud house during the first dumping operation; one between operations, one during the second dump and one after the completion of the operation. Personal breathing zone samples were collected from both operators during each dump. As in Cactus #16, sampling time included transportation of the sacks from truck to hopper, a distance of approximately 30 ft. 12 sacks were dumped in the first operation, and 13 in the second.

3. Cedco #37 - The drilling operation was essentially to Cactus #16 in that the hopper was outside and entirely exposed to the elements (Figure 3). One major difference in this test was that all 25 sacks were dumped at once. Three samples were collected at this rig. An environmental, located over the hopper, was collected upon completion of dumping. One had been attempted during dumping, but mud "blow back" spurted up from the hopper and destroyed the filter. Personal breathing zone samples were collected from both operators during the dump. All 25 sacks were dumped at one time in this operation and, again, sampling time included sack transportation, a distance of approximately 20 ft.

GENERAL CLIMATIC CONDITIONS

The test at Cactus #16 was marred by a sporadic light rain. The day improved slowly to scattered clouds by the time the tests ended. Temperatures hovered around 50° all day with a very gusty wind 10-25 mph.

EQUIPMENT AND PROCEDURE

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.93a, using the Bayer, Zummalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type) calibrated to 2 liters per minute were used to collect personal breathing zone and environmental samples on millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Vicker's phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

Reported as fibers greater than 5 microns in length per cubic centimeter of air sampled. A fiber is defined as a material having an aspect ratio greater than 3:1.

INTERPRETATION

The OSHA regulations have been established with a limit of 5 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\sum T}$ describes

time-weighted average where C = fiber count in fibers/cc and T = time.

The 8-hour time-weighted averages calculated below have been based on the assumption that New Granular Supervisbestos will be dumped only once a day. Also, due to a lack of sampling time available, environmental samples have been used in place of the normal personal breathing zone samples. They are noted and explained in each calculation.

1. Cactus #16

Calculations based on two personal breathing zones samples for each operator (M-9 and M-24 for David Kniss and M-8 and M-23 for Carl Wind) and two environmental samples (M-7 and M-20). Sample M-20, taken after completion of the test, was used to approximate the exposure during the bulk of the day.

A) David Kniss

$$\frac{(3.7)(5) + (0.4)(15) + (2.2)(6) + (0.2)(454)}{480}$$

= 0.27 fibers/cc TWA

B) Carl Wind

$$\frac{(5.7)(5) + (0.4)(15) + (3.9)(6) + (0.2)(454)}{480}$$

= 0.31 fibers/cc TWA

013512

2. Cactus #21

Calculations based on two personal breathing zone samples for each operator (M-16 and H-8 for Don Gustafson and M-22 and D-45 for Mike Jewett) and two environmental samples (M-18 and I-8). Sample I-8, taken after completion of the test, was used to approximate the exposure during the bulk of the day.

A) Don Gustafson

$$\frac{(6.7)(9) + (0.3)(20) + (2.1)(9) + (0.3)(442)}{480}$$

$$= 0.45 \text{ fibers/cc TWA}$$

B) Mike Jewett

$$\frac{(8.3)(9) + (0.3)(20) + (2.3)(9) + (0.3)(442)}{480}$$

$$= 0.49 \text{ fibers/cc TWA}$$

3. Cedco #37

Calculations based on one personal breathing zone sample for each operator (I-37 for Donald Thompson and J-23 for George Arnott) and one environmental sample (M-21) which was used as exposure for the bulk of the day.

A) Donald Thompson

$$\frac{(1.9)(15) + (0.4)(465)}{480}$$

$$= 0.45 \text{ fibers/cc TWA}$$

B) George Arnott

$$\frac{(0.7)(15) + (0.4)(465)}{480}$$

$$= 0.41 \text{ fibers/cc TWA}$$

SUMMARY OF FIBER COUNTS

013513

<u>Sample No.</u>	<u>Sampling Time</u>	<u>Description</u>	<u>Fibers/cc >5μ</u>
<u>Cactus #16</u>			
M-14	13 min.	Environmental - Located 3-1/2 ft. off ground, 7 ft. downwind from hopper prior to test.	0.1
M-9	5 min.	Personal - Operator (David Kniss) transporting 6 bags of New Granular Super-visbestos (NGSV) from truck to hopper and dumping them in.	3.7
M-8	5 min.	Personal - Operator (Carl Wind) transporting 6 sacks of NGSV from truck to hopper and dumping them in. Sample run simultaneously with M-9.	1.4
M-5	6 min.	Environmental - Located in same position as M-14 during first test (M-8 and M-9).	1.8
M-7	5 min.	Environmental - Located in same position as M-14 between runs.	0.4
M24	6 min.	Personal - Operator (David Kniss) transporting 6 sacks NGSV from truck to hopper and dumping. Sampling time includes transporting empty sacks to pit, a distance of about 30 ft.	2.2
M-23	6 min.	Personal - Operator (Carl Wind) transporting 7 sacks NGSV from truck to hopper and dumping. Sampling time includes transporting empty sacks to pit, a distance of about 30 ft. Sample run simultaneously with M-23.	3.9
M-25	7 min.	Environmental - Same location as M-14 during second test (M-23 and M-24).	1.3
M-20	13 min.	Environmental - Same location as M-14 after test.	0.2
<u>Cactus #21</u>			
M-16	9 min.	Personal - Operator (Don Gustafson) transporting 6 sacks NGSV from truck to mud house and dumping them in.	6.7
M-22	9 min.	Personal - Operator (Mike Jewett) transporting 6 sacks NGSV from truck to mud house and dumping. Sample run simultaneously with M-16.	8.3

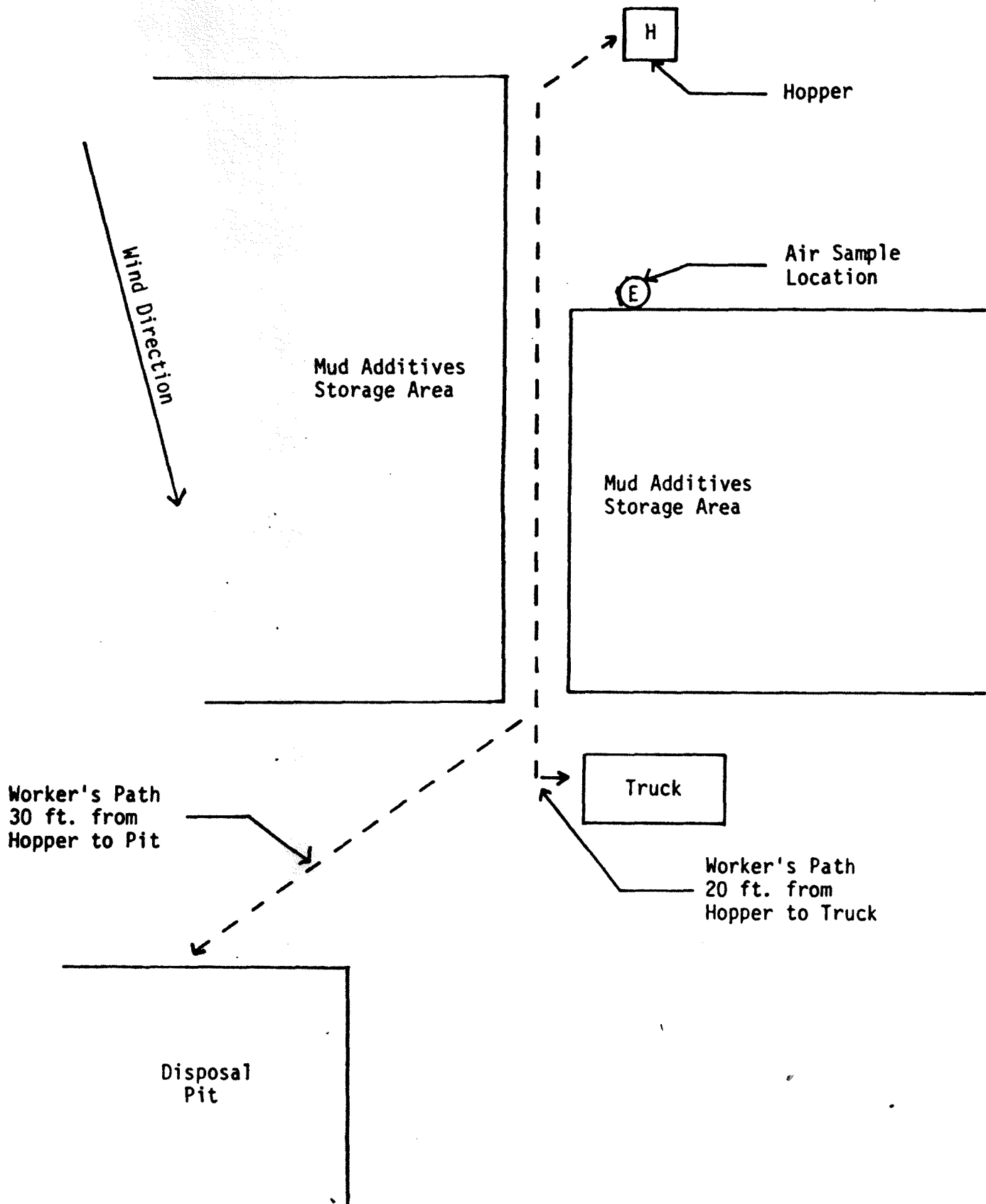
Summary of Fiber Counts - Continued

013514

<u>Sample No.</u>	<u>Sampling Time</u>	<u>Description</u>	<u>Fibers/cc</u> <u>>5μ</u>
M-17	10 min.	Environmental - Located in mud house, 5-1/2 ft. off floor, 3 ft. from hopper during test (M-22 and M-16).	0.4
M-18	20 min.	Environmental - Same location as M-17 between tests.	0.3
H-8	9 min.	Personal - Operator (Don Gustafson) transporting 7 sacks NGSV to mud house and dumping.	2.1
D-45	9 min.	Personal - Operator (Mike Jewett) transporting 6 sacks NGSV to mud house and dumping. Sample run simultaneous with H-8.	2.3
K-11	8 min.	Environmental - Same position as M-17 during test (D-45 and H-8).	1.6
I-8	13 min.	Environmental - Same position as M-17 after test.	0.3
<u>Cedco #37</u>			
I-37	15 min.	Personal - Operator (Donald Thompson) hauling 13 sacks NGSV from truck to hopper and dumping.	1.9
J-23	15 min.	Personal - Operator (George Arnott) hauling 12 sacks NGSV from truck to hopper and dumping.	0.7
M-21	13 min.	Environmental - Located directly over the hopper, after test.	0.4

FIGURE 1

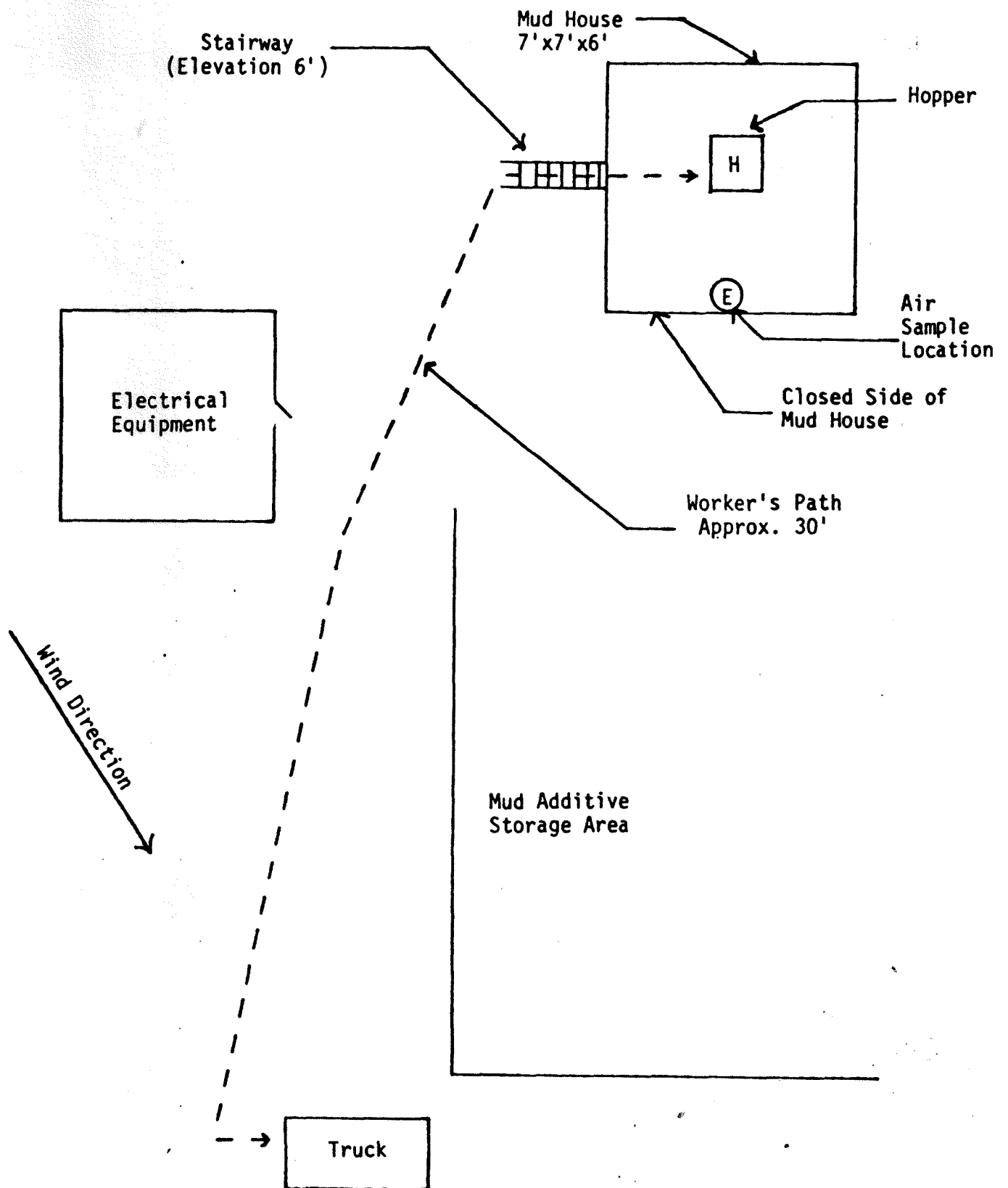
013515



CACTUS 16

FIGURE 2

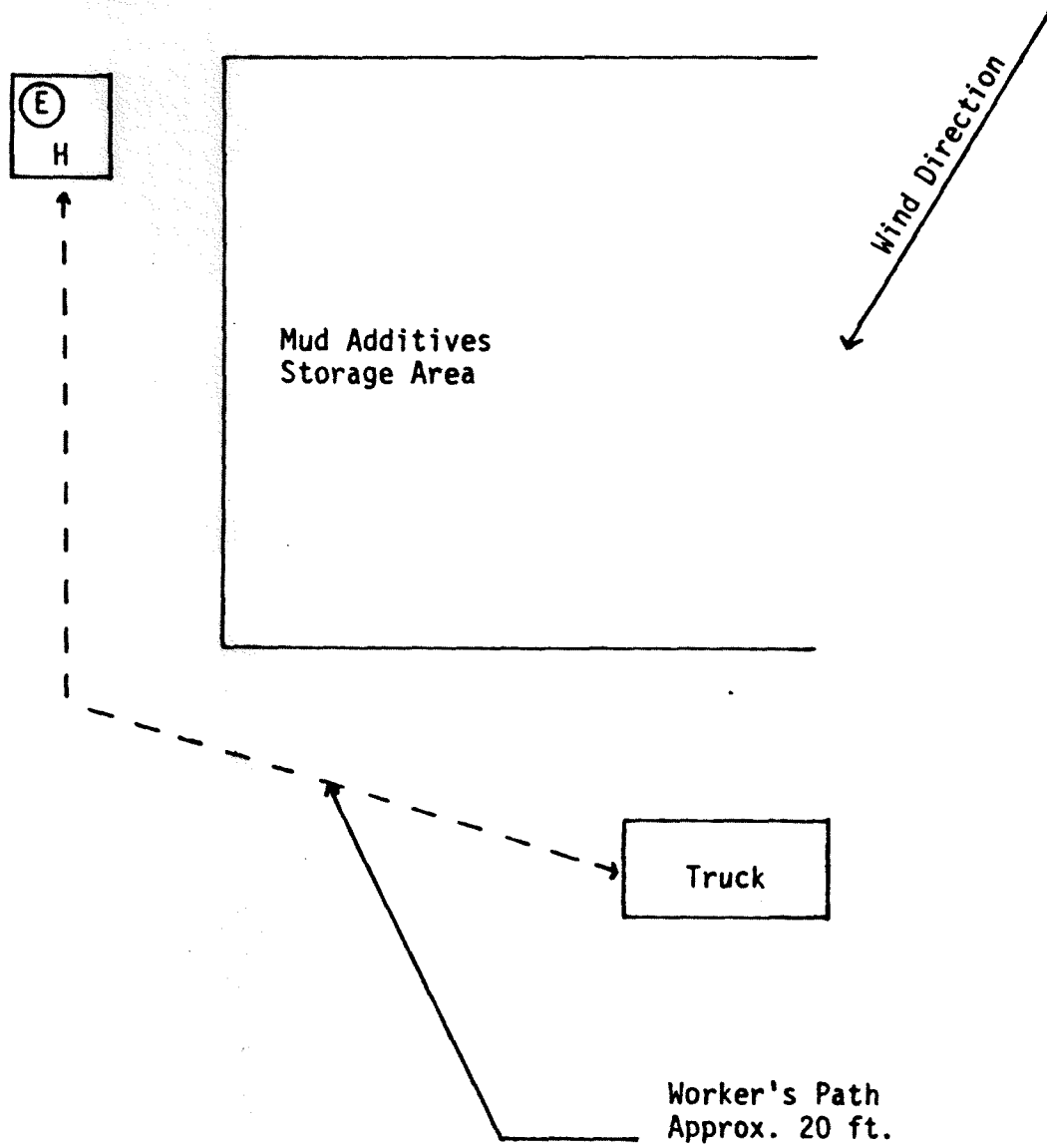
013516



CACTUS 21.

FIGURE 3

013517



CEDCO 37

DOME PETROLEUM LIMITED

R. C. J. JAMES
VICE PRESIDENT, OIL PRODUCTION

P.O. Box 200
CALGARY, CANADA
T2P 2H8

TELEPHONE
267-3910
(AREA 403)

013518

July 29, 1976

Montello
P.O. Box 130
Sand Springs, Oklahoma
U.S.A. 74063

Dear Sirs:

Re: Super Visbestos

Please send one complimentary copy of "Airborne Asbestos
Dust Concentrations in Drilling Fluid Operations" to the attention
of W. R. Bohdan at the above address.

Yours very truly,

DOME PETROLEUM LIMITED

for E. M. Look
W. R. Bohdan
Drilling Engineer

/el

013519

Industrial Dust

Surveys and Analyses

Airborne Contaminants
Environmental Testing Services
Provided By
National Gypsum Company

An environmental testing service supported by the most advanced testing facilities

The Occupational Safety and Health Act of 1970 (OSHA) has created increased awareness and concern on the industrial scene. To implement this act, certain rules and regulations pertaining to Occupational Health and Environmental Control have been promulgated by O.S.H.A. These rules and regulations state specific limits of employees' exposure to hazardous substances and what action must be taken to achieve compliance as related to acceptable industrial hygiene practices. The Mining Enforcement and Safety Administration (MESA) administers certain functions under the Federal Metal and Non-metallic Mine Safety Act and establishes other rules and regulations pertaining to air quality standards.

The NGC Research Center maintains and operates Environmental Laboratories at 1650 Military Rd., Buffalo, N.Y. The most up-to-date laboratory facilities and testing procedures are used by highly trained technical personnel in determining in-plant environmental problems. The Environmental Laboratories take great pride in its expertise in developing data and in providing analyses for its clients.

Specifically the NGC Research Center can perform the following services for its clients to establish compliance with OSHA and MESA regulations:

1. Comprehensive base-line airborne contaminants studies can be conducted at the clients' plants. Qualified NGC Research Center personnel meet with the client to decide which points of operation should be included in the survey. Appropriate personal monitoring and high volume samples are taken to ascertain the level of worker exposure to airborne contaminants. Samples returned to the Environmental Laboratories are analyzed and complete reports of findings are sent to the client.
2. Capabilities include the following:
 - a. Asbestos, fiber count—the asbestos concentration is determined by in-plant monitoring procedures and laboratory evaluation with fiber counts being conducted by up-to-date phase contrast light microscopy.
 - b. Gravimetric Dust—samples of dust are collected in the clients plant with personal or high volume monitoring devices. The gravimetric analysis of these samples are correlated with sampling data to ascertain the level of airborne contaminants. The procedure is particularly adapted to mineral



Chemical analyses, including trace elements, conducted using Atomic Absorption Spectrophotometer.

dusts such as quartz, mica, talc, clay, portland cement, coal dust, limestone, lime, gypsum, etc. The procedure includes both total dust and the respirable fraction.

- c. Quartz—quartz concentrations are determined by X-Ray Diffraction. The quartz content of dust is generally used to determine if the dust is classified under the silica or the nuisance dust regulations.
 - d. Test methods may be developed as required to provide proper analytical procedures for those complex mineral substances or mixtures often times encountered in today's processing technology.
 - e. X-Ray Diffraction and atomic absorption analyses are conducted for determination of mineral composition and trace element content.
3. In the event the client has sampling capabilities, collected samples can be sent direct to the NGC Research Center for analysis. Open accounts can be set up for receiving the clients samples on a routine as-received basis.
 4. Special problems can be reviewed and capabilities resolved.

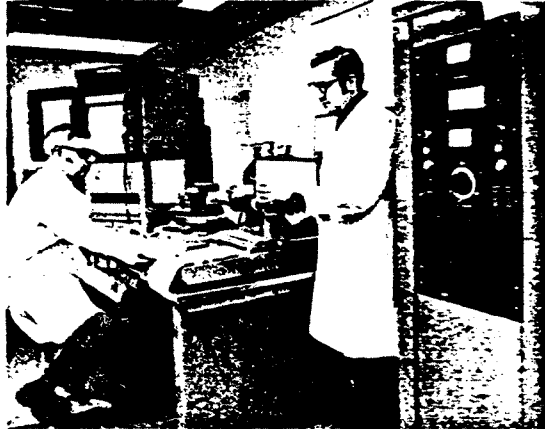
For further information and current fees, contact:

Director of Technical Service
NGC Research Center
1650 Military Rd.
Buffalo, N.Y. 14217
716 873-9750

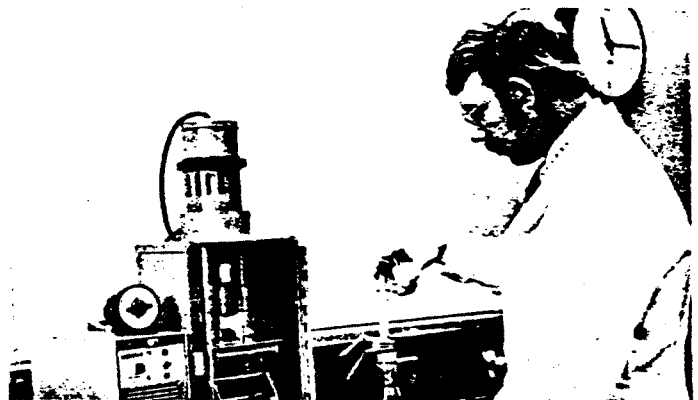
Send for our literature on Noise Control Environmental Testing Services.



Asbestos fiber counts are made on specially prepared monitor filter using Phase Contrast Microscopy.



X-Ray Diffractometer used to determine mineral composition of airborne dust samples as they relate to industrial hygiene.



Ultrasonic probe used in the preparation of dust specimens for quartz and mineral composition determination.



Special sample preparation and analyses by wet chemical procedures are conducted in this analytical laboratory.



Transfer of minerals in mines could result in release of airborne dust.



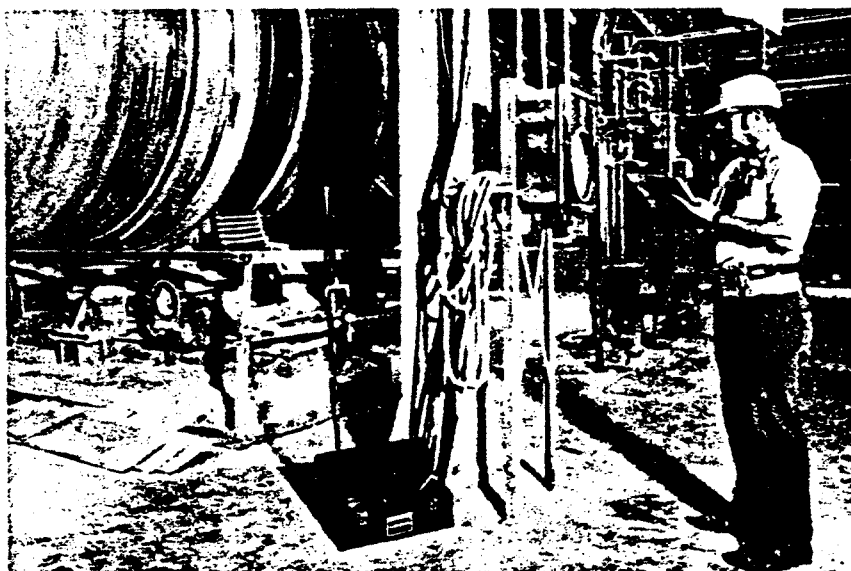
Inefficient dry powder packers are a common source of airborne dust.



Crushers and conveyors are typical points of operation in a mine which generate airborne dust and require monitoring.



Monitoring worker exposure to airborne dust at a rock pulverizing operation.



High volume and personal samples of dust being obtained near a rock dryer.



NATIONAL GYPSUM COMPANY RESEARCH CENTER • Buffalo, New York 14217

013523

AIRBORNE FIBER COUNTS

for

Montello, Inc.

at

Universal Resources Corporation
Dannehl 2-16, N.W. Richland
Canadian Company, Oklahoma

Date Sampled: July 1 & 2, 1975
Date Reported: August 13, 1975

Samples Collected By: H. B. Rhodes
Union Carbide Corporation

Samples Analyzed By: B. L. Ingalls
Union Carbide Corporation

Reported By: H. B. Rhodes
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

OBJECTIVES

013524

To measure the airborne asbestos fiber count during the following operations:

1. Unloading of bentonite, Flosal asbestos, and crushed Super Visbestos (not overwrapped) from a truck and hand stacking in a mud house.
2. Rapid addition of 8 bags of Flosal to the mud hopper.
3. Rapid addition of 8 bags of crushed Super Visbestos to the mud hopper.

OBSERVATIONS

This air sampling was done in conjunction with tests to determine the characteristics of the new, wetted Flosal when it passed over the shaker screen. Conditions were typical of rig operation except that the amount of asbestos dumped in each case was several times the 2-3 bag quantity normally used.

Unloading the Delivery Truck

In the truck unloading tests, the material was delivered to the site in an open-bodied truck. The truck was loaded nearest the cab with 20 bags of crushed Super Visbestos, followed by 20 bags of the new (wetted) Flosal, and by 110 bags (100 lbs. each) of Wyoming bentonite. All bags were stacked five high on pallets ~1' wide x 2-1/2' long.

The mud house was about 10' x 20' x 9' high with doors in each end. The truck backed up to ~8' from the door. One man unloaded the bags individually from the rear of the truck, carried them on his shoulder into the mud house, and stacked them about 10 high along the walls. The helper moved the pallets to the rear of the truck as needed. The Super Visbestos was carried through the mud house and stacked against a water tank about 6' from the far door. It was observed that each time a bag of SVB was lifted, there was a puff of dust from the spout. The same thing happened when it was dropped on the stack.

Personal samples were taken on both the driver and the helper during the handling of each of the three materials.

Preparation of Cleaning Slug

The mud hopper was located in the rear corner of the mud house directly adjacent to the door. It consisted of a 55-gallon drum equipped with a 2' pipe running up the center and extending about one foot above the top of the drum. The pipe had a valve at the top and a tee at the bottom of the drum. The downward side of the tee was connected by an equal diameter rubber hose about 20' long to an aspirator.

When ingredients were to be added, the mud was circulated by a pump through the aspirator. The vacuum created pulled the dry material out of the mud hopper, through the hose, and into the liquid passing through the aspirator.

When the Flosal was added, the operator removed each bag from the stack, slit the end, and emptied it into the hopper. The empty bags were tossed outside the door. It took about three minutes to empty eight bags. The operator then used a shovel to push the material held up around the sides into the hole. The bags were then gathered up and taken about 100 feet to a trench for disposal. No visible dust was generated during the handling of the Flosal.

A personal sample was taken on the operator during the dump. Area samples were taken adjacent to the hopper before and after dumping. A personal sample was also collected on an observer standing approximately three feet from the door during the dumping.

The Super Visbestos was added in the same manner as the Flosal. After about half of the bags were dumped, the hose plugged leaving about three bags in the hopper. The hose was blown out at the mud pits and the remaining asbestos was transferred.

Personal samples were taken during the dumping on the operator and on an observer standing approximately three feet from the door. The sampler was removed from the operator (at his request), however, while the plugged line was cleaned out and during the transfer of the final portion of the Super Visbestos. Area samples were collected before, during, and after dumping. A personal sample representative of general area asbestos exposure on a drilling rig was also collected.

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zummalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 5 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). This allowable level will be reduced to 2 fibers/cc on July 1, 1976. The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA where

C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table.

SUMMARY OF FIBER COUNTS

Sample No.	Air Sample Time	Minutes	Operation Description	Airborne Fiber Count (fibers/cc >5μ)	
				Total	Chrysotile Asbestos
<u>Unloading Bentonite, Flosal, and Crushed Super Visbestos 7/1/75</u>					
B-63	10:22-10:53AM	31	Personal sample (Robert Wall). Truck operator unloading 110 bags of Wyoming bentonite (100 lbs./bag). Hand carried about 20' and stacked along wall of mud house.	0.3	0.3
B-77	10:56-11:06AM	10	Personal sample (Robert Wall). Operator unloading 20 bags of Flosal asbestos. Hand carried about 20' and stacked along wall of mud house.	0.3	0.3
B-83	11:08-11:15AM	7	Personal sample (Robert Wall). Operator unloading 20 bags of crushed Super Visbestos (not shrink filmed). Hand carried about 30' and stacked against water tank beyond far door of mud house.	4.5	4.5

A-83	10:25-10:54AM	29	Personal sample. Helper (Harold Willson) during unloading of bentonite.	0.9	0.5
B-67	10:56-11:04AM	8	Personal sample. Helper (Harold Willson) Removes bags of Flosal from Super Visbestos. Moves Flosal pallet to rear of truck. Flosal pallet falls on floor of truck.	6.8	6.8
B-66	11:07-1:15PM	8	Personal sample. Helper (Harold Willson) during unloading of 20 bags of crushed Super Visbestos. Rolls pallets (5 high) from front to rear of truck.	1.3	1.3
<u>Adding Flosal to the Mud System 7/1/75</u>					
B-87	11:25-12:23PM	58	Area sample. Two feet to right of mud hopper, 2-1/2' above, approximately 5' above floor.	0.2	0.08
B-74	12:25-12:30PM	5	Personal sample. Observer (H.B. Rhodes) standing outside door adjacent to mud hopper during dumping of 8 bags of Flosal.	0.8	0.8

Universal Resources Corporation Rig
Summary of Fiber Counts - Continued

013528

Sample No.	Air Sample Time	Minutes	Operation Description	Airborne Fiber Cou (fibers/cc >5 μ)	
				Total	Chrysoti Asbesto
B-76	12:25-12:30PM	5	Personal sample. Operator (Dale Mull) dumping 8 bags of Flosal into mud hopper and pushing into suction line with shovel.	2.1	1.3
B-65	12:36-2:08PM	92	Area sample. In mud room after Flosal dump. Same location as B-87.	0.1	0.02
<u>Addition of Super Visbestos to the Mud System 7/2/75</u>					
B-73	11:49-12:02PM	13	Personal sample. Operator (Dale Mull) adding 8 bags of crushed Super Visbestos (not shrink-wrapped) to mud hopper. Stirring with shovel to aid in suction pickup.	1.8	1.8
B-80	11:49-12:02PM	13	Personal sample. Observer (H.B. Rhodes) standing outside door of mud hopper during dumping of crushed Super Visbestos.	0.9	0.9
B-61	11:10-11:48PM	38	Area sample. In center of door, 6" inside, adjacent to hopper, 3' above and 3' to side of hopper. Prior to Super Visbestos dump.	0.1	0.0
B-62	11:49-12:04PM	15	Area sample. Same location as B-61 during Super Visbestos dump.	1.0	1.0
B-84	12:26-12:52PM	26	Area sample. Same location as B-61. After dump.	0.05	0.05
B-58	12:10-12:51PM	41	Personal sample. Observer (H.B. Rhodes) in rig and mud pit area.	0.07	0.07

5/8/75 W.S.J.

Johns-Manville Corp., Four Others Are Sued Over Asbestos Hazards

NEWARK, N.J. (AP) — Johns-Manville Corp. and four other asbestos makers were charged in a civil class action suit with negligence leading to illness and disability of at least 163 former employees of Raybestos-Manhattan Inc.

The employees, who worked at a plant in Passaic, N.J., charged in a suit filed in federal court here that the five asbestos makers supplying material to the plant were negligent in failing to provide adequate warning of the health hazards of their products.

The suit charges that Johns-Manville, Denver, Colo.; Asbestos Corp. of America, Garwood, N.J.; and three Canadian concerns, Bell's Asbestos Co., Asbestos Corp. and Cassiar Asbestos Ltd., ignored scientific data and medical evidence that should have prompted them to take more stringent safety measures.

The suit also charges that the companies and Metropolitan Life Insurance Co., in effect, "warranted that their asbestos products were safe and fit for use." Metropolitan Life advised the companies on employee-safety hazards.

[In Toronto, an official of Cassiar As-

bestos said the company hadn't been informed of the suit yet, but added that "it wouldn't surprise us much." He said Cassiar and certain other producers are codefendants in a similar suit brought by a Dallas woman. That suit has been pending for more than a year, he said.

"The principle in the Raybestos action would appear to be the same one involved in the Texas suit—namely that the plaintiff casts a wide net over anyone who has ever supplied the asbestos fiber that he or she worked with," the official said. He said the producers doubtless also will decide to defend the latest suit "vigorously."

None of the other defendants in the suit could be reached immediately for comment.]

Each worker asked for \$1 million in compensatory damages and \$1 million in punitive damages, or a total of \$2 million.

Raybestos made brake shoes at the plant, which was closed in 1973. The closing was widely publicized because many workers were dismissed only a few years' short of retirement age and didn't receive any pensions.

Karl Asph, attorney for the plaintiffs, said most of the workers also have filed Workman's Compensation claims against Raybestos. He said the 163 plaintiffs have suffered various injuries up to full disability. In the suit, the plaintiffs say they were exposed to the risk of cancer, asbestosis, sarcoma, mesothelioma, scarred lungs and other illnesses.

PHONE : 74749 - 776147



CABLES : DRESSER JAKARTA

DRESSER MINERALS INTERNATIONAL INC.

013530

P.O. BOX 27/JKT.
JAKARTA
INDONESIA

May 25, 1976.

Marketing Manager
Montello, Inc.
P.O. Box 130
Sand Springs, Oklahoma 74063
U.S.A.

Dear Sir:

Attached is a newspaper article expounding upon the perils of asbestos. This type publicity is becoming an increasing detriment to the sales of your product, Super Visbestos.

Will you please provide all possible assistance to show that this material is not a health hazard? Information must be legitimate and be from internationally recognized research laboratories. In the enclosed article the author, Mrs. Nancy Tait quotes "Wet dust does not become airborne and is not inhaled". Since this lady is so dedicated to her research, may I suggest that you write to her for her approval of your product. A letter from an individual such as she could be worth more than all the reports from governmental agencies combined.

Please act quickly on this matter for it is curtailing our sales. In fact, we can not afford to order additional material until we can convince our warehouse people and our customers that it is not a health hazard. At this time we cannot do this for I do not know if it is safe or not.

We anxiously await your reply and literature.

Sincerely yours,

Jerry E. Haston
Area Technical Service Engineer

Encl.:

JEH/es

013531

June 4, 1976

Mr. Jerry E. Haston
Dresser Minerals International Inc.
P.O. Box 27/JKT.
Jakarta
Indonesia

Dear Mr. Haston:

Thank you for your letter of May 25th, with the enclosed article about asbestos. That article is an almost classic example of inaccurate, irresponsible, "scare tactic" journalism. Such sensationalism is a reprehensible and scandalous disservice to a trusting public, by an unprincipled newspaper whose only possible motive is financial gain through expanding circulation. It would take a book to fully clarify the concoction of half-truths on which Mr. Toulson bases his ridiculous but attention-getting headline.

We will attempt to offer certain facts which we hope will provide you with a more balanced view of asbestos usage than the highly inflammatory and slanted one which Mr. Toulson has promoted. First, it has been recognized for many years that a group of respiratory diseases are related to asbestos. It is also known that these generally result from inhaling excessive amounts of asbestos dust over a long period of time, (20 to 40 years). Typical industries where a measurable increase of such disease is noted, are ones where workers were regularly exposed to high dust levels on a daily basis for many years.

As you know, workers exposed to asbestos in the drilling industry are only handling the material for a few minutes of each day, and they rarely if ever would have the job of "dumping" for half or more of their working life. Put another way, the exposure of workers in our industry is minute, compared with that of industries (i.e. mining, fabricating, insulating, etc.) where a measurable incidence of asbestos related disease has been found.

In 1972, stringent regulations were passed in the U.S., which called for a maximum ceiling limit and a time-weighted average for exposure of workers to airborne asbestos dust. These limits were based upon the concept of dust levels at which it was felt there would be no demonstrable risk to health. The regulations are still in effect.

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

Mr. Jerry E. Haston
June 4, 1976
Page 2

At that time, we co-sponsored a series of field tests to monitor the dust levels associated with drilling applications. A copy of those results is enclosed for your consideration. On the last two pages, you will note that in every instance, the levels found were far below the Federal standards. Subsequent monitoring tests have borne out these findings.

To further minimize the possibility of health hazard, our product (Super Visbestos) is in the form of crushed pellets. This is a substantial improvement over the dry ground, fluffy materials sometimes used. In addition, all of our production is in individually shrink filmed bags. This nearly eliminates "dusting" in the course of shipping, handling and warehousing. All this, coupled with the sporadic and short term exposure of workers in the drilling industry, should fairly lead one to conclude that the data on health risks associated with heavy, long-term exposure cannot be properly applied.

Mr. Toulson is quite right on one point. With its thousands of commercial applications, asbestos does indeed surround all of us. Fortunately, his likening it to spray of machine gun bullets is pure rubbish. Proof of his fallaciousness is not hard to find - - - our homes and offices and plants and streets are filled with people - - - not bullet-riddled bodies.

In conclusion, we will mention that we have worked closely with your own safety people in Houston. At present the appropriate Dresser office is headed by Mr. H. Robert Moseley, Jr. of the Petroleum and Minerals Group. You may wish to contact him for additional intra-company information.

We hope we have been of service to you, and are indeed sensitive to the problem you raise. It is most unfortunate that writers of Mr. Toulson's ilk are typically rewarded for such unwarranted and cavalier disservice to the public.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/wj

Enc. (1)

New Rules on Worker Exposure to Lead, Toluene, Asbestos Offered by Labor Unit

By a WALL STREET JOURNAL Staff Reporter

WASHINGTON—The Labor Department proposed new and revised job health standards limiting worker exposure to three widely used industrial substances and setting procedures for handling 11 other toxic chemicals.

The new standards cut in half the permissible exposure to lead and toluene, an industrial chemical, and reduce by 90% the amount of asbestos fibers permitted in the air at work places.

An estimated 50,000 workers are involved in manufacture of products containing asbestos. The department issued its new standard controlling asbestos, which can cause lung cancer and other serious diseases, in mid-1972.

The new proposed standards will appear soon in the Federal Register. Before they become final, the Labor Department will request public comments on them, environmental and inflationary impact statements, and may hold public hearings.

The revised asbestos standard allows workers to be exposed to an average of 0.5 fibers a cubic centimeter of air over any eight-hour period instead of the present limit of five fibers a cubic centimeter of air. The standard defines a fiber as a particle of asbestos longer than five micrometers.

A worker couldn't be exposed to more than five fibers a cubic centimeter of air over any 15-minute period.

The new levels also are more stringent than a previously planned additional standard that would have cut exposure limits beginning next year to two fibers a cubic centimeter of air, averaged over eight hours.

The proposal also would require employers to retain employee medical records for 40 years, or for the duration of an employee's career plus 20 years. Currently, asbestos regulations require that some records be kept for only three years and others for 20 years.

The tighter rules for asbestos exposure wouldn't apply to the construction industry, which would operate under present standards until a special set of revisions for that industry is developed. The department said workers could be exposed to asbestos on jobs in construction, shipbuilding, auto manufacturing, auto repair, asbestos products and asbestos removal.

Note: we should recalculate all TWA's based on more realistic background counts.

The Northern Miner

Asbestos and health

Some common questions answered

By J. D. CHRISTIAN
Chairman

Cassiar Asbestos Corp.*

I recently received a letter from an associate of mine that prompted me to speak to you on the very important and currently topical subject of "Asbestos and health". Let me read you his short letter — you may well have the same thoughts in mind:

Dear Mr. Christian:

I have been pondering over this question of the health hazards of asbestos and putting myself in the position of an asbestos worker or a citizen living in an asbestos-dominated community. Here are some questions that I might be prone to ask. I'm bringing these questions up as I think that the material that has been put forth both by the press and by the industry is so highly technical that the true meaning or significance of these reports is being lost on the man in the street and instead he is being fired with anxiety by the sensationalism of jargons that are over his head.

What is asbestos? What kinds are there? What are the differences between the different types of fibre? Where do these fibres come from?

It has been made to sound like a poison similar to arsenic. Why is it so dangerous? What makes it so dangerous? What is happening in the body when excessive amounts of asbestos are taken in? What is happening to me when I have asbestos particles in my lungs or in my stomach or in my digestive tract? Is it dangerous to touch? Can it do me harm just by handling the material? What is the meaning of five fibres per c.c.?

We have trouble as lay people visualizing any fibre smaller than a human hair, so when I think of five fibres I think of five short pieces of hair inside a thimble. If I was to inhale 5,000,000 c.c. of air per day, then I must be consuming 25,000,000 fibre particles per day.

* From Mr. Christian's address to shareholders at the 23rd annual meeting of Cassiar Asbestos Corp. in April this year. There have not been any technical developments since that date to change the context of the report. Mr. Christian has informed The Northern Miner.

What is the weight of 25,000,000 fibres? What percentage is being discharged by my body and what percentage is being retained? If I am unfortunately going to contract asbestosis, is there any cure for this? What is happening to me with asbestosis?

I happen to live in Toronto. What is my mortality rate living in this city as compared to Thetford or Sudbury or for that matter Regina? I would pose the same questions with respect to particles of fibre contained in volumes of water as I did above with respect to air.

Over a lifetime, what kind of weight of fibre are we actually talking about? Is it visible to the naked eye, even over a lifetime? Life is finite, but I don't want to die prematurely. What assurance can you offer me as a potential employee in your operation that I am not going to unnecessarily shorten my life?

Yours sincerely,

This is a very sincere letter from a deeply concerned person. I have replied to the best of my ability and would like to read what I said.

Dear Mr. X:

Thank you for your very thoughtful letter. You will appreciate that I am not a medical doctor, nor a scientist, and that the opinions and facts that I can give you in reply to your questions, have been gleaned from studying published reports from the medical and scientific world. As you have expressed confusion over the use of highly technical terms and numbers, I will attempt to express myself in everyday language, even though it may be at the expense of absolute accuracy.

What is asbestos?

The term "asbestos" applies to all minerals which have one common attribute, namely, the ability to be separated from the parent rock in the form of a fibre. Chrysotile asbestos is the fibrous form of serpentine rock and represents 95% of the world's commercial fibre production. Crocidolite and amosite are the most important fibrous forms of another rock known as amphibole. These types of asbestos have slightly different chemical and physical properties than chrysotile and hence different practical uses. When we

speak of "asbestos", we are, therefore, really talking about the fibrous forms of rocks which are quite common throughout the world. The commercial asbestiform amphiboles are largely found and mined in South Africa and Brazil, whereas the chrysotile variety of serpentine is more widespread and is found in most countries of the world. The fact that asbestos fibres are very strong (similar to high tensile steel), and can be broken down to extremely fine dimensions (1,000th the diameter of a human hair), makes it a very useful material for reinforcing cement, plastics and rubber, or it can be spun or woven into yarn or cloth for clutch facings, brake linings and protective clothing.

Why is it so dangerous?

First of all, let me say that it is not a poison like arsenic, as you suggested, nor is it dangerous to touch. The health hazards that, in recent years, have been found to exist are broadly associated with the inhalation of large quantities of fibre over prolonged periods of time, and I mean 15-20 years or more. During processing some of the fibres become very fine, and without proper dust control will readily float in the air. Naturally, some of these will be inhaled, but a high percentage will be rapidly removed from the respiratory tract by ciliary action.

What are the asbestos diseases?

There are now three recognized diseases:

(1) Asbestosis — This is one variety of the lung disease called "pneumoconiosis". It is a progressive fibrosis of the lung, which can make breathing difficult and can lead to other disabilities. Occurrences have been clearly related to prolonged inhalation of respirable sized fibres over a period of many years. Those cases of asbestosis which are appearing today are the result of exposure to heavy concentrations of asbestos dust prevalent many years ago, when little was known about the risks involved. It has been shown that, when the level of exposure is reduced, the incidence of asbestosis is also reduced.

(2) Bronchogenic cancer — The is now medical evidence to indicate that asbestos exposure is associated with an increased frequency of bronchogenic cancer in workers who have first developed asbestosis. At the present time, we do not know what causes the cancer, whether it is the chemistry of the asbestos, the fibrous nature of the material, something else quite unrelated, or you are aware, there are many other known carcinogens, which include coal tar, benzidine, tobacco, vinyl chloride, x-rays and even sunlight. These, along with asbestos, are currently the subject of a great deal of research. You will also be interested to know that few, if any, asbestos-related lung cancers have been found in workers who are not cigarette smokers and do not have asbestosis. This fact has been well documented by a number of researchers.

(3) Mesothelioma — Mesothelioma is one of those rare and newly recognized cancer diseases and is a malignant tumor of the lining membrane of the chest and abdominal cavity. By no means are such tumors associated with asbestos, but where a relationship can be established, the exposure has largely been crocidolite (blue asbestos). Far fewer cases have been found where the exposure was limited to chrysotile fibre, which is the type mined in Canada. An investigation of the 236 known cases of mesothelioma in Canada between 1960 and 1970 showed that only nine were associated in any way with the Quebec chrysotile mining and milling industry. Seven men had been employed and two were women whose fathers worked in the industry.

The McDonald report

A group of very capable Canadian doctors and scientists have since 1966 been studying the history of 11,572 persons born between 1891 and 1920, who were or are still employed in the Quebec asbestos mining industry. They have found that the industry has a lower mortality rate for people of comparable age than the general population of Quebec. Hence, within the industry group those who had a long histo-

of exposure to the two highest dust classifications showed a higher death rate from respiratory cancer and pneumoconiosis than the others. The studies are continuing and the report encouragingly suggests that a 1% risk of acquiring a clinically significant disease over a working life of 50 years in an asbestos mine can be achieved by maintaining threshold levels of 2.4 million particles per cubic foot.

Possibly, I should at this point tell you about the two methods of measuring the dust. The impinger method sucks in a given amount of air and the fibre and dust particles present impinge on a treated glass slide. They are counted under a microscope and are reported as millions of particles per cubic foot of air. The newer method is the membrane filter. A measured quantity of air is pulled through a membrane filter which removes all the dust and fibre. In this method only the fibres are counted and hence it is difficult to relate the two results. This latter test is reported as the number of fibres in a cubic centimetre of air. Both are highly susceptible to human error. Your thimble is a good estimate of a cubic centimetre, but it would take 2,000 fibres placed end to end to span the width of the thimble, and the thickness of the fibres would be many times less than the human hair you envisage.

The McDonald report on the asbestos mines and mills of Quebec confirms the results of other studies in the Soviet Union and Italy which indicate that the risks are much lower in the chrysotile mining and milling industry than reported from the New York insulation workers or the British naval dockyards.

At our Cassiar mines most of the emissions to the atmosphere are now under control, or in the process of becoming so. Inside the buildings, in spite of extensive control measures, there are still some areas where the wearing of masks is required. These troublesome areas are under active study and an extensive program, designed to achieve the best possible threshold levels, is being undertaken.

The most serious obstacle in our path is the shortage of personnel. You are already aware of some of the serious effects this has had on production over the past several years. Incidentally, in 20 years of operation we have not had one reported case of any of the three asbestos-related diseases, but we must not be complacent in view of the long latent period (30-45 years) which can elapse between the first exposure and the development of mesothelioma. This, along with the Quebec studies, is the best assurance we can give any potential employee that things now appear to

be under control and the risk of premature death or impairment of health is very remote indeed.

Asbestos from our Cassiar and Clinton mines is used for the greatest part in the asbestos-cement industry, followed by the asbestos textile industry, and to a much lesser degree in the manufacture of filters, compressed sheet packing, reinforced plastics, and so on. Of these, the textile industry, which until recently was exclusively a dry carding, spinning and weaving process, has had some comparatively serious dust problems.

In the early 1930s, in a particular textile factory in the United Kingdom, signs of asbestosis were found in some 80% of the workers with 20 or more years' exposure. Another survey in 1957 of the same plant showed that in workers with 20 years' exposure, after the installation of dust control, the incidence of asbestosis had dropped to 3%. The lung cancer rate in workers in the plant exposed to pre-1933 conditions was at 10 times that of the general population, whereas it is currently reported to be at the same level as the general population. This example clearly demonstrates that with experience and improved technology asbestos can be handled safely.

A hazard to the public?

You have asked about the risk of living in Toronto, as compared to Thetford or Regina. Most of the studies on the relationship of asbestos diseases to mortality rates have been carried out in the occupational field, and before absolutely denying any public health risk, scientists agree that more data must be collected over an extended period of time. However, a number of studies have already been carried out and there is to date no evidence, scientific or otherwise, to suggest that anyone in the general public has ever contacted any disease from exposure to the minute amounts of asbestos released into the community air through the use, or wearing, or weathering of finished asbestos products.

As far as water is concerned, the Conference of the International Agency for Research on Cancer, held in Lyon, France, in the fall of 1972 — which I feel should represent as qualified and authoritative an opinion as is available — provided the following information:

Question: "Is there evidence of an increased risk of cancer resulting from asbestos fibres present in water, beverages, food, or in fluids used for the administration of drugs?"

Answer: "Such evidence, as there is, does not indicate any risk."

You might well ask at this point, "If this is so, then why the great hue and cry?" In the scientific, legal and bureaucratic world, there are those who have a craving to push the panic button and who define "a

hazard" as "something which may possibly occur", even though they are unable to produce any evidence to support their contentions. No one denies that there have been — and still are — problem areas. The world today is faced with many, many problems, all of which must be viewed in their proper perspective, and "panic" reporting and "panic" legislation is not the answer. The asbestos and other industries are working hard to correct the conditions which are thought to create a health hazard. Unfortunately, final proof will not be available for 20, 30 or even 40 years. In the meantime, the best that any prudent person can do is to continue to research all aspects of the problem, to analyze the facts and trends as they become known, and to set goals and standards which will progressively reduce the element of risk and hopefully will finally eliminate it entirely.

What is the industry doing?

In addition to the continuous development of techniques and equipment to improve dust control, the Canadian asbestos mining industry, through the Institute of Occupational and Environmental Health in Montreal, the Industrial Health Foundation in Pittsburgh, and selected hospitals and universities, is sponsoring or cooperating in major epidemiological and research projects, designed to identify and eliminate asbestos-related health risks. There is still a great deal of research to be done. Active studies are also under way in other countries, such as England, South Africa, Italy and Russia. There is already strong evidence to suggest that the physical aspects (i.e., the length, diameter and stiffness) of a fibre is the real source of trouble, and not its chemical composition. If this proves to be the case, then certain other fibrous material may also become suspect and the work currently being done on asbestos may well prove to have been a great step forward in our search for a healthier environment.

I sincerely hope that what I have said so far has answered most of your pertinent questions. Before closing, I would like to add a few comments of a general nature.

It has frequently been proposed that asbestos should be replaced by other types of materials. This can and has been done in some products, but in others such substitution has been either very expensive, much less effective, or even impossible. To forgo the many benefits of asbestos products, simply on the basis of a suspicion of possible hazards, would be irrational and unwarranted, particularly so when we are still uncertain of the health hazards that might arise from many other replacement materials.

Amongst insulation workers in the United States and the United Kingdom, particularly those who worked in the dockyards during the war years, some very serious health conditions have been found and ably researched and reported upon. It is a sad story, and the result of lack of knowledge at the time and possibly the exigencies of the war years. Very valuable lessons have been learned which will be of great benefit in solving the problems the present and the future.

In the matter of publicizing and reporting, there is no doubt that it is far more dramatic and eye-catching to use headlines such as "ASBESTOS KILLS" or for example to report "TWO MILLION FIBRES PER LITRE OF WATER" than to report the same thing as approximately 4/1,000ths of a millionth part of a gram. Let me put these figures to you in another way. If 5,000 people agreed to drink two quarts of water containing 4,000,000 fibres per quart, every day for 80 years then they — the 5,000 people — would have swallowed in total one gram of asbestos, which is a cubic pile a little more than half an inch on each side.

Whenever I have the opportunity, I assure you that I will urge all those who have the responsibility for researching and reporting to the public, through whatever media it may be, to remain as factual and fair in their research as possible and to avoid the "half truths". Excellent progress is being made in Canada in improving industrial health and safety, in controlling pollution, and in protecting the environment. Regulatory bodies are being established at various governmental levels and in cooperation with industry itself to measure and control to the best of our combined technical ability those conditions likely to create a risk to the well-being of workmen and the public. The use of any of these problem areas to solicit public sympathy and support for individual political or monetary gains should be looked upon with scorn by all decent thinking people.

Thank you once again for your letter. I hope that I have put things in a little better perspective for you.

Yours sincerely,
J. D. Christian.

December 20, 1972

013537

Through OSHA, stringent regulations are now in effect on the use of asbestos. The impact of these regulations on the drilling industry has, until now, been a source of concern and confusion to suppliers as well as users. Several months ago, we at Montello determined to ascertain how our wet processed Super Visbestos would perform, in the context of the OSHA regulations, under the widely varying conditions found on drilling rigs. With the invaluable assistance and cooperation of several companies, these on-site tests and their evaluation have now been completed.

Attached are copies of the reports on each of four field tests, as well as an interpretive analysis of these reports. Site selection was based on a desire to evaluate the broadest possible range of dumping environments. During the tests a radically new granular form of Super Visbestos was also evaluated.

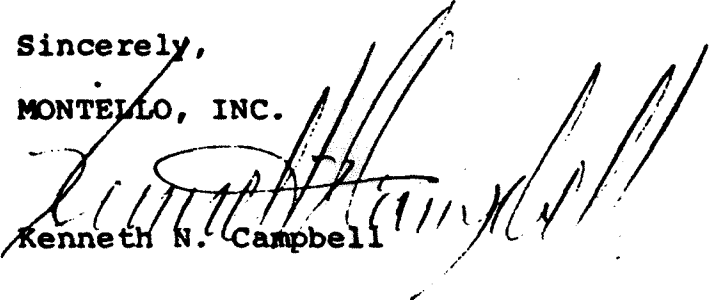
Certain points are worthy of special note at this time.

1. All tests were performed on Montello's exclusive, wet processed asbestos products. The data and results cannot be safely applied, therefore, to any of the several dry ground products on the market.
2. On all tests, Super Visbestos consistently fell well below the present OSHA regulations as to maximum ceiling limit and 8-hour time weighted average.
3. The New Granular form of Super Visbestos proved to be from 20% to 50% cleaner than present Super Visbestos.
4. On no test did either product exceed even the much more stringent TWA level to be imposed by OSHA, in 1976.
5. Based on these extensive tests under varied conditions, no special breathing apparatus would be required when running either Montello's Super Visbestos or the much cleaner New Granular form of Super Visbestos.

We will be pleased to discuss the attached reports with any interested parties in greater detail. Please contact our Sand Springs office if you have any questions.

Sincerely,

MONTELLO, INC.


Kenneth N. Campbell

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74069 / (918) 348-0861/TWX 910-840-3087

013538

AIRBORNE ASBESTOS DUST CONCENTRATIONS

in

DRILLING FLUID OPERATIONS

using

WET-REFINED ASBESTOS

H. B. Rhodes
&
E. J. Kleber

Union Carbide Corporation
Mining and Metals Division
Niagara Falls, New York

INTRODUCTION

A survey has been made to examine the levels of asbestos dust that may occur when wet-refined asbestos is used as an ingredient in drilling fluids. Both open-air and enclosed dumping operations were checked. A range of dumping rates from 10 to 80 sacks per hour was used.

Tests were run with two types of wet-refined asbestos:

1. A coarse-ground asbestos known commercially as Super-Visbestos.
2. A new version of Super-Visbestos in the form of 1/8" granular pellets.

It is important to emphasize that the dust levels reported herein are specific for the wet-refined asbestos types described and do not apply to dry-processed California or Canadian asbestos.

The reports giving the details of the dumping and sampling at four locations and the raw data obtained are appended for reference. This report provides a more general interpretation of the overall results.

SUMMARY AND CONCLUSIONS

The highest dust level measured during any of the seven dumping operations tested was 1.9 fibers/ml. greater than 5μ in length. This is only 19% of the value allowable under OSHA regulations.

Time-weighted average values were calculated for all dumps on the basis of one dumping period per eight hour shift. A background exposure value of 0.3 fiber per ml. greater than 5μ was assumed in these calculations. The highest TWA found in any of the dumps was 0.4 fibers/ml. greater than 5μ . This is only 8% of the current allowable value and 20% of the projected value for 1976.

As would be expected, the new granular product gave much less dust, i.e., 20-50%, than the coarse ground Super-Visbestos.

CALCULATION PROCEDURES

The OSHA regulations permit exposure to a peak fiber concentration of 10 fibers/ml. greater than 5μ in length and an eight-hour time-weighted average of 5 fibers*. In this work, the peak exposure occurred in the breathing zone of the operator during the dumping and is reported directly as measured.

The eight-hour time-weighted average is basically a simple concept that can be expressed as:

$$\text{T.W.A.} = \text{Time-Weighted Average} = \frac{\sum \left[\begin{array}{l} \text{Fibers/ml. in a} \\ \text{particular sample} \end{array} \right] \left[\begin{array}{l} \text{Time in hours over which the} \\ \text{particular sample was collected} \end{array} \right]}{8}$$

Where: Σ = Summation of samples collected over the 8-hour period.

* For convenience, in this discussion the term "fibers" will be taken to mean the entire term, "fibers/ml. greater than 5μ in length."

~~PERSPECTIVE ON USE OF THE TEST RESULTS~~

Companies co-operating in these tests are customers of Montello and conducted the tests to ascertain that their use of the product complies with standards set forth in the federal Occupational Safety and Health Act. Results of these tests are made available to other companies solely for their use in making their own evaluations of procedures to be followed in using the material. No representations are made, nor are to be implied, from this report as to the safety of this material no matter how it is used.

In order to be strictly correct, it is necessary to sample over the entire eight-hour period to define the TWA. In these tests, however, only a short post-dump sample was obtained. Normally, at a well, an operator dumps for a short period once a shift (or tour) and spends the remainder of the time out of the immediate dump area. It is thus reasonable to estimate the TWA for the operator as a combination of the peak (measured) exposure during the dump and a background exposure for the remainder of the shift. The data obtained in this work indicate a reasonable and probably conservative (high) value for the background is 0.3 fibers. This number will be used in the calculation of eight-hour TWA values.

The airborne asbestos concentration measured in the breathing zone of the operator results from a balance between the rate of generation of airborne fiber by the handling of the asbestos and the rate of dissipation into the surrounding region. If these rates are in equilibrium during the dumping period, the peak value obtained should be a good approximation of the average condition that would prevail during a continuous eight-hour dump at the same overall conditions.

The results can thus be expressed in an alternative form, i.e., total sacks dumped in eight hours with the measured peak value becoming the Time-Weighted Average. The data will also be presented in this form.

REVIEW OF DATA

Dust counts have been obtained for this study at four locations; three by Union Carbide and one by [REDACTED]. Complete reports are appended for reference. *a major producing company.*

In this section, the data will be reviewed and the technical basis for the background level and equilibrium assumptions just described will be provided. Eight-hour time-weighted average and "total sacks in eight hours" values will be calculated for each dump.

[REDACTED] Well Location - [REDACTED]
this location - [REDACTED]

The fiber count data taken at [REDACTED] on September 27, 1972 are shown graphically in Figure 1. The Figure gives fiber count as a function of elapsed time.

In this test, 20 sacks of regular Super-Visbestos were dumped over a 21-minute period. After a wait of about 10 minutes, 20 sacks of the new granular Super-Visbestos were dumped over a 26-minute period.

The sample taken in the breathing zone of the operator during the dump of regular Super-Visbestos gave a count of 1.91 fibers. When granular Super-Visbestos was dumped 10 minutes later, the count dropped to 0.42 fibers. During these same periods, the downwind counts were 0.51 and 0.31 fibers, respectively, while upwind values of <0.1 and 0.15 fibers were found. The wind was a light, somewhat variable breeze so all of these values seem reasonable and internally consistent.

Note that both environmental samples (Positions 1 and 3) were 0.3 fiber or below during the granular Super-Visbestos dump. The assumed value of 0.3 fiber for the background level when no asbestos is being handled thus seems reasonable.

The data in Figure 1 can be used to estimate TWA values for both types of asbestos dumped. For the regular Super-Visbestos, consider the exposure to be 1.91 fibers for the 30-minute period covering both the dump and subsequent time until the lower reading was obtained. For the remaining 7-1/2 hours of the shift, it is assumed that the operator dumps no more asbestos and is exposed to a background level of 0.3 fibers.

Thus:

$$TWA = \frac{(1.91 \text{ fibers}) (0.5 \text{ hours}) + (0.3 \text{ fibers}) (7.5 \text{ hours})}{8 \text{ hours}}$$

$$TWA = \frac{3.21}{8} = 0.4 \text{ fibers}$$

This is only $(0.4) (100)/5 = 8\%$ of the allowable exposure level.

For the granular Super-Visbestos, consider the exposure to be 0.42 fibers for 0.5 hour and the assumed background of 0.3 fibers for 7.5 hours. Thus:

$$TWA = \frac{(0.42)(0.5) + (0.3)(7.5)}{8} = 0.3 \text{ fibers}$$

This is 6% of the allowable TWA.

Referring again to Figure 1, within 10 minutes after the end of the dump with regular Super-Visbestos, the asbestos level over the hopper (breathing zone, Position 2) had dropped sharply from 1.8 fibers to only 0.4 fibers. This indicates that the system responded quite rapidly to changes in conditions and the use of a peak value as representative of the continuous eight-hour dump is a valid approximation. On the basis of this assumption, an operator should be able to dump $(20/21)(480)$ sacks per eight-hour shift at a breathing zone TWA value equal to the peak value found during the test dump.

The same reasoning applied to the granular Super-Visbestos gives $(20/21)(480)$ or 369 sacks per shift at a TWA of about 0.4 fibers. This is only 8% of the allowable value. It should also be noted that the peak value for granular Super-Visbestos is so close to the assumed value for the background and they are both so low that the question of steady state is largely academic.

All of the values calculated have been collected in the overall summary, Table I.

~~Location~~ Location Near Houston

The next series of tests to be examined were run at ~~Location~~ near Houston, Texas on September 26, 1972. These tests were intended to simulate conditions on the North Slope. Dumping was done in a small, covered enclosure

about 10' x 11' by 9' high. Dumps were made with one side open 8' to approximate normal conditions and with everything closed as occurs in the Arctic during extremely cold and windy weather. Both Arcovis 953 and granular Super-Visbestos were dumped but only the Super-Visbestos will be examined here.

In the initial test 30 bags of granular Super-Visbestos were dumped in 29 minutes with the opening closed off. Dust levels were monitored during the dump and for a 1-1/2 hour period thereafter. The door was then opened and 30 more bags were dumped in 30 minutes. Dust levels were again measured during the dump and for approximately 1-1/3 hours thereafter. The data are shown in Figure 2 with the airborne asbestos dust concentration in fibers/ml. $\times 5$ shown as a function of time.

The exact sample point locations referred to in the Figure are given in the appended report. They are approximately:

1. In a "dead" corner adjacent to the door.
2. Directly over the hopper. (The hopper is near the wall on the opposite side from the door.)
3. Breathing zone of operator during dump.
4. Over empty sacks in rear corner near hopper.

Before examining the data, it should be noted that on the previous day, a more dusty product, Arcovis 953, had been dumped with the building closed. Sample Point #1 gave a reading of 1.0 fibers on a sample collected during and after the Arcovis dump.

During the first Super-Visbestos dump shown in Figure 2, Point 1 gave a value of 0.8 fiber. This dropped sharply to only 0.1 fiber when the door was opened. Also, a background sample taken over the hopper before the start of this dump had a reading of 0.7 fiber. This suggests that the closed room at the start of these dumps contained a level of 0.7 - 0.8 fibers as a residual from the previous days' tests.

During the first granular Super-Visbestos dump (room closed) the breathing zone sample, #3, showed a level of 1.8 fibers. At the same time, the adjacent region over the hopper, Point #2, was at essentially the same level, i.e., 1.7 fibers. When the dump was finished, the level over the hopper (Point #2) dropped to the very low value of 0.2 fiber. At Point #4, near the hopper but over the empty bags, the level was only 0.1 fiber throughout the two hours.

During the second dump, with the door open, the breathing zone (#3) and hopper (#2) samples were both only 0.4 fiber. The formerly "dead" area (#1) was 0.1 fiber throughout. The hopper (#2) dropped to 0.1 fiber after the dump was completed. The #4 position, in the corner over the bags, went up from 0.1 fiber to the still very low level of 0.3 fiber.

Recognizing the inherent inaccuracies in the dust count technique, the data obtained present an internally consistent picture. It appears that the hopper is acting as an aspirator and is removing dust-laden air from the immediate

vicinity. Its effect does not appear to reach as far as the opposite corner of the room, Position #1, however. The modest increase in Point #4 with the door open could be due to a "dead" area developing in the corner but the data are too limited to more than speculate.

In normal practice in the Arctic, the dump is made and the operator leaves the area entirely. On this basis, it would be reasonable to use a value of 0 fibers for the time outside of the dump in estimating the TWA exposure. In order to keep the data directly comparable with the other locations covered in this report, however, the value of 0.3 fiber will be used. The results in Figure 2 also corroborate that the 0.3 level for general background is probably quite high.

The data in Figure 2 can be used to estimate the TWA values for both the closed and open dumps. For the closed dump, consider the exposure to be 1.8 fibers for 1/2 hour and 0.3 fiber for 7-1/2 hours.

Thus:

$$TWA = \frac{(1.8)(0.5) + (0.3)(7.5)}{8} = 0.4 \text{ fibers}$$

For the second dump, the values are 0.4 and 0.3, respectively, to give:

$$TWA = \frac{(0.4)(0.5) + (0.3)(7.5)}{8} = 0.31 \text{ fibers}$$

As noted previously, in both tests in this sequence the dust level over the hopper is very close to that in the breathing zone during the actually dumping but drops very sharply as soon as the dumping is stopped. This is very good evidence that conditions are steady and that the "total sacks dumped" concept can be applied. For this case the results are:

Closed dump:

$$\left(\frac{29}{30}\right)(480) = 464 \text{ sacks}$$

at a TWA of 1.8 fibers.

Open dump:

$$\left(\frac{30}{30}\right)(480) = 480 \text{ sacks}$$

at a TWA of 0.4 fibers.

These and the foregoing TWA values have been entered in Table I.

Well Location - Texas Panhandle

of The third series of tests were run at a [redacted] rig in the Panhandle of Texas. The mud was mixed in a 25' x 7' mud house with open doors at both ends. The hopper was adjacent to the door at one end of the house. A diagram is available in the complete report appended.

The test consisted of a dump of 10 bags of Super-Visbestos at regularly spaced intervals of 6 minutes over a 60-minute period. This was followed by a 30-minute wait and then a dump of 10 bags of granular Super-Visbestos in the same manner. During the entire period, the wind outside was blowing strongly. It was in a direction, however, such that even though both doors were open there was no strong draft through the building.

For these tests, samples were collected at the following points:

Position 1: Opposite corner at same end of trailer as mud hopper.

Position 2: End of trailer at opposite from the mud hopper.

Position 3: Operator breathing zone during dumps.

The dust count results obtained are shown graphically in Figure 3. For the dump of regular Super-Visbestos, the dust level in the breathing zone was 1.0 fiber. The environmental samples near the hopper and at the other end of the trailer were considerably lower and decreased with distance from the hopper.

During the following half hour (12:15-12:45) the two environmental samples showed a moderate increase which also continued over the ensuing one hour dump of the granular Super-Visbestos. In the half hour after the second dump, however, the levels at both Position 1 and Position 2 dropped. The breathing zone sample collected during this dump was the same as the adjacent environmental sample at Position 1, i.e., 0.5 fiber.

This pattern suggests that the second breathing zone sample is more representative of the general level at the hopper end of the trailer than a direct measure of dust generation by the granular Super-Visbestos. The correct granular Super-Visbestos level, however, should be no more than the 0.5 fiber measured.

As in the previous tests, the general level of environmental samples, i.e., 0.1-0.3 fibers in the opposite end of the trailer, and 0.3-0.5 fibers directly adjacent to the dumping area, continue to support the validity of the value of 0.3 fiber as the background exposure level for the time period when asbestos is not being handled. Also the sharp drop in breathing zone level after the initial dump makes it reasonable to calculate the "total sacks in eight hours" values for these tests. Thus:

Regular Super-Visbestos:

$$TWA = \frac{(1.03)(1) + (0.3)(7)}{8} = 0.39 \text{ fibers}$$

$$\left(\frac{10}{59}\right)(480) = 82 \text{ sacks in 8 hours at a TWA of 1.03 fibers}$$

Granular Super-Visbestos:

$$TWA = \frac{(0.5)(1) + (0.3)(7)}{8} = 0.33 \text{ fibers}$$

$$\frac{(10)}{(59)}(480) = 82 \text{ sacks in 8 hours at a TWA of 0.5 fibers}$$

~~Location - South Louisiana~~ *Location - South Louisiana*
a major producing Company in South

Louisiana. The last data to be considered were obtained by ~~at~~ *ing cleanup and associated operations*. This was an open-air dump wherein 21 bags of granular Super-Visbestos were dumped in 15 minutes and 5 minutes were spent in cleanup and disposal of the bags. A slight wind was blowing towards the worker. Two samples were collected simultaneously in the breathing zone of the worker during the dump and *and a* One sample was collected at the same time in the breathing zone of an observer standing about 3' upwind. Results are shown in the Table below.

SAMPLE NO.	LOCATION	TIME MINUTES	FLOW RATE LITERS/MIN	TOTAL VOLUME LITERS	ASBESTOS CONC. FIBERS/CC
1	At breathing zone of worker, at	22.0	1.5	33.0	1.4
2	At breathing zone of worker, at	21.3	2.9	61.8	0.6
3	At breathing zone of Observer <i>Observer</i>	20.3	4.3	87.3	0.0

The data from the two breathing zone samples, although somewhat different, are in reasonable agreement for this kind of dust sampling and counting. The levels found are also in the same general range as the results obtained at the other three locations.

The zero level found for the observer also supports the assumption of the 0.3 fiber value for TWA calculations. There is no evidence to tell whether the observed breathing zone levels had reached steady-state but based on the other tests it seems reasonable to make the same calculation. Thus:

$$TWA = \frac{(1.4)(0.33) + (0.3)(7.67)}{8} = 0.33$$

or using the 0.6 fiber reading

$$TWA = \frac{(0.6)(0.33) + (0.3)(7.67)}{8} = 0.31$$

The corresponding sacks dumped would be $\frac{(21)}{(15)}(480) = 672$ at a TWA of either 1.4 or 0.6 fibers.

TABLE 1
AIRBORNE ASBESTOS DUST CONCENTRATIONS
IN
DRILLING FLUID OPERATIONS

LOCATION	SUPER-VISBESTOS PRODUCT	CONDITIONS	DUST LEVEL (1)							CALCULATED VALUES (6)		
			DUMPING		Peak			Time-Weighted Ave. (TWA) (2)		8 HOUR CONTINUOUS DUMP		
			Sacks	Min.	Rate (S/Min)	Fibers/Ml. (3)	% of Allowable (4)	Fibers/Ml. (3)	% of Allowable (5)	Total Sacks in 8 hours	DUST LEVEL	
											Time-Weighted Ave. (TWA)	
											Fibers/Ml. (3)	% of Allowable (5)
TX	Regular	7'x25' Mud House. Open door at both ends	10	59	0.17	1.03	10	0.39	8	82	1.03	21
TX	Granular	7'x25' Mud House. Open door at both ends	10	59	0.17	0.5	5	0.33	7	82	0.5	10
OK	Regular	Open air. Light breeze	20	21	0.95	1.91	19	0.4	8	457	1.91	38
OK	Granular	Open air. Light breeze	20	26	0.77	0.42	4	0.3	6	369	0.4	8
TX	Granular	10'x11' Room. Totally enclosed	30	29	1.03	1.8	18	0.4	8	464	1.8	36
TX	Granular	10'x11' Room. 1 side open, 8'	30	30	1.0	0.4	4	0.3	6	480	0.4	8
LA	Granular	Open air. Slight breeze	21	15	1.4	1.4 (7) 0.6 (7)	14 6	0.33 0.31	7 6	672 672	1.4 0.6	28 12

1. Sampling and dust counting carried out in accordance with OSHA Regulation 1910.93a.
2. Calculated at a background exposure of 0.3 fiber/ml. for all time except during actual dumping.
3. Fibers/ml. greater than 5µ in length.
4. Allowable = 10 fibers/ml. greater than 5µ.
5. Allowable = 5 fibers/ml. greater than 5µ.
6. Based on continuous exposure to peak value found during short dump. Assumes dumping and surrounding conditions do not change.
7. Operator wore 2 samplers.

013546

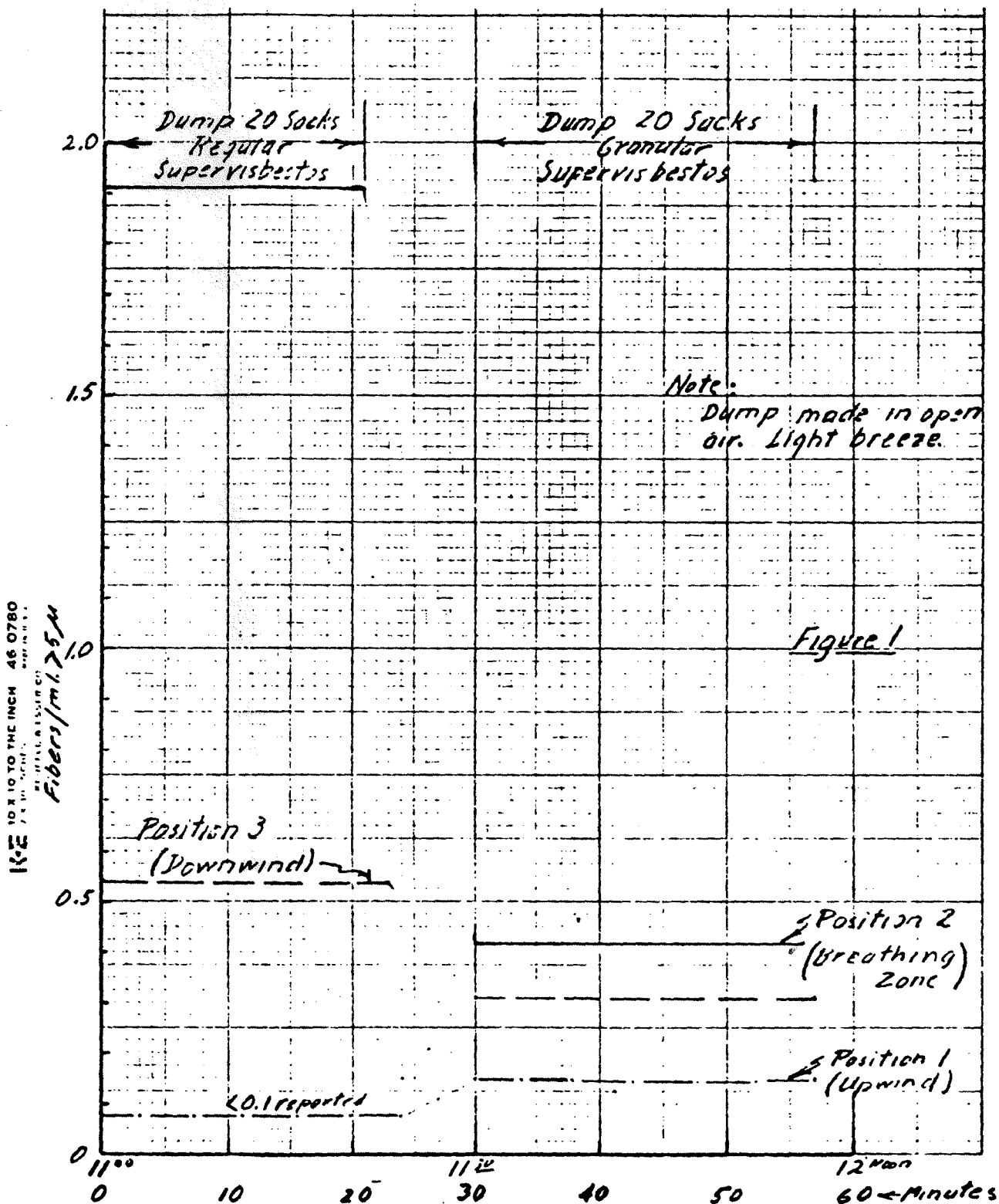
ASBESTOS FIBER COUNTS OF AIRBORNE SAMPLES COLLECTED

FOR

A Major Oil Operator

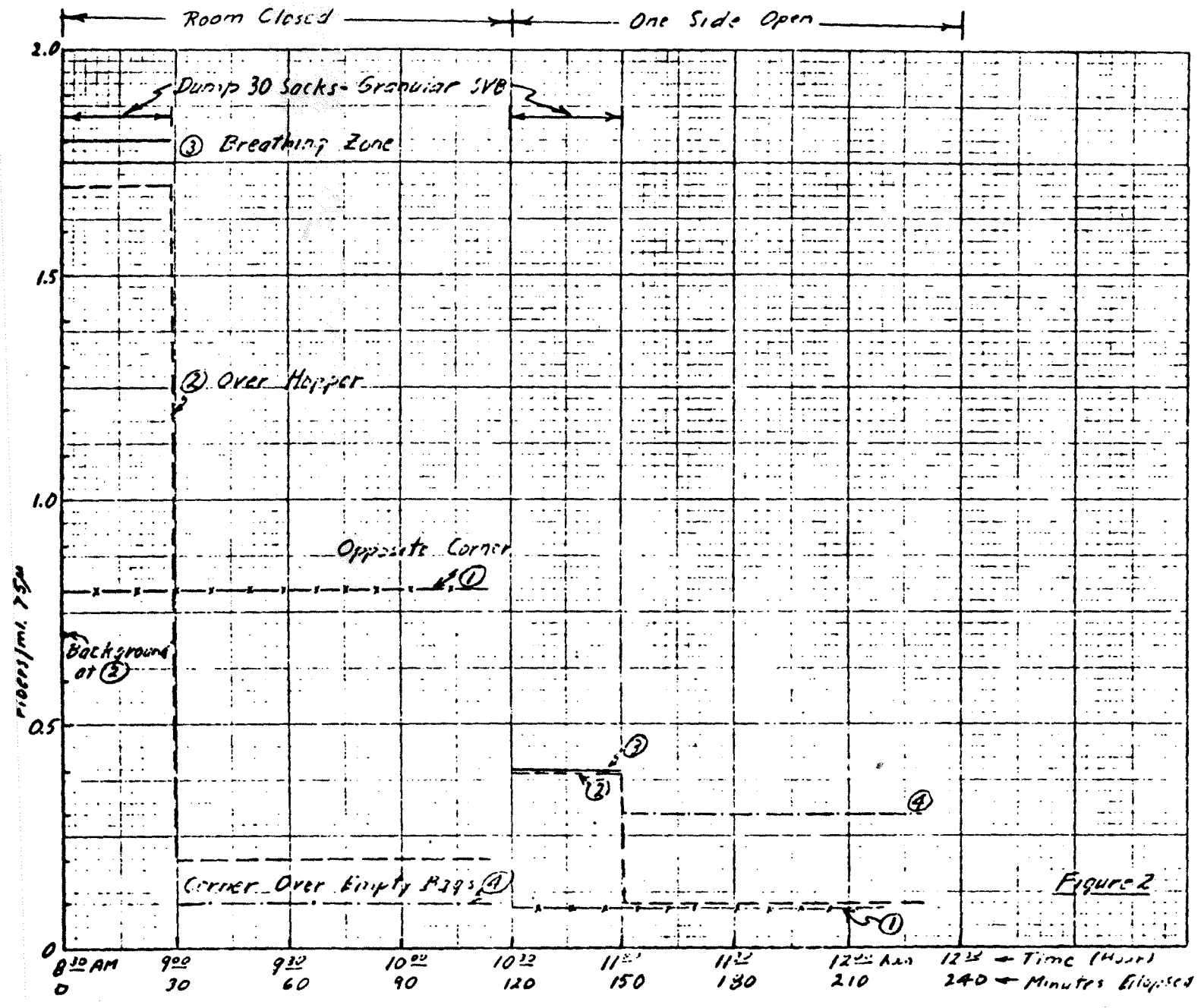
Central Oklahoma

September 27, 1972



ASBESTOS FIBER COUNTS OF AIRBORNE SAMPLES COLLECTED
FOR

Project P.I. Operator - New Houston, Tx.
September 25-26, 1972

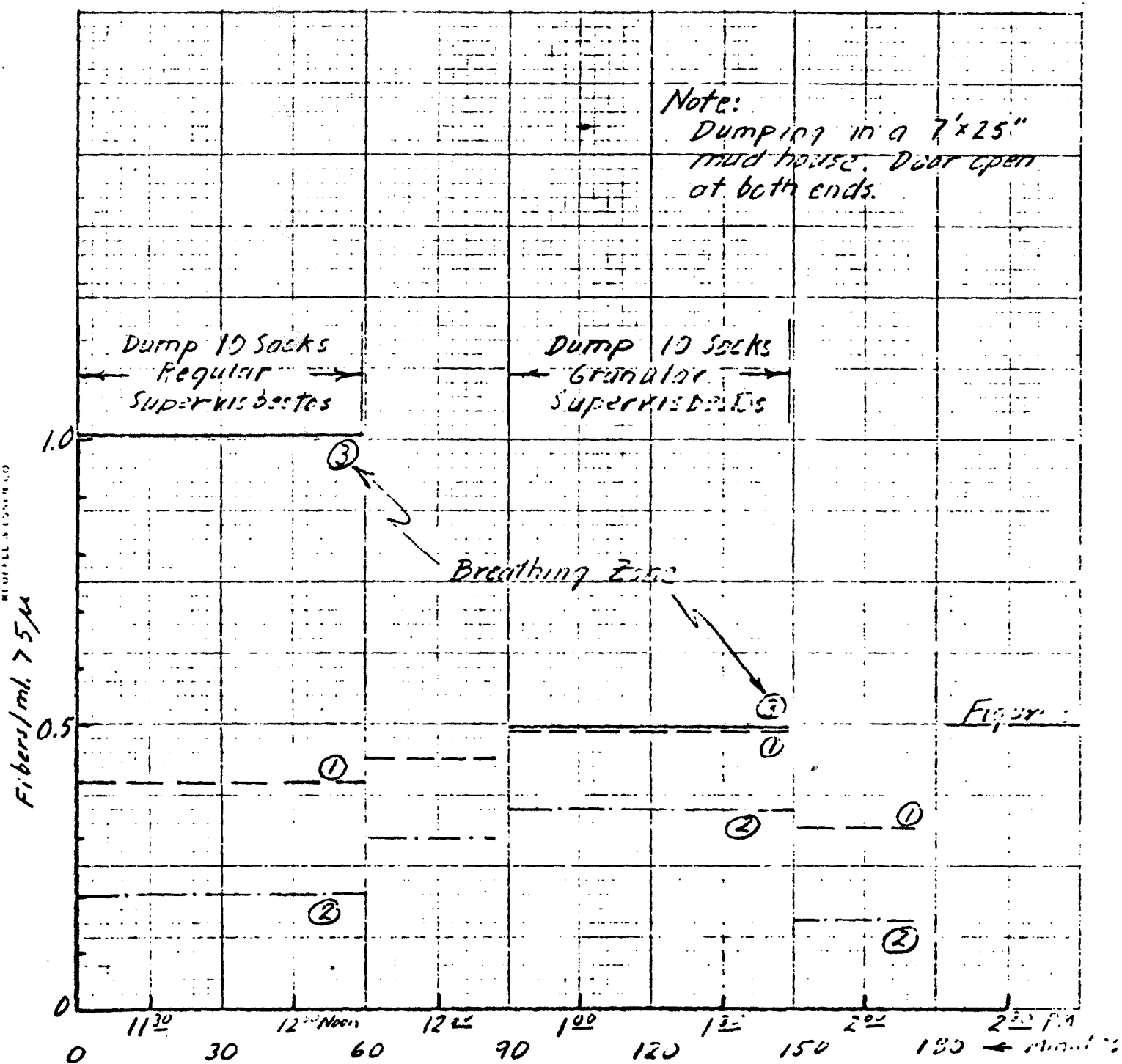


ASBESTOS FIBER COUNTS OF AIRBORNE SAMPLES COLLECTED

FOR

Operator - Texas Fur Lender

September 28, 1972



013550

ASBESTOS FIBER COUNTS OF AIRBORNE SAMPLES COLLECTED

FOR

[REDACTED] - A Major P.I. Operation

[REDACTED]

Central Oklahoma

September 27, 1972

PERSONNEL PRESENT

Montello, Inc. : R. Newman

Union Carbide Corporation: E. Kleber
J. Myers

UNION CARBIDE CORPORATION
Mining and Metals Division
Niagara Falls, New York

OBJECTIVE

013551

Monitor airborne asbestos under "on site" conditions.

INTRODUCTION

On September 27, 1972 tests were conducted at ^{a central} [REDACTED] Oklahoma ^{location} to provide ~~on-site~~ on-site airborne asbestos data. Two products were evaluated; Super Visbestos, a cracked pellet form of asbestos and New Granular Super Visbestos, a pelletized product.

TEST METHOD

11:00 - 11:30 - 20 bags Super Visbestos added to premix pit.

11:30 - 12:00 - 20 bags New Granular Super Visbestos added to premix pit.

PREMIX PIT - (See Figure 1)

Pit was approximately 30' x 8' x 5' deep. The 20 bags of product were added to a hopper connected to a discharge pipe. The vacuum created by the flow of liquid through the pipe was sufficient to keep the addition rate at a little over 1 bag/min.

SAMPLER LOCATIONS - (See Figure 1)

The samplers were left in the same positions for both tests. They are designated position 1, 2, and 3.

Position 1 - 9 ft. upwind from hopper across tank, mounted on light pole, approx. 3 ft. above top rim of premix pit.

Position 2 - Located on operator as he dumps 20 bags of product.

Position 3 - 7 ft. downwind from operator on top of a pile of bags, approx. 2-1/2 ft. above top rim of premix pit.

Note: The terms upwind and downwind are fairly accurate. However, the wind did some shifting during the tests.

EQUIPMENT

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.93a.

Personal air samplers were used to collect personal breathing zone and environmental samples on Millipore Membrane Filters of 0.8 micron porosity.

Air samplers were as follows:

MSA Personal Sampler - Calibrated to draw 2 liters per minute of air, used in positions 3 and 4.

Unico Personal Sampler "A" - Draws 1.8 liters per minute. Used in position 1.

Unico Personal Sampler "B" - Draws 1.7 liters per minute. Used in position 2.

Fiber counting was performed on a Leitz Microscope utilizing Phase Contrast Illumination at 400X and a Patterson Globe and Circle Reticle.

TEST RESULTS - (See Table 1)

Table 1 contains the results of the sample analysis dust counting. The count is reported as fibers greater than 5 microns in length per milliliter of air sampled. A fiber is defined as any material having an aspect ratio greater than 3.

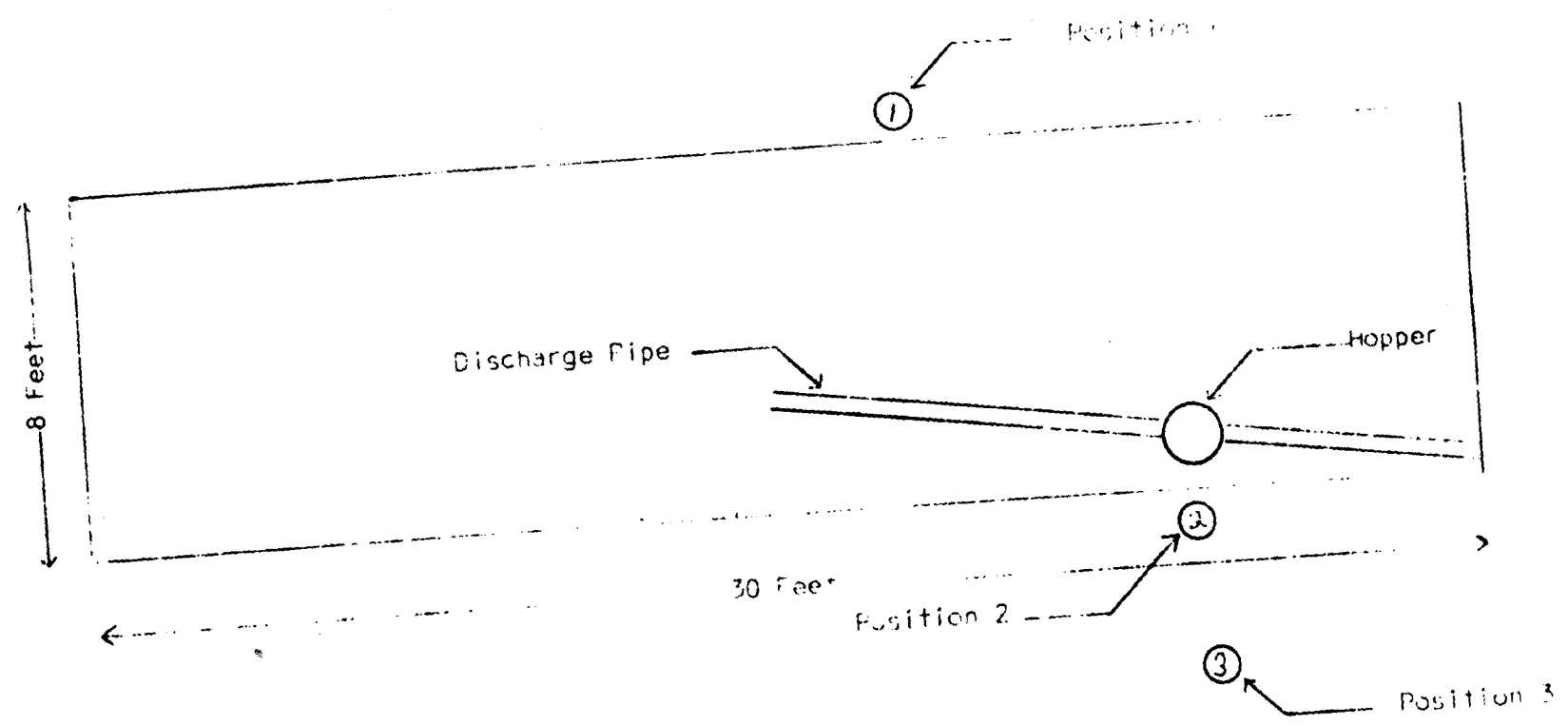
INTERPRETATION

Although the figures speak for themselves, it may be worthwhile to briefly review the Time Weighted Average (TWA) aspect. The Regulations have been established with a limit of 5 fibers per milliliter greater than 5 microns in length on a Time Weighted Average. This means the figures must be arranged to show the employee's average intake of fibers per milliliter on an 8 hour day. For example, a worker dumping asbestos for one hour per day and inhaling 8 fibers per milliliter during that hour would have a TWA of 1 fiber per milliliter and for 2 hours dumping at the 8 fibers per milliliter level would be 2 fibers per milliliter, etc. The highest reading in Table 1 is 1.91 fibers per milliliter and the operator was exposed to this level for only 21 minutes. If this were his only exposure during the day, his TWA would be less than 0.1 fiber per milliliter.

TABLE I
SUMMARY OF DUST COUNTS

<u>N.B. No.</u>	<u>Field No.</u>	<u>Time (Minutes)</u>	<u>Position</u>	<u>Description</u>	<u>Fibers/m³</u> <u>> 5 μm</u>
Addition of 20 bags Super Visbestos					
1929-34-1	5	24	1	Environmental	<0.1
1929-34-2	4	21	2	Personal	1.91
1929-34-3	6	23	3	Environmental	0.54
Addition of 20 bags New Granular Super Visbestos					
1929-34-4	37	27	1	Environmental	0.15
1929-34-5	16	26	2	Personal	0.42
1929-34-6	25	27	3	Environmental	0.31

FIGURE 1
Premix Pit



013554

013555

ASBESTOS FIBER COUNTS OF AIRBORNE SAMPLES COLLECTED

A Major P.I. Operator - Near Houston, Tx.

September 25-26, 1972

PERSONNEL PRESENT

[REDACTED]	:	[REDACTED]
Montello, Inc.	:	R. Newman
[REDACTED]	:	[REDACTED]
		[REDACTED]
		[REDACTED]
Union Carbide Corporation:		E. Klobar
		J. Myers

UNION CARBIDE CORPORATION
Mining and Metals Division
Niagara Falls, New York

OBJECTIVE

Monitor airborne asbestos in simulated North Slope mud house conditions.

INTRODUCTION

On September 25 & 26, 1972 tests were conducted ~~at~~ ^{near Houston} Texas in order to determine the amount of airborne asbestos that could be generated in a North Slope drilling operation. A building was constructed for the tests and all air samples were taken inside this structure. Two products were evaluated: Arcovis 953, essentially 100% liberated fiber and New Granular Super-Visbestos, a pelletized form of asbestos.

TEST METHOD

In order to closely simulate North Slope drilling mud preparation conditions, tests were made as follows:

September 25th 9:00 a.m. - Noon	- 30 bags of Arcovis 953 added to 100 barrels of diesel. "Door" open.
September 25th 1:30 p.m. - 4:00 p.m.	- 30 bags of Arcovis 953 added to 100 barrels of diesel. "Door" closed.
September 26th 8:30 a.m. - 10:30 a.m.	- 30 bags of New Granular Super-Visbestos added to 125 barrels of water. "Door" closed.
September 26th 10:30 a.m. - 12:30 p.m.	- 30 bags of New Granular Super-Visbestos added to 125 barrels of water. "Door" open.

PHYSICAL DIMENSIONS OF BUILDING - (See Figure 1)

A specially constructed plywood building, approximately 9 x 10 x 11.5 feet was used for all tests. The building was enclosed on all sides except for an 8 x 9 foot opening in front.

When a "Door open" test was run the opening was left alone and wind was free to blow about. When a "Door closed" test was conducted a large piece of plastic was stapled over the opening, effectively shutting off outside wind. This technique was devised to simulate a cold day on the North Slope when trailer doors would be closed.

SAMPLER LOCATIONS - (See Figure 1)

In order to obtain a high amount of comparative data it was decided that the samplers would be located in the same positions for all tests. For ease of identification they have been labeled positions 1, 2, 3, and 4.

Position 1 - Approximately 7 feet from Hopper in corner near door opening. Somewhat of a "dead" area from the standpoint of air circulation. In all tests this sampler ran both during dump and in the "settling" period.

Position 2 - Directly over Hopper. It was decided that since the operator moves about quite a bit obtaining and disposing of bags, a stationary sample would be of value to catch any "blow back" from the Hopper. This sampler was run during the dump. Upon completion a new filter was inserted and allowed to run through the "settling" period. This accounts for two position 2 samples in each test.

Position 3 - Attached to operator and run during entire dump.

Position 4 - Placed over bag disposal area, approximately 5 feet from Hopper. Run after completion of dump.

MISCELLANEOUS

All samplers were 5-1/2 to 6 feet above the ground, except background sample on 9/25 which was 4-1/2 feet above the ground.

In each test, 30 bags of asbestos were added through a Hopper to approximately 100 barrels of liquid (either diesel or water) in a 170 barrel tank at the rate of 1 bag per minute. A 6 x 8 inch B. J. Centrifugal Pump operated at 790 G.P.M.

Background sample 1929-32-12 has a rather large fiber content. This is probably due to movement in the area kicking up the previous day's dust and the placement of a pallet of asbestos during sampling time.

EQUIPMENT

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.93a.

Personal air samplers were used to collect personal breathing zone and environmental samples on Millipore Membrane Filters of 0.8 micron porosity.

Air samplers were as follows:

MSA Personal Sampler - Calibrated to draw 2 liters per minute of air. used in positions 3 and 4.

Unico Personal Sampler "A" - Draws 1.8 liters per minute. Used in position 1.

Unico Personal Sampler "B" - Draws 1.7 liters per minute. Used in position 2.

Fiber counting was performed on a Leitz Microscope utilizing Phase Contrast Illumination at 400X and a Patterson Globe and Circle Reticle.

TEST RESULTS - (See Table 1)

Table 1 contains the results of the sample analysis dust counting. The count is reported as fibers greater than 5 microns in length per milliliter of air sampled. A fiber is defined as any material having an aspect ratio greater than 3.

INTERPRETATION

Although the figures speak for themselves, it may be worthwhile to briefly review the Time Weighted Average (TWA) aspect. The Regulations have been established with a limit of 5 fibers per milliliter greater than 5 microns in length on a Time Weighted Average. This means the figures must be arranged to show the employee's average intake of fibers per milliliter on an 8 hour day. For example, a worker dumping asbestos for one hour per day and inhaling 8 fibers per milliliter during that hour would have a TWA of 1 fiber per milliliter and for 2 hours dumping at the 8 fibers per milliliter level would be 2 fibers per milliliter, etc. The highest reading in Table 1 is 5.5

013558

fibers per milliliter and the operator was exposed to this level for only 35 minutes. If this were his only exposure during the day his TWA would be 0.4 fibers per milliliter.

TABLE I

SUMMARY OF DUST COUNTS

013559

<u>N.B. No.</u>	<u>Field No.</u>	<u>Time (Minutes)</u>	<u>Position</u>	<u>Description</u>	<u>Fibers/m⁵</u>
<u>September 25, 1972</u>					
1929-32-1	58	56	2	Background for 9/25	0.1
OPEN SYSTEM - Addition of 30 bags Arcovis 953 to 100 barrels of diesel					
1929-32-2	62	29	2	Environmental - During Dump	0.3
1929-32-3	52	30	3	Operator - During Dump	1.3
1929-32-4	70	81	2	Environmental - After Dump	0.1
1929-32-5	54	78	4	Environmental - After Dump	0.2
1929-32-6	56	110	1	Environmental - During & After Dump	0.2
CLOSED SYSTEM - Addition of 30 bags Arcovis to 102 barrels of diesel/Arcovis mix					
1929-32-7	57	36	2	Environmental - During Dump	5.2
1929-32-8	55	35	3	Operator - During Dump	5.5
1929-32-9	82	95	2	Environmental - After Dump	0.5
1929-32-10	50	95	4	Environmental - After Dump	0.3
1929-32-11	63	132	1	Environmental - During & After Dump	1.0
<u>September 26, 1972</u>					
1929-32-12	23	31	2	Background for 9/26	0.7
CLOSED SYSTEM - Addition of 30 bags New Granular Super Visbestos to 125 barrels of water					
1929-32-13	93	29	2	Environmental - During Dump	1.7
1929-32-14	95	29	3	Operator - During Dump	1.8
1929-32-15	68	85	2	Environmental - After Dump	0.2
1929-32-16	92	83	4	Environmental - After Dump	0.1
1929-32-17	27	114	1	Environmental - During & After Dump	0.8
OPEN SYSTEM - Addition of 30 bags New Granular Super Visbestos to 120 barrels of water					
1929-32-18	90	31	2	Environmental - During Dump	0.4
1929-32-19	79	30	3	Operator - During Dump	0.4
1929-32-20	19	77	2	Environmental - After Dump	0.1
1929-32-21	36	77	4	Environmental - After Dump	0.3
1929-32-22	74	107	1	Environmental - During & After Dump	0.1

TOP VIEW

10-1/3'

013560

Position
(1)

8'
Opening

SACKS ON
PALLET

33"

Position
(2)
HOPPER

1 1/2'

11-1/2'

BODY

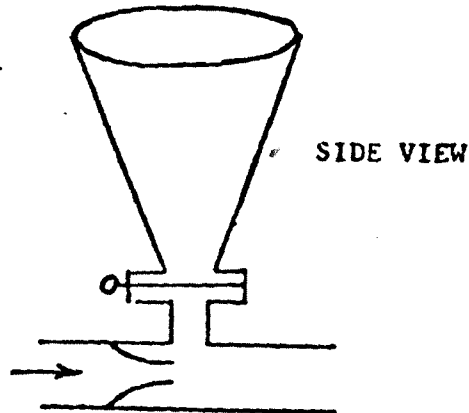
Position
(3)

EMPTY
SACKS

Position (4)

10-1/3'

All monitors about 5.5' above ground level
Building 9' high
Hopper 3' high



SIDE VIEW

FIGURE 1 - HOPPER AND BUILDING

013561

ASBESTOS FIBER COUNTS OF AIRBORNE SAMPLES COLLECTED

FOR
Oil Company
Texas Panhandle

September 28, 1972

PERSONNEL PRESENT

 :

Montello, Inc. : R. Newman
H. Wyatt

Union Carbide Corporation: E. J. Kleber

UNION CARBIDE CORPORATION
Mining and Metals Division
Niagara Falls, New York

OBJECTIVE

Monitor airborne asbestos in an actual on site condition inside a mud house.

INTRODUCTION

On September 28, 1972 tests were conducted at a ~~drilling site~~ ^{in the Texas Panhandle} ~~40 miles from Texas~~. All samples were collected in a mud house approx. 25' x 7' with a Quonset hut roof 7 ft. high at the zenith. Two asbestos products were evaluated; Super-Visbestos, essentially 100% liberated fiber, and New Granular Super-Visbestos, a pelletized form.

TEST METHOD

11:15 - 12:45 - 10 bags Super-Visbestos added to hopper.

12:45 - 2:10 - 10 bags New Granular Super-Visbestos added to hopper.

The first hour of each test was the dumping of asbestos, 1 bag every 6 minutes. The last half hour was monitored as a settling period.

SAMPLER LOCATIONS - (See Figure 1)

The samplers were left in the same spots for each test. They are designated as Position 1, 2, and 3.

Position 1 - 4 ft. from hopper in somewhat of a "dead" air area, 5-1/2 ft. above floor.

Position 2 - At opposite end of mud house, 3 ft. from door, downwind from hopper, 5-1/2 ft. above ground.

Position 3 - Operator dumping bags at the rate of 10/hour.

EQUIPMENT

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.93a.

Personal air samplers were used to collect personal breathing zone and environmental samples on Millipore Membrane Filters of 0.8 micron porosity.

Air samplers were as follows:

MSA Personal Sampler - Calibrated to draw 2 liters per minute of air. Used in position 3.

Unico Personal Sampler "A" - Draws 1.8 liters per minute. Used in position 1.

Unico Personal Sampler "B" - Draws 1.7 liters per minute. Used in position 2.

Fiber counting was performed on a Leitz Microscope utilizing Phase Contrast Illumination at 400X and a Patterson Globe and Circle Reticle.

TEST RESULTS - (See Table 1)

Table 1 contains the results of the sample analysis dust counting. The count is reported as fibers greater than 5 microns in length per milliliter of air sampled. A fiber is defined as any material having an aspect ratio greater than 3.

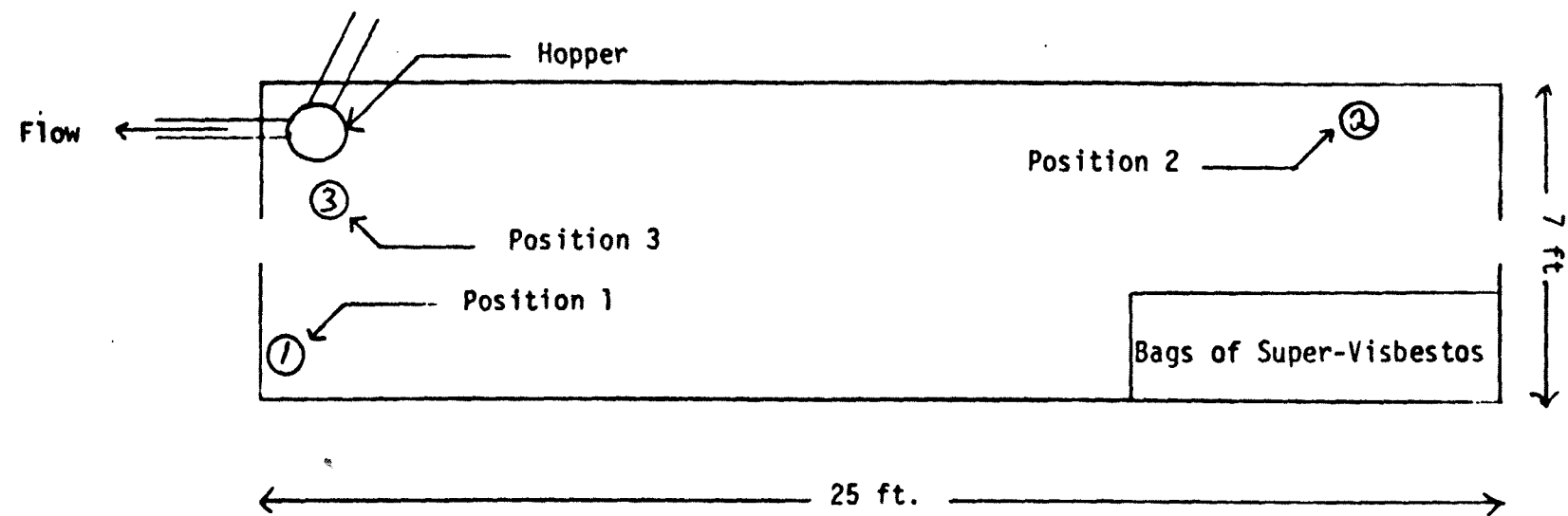
INTERPRETATION

Although the figures speak for themselves, it may be worthwhile to briefly review the Time Weighted Average (TWA) aspect. The Regulations have been established with a limit of 5 fibers per milliliter greater than 5 microns in length on a Time Weighted Average. This means the figures must be arranged to show the employee's average intake of fibers per milliliter on an 8 hour day. For example, a worker dumping asbestos for one hour per day and inhaling 8 fibers per milliliter during that hour would have a TWA of 1 fiber per milliliter and for 2 hours dumping at the 8 fibers per milliliter level would be 2 fibers per milliliter, etc. The highest reading in Table 1 is 1.03 fibers per milliliter and the operator was exposed to this level for 59 minutes. If this were his only exposure during the day, his TWA would be less than 0.2 fiber per milliliter.

TABLE I
SUMMARY OF DUST COUNTS

<u>N.B. No.</u>	<u>Field No.</u>	<u>(Minutes)</u>	<u>Position</u>	<u>Description</u>	<u>Fibers/ml</u> <u>> 5 μ</u>
Dumping of 10 bags Super-Visbestos					
1929-36-1	33	60	1	Environmental	0.40
-2	41	61	2	Environmental	0.20
-3	47	59	3	Personal	1.03
-4	9	27	1	Env. - After Dump	0.44
-5	34	27	2	Env. - After Dump	0.31
Dumping of 10 bags New Granular Super-Visbestos					
-6	15	59	1	Environmental	0.47
-7	11	60	2	Environmental	0.35
-8	10	59	3	Personal	0.49
-9	42	25	1	Env. - After Dump	0.32
-10	46	25	2	Env. - After Dump	0.16

FIGURE 1
Mud House



013565

013566

Major C. I. Operator

Environmental Health Services Division of
Medical and Health Services Department

Director, Industrial Hygiene

November 2, 1972

Mr. [REDACTED]

Tulsa

Dear Mr. [REDACTED]

Use underlined portion as title for following page

Attached is (report of sampling and determination of asbestos concentration at the breathing zone of workers during the dumping of asbestos into drilling mud) at the [REDACTED] La.

Sincerely,

mz
Attachment

cc: [REDACTED]

Remove entire page

SAFETY [initials]

NOV 13 1972

Title from preceding page (underlined portion)

Major Oil Operator

013567

La.

South Louisiana

SUMMARY

A survey indicated that the asbestos exposure of the employee dumping asbestos (Visbestos, Montello Inc., Tulsa, Oklahoma) into the hopper leading to the tank containing drilling mud at the [REDACTED] was well below the present OSHA permissible limit.

PURPOSE

~~At the request of Mr. [REDACTED],~~ A survey was made by [REDACTED] Director, Industrial Hygiene, Environmental Health Services Division of Medical and Environmental Health Services Department, [REDACTED] of asbestos exposure during the dumping of asbestos into drilling mud at the [REDACTED] ^{South} in [REDACTED], La. The operation at [REDACTED] is similar to what occurs at a drilling rig except that only 1/3 of the amount of asbestos is used in the latter operation.

Messrs. [REDACTED] Mud Engineer, [REDACTED] Drilling Engineer and [REDACTED] Safety Engineer, New Orleans Office, [REDACTED] were present to observe and discuss the procedure and survey.

SURVEY

Personal samples were collected at the breathing zone of the worker during the dumping of asbestos using 37 millimeter Millipore type (membrane) AA filter in a holder connected to a MSA or Unico pump pulling air through the filter at a constant flow rate. The determination of asbestos concentrations was made by counting asbestos fibers longer than 5 micrometers at 400-450 X magnification (4 millimeters objective) with phase contrast illumination.

DESCRIPTION OF OPERATION

In drilling operations a mud circulates around the drill for cooling and lubrication. The mud is treated for weight, viscosity and gel strength. Asbestos increases the effectiveness of gel, that is, keeps it from setting up like cement. The mud must be left in the annulus of the drill with gel characteristics.

Bags weighing 50 pounds of Super Visbestos, Montello Inc., Tulsa, Oklahoma were dumped into a hopper (15" x 15" opening) over a tank containing 215 barrels of mud (14.5 lbs/gal lignosulfonate). The Montello asbestos, produced by Union Carbide by a wet process, is in a pelletized form. Twenty-one bags of asbestos were dumped over a period of approximately 15 minutes. About 5 minutes was spent in disposing of the empty bags. A slight breeze was blowing dust toward the worker but the dust began to settle before reaching the breathing zone. ~~While conducting the operation, the worker wore an unapproved Flexoprene paint mask manufactured by the Flexo Products Inc., Westlake, Ohio.~~

013568

RESUL

SAMPLE NO	LOCATION	TIME MINUTES	ASBESTOS FIBERS
1	At breathing zone of worker, [REDACTED]	22.0	1
2	At breathing zone of worker, [REDACTED]	21.3	0
3	At breathing zone of [REDACTED] Observer	20.3	0

Two samplers were placed at the breathing zone of the surveyor and worker during dumping and during cleanup and

DISCUSSION

The Occupational Safety and Health Administration 8-hour time-weighted average airborne concentration of asbestos which an employee may be exposed shall not exceed five fibers per cubic centimeter of air. The ceiling (maximum) concentration shall not exceed 5 micrometers, per cubic centimeter of air.

The results of the sampling and determination of the employee dumping asbestos was below the limit which result was below 2 fibers/cc, the limit which

Respiratory protection need not be worn during higher concentrations of asbestos are anticipated. Approved by the Bureau of Mines or a National Institute for Occupational Safety and Health (NIOSH) for protection against pneumo-

[REDACTED]
[REDACTED]
Director, Industrial Hygiene
Environmental Health Services Division
Medical & Environmental Health Services Department
November, 1972

013569

AIRBORNE ASBESTOS COUNTS

for

**Southwest Drilling Mud
(Warehouse)
Midland, Texas**

**Date Sampled: January 13, 1977
Date Reported: January 24, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To determine airborne asbestos emissions at the subject company's storage facilities.

DESCRIPTION OF OPERATION:

Warehouse was open on one side. Airborne samples were obtained prior to the transfer of asbestos to a truck. Airborne samples were also obtained after the transfer of asbestos (Environmental).

Personal samples were obtained at the breathing zone of the forklift operator during the transfer of 139 bags Super Visbestos and also of other personnel working in the loading area.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTSSouthwest Drilling Mud
(Warehouse)
Midland, Texas

013572

Airborne Fiber Count
(fibers/cc >5 μ)

Sample No.	Air Sample		Operation Description	Airborne Fiber Count	
	Time	Minutes		Total	Chrysotil Asbestos
J-17	on: 8:20A off: 8:49A	29	Environmental - (Prior to the use of SVB). Located at enclosed end of warehouse ~8' from floor and ~10' from bags. (Bags stacked ~10' high.)	0.1	0.1
J-42	on: 8:22A off: 8:46A	24	Environmental - (Prior to the use of SVB) Located ~10' from door and 4 1/2' from floor ~20' from bags.	0.1	0.1
J-1	on: 8:24A off: 8:47A	23	Environmental - (Prior to the use of SVB.) Located at enclosed end of warehouse 6' bags and 5 1/2' from floor.	0.1	0.1
G-15	on: 8:59A off: 9:15A	16	Personal - (Jeff Darr - helped load truck) 139 bags SVB loaded onto truck.	0.3	0.3
J-77	on: 8:59A off: 9:15A	16	Personal - (Randall Brook - forklift operator.) During the handling of 139 bags SVB.	0.1	0.1
J-37	on: 8:59A off: 9:15A	16	Personal - (Joe Rusnak - helped load 139 bags SVB from truck.	0.3	0.3
J-76	on: 9:20A off: 9:45A	25	Environmental - (After the transfer of 139 bags SVB.) Located same as J-42.	<0.1	<0.1
A-94	on: 9:22A off: 9:45A	23	Environmental - (After the transfer of 139 bags SBV.) Located same as J-17.	<0.1	<0.1

013573

AIRBORNE ASBESTOS COUNTS
for
Robinson Drilling of Texas Inc.
Rig #6

Date Sampled: January 13, 1977
Date Reported: January 21, 1977

Samples Collected By: G. J. Spencer
Union Carbide Corporation
Samples Analyzed By: G. J. Spencer
Union Carbide Corporation
Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

013574

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling location, located ~25 miles north of Bigspring, Texas, (Rig #6) during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Operation involved the addition of 5 bags SVB to a hopper in the formulation of a drilling mud. Airborne samples (Environmental) were taken prior to, during and after the dump. A personal sample was obtained in the breathing area of the dump during addition of 5 bags SVB to a hopper.

Samples were obtained outdoors on a moderately windy day.

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS
Robinson Drilling of Texas Inc.
Rig #6

013576

Sample No.	Air Sample Time	Minutes	Operation Description	Airborne Fiber Count (fibers/cc >5μ)	
				Total	Chrysotile Asbestos
G-12	on: 11:20A off: 11:44A	24	Environmental - (Prior to the use of SVB) Located 15' from hopper and 4 1/2' from ground.	0	0
J-86	on: 11:23A off: 11:46A	23	Environmental - (Prior to the use of SVB.) Located 10' downwind of bag storage area and 5' from ground.	0	0
J-18	on: 11:48A off: 12:07P	19	Personal - (M.R. Cooper-dump operator) During the dump of 5 bags SVB into a hopper, and during bag disposal. (Operator upwind.)	0	0
J-27	on: 11:49A off: 12:04P	15	Environmental - (During the use of SVB.) Located same as G-12.	0.1	0.1
J-34	on: 11:51A off: 12:07P	16	Environmental - (During the use of SVB.) Located same as J-86. (8' downwind of dump.)	0	0
C-24	on: 12:06P off: 12:16P	10	Environmental - (After the use of SVB.) Located same as G-12.	0.4	0.4

AIRBORNE FIBER COUNTS

for

D. B. Drilling (AMOCO) Rig #6
Hamlin, Texas

Date Sampled: January 12, 1977
Date Reported: January 26, 1977

Samples Collected By: G. J. Spencer
Union Carbide Corporation

Samples Analyzed By: G. J. Spencer
Union Carbide Corporation

Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling facilities during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Airborne samples were obtained in the area of the dump prior to and during the use of SVB (Environmental). The dump area was located outdoors and samples were taken on a moderately rainy day. No environmental samples were obtained after the dump due to increasingly heavy rain.

A personal sample was obtained in the breathing zone of the dump operator during the addition of five bags of Super Visbestos to a hopper. A personal sample was also obtained during bag disposal.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTSD. B. Drilling (AMOCO)
Hamlin, Texas

013530

Airborne Fiber Cou.
(fibers/cc >5 μ)Chrysoti
Asbesto

Sample No.	Air Sample Time	Minutes	Operation Description	Total	Chrysoti Asbesto
J-28	on: 1:20P off: 1:40P	20	Environmental - (Prior to the use of SVB.) Located ~3 1/2' above hopper of Rig #6. Weather conditions during time of monitoring - misty rain.	0.1	0.1
J-15	on: 1:57P off: 2:28P	31	Personal - (Allen Morgan - dump operator, during the use of SVB.) Operation included unloading and addition of 5 bags SVB to a hopper, located outdoors. Weather conditions during time of monitoring - misty rain.	0.3	0.3
J-10	on: 1:57' 30" off: 2:28P	30'30"	Environmental -(During the use of SVB.) Located same as J-28. Weather conditions at the time of monitoring - moderate rain.	0.1	0.1
J-31		2	Personal - (Allen Morgan, during bag disposal only.) Weather conditions at the time of monitoring - moderate rain.	1.7	1.7

013531

AIRBORNE FIBER COUNTS

for

West Texas Drilling Company Rig #14
(Sun Oil Company)

Date Sampled: January 12, 1977
Date Reported: January 26, 1977

Samples Collected By: G. J. Spencer
Union Carbide Corporation

Samples Analyzed By: G. J. Spencer
Union Carbide Corporation

Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

OBJECTIVE:

013582

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #14 located ~25 minutes south of Colorado City, Texas) during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Operation involved the addition of nine bags Super Visbestos to a hopper located outdoors. Environmental samples were obtained in the breathing zone of the dump area prior to, during and after the dump.

A personal sample was obtained in the breathing zone of the dump operator during the addition of nine bags Super Visbestos to a hopper, which was located outdoors.

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

West Texas Drilling Company Rig #14
(Sun Oil Company)

013534

Airborne Fiber Cou
(fibers/cc >5 μ)

Sample No.	Air Sample		Operation Description	Airborne Fiber Cou	
	Time	Minutes		Total	Chrysoti Asbesto
J-21	on: 5:30P off: 5:50P	20	Environmental - (Prior to the use of SVB.) Located ~3' from hopper and ~6' from ground. Hopper located outdoors.	0.1	0.1
J-24	on: 5:50P off: 6:17P	27	Personal - (Randy Pelton, dump operator) During the addition of nine bags SVB to hopper and during bag disposal.	0.3	0.3
J-20	on: 5:50P off: 6:17P	27	Environmental - (During the use of nine bags SVB.) Located same as J-21.	0.4	0.4
J-16	on: 6:18P off: 6:31P	23	Environmental - (After the use of nine bags SVB.) Located same as J-21.	0.3	0.3

013585

AIRBORNE ASBESTOS COUNTS

for

**Grand Mud Company
Abilene, Texas**

**Date Sampled: January 12, 1977
Date Reported: February 10, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

013536

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's storage facilities.

DESCRIPTION OF OPERATION:

Operation involved the transfer of Super Visbestos from warehouse storage facilities to a truck in the loading area. Environmental samples were taken in and near the storage area prior to and during the transfer of Super Visbestos. A personal sample was obtained in the breathing zone of the forklift operator during the transfer of Super Visbestos from warehouse storage area to loading zone. Approximately one pallet was transferred.

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

Grand Mud Company
Abilene, Texas

013538

Airborne Fiber Count
(fibers/cc >5 μ)

Sample No.	Air Sample Time	Minutes	Operation Description	Airborne Fiber Count (fibers/cc >5 μ)	
				Total	Chrysotile Asbestos
J-32	on: 10:38A off: 11:05A	27	Environmental - (Prior to the transfer of SVB.) Located ~8' from bags and 5' from floor. Near entrance to men's wash room.	<0.1	<0.1
J-41	on: 10:38A off: 11:05A	27	Environmental - (Prior to the transfer of SVB.) Located ~10' from bags and 5 1/2' from floor. On wall near 14' doors between two storage areas.	0.1	0.1
J-44	on: 11:13A off: 11:30A	17	Environmental - (During the transfer of ~1 pallet of SVB from warehouse storage area to truck.) Located same as J-41. Forklift passes through doors where pump is located.	0.1	0.1
X-9	on: 11:13A off: 11:21A	8	Personal - (Mike Poind, extra forklift operator.) During the transfer of ~1 pallet SVB from warehouse storage area to truck.	0.2	0.2
J-23	on: 11:15A off: 11:30A	15	Environmental - during the transfer of ~1 pallet SVB from warehouse storage area to truck. Located same as J-32.	0.3	0.3

013589

AIRBORNE ASBESTOS COUNTS

for

**American Mud Company
Abilene, Texas**

**Date Sampled: January 12, 1977
Date Reported: February 10, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's storage facilities during the transfer of Super Visbestos from storage area to pick-up truck.

DESCRIPTION OF OPERATION:

Operation involved the transfer of 40 bags Super Visbestos from warehouse storage area to pick-up truck in loading area. Environmental samples were obtained prior to and during the transfer of Super Visbestos.

A personal sample was obtained in the breathing zone of the fork-lift operator during the transfer of Super Visbestos from storage area to loading area.

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTSAmerican Mud Company
Abilene, Texas

013592

Airborne Fiber Count
(fibers/cc >5 μ)Chrysotile
Asbestos

Sample No.	Air Sample Time	Minutes	Operation Description	Total	Chrysotile Asbestos
J-22	on: 8:45A off: 9:15A	30	Environmental - Prior to the transfer of SVB. Located ~5' from floor and 4' from bags. Inside warehouse storage area.	0.1	0.1
E-22	on: 8:45A off: 9:15A	30	Environmental - Prior to the transfer of SVB. Located ~30' from bags and 3 1/2' from floor. Inside warehouse storage area.	<0.1	<0.1
J-19	on: 9:34A off: 9:44A	10	Personal - (Bernis Rains - forklift operator.) During the transfer of 40 bags SVB from warehouse storage area to loading area.	0.2	0.2
J-25	on: 9:34A off: 10:00A	26	Environmental - During the transfer of 40 bags SVB from warehouse storage area to loading area. Located same as E-22.	0.1	0.1
J-39	on: 9:34A off: 10:00A	26	Environmental - During the transfer of 40 bags SVB from warehouse storage area to loading area. Located same as J-25.	0.1	0.1

013593

AIRBORNE ASBESTOS COUNTS

for

**Cactus Drilling
Rig #5
~ 20 Miles Southwest of
Vernal, Utah**

**Date Sampled: September 23, 1977
Date Reported: September 28, 1977**

**Samples Collected By: B. L. Ingalls
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE

013594

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #5) during the use of five bags of Super Visbestos.

DESCRIPTION OF OPERATION

Operation involved the addition of five bags Super Visbestos, bentonite, limestone and zinc chromate to a vent-type hopper in a drilling application.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

Several photographs obtained in the work zone during monitoring are included.

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

In the present application the worker handled asbestos for 14 minutes and left the area. Asbestos was not used again. Presumably his exposure for the other parts of the shift was zero or at most at the level of the natural background. For a zero exposure, for the time not handling asbestos, his 8-hour, time-weighted average exposure can be estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.0)(466)}{480} \approx 0.01 \text{ fibers/cc} > 5\mu$$

In the vicinity of the hopper, the levels before and after handling ranged from 0.0 to 0.04 fibers/cc > 5 μ . If the worker had stayed in the vicinity of the hopper throughout the shift his maximum TWA exposure is estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.04)(466)}{480} = 0.05$$

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time. The ceiling exposure for this operation was 0.3 fibers/cc greater than 5 microns.

013596

Airborne Fiber Cou
(fibers/cc >5μ)

<u>Sample No.</u>	<u>Air Sample Time</u>	<u>Minutes</u>	<u>Operation Description</u>	<u>Chrysotile Asbestos</u>
M-39	on: 1:00P off: 1:39P	39	Area - prior to the use of asbestos. Located ~20 feet south of hopper and 3-1/2 feet above ground.	0.04
M-48	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~4 feet west of hopper ~6 feet above ground, and ~2 feet above hopper.	0.02
M-52	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~5 feet east of hopper ~3-1/2 feet above hopper and ~6-1/2 feet above ground. Rig #5.	0.04
M-19	on: 1:47P off: 2:01P	14	Personal - (Chuck Ireland) During 12 min. dump of five bags SVB, and during bag disposal.	0.3
M-49	on: 1:48P off: 1:59P	11	Area - during the dump of five bags SVB. Located same as M-52.	0.1
N-95	on: 1:48P off: 2:00P	12	Area - during the use of asbestos. Located same as M-48.	0.3
M-44	on: 2:05P off: 3:14P	69	Area - after the use of asbestos. Located same as M-52.	0
M-46	on: 2:07P off: 3:16P	69	Area - after the use of asbestos. Located same as M-48.	0.01
B-9	on: 2:09P off: 3:13P	64	Area - after the use of asbestos. Located ~3 feet from hopper, ~2 feet above hopper and ~5 feet above ground.	0.01

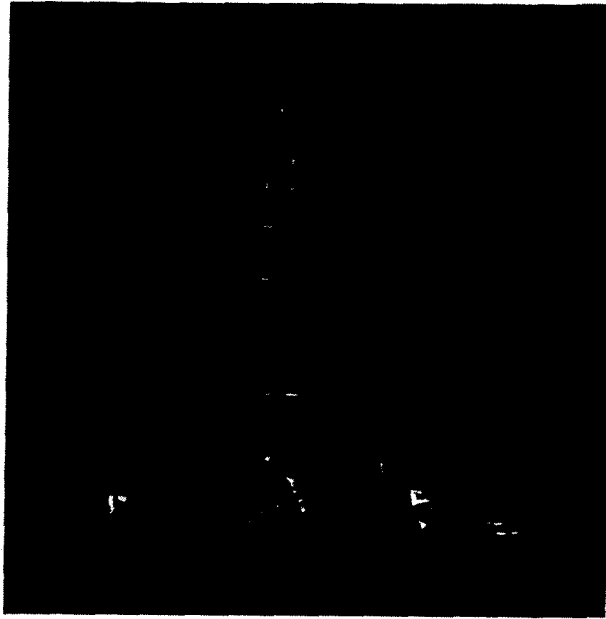


FIGURE 1 - Rig #5

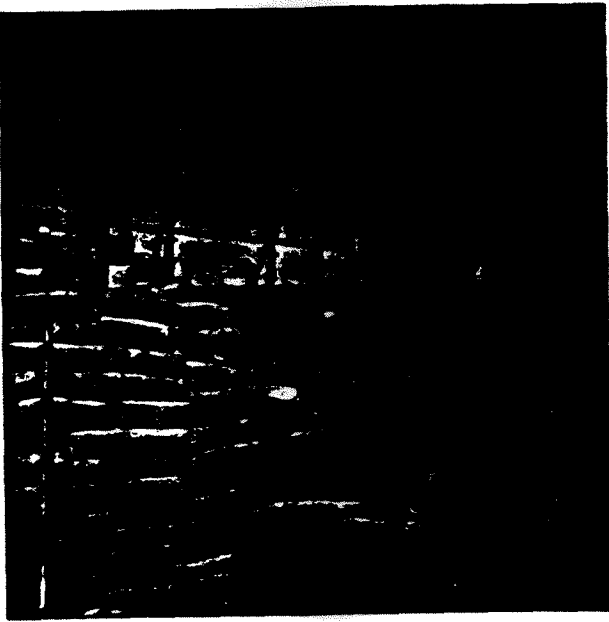


FIGURE 2 - Hopper and dry materials storage area.

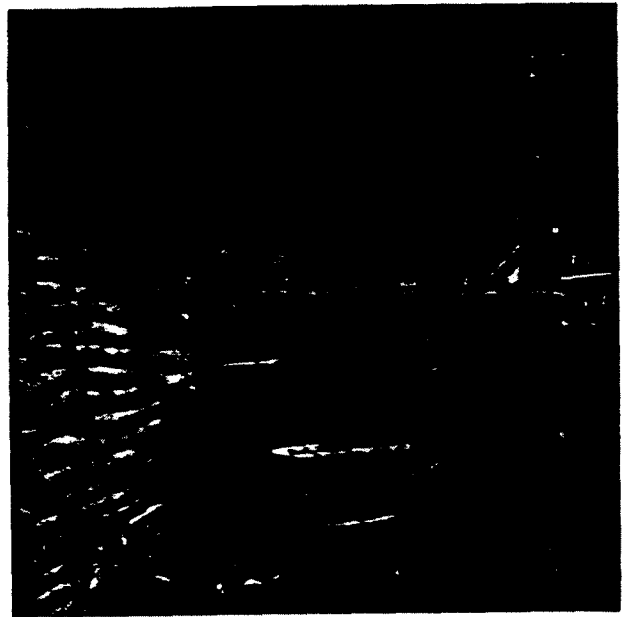


FIGURE 3 - Hopper and dry materials storage area.

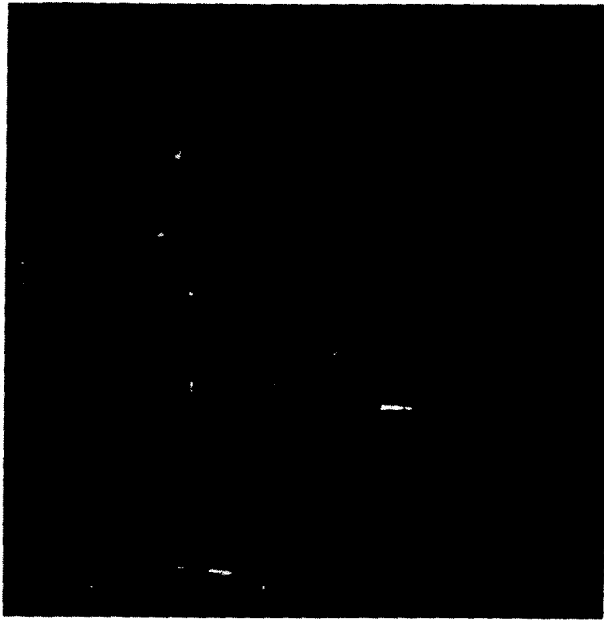


FIGURE 4 - Addition of SVB
to hopper.

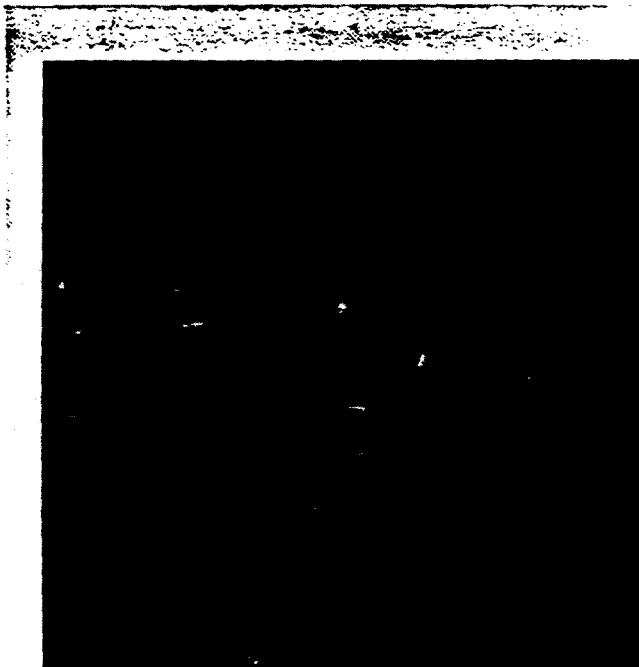


FIGURE 5 - Addition of SVB to hopper.

AIRBORNE FIBER COUNTS

for

**Amoco/Norton
Rig #2
Lubbock, Texas**

**Date Sampled: September 22, 1977
Date Reported: September 28, 1977**

**Samples Collected By: B. L. Ingalls
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE

To monitor airborne asbestos emissions during the use of 480 pounds Super Visbestos-0X in a drilling mud application.

DESCRIPTION OF OPERATION

Operation involved the addition of 480 pounds Super Visbestos-0X to a hopper located outdoors. Area and personal samples were obtained prior to, during and after the use of asbestos.

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Chrysotile Asbestos - Any fiber having an aspect ratio ≥ 3 and a length $\geq 5\mu$ that is in the operator's judgement chrysotile. In the event of doubt and in the absence of further information, any fiber having the above physical dimensions will also be counted as chrysotile.
2. Possible Amphibole Asbestos - Any fiber having an aspect ratio ≥ 3 and a length $\geq 5\mu$ that is not obvious to be material other than asbestos. This includes all amphiboles and material similar in appearance.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

Several photographs of the areas monitored have been included.

SUMMARY OF FIBER COUNTS

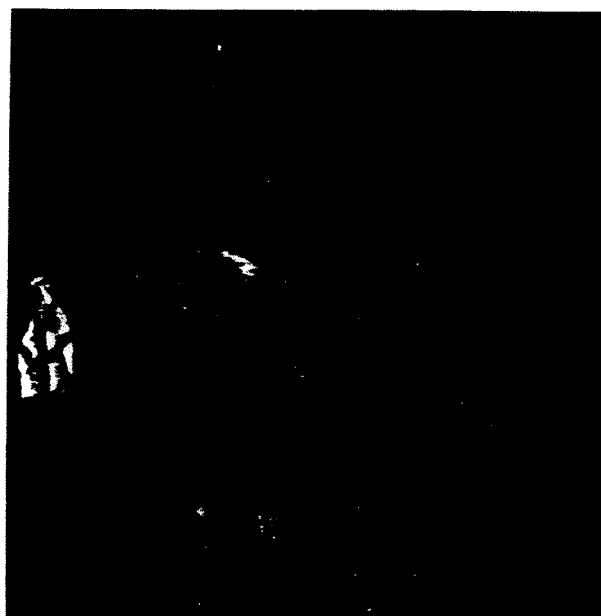
013602

Sample No.	Air Sample Time	Minutes	Operation Description	Airborne Fiber Cou (fibers/cc >5 μ)	
				Chrysotile Asbestos	Possibl Amphibol Asbesto
D-54	on: 2:12A off: 3:04A	52	Area - prior to the use of asbestos. Located ~6-1/2 feet above ground, 4 feet above hopper and ~6 feet from west side of hopper.	0	0
D-60	on: 2:21A off: 3:03A	42	Area - prior to the use of asbestos. Located ~6 feet northwest of hopper, 4' above ground and ~2' above hopper.	0	0
D-36	on: 2:33A off: 2:59A	26	Personal - (Allen Johnson) Prior to the use of asbestos. Located in general area of rig and hopper.	0	0
D-8	on: 3:17A off: 3:37A	20	Personal - (Johnnie Wheeler) During the use of 480 pounds SG-0X, in the manufacture of brine water.	0.03	0
D-46	on: 3:18A off: 3:38A	20	Area - during the use of 480 pounds SG-0X. Located same as D-60.	0.1	0
D-30	on: 3:18A off: 3:38A	20	Area - during the use of 480 pounds SG-0X. Located same as D-54.	0.03	0
D-84	on: 3:43A off: 4:39A	56	Area - after the use of asbestos. Located same as D-60.	0	0
D-80	on: 3:45A off: 4:43A	58	Area - after the use of asbestos. Located same as D-54.	0.1	0
D-1	on: 3:48A off: 4:47A	59	Personal - (Allen Johnson) After the use of asbestos. Located in general area of yard and hopper.	0.04	0
C-21	on: 4:40A off: 7:25A	165	Area - after the use of asbestos. Located same as D-60.	0.01	0
M-40	on: 4:44A off: 7:25A	161	Area - after the use of asbestos. Located same as D-54.	0.03	0
N-58	on: 4:48A off: 5:10A	22	Personal - (Allen Johnson) After the use of asbestos. Located in general area of rig.	0.03	0
M-51	on: 5:17A off: 7:29A	132	Area - after the use of asbestos. Located near mud return pool ~2 feet above ground and ~10 feet from return discharge.	0.03	0

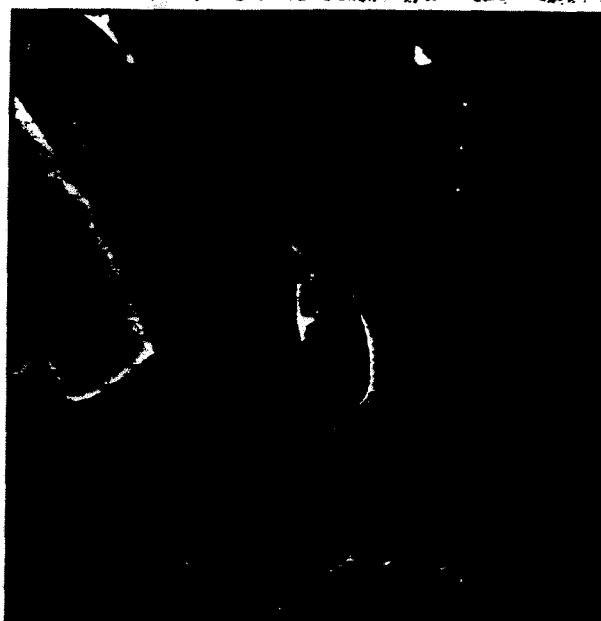
Background covered with fine black particulate and some chunky material. Fibers counted were coated with fine black particulate.



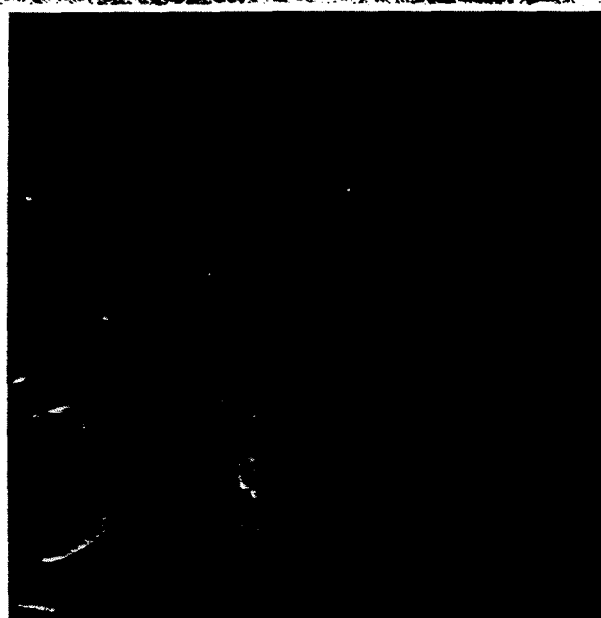
**FIGURE #1 - Sample
Location D-60**



**FIGURE #2 - Hopper Area
Sample Shown (Upper Middle)**



**FIGURE #3 - Personal Sample - Obtained During
the Addition of SVB-0X to Hopper**



**FIGURE #4 - Area Sample - Shown, Obtained During
the Addition of SVB-0X to Hopper**

HARRY

013605

April 25, 1977

Mr. George Ross, Drilling Superintendent
Amoco Production Company
P. O. Box 3092
Houston, Texas 77001

Dear Mr. Ross:

We spoke earlier today with Mr. A. R. Reed, and he has asked that we contact you directly. One of the products which we distribute is Super Visbestos. This asbestos product is manufactured to our specifications by Union Carbide Corporation. Super Visbestos has been widely used for many years as a mechanical viscosifier for drilling fluids.

OSHA regulations covering the use of asbestos, were enacted back in 1972. Since that time Ucar and Montello have joined in a continuing program of field monitoring to establish a data base indicative of the air entrained fiber counts associated with the use of Super Visbestos in drilling fluids. We have enclosed a folder containing the results of this continuing program. We make this information freely available to all interested parties, including operators, contractors, service companies and OSHA personnel. The presentation has been useful in demonstrating the relatively low exposure levels inherent in the drilling industry.

We and Ucar would welcome the opportunity to discuss this matter with you or your people further. Please feel free to contact us on this, or any of our many other products, whenever we can be of service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74083 / (918)-245-6661/TWX 910-840-3007

013606

AIRBORNE ASBESTOS COUNTS

for

**American Mud Company
Abilene, Texas**

**Date Sampled: January 12, 1977
Date Reported: February 10, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's storage facilities during the transfer of Super Visbestos from storage area to pick-up truck.

DESCRIPTION OF OPERATION:

Operation involved the transfer of 40 bags Super Visbestos from warehouse storage area to pick-up truck in loading area. Environmental samples were obtained prior to and during the transfer of Super Visbestos.

A personal sample was obtained in the breathing zone of the fork-lift operator during the transfer of Super Visbestos from storage area to loading area.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method of counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

013609

American Mud Company
Abilene, Texas

<u>Sample No.</u>	<u>Air Sample Time (Minutes)</u>	<u>Operation Description</u>	<u>Asbestos Fiber Count (Fibers/cc > 5μ)</u>
J-22	30	Environmental - Prior to the transfer of SVB. Located ~5' from floor and 4' from bags. Inside warehouse storage area.	0.1
E-22	30	Environmental - Prior to the transfer of SVB. Located ~30' from bags and 3 1/2' from floor. Inside warehouse storage area.	<0.1
J-19	10	Personal - (Bernis Rains - forklift operator.) During the transfer of 40 bags SVB from warehouse storage area to loading area.	0.2
J-25	26	Environmental - During the transfer of 40 bags SVB from warehouse storage area to loading area. Located same as E-22.	0.1
J-39	26	Environmental - During the transfer of 40 bags SVB from warehouse storage area to loading area. Located same as J-22.	0.1

Ceiling concentration: 0.2 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The loading operation took place only once during the day.
- (2) The background fiber concentration was 0.1 fibers/cc.

$$TWA = \frac{(0.167)(0.2) + (7.833)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

013610

AIRBORNE ASBESTOS COUNTS

for

**Grand Mud Company
Abilene, Texas**

**Date Sampled: January 12, 1977
Date Reported: February 10, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

013611

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's storage facilities.

DESCRIPTION OF OPERATION:

Operation involved the transfer of Super Visbestos from warehouse storage facilities to a truck in the loading area. Environmental samples were taken in and near the storage area prior to and during the transfer of Super Visbestos. A personal sample was obtained in the breathing zone of the forklift operator during the transfer of Super Visbestos from warehouse storage area to loading zone. Approximately one pallet was transferred.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method of counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

013613

Grand Mud Company
Abilene, Texas

<u>Sample No.</u>	<u>Air Sample Time (Minutes)</u>	<u>Operation Description</u>	<u>Asbestos Fiber Count (Fibers/cc >5μ)</u>
J-32	27	Environmental - (Prior to the transfer of SVB.) Located ~8' from bags and 5' from floor. Near entrance to men's wash room.	<0.1
J-41	27	Environmental - (Prior to the transfer of SVB.) Located ~10' from bags and 5 1/2' from floor. On wall near 14' doors between two storage areas.	0.1
J-44	17	Environmental - (During the transfer of ~1 pallet of SVB from warehouse storage area to truck.) Located same as J-41. Forklift passes through doors where pump is located.	0.1
X-9	8	Personal - (Mike Poindexter - forklift operator.) During the transfer of ~1 pallet SVB from warehouse storage area to truck.	0.2
J-23	15	Environmental - during the transfer of ~1 pallet SVB from warehouse storage area to truck. Located same as J-32.	0.3

Ceiling concentration: 0.2 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The loading operation took place only once during the day.
- (2) The background fiber concentration was 0.1 fibers/cc.

$$\text{TWA} = \text{Mike Poindexter} - \frac{(0.2)(0.133) + (0.15)(0.25) + (7.6)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

013614

AIRBORNE FIBER COUNTS

for

**D. B. Drilling (AMOCO) Rig #6
Hamlin, Texas**

**Date Sampled: January 12, 1977
Date Reported: January 26, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling facilities during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Airborne samples were obtained in the area of the dump prior to and during the use of SVB (Environmental). The dump area was located outdoors and samples were taken on a moderately rainy day. No environmental samples were obtained after the dump due to increasingly heavy rain.

A personal sample was obtained in the breathing zone of the dump operator during the addition of five bags of Super Visbestos to a hopper. A personal sample was also obtained during bag disposal.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method of counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

013617

D. B. Drilling (AMOCO)
Hamlin, Texas

Sample No.	Air Sample Time (Minutes)	Operation Description	Asbestos Fiber Count (Fibers/cc >5μ)
J-28	20	Environmental - (Prior to the use of SVB.) Located ~3 1/2' above hopper of Rig #6. Weather conditions during time of monitoring - misty rain.	0.1
J-15	31	Personal - (Allen Morgan - dump operator, during the use of SVB.) Operation included unloading and addition of 5 bags SVB to a hopper, located outdoors. Weather conditions during time of monitoring - misty rain.	0.3
J-10	30'30"	Environmental - (During the use of SVB.) Located same as J-28. Weather conditions at the time of monitoring - moderate rain.	0.1
J-31	2	Personal - (Allen Morgan, during bag disposal only.) Weather conditions at the time of monitoring - moderate rain.	1.7

Ceiling concentration: 1.7 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The dump operation took place only once during the day.
- (2) The background fiber concentration was 0.1 fibers/cc.

$$\text{TWA} = \text{Allen Morgan} - \frac{(0.51)(0.3) + (0.03)(1.7) + (7.45)(0.1)}{8} = 0.2$$

013618

AIRBORNE ASBESTOS COUNTS

for

West Texas Drilling Company Rig #14
(Sun Oil Company)

Date Sampled: January 12, 1977
Date Reported: January 26, 1977

Samples Collected By: G. J. Spencer
Union Carbide Corporation

Samples Analyzed By: G. J. Spencer
Union Carbide Corporation

Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #14 located ~25 minutes south of Colorado City, Texas) during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Operation involved the addition of nine bags Super Visbestos to a hopper located outdoors. Environmental samples were obtained in the breathing zone of the dump area prior to, during and after the dump.

A personal sample was obtained in the breathing zone of the dump operator during the addition of nine bags Super Visbestos to a hopper, which was located outdoors.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method of counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

013621

West Texas Drilling Company Rig #14
(Sun Oil Company)

Sample No.	Air Sample Time (Minutes)	Operation Description	Asbestos Fiber Count (Fibers/cc >5μ)
J-21	20	Environmental - (Prior to the use of VB.) Located ~3' from hopper and ~6' from ground. Hopper located outdoors.	0.1
J-24	27	Personal - (Randy Pelton, dump operator) During the addition of nine bags SVB to hopper and during bag disposal.	0.3
J-20	27	Environmental - (During the use of nine bags SVB.) Located same as J-21.	0.4
J-16	23	Environmental - (After the use of nine bags SVB.) Located same as J-21.	0.3

Ceiling concentration: 0.3 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The dump operation took place only once during the day.
- (2) The background fiber concentration was 0.3 fibers/cc for 23 minutes after the dump and 0.1 fiber/cc for the remainder of the day.

$$\text{TWA} = \text{Randy Pelton} - \frac{(0.45)(0.3) + (.38)(0.3) + (7.17)(0.1)}{8} = 0.1$$

AIRBORNE ASBESTOS COUNTS

for

Southwest Drilling Mud
(Warehouse)
Midland, Texas

Date Sampled: January 13, 1977

Date Reported: January 24, 1977

Samples Collected By: G. J. Spencer
Union Carbide Corporation

Samples Analyzed By: G. J. Spencer
Union Carbide Corporation

Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

OBJECTIVE:

To determine airborne asbestos emissions at the subject company's storage facilities.

DESCRIPTION OF OPERATION:

Warehouse was open on one side. Airborne samples were obtained prior to the transfer of asbestos to a truck. Airborne samples were also obtained after the transfer of asbestos. (Environmental).

Personal samples were obtained at the breathing zone of the forklift operator during the transfer of 139 bags Super Visbestos and also of other personnel working in the loading area.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method of counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

Southwest Drilling Mud
(Warehouse)
Midland, Texas

013625

Sample No.	Air Sample Time (Minutes)	Operation Description	Asbestos Fiber Count (Fibers/cc > 5μ)
J-17	29	Environmental - (Prior to the use of SVB). Located at enclosed end of warehouse ~8' from floor and ~10' from bags. (Bags stacked ~10' high.)	0.1
J-42	24	Environmental - (Prior to the use of SVB) Located ~10' from door and 4 1/2' from floor ~20' from bags.	0.1
J-1	23	Environmental - (Prior to the use of SVB.) Located at enclosed end of warehouse 6' bags and 5 1/2' from floor.	0.1
G-15	16	Personal - (Jeff Darr - helped load truck) 139 bags SVB loaded onto truck.	0.3
J-77	16	Personal - (Randall Brook - forklift operator.) During the handling of 139 bags SVB.	0.1
J-37	16	Personal - (Joe Rusnak - helped load 139 bags SVB from truck.	0.3
J-76	25	Environmental - (After the transfer of 139 bags SVB.) Located same as J-42.	< 0.1
A-94	23	Environmental - (After the transfer of 139 bags SVB.) Located same as J-17.	< 0.1

Ceiling concentration: 0.3 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The loading operation took place only once during the day.
- (2) The background fiber concentration was 0.1 fibers/cc.

$$\text{TWA} = \text{Jeff Darr} - \frac{(0.26)(0.3) + (7.73)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

$$\text{TWA} = \text{Randall Brook} - \frac{(0.26)(0.1) + (7.73)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

$$\text{TWA} = \text{Joe Rusnak} - \frac{(0.26)(0.3) + (7.73)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

013626

AIRBORNE ASBESTOS COUNTS

for

**Robinson Drilling of Texas, Inc.
Rig #6**

**Date Samples: January 13, 1977
Date Reported: January 21, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

013627

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling location, located 25 miles north of Bigspring, Texas, (Rig #6) during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Operation involved the addition of 5 bags SVB to a hopper in the formulation of a drilling mud. Airborne samples (Environmental) were taken prior to, during and after the dump. A personal sample was obtained in the breathing area of the dump during addition of 5 bags SVB to a hopper.

Samples were obtained outdoors on a moderately windy day.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method of counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

Robinson Drilling of Texas, Inc.
Rig #6

013629

<u>Sample No.</u>	<u>Air Sample Time (Minutes)</u>	<u>Operation Description</u>	<u>Asbestos Fiber Count (Fibers/cc 5u)</u>
G-12	24	Environmental - (Prior to the use of SVB) Located 15' from hopper and 4 1/2' from ground.	0
J-86	23	Environmental - (Prior to the use of SVB.) Located 10' downwind of bag storage area and 5' from ground.	0
J-18	19	Personal - (M. R. Cooper - Dump Operator) During the dump of 5 bags SVB into a hopper, and during bag disposal (Operator upwind).	0
J-27	15	Environmental - (During the use of SVB.) Located same as G-12.	0.1
J-34	16	Environmental - (During the use of SVB.) Located same as J-86. (8' downwind of dump.)	0
C-24	10	Environmental - (After the use of SVB.) Located same as G-12.	0.4

Ceiling concentration: 0.4 maximum (not breathing zone) - windy day.

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The dump operation took place only once during the day.
- (2) The background fiber concentration is assumed to be 0.

TWA - M. R. Cooper - 0.1 or less

013630

AIRBORNE ASBESTOS COUNTS

for

**American Mud Company
Abilene, Texas**

**Date Sampled: January 12, 1977
Date Reported: February 10, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's storage facilities during the transfer of Super Visbestos from storage area to pick-up truck.

DESCRIPTION OF OPERATION:

Operation involved the transfer of 40 bags Super Visbestos from warehouse storage area to pick-up truck in loading area. Environmental samples were obtained prior to and during the transfer of Super Visbestos.

A personal sample was obtained in the breathing zone of the fork-lift operator during the transfer of Super Visbestos from storage area to loading area.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTSAmerican Mud Company
Abilene, Texas

013633

Sample No.	Air Sample		Operation Description	Airborne Fiber Co. (fibers/cc >5 μ)	
	Time	Minutes		Total	Chrysot Asbest
J-22	on: 8:45A off: 9:15A	30	Environmental - Prior to the transfer of SVB. Located ~5' from floor and 4' from bags. Inside warehouse storage area.	0.1	0.1
E-22	on: 8:45A off: 9:15A	30	Environmental - Prior to the transfer of SVB. Located ~30' from bags and 3 1/2' from floor. Inside warehouse storage area.	<0.1	<0.1
J-19	on: 9:34A off: 9:44A	10	Personal - (Bernis Rains - forklift operator.) During the transfer of 40 bags SVB from warehouse storage area to loading area.	0.2	0.2
J-25	on: 9:34A off: 10:00A	26	Environmental - During the transfer of 40 bags SVB from warehouse storage area to loading area. Located same as E-22.	0.1	0.1
J-39	on: 9:34A off: 10:00A	26	Environmental - During the transfer of 40 bags SVB from warehouse storage area to loading area. Located same as J-22.	0.1	0.1

Ceiling concentration: 0.2 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The loading operation took place only once during the day.
- (2) The background fiber concentration was 0.1 fibers/cc.

$$TWA = \frac{(0.167)(0.2) + (7.833)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

SURVEY AIA-9: DRILLING MUD ADDITIVES--SHIPMENT, STORAGE

Survey AIA-9 was performed in the warehouse of a retail drilling mud company during the handling of bags of asbestos additives for shipping. Sampling was done indoors, while it was drizzling rain outdoors.

Work was performed in the warehouse by a lift truck operator and an unloader on the truck. Several other persons were working in the warehouse during the survey. The operations consisted of moving pallets of the bagged asbestos additive with a lift truck to the bed of the truck used for shipping the product to the customer. A full pallet was placed on the bed and an additional 10 bags of material were unloaded from the pallet to the truck by hand and stacked. A diagram of the work area is shown in Figure 9.

All bags of the material were in good condition and no broken bags were observed. The condition of the warehouse was clean and the bags of material were handled carefully by the workers. No visible dust was observed during the handling of the bags.

Five air samples, including four general air and one breathing zone sample, were taken. The sampling data are summarized as follows:

013636

013635

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
AW-1	General air, center of warehouse on lift truck 084-0917	36	0.063
AW-2	General air, center of warehouse during loading of truck 0934-0944	10	<0.077
AW-4	General air, on cab of truck during loading 0934-0941	10	0.078
AW-5	Worker exposure, lift operator during truck loading 0933-0945	12	0.065
AW-6	General air, center of warehouse after loading 0947-0957	10	0.077

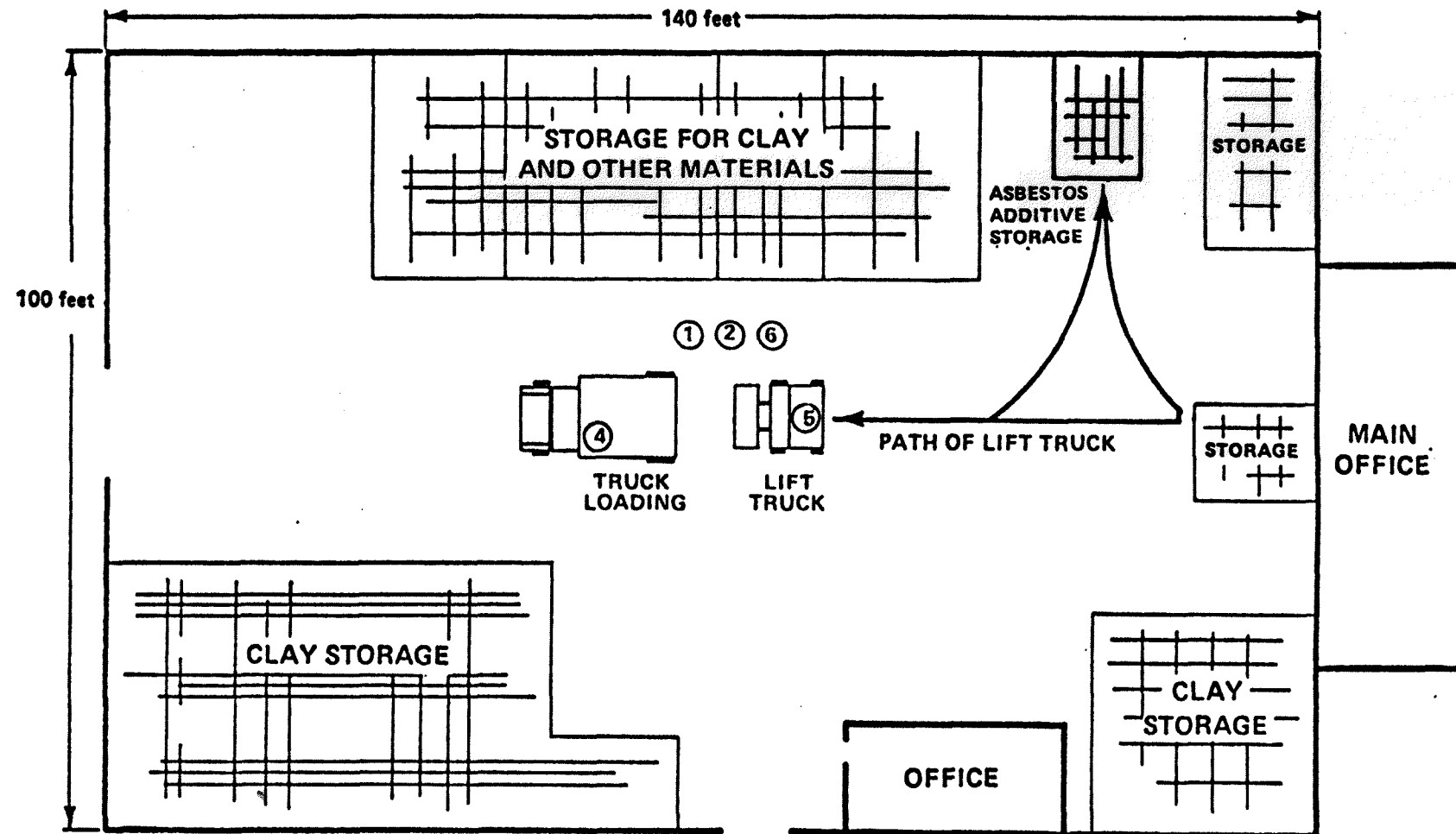


Figure 9. Diagram showing work area and sampling locations for survey AIA-9.

013637

013638

AIRBORNE ASBESTOS COUNTS

for

**Grand Mud Company
Abilene, Texas**

**Date Sampled: January 12, 1977
Date Reported: February 10, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

SURVEY AIA-10: DRILLING MUD ADDITIVES--SHIPMENT, STORAGE

During field survey AIA-10, air samples were collected in the warehouse of a retail drilling mud firm, while workers loaded a truck with bags of asbestos additive for shipment to a job site. Sampling was performed indoors while rain fell outside.

The work area is shown in Figure 10. The operations monitored consisted of moving a pallet of bagged asbestos additive over to a truck using a lift-truck, loading a full pallet onto the bed, and then unloading an additional 10 bags onto the truck by hand for shipment. Work was performed by a lift-truck operator and two warehouse employees.

The general condition of the warehouse was dirty with considerable airborne dust and settled dust throughout the area from past bag breakage--primarily clays. Apparently, no cleanup procedures were in effect.

Four air samples were collected consisting of two general air and two breathing zone samples. The sampling data are summarized as follows:

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's storage facilities.

DESCRIPTION OF OPERATION:

Operation involved the transfer of Super Visbestos from warehouse storage facilities to a truck in the loading area. Environmental samples were taken in and near the storage area prior to and during the transfer of Super Visbestos. A personal sample was obtained in the breathing zone of the forklift operator during the transfer of Super Visbestos from warehouse storage area to loading zone. Approximately one pallet was transferred.

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

Grand Mud Company
Abilene, Texas

013641

Sample No.	Air Sample Time	Minutes	Operation Description	Airborne Fiber Co (fibers/cc >5μ)	
				Total	Chryso Asbest
J-32	on: 10:38A off: 11:05A	27	Environmental - (Prior to the transfer of SVB.) Located ~8' from bags and 5' from floor. Near entrance to men's wash room.	< 0.1	< 0.1
J-41	on: 10:38A off: 11:05A	27	Environmental - (Prior to the transfer of SVB.) Located ~10' from bags and 5 1/2' from floor. On wall near 14' doors between two storage areas.	0.1	0.1
J-44	on: 11:13A off: 11:30A	17	Environmental - (During the transfer of ~1 pallet of SVB from warehouse storage area to truck.) Located same as J-41. Forklift passes through doors where pump is located.	0.1	0.1
X-9	on: 11:13A off: 11:21A	8	Personal - (Mike Poindexter - forklift operator.) During the transfer of ~1 pallet SVB from warehouse storage area to truck.	0.2	0.2
J-23	on: 11:15A off: 11:30A	15	Environmental - during the transfer of ~1 pallet SVB from warehouse storage area to truck. Located same as J-32.	0.3	0.3

Ceiling concentration: 0.2 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The loading operation took place only once during the day.
- (2) The background fiber concentration was 0.1 fibers/cc.

$$TWA = \text{Mike Poindexter} - \frac{(0.2)(0.133) + (0.15)(0.25) + (7.6)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

013643

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
AG-1	General air, warehouse 10324056	23.5	<0.033
AG-3	Worker exposure, lift operator loading truck with pallets 1111-1119	8	<0.098
AG-4	Worker exposure, helper unloading bags from pallet 1111-1120	9	0.59
AG-5	General air, warehouse after loading 1125-1140	15	0.15

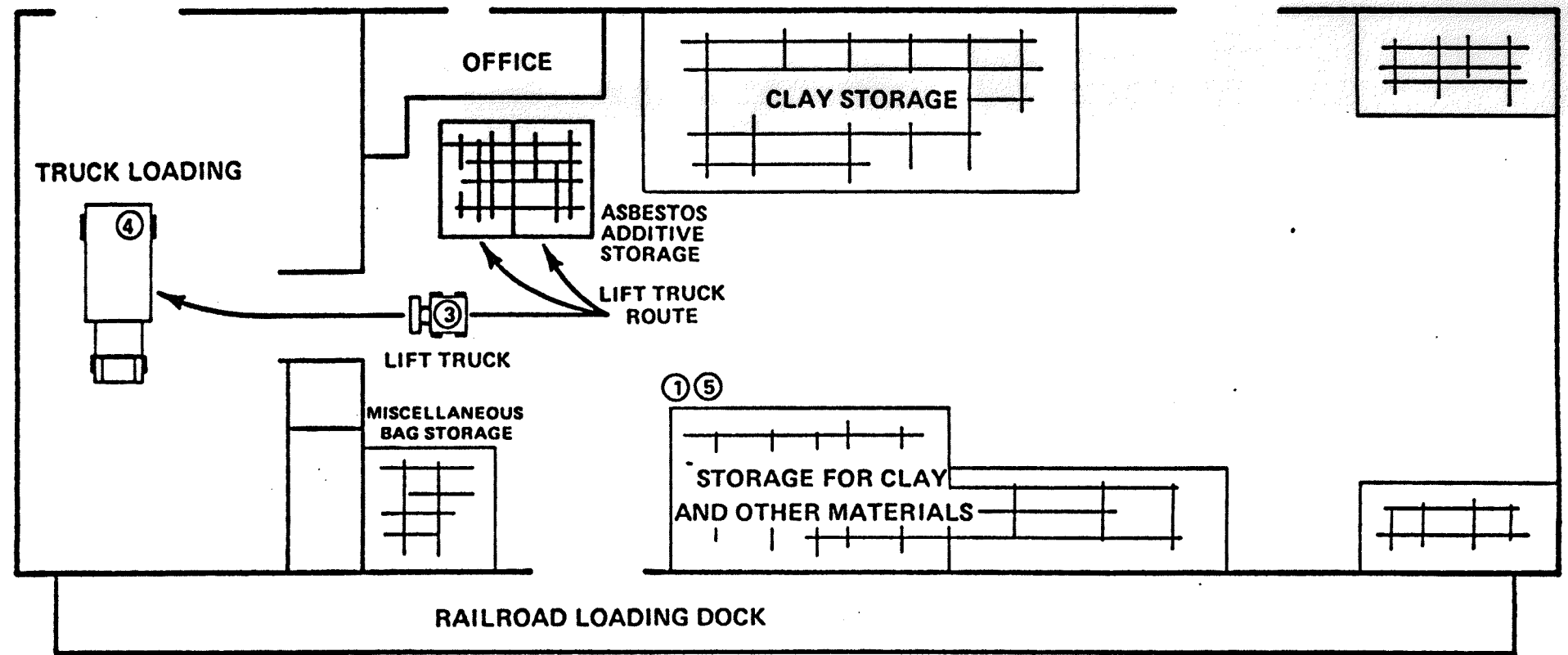


Figure 10. Diagram showing work area and sampling locations for survey AIA-10.

013645

AIRBORNE FIBER COUNTS

for

**D. B. Drilling (AMOCO) Rig #6
Hamlin, Texas**

**Date Sampled: January 12, 1977
Date Reported: January 26, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling facilities during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Airborne samples were obtained in the area of the dump prior to and during the use of SVB (Environmental). The dump area was located outdoors and samples were taken on a moderately rainy day. No environmental samples were obtained after the dump due to increasingly heavy rain.

A personal sample was obtained in the breathing zone of the dump operator during the addition of five bags of Super Visbestos to a hopper. A personal sample was also obtained during bag disposal.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

013643

Sample No.	Air Sample		Operation Description	Airborne Fiber C (fibers/cc >5μ	
	Time	Minutes		Total	Chryso Asbes
J-28	on: 1:20P off: 1:40P	20	Environmental - (Prior to the use of SVB.) Located ~3 1/2' above hopper of Rig #6. Weather conditions during time of monitoring - misty rain.	0.1	0.1
J-15	on: 1:57P off: 2:28P	31	Personal - (Allen Morgan - dump operator, during the use of SVB.) Operation included unloading and addition of 5 bags SVB to a hopper, located outdoors. Weather conditions during time of monitoring - misty rain.	0.3	0.3
J-10	on: 1:57' 30" off: 2:28P	30'30"	Environmental -(During the use of SVB.) Located same as J-28. Weather conditions at the time of monitoring - moderate rain.	0.1	0.1
J-31		2	Personal - (Allen Morgan, during bag disposal only.) Weather conditions at the time of monitoring - moderate rain.	1.7	1.7

Ceiling concentration: 1.7 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

(1) The dump operation took place only once during the day.

(2) The background fiber concentration was 0.1 fibers/cc.

$$\text{TWA} = \text{Allen Morgan} - \frac{(0.51)(0.3) + (0.03)(1.7) + (7.45)(0.1)}{8} = 0.2$$

SURVEY AIA-11: DRILLING MUD ADDITIVES, DRILLING SITE

Survey AIA-11 covered the operations involving the use of an asbestos additive to the muds at an oil drilling rig. Sampling was performed outdoors and the weather was cold and rainy with a slight wind.

The operation at the drilling site involved one worker who was responsible for adding the material to the drilling mud through the mud hopper, which was outdoors. The operation consisted of the worker carrying a 50-pound bag of the additive to the side of the hopper, cutting the bag open, and slowly adding the asbestos material to the hopper. As the bags were emptied, the operator would put them in a pile. Upon completion of the pouring (usually 5 to 6 bags of additive), the operator would step on the bags to compress their size and then carry them off to a pit for disposal. At one point during the pouring, one of the bags tore slightly and the asbestos material spilled onto the worker's clothing.

Four general air samples and two breathing zone sample were collected during the survey. The air sampling data are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
DB-1	General air, 10 feet north of hopper during cleaning 1320-1340	19.5	0.039
DB-2	General air, 3.5 feet south of hopper during cleaning 1321-1340	19	0.041
DB-3	General air, 10 feet north of hopper during dump 1356-1424	28	0.027
DB-4	General air, 3.5 feet south of hopper during dump 1357-1428	31	0.099
DB-5	Worker exposure (operator) during dump into hopper 1356-1426	29.5	0.13 (0.3)
DB-6	Worker exposure, disposal of empty bags 1429-1431	2	0.39 (1.7)

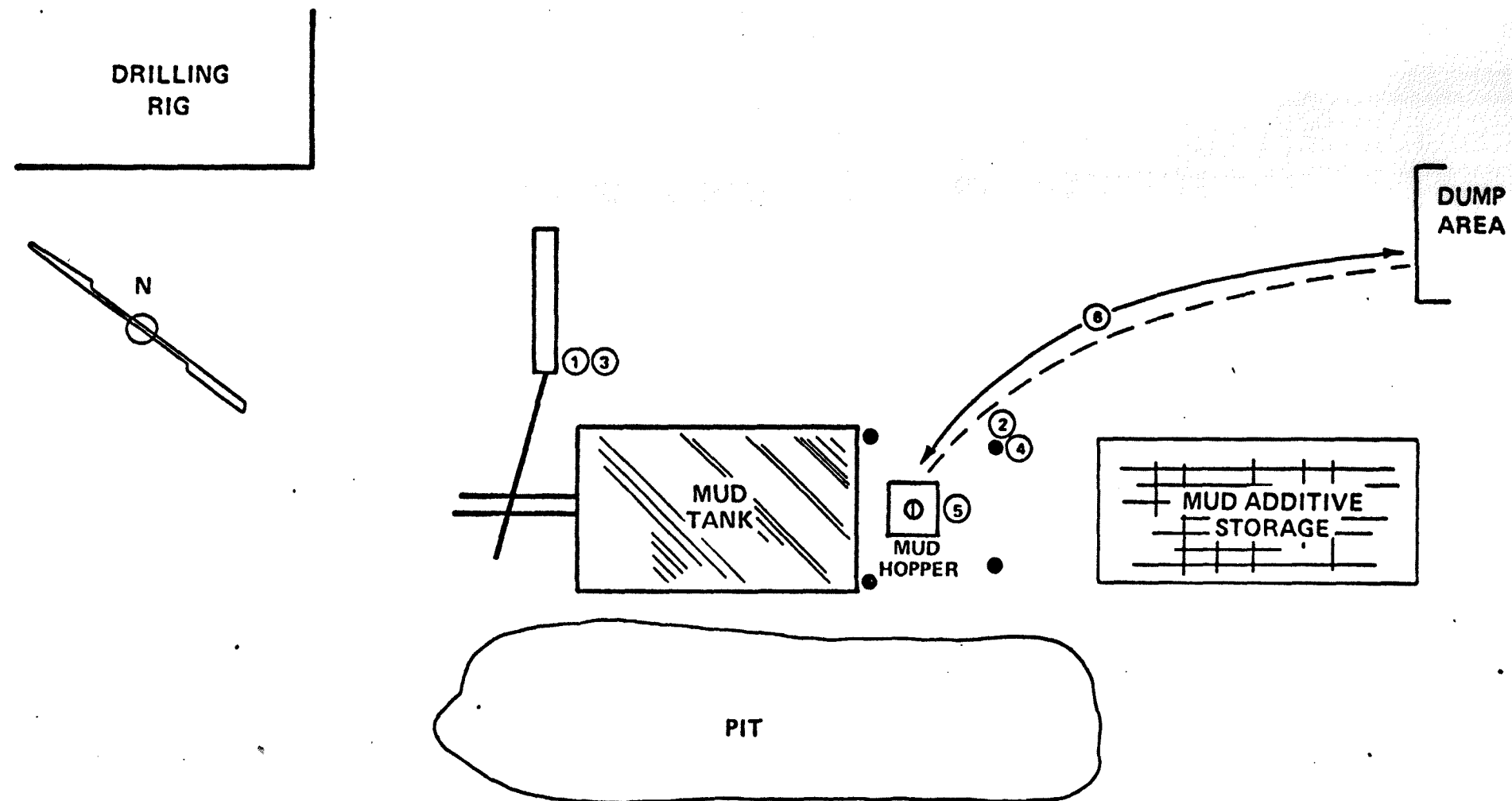


Figure 11. Diagram of work area showing sampling locations for survey AIA-11.

013651

AIRBORNE FIBER COUNTS

for.

**West Texas Drilling Company Rig #14
(Sun Oil Company)**

**Date Sampled: January 12, 1977
Date Reported: January 26, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #14 located ~25 minutes south of Colorado City, Texas) during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Operation involved the addition of nine bags Super Visbestos to a hopper located outdoors. Environmental samples were obtained in the breathing zone of the dump area prior to, during and after the dump.

A personal sample was obtained in the breathing zone of the dump operator during the addition of nine bags Super Visbestos to a hopper, which was located outdoors.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

West Texas Drilling Company Rig #14013655
(Sun Oil Company)

Airborne Fiber Count
(fibers/cc >5μ)

Chrysotile
Asbestos

Sample No.	Air Sample Time	Minutes	Operation Description	Total	Chrysotile Asbestos
J-21	on: 5:30P off: 5:50P	20	Environmental - (Prior to the use of SVB.) Located ~3' from hopper and ~6' from ground. Hopper located outdoors.	0.1	0.1
J-24	on: 5:50P off: 6:17P	27	Personal - (Randy Pelton, dump operator) During the addition of nine bags SVB to hopper and during bag disposal.	0.3	0.3
J-20	on: 5:50P off: 6:17P	27	Environmental - (During the use of nine bags SVB.) Located same as J-21.	0.4	0.4
J-16	on: 6:18P off: 6:31P	23	Environmental - (After the use of nine bags SVB.) Located same as J-21.	0.3	0.3

Ceiling concentration: 0.3 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The dump operation took place only once during the day.
- (2) The background fiber concentration was 0.3 fibers/cc for 23 minutes after the dump and 0.1 fiber/cc for the remainder of the day.

$$TWA = \text{Randy Pelton} - \frac{(0.45)(0.3) + (.38)(0.3) + (7.17)(0.1)}{8} = 0.1$$

SURVEY AIA-12: DRILLING MUD ADDITIVES--OIL RIG

Survey AIA-12 consisted of monitoring asbestos exposures at an oil drilling rig where asbestos additives were used in the drilling muds. Sampling was performed outdoors during a rainy, cold, and slightly windy day.

The operation consisted of one worker carrying a 50-pound bag of additive to the side of the mudhopper, breaking open the double bag (plastic outside, paper inside), and slowly pouring the asbestos additive into a mudhopper. The hopper was located outdoors. After pouring, the worker crumpled up the empty bag and, at the completion of operations, brought them to a disposal area. Nine bags of asbestos were added during the survey.

Three general air and two breathing zone samples were collected, and the air sampling data are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
WT-1	General air, 3 feet upwind of hopper 1730-1744	14.8	<0.053
WT-2	General air, 3 feet upwind of hopper during dump 1752-1820	27.6	0.14
WT-3	Worker exposure (operator) during dump and disposal of empty bags 1752-1819	26.8	0.20 (0.3)
WT-4	Observer exposed during dump 1751-1819	28	0.08
WT-5	General air, 3 feet upwind of hopper after dump 1823-1838	15	0.10

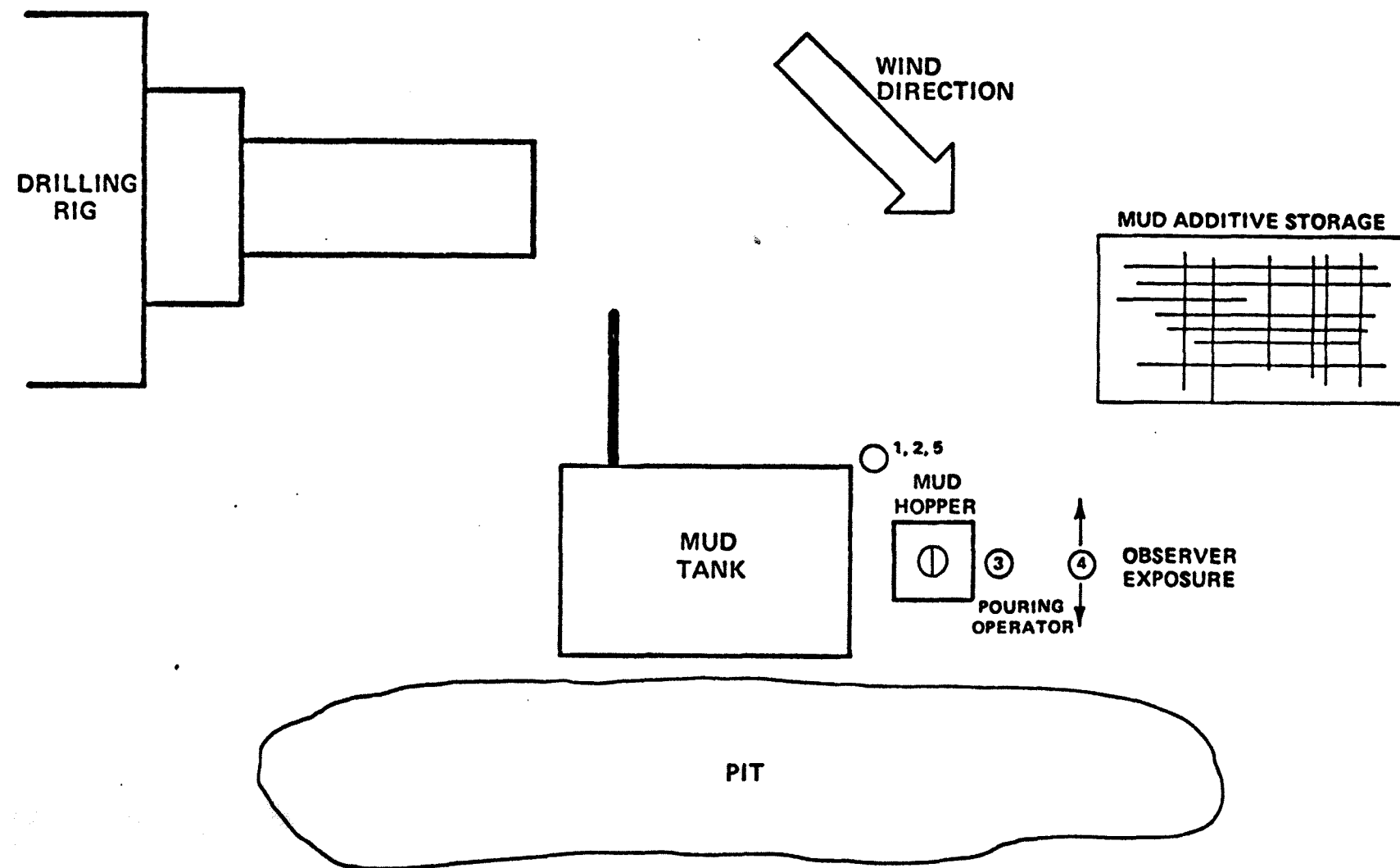


Figure 12. Work area for survey AIA-12.

013659

AIRBORNE ASBESTOS COUNTS

for

**Southwest Drilling Mud
(Warehouse)
Midland, Texas**

**Date Sampled: January 13, 1977
Date Reported: January 24, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To determine airborne asbestos emissions at the subject company's storage facilities.

DESCRIPTION OF OPERATION:

Warehouse was open on one side. Airborne samples were obtained prior to the transfer of asbestos to a truck. Airborne samples were also obtained after the transfer of asbestos (Environmental).

Personal samples were obtained at the breathing zone of the forklift operator during the transfer of 139 bags Super Visbestos and also of other personnel working in the loading area.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS

013662

Southwest Drilling Mud
(Warehouse)
Midland, Texas

Sample No.	Air Sample		Operation Description	Airborne Fiber Count (fibers/cc >5μ)	
	Time	Minutes		Total	Chrysotil Asbestos
J-17	on: 8:20A off: 8:49A	29	Environmental - (Prior to the use of SVB). Located at enclosed end of warehouse ~8' from floor and ~10' from bags. (Bags stacked ~10' high.)	0.1	0.1
J-42	on: 8:22A off: 8:46A	24	Environmental - (Prior to the use of SVB) Located ~10' from door and 4 1/2' from floor ~20' from bags.	0.1	0.1
J-1	on: 8:24A off: 8:47A	23	Environmental - (Prior to the use of SVB.) Located at enclosed end of warehouse 6' bags and 5 1/2' from floor.	0.1	0.1
G-15	on: 8:59A off: 9:15A	16	Personal - (Jeff Darr - helped load truck) 139 bags SVB loaded onto truck.	0.3	0.3
J-77	on: 8:59A off: 9:15A	16	Personal - (Randall Brook - forklift operator.) During the handling of 139 bags SVB.	0.1	0.1
J-37	on: 8:59A off: 9:15A	16	Personal - (Joe Rusnak - helped load 139 bags SVB from truck.	0.3	0.3
J-76	on: 9:20A off: 9:45A	25	Environmental - (After the transfer of 139 bags SVB.) Located same as J-42.	<0.1	<0.1
A-94	on: 9:22A off: 9:45A	23	Environmental - (After the transfer of 139 bags SBV.) Located same as J-17.	<0.1	<0.1

Ceiling concentration: 0.3 fibers/cc

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The loading operation took place only once during the day.
- (2) The background fiber concentration was 0.1 fibers/cc.

$$TWA = \text{Jeff Darr} - \frac{(0.26)(0.3) + (7.73)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

$$TWA = \text{Randall Brook} - \frac{(0.26)(0.1) + (7.73)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

$$TWA = \text{Joe Rusnak} - \frac{(0.26)(0.3) + (7.73)(0.1)}{8} = 0.1 \text{ fibers/cc}$$

SURVEY AIA-13: DRILLING MUD ADDITIVES--SHIPPING, STORAGE

During survey AIA-13, air samples were collected in a drilling mud company warehouse during handling and shipping of an asbestos additive for drilling muds. Work was performed indoors with the door to the warehouse open and the wind blowing slightly.

The work performed consisted of moving a pallet of bagged asbestos material to a nearby truck (inside the warehouse) using a lift truck and loading the bags on the truck by hand. Two workers and one lift-truck operator completed the work.

The condition of the warehouse was clean, the materials were stored and arranged in an organized fashion, and the work was performed carefully.

Two general air and two breathing zone samples were collected. The air sampling data are summarized as follows:

Eff. 1977

013664

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
MW-1	General air, middle of shed before operations $\phi 811 - \phi 843$	25.5	0.031
MW-2	General air, middle of shed during loading $\phi 902 - \phi 917$	15	<0.052
MW-3	Worker exposure, lift-truck operator during loading $\phi 901 - \phi 918$	17	0.23 0.1
MW-4	Worker exposure, loader's exposure transferring bags from pallet to truck bed $\phi 901 - \phi 918$	17.5	0.36 0.3

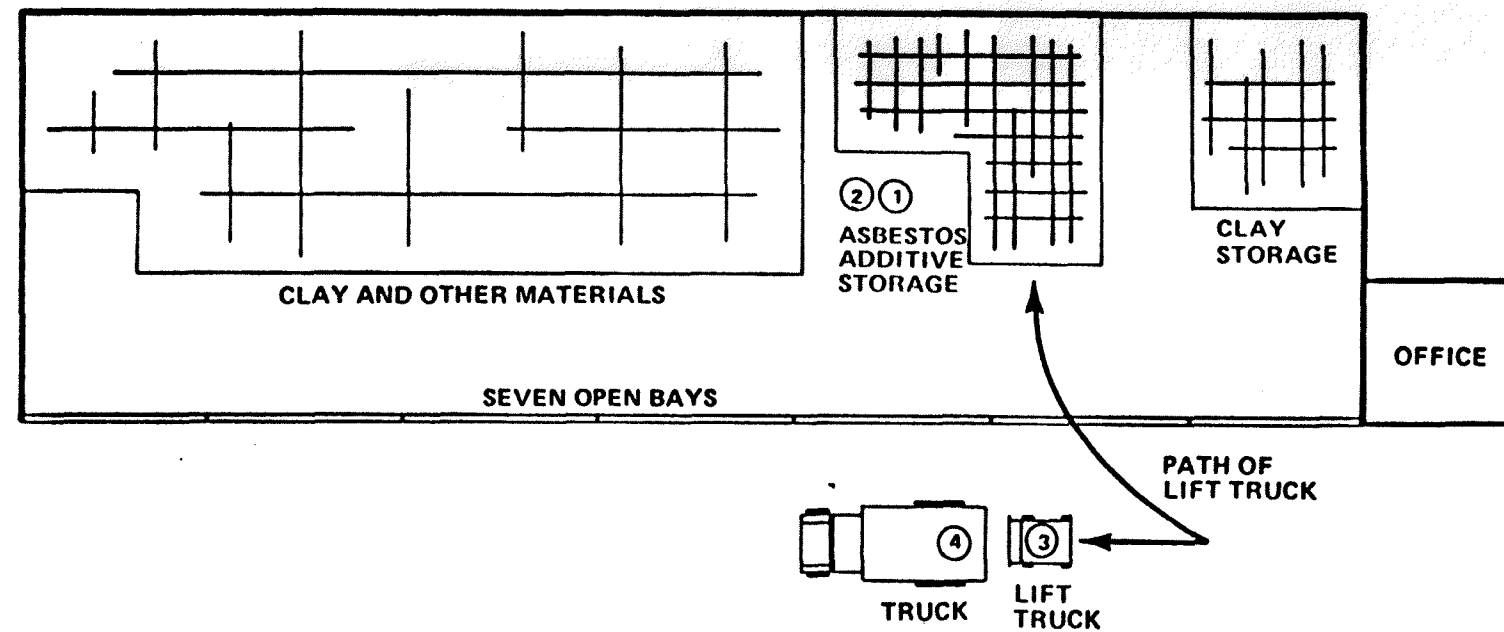


Figure 13. Diagram showing work area and sample locations for survey AIA-13.

013666

AIRBORNE ASBESTOS COUNTS

for.

**Robinson Drilling of Texas Inc.
Rig #6**

**Date Sampled: January 13, 1977
Date Reported: January 21, 1977**

**Samples Collected By: G. J. Spencer
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

OBJECTIVE:

To monitor airborne asbestos emissions at the subject company's drilling location, located ~25 miles north of Bigspring, Texas, (Rig #6) during the use of Super Visbestos.

DESCRIPTION OF OPERATION:

Operation involved the addition of 5 bags SVB to a hopper in the formulation of a drilling mud. Airborne samples (Environmental) were taken prior to, during and after the dump. A personal sample was obtained in the breathing area of the dump during addition of 5 bags SVB to a hopper.

Samples were obtained outdoors on a moderately windy day.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

Two results have been reported for each sample - they are:

1. Total Fiber - Any material longer than 5 microns, having an aspect ratio greater than 3:1. This number will include the asbestos fibers as well as other particles which meet the foregoing criteria. If tremolitic talc is present in the sample, the tremolite "chips" and anthophyllite impurities (if present) would also be in this category.
2. Chrysotile Asbestos Fiber - Any fiber longer than 5 microns, having an aspect ratio greater than 3:1 which, in the judgement of an experienced operator could be chrysotile asbestos.

COMMENTS

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

SUMMARY OF FIBER COUNTS
Robinson Drilling of Texas Inc.
Rig #6

013669

Sample No.	Air Sample		Operation Description	Airborne Fiber Cou (fibers/cc >5 μ)	
	Time	Minutes		Total	Chrysoti Asbesto
G-12	on: 11:20A off: 11:44A	24	Environmental - (Prior to the use of SVB) Located 15' from hopper and 4 1/2' from ground.	0	0
J-86	on: 11:23A off: 11:46A	23	Environmental - (Prior to the use of SVB.) Located 10' downwind of bag storage area and 5' from ground.	0	0
J-18	on: 11:48A off: 12:07P	19	Personal - (M.R. Cooper-dump operator) During the dump of 5 bags SVB into a hopper, and during bag disposal. (Operator upwind.)	0	0
J-27	on: 11:49A off: 12:04P	15	Environmental - (During the use of SVB.) Located same as G-12.	0.1	0.1
J-34	on: 11:51A off: 12:07P	16	Environmental - (During the use of SVB.) Located same as J-86. (8' downwind of dump.)	0	0
C-24	on: 12:06P off: 12:16P	10	Environmental - (After the use of SVB.) Located same as G-12.	0.4	0.4

Ceiling concentration: 0.4 maximum (not breathing zone) - windy day.

Time weighted average concentration:

The 8-hour TWA has been estimated for the conditions under which the samples were collected based on the following assumptions:

- (1) The dump operation took place only once during the day.
- (2) The background fiber concentration is assumed to be 0.

TWA = M. R. Cooper - 0.1 or less

013670

SURVEY AIA-14: DRILLING MUD ADDITIVES--OIL RIG

General air and worker breathing zone samples were collected at an oil rig during the operations involving the use of asbestos drilling mud additives. The sampling was performed outdoors where the weather was cloudy and cool and the winds were blowing from 5 to 10 mph.

Work consisted of those operations previously described, that is, one employee cutting open a 50-pound bag of additive, pouring the asbestos into the mudhopper, and at completion bringing the empty bags to a waste disposal pit. Five bags of additive were used during the survey. A diagram of the work area is shown in Figure 14.

Four samples were collected and the air sampling results are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
BD-1	General air, 20 feet upwind of hopper 1116-1144	28	0.027
BD-2	Worker exposure, dumping sacks and disposing of empties 1145-1202	17.5	0.13 (0) ✓
BD-3	General air, 3 feet downwind of hopper during dumping 1146-1201	15	<0.052
BD-4	Observer, 10 feet from hopper 1152-1204	11.5	<0.067

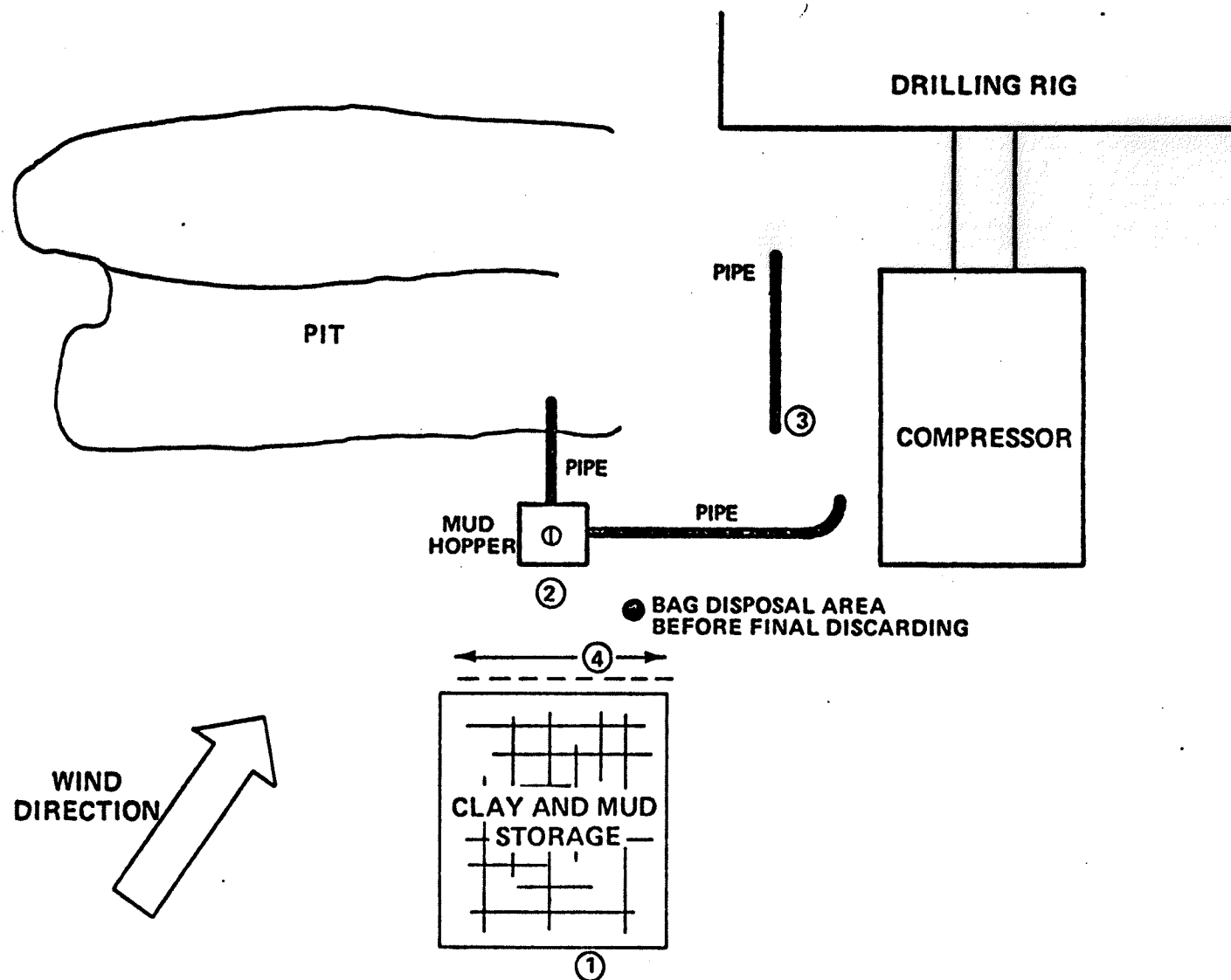


Figure 14. Diagram of work area with sampling locations for survey AIA-14.

013672

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SURVEY AIA-9: DRILLING MUD ADDITIVES--SHIPMENT, STORAGE

Survey AIA-9 was performed in the warehouse of a retail drilling mud company during the handling of bags of asbestos additives for shipping. Sampling was done indoors, while it was drizzling rain outdoors.

Work was performed in the warehouse by a lift truck operator and an unloader on the truck. Several other persons were working in the warehouse during the survey. The operations consisted of moving pallets of the bagged asbestos additive with a lift truck to the bed of the truck used for shipping the product to the customer. A full pallet was placed on the bed and an additional 10 bags of material were unloaded from the pallet to the truck by hand and stacked. A diagram of the work area is shown in Figure 9.

All bags of the material were in good condition and no broken bags were observed. The condition of the warehouse was clean and the bags of material were handled carefully by the workers. No visible dust was observed during the handling of the bags.

Five air samples, including four general air and one breathing zone sample, were taken. The sampling data are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
AW-1	General air, center of warehouse on lift truck 084-0917	36	0.063
AW-2	General air, center of warehouse during loading of truck 0934-0944	10	<0.077
AW-4	General air, on cab of truck during loading 0934-0941	10	0.078
AW-5	Worker exposure, lift operator during truck loading 0933-0945	12	0.065
AW-6	General air, center of warehouse after loading 0947-0957	10	0.077

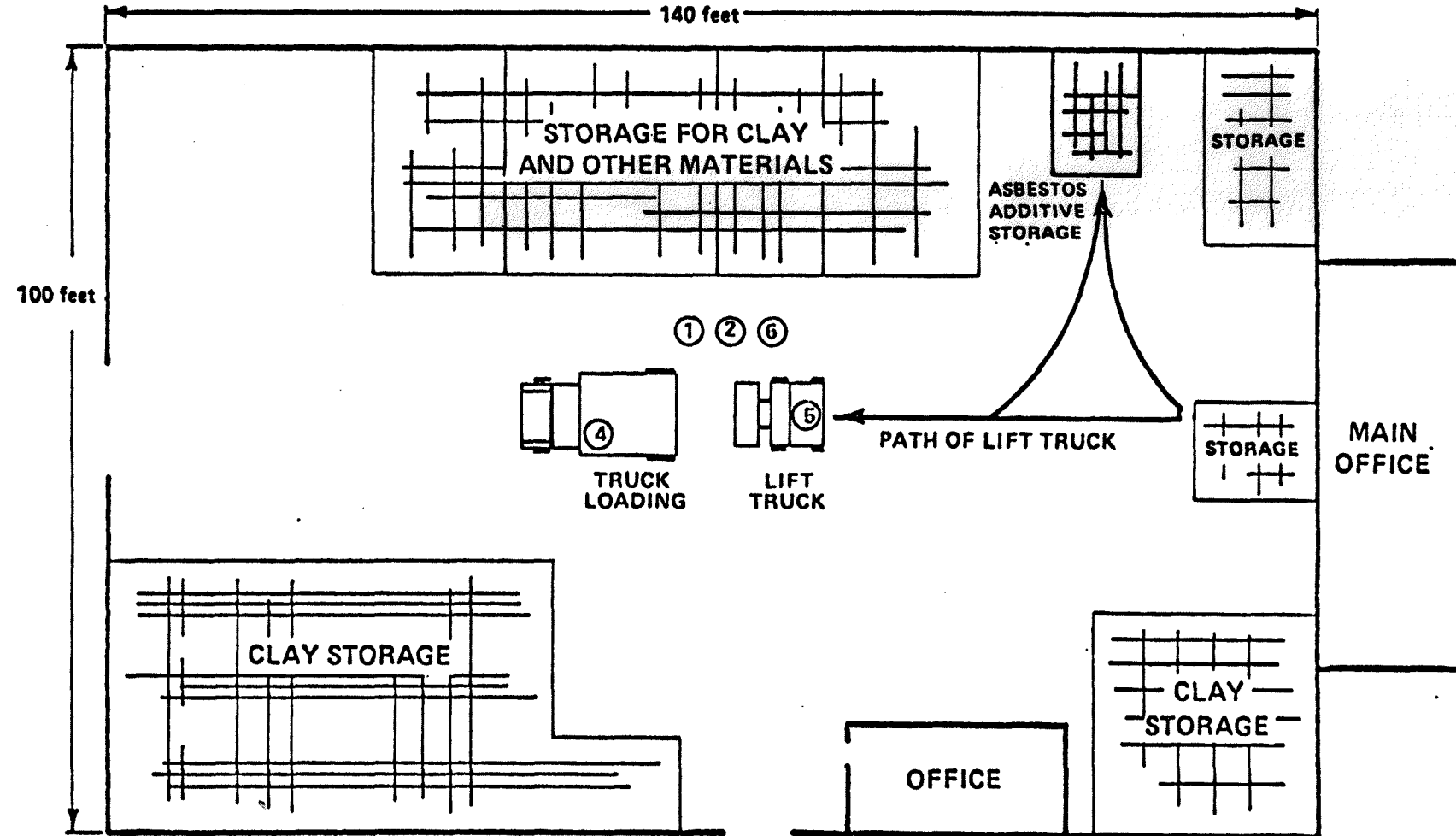


Figure 9. Diagram showing work area and sampling locations for survey AIA-9.

SURVEY AIA-10: DRILLING MUD ADDITIVES--SHIPMENT, STORAGE

During field survey AIA-10, air samples were collected in the warehouse of a retail drilling mud firm, while workers loaded a truck with bags of asbestos additive for shipment to a job site. Sampling was performed indoors while rain fell outside.

The work area is shown in Figure 10. The operations monitored consisted of moving a pallet of bagged asbestos additive over to a truck using a lift-truck, loading a full pallet onto the bed, and then unloading an additional 10 bags onto the truck by hand for shipment. Work was performed by a lift-truck operator and two warehouse employees.

The general condition of the warehouse was dirty with considerable airborne dust and settled dust throughout the area from past bag breakage--primarily clays. Apparently, no cleanup procedures were in effect.

Four air samples were collected consisting of two general air and two breathing zone samples. The sampling data are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
AG-1	General air, warehouse 10324056	23.5	<0.033
AG-3	Worker exposure, lift operator loading truck with pallets 1111-1119	8	<0.098
AG-4	Worker exposure, helper unloading bags from pallet 1111-1120	9	0.59
AG-5	General air, warehouse after loading 1125-1140	15	0.15

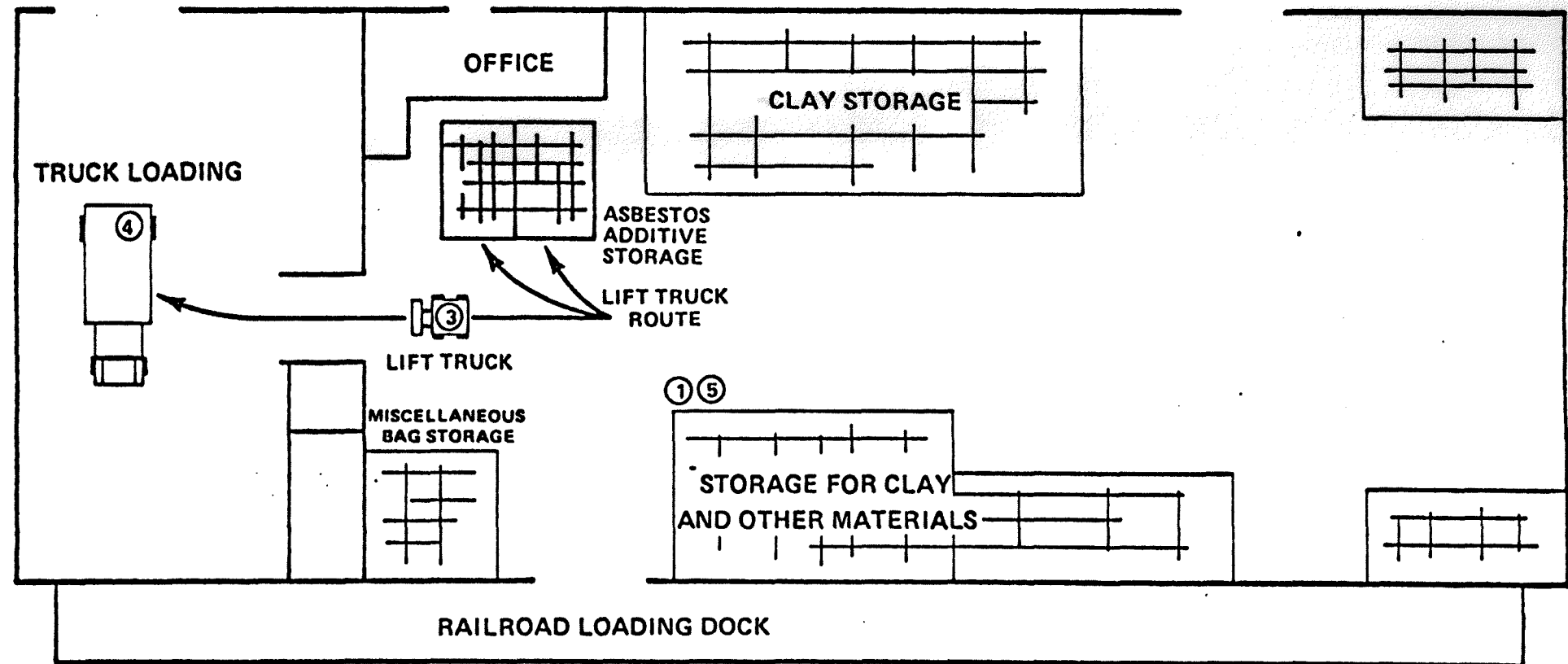


Figure 10. Diagram showing work area and sampling locations for survey AIA-10.

SURVEY AIA-11: DRILLING MUD ADDITIVES, DRILLING SITE

Survey AIA-11 covered the operations involving the use of an asbestos additive to the muds at an oil drilling rig. Sampling was performed outdoors and the weather was cold and rainy with a slight wind.

The operation at the drilling site involved one worker who was responsible for adding the material to the drilling mud through the mud hopper, which was outdoors. The operation consisted of the worker carrying a 50-pound bag of the additive to the side of the hopper, cutting the bag open, and slowly adding the asbestos material to the hopper. As the bags were emptied, the operator would put them in a pile. Upon completion of the pouring (usually 5 to 6 bags of additive), the operator would step on the bags to compress their size and then carry them off to a pit for disposal. At one point during the pouring, one of the bags tore slightly and the asbestos material spilled onto the worker's clothing.

Four general air samples and two breathing zone sample were collected during the survey. The air sampling data are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
DB-1	General air, 10 feet north of hopper during cleaning 1320-1340	19.5	0.039
DB-2	General air, 3.5 feet south of hopper during cleaning 1321-1340	19	0.041
DB-3	General air, 10 feet north of hopper during dump 1356-1424	28	0.027
DB-4	General air, 3.5 feet south of hopper during dump 1357-1428	31	0.099
DB-5	Worker exposure (operator) during dump into hopper 1356-1426	29.5	0.13 (0.3)
DB-6	Worker exposure, disposal of empty bags 1429-1431	2	0.39 (1.7)

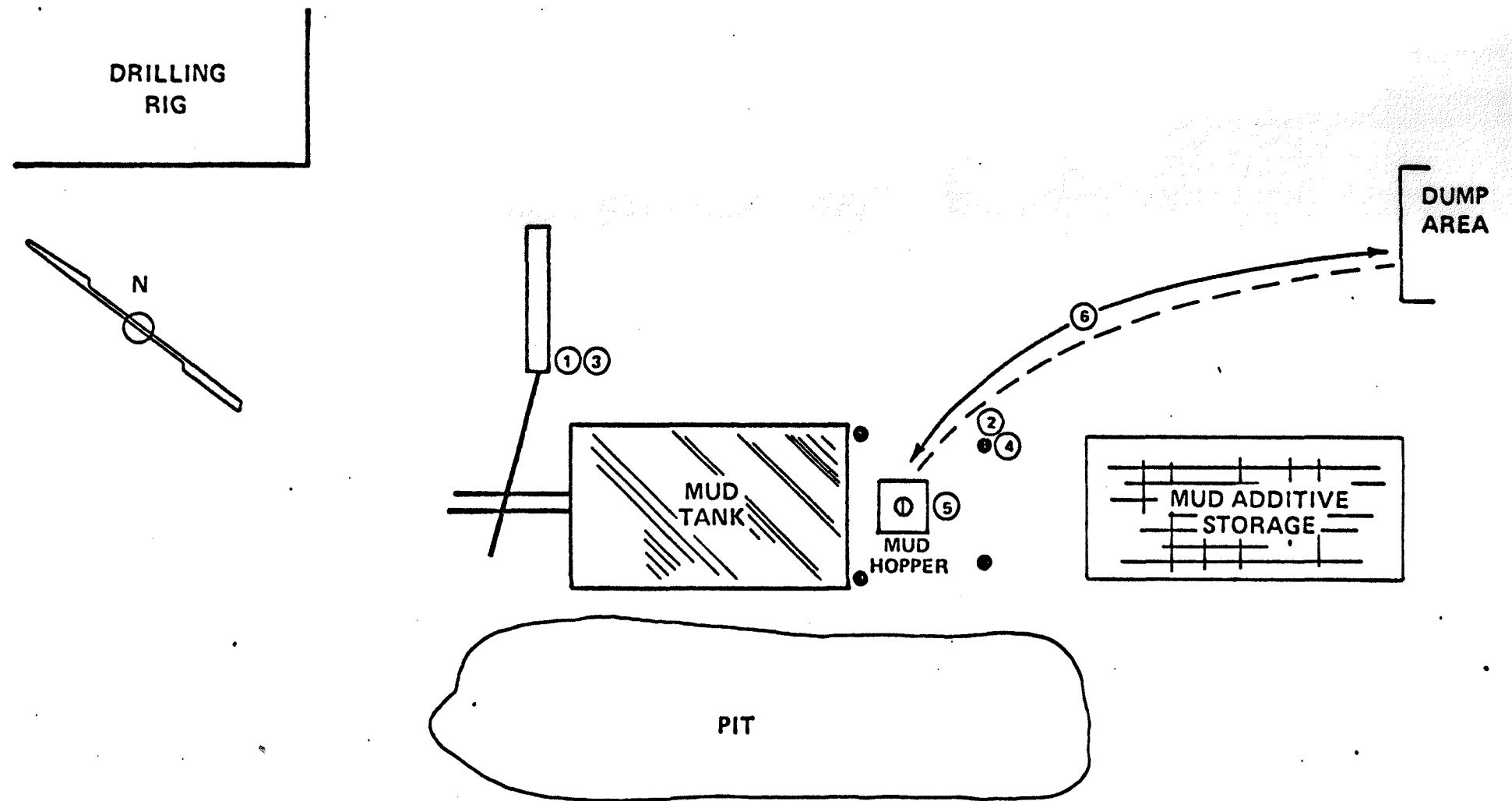


Figure 11. Diagram of work area showing sampling locations for survey AIA-11.

SURVEY AIA-12: DRILLING MUD ADDITIVES--OIL RIG

Survey AIA-12 consisted of monitoring asbestos exposures at an oil drilling rig where asbestos additives were used in the drilling muds. Sampling was performed outdoors during a rainy, cold, and slightly windy day.

The operation consisted of one worker carrying a 50-pound bag of additive to the side of the mudhopper, breaking open the double bag (plastic outside, paper inside), and slowly pouring the asbestos additive into a mudhopper. The hopper was located outdoors. After pouring, the worker crumpled up the empty bag and, at the completion of operations, brought them to a disposal area. Nine bags of asbestos were added during the survey.

Three general air and two breathing zone samples were collected, and the air sampling data are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
WT-1	General air, 3 feet upwind of hopper 1730-1744	14.8	<0.053
WT-2	General air, 3 feet upwind of hopper during dump 1752-1820	27.6	0.14
WT-3	Worker exposure (operator) during dump and disposal of empty bags 1752-1819	26.8	0.20 (0.3)
WT-4	Observer exposed during dump 1751-1819	28	0.08
WT-5	General air, 3 feet upwind of hopper after dump 1823-1838	15	0.10

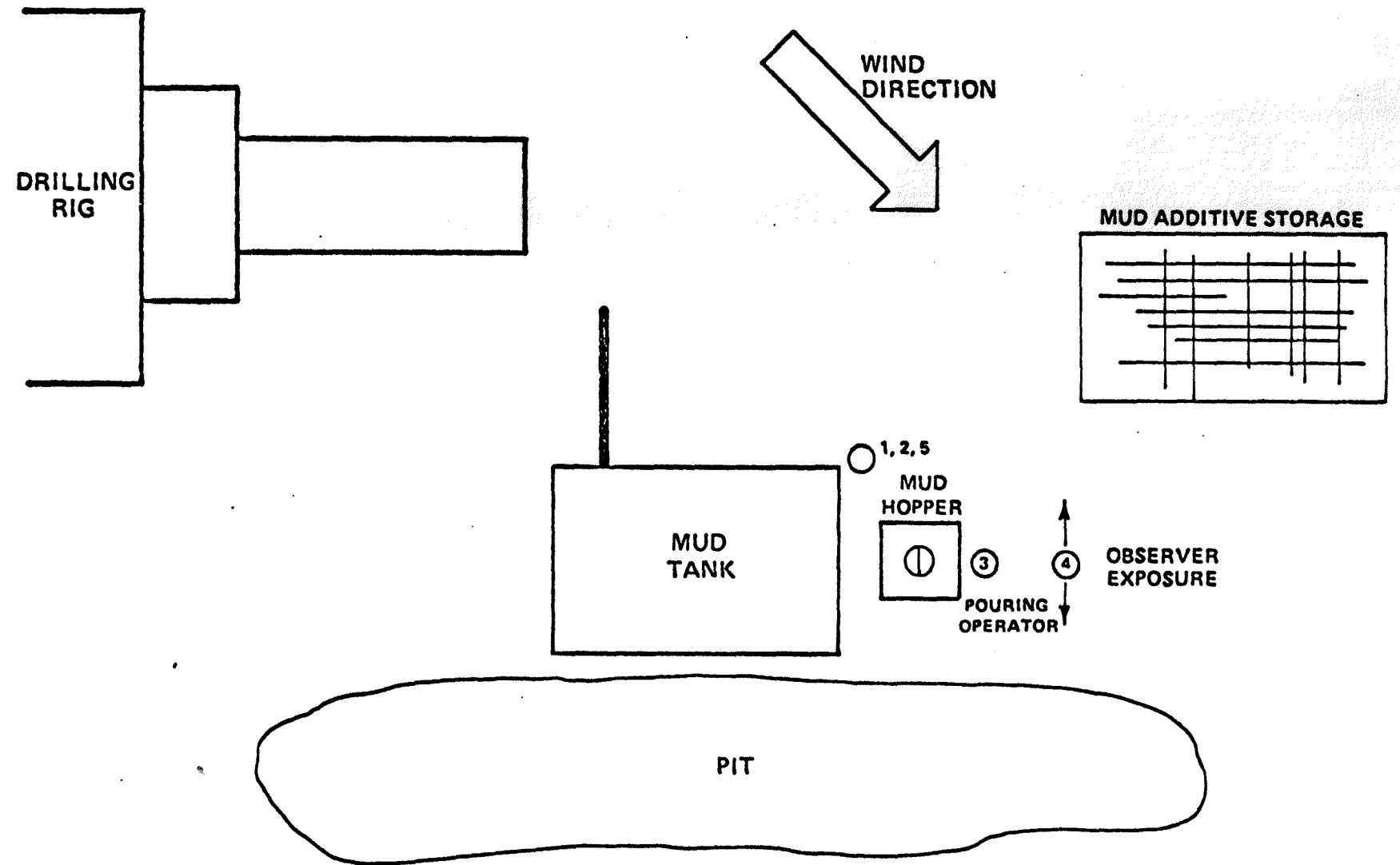


Figure 12. Work area for survey AIA-12.

SURVEY AIA-13: DRILLING MUD ADDITIVES--SHIPPING, STORAGE

During survey AIA-13, air samples were collected in a drilling mud company warehouse during handling and shipping of an asbestos additive for drilling muds. Work was performed indoors with the door to the warehouse open and the wind blowing slightly.

The work performed consisted of moving a pallet of bagged asbestos material to a nearby truck (inside the warehouse) using a lift truck and loading the bags on the truck by hand. Two workers and one lift-truck operator completed the work.

The condition of the warehouse was clean, the materials were stored and arranged in an organized fashion, and the work was performed carefully.

Two general air and two breathing zone samples were collected. The air sampling data are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
MW-1	General air, middle of shed before operations $\phi 811 - \phi 813$	25.5	0.031
MW-2	General air, middle of shed during loading $\phi 902 - \phi 917$	15	<0.052
MW-3	Worker exposure, lift-truck operator during loading $\phi 901 - \phi 918$	17	0.23 0.1
MW-4	Worker exposure, loader's exposure transferring bags from pallet to truck bed $\phi 901 - \phi 918$	17.5	0.36 0.3

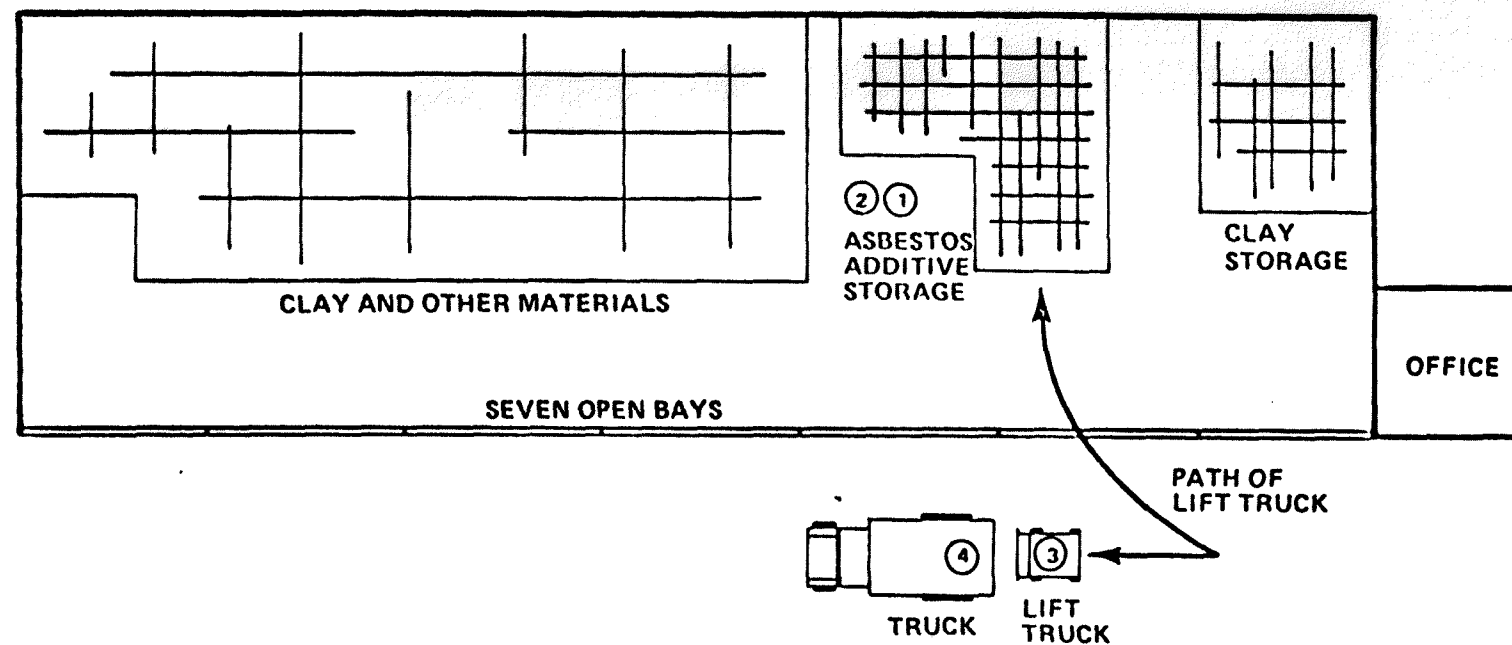


Figure 13. Diagram showing work area and sample locations for survey AIA-13.

013688

SURVEY AIA-14: DRILLING MUD ADDITIVES--OIL RIG

General air and worker breathing zone samples were collected at an oil rig during the operations involving the use of asbestos drilling mud additives. The sampling was performed outdoors where the weather was cloudy and cool and the winds were blowing from 5 to 10 mph.

Work consisted of those operations previously described, that is, one employee cutting open a 50-pound bag of additive, pouring the asbestos into the mudhopper, and at completion bringing the empty bags to a waste disposal pit. Five bags of additive were used during the survey. A diagram of the work area is shown in Figure 14.

Four samples were collected and the air sampling results are summarized as follows:

<u>Sample No.</u>	<u>Description</u>	<u>Time (minutes)</u>	<u>Fibers/Cubic Centimeter >5 micron</u>
BD-1	General air, 20 feet upwind of hopper 1116-1144	28	0.027
BD-2	Worker exposure, dumping sacks and disposing of empties 1145-1202	17.5	0.13 (0) ✓
BD-3	General air, 3 feet downwind of hopper during dumping 1146-1201	15	<0.052
BD-4	Observer, 10 feet from hopper 1152-1204	11.5	<0.067

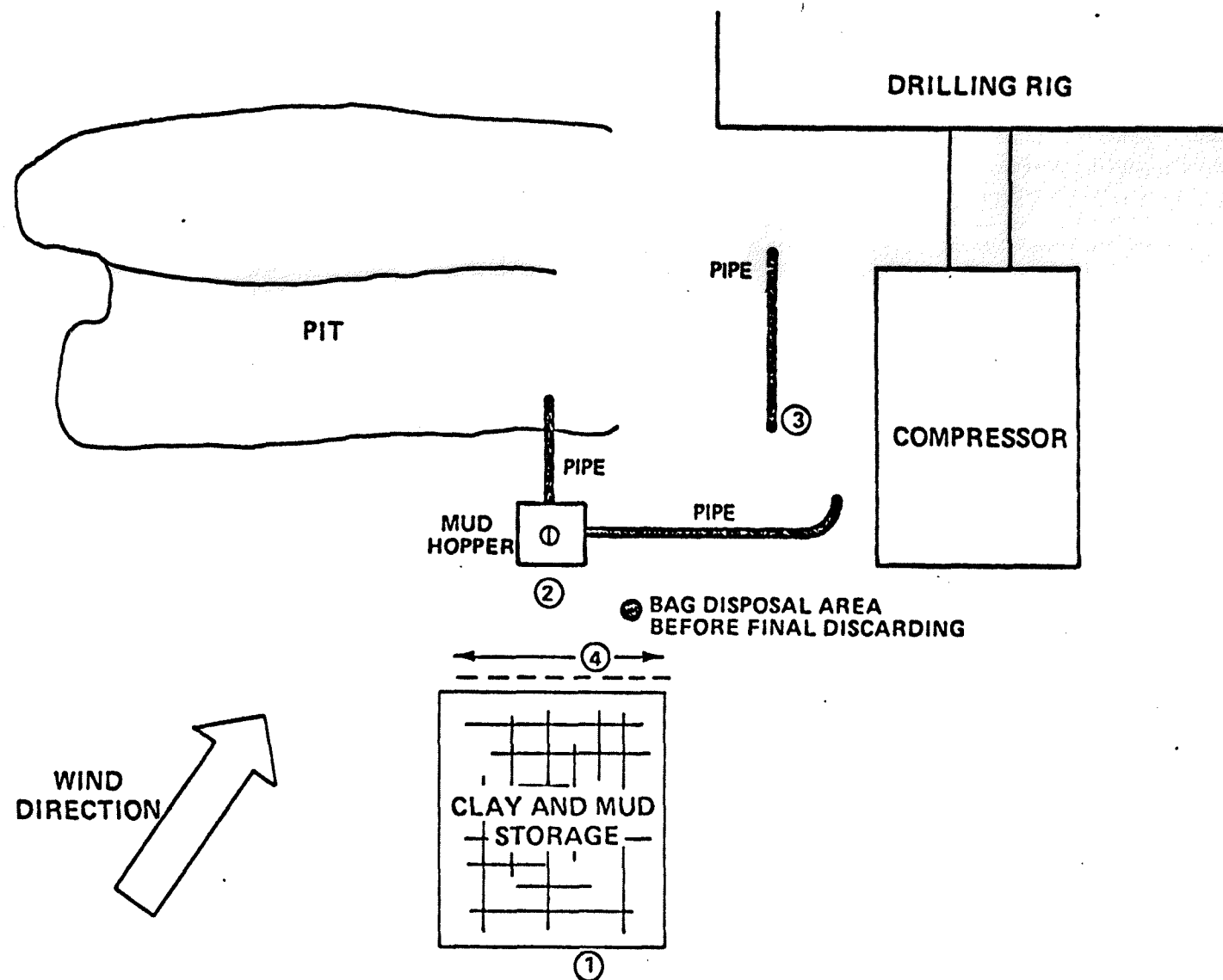


Figure 14. Diagram of work area with sampling locations for survey AIA-14.

SHAHER, GILLILAND, DAVIS, BUNTON & MCCOLLUM

A PROFESSIONAL CORPORATION

ATTORNEYS AT LAW

SECOND FLOOR

FIRST NATIONAL BANK BUILDING

POST OFFICE DRAWER 1552

ODESSA, TEXAS 79760

013690

TELEPHONE A/C 918
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W. O. SHAHER
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LUCIUS D. BUNTON
PAUL MCCOLLUM
CONNELL ASHLEY
JAMES M. O'LEARY
RAY STOKER, JR.
TRYON D. LEWIS
FRED M. (MICKEY) JONES
STEPHEN L. BRANNAN
WM. MICHAEL HOLMES
GARY C. RILEY

May 23, 1977

Mr. Robert Hailey
Texland Drilling Corporation
600 First National Bank Building
Abilene, TX

Re: Secretary of Labor v. Texland Drilling Corp.
OSHRC Docket No. 76-5316
SOL Case No. 03540

Dear Bob:

As you know the government has decided to throw in the towel on this case. I think that after looking at all of the facts they decided that they simply could not win and after a meeting several people in the Dallas office decided to dismiss the complaint.

It is disappointing that we were not able to have a hearing on this matter because we would have won it outright. On the other hand, I am gratified to see that the Citation has been dismissed and the government indicated its unwillingness to go to trial on cases of this type. I hope they show this forbearance in the future without requiring the in depth preparation which was done in this case. Therefore it is possible that within the OSHA organization this case might have some impact as to their enforcement procedures.

I am herewith sending to you a copy of their Motion to Dismiss and a letter from the Judge noting this dismissal is to take place. I will probably receive an Order to that effect later.

By copy of this correspondence I am notifying Ken Campbell and Harry Wyatt of Montello that I have received this document and am sending them copies.

Sincerely,
ORIGINAL
Signed By TRYON D. LEWIS

Tryon D. Lewis

TDL/mvn
Encs:

013691

Mr. Robert Hailey

Page 2

May 23, 1977

cc: Mr. Ken Campbell ✓
Montello
P. O. Box 130
Sand Springs, OK 74063

cc: Mr. Harry Wyatt
Montello
P.O. Box 130
Sand Springs, OK 74063

UNITED STATES OF AMERICA

OCCUPATIONAL SAFETY AND HEALTH REVIEW COMMISSION

RAY MARSHALL, Secretary of Labor,)
 United States Department of Labor,)

Complainant,)

OSHRC Docket

v.)

No. 76-5316

TEXLAND DRILLING CORPORATION,)

Defendant.)

MOTION TO DISMISS CITATION

Comes now the complainant in the above styled case
 and moves that the citation be withdrawn and the complaint
 dismissed in the above case.

CARIN A. CLAUSS
 Solicitor of Labor

RONALD M. GASWIRTH
 Regional Solicitor

HERIBERTO DE LEON
 Counsel for Occupational
 Safety and Health

By:

 U. SIDNEY CORNELIUS, JR.
 Attorney

Attorneys for RAY MARSHALL,
 Secretary of Labor, United
 States Department of Labor,

SOL Case No. 03540

Complainant.

013693

CERTIFICATE OF SERVICE

I hereby certify that on the 20th day of May, 1977, I served one copy of motion to dismiss citation upon respondent by mailing the document in a franked envelope addressed to:

Mr. Tryon D. Lewis
Attorney at Law
2nd Floor, First National
Bank Building
Post Office Drawer 1552
Odessa, Texas 79760

U. SIDNEY CORNELIUS, JR.
Attorney

013694



UNITED STATES OF AMERICA
OCCUPATIONAL SAFETY AND HEALTH REVIEW COMMISSION
SUITE 400, FIDELITY UNION TOWER
1507 PACIFIC AVENUE
DALLAS, TEXAS 75201
(214) 749-7171

May 19, 1977

Tyron D. Lewis, Esq.
Shafer, Gilliland, Davis, Bunton
& McCollum, Inc.
2nd Floor First National Bank Bldg.
PO Drawer 1552
Odessa, Texas 79760

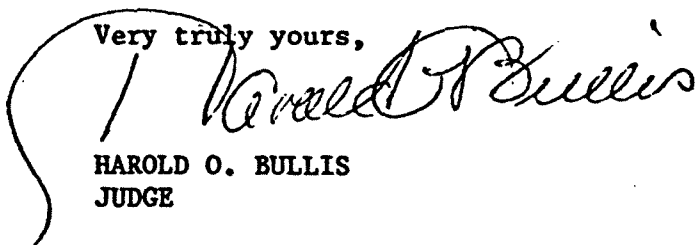
U. Sidney Cornelius, Jr., Esq.
USDOL, Solicitor's Office
555 Griffin Square, Suite 501
Dallas, Texas 75202

Re: Secretary of Labor v. Texland Drilling Corp.
OSHRC Docket No. 76-5316

Gentlemen:

This is to confirm that complainant has advised this office today that the Secretary is going to file a motion to dismiss the above entitled matter. Accordingly, the hearing scheduled for Abilene, Monday, May 23, 1977, is hereby cancelled.

Very truly yours,


HAROLD O. BULLIS
JUDGE

CITATION and NOTIFICATION OF PENALTY

Dallas/Fort Worth Area Office
Central Place, 1425 W. Pioneer Dr. - Suite 230
Irving, Texas 75061

ISSUANCE DATE	OSHA NUMBER	
11/18/76	F6435 830	
REGION	AREA	PAGE
6	1730	2 OF 3

013695

TYPE OF VIOLATION(S)	CITATION NO.
OTHER	1

INSPECTION DATE:

11/10/76

INSPECTION SITE:

Two Miles West
Agnes, TX

THE LAW REQUIRES that a copy of this Citation be posted immediately in a prominent place at or near the location of the violation(s) cited below. The Citation must remain posted until the violations cited below have been corrected, or for 3 working days (excluding weekends and Federal holidays) whichever is longer.

PENALTIES
ARE DUE
WITHIN 15
DAYS OF
RECEIPT
OF THIS
NOTIFICATION
UNLESS
CONTESTED
(See enclosed
Booklet)

This Section May
Be Detached
Before Posting

TO: Texland Drilling Corp., Rig #2
P. O. Box 3037
Abilene, TX 79604

Attn: Mr. Dick Bowen, President

This citation describes violations of the Occupational Safety and Health Act of 1970. The penalty(ies) listed below are based on these violations. You must correct the violations referred to in this citation by the dates listed below and pay the penalties proposed, unless within 15 working days (excluding weekends and Federal holidays) from your receipt of this citation and penalty you mail a notice of contest to the U.S. Department of Labor Area Office at the address shown above. (See the enclosed booklet which outlines your responsibilities and courses of action and should be read in conjunction with this form.)

ITEM NUMBER	STANDARD, REGULATION OR SECTION OF THE ACT VIOLATED: DESCRIPTION	DATE BY WHICH VIOLATION MUST BE CORRECTED	PENALTY
1	29 CFR 1926.251(c)(4)(iv): The total number of visible broken wires in wires in wire rope(s) exceeded 10 percent of the total number of wires: One strand out of four completely severed in the eyelet loop, east of Rig #2 at gerionimo line secure point	Immediately	0
2	29 CFR 1926.301(d): Wooden handles of tool(s) were not free of splinters or cracks: Long handled shovel with split wooden handle, ground level, east side of Rig #2	Immediately	0
3	29 CFR 1926.400(a), Section 501-9(b)(2) National Electrical Code, NFPA 70-1971, as adopted by 29 CFR 1926.400(a): Lighting fixtures for fixed lighting was not protected from physical damage by suitable guides or by location: Rig #2 a. All mast lights from floor to ground b. Festoon lights in standby and main mud pump areas c. Festoon lights across east end of slush pits to south end of pipe rack	Immediately	55.
4	29 CFR 1926.402(a)(4): Attachment plugs for use in work areas are not so constructed as to endure rough use and were not equipped with a suitable cord grip to prevent strain on the terminal screws: Home made attachment plug used attached to pigtail of light socket, dog house, Rig #2, northeast corner	Immediately	0
5	29 CFR 1926.402(a)(8): Cable(s) passing through work areas were not covered or elevated to protect them from damage which would create a hazard to employees: Electrical power supply cable across roadway, Rig #2, ground level, east side between rig and trailer house	Immediately	0

AREA DIRECTOR

NOTICE TO EMPLOYEES - The law gives an employee or his representative the opportunity to object to any abatement date set for a violation if he believes the date to be unreasonable. The contest must be mailed to the U.S. Department of Labor Area Office at the address shown above within 15 working days (excluding weekends and Federal holidays) of the receipt by the employer of this citation and penalty.

EMPLOYER RESPONSIBILITIES AND COURSES OF ACTION - The enclosed booklet outlines employer responsibilities and courses of action and should be read in conjunction with this notification.

EMPLOYER DISCRIMINATION UNLAWFUL - The law prohibits discrimination by an employer against an employee for filing a complaint or for exercising any rights under this Act. An employee who believes that he has been discriminated against may file a complaint no later than 30 days after the discrimination with the U.S. Department of Labor Area Office at the address shown above.

TOTAL PENALTY
FOR THIS
CITATION

Make check or Money Order Payable To "DOL OSHA" Indicate OSHA on Remittance

CITATION and NOTIFICATION OF PENALTY

Dallas/Fort Worth Area Office
Central Place, 1425 W. Pioneer Dr. - Suite 230
Irving, Texas 75061

ISSUANCE DATE	OSHA NUMBER	
11/18/76	F6435 830	
REGION	AREA	PAGE
6	1730	3 OF 3

TYPE OF VIOLATION(S)	CITATION NO.
OTHER	1

INSPECTION DATE:

11/10/76

013696

INSPECTION SITE:

Two Miles West
Agnes, TX

THE LAW REQUIRES that a copy of this Citation be posted immediately in a prominent place at or near the location of the violation(s) cited below. The Citation must remain posted until the violations cited below have been corrected, or for 3 working days (excluding weekends and Federal holidays) whichever is longer.

PENALTIES
ARE DUE
WITHIN 15
DAYS OF
RECEIPT
OF THIS
NOTIFICATION
UNLESS
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(See enclosed
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This Section May
Be Detached
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TO: Texland Drilling Corp., Rig #2
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ITEM NUMBER	STANDARD, REGULATION OR SECTION OF THE ACT VIOLATED: DESCRIPTION	DATE BY WHICH VIOLATION MUST BE CORRECTED	PENALTY
1	CFR 1926.500(c)(1): Wall opening which had more than a four foot drop as not guarded: Rig #2, open doorway, 6'8" above ground level, drill floor, southeast corner, change house, south doorway	Immediately	0
2	CFR 1910.27(d)(5): Cage protection, or ladder safety devices in lieu of cage protection, were not used on tower, water, tank, or chimney ladders over 20 feet in unbroken length: Mast ladder approximately 95' unbroken length, Rig #2	Immediately	0
3	CFR 1910.1001(h)(2): Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce airborne levels of asbestos fibers in excess of prescribed limits was not collected and disposed of in sealed impermeable bags or other closed, impermeable containers: Approximately 10 used bags Mentello Super Visbestos - used to viscosity drill mud to clean out drill hole, Rig #2, south side, ground level, standby mud pump	Immediately	0

AREA DIRECTOR

A. WARREN

\$80.

NOTICE TO EMPLOYEES - The law gives an employee or his representative the opportunity to object to any abatement date set for a violation if he believes the date to be unreasonable. The contest must be mailed to the U.S. Department of Labor Area Office at the address shown above within 15 working days (excluding weekends and Federal holidays) of the receipt by the employer of this citation and penalty.

EMPLOYER DISCRIMINATION UNLAWFUL - The law prohibits discrimination by an employer against an employee for filing a complaint or for exercising any rights under this Act. An employee who believes that he has been discriminated against may file a complaint no later than 30 days after the discrimination with the U.S. Department of Labor Area Office at the address shown above.

TOTAL PENALTY
FOR THIS
CITATION
Make check or Money
Order Payable To:
"DOL-OSHA"
Indicate OSHA N
on Remittance

EMPLOYER RESPONSIBILITIES AND COURSES OF ACTION - The enclosed booklet outlines employer responsibilities and courses of action and should be read in conjunction with this notification.

RULES AND REGULATIONS

tions for an Occupational Exposure Standard for Asbestos by the National Institute for Occupational Safety and Health (NIOSH). Public notice was given of the receipt of the recommendations and their availability for inspection and copying. On or about February 25, 1972, the Advisory Committee on Asbestos Dust submitted its written recommendations to the Assistant Secretary of Labor for Occupational Safety and Health.

Pursuant to the notice of rule making, a hearing was held on March 14 through 17, 1972, for the purpose of receiving oral data, views, and arguments concerning the proposed standard. On or about March 31, 1972, the presiding hearing examiner certified to the Assistant Secretary of Labor for Occupational Safety and Health the record of the proceeding. The record includes prehearing written comments, a transcript of the oral presentations made at the hearing, and numerous exhibits received during the course of the hearing or within the period allowed after the close of the hearing.

The proposed standard dealt with (1) permissible concentrations of asbestos fibers; (2) methods of compliance; (3) warning signs; (4) monitoring; (5) medical examinations; and (6) recordkeeping. Each of these major proposals elicited comments, arguments, objections, and counterproposals. They all have been examined and considered.

1. *Acceptable concentrations of asbestos dust.* The proposed standard would limit occupational exposure to 8-hour time-weighted average (TWA) airborne concentrations of asbestos dust not exceeding five fibers longer than five micrometers per milliliter. Concentrations above five fibers but not to exceed 10 fibers (ceiling concentration) would be permitted up to 15 minutes in an hour, but for not more than 5 hours in any one 8-hour day.

NIOSH in effect has recommended that the five-fiber TWA and 10-fiber peak concentrations be permitted only for 2 years; thereafter, TWA concentrations should be not more than 2 fibers per cubic centimeter (cm.³) of air, and peak concentrations should not exceed 10 fibers/cm.³, with no time restriction. Numerous objections and counterproposals have been made, with regard to both the limits of asbestos fiber concentrations and the time periods to comply with them. Some, for example, have recommended return to a 12-fiber standard of an earlier day; i.e., a level adopted under the Walsh-Healey Public Contracts Act in 1969. Others have recommended a two-fiber standard to become effective in 6 months, then a one-fiber standard for 2 years, and finally a zero-fiber standard after 3 years. These recommendations give a fair indication of the wide spread of the counterproposals.

No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers. The dispute is as to the determination of a specific level below which exposure is safe. Various studies attempting to establish quantitative relations between specific levels of

exposure to asbestos fibers and the appearance of adverse biological manifestations, such as asbestosis, lung cancers, and mesothelioma, have given rise to controversy as to the validity of the measuring techniques used and the reliability of the relations attempted to be established. Because of the long lapse of time between onset of exposure and biological manifestations, we have now evidence of the consequences of exposure, but we do not have, in general, accurate measures of the levels of exposure occurring 20 or 30 years ago, which have given rise to these consequences. There are also controversies concerning the relative toxicity of the various kinds of asbestos, and varying hazards in different workplaces.

It is fair to say that the controversy has centered in the area between a two-fiber TWA concentration and five-fiber TWA concentration, with variations on the time needed for compliance. Many employers support a five-fiber TWA. Most medical opinion is divided between a two-fiber standard and a five-fiber standard.

In view of the undisputed grave consequences from exposure to asbestos fibers, it is essential that the exposure be regulated now, on the basis of the best evidence available now, even though it may not be as good as scientifically desirable. An asbestos standard can be re-evaluated in the light of the results of ongoing studies, and future studies, but cannot wait for them. Lives of employees are at stake.

It is concluded that there should be one minimum standard of exposure to asbestos applicable to all workplaces exposed to any kind, or mixture of kinds, of asbestos. Reasons of practical administration preclude a variety of standards for different kinds of asbestos and of workplaces. Also, while the evidence tends to show that crocidolite, for instance, is more harmful than chrysotile, the evidence is not sufficient to establish separate standards for varieties of asbestos.

Because there must be one standard governing exposure to all varieties of asbestos, and in workplaces apparently more hazardous than others; because some present employees with regular exposure to asbestos have probably already accumulated great doses of asbestos fibers, due to higher levels of exposure in the past; because it appears that levels of exposure which may be safe with regard to asbestosis are not safe with regard to mesothelioma; because the statute requires the protection of every employee, even of one who may have regular exposure to asbestos during a working life which may reach, or even exceed, 40 years; and because of several other considerations which have been urged and are reflected in the record of the proceeding, the conflict in the medical evidence is resolved in favor of the health of employees. As of July 1, 1976, TWA concentrations of asbestos fibers longer than 5 micrometers will not be allowed to exceed two fibers/cc., with a ceiling value of 10 fibers/cc. The current TWA concentrations of five fibers, and

Title 29—LABOR

Chapter XVII—Occupational Safety and Health Administration, Department of Labor

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Standard for Exposure to Asbestos Dust

On December 7, 1971, an emergency temporary standard concerning exposure to asbestos fibers was published in the FEDERAL REGISTER (36 F.R. 23207). In accordance with section 6(c) (3) of the Williams-Steiger Occupational Safety and Health Act of 1970, a notice of proposed rulemaking regarding a permanent standard for exposure to asbestos fibers was published in the FEDERAL REGISTER on January 12, 1972 (37 F.R. 466). The notice invited interested persons to submit both orally and in writing, data, views, and arguments concerning the proposal.

On or about January 24, 1972, the Advisory Committee on Asbestos Dust was established and requested to make written recommendations with regard to the proposed standard on asbestos. On or about February 1, 1972, the Department of Health, Education, and Welfare transmitted to the Secretary of Labor a criteria document containing Recommendations

ceiling concentrations of 10 fibers/cc, will be permitted until July 1, 1976, during what will be a transitional period deemed necessary to allow employers to make the needed changes for coming into compliance with the more stringent standard.

The record shows that the many work operations subject to the single asbestos standard (textile, manufacturing, industrial, and marine installation, etc.) will meet varying degrees of difficulty in complying with the standard. In some plants, extensive redesign and relocation of equipment may be needed. It appears, however, the delay in the effective date of the two-fiber standard will provide all employers a reasonable time to comply. At the same time, so long as the ceiling limit is complied with, no harm is reasonably expected to result from exposures during the transitional period.

2. Methods of compliance. It has been pointed out by many persons, that protection against asbestos fibers is best obtained by controlling the generation of fibers first, and secondly, by controlling the dispersion of released fibers into the ambient air of the workplaces. Therefore, the standard requires feasible technological controls and appropriate work practices as the primary means of compliance. Rotation of employees as a way of meeting the TWA concentration requirement is allowed only in stated exceptional circumstances, because, as a general rule, it would be difficult to implement. Personal protective equipment, such as respirators, cannot be relied upon because, among other reasons, they may be so uncomfortable as to be burdensome, except for short periods of time. Therefore, it is expected that respirators and shift rotation will be used during the period necessary to install engineering controls and to train employees in sound work practices, but, after technological compliance has been achieved, their use must be limited to special work situations and emergencies. Where both are practicable, shift rotation is required.

3. Labeling. The proposed standard stopped short of requiring labeling asbestos and asbestos-containing products. The proposed standard would have required only warning signs at locations where asbestos hazards are present. However, labeling, rather than warning signs, has proved to be a point of controversy. Both NIOSH and the Advisory Committee on Asbestos Dust recommended labels for asbestos products and containers, and these recommendations became very controversial in the course of the proceeding. Many counterproposals have been made as to the language of the warning as well as to the products to be subject to the labeling requirements. Employers, in general, strongly contend that (1) finished products which effectively entrap asbestos

fibers, so that these would not be released in the normal use of the products, should not be required to be labeled; and (2) words such as "danger" and "cancer" are unwarrantedly alarming.

Both contentions have merit, and the standard has been changed accordingly.

4. Monitoring. The proposed standard would have required personal monitoring and environmental monitoring. Many issues have been raised concerning the availability and reliability of measuring instruments, frequency of monitoring, and conditions in which monitoring should be required. The adopted standard takes the objections into consideration. It requires periodic monitoring at intervals no longer than 6 months, thus allowing considerable time and discretion, and prescribes the use of the membrane filter method, which is an acceptable method for determination of asbestos fibers.

It has also been recommended that employees or their representatives should have an opportunity to observe the monitoring. The recommendation has been accepted.

5. Medical examinations. The proposed standard would only require an appropriate medical examination on a periodic basis. The generality of the proposal has attracted many objections and also many helpful comments. The recommendations of NIOSH and of the Advisory Committee on Asbestos Dust were much more specific with respect to both frequency and type of medical examinations to be required. The comments vary as to the class of employees to be examined and as to the frequency of the examinations.

The adopted standard requires medical examinations both at the beginning and the termination of employments exposed to concentrations of asbestos fibers, and also requires annual medical examinations of every employee exposed to airborne concentrations of asbestos. It has been pointed out that in certain industries, such as construction, an employee may work for several employers during the same year. Accordingly, the standard does not require either preemployment, or termination, or periodic examination of any employee who has been examined in accordance with the standard within the past year.

One question which has been raised goes to whether the employer or the employee should be allowed to choose the examining physician. The standard gives the option to the employer. Since some employers already have a medical examination program in operation, and, also, have medical departments with some expertise in the diagnosis of asbestos-related diseases, it seems more reasonable to permit them to utilize the present programs and expertise, than to permit an employee to choose a private general practitioner.

6. Records. The standard, as proposed and as adopted, requires maintenance of records of monitoring and of medical examinations. Most of the controversy in this area has revolved around the question whether an employer should be allowed to have access to the results of the required medical examinations. The apprehension of those who have argued against employer access is based on the expectation that some employers will use the medical examinations as a means of screening employment applicants, and worse, as grounds for discharging current employees, who show signs of being affected by exposure to asbestos. Since the purpose of the medical examinations is to monitor the health of employees exposed to the hazards of asbestos, employees cannot in reason be granted the privilege of refusing to disclose to their employers results of occupational exposure. It does not make sense to require employers to provide medical examinations if they cannot know and use the results of the examinations. For these reasons the standard provides that employers may have a restricted access to some medical information.

On the other hand, there is no intention to allow employers to abuse medical information obtained pursuant to the Act, to the detriment of employees. Therefore, the administration of the medical records requirement will be closely watched, and, in cases of abuse, appropriate action will be considered.

The issues discussed above are believed to be the major ones. Numerous other issues have been raised in the rulemaking proceedings. Some have been referred to incidentally. Many recommendations, for instance, about work practices, are so obviously meritorious that their adoption needs no exposition here. Other recommendations and many objections have not been adopted for a variety of reasons which should be manifest. Several, for instance, have recommended the use of respirators only pursuant to a variance, or in cases of emergency and occasional short-term exposures. The recommendation with respect to variances undoubtedly has many merits, but is considered administratively impractical.

Accordingly, after consideration of the whole record of the proceeding, and pursuant to sections 6 (b) and (c) and 8(c) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1593, 1596, 1599; 29 U.S.C. 655, 657), 29 CFR 1910.4, and to Secretary of Labor's Order No. 12-71 (36 F.R. 8784), Part 1910 of Title 29 of the Code of Federal Regulations is amended as set forth below.

(1) Section 1910.93 is amended by revising Table G-3 to read as follows:

§ 1910.93 Air contaminants.

TABLE G-3—MINERAL DUSTS

Substance	Mppcf	Mg/M ³
Silica:		
Crystalline:		
Quartz (respirable).....	250 ¹	10mg/M ³ =
	%SiO ₂ +5	%SiO ₂ +2
Quartz (total dust).....		50mg/M ³
		%SiO ₂ +2
Cristobalite: Use $\frac{1}{2}$ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use $\frac{1}{2}$ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth.....	20	80mg/M ³
		%SiO ₂
Silicates (less than 1% crystalline silica):		
Mica.....	20	
Soapstone.....	20	
Talc.....	20	
Portland cement.....	80	
Graphite (natural).....	15	
Coat dust (respirable fraction less than 5% SiO ₂).....		2.4mg/M ³ or 10mg/M ³
For more than 5% SiO ₂		%SiO ₂ +2
Inert or Nuisance Dust:		
Respirable fraction.....	15	5mg/M ³
Total dust.....	80	15mg/M ³

NOTE: Conversion factors—
 mppcf $\times$ 35.3 = million particles per cubic meter = particles per c.c.
¹ Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.
² The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been shown to be applicable.
³ As determined by the membrane filter method at 43 $\times$ phase contrast magnification.
⁴ Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an AEC instrument. If the respirable fraction of coal dust is determined with a MRE the figure corresponding to that of 2.4 Mg/M³ in the table for coal dust is 4.8 Mg/M³.

2. A new § 1910.93a is added to Part 1910, reading as follows:

§ 1910.93a Asbestos.

(a) *Definitions.* For the purpose of this section, (1) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.
 (2) "Asbestos fibers" means asbestos fibers longer than 5 micrometers.
 (b) *Permissible exposure to airborne concentrations of asbestos fibers—*(1) *Standard effective July 7, 1972.* The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.
 (2) *Standard effective July 1, 1976.* The 8-hour time-weighted average airborne concentrations of asbestos fibers

to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.
 (3) *Ceiling concentration.* No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.
 (c) *Methods of compliance—*(1) *Engineering methods.* (i) *Engineering controls.* Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in paragraph (b) of this section.
 (ii) *Local exhaust ventilation.* (a) Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1971, which is incorporated by reference herein.
 (b) See § 1910.6 concerning the availability of ANSI Z9.2-1971, and the maintenance of a historic file in connection therewith. The address of the American National Standards Institute is given in § 1910.100.
 (iii) *Particular tools.* All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with subdivision (ii) of this subparagraph.
 (2) *Work practices—*(i) *Wet methods.* Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in paragraph (b) of this section, unless the usefulness of the product would be diminished thereby.
 (ii) *Particular products and operations.* No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in paragraph (b) of this section.
 (iii) *Spraying, demolition, or removal.* Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with paragraph (d)(2)(iii) of this section and with special clothing in accordance with paragraph (d)(3) of this section.

(d) *Personal protective equipment—*
 (1) Compliance with the exposure limits prescribed by paragraph (b) of this section may not be achieved by the use of respirators or shift rotation of employees, except:
 (i) During the time period necessary to install the engineering controls and to institute the work practices required by paragraph (c) of this section;
 (ii) In work situations in which the methods prescribed in paragraph (c) of this section are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by paragraph (b) of this section; or
 (iii) In emergencies.
 (iv) Where both respirators and personnel rotation are allowed by subdivisions (i), (ii), or (iii) of this subparagraph, and both are practicable, personnel rotation shall be preferred and used.
 (2) Where a respirator is permitted by subparagraph (1) of this paragraph, it shall be selected from among those approved by the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, under the provisions of 30 CFR Part 11 (37 F.R. 6244, Mar. 25, 1972), and shall be used in accordance with subdivisions (i), (ii), (iii), and (iv) of this subparagraph.
 (i) *Air purifying respirators.* A reusable or single use air purifying respirator, or a respirator described in subdivision (ii) or (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits.
 (ii) *Powered air purifying respirators.* A full facepiece powered air purifying respirator, or a powered air purifying respirator, or a respirator described in subdivision (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average concentrations of asbestos fibers are reasonably expected to exceed 10 times, but not 100 times, those limits.
 (iii) *Type "C" supplied-air respirators, continuous flow or pressure-demand class.* A type "C" continuous flow or pressure-demand, supplied-air respirator shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed 100 times those limits.
 (iv) *Establishment of a respirator program.* (a) The employer shall establish a respirator program in accordance with

the requirements of the American National Standards Practices for Respiratory Protection, ANSI Z88.2-1969, which is incorporated by reference herein.

b. See § 1910.6 concerning the availability of ANSI Z88.2-1969 and the maintenance of an historic file in connection therewith. The address of the American National Standards Institute is given in § 1910.100.

(c) No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his use of a respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he had just prior to such transfer, if such a different position is available.

(3) Special clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in paragraph (b) of this section.

(4) Change rooms: (i) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, the employer shall provide change rooms for employees working regularly at the place.

(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.

(iii) Laundering: (a) Laundering of asbestos contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(b) Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in (a) of this subdivision to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(c) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with paragraph (g) of this section.

(e) Method of measurement. All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at 400-450 X (magnification) (4 millimeter objective) with phase contrast illumination.

(f) Monitoring—(1) Initial determinations. Within 6 months of the publication of this section, every employer shall cause every place of employment

where asbestos fibers are released to be monitored in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in paragraph (b) of this section. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with paragraph (c) of this section.

(2) Personal monitoring—(i) Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees. In no case shall the sampling be done at intervals greater than 6 months for employees whose exposure to asbestos may reasonably be foreseen to exceed the limits prescribed by paragraph (b) of this section.

(3) Environmental monitoring—(i) samples shall be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than 6 months for employees whose exposures to asbestos may reasonably be foreseen to exceed the exposure limits prescribed in paragraph (b) of this section.

(4) Employee observation of monitoring. Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof.

(g) Caution signs and labels. (1) Caution signs. (i) Posting. Caution signs shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in paragraph (b) of this section. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers.

(ii) Sign specifications. The warning signs required by subdivision (1) of this

subparagraph shall conform to the requirements of 20" x 14" vertical format signs specified in § 1910.145(d) (4), and to this subdivision. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this subdivision.

Legend	Notation
Asbestos.....	1" Sans Serif, Gothic or Block.
Dust Hazard.....	¾" Sans Serif, Gothic or Block.
Avoid Breathing Dust....	¾" Gothic.
Wear Assigned Protective Equipment.	¾" Gothic.
Do Not Remain In Area Unless Your Work Requires It.	¾" Gothic.
Breathing Asbestos Dust May Be Hazardous To Your Health.	14 point Gothic.

Spacing between lines shall be at least equal to the height of the upper of any two lines.

(2) Caution labels—(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released.

(ii) Label specifications. The caution labels required by subdivision (1) of this subparagraph shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state:

CAUTION
Contains Asbestos Fibers
Avoid Creating Dust
Breathing Asbestos Dust May Cause Serious Bodily Harm

(h) Housekeeping—(1) Cleaning. All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration.

(2) Waste disposal. Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce in any reasonably foreseeable use, handling, storage, processing, disposal, or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers.

(i) Recordkeeping—(1) Exposure records. Every employer shall maintain records of any personal or environmental monitoring required by this section. Records shall be maintained for a period of at least 3 years and shall be made available upon request to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National

Institute for Occupational Safety and Health, and to authorized representatives of either.

(2) *Employee access.* Every employee and former employee shall have reasonable access to any record required to be maintained by subparagraph (1) of this paragraph, which indicates the employee's own exposure to asbestos fibers.

(3) *Employee notification.* Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in paragraph (b) of this section shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken.

(j) *Medical examinations—(1) General.* The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this paragraph.

(2) *Preplacement.* The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(3) *Annual examinations.* On or before January 31, 1973, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(4) *Termination of employment.* The employer shall provide, or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(5) *Recent examinations.* No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

(6) *Medical records—(i) Maintenance.* Employers of employees examined pursuant to this paragraph shall cause to be maintained complete and accurate records of all such medical examina-

tions. Records shall be retained by employers for at least 20 years.

(ii) *Access.* The contents of the records of the medical examinations required by this paragraph shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of NIOSH, to authorized physicians and medical consultants of either of them, and, upon the request of an employee or former employee, to his physician. Any physician who conducts a medical examination required by this paragraph shall furnish to the employer of the examined employee all the information specifically required by this paragraph, and any other medical information related to occupational exposure to asbestos fibers.

3. A new § 1910.19 is added to Subpart B of Part 1910, reading as follows:

§ 1910.19 Asbestos dust.

Section 1910.93a shall apply to the exposure of every employee to asbestos dust in every employment and place of employment covered by § 1910.12, § 1910.13, § 1910.14, § 1910.15, or § 1910.16, in lieu of any different standard on exposure to asbestos dust which would otherwise be applicable by virtue of any of those sections.

Effective date. Paragraph (b)(2) of § 1910.93a shall become effective July 1, 1976. All other provisions of §§ 1910.93a, 1910.93, and 1910.19 shall become effective July 7, 1972. The current emergency temporary standard remains in effect until July 7, 1972.

(Secs. 6, 8, 24 Stat. 1593, 1598; 29 U.S.C. 655, 657; 29 CFR 1910.4; Secretary of Labor's Order No. 12-71, 36 FR 8764)

Signed at Washington, D.C., this 2d day of June 1972.

G. C. GUENTHER,
Assistant Secretary of Labor.

[FR Doc.72-8574 Filed 6-6-72;8:48 am]

OSHA REPORT

A service covering the executive's responsibilities under the new Federal Occupational Safety & Health Act.

Run me a copy of first page.

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- Employee Relations In Act
- Businessman & The Law
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MAN & MANAGER, INC.

799 Broadway, New York, N. Y. 10003

May 1, 1977

Baird Zumwalt phase contrast method

OSHA ALERT

013702

1239. In the first clear-cut U. S. Supreme Court test of OSHA, the Court unanimously upheld the enforcement provisions of the Job Safety Act. It rejected arguments by two contractors that the imposition of penalties without a jury trial was unconstitutional--and it upheld fines levied by OSHA against them totaling \$5,600.

Management is asking these questions about OSHA:

Q-1240. We use asbestos insulation in our office building and some of the fibers get into the air. Does that mean we have to take air samples--and give our employees physical exams?

A. Not necessarily. Bell Laboratories raised this point with OSHA--and received the following reply:

- + When an employer suspects there are airborne concentrations of asbestos, it should take initial tests to determine the extent of employee exposure.
- + If employee exposure does not exceed 0.1 fibers greater than 5 microns in length per cubic centimeter on an 8-hour basis, physical exams are not required.
- + Continuous air sampling is not required unless employee exposure exceeds 2 fibers greater than 5 microns per cubic centimeter on a 3-hour time-weighted basis.

Q-1241. What's all the excitement about a new health Standard covering lead exposure?

A. OSHA wants to amend its regulations to limit worker exposure to airborne lead to not more than 100 micrograms per cubic meter of air over an 8-hour workday. The agency estimates that initial cost of compliance will run anywhere from \$4.1 to \$9.8 million--and that annual compliance costs will approximate \$2.5 to \$4.8 million.

A draft 'economic impact' statement predicts that 17 to 19 independent lead smelters and a number of marginal battery plants will be forced out of business.

Hearings on the proposed new regulation are now underway. The Lead Industries Association has launched a strong campaign in opposition, claiming the regulation will not materially improve worker health.

Q-1242. We give our employees periodic medical exams--and keep the results in their personnel files. Does the government have the right to look at these records?

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
ROOM 512, PETROLEUM BUILDING
420 SOUTH BOULDER STREET
TULSA, OKLAHOMA 74103

013703

March 26, 1975



Mr. Ken Campbell
Montello, Inc.
P.O. Box 130
Sand Springs, Oklahoma 74063

RE: Asbestos - 29 CFR 1910.93(a)(g)(1)(i)

Dear Mr. Campbell:

The following information is provided regarding your inquiry and to confirm our telephone conversation of March 24, 1975.

a. Caution signs are required where in the judgement of the compliance officer, based upon air sample results or visual observation, backed up with documentation that airborne concentrations of asbestos may be in excess of exposure limits.

b. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers. These signs are required where airborne concentrations of asbestos exceed exposure limits.

It is hoped that this information will assist in providing a safe and healthful workplace and complying with applicable standards.

Sincerely,

A handwritten signature in black ink, appearing to read "J. T. Knorpp".

J. T. KNORPP
Area Director

JTK/bl

CITATION and NOTIFICATION OF PENALTY

Dallas/Fort Worth Area Office
Central Place, 1425 W. Pioneer Dr. - Suite 230
Irving, Texas 75061

ISSUANCE DATE	11/18/76		OSHA NUMBER	F6435 830	
REGION	6	AREA	1730	PAGE	2 OF 3

PENALTIES ARE DUE WITHIN 15 DAYS OF RECEIPT OF THIS NOTIFICATION UNLESS CONTESTED (See enclosed Booklet)

This Section Be Detached Before Posting

TYPE OF VIOLATION	SITING CITATION NO.
OTHER	1

mail to Montello Inc. P.O. Box 130 SAND SPRING, OK 74063

INSPECTION DATE: 11/10/76
013704

INSPECTION SITE:
Two Miles West Agnes, TX

TO: Texland Drilling Corp., Rig #2
P. O. Box 3037
Abilene, TX 79604

Attn: Mr. Dick Bowen, President

THE LAW REQUIRES that a copy of this Citation be posted immediately in a prominent place at or near the location of the violation(s) cited below. The Citation must remain posted until the violations cited below have been corrected, or for 3 working days (excluding weekends and Federal holidays) whichever is longer.

This citation describes violations of the Occupational Safety and Health Act of 1970. The penalty(ies) listed below are based on these violations. You must correct the violations referred to in this citation by the dates listed below and pay the penalties proposed, unless within 15 working days (excluding weekends and Federal holidays) from your receipt of this citation and penalty you mail a notice of contest to the U.S. Department of Labor Area Office at the address shown above. (See the enclosed booklet which outlines your responsibilities and courses of action and should be read in conjunction with this form.)

ITEM NUMBER	STANDARD, REGULATION OR SECTION OF THE ACT VIOLATED; DESCRIPTION	DATE BY WHICH VIOLATION MUST BE CORRECTED	PENALTY
5	29 CFR 1926.251(c)(4)(iv): The total number of visible broken wires in wires in wire rope(s) exceeded 10 percent of the total number of wires: One strand out of four completely severed in the eyelet loop, east of Rig #2 at gerionimo line secure point	Immediately	0
7	29 CFR 1926.301(d): Wooden handles of tool(s) were not free of splinters or cracks: Long handled shovel with split wooden handle, ground level, east side of Rig #2	Immediately	0
3	29 CFR 1926.400(a), Section 501-9(b)(2) National Electrical Code, NFPA 70-1971, as adopted by 29 CFR 1926.400(a): Lighting fixtures for fixed lighting was not protected from physical damage by suitable guides or by location: Rig #2 a. All mast lights from floor to ground b. Festoon lights in standby and main mud pump areas c. Festoon lights across east end of slush pits to south end of pipe rack	Immediately	55.
9	29 CFR 1926.402(a)(4): Attachment plugs for use in work areas are not so constructed as to endure rough use and were not equipped with a suitable cord grip to prevent strain on the terminal screws: Home made attachment plug used attached to pigtail of light socket, dog house, Rig #2, northeast corner	Immediately	0
0	29 CFR 1926.402(a)(8): Cable(s) passing through work areas were not covered or elevated to protect them from damage which would create a hazard to employees: Electrical power supply cable across roadway, Rig #2, ground level, east side between rig and trailer house	Immediately	0

AREA DIRECTOR

NOTICE TO EMPLOYEES - The law gives an employee or his representative the opportunity to object to any abatement date set for a violation if he believes the date to be unreasonable. The contest must be mailed to the U.S. Department of Labor Area Office at the address shown above within 15 working days (excluding weekends and Federal holidays) of the receipt by the employer of this citation and penalty.

EMPLOYER DISCRIMINATION UNLAWFUL - The law prohibits discrimination by an employer against an employee for filing a complaint or for exercising any rights under this Act. An employee who believes that he has been discriminated against may file a complaint no later than 30 days after the discrimination with the U.S. Department of Labor Area Office at the address shown above.

EMPLOYER RESPONSIBILITIES AND COURSES OF ACTION - The enclosed booklet outlines employer responsibilities and courses of action and should be read in conjunction with this notification.

TOTAL PENALTY FOR THIS CITATION: \$0.00
Make check or Order Payable to "DOL OSH" Indicate OSHA on Remittance

CITATION and NOTIFICATION OF PENALTY

Dallas/Fort Worth Area Office
Central Place, 1425 W. Pioneer Dr. - Suite 230
Irving, Texas 75061

ISSUANCE DATE	OSHA NUMBER	
11/18/76	F6435 830	
REGION	AREA	PAGE
6	1730	3 OF 3

TYPE OF VIOLATION(S)	CITATION NO.
OTHER	1

INSPECTION DATE:

11/10/76

INSPECTION SITE:

Two Miles West
Agnes, TX

THE LAW REQUIRES that a copy of this Citation be posted immediately in a prominent place at or near the location of the violation(s) cited below. The Citation must remain posted until the violations cited below have been corrected, or for 3 working days (excluding weekends and Federal holidays) whichever is longer.

013705

PENALTIES ARE DUE WITHIN 15 DAYS OF RECEIPT OF THIS NOTIFICATION UNLESS CONTESTED (See enclosed Booklet)

This Section Must Be Detached Before Posting

TO: Texland Drilling Corp., Rig #2
P. O. Box 3037
Abilene, TX 79604

Attn: Mr. Dick Bowen, President

This citation describes violations of the Occupational Safety and Health Act of 1970. The penalty(ies) listed below are based on these violations. You must correct the violations referred to in this citation by the dates listed below and pay the penalties proposed, unless within 15 working days (excluding weekends and Federal holidays) from your receipt of this citation and penalty you mail a notice of contest to the U.S. Department of Labor Area Office at the address shown above. (See the enclosed booklet which outlines your responsibilities and courses of action and should be read in conjunction with this form.)

ITEM NUMBER	STANDARD, REGULATION OR SECTION OF THE ACT VIOLATED; DESCRIPTION	DATE BY WHICH VIOLATION MUST BE CORRECTED	PENALTY
1	CFR 1926.500(c)(1): Wall opening which had more than a four foot drop is not guarded: Rig #2, open doorway, 6'8" above ground level, drill floor, southeast corner, change house, south doorway	Immediately	0
2	CFR 1910.27(d)(5): Cage protection, or ladder safety devices in lieu of cage protection, were not used on tower, water, tank, or chimney ladders over 20 feet in unbroken length: Mast ladder approximately 95' unbroken length, Rig #2	Immediately	0
3	CFR 1910.1001(h)(2): Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce airborne levels of asbestos fibers in excess of prescribed limits was not collected and disposed of in sealed impermeable bags or other closed, impermeable containers: Approximately 10 used bags Mentello Super Visbestos - used to viscosity drill mud to clean out drill hole, Rig #2, south side, ground level, standby mud pump	Immediately	0

AREA DIRECTOR

A. WARREN

\$80.

NOTICE TO EMPLOYEES - The law gives an employee or his representative the opportunity to object to any abatement date for a violation if he believes the date to be unreasonable. Contest must be mailed to the U.S. Department of Labor Office at the address shown above within 15 working days (excluding weekends and Federal holidays) of the receipt by employer of this citation and penalty.

EMPLOYER DISCRIMINATION UNLAWFUL - The law prohibits discrimination by an employer against an employee for filing a complaint or for exercising any rights under this Act. An employee who believes that he has been discriminated against may file a complaint no later than 30 days after the discrimination with the U.S. Department of Labor Area Office at the address shown above.

EMPLOYER RESPONSIBILITIES AND COURSES OF ACTION - The enclosed booklet outlines employer responsibilities and courses of action and should be read in conjunction with this notification.

TOTAL PENALTY FOR THIS CITATION
Make check or Money Order Payable to "DOL OSHA"
Indicate OSHA on Remittance

INDUSTRIAL COMMISSION OF UTAH
Occupational Safety and Health Division

CSHO NO. N0002	UOSHD-1 NO. 018	TY 75
AREA 1700	REGION 08	

CITATION

1. Don J. Christiansen,
Administrator
448 South 400 East
Salt Lake City, Utah 84111

013706

TO: 2.

3. Citation Number

Copy

4. Page 1 of 1

6. TYPE OF ALLEGED VIOLATION(S):

None

7. An inspection was made on September 12 19 74 of a place of employment located at:
8. Vernal and Roosevelt Warehouses and Yards and described as follows:
9. Asbestos loading, unloading, trucking and warehousing

On the basis of the inspection it is alleged that you have violated the Utah Occupational Safety and Health Act of 1973, in the following respects:

10. Item number	11. Standard, regulation or section of the Act allegedly violated	12. Description of alleged violation	13. Date by which alleged violation must be corrected
		In compliance	
THIS NOTICE MUST BE POSTED			

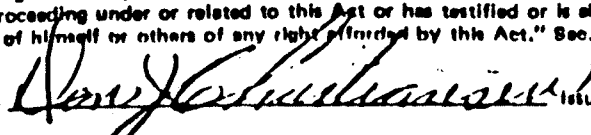
The law requires that a copy of this citation shall be prominently posted in a conspicuous place at or near each place that an alleged violation referred to in the citation occurred. The citation must remain posted until all alleged violations cited therein are corrected, or for 3 working days, whichever period is longer.

RIGHTS OF EMPLOYEES

Any employee or representative of employees who believes that any period of time fixed in this citation for the correction of a violation is unreasonable has the right to contest such time for correction by submitting a letter to the Utah Occupational Safety and Health Division at the address shown above within 30 days of the issuance of this citation.

"No person shall discharge or in any manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this Act or has testified or is about to testify in such proceeding or because of the exercise by such employee on behalf of himself or others of any right afforded by this Act." Sec. 11(2)(e) of the Utah Occupational Safety and Health Act of 1973.

14. Administrator's Signature



Issuance Date

December 11 19 74

(NOTICE: Additional Important Information On Reverse Side)

UOSHD Form-2
July 1, 1973

013707

AIRBORNE ASBESTOS COUNTS

for

Cactus Drilling
Rig #5
~20 Miles Southwest of
Vernal, Utah

Date Sampled: September 23, 1977
Date Reported: September 28, 1977

Samples Collected By: B. L. Ingalls
Union Carbide Corporation

Samples Analyzed By: G. J. Spencer
Union Carbide Corporation

Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

013708

OBJECTIVE

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #5) during the use of five bags of Super Visbestos.

DESCRIPTION OF OPERATION

Operation involved the addition of five bags Super Visbestos, bentonite, limestone and zinc chromate to a vent-type hopper in a drilling application.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

Several photographs obtained in the work zone during monitoring are included.

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

In the present application the worker handled asbestos for 14 minutes and left the area. Asbestos was not used again. Presumably his exposure for the other parts of the shift was zero or at most at the level of the natural background. For a zero exposure, for the time not handling asbestos, his 8-hour, time-weighted average exposure can be estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.0)(466)}{480} \approx 0.01 \text{ fibers/cc} > 5\mu$$

In the vicinity of the hopper, the levels before and after handling ranged from 0.0 to 0.04 fibers/cc $> 5\mu$. If the worker had stayed in the vicinity of the hopper throughout the shift his maximum TWA exposure is estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.04)(466)}{480} = 0.05$$

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time. The ceiling exposure for this operation was 0.3 fibers/cc greater than 5 microns.

013710

Airborne Fiber Co.
(fibers/cc >5 μ)

Sample No.	Air Sample Time	Minutes	Operation Description	Chrysotile Asbestos
M-39	on: 1:00P off: 1:39P	39	Area - prior to the use of asbestos. Located ~20 feet south of hopper and 3-1/2 feet above ground.	0.04
M-48	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~4 feet west of hopper ~6 feet above ground, and ~2 feet above hopper.	0.02
M-52	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~5 feet east of hopper ~3-1/2 feet above hopper and ~6-1/2 feet above ground. Rig #5.	0.04
M-19	on: 1:47P off: 2:01P	14	Personal - (Chuck Ireland) During 12 min. dump of five bags SVB, and during bag disposal.	0.3
M-49	on: 1:48P off: 1:59P	11	Area - during the dump of five bags SVB. Located same as M-52.	0.1
N-95	on: 1:48P off: 2:00P	12	Area - during the use of asbestos. Located same as M-48.	0.3
M-44	on: 2:05P off: 3:14P	69	Area - after the use of asbestos. Located same as M-52.	0
M-46	on: 2:07P off: 3:16P	69	Area - after the use of asbestos. Located same as M-48.	0.01
B-9	on: 2:09P off: 3:13P	64	Area - after the use of asbestos. Located ~3 feet from hopper, ~2 feet above hopper and ~5 feet above ground.	0.01

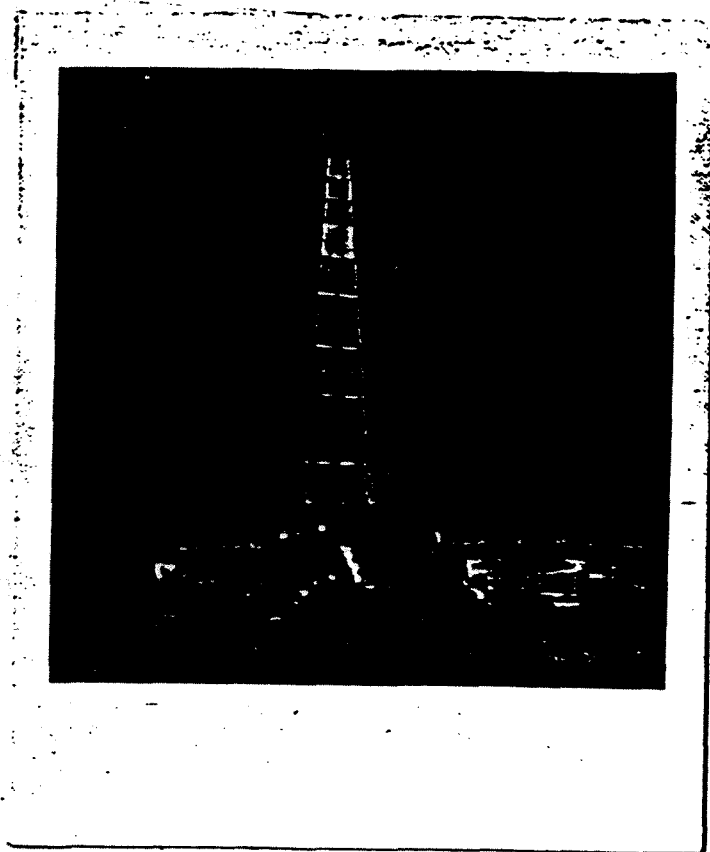


FIGURE 1 - Rig #5

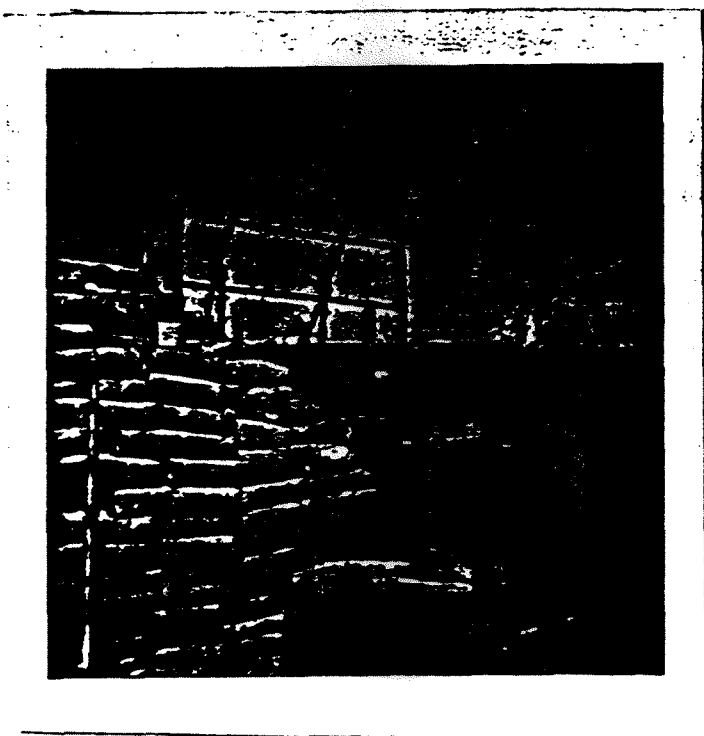


FIGURE 2 - Hopper and dry materials storage area.

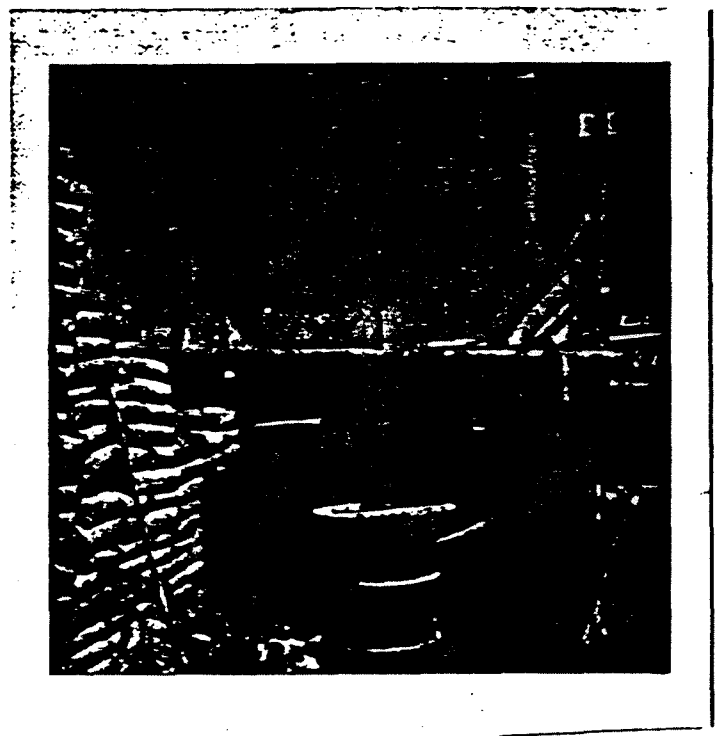


FIGURE 3 - Hopper and dry materials storage area.



FIGURE 4 -- Addition of SVB to hopper.

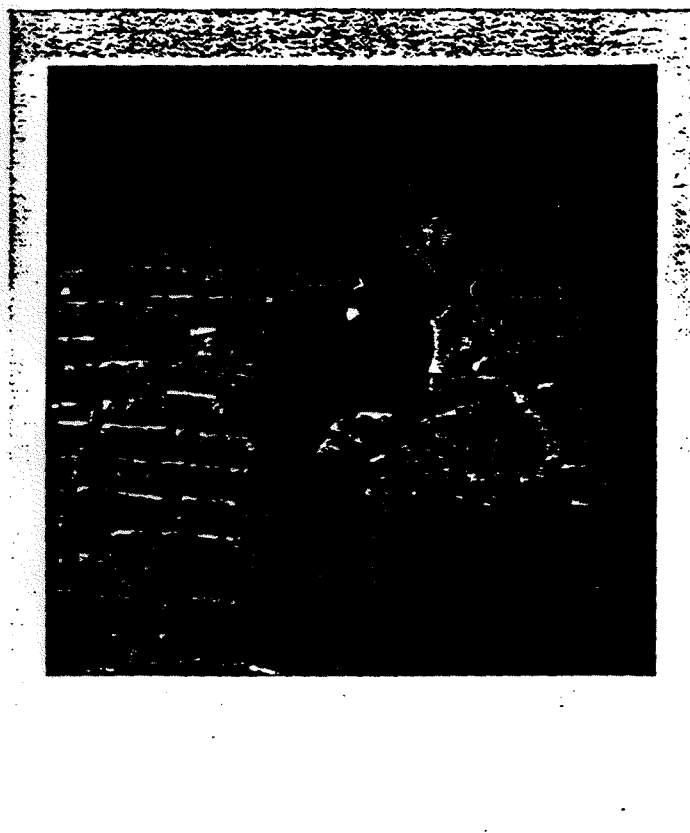


FIGURE 5 - Addition of SVB to hopper.



Utah Biomedical Test Laboratory

520 Wakara Way
Salt Lake City, Utah 84108
Phone 801 581-8267

Send to
Bar. No. 013713

LABORATORY REPORT

TO:

Don J. Christensen, Administrator
Utah State Industrial Commission
444 South 4th East
Salt Lake City, Utah

DATE: August 22, 1977

REFERENCE NO: 77-14

ANALYSIS Type and
Percent ASBESTOS

Laboratory Number	Field Number	Sample Type	Sample Volume	TYPE ASBESTOS	% ASBESTOS
0157	#1	BULK		Chrysotile	95 %

COMMENTS:

John C. Halt
Analyst

J. E. Rushing
Reviewer

James B. [Signature]
Laboratory Supervisor

013714

AIRBORNE ASBESTOS COUNTS

for

Cactus Drilling
Rig #5
~20 Miles Southwest of
Vernal, Utah

Date Sampled: September 23, 1977
Date Reported: September 28, 1977

Samples Collected By: B. L. Ingalls
Union Carbide Corporation

Samples Analyzed By: G. J. Spencer
Union Carbide Corporation

Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

OBJECTIVE

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #5) during the use of five bags of Super Visbestos.

DESCRIPTION OF OPERATION

Operation involved the addition of five bags Super Visbestos, bentonite, limestone and zinc chromate to a vent-type hopper in a drilling application.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

Several photographs obtained in the work zone during monitoring are included.

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

In the present application the worker handled asbestos for 14 minutes and left the area. Asbestos was not used again. Presumably his exposure for the other parts of the shift was zero or at most at the level of the natural background. For a zero exposure, for the time not handling asbestos, his 8-hour, time-weighted average exposure can be estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.0)(466)}{480} \approx 0.01 \text{ fibers/cc} > 5\mu$$

In the vicinity of the hopper, the levels before and after handling ranged from 0.0 to 0.04 fibers/cc > 5 μ . If the worker had stayed in the vicinity of the hopper throughout the shift his maximum TWA exposure is estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.04)(466)}{480} = 0.05$$

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time. The ceiling exposure for this operation was 0.3 fibers/cc greater than 5 microns.

013717

Airborne Fiber Count
(fibers/cc >5 μ)

Sample No.	Air Sample Time	Minutes	Operation Description	Chrysotile Asbestos
M-39	on: 1:00P off: 1:39P	39	Area - prior to the use of asbestos. Located ~20 feet south of hopper and 3-1/2 feet above ground.	0.04
M-48	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~4 feet west of hopper ~6 feet above ground, and ~2 feet above hopper.	0.02
M-52	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~5 feet east of hopper ~3-1/2 feet above hopper and ~6-1/2 feet above ground. Rig #5.	0.04
M-19	on: 1:47P off: 2:01P	14	Personal - (Chuck Ireland) During 12 min. dump of five bags SVB, and during bag disposal.	0.3
M-49	on: 1:48P off: 1:59P	11	Area - during the dump of five bags SVB. Located same as M-52.	0.1
N-95	on: 1:48P off: 2:00P	12	Area - during the use of asbestos. Located same as M-48.	0.3
M-44	on: 2:05P off: 3:14P	69	Area - after the use of asbestos. Located same as M-52.	0
M-46	on: 2:07P off: 3:16P	69	Area - after the use of asbestos. Located same as M-48.	0.01
B-9	on: 2:09P off: 3:13P	64	Area - after the use of asbestos. Located ~3 feet from hopper, ~2 feet above hopper and ~5 feet above ground.	0.01

013718

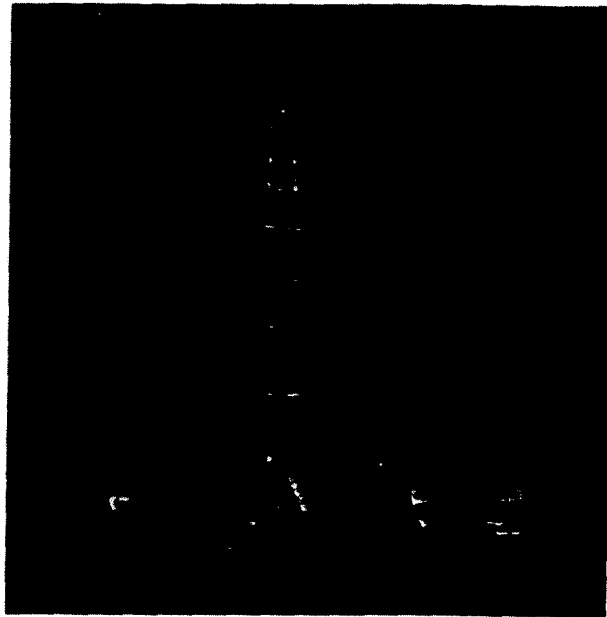


FIGURE 1 - Rig #5

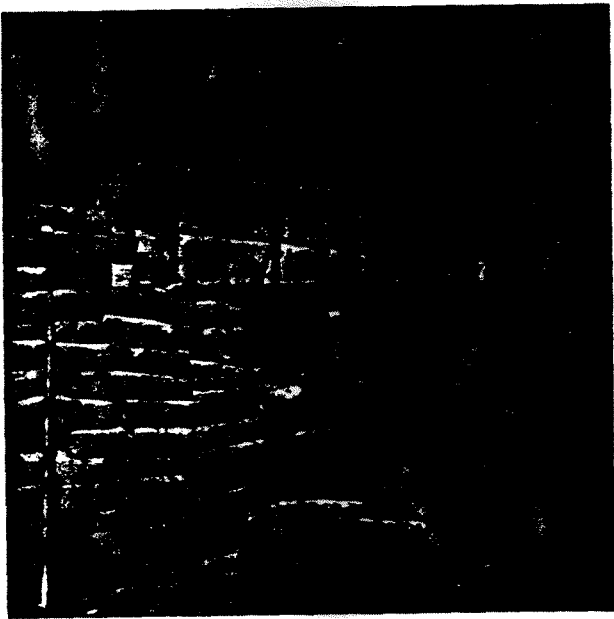


FIGURE 2 - Hopper and dry materials storage area.

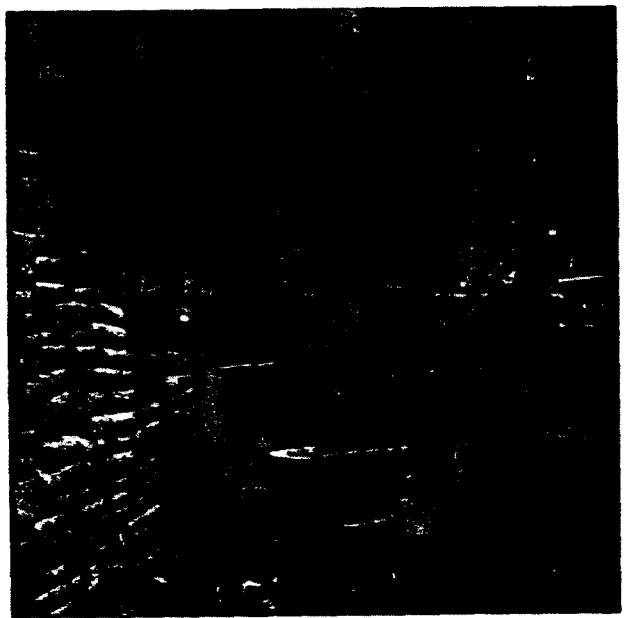


FIGURE 3 - Hopper and dry materials storage area.

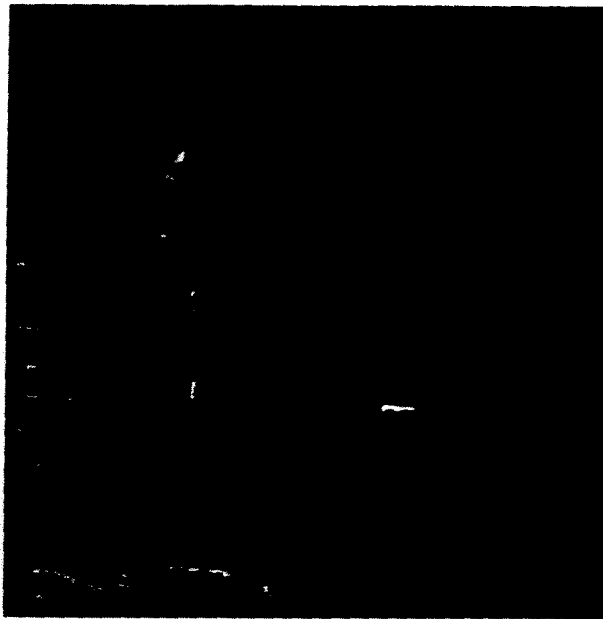


FIGURE 4 - Addition of SVB
to hopper.

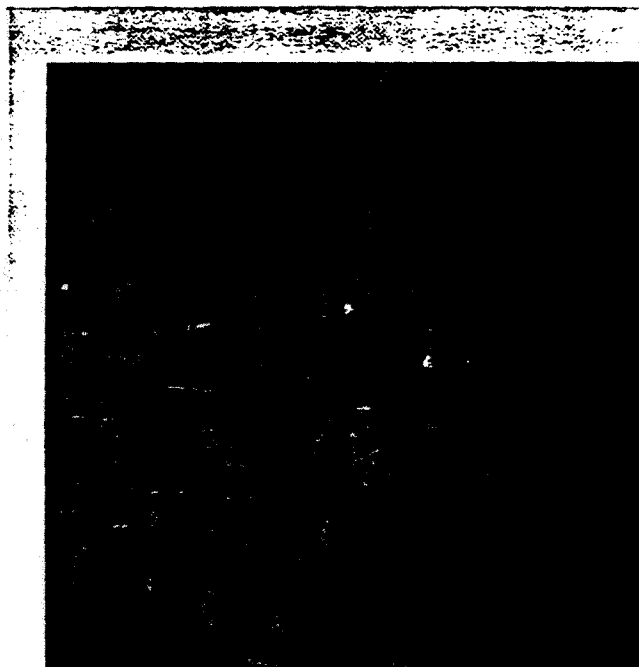


FIGURE 5 - Addition of SVB to hopper.

in accordance with 93a.3.1.2 of this Part.

93a.3.2 Work practices.

93a.3.2.1 Wet methods. Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in 93a.2 of this Part, unless the usefulness of the product would be diminished thereby.

93a.3.2.2 Particular products and operations. No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in 93a.2 of this Part.

93a.3.2.3 Spraying, demolition, or removal. Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with 93a.4.2.3 of this Part and with special clothing in accordance with 93a.4.3 of this Part.

93a.4 Personal protective equipment.

93a.4.1 Compliance with the exposure limits prescribed by 93a.2 of this Part may not be achieved by the use of respirators or shift rotation of employees, except:

93a.4.1.1 During the time period necessary to install the engineering controls and to institute the work practices required by 93a.3 of this Part.

93a.4.1.2 In work situations in which the methods prescribed in 93a.3 of this Part are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by 93a.2 of this Part; or

93a.4.1.3 In emergencies.

93a.4.1.4 Where both respirators and personnel rotation are allowed by subdivisions 93a.4.1.1, .2, or .3 of this Part, and both are practicable, personnel rotation shall be preferred and used.

93a.4.2 Where a respirator is permitted by 93a.4.2.1, it shall be selected from among those approved by the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health, and shall be used in accordance with 93a.4.2.1, .2, .3, and .4 of this Chapter.

93a.4.2.1 Air purifying respirators. A reusable or single use air purifying respirator, or a respirator described in 93a.4.2.2 or 93a.4.2.3 of this Chapter, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in 93a.2 of this Part, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits.

93a.4.2.2 Powered air purifying respirators. A full facepiece



Utah Biomedical Test Laboratory

520 Wakara Way
Salt Lake City, Utah 84108
Phone 801 581-8267

Send to
Bar. No. d

013721

LABORATORY REPORT

TO:

Don J. Christensen, Administrator
Utah State Industrial Commission
444 South 4th East
Salt Lake City, Utah

DATE: August 22, 1977

REFERENCE NO: 77-14

ANALYSIS Type and
Percent ASBESTOS

Laboratory Number	Field Number	Sample Type	Sample Volume	TYPE ASBESTOS	% ASBESTOS
0157	#1	BULK		Chrysotile	95 %

COMMENTS:

John C. Halt
Analyst

J.E. Rushing
Reviewer

James B. Burt
Laboratory Supervisor

BASIN MUD SERVICE 013722

P.O. BOX 1075
VERNAL, UTAH 84078

September 6, 1977

Industrial Commission of Utah
Occupational Safety and Health Division
448 South 400 East
Salt Lake City, Utah 84111

Attention: Don J. Christiansen, Administrator

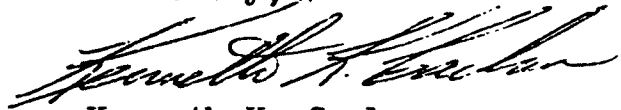
Dear Sir;

In reference to your "UOSHA Form - 2" of July 12, 1977 citing our company for allowing our employees to be exposed to asbestos fibers on July 2, 1977, we are requesting a formal hearing for the following reasons:

1. Our employees do not incorporate said material with the mud mix.
2. In a conversation with our supplier we have found that the past tests have shown to have far less than 10 fibers longer than 5 micrometers, per cubic centimeter of air, as noted in regulation 93a2.3 Chapter G page 93a. of Utah Occupational Safety and Health Rules and Regulations.

We would appreciate having enough notification to collect information needed in our defense from our suppliers and or contractors.

Sincerely,



Kenneth K. Carlson
Production Manager

KC/dj

cc: Chuck Petrey, Montello, Inc.
Larry Dernback, Manning Co.
file



ASBESTOS INFORMATION ASSOCIATION

XX
1745 Jefferson Davis Hwy., Crystal Square 4,
Suite 509, Arlington, VA. 22202

1 September 1977

Mr. Harry Wyatt
Mantello, Inc.
P. O. Box 130
Sand Springs, Oklahoma 74063

Dear Mr. Wyatt:

I enjoyed talking with you yesterday. Pursuant to our conversation, I am enclosing the case that Dr. Rhodes had mentioned to you. Hopefully it will be of some assistance.

If there is any way that this Association can be for additional service to you in the future, please do not hesitate to call. Good luck in Utah.

Warm regards,


Mark E. Grayson

Enclosure

MEG:pl



FILE these Decisions in your Occupational Safety & Health Reporter Decisions binder in page number order behind the Cases tab.

OCCUPATIONAL SAFETY & HEALTH REPORTER

Number 16

THE BUREAU OF NATIONAL AFFAIRS, INC.

June 16, 1977

DECISIONS IN THIS ISSUE

5 OSHC 1485 — 1494

Inspection—Warrantless Search—Constitutionality

Ky Ct App: Kentucky Department of Labor is not entitled to court order compelling inspection of closed areas of employer's business premises without warrant based on showing of probable cause, absent showing that business is inherently dangerous or is subject to Federal or state regulation or is pervasively regulated. . . 1465

Discrimination—Union Business Agent's Access to Workplace

DC WPA: Employer's refusal to permit union's business representative to enter employer's premises for monthly safety meeting, contrary to past practice and in apparent retaliation for union's filing of safety complaint with OSHA, constitutes violation of Section 11(c) of Act. . . 1467

Air Contaminants—Asbestos—Proof of "Release"

RevComm: Monitoring requirement of asbestos standard, 29

CFR 1910.1001, is not triggered by "genuine possibility" of release but only by actual release of asbestos fibers; accordingly, Secretary's failure to establish that employer's process of replacing asbestos insulation resulted in release of fibers requires vacation of citation for violation of 29 CFR 1910.1001(f)(1). . . 1473

Jurisdiction — Affecting Commerce—Business in Dissolution

RevComm: Employer whose business was in process of dissolution but had employees engaged in dismantling machinery to be sold as scrap metal engaged in business affecting commerce. . . 1491

Jurisdiction—Federal Agencies—Truck Maintenance Shop

RevComm: Fact that Bureau of Motor Carrier Safety of Federal Highway Administration has adopted no regulations concerning truck maintenance shop safety warrants finding that employer is not exempt from coverage of

(Continued on following page)

TABLE OF CASES

American Barrel Company, Inc.	1491
Braswell Motor Freight Lines, Inc.	1459
Burk Construction Corporation	1488
Capitol Erection and Engineering Company, Inc.	1493
Consolidated Freightways Corporation	1481
D & H Pump Service, Inc.	1485
Goodyear Tire & Rubber Company	1473
Kennedy Tubular Products, Marshall v.	1467
K M Engineering Company	1487
Spencer Leathers	1434
Western Steel Company	1489
Wheeling-Pittsburgh Steel Corporation	1477
Willamette Iron & Steel Company	1478
Yocom v. Burnette Tractor Company, Inc.	1465

Section 3

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assesses no penalty in light of respondent's good faith efforts to have handrails erected.

I dissent from vacating the notification of failure to correct items 5, 7, and 11.⁵ In my view, the Judge correctly held that respondent failed to abate these violations, and the violation as to each should therefore be affirmed.

My disagreement with the majority's decision is rooted in the different meanings that we ascribe to the term "abatement." Under the majority's interpretation, abatement of a violation requires only that the violative condition be brought into momentary compliance with the literal terms of the standard. I submit that this is an unduly narrow reading of the term "abatement" that poorly serves the purposes of the Act.

In my view, "abatement" contemplates an initial remedying of noncomplying conditions as well as a continuing duty on the part of an employer to take all reasonable steps necessary to ensure that compliance with a standard's requirements is maintained. *The Murphy Co.*, 1 BNA OSHC 1618, 1973-74 CCH OSHD para. 17,532 (No. 445, 1974) (Cleary, Commissioner, concurring and dissenting opinion). The undesirability of the majority's position is amply demonstrated by the facts of the instant case.

The original citation alleging a failure to comply with the standards herein involved was issued on July 3. The violations were ordered to be corrected by July 29. Respondent did not contest the citation, and the citation therefore became a final order of the Commission by operation of law. On August 5, a reinspection of respondent's facility was made. On this date, less than one week after abatement was to be completed, the same oily rag receptacle was found uncovered,⁶ the same fire extinguishers were found sitting on the shop floor,⁷ and

certain of the same electrical switches and panels were found with wires exposed.⁸

Even if respondent's evidence that it covered the receptacle and electrical outlets, and that it mounted the fire extinguishers, is credible, I would conclude that these actions alone do not fulfill respondent's continuing duty to control the hazards involved. To do so in view of the fleeting nature of the "compliance" achieved in this case is to compromise unnecessarily the safety of employees.⁹

GOODYEAR TIRE & RUBBER COMPANY

Review Commission Decision

SECRETARY OF LABOR, Complainant v. GOODYEAR TIRE & RUBBER COMPANY, Respondent, OSAHRC Docket No. 13442, May 12, 1977.

James F. Gruben, Dallas, Tex., for complainant.

Dale R. Martin, Cincinnati, Ohio, for respondent.

Review Commission Judge J. Paul Brenton.

Before Barnako, Chairman; Moran and Cleary, Commissioners.

AIR CONTAMINANTS

Asbestos—Proof of "Release" ▶ 220.03

Monitoring requirement of asbestos standard, 29 CFR 1910.1001, is not triggered by "genuine possibility" of release but only by actual release of asbestos fibers; accordingly, Secretary's failure to establish that employer's process of replacing asbestos insulation resulted in release of fibers requires vacation of citation for violation of 29 CFR 1910.1001(f)(1).

⁵I do not join the majority's discussion of items 9 and 10 involving an alleged failure to comply with 29 CFR §1910.215(a)(2) and (4), as it is unnecessary. The Judge vacated these items on the basis of lack of employee exposure to the hazards involved. In his brief, the Secretary expressly states that the Judge's vacation of these items is not being challenged before the Commission. These items, therefore, are not before us for review. Cf. *Star Circle Wall Systems, Inc.*, 4 BNA OSHC 1011, 1975-76 CCH OSHD para. 20,502 (No. 3271, 1976).

⁶The applicable standard, 29 CFR §1910.106(e)(9)(iii), a fire protection standard, requires that combustible waste and residues be "kept to a minimum, stored in covered metal receptacles and disposed of daily." Plainly, respondent has failed to do this.

⁷The standard at 29 CFR §1910.157(a)(5) requires the mounting of portable fire extinguishers. It does not provide for mounting only some of the time.

⁸Section 1910.302(a) of 29 CFR Part 1910 incorporates by reference the 1970 National Electrical Code requiring the guarding of live parts of electrical equipment. As the Administrative Law Judge observed, "To put a cover in place and then promptly remove it or permit it to be knocked off and remain off is not genuine abatement of a violation." J.D. 22.

⁹To cite the noncomplying conditions observed during the reinspection as "repeat" violations, as is suggested in the majority opinion, would be an unsatisfactory method of dealing with this type of situation, especially in view of the fact that my colleagues' interpretation of the term "repeated" limits its application to some form of aggravated conduct. See the separate opinions in *George Hyman Constr. Co.*, (No. 13559 [5 OSHC 1315], April 26, 1977).

Full Text of Decision

BARNAKO, Chairman:

The issue in this case is whether Respondent violated the monitoring and record-keeping requirements of the standard for asbestos.¹ Respondent was cited for allegedly failing to monitor an operation wherein asbestos insulation on pipes was removed and replaced with non-asbestos insulation. Judge J. Paul Brenton dismissed the charges on the grounds that Complainant failed to establish a *prima facie* case that asbestos fibers were released during the operation. For the reasons that follow we affirm Judge Brenton's decision.

Respondent is engaged in the manufacture of petrochemicals and latex rubber at its Houston, Texas plant. The plant contains approximately 100 miles of pipe, most of it out-of-doors. One quarter of the piping is insulated with various materials, some of which is asbestos insulation. Most of the asbestos insulation is covered and contained with metal jacketing.

Respondent ceased installing asbestos insulation in 1972. Thereafter, whenever leaks in the piping occur and repairs are necessary, any asbestos insulation in the vicinity of the leaks is removed and replaced by non-asbestos insulation. Since most of the insulated pipe carries caustic liquids, a line is thoroughly flushed as part of the repair procedure, and this results in complete saturation of the insulation before its removal.

The job of removing insulation is performed by one of four different employees who are pipefitters. The operation is per-

formed on the average of once monthly and takes between five and ten minutes. When changing insulation employees wear protective clothing and respirators in accordance with Respondent's instructions.

Infrequently, the pipefitters replace dry insulation in buildings where "dryers" are located. The amount of insulation removed is less than ten feet and the job is performed when no one else is in the building. Any dry asbestos insulation removed is placed in plastic bags and put in the trash.

During the inspection a few pieces of asbestos insulation were discovered in a storage loft contrary to Respondent's instructions. However, only the pipefitter working on replacement entered the loft while this insulation was stored there.

Complainant's compliance officer testified that, generally, whether fibers are released is determined by sampling the air in the vicinity of the asbestos. He stated he did not know if asbestos fibers were being released at Respondent's plant since he did not take any air samples. He opined that, from his past experience working with asbestos fibers at other plants, there was some release of asbestos fibers in the atmosphere of Respondent's plant. He also testified that his area director and one of Complainant's industrial hygienists were of the opinion that due to the type of operation, there was a release of fibers.

Respondent's pipe department foreman maintained that dust is not created when old insulation is removed as it is already saturated. He testified that all asbestos insulation is covered, the pipefitters performing this work always wear respiratory equipment, 90 percent of the work is out-of-doors. A former employee testified that he had always worn a respirator when changing insulation.

The Judge ruled that since the standard requires monitoring only "where asbestos fibers are released", it does not operate to require monitoring where asbestos is merely present and/or in use. He stated that one essential element of proof was "some fact or circumstance from which it may be reasonably rationalized that at least a trace of this kind of fiber was being released".

Regarding the asbestos insulation on the pipes, the Judge pointed out that most of it was completely saturated upon removal. He observed that any dry insulation that was replaced because it had been knocked loose from the pipes was contained with metal jacketing, and there was no evidence that this jacketing had been punctured so as to allow release of asbestos fibers. The Judge found that the

¹At the time of the inspection the standard was codified at 29 C.F.R. 1910.93a. It is now codified at 29 C.F.R. 1910.1001. 40 F.R. 25072 (May 23, 1975). The monitoring provision states as follows:

1910.1001(f) *Monitoring*. (1) *Initial determinations*. Within 6 months of the publication of this section, every employer shall cause every place of employment where asbestos fibers are released to be monitored in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in paragraph (b) of this section. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with paragraph (c) of this section.

The relevant portion of the recordkeeping provision states as follows:

1910.1001(i) *Recordkeeping*. (1) *Exposure records*. Every employer shall maintain records of any personal or environmental monitoring required by this section. Records shall be maintained for a period of at least 20 years and shall be made available upon request to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National Institute for Occupational Safety and Health, and to authorized representatives of either.

After recodification this provision was changed by substituting "20 years" for "3 years." 41 Fed. Reg. 11504 (March 19, 1976).

of insulation, dry or wet, does not prove release. The evidence as a whole, he concluded, failed to sustain the inference that fibers were released into the atmosphere in the presence of employees. Accordingly, he vacated the alleged violations of the asbestos standard.

On review Complainant contends that a *prima facie* case is established by showing a genuine possibility of the release of asbestos fibers and employee access thereto. Complainant argues that the evidence of record establishes the possibility of release and employee access. Complainant also argues that the standard does not require proof of exposure inasmuch as the standard speaks only of release. Even if exposure is necessary to sustain a violation, Complainant contends that evidence of Respondent's precautionary measures is irrelevant because the standard is directed toward obtaining a reading of asbestos in the atmosphere and not the amount inhaled by employees.² Finally, Complainant argues that Respondent, by alleging that asbestos release did not occur, has the burden of proof on this matter.

As noted above, Complainant would have us read the standard to require monitoring by a showing of "the genuine possibility of asbestos release in Respondent's plant and employee access thereto."³ The standard does not rely, however, on the mere possibility of release before triggering the monitoring requirement. It requires monitoring only "where asbestos fibers are released" (emphasis added). Complainant has the burden of proving that the standard was violated. 29 C.F.R. 2200.73. He must carry that burden by a preponderance of the evidence. *Armor Elevator Co.*, 5 OSAHRC 260, BNA 1 OSHC 1409, CCH OSHD para. 16,958 (1973). Thus, to prove a violation, Complainant must establish that it is more likely than not that fibers

were released. McCormick, *Law of Evidence*, Sec. 339, at 794 (2d ed. 1972). We therefore reject the argument that he need only show a "genuine possibility" of release.

Complainant relies on *Amoco Oil Co.*, 76 OSAHRC 39/A2, BNA 3 OSHC 1745, CCH OSHD para. 20,183 (1975). In that case, the administrative law judge found a violation based on evidence that certain work practices at an Amoco refinery caused the airborne release of asbestos fibers. That is not the case here, and this case is distinguishable because release cannot be inferred from the nature of Respondent's work practices.

Complainant also relies on the compliance officer's testimony to establish that an inference of release can be drawn. We note, however, that the compliance officer's testimony was equivocal.⁴ In weighing the evidence, the Judge found his testimony insufficient. The Judge's evaluation is supported by the record and we accept it. *Oakland Construction Co.*, 76 OSAHRC 30/F4, BNA 3 OSHC 2023, CCH OSHD para. 20,441 (1976).

Complainant also urges that we find a violation based on our decision in *GAF Corp.*, 75 OSAHRC 3/A2, BNA 3 OSHC 1686, CCH OSHD para. 20,163 (1975), *pet. for review filed*, No. 76-1028 (D.C. Cir., Jan. 13, 1976). In *GAF* a divided Commission affirmed citations for violations of the medical examination requirements of the asbestos standard upon a showing that employees were exposed to some concentration of airborne asbestos. In this case, there has been no similar showing. Furthermore, in placing the burden of proving release upon Complainant we do not go so far as to require that he prove the concentration of asbestos fibers has reached any specified level in order to establish a *prima facie* case. In this respect our decision in this case is consistent with *GAF Corp.* See *Western Electric, Inc.*, No. 8902, BNA 4 OSHC 2021, CCH OSHD para. 21,538 (January 24, 1977).

Since the evidence fails to establish that Respondent's process of replacing asbestos insulation resulted in the release of asbestos fibers, a violation of Section 1910.1001(f)(1) has not been established. Consequently there is no violation of the record.

² Respondent argues that, even if fibers are released, the sporadic nature of the exposure of its employees in view of the size of the plant and infrequent nature of the work would render monitoring infeasible. It contends that the purposes of the Act are better served by its policy of using personal protective equipment and precautionary work practices when its employees work with asbestos. In view of our disposition, we need not resolve this issue.

³ Complainant would have us conclude from the fact that Respondent required the use of respirators and its work practices that Respondent recognized the possibility of asbestos release. We will not draw such an inference. The fact that an employer, perhaps out of an abundance of caution, takes certain precautionary steps does not establish that the employer believes those precautions are required by Complainant's standards. See *Reynolds Metals Co.*, 76 OSAHRC 31/C14, BNA 3 OSHC 2051, CCH OSHD para. 20,447 (1976).

⁴ In addition to relying on his own opinion, the compliance officer purported to rely on the opinions of the area director and the industrial hygienist. Aside from the hearsay nature of that testimony, the record does not reveal the qualifications, if any, of the area director and the industrial hygienist to form such an opinion.

keeping requirements of Section 1910.1001 (i)(1).

Accordingly, the decision of Judge Brenton to vacate the alleged violations of the asbestos standard is affirmed.

Dissenting Opinion

CLEARY, Commissioner, dissenting:

Regardless of whether the asbestos standard requires monitoring when there is a "genuine possibility of asbestos release," as argued by the Secretary, or only when "it is more likely than not that fibers [are] released," as stated by the majority, the evidence adduced in this case shows a failure to comply with the standard published at 29 CFR §1910.1001(f)(1). The majority, therefore, errs when it accepts the Judge's evaluation of the evidence and affirms his disposition.

There was no dispute that respondent's pipefitters repaired leaks and replaced worn or damaged insulation on pipes, some of which were insulated with asbestos. It was complainant's position at the hearing that the removal of asbestos insulation would release asbestos fibers into the air. Although not urged by complainant during the course of these proceedings, there is a strong indication within the provisions of §1910.1001 that the removal of asbestos insulation causes the release of asbestos fibers. Paragraph (c)(2)(iii) of §1910.1001 requires the wearing of respirators and special clothing when employees are engaged "... in the removal or demolition of asbestos insulation or coverings. . . ." The presence of such a requirement strongly suggests a finding by the Secretary of Labor during rule-making that the removal of asbestos insulation releases asbestos fibers.

Moreover, proof of complainant's position was adduced through testimony of the compliance officer and two of respondent's employees. Their testimony establishes a probability of asbestos release warranting monitoring of the operations involving the handling of asbestos insulation.

Before working for the Department of Labor, the compliance officer had worked for 21 years in the petrochemical industry. During this time he had handled asbestos insulation on numerous occasions. He testified that, when replacing worn and often-times crumbling asbestos insulation, fibers were released into the air. The majority notes, but fails to specify, equivocation in the compliance officer's testimony. My review of his testimony reveals nothing that could be considered equivocal.

In any event, the most persuasive testimony on asbestos release during the replacement process came from the foreman of respondent's pipe department. Part of his testimony was that most but not all the asbestos insulation was saturated with water before removal. He opined that saturated insulation would not release asbestos fibers during removal and replacement. Both the majority and the Judge attach significance to the fact that most of the insulation was saturated before replacement. Apparently, they regard the saturation process as obviating the requirement for monitoring. I would not.

Although saturation is a work practice which contributes to compliance under §1910.1001(c)(2)(i), it does not necessarily follow that employers who use the method are relieved from the duty to monitor under §1910.1001(f)(1). I submit that, by its terms, §1910.1001(f)(1) requires an employer to monitor exposure levels *before* instituting specific compliance methods. This is evidenced by the last sentence of §1910.1001(f)(1), which reads as follows:

If the [permissible exposure] limits are exceeded, the employer shall immediately undertake a compliance program in accordance with paragraph (c) of this section.

Respondent did not monitor the vicinity of damaged asbestos insulation before saturating it. Moreover, even if I were to disregard the standard's mandate for pre-abatement monitoring, I submit that an employer who implements a compliance program must conduct personal monitoring under §1910.1001(f)(2) to determine the efficacy of the methods in use. This was not done by respondent.

As noted, respondent's foreman testified that some of the asbestos insulation was replaced without first being saturated. He also testified that dry, damaged insulation would release asbestos fibers into the air during replacement. Nevertheless, the Judge rejected this evidence of asbestos release because "the quantity [of asbestos dust released] would be so small and infrequent that exposure to asbestos fibers would be nil. . . ." In addition, he stressed the fact that the insulation was enclosed in a jacketing that was "pretty hard."

Both bases for ignoring the foreman's explicit statement that asbestos dust is released are incorrect. It is plain error to attach any significance to estimates of low concentrations in determining whether the duty to monitor attaches. Monitoring standards are intended to supplant such estimates, no matter how reliable they may be.

See *Western Electric, Inc.*, 4 BNA OSHC 2021, 1976-77 CCH OSHD para. 21,538 (No. 8902, 1977) (Cleary, Commissioner, dissenting), *petition for review withdrawn*, No. 77-1252, 8th Cir., April 8, 1977. Under the facts of this case it is also error to regard the fact that the insulation was jacketed as negating a duty to monitor. The reason for replacing the insulation was that it was damaged. Such damage, according to both respondent's pipefitter and foreman, sometimes involved breaks or cracks in the jacketing. Thus, the Judge erred in ruling that respondent had no duty to monitor asbestos release during the handling of dry insulation.

Similarly, the majority errs when, in addition to accepting the Judge's erroneous analysis, it regards as probative the frequency and duration of exposure and the precautions taken when dry asbestos insulation is replaced. The monitoring standard does not permit these qualifications. Rather, §1910.1001(f)(1) requires that "... every employer shall cause every place of employment where asbestos fibers are released to be monitored. . . ."

Accordingly, I dissent from the majority's disposition of the citations at issue in this case.

WHEELING-PITTSBURGH STEEL CORPORATION

Review Commission Decision

SECRETARY OF LABOR, Complainant v. WHEELING-PITTSBURGH STEEL CORPORATION, Respondent, OSAHRC Docket No. 13949, May 13, 1977.

Dennis Dowdell, Jr., Cleveland, Ohio, for complainant.

George Raynovich, Jr., Pittsburgh, Pa., for respondent.

Review Commission Judge Ben D. Worcester.

Before Barnako, Chairman; Moran and Cleary, Commissioners.

NOISE

Feasibility of Controls >210.1155 >110.031

Secretary's failure to present evidence regarding feasibility of administrative or engineering noise controls for employer's worksite, other than testimony of industrial hygienist with no particular expertise in area of noise abatement and control, warrants affirmance of judge's decision vacating citation for violation of 29 CFR 1910.95(b).

Full Text of Decision

MORAN, Commissioner:

A January 26, 1976, decision of Review Commission Judge Ben D. Worcester, attached hereto as Appendix A [omitted],¹ is before this Commission for review pursuant to 29 U.S.C. §661(i). That decision vacated a citation which alleged that respondent had violated 29 U.S.C. §654(a) (2) by failing to comply with the occupational safety standard codified at 29 C.F.R. §1910.95(b).² The Judge's vacation of the citation was based on complainant's failure to establish the existence of feasible engineering and administrative controls for reducing employee exposure to noise. For reasons that follow, the Judge's decision is affirmed.

Review of the Judge's decision in this matter was requested by Local #1190, United Steelworkers of America, the authorized employee representative. The union contends that (1) respondent did not use feasible controls to reduce employee exposure to noise and (2) the Judge erred in placing the burden of proof on complainant to establish the feasibility of engineering and administrative controls.

It is a well-settled principle that the burden of proving all elements of an alleged violation rests with complainant. *Brennan v. OSAHRC and Raymond Hendrix d/b/a Alsea Lumber Company*, 511 F.2d 1139 [2 OSHC 1646] (9th Cir. 1975); 29 C.F.R. §2200.73(a). The standard of proof to be applied in these proceedings is the preponderance of the evidence rule. *Olin Construction Co. v. OSAHRC*, 525 F.2d 464 [3 OSHC 1526] (2d Cir. 1975); *Secretary v. Armor Elevator Co., Inc.*, 5 OSAHRC 260 [1 OSHC 1409] (1973). The burden of proving that engineering or administrative controls are feasible was therefore properly assigned to complainant. Also see *Secretary v. Continental Can Co., Inc.*, OSAHRC Docket No. 3973 [4 OSHC 1541], August 24, 1976.

The record before us is totally devoid of any probative evidence regarding the feasibility of administrative or engineering noise controls for respondent's worksite. Complainant's only witness on this subject was the industrial hygienist who conducted the inspection at respondent's mill. This witness had no particular expertise in the

¹Chairman Barnako does not agree to this attachment.

²That standard provides in pertinent part as follows: "When employees are subjected to sound levels exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized."

Ken
October 4, 1977

Mr. Ken Carlson
Basin Mud Service
P. O. Box 1075
Vernal, Utah 84078

801-789-4312

Dear Ken:

Enclosed is a copy of Carbide's report on Blair's field monitoring at the well near Vernal. As you can see, the counts are all far below the ceiling limit of 10 fibers per cc. Any assumption that they could exceed 10 times that ceiling (as specified in the citation) is just simply ridiculous.

We are standing by for information from you on the following points:

1. Whether the November 14th hearing can be set back to Friday morning, November 11th. (This would enable Dr. Rhodes to be there.)
2. The name of your attorney, so Dr. Rhodes can talk with him in advance by phone. Before this, it would be useful if your man could look over the reports we have sent you.
3. Any indication you can get from Gulf and Manning that they would go back to Super Visbestos, if we can succeed in getting the citation rescinded.
4. A description of the type of hearing that has been set in Salt Lake. Who will preside? Is it with OSHA only, or is a Review Commission involved? Who will argue for OSHA's side on the citation? etc. etc.

Ken, please let us know if you need any further back up information from here. As soon as we hear from you, we will get Dr. Rhodes wired in for the trip.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KC/mt

Enc: (1)



Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013731

From The Desk Of
DOROTHY LEPIANO

September 29, 1977

Dear Mr. Wyatt,

At the request of Mr. Ingalls, kindly
forward three copies of the Cactus Drilling
Rig #5 report to Basin Mud. Any questions
may be forwarded to Dr. Rhodes or Ms. Spencer.

Thank you.

Dorothy
(Secretary to Dr. Rhodes)



"CALIDRIA" ASBESTOS

013732

AIRBORNE ASBESTOS COUNTS

for

Cactus Drilling
Rig #5
~20 Miles Southwest of
Vernal, Utah

Date Sampled: September 23, 1977
Date Reported: September 28, 1977

Samples Collected By: B. L. Ingalls
Union Carbide Corporation

Samples Analyzed By: G. J. Spencer
Union Carbide Corporation

Reported By: G. J. Spencer
Union Carbide Corporation

Union Carbide Corporation
Metals Division
Niagara Falls, New York

OBJECTIVE

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #5) during the use of five bags of Super Visbestos.

DESCRIPTION OF OPERATION

Operation involved the addition of five bags Super Visbestos, bentonite, limestone and zinc chromate to a vent-type hopper in a drilling application.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

Several photographs obtained in the work zone during monitoring are included.

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1T_1 + C_2T_2 + C_nT_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

In the present application the worker handled asbestos for 14 minutes and left the area. Asbestos was not used again. Presumably his exposure for the other parts of the shift was zero or at most at the level of the natural background. For a zero exposure, for the time not handling asbestos, his 8-hour, time-weighted average exposure can be estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.0)(466)}{480} \approx 0.01 \text{ fibers/cc} > 5\mu$$

In the vicinity of the hopper, the levels before and after handling ranged from 0.0 to 0.04 fibers/cc > 5 μ . If the worker had stayed in the vicinity of the hopper throughout the shift his maximum TWA exposure is estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.04)(466)}{480} = 0.05$$

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time. The ceiling exposure for this operation was 0.3 fibers/cc greater than 5 microns.

013735

Airborne Fiber Count
(fibers/cc >5 μ)

Sample No.	Air Sample Time	Minutes	Operation Description	Chrysotile Asbestos
M-39	on: 1:00P off: 1:39P	39	Area - prior to the use of asbestos. Located ~20 feet south of hopper and 3-1/2 feet above ground.	0.04
M-48	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~4 feet west of hopper ~6 feet above ground, and ~2 feet above hopper.	0.02
M-52	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~5 feet east of hopper ~3-1/2 feet above hopper and ~6-1/2 feet above ground. Rig #5.	0.04
M-19	on: 1:47P off: 2:01P	14	Personal - (Chuck Ireland) During 12 min. dump of five bags SVB, and during bag disposal.	0.3
M-49	on: 1:48P off: 1:59P	11	Area - during the dump of five bags SVB. Located same as M-52.	0.1
N-95	on: 1:48P off: 2:00P	12	Area - during the use of asbestos. Located same as M-48.	0.3
M-44	on: 2:05P off: 3:14P	69	Area - after the use of asbestos. Located same as M-52.	0
M-46	on: 2:07P off: 3:16P	69	Area - after the use of asbestos. Located same as M-48.	0.01
B-9	on: 2:09P off: 3:13P	64	Area - after the use of asbestos. Located ~3 feet from hopper, ~2 feet above hopper and ~5 feet above ground.	0.01

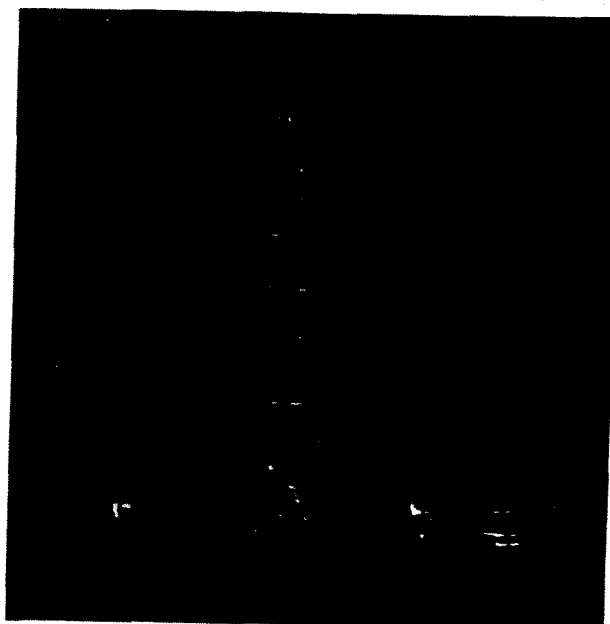


FIGURE 1 - Rig #5

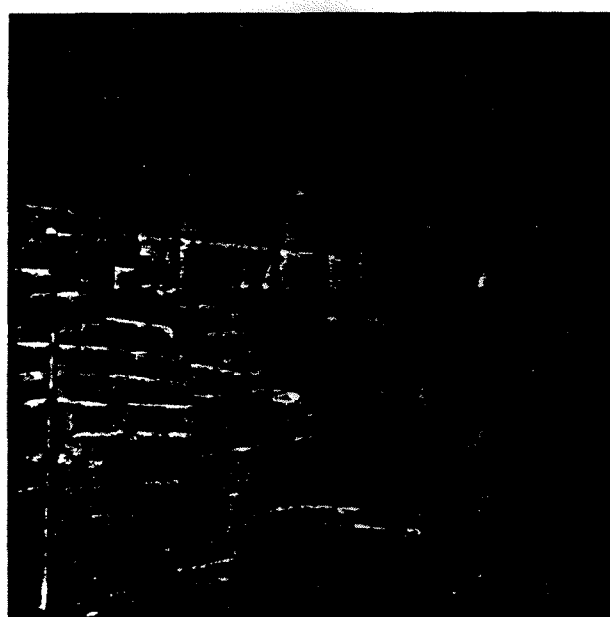


FIGURE 2 - Hopper and dry materials storage area.

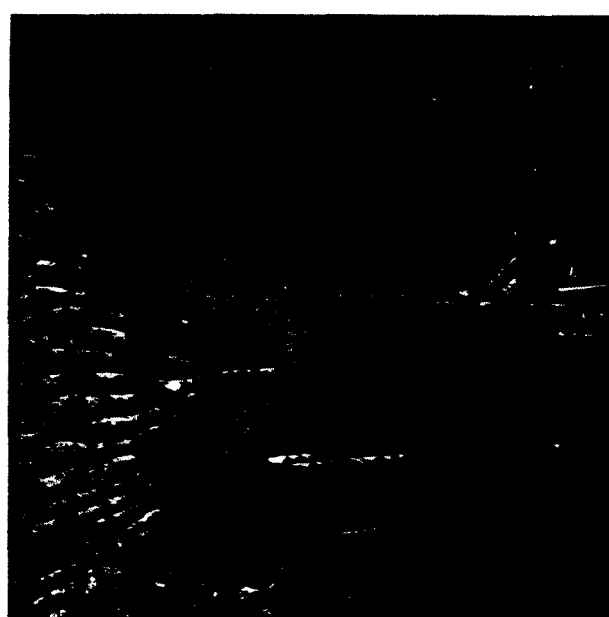


FIGURE 3 - Hopper and dry materials storage area.

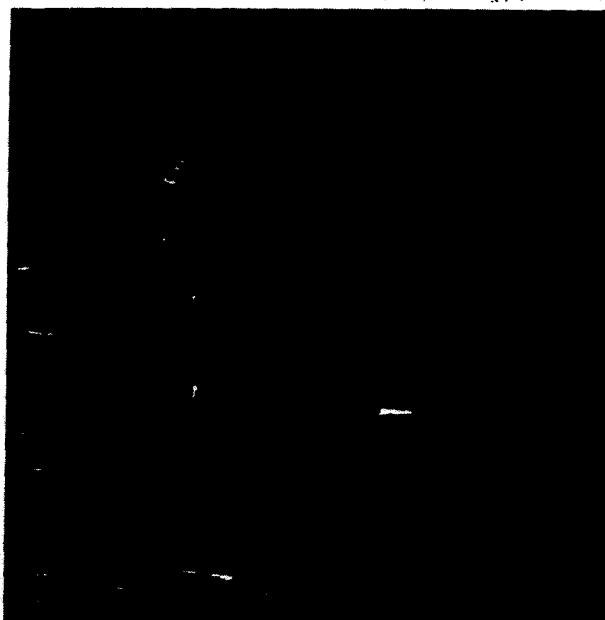


FIGURE 4 -- Addition of SVB
to hopper.

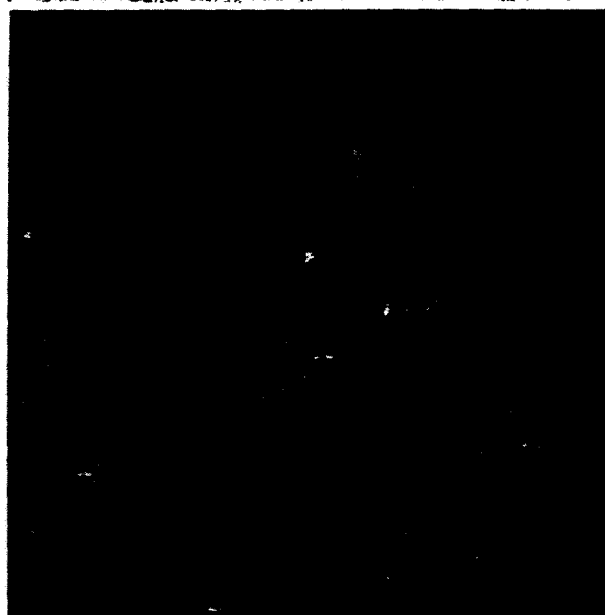


FIGURE 5 - Addition of SVB to hopper.

013738

AIRBORNE ASBESTOS COUNTS

for

**Cactus Drilling
Rig #5
~20 Miles Southwest of
Vernal, Utah**

**Date Sampled: September 23, 1977
Date Reported: September 28, 1977**

**Samples Collected By: B. L. Ingalls
Union Carbide Corporation**

**Samples Analyzed By: G. J. Spencer
Union Carbide Corporation**

**Reported By: G. J. Spencer
Union Carbide Corporation**

**Union Carbide Corporation
Metals Division
Niagara Falls, New York**

013739

OBJECTIVE

To monitor airborne asbestos emissions at the subject company's drilling facilities (Rig #5) during the use of five bags of Super Visbestos.

DESCRIPTION OF OPERATION

Operation involved the addition of five bags Super Visbestos, bentonite, limestone and zinc chromate to a vent-type hopper in a drilling application.

SAMPLE EQUIPMENT AND TEST PROCEDURES

Sampling and dust counting were carried out in accordance with OSHA Regulation 1910.1001, using the Bayer, Zumwalde and Brown method for counting asbestos fibers by phase contrast microscopy (Bureau of Occupational Safety and Health, Feb. 1969).

Battery-powered air pumps (M.S.A. type), calibrated to 2 liters per minute, were used to collect personal breathing zone and environmental samples on Millipore membrane filters of 0.8 micron porosity.

Fiber counting was performed on a Nikon phase contrast microscope at 400X utilizing a Porton reticle for sizing and field definition.

TEST RESULTS

The details of sample collection and resultant fiber counts are listed in the attached table(s).

Several photographs obtained in the work zone during monitoring are included.

The OSHA regulations permit a maximum limit of 2 fibers greater than 5 microns in length per cubic centimeter of air sampled on an 8-hour, time-weighted average (TWA). The formula $\frac{C_1 T_1 + C_2 T_2 + C_n T_n}{\Sigma T}$ describes the TWA

where C = fiber count in fibers/cc and T = time.

In the present application the worker handled asbestos for 14 minutes and left the area. Asbestos was not used again. Presumably his exposure for the other parts of the shift was zero or at most at the level of the natural background. For a zero exposure, for the time not handling asbestos, his 8-hour, time-weighted average exposure can be estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.0)(466)}{480} \approx 0.01 \text{ fibers/cc} > 5\mu$$

In the vicinity of the hopper, the levels before and after handling ranged from 0.0 to 0.04 fibers/cc > 5 μ . If the worker had stayed in the vicinity of the hopper throughout the shift his maximum TWA exposure is estimated as:

$$\text{8-hour TWA} = \frac{(0.3)(14) + (0.04)(466)}{480} = 0.05$$

The regulations also stipulate a ceiling concentration of 10 fibers/cc greater than 5 microns which is not to be exceeded at any time. The ceiling exposure for this operation was 0.3 fibers/cc greater than 5 microns.

013741

Airborne Fiber Count
(fibers/cc >5 μ)

Sample No.	Air Sample Time	Minutes	Operation Description	Chrysotile Asbestos
M-39	on: 1:00P off: 1:39P	39	Area - prior to the use of asbestos. Located ~20 feet south of hopper and 3-1/2 feet above ground.	0.04
M-48	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~4 feet west of hopper ~6 feet above ground, and ~2 feet above hopper.	0.02
M-52	on: 1:01P off: 1:41P	40	Area - prior to the use of asbestos. Located ~5 feet east of hopper ~3-1/2 feet above hopper and ~6-1/2 feet above ground. Rig #5.	0.04
M-19	on: 1:47P off: 2:01P	14	Personal - (Chuck Ireland) During 12 min. dump of five bags SVB, and during bag disposal.	0.3
M-49	on: 1:48P off: 1:59P	11	Area - during the dump of five bags SVB. Located same as M-52.	0.1
N-95	on: 1:48P off: 2:00P	12	Area - during the use of asbestos. Located same as M-48.	0.3
M-44	on: 2:05P off: 3:14P	69	Area - after the use of asbestos. Located same as M-52.	0
M-46	on: 2:07P off: 3:16P	69	Area - after the use of asbestos. Located same as M-48.	0.01
B-9	on: 2:09P off: 3:13P	64	Area - after the use of asbestos. Located ~3 feet from hopper, ~2 feet above hopper and ~5 feet above ground.	0.01

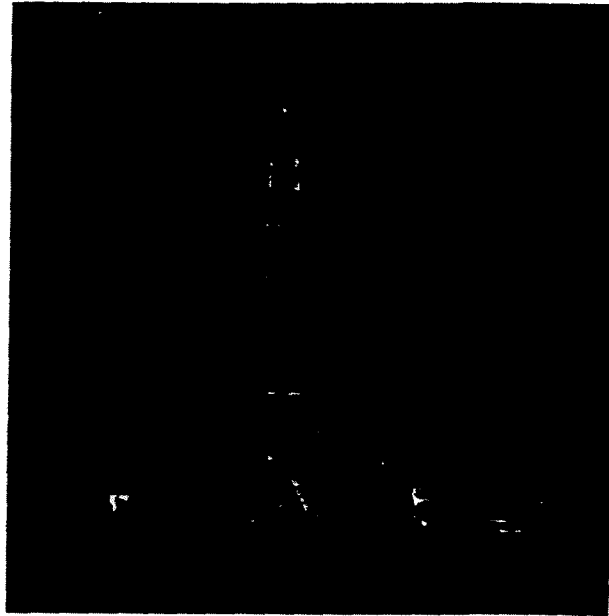


FIGURE 1 - Rig #5

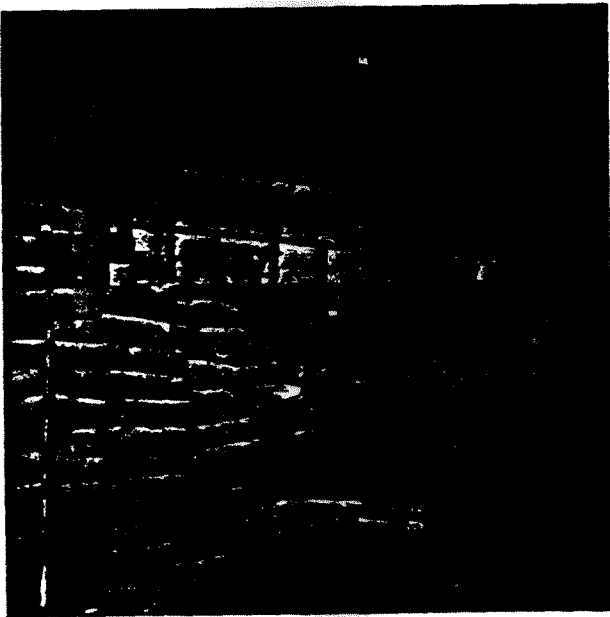


FIGURE 2 - Hopper and dry materials storage area.

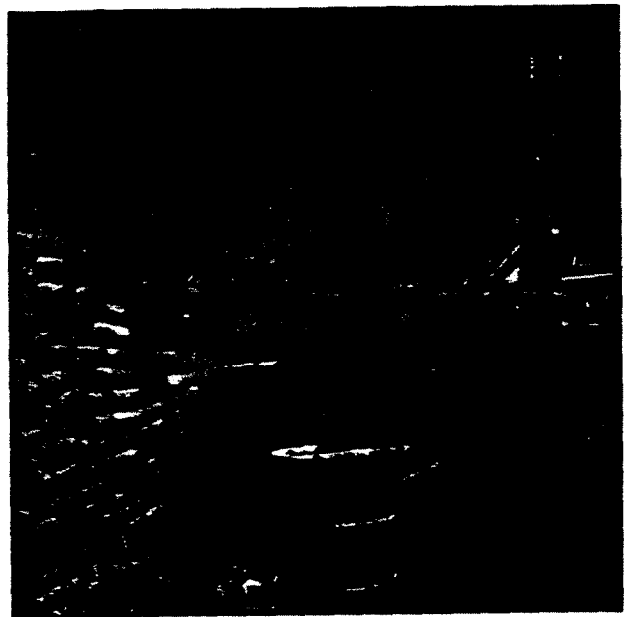


FIGURE 3 - Hopper and dry materials storage area.

013743

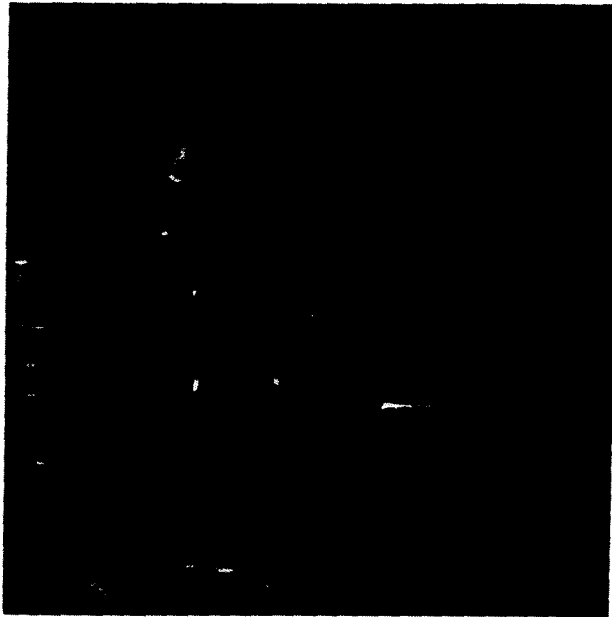


FIGURE 4 -- Addition of SVB
to hopper.

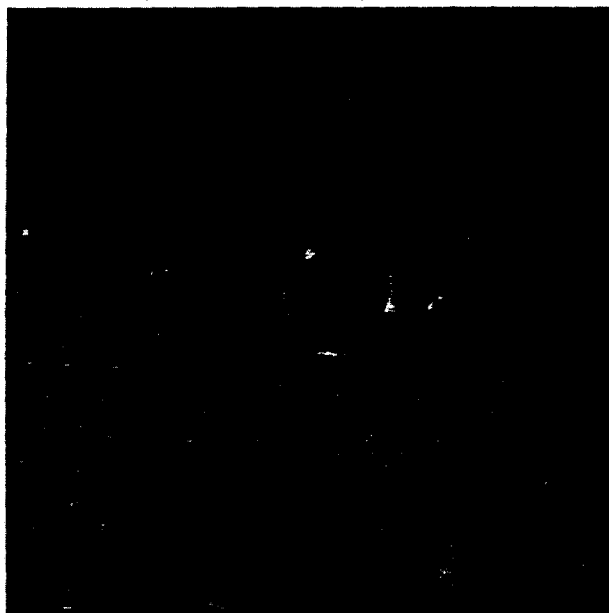
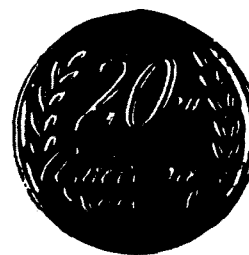


FIGURE 5 - Addition of SVB to hopper.

013744



September 28, 1977

Mr. Ken Carlson
Basin Mud Service
P. O. Box 1075
Vernal, Utah 84078

Dear Ken:

Enclosed you will find a complete file folder covering field monitoring on our Super Visbestos. We will send you a copy of the report on Blair's monitoring in Utah as soon as it is completed. Please accept our thanks for your help in getting him to location for those tests.

Best regards,
MONTELLO, INC.

Kenneth N. Campbell

KC/mt

Enc: (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

013745

Aerodynamic diameter (unit density sphere)	Percent Passing selector
2.5	90
3.5	75
5.0	50
10	25

The measurements under this note refer to the use of an AEC instrument. If the respirable fraction of coal dust is determined with a MRE the figure corresponding to that of 2.4 Mg/M³ in the table for coal dust is 0.5 Mg/M³.

Part 93a ASBESTOS

93a.1 Definitions. For the purpose of this Part, 93a.1.1 "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

93a.1.2 "Asbestos fibers" means asbestos fibers longer than 5 micrometers.

93a.2 Permissible exposure to airborne concentrations of asbestos fibers.

93a.2.1 Standard effective July 7, 1972. The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in 93a.5 of this Part.

93a.2.2 Standard effective July 1, 1976. The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined

by the method prescribed in 93a.5 of this Part.

93a.2.3 Ceiling concentration. No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in 93a.5 of this Part.

93a.3 Methods of compliance.

93a.3.1 Engineering methods.

93a.3.1.1 Engineering controls.

Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in 93a.2 of this Part.

93a.3.1.2 Local exhaust ventilation.

93a.3.1.2.1 Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1971, which is incorporated by reference herein.

93a.3.1.2.2 Reference ANSI Z9.2-1971, and the maintenance of a historic file in connection therewith. The address of the American National Standards Institute is given in Part 100.

93a.3.1.3 Particular tools. All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in 93a.2 of this Part, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilations systems

013746

in accordance with 93a.3.1.2 of this Part.

93a.3.2 Work practices.

93a.3.2.1 Wet methods. Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in 93a.2 of this Part, unless the usefulness of the product would be diminished thereby.

93a.3.2.2 Particular products and operations. No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in 93a.2 of this Part.

93a.3.2.3 Spraying, demolition, or removal. Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with 93a.4.2.3 of this Part and with special clothing in accordance with 93a.4.3 of this Part.

93a.4 Personal protective equipment.

93a.4.1 Compliance with the exposure limits prescribed by 93a.2 of this Part may not be achieved by the use of respirators or shift rotation of employees, except:

93a.4.1.1 During the time period necessary to install the engineering controls and to institute the work practices required by 93a.3 of this Part.

93a.4.1.2 In work situations in which the methods prescribed in 93a.3 of this Part are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by 93a.2 of this Part; or

93a.4.1.3 In emergencies.

93a.4.1.4 Where both respirators and personnel rotation are allowed by subdivisions 93a.4.1.1, .2, or .3 of this Part, and both are practicable, personnel rotation shall be preferred and used.

93a.4.2 Where a respirator is permitted by 93a.4.2.1, it shall be selected from among those approved by the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health, and shall be used in accordance with 93a.4.2.1, .2, .3, and .4 of this Chapter.

93a.4.2.1 Air purifying respirators. A reusable or single use air purifying respirator, or a respirator described in 93a.4.2.2 or 93a.4.2.3 of this Chapter, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in 93a.2 of this Part, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits.

93a.4.2.2 Powered air purifying respirators. A full facepiece

013747

powered air purifying respirator, or a powered air purifying respirator, or a respirator described in 93a.4.2.3 of this Chapter, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in 93a.2 of this Part, when the ceiling or the 8-hour time-weighted average concentrations of asbestos fibers are reasonably expected to exceed 10 times, but not 100 times, those limits.

93a.4.2.3 Type "C" supplied-air respirators, continuous flow or pressure-demand class. A type "C" continuous flow or pressure-demand, supplied air respirator shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in 93a.2 of this Part, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed 100 times those limits.

93a.4.2.4 Establishment of a respirator program.

93a.4.2.4.1 The employer shall establish a respirator program in accordance with the requirements of the American National Standards Practices for Respiratory Protection, ANSI Z88.2-1969, which is incorporated by reference herein.

93a.4.2.4.2 Reference ANSI Z88.2-1969 and the maintenance of an historic file in connection therewith. The address of the American National Standards Institute is given in Part 100.

93a.4.2.4.3 No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the

employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his use of a respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he had just prior to such transfer, if such a different position is available.

93a.4.3 Special clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in 93a.2 of this Part.

93a.4.4 Change rooms:

93a.4.4.1 At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in 93a.2 of this Part, the employer shall provide change rooms for employees working regularly at the place.

93a.4.4.2 Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.

93a.4.4.3 Laundering:

93a.4.4.3.1 Laundering of asbestos contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers

013748

in excess of the exposure limits prescribed in 93a.2 of this Part.

93a.4.4.3.2 Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in 93a.4.4.3.1 to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in 93a.2 of this Part.

93a.4.4.3.3 Contaminated clothing shall be transported in sealed, impermeable bags, or other closed, impermeable containers, and labeled in accordance with 93a.7 of this Part.

93a.5 Method of measurement. All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at 400-450 X (magnification) (4 millimeter objective) with phase contrast illumination.

93a.6 Monitoring.

93a.6.1 Initial determinations. Within 6 months of the publication of this Part, every employer shall cause every place of employment where asbestos fibers are released to be monitored in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in 93a.2 of this Part. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with 93a.3 of this Part.

93a.6.2 Personal monitoring.

93a.6.2.1 Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder.

Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

93a.6.2.2 Sampling frequency and patterns. After the initial determinations required by 93a.6.1, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees. In no case shall the sampling be done at intervals greater than 6 months for employees whose exposure to asbestos may reasonably be foreseen to exceed the limits prescribed by 93a.2 of this Part.

93a.6.3 Environmental monitoring.

93a.6.3.1 Samples shall be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

93a.6.3.2 Sampling frequency and patterns. After the initial determinations required by 93a.6.1, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than 6 months for employees whose exposures to asbestos may reasonably be foreseen to exceed the exposure limits prescribed in 93a.2 of this Part.

93a.6.4 Employee observation of

013749

monitoring. Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof.

93a.7 Caution signs and labels.

93a.7.1 Caution signs.

93a.7.1.1 Posting. Caution signs shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in 93a.2 of this Part. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers.

93a.7.1.2 Sign specifications. The warning signs required by 93a.7.1.1 shall conform to the requirements of 20" x 14" vertical format signs specified in 145.4.4, and of this subdivision. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this subdivision.

LEGEND

Asbestos.....
Dust Hazard.....
Avoid Breathing Dust.....
Wear Assigned Protective Equipment..
Do Not Remain in Area Unless Your
Work Requires It.....
Breathing Asbestos Dust May Be
Hazardous to Your Health.....

93a.7.2 Caution Labels.

93a.7.2.1 Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste,

debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in 93a.2 of this Part will be released.

93a.7.2.2 Label specifications.

The caution labels required by 93a.7.2.1 of this subparagraph shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state:

CAUTION

Contains Asbestos Fibers
Avoid Creating Dust
Breathing Asbestos Dust May Cause
Serious Bodily Harm

93a.8 Housekeeping.

93a.8.1 Cleaning. All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration.

NOTATION

1" Sans Serif, Gothic or Block
3/4" Sans Serif, Gothic or Block
1/4" Gothic
1/4" Gothic
1/4" Gothic
14 point Gothic
Spacing between lines shall be at least equal to the height of the upper of any two lines.

93a.8.2 Waste Disposal.

Asbestos waste, scrap, debris, bags,

013750

containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce in any reasonably foreseeable use, handling, storage, processing, disposal, or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in 93a.2 of this Part shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers.

93a.9 Recordkeeping.

93a.9.1 Exposure records. Every employer shall maintain records of any personal or environmental monitoring required by this Part. Records shall be maintained for a period of at least 3 years and shall be made available upon request to the Administrator of the Utah Occupational Safety and Health Act.

93a.9.2 Employee access. Every employee and former employee shall have reasonable access to any record required to be maintained by 93a.9.1, which indicates the employee's own exposure to asbestos fibers.

93a.9.3 Employee notification. Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in 93a.2 of this Part shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken.

93a.10 Medical examinations.

93a.10.1 General. The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this paragraph.

93a.10.2 Preplacement. The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}).

93a.10.3 Annual examinations. On or before January 31, 1973, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}).

93a.10.4 Termination of employment. The employer shall provide or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches) a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}).

013751

93a.10.5 Recent examinations. No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

93a.10.6 Medical records.

93a.10.6.1 Maintenance. Employers of employees examined pursuant to this paragraph shall cause to be maintained complete and accurate records of all such medical examinations. Records shall be retained by employers for at least 20 years.

93a.10.6.2 Access. The contents of the records of the medical examinations required by this paragraph shall be made available, for inspection and copying, to the UOSH Administrator, to authorized physicians and medical consultants, and, upon the request of an employee or former employee, to his physician. Any physician who conducts a medical examination required by this paragraph shall furnish to the employer of the examined employee all the information specifically required by this paragraph, and any other medical information related to occupational exposure to asbestos fibers.

**Part 93b COAL TAR PITCH VOLATILES:
INTERPRETATION OF TERM**

As used in Part 93 (Table G-1) coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum, wood, and other organic matter.

Part 93c 4-Nitrobiphenyl

93c.1 Scope and Application.

93c.1.1 This part applies to any

area in which 4-Nitrobiphenyl. Chemical Abstracts Service Registry Number 92537 is manufactured, processed, repackaged, released, handled, or stored, but shall not apply to transshipment in sealed containers, except for the labeling requirements under 93c.5.2, 3 and 4 of this Part.

93c.1.2 This Part shall not apply to solid or liquid mixtures containing less than 0.1 percent by weight or volume of 4-Nitrobiphenyl.

93c.2 Definitions. For purposes of this Part:

93c.2.1 "Absolute filter" is one capable of retaining 99.97 percent of a mono disperse aerosol of 0.3 μ m particles.

93c.2.2 "Authorized employee" means an employee whose duties require him to be in the regulated area and who has been specifically assigned by the employer.

93c.2.3 "Clean change room" means a room where employees put on clean clothing and/or protective equipment in an environment free of 4-Nitrobiphenyl. The clean change room shall be contiguous to and have an entry from a shower room, when the shower room facilities are otherwise required in this Part.

93c.2.4 "Closed system" means an operation involving 4-Nitrobiphenyl where containment prevents the release of 4-Nitrobiphenyl into regulated areas, nonregulated areas, or the external environment.

93c.2.5 "Decontamination" means the inactivation of 4-Nitrobiphenyl or its safe disposal.

93c.2.6 "UOSH Administrator"

Harry

SUMMARY OF FIELD MONITORING TESTS
Super Visbestos (Crushed Pellets)

013752

(Current OSHA Regs: 10.0 Fiber Ceiling; 2.0 Fiber TWA)

Date	Location	Explanation	Maximum Count (10.0 Allowed)	TWA Calculation (2.0 Allowed)
9/72	Rig - Central Oklahoma	Breathing Zone - Dumper Upwind Location Downwind Location	1.9 .1 .5	.40 - -
9/72	Rig - Texas Panhandle	Breathing Zone - Dumper 4 Feet From Hopper 20 Feet Downwind	1.0 .4 .2	.39 - -
11/74	3 Rigs - Upper Michigan			
	First Rig	Breathing Zone - Dumper A 1st Dump 2nd Dump Breathing Zone - Dumper B 1st Dump 2nd Dump 7 Feet Downwind Before Dump #1 During Dump #1 Between Dumps During Dump #2 After Dump #2	3.7 2.2 1.4 3.9 . 1.8 .4 1.3 .2	Ave. .27 - - Ave. .31 - - - -
	Second Rig	Breathing Zone - Dumper A 1st Dump 2nd Dump Breathing Zone - Dumper B 1st Dump 2nd Dump 3 Feet From Hopper During Dump #1 Between Dumps During Dump #2 After Dump #2	6.7 2.1 8.3 2.3 . .3 1.6 .3	Ave. .45 - Ave. .49 - - - -
	Third Rig	Breathing Zone Dumper A Breathing Zone Dumper B Directly Over Hopper	1.9 .7 .4	.45 .41 -
3/75	Rig - Canadian, Texas	Breathing Zone - Dumper 3 Feet From Hopper During Dump After Dump	1.8 . .3	.38 - -
3/75	Warehouse - Woodward, OK	Breathing Zone - Loading Breathing Zone - Unloading Worker on Truck Storage Area Loading Dock Sweep Up Background	.3 .6 .3 .2 .3 .5	Ave. .22 - - - -

SUMMARY OF FIELD MONITORING TESTS (cont'd.)

Date	Location	Explanation	Maximum Count (10.0 Allowed)	TWA Calculation (2.0 Allowed)
4/75	Rig - Wichita Falls, TX ---	Breathing Zone - Worker During Dump ----- .6 Bag Disposal ----- .5 4 Feet From Hopper Before Dump ----- .1 During Dump ----- .5 Bag Disposal ----- .2 After Disposal ----- .0		Ave. .22 - - - -
6/76	Warehouse A - Gillette, WY-	Breathing Zone - Loader ----- 2.5 4 Feet From Storage Before Loading ----- .1 During Loading ----- .5 Loading Dock Before Loading ----- .2 During Loading ----- 1.6		.24 - - - -
6/76	Rig A - Gillette, WY -----	Breathing Zone - Dump A During Dump ----- 1.2 Bag Disposal ----- 4.7 Breathing Zone - Dumper B During Dump ----- .6 Bag Disposal ----- 3.3 4 Feet Downwind, Hopper Before Dump ----- .4 During Dump ----- .8		Ave. .30 - Ave. .33 - -
6/76	Warehouse - Yellowstone, WY-	Breathing Zone - Loader Before Loading ----- .1 During Loading ----- .1 2 Feet From Storage Before Loading ----- .1 During Loading ----- .1 After Loading ----- .2 Loading Dock Before Loading ----- .1 During Loading ----- .2 After Loading ----- .2		Ave. .19 - - - - - -
6/76	Warehouse - Casper, WY -----	Breathing Zone - Loader ----- 1.5 Storage Area During Loading ----- 1.6 After Loading ----- .1 Loading Dock During Loading ----- .2 After Loading ----- .1		.15 - - - -

SUMMARY OF FIELD MONITORING TESTS (cont'd.)

013754

Date	Location	Explanation	Maximum Count (10.0 Allowed)	TWA Calculation (2.0 Allowed)
6/76	Rig B - Gillette, WY -----	Breathing Zone - Dumper ----- 4 Feet Upwind, Hopper Before Dump ----- During Dump ----- 5 Feet Downwind, Hopper Before Dump ----- During Dump -----	.9 ----- ----- ----- ----- ----- ----- -----	.28 ----- ----- ----- ----- ----- ----- -----
6/76	Warehouse B - Gillette, WY-	Breathing Zones Loader A ----- Loader B ----- 5 Feet From Storage Before Loading ----- During Loading ----- Loading Dock Before Loading ----- During Loading -----	----- 1.7 ----- ----- ----- ----- 1.1 ----- ----- ----- ----- ----- ----- -----	----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----
6/76	Rig C - Gillette, WY -----	Breathing Zone - Dumper ----- 5 Feet Upwind, Hopper Before Dump ----- During Dump ----- 7 Feet Downwind, Hopper Before Dump ----- During Dump -----	.2 ----- ----- ----- ----- ----- ----- -----	.11 ----- ----- ----- ----- ----- ----- -----

013755

The purpose of this bulletin is to provide certain background information on the use of Super Visbestos in the drilling industry. Existing OSHA regulations cover all commercial applications of asbestos. A reading of these regulations makes it appear that the total range of workplace environments was intended. A more careful study, however, enables us to characterize the concept of "workplace" in some detail. Implicit are the assumptions of fixed places of employment; of regular, day-to-day exposure; of exposure on essentially a full shift basis; of comparatively large asbestos tonnages being involved; of specific individuals being exposed with little relief; of enclosed or nearly enclosed work spaces. Even in those references to irregular workplaces, such as in construction, the inference is of specific workers, exposed for nearly a full shift, on a day-to-day basis, in at least partially enclosed surroundings.

Exposure to asbestos in the drilling industry is of a substantially different type. Asbestos is added to the drilling fluid through a mud hopper. Venturi action of the fluid rushing through the bottom of this hopper creates a suction, which pulls the dry product into the liquid stream. Additions to the system are made only occasionally, typically occurring no more often than once per shift. The amounts added are small, rarely exceeding 500 pounds at a time. With three eight hour shifts per day and eight to ten men per shift, assignments are exchanged frequently, with the same worker rarely performing the job of adding materials for more than a few shifts and then only for a small part of the shift. Dumping rates are slow, averaging an hour or so for 500 pounds. In dumping, the worker cuts the end of the 50 pound bag and allows the asbestos to fall into the suction end of the hopper, where the material becomes part of the liquid drilling fluid seconds later. The hopper itself is typically located in the open.

Montello

(Continued on
other side --)

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

A totally enclosed mixing area is a rare exception.

With enactment of the regulations in 1972, Union Carbide Corporation and Montello, Inc. began a series of drillsite monitoring tests, in accordance with the procedures established by OSHA. A substantial body of data has been accumulated from all parts of the U.S. Many different locations (including rigs and warehouses) have been evaluated, and we believe the widely varying conditions inherent in the drilling industry have been fairly included. The results show a consistent pattern of readings which are substantially below both the maximum ceiling limit (10 fibers/cc >5μ and the time weighted average (2 fibers/cc >5μ) prescribed in the regulations.

In more than 4 years since the asbestos regulations became law, we have no knowledge of any OSHA citation having been issued, based on corroborating monitoring data to establish the existence of excess air-borne fiber concentrations. In fact, where such tests have been run by compliance officers, no basis has been found for citation. (In September of 1974, a compliance office for the State of Utah carried on field monitoring tests at one of our customer's locations. After analysis, a ruling of "In Compliance" was handed down.)

In addition to the continuing program of field monitoring, Union Carbide and Montello are carrying on basic research with the aim of improving both the cleanliness and the field performance of Super Visbestos. Outgrowths of this research are the high density, crushed pellet form of the product; and the introduction of individually shrink filmed bags to minimize handling and storage problems. With Union Carbide, we will continue to work toward the highest possible standards of quality and safety.



013757

January 5, 1977

Mr. Robert Hailey
Texland Drilling Corporation
P. O. Box 3037
Abilene, Texas 79604

Dear Mr. Hailey:

Please refer to our recent phone conversation about the field monitoring tests on Super Visbestos. After the individual reports, we felt it might be useful to collect all the scattered data into a single recap format. We also prepared an updated bulletin giving general background on the use of Super Visbestos in the drilling industry. We hope you will find the contents of this updated presentation both helpful and informational.

A second folder is enclosed for your lawyer, as requested. Under separate cover we have also sent a copy to Mr. Don Dyer of Safety Consultants in Odessa. We have spoken with our Union Carbide people in Niagara Falls about the possibility of initiating a field monitoring series in your area of activity, as soon as practical. As always, they are pleased to cooperate and we plan to coordinate the "whens and wheres" with Mr. Dyer. Will keep you advised as the program develops.

Thanks for your continuing interest in Super Visbestos. Please let us know whenever we can be of service in any way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd
Enc. (2)

P.S. We have received the citation copy you mailed, and appreciate having it.

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007



013758

January 5, 1977

Mr. Don Dyer
Safety Consultants, Inc.
P. O. Box 6564
Odessa, Texas 79762

Dear Mr. Dyer:

We spoke to Mr. Robert Hailey of Texland Drilling recently, about the OSHA regulations on asbestos. He suggested that we send you a duplicate of information which we furnished him. The presentation is enclosed. We hope you will find it both informational and helpful.

We have spoken to our people with Union Carbide in Niagara Falls about the possibility of initiating a series of monitoring tests in West Texas, as a part of our ongoing program. Mr. Hailey had indicated his interest and willingness to cooperate in such a series, assuming a convenient time frame could be established. Is it possible that you might have other clients who would be similarly interested?

Depending upon the distance between locations, it is generally possible to run two or three monitoring tests per day. The series are generally designed to last about three days. Union Carbide furnishes the professional person and equipment to perform the tests. They also do the phase contrast counting on the resulting samples. Reports are prepared for each location, and copies forwarded to all participants.

We will take the liberty of contacting you shortly, in the hope that some one with your company might be willing to assist in working out the logistics for such a series. In the meantime, please let us know whenever we can be of any help.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell
KNC/jd
Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007



013759

January 5, 1977

Mr. Van Harry
Loffland Brothers Company
P. O. Box 459
New Iberia, Louisiana 70560

Dear Mr. Harry:

Please refer to our recent phone conversation about the OSHA regulations on asbestos, and our product Super Visbestos. After gathering the individual reports, we felt it might be useful to collect all the scattered data into a single recap format. We also prepared an updated bulletin giving what we hope will be a useful "overall" view of Super Visbestos in the drilling industry. All this is in the enclosed file folder.

As requested, we have also included a half dozen extra business cards, along with the disposable respirator information discussed. We will be happy to supply extra copies of any or all of the enclosures. Many thanks for your interest in our products, and please let us know whenever we can be of further service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

cc: Mr. Charlie Reeves
Enc. (3)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007



013760

January 5, 1977

Mr. Leo Dean
Sharp Drilling Company
First National Bank Building
Midland, Texas 79701

Dear Mr. Dean:

Mr. Bud Tucker called us recently and asked that we send you information on Super Visbestos, in the context of the OSHA regulations which cover asbestos. The enclosed file folder contains an updated presentation of this data. We hope you will find it useful and informative. At Bud's request, we've sent a duplicate to Mr. Leroy Cargile.

Many thanks for your interest in our products. Please let us know whenever we can be of service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

Harry



013761

January 5, 1977

Mr. Leroy Cargile
Sharp Drilling Company
P. O. Box 182
Stanton, Texas 79782

Dear Mr. Cargile:

Mr. Bud Tucker phoned us recently and asked that we send information to you on Super Visbestos in the context of the OSHA regulations covering the use of asbestos. This information is enclosed. We hope you'll find it helpful. At Bud's request, we've sent the same presentation to Mr. Leo Dean in Midland.

We appreciate your interest in our products, and hope you will contact us whenever we can be of service.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007



013762

January 5, 1977

Mr. Taylor Davis
American Mud Company
P. O. Box 555
Abilene, Texas 79604

Dear Taylor:

We spoke to Bob Hailey earlier about the OSHA/Super Visbestos matter. Our form of presentation has been brought up to date, and we've sent him copies. At his request, we've also copied Don Dyer of Safety Consultants in Odessa with the same presentation.

Enclosed is a similar copy for your files. We're working out a program to carry on a series of field monitoring tests in West Texas soon. Will keep you advised as the plans take shape.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

P.O. BOX 130, SAND SPRINGS, OKLAHOMA 74063 / (918)-245-6661/TWX 910-840-3007

Harry



013763

January 5, 1977

Mr. Bud Tucker
3710 Stanolind St.
Midland, Texas 79701

Dear Bud:

Many thanks for your call the other day. We've updated our presentation on the OSHA matter, and have sent copies to Mr. Leo Dean and Mr. Leroy Cargile of Sharp Drilling. As requested, we're enclosing two copies for your use.

We appreciate your help on this one. Please let us know whenever we can help.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (2)

Montello

Montell

6106 EAST 10TH PLACE
TULSA, OKLAHOMA 74136
(918) 661-1170 / TWX 910-845-2396

013764

79

Mr. T. J. Davis
American Oil Company
P. O. Box 111
Abilene, Texas 79604

Dear Mr. Davis:

Please refer to our letter
DOT regulations on shipper
please refer to the last
mention the petition file
successful on both issues.
to August 20th, the regula
31, 1979. Final regulatio
small quantities in fiber

In addition, the DOT has r
carriers from the palletiz
This is certainly a welcom
have enclosed a copy of th
1979 Federal Register.

We sincerely hope the regs
our customers. As stated
and sift proof bags before
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Best regards,

MONTPELL, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

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Montello

013765

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 7, 1979

Mr. Taylor Davis
American Mud Company
P. O. Box 555
Abilene, Texas 79604

Dear Taylor:

New DOT regulations affecting the packaging and transportation of asbestos in the U.S. will become effective August 20, 1979. The Super Visbestos which we supply you will be subject to these regulations. We suggest that you become familiar with the regulations, and especially with the following provision:

173.1090(d) Commercial asbestos must be offered for transportation and transported in -

- (1) Rigid, airtight packagings such as metal or fiber drums, portable tanks;
- (2) Bags or other non-rigid packagings in closed freight containers, motor vehicles, or rail cars that are loaded by and for the exclusive use of the consignor and unloaded by the consignee; or
- (3) Bags or other non-rigid packagings which are dust and sift proof and which are palletized and unitized by methods such as shrink wrapping in plastic film or wrapping in fiberboard secured by strapping.

Beginning immediately all Super Visbestos shipped to you will be in dust and sift proof bags. This is being accomplished by double shrink filming each bag, at no additional cost to you. In addition, palletizing and unitizing with shrink wrap will be available at our cost of \$15.00 per ton. All bags will be marked "ASBESTOS ORM-C", as provided in the regulations.

Realizing that field inventories of previously purchased Super Visbestos may be on hand August 20th, our manufacturer Union Carbide has petitioned the DOT for an extension of the effective date to October 1, 1979, on all such previously purchased material. Included in that petition is a request for DOT approval on the use of cardboard boxes as an alternate to palletizing and

Mr. Taylor Davis
August 7, 1979
Page 2:

unitizing. (It is felt that the latter can offer somewhat greater flexibility in the handling of small lots between field locations.) We are informed that there is good reason to expect DOT approval of the petition, and we will contact you as soon as we are notified.

Finally, we will call your attention to paragraphs 174.840 and 177.844, which read essentially the same, as follows:

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of rail cars (transport vehicles) removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation.

Please let us know if you have need of any further information on this subject. We will do our best to cooperate in every possible way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Materials Transportation Bureau

49 CFR Part 173

[Docket Nos. HM-160; Amdt. Nos. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44]

Transportation of Asbestos; Additional Revisions of Amendment No. 173-123

AGENCY: Materials Transportation Bureau (MTB), Research and Special Programs Administration, DOT.

ACTION: Additional Revisions of Previous Amendment No. 173-123.

SUMMARY: These revisions to Amendment No. 173-123 (44 FR 18673, March 29, 1979) will permit carriage of asbestos: (1) by private carrier in dust and sift-proof bags and other non-rigid packaging without palletizing and unitizing; (2) in dust and sift-proof bags and other non-rigid packagings within fiberboard or wooden boxes when shipped in less than pallet load quantities. This revision also clarifies the authority to ship leaktight hopper cars and leaktight hopper motor vehicles, and provides a grandfather clause for shipments initially shipped and transported prior to August 20, 1979.

EFFECTIVE DATE: August 20, 1979.

FOR FURTHER INFORMATION CONTACT: Delmer F. Billings, Standards Division, Materials Transportation Bureau, Research and Special Programs Administration, DOT, Washington, D.C. 20590, phone 202-426-2075.

SUPPLEMENTARY INFORMATION: On March 29, 1979, the MTB published an amendment to the final rule under docket HM-160 in the Federal Register (44 FR 18673). Since this publication, the MTB has received two petitions for reconsideration in accordance with the provisions of 49 CFR 106.35.

One petitioner requested that the MTB clarify the meaning of the word "airtight" as it is used in § 173.1090(d)(1), and he questioned whether hopper cars would be authorized by the provisions of this same section. For the purposes of this section, the word "airtight" means that there can be no transfer of either air or particles between the packaging and the surrounding atmosphere under ambient conditions. Packaging specified in this section need not be pressure tight packaging. In an effort to eliminate any confusion, the word "airtight" has been deleted from this section, and the word "leaktight" has been substituted. Also, this section has been amended to include a specific reference allowing the use of leaktight hopper cars or hopper motor vehicles for the shipment of asbestos.

A petitioner stated that difficulties arise due to the lack of a provision

allowing the shipment of dust and sift-proof bags or other non-rigid packagings in less than pallet load quantities. The petitioner stated that the use of an exclusive use vehicle for shipments of only a few bags of asbestos is extremely uneconomical and that it is also not feasible to maintain supplies to unitize and palletize small quantity shipments of bags of asbestos. This petitioner requested that fiber boxes be allowed as an alternative to the palletizing and unitizing method. The MTB is in basic agreement with this petitioner concerning small quantity shipments of asbestos in bags, therefore, this amendment provides for the shipment of dust and sift-proof bags or other non-rigid packagings when in rigid outside fiberboard or wooden boxes. This option will continue to provide for public safety by providing for equal protection of the bags during shipment but will allow shipment of less than pallet load quantities.

A petitioner objected that the amendment to the final rule as published on March 29, 1979, did not include the provision allowing private highway carriers to transport dust and sift-proof packagings without palletizing and unitizing which appeared in the final rule published on December 4, 1978 (43 FR 56664). The MTB agrees that the provision should be reinstated in view of the closer control exercised by private carriers over shipments. This provision will allow for private carriage by highway of dust and sift-proof bags and other non-rigid packagings which are not palletized and unitized.

Several questions have been raised concerning the meaning of the words "exclusive use" as used in § 173.1090(d)(3). For the purposes of this section, "exclusive use" means that the consignor has complete use of the transport vehicle and that the loading is carried out by the consignor and unloading is carried out by the consignee or consignees.

A petitioner also cited a need for an extended effective date for packages of asbestos initially entered into transportation prior to August 20, 1979, but which would still be required to be shipped from distributors, warehouses, and the like, after that date. It was stated that many distributors, etc., do not have the ability or facilities to repackage such shipments and, therefore, such stocks would not be able to be reshipped after the effective date of the final rule, thus causing severe hardships. The MTB is in agreement that this situation could pose a serious burden and, therefore, this amendment includes a provision allowing packages of asbestos initially shipped prior to August 20, 1979, to continue to be shipped until December 31, 1979.

In consideration of the foregoing, § 173.1090 as it appeared in the Federal Register published on March 29, 1979 (44 FR 18673) is revised as follows:

In § 173.1090, paragraphs (d) (1), (2), and (3) are revised; paragraphs (d) (4) and (5) are added to read as follows:

§ 173.1090 Asbestos.

(d) . . .

(1) Rigid, leaktight packagings, such as metal or fiber drums, portable tanks, hopper-type rail cars, or hopper-type motor vehicles;

(2) Bags or other non-rigid packagings in closed freight containers, motor vehicles, or rail cars that are loaded by and for the exclusive use of the consignor and unloaded by the consignee;

(3) Bags or other non-rigid packagings which are dust and sift-proof. When transported by other than private carrier by highway, such packagings containing asbestos must be palletized and unitized by methods such as shrink-wrapping in plastic film or wrapping in fiberboard secured by strapping. Pallets need not be used during transportation by vessel for loads with slings that are unitized by methods such as shrink-wrapping, if the slings adequately and evenly support the loads and the unitizing method prevents shifting of the bags or other non-rigid packagings during conditions normally incident to transportation; or

(4) Bags or other non-rigid packagings which are dust and sift-proof in strong outside fiberboard or wooden boxes.

(5) Notwithstanding the requirements of this section, packages containing asbestos initially shipped and transported prior to August 20, 1979, may continue to be shipped and transported until December 31, 1979.

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53 and App. A to Part 1.)

Note.—The Materials Transportation Bureau has determined that this final rule will not result in a major economic impact under the terms of Executive Order 12044 and DOT implementing procedures (44 FR 11034) nor require an environmental impact statement under the National Environmental Policy Act (49 U.S.C. 4321 et seq.). A regulatory evaluation is available in the docket.

Issued in Washington, D.C. on August 10, 1979.

L. D. Santman,
Director, Materials Transportation Bureau.

[FR Doc. 79-25237 Filed 8-15-79; 8:45 am]
BILLING CODE 4910-60-M

Materials Transportation Bureau**49 CFR Part 173**

[Docket Nos. HM-160; Amdt. Nos. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44]

Transportation of Asbestos; Additional Revisions of Amendment No. 173-123

AGENCY: Materials Transportation Bureau (MTB), Research and Special Programs Administration, DOT.

ACTION: Additional Revisions of Previous Amendment No. 173-123.

SUMMARY: These revisions to Amendment No. 173-123 (44 FR 18673, March 29, 1979) will permit carriage of asbestos: (1) by private carrier in dust and sift-proof bags and other non-rigid packaging without palletizing and unitizing; (2) in dust and sift-proof bags and other non-rigid packagings within fiberboard or wooden boxes when shipped in less than pallet load quantities. This revision also clarifies the authority to ship leaktight hopper cars and leaktight hopper motor vehicles, and provides a grandfather clause for shipments initially shipped and transported prior to August 20, 1979.

EFFECTIVE DATE: August 20, 1979.

FOR FURTHER INFORMATION CONTACT: Delmer F. Billings, Standards Division, Materials Transportation Bureau, Research and Special Programs Administration, DOT, Washington, D.C. 20590, phone 202-426-2075.

SUPPLEMENTARY INFORMATION: On March 29, 1979, the MTB published an amendment to the final rule under docket HM-160 in the Federal Register (44 FR 18673). Since this publication, the MTB has received two petitions for reconsideration in accordance with the provisions of 49 CFR 106.35.

One petitioner requested that the MTB clarify the meaning of the word "airtight" as it is used in § 173.1090(d)(1), and he questioned whether hopper cars would be authorized by the provisions of this same section. For the purposes of this section, the word "airtight" means that there can be no transfer of either air or particles between the packaging and the surrounding atmosphere under ambient conditions. Packaging specified in this section need not be pressure tight packaging. In an effort to eliminate any confusion, the word "airtight" has been deleted from this section, and the word "leaktight" has been substituted. Also, this section has been amended to include a specific reference allowing the use of leaktight hopper cars or hopper motor vehicles for the shipment of asbestos.

A petitioner stated that difficulties arise due to the lack of a provision

allowing the shipment of dust and sift-proof bags or other non-rigid packagings in less than pallet load quantities. The petitioner stated that the use of an exclusive use vehicle for shipments of only a few bags of asbestos is extremely uneconomical and that it is also not feasible to maintain supplies to unitize and palletize small quantity shipments of bags of asbestos. This petitioner requested that fiber boxes be allowed as an alternative to the palletizing and unitizing method. The MTB is in basic agreement with this petitioner concerning small quantity shipments of asbestos in bags, therefore, this amendment provides for the shipment of dust and sift-proof bags or other non-rigid packagings when in rigid outside fiberboard or wooden boxes. This option will continue to provide for public safety by providing for equal protection of the bags during shipment but will allow shipment of less than pallet load quantities.

A petitioner objected that the amendment to the final rule as published on March 29, 1979, did not include the provision allowing private highway carriers to transport dust and sift-proof packagings without palletizing and unitizing which appeared in the final rule published on December 4, 1978 (43 FR 56664). The MTB agrees that the provision should be reinstated in view of the closer control exercised by private carriers over shipments. This provision will allow for private carriage by highway of dust and sift-proof bags and other non-rigid packagings which are not palletized and unitized.

Several questions have been raised concerning the meaning of the words "exclusive use" as used in § 173.1090(d)(3). For the purposes of this section, "exclusive use" means that the consignor has complete use of the transport vehicle and that the loading is carried out by the consignor and unloading is carried out by the consignee or consignees.

A petitioner also cited a need for an extended effective date for packages of asbestos initially entered into transportation prior to August 20, 1979, but which would still be required to be shipped from distributors, warehouses, and the like, after that date. It was stated that many distributors, etc., do not have the ability or facilities to repack such shipments and, therefore, such stocks would not be able to be reshipped after the effective date of the final rule, thus causing severe hardships. The MTB is in agreement that this situation could pose a serious burden and, therefore, this amendment includes a provision allowing packages of asbestos initially shipped prior to August 20, 1979, to continue to be shipped until December 31, 1979.

In consideration of the foregoing, § 173.1090 as it appeared in the Federal Register published on March 29, 1979 (44 FR 18673) is revised as follows:

In § 173.1090, paragraphs (d) (1), (2), and (3) are revised; paragraphs (d) (4) and (5) are added to read as follows:

§ 173.1090 Asbestos.

(d) . . .

(1) Rigid, leaktight packagings, such as metal or fiber drums, portable tanks, hopper-type rail cars, or hopper-type motor vehicles;

(2) Bags or other non-rigid packagings in closed freight containers, motor vehicles, or rail cars that are loaded by and for the exclusive use of the consignor and unloaded by the consignee;

(3) Bags or other non-rigid packagings which are dust and sift-proof. When transported by other than private carrier by highway, such packagings containing asbestos must be palletized and unitized by methods such as shrink-wrapping in plastic film or wrapping in fiberboard secured by strapping. Pallets need not be used during transportation by vessel for loads with slings that are unitized by methods such as shrink-wrapping, if the slings adequately and evenly support the loads and the unitizing method prevents shifting of the bags or other non-rigid packagings during conditions normally incident to transportation; or

(4) Bags or other non-rigid packagings which are dust and sift-proof in strong outside fiberboard or wooden boxes.

(5) Notwithstanding the requirements of this section, packages containing asbestos initially shipped and transported prior to August 20, 1979, may continue to be shipped and transported until December 31, 1979.

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53 and App. A to Part 1.)

Note.—The Materials Transportation Bureau has determined that this final rule will not result in a major economic impact under the terms of Executive Order 12044 and DOT implementing procedures (44 FR 11034) nor require an environmental impact statement under the National Environmental Policy Act (49 U.S.C. 4321 et seq.). A regulatory evaluation is available in the docket.

Issued in Washington, D.C. on August 10, 1979.

L. D. Santman,
Director, Materials Transportation Bureau.

[FR Doc. 79-25217 Filed 8-15-79; 8:45 am]

BILLING CODE 4910-60-M

Materials Transportation Bureau**49 CFR Part 173**

[Docket Nos. HM-160; Amdt. Nos. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44]

Transportation of Asbestos; Additional Revisions of Amendment No. 173-123

AGENCY: Materials Transportation Bureau (MTB), Research and Special Programs Administration, DOT.

ACTION: Additional Revisions of Previous Amendment No. 173-123.

SUMMARY: These revisions to Amendment No. 173-123 (44 FR 18673, March 29, 1979) will permit carriage of asbestos: (1) by private carrier in dust and sift-proof bags and other non-rigid packaging without palletizing and unitizing; (2) in dust and sift-proof bags and other non-rigid packagings within fiberboard or wooden boxes when shipped in less than pallet load quantities. This revision also clarifies the authority to ship leaktight hopper cars and leaktight hopper motor vehicles, and provides a grandfather clause for shipments initially shipped and transported prior to August 20, 1979.

EFFECTIVE DATE: August 20, 1979.

FOR FURTHER INFORMATION CONTACT: Delmer F. Billings, Standards Division, Materials Transportation Bureau, Research and Special Programs Administration, DOT, Washington, D.C. 20590, phone 202-426-2075.

SUPPLEMENTARY INFORMATION: On March 29, 1979, the MTB published an amendment to the final rule under docket HM-160 in the Federal Register (44 FR 18673). Since this publication, the MTB has received two petitions for reconsideration in accordance with the provisions of 49 CFR 106.35.

One petitioner requested that the MTB clarify the meaning of the word "airtight" as it is used in § 173.1090(d)(1), and he questioned whether hopper cars would be authorized by the provisions of this same section. For the purposes of this section, the word "airtight" means that there can be no transfer of either air or particles between the packaging and the surrounding atmosphere under ambient conditions. Packaging specified in this section need not be pressure tight packaging. In an effort to eliminate any confusion, the word "airtight" has been deleted from this section, and the word "leaktight" has been substituted. Also, this section has been amended to include a specific reference allowing the use of leaktight hopper cars or hopper motor vehicles for the shipment of asbestos.

A petitioner stated that difficulties arise due to the lack of a provision

allowing the shipment of dust and sift-proof bags or other non-rigid packagings in less than pallet load quantities. The petitioner stated that the use of an exclusive use vehicle for shipments of only a few bags of asbestos is extremely uneconomical and that it is also not feasible to maintain supplies to unitize and palletize small quantity shipments of bags of asbestos. This petitioner requested that fiber boxes be allowed as an alternative to the palletizing and unitizing method. The MTB is in basic agreement with this petitioner concerning small quantity shipments of asbestos in bags, therefore, this amendment provides for the shipment of dust and sift-proof bags or other non-rigid packagings when in rigid outside fiberboard or wooden boxes. This option will continue to provide for public safety by providing for equal protection of the bags during shipment but will allow shipment of less than pallet load quantities.

A petitioner objected that the amendment to the final rule as published on March 29, 1979, did not include the provision allowing private highway carriers to transport dust and sift-proof packagings without palletizing and unitizing which appeared in the final rule published on December 4, 1978 (43 FR 56664). The MTB agrees that the provision should be reinstated in view of the closer control exercised by private carriers over shipments. This provision will allow for private carriage by highway of dust and sift-proof bags and other non-rigid packagings which are not palletized and unitized.

Several questions have been raised concerning the meaning of the words "exclusive use" as used in § 173.1090(d)(3). For the purposes of this section, "exclusive use" means that the consignor has complete use of the transport vehicle and that the loading is carried out by the consignor and unloading is carried out by the consignee or consignees.

A petitioner also cited a need for an extended effective date for packages of asbestos initially entered into transportation prior to August 20, 1979, but which would still be required to be shipped from distributors, warehouses, and the like, after that date. It was stated that many distributors, etc., do not have the ability or facilities to repackage such shipments and, therefore, such stocks would not be able to be reshipped after the effective date of the final rule, thus causing severe hardships. The MTB is in agreement that this situation could pose a serious burden and, therefore, this amendment includes a provision allowing packages of asbestos initially shipped prior to August 20, 1979, to continue to be shipped until December 31, 1979.

In consideration of the foregoing, § 173.1090 as it appeared in the Federal Register published on March 29, 1979 (44 FR 18673) is revised as follows:

In § 173.1090, paragraphs (d) (1), (2), and (3) are revised; paragraphs (d) (4) and (5) are added to read as follows:

§ 173.1090 Asbestos.

(d) . . .

(1) Rigid, leaktight packagings, such as metal or fiber drums, portable tanks, hopper-type rail cars, or hopper-type motor vehicles;

(2) Bags or other non-rigid packagings in closed freight containers, motor vehicles, or rail cars that are loaded by and for the exclusive use of the consignor and unloaded by the consignee;

(3) Bags or other non-rigid packagings which are dust and sift-proof. When transported by other than private carrier by highway, such packagings containing asbestos must be palletized and unitized by methods such as shrink-wrapping in plastic film or wrapping in fiberboard secured by strapping. Pallets need not be used during transportation by vessel for loads with slings that are unitized by methods such as shrink-wrapping, if the slings adequately and evenly support the loads and the unitizing method prevents shifting of the bags or other non-rigid packagings during conditions normally incident to transportation; or

(4) Bags or other non-rigid packagings which are dust and sift-proof in strong outside fiberboard or wooden boxes.

(5) Notwithstanding the requirements of this section, packages containing asbestos initially shipped and transported prior to August 20, 1979, may continue to be shipped and transported until December 31, 1979.

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53 and App. A to Part 1.)

Note.—The Materials Transportation Bureau has determined that this final rule will not result in a major economic impact under the terms of Executive Order 12044 and DOT implementing procedures (44 FR 11034) nor require an environmental impact statement under the National Environmental Policy Act (49 U.S.C. 4321 et seq.). A regulatory evaluation is available in the docket.

Issued in Washington, D.C. on August 10, 1979.

L. D. Santman,

Director, Materials Transportation Bureau.

[FR Doc. 79-25227 Filed 8-15-79; 8:45 am]

BILLING CODE 4910-80-M



REVISIONS 3/29/79
DEPARTMENT OF TRANSPORTATION
MATERIALS TRANSPORTATION BUREAU
WASHINGTON, D.C. 20590

013770

18673

(Docket No. HM-160; Amdt. No. 173-47,
173-123, 174-33, 175-7, 176-6, 177-44)

**PART 173—SHIPPERS—GENERAL RE-
QUIREMENTS FOR SHIPMENTS AND
PACKAGINGS**

**Transportation of Asbestos; Revision
of Amendment No. 173-123; Effective
Date Extension**

AGENCY: Materials Transportation
Bureau (MTB), Research and Special
Programs Administration, DOT.

ACTION: Revision of previous Amend-
ment No. 173-123 and extension of the
effective date for all amendments.

SUMMARY: This revision of Amend-
ment No. 173-123 regarding the trans-
portation of asbestos as published on
December 4, 1978, in the *FEDERAL REG-
ISTER* (43 FR 56664) will allow ship-
ments of asbestos when packaged in
bags or other non-rigid packagings to
be transported in closed freight con-
tainers, motor vehicles, or rail cars
when loaded by the consignor and un-
loaded by the consignee; or in bags
and other non-rigid packagings that
are dust and sift proof which are pal-
letized and unitized. Unitized loads in
slings need not be palletized during
transportation by vessel. The effective
date of the entire Docket HM-160 is
revised from April 30, 1979 to August
20, 1979.

EFFECTIVE DATE: August 20, 1979.

ADDRESS: All written comments re-
ceived in this rulemaking action are
available for examination during regu-
lar business hours in the Docket
Branch, Room 6500, TransPoint Build-
ing, 2100 Second Street, S.W., Wash-
ington, D.C.

**FOR FURTHER INFORMATION
CONTACT:**

Delmer F. Billings, Standards Divi-
sion, Materials Transportation
Bureau, Research and Special Pro-
grams Administration, 2100 Second
Street, S.W., Washington, D.C.
20590, phone 202-755-4902.

SUPPLEMENTARY INFORMATION:
On December 4, 1978, the MTB pub-
lished a final rule under Docket HM-
160 in the *FEDERAL REGISTER* (43 FR
56664). Since this publication, the
MTB has received several petitions for
reconsideration in accordance with the
provisions of 49 CFR 106.35. The peti-
tions requested reconsideration of the
provisions and/or extension of the ef-

fective date of the final rule. This doc-
ument will incorporate methods of
shipment which were identified in the
notice of proposed rulemaking (43 FR
8562, March 2, 1978) and also those
which were included in the final rule.
These amendments represent mini-
mum safety requirements and are in-
tended to reduce the risks to public
health associated with the generation
of unacceptable airborne concentra-
tions of asbestos that may result from
packaging and handling of asbestos
shipments in commercial transporta-
tion.

Two petitioners based their petitions
on the fact that the final rule con-
tained a provision requiring bags and
other non-rigid containers of asbestos
to be palletized and unitized by some
method such as shrink-wrapping in
plastic film or wrapping in fiberboard
secured by strapping. It was noted
that this requirement was not includ-
ed in the notice of proposed rulemak-
ing (43 FR 8562), thus making com-
ments on this requirement impossible
during the normal comment period for
the proposed rulemaking. Petitioners
also posed the question of whether or
not freight containers, rail cars, etc.,
constituted rigid, airtight packagings
as required in § 173.1090(d)(1). It was
stated that if such containers were not
included in this provision, all ship-
ments of bags or non-rigid containers
would be required to be palletized and
unitized according to the provisions of
§ 173.1090(d)(2), and that this require-
ment would impose great hardship on
the asbestos industry and on shippers
of large volumes of asbestos who nor-
mally ship using exclusive use vehicles
and rail cars. It was also indicated that
neither the equipment nor facilities
exist at the present time to achieve
compliance with the palletizing and
unitizing requirement of the final rule
by the published effective date. The
MTB has determined that freight con-
tainers and, probably, motor vehicles
and rail cars would not satisfy the re-
quirements of § 173.1090(d)(1).

By allowing the use of unitized
pallet loads as identified in the final
rule, the MTB intended to recognize
less restrictive handling requirements
for bagged asbestos than those that
would have been required by the
"loading by consignor/unloading by
consignee" approach. However, it was
not the intent of the MTB to elimi-
nate the more restrictive consignor/
consignee approach. Therefore,
§ 173.1090(d) is being revised to allow
the option of either the consignor/
consignee approach as identified in

the original proposed rulemaking with
inclusion of an exclusive use provision
or the unitized pallet approach using
bags or other non-rigid packagings as
required by the final rule.

One petitioner noted that a method
of shipment of asbestos via water was
the use of slings which are shrink-
wrapped or stretch-wrapped and trans-
ported in the hold of a vessel without
the use of pallets. It was the petiti-
oner's contention that the use of pallets
would increase the incidents of unin-
tentional release of asbestos due to
the interaction of the pallets against
the bags which are unitized by the
slings. It was noted that pallets were
used in all instances except when
placed in the hold of the transport
vessel. Given the lack of detailed data
on the amount of asbestos fibers re-
leased in transportation and the cir-
cumstances and cause for such release,
the MTB is in general agreement that
increased unintentional releases may
be likely if pallets were used under the
method identified in the petition.
Therefore, § 173.1090(d) is being re-
vised to allow slings in loads that are
shrink-wrapped or stretch-wrapped to
be transported by water without the
use of pallets. Future monitoring of
hazardous materials incident reports
will assist the MTB in determining the
safety and efficiency of this and other
methods for shipment of asbestos.

One petitioner suggested that the
terms "pallet" and "palletized" be de-
fined in the rulemaking. The MTB
does not intend to publish a definition
of pallet or palletized. It is the MTB's
opinion that any rigid platform or
board upon which goods may be
placed for transportation would meet
the requirements when unitizing a
load of bags or other non-rigid packag-
ings.

Several petitioners cited a need for
the MTB to define the term "dust and
sift proof". For the purposes of this
amendment, the MTB considers dust
and sift proof to mean packagings
which are constructed so as to prevent
the release of their contents either
through materials of construction,
seams, or closures during conditions
normally incident to transportation.

One petitioner requested that the
use of gluing of bags into a unit be al-
lowed as an alternative to the unitiz-
ing methods identified in the final
rule. It is the MTB's opinion that the
use of shrink-wrapping or other simi-
lar methods of enclosure assist not
only in unitizing a pallet load of bags
or other non-rigid packagings, but also
assist in the prevention of airborne as-

bestos contamination of individuals involved in the transportation of asbestos. Simply gluing these packagings together to form a unit would not provide this added measure of safety to which the final rule addresses itself. Therefore, gluing of bags into a unit is not being included as an alternative unitizing method.

One petitioner requested that quantities of less than 2,000 pounds, net weight, per vehicle be excepted from the palletizing and unitizing requirement. It is MTB's opinion that the palletizing and unitizing requirement does not unreasonably restrict the shipment of asbestos in any quantity. This requirement is necessary to provide a minimum level of safety.

Several petitioners requested an extension of the effective date of the final rule. The effective date has been extended to allow five months for compliance as originally intended by the December 4, 1978 publication.

Primary drafters of this document are Delmer F. Billings, Standards Division, Office of Hazardous Materials Regulation, and Douglas A. Crockett, Standards Division, Office of Hazardous Materials Regulations.

In consideration of the foregoing, the effective date and paragraph (d) of § 173.1090 as they appeared in the FEDERAL REGISTER published on December 4, 1978 (43 FR 56664) are revised to read as follows:

1. The effective date of the final rule as it appeared in HM-160 on December 4, 1978, is revised to read as follows:

EFFECTIVE DATE: August 20, 1979.

2. In § 173.1090 paragraph (d) as it appeared at 43 FR 56669 is revised to read as follows:

§ 173.1090 Asbestos.

(d) Commercial asbestos must be offered for transportation and transported in—

(1) Rigid, airtight packagings such as metal or fiber drums, portable tanks;

(2) Bags or other non-rigid packagings in closed freight containers, motor vehicles, or rail cars that are loaded by and for the exclusive use of the consignor and unloaded by the consignee; or

(3) Bags or other non-rigid packagings which are dust and sift proof and which are palletized and unitized by methods such as shrink wrapping in plastic film or wrapping in fiberboard secured by strapping. Pallets need not be used during transportation by vessel for loads with slings that are unitized by methods such as shrink wrapping, if the slings adequately and evenly support the loads and the unitizing method prevents shifting of the bags or other non-rigid packagings during conditions normally incident to transportation.

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53).

NOTE.—The Materials Transportation Bureau has determined that these amendments do not require a regulatory analysis under the terms of Executive Order 12044 and DOT implementing procedures (43 FR 9582). A regulatory evaluation is available for review in the Docket.

Issued in Washington, D.C. on March 22, 1979.

L.D. SANTMAN,
Director,

Materials Transportation Bureau.
(FR Doc. 79-9325 Filed 3-23-79; 8:45 am)

FEDERAL REGISTER, VOL. 44, NO. 62—THURSDAY, MARCH 29, 1979

§ 172.316 Packagings containing material classed as ORM.

(a) Except as provided in § 173.505 of this subchapter, each package containing a material classed as ORM-A, B, C, or D must be plainly and durably marked on at least one side or end with the appropriate ORM designation immediately following or below the proper shipping name of the material. The appropriate ORM designation must be placed within a rectangle that is approximately 1/4 inch (6.3 mm.) larger on each side than the designation. The appropriate designation for each ORM must be:

- (1) ORM-A for and ORM-A.
- (2) ORM-B-KEEP DRY for an ORM-B that is a solid and is corrosive only to aluminum when wet.
- (3) ORM-B for an ORM-B other than that described in paragraph (a)(2) of this section.
- (4) ORM-C for an ORM-C.
- (5) ORM-D-AIR for an ORM-D that is prepared for air shipment and packaged in accordance with the provisions of § 173.6 of this subchapter.

(6) ORM-D for an ORM-D other than that described in paragraph (a)(5) of this section.

(b) When the ORM-D marking, including the proper shipping name, can not be affixed on the package surface, it may be on an attached tag.

(c) The marking ORM-A, B, C or D is the certification by the person offering the package for transportation that the material is properly classed, packaged, marked, and labeled (when appropriate) and in proper condition for transportation according to the applicable regulation of the Department. This form of certification does not preclude the requirement for a certificate on a shipping paper when required by § 172.204.

[4910-60-M]

Title 49—Transportation

CHAPTER I—RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

(Docket No. HM-160; Amdt. Nos. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44)

TRANSPORTATION OF ASBESTOS

Miscellaneous Amendment

AGENCY: Materials Transportation Bureau, Research and Special Programs Administration, DOT.

ACTION: Final Rule.

SUMMARY: These amendments require shipments of commercial asbestos fibers to be packaged in rigid, airtight or dust and sift proof packagings. Except when the shipment is by private carrier, non-rigid packages, such as bags, must be palletized and unitized using shrink-wrapping or strapped fiberboard wrapping. These amendments represent minimum safety requirements and are intended to reduce the risks to the public health associated with the generation of airborne concentrations of asbestos that may result from the packaging and handling of asbestos fiber shipments in commercial transportation.

EFFECTIVE DATE: These regulations are effective April 30, 1979.

ADDRESS: All written comments received in this rulemaking action are available for examination during regular business hours in the Dockets Branch, Room 6500, Trans Point Building, 2100 Second Street SW., Washington, D.C.

FOR FURTHER INFORMATION CONTACT:

Douglas A. Crockett, Standards Division, Materials Transportation Bureau, Research and Special Programs Administration, 2100 Second Street SW., Washington, D.C. 20590, phone 202-426-2075.

SUPPLEMENTARY INFORMATION: On March 2, 1973, a notice of proposed rulemaking (HM-160; Notice 78-3) was published in the FEDERAL REGISTER (43 FR 8562) stating that the MTB was planning to exercise regulatory control over the transportation of asbestos. Specific regulatory requirements were proposed for the control of certain forms of asbestos (e.g., milled or crude asbestos fibers). No requirements were proposed for asbestos fibers which are immersed or fixed in a natural or artificial binder material, or for manufactured products containing asbestos. Interested persons were invited to participate in the rulemaking proceeding through submission of written comments on the proposal to

the MTB. All submissions, including late submissions, that were received on the proposal were fully considered by the MTB in the development of this final rule.

NEED TO REGULATE THE TRANSPORTATION OF ASBESTOS

Several commenters felt that the MTB had failed to establish a need to regulate the transportation of asbestos. One of the commenters suggested that there was no need for the proposed regulatory control of asbestos in transportation because the "methods and procedures now in use for the packaging and transport of asbestos meet the requirements of Part 173.24(A)(sic) of the Transportation Act, that is 'under conditions normally incident to transportation there will be no significant release of the hazardous materials to the environment' and 'the effectiveness of the packaging will not be substantially reduced . . . (t)he proposal contains no documentation to justify additional regulation.'" This commenter, while apparently believing that asbestos is a hazardous material, was incorrect in suggesting that asbestos is currently regulated by the MTB; or in suggesting that the purpose of Notice 78-3 was to justify the additional regulation by the MTB of asbestos in transportation. The transportation of asbestos is not now regulated by the MTB. It was precisely the purpose of Notice 78-3 that it should be. If, as the commenter suggests, the transportation of asbestos is now "in compliance with pertinent provisions of the Transportation Act," this rulemaking action will formalize and insure in a uniform and systematic manner that this is the case.

Another commenter stated that Notice 73-8 did "not establish a foundation for regulation, in that it does not document, or even allege for that matter, the actual release of fiber during the transportation of asbestos." As was pointed out in Notice 78-3, the MTB has "no detailed information on the amount of asbestos fibers released during transportation." The MTB does not now regulate asbestos, and has not therefore systematically collected accident data on the amounts of asbestos released in transportation or data on the frequency of such accidents. Most asbestos fiber, however, is currently shipped in bags, and it is undeniable that these bags can and do break, or can be and are being torn or punctured, with a consequent release of some or all of the bag contents. It can be speculated, moreover, that if all of the 750,000 tons of asbestos annually shipped in the United States were packaged in, as one commenter states, the "standard package" of a 100-pound bag; and if as little as one-tenth of one percent of these bags were damaged in

transportation during the year (one out of a thousand) and if on the average 1 percent of the contents of the bags so damaged were released, the total amount of asbestos released per year would equal about 7.5 tons. These calculations give a general idea of the magnitude of asbestos fiber that would be released, given a 99.9 percent efficiency factor for "bag integrity" in transportation, and a 99.0 percent efficiency factor in minimizing the amount of asbestos released given a tear in the bag. The rather evident fact that asbestos has been accidentally released during transportation has not been contradicted by anything submitted to the public docket on this rulemaking action. One commenter, for example, in discussing the use of open-bed trailers with side racks and tarpaulins to transport asbestos stated that there is no evidence that the use of such trailers "has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." The Asbestos Information Association, an incorporated nonprofit organization representing 51 firms in the United States and Canada engaged in the manufacture or processing of asbestos-containing products and the mining/milling of asbestos fibers, stated that with "the very large volume of asbestos shipped, occasional container damage may occur."

Although several commenters who discussed this matter do not contend that asbestos has not been released in transportation, they generally are of the view that the amounts that are being released are not significant or of a sufficient amount to pose an unreasonable risk to public health. The MTB does not agree; it believes that the amounts of asbestos fibers that are being released now, or would be released in the future, in the absence of these amendments, may pose an unreasonable risk to health.

Several commenters were concerned with the statement appearing in Notice 78-3 that "asbestos in its several commercial forms, poses serious health hazards to individuals subject to long term exposure to airborne asbestos concentrations." One commenter stated that "not all long-term exposures to airborne concentrations pose any health hazards . . ." Another commenter suggested that the statement needed "more explicit definition" and that "reference should have been made to unanswered questions within the scientific community concerning mineral type, fiber size and smoking in the asbestos-cancer relationship." One commenter stated that there is a dose-response relationship between exposure to asbestos and disease causation, and that this conclusion is supported by an OSHA statement from its June 7, 1972 preamble

to its standard for exposure to asbestos dust (37 FR 11318). The OSHA statement is that: "No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers" (emphasis added). Although the MTB had also quoted this statement in Notice 78-3, the words underlined for emphasis had been inadvertently omitted. Under these circumstances, some commenters apparently felt that the MTB was asserting the view that because, according to some commenters, asbestos is ubiquitous, long term exposure to ambient levels of asbestos fibers poses serious health hazards to all people, without regard to their occupational or para-occupational status. It was not the intention of the MTB to assert this view. That there are or can be "undisputed grave consequences from exposure to asbestos" (37 FR 11318) does not depend on the questioned conclusiveness of the evidence reported by OSHA (40 FR 47652) regarding the potential health hazards posed by low-level, brief or intermittent exposure to asbestos. The MTB relies on the foregoing FEDERAL REGISTER references for the general view that exposure to asbestos may pose an unreasonable risk to the public.

SECTION 173.1090(a) AND (b)

Several commenters stated that there are certain mineral ores, ore concentrates and milled mineral products which may have trace amounts of asbestos, or minor amounts of asbestos occurring as contaminants. They suggested that these materials presented no risk to property and little, if any, risk to public health and safety in transportation. Moreover, since the packaging requirements proposed in Notice 78-3 applied to only certain kinds of asbestos, namely milled or crude asbestos fibers produced by an asbestos mill, they further suggested that only "commercial asbestos fibers" be defined as a hazardous material.

The MTB recognizes that there are certain mineral ores, ore concentrates and milled mineral products, as well as other products, that contain certain amounts of asbestos, and that the commercial value of these minerals or products is not dependent on their asbestos content. The specific requirements in these amendments for the control of asbestos fibers in transportation do not apply to such materials or products, nor do they apply to asbestos as a waste product¹ or as a con-

¹Under Docket HM-145A (43 FR 22626, May 25, 1978), new standards and procedures were proposed for the transportation of hazardous waste materials. That proposal would include waste asbestos if so identified by EPA under Section 3001 of the Solid Waste Disposal Act as amended by the Re-

taminating trace element. The amendments apply only to asbestos in its several commercial forms since it is those forms of asbestos that have been firmly established as posing serious health hazards to individuals. A new paragraph has been added which would define commercial asbestos as any material or product containing asbestos that has commercial value because of its asbestos content, and appropriate modifications have been made in the amendments to reflect this clarification. This new paragraph is identified in this amendment as paragraph (b) (paragraphs (b) and (c) in the notice are now paragraphs (c) and (d), respectively).

One commenter recommended that the scope of Notice 78-3 be amended to include, in addition to asbestos fibers, "all mineral and man-made (fibers) which have been identified by U.S. Government agencies as being carcinogenic and which may pose serious health risk." On December 9, 1976, the MTB published an Advance Notice of Proposed Rulemaking (41 FR 53224) in Docket No. HM-145 entitled "Environmental and Health Effects Materials." In that Notice, the MTB announced that it was considering whether new or additional transportation controls are necessary for certain classes of materials which are not generally subject to the existing Hazardous Materials Regulations. The question of whether all mineral and man-made fibers, which have been identified by U.S. Government agencies as being carcinogenic and which pose an unreasonable risk to public health, should be controlled in transportation will be considered in terms of the further development and resolution of the issues associated with Docket HM-145. Notice 78-3 however, pointed out that a large number of comments were received in Docket HM-145, and that a considerable amount of staff evaluation of these comments was still required before it would be possible to issue a notice or notices of proposed rulemaking for environmental and health effects materials, either on a comprehensive or on a selective basis.

SECTION 173.1090(c)(1)

Several commenters objected to the reference made to metal or fiber drums to illustrate the rigid packaging alternative for asbestos fibers. These commenters stated that the asbestos industry has not developed the technology to use this type of packaging alternative; that available technology is not transferable to the use of metal or fiber drums; and that, among other things, the use of this alternative could generate far greater airborne concentrations of asbestos than pack-

source Conservation and Recovery Act (Pub. L. 94-580).

aging and shipping practices currently in effect. As one commenter pointed out:

Commercial asbestos is fluffy. It is difficult to pack this material in a rigid container, and, because the fiber would gradually compact during shipment, it would be difficult to remove it for introduction into the manufacturing process. It would also be extremely cumbersome, if not impossible, to empty rigid containers effectively and rapidly into hoods designed for bags. Spillage would no doubt occur and workers would be unnecessarily exposed to fibers.

Another commenter recommended that a DOT Specification 56 portable tank be included in the amended rule as an acceptable package "for the transportation of asbestos-type products." This commenter stated that "with the use of equipment designed for the purpose, the D.O.T. 56 package can be readily filled or emptied without release of any product dust to the atmosphere or contact with the product by the operator." Another commenter insisted that only metal drums and not fiber drums were acceptable for the transportation of asbestos fibers. These commenters apparently lost sight of the fact that proposed § 173.1090(c)(1) does not "mandate," as one commenter suggested, or even encourage the use of rigid, airtight packaging such as metal or fiber drums or even portable tanks. It provides an alternative method of shipping commercial asbestos fibers. As was indicated in Notice 78-3, the MTB believes that its proposed non-specification packaging standards as applied to the transportation of commercial asbestos is an effective and efficient means of precluding potential problems associated with asbestos airborne emissions occurring during transportation; and that they are consistent with the standards of the EPA and the OSHA. Some of the commenters however were also apparently unaware that the transportation standards for the control of asbestos are designed to be comprehensive in nature such that, once the standards are promulgated, commercial asbestos cannot be packaged and transported in any matter not specified in the amendments. If under more advanced technology the use of rigid, airtight packaging would lessen the likelihood of airborne asbestos emissions associated with bag breakages under current industry wide non-uniform non-standardized packaging practices, then it is necessary that alternative transportation standards be available so as not to preclude the development and utilization of such technology. Although the public record on Notice 78-3 contains statements that the asbestos industry is seeking to improve the technology involved in the shipment and handling of commercial asbestos so as to minimize the possibility for the accidental release of such asbestos incident to

transportation. It is by no means certain that the pace of such technological improvements is rapid enough or that the best, economically feasible technology is being considered. However, the classification of asbestos as an ORM-C will, for the first time, require the submission of incident reports to the MTB by carriers of any unintentional release of asbestos during transportation, and enable the MTB to monitor the safety performance record associated not only with the transportation alternatives available under current technology as provided for by these amendments, but also with any improvements in that technology.

For these reasons, the substance of proposed § 173.1090(c)(1) is being retained but modified to reflect an even broader range of permissible rigid, airtight packaging alternatives. This section now is identified in this amendment as § 173.1090(d)(1) because of the addition of new paragraph (b).

SECTION 173.1090(c)(2)

Proposed paragraph (c)(2) of Notice 78-3 covered the transportation alternative of shipping commercial asbestos in bags when in closed freight containers, motor vehicles, or rail cars that were loaded by the consignor and unloaded by the consignee. Several commenters noted that, unless reliance was placed on using the rigid, airtight packaging alternative provided in the proposal, this alternative would preclude the shipment of asbestos fibers by open-bed trailers. One commenter noted that there is "no evidence to indicate that the use of open-bed trailers with side racks and tarpaulins has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." Another commenter noted that the type of bag permitted by proposed paragraph (c)(2) was not specified, and that the shipper could package asbestos in burlap bags, or very thin paper or polyethylene bags which could permit asbestos fibers to be easily released into the air during transit. Another commenter was concerned with "small volume users of asbestos and customers who, from time to time, require sample shipments for trial production runs of a few hundred pounds," and who under § 173.1090(c)(2) would be forced to acquire the exclusive use of a railcar or highway trailer, or rely on the alternative provided by § 173.1090(c)(1).

Given the lack of detailed data on the amount of asbestos fibers released in transportation and the circum-

stances and causes for such release, the MTB is in general agreement with the thrust of these comments; accordingly, a new paragraph (d)(2) recognizes less restrictive handling of bagged asbestos than was proposed.

SECTIONS 174.840, 175.840, 176.906, 177.844

In these Sections, Notice 78-3 had proposed that, incident to its transportation, asbestos must be loaded, handled, and any asbestos contamination removed, in a manner that will prevent occupational exposure to airborne asbestos particles (emphasis added).

Some commenters objected to the word "prevent," believing that this word was intended to mean completely precluding the possibility of an accident occurring in which asbestos fibers would be released; or completely isolating people involved in the transportation, loading and unloading of asbestos from exposure to asbestos fibers from whatever source such fibers were generated. One commenter pointed out that with "the very large volume of asbestos shipped, occasional container damage may occur." Another commenter pointed out, although in a somewhat contradictory fashion, that since "asbestos is ubiquitous," therefore "airborne levels of asbestos fibers can be present in any place of employment, regardless of whether or not asbestos or products containing known quantities of asbestos are handled" (emphasis added). The Asbestos Information Association in its comments stated that "asbestos is ubiquitous, and there are no workplaces where there is zero occupational exposure to asbestos" (original emphasis). If Notice 78-3 was not as clear as it might have been on this point, it is only necessary to say that the basic purpose of these amendments is to minimize the exposure to airborne asbestos particles accidentally released during or incident to transportation; and appropriate changes to Parts 174, 175, 176, and 177 have been made to reflect this purpose.

ORM-C CLASSIFICATION

Notice 78-3 proposed that the classification for "asbestos" would be as an ORM-C, (Other Regulated Material, Group C). Several commenters were uncertain and concerned about the marking requirements associated with ORM-C classifications. One commenter noted that the designation ORM-C would "carry no meaningful warning to the person handling or opening the package." Another noted that the present regulations of the Occupational Safety and Health Admin-

istration (OSHA) on labeling requirements for asbestos convey much more information than an ORM-C marking requirement. These commenters were apparently not completely familiar with the marking requirements associated with ORM-C designated materials. The ORM-C marking not only warns when a package contains hazardous material, but it is also a certification by the person offering the package for transportation that the material is properly described, classed, packaged, marked, and labeled (when appropriate) and in proper condition for transportation according to applicable regulations of the Department. Neither function precludes or preempts OSHA labeling requirements or creates "contradictory regulatory requirements for labeling" as one commenter suggested. For these reasons, no changes have been made with respect to any marking requirements for asbestos packages.

ECONOMIC/INFLATIONARY IMPACT

In reviewing the potential economic and inflationary impacts associated with the final rule, the MTB has determined that such impacts will be minimal. Based on the comments received, and the consequent modification of Notice 78-3, the only economic costs associated with final amendment pertain to the reporting requirements to be submitted to MTB on the accidental releases of commercial asbestos fibers during or incident to transportation. The absolute annual magnitude of these costs will be, of course, a function of the total number of incident reports that are submitted on accidental releases of asbestos fibers; but in view of the undisputed grave consequences from exposure to asbestos fibers, these reporting requirements will not impose an unnecessary burden on the economy, on individuals, or on public and private organizations.

In consideration of the foregoing, Title 49, Code of Federal Regulations, Parts 172, 173, 174, 175, 176, and 177 are amended as follows:

PART 172—HAZARDOUS MATERIALS TABLE AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS

1. In § 172.101 the Hazardous Materials Table is amended by adding a new entry, immediately following "Arsine," to read as follows:

ASBESTOS, COMMERCIAL, RELEASED DURING TRANSPORTATION

[4910-60-C]

§ 172.101 Hazardous materials table.

(1) */ W/ A	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(4) Labels(s) required (if not excepted)	(5) Packaging		Maximum net quantity in one package		(7) Water shipments		
				(a) Exception	(b) Specific require- ments	(a) Passenger carry- ing aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other requirement
*	(Add) Asbestos	ORM-C	None	173.1090 (c)	173.1090 (d)	No Limit	No Limit	1, 2	1, 2	Stow and handle to avoid air- borne particles.

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

2. Section 173.1090 is added preceding Subpart M to read as follows:

§ 173.1090 Asbestos.

(a) Asbestos includes any of the following hydrated mineral silicates: chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, actinolite asbestos, and every product containing any of these minerals.

(b) Commercial asbestos is any material or product containing asbestos that has commercial value because of its asbestos content.

(c) Asbestos which is immersed or fixed in a natural or artificial binder material (such as cement, plastic, asphalt, resins or mineral ore) and manufactured products containing asbestos or any materials or products whose commercial value is not dependent on their asbestos content, are not subject to the requirements of this subchapter.

(d) Commercial asbestos must be offered for transportation and transported in—

(1) Rigid, airtight packagings such as metal or fiber drums, portable tanks, or

(2) Bags and other non-rigid packagings that are dust and sift proof. When transported by other than a private carrier by highway, bags and other non-rigid packagings containing asbestos must be palletized and unitized by methods such as shrink-wrapping in plastic film or wrapping in fiberboard secured by strapping.

PART 174—CARRIAGE BY RAIL

3. A Subpart M Heading is added immediately following § 174.812 to read as follows:

Subpart M—Detailed Requirements for Other Regulated Materials

4. Section 174.840 is added to read as follows:

§ 174.840 Special loading and handling requirements for asbestos.

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of rail cars removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 175—CARRIAGE BY AIRCRAFT

5. Section 175.640 is added to read as follows:

§ 175.640 Special requirements for other regulated materials.

Asbestos must be loaded, handled,

and unloaded, and any asbestos contamination of aircraft removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 176—CARRIAGE BY VESSEL

6. Section 176.906 is added to read as follows:

§ 176.906 Stowage and handling of asbestos.

Asbestos must be stowed, handled, and unloaded, and any asbestos contamination of vessels removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 177—CARRIAGE BY PUBLIC HIGHWAY

7. Section 177.844 is added to read as follows:

§ 177.844 Other regulated materials.

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of transport vehicles removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53(e).)

NOTE—The Materials Transportation Bureau has determined that these amendments do not require a regulatory analysis under the items of Executive Order 12044 and DOT implementing procedures (43 FR 9582). A regulatory evaluation is available for review in the docket.

Issued in Washington, D.C., on November 27, 1978.

L. D. SANTMAN,
*Director, Materials
Transportation Bureau.*

[FR Doc. 78-33771 Filed 12-1-78; 8:45 am]



UNION CARBIDE CORPORATION
CORPORATE DISTRIBUTION
270 PARK AVENUE, NEW YORK, N. Y. 10017

013777

July 23, 1979

Materials Transportation Bureau
US Department of Transportation
2100 Second Street, SW
Washington, DC 20590

SUBJECT: Docket No. 174-160
Transportation of Asbestos

Gentlemen:

On March 29, 1979, the Materials Transportation Bureau published in the Federal Register (44 F.R. 18573) a revision of Amendment No. 173-23 regarding the transportation of asbestos, as published on December 4, 1978, (43 F.R. 55654).

Union Carbide Corporation is engaged, among other things, in the production, sale and distribution of chrysotile asbestos and ships an aggregate of over 30,000 tons per year of such material for use in various applications. Although a substantial portion of Union Carbide's shipments of asbestos is made in bulk, an equally substantial portion requires packaging in bags.

As revised, §173.1030 (d) (2) and (3) contemplate the use of bags or other non-rigid packagings. In each case, however, the revised section appears to assume that shipments in bags can always be made in fairly large quantities. Thus, subparagraph (2) permits the use of bags in closed vehicles which are assigned for the "exclusive use" of the consignor. Obviously it would in most circumstances be exceedingly uneconomical for any consignor to operate, or contract for the exclusive use of, a vehicle to transport a shipment of only a few bags of asbestos.

Similarly, subparagraph (3) requires that bags be palletized and unitized. Ordinarily, in commercial sales of asbestos, shipment quantities are sufficient to economically and practically accommodate that requirement. In many cases, however, distributors must ship quantities of only a few bags to meet customer requirements or limitations. Additionally, in the case of sample shipments, only a single bag may be involved.

It is normally impractical, however, for distributors to maintain supplies of pallets of various sizes to accommodate shipments of varying numbers of bags. It is also impractical for distributors or manufacturers to acquire and maintain equipment capable of unitizing pallet loads of widely divergent dimensions.

In the oil drilling industry, for example, customers tend to order asbestos in relatively small quantities. It is also customary, for reasons explained in the enclosed letter from one of Union Carbide's distributors, for such customers to return one or more bags (as "overages") for credit. It would not be realistic to expect oil drillers, frequently at remote locations, to have available either the required pallets or unitizing equipment.

It is respectfully suggested, therefore, that the regulations be further revised to permit shipments of asbestos in dust and sift proof bags which are protected in transit by enclosure in a sufficiently strong outside packaging. Such a revision would make possible the shipment of one or more bags with protection against leakage of asbestos during transportation at least equal to that afforded by palletizing and unitizing.

If the Bureau agrees with the foregoing suggestion, it would appear to be most simply accomplished by revising the initial portion of §173.1090(d) (3) to read as follows:

- (3) Bags or other non-rigid packagings which are dust and sift proof and which are (i) enclosed in a rigid outside fiberboard or wooden packaging, or (ii) palletized and unitized....

In order to assure continuity of movement without excessive interruption, it is requested that the foregoing revision be published to become effective on August 20, 1979, simultaneously with the previously revised §173.1090, or as soon thereafter as possible.

In connection with the currently scheduled effective date of August 20, 1979, Union Carbide is concerned with certain packages of asbestos presently in the possession of distributors located primarily in the eastern portion of the United States. Although such materials are palletized, they do not entirely conform with the new requirements of §173.1090(d) (3) and, therefore, could not lawfully be shipped after August 20, 1979. Since it is unlikely that all such inventory could be finally disposed of before August 20, 1979, it would be necessary, prior to that date, to return at least a portion thereof to Union Carbide's facility at King City, California for repackaging in accordance with the new regulations.

Aside from the additional costs which such a movement would generate, it appears incongruous to require the transcontinental transportation of asbestos in non-conforming packaging, even though such transportation would be lawful prior to August 20. If, on the other hand, such materials were allowed sufficient time to be shipped the relatively short distances from eastern distributors to final destinations, such unnecessary transcontinental movement could be avoided.

Accordingly, it is respectfully requested that the effective date of the new regulations be further extended to October 1, 1979, but solely with respect to asbestos packaged and initially shipped prior to August 20, 1979. It must be recognized, however, that a prompt response to this request is imperative since, if no extension is to be granted, movement to California must commence shortly in order to be completed on or before August 20.

Your courtesy and cooperation in considering the matters discussed herein are greatly appreciated.

Respectfully submitted,

UNION CARBIDE CORPORATION

M. D. Michaud
M. D. Michaud
Assistant Administrator
Hazardous Materials Transportation
Regulations

WDM:jnr

[4910-60-M]

Title 49—Transportation

CHAPTER I—RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

(Docket No. HM-160; Amdt. Nos. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44)

TRANSPORTATION OF ASBESTOS

Miscellaneous Amendment

AGENCY: Materials Transportation Bureau, Research and Special Programs Administration, DOT.

ACTION: Final Rule.

SUMMARY: These amendments require shipments of commercial asbestos fibers to be packaged in rigid, airtight or dust and sift proof packagings. Except when the shipment is by private carrier, non-rigid packages, such as bags, must be palletized and unitized using shrink-wrapping or strapped fiberboard wrapping. These amendments represent minimum safety requirements and are intended to reduce the risks to the public health associated with the generation of airborne concentrations of asbestos that may result from the packaging and handling of asbestos fiber shipments in commercial transportation.

EFFECTIVE DATE: These regulations are effective April 30, 1979.

ADDRESS: All written comments received in this rulemaking action are available for examination during regular business hours in the Dockets Branch, Room 6500, Trans Point Building, 2100 Second Street SW., Washington, D.C.

FOR FURTHER INFORMATION CONTACT:

Douglas A. Crockett, Standards Division, Materials Transportation Bureau, Research and Special Programs Administration, 2100 Second Street SW., Washington, D.C. 20590, phone 202-426-2075.

SUPPLEMENTARY INFORMATION: On March 2, 1978, a notice of proposed rulemaking (HM-160; Notice 78-3) was published in the *FEDERAL REGISTER* (43 FR 8562) stating that the MTB was planning to exercise regulatory control over the transportation of asbestos. Specific regulatory requirements were proposed for the control of certain forms of asbestos (e.g., milled or crude asbestos fibers). No requirements were proposed for asbestos fibers which are immersed or fixed in a natural or artificial binder material, or for manufactured products containing asbestos. Interested persons were invited to participate in the rulemaking proceeding through submission of written comments on the proposal to

the MTB. All submissions, including late submissions, that were received on the proposal were fully considered by the MTB in the development of this final rule.

NEED TO REGULATE THE TRANSPORTATION OF ASBESTOS

Several commenters felt that the MTB had failed to establish a need to regulate the transportation of asbestos. One of the commenters suggested that there was no need for the proposed regulatory control of asbestos in transportation because the "methods and procedures now in use for the packaging and transport of asbestos meet the requirements of Part 173.24(A)(sic) of the Transportation Act, that is 'under conditions normally incident to transportation there will be no significant release of the hazardous materials to the environment' and 'the effectiveness of the packaging will not be substantially reduced' . . . (t)he proposal contains no documentation to justify additional regulation." This commenter, while apparently believing that asbestos is a hazardous material, was incorrect in suggesting that asbestos is currently regulated by the MTB; or in suggesting that the purpose of Notice 78-3 was to justify the additional regulation by the MTB of asbestos in transportation. The transportation of asbestos is not now regulated by the MTB. It was precisely the purpose of Notice 78-3 that it should be. If, as the commenter suggests, the transportation of asbestos is now "in compliance with pertinent provisions of the Transportation Act," this rulemaking action will formalize and insure in a uniform and systematic manner that this is the case.

Another commenter stated that Notice 78-3 did "not establish a foundation for regulation, in that it does not document, or even allege for that matter, the actual release of fiber during the transportation of asbestos." As was pointed out in Notice 78-3, the MTB has "no detailed information on the amount of asbestos fibers released during transportation." The MTB does not now regulate asbestos, and has not therefore systematically collected accident data on the amounts of asbestos released in transportation or data on the frequency of such accidents. Most asbestos fiber, however, is currently shipped in bags, and it is undeniable that these bags can and do break, or can be and are being torn or punctured, with a consequent release of some or all of the bag contents. It can be speculated, moreover, that if all of the 750,000 tons of asbestos annually shipped in the United States were packaged in, as one commenter states, the "standard package" of a 100-pound bag; and if as little as one-tenth of one percent of these bags were damaged in

transportation during the year (out of a thousand) and if on the average 1 percent of the contents of the bags so damaged were released, the total amount of asbestos released per year would equal about 7.5 tons. The calculations give a general idea of the magnitude of asbestos fiber that would be released, given a 99.9 percent efficiency factor for "bag integrity" in transportation, and a 99.0 percent efficiency factor in minimizing the amount of asbestos released given tear in the bag. The rather evident fact that asbestos has been accidentally released during transportation has not been contradicted by anything submitted to the public docket on the rulemaking action. One commenter, for example, in discussing the use of open-bed trailers with side racks and tarpaulins to transport asbestos stated that there is no evidence that the use of such trailers "has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." The Asbestos Information Association, an incorporated nonprofit organization representing 51 firms in the United States and Canada engaged in the manufacture or processing of asbestos-containing products and the mining/milling of asbestos fibers, stated that with "the very large volume of asbestos shipped, occasional container damage may occur."

Although several commenters who discussed this matter do not contend that asbestos has not been released in transportation, they generally are of the view that the amounts that are being released are not significant or a sufficient amount to pose an unreasonable risk to public health. The MTB does not agree; it believes that the amounts of asbestos fibers that are being released now, or would be released in the future, in the absence of these amendments, may pose an unreasonable risk to health.

Several commenters were concerned with the statement appearing in Notice 78-3 that "asbestos in its several commercial forms, poses serious health hazards to individuals subject to long term exposure to airborne asbestos concentrations." One commenter stated that "not all long-term exposures to airborne concentrations pose any health hazards . . ." Another commenter suggested that the statement needed "more explicit definition" and that "reference should have been made to unanswered questions within the scientific community concerning mineral type, fiber size and smoking in the asbestos-cancer relationship." One commenter stated that there is a dose-response relationship between exposure to asbestos and disease causation, and that this conclusion is supported by an OSHA statement from its June 7, 1972 preamble.

to its standard for exposure to asbestos dust (37 FR 11318). The OSHA statement is that: "No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers" (emphasis added). Although the MTB had also quoted this statement in Notice 78-3, the words underlined for emphasis had been inadvertently omitted. Under these circumstances, some commenters apparently felt that the MTB was asserting the view that because, according to some commenters, asbestos is ubiquitous, long term exposure to ambient levels of asbestos fibers poses serious health hazards to all people, without regard to their occupational or para-occupational status. It was not the intention of the MTB to assert this view. That there are or can be "undisputed grave consequences from exposure to asbestos" (37 FR 11318) does not depend on the questioned conclusiveness of the evidence reported by OSHA (40 FR 47652) regarding the potential health hazards posed by low-level, brief or intermittent exposure to asbestos. The MTB relies on the foregoing FEDERAL REGISTER references for the general view that exposure to asbestos may pose an unreasonable risk to the public.

SECTION 173.1090(a) AND (b)

Several commenters stated that there are certain mineral ores, ore concentrates and milled mineral products which may have trace amounts of asbestos, or minor amounts of asbestos occurring as contaminants. They suggested that these materials presented no risk to property and little, if any, risk to public health and safety in transportation. Moreover, since the packaging requirements proposed in Notice 78-3 applied to only certain kinds of asbestos, namely milled or crude asbestos fibers produced by an asbestos mill, they further suggested that only "commercial asbestos fibers" be defined as a hazardous material.

The MTB recognizes that there are certain mineral ores, ore concentrates and milled mineral products, as well as other products, that contain certain amounts of asbestos; and that the commercial value of these minerals or products is not dependent on their asbestos content. The specific requirements in these amendments for the control of asbestos fibers in transportation do not apply to such materials or products, nor do they apply to asbestos as a waste product¹ or as a con-

laminating trace element. The amendments apply only to asbestos in its several commercial forms since it is those forms of asbestos that have been firmly established as posing serious health hazards to individuals. A new paragraph has been added which would define commercial asbestos as any material or product containing asbestos that has commercial value because of its asbestos content, and appropriate modifications have been made in the amendments to reflect this clarification. This new paragraph is identified in this amendment as paragraph (b) (paragraphs (b) and (c) in the notice are now paragraphs (c) and (d), respectively).

One commenter recommended that the scope of Notice 78-3 be amended to include, in addition to asbestos fibers, "all mineral and man-made (fibers) which have been identified by U.S. Government agencies as being carcinogenic and which may pose serious health risk." On December 9, 1976, the MTB published an Advance Notice of Proposed Rulemaking (41 FR 53824) in Docket No. HM-145 entitled "Environmental and Health Effects Materials." In that Notice, the MTB announced that it was considering whether new or additional transportation controls are necessary for certain classes of materials which are not generally subject to the existing Hazardous Materials Regulations. The question of whether all mineral and man-made fibers, which have been identified by U.S. Government agencies as being carcinogenic and which pose an unreasonable risk to public health, should be controlled in transportation will be considered in terms of the further development and resolution of the issues associated with Docket HM-145. Notice 78-3 however, pointed out that a large number of comments were received in Docket HM-145, and that a considerable amount of staff evaluation of these comments was still required before it would be possible to issue a notice or notices of proposed rulemaking for environmental and health effects materials, either on a comprehensive or on a selective basis.

SECTION 173.1090(c)(1)

Several commenters objected to the reference made to metal or fiber drums to illustrate the rigid packaging alternative for asbestos fibers. These commenters stated that the asbestos industry has not developed the technology to use this type of packaging alternative; that available technology is not transferable to the use of metal or fiber drums; and that, among other things, the use of this alternative could generate far greater airborne concentrations of asbestos than pack-

source Conservation and Recovery Act (Pub. L. 94-580).

aging and shipping practices currently in effect. As one commenter pointed out:

Commercial asbestos is fluffy. It is difficult to pack this material in a rigid container, and, because the fiber would gradually compact during shipment, it would be difficult to remove it for introduction into the manufacturing process. It would also be extremely cumbersome, if not impossible, to empty rigid containers effectively and rapidly into hoods designed for bags. Spillage would no doubt occur and workers would be unnecessarily exposed to fibers.

Another commenter recommended that a DOT Specification 56 portable tank be included in the amended rule as an acceptable package "for the transportation of asbestos-type products." This commenter stated that "with the use of equipment designed for the purpose, the D.O.T. 56 package can be readily filled or emptied without release of any product dust to the atmosphere or contact with the product by the operator." Another commenter insisted that only metal drums and not fiber drums were acceptable for the transportation of asbestos fibers. These commenters apparently lost sight of the fact that proposed § 173.1090(c)(1) does not "mandate," as one commenter suggested, or even encourage the use of rigid, airtight packaging such as metal or fiber drums or even portable tanks. It provides an alternative method of shipping commercial asbestos fibers. As was indicated in Notice 78-3, the MTB believes that its proposed non-specification packaging standards as applied to the transportation of commercial asbestos is an effective and efficient means of precluding potential problems associated with asbestos airborne emissions occurring during transportation; and that they are consistent with the standards of the EPA and the OSHA. Some of the commenters however were also apparently unaware that the transportation standards for the control of asbestos are designed to be comprehensive in nature such that, once the standards are promulgated, commercial asbestos cannot be packaged and transported in any matter not specified in the amendments. If under more advanced technology the use of rigid, airtight packaging would lessen the likelihood of airborne asbestos emissions associated with bag breakages under current industry wide non-uniform non-standardized packaging practices, then it is necessary that alternative transportation standards be available so as not to preclude the development and utilization of such technology. Although the public record on Notice 78-3 contains statements that the asbestos industry is seeking to improve the technology involved in the shipment and handling of commercial asbestos so as to minimize the possibility for the accidental release of such asbestos incident to

¹Under Docket HM-145A (43 FR 22626, May 25, 1978), new standards and procedures were proposed for the transportation of hazardous waste materials. That proposal would include waste asbestos if so identified by EPA under Section 3001 of the Solid Waste Disposal Act as amended by the Re-

transportation, it is by no means certain that the pace of such technological improvements is rapid enough or that the best, economically feasible technology is being considered. However, the classification of asbestos as an ORM-C will, for the first time, require the submission of incident reports to the MTB by carriers of any unintentional release of asbestos during transportation, and enable the MTB to monitor the safety performance record associated not only with the transportation alternatives available under current technology as provided for by these amendments, but also with any improvements in that technology.

For these reasons, the substance of proposed § 173.1090(c)(1) is being retained but modified to reflect an even broader range of permissible rigid, airtight packaging alternatives. This section now is identified in this amendment as § 173.1090(d)(1) because of the addition of new paragraph (b).

SECTION 173.1090(c)(2)

Proposed paragraph (c)(2) of Notice 78-3 covered the transportation alternative of shipping commercial asbestos in bags when in closed freight containers, motor vehicles, or rail cars that were loaded by the consignor and unloaded by the consignee. Several commenters noted that, unless reliance was placed on using the rigid, airtight packaging alternative provided in the proposal, this alternative would preclude the shipment of asbestos fibers by open-bed trailers. One commenter noted that there is "no evidence to indicate that the use of open-bed trailers with side racks and tarpaulins has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." Another commenter noted that the type of bag permitted by proposed paragraph (c)(2) was not specified, and that the shipper could package asbestos in burlap bags, or very thin paper or polyethylene bags which could permit asbestos fibers to be easily released into the air during transit. Another commenter was concerned with "small volume users of asbestos and customers who, from time to time, require sample shipments for trial production runs of a few hundred pounds," and who under § 173.1090(c)(2) would be forced to acquire the exclusive use of a railcar or highway trailer, or rely on the alternative provided by § 173.1090(c)(1).

Given the lack of detailed data on the amount of asbestos fibers released in transportation and the circum-

stances and causes for such release, the MTB is in general agreement with the thrust of these comments; accordingly, a new paragraph (d)(2) recognizes less restrictive handling of bagged asbestos than was proposed.

SECTIONS 174.840, 175.640, 176.906, 177.844

In these Sections, Notice 78-3 had proposed that, incident to its transportation, asbestos must be loaded, handled, and any asbestos contamination removed, in a manner that will prevent occupational exposure to airborne asbestos particles (emphasis added).

Some commenters objected to the word "prevent," believing that this word was intended to mean completely precluding the possibility of an accident occurring in which asbestos fibers would be released; or completely isolating people involved in the transportation, loading and unloading of asbestos from exposure to asbestos fibers from whatever source such fibers were generated. One commenter pointed out that with "the very large volume of asbestos shipped, occasional container damage may occur." Another commenter pointed out, although in a somewhat contradictory fashion, that since "asbestos is ubiquitous," therefore "airborne levels of asbestos fibers can be present in any place of employment, regardless of whether or not asbestos or products containing known quantities of asbestos are handled" (emphasis added). The Asbestos Information Association in its comments stated that "asbestos is ubiquitous, and there are no workplaces where there is zero occupational exposure to asbestos" (original emphasis). If Notice 78-3 was not as clear as it might have been on this point, it is only necessary to say that the basic purpose of these amendments is to minimize the exposure to airborne asbestos particles accidentally released during or incident to transportation; and appropriate changes to Parts 174, 175, 176, and 177 have been made to reflect this purpose.

ORM-C CLASSIFICATION

Notice 78-3 proposed that the classification for "asbestos" would be as an ORM-C, (Other Regulated Material, Group C). Several commenters were uncertain and concerned about the marking requirements associated with ORM-C classifications. One commenter noted that the designation ORM-C would "carry no meaningful warning to the person handling or opening the package." Another noted that the present regulations of the Occupational Safety and Health Admin-

istration (OSHA) on labeling requirements for asbestos convey much more information than an ORM-C marking requirement. These commenters were apparently not completely familiar with the marking requirements associated with ORM-C designated materials. The ORM-C marking not only warns when a package contains hazardous material, but it is also a certification by the person offering the package for transportation that the material is properly described, classified, packaged, marked, and labeled (where appropriate) and in proper condition for transportation according to applicable regulations of the Department. Neither function precludes or preempts OSHA labeling requirements or creates "contradictory regulatory requirements for labeling" as one commenter suggested. For these reasons, no changes have been made with respect to any marking requirements for asbestos packages.

ECONOMIC/INFLATIONARY IMPACT

In reviewing the potential economic and inflationary impacts associated with the final rule, the MTB has determined that such impacts will be minimal. Based on the comments received, and the consequent modification of Notice 78-3, the only economic costs associated with final amendments pertain to the reporting requirement to be submitted to MTB on the accidental releases of commercial asbestos fibers during or incident to transportation. The absolute annual magnitude of these costs will be, of course, a function of the total number of incident reports that are submitted on accidental releases of asbestos fibers; but in view of the undisputed grave consequences from exposure to asbestos fibers, these reporting requirements will not impose an unnecessary burden on the economy, on individuals, or on public and private organizations.

In consideration of the foregoing Title 49, Code of Federal Regulations Parts 172, 173, 174, 175, 176, and 177 are amended as follows:

PART 172—HAZARDOUS MATERIALS TABLE AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS

1. In § 172.101 the Hazardous Materials Table is amended by adding a new entry, immediately following "Arsine," to read as follows:

[4910-60-C]

§ 172.101 Hazardous materials table.

(1)	(2)	(3)	(4)	(5)		Maximum net quantity in one package		(7)		
				(a)	(b)	(a)	(b)	(a)	(b)	(c)
	Hazardous materials descriptions and proper shipping names	Hazard class	Labels (a) required (if not excepted)	Exception requirements	Specific requirements	Passenger carrying aircraft or railcar	Cargo only aircraft	Cargo vessel	Passenger vessel	Other requirements
a/ w/ A										
(Add)	Asbestos	ORM-C	None	173.1090 (c)	173.1090 (d)	No Limit	No Limit	1, 2	1, 2	Stow and handle to avoid airborne particles.

013783

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

2. Section 173.1090 is added preceding Subpart N to read as follows:

§ 173.1090 Asbestos.

(a) Asbestos includes any of the following hydrated mineral silicates: chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, actinolite asbestos, and every product containing any of these minerals.

(b) Commercial asbestos is any material or product containing asbestos that has commercial value because of its asbestos content.

(c) Asbestos which is immersed or fixed in a natural or artificial binder material (such as cement, plastic, asphalt, resins or mineral ore) and manufactured products containing asbestos or any materials or products whose commercial value is not dependent on their asbestos content, are not subject to the requirements of this subchapter.

(d) Commercial asbestos must be offered for transportation and transported in—

(1) Rigid, airtight packagings such as metal or fiber drums, portable tanks, or

(2) Bags and other non-rigid packagings that are dust and sift proof. When transported by other than a private carrier by highway, bags and other non-rigid packagings containing asbestos must be palletized and unitized by methods such as shrink-wrapping in plastic film or wrapping in fiberboard secured by strapping.

PART 174—CARRIAGE BY RAIL

3. A Subpart M Heading is added immediately following § 174.812 to read as follows:

Subpart M—Detailed Requirements for Other Regulated Materials

4. Section 174.840 is added to read as follows:

§ 174.840 Special loading and handling requirements for asbestos.

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of rail cars removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 175—CARRIAGE BY AIRCRAFT

3. Section 175.640 is added to read as follows:

§ 175.640 Special requirements for other regulated materials.

Asbestos must be loaded, handled,

and unloaded, and any asbestos contamination of aircraft removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 176—CARRIAGE BY VESSEL

6. Section 176.906 is added to read as follows:

§ 176.906 Stowage and handling of asbestos.

Asbestos must be stowed, handled, and unloaded, and any asbestos contamination of vessels removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 177—CARRIAGE BY PUBLIC HIGHWAY

7. Section 177.844 is added to read as follows:

§ 177.844 Other regulated materials.

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of transport vehicles removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53(e).)

NOTE—The Materials Transportation Bureau has determined that these amendments do not require a regulatory analysis under the terms of Executive Order 12044 and DOT implementing procedures (43 FR 9582). A regulatory evaluation is available for review in the docket.

Issued in Washington, D.C., on November 27, 1978.

L. D. SANTMAN,
Director, Materials
Transportation Bureau
(FR Doc. 78-33771 Filed 12-1-78; 8:45 am)

[4910-59-M]

CHAPTER V—NATIONAL HIGHWAY

TRAFFIC SAFETY ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

(Docket No. 78-17; Notice 1)

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

New Pneumatic Tires—Passenger Cars

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation.

ACTION: Final rule.

SUMMARY: Pursuant to petitions the Michelin Tire Corporation (Michelin) and by the Rubber Manufacturers Association (RMA), this notice amends Federal Motor Vehicle Safety Standard No. 109, *New Pneumatic Tire Passenger Cars*, by adding four new tire size designations to Table I of Appendix A of the standard. The amendment permits the introduction into interstate commerce of the new tire sizes.

EFFECTIVE DATE: January 3, 1979, if objections are not received prior to that date.

ADDRESS: Comments should refer to the docket number and be submitted to Room 5108, Nassif Building, 4 Seventh Street SW., Washington, D.C. 20590.

FOR FURTHER INFORMATION CONTACT:

John Diehl, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street SW., Washington, D.C. 20590 (202-426-1714).

SUPPLEMENTARY INFORMATION: According to agency practice, the National Highway Traffic Safety Administration responds to petitions for adding new tire sizes to Table I of Appendix A of Standard No. 109 by quarterly issuing final rules under an abbreviated rulemaking procedure for expediting such routine amendments.

On July 13, 1978, Michelin petitioned for the addition of two new tire size designations requested to be located in a new table, I-QQ within Appendix A of Standard No. 109. On July 13, 1978, and August 3, 1978, the RMA petitioned for the addition of two new tire size designations to existing table I within Table I of Appendix A of the standard. The bases for accepting or denying requests to add new tire size designations are set forth in introductory guidelines to the appendix (October 5, 1968, 33 FR 14954, as amended May 4, 1971, 36 FR 8298; July 22, 1971, 36 FR 13601; and August 13, 1974, 39 FR 28980). The four new tire size designations requested to be added to

Montello

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

013785

March 29, 1979

Mr. Robert Moseley
Safety and Environmental Control
Petroleum & Minerals Group
Dresser Industries, Inc.
P. O. Box 6504
Houston, Texas 77005

Dear Rob:

We have received an updated report from Union Carbide on the proposed DOT asbestos regulations. Copies of relevant information are enclosed for your use.

Union Carbide will be keeping us informed as the issue develops, and of course we'll be doing the same with you.

Best personal regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC:kb
Enclosure

Montello

013786

6106 EAST 32ND PLACE
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March 29, 1979

Mr. W. B. Kirkland
Baroid Petroleum Services Div.
NL Industries, Inc.
P. O. Box 1675
Houston, Texas 77001

Dear Mr. Kirkland:

We have received an updated report from Union Carbide on the proposed DOT asbestos regulations. Copies of relevant information are enclosed for your use.

Union Carbide will be keeping us informed as the issue develops, and of course we'll be doing the same with you.

Best personal regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC:kb

Enclosure

013787

**NL Baroid
Petroleum Services**

January 10, 1979

Montello, Inc.
Attn: Mr. Kenneth Campbell
6101 E. 32nd Place
Tulsa, Oklahoma 74135

Re: Transportation of Asbestos- Visbestos

Dear Ken,

Beginning May 1st 1979 Asbestos Fiber in the form we sell as Visbestos will be classified as a hazardous material for transportation purposes. Because of this, extreme measures must be taken in both the packaging and shipping of Visbestos to be in compliance with the Federal Regulations. Please furnish us information including photographs of packaging, both individual bags and palletized or unitized units to be shipped to us, indicating the required markings of proper shipping name and hazardous classification as required in the regulations. Also furnish us in your letter a statement to indicate that you comply with the regulations as stated.

Your prompt reply will be appreciated.

Yours very truly,


W. B. Kirkland
Director of Purchases

WBK:sa

Baroid Petroleum Services Division/NL Industries, Inc.
P.O. Box 1675, Houston, Texas 77001 Tel. (713) 527-1100 • Cable Address: Baroid-Houston

Montello

013788

6106 EAST 32ND PLACE
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(918) 665-1170 / TWX 910-845-2396

August 24, 1979

Ms. Arlene Schaefer
Milchem, Inc.
P. O. Box 22111
Houston, Texas 77027

Dear Arlene:

Please refer to our letter of August 7th concerning the new DOT regulations on shipments of asbestos. In particular, please refer to the last paragraph on the first page, which mentions the petition filed by Union Carbide. They have been successful on both issues. On Super Visbestos shipped prior to August 20th, the regulations do not apply until December 31, 1979. Final regulations also allow for the shipment of small quantities in fiberboard or wooden boxes, as requested.

In addition, the DOT has reinstated the exemption of private carriers from the palletizing and unitizing requirements. This is certainly a welcome inclusion. For your files, we have enclosed a copy of the regs as printed in the August 16, 1979 Federal Register.

We sincerely hope the regs won't impose any undue burden on our customers. As stated earlier, we began shipping in dust and sift proof bags before August 20th. This should make compliance simpler. Please contact us if you have any questions, or whenever we can be of further service.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

013789

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 24, 1979

Mr. Howard Sutter
Baroid Division
N. L. Industries
P. O. Box 1675
Houston, Texas 77001

Dear Howard:

Please refer to our letter of August 7th concerning the new DOT regulations on shipments of asbestos. In particular, please refer to the last paragraph on the first page, which mentions the petition filed by Union Carbide. They have been successful on both issues. On Super Visbestos shipped prior to August 20th, the regulations do not apply until December 31, 1979. Final regulations also allow for the shipment of small quantities in fiberboard or wooden boxes, as requested.

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We sincerely hope the regs won't impose any undue burden on our customers. As stated earlier, we began shipping in dust and sift proof bags before August 20th. This should make compliance simpler. Please contact us if you have any questions, or whenever we can be of further service.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

013790

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 24, 1979

Mr. Tom Stacy
IMCO Services
P. O. Box 22605
Houston, Texas 77027

Dear Tom:

Please refer to our letter of August 7th concerning the new DOT regulations on shipments of asbestos. In particular, please refer to the last paragraph on the first page, which mentions the petition filed by Union Carbide. They have been successful on both issues. On Super Visbestos shipped prior to August 20th, the regulations do not apply until December 31, 1979. Final regulations also allow for the shipment of small quantities in fiberboard or wooden boxes, as requested.

In addition, the DOT has reinstated the exemption of private carriers from the palletizing and unitizing requirements. This is certainly a welcome inclusion. For your files, we have enclosed a copy of the regs as printed in the August 16, 1979 Federal Register.

We sincerely hope the regs won't impose any undue burden on our customers. As stated earlier, we began shipping in dust and sift proof bags before August 20th. This should make compliance simpler. Please contact us if you have any questions, or whenever we can be of further service.

Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

013791

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 24, 1979

Mr. Al Pinkerton
GH-Gufco
5005 Riverway
Suite 100
Houston, Texas 77056

Dear Al:

Please refer to our letter of August 7th concerning the new DOT regulations on shipments of asbestos. In particular, please refer to the last paragraph on the first page, which mentions the petition filed by Union Carbide. They have been successful on both issues. On Super Visbestos shipped prior to August 20th, the regulations do not apply until December 31, 1979. Final regulations also allow for the shipment of small quantities in fiberboard or wooden boxes, as requested.

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We sincerely hope the regs won't impose any undue burden on our customers. As stated earlier, we began shipping in dust and sift proof bags before August 20th. This should make compliance simpler. Please contact us if you have any questions, or whenever we can be of further service.

Best regards,

MONTELO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

013792

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 24, 1979

Mr. Robert Moseley
Petroleum & Minerals Group
Dresser Industries, Inc.
P. O. Box 6504
Houston, Texas 77005

Dear Rob:

Please refer to our letter of August 7th concerning the new DOT regulations on shipments of asbestos. In particular, please refer to the last paragraph on the first page, which mentions the petition filed by Union Carbide. They have been successful on both issues. On Super Visbestos shipped prior to August 20th, the regulations do not apply until December 31, 1979. Final regulations also allow for the shipment of small quantities in fiberboard or wooden boxes, as requested.

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Best regards,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

013793

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 24, 1979

Mr. John Bracken
Oil Base Incorporated
3625 S. W. Freeway
Houston, Texas 77027

Dear John:

Please refer to our letter of August 7th concerning the new DOT regulations on shipments of asbestos. In particular, please refer to the last paragraph on the first page, which mentions the petition filed by Union Carbide. They have been successful on both issues. On Super Visbestos shipped prior to August 20th, the regulations do not apply until December 31, 1979. Final regulations also allow for the shipment of small quantities in fiberboard or wooden boxes, as requested.

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Best regards,

MONTELLLO, INC.

Kenneth N. Campbell

KNC/jd

Enc. (1)

Montello

013794

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 7, 1979

Mr. John Bracken
Oil Base Incorporated
3625 S. W. Freeway
Houston, Texas 77027

Dear John:

New DOT regulations affecting the packaging and transportation of asbestos in the U.S. will become effective August 20, 1979. The Super Visbestos which we supply you will be subject to these regulations. We suggest that you become familiar with the regulations, and especially with the following provision:

173.1090(d) Commercial asbestos must be offered for transportation and transported in -

- (1) Rigid, airtight packagings such as metal or fiber drums, portable tanks;
- (2) Bags or other non-rigid packagings in closed freight containers, motor vehicles, or rail cars that are loaded by and for the exclusive use of the consignor and unloaded by the consignee; or
- (3) Bags or other non-rigid packagings which are dust and sift proof and which are palletized and unitized by methods such as shrink wrapping in plastic film or wrapping in fiber-board secured by strapping.

Beginning immediately all Super Visbestos shipped to you will be in dust and sift proof bags. This is being accomplished by double shrink filming each bag, at no additional cost to you. In addition, palletizing and unitizing with shrink wrap will be available at our cost of \$15.00 per ton. All bags will be marked "ASBESTOS ORM-C", as provided in the regulations.

Realizing that field inventories of previously purchased Super Visbestos may be on hand August 20th, our manufacturer Union Carbide has petitioned the DOT for an extension of the effective date to October 1, 1979, on all such previously purchased material. Included in that petition is a request for DOT approval on the use of cardboard boxes as an alternate to palletizing and

Mr. John Bracken
August 7, 1979
Page 2:

unitizing. (It is felt that the latter can offer somewhat greater flexibility in the handling of small lots between field locations.) We are informed that there is good reason to expect DOT approval of the petition, and we will contact you as soon as we are notified.

Finally, we will call your attention to paragraphs 174.840 and 177.844, which read essentially the same, as follows:

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of rail cars (transport vehicles) removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation.

Please let us know if you have need of any further information on this subject. We will do our best to cooperate in every possible way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Montello

013796

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 7, 1979

Mr. Robert Moseley
Petroleum & Minerals Group
Dresser Industries, Inc.
P. O. Box 6504
Houston, Texas 77005

Dear Rob:

New DOT regulations affecting the packaging and transportation of asbestos in the U.S. will become effective August 20, 1979. The Super Visbestos which we supply you will be subject to these regulations. We suggest that you become familiar with the regulations, and especially with the following provision:

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Mr. Robert Moseley
August 7, 1979
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Please let us know if you have need of any further information on this subject. We will do our best to cooperate in every possible way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Montello

013798

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 7, 1979

Mr. Al Pinkerton
GH-Gufco
5005 Riverway
Suite 100
Houston, Texas 77056

Dear Al:

New DOT regulations affecting the packaging and transportation of asbestos in the U.S. will become effective August 20, 1979. The Super Visbestos which we supply you will be subject to these regulations. We suggest that you become familiar with the regulations, and especially with the following provision:

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Mr. Al Pinkerton
August 7, 1979
Page 2:

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Please let us know if you have need of any further information on this subject. We will do our best to cooperate in every possible way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Montello

013800

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 7, 1979

Mr. Tom Stacy
IMCO Services
P. O. Box 22605
Houston, Texas 77027

Dear Tom:

New DOT regulations affecting the packaging and transportation of asbestos in the U.S. will become effective August 20, 1979. The Super Visbestos which we supply you will be subject to these regulations. We suggest that you become familiar with the regulations, and especially with the following provision:

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- (1) Rigid, airtight packagings such as metal or fiber drums, portable tanks;
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Mr. Tom Stacy
August 7, 1979
Page 2:

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Please let us know if you have need of any further information on this subject. We will do our best to cooperate in every possible way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Montello

013802

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 7, 1979

Mr. Howard Sutter
Baroid Division
N L Industries
P. O. Box 1675
Houston, Texas 77001

Dear Howard:

New DOT regulations affecting the packaging and transportation of asbestos in the U.S. will become effective August 20, 1979. The Super Visbestos which we supply you will be subject to these regulations. We suggest that you become familiar with the regulations, and especially with the following provision:

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Mr. Howard Sutter
August 7, 1979
Page 2:

013803

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Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

Montello

013804

6106 EAST 32ND PLACE
TULSA, OKLAHOMA 74135
(918) 665-1170 / TWX 910-845-2396

August 7, 1979

Ms. Arlene Schaefer
Milchem, Inc.
P. O. Box 22111
Houston, Texas 77027

Dear Arlene:

New DOT regulations affecting the packaging and transportation of asbestos in the U.S. will become effective August 20, 1979. The Super Visbestos which we supply you will be subject to these regulations. We suggest that you become familiar with the regulations, and especially with the following provision:

173.1090(d) Commercial asbestos must be offered for transportation and transported in -

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Ms. Arlene Schaefer
August 7, 1979
Page 2:

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Please let us know if you have need of any further information on this subject. We will do our best to cooperate in every possible way.

Sincerely,

MONTELLO, INC.

Kenneth N. Campbell

KNC/jd

[4910-60-M]

Title 49—Transportation

CHAPTER I—RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

(Docket No. HM-160; Amdt. Nos. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44)

TRANSPORTATION OF ASBESTOS

Miscellaneous Amendment

AGENCY: Materials Transportation Bureau, Research and Special Programs Administration, DOT.

ACTION: Final Rule.

SUMMARY: These amendments require shipments of commercial asbestos fibers to be packaged in rigid, airtight or dust and sift proof packagings. Except when the shipment is by private carrier, non-rigid packages, such as bags, must be palletized and unitized using shrink-wrapping or strapped fiberboard wrapping. These amendments represent minimum safety requirements and are intended to reduce the risks to the public health associated with the generation of airborne concentrations of asbestos that may result from the packaging and handling of asbestos fiber shipments in commercial transportation.

EFFECTIVE DATE: These regulations are effective April 30, 1979.

ADDRESS: All written comments received in this rulemaking action are available for examination during regular business hours in the Dockets Branch, Room 6500, Trans Point Building, 2100 Second Street SW., Washington, D.C.

FOR FURTHER INFORMATION CONTACT:

Douglas A. Crockett, Standards Division, Materials Transportation Bureau, Research and Special Programs Administration, 2100 Second Street SW., Washington, D.C. 20590, phone 202-426-2075.

SUPPLEMENTARY INFORMATION: On March 2, 1978, a notice of proposed rulemaking (HM-160; Notice 78-3) was published in the *FEDERAL REGISTER* (43 FR 8562) stating that the MTB was planning to exercise regulatory control over the transportation of asbestos. Specific regulatory requirements were proposed for the control of certain forms of asbestos (e.g., milled or crude asbestos fibers). No requirements were proposed for asbestos fibers which are immersed or fixed in a natural or artificial binder material, or for manufactured products containing asbestos. Interested persons were invited to participate in the rulemaking proceeding through submission of written comments on the proposal to

the MTB. All submissions, including late submissions, that were received on the proposal were fully considered by the MTB in the development of this final rule.

NEED TO REGULATE THE TRANSPORTATION OF ASBESTOS

Several commenters felt that the MTB had failed to establish a need to regulate the transportation of asbestos. One of the commenters suggested that there was no need for the proposed regulatory control of asbestos in transportation because the "methods and procedures now in use for the packaging and transport of asbestos meet the requirements of Part 173.24(A)(sic) of the Transportation Act, that is 'under conditions normally incident to transportation there will be no significant release of the hazardous materials to the environment' and 'the effectiveness of the packaging will not be substantially reduced . . . (t)he proposal contains no documentation to justify additional regulation." This commenter, while apparently believing that asbestos is a hazardous material, was incorrect in suggesting that asbestos is currently regulated by the MTB; or in suggesting that the purpose of Notice 78-3 was to justify the additional regulation by the MTB of asbestos in transportation. The transportation of asbestos is not now regulated by the MTB. It was precisely the purpose of Notice 78-3 that it should be. If, as the commenter suggests, the transportation of asbestos is now "in compliance with pertinent provisions of the Transportation Act," this rulemaking action will formalize and insure in a uniform and systematic manner that this is the case.

Another commenter stated that Notice 73-8 did "not establish a foundation for regulation, in that it does not document, or even allege for that matter, the actual release of fiber during the transportation of asbestos." As was pointed out in Notice 78-3, the MTB has "no detailed information on the amount of asbestos fibers released during transportation." The MTB does not now regulate asbestos, and has not therefore systematically collected accident data on the amounts of asbestos released in transportation or data on the frequency of such accidents. Most asbestos fiber, however, is currently shipped in bags, and it is undeniable that these bags can and do break, or can be and are being torn or punctured, with a consequent release of some or all of the bag contents. It can be speculated, moreover, that if all of the 750,000 tons of asbestos annually shipped in the United States were packaged in, as one commenter states, the "standard package" of a 100-pound bag; and if as little as one-tenth of one percent of these bags were damaged in

transportation during the year (or out of a thousand) and if on the average 1 percent of the contents of the bags so damaged were released, the total amount of asbestos released per year would equal about 7.5 tons. The calculations give a general idea of the magnitude of asbestos fiber that would be released, given a 99.9 percent efficiency factor for "bag integrity" in transportation, and a 99.0 percent efficiency factor in minimizing the amount of asbestos released given tear in the bag. The rather evident fact that asbestos has been accidentally released during transportation has not been contradicted by anything submitted to the public docket on the rulemaking action. One commenter, for example, in discussing the use of open-bed trailers with side racks and tarpaulins to transport asbestos states that there is no evidence that the use of such trailers "has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." The Asbestos Information Association, an incorporated nonprofit organization representing 51 firms in the United States and Canada engaged in the manufacture or processing of asbestos-containing products and the mining/milling of asbestos fiber, stated that with "the very large volume of asbestos shipped, occasional container damage may occur."

Although several commenters who discussed this matter do not contend that asbestos has not been released in transportation, they generally are of the view that the amounts that are being released are not significant or of a sufficient amount to pose an unreasonable risk to public health. The MTB does not agree; it believes that the amounts of asbestos fibers that are being released now, or would be released in the future, in the absence of these amendments, may pose an unreasonable risk to health.

Several commenters were concerned with the statement appearing in Notice 78-3 that "asbestos in its several commercial forms, poses serious health hazards to individuals subject to long term exposure to airborne asbestos concentrations." One commenter stated that "not all long-term exposures to airborne concentrations pose any health hazards . . ." Another commenter suggested that the statement needed "more explicit definition" and that "reference should have been made to unanswered questions within the scientific community concerning mineral type, fiber size and smoking in the asbestos-cancer relationship." One commenter stated that there is a dose-response relationship between exposure to asbestos and disease causation, and that this conclusion is supported by an OSHA statement from its June 7, 1972 preamble

RULES AND REGULATIONS

to its standard for exposure to asbestos dust (37 FR 11318). The OSHA statement is that: "No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers" (emphasis added). Although the MTB had also quoted this statement in Notice 78-3, the words underlined for emphasis had been inadvertently omitted. Under these circumstances, some commenters apparently felt that the MTB was asserting the view that because, according to some commenters, asbestos is ubiquitous, long term exposure to ambient levels of asbestos fibers poses serious health hazards to all people, without regard to their occupational or para-occupational status. It was not the intention of the MTB to assert this view. That there are or can be "undisputed grave consequences from exposure to asbestos" (37 FR 11318) does not depend on the questioned conclusiveness of the evidence reported by OSHA (40 FR 47652) regarding the potential health hazards posed by low-level, brief or intermittent exposure to asbestos. The MTB relies on the foregoing FEDERAL REGISTER references for the general view that exposure to asbestos may pose an unreasonable risk to the public.

SECTION 173.1090(a) AND (b)

Several commenters stated that there are certain mineral ores, ore concentrates and milled mineral products which may have trace amounts of asbestos, or minor amounts of asbestos occurring as contaminants. They suggested that these materials presented no risk to property and little, if any, risk to public health and safety in transportation. Moreover, since the packaging requirements proposed in Notice 78-3 applied to only certain kinds of asbestos, namely milled or crude asbestos fibers produced by an asbestos mill, they further suggested that only "commercial asbestos fibers" be defined as a hazardous material.

The MTB recognizes that there are certain mineral ores, ore concentrates and milled mineral products, as well as other products, that contain certain amounts of asbestos, and that the commercial value of these minerals or products is not dependent on their asbestos content. The specific requirements in these amendments for the control of asbestos fibers in transportation do not apply to such materials or products, nor do they apply to asbestos as a waste product or as a con-

taminating trace element. The amendments apply only to asbestos in its several commercial forms since it is those forms of asbestos that have been firmly established as posing serious health hazards to individuals. A new paragraph has been added which would define commercial asbestos as any material or product containing asbestos that has commercial value because of its asbestos content, and appropriate modifications have been made in the amendments to reflect this clarification. This new paragraph is identified in this amendment as paragraph (b) (paragraphs (b) and (c) in the notice are now paragraphs (c) and (d), respectively).

One commenter recommended that the scope of Notice 78-3 be amended to include, in addition to asbestos fibers, "all mineral and man-made (fibers) which have been identified by U.S. Government agencies as being carcinogenic and which may pose serious health risk." On December 9, 1976, the MTB published an Advance Notice of Proposed Rulemaking (41 FR 53824) in Docket No. HM-145 entitled "Environmental and Health Effects Materials." In that Notice, the MTB announced that it was considering whether new or additional transportation controls are necessary for certain classes of materials which are not generally subject to the existing Hazardous Materials Regulations. The question of whether all mineral and man-made fibers, which have been identified by U.S. Government agencies as being carcinogenic and which pose an unreasonable risk to public health, should be controlled in transportation will be considered in terms of the further development and resolution of the issues associated with Docket HM-145. Notice 78-3 however, pointed out that a large number of comments were received in Docket HM-145, and that a considerable amount of staff evaluation of these comments was still required before it would be possible to issue a notice or notices of proposed rulemaking for environmental and health effects materials, either on a comprehensive or on a selective basis.

SECTION 173.1090(c)(1)

Several commenters objected to the reference made to metal or fiber drums to illustrate the rigid packaging alternative for asbestos fibers. These commenters stated that the asbestos industry has not developed the technology to use this type of packaging alternative; that available technology is not transferable to the use of metal or fiber drums; and that, among other things, the use of this alternative could generate far greater airborne concentrations of asbestos than pack-

aging and shipping practices currently in effect. As one commenter pointed out:

Commercial asbestos is fluffy. It is difficult to pack this material in a rigid container, and, because the fiber would gradually compact during shipment, it would be difficult to remove it for introduction into the manufacturing process. It would also be extremely cumbersome, if not impossible, to empty rigid containers effectively and rapidly into hoods designed for bags. Spillage would no doubt occur and workers would be unnecessarily exposed to fibers.

Another commenter recommended that a DOT Specification 56 portable tank be included in the amended rule as an acceptable package "for the transportation of asbestos-type products." This commenter stated that "with the use of equipment designed for the purpose, the D.O.T. 56 package can be readily filled or emptied without release of any product dust to the atmosphere or contact with the product by the operator." Another commenter insisted that only metal drums and not fiber drums were acceptable for the transportation of asbestos fibers. These commenters apparently lost sight of the fact that proposed § 173.1090(c)(1) does not "mandate," as one commenter suggested, or even encourage the use of rigid, airtight packaging such as metal or fiber drums or even portable tanks. It provides an alternative method of shipping commercial asbestos fibers. As was indicated in Notice 78-3, the MTB believes that its proposed non-specification packaging standards as applied to the transportation of commercial asbestos is an effective and efficient means of precluding potential problems associated with asbestos airborne emissions occurring during transportation; and that they are consistent with the standards of the EPA and the OSHA. Some of the commenters however were also apparently unaware that the transportation standards for the control of asbestos are designed to be comprehensive in nature such that, once the standards are promulgated, commercial asbestos cannot be packaged and transported in any matter not specified in the amendments. If under more advanced technology the use of rigid, airtight packaging would lessen the likelihood of airborne asbestos emissions associated with bag breakages under current industry wide non-uniform non-standardized packaging practices, then it is necessary that alternative transportation standards be available so as not to preclude the development and utilization of such technology. Although the public record on Notice 78-3 contains statements that the asbestos industry is seeking to improve the technology involved in the shipment and handling of commercial asbestos so as to minimize the possibility for the accidental release of such asbestos incident to

¹Under Docket HM-145A (43 FR 22626, May 25, 1978), new standards and procedures were proposed for the transportation of hazardous waste materials. That proposal would include waste asbestos if so identified by EPA under Section 3001 of the Solid Waste Disposal Act as amended by the Re-

source Conservation and Recovery Act (Pub. L. 94-580).

transportation, it is by no means certain that the pace of such technological improvements is rapid enough or that the best, economically feasible technology is being considered. However, the classification of asbestos as an ORM-C will, for the first time, require the submission of incident reports to the MTB by carriers of any unintentional release of asbestos during transportation, and enable the MTB to monitor the safety performance record associated not only with the transportation alternatives available under current technology as provided for by these amendments, but also with any improvements in that technology.

For these reasons, the substance of proposed § 173.1090(c)(1) is being retained but modified to reflect an even broader range of permissible rigid, airtight packaging alternatives. This section now is identified in this amendment as § 173.1090(d)(1) because of the addition of new paragraph (b).

SECTION 173.1090(c)(2)

Proposed paragraph (c)(2) of Notice 78-3 covered the transportation alternative of shipping commercial asbestos in bags when in closed freight containers, motor vehicles, or rail cars that were loaded by the consignor and unloaded by the consignee. Several commenters noted that, unless reliance was placed on using the rigid, airtight packaging alternative provided in the proposal, this alternative would preclude the shipment of asbestos fibers by open-bed trailers. One commenter noted that there is "no evidence to indicate that the use of open-bed trailers with side racks and tarpaulins has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." Another commenter noted that the type of bag permitted by proposed paragraph (c)(2) was not specified, and that the shipper could package asbestos in burlap bags, or very thin paper or polyethylene bags which could permit asbestos fibers to be easily released into the air during transit. Another commenter was concerned with "small volume users of asbestos and customers who, from time to time, require sample shipments for trial production runs of a few hundred pounds," and who under § 173.1090(c)(2) would be forced to acquire the exclusive use of a railcar or highway trailer, or rely on the alternative provided by § 173.1090(c)(1).

Given the lack of detailed data on the amount of asbestos fibers released in transportation and the circum-

stances and causes for such release, the MTB is in general agreement with the thrust of these comments; accordingly, a new paragraph (d)(2) recognizes less restrictive handling of bagged asbestos than was proposed.

SECTIONS 174.840, 175.640, 176.906, 177.844

In these Sections, Notice 78-3 had proposed that, incident to its transportation, asbestos must be loaded, handled, and any asbestos contamination removed, in a manner that will prevent occupational exposure to airborne asbestos particles (emphasis added).

Some commenters objected to the word "prevent," believing that this word was intended to mean completely precluding the possibility of an accident occurring in which asbestos fibers would be released; or completely isolating people involved in the transportation, loading and unloading of asbestos from exposure to asbestos fibers from whatever source such fibers were generated. One commenter pointed out that with "the very large volume of asbestos shipped, occasional container damage may occur." Another commenter pointed out, although in a somewhat contradictory fashion, that since "asbestos is ubiquitous," therefore "airborne levels of asbestos fibers can be present in any place of employment, regardless of whether or not asbestos or products containing known quantities of asbestos are handled" (emphasis added). The Asbestos Information Association in its comments stated that "asbestos is ubiquitous, and there are no workplaces where there is zero occupational exposure to asbestos" (original emphasis). If Notice 78-3 was not as clear as it might have been on this point, it is only necessary to say that the basic purpose of these amendments is to minimize the exposure to airborne asbestos particles accidentally released during or incident to transportation; and appropriate changes to Parts 174, 175, 176, and 177 have been made to reflect this purpose.

ORM-C CLASSIFICATION

Notice 78-3 proposed that the classification for "asbestos" would be as an ORM-C. (Other Regulated Material, Group C). Several commenters were uncertain and concerned about the marking requirements associated with ORM-C classifications. One commenter noted that the designation ORM-C would "carry no meaningful warning to the person handling or opening the package." Another noted that the present regulations of the Occupational Safety and Health Admin-

istration (OSHA) on labeling requirements for asbestos convey much more information than an ORM-C marking requirement. These commenters were apparently not completely familiar with the marking requirements associated with ORM-C designated materials. The ORM-C marking not only warns when a package contains hazardous material, but it is also a certification by the person offering the package for transportation that the material is properly described, classed, packaged, marked, and labeled (when appropriate) and in proper condition for transportation according to applicable regulations of the Department. Neither function precludes or preempts OSHA labeling requirements or creates "contradictory regulatory requirements for labeling" as one commenter suggested. For these reasons, no changes have been made with respect to any marking requirements for asbestos packages.

ECONOMIC/INFLATIONARY IMPACT

In reviewing the potential economic and inflationary impacts associated with the final rule, the MTB has determined that such impacts will be minimal. Based on the comments received, and the consequent modification of Notice 78-3, the only economic costs associated with final amendment pertain to the reporting requirements to be submitted to MTB on the accidental releases of commercial asbestos fibers during or incident to transportation. The absolute annual magnitude of these costs will be, of course, a function of the total number of incident reports that are submitted on accidental releases of asbestos fibers; but in view of the undisputed grave consequences from exposure to asbestos fibers, these reporting requirements will not impose an unnecessary burden on the economy, on individuals, or on public and private organizations.

In consideration of the foregoing, Title 49, Code of Federal Regulations, Parts 172, 173, 174, 175, 176, and 177 are amended as follows:

PART 172—HAZARDOUS MATERIALS TABLE AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS

1. In § 172.101 the Hazardous Materials Table is amended by adding a new entry, immediately following "Arsine," to read as follows:

[4910-60-C]

§ 172.101 Hazardous materials table.

(1) */ W/ A	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(4) Labels(a) required (if not excepted)	(5) Packaging		Maximum net quantity in one package		(7) Water shipments		
				(a) Exception	(b) Specific require- ments	(a) Passenger carry- ing aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- senger vessel	(c) Other requirement
*	(Add)	ORM-C	None	173.1090 (c)	173.1090 (d)	No Limit	No Limit	1, 2	1, 2	Stow and handle to avoid air- borne particles.
	Asbestos									

Department of Transportation final rule
on the transportation of asbestos, Federal
Register, Vol. 43, No. 233, p. 56664, Dec. 4,
1978.

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[4910-60-M]

Title 49—Transportation

CHAPTER I—RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

(Docket No. HM-160; Amdt. Nos. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44)

TRANSPORTATION OF ASBESTOS

Miscellaneous Amendment

AGENCY: Materials Transportation Bureau, Research and Special Programs Administration, DOT.

ACTION: Final Rule.

SUMMARY: These amendments require shipments of commercial asbestos fibers to be packaged in rigid, airtight or dust and sift proof packagings. Except when the shipment is by private carrier, non-rigid packages, such as bags, must be palletized and unitized using shrink-wrapping or strapped fiberboard wrapping. These amendments represent minimum safety requirements and are intended to reduce the risks to the public health associated with the generation of airborne concentrations of asbestos that may result from the packaging and handling of asbestos fiber shipments in commercial transportation.

EFFECTIVE DATE: These regulations are effective April 30, 1979.

ADDRESS: All written comments received in this rulemaking action are available for examination during regular business hours in the Dockets Branch, Room 6500, Trans Point Building, 2100 Second Street SW., Washington, D.C.

FOR FURTHER INFORMATION CONTACT:

Douglas A. Crockett, Standards Division, Materials Transportation Bureau, Research and Special Programs Administration, 2100 Second Street SW., Washington, D.C. 20590, phone 202-426-2075.

SUPPLEMENTARY INFORMATION: On March 2, 1978, a notice of proposed rulemaking (HM-160; Notice 78-3) was published in the FEDERAL REGISTER (43 FR 8562) stating that the MTB was planning to exercise regulatory control over the transportation of asbestos. Specific regulatory requirements were proposed for the control of certain forms of asbestos (e.g., milled or crude asbestos fibers). No requirements were proposed for asbestos fibers which are immersed or fixed in a natural or artificial binder material, or for manufactured products containing asbestos. Interested persons were invited to participate in the rulemaking proceeding through submission of written comments on the proposal to

the MTB. All submissions, including late submissions, that were received on the proposal were fully considered by the MTB in the development of this final rule.

NEED TO REGULATE THE TRANSPORTATION OF ASBESTOS

Several commenters felt that the MTB had failed to establish a need to regulate the transportation of asbestos. One of the commenters suggested that there was no need for the proposed regulatory control of asbestos in transportation because the "methods and procedures now in use for the packaging and transport of asbestos meet the requirements of Part 173.24(A)(5)(c) of the Transportation Act, that is 'under conditions normally incident to transportation there will be no significant release of the hazardous materials to the environment' and 'the effectiveness of the packaging will not be substantially reduced'." (The proposal contains no documentation to justify additional regulation." This commenter, while apparently believing that asbestos is a hazardous material, was incorrect in suggesting that asbestos is currently regulated by the MTB; or in suggesting that the purpose of Notice 78-3 was to justify the additional regulation by the MTB of asbestos in transportation. The transportation of asbestos is not now regulated by the MTB. It was precisely the purpose of Notice 78-3 that it should be. If, as the commenter suggests, the transportation of asbestos is now "in compliance with pertinent provisions of the Transportation Act," this rulemaking action will formalize and insure in a uniform and systematic manner that this is the case.

Another commenter stated that Notice 78-3 did "not establish a foundation for regulation, in that it does not document, or even allege for that matter, the actual release of fiber during the transportation of asbestos." As was pointed out in Notice 78-3, the MTB has "no detailed information on the amount of asbestos fibers released during transportation." The MTB does not now regulate asbestos, and has not therefore systematically collected accident data on the amounts of asbestos released in transportation or data on the frequency of such accidents. Most asbestos fiber, however, is currently shipped in bags, and it is undeniable that these bags can and do break, or can be and are being torn or punctured, with a consequent release of some or all of the bag contents. It can be speculated, moreover, that if all of the 750,000 tons of asbestos annually shipped in the United States were packaged in, as one commenter states, the "standard package" of a 100-pound bag; and if as little as one-tenth of one percent of these bags were damaged in

transportation during the year (one out of a thousand) and if on the average 1 percent of the contents of the bags so damaged were released, the total amount of asbestos released per year would equal about 7.5 tons. These calculations give a general idea of the magnitude of asbestos fiber that would be released, given a 99.9 percent efficiency factor for "bag integrity" in transportation, and a 99.0 percent efficiency factor in minimizing the amount of asbestos released given a tear in the bag. The rather evident fact that asbestos has been accidentally released during transportation has not been contradicted by anything submitted to the public docket on this rulemaking action. One commenter, for example, in discussing the use of open-bed trailers with side racks and tarpaulins to transport asbestos stated that there is no evidence that the use of such trailers "has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." The Asbestos Information Association, an incorporated nonprofit organization representing 51 firms in the United States and Canada engaged in the manufacture or processing of asbestos-containing products and the mining/milling of asbestos fibers, stated that with "the very large volume of asbestos shipped, occasional container damage may occur."

Although several commenters who discussed this matter do not contend that asbestos has not been released in transportation, they generally are of the view that the amounts that are being released are not significant or of a sufficient amount to pose an unreasonable risk to public health. The MTB does not agree; it believes that the amounts of asbestos fibers that are being released now, or would be released in the future, in the absence of these amendments, may pose an unreasonable risk to health.

Several commenters were concerned with the statement appearing in Notice 78-3 that "asbestos in its several commercial forms, poses serious health hazards to individuals subject to long term exposure to airborne asbestos concentrations." One commenter stated that "not all long-term exposures to airborne concentrations pose any health hazards." Another commenter suggested that the statement needed "more explicit definition" and that "reference should have been made to unanswered questions within the scientific community concerning mineral type, fiber size and smoking in the asbestos-cancer relationship." One commenter stated that there is a dose-response relationship between exposure to asbestos and disease causation, and that this conclusion is supported by an OSHA statement from its June 7, 1972 preamble

to its standard for exposure to asbestos dust (37 FR 11318). The OSHA statement is that: "No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers" (emphasis added). Although the MTB had also quoted this statement in Notice 78-3, the words underlined for emphasis had been inadvertently omitted. Under these circumstances, some commenters apparently felt that the MTB was asserting the view that because, according to some commenters, asbestos is ubiquitous, long term exposure to ambient levels of asbestos fibers poses serious health hazards to all people, without regard to their occupational or para-occupational status. It was not the intention of the MTB to assert this view. That there are or can be "undisputed grave consequences from exposure to asbestos" (37 FR 11318) does not depend on the questioned conclusiveness of the evidence reported by OSHA (40 FR 47652) regarding the potential health hazards posed by low-level, brief or intermittent exposure to asbestos. The MTB relies on the foregoing FEDERAL REGISTER references for the general view that exposure to asbestos may pose an unreasonable risk to the public.

SECTION 173.1090(a) AND (b)

Several commenters stated that there are certain mineral ores, ore concentrates and milled mineral products which may have trace amounts of asbestos, or minor amounts of asbestos occurring as contaminants. They suggested that these materials presented no risk to property and little, if any, risk to public health and safety in transportation. Moreover, since the packaging requirements proposed in Notice 78-3 applied to only certain kinds of asbestos, namely milled or crude asbestos fibers produced by an asbestos mill, they further suggested that only "commercial asbestos fibers" be defined as a hazardous material.

The MTB recognizes that there are certain mineral ores, ore concentrates and milled mineral products, as well as other products, that contain certain amounts of asbestos, and that the commercial value of these minerals or products is not dependent on their asbestos content. The specific requirements in these amendments for the control of asbestos fibers in transportation do not apply to such materials or products, nor do they apply to asbestos as a waste product or as a con-

taminating trace element. The amendments apply only to asbestos in its several commercial forms since it is those forms of asbestos that have been firmly established as posing serious health hazards to individuals. A new paragraph has been added which would define commercial asbestos as any material or product containing asbestos that has commercial value because of its asbestos content, and appropriate modifications have been made in the amendments to reflect this clarification. This new paragraph is identified in this amendment as paragraph (b) (paragraphs (b) and (c) in the notice are now paragraphs (c) and (d), respectively).

One commenter recommended that the scope of Notice 78-3 be amended to include, in addition to asbestos fibers, "all mineral and man-made (fibers) which have been identified by U.S. Government agencies as being carcinogenic and which may pose serious health risk." On December 9, 1976, the MTB published an Advance Notice of Proposed Rulemaking (41 FR 53824) in Docket No. HM-145 entitled "Environmental and Health Effects Materials." In that Notice, the MTB announced that it was considering whether new or additional transportation controls are necessary for certain classes of materials which are not generally subject to the existing Hazardous Materials Regulations. The question of whether all mineral and man-made fibers, which have been identified by U.S. Government agencies as being carcinogenic and which pose an unreasonable risk to public health, should be controlled in transportation will be considered in terms of the further development and resolution of the issues associated with Docket HM-145. Notice 78-3 however, pointed out that a large number of comments were received in Docket HM-145, and that a considerable amount of staff evaluation of these comments was still required before it would be possible to issue a notice or notices of proposed rulemaking for environmental and health effects materials, either on a comprehensive or on a selective basis.

SECTION 173.1090(c)(1)

Several commenters objected to the reference made to metal or fiber drums to illustrate the rigid packaging alternative for asbestos fibers. These commenters stated that the asbestos industry has not developed the technology to use this type of packaging alternative; that available technology is not transferable to the use of metal or fiber drums; and that, among other things, the use of this alternative could generate far greater airborne concentrations of asbestos than pack-

aging and shipping practices currently in effect. As one commenter pointed out:

Commercial asbestos is fluffy. It is difficult to pack this material in a rigid container, and, because the fiber would gradually compact during shipment, it would be difficult to remove it for introduction into the manufacturing process. It would also be extremely cumbersome, if not impossible, to empty rigid containers effectively and rapidly into hoods designed for bags. Spillage would no doubt occur and workers would be unnecessarily exposed to fibers.

Another commenter recommended that a DOT Specification 56 portable tank be included in the amended rule as an acceptable package "for the transportation of asbestos-type products." This commenter stated that "with the use of equipment designed for the purpose, the D.O.T. 56 package can be readily filled or emptied without release of any product dust to the atmosphere or contact with the product by the operator." Another commenter insisted that only metal drums and not fiber drums were acceptable for the transportation of asbestos fibers. These commenters apparently lost sight of the fact that proposed § 173.1090(c)(1) does not "mandate," as one commenter suggested, or even encourage the use of rigid, airtight packaging such as metal or fiber drums or even portable tanks. It provides an alternative method of shipping commercial asbestos fibers. As was indicated in Notice 78-3, the MTB believes that its proposed non-specification packaging standards as applied to the transportation of commercial asbestos is an effective and efficient means of precluding potential problems associated with asbestos airborne emissions occurring during transportation; and that they are consistent with the standards of the EPA and the OSHA. Some of the commenters however were also apparently unaware that the transportation standards for the control of asbestos are designed to be comprehensive in nature such that, once the standards are promulgated, commercial asbestos cannot be packaged and transported in any matter not specified in the amendments. If under more advanced technology the use of rigid, airtight packaging would lessen the likelihood of airborne asbestos emissions associated with bag breakages under current industry wide non-uniform non-standardized packaging practices, then it is necessary that alternative transportation standards be available so as not to preclude the development and utilization of such technology. Although the public record on Notice 78-3 contains statements that the asbestos industry is seeking to improve the technology involved in the shipment and handling of commercial asbestos so as to minimize the possibility for the accidental release of such asbestos incident to

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source Conservation and Recovery Act (Pub. L. 94-580).

transportation, it is by no means certain that the pace of such technological improvements is rapid enough or that the best, economically feasible technology is being considered. However, the classification of asbestos as an ORM-C will, for the first time, require the submission of incident reports to the MTB by carriers of any unintentional release of asbestos during transportation, and enable the MTB to monitor the safety performance record associated not only with the transportation alternatives available under current technology as provided for by these amendments, but also with any improvements in that technology.

For these reasons, the substance of proposed § 173.1090(c)(1) is being retained but modified to reflect an even broader range of permissible rigid, airtight packaging alternatives. This section now is identified in this amendment as § 173.1090(d)(1) because of the addition of new paragraph (b).

SECTION 173.1090(c)(2)

Proposed paragraph (c)(2) of Notice 78-3 covered the transportation alternative of shipping commercial asbestos in bags when in closed freight containers, motor vehicles, or rail cars that were loaded by the consignor and unloaded by the consignee. Several commenters noted that, unless reliance was placed on using the rigid, airtight packaging alternative provided in the proposal, this alternative would preclude the shipment of asbestos fibers by open-bed trailers. One commenter noted that there is "no evidence to indicate that the use of open-bed trailers with side racks and tarpaulins has contributed to bag breakage and the release of airborne concentrations of asbestos fiber." Another commenter noted that the type of bag permitted by proposed paragraph (c)(2) was not specified, and that the shipper could package asbestos in burlap bags, or very thin paper or polyethylene bags which could permit asbestos fibers to be easily released into the air during transit. Another commenter was concerned with "small volume users of asbestos and customers who, from time to time, require sample shipments for trial production runs of a few hundred pounds," and who under § 173.1090(c)(2) would be forced to acquire the exclusive use of a railcar or highway trailer, or rely on the alternative provided by § 173.1090(c)(1).

Given the lack of detailed data on the amount of asbestos fibers released in transportation and the circum-

stances and causes for such release, the MTB is in general agreement with the thrust of these comments; accordingly, a new paragraph (d)(2) recognizes less restrictive handling of bagged asbestos than was proposed.

SECTIONS 174.840, 175.640, 176.906, 177.844

In these Sections, Notice 78-3 had proposed that, incident to its transportation, asbestos must be loaded, handled, and any asbestos contamination removed, in a manner that will *prevent* occupational exposure to airborne asbestos particles (emphasis added).

Some commenters objected to the word "prevent," believing that this word was intended to mean completely precluding the possibility of an accident occurring in which asbestos fibers would be released; or completely isolating people involved in the transportation, loading and unloading of asbestos from exposure to asbestos fibers from whatever source such fibers were generated. One commenter pointed out that with "the very large volume of asbestos shipped, occasional container damage may occur." Another commenter pointed out, although in a somewhat contradictory fashion, that since "asbestos is ubiquitous," therefore "airborne levels of asbestos fibers can be present in any place of employment, regardless of whether or not asbestos or products containing known quantities of asbestos are handled" (emphasis added). The Asbestos Information Association in its comments stated that "asbestos is ubiquitous, and there are no workplaces where there is zero occupational exposure to asbestos" (original emphasis). If Notice 78-3 was not as clear as it might have been on this point, it is only necessary to say that the basic purpose of these amendments is to minimize the exposure to airborne asbestos particles accidentally released during or incident to transportation; and appropriate changes to Parts 174, 175, 176, and 177 have been made to reflect this purpose.

ORM-C CLASSIFICATION

Notice 78-3 proposed that the classification for "asbestos" would be as an ORM-C, (Other Regulated Material, Group C). Several commenters were uncertain and concerned about the marking requirements associated with ORM-C classifications. One commenter noted that the designation ORM-C would "carry no meaningful warning to the person handling or opening the package." Another noted that the present regulations of the Occupational Safety and Health Admin-

istration (OSHA) on labeling requirements for asbestos convey much more information than an ORM-C marking requirement. These commenters were apparently not completely familiar with the marking requirements associated with ORM-C designated materials. The ORM-C marking not only warns when a package contains hazardous material, but it is also a certification by the person offering the package for transportation that the material is properly described, classed, packaged, marked, and labeled (when appropriate) and in proper condition for transportation according to applicable regulations of the Department. Neither function precludes or preempts OSHA labeling requirements or creates "contradictory regulatory requirements for labeling" as one commenter suggested. For these reasons, no changes have been made with respect to any marking requirements for asbestos packages.

ECONOMIC/INFLATIONARY IMPACT

In reviewing the potential economic and inflationary impacts associated with the final rule, the MTB has determined that such impacts will be minimal. Based on the comments received, and the consequent modification of Notice 78-3, the only economic costs associated with final amendment pertain to the reporting requirements to be submitted to MTB on the accidental releases of commercial asbestos fibers during or incident to transportation. The absolute annual magnitude of these costs will be, of course, a function of the total number of incident reports that are submitted on accidental releases of asbestos fibers; but in view of the undisputed grave consequences from exposure to asbestos fibers, these reporting requirements will not impose an unnecessary burden on the economy, on individuals, or on public and private organizations.

In consideration of the foregoing, Title 49, Code of Federal Regulations, Parts 172, 173, 174, 175, 176, and 177 are amended as follows:

PART 172—HAZARDOUS MATERIALS TABLE AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS

1. In § 172.101 the Hazardous Materials Table is amended by adding a new entry, immediately following "Arsine," to read as follows:

[4910-60-C]

§ 172.101 Hazardous materials table.

(1) */ W/ A	(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(4) Labels(a) required (if not excepted)	(5) Packaging		Maximum net quantity in one package		(7) Water shipments		
				(a) Exception	(b) Specific require- ments	(a) Passenger carry- ing aircraft or railcar	(b) Cargo only aircraft	(a) Cargo vessel	(b) Pas- enger vessel	(c) Other requirement
*	(Add) Asbestos	ORM-C	None	173.1090 (c)	173.1090 (d)	No Limit	No Limit	1, 2	1, 2	Stow and handle to avoid air- borne particles.

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

2. Section 173.1090 is added preceding Subpart N to read as follows:

§ 173.1090 Asbestos.

(a) Asbestos includes any of the following hydrated mineral silicates: chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, actinolite asbestos, and every product containing any of these minerals.

(b) Commercial asbestos is any material or product containing asbestos that has commercial value because of its asbestos content.

(c) Asbestos which is immersed or fixed in a natural or artificial binder material (such as cement, plastic, asphalt, resins or mineral ore) and manufactured products containing asbestos or any materials or products whose commercial value is not dependent on their asbestos content, are not subject to the requirements of this subchapter.

(d) Commercial asbestos must be offered for transportation and transported in—

(1) Rigid, airtight packagings such as metal or fiber drums, portable tanks, or

(2) Bags and other non-rigid packagings that are dust and sift proof. When transported by other than a private carrier by highway, bags and other non-rigid packagings containing asbestos must be palletized and unitized by methods such as shrink-wrapping in plastic film or wrapping in fiberboard secured by strapping.

PART 174—CARRIAGE BY RAIL

3. A Subpart M Heading is added immediately following § 174.812 to read as follows:

Subpart M—Detailed Requirements for Other Regulated Materials

4. Section 174.840 is added to read as follows:

§ 174.840 Special loading and handling requirements for asbestos.

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of rail cars removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 175—CARRIAGE BY AIRCRAFT

5. Section 175.640 is added to read as follows:

§ 175.640 Special requirements for other regulated materials.

Asbestos must be loaded, handled,

and unloaded, and any asbestos contamination of aircraft removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 176—CARRIAGE BY VESSEL

6. Section 176.906 is added to read as follows:

§ 176.906 Stowage and handling of asbestos.

Asbestos must be stowed, handled, and unloaded, and any asbestos contamination of vessels removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

PART 177—CARRIAGE BY PUBLIC HIGHWAY

7. Section 177.844 is added to read as follows:

§ 177.844 Other regulated materials.

Asbestos must be loaded, handled, and unloaded, and any asbestos contamination of transport vehicles removed, in a manner that will minimize occupational exposure to airborne asbestos particles released incident to transportation. (See § 173.1090 of this subchapter.)

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53(e).)

NOTE.—The Materials Transportation Bureau has determined that these amendments do not require a regulatory analysis under the items of Executive Order 12044 and DOT implementing procedures (43 FR 9532). A regulatory evaluation is available for review in the docket.

Issued in Washington, D.C., on November 27, 1978.

L. D. SANTMAN,
Director, Materials
Transportation Bureau.

(FR Doc. 78-33771 Filed 12-1-78; 8:45 am)

Pertinent sections of the Department of
Transportation's Hazardous Materials Regulations,
Title 49, Code of Federal Regulations, Parts 171-
172.

chapter, the letters "ICC" may continue to be placed on any packaging requiring specification markings until January 1, 1970.

(b) Packagings with the specification markings "ICC" placed thereon before January 1, 1970, may be continued in service as marked.

[Amdt. 171-2, 33 F.R. 17918, Dec. 3, 1968]

§ 171.15 Immediate notice of certain hazardous materials incidents.

(a) At the earliest practicable moment, each carrier who transports hazardous materials shall give notice in accordance with paragraph (b) of this section after each incident that occurs during the course of transportation (including loading, unloading and temporary storage) in which as a direct result of hazardous materials—

(1) A person is killed;

(2) A person receives injuries requiring his hospitalization;

(3) Estimated carrier or other property damage exceeds \$50,000;

(4) Fire, breakage, spillage, or suspected radioactive contamination occurs involving shipment of radioactive material. (See also §§ 174.588(c)(1), 175.655 (j)(3), and 177.861(a) of this chapter.); or

(5) Fire, breakage, spillage, or suspected contamination occurs involving shipment of etiologic agents; or

(6) A situation exists of such a nature that, in the judgment of the carrier, it should be reported in accordance with paragraph (b) of this section even though it does not meet the criteria of paragraph (a) (1), (2), or (3) of this section; e.g., a continuing danger of life exists at the scene of the incident.

(b) Each notice required by paragraph (a) of this section shall be given the Department by telephone at Area Code (202) 426-1830. Notice involving etiologic agents may be given the Director, Center for Disease Control, U.S. Public Health Service, Atlanta, Ga., Area Code (404) 633-5313, in place of the notice to the Department. Each notice must include the following information:

(1) Name of reporter.

(2) Name and address of carrier represented by reporter.

(3) Phone number where reporter can be contacted.

(4) Date, time, and location of incident.

(5) The extent of injuries, if any.

(6) Classification, name, and quantity of hazardous materials involved, if such information is available.

(7) Type of incident and nature of hazardous material involvement and whether a continuing danger to life exists at the scene.

(c) Each carrier making a report under this section shall also make the report required by § 171.16.

[Amdt. 171-7, 35 F.R. 16837, Oct. 3, 1970, as amended by Amdt. 171-13, 36 F.R. 21201, Nov. 4, 1971; Amdt. 171-18, 38 F.R. 8162, Mar. 22, 1973]

§ 171.16 Detailed hazardous materials incident reports.

(a) Each carrier who transports hazardous materials shall report in writ-

ing in duplicate on DOT Form F 5800.1 to the Department within 15 days of the date of discovery, each incident that occurs during the course of transportation (including loading, unloading, or temporary storage) in which, as a direct result of the hazardous materials, any of the circumstances set forth in § 171.15(a) occurs or there has been an unintentional release of hazardous materials from a package (including a tank).

(b) Each carrier making a report under this section shall send that report to the Secretary, Hazardous Materials Regulations Board, Department of Transportation, Washington, D.C. 20590.

[Amdt. 171-7, 35 F.R. 16837, Oct. 3, 1970]

PART 172—HAZARDOUS MATERIALS TABLE AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS

Subpart A—General

Sec. 172.1 Purpose and scope.
172.3 Applicability.

Subpart B—Table of Hazardous Materials, Their Description, Proper Shipping Name, Class, Label, Packaging, and Other Requirements

172.100 Purpose and use of the table.

172.101 Hazardous materials table.

Subpart C—Shipping Papers

172.200 Applicability.

172.201 General entries.

172.202 Description of hazardous material on shipping papers.

172.203 Additional description requirements.

172.204 Shipper's certification.

Subpart D—Marking

172.300 General marking requirements.

172.302 Export shipments by water.

172.304 Marking specifications.

172.305 Consignee's name and address.

172.308 Authorized abbreviations.

172.310 Radioactive materials.

172.312 Liquid hazardous materials.

172.316 Packagings containing material classed as ORM.

172.326 Portable tanks.

172.328 Cargo tanks.

172.330 Tank cars.

Subpart E—Labeling

172.400 General labeling requirements.

172.401 Prohibited labeling.

172.402 Additional labeling requirements.

172.403 Radioactive material.

172.404 Labels for mixed and consolidated packaging.

172.405 Authorized label modifications.

172.406 Placement of labels.

172.407 Label specifications.

172.411 EXPLOSIVE A, EXPLOSIVE B, AND EXPLOSIVE C labels.

172.415 NON-FLAMMABLE GAS label.

172.416 POISON GAS label.

172.417 FLAMMABLE GAS label.

172.419 FLAMMABLE LIQUID label.

172.420 FLAMMABLE SOLID label.

172.422 SPONTANEOUSLY COMBUSTIBLE label.

172.423 DANGEROUS WHEN WET label.

172.426 OXIDIZER label.

172.427 ORGANIC PEROXIDE label.

172.430 POISON label.

172.432 IRRITANT label.

172.436 RADIOACTIVE WHITE-I label.

172.438 RADIOACTIVE YELLOW-II label.

172.440 RADIOACTIVE YELLOW-III label.

172.442 CORROSIVE label.

172.444 ETIOLOGIC AGENT label.

Filed as part of the original document.

Sec. 172.446 MAGNETIZED MATERIAL label.
172.448 CARGO AIRCRAFT ONLY label.
172.450 EMPTY label.

Subpart F—Placarding

172.500 Applicability of placarding requirements.

172.502 Prohibited placarding.

172.504 General placarding requirements.

172.506 Providing and affixing placards: highway.

172.508 Providing and affixing placards: rail.

172.510 Special placarding provisions: rail.

172.512 Freight container.

172.514 Cargo tanks and portable tanks.

172.516 Visibility and display of placards.

172.519 General specifications for placards.

172.521 DANGEROUS placard.

172.522 EXPLOSIVES A placard.

172.524 EXPLOSIVES B placard.

172.525 Standard requirements for the EMPTY placard.

172.527 Background requirements for certain placards on rail cars.

172.528 NON-FLAMMABLE GAS placard.

172.530 OXYGEN placard.

172.532 FLAMMABLE GAS placard.

172.536 CELORENE placard.

172.540 POISON GAS placard.

172.542 FLAMMABLE placard and modification.

172.544 COMBUSTIBLE placard and modification.

172.546 FLAMMABLE SOLID placard.

172.548 FLAMMABLE SOLID W placard.

172.550 OXIDIZER placard.

172.552 ORGANIC PEROXIDE placard.

172.554 POISON placard.

172.556 RADIOACTIVE placard.

172.558 CORROSIVE placard.

APPENDIX A—Specifications for colors.

APPENDIX B—Dimensional specification for placards.

APPENDIX C—Dimensional specifications for recommended placard holder.

AUTHORITY: 18 U.S.C. 824, 46 U.S.C. 170 (7)

(49 U.S.C. 1471, 1472(b)(1), 1807), 49 CFR

1.53(e)-(h).

AUTHORITY: 49 U.S.C. 1803, 1804; 49 CFR

1.53(e).

EFFECTIVE DATE NOTE: Jan. 3, 1977, for

above emergency citation.

Source: Amdt. 172-22, 41 FR 15996, Apr. 15,

1976, unless otherwise noted.

EFFECTIVE DATE NOTE: (1) Except as pro-

vided in paragraphs (2) through (4), com-

pliance with the provisions of this amend-

ment is not mandatory until January 1, 1977.

(2) Compliance with the provisions of this

amendment pertaining to the information

required to appear on a shipping paper or the

format of a shipping paper, is not mandatory

until July 1, 1977. (See note to 49 CFR

172.204(a) regarding delayed compliance with

that section's required use of a newly worded

shipper's certification.)

(3) A package filled, marked or labeled be-

fore July 1, 1975, in accordance with regula-

tions in effect on June 30, 1976, may be offered

for transportation and transported, even

though it does not comply with the package,

marking and labeling provisions of this

amendment, if: (1) it is offered for transporta-

tion before July 1, 1977, and (2) it complies

with the package, marking and labeling regu-

lations in effect on June 30, 1976.

(4) Compliance with the provisions of this

amendment appearing in Subpart F of Part

172 (Placarding) is not mandatory until July

1, 1977.

(5) Under the authority of any of the pre-

ceding four numbered paragraphs:

(1) When a provision of this amendment

is not complied with, the comparable pro-

vision (if any) of the regulations in effect

subchapter must be entered either before the name of the class of the material or following the basic description of the material in the car.

(3) The shipping paper for each specification DOT 112A or 114A tank car (without head shields) containing a flammable compressed gas must contain the notation, "DOT 112A" or "DOT 114A," as appropriate, and either "Must be handled in accordance with FRA E.O. No. 5" or "Shove to rest per E.O. No. 5."

(b) *Transportation by highway.* Following the basic description for a hazardous material in a specification MC 330 or MC 331 cargo tank made of quenched and tempered steel, there must be entered for—

(1) *Anhydrous ammonia.* (i) The words "0.2 per cent water" to indicate the suitability for shipping anhydrous ammonia in the cargo tank as authorized by § 172.817 of this subchapter, or

(ii) The words "NOT FOR Q AND T TANKS" when the anhydrous ammonia does not contain 0.2 per cent or more water by weight.

(2) *Liquefied petroleum gas.* The word "Non-corrosive" or "Non-cor" to indicate the suitability for shipment of the "Non-corrosive" liquefied petroleum gas offered for transportation by cargo tank as authorized by § 173.315(a)(1) Note 15 of this subchapter.

(i) *Transportation by water.* (1) Each shipment by water must have the following additional shipping paper entries:

(i) Identification of the type of packages such as barrels, drums, cylinders, and boxes.

(ii) The number of each type of package including those in a freight container or on a pallet, and

(iii) The gross weight of each type of package or the individual gross weight of each package.

(2) The shipping paper for a hazardous material offered for transportation by water to any country outside the United States must have in parenthesis the technical name of the material following the proper shipping name when the material is described by a "n.o.s." entry in § 172.101. For Example: Corrosive liquid, n.o.s. (caprylyl chloride), Corrosive material. However, for a mixture, only the technical name of any hazardous material giving the mixture its hazardous properties must be identified.

§ 172.204 Shipper's certification.

(a) *General.* Except as provided in paragraphs (b) and (c) of this section, each person who offers a hazardous material for transportation shall certify that the material offered for transportation in accordance with this subchapter by printing (manually or mechanically) the following statement on the shipping paper containing the required shipping description:

This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

NOTE.—Preprinted certificates complying with 49 CFR 173.430(a) in effect on June 30, 1976, may be used through June 30, 1979. After June 30, 1979, use of the certificate required by this section is mandatory.

(b) *Exceptions.* No certification is required for hazardous material offered for transportation by highway that is transported—

(1) In a cargo tank supplied by the carrier, or

(2) By the shipper as a private carrier except for a hazardous material that is to be reshipped or transferred from one carrier to another.

(c) *Transportation by air.*—(1) *General.* Certification containing the following language may be used in place of the certification required by paragraph (a) of this section:

I hereby certify that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and in proper condition for carriage by air according to applicable national governmental regulations.

(2) *Certificate in duplicate.* Each person who offers a hazardous material to an aircraft operator for transportation by air shall provide two copies of the certification required in this section. (See § 175.30 of this subchapter.)

(3) *Passenger and cargo aircraft.* Each person who offers for transportation by air a hazardous material authorized for air transportation shall add to the certification required in this section the following statement:

This shipment is within the limitations prescribed for passenger aircraft/cargo-only aircraft (delete nonapplicable).

(4) *Radioactive material.* Each person who offers any radioactive material for transportation aboard a passenger-carrying aircraft shall sign (mechanically or manually) a printed certificate stating that the shipment contains radioactive material intended for use in, or incident to, research, medical diagnosis or treatment. This requirement does not apply to materials excepted under the provisions of § 175.10(a)(6) and (a)(8) of this subchapter.

(d) *Signature.* The certifications required by paragraph (a) or (c) of this section—

(1) Must be legibly signed by a principal, officer, partner, or employee of the shipper or his agent; and

(2) May be legibly signed manually, by typewriter, or by other mechanical means.

Subpart D—Marking

§ 172.300 General marking requirements.

Except as provided by this subchapter, each person who offers a package containing a hazardous material for transportation shall mark the package with the proper shipping name required by § 172.101. However, when it has been determined by the shipper that a package has been previously marked as required for the material it contains, it need not

be re-marked. This section does not apply to portable tanks, cargo tanks and tank cars.

[Amdt. 172-29, 41 FR 15996, Apr. 15, 1976, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

§ 172.302 Export shipments by water.

(a) Each package of hazardous material offered for export by water and described by a "n.o.s." entry in § 172.101 must have the technical name of the material added in parentheses immediately following the proper shipping name. For example: Corrosive liquid, n.o.s. (Caprylyl chloride).

(b) For a mixture, only the technical name of any hazardous material giving a mixture its hazardous properties must be identified.

[Amdt. 172-29, 41 FR 15996, Apr. 15, 1976, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

§ 172.304 Marking specifications.

(a) The marking required in this subpart—(1) Must be durable, in English and printed on or affixed to the surface of a package or on a label, tag, or sign.

(2) Must be displayed on a background of sharply contrasting color;

(3) Must be unobscured by labels or attachments; and

(4) Must be located away from any other marking (such as advertising) that could substantially reduce its effectiveness.

§ 172.306 Consignee's name and address.

(a) Each package containing a hazardous material offered for transportation must be marked with the name and address of the consignee or consignor except when the package is—(1) Transported by highway and will not be transferred from one motor carrier to another;

(2) Part of a carload lot, truckload lot, or freight container load, and the entire contents of the rail car, truck or freight container are tendered from one consignor to one consignee, or

(3) A portable tank, cargo tank or tank car.

[Amdt. 172-29, 41 FR 15996, Apr. 15, 1976, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

§ 172.308 Authorized abbreviations.

(a) Abbreviations may not be used except in the following instances—(1) For marking descriptions on ammunition, such as ammunition for cannon without projectiles, etc., the words "with" or "without" may be abbreviated as "W" or "W/O" for example: "ammunition for cannon W/O projectiles"

(2) The abbreviation "ORM" may be used in place of the words "Other Regulated Materials."

§ 172.310 Radioactive materials.

(a) In addition to any other markings required by this subpart, each package containing radioactive materials must be marked as follows: (1) Each package of radioactive materials in excess of 110

RULES AND REGULATIONS

pounds (50 kilograms) must have its gross weight plainly and durably marked on the outside of the package.

(2) Each package of radioactive materials which conforms to the requirements for Type A or Type B packaging (§§ 173.389(j) and (k) and 173.398(b) and (c) of this subchapter) must be plainly and durably marked on the outside of the package in letters at least 1/2-inch (13 mm.) high, with the words "TYPE A" or "TYPE B" as appropriate. A packaging which is not in compliance with these requirements may not be so marked.

(3) Each package of radioactive material destined for export shipment must also be marked "USA" in conjunction with the specification marking, or other package certificate identification. (See §§ 173.393a and 173.393b of this subchapter.)

§ 172.312 Liquid hazardous materials.

(a) Except as provided in this section, each package having an inside packaging containing liquid hazardous materials must be—(1) Packed with closures upward, and

(2) Legibly marked "THIS SIDE UP" or "THIS END UP" as appropriate, to indicate the upward position of the inside packaging.

(b) Except as otherwise prescribed in Part 173 of this subchapter cylinders of liquefied compressed gas and specification containers 6D, 37M, 37P, and 21P are not required to be marked "THIS SIDE UP" or "THIS END UP".

(c) Arrows for purposes other than indicating proper package orientation may not be displayed on a package containing a hazardous material that is a liquid.

(1) An arrow symbol indicating "This Way Up" as specified in ANSI MH6.11968 entitled "Pictorial Marking for Handling of Goods" should be used in addition to the marking required by this section and § 173.25 of this subchapter.

[Amdt. 172-29, 41 FR 15996, Apr. 15, 1976, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

§ 172.316 Packagings containing material classed as ORM.

(a) Except as provided in § 173.505 of this subchapter, each package containing a material classed as ORM-A, B, C, or D must be plainly and durably marked on at least one side or end with the appropriate ORM designation immediately following or below the proper shipping name of the material. The appropriate ORM designation must be placed within a rectangle that is approximately 1/4 inch (6.3 mm.) larger on each side than the designation. The appropriate designation for each ORM must be:

- (1) ORM-A for an ORM-A.
- (2) ORM-B-KEEP DRY for an ORM-B that is a solid and is corrosive only to aluminum when wet.
- (3) ORM-B for an ORM-B other than that described in paragraph (a) (2) of this section.
- (4) ORM-C for an ORM-C.
- (5) ORM-D-AIR for an ORM-D that is prepared for air shipment and pack-

aged in accordance with the provisions of § 173.6 of this subchapter.

(6) ORM-D for an ORM-D other than that described in paragraph (a) (5) of this section.

(b) When the ORM-D marking including the proper shipping name can not be affixed on the package surface, it may be on an attached tag.

(c) The marking ORM-A, B, C, or D is the certification by the person offering the package for transportation that the material is properly described, classed, packaged, marked, and labeled (when appropriate) and in proper condition for transportation according to the applicable regulations of the Department. This form of certification does not preclude the requirement for a certificate on a shipping paper when required by § 172.204.

[Amdt. 172-29, 41 FR 15996, Apr. 15, 1976, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

§ 172.326 Portable tanks.

(a) A portable tank containing a hazardous material must be marked in lettering two inches (50.8 mm.) or more in height with the proper shipping name of the material. This marking must be legibly displayed, as specified in this part on two opposing sides.

(b) A portable tank marked with the name of a specific hazardous material may not be used to transport any other material unless the marking is removed, or changed to identify the hazardous material in the portable tank, whichever is appropriate.

(c) The name of the owner, or when appropriate, of the lessee, must be legibly displayed on a portable tank that contains a hazardous material.

[Amdt. 172-29, 41 FR 15996, Apr. 15, 1976, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

§ 172.328 Cargo tanks.

(a) *Required markings: Hazardous materials other than gases.* When transporting a hazardous material other than a compressed gas, a cargo tank required by Part 173 of this subchapter to be marked with the proper shipping name of the contents must be marked as specified in this part on each end and each side.

(b) *Required markings: gases.* Each cargo tank transporting flammable or nonflammable compressed gas subject to this subchapter must be legibly marked in lettering two inches (50.8 mm.) or more in height as specified in this Part on each end and each side with—

(1) The Proper shipping name of the gas, or

(2) An appropriate common name for the material such as "Refrigerant Gas."

(c) *QT/NQT marking for MC 330 and MC 331 cargo tanks.* Each specification MC 330 and MC 331 cargo tank must be appropriately marked "QT" or "NQT" to indicate it is constructed of quenched and tempered steel (QT) or other than quenched and tempered steel (NQT).

These markings must be 2 inches (50.8 mm.) or more in height and must be placed near the specification identification plate.

(d) A cargo tank marked with the name of a specific hazardous material may not be used to transport any other material unless the marking is removed, or changed to identify the hazardous material the cargo tank contains, whichever is appropriate.

[Amdt. 172-29, 41 FR 15996, Apr. 15, 1976, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

§ 172.330 Tank cars.

(a) When required to be marked by Parts 173 or 179 of this subchapter, each tank car used to transport a hazardous material must be marked as specified in this subpart with the—(1) Proper shipping name, or

(2) Common name authorized in this subchapter for the material such as "Refrigerant Gas."

(b) The letters in required markings must be 4 inches (101.6 mm.) or more in height with at least a 5/8-inch (15.9 mm.) stroke. The separation between each letter must be at least 3/4-inch (19.0 mm.).

(c) The markings must be—(1) Affixed to both sides of the tank car; and

(2) Readily visible when viewed from each side of the tank car.

(d) A tank car marked with the name of a specific hazardous material may not be used to transport any other material unless the marking is removed, or changed to identify the hazardous material the tank car contains, whichever is appropriate.

[Amdt. 172-29, 41 FR 15996, as amended by Amdt. 172-29A, 41 FR 40678, Sept. 20, 1976]

Subpart E—Labeling

§ 172.400 General labeling requirements.

(a) Except as otherwise provided in this subchapter, each person who offers a package, overpack, or freight container containing a hazardous material for transportation shall label it, when required, with labels prescribed for the material as specified in § 172.101 and in accordance with this subpart.

(b) A label is not required on a—

(1) Package for which labeling is not required under the conditions set forth in this subchapter and in this section;

(2) Cylinder containing a compressed gas classed as flammable or nonflammable that is—(i) Carried by a private or contract motor carrier;

(ii) Not overpacked; and

(iii) Durably and legibly marked in accordance with CGA Pamphlet C-7, Appendix A.

(3) Military ammunition shipped by, for, or to the U.S. Department of Defense (DOD) when in carload or truckload shipments, if loaded and unloaded by the shipper, or DOD.

(4) Package containing a hazardous material other than ammunition that is—(i) Loaded and unloaded under the supervision of DOD personnel, and

DOT Form F 5800.1

Department of Transportation Incident Report Form

DEPARTMENT OF TRANSPORTATION

Form Approved OMB No. 04-5613

HAZARDOUS MATERIALS INCIDENT REPORT

INSTRUCTIONS: Submit this report in duplicate to the Director, Office of Hazardous Materials Operations, Materials Transportation Bureau, Department of Transportation, Washington, D.C. 20590, (ATTN: Op. Div.). If space provided for any item is inadequate, complete that item under Section H, "Remarks", keying to the entry number being completed. Copies of this form, in limited quantities, may be obtained from the Director, Office of Hazardous Materials Operations. Additional copies in this prescribed format may be reproduced and used, if on the same size and kind of paper.

A INCIDENT			
1. TYPE OF OPERATION 1 ☐ AIR 2 ☐ HIGHWAY 3 ☐ RAIL 4 ☐ WATER 5 ☐ FREIGHT FORWARDER 6 ☐ OTHER (Identify) _____			
2. DATE AND TIME OF INCIDENT (Month - Day - Year) _____ a.m. _____ p.m.		3. LOCATION OF INCIDENT _____	
B REPORTING CARRIER, COMPANY OR INDIVIDUAL			
4. FULL NAME _____		5. ADDRESS (Number, Street, City, State and Zip Code) _____	
6. TYPE OF VEHICLE OR FACILITY _____			
C SHIPMENT INFORMATION			
7. NAME AND ADDRESS OF SHIPPER (Origin address) _____		8. NAME AND ADDRESS OF CONSIGNEE (Destination address) _____	
9. SHIPPING PAPER IDENTIFICATION NO. _____		10. SHIPPING PAPERS ISSUED BY ☐ CARRIER ☐ SHIPPER ☐ OTHER (Identify) _____	
D DEATHS, INJURIES, LOSS AND DAMAGE			
DUE TO HAZARDOUS MATERIALS INVOLVED			13. ESTIMATED AMOUNT OF LOSS AND/OR PROPERTY DAMAGE INCLUDING COST OF DECONTAMINATION (Round off in dollars) \$ _____
11. NUMBER PERSONS INJURED _____	12. NUMBER PERSONS KILLED _____		
14. ESTIMATED TOTAL QUANTITY OF HAZARDOUS MATERIALS RELEASED _____			
E HAZARDOUS MATERIALS INVOLVED			
15. HAZARD CLASS (*Sec. 172.101, Col. 3) _____	16. SHIPPING NAME (*Sec. 172.101, Col. 2) _____	17. TRADE NAME _____	
F NATURE OF PACKAGING FAILURE			
18. (Check all applicable boxes)			
(1) DROPPED IN HANDLING	(2) EXTERNAL PUNCTURE	(3) DAMAGE BY OTHER FREIGHT	
(4) WATER DAMAGE	(5) DAMAGE FROM OTHER LIQUID	(6) FREEZING	
(7) EXTERNAL HEAT	(8) INTERNAL PRESSURE	(9) CORROSION OR RUST	
(10) DEFECTIVE FITTINGS, VALVES, OR CLOSURES	(11) LOOSE FITTINGS, VALVES OR CLOSURES	(12) FAILURE OF INNER RECEPTACLES	
(13) BOTTOM FAILURE	(14) BODY OR SIDE FAILURE	(15) WELD FAILURE	
(16) CHIME FAILURE	(17) OTHER CONDITIONS (Identify) _____	19. SPACE FOR DOT USE ONLY	

Form DOT F 5800.1 (10-70) (9/1/76)

*Editorial change to incorporate redesignation per HM-112.

G					PACKAGING INFORMATION - If more than one size or type packaging is involved in loss of material show packaging information separately for each. If more space is needed, use Section H "Remarks" below keying to the item number.																				
					ITEM		#1		#2		#3														
20					TYPE OF PACKAGING INCLUDING INNER RECEPTACLES (Steel drums, wooden box, cylinder, etc.)																				
21					CAPACITY OR WEIGHT PER UNIT (55 gallons, 65 lbs., etc.)																				
22					NUMBER OF PACKAGES FROM WHICH MATERIAL ESCAPED																				
23					NUMBER OF PACKAGES OF SAME TYPE IN SHIPMENT																				
24					DOT SPECIFICATION NUMBER(S) ON PACKAGES (21P, 17E, 3AA, etc., or none)																				
25					SHOW ALL OTHER DOT PACKAGING MARKINGS (Part 178)																				
26					NAME, SYMBOL, OR REGISTRATION NUMBER OF PACKAGING MANUFACTURER																				
27					SHOW SERIAL NUMBER OF CYLINDERS, CARGO TANKS, TANK CARS, PORTABLE TANKS																				
28					TYPE DOT LABEL(S) APPLIED																				
29					IF RECONDITIONED OR REQUALIFIED, SHOW		A		REGISTRATION NO. OR SYMBOL																
							B		DATE OF LAST TEST OF INSPECTION																
30					IF SHIPMENT IS UNDER DOT OR USCG SPECIAL PERMIT OR EXEMPTION, ENTER PERMIT OR EXEMPTION NO.																				
H													REMARKS - Describe essential facts of incident including but not limited to defects, damage, probable cause, stowage, action taken at the time discovered, and action taken to prevent future incidents. Include any recommendations to improve packaging, handling, or transportation of hazardous materials. Photographs and diagrams should be submitted when necessary for clarification.												
31. NAME OF PERSON PREPARING REPORT (Type or print)													32. SIGNATURE												
33. TELEPHONE NO. (Include Area Code)													34. DATE REPORT PREPARED												

Reverse of Form DOT F 5800.1 (10-70)



ASBESTOS INFORMATION ASSOCIATION

NORTH AMERICA

1745 Jefferson Davis Highway, Crystal Square 4, Suite 509
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013823

Dockets Section
Office of Hazardous Materials Operations
Department of Transportation
Washington, D.C. 20590

1 May 1978

Re: Notice of proposed rulemaking. Transportation of
Asbestos; (Docket No. HM 160; Notice No. 78-3;
FR Vol. 43, No. 42, March 2, 1978

Gentlemen:

The Asbestos Information Association/North America (AIA/NA) invites the attention of the Department of Transportation to these comments submitted in accordance with the Federal Register notice of March 2, 1978.

AIA/NA is an incorporated, nonprofit organization of 51 firms in the United States and Canada (see attachment) engaged in the manufacture or processing of asbestos-containing products and in the mining/milling of asbestos fiber. The AIA/NA was established in 1970 with the following objectives:

- To provide industry-wide information on the asbestos-health relationship, and on industry efforts to eliminate problems associated with asbestos dust.
- To cooperate with government agencies in developing and implementing standards for worker protection from asbestos dust, and for the control of asbestos emissions into community air and water.
- To exchange information on asbestos dust control methodology.
- To assist members in the solution of asbestos-health related problems.
- To increase public knowledge of the benefits to be derived from and the importance of asbestos-containing products.

INTRODUCTION

Substantial changes in the packaging and shipping of asbestos fiber have been made over a period of more than ten years. Permeable bags such as those made of jute have been replaced with strong, multiwall kraft paper bags and film or woven plastic bags. Paper bags may be covered or lined with plastic as an added protective measure. Asbestos pellets and compressed blocks which also control dust emission have been developed for certain applications. Both are enclosed in paper or plastic to further ensure that no dust emissions occur. Pellets may also be shipped in hopper cars.

It is customary to package asbestos in bags containing 100 pounds of fiber. Manufacturers' formulae and handling procedures are generally based on incremental quantities of 100 pounds of fiber in bags. Paper bags are preferred in some manufacturing processes because the bag and its contents can be introduced into processing without adverse effect on the product and, by so doing, eliminate risk of fiber exposure. Bag opening machines have been designed to eliminate dust emissions during the introduction of fiber into the manufacturing process.

In transportation of major asbestos shipments from mills, bags are stacked as unitized loads on pallets and the pallets are wrapped with plastic film. Glueing bag to bag and metal strapping may be used as a means to avoid shifting of pallet loads. Lumber and inflatable dunnage may be used between pallets in rail and truck transport. Bagged asbestos on pallets is transported in inter-modal freight containers for marine shipment. Small-lot shipments of bags by truck from warehouses or other sources are common and may or may not be palletized depending on the number of bags transported. Tests have demonstrated both plastic and paper bags withstand transport and handling in this manner without unusual risk of breaking or tearing.

The methods and procedures now in use for the packaging and transport of asbestos meet the requirements of Part 173.24 (A) of the Transportation Act, that is "under conditions normally incident to transportation there will be no significant release of the hazardous materials to the environment" and "the effectiveness of the packaging will not be substantially reduced."

We submit there is no need for the proposed regulations on the basis that current practices and procedures for the transport of asbestos are in compliance with pertinent provisions of the Transportation Act. The proposal contains no documentation to justify additional regulation. This is the position of this Association in response to the Department's proposal.

We take this opportunity to offer a number of comments on specific areas of the proposal which we believe will be helpful to the Department in its deliberations. A discussion follows:

DISCUSSION

I - Unreasonable Risk to the Public

The Transportation Act of 1974 requires the finding of "an unreasonable risk to the public" as the statutory basis for the promulgation of a regulation (49 U.S.C. 1803, 1804). The March 2, 1978, DOT Proposal, addresses this issue in Part II starting with the following statement:

"The MTB believes it to be firmly established that asbestos in its several commercial forms, poses serious health hazards to individuals subject to long-term exposure to airborne asbestos concentrations. As noted in the 1972 preamble of the Occupational

Safety and Health Administration (OSHA) standard on asbestos (37 FR 11318): "No one has disputed that exposure to asbestos of high enough duration is causally related to asbestosis and cancers."... Recent new evidence, however, as reported by OSHA, not only tends to confirm this finding but also suggests that serious potential health risks are involved with even relatively low-level, brief or intermittent exposure to airborne asbestos concentrations." (Emphasis added)

The claim that asbestos "...poses serious health hazards to individuals subject to long-term exposure to asbestos concentrations" requires more explicit definition. Man has been exposed to naturally occurring low concentrations of asbestos throughout his existence. Asbestos is common to the earth's crust. There are no known or identified health hazards from natural sources. DOT's statement, without identification of concentration, is not substantiated.

The statement from the proposal discussed above was supported by an erroneous quotation from OSHA (37 FR 11318):

"No one has disputed that exposure to asbestos of high enough duration is causally related to asbestosis and cancer."

Key words relating to level exposure were omitted. The quotation should have read:

"No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers."
(Underlined words were omitted)

For more complete understanding of the problem, reference should have been made to unanswered questions within the scientific community concerning mineral type, fiber size, and smoking in the asbestos-cancer relationship.

A reference is made to "recent new evidence" reported by OSHA which "also suggests" serious potential health risks from relatively low-level, brief, or intermittent exposure. AIA/NA provided comments to OSHA on this "new evidence" (copy attached) with the following conclusions:

"Review of the literature indicated that no credible epidemiological studies have been published which would suggest an excess of malignant tumors among persons exposed to no more than 2 asbestos fibers per cc of air (TWA), using the prescribed membrane filter test method. This is a fact simply because there have yet been identified for study no populations the exposure experience of which consistently has been as low as 2 fibers.

Since all populations studied to date have been exposed to substantially higher concentrations of airborne asbestos, we can conclude only that an excess of all types of asbestos disease is associated with levels of exposure significantly higher than the level currently mandated to become effective on July 1, 1976."

That portion of the OSHA references cited in the proposal wherein worker exposure to asbestos dust is of sufficient duration and the cohort is of sufficient size to be valid for standards setting is based on the occupational situation where raw fiber is handled with regularity. In transportation, the fiber is contained in sealed bags. The only direct contact of a transport worker with free fiber would be in the event of an accident. The difference between these situations was not considered in the Department's proposal.

This section of the preamble of the proposal concludes with the statement:

"Although there is no detailed information available on the amount of asbestos fibers released in transportation, the MTB believes that, in consideration of the carcinogenic and other health hazards associated with asbestos, there is a sufficient basis for establishing regulatory control of asbestos in transportation." (Emphasis added)

From the statement that "...there is no detailed information available on the amount of asbestos fibers released in transportation.." and the fact that inaccurate and disputed information, as noted above, was used in the development of the proposal, we contend that sufficient evidence to meet the statutory requirement of the finding of "unreasonable risk" needed to promulgate a regulation has not been presented.

II - Rigid, Airtight Packages to Transport Asbestos

Bagged asbestos is typically introduced into the manufacturing process by inserting bags under a hood or placing them adjacent to a suction duct. The bag is slit and the fiber is released into a hopper or process tank. Empty bags are placed in plastic containers for disposal in accordance with OSHA regulations. Hoods and suction ducts are designed to accommodate the standardized bags.

Commercial asbestos is fluffy. It is difficult to pack this material in a rigid container and, because the fiber would gradually compact during shipment, it would be difficult to remove it for introduction into the manufacturing process. It would also be extremely cumbersome, if not impossible, to empty rigid containers effectively and rapidly into hoods designed for bags. Spillage would no doubt occur and workers would be unnecessarily exposed to fibers.

In addition to these packaging and handling problems, cost and logis-

tical factors in the use of rigid containers must be considered. The standard package for asbestos is a 100-pound bag and manufacturing formulations are based on this unit size. The equivalent rigid container to hold 100 pounds is a 15-gallon open-head drum that would be required to be fitted with a gasket and seal ring to make it dust tight. This type of container is available in fiberboard (leverpack) at a cost of about \$3.00 each and in metal at about \$5.75 each. The annual asbestos usage in the United States is about 750,000 tons. Fifteen million drums at a cost of \$45,000,000 to \$90,000,000, depending on choice of material, would be required.

At these purchase costs, return and reuse of the container must be considered. Since shipment of asbestos has not been made in this manner, there are no specific data on the average number of round trips to be expected with such containers. Damage from repeated handling is expected to be substantial and only dust-tight drums could be reused. For calculation purposes an average of one and a half round trips for leverpack and three round trips for metal has been assumed.

The cost of shipping a carload of 1680 empty drums at weights of 10,41 pounds for leverpack and 18,480 pounds for metal to Quebec from three representative locations in the United States are summarized in the table below:

	<u>Shipping Cost per Drum</u>	
	<u>Leverpack</u>	<u>Metal</u>
New York City	0.44	0.57
Houston	1.14	1.48
Los Angeles	1.64	2.13

The materials cost for present packagings, i.e. multiwall paper bags on pallets with the pallet wrapped in plastic sheet, is about \$15 per ton or \$0.75 per 100-pound unit. The incremental cost for material only can be calculated as the original cost of the drum adjusted for the average service life, plus the cost to return it to the origin, minus the saving from the elimination of the present packaging. For the case here, this ranges from \$34 to \$65 per ton depending on the location.

There is also a disposal cost to consider. With the service life assumed, 10 million leverpack or 5 million metal drums would be added to the present burden on the solid waste disposal facilities of the country. These containers would each have to be vacuum cleaned or washed to remove the last trace of asbestos or be deposited in controlled hazardous waste facilities.

The proposed use of rigid containers would require development of new filling and handling technology and new machinery, all at great expense. Present equipment, developed at high cost for bag usage would become needlessly obsolete. Rigid containers would greatly increase materials costs and add waste disposal problems. In short, for a variety of reasons, discussed above, rigid containers are not practicable for asbestos packaging.

III - Shipment in Uncovered Vehicles

Prohibition of transport of bagged asbestos in open vehicles would result in severe and costly disruption to the industry, particularly to small businesses. Two modes must be considered: (1) shipment of TL amounts of palletized bags on flatbed trucks and (2) shipment of LTL quantities either palletized or as individual bags from warehouses and other sources to small users.

Flatbed truck shipments are the result of specific transportation needs and are handled by both contract and common carriers. Examples include, but are not limited to, the movement of product from the mill to the rail shipping point, deliveries to larger users within a limited geographical area from an asbestos mill, and backhaul of asbestos from the supplier to the asbestos user's plant. In this type of shipment, the pallets generally are protected by one or more of the following procedures:

- Pallets are shrink or stretch wrapped with plastic film .
- Individual bags are enclosed in plastic film prior to palletizing.
- The entire load is protected with a canvas or plastic cover.

Shipments from warehouses are typically less than truckload, i.e. from a few bags to a few pallets. Although the total tonnage is a relatively modest percentage of the total U.S. usage, it is estimated that 500-1000 businesses, many of them small, are serviced in this manner. Examples include manufacturers of caulks, adhesives, sealants, mastics, reinforced plastics and high-performance specialty industrial coatings. In these cases, asbestos is used to provide unique properties to a product. Although bagged asbestos may move in closed trucks in inter-city shipments, a substantial amount is transported in open vehicles. In this situation, the pallets normally are or should be covered with plastic film. Similarly, where individual bags are handled, they are either covered or lined with plastic film.

The DOT concern seems to be the need to avoid airborne asbestos emissions to the environment from the moving vehicle. This can and is being achieved in open vehicles today. Prohibition of their use is not needed nor justified.

IV - Definition of Occupational Exposure to Asbestos

A far-reaching impact of this proposal comes from a wording which occurs, with variation to identify the type of carrier, in Parts 174, 175, 176, and 177. This is illustrated in paragraph 177.844:

"Asbestos must be loaded, handled, and any asbestos contamination of transport vehicles removed, in a manner that will prevent occupational exposure to airborne asbestos particles." (Emphasis added)

If it is assumed that "prevent occupational exposure" means what it implies, i.e. zero exposure, some fundamental problems result. Asbestos is ubiquitous in the environment and there are no work-places where there is zero occupational exposure to asbestos.

Zero or any other extremely low-level exposure requirement, as a practical matter would preclude the use of bag and compressed block packaging. With the very large volume of asbestos shipped, occasional container damage may occur. There is no provision for this in a zero exposure standard and the problem cannot be eliminated entirely regardless of the container used. Such a requirement would be incapable of compliance.

The wording also does not define which workers are covered by a DOT standard. It is assumed that the DOT jurisdiction applies only to employees of the transportation employer who are engaged in specific tasks in proximity to the transport vehicle. Employees of the manufacturing, the warehouse facilities, and the end user of the asbestos would be under OSHA asbestos regulation.

The wording in the proposal lacks: (1) clear and concise definition of the statutory authority under which the regulation would be promulgated and identification of workers to be covered, (2) definition of occupational exposure to include a specified numerical level, specification of fiber length and aspect ratio of fibers; and (3) an analytical method to measure airborne fiber concentration.

V - Loading by Consignor, Unloading by Consignee

The meaning of the requirement that bags shipped in closed transport be loaded by the consignor and unloaded by the consignee is not clear. Does this mean that transport company employees cannot load, unload, or tranship? If so, such a restriction would seriously impact on the small user. Present asbestos packaging satisfies the statutory requirement of "no unreasonable risk". An added restriction is unnecessary.

VI - The Use of Package Markings

The proposed regulation places asbestos in Class ORM-C, but labels are not required. ORM-C identification on shipping papers is necessary only for air and water transport. The proposal does not define package marking requirements. It would appear, however, that paragraph 172.316 of the Transportation Act would require a marking on each package, i.e.

ASBESTOS ORM-C

Under present OSHA regulations, every bag of asbestos must be labeled:

CAUTION
Contains Asbestos Fibers
Avoid Creating Dust
Breathing Asbestos Dust May Cause
Serious Bodily Harm

This is a more informative marking than that required under paragraph 172.316. The OSHA stipulation that this label must be on every bag of asbestos is fully responsive to the Department of Transportation marking requirements.

The Association respectfully submits its views on this important rulemaking proposal affecting the asbestos industry. We will be happy to provide any additional information or clarification of these comments as might be desired.

Very truly yours,


R. H. Mereness
Executive Director

RHM:sm

Enclosures

[4910-60]

DEPARTMENT OF TRANSPORTATION

Materials Transportation Bureau

[49 CFR Parts 172, 173, 174, 175, 176, 177]

[Docket No. HM-160; Notice No. 78-3]

TRANSPORTATION OF ASBESTOS

AGENCY: Materials Transportation Bureau, DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: The amendments proposed herein would require certain kinds of asbestos to be shipped by all modes in non-specification, rigid, airtight packagings, such as metal or fiber drums; or in bags when shipped in closed freight containers. The proposals are intended to reduce the risks to property and to the public health and safety associated with the generation of airborne concentrations of asbestos that may result from the packaging and handling of asbestos fiber shipments. The available data clearly indicates that regular, long term exposure to airborne concentrations of asbestos fibers poses a range of carcinogenic and other serious health risks; and recent studies suggest that these dangers are also associated with exposures that are low-level, brief or intermittent.

DATE: Comments must be received on or before May 2, 1978.

ADDRESS COMMENTS TO: Dockets Section, Office of Hazardous Materials Operations, Department of Transportation, Washington, D.C. 20590. It is requested that five copies be submitted.

FOR FURTHER INFORMATION CONTACT:

Alan I. Roberts, Director, Office of Hazardous Materials Operations, 2100 Second Streets SW., Washington, D.C. 20590, 202-426-0656.

SUPPLEMENTARY INFORMATION:

I. BACKGROUND—PRODUCTION/CONSUMPTION/TRANSPORTATION PATTERNS

Asbestos is a generic term used to describe a number of naturally occurring fibrous, hydrated mineral silicates. It includes chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos. These are all asbestiform minerals which, when crushed, produce asbestos fibers with various chemical and physical properties.

Asbestos fibers are generally characterized by high tensile strength and flexibility, and favorable chemical resistance, heat and frictional properties. Certain grades of asbestos can be spun and woven, while others can be laid and pressed to form paper, or used for structural reinforcement of materials such as cement, plastic, asphalt and tile. The asbestos content of these latter products ranges from 5 to 15 percent by weight.

Although asbestos is adaptable to more than 2,000 uses, the construction industry accounts for nearly two-thirds of the United States (U.S.) asbestos fiber consumption. The remaining 33 percent is utilized in a myriad of industrial and consumer products.

During the ten-year period ending 1976, the total amount of new asbestos introduced into the U.S. transportation system averaged approximately 1,700,000 short tons annually. Slightly more than half this tonnage consists of crude or milled asbestos fibers, with the remainder consisting of asbestos contained in products manufactured in whole or in part from asbestos. There is, of course, a lag between the time a shipment of asbestos fibers enters the transportation system and the time that shipment enters the transportation system as a manufactured product.

Growth in the utilization and transportation of asbestos is expected to slowly increase at a rate of about 2 percent per year.

During the entire history of the asbestos industry in the United States, domestic sources have been able to meet only a small percentage of U.S. requirements. Roughly 90 percent of the total U.S. industrial demand for all grades and types of asbestos fibers is thus dependent on foreign imports—with Canada being the major source of supply. In 1975, 93 percent of U.S. imports came from Canada with the next largest suppliers being the Republic of South Africa (3 percent) and the U.S.S.R. (2 percent). Eight other countries shipped smaller amounts of asbestos to the U.S. in 1975.

The transportation pattern for asbestos is characterized by three distinct stages:

In the first stage, asbestos ore is transported from the mine site to a milling plant where the ore is crushed and processed into fibers.

Of the five mills operating in the U.S. as of late 1976, three are located at the mines, but the other two are 32 and 52 miles distant. Transportation is reported to be by open-hopper vehicles such as dump trucks.

The second stage is characterized by the shipment of crude or milled asbes-

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FEDERAL REGISTER, VOL. 43, NO. 42—THURSDAY, MARCH 2, 1978

tos fibers from the mills (mostly foreign) to industries that use asbestos in the products they manufacture. The largest industry in this category (SIC 3292) as of 1972 consisted of 142 establishments primarily engaged in the manufacture of asbestos textiles, asbestos building materials, asbestos insulating materials for covering boilers and pipes, and other products composed wholly or chiefly of asbestos fibers. Other industries receiving asbestos fibers are mainly industries engaged in the production of asphalt felts and coatings (SIC 2952), hard surface floor coverings (SIC 3998), gaskets (SIC 3293), and paper products (SIC 2281).

These industries generally receive their shipments of asbestos fibers in pressure packed, five-ply paper or woven vinyl bags weighing about 100 lbs. per bag, with the bags glue-locked to each other and shrink wrapped to a pallet (wrapped with a film of plastic which is then shrunk). In the aggregate, rail shipments handle about 80 percent of all milled asbestos fibers entering the U.S. transportation system, with merchant vessel shipments accounting for the remaining 20 percent. Packaging for ocean transportation, both for imported and exported asbestos fibers, is changing to containerization. All shipments, for example, from the Union of South Africa have been reported to be containerized. Although rail shipments of asbestos fibers are not yet being containerized, the majority of such shipments are made in sealed, railroad box cars which are routed for the most part direct to the asbestos products manufacturing industries.

The third stage in the transportation of asbestos involves the shipment of manufactured products made wholly or in part from asbestos. Approximately 81 percent of the asbestos used in manufactured products is firmly imbedded or "locked in" such products as floor tiles, asbestos cement pipes and sheets, floor products and plastics. These products generate less airborne fibers than asbestos manufactured products that are friable or in powder form, although at the present time, it is not known whether the transportation of products in either category under current conditions presents an unreasonable risk to the public health and safety. As defined in the Department of Commerce's 1972 Census of Transportation, approximately 92 percent of asbestos manufactured products are shipped by motor vehicle, with rail and all other modes accounting for about 7 percent and 1 percent, respectively.

II. GENERAL EFFECTS OF AIRBORNE ASBESTOS EXPOSURE/EVIDENCE OF ACCIDENTAL RELEASE OF ASBESTOS FIBERS

The MTB believes it to be firmly established that asbestos, in its several commercial forms, poses serious health hazards to individuals subject

to long term exposure to airborne asbestos concentrations. As noted in the 1972 preamble of the Occupational Safety and Health Administration (OSHA) standard on asbestos (37 FR 11318): "No one has disputed that exposure to asbestos of high enough duration is causally related to asbestosis and cancers * * *." Recent new evidence, however, as reported by OSHA, not only tends to confirm this finding but also suggests that serious potential health risks are involved with even relatively low-level, brief or intermittent exposure to airborne asbestos concentrations. Although there is no detailed information available on the amount of asbestos fibers released in transportation, the MTB believes that, in consideration of the carcinogenic and other health hazards associated with asbestos, there is a sufficient basis for establishing regulatory control of asbestos in transportation.

III. RELATIONSHIP TO HM-145

On December 9, 1978, the MTB published an Advanced Notice of Proposed Rulemaking (41 FR 53824) in Docket No. HM-145 entitled "Environmental and Health Effects Materials." In that Notice, the MTB announced that it was considering whether new or additional transportation controls are necessary for certain classes of materials which are not generally subject to the existing Hazardous Materials Regulations.

A large number of comments were received in Docket HM-145. The MTB has concluded that a considerable amount of time and effort is still needed in staff evaluation of these comments before it will be in a position to issue a notice or notices of proposed rulemaking for environmental and health effects materials, either on a comprehensive or on a selective basis.

Several comments on HM-145, however, were specifically directed to the idea that transportation regulatory controls for asbestos be established as soon as possible, with the suggestion that asbestos be addressed on an individual basis, rather than waiting until the eventual resolution of Docket HM-145. The MTB agrees with the urgency of the views expressed on this matter, and therefore asbestos is being treated separately under this proposed rulemaking.

IV. QUANTITATIVE VERSUS QUALITATIVE STANDARDS

In determining that there is a need for transportation controls on asbestos, the MTB has considered the desirability and practicality of utilizing quantitative or qualitative emission criteria or some combination of the two, either as developed by the MTB or as developed by other agencies.

Currently, quantitative permissible exposure limits for asbestos, as promulgated by the Environmental Protection Agency (EPA) have not been established for environmental or non-

occupational settings. The EPA's standard for airborne asbestos emissions falls under its "no visible emissions" criterion. This is in contrast to the quantitative criteria established by OSHA for airborne concentrations of asbestos fibers in occupational or worksite conditions. The criteria of OSHA consist of an 8-hour time weighted average standard, and a maximum "ceiling concentration" standard. Both standards are to some extent based on the ability of current devices to measure asbestos airborne concentrations in a systematic, meaningful manner, and are not directly based on any causal or threshold relationship between the standards and the probability of contracting an asbestos induced disease.

The MTB believes that its proposed non-specification packaging standards as applied to the transportation of asbestos fiber is an effective and efficient means of precluding potential problems associated with asbestos airborne emissions occurring during transportation; and that they are consistent with the standards of both EPA and OSHA.

V. SCOPE AND IMPACT

The standards as herein proposed would only apply to the transportation of what are generally regarded as milled or crude asbestos fibers, but would exclude asbestos contained in a natural or artificial binding material and manufactured products containing asbestos.

In light of the regulatory controls already in existence or under consideration by other federal agencies, and until such time as the MTB has more specific and concrete information that the normal packaging and handling of these forms of asbestos is such as to create unreasonable asbestos exposure problems, the MTB does not believe their specific regulation in transportation is warranted.

In reviewing the potential inflationary and economic impacts associated with the proposed rule, the MTB has determined that such impacts will be minimal. Based on the foregoing discussion of the production and transportation pattern for asbestos shipments, it is clear that the only aspect of that pattern which might experience a cost impact pertains to import and export shipments by merchant vessel. This follows from the fact that the proposed rule would generally require all such shipments to be containerized in contrast to packaging alternatives now available to shippers. However, the cost-differential between these alternative cargo handling methods is not only very small, but a significant portion of such shipments are already containerized, or being containerized.

As proposed herein, a new paper shipping name "Asbestos" would be added to the list of hazardous materials in 49 CFR 172.101. The proposed

classification for "asbestos" would be as an ORM-C (Other Regulated Material, Group C).

Primary drafters of this document are A. W. Grella, Technology Division, Office of Hazardous Materials Operations; J. S. Nalevanko, Economist, Materials Transportation Bureau; and Douglas A. Crockett, Office of the Chief Council, Research and Special Programs Directorate.

In consideration of the foregoing, Title 49, Code of Federal Regulations,

Parts 172 through 177 would be amended as follows:

**PART 172—HAZARDOUS MATERIALS
TABLE AND HAZARDOUS MATERIALS
COMMUNICATIONS REGULATIONS**

§ 172.10 [Amended]

1. In § 172.101, the Hazardous Materials Table would be amended by adding a new entry, immediately following "Arsine," to read as follows:

8565

(2) Hazardous materials descriptions and proper shipping names	(3) Hazard class	(4) Label(s) required (if not excepted)	(5) Packaging		(6) Maximum net quantity in one package		(7) Water shipments		
			(a) Exceptions	(b) Specific requirements	(a) Passenger carrying aircraft or rail car	(b) Cargo only aircraft	(a) Cargo vessel	(b) Passenger vessel	(c) Other requirements
(Add) Asbestos	ORM-C	None	173.1090(b)	173.1090(c)	No limit	No limit	1, 2	1, 2	Stow and handle to avoid airborne particles.

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

2. § 173.1090 would be added to read as follows:

§ 173.1090 Asbestos.

(a) Asbestos includes any of the following hydrated mineral silicates: chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos, and every product containing any of these minerals.

(b) Asbestos which is immersed or fixed in a natural or artificial binder material (such as cement, plastic, asphalt, resins or mineral ore) and manufactured products containing asbestos are not subject to the requirements of this subchapter.

(c) Asbestos must be offered for transportation and transported in—

(1) Rigid, airtight packagings such as metal or fiber drums, or

(2) Bags when in closed freight containers, motor vehicles, or rail cars, that are loaded by the consignor and unloaded by the consignee.

PART 174—CARRIAGE BY RAIL

3. Subpart Heading M would be added immediately following § 174.812 to read as follows:

Subpart M—Detailed Requirements for Other Regulated Materials

4. § 174.840 would be added to read as follows:

§ 174.840 Special loading and handling requirements for asbestos.

Asbestos must be loaded, handled, and any asbestos contamination of rail cars removed, in a manner that will prevent occupational exposure to airborne asbestos particles. (See § 173.1090 of this subchapter.)

PART 175—CARRIAGE BY AIRCRAFT

5. § 175.640 would be added to read as follows:

§ 175.640 Special requirements for other regulated materials.

Asbestos must be loaded, handled, and any asbestos contamination of aircraft removed, in a manner that will prevent occupational exposure to airborne asbestos particles. (See § 173.1090 of this subchapter.)

PART 176—CARRIAGE BY VESSEL

6. § 176.906 would be added to read as follows:

§ 176.906 Stowage and handling of asbestos.

Asbestos must be stowed, handled and any asbestos contamination of ves-

sels removed, in a manner that will prevent occupational exposure to airborne asbestos particles. (See § 173.1090 of this subchapter.)

7. § 177.844 would be added to read as follows:

§ 177.844 Other regulated materials.

Asbestos must be loaded, handled, and any asbestos contamination of transport vehicles removed, in a manner that will prevent occupational exposure to airborne asbestos particles. (See § 173.1090 of this subchapter.)

AUTHORITY: (18 U.S.C. 1803, 1804, 1808; 49 CFR 1.53(e) and paragraph (a)(4) of Appendix A to Part 102).

NOTE:—The Materials Transportation Bureau has determined that this document does not contain a major proposal requiring preparation of an Economic Impact Statement under Executive Order 11821 and OMB Circular A-107.

Issued in Washington, D.C., on February 23, 1978.

ALAN I. ROBERTS,
Director, Office of Hazardous
Materials Operations.

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TITLE 49 -- TRANSPORTATION

CHAPTER I - RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION **013835**
MATERIALS TRANSPORTATION BUREAU
DEPARTMENT OF TRANSPORTATION

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS
AND PACKAGINGS

(Docket No. HM-160; Amdt. No. 172-47, 173-123, 174-33, 175-7, 176-6, 177-44)

TRANSPORTATION OF ASBESTOS
REVISION OF AMENDMENT NO. 173-123
EFFECTIVE DATE EXTENSION

AGENCY: Materials Transportation Bureau (MTB), Research and Special Programs
Administration, DOT. 8

ACTION: Revision of previous Amendment No. 173-123 and extension of the
effective date for all amendments. 28

SUMMARY: This revision of Amendment No. 173-123 regarding the transportation
of asbestos as published on December 4, 1978, in the Federal Register (43 FR
56664) will allow shipments of asbestos when packaged in bags or other non-rigid
packagings to be transported in closed freight containers, motor vehicles, or rail
cars when loaded by the consignor and unloaded by the consignee; or in bags and
other non-rigid packagings that are dust and sift proof which are palletized and
unitized. Unitized loads in slings need not be palletized during transportation by
vessel. The effective date of the entire Docket HM-160 is revised from April 30, 1979
to August 20, 1979.

EFFECTIVE DATE: August 20, 1979.

ADDRESS: All written comments received in this rulemaking action are available
for examination during regular business hours in the Docket Branch, Room 5500,
TransPoint Building, 2100 Second Street, S.W., Washington, D.C.

FOR FURTHER INFORMATION CONTACT:

Delmer F. Billings, Standards Division, Materials Transportation Bureau,
Research and Special Programs Administration, 2100 Second Street, S.W.,
Washington, D.C. 20590, phone 202-755-4902.

SUPPLEMENTARY INFORMATION: On December 4, 1978, the MTB published a final rule under Docket HM-160 in the Federal Register (43 FR 56664). Since this publication, the MTB has received several petitions for reconsideration in accordance with the provisions of 49 CFR 106.35. The petitions requested reconsideration of the provisions and/or extension of the effective date of the final rule. This document will incorporate methods of shipment which were identified in the notice of proposed rulemaking (43 FR 8562, March 2, 1978) and also those which were included in the final rule. These amendments represent minimum safety requirements and are intended to reduce the risks to public health associated with the generation of unacceptable airborne concentrations of asbestos that may result from packaging and handling of asbestos shipments in commercial transportation.

Two petitioners based their petitions on the fact that the final rule contained a provision requiring bags and other non-rigid containers of asbestos to be palletized and unitized by some method such as shrink-wrapping in plastic film or wrapping in fiberboard secured by strapping. It was noted that this requirement was not included in the notice of proposed rulemaking (43 FR 8562), thus making comments on this requirement impossible during the normal comment period for the proposed rulemaking. Petitioners also posed the question of whether or not freight containers, rail cars, etc., constituted rigid, airtight packagings as required in § 173.1030(d)(1). It was stated that if such containers were not included in this

provision, all shipments of bags or non-rigid containers would be required to be palletized and unitized according to the provisions of § 173.1090(d)(2), and that this requirement would impose great hardship on the asbestos industry and on shippers of large volumes of asbestos who normally ship using exclusive use vehicles and rail cars. It was also indicated that neither the equipment nor facilities exist at the present time to achieve compliance with the palletizing and unitizing requirement of the final rule by the published effective date. The MTB has determined that freight containers and, probably, motor vehicles and rail cars would not satisfy the requirements of § 173.1090(d)(1).

By allowing the use of unitized pallet loads as identified in the final rule, the MTB intended to recognize less restrictive handling requirements for bagged asbestos than those that would have been required by the "loading by consignor/unloading by consignee" approach. However, it was not the intent of the MTB to eliminate the more restrictive consignor/consignee approach. Therefore, § 173.1090(d) is being revised to allow the option of either the consignor/consignee approach as identified in the original proposed rulemaking with inclusion of an exclusive use provision or the unitized pallet approach using bags or other non-rigid packagings as required by the final rule.

One petitioner noted that a method of shipment of asbestos via water was the use of slings which are shrink-wrapped or stretch-wrapped and transported in the hold of a vessel without the use of pallets. It was the petitioner's contention that the use of pallets would increase the incidents of unintentional release of asbestos due to the interaction of the pallets against the bags which are unitized by the slings. It was noted that pallets were used in all instances except when placed in the hold of the transport vessel. Given the lack of detailed data on the amount of

asbestos fibers released in transportation and the circumstances and cause for such release, the MTB is in general agreement that increased unintentional releases may be likely if pallets were used under the method identified in the petition. Therefore, § 173.1090(d) is being revised to allow slings in loads that are shrink-wrapped or stretch-wrapped to be transported by water without the use of pallets. Future monitoring of hazardous materials incident reports will assist the MTB in determining the safety and efficiency of this and other methods for shipment of asbestos.

One petitioner suggested that the terms "pallet" and "palletized" be defined in the rulemaking. The MTB does not intend to publish a definition of pallet or palletized. It is the MTB's opinion that any rigid platform or board upon which goods may be placed for transportation would meet the requirements when unitizing a load of bags or other non-rigid packagings.

Several petitioners cited a need for the MTB to define the term "dust and sift proof". For the purposes of this amendment, the MTB considers dust and sift proof to mean packagings which are constructed so as to prevent the release of their contents either through materials of construction, seams, or closures during conditions normally incident to transportation.

One petitioner requested that the use of gluing of bags into a unit be allowed as an alternative to the unitizing methods identified in the final rule. It is the MTB's opinion that the use of shrink-wrapping or other similar methods of enclosure assist not only in unitizing a pallet load of bags or other non-rigid packagings, but also assist in the prevention of airborne asbestos contamination of individuals involved in the transportation of asbestos. Simply gluing these

packagings together to form a unit would not provide this added measure of safety to which the final rule addresses itself. Therefore, gluing of bags into a unit is not being included as an alternative unitizing method.

One petitioner requested that quantities of less than 2,000 pounds, net weight, per vehicle be excepted from the palletizing and unitizing requirement. It is MTB's opinion that the palletizing and unitizing requirement does not unreasonably restrict the shipment of asbestos in any quantity. This requirement is necessary to provide a minimum level of safety.

Several petitioners requested an extension of the effective date of the final rule. The effective date has been extended to allow five months for compliance as originally intended by the December 4, 1978 publication.

Primary drafters of this document are Delmer F. Billings, Standards Division, Office of Hazardous Materials Regulation, and Douglas A. Crockett, Standards Division, Office of Hazardous Materials Regulation.

In consideration of the foregoing, the effective date and paragraph (d) of § 173.1090 as they appeared in the Federal Register published on December 4, 1978 (43 FR 56664) are revised to read as follows:

1. The effective date of the final rule as it appeared in HM-160 on December 4, 1978, is revised to read as follows:

EFFECTIVE DATE: August 20, 1979.

2. In § 173.1090 paragraph (d) as it appeared at 43 FR 56669 is revised to read as follows:

§173.1090 Asbestos.

* * * * *

(d) Commercial asbestos must be offered for transportation and transported in--

(1) Rigid, airtight packagings such as metal or fiber drums, portable tanks;

(2) Bags or other non-rigid packagings in closed freight containers, motor vehicles, or rail cars that are loaded by and for the exclusive use of the consignor and unloaded by the consignee; or

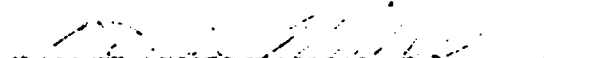
(3) Bags or other non-rigid packagings which are dust and sift proof and which are palletized and unitized by methods such as shrink wrapping in plastic film or wrapping in fiberboard secured by strapping. Pallets need not be used during transportation by vessel for loads with slings that are unitized by methods such as shrink wrapping, if the slings adequately and evenly support the loads and the unitizing method prevents shifting of the bags or other non-rigid packagings during conditions normally incident to transportation.

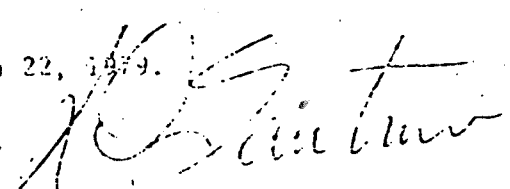
AUTHORITY: (49 U.S.C. 1803, 1804, 1802; 49 CFR 1.53).

Note.-The Materials Transportation Bureau has determined that these amendments do not require a regulatory analysis under the terms of Executive Order 12044 and DOT implementing procedures (43 FR 9582). A regulatory evaluation is available for review in the Docket.

Issued in Washington, D.C., on March 22, 1979.

Certified to be a true copy of the original.

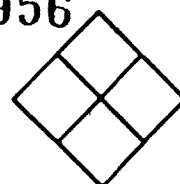

Certifying Officer


L. D. Santiman,
Director
Materials Transportation Bureau



Material Safety Data

013956



September 1, 1976

UNION CARBIDE CORPORATION • 4625 ROYAL AVENUE • NIAGARA FALLS, NEW YORK • 14302

TELEPHONE: (716) 278-3376

PRODUCT: Chrysotile Asbestos

CHEMICAL FORMULA: $Mg_6(OH)_8Si_4O_{10}$

TRADE NAMES: "Calidria" Asbestos

I. PHYSICAL DATA

BOILING POINT AND MELTING POINT: Not Pertinent

SPECIFIC GRAVITY ($H_2O = 1$): 2.45

VOLATILE CONTENT: Absorbed Water 1 – 4% By Weight. Structural Water Approximately 13% by Weight.

APPEARANCE: Pellets or Fine White Powder. No odor. Very Slight Solubility in Water.

II. HAZARDOUS INGREDIENTS

Asbestos contains no hazardous ingredients. However, the material itself can be hazardous under certain conditions. (See V below.)

III. FIRE AND EXPLOSION HAZARD DATA

NON-COMBUSTIBLE MATERIAL: No Fire or Explosion Hazard.

IV. REACTIVITY DATA

INERT MATERIAL: No Decomposition or Polymerization Conditions.

V. HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE TO AIRBORNE CONCENTRATION:

The current Occupational Safety and Health Standard (CFR 29, 1910.1001) contains the following exposure limits:

"The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed 2 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the membrane filter method at 400-450 X magnification (4 millimeter objective) phase contrast illumination. No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method just noted."

EFFECTS OF EXPOSURE: CAUTION: Breathing asbestos may cause serious bodily harm.

EMERGENCY AND FIRST AID PROCEDURES: No acute toxicity. Use respirator if airborne asbestos fiber concentration exceeds OSHA limits.

VI. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Avoid inhalation of dust. Remove spilled material by vacuum cleaner or by water wash.

WASTE DISPOSAL:

Bags and waste and scrap materials should be disposed of in a manner which will avoid airborne concentrations of asbestos, such as the use of dust-tight trash bags or containers. Ensure that disposal complies with all applicable federal, state or local regulations.

Union Carbide Corporation assumes no responsibility and makes no warranty, expressed or implied, representation, promise, or statement as to completeness, accuracy, or currency of any data provided.

VII. SPECIAL PROTECTION INFORMATION

VENTILATION:

Local exhaust for each operation is preferable. (See American National Standards Institute booklet, Z9.2 – 1971.) General area exhaust is acceptable. No special considerations.

PROTECTIVE GLOVES: None

EYE PROTECTION: None

RESPIRATORY PROTECTION ⁽¹⁾

The current Occupational Safety and Health Standard CFR 29, 1910.1001 contains the following requirements for respiratory protection.

AIRBORNE CONCENTRATION ⁽²⁾		MINIMUM REQUIRED MASK TYPE ⁽⁴⁾
8-HOUR EXPOSURE ⁽³⁾	CEILING CONCENTRATION	
2 maximum	10 maximum	Not required when allowable limits are not exceeded.
20 maximum	100 maximum	Reusable or single use air purifying respirator.
200 maximum	1000 maximum	Powered filter positive pressure.
Over 200	—	Type C positive pressure, air supplied.

- (1) Allowed only during the time required for installation of engineering controls, when engineering controls are not technically feasible or adequate, and in emergencies. Current OSHA standards require that no employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by the use of a respirator.
- (2) Fibers per milliliter greater than 5 microns in length, as determined by the membrane filter method at 400-450X magnification (4 millimeter objective) phase contrast illumination.
- (3) 8-Hour time-weighted average.
- (4) Only masks certified by NIOSH as acceptable for the exposures encountered may be used.

OTHER PROTECTIVE EQUIPMENT:

If the ceiling concentration limit is exceeded, clothing providing whole body covering shall be supplied and its use required.

VIII. SPECIAL PRECAUTIONS

Every place of employment where asbestos fibers are released must be monitored to determine exposure levels. If the permissible time-weighted average and ceiling concentration limits are not exceeded, no special precautions are required except:

- a) Bag damage and dusting should be minimized and dust inhalation avoided.
- b) A comprehensive medical examination is required for any employee exposed to airborne fibers within 30 days of first such employment, annually thereafter and on termination of employment.
- c) Personal work clothing can become contaminated with asbestos and may constitute an exposure hazard. Such clothing should be handled and laundered in a manner to avoid airborne concentrations of asbestos.
- d) Substantial medical evidence indicates that smoking will increase the risk from asbestos exposure. Those working with asbestos should not smoke.

Where exposure limits may be exceeded, reference should be made to the regulation CFR 29, 1910.1001 for details on caution signs, monitoring, change rooms, protective clothing laundering and record keeping.

MINERALOGY OF CHRYSOTILE ASBESTOSF. A. MumptonINTRODUCTION

All of the properties and reactions of a material, no matter how complex or sophisticated, are basically dependent upon the answers to just two questions about the material - what is there, and how is it put together? It is, therefore, appropriate that any discussion of the Coalinga asbestos begin by a consideration of these two aspects of chrysotile asbestos - what is its chemical composition, and what is its crystal structure? As will be seen, everything which follows is fundamentally related to these two properties.

To begin with, an understanding of what is usually meant by the term "asbestos" is in order. The word itself is derived from the Greek, $\alpha\beta\epsilon\sigma\tau\omicron\varsigma$, meaning incombustible, and was originally applied to a number of calcium and magnesium silicates when they occurred as fine, silky fibers. Today, asbestos is a commercial term for a group of fibrous silicate minerals which are not only fire-proof, but which are capable of being processed into flexible fibers of various lengths and widths. Six different minerals have been classified as asbestos minerals, including chrysotile, anthophyllite, actinolite, tremolite, crocidolite, and amosite, with chrysotile accounting for over 95% of the world's production of asbestos. As shown in Table I, each of these minerals is different chemically and each possesses its own distinctive physical properties which make it useful in particular applications. Although both crocidolite and anthophyllite are used currently within the Corporation, the present discussion will be confined primarily to chrysotile asbestos, which, of course, is the main constituent of the Coalinga deposit, and is by far the most useful type of asbestos used today.

OCCURRENCE

Almost all chrysotile asbestos occurs in the form of slip or cross-fiber veinlets, varying from a few hundredths of an inch to several inches in thickness, within large bodies of serpentinite rock, and is accompanied by small amounts of magnetite, chromite, and other members of the serpentine group of minerals. Serpentine, by definition, is a rock composed primarily of minerals of the serpentinite group and is generally found as (a) low-temperature alteration product of pre-existing ultrabasic rocks, composed primarily of olivine $(\text{Mg,Fe})_2\text{SiO}_4$ and pyroxene $(\text{Mg,Fe})\text{SiO}_3$, or (b) metamorphic replacement product of magnesium-rich limestones. The exact origin of the cross-fiber veinlets is not well understood. However, one theory maintains that fibrous chrysotile precipitated from hydrothermal solutions along cracks and fissures in the rock during the serpentinization process. Recent speculations, on the other hand, suggest that the chrysotile veinlets precipitated from solution some time after the initial serpentinization process, and may be considerably lower temperature in origin. In any case, the great bulk of the rock was formed by the low-temperature hydration of the olivine and pyroxene, according to the following reaction:

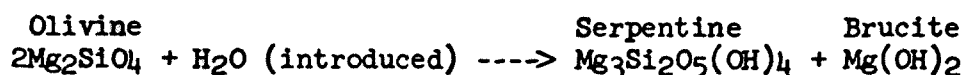


TABLE I. PHYSICAL PROPERTIES OF ASBESTOS MINERALS

PROPERTY	CHRYSTILE	ANTHOPHYLLITE	CROCIDOLITE	ACTINOLITE	TREMOLITE	AMOSITE
Composition	$Mg_3Si_2O_5(OH)_4$	$Mg_7Si_8O_{22}(OH)_2$	$Na_2Fe_3Fe_2Si_8O_{22}(OH)_2$	$Ca_2Fe_5Si_8O_{22}(OH)_2$	$Mg_5Ca_2Si_8O_{22}(OH)_2$	$(Fe,Mg)_7Si_8O_{22}(OH)_2$
Crystal Habit	Fine, thin, easily separable fibers	Prismatic crystals and fibers	Long brittle fibers	Prismatic crystals and fibers	Prismatic crystals and fibers	Prismatic crystals and fibers
Color	White, gray, greenish	Gray-white	Blue	Green	White, gray-white, greenish	Ash gray or brown
Luster	Silky	Vitreous to pearly	Silky to dull	Silky	Silky	Vitreous to pearly
Occurrence	Altered ultrabasics and intruded limestone	Crystalline schists and gneisses	Fe-rich, argillaceous schists	Metamorphosed limestones and crystalline schists	Metamorphosed limestones and Mg-rich rocks	Crystalline schists
Veining	Cross-fiber, Slip-fiber, Massive fiber	Slip-fiber Massive fiber	Cross-fiber	Slip-fiber Massive fiber	Slip-fiber Massive fiber	Cross-fiber
Hardness	2.5-4	5.5-6	4	6	5.5	5.5-6
Specific Gravity	2.4-2.6	2.8-3.1	3.2-3.3	3.0-3.2	2.9-3.2	3.1-3.3
Refractive Index (mean)	1.51-1.55	1.61	1.7	1.63	1.61	1.64
Texture	Soft to harsh also silky	Harsh	Soft to harsh	Harsh	Harsh	Harsh
Tensile Strength (psi)	80,000-100,000	<4000	100,000-300,000	<1000	1000-8000	16,000-90,000
Electric Charge	Positive	Negative	Negative	Negative	Negative	Negative
Resistance to Acids and Alkalis	Poor	Very good	Good	Fair	Good	Good
Flexibility	Very good	Poor	Good	Poor	Poor	Good
Impurities Usually Encountered	Magnetite, chromite, calcite	Magnetite	Magnetite	Calcite	Calcite	Magnetite

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Current studies indicate that this reaction took place probably below 300°C., under several thousand pounds of water pressure.

Most serpentinite bodies throughout the world contain small quantities of cross-fiber chrysotile, but mineable deposits are those which contain about 5-10% recoverable fiber in veinlets varying from about 1/16" to 1" thick. Although the Coalinga deposit was also formed by the serpentinization of a parent magnesium silicate rock, it bears little resemblance to most of the world's asbestos deposits. Cross-fiber veinlets are essentially absent from the body. Instead, nearly 75% of the entire mountain consists of soft, powdery chrysotile, in the form of friable agglomerates and leathery sheets.

PRODUCTION

The asbestos production of the United States is quite small compared with that of Canada and Russia, each of which produces about 1.5×10^6 tons a year, but it has increased from about 40,000 tons a year in 1960 to over 100,000 tons in 1965, primarily due to the development of the Coalinga asbestos deposit, by three major companies - Johns Manville, Atlas Corporation, and Union Carbide. In contrast to the large-scale production of chrysotile asbestos, only about 2000-3000 tons of anthophyllite asbestos are sold each year, principally as filler materials in plastics. Crocidolite is produced mainly in South Africa, Australia, and in the Transvaal at about 100,000 tons a year. Its high strength (see Table I) and long fiber length command slightly higher prices than other asbestos (\$250 to \$600/ton), although the brittleness of the fiber restricts its usage in most applications.

CRYSTAL STRUCTURE

As can be seen in Table I, the structural formula for chrysotile is somewhat different from those of the other asbestos minerals. This is because the basic crystal structure of chrysotile is different from that of the others; it belongs to a group of structures called layer lattice silicates, while anthophyllite, crocidolite, and the others are all chain structure silicates. Chrysotile itself is a member of the serpentine group of minerals. As seen in Figure 1, the serpentine minerals are divided into three main varieties, chrysotile, which occurs as tubular fibers, and lizardite and antigorite, both of which occur as platy or lath-like particles. The word chrysotile is derived from the Greek χρυσος = golden + τριλός = fiber. Lizardite and antigorite derive their names from their type localities in Cornwall, England, and Val Antigorio, Italy, respectively. All serpentines have essentially the same chemical composition and are hydrous magnesium silicates, with small amounts of iron, aluminum, and nickel substituting for magnesium in the structure.

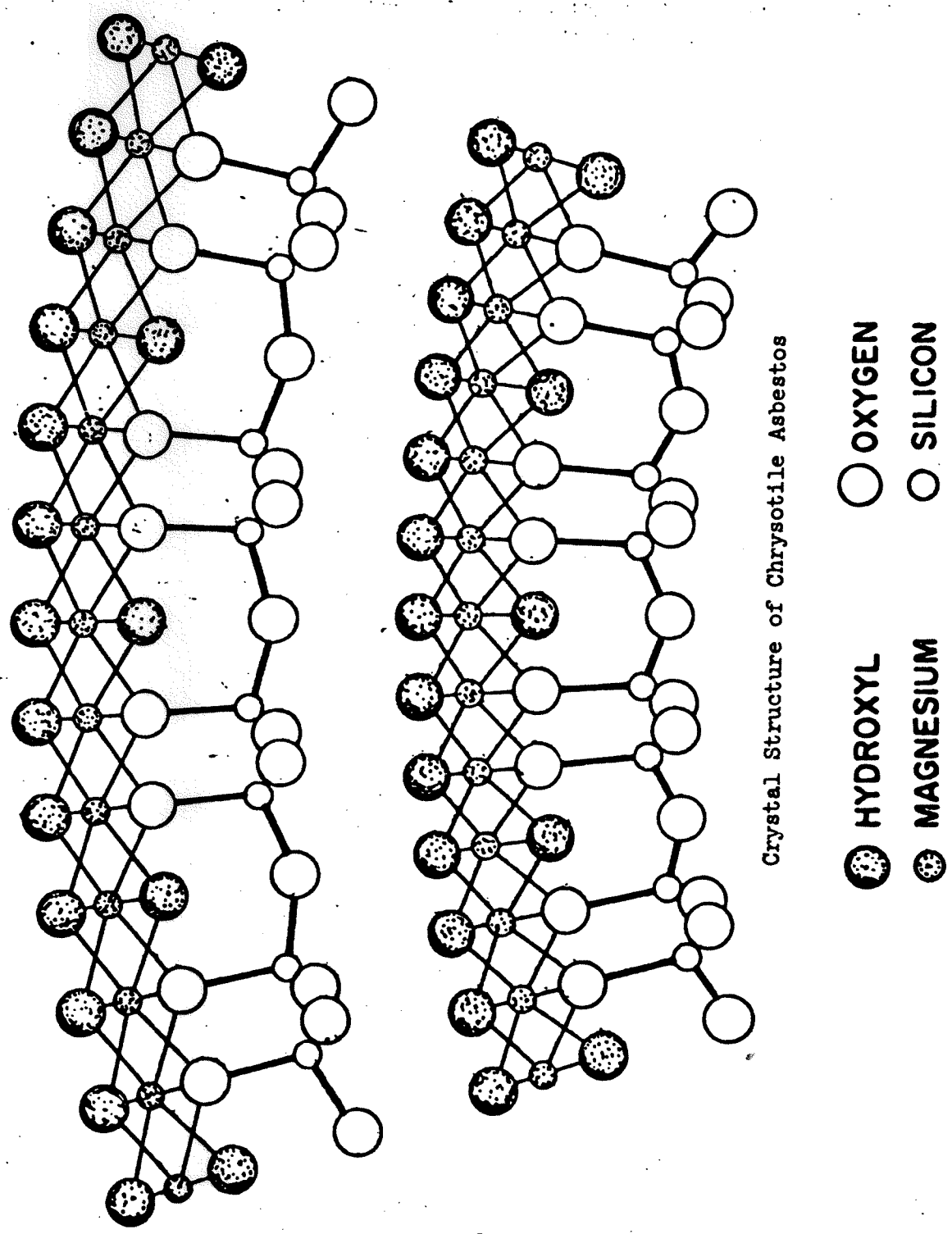
The fundamental crystal structure of the serpentine minerals is similar to that of most clay minerals in that it is a layer lattice silicate, in which three of the four corners of the silicate tetrahedra are shared by adjacent tetrahedra. As shown in Figure 2, the fundamental units are a brucite-like layer, in which the cations are in octahedral coordination, coupled to a tridymite-like layer of silicate tetrahedra. This structure is analogous to the basic crystal structure of kaolinite clay; however, the serpentine structure contains three divalent cations, per two silicons, while the kaolinite structure is composed of two trivalent cations per two silicons. The basic brucite layer has unit dimensions of $5.4 \times 9.3 \text{ \AA}$, while the silicate layer has unit dimensions of $5.0 \times 8.7 \text{ \AA}$. Differences in these unit dimensions produce what is called a structural "misfit" between the two layers, which is alleviated in the serpentine minerals in the following manners.

FIGURE 1

CLASSIFICATION OF SERPENTINE - GROUP MINERALS

	CHRYSOTILE			LIZARDITE	ANTIGORITE
Hand Specimen Morphology Electron Microscope Morphology	Fibrous, platy Tubes			Massive, platy Plates, laths	Massive, fibrous Plates, laths
	Clino-	Ortho-	Para-		
a_o (Å)	5.34	5.34	5.3	5.31	43.3
b_o (Å)	9.25	9.2	9.24	9.20	9.23
c_o (Å)	14.65	14.63	14.7	7.31	7.27
beta	93°16'	90°	90°	90°	91.6°
Layers/unit cell	2	2	2	1	1

FIGURE 2



1. The combined sheet may be curved with the smaller silicate layer on the inside of the curve.
2. Ions of different sizes may substitute in either the octahedral or tetrahedral layers, thereby changing the basic unit dimensions.
3. Vacancies may exist in the octahedral layer, with simultaneous removal of hydroxyl ions to balance the change, also changing the dimension of this layer.

In chrysotile, the structural misfit is apparently alleviated by a curvature of the structure as illustrated in Figure 2, with the brucite layer on the outside of the curve, and a radius of curvature close to 88 Å. In practice, the curved sheet goes all the way around, forming an elongated, hollow cylinder. The tubular structure of chrysotile can be seen in the electron micrograph shown in Figure 3. Measured internal and external diameters of 110 Å and 260 Å, respectively, suggest that each fiber consists of about ten concentric cylinders, each about 7.3 Å thick. In general, the tubes are fairly uniform in diameter. However, length/width ratios of from 2-3 to several hundred have been observed. Commonly, the tubes appear to be partially filled with foreign material at periodic intervals. The filling material is thought to be amorphous, or poorly crystalline material having essentially the same composition as the chrysotile itself. Since it cannot be removed from the tubes by heating or evacuation, it is probably not water, per se. The pore spaces between the tubes also commonly contain similar material, but electron microscope studies have indicated that the Coalinga chrysotile is remarkably free of such adhering particles between the tubes.

Although there was considerable controversy a few years ago as to whether or not chrysotile was actually tubular in nature and did not just roll up under the electron beam, the recent structural analyses of Whittaker and the electron microscopic work of Maser, Rice, and Klug have shown beyond any reasonable doubt that chrysotile is definitely tubular, both in and out of the electron microscope. This latter work was carried out on microtomed sections of chrysotile bundles and showed the "doughnut"-shaped end sections of the natural tubes quite clearly.

While all three varieties of chrysotile, clino, ortho, and para are tubular, particles of lizardite and antigorite appear platy to lath-like under the electron microscope with no evidence of a rolled or tubular structure. In these phases, the structural "misfit" is alleviated by ionic substitutions within the octahedral and tetrahedral positions of the lattice, combined with small amounts of vacancies in the brucite layer of antigorite. Substitutions of this sort give rise to unit dimensions much closer to one another, thereby eliminating any need for a curved structure.

SURFACE AREA

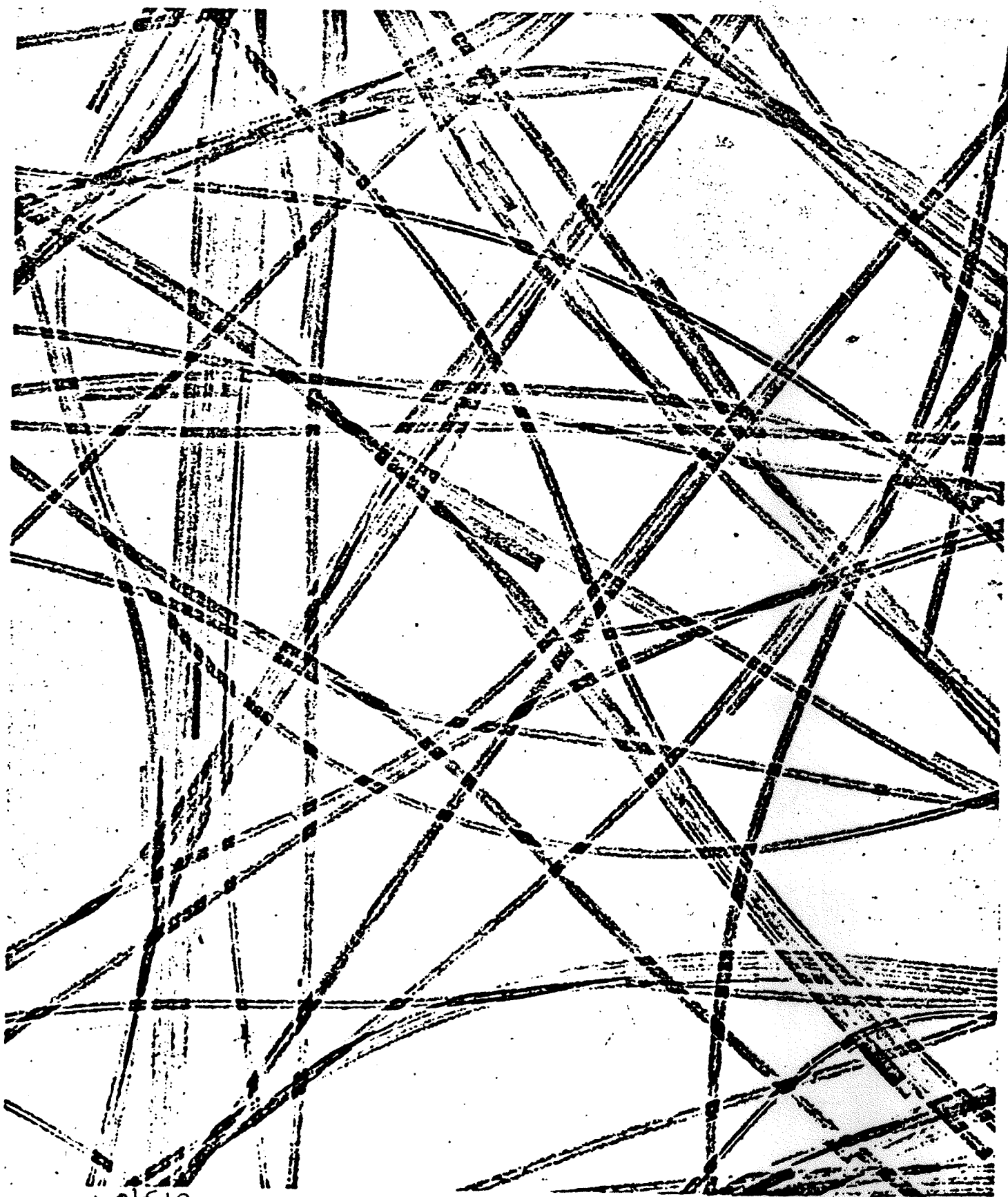
The unique shape of chrysotile asbestos gives rise to one of its most important physical properties - that of its surface area. From strictly geometrical considerations, an assemblage of closely packed hollow cylinders having the dimensions of chrysotile should have the following surface area:

Internal Surface Area	35 M ² /g.
External Surface Area	70 M ² /g.
Total Surface Area	105 M ² /g.

FIGURE 3 - Liberated Chrysotile Asbestos Fibrils

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Most natural chrysotiles, however, have surface areas only of about 20-30 M²/g., suggesting that all of their internal area and parts of the external area are blocked by the foreign material mentioned on preceding page. Dispersion and/or defibrillation of many such chrysotiles results in an increase in the surface area by a removal of the inter-tubular material, but the intra-tubular material appears to be unaffected by such treatment.

Fortunately, the Coalinga chrysotile appears to have a surface area of 70-80 M²/g., in line with the electron microscopic observations that little or no foreign material is present between the tubes. High surface area chrysotile of this type is found in only one other asbestos deposit in the world, the Stragari deposit in southern Yugoslavia. The material from this deposit, by the same token, closely resembles the Coalinga asbestos in physical appearance and in fiber content.

THERMAL REACTIONS

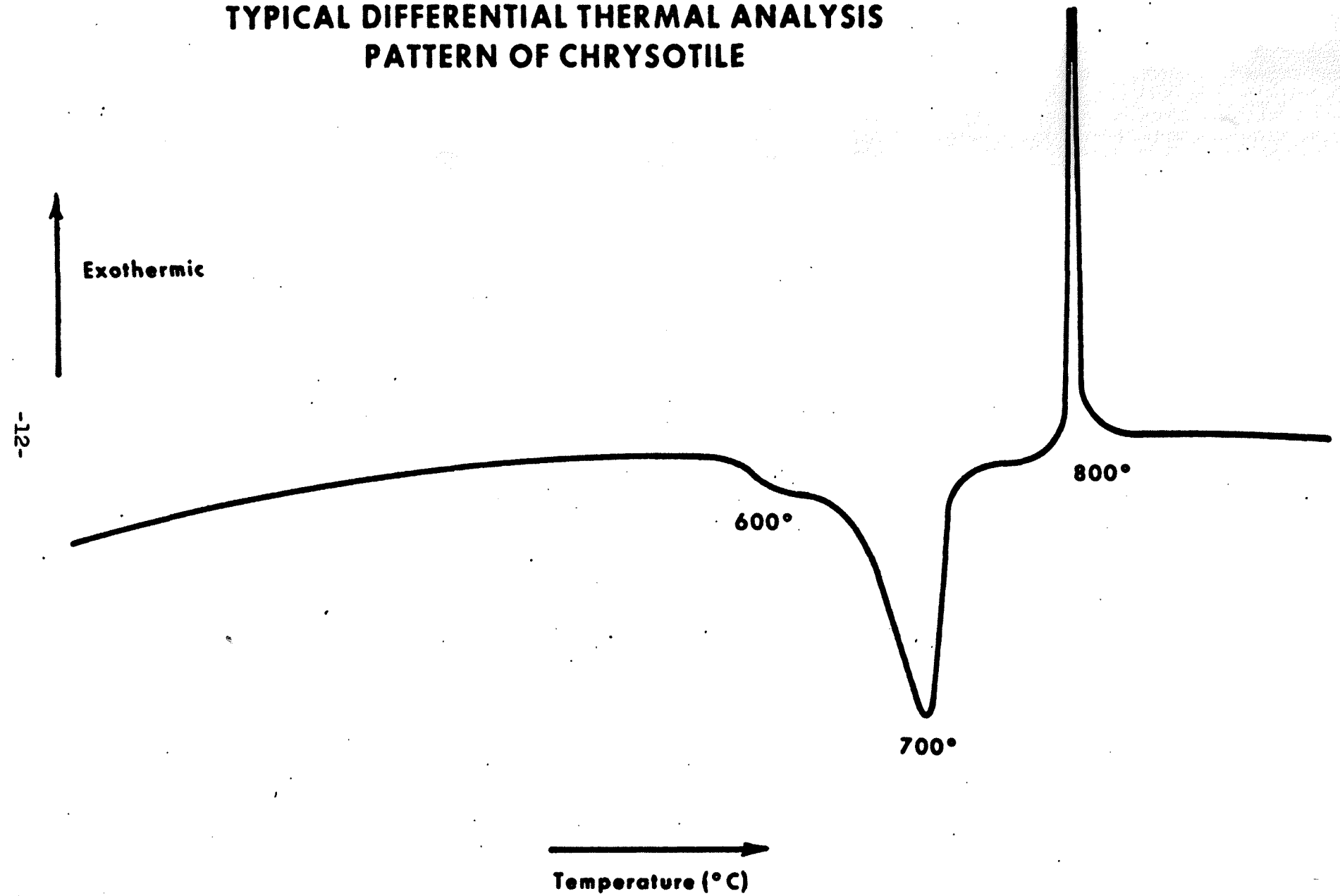
A second physical property of chrysotile and the serpentine minerals of considerable interest is their thermal stability. The dehydration reactions of chrysotile can easily be explained with reference to the differential thermal analysis pattern shown in Figure 4. The small endotherm at about 600°C. corresponds to the loss of water from just the surface layer of hydroxyls in the structure. The major endotherm at 700°C., however, is related to the removal of the remaining water from the lattice. At this temperature, the structure collapses and appears amorphous until recrystallization takes place. At 800°C., recrystallization to forsterite (Mg₂SiO₄) takes place, but neither silicanor enstatite (MgSiO₃) appears in the X-ray diffraction patterns of these materials until well above 1000°C.

In the past, dehydration of such materials was thought to take place by a simple reaction of two hydroxyl ions, forming a water molecule and an oxygen ion. Such a mechanism would, however, tend to disrupt considerably the internal structure of a serpentine particle, which apparently, from single crystal X-ray studies, does not occur. Instead, the dehydration appears to proceed in an extremely well ordered manner, and the final anhydrous products are highly oriented with respect to the crystallographic axes of the starting serpentine. As shown in Figure 5, dehydration probably takes place by an initial migration of protons from the interior of the particle toward the edge, with a simultaneous migration of all of the magnesium and some of the silicon from the edge toward the center. This leaves a forsterite-rich interior, with a silica-rich exterior, both of which appear to be amorphous to X-rays. During recrystallization, the forsterite interior crystallizes, but the silica shell does not. Above 1000°C., however, the forsterite reacts with the silica, producing the equilibrium assemblage-forsterite + enstatite. It is interesting to note that the tubular morphology of chrysotile persists upon heating, even after the crystal structure itself has disappeared during dehydration. Similarly, the gross fibrous nature of the material is retained even after the sample has been heated to 1000°C., although the initial strength of the material is considerably reduced.

If chrysotile is leached completely in dilute acid, a silica residue is left which retains the original tubular structure of the starting material. The tubular silica product, however, is considerably shorter than the original chrysotile and much more brittle. Skeletal silica produced by leaching cations from silicate structures is not unique with chrysotile, and several other minerals, such as mica, wollastonite, zeolites, etc. also yield silica pseudomorphs in this manner.

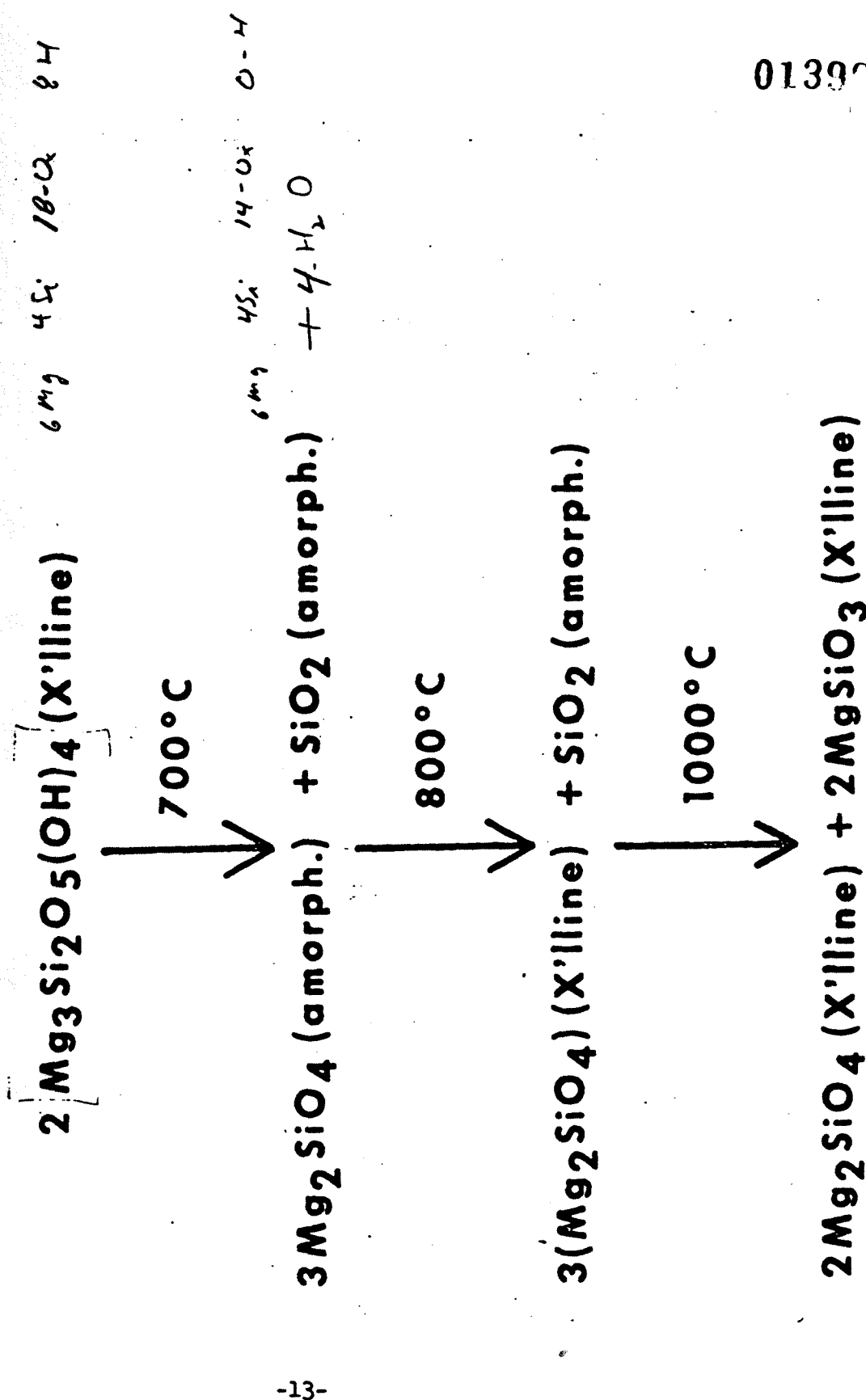
FIGURE 4

**TYPICAL DIFFERENTIAL THERMAL ANALYSIS
PATTERN OF CHRYSOTILE**



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THERMAL REACTIONS OF CHRYSOTILE



BASIC FIBER PROPERTIES OF ASBESTOSS. Chwastiak

My function today is to tell you about the properties of chrysotile asbestos, not only its intrinsic properties, but how they can be altered.

Much data are available, so I will try to get them all in by presenting these pictorially - sketches and graphs, about 20,000 words worth. Initially, our mineralogical expert in the asbestos project was Fred Mumpton, who spoke to you just preceding me. Bill Drescher and Wayne Naumann studied the basic properties when we were located at the Tuxedo Research Center, and recently I have become heir to this job. The data that I will present will be from all of these sources and from the published literature on chrysotile asbestos, which is primarily about asbestos from the Johns-Manville deposits in Quebec, Canada.

As Fred Mumpton has told you, there are a number of minerals which are called asbestos. When I refer to asbestos, I will mean chrysotile asbestos and, unless I state otherwise, I will mean chrysotile from our Coalinga deposit in California.

Asbestos occurs commonly as flakes, as seen in this first picture (Figure 1). There are some veins of material composed of aligned fibrils, there are lots of disordered regions, and the whole structure is surprisingly porous.

In this form, the flake material is not fibrous, but fortunately it can be separated into its component fibers readily. In the laboratory this is no problem; a blade spinning at high speed, such as in a Waring Blendor, will perform this task readily. One possible intermediate stage in the opening process is shown in the second picture (Figure 2). After the final stage of opening, ideally there would be only individual fibrils as shown in Figure 3. The magnification in this picture, as seen on the screen, is more than 300,000. The particles are semicolloidal in nature. Let me explain - colloids are normally defined as ranging from a top size of 10,000 Å, or 1 micron, to the finer sizes. The chrysotile fibers are about 250 Å in diameter, which is definitely colloidal, but the lengths are generally substantially greater than 1 micron and so are not colloidal. Optically, it is only possible to resolve dimensions as low as about 1 micron. Thus, we have the interesting phenomenon that the fibers are long enough to see but are not wide enough to see, so these fibers have to be studied with the aid of an electron microscope.

In the next slide, Figure 4, the diameter size distribution of Coalinga fibers is compared to that of Canadian fibers. Our fibers average about 260 Å in diameter, while the Canadian fibers are somewhat larger in diameter.

The lengths of the fibers are just about impossible to determine, but the range of fiber length is large. Unfortunately, the magnitude of the length of the fibers determines the effectiveness of the product in some of its uses, so it is necessary to characterize the fibers some way according to their length.

When a fiber is present in a fluid, it spins and turns freely as it is buffeted by thermal forces. In the presence of other fibers, however, it may collide and interact with them. There are always Van der Waals-type forces which

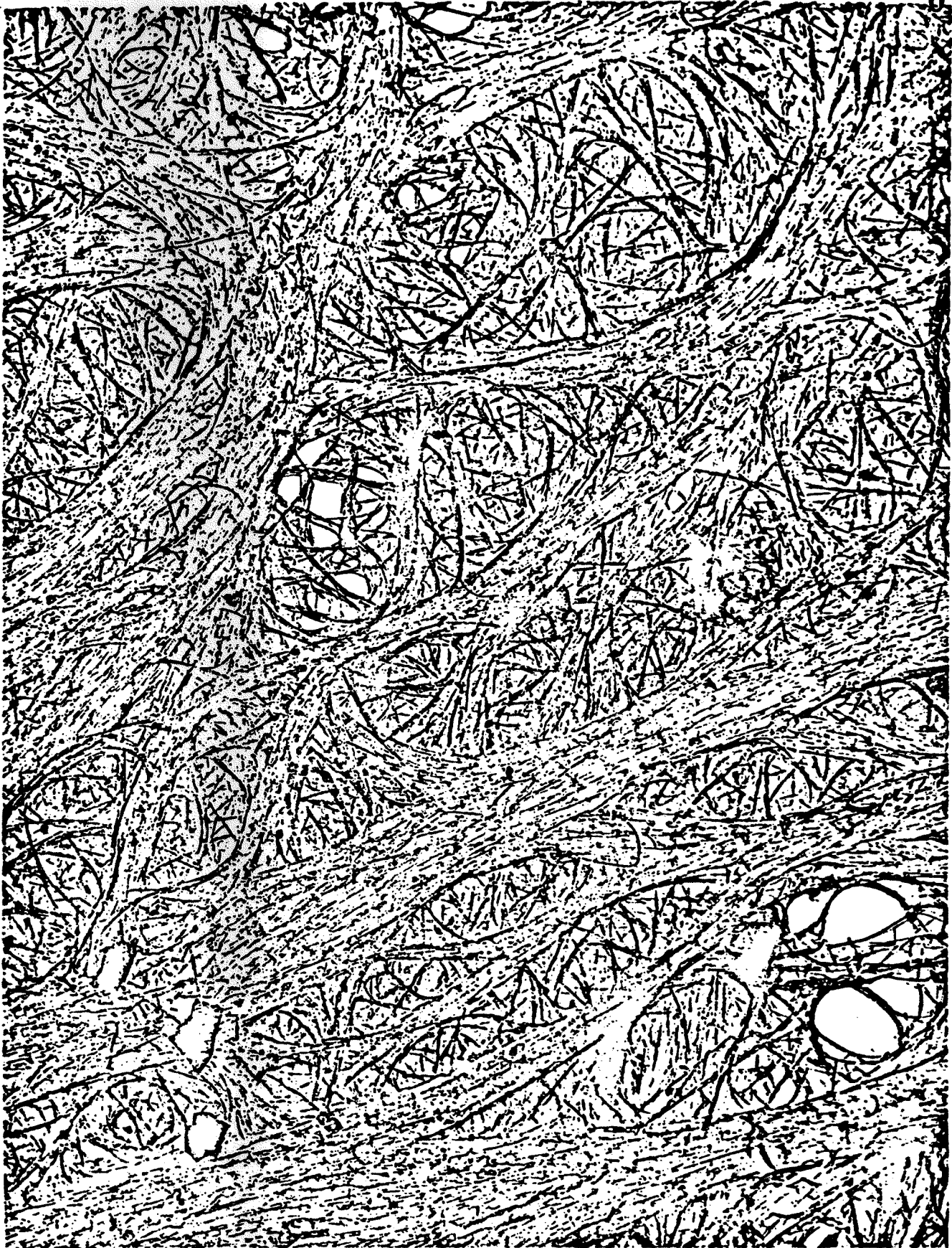


FIGURE 1 - Replica of Asbestos Flake
Magnification 9,000X - Photo No. 2550

HT-1566



FIGURE 2 - Aggregated Asbestos Fibrils
Magnification 8,500X - Photo No. 1996-11

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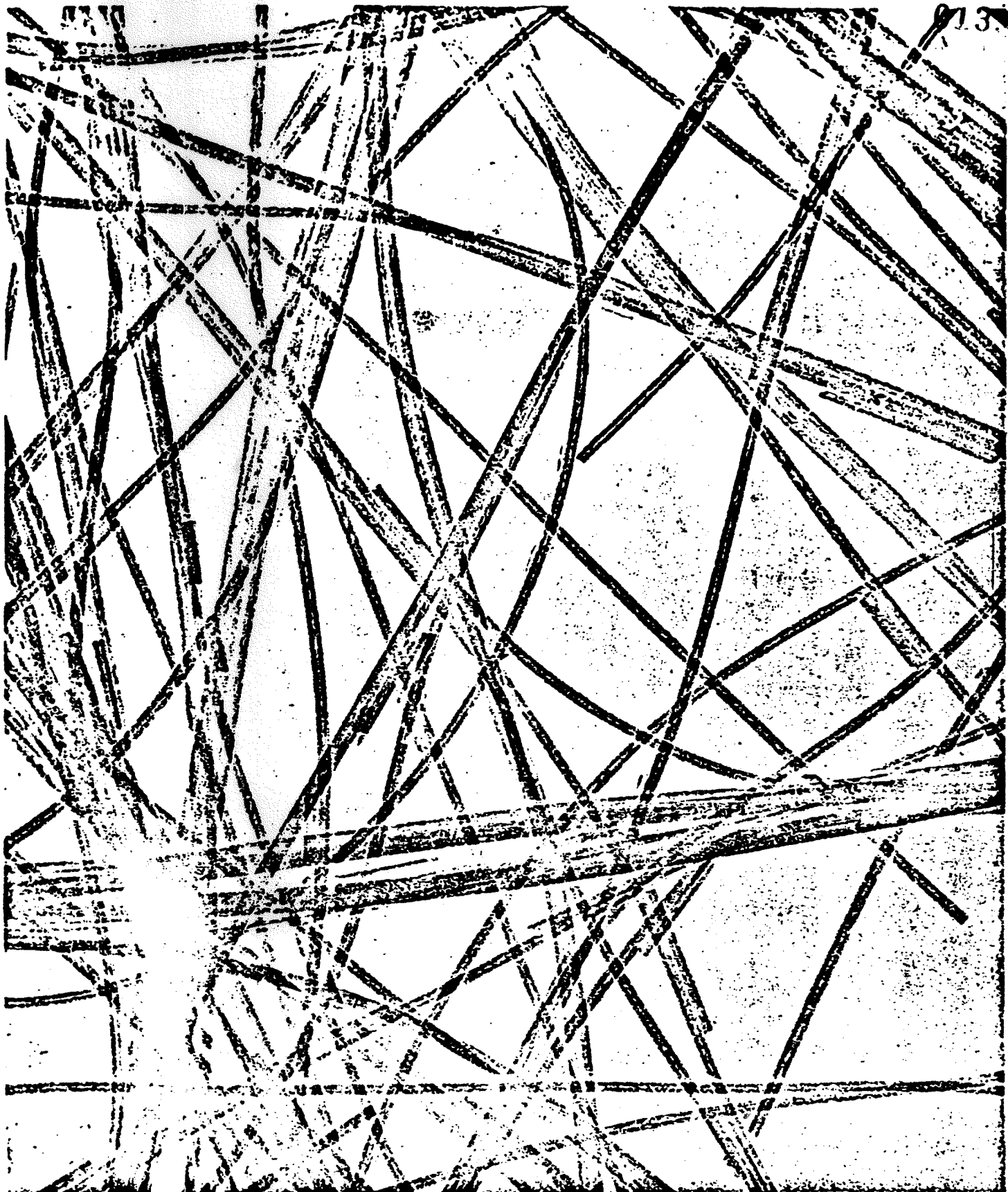


FIGURE 3 - Liberated Asbestos Fibrils
Magnification 75,000X - Photo No. 2340

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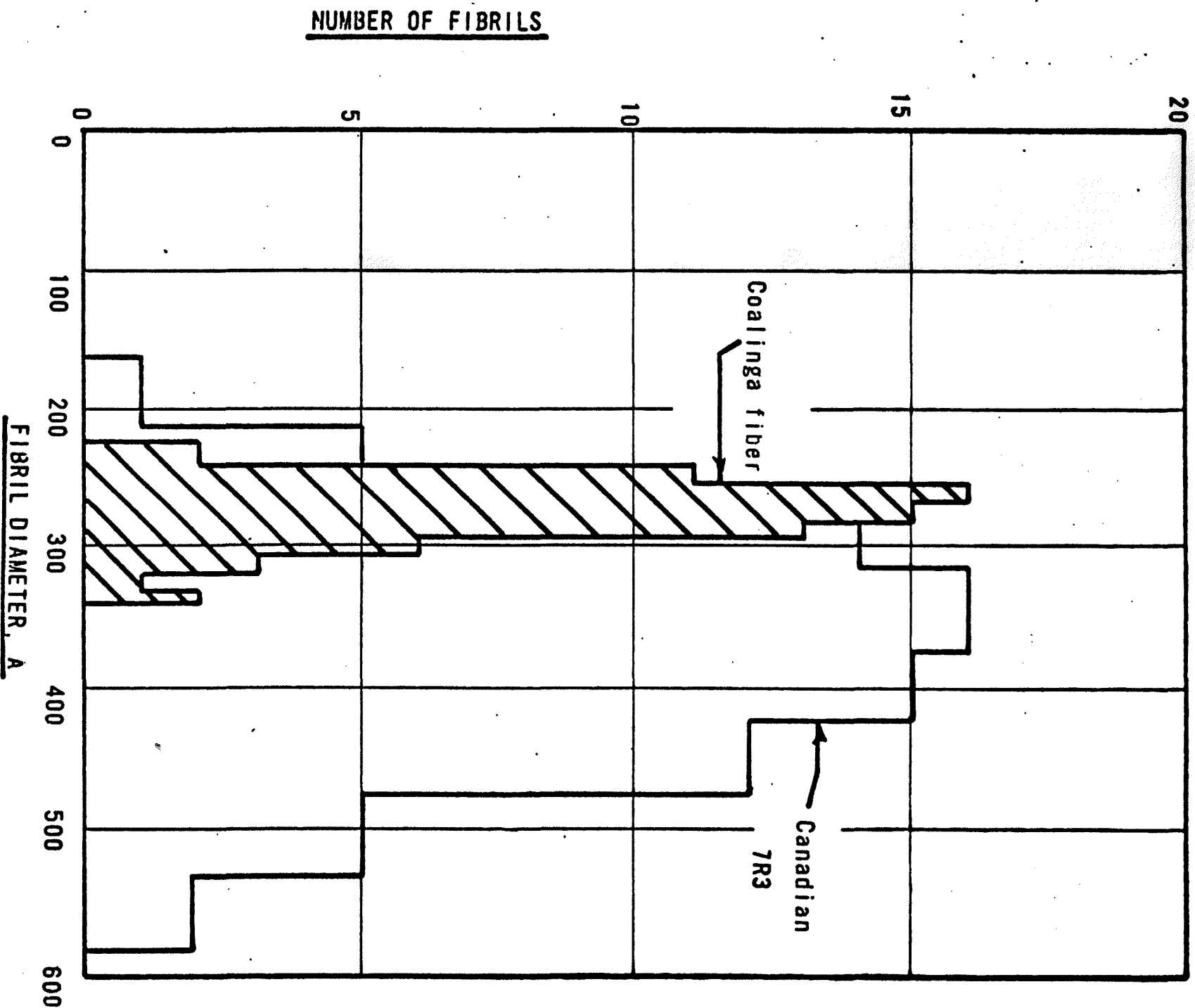


FIGURE 4 HISTOGRAM OF FIBRIL DIAMETER DISTRIBUTIONS.

cause fibers to attract each other and form agglomerates. The simplest possible model relating the concentration of fibers and their probability of collision is shown in Figure 5. When the spheres of influence of the fibers start to overlap, their chances for collision go up rapidly. The volume of influence is a sphere defined using the length of the fiber as the diameter of the sphere.

In the next slide, Figure 6, I have plotted this critical concentration of fibers as the function of a hypothetical average length. We have made a guess that most of the weight of our product has a length-to-diameter ratio between 100 and 1000. I have arbitrarily chosen 200 as the average l/d ratio. This corresponds to a length of about 5 microns, and the critical concentration is 0.06 gram per liter, or 60 mg. per liter, which is 60 ppm. Or to put it another way, one gram of fibers should start to interact in 17 liters of fluid. The line on the graph, by the way, has an l/d ratio of approximately 200. That is the shape that I am proposing as the average for our asbestos fibers. Using the dimensions of 260 Å for the diameter and 5 microns for the average length, I have calculated that there are about 10^{14} fibrils in one gram of asbestos. This is the ideal number, but the product that we sell probably has a hundred times of particles less per gram. In other words, all of the fibers are not liberated. This is a processing problem yet to be solved. However, first we have to solve another problem, and this is - how to determine quantitatively what the degree of liberation is. We have only begun to study this aspect of the problem.

A fundamental bulk property of a solid is its solubility in water. It has been stated that asbestos has a brucite, or magnesium hydroxide, surface, so one might expect it to be as soluble as brucite. It is, at pH 11. At lower pH values, the influence of a silica layer below the brucite layer must become important. The solubility of asbestos is shown as a function of pH in Figure 7. Specific data points collected have been erratic, but the trend is definite. The magnesia is much more firmly bound to its structure than is the magnesia in brucite, at least down to pH 5. At very low pH values, below 1, all of the magnesia in the structure is leached irreversibly, leaving a fiber skeleton composed of silica. As noted in Figure 7, the silica has a low but finite solubility also. The pH of 11 has a special significance for asbestos, as will be seen shortly.

However, the most important properties of our system are the fibrous shape of the particles and the positive surface charge of the fiber.

Before I discuss the charge properties of chrysotile asbestos, let me introduce you in general to that important concept in the surface chemistry of colloids, the double layer. A schematic view of a double layer is shown in Figure 8. A charged particle, suspended in a solution, has an equal number of oppositely charged species in the liquid adjacent to its surface. The net charge on the particle and in its adjacent solution is zero, but there is a difference in character between the charges on the surface and those in the liquid. The surface charges occur at fixed sites, while many of those in the diffuse layer around the particle, the double layer, are relatively mobile and free to exchange with other ions in solution. Their distribution can be distorted by mechanical forces, leaving the particle with an apparent net charge temporarily. In this figure, I have also shown that the potential due to the surface charge drops off exponentially with distance beyond the first layer of absorbed ions. It is the form of this potential decrease which is responsible for the Boltzman-type distribution of ions in the double layer.

In Figure 9, two similarly charged particles are depicted as repelling each other when their double layers start to overlap. The lower sketch shows a

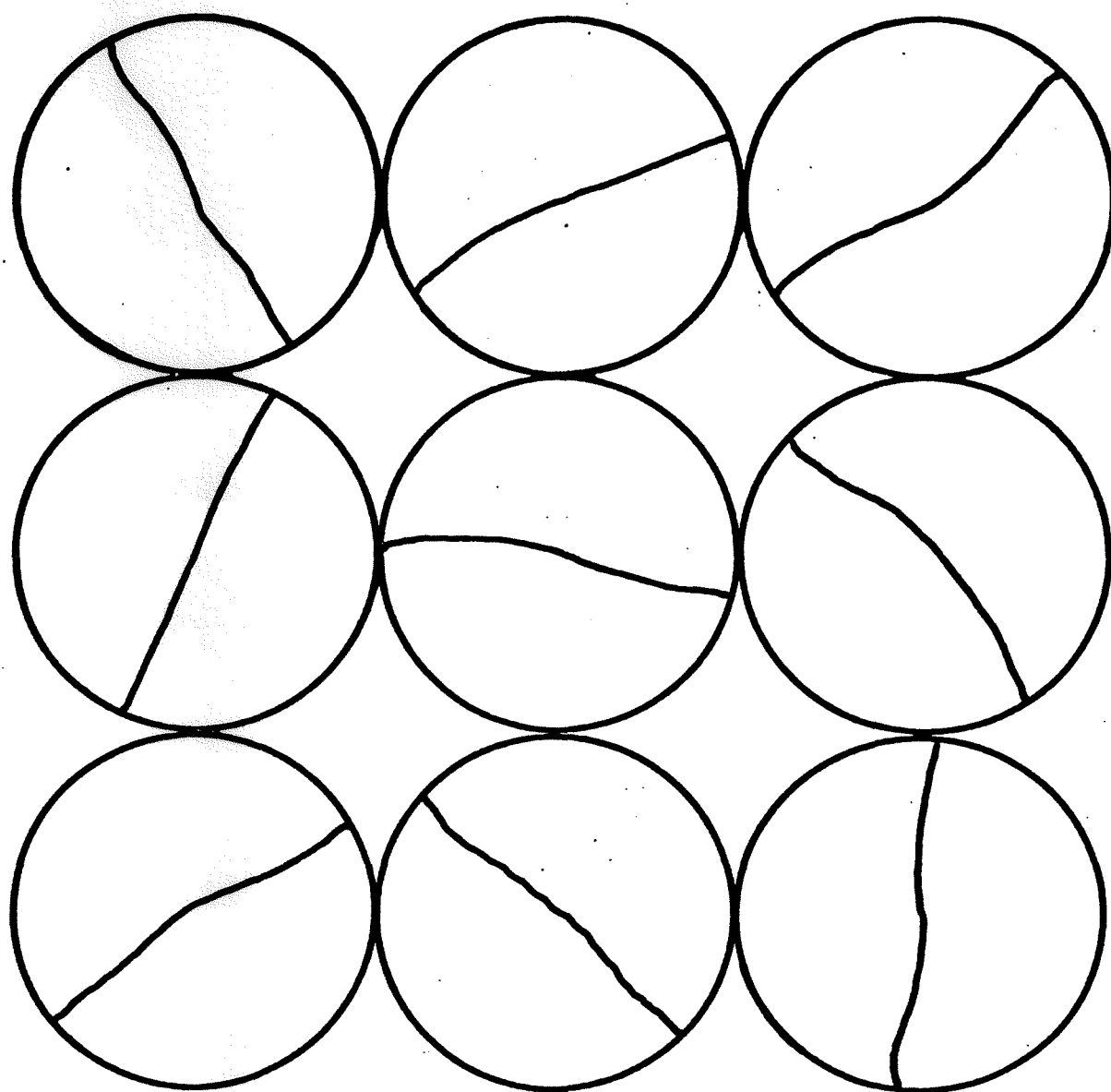
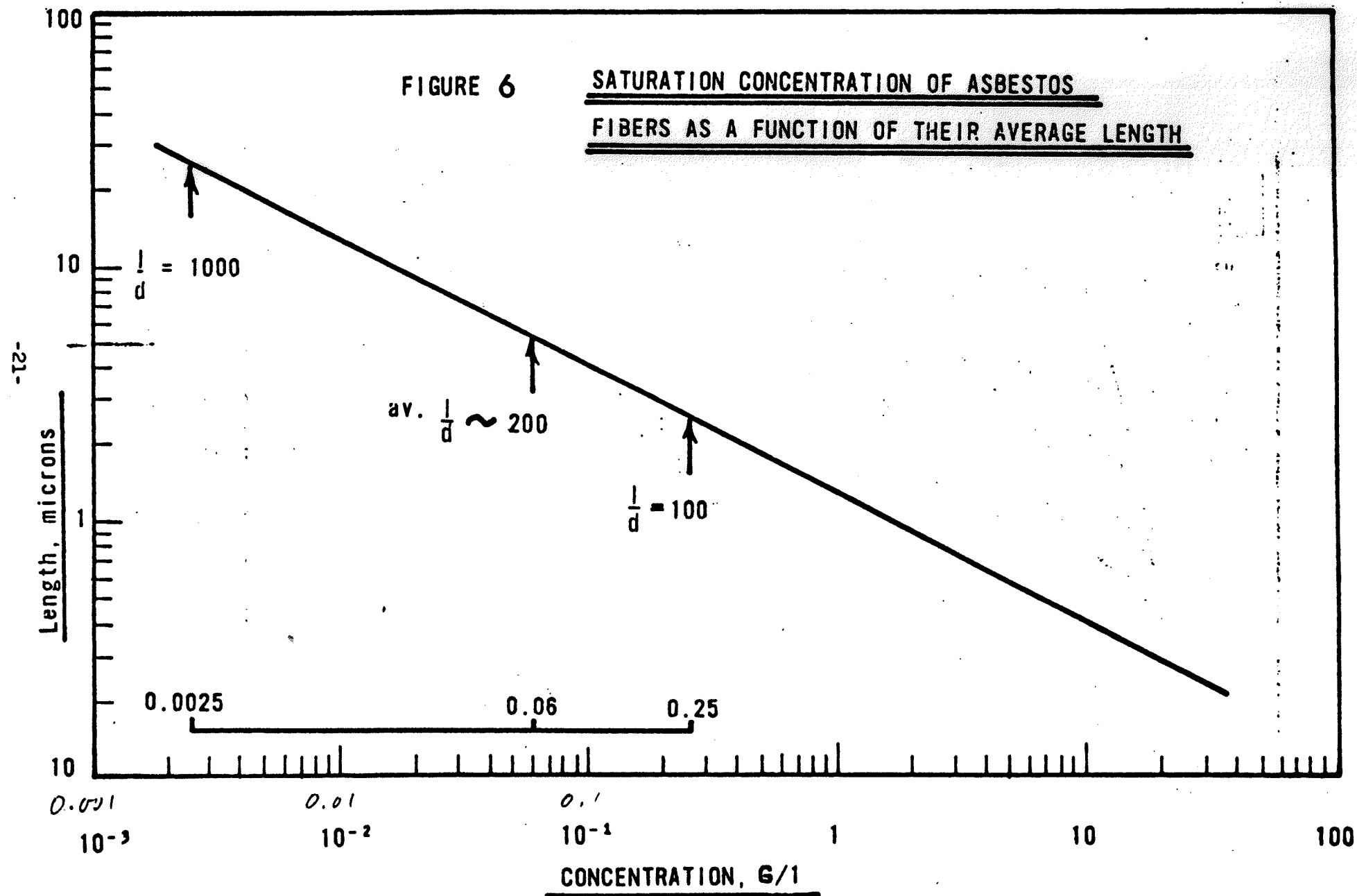


FIGURE 5

AN APPROXIMATION OF CRITICAL FIBERCONCENTRATION FOR STRUCTURE FORMATION



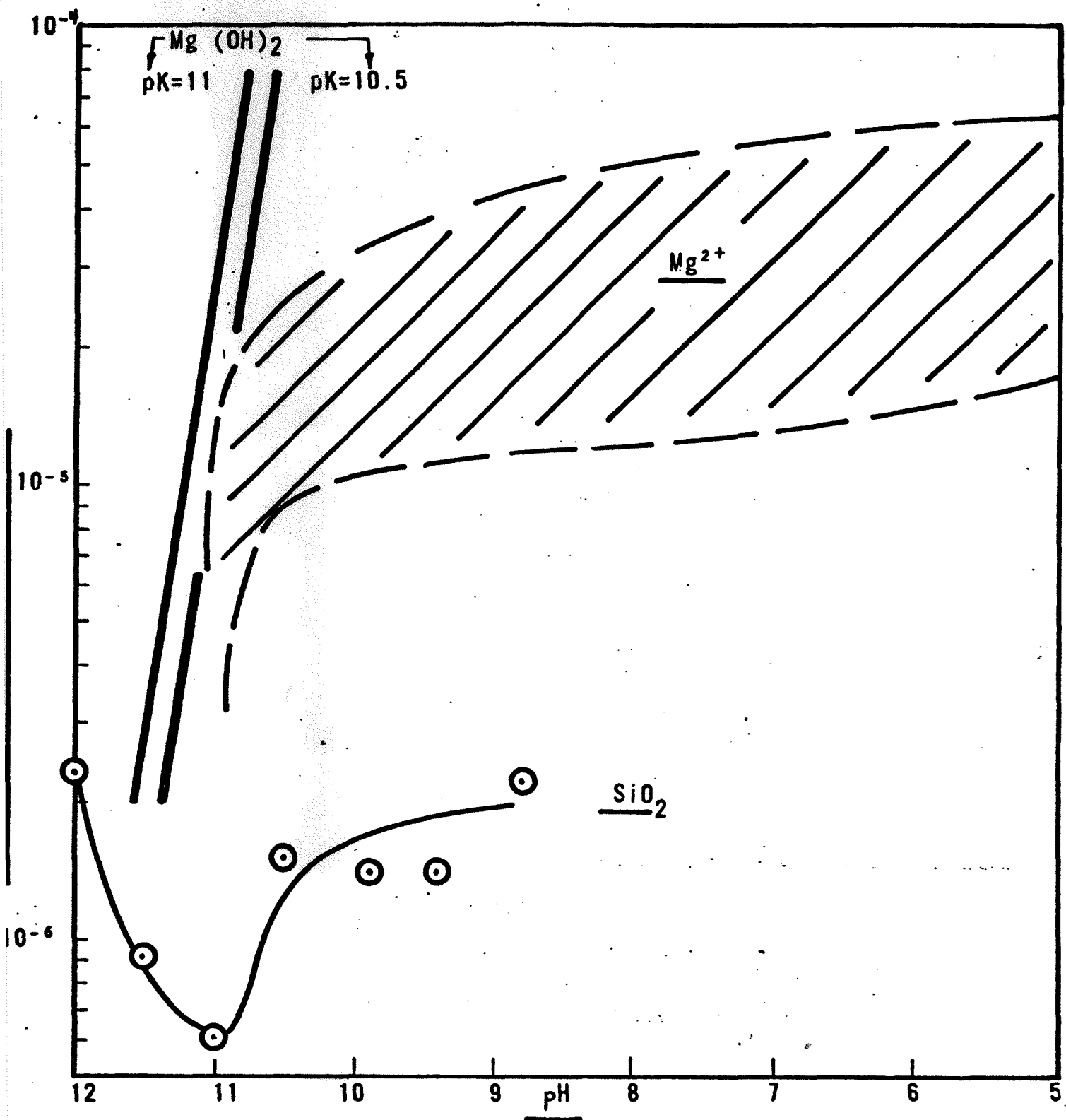


FIGURE 7 ASBESTOS SOLUBILITY IN WATER
AT ROOM TEMPERATURE

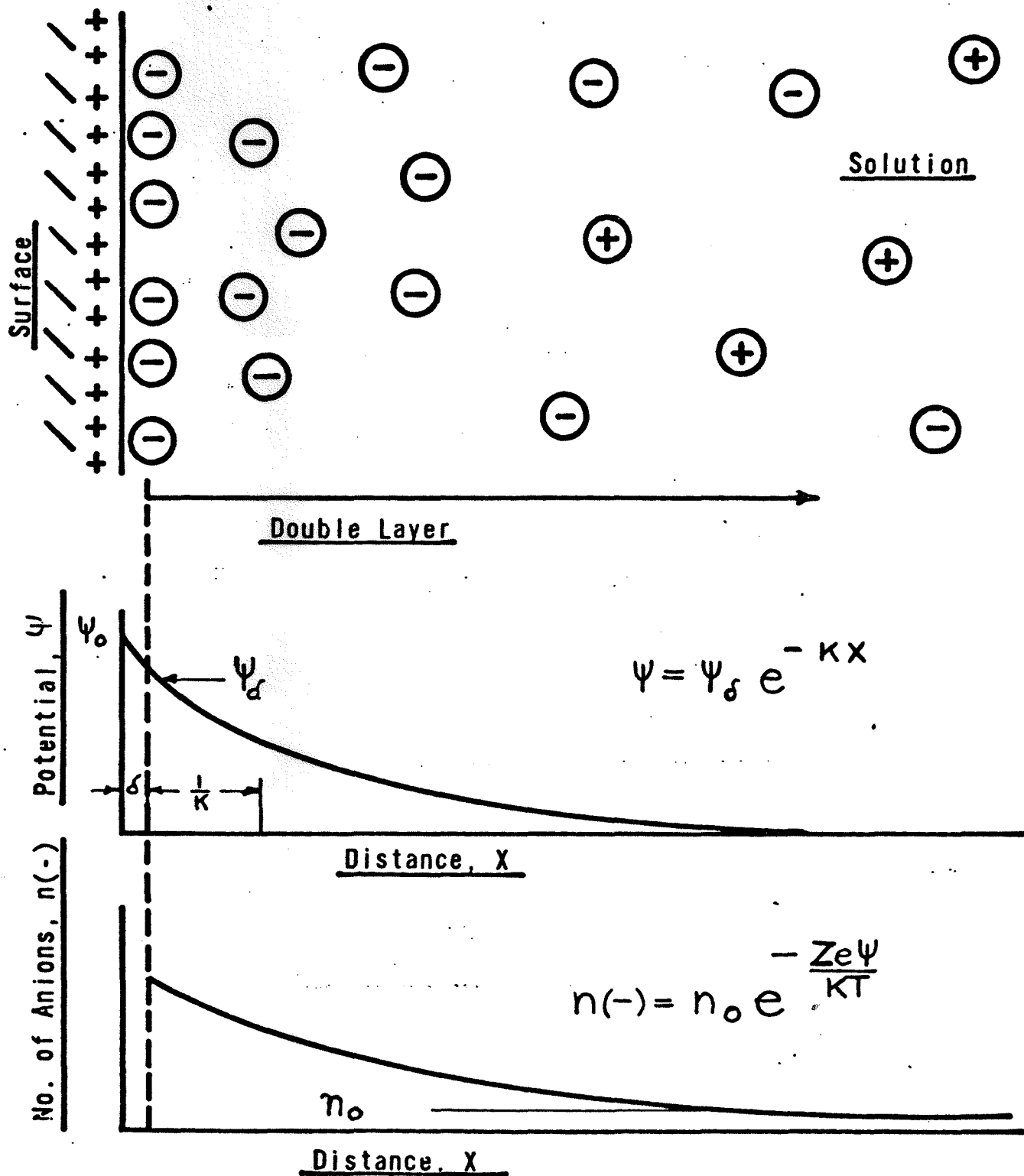
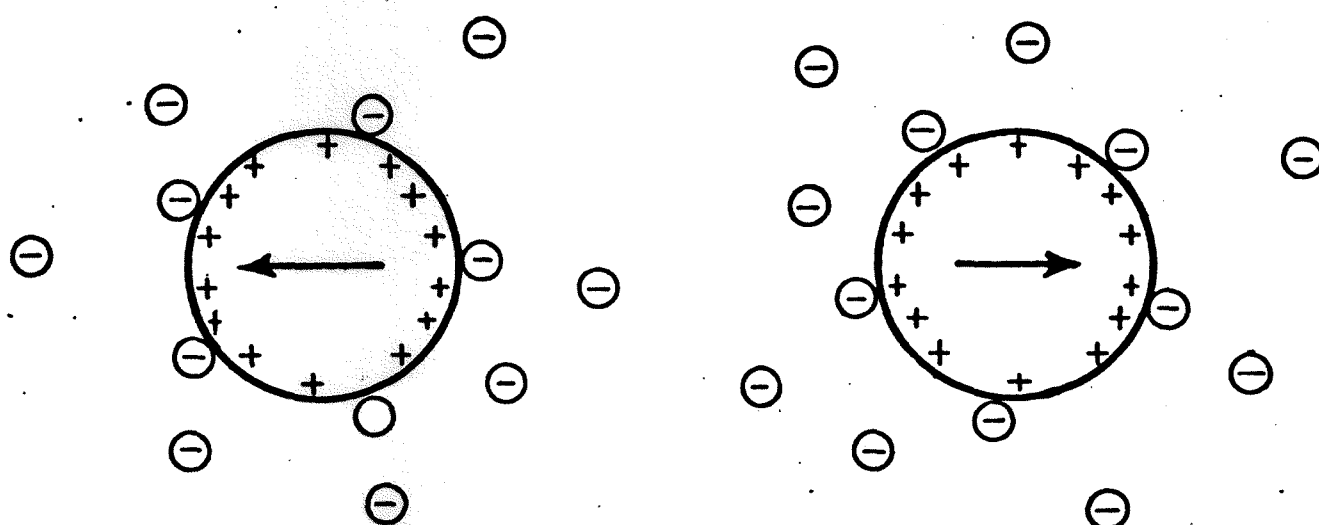


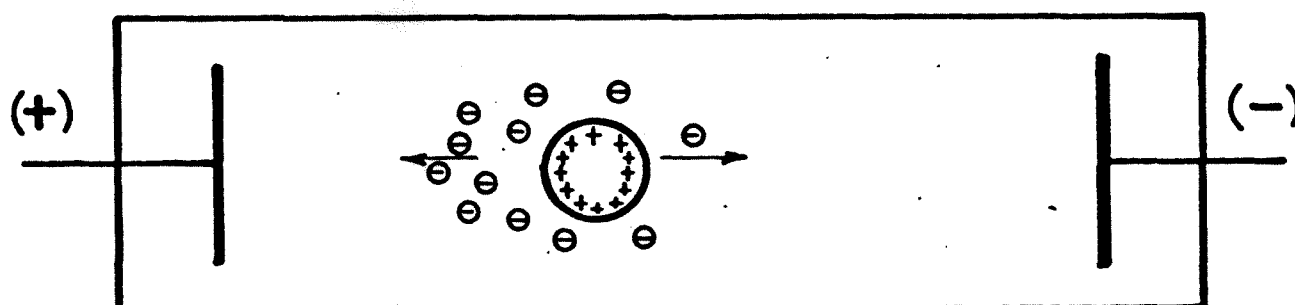
FIGURE 8

DOUBLE LAYER AT A CHARGED SURFACE

FIGURE 9



REPULSION DUE TO DOUBLE LAYERS AROUND
CHARGED PARTICLES



MOVEMENT OF A CHARGED PARTICLE IN AN
ELECTRICAL FIELD

typical way in which charged properties are measured. This particular technique is known as electrophoresis. The velocity of a particle in an electric field of known strength is measured, and potentials at the particle surface can be calculated from this information.

The results of experimental measurements on chrysotile are given in Figure 10. Surface properties of a mineral are generally characterized by its zero point of charge. The latter is the solution concentration of potential determining ions when the surface has no net charge. For oxides, hydrogen and hydroxyl ions are the most important species affecting the basic surface properties. On the slide, the zero point of charge of chrysotile is shown as being at pH 11.8, 10.1, or 10.9, depending on the investigation. This is not an unusually large spread in the rather imprecise measurements common in colloidal systems. At pH values below 10, the surface is quite positively charged, and at pH values below 6, the surface potentials increase very rapidly.

At this point I will try to demonstrate the phenomenon known as dispersion as opposed to flocculation. The dispersed state is characterized by low viscosity suspensions, approaching that of water itself, while flocculated suspensions are quite viscous. The truly colloidal fibrils won't be visible as such when they are dispersed, although the aggregates of fibrils, the flocs, will be visible.

In the next slide, Figure 11, the zeta potentials of some other materials are shown for comparison with asbestos. The magnitudes of the potentials are lower than those shown in the previous graph because they have been calculated from data collected by different experimental techniques, but the behavior of the materials is correctly represented. The most prominent characteristic of these minerals is that they are, for the most part, negatively charged as compared with the more positively charged chrysotile.

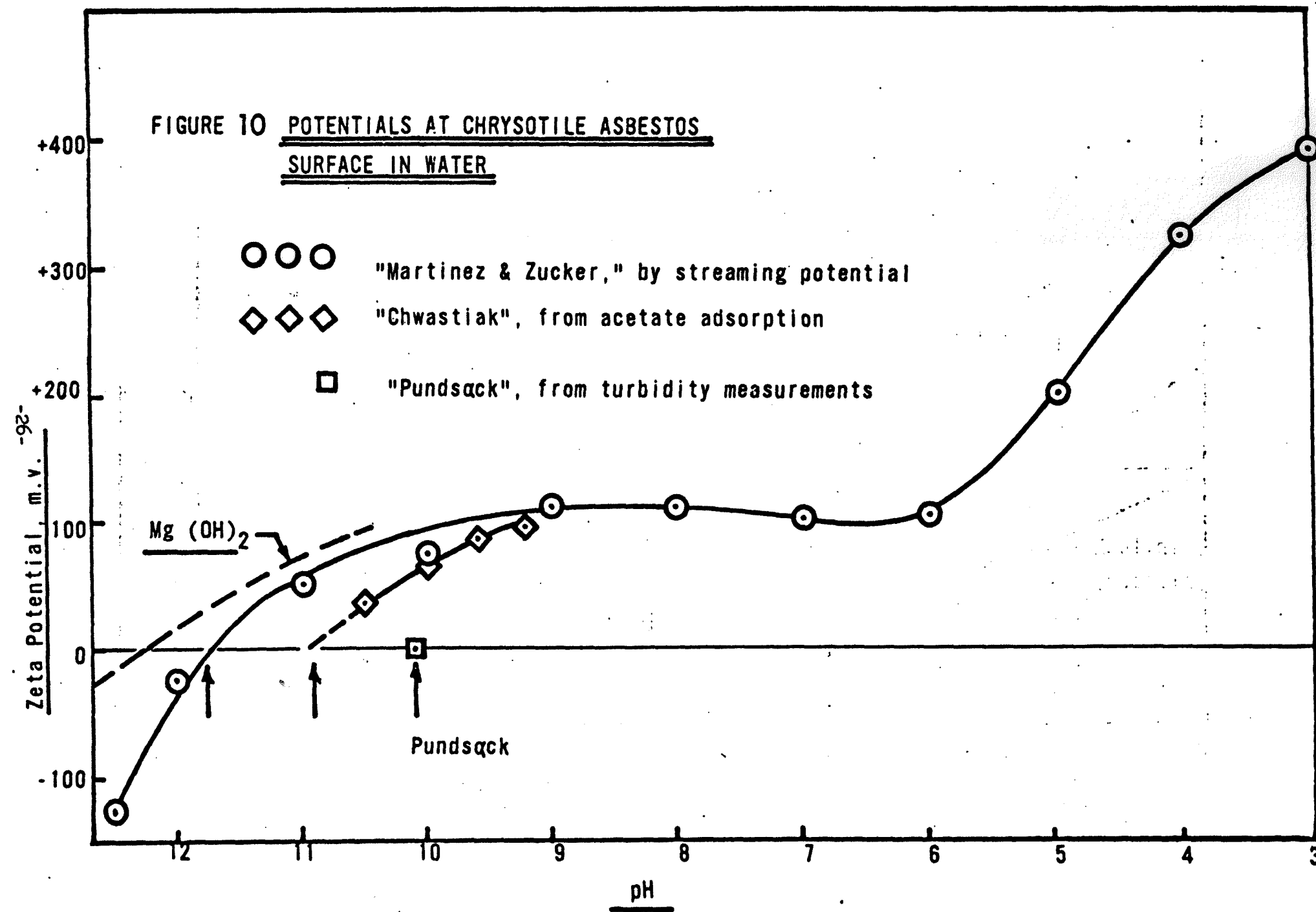
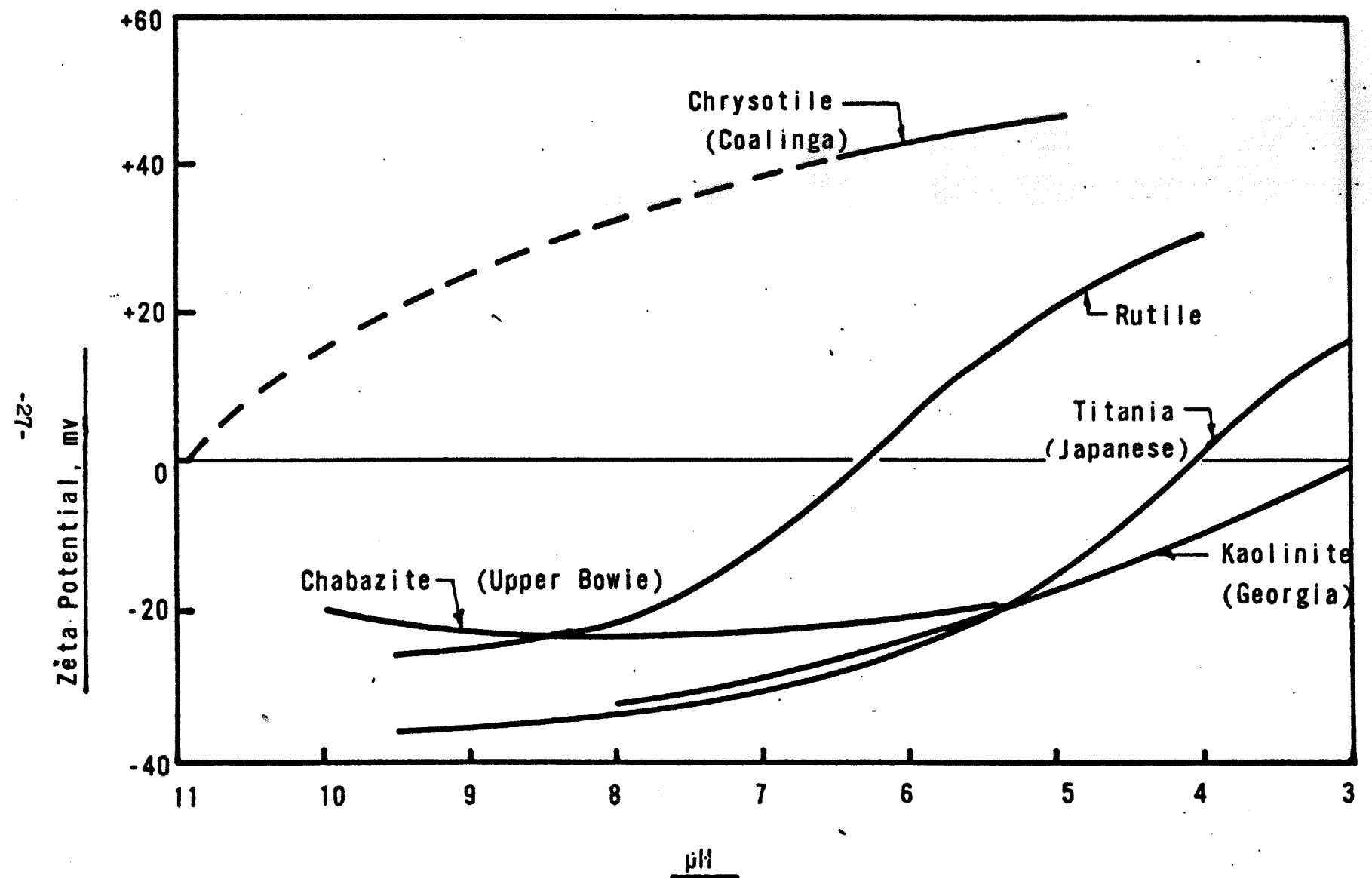


FIGURE 11

ZETA POTENTIALS OF SOME MINERALS



Properties of Asbestos Suitable for Use in Cellulosic Paper

A. W. NAUMANN

ASBESTOS is a class name for several naturally occurring fibrous minerals. The most common, and the one that is finding increasing use as a paper additive, is chrysotile, $Mg_3(OH)_2Si_2O_5$. The purpose of this paper is to compare chrysotile properties with those of other commonly used additives.

CRYSTAL STRUCTURE AND PARTICLE MORPHOLOGY

The structure of chrysotile is similar to that of the kaolinite minerals (1) in that it consists of an alternate series of layers of tetrahedrally coordinated silica and octahedrally coordinated magnesium joined into a composite sheet, with the tips of the silica tetrahedra and one of the surfaces of the octahedral layer lying in a common plane. The silica layer is in an oxide form. The magnesium layer is in a hydroxide form, giving this layer a resemblance to the mineral brucite [$Mg(OH)_2$]. Figure 1 is a representation of the structure, the "a" dimension having been exaggerated to show the details of the structure.

Pauling (2) predicted, before the layer structure of chrysotile was recognized, that a magnesium analog of the kaolinite minerals would have to exist as curved sheets because of a mismatch in the repeat distances of the individual layers. The normal repeat distance for the silica layers (8.9A), as found in kaolin, is smaller than the corresponding repeat distance of an octahedral magnesia sheet (9.4A), as found in the mineral brucite (3). Pauling's prediction has been abundantly verified by X-ray diffraction studies and by electron microscopy (1, 4, 5). The layers of chrysotile curve and close to form cylinders of extreme length-to-diameter ratio. It is partially this filament-like form of chrysotile asbestos that makes it useful as an additive to a paper furnish. An electron micrograph of typical chrysotile fibrils is given in Fig. 2.

As is shown by the calibration marks, the individual chrysotile fibrils are extremely small; many thousands being needed to make up the asbestos fila-

ments visible to the naked eye. Fibril lengths vary from a few microns to many tens of microns. Diameters vary much less and are usually in the range 250-350A. As the following data illustrate, this is a size considerably below that of many materials normally considered to be of small dimensions.

Material	Typical diameter, μ
Rock wool	1-20
Synthetic organic fibers	10-40
Human hair	Approx. 40
Paper pulp fibers	10-30
Kaolin	0.2-10
TiO ₂ pigments	0.2-2
Chrysotile	0.025-0.035

The usual mode of occurrence of chrysotile is a "cross-fiber" configuration in which filaments of chrysotile (i.e., bundles of fibers) are closely packed together and set at right angles to the walls of cracks and fissures that extend through the host rock of the ore body (6). Liberation of this material is accomplished by repeated crushing and classification operations (6). The resultant products, particularly the less expensive grades, contain up to several per cent by weight of rock fragments and other abrasive constituents; and, for this reason, are not well suited to use on the high-speed machinery used in the paper industry.

In 1959, an unusual deposit of chrysotile asbestos, with properties and mode of occurrence that differ from those of cross-fiber material, was discovered in central California (7). The ore of this deposit, instead of occurring in veins, occurs in randomly-oriented, matte-like flakes and agglomerates that are not associated with the hard, consolidated rock masses characteristic of cross-fiber deposits. The ore is of high grade and is therefore amenable to different processing procedures than are usually used with conventional chrysotile ores. Specifically, wet-processing procedures have been developed that give rise to high-purity asbestos prod-

ucts, essentially grit-free and of high brightness.

ABRASIVENESS OF CHRYSOTILE PRODUCTS

The measure of abrasiveness commonly used in the paper industry is the Valley Abrasion Test. Essentially, the method consists of rubbing a section of fourdrinier wire with a Micarta block in the presence of a slurry of the material under test. The slurry is introduced at the interface between block and wire. It then flows through the wire to a receiving vessel from which it is recirculated to the interface. The results of the test are reported as the "Valley Abrasion Value," corresponding to the weight lost by the wire in milligrams. Unfortunately the Valley Abrasion Test does not work well with fibrous materials, since fibers are retained on the fourdrinier wire and do not recirculate freely. A radiometric-tracer method

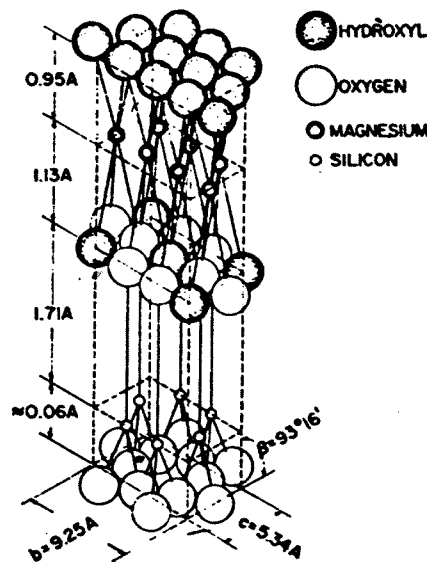


Fig. 1. Chrysotile structure (after Whittaker)

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Fig. 2. Electron micrograph of chrysotile fibrils

was developed to circumvent this problem. The details of this method have been given elsewhere (8); but, basically, it consists of measuring the amount of radioactivity transferred to the particles of a suspension, from an irradiated Waring Blendor impeller, during a prescribed blending period.

A comparison of the abrasiveness of wet-processed and conventional dry-processed chrysotile products, along with data for bleached-sulfite paper stock, is given in Fig. 3. The data points of this figure, which establish the correlation between the Valley and the radiometric methods, are for a group of nonfibrous samples for which Valley abrasion values were available. Count-rate ranges observed for samples of the fibrous materials are superimposed on this correlation curve, and the Valley abrasion values inferred. The actual count-rate ranges for materials of the different types were:

	Count rate, counts/min
Wet-processed chrysotile products	500-1500
Bleached sulfite paper stock	2000-2700
Dry-processed chrysotile products	24,000-78,000

The wet-processed materials were clearly much less abrasive than the conventional products and, in fact, were less abrasive than paper pulp. The wet-processed materials, therefore, would not be expected to cause excessive wear to metal surfaces such as those of fourdrinier wires, trimming knives, printing plates, etc.

CHEMICAL AND PHYSICAL PROPERTIES

It will be shown in the paper by Woolery (this issue, p. 92 A) that chrysotile is an unusually versatile paper additive. The properties that make this possible are:

1. Electropositive surface charge in the pH range where most paper-making circuits operate
2. Highly anisodimensional particle shape
3. High surface area

Chrysotile fibrils are of colloidal dimensions and, when suspended in water, behave according to the classical electrokinetic rules of hydrophobic colloids. That is, the fibrils develop a surface charge when suspended in aqueous solutions as a result of an adsorption of "potential-determining" ions from the suspending medium. With chrysotile and other oxygen-containing materials (metal silicates, oxides, hydroxides, etc.), the potential-determining ions are H^+ and OH^- . For a given material, adsorption favors hydrogen or hydroxide, depending upon pH. Chrysotile, by virtue of the magnesium hydroxide layer exposed at the surface, has a strong preference for the adsorption of hydrogen ions. Chrysotile surfaces retain hydrogen and display a positive charge up to a pH of 10-12 (9, 10). Most materials (including cellulose and the mineral fillers commonly used in the paper industry) carry a negative charge in neutral or acidic solutions. Typical values for the electrophoretic mobility of cellulose and of representative fillers are given in Table I. The significance of the charge of chrysotile fibrils, from the standpoint of the retention of fillers and cellulose fines, is obvious. Having a mutually coagulating system of oppositely charged particles is clearly desirable.

Table I. Electrophoretic Mobility Data for Mineral Fillers*

Material	pH	Mobility, micron/sec per volt/cm
Kaolin (Hydrite UF)	6.2	-1.4
Talc (Mistron Frost)	6.6	-1.1
Titanium dioxide (Titanox AWD)	6.1	-1.1
Bleached sulfite paper pulp	6.4	-1.0
Chrysotile	6.2	+3.1

* Data were obtained by the micro-electrophoresis technique described by Riddick (12).

Electrostatic attraction, however, is only one of the factors that influence the effectiveness of chrysotile as a retention aid. The cylindrical shape of chrysotile particles is equally important. Collision and coagulation rate in suspensions of solids follow an expression of the form (11):

$$\frac{dn}{dt} = KDRn^2$$

where

- K = proportionality constant
 D = particle diffusion constant
 R = particle radius of influence
 n = particle concentration

To a first approximation, R (the collision radius of an anisodimensional particle),

varies as the longest dimension of the particle; while D (the diffusion constant) varies as the mean particle dimension (11). The net result, for the rod-like particles of chrysotile, is a large effective collision radius and a large diffusion constant. It has also been established that coagulation in polydisperse systems (i.e., systems containing particles of differing size) proceeds more rapidly than in monodisperse suspensions (11). These factors combine to give a high probability for collisions, not only between chrysotile fibrils, but also between the fibrils and other particulate matter. Thus, in a paper furnish, chrysotile simultaneously acts as an effective "getter" for small particles such as pigments or cellulose fines; and is collected itself, either by the fibers of the paper pulp or as tenuous asbestos flocs. With either mode of collection, macroscopically uniform distribution of chrysotile, and of materials collected by the chrysotile, is obtained. The electron micrographs of Fig. 4, which are of surface replicas of handsheets prepared with and without fillers, show the distribution of asbestos and TiO_2 on the surface of a pulp fiber.

The electron micrographs of Fig. 4 are of further interest with regard to the mechanical properties of paper. The strength of paper is attributable to the combined effects of four factors: (1) the strength of the pulp fibers, (2) the strength of fiber-to-fiber bonds, (3) the fraction of the fiber areas involved in bonding, and (4) the overall distribution of bonds as determined by sheet formation (15). The adsorption of chrysotile fibrils onto pulp fiber surfaces will have little influence on the strength of the fibers, but may have considerable influence on the bonding between fibers. It is now generally agreed that bonding in paper is due to the formation of

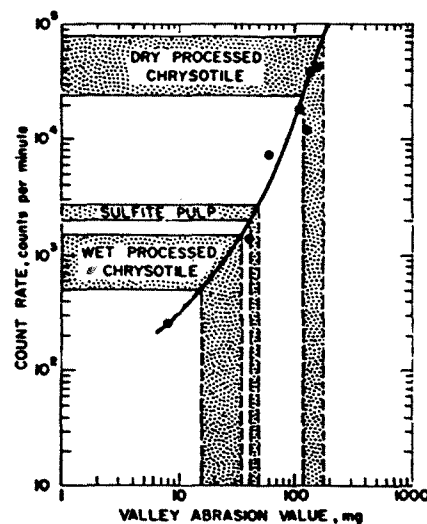


Fig. 3. Abrasion values for chrysotile products



Fig. 4. Surface replicas of filled and unfilled paper handsheets

hydrogen bonds at fiber-fiber contacts, and to secondary valence forces of the London-van der Waal's type. Both types of bonding are of short range nature. London-van der Waal's forces decrease as some multiple power of distance. Even for interactions between large particles, where the additivity of forces extend their operative range, the forces fall off rapidly in the first few angstroms and are practically nonexistent beyond 100Å (14). Typical hydrogen bond distances are 1 to 2Å (15). The diameters of chrysotile fibrils (approximately 300Å) are long compared to these bond distances. This is not to say that the fibrils act as inert spacers, separating pulp fibers by 300Å; for chrysotile fibrils have OH outer surfaces that can enter into hydrogen bonding. Also, pulp fibers are pliable and deformable to a degree, and can expand to fill in the spaces between chrysotile fibrils. But the net effect is to reduce the total attraction between pulp fibers. It has been found, for example, that chrysotile additions to paper result in lower tensile and burst values, and correspondingly improved tear factor and softness. Practical applications of this effect—to improve the softness of tissue and towel products—will be discussed by Woolery.

As would be expected from geometric considerations, chrysotile has a relatively high surface area. BET nitrogen values for wet-processed asbestos suitable for the paper industry fall in range 50 to 60 m²/g. As is evidenced by the rather extensive use of chrysotile as a reinforcing filler for plastic and resin systems, chrysotile surfaces have an affinity for organic materials. Use can be made of this property to adsorb soluble organic matter. Adsorption occurs not only for negatively charged molecules (anionic dyes, organic acids, etc.), where electrostatic attraction can be used to account for adsorption, but under favorable conditions can also occur with cationic species. The adsorption of methylene blue from an aqueous solution is given in Fig. 5. Dye concentration in solution was extremely low until surface saturation was reached, indicating an extremely favorable distribution between the surface and solution even though a positive ion and a positive surface were involved. Woolery will give examples of where the adsorption properties of chrysotile have been used for specific applications such as dye retention, improved printability, and pitch control.

Another property of chrysotile that may be of interest for paper applications

is its chemical reactivity. Chrysotile is inherently a basic (alkaline) material because of the brucite-like layers that are exposed at fibril surfaces. It has been shown that the solubility and reactivity of chrysotile suspensions are, to a first approximation, similar to those of magnesium hydroxide slurries (16). It is also known that acid gases in the atmosphere and the acid nature of some of the constituents of paper (alum and chloride residues from bleaching) shorten the useful life of paper. It is reasonable to expect that chrysotile would provide a reserve of alkali that would adsorb and neutralize these acids, and thus would contribute to paper's permanence and durability.

In summary, the shape and composition of chrysotile fibrils give rise to a unique combination of chemical and physical properties that should make chrysotile an unusually versatile paper additive. Nonabrasive chrysotile products are now available in quantity, permitting their evaluation for specific applications.

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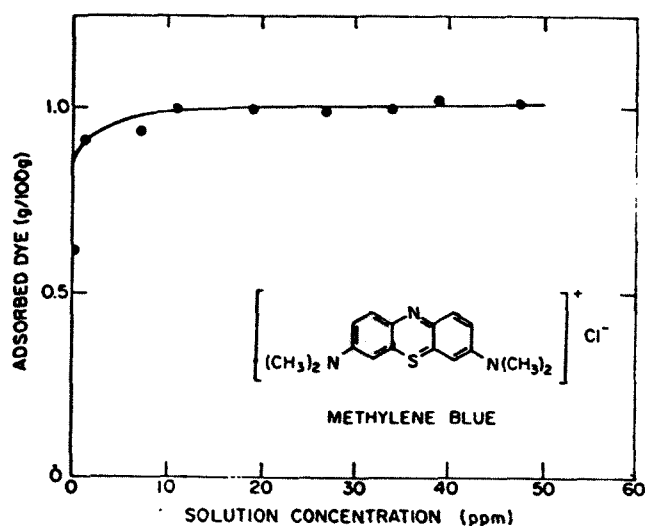


Fig. 5. Adsorption isotherm for methylene blue on chrysotile

EQUIPMENT AND PROCEDURES FOR MOUNTING MILLIPORE FILTERS
AND COUNTING ASBESTOS FIBRES
BY PHASE CONTRAST MICROSCOPY

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February 1969

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Consumer Protection and Environmental Health Service
Environmental Control Administration

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
EQUIPMENT LIST	1
LABORATORY SET-UP	2
PRELIMINARY MICROSCOPE SET-UP	2
MICROSCOPE SET-UP AND THE PROCEDURE FOR OBTAINING KOHLER ILLUMINATION	4
DETAILED INSTRUCTIONS FOR BAUSCH AND LOMB BINOCULAR MICROSCOPES	7
FILTER MOUNTING	8
Set-up Prior to Mounting	8
Mounting Procedure	8
MICROSCOPE PRECAUTIONS AND MAINTENANCE	9
COUNTING PROCEDURE	10
FIELD MONITOR DISCUSSION	11
CALCULATION OF CONCENTRATION	12
ADDRESSES	15

F O R E W O R D

To determine concentrations of asbestos dust in air for comparison with established hygiene limits, a simple reproducible method is required. A simple and inexpensive sampling method uses disposable (reloadable if desired) plastic membrane filter holders, pre-loaded with membrane filters. These membrane filters may be rendered transparent and the asbestos fibers counted with a phase-contrast microscope at 430X (or 400X). This method has been used by the Asbestosis Research Council in Great Britain and the U. S. Public Health Service in the United States of America. It is specified in the proposed change for asbestos in the 1968 threshold limit values of the American Conference of Governmental Industrial Hygienists.

Uniform procedures must be used for carrying out these counts if reproducible results are to be achieved. Detailed equipment and procedures used by the U. S. Public Health Service are described here.

INTRODUCTION

For several years, a set method for counting and sizing airborne particulate matter, which has been deposited upon membrane filters, has been used. The filters used in this technique are 37 mm diameter cellulose ester membrane filters manufactured by Millipore Corporation, (Cat. No. AAWPO3700). The slide mounting technique refers only to these filters, and will not work for any others.

The filters may be purchased premounted in convenient field monitor cases, and are ready for sampling. The filters are nearly 100% efficient for any asbestos dust, even for fibers with diameters much smaller than the 0.8 micron (1) pore size. Sample preparation for electron and optical examination are both relatively simple. Slide mounts of the filters are semi-permanent.

The following procedures and recommendations will produce accurate results, if each step is performed exactly as indicated.

EQUIPMENT LIST

1. Table
2. Adjustable chair
3. Phase contrast microscope
4. Ribbon filament illuminator or (built-in illuminator)
5. Eye piece reticle (Porton type)
6. Lens tissue
7. Small camels hair brush
8. Slides
9. Cover slips
10. Spatula
11. Tweezers
12. Scalpel
13. Wheaton Balsam bottle

LABORATORY SET-UP

It is important to provide a suitable counting area, for the room in which the counting is to be done has a great bearing upon the microscopist. It should be out of the way of normal traffic, and be kept as free from dust and smoke as possible. The tables on which the microscopes are placed should be free from vibrations and shocks as possible. An adjustable chair will do much to add to the comfort of the counter.

PRELIMINARY MICROSCOPE SET UP

Before any dust sizing or counting can be done, proper equipment must be at hand. This section describes the required equipment.

The illuminator should be small and reasonably compact. Ribbon filament illuminators are generally much easier to use. The illuminator must incorporate a condensing lens, so that the enlarged image of the lamp filament may be focused in the plane of the substage condenser diaphragm. The illuminator must also have an iris diaphragm located as near as possible to the condensing lens. The iris serves as a field diaphragm and is focused in the plane of the specimen.

The microscope used must have a substage condenser fitted with an iris diaphragm. This iris serves as an aperture diaphragm. The microscope should have a calibrated reticle inside the non-adjustable eyepiece. The reticle should be small enough that all the counting field is in focus (if the flat field objective and eyepieces are used, essentially the entire field will be in focus). The microscope must be equipped with phase contrast accessories. Using phase contrast, even objects with almost the same refractive index as the mounting media can be seen. Light waves which travel through such a specimen are retarded by a fraction of a wave-length to produce a change in phase. The phase contrast optical system reveals these phase changes as light or dark contrast against the background.

This procedure was written by a user of Bausch and Lomb phase-equipped microscopes, so that microscope set-up procedures correspond with these. However, any good microscope with phase contrast accessories will be satisfactory.

For continual routine examination of filters, the binocular type microscope is much more comfortable. The use of a first surface mirror is recommended, but not necessary. By utilizing a second surface mirror, multiple images of the illuminator field iris are formed which will detract from the crispness of the final image.

As mentioned previously, the microscope must contain a reticle. Any reticle, such as the Porton or Patterson Globe and Circle, which projects a constant counting area and has provision for sizing, will work. The Porton reticle which we use outlines a rectangle that fits easily within the periphery of focus. The rectangle is divided into two squares. The left square is divided into six rectangles which constitutes the counting area. Above and below the large rectangle are a series of circles in which every other circle doubles in diameter. Hence the third is twice the diameter of the first; the fourth is twice the size of the second, etc. The right half of the rectangle contains a scale for extending the size above the number nine circle. The formula $D=L 2^N$ describes the circles sizes. The diameter D is found from L which is the unit of length, and N which represents the number of the circle. L is determined by calibration with a stage micrometer. The entire length of the rectangle is 200 L units. By measuring the length and dividing by 200, L is obtained and the circle sizes may be calculated. Whenever a microscope is disassembled or cleaned, the reticle calibration should be checked. Another fact to take into consideration is that changing the interpupillary distance of the binocular will change the calibration, so the

microscopist may want to check the calibration at both extremes of adjustment. The counting area on the reticle should be kept as clean as possible, as dirt on the reticle is in focus and may be counted.

MICROSCOPE SET-UP AND THE PROCEDURE FOR OBTAINING KOHLER ILLUMINATION

By utilizing equipment that meets the requirements just mentioned, any counter may achieve comparable counts after some practice. This section will deal with setting the microscope up and obtaining Kohler illumination. It is extremely important that every step be followed exactly as indicated.

1. Place the microscope on a flat, level surface at a height such that the eyepieces may be observed without strain or discomfort.
2. Place a moderate dust sample upon the stage.
3. Place the illuminator directly in front of the microscope. Sight across the two and be sure they are aligned. For coil filament bulbs the illuminator iris should be ten inches from the center of the microscope mirror. For ribbon filament bulbs, the front of the filter holder should be seven inches from the center of the plane side of the mirror. Never use the curved side.
4. Remove all diffusing filters from the system and insert a neutral density filter and a clear blue filter. Blue or green colored filters may be used at the discretion of the microscopist.

NOTE: Where the microscope includes a built-in illuminator to give Kohler illumination, the above steps will not all be necessary.

REVIEW

- A. Check microscope and illuminator alignment.
- B. Check the distance between the microscope and the illuminator.
- C. Be sure that you are using the flat side of the mirror.
- D. Make sure that there are only two filters in the system.
5. By means of the focusing knob on the side of the substage condenser assembly, raise it until the upper lens nearly touches the bottom of the slide. Remember that the free working distance of the condenser is in the order of 1.2 mm and that the slide is about 1 mm thick.
6. Turn on the illuminator. Using the tilt controls, direct the beam onto the center of the mirror. Then, by tilting the mirror direct the beam upward into the condenser.
7. Close the substage iris completely. Open the illuminator iris all the way.
8. By means of the focusing controls on the side of the illuminator, focus the image of the filament on the bottom of the substage iris. This may be done by leaning over the microscope and observing the substage iris in the microscope mirror. (On such models as the Bausch and Lomb PR-27, there is a fine focus knob at the rear of the illuminator. In that case, move the condensing lens all the way forward and trim the focus with the fine focus knob.)
9. Open the substage iris about half way.

REVIEW

- A. Check the distance between the slide and condenser.

- B. Be sure that the beam is striking the center of the mirror, and that it is being deflected upward into the condenser.
- C. Please repeat step 7.
- D. Check step 8. If the image is not in focus now, correct it. Do not continue until the filament is correctly focused.
- E. Please repeat step 9.

10. Put the 10X objective in place and focus on the sample. This is done as follows: First, looking from the side of the microscope, lower the objective until it gets very near to the slide. Then, by looking through the eyepieces, focus up.

Never focus down with coarse focus when looking through eyepieces.

A word of caution: The objective lenses are very expensive, so be careful not to grind them through the slide. Always focus up. Now trim the focus with fine focus knob. Focus sharply on the sample. Secondly, close the field iris fully. If the condenser is nearly in focus, you should see a bright spot of light. By using the condenser focus knob, bring the field iris into sharp focus. Now, both the field iris and the objective are in focus on the sample. If there appear to be multiple images of the field iris, it is because of the second surface mirror. Some of the light waves are reflected from the first surface, resulting in secondary images.

12. If the image of the field iris is not centered, re-center it by tilting the mirror. If the color around the field iris is not uniform, recheck the tilting of the illuminator.

REVIEW

- A. Check and be sure you are focused on the sample. 10X objectives have a relatively long focal length and it may be possible to focus on:
- (a) the top of the cover slip. (b) the sample. (c) the bottom of the filter. (d) the top of the slide. (e) the bottom of the slide. (f) the top of the condenser. So be sure of the focal plane.

- B. Be sure that the field iris is focused in the sample plane. Check this often when examining samples. As the sample focus changes, so does the condenser focus.
- C. Recheck the centering and tilt of the illuminator.

DETAILED INSTRUCTIONS FOR BAUSCH AND LOMB BINOCULAR MICROSCOPES

1. Leave the microscope phase ring on C. Insert the telescope that is supplied with the kit into the right eyepiece tube. Focus on the dark phase ring. Open and close the substage iris to be sure that it is centered in relation to the objective phase ring. If it is not in the center, loosen the set screw on the condenser mount and properly seat the condenser. Then re-tighten the set screw. This should very seldom be necessary. Do not force anything and be careful and patient. When you are satisfied that the condenser is aligned, open it all the way.
2. Turn the phase wheel to 10. This shows that the 10X phase ring is in place. Look through the telescope again. By using the adjustment screws on the side of the condenser, move the rings until they are perfectly concentric. When changing phase rings, move them carefully, so as not to knock the condenser out of alignment.
3. Turn to the 43X objective. Carefully turn the wheel to the 43 phase ring. Align the two rings in the same manner as performed in step 2.
4. Remove the telescope and replace the eyepieces. Again, check the condenser focus. You are now ready to examine the sample at 430X, assuming that you are using 10X eyepieces.

FILTER MOUNTING

Set-up Prior to Mounting

Have available at hand a quality scalpel and a supply of No. 10 curved blades, a pair of tweezers (fine pointed are preferred), a spatula or fire polished glass rod and a box of lens tissue. Slides (1" x 3" or 25 x 75 mm) with frosted ends are best because one may label the slide with the date, sample number, etc. It is advisable to use quality number 1-1/2 cover slips. Most dry objectives are corrected for this thickness cover glass. The mounting media should be kept in a Wheaton balsam bottle. The edge around the lid should be coated with stopcock grease to keep out the surrounding air.

The mounting solution may now be prepared. A one to one solution by volume of dimethyl phthalate and diethyl oxalate is poured into the balsam bottle. Then add 0.05 gram of filter material for each milliliter of solution. The added filters increase the viscosity of the solution. Before using the solution, all of the filter material must be dissolved and the solution must be of uniform consistency. This may require a day or so with frequent stirring. Refrigeration may add to the shelf life of the solution.

Mounting Procedure

Keep in mind that cleanliness is important. First, lay down two pieces of lens tissue; one directly in front of you and the other to the left or right for the mounting tools. Next, wipe the scalpel, tweezers and glass rod or spatula with lens tissue. Holding a slide by the frosting, wipe it clean. Lay it down with the frosted end toward you. Even pre-cleaned slides must be cleaned this way. Hold a cover slip by the edges between the index finger and the thumb, and clean it in the same manner as the slide.

Place the cover slip so that one edge rests on the unfrosted end of the slide and the other edge rests on the lens tissue. Be sure that the lower surface does not come into contact with the lens tissue.

Using the glass rod, or dropper, dispense a small drop of the mounting media onto the center of the slide. Replace the rod or dropper into the solution bottle and cover it. Using the spatula, spread the solution into a triangular shape. While the fluid is spreading, cut a wedge of corresponding size from the filter. Place it upon the mounting media, sample side up. Pick up the cover slip and place it on top of the filter. Press lightly on the cover slip to be sure the mounting media has made contact with it. Label the slide before completing any other slide. Sometimes, after an hour or so, the filter may not have cleared. Usually, this can be cured by pressing lightly on the cover slip with a pencil eraser that has been wrapped with lens tissue. If the filter has been used to filter liquids or is damp, it will require drying, for it will not clear unless completely dry.

Use only enough solution to clear the filter. If too much solution is used the sample may spread and give an erroneous count per unit area. The filter should be counted as soon as possible because the solution may eventually form crystals that look like fibers and may be mistaken for part of the sample.

After a little practice and experience, several samples may be mounted at the same time with excellent results.

Remember to keep the area in which mounting is done as clean as possible to prevent contamination of the filter.

MICROSCOPE PRECAUTIONS AND MAINTENANCE

Quality lens tissue is a must. The microscopist should use it for any kind of lens cleaning. It should be as lint free as possible. It may be wrapped around the blunt end of a small camels hair brush and used to clean the eyepieces. Never wipe the inside of the microscope body. If it is necessary to remove dirt from the inside of the tubes, blow it out with

an aspirator bulb. Whenever you are using immersion oil, be sure that you wipe all surfaces that were in contact with the oil.

Generally, solvents should not be used when cleaning lenses. Alcohol, like most solvents will dissolve the lens mounting cement, which may ruin the lens system. Xylene should be used sparingly to remove immersion oil.

Use a camels hair brush to clean first-surface mirrors and non-critical lens surfaces. Never wipe first-surface mirrors with lens tissue.

Avoid touching a lens surface with fingers as the fingerprint has a tendency to etch into the lens surface.

COUNTING PROCEDURE

Place the sample on the stage and focus on it. Since the sample is retained in the top ten to fifteen microns of the filter, be sure that you are focused in the proper plane. The reticle in the left eyepiece is used to define the counting area. The reticle should be calibrated prior to being used. The total fiber count (a fiber is anything three times as long as it is wide) should be at least 100 fibers, or twenty fields, whichever is less. It is advisable to make as large a count as practical to get an accurate average. If a fiber crosses the limits of the counting field, only those crossing either or both of two adjacent sides are counted. For example, a fiber crossing the top or right, or possibly both sides would be counted. The sides chosen are at the discretion of the counter, but any counter must always use the same sides. The fibers counted are estimated as to length, using the circles at the top of the reticle. Our practice has been to record all fibers seen, all fibers longer than five microns and all fibers longer than 10 microns. However, for comparison with the ACGYH TLV (1968), only the longer than 5 μ fibers need be counted.

FIELD MONITOR DISCUSSION

Membrane filters may be purchased pre-loaded in plastic holders (Aerosol Analysis Monitors). The Monitors consist of three sections. The filter is held between the middle and bottom sections. Between the membrane filter and the bottom section lies a support pad. The calibrated pump, designed to draw a known and constant supply of air, is always connected to the bottom of the field monitor case. When many loaded cases are taken into one particular area for sampling, a blank or control filter (meaning a loaded field monitor case) should be taken out to the area, brought back unused and counted. This will determine what degree of general contamination is present on the filters. We have found that banding the field monitor cases with cellulose bands greatly reduces the general contamination of the filters. The bands may be purchased from Walter H. Jelly and Company, Inc. They are white, opaque, size 41 x 25 and come packed in solution S-132. Upon removal from the solution, the bands are slipped around the middle and bottom joints, or around all joints, depending upon whether the sample is going to be drawn through the top section plug hole, or the entire top section removed for "open" sampling. The latter procedure is recommended for asbestos dust sampling since it results in a more even sample distribution over the entire exposed filter surface.

Convenient personal sampling pumps, such as those distributed by Mine Safety Appliances Co., Willson Products Division or Union Industrial are excellent for short term, low rate (around 2 lpm) sampling. A sampling pump is connected to a 3 foot length of non-collapsible, one quarter inch, rubber tubing with a male Leur slip adapter (stock number LH/L, available from Becton, Dickinson & Co.) inserted into the other end. This enables one to connect the hose directly to the case by simply inserting the adapter into the plug hole at the bottom of the case.

Field monitor cases may easily be re-used. The plugs and all sections are separated and placed in warm detergent water. The parts should be scrubbed thoroughly and rinsed in tap water. However, if the filters are to receive any chemical analysis, the cases should also be rinsed in distilled water. The cases should be allowed to dry in a clean area, (a clean room is preferable), to reduce contamination. The clean area is equally important when loading the filters into the cases. The filter pad (the thicker, fibrous disc) is placed in the bottom section. The filter is placed directly on the pad. The middle and top sections are added, the case is pressed tightly together, and the top plug is inserted. Replacement of the bottom plug is not necessary. A cellulose band is then placed around the case and after the band dries, the unit is ready for sampling. Sample code numbers, etc. may be written on the band or upon the filter case, first making sure the markings can be removed when and if it is necessary.

Additional information concerning filters and field monitors may be obtained from Millipore Corporation.

CALCULATION OF CONCENTRATION

When a sample is taken, pertinent information about the sample should be recorded at the sampling site. First, the sample number should be written on the field monitor case and the sample ticket. Next, enter a description of his operation in the appropriate space. If the sample is a general air sample and does not pertain to any particular employee, write "general air sample" in the employee's name space. Information about the area may be written in the "description of operation" space. If you have several pumps which are identical in appearance, but have different flow rates, it would be a good idea to assign them instrument numbers. This enables you to keep accurate records of maintenance and calibration. When instrument

SUPERVISBESTOS
A REVIEW OF PRODUCT QUALITY, TEST METHODS
AND END-USE PERFORMANCE CHARACTERISTICS

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SUMMARY

Supervisbestos was introduced as a drilling fluid viscosifier and suspension aid in 1969. Product specifications were established based on Fann Viscometer Apparent Viscosity and Yield Point values of 15 cps and 25 lb/100 ft. ² respectively. Originally, these specifications were high enough to exclude other competitive products from qualifying but lower than typical values for Supervisbestos being manufactured at the time. In recent years, the plant has had difficulties meeting these specifications; and new competitive products, namely Flosal, have made significant inroads both in quality and the marketplace.

A review of product quality over the last several years was conducted to determine the possibility of any trends. Some 60 monthly composite samples available from years 1970 through February 1982 were tested and analyzed statistically. The data support two important conclusions. First, the average quality of production over the years borderlines the minimum Q. C. specifications, particularly with regards to Yield Point; and secondly, the extent of product variation has declined since the early seventies. No significant trends were observed in mean production values based on regression analyses of the data.

Variances in Supervisbestos quality are dependent primarily on the Hartz jig and M-30 mill performance characteristics. Other factors can influence product quality, however, particle size distribution analyses suggest a strong correlation between quality and these production operations. Less than one percent of 1982 Supervisbestos production was off spec as of the third quarter this year. This is attributed to improved efficiencies in the rock fiber circuit due to the new ore slurry feed system and increased attention to the wet milling operations.

The AEC #2 quality control test currently used in production demonstrated reasonable correlation with performance characteristics based on settling tests. However, the relationship is purely empirical and not indicative of rheological influences existing in application. Furthermore, this test cannot be used for comparison of asbestos materials having significantly different fiber length distributions or other types of mineral thickening agents. The AEC test does not take into account the effects of shear and time-dependent properties which can vary significantly for different materials. Multi-point measurements over a broad range of shear rates with time studies are required to define the rheological properties of non-Newtonian time-dependent systems.

A simplified test procedure consisting of a single point measurement without bentonite has been developed for production quality control. It's implementation is pending review by the plant. A similar test is also being developed for the pelletized version of SVB.

Flosal, a Canadian asbestos product, was found to exhibit somewhat higher viscosities and anti-settling characteristics when compared to Supervisbestos at the low shear-rates indicative of drilling operations. Long fiber fractions (50-100 μ M) present in Flosal contribute to high rheopectic property which causes viscosity to increase at low shear rates. Flosal is also highly

pseudoplastic; ie: viscosity decreases with increasing levels of shear. This could adversely affect its relative sweeping capabilities at high shear rates existing at the bottom of the hole. Both products, however, exhibit excellent viscosity building and suspension properties. In the author's opinion, the performance characteristics of the two products are in all probability indistinguishable in application.

The relationship between rheological properties and fiber length distribution is of academic importance. Supervisbestos has a finer particle size distribution and a surface area $\sim 1\frac{1}{2}$ times that of Flosal; and yet its performance characteristics are somewhat inferior at low shear rates. The principle mechanisms affected by fiber length are time and shear dependent properties. In effect, performance characteristics can be improved within limits by changing fiber length distribution. Although unsubstantiated, fiber aspect ratio may be a contributing factor as well.

RECOMMENDATIONS

1. A minimum specification of 13 cps based on Apparent Viscosity as defined by the current AEC #2 test procedure is recommended. Results demonstrated a significant drop off in both physical properties and settling characteristics of SVB products having Apparent Viscosities less than 11 cps. A minimum Av of 13 cps would insure product quality within predictable limits of test variability.
 2. It is recommended that the Yield Point specification be discontinued. Yield Point offers no advantage as a secondary specification number. It has been shown that Yp has no real significance as related to end-use performance characteristics.
 3. A simplified Q.C. test based on a single point Fann measurement without bentonite is recommended for Supervisbestos. It has been shown that bentonite does not contribute to product quality or alter test results in any way. Furthermore, bentonite is a potential source of test variation.
- An asbestos suspension having a solids content of 12 to 15 grams per 400 ml distilled water is recommended for test purposes. The slurry should be mixed for 10 minutes with a Multi-mixer (3 discs) at 11,500 rpm. Measurements are to be based on the Fann 600 rpm value taken at 15 seconds. The minimum product specification should equate to the 13 cps AEC test value stated earlier.
4. Univis should have the same minimum 13 cps Av specifications as Supervisbestos. A test similar to the SVB aqueous test described herein should be developed for Univis. Some modifications of the SVB test may be required in order to insure proper opening of the pellets. Exact details of the test procedures will be worked out in cooperation with the plant.
 5. Potentially new products and/or applications could be developed with a better understanding of the implications of fiber length distribution on rheological behavior in both aqueous and polymer suspensions. Further study is recommended in this area.

TABLE OF CONTENTS

	<u>Page</u>
SUMMARY	i
RECOMMENDATIONS	ii
LIST OF TABLES	
LIST OF FIGURES	
INTRODUCTION	1
ACKNOWLEDGMENTS	1
EXPERIMENTAL	2
DISCUSSION	
1.0 AEC #2 QUALITY CONTROL TEST	3
2.0 PRODUCTION QUALITY CONTROL HISTORY	4
3.0 SIGNIFICANCE OF PARTICLE SIZE DISTRIBUTION ON PRODUCT QUALITY	6
4.0 IMPLICATIONS OF RHEOLOGICAL PROPERTIES ON RELATIVE PERFORMANCE CHARACTERISTICS	
4.1 Background Theory	11
4.2 Effects of Mixing Energy	13
4.3 Relative Performance Characteristics-Anti Settling Properties	20
4.4 Comparison of Rheological Properties and Settling Characteristics	26
4.5 Supervisbestos Production Specifications	31
5.0 FLOSAL COMPETITIVE PRODUCT EVALUATION	32
REFERENCES	50
APPENDIX I - Production Data & Statistical Computations	51
APPENDIX II - Tabulated Fann Viscosity & Settling Data	60

LIST OF TABLES

			<u>Page</u>
TABLE	I	 Particle Size Distribution of Several Supervisbestos Products	10
TABLE	II	 Comparison of Supervisbestos Properties	31
TABLE	III	 Typical Physical Properties of Flosal & Supervisbestos	33
TABLE	IV	 AEC #2 Fann Test Results on King City Supervisbestos Monthly Composites for Years 1970 - 1982	52
TABLE	V	 Statistical Data Reference for Figure 2	54
TABLE	VI	 Statistical Data Reference for Figure 3	55
TABLE	VII	 Statistical Data Reference for Figure 4	56
TABLE	VIII	 Statistical Data Reference for Figure 5	57
TABLE	IX	 Fann Viscosity and Settling Test Results	61
TABLE	X	 Settling Tests 10 Lb/bbl Asbestos Aqueous Suspensions	62
TABLE	XI	 Settling Tests 3 Lb/bbl Asbestos Aqueous Suspensions	63
TABLE	XII	 Fann Rheological Properties of (1:1) Ratio Supervisbestos Feb.-76/Bentonite Aqueous Suspensions	64
TABLE	XIII	 Fann Rheological Properties of (1:1) Ratio Supervisbestos Nov.-76/Bentonite Aqueous Suspensions	66
TABLE	XIV	 Fann Rheological Properties of (1:1) Ratio Supervisbestos June-74/Bentonite Aqueous Suspensions	68
TABLE	XV	 Fann Rheological Properties of (1:1) Ratio Supervisbestos Sept.-73/Bentonite Aqueous Suspensions	70
TABLE	XVI	 Fann Rheological Properties of (1:1) Ratio Supervisbestos March 73/Bentonite Aqueous Suspensions	71
TABLE	XVII	 Fann Rheological Properties of Supervisbestos Feb.-76/Aqueous Suspensions	73

LIST OF TABLES (Contd.)

			<u>Page</u>
TABLE	XVIII	 Fann Rheological Properties of Supervisbestos Nov.-76 Aqueous Suspensions	75
TABLE	XIX	 Fann Rheological Properties of Supervisbestos June-74 Aqueous Suspensions	77
TABLE	XX	 Fann Rheological Properties of Supervisbestos March-73 Aqueous Suspensions	79
TABLE	XXI	 Fann Rheological Properties of (1:1) Ratio Flosal Feb.-82	81
TABLE	XXII	 Rheological Properties of Flosal Feb.-82 Aqueous Suspensions	83
TABLE	XXIII	 Fann Instant Reading Test Results (1:1) Asbestos/Bentonite 10 Lb/Bbl Suspensions	85

LIST OF FIGURES

	<u>Page</u>
Figure 1 Graphical Representation of Yield Point	3
Figure 2 Supervisbestos Production Quality Control Values for Apparent Viscosity	5
Figure 3 Least Squares Fit of A_v Values for Supervisbestos vs. Production Year	7
Figure 4 Supervisbestos Production Quality Control Values for Yield Point	8
Figure 5 Least Squares Fit of Y_p Values for Supervisbestos vs. Production Year	9
Figure 6 Typical Flow Curves for Time-Independent Non-Newtonian Fluids	11
Figure 7 Affect of Mixing Time on Shear Stress Response of 10 lb./bbl. (1:1) Ratio Asbestos/Bentonite Suspensions	14
Figure 8 Shear Stress-Shear Rate Curves for (1:1) Supervisbestos/Bentonite Suspension	16
Figure 9 Shear Stress-Shear Rate Properties of Supervisbestos Suspensions	17
Figure 10 Time Dependent Properties at 170.4 sec^{-1} of 10 lb/bbl (1:1) Supervisbestos (2-76)/Bentonite Suspensions Prepared with the Multi-Mixer for 5 to 20 Minutes	18
Figure 11 Time Dependent Properties at 170.4 sec^{-1} of 10 lb/bbl (1:1) Supervisbestos (2-76)/Bentonite Suspensions Prepared with the Multi-Mixer for 25 to 50 Minutes	19
Figure 12 Settling Characteristics of Supervisbestos/Bentonite Suspensions Mixed in Multi-Mixer for 10 Minutes (5 lb. Asbestos, 5 lb. Bentonite and 44 lb. W_0_3 per Barrel)	22
Figure 13 Settling Characteristics of Supervisbestos/Bentonite Suspensions Mixed in Multi-Mixer 40 Minutes (5 lb. Asbestos, 5 lb. Bentonite and 44 lb. W_0_3 per Barrel)	23
Figure 14 Settling Characteristics of Supervisbestos/Bentonite Suspensions (1.5 lb. Asbestos, 1.5 lb. Bentonite and 13 lb. W_0_3 per Barrel)	24
Figure 15 Comparison of the Settling Characteristics of Supervisbestos and Supervisbestos/Bentonite Aqueous Suspensions	25
Figure 16 Settling Properties vs. Apparent Viscosity Values	27

LIST OF FIGURES (Contd.)

	<u>Page</u>
Figure 17 Settling Properties vs. Fann Yield Point Values	28
Figure 18 Time Dependent Properties @ 170.4 sec^{-1} of 10 lb/bbl Asbestos Suspensions	29
Figure 19 Relationship Between Supervisbestos and Supervisbestos/ Bentonite Suspensions	30
Figure 20 SEM Photomicrograph of Flosal as is @ 500 X	34
Figure 21 SEM Photomicrograph of Supervisbestos as is @ 500 X	34
Figure 22 SEM Photomicrograph of Flosal as is @ 2000 X	34
Figure 23 SEM Photomicrograph of Supervisbestos as is @ 2000 X	34
Figure 24 SEM Photomicrograph of Flosal @ 100 X Prepared from Dilute Aqueous Suspension	35
Figure 24a.... EDAX Full Field Scan of Area in Figure 24	35
Figure 25 SEM Photograph of Supervisbestos @ 100 X Prepared from Dilute Aqueous Suspension	35
Figure 25a.... EDAX Full Field Scan of Area in Figure 25	35
Figure 26 SEM Photomicrograph of Supervisbestos @ 20,000 X Prepared from Dilute Aqueous Suspension	36
Figure 27 SEM Photomicrograph of Flosal @ 20,000 X Prepared from Dilute Aqueous Suspension	36
Figure 28 SEM Photomicrograph of Supervisbestos @ 50,000 X Prepared from Dilute Aqueous Suspension	37
Figure 29 SEM Photomicrograph of Flosal @ 50,000 X Prepared from Dilute Aqueous Suspension	37
Figure 30 Flosal and Supervisbestos Comparisons-Settling Tests (1:1) Asbestos/Bentonite Suspensions (10 Minute mix in Multi-mixer)	39
Figure 31 Flosal and Supervisbestos Comparisons-Settling Tests 1:1 Asbestos/Bentonite Suspensions (40 Minute Mixing in Multi-Mixer)	40
Figure 32 Flosal and Supervisbestos Comparisons-Settling Tests Asbestos Suspensions	41

LIST OF FIGURES (Contd.)

	<u>Page</u>
Figure 33 Time Dependent Properties at 170.4 sec^{-1} of 10 lb/bbl (1:1) Flosal/Bentonite Suspensions Prepared with Multi-Mixer for 5 to 20 minutes	42
Figure 34 Time Dependent Properties at 170.4 sec^{-1} of 10 lb/bbl (1:1) Flosal/Bentonite Suspensions Prepared with Multi-Mixer for 30-50 Minutes	43
Figure 35 Time Dependent Shear-Stress Response of 1:1 Asbestos/Bentonite Suspensions	44
Figure 36 Pseudoplastic (Shear Dependent) Properties of Supervisbestos and Flosal Bentonite Suspensions	45
Figure 37 Pseudoplastic (Shear Dependent) Properties of Supervisbestos and Flosal Bentonite Suspensions After Shearing @ 170.4 sec^{-1} for 5 Minutes	46
Figure 38 Relationship Between Settling Characteristics and the Rheological Properties of Asbestos Aqueous Suspensions	47
(a) Apparent Viscosity @ 1022 sec^{-1}	
(b) Yield Point @ 1022 & 511 sec^{-1}	
Figure 39 Relationship Between Settling Characteristics and the Rheological Properties of Asbestos Aqueous Suspensions	48
(a) K (based on $10.2 - 5.1 \text{ sec}^{-1}$)	
(b) K (based on $1022 - 170.4 \text{ sec}^{-1}$)	
Figure 40 Normal Probability Plot for Apparent Viscosity	58
Figure 41 Histogram of Apparent Viscosity	58
Figure 42 Normal Probability Plot for Yield Point	59
Figure 43 Histogram of Yield Point	59

INTRODUCTION

Calidria Supervisbestos products were developed for oil and gas well drilling fluid applications and are sold by Montello, Inc. Originally, product specifications were selected which were high enough to exclude other asbestos products from qualifying, namely Flosal, but were lower than typical values for Supervisbestos being manufactured at the time. In 1978, specifications were reduced by roughly 10%. This has led to some concern on the part of Montello, Inc. and speculation of a downward trend in SVB quality.

In 1973, Drilling Specialities introduced a new version of Flosal based on Canadian chrysotile that was alleged to be equal to Supervisbestos. Prior to this, Flosal was produced from California Coalinga chrysotile. Subsequent studies in 1974 by Dr. H. B. Rhodes, et. al. confirmed that the new Flosal had in fact been improved substantially (1). Since then questions have been raised regarding the relative merits of Flosal and Supervisbestos in actual application. The present study was undertaken with the following objectives:

1. Determine the significance of production trends pertaining to Supervisbestos quality over the last ten years.
2. Review current test methods and establish quality control guidelines indicative of end-use performance characteristics.
3. Determine comparative rheological characteristics of Supervisbestos and Flosal.

Results reported herein are based on the definition of asbestos physical properties as related to rheological behavior in aqueous suspensions. The influences of particle size, fiber length distribution and electrokinetic phenomena on performance characteristics are discussed.

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Fred assisted with computer compilations of the data and statistical analyses. The major body of data reported herein were collected by Bob with unerring patience and precision making it possible to present this work with confidence.

EXPERIMENTAL

A Multi-mixer Model 9B with 3 discs was used for preparation of the asbestos slurries. Total solids content of the suspensions was 2.86% by weight equating to 10 lb/barrel, unless specifically stated otherwise. Bentonite, where used, was added on a one to one basis to asbestos. Tap water was used with exception of distilled water in the case of the standard Q.C. AEC #2 test.

Rheological data were measured with a Model 35 Fann V.G. Meter at 600, 300, 200, 100, 6 & 3 rpm at 15 second intervals except as stated otherwise. Equivalent shear-rates in reciprocal seconds may be obtained by multiplying Fann rpm times 1.704. All Fann readings were obtained at ambient temperatures ranging between 21-25°C. In order to eliminate variations due to time required for cooling after prolonged mixing, all the samples were allowed to stand overnight. The suspensions were then re-dispersed for 2 minutes with the Multi-mixer prior to Fann tests to negate any settling or syneresis effects.

Relative performance characteristics analogous to conditions existing in the annulus of the well were based on quiescent settling tests with tungsten oxide weighting agent. WO_3 has a specific gravity of 7.2 which is equal to a density of 60 lbs/gal. Typical drilling formations have a density of 20 to 23 lbs/gal. Settling was observed at high and low solids concentrations. Tungsten oxide was added at a concentration of 12.5% by weight (~ 44 lb/bbl) during the last two minutes of the mix cycle. 250 ml of the resultant slurry was transferred to a 250 ml graduate cylinder. The remaining 150 ml of slurry was added to a 500 ml cylinder and diluted to the 500 ml mark. The cylinder was then inverted 25 times to achieve a homogeneous suspension. Settling was recorded by measuring the height of the interface in milliliters between clear water and sinks. Percent settling was reported as the height of the column minus the height of the interface divided by the height of the column times 100.

Flocced and dispersed wet screen analyses were performed as outlined in the "Calidria" asbestos Physical Tests and Procedures Manual - B. L. Ingalls, October, 1979.

DISCUSSION1.0 AEC #2 QUALITY CONTROL TEST

The AEC quality control test currently used by King City for Supervisbestos is based on Fann Viscometer Apparent Viscosity (A_v) and Yield Point (Y_p) at 600 and 300 rpm of a 1:1 Supervisbestos & Bentonite aqueous suspension. Total solids are 10 grams per 350 ml distilled water (10 lb/barrel system). Slurries are mixed in a Multi-mixer with 3 discs for 4 minutes at 11,500 rpm prior to Fann measurements.

The Fann is so designed that A_v (centipoise) may be calculated directly by dividing the 600 rpm reading by 2. Yield Point (lbs/100 ft.²) is determined by multiplying the 300 rpm reading by 2 and subtracting the 600 rpm reading. In theory, A_v and Y_p represent the following:

$$A_v = \frac{\text{shear stress } (\tau)}{\text{shear rate } (\dot{\gamma})} = \frac{\text{lb/100 ft.}^2}{\text{sec}^{-1}}$$

$$\frac{\text{lb-sec}}{100 \text{ ft.}^2} \times 478.8 = \frac{\text{dynes-sec}}{\text{cm}^2} = \text{centipoise}$$

Y_p is the point where the asymptote of the shear stress-shear rate curve between 600 and 300 rpm intersects the shear stress axis as shown in Figure 1 and is expressed in lb/100 ft.² or dynes/cm². (lb/100 ft.² x 4.788 = dynes/cm².)

Fann rpm can be converted to sec⁻¹ by multiplying by 1.7034; i.e., 600 rpm is equal to 1022 sec⁻¹.

Figure 1

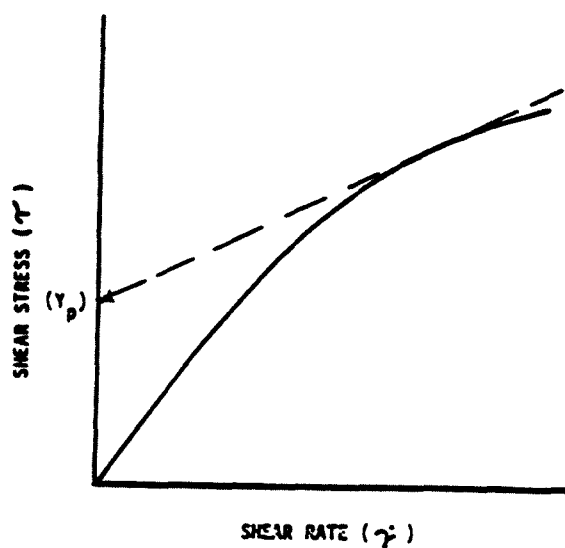


FIGURE 1 GRAPHICAL REPRESENTATION OF YIELD POINT

Although the coefficient of variance of the AEC test has been demonstrated to be within acceptable limits, (1) the test has some drawbacks. The extent to which the test reflects actual product end performance characteristics has never been established. As such, product specifications are not definitive with regard to "down the hole" performance. Properties are measured at 1022 and 511 sec. ⁻¹ by the AEC test procedure. Shear rates in the well annulus are much lower, 5 to 170 sec. ⁻¹. The rheological properties of SVB suspensions can vary considerably depending upon shear rate. Furthermore, the use of bentonite as required by the AEC test, is a potential source of variation due to manufacturing fluctuations (2).

2.0 PRODUCTION QUALITY CONTROL HISTORY

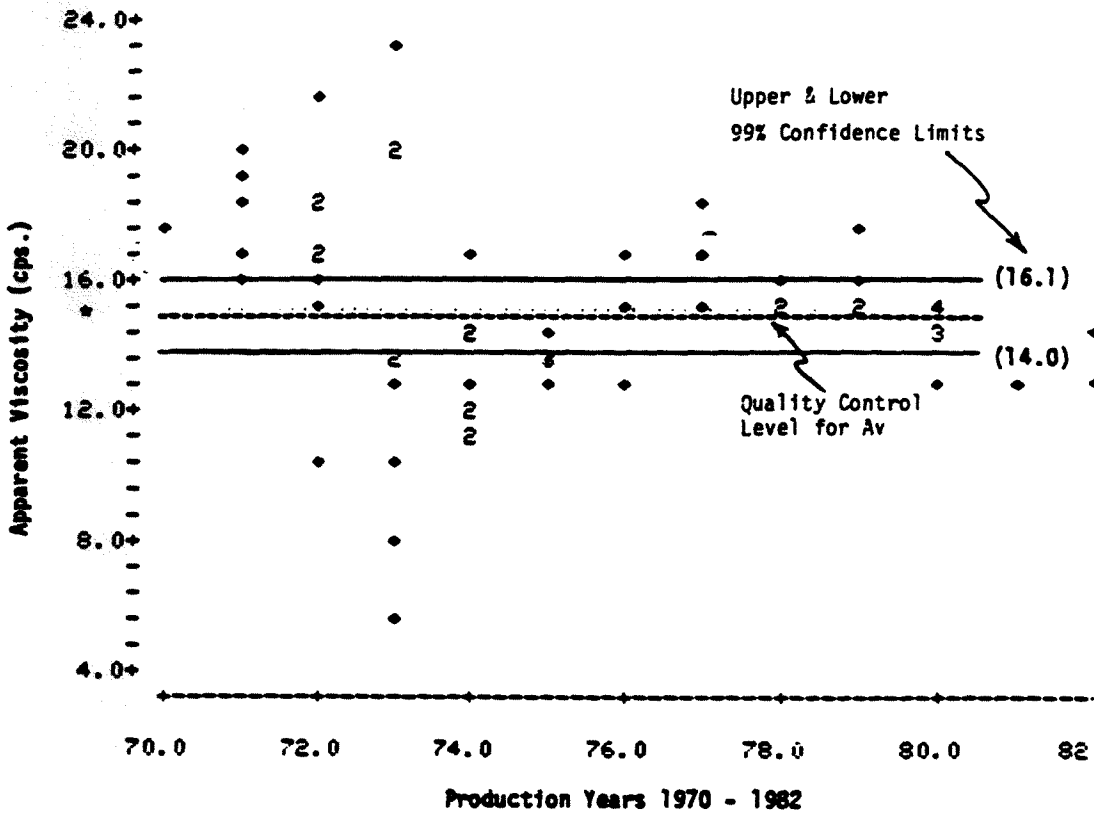
Moisture content has a significant impact on values for Yield Point and Apparent Viscosity. Manufacturing Q.C. tests are run on product samples immediately and moisture content is normally $\leq 1\%$. Asbestos is hydrophilic and, depending on temperature and humidity, can adsorb as much as 6% moisture. The composite samples tested during this investigation contained between 2.0 to 4.5% moisture. As a result, Y_p and Av values stated herein will be lower compared to their corresponding "as-manufactured" test values since they contained less asbestos on a bone dry basis.

The effect of solids concentration on the AEC test is not linear. Higher quality product tends to show a greater change in Y_p and Av with a change in concentration than do lower quality materials. An increase from 1 to 5 percent adsorbed free water can reduce Av and Y_p by $\sim 1-3$ points. There is no easy method to standardize for free water content. Asbestos is so hydrophilic that several hours are required at evaluated temperatures to effectively drive off the moisture. Rapid moisture adsorption by the "bone dry" material necessitates "swing readings" during weighing. At ambient conditions approximating 25°C and 70% RH, dry SVB can adsorb upwards of one percent moisture in a matter of seconds.

Originally, Supervisbestos product specifications for Y_p and Av were 25 lb/100 ft.² and 15 cps respectively. In 1978, Y_p and Av were "temporarily" reduced to 23 lb/100 ft.² and 13 cps and have remained in effect since. This has been of some concern to Montello and questions have been raised regarding the possibilities of a downward trend in SVB quality.

A review of product quality over the last 12 years was conducted to determine the possibility of any trends and their potential significance. Sixty monthly composite samples from years 1970 through February 1982 were tested by the current AEC test procedure and the data analyzed statistically. Figure 2 shows a plot of apparent viscosity for monthly composites versus the year in which they were manufactured. The dash line is the minimum specification for Av , 15 cps. The solid lines represent the upper and lower 99% confidence limits for the true but unknown mean of the population from which the samples were obtained. The actual mean and median of Av were 15.05 and 15.25 respectively. The data support two important conclusions; first, that the average quality of production for the last 12 years border lines the minimum specification of 15 for Av and second, the degree of product variation has declined since the early seventies. ●

FIGURE 2
SUPERVISBESTOS PRODUCTION QUALITY CONTROL
VALUES FOR APPARENT VISCOSITY



* Production minimum specification for Av, 15.0 cps. Solid lines represent the upper and lower 99% confidence limits for the true but unknown mean (MU) of the population from which the samples were obtained. The actual mean of the Av values was 15.05. The median of Av was 15.25.

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A regression analysis of the same data is shown in Figure 3. At first glance, the solid least squares line suggests a slight downward trend in Av from 1970 to present. However, the correlation coefficient (r) of the paired data was determined as 0.0837 which refutes any significance of the regression line. In order to show statistical significance, (r) would have to be at least 0.2 for 58 degrees of freedom. Statistically, there is no evidence to support a downward trend in quality as defined by the production Av data.

A similar treatment of the data for (Y_p) is shown in Figures 4 & 5. The actual mean and median for Y_p were 23.49 and 23.0 respectively. Based on the 99% confidence limits, the true mean value of Y_p for production years 1970-1982 could be as low as 21.5.

As stated earlier, the monthly composite samples tested herein contained a higher amount of free water than production Q.C. test samples. The average for Yield Point based on "as-manufactured" test values having ~1% free water is estimated to be in the order of 24 to 26 lbs/100 ft.². The production norm for Apparent Viscosity is estimated to be between 16 and 18 cps. On the basis of the trends illustrated, the margin between typical production mean capabilities and product specifications is too narrow, particularly in the case of Yield Point. The lower 99% confidence limit of the production mean should not fall below product specifications. Yield Point is at best border line in this respect.

Off spec production of Supervisbestos has decreased appreciably in recent months, due in part to the new ore slurry feed system and increased attention to the wet milling operations. The slurried ore is a more liberated feed stock than "dry" ore and has improved the efficiencies of the rock fiber circuit; i.e., upgraded the attrition and classification stages. Rotation or changing of the hammers in the M-30 mill prior to Supervisbestos production is now standard procedure.

Supporting data and statistical calculations for these data including probability plots and histograms are appended, Appendix I.

3.0 SIGNIFICANCE OF PARTICLE SIZE DISTRIBUTION ON PRODUCT QUALITY

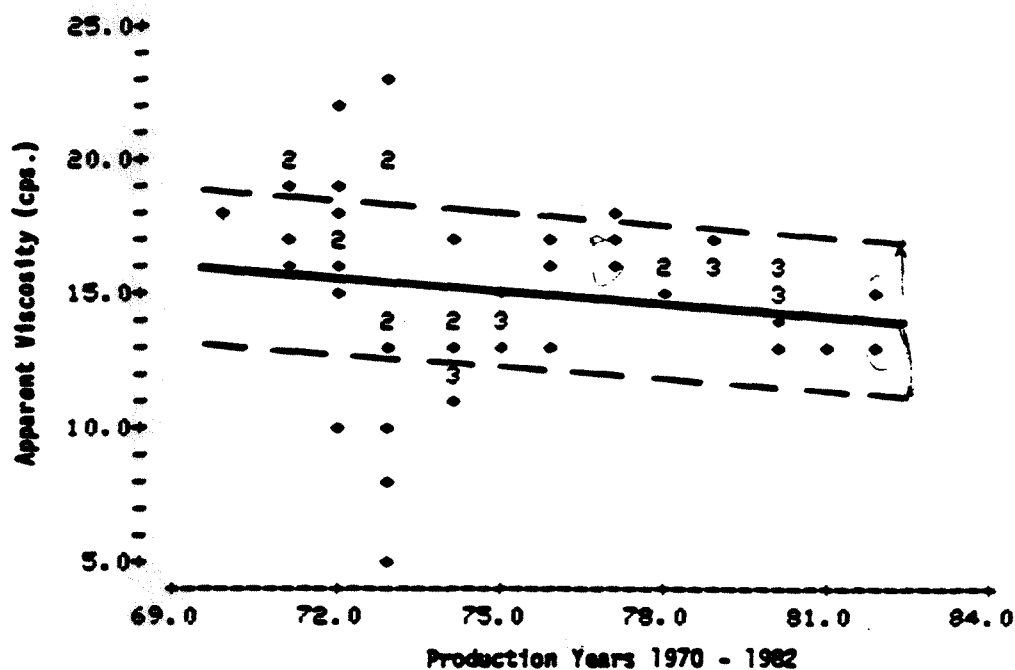
Several SVB samples of varying quality (as determined by the AEC #2 test) were wet screened in the flocculated and chemically dispersed state. Results are shown in Table I. Flocculated wet screen particle size distributions and Fann test properties were inversely related, i.e. the coarser the size distribution, the lower the values of Y_p and Av.

Variation among samples was greatest in the coarser screen fractions. The difference between the + 65 mesh fractions of high and low quality materials was as much as 250% whereas their + 325 mesh values varied by only ~20%.

Dispersed screen results showed no significant differences between products. This suggests that the difference in quality observed with these materials is not a function of variances in their wet classification during processing. If the differences in particle size distributions observed with

FIGURE 3

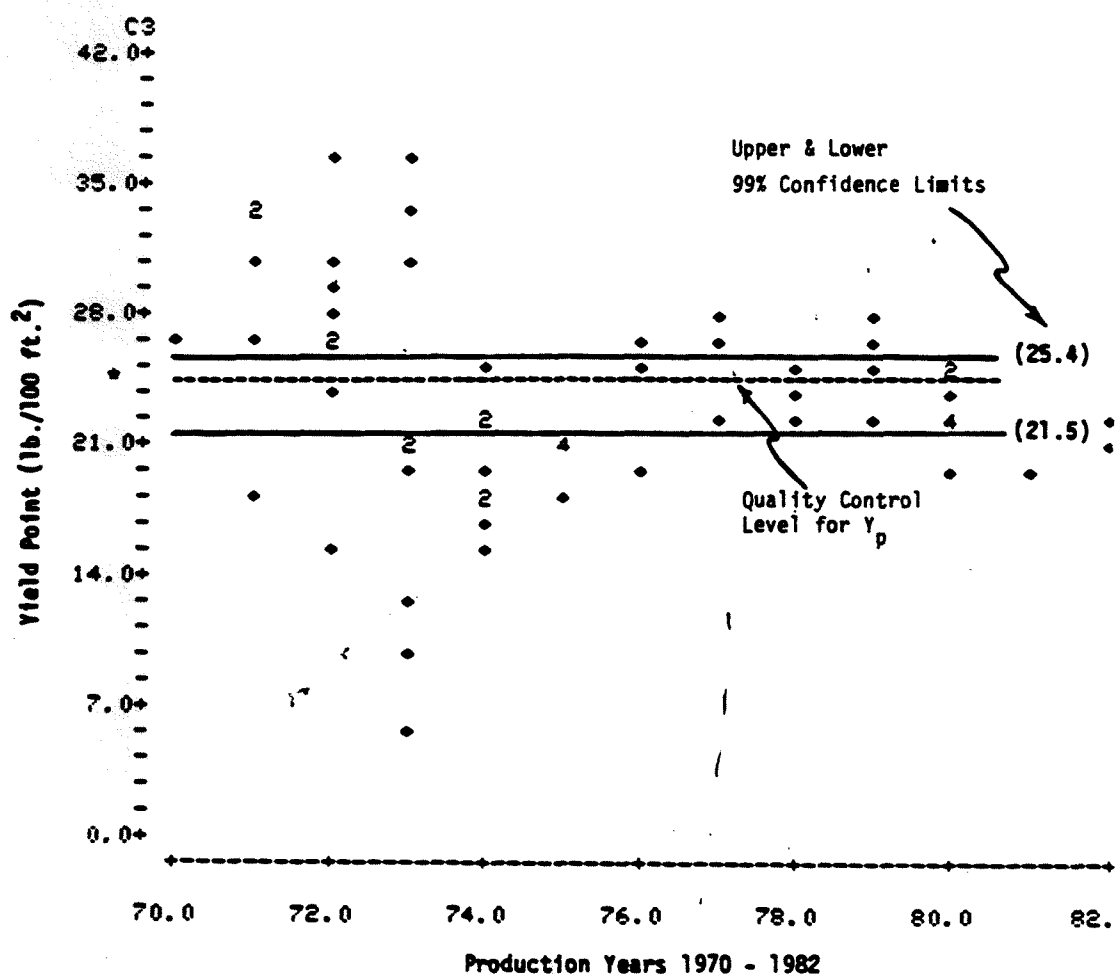
LEAST SQUARES FIT OF
AV VALUES FOR SUPERVISBESTOS
VS. PRODUCTION YEAR



The correlation coefficient (r) with 58 degrees of freedom = 0.0837. The dash lines denote the standard deviation of Av about the regression line (± 3.08).

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FIGURE 4
SUPERVISBESTOS PRODUCTION QUALITY CONTROL
VALUES FOR YIELD POINT

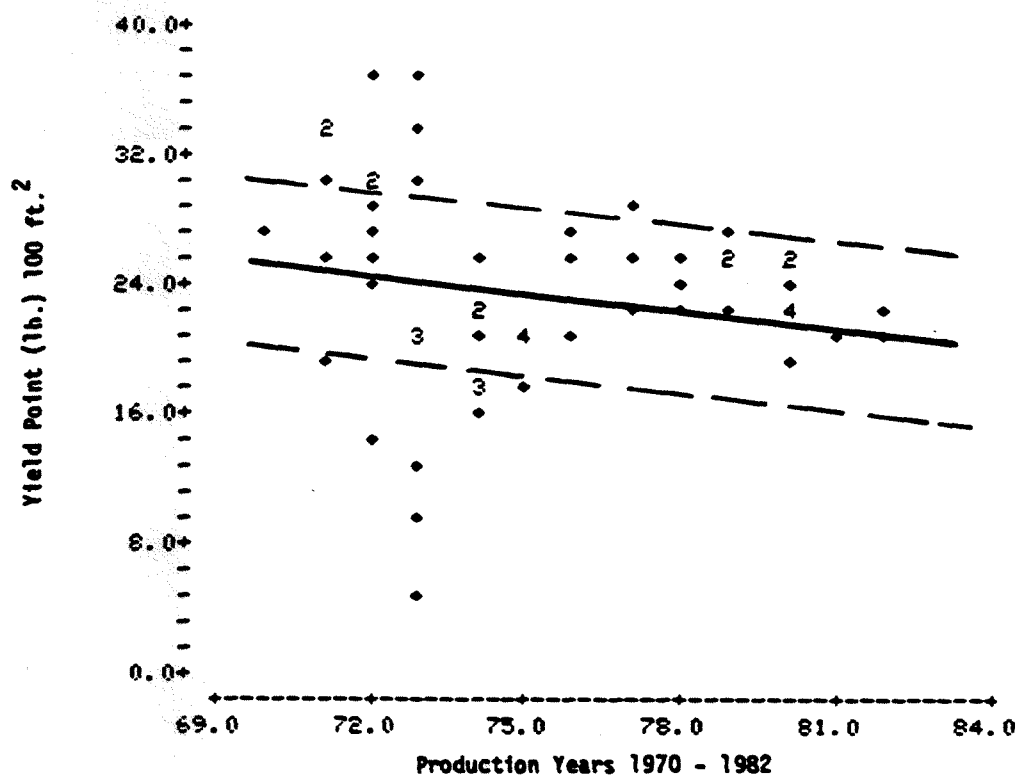


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* Production minimum specification for Y_p , 25.0 lb./100 ft.². Solid lines represent the upper and lower 99% confidence limits for the true but unknown mean (μ) of the population from which the samples were obtained. The actual mean of the Y_p values was 23.49 the median of Y_p was 23.0.

FIGURE 5

LEAST SQUARES FIT OF Y_p VALUES
 SUPERVISBESTOS VS. PRODUCTION YEAR



The correlation coefficient (r) with 58 degrees of freedom = 0.0316.
 The dash lines denote the standard deviation of Y_p about the regression line (± 5.85).

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TABLE I
PARTICLE SIZE DISTRIBUTION OF SEVERAL SUPERVISBESTOS PRODUCTS

<u>Production Date</u>	<u>March 1973</u>	<u>September 1973</u>	<u>June 1974</u>	<u>February 1976</u>	<u>Nov. 1976</u>
<u>AEC #2 Fanntest</u>					
Yield Point (lb/100 ft. ²)	5.5	10	16	27	20
Apparent Viscosity (Cps)	5.3	8	11	16.5	13
 Wet Screen Test					
<u>% Retained</u>					
Flocced Screen					
Mesh + 65	9.5	8.1	5.8	3.8	3.9
+ 100	14.6	13.8	11.1	7.2	6.7
+ 200	28.7	31.2	28.0	21.8	20.5
+ 325	34.5	39.1	38.9	33.6	28.3
 Dispersed Screen					
Mesh + 65	2.8	5.6	4.1	3.0	3.2
+ 100	5.5	8.7	6.8	5.1	4.7
+ 200	13.1	19.2	16.8	12.7	12.1
+ 325	22.3	25.9	26.0	18.1	22.8

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the flocced screenings were due to varying amounts of gangue, then the dispersed screen results should demonstrate similar trends because rock and magnetite are not affected by the chemical dispersant. The possibility of over-drying can also be eliminated since sintered material produced by excessive drying temperatures will not disperse chemically.

The differences in quality can be attributed to two potential areas of production, the Hartz jig and M-30 mill. If the jig is not operating properly, excessive green bladed material can be introduced which is more difficult to mechanically open, and has a coarser fiber size distribution. The importance of M-30 mill efficiency on SVB quality has been recognized by the plant for some time. Current operating procedures require rotation or replacement of the hammers prior to every SVB production run. This has been in effect the last several months this year. Super standard Grade off spec production as a whole decreased from a 1981 average of 10.6% to 5.4% for the same period.

4.0 IMPLICATIONS OF RHEOLOGICAL PROPERTIES ON RELATIVE PERFORMANCE CHARACTERISTI

4.1 Background Theory

The principle mechanisms governing the rheological properties of asbestos aqueous suspensions are; particle size and shape, the state of flocculation and concentration. Asbestos fibers flocculate in water due to attractive Van der Waal's forces. If sufficient shear is applied to the suspension, these forces are overcome and the particles orientate with their lengths parallel to the direction of flow. When this occurs, viscosity of the suspension decreases. This phenomenon is referred to as plastic (Bingham) or pseudoplastic behavior and demonstrates flow curves typical of those shown in figure 6.

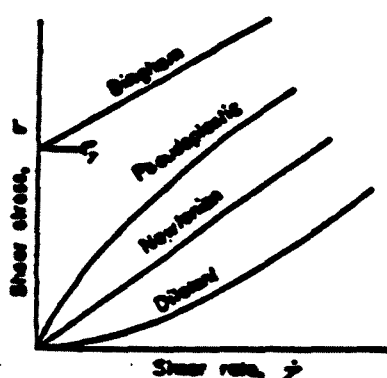


Figure 6- Typical Flow Curves for Time-independent
Non-Newtonian Fluids

Bingham fluids exhibit a yield point where as pseudoplastic systems do not. Yield Point is the stress which must be exceeded before flow will start. Asbestos suspensions can be pseudoplastic or plastic depending on the state of flocculation. Flocculation contributes to pseudoplastic behavior. Dispersed (deflocculated) suspensions act more Bingham-like.

Asbestos suspensions are also time-dependent, that is, viscosity changes with time at a constant rate of shear. The rheology of asbestos suspensions is further complicated by the fact that they exhibit both thixotropic and rheopectic behavior depending on the state of flocculation and shear-rate. In the case of thixotropy, viscosity decreases with time. Thixotropy is rather like pseudoplasticity in which the time required for the alignment of particles is not negligible.

Rheopectic property is attributed to the liquid acting as a lubricant for the particles when voidage is at a minimum. As shear is applied, the dense packing of the particles is broken up and consequently the voidage increases. As a result, there is insufficient liquid in the new structure to lubricate the flow of particles as they pass each other and the applied stresses have to be much greater to maintain flow. (3) Flocculated suspensions tend to exhibit rheopectic property only at low shear rates. These systems can also behave thixotropically at high shear rates. Deflocculated suspensions demonstrate greater thixotropic property. (4).

State of flocculation is the major factor influencing rheological properties of asbestos aqueous suspensions. This depends on the net effect of the electrokinetics of the system. When the electrical repulsion forces of the particles predominate over Van der Waal's attractive forces, the particles remain separated and the suspension is deflocculated. This occurs with asbestos suspensions below a pH of 5. At pH values greater than 8, flocculation is achieved. Aside from pH, chemical treatment and the presence of other materials can also affect the state of flocculation(5).

State of the art pertaining to the fluid dynamics of non-Newtonian systems is at best empirical. The rheometric quantitative characterization of non-Newtonian time-dependent fluids is complicated and there is no mathematical model that totally defines the behavior of these suspensions. Two models commonly used in drilling fluid technology are the Bingham (Plastic) model having a linear function on rectangular coordinates and; the Power Law, a linear model on logarithmic coordinates.(6).

$$(\text{Bingham}) \tau = \tau_y + u_p (\dot{\gamma})$$

$$(\text{Power Law}) \tau = K (\dot{\gamma})^n$$

Where τ_y = Yield point or yield stress (dyne-cm⁻²)

$\dot{\gamma}$ = shear rate (sec⁻¹)

u_p = Plastic Viscosity (cps)

K = Constant, a measure of fluid consistency; the higher K , the more viscous the fluid.

n = Constant, slope of the shear stress-shear rate plot and a measure of the degree of non-Newtonian properties.

It should be emphasized that neither of these models properly characterize time-dependent pseudoplastic systems. The Bingham model is based on the premise of a yield point, when in fact, pseudoplastic systems do not exhibit yield stress values. In the case of the Power Law, K and n are considered constants. However, n is not a true constant for real fluids over all, possible ranges of shear; and K is dependent on the index n . (7) Furthermore, neither model takes into account the effects of time-dependency. Since yield stress is dependent not only on the slope of the shear stress-shear rate curve but also the duration of shear rate, multi-point measurements must be obtained as function of time over a broad range of shear rates (5 to 1000 sec⁻¹) to effectively define the rheology of the total system. Within limits, these models do provide an empirical method by which the data can be analyzed quantitatively. However, care must be taken with interpretation of the data.

4.2 Effects of Mixing Energy

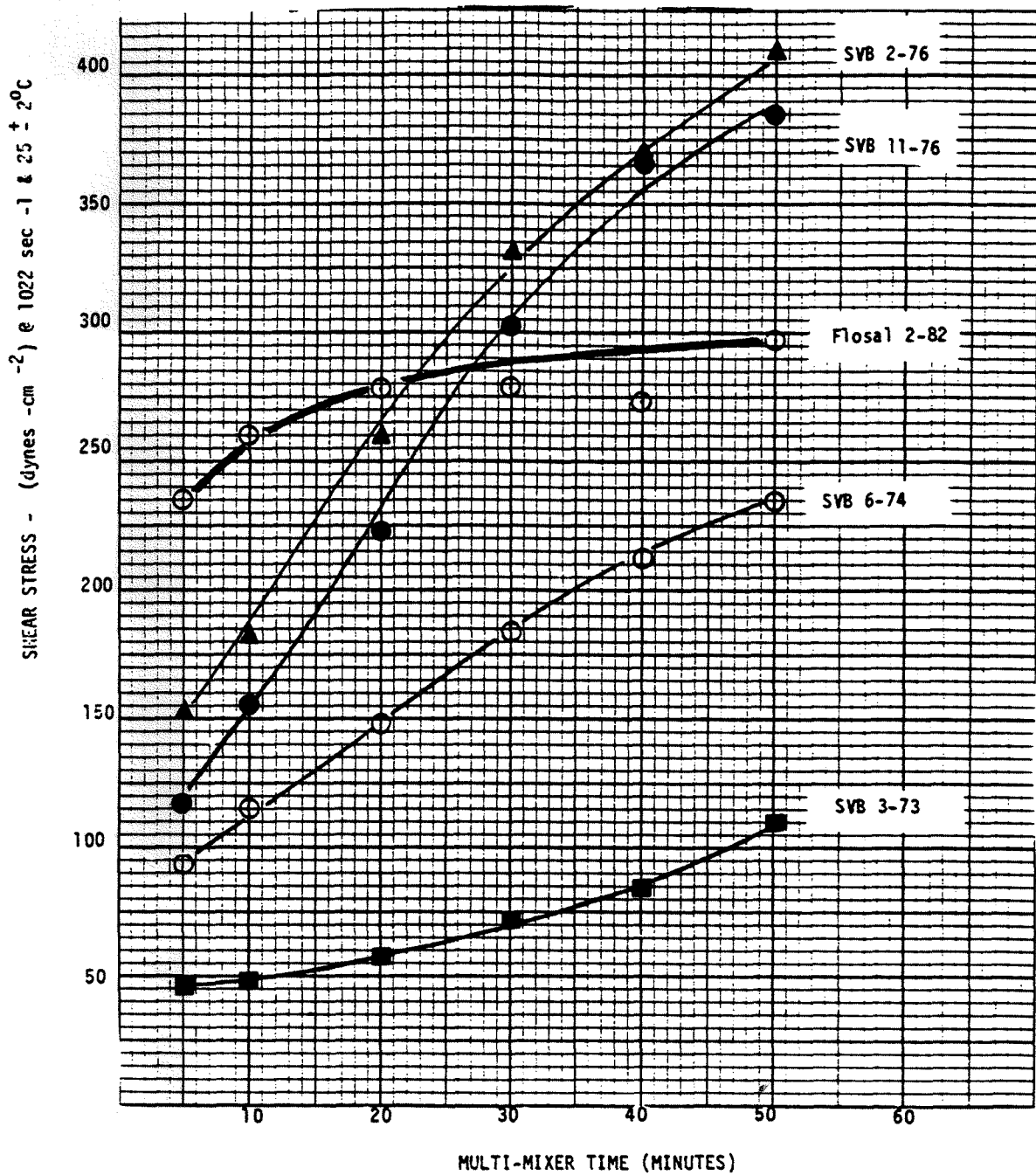
The affect of mixing intensity on the rheological properties of supervisbestos/bentonite suspensions is illustrated in Figure 7. Shear stress at 1022 sec⁻¹ is plotted against mixing time. All the SVB products exhibited a marked increase in viscosity with mixing time. (a) The higher the viscosity building properties of the product, the more pronounced the effects of mixing. This is best illustrated by the slope of the curves as shown below:

	<u>Supervisbestos</u>			
	<u>March-73</u>	<u>June-74</u>	<u>November-76</u>	<u>February-76</u>
<u>Slope</u> (b)	1.1	3.5	7.4	7.2

Performance characteristics of the competitive Canadian asbestos product, Flosal, will be discussed later in the report.

- (a) The shear stress values (τ) were all measured at the same shear-rate (1022 sec⁻¹) and as such are directly proportional to viscosity, $\tau/\dot{\gamma}$ = poise.
- (b) The slope was based on the linear region of curves between 5 and 30 minutes.

FIGURE 7
AFFECT OF MIXING TIME ON SHEAR STRESS RESPONSE
OF 10 lb/bbl (1:1 ratio) ASBESTOS/BENTONITE SUSPENSIONS



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12/7/82

The effects of mixing on the shear stress-shear rate flow curve for the Feb.-76 products is shown in Figure 8. The fallacy of applying the Bingham model to pseudoplastic suspensions is immediately evident. The suspension mixed for 50 minutes is considerably more Bingham-like than the 10 minute suspension. However, neither exhibits a yield point over the range of shear-rates tested. By the AEC test, Y_p for the 10 and 50 minute curves would approximate 33 and 62 lb/100 ft.² respectively, as demonstrated by the dash asymptotic lines based on shear rates of 1022 and 511 sec⁻¹. The same data are shown in Figure 9 as represented by the Power Law. K is a measure of consistency and n is indicative of the degree of non-Newtonian properties. The greater n deviates from 1.0 (Newtonian), the more pronounced is the non-Newtonian property.

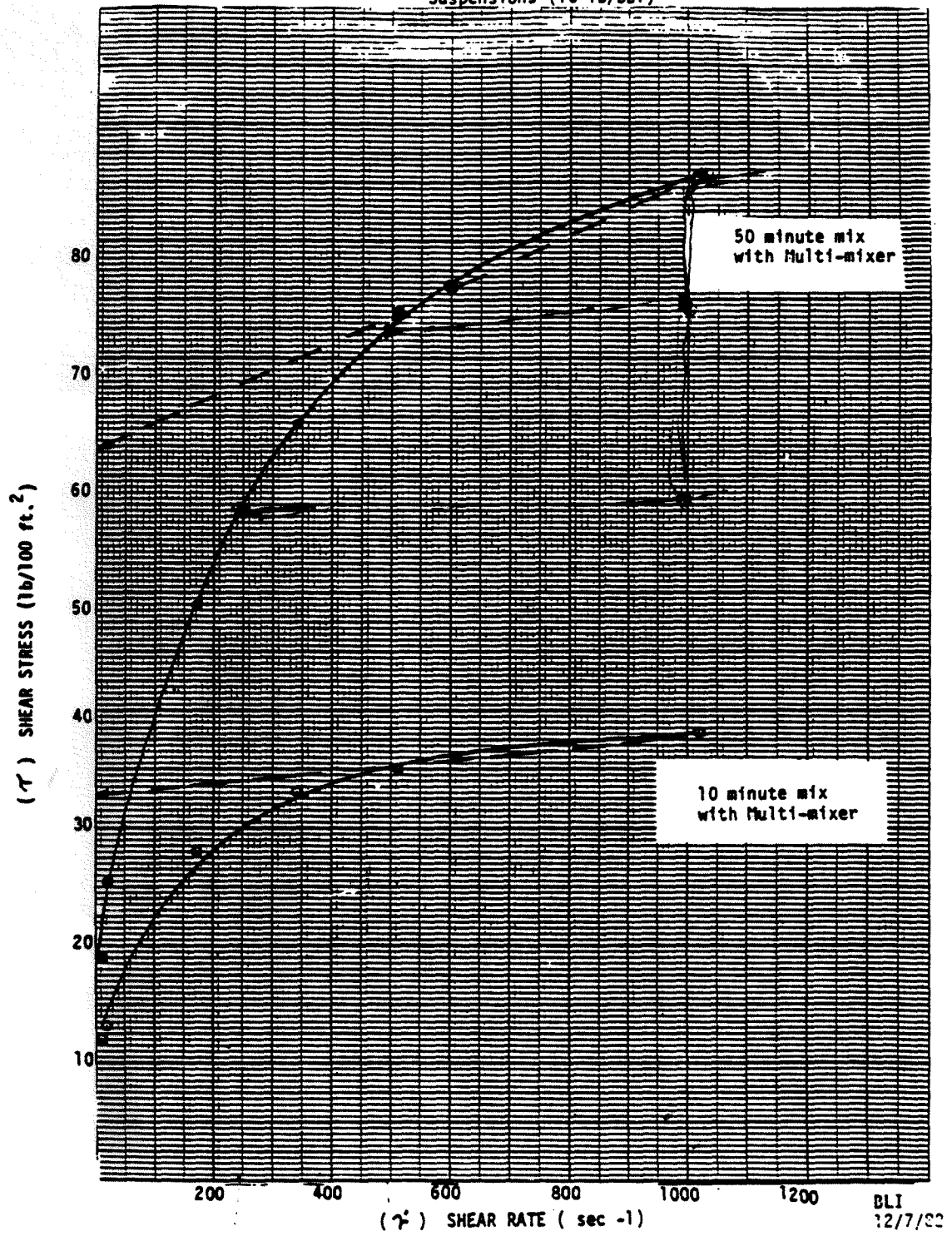
At low conditions of mixing, the suspensions exhibit high pseudo-plastic property and are time-independent except at very low rates of shear. As the suspensions are mechanically worked, the state of flocculation decreases and they become more plastic and thixotropic in property. It appears that as the available fiber content in suspension increases, the electrical charge on the particles predominate over Van der Waal's attractive forces reducing the state of flocculation. Although this would tend to lower viscosity, the increase in available fiber content from attritioning with additional mixing is sufficient to affect a net increase in viscosity.

The time-independent property of SVB suspensions is also influenced by energy of mixing. Changes in shear stress at a constant shear-rate of 170 sec⁻¹ (100 rpm Fann) were monitored over a period of ~ 6 minutes for samples pre-mixed 5 to 50 minutes with the Multi-mixer. Mechanical opening by the Multi-mixer for the mixing times indicated should encompass those conditions existing in actual drilling operations. As shown in Figure 10, asbestos suspensions mixed 5 to 15 minutes were relatively time-independent. Viscosity of the 20 minute sample decreased under constant shear with time. Thixotropic property was more pronounced as mixing time increased from 20 to 50 minutes as shown in Figure 11. In terms of viscosity, the 50 minute suspension decreased from 118 to 72 centipoise (cps) when sheared @ 170 sec⁻¹ for 5.75 minutes ($t = 5.75$). By comparison, viscosity of the 10 minute sample only decreased from 79 to 73 cps under similar conditions of shear.

The significance of time-dependency and importance of multi-point measurements can be best illustrated by comparison of the June 74 and February 76 SVB products. As shown earlier in Table 1, the February 76 sample has vastly superior Y_p and Av properties by the AEC test. However, these values are representative of instantaneous readings ($t = 0$) at high shear rates. Conditions existing in the annulus of the well are in the order of 5 to 170 sec⁻¹. If we compare the Power Law K constants of the suspensions over this range, their properties are quite different as shown below:

	<u>K Constant based on 5 to 170 sec⁻¹</u>			
	<u>June 74 Product</u>		<u>Feb. 76 Product</u>	
	<u>for 5 min. mix</u>	<u>for 50 min. mix</u>	<u>for 5 min. mix.</u>	<u>for 50 min. mix</u>
$t = 0$	3.7	11.4	6.9	13.1
$t = 5.75$ min.	3.0	8.2	6.4	6.8

FIGURE 8
Shear Stress - Shear Rate Curves for (1:1) Supervisbestos (Feb.-76)/Bentonite
Suspensions (10 lb/bbl)



150 300 600 6

Figure 9
SHEAR STRESS - SHEAR RATE PROPERTIES
OF SUPERVISBESTOS SUSPENSIONS

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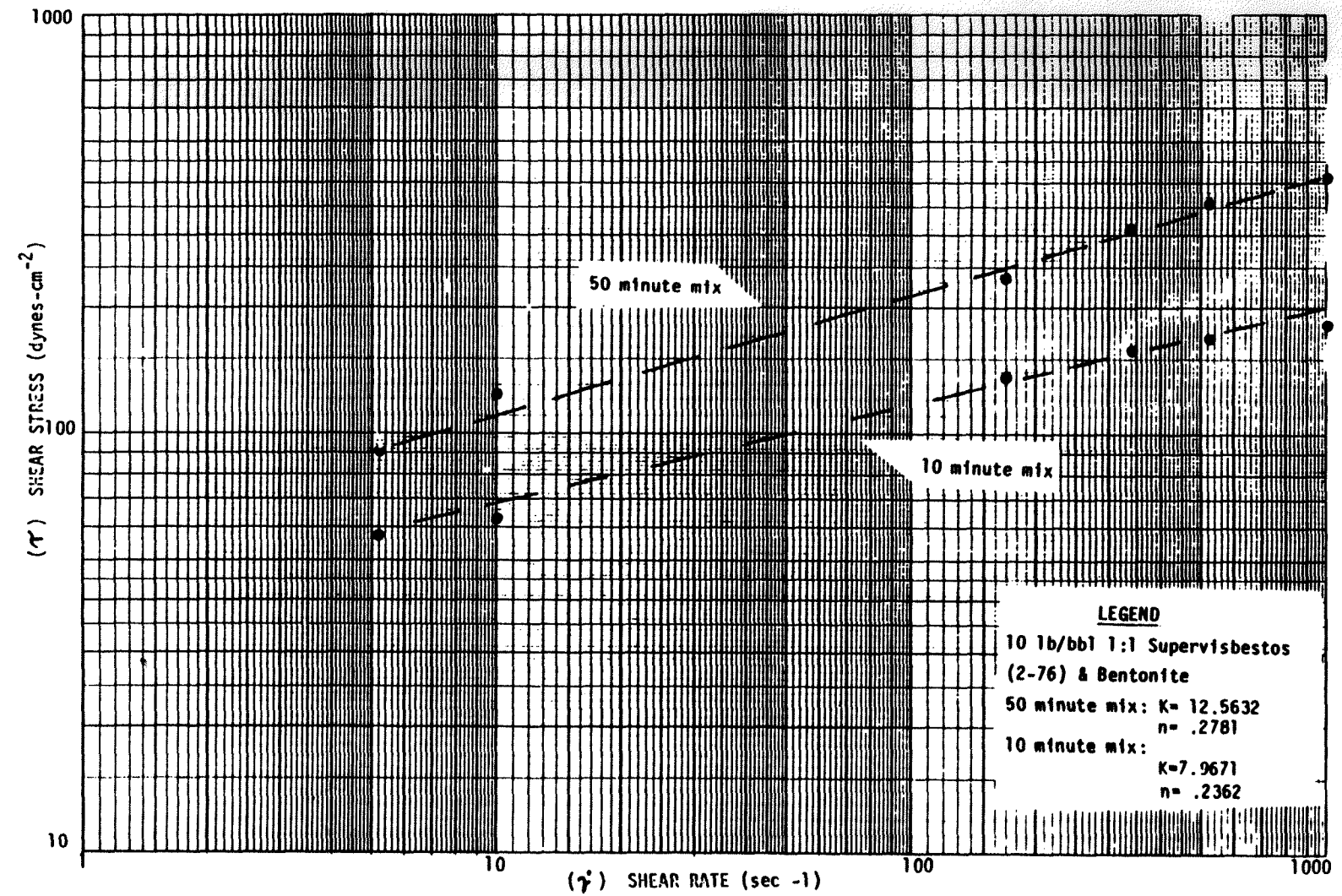
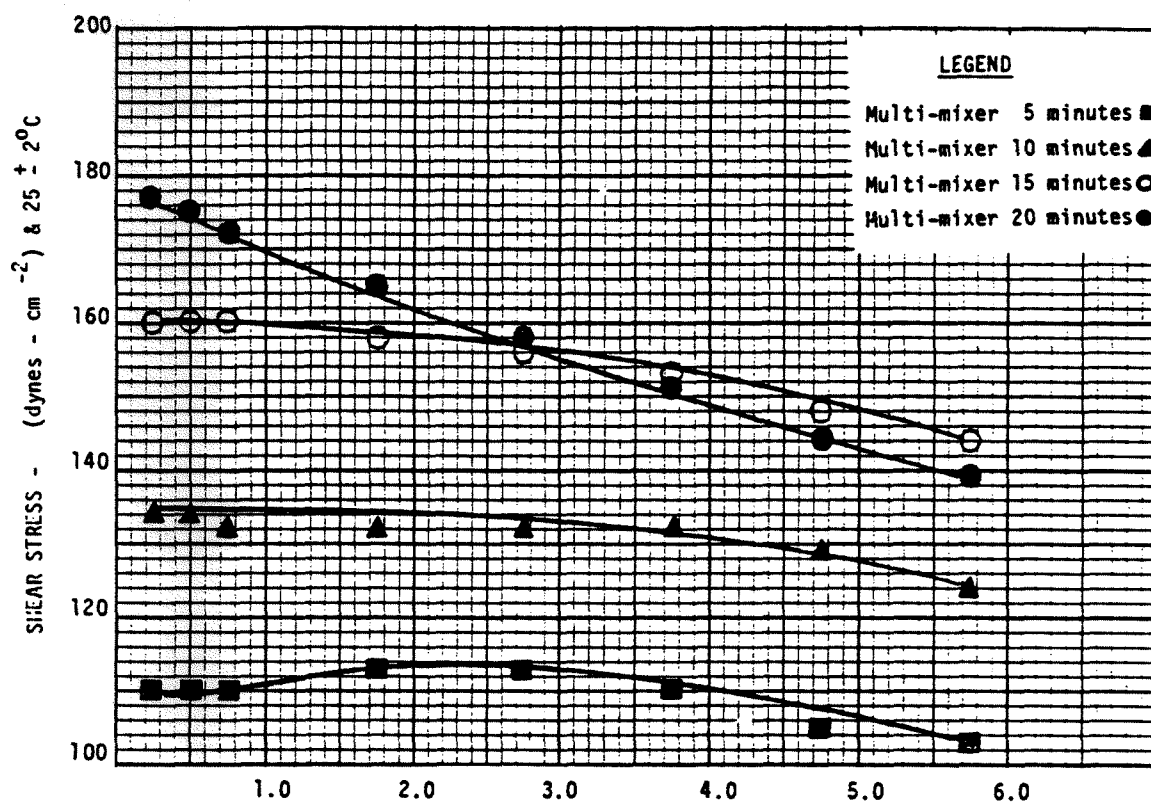


FIGURE 10

TIME DEPENDENT PROPERTIES AT 170.4 sec -1 OF
 10 lb/bbl (1:1) SUPERVISBESTOS (2-76)/BENTONITE SUSPENSIONS
 PREPARED WITH THE MULTI-MIXER FOR 5 TO 20 MINUTES

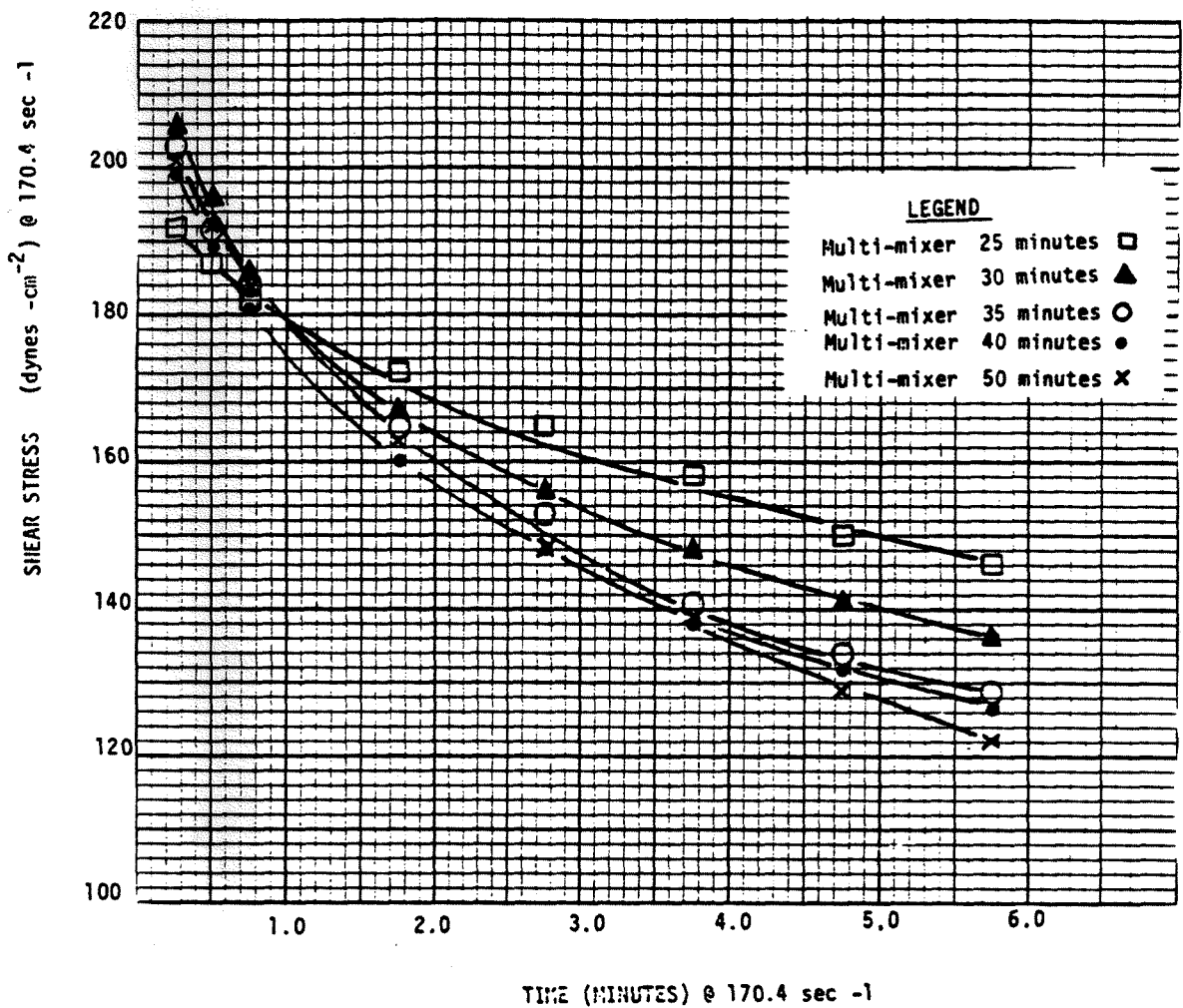


TIME (MINUTES) @ 170.4 sec -1

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FIGURE 11

TIME DEPENDENT PROPERTIES AT 170.4 sec ⁻¹ OF 10 lb/bbl (1:1)
SUPERVISBESTOS (2-76)/BENTONITE SUSPENSIONS PREPARED
WITH THE MULTI-MIXER FOR 25 TO 50 MINUTES



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The February 76 product exhibits superior viscosity building characteristics at low mixing conditions. However, when the products are compared after being mixed for 50 minutes, the June 74 sample has a higher K factor in the low shear rate range under conditions of prolonged shear. In effect, with sufficient mechanical opening, the June 74 product would have superior performance properties in actual application. By comparison, its viscosity building properties at low shear rates are higher; and at high shear rates (500 to 1022 sec^{-1}), its viscosity is lower than the February 76 product. Pressure loss inside the drill string and drilling rate are a function of fluid viscosities in the range of 150 to 10,000 sec^{-1} . As such, low viscosity is desirable in this region of shear-rates.

The relationship between mixing parameters for laboratory test procedures and conditions existing in drilling applications has been a subject of conjecture for some time. Energy shear-rate intensities are greatest at the drilling bit and estimated to be in the order of 10,000 to 100,000 + sec^{-1} . There is no information presently available for determining the intrinsic energy of mixing for the Multi-mixer. Currently, the rule of thumb for laboratory testing in the drilling industry is to mix 10 to 30 minutes with a Multi-mixer. The 4 minute mix now used for the SVB AEC quality control test certainly imparts considerably less energy than that existing in actual application.

4.3 Relative Performance Characteristics - Anti-settling Properties

Quantifying the performance characteristics of drilling fluid additives is difficult due to the complexities and numerous variables involved in drilling operations. Asbestos is used primarily to remove cuttings generated at the drill bit and as a suspension aid. Asbestos assists particle suspension in two ways, by reducing particle slip velocities in the annulus under conditions of flow and when the system is at rest. In the event of shut downs, suspension of the cuttings is critical in order to prevent settling which can result in freezing of the bit. The problem is not uncommon and besides being costly, it occasionally can result in loss of the bit; or worse, the necessity of drilling a new hole.

It has been demonstrated theoretically that particle slip velocity (settling rate) under conditions of flow in a column is the same for a quiescent stream. Therefore, static settling tests should relate to normal conditions of laminar flow in the well annulus. In an effort to relate rheological properties with end use performance characteristics, a settling test was developed using tungsten oxide (WO_3 minus 80 mesh) as a weighting agent. A test was required that would effectively demonstrate over a broad range of conditions the rheological influences of SVB as related to settling properties. High density tungsten oxide was found to exaggerate settling effects. Lower density weighting materials (3- 4.5 SG) settled very slowly and tended to demonstrate greater variability of the test results. WO_3 has a specific gravity of ~ 7.2 which equates to 60 lb/gal density. Formation particles in general have densities in the range of 20 to 23 lb/gal. As such, the settling rate data herein reflect the extreme rather than the norm. Ten lb/bbl one to one asbestos/bentonite suspensions were prepared with the multi-mixer. WO_3 (44 lb/bbl) was added during the last two minutes of mixing. A 250 ml aliquot of the suspension was then transferred to a graduated cylinder. Another 150 ml of slurry was diluted to 500 ml and the cylinder inverted 25 times to obtain a homogenous suspension. Concentration after dilution was 3 and 13 lb/bbl of asbestos/bentonite and WO_3 , respectively.

Settling rate data for the high solids prepared 10 and 40 minutes in the multi-mixer are shown in Figures 12 and 13. The relative order of performance for the various products shown was not the same for different mixing conditions, the most obvious being the SVB 6-74 sample. This sample settled more rapidly than all but the SVB 3-73 product when mixed 10 minutes. However, the same sample mixed 40 minutes demonstrated the best suspension properties. This may be explained, in part, by comparing the K and n constants of some of the products at low shear rates ($5-10 \text{ sec}^{-1}$).

K & n Constants @ Low Shear ($5-10 \text{ sec}^{-1}$)

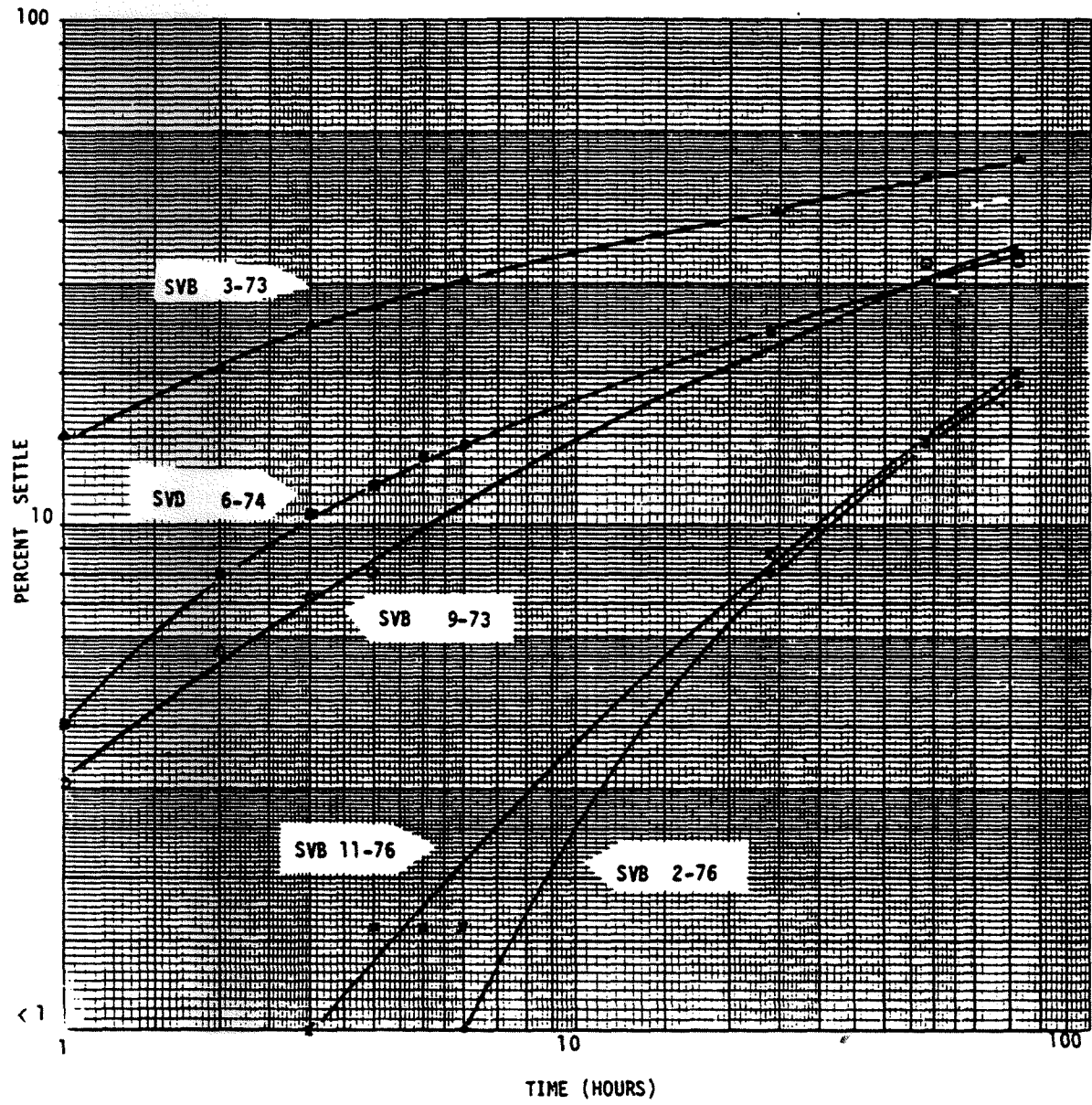
	<u>Multi-mixer 10 minutes</u>			<u>Multi-mixer 40 minutes</u>		
	<u>Nov. 76</u>	<u>June 74</u>	<u>Feb. 76</u>	<u>Nov. 76</u>	<u>June 74</u>	<u>Feb. 76</u>
(K)	8.5	6.4	9.9	12.4	11.4	11.5
(n)	0.1312	0.0931	0.1155	0.2928	0.1031	0.3067

The June 74 product has a lower K value compared to the other suspensions when mixed for 10 minutes. The 40 minute suspensions, however, exhibited approximately the same K constants. The principle difference in the 40 minute suspensions was their n constants. The value of n for June 74 was approximately one third that of the other products. This indicates a greater degree of non-Newtonian property, i.e., pseudoplastic behavior. As mentioned earlier, pseudoplastic systems tend to exhibit a higher state of flocculation and rheopectic property at very low shear rates. The June 74 product demonstrated only marginal decreases in viscosity at a constant shear rate of 170 sec^{-1} (data reference Table XIV - Appendix II, page 68). As such, at the lower shear-rates evident with the quiescent settling test its viscosity increased with time. This may also occur with the other suspensions, but to a much lesser degree.

Similar plots of the diluted suspensions are shown in Figure 14. As would be expected, settling was much more pronounced with these suspensions. In general, the SVB 3-73 & 9-73 materials were again the worst performers.

Comparisons were also conducted of settling properties without bentonite (refer Figure 15). Straight asbestos suspensions were highly flocculated and it was often difficult to obtain accurate Fann readings. Low shear-rate ($5 - 10 \text{ sec}^{-1}$) K constants for the asbestos and asbestos/bentonite suspensions were 12.9 and 9.9, respectively. The asbestos suspension exhibited rapid settling over the first six hours with minimum settling thereafter. Conversely, asbestos/bentonite systems settled slowly but, ultimately to a greater degree. The difference in settling properties between the two systems is attributed to their state of flocculation. Flocculation of the asbestos suspensions may alter the "effective" particle size distribution of the suspension resulting in heavy dense flocs that affect rapid settling. Bentonite tends to decrease flocculation, but contributes to Bingham property and exhibits a real yield point. The complexities of the co-flocculated system can at best be guessed at.

FIGURE 12
SETTLING CHARACTERISTICS OF SUPERVISBESTOS/BENTONITE
SUSPENSIONS MIXED IN MULTI-MIXER FOR 10 MINUTES
(5 lb. ASBESTOS, 5 lb. BENTONITE & 44 lb. WO_3 PER BARREL)



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FIGURE 13

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SETTLING CHARACTERISTICS OF SUPERVISBESTOS/BENTONITE SUSPENSIONS
 MIXED IN MULIT-MIXER 40 MINUTES (5 lbs ASBESTOS, 5 lbs BENTONITE & 44 lbs H₂O PER
 BARREL)

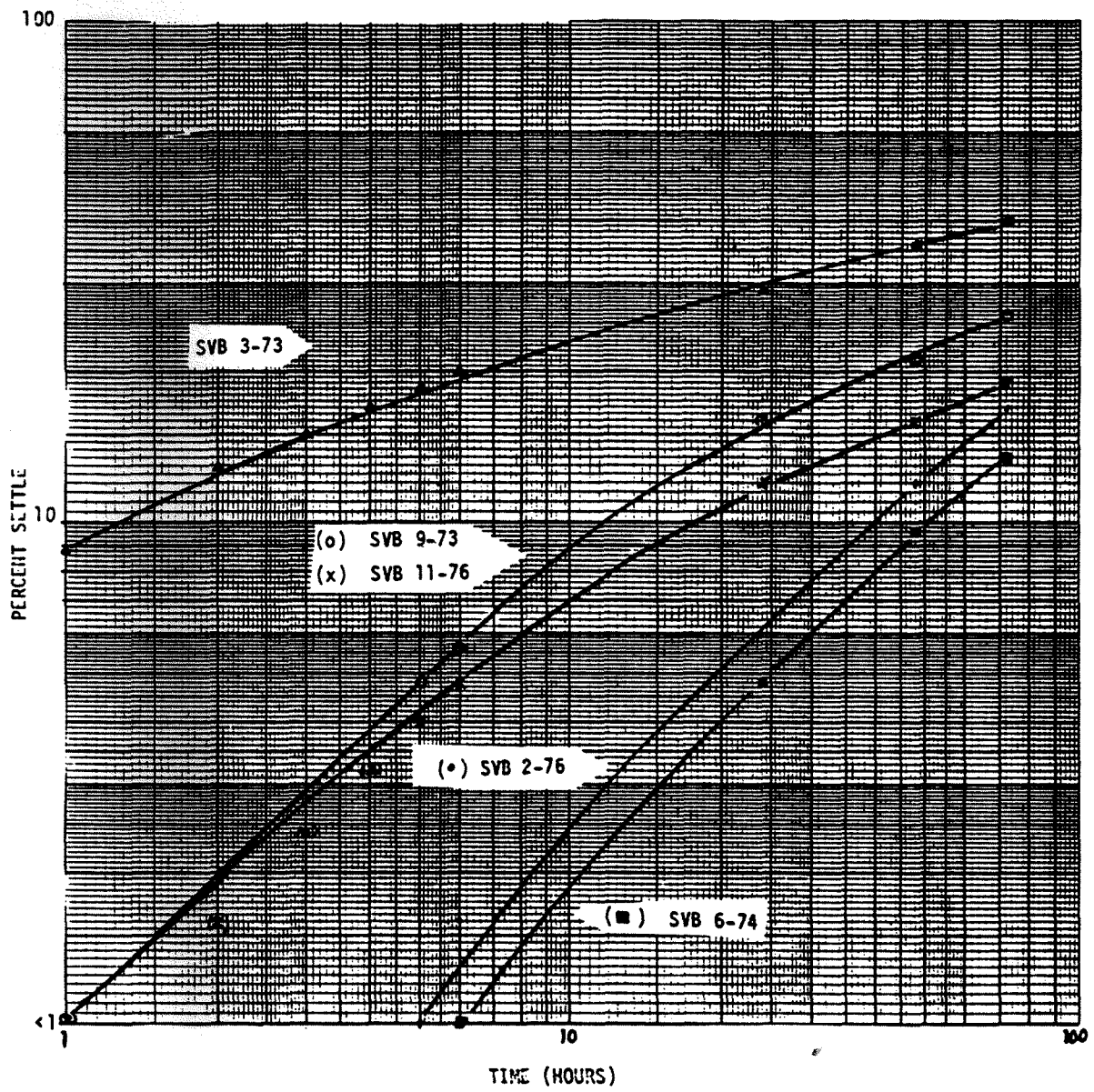
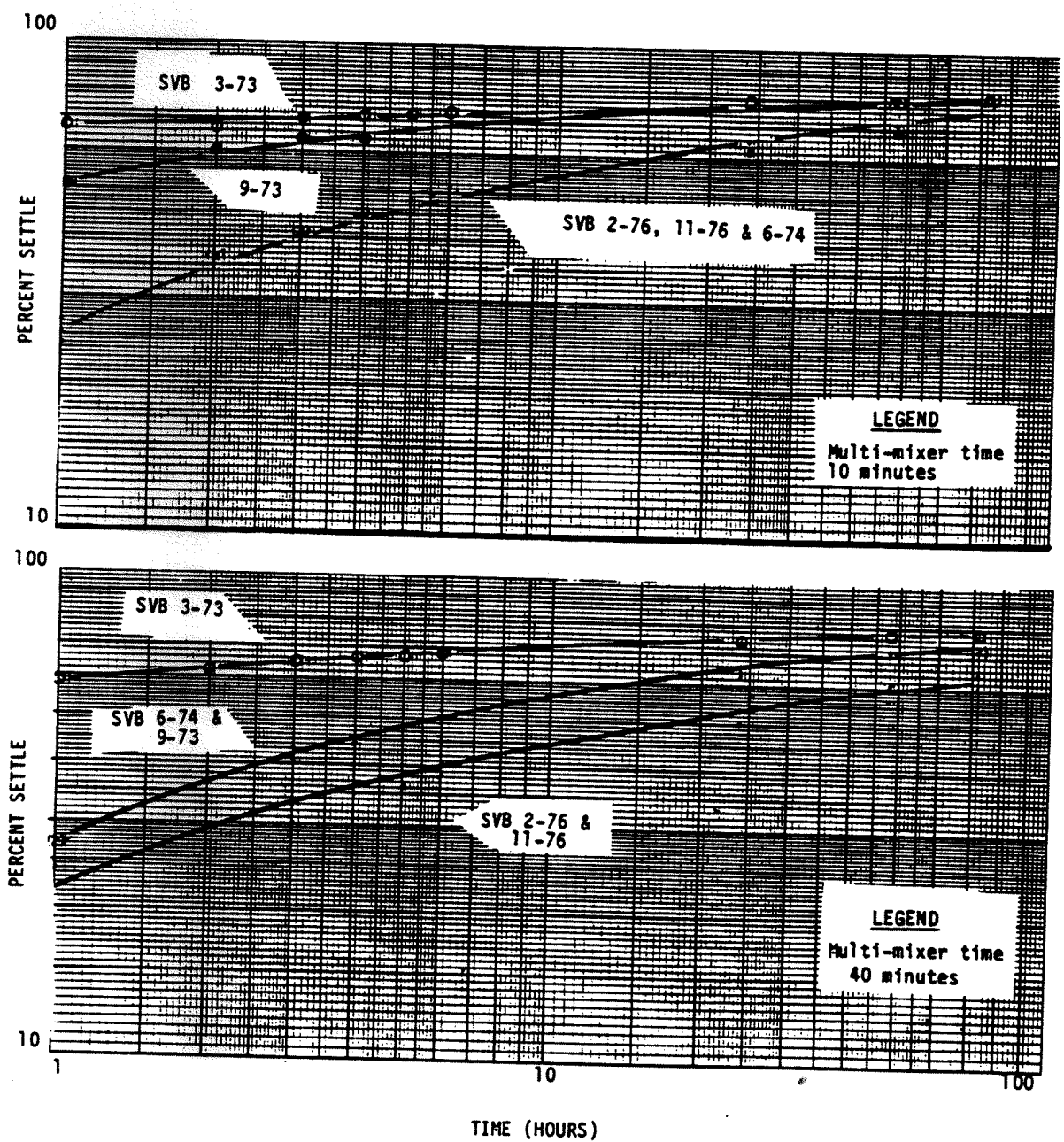
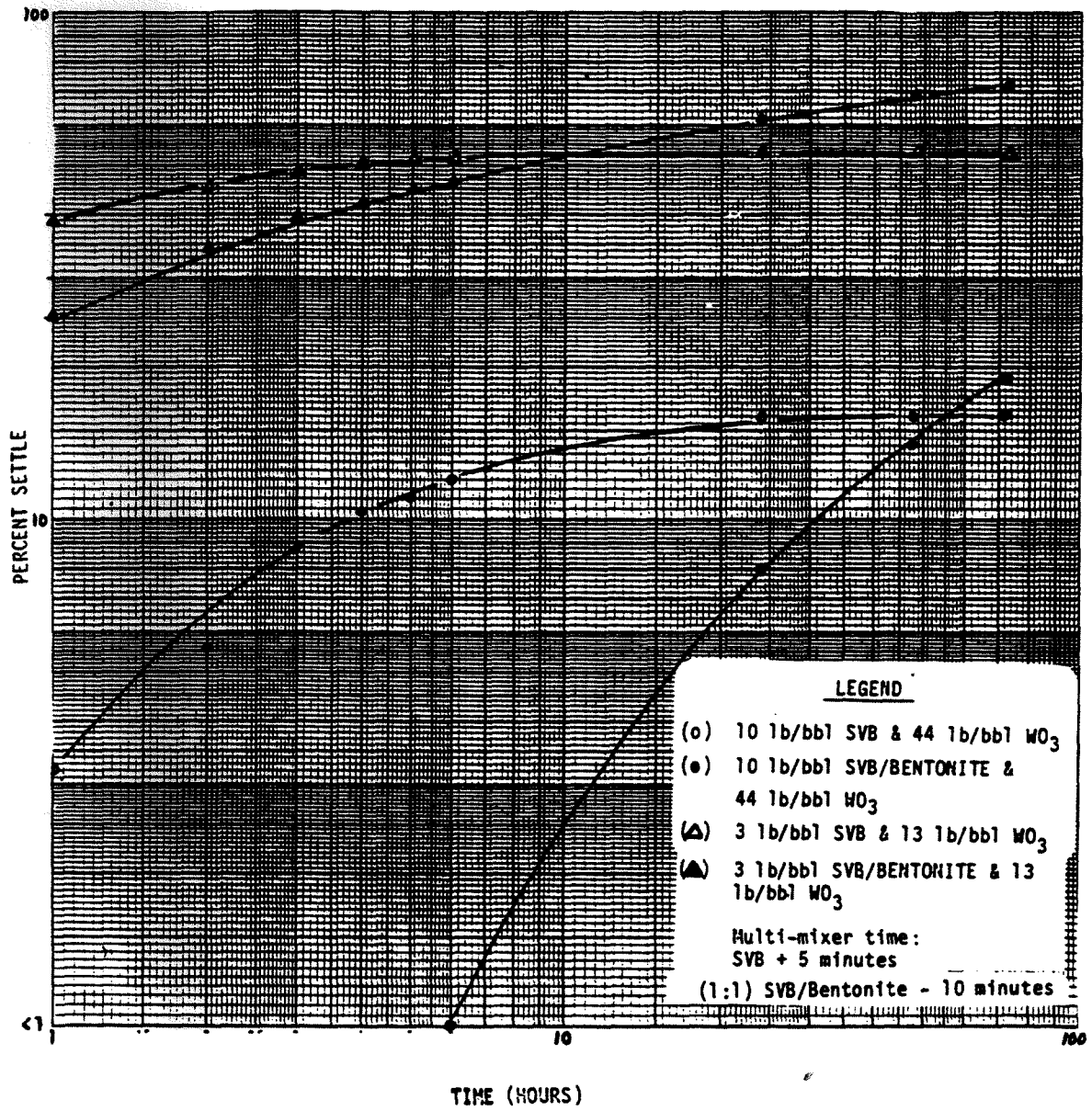
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FIGURE 14
SETTLING CHARACTERISTICS OF SUPERVISBESTOS/BENTONITE SUSPENSIONS
(1.5 lbs. ASBESTOS, 1.5 lbs. BENTONITE & 13 lbs. WO_3 PER BARREL)



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FIGURE 15
COMPARISON OF THE SETTLING CHARACTERISTICS OF
SUPERVISBESTOS & SUPERVISBESTOS/BENTONITE AQUEOUS SUSPENSIONS



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4.4 Comparison of Rheological Properties and Settling Characteristics

The relationship between A_v and Y_p and settling effects are demonstrated in Figures 16 and 17, respectively. Although A_v and Y_p are based on high shear-rate determinations, they demonstrated a reasonable correlation with the corresponding settling values. The reason this occurs is that the only difference between the various suspensions tested is the amount of available fiber in suspension. Particle size and fiber length distribution is relatively the same for all the suspensions. A change in available fiber will result in a direct change in viscosity proportionally over the entire range of shear-rates. Yield Point at these high shear-rates, though indicative of product performance characteristics, is purely empirical. Apparent Viscosity is indicative of real rheological property.

The use of bentonite in the AEC test is not necessary for determining quality of Supervisbestos. Since product variance is predominately a function of available fiber content, product viscosity will change in direct proportion to the rate of shear. As fiber content increases, viscosity will increase accordingly with or without bentonite present. Figure 18 shows the relative time-response properties of asbestos and asbestos/bentonite suspensions parallel each other in properties when compared at comparable levels of mixing.

The AEC test can be further simplified by a single point reading at a standard shear-rate and a fixed mixing time. The higher shear-rates tend to be less subject to fluctuation and therefore best suited for a quality control test. A comparison of Fann readings at 600 rpm (1022 sec⁻¹) and A_v and Y_p values for SVB suspensions of varying quality is shown in Figure 19. The relationships are close to linear over the major portion of the curve on semi-log coordinates.

FIGURE 16
SETTLING PROPERTIES VERSUS APPARENT VISCOSITY VALUES

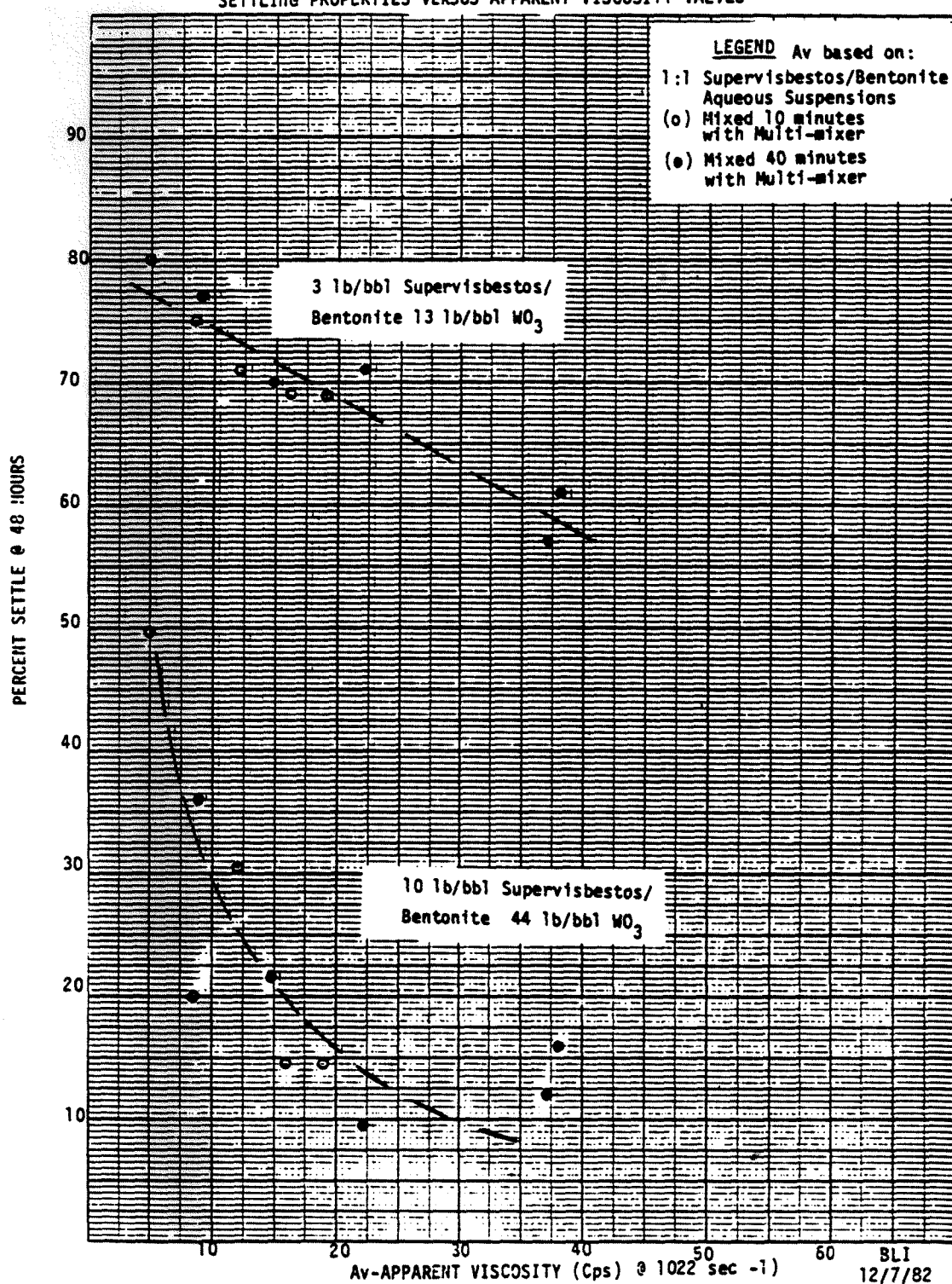


FIGURE 17
SETTLING PROPERTIES VERSUS FAHM YIELD POINT VALVES

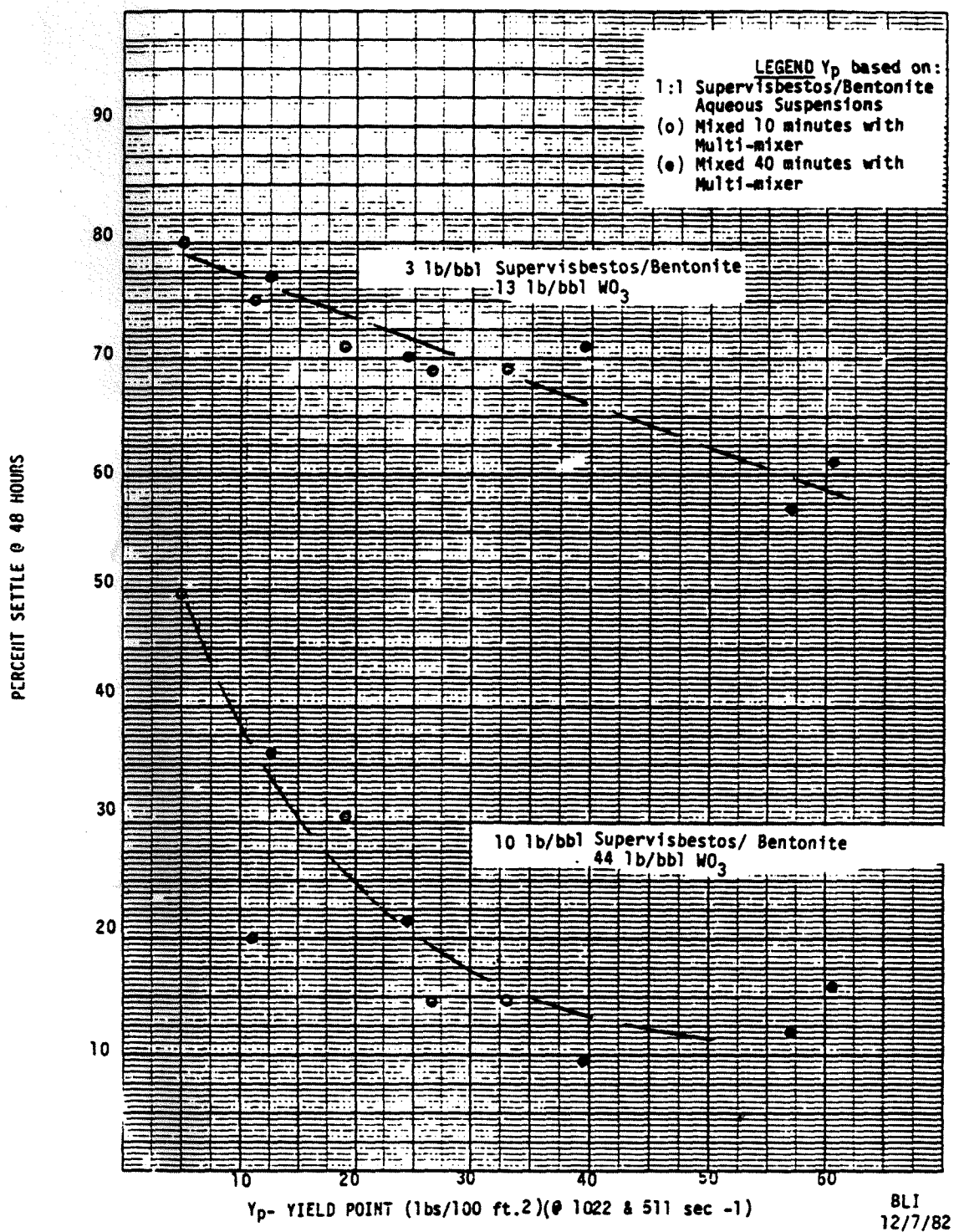
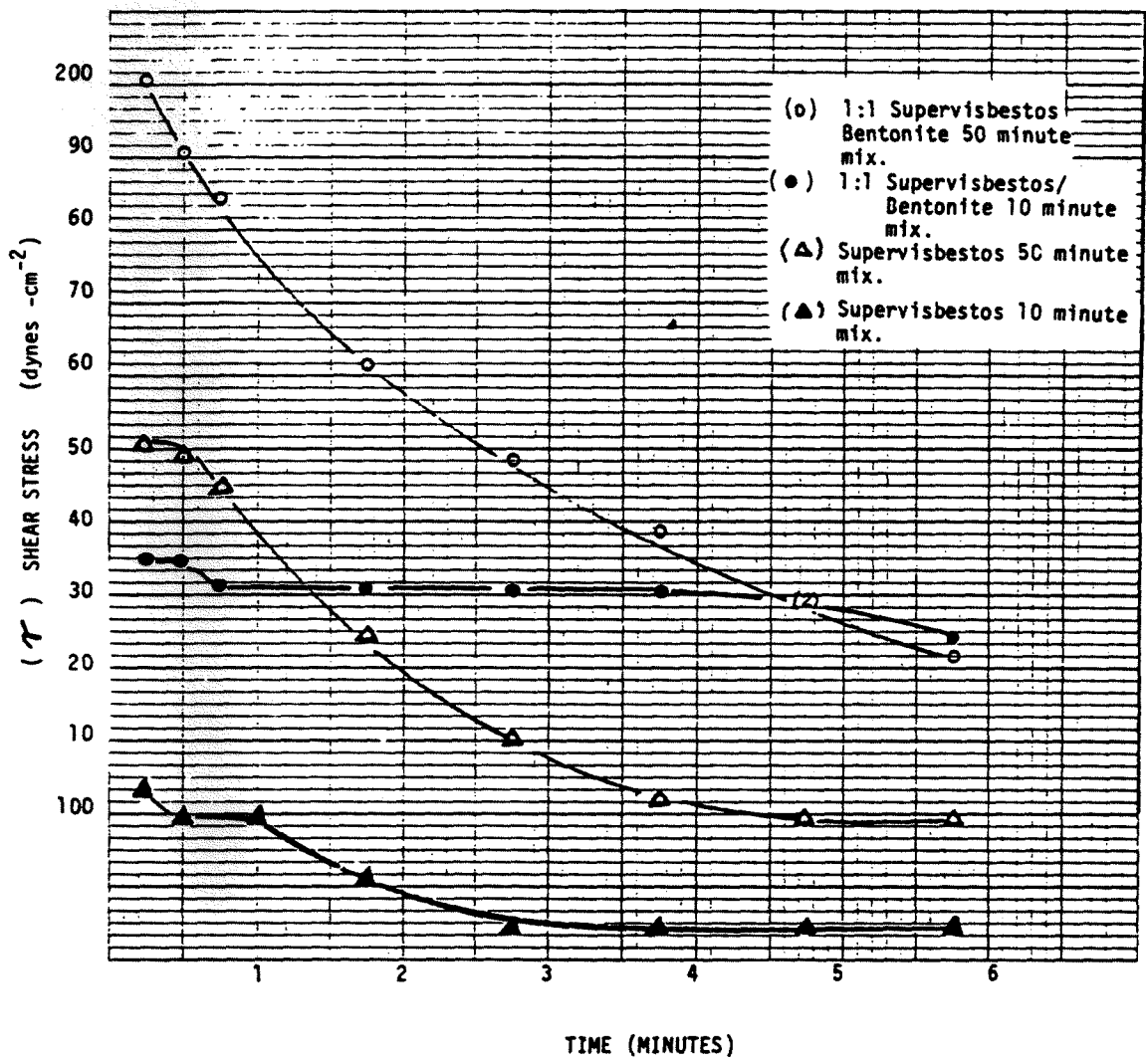


FIGURE 18

TIME DEPENDENT PROPERTIES @ 170.4 sec ⁻¹ of 10 lb/bbl ASBESTOS SUSPENSIONS

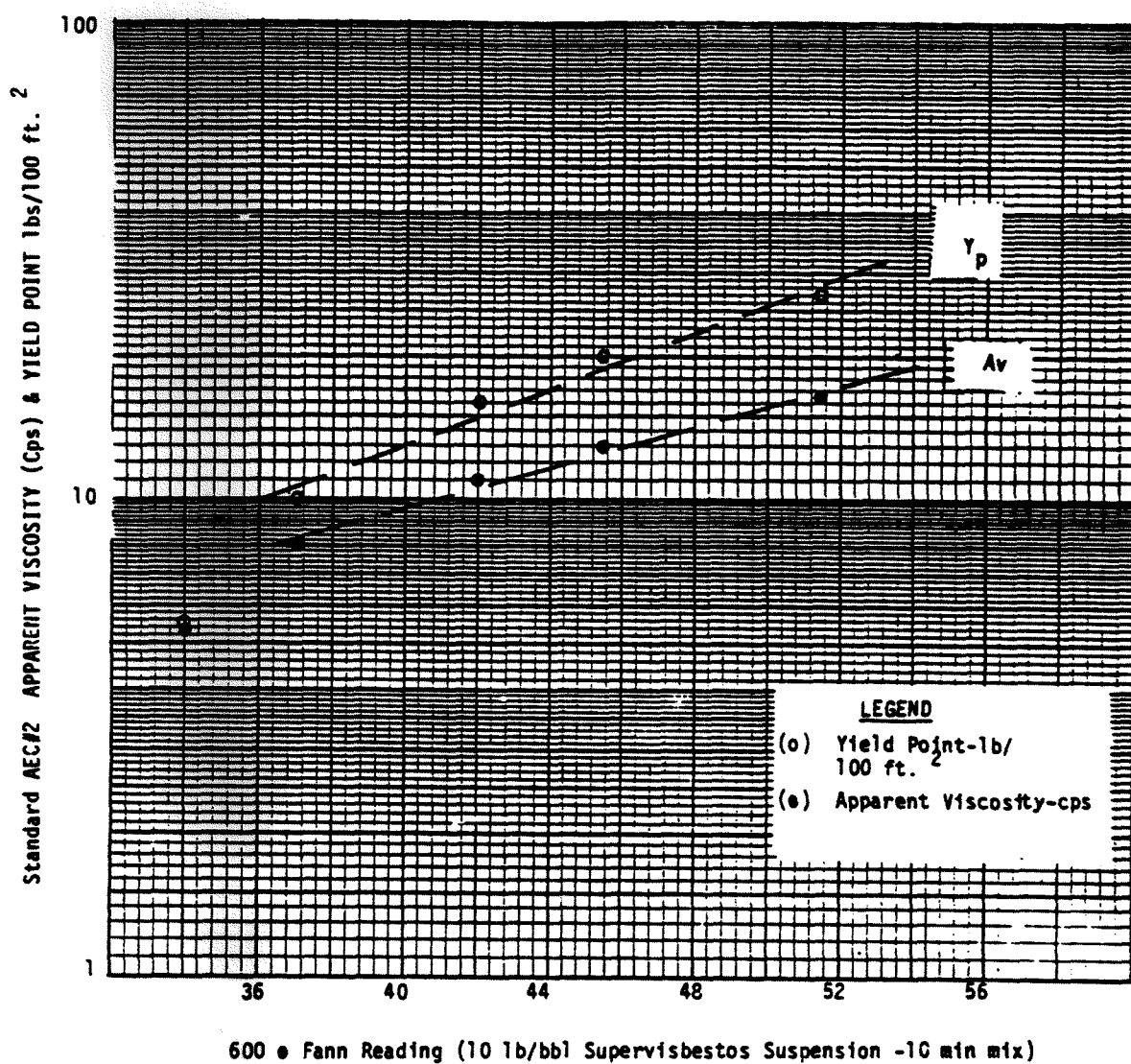


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FIGURE 19

7.

RELATIONSHIP BETWEEN SUPERVISBESTOS AND SUPERVISBESTOS/BENTONITE SUSPENSIONS



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4.5 Supervisbestos Production Specifications

Of the five products evaluated, the March 73 and September 73 samples exhibited by far the lowest properties ie, settling, viscosity, particle size distribution and with regards to ease of mechanical opening as shown below:

TABLE II
Comparison of Supervisbestos
Properties

	<u>March 73</u>	<u>Sept. 73</u>	<u>June 74</u>	<u>Nov. 76</u>	<u>Feb. 76</u>
AEC #2 Test					
Y _p	5.5	10	16	20	27
Av	5.3	8	11	13	16.5
Asbestos-only (10 min-mix)					
600 ø value	34	37	42	45.5	51.5
Relative ease of opening (multi-mixer)	poor	poor	fair	good	good
Flocced Particle Size					
+ 65 mesh	9.5	8.1	5.8	3.9	3.8
+ 100 mesh	14.6	13.8	11.1	6.7	7.2
Percent Settle 10 lb/bbl Asbestos/Bentonite (44 lb/bbl W _O ₃) (10 min. mix)					
1 hr.	15.2	3.2	4	0	0
48 hr.	48.8	33	30.4	14.4	14.4

The density of tungsten oxide is roughly three times that of typical formation materials and should be considered when interpreting the settling data. All the products showed good suspension properties for upwards of an hour, with exception of the March 73 sample. Suspension properties with low density muds should be considerably better than that indicative with WO_3 . Furthermore, asbestos is used a majority of the time to create temporary plug flow for cleaning of the hole and prolonged suspension properties are not important.

In the author's opinion, a reasonable cut off point for product quality control is an Apparent Viscosity of 13 cps as measured by the current AEC #2 test procedure. This is based on an asbestos free water content of one to two percent which approximates manufacturing test conditions. Results reported herein show a significant drop off in both the physical properties and settling characteristics of SVB products having Apparent Viscosities less than 11 cps. The coefficient of variance for the AEC test procedure is within ± 10 to 15% which represents a swing of one to two centipoise. A minimum Av spec of 13 cps would insure product quality within predictable limits of test variability. A yield point specification is at best redundant. Yield Point is subject to greater variation than Av and has been shown to have no real significance regarding end-use performance characteristics.

As mentioned earlier, a simplified test procedure based on a single point Fann measurement has been developed without bentonite. It is based on an asbestos suspension having a solids content of 12 to 15 grams per 400 ml distilled water. The slurry is mixed for 10 minutes with the Multi-mixer (3 discs) at 11,500 rpm. Measurements are to be based on the Fann 600 rpm value taken at 15 seconds. Details of its implementation will have to be worked out with the plant.

5.0 FLOSAL COMPETITIVE PRODUCT EVALUATION

Flosal is a chrysotile asbestos produced by Johns-Manville Corp. and sold exclusively to the drilling industry by Drilling Specialties Company, Inc. The original product was based on Coalinga California chrysotile. A new product was introduced in 1973 based on Quebec Canadian chrysotile. The material contains both very fine and long fiber length distributions and sells for approximately the same price as Supervisbestos.

Typical physical properties of Supervisbestos and Flosal are shown in Table III. Supervisbestos has a finer particle size distribution and higher surface area than Flosal. However, Flosal exhibits better suspension characteristics and viscosity building properties as demonstrated by Apparent viscosity and wet bulk values. The physical differences between the two products can be best appreciated by visual observations under the microscope. Figures 20 & 23 show scanning electron photomicrographs (SEM) of the materials. Photomicrographs of dilute aqueous suspensions that were ultrasonically opened are shown in Figures 24-29. The longer fiber length distribution of Flosal is clearly evident in Figures 24 & 25. The EDAX scans shown represent full field Energy-Dispersive Analysis of X-rays of the areas referenced. The specimens were gold coated, giving the characteristic Au peak. At high magnifications, the short fiber fractions of the products appear very similar as shown in Figures 26-29.

TABLE III

TYPICAL PHYSICAL PROPERTIES OF FLOSAL & SUPERVISBESTOS

	<u>%Reflectance</u>	<u>%Total Iron</u>	<u>%MgO</u>	<u>%SiO₂</u>	<u>BET Surface Area (m²/gm)</u>	<u>AEC#2 Fann</u>		<u>2g/1 Wet Bulk Settle Vol.(cc)</u>	<u>%Retained Flocced Wet Screen</u>			
						<u>Av</u>	<u>Y_p</u>		<u>+65M</u>	<u>+100M</u>	<u>+200M</u>	<u>+325M</u>
Supervisbestos	70	2.0	40	40	58	15	25	865	4	7	22	34
Flosal	54	4.5	36	36	34	22	20	1000	3	9	34	48

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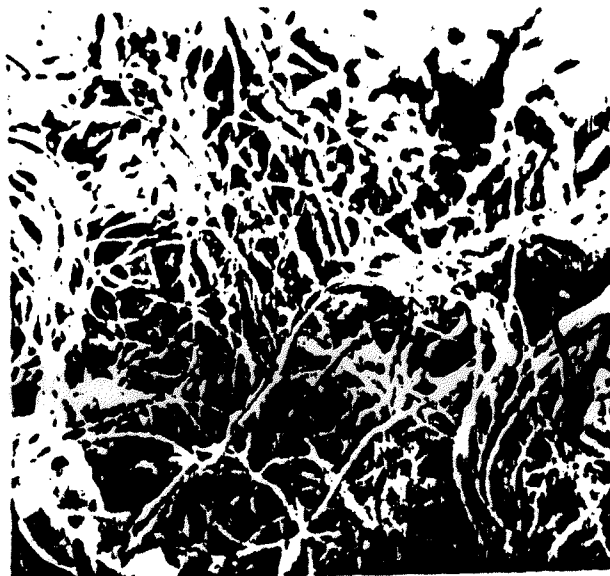


Figure 20 SEM Photo micrograph of Flosal as is @ 500 X.



Figure 22 SEM Photomicrograph of Flosal as is @ 2000 X.

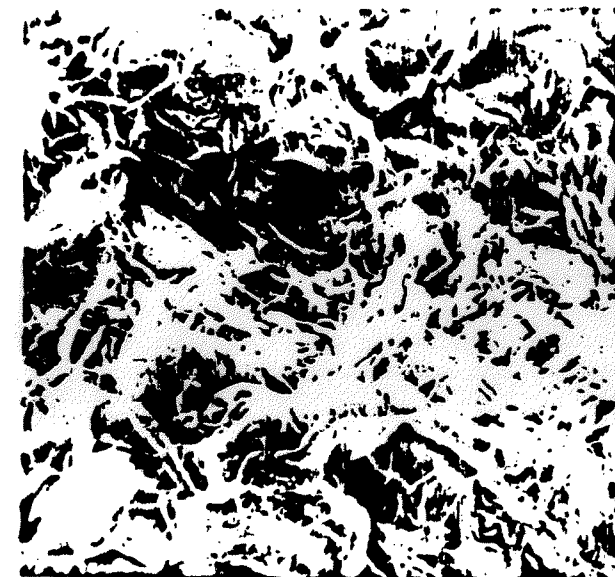


Figure 21 Photo micrograph of Supervisbestos as is @ 500 X.



Figure 23 SEM Photomicrograph of Supervisbestos as is @ 2000 X.

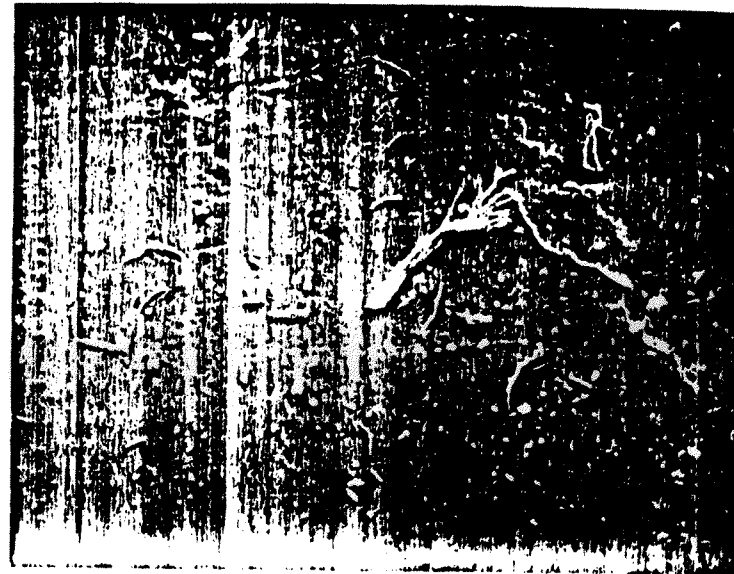


Figure 24 SEM Photograph of Flosal @ 100 X Prepared from dilute Aqueous Suspension.

-35-

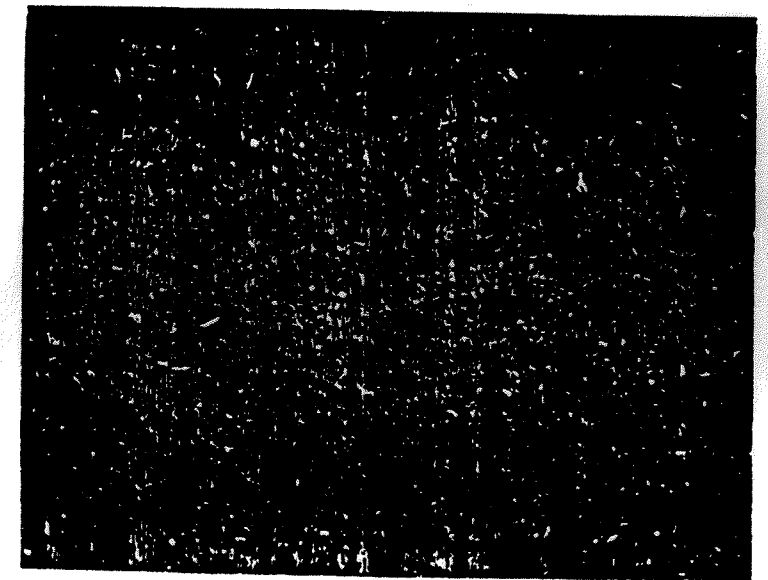


Figure 25 SEM Photograph of Supervisbestos @ 100 X Prepared from dilute Aqueous Suspension.

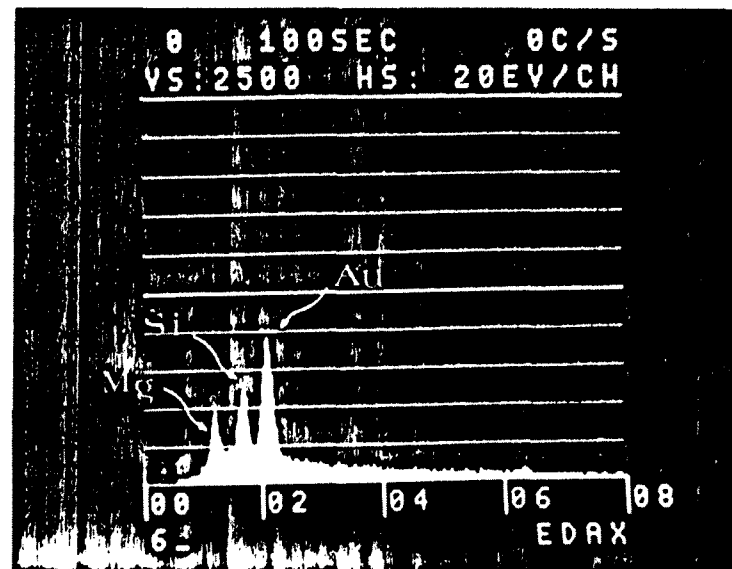


Figure 24a EDAX Full Field Scan of area in Figure 24

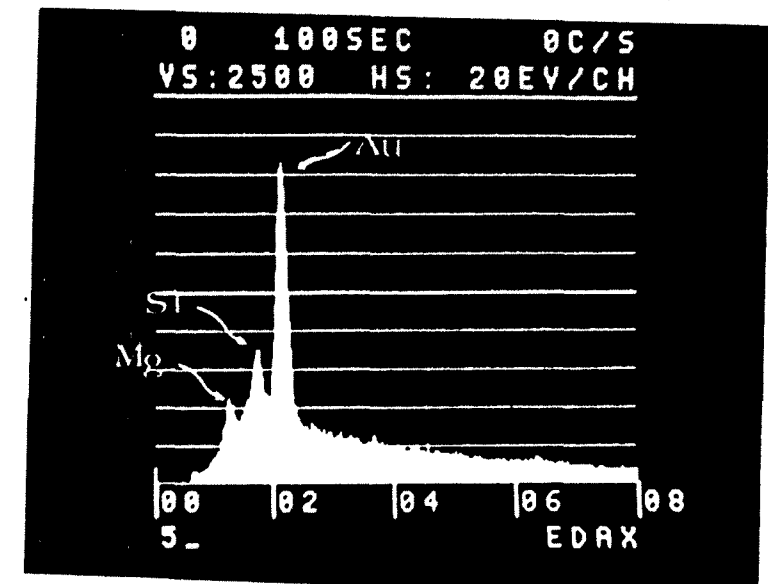


Figure 25a EDAX Full Field Scan of area in Figure 25

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Figure 26 SEM Photomicrograph of Supervisbestos @ 20,000 X prepared from dilute aqueous suspension.

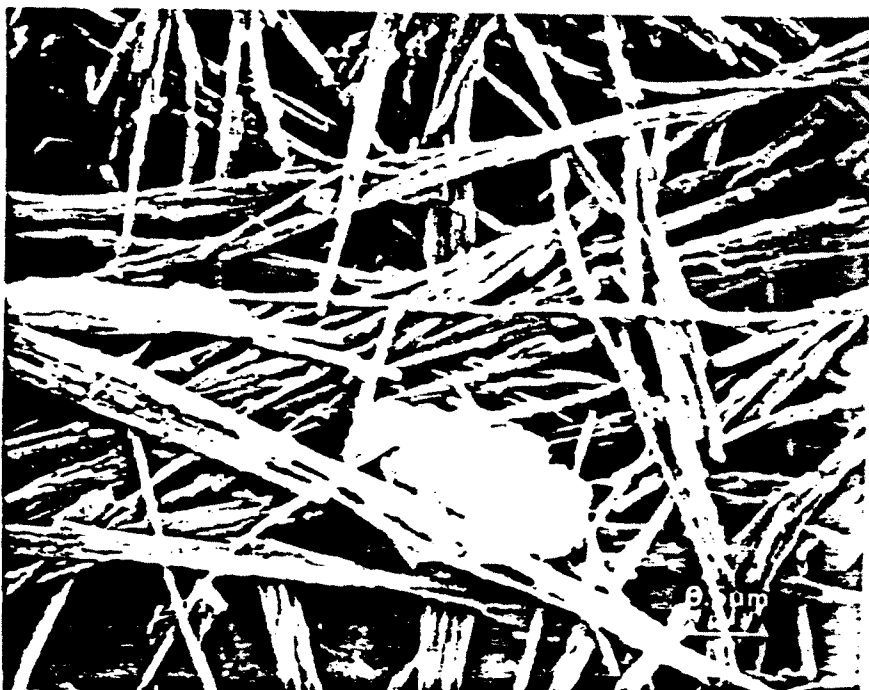


Figure 27 SEM Photomicrograph of Flosal @ 20,000 X prepared from dilute aqueous suspension.



Figure 28 SEM Photomicrograph of Supervisbestos @ 50,000 X prepared from dilute aqueous suspension.

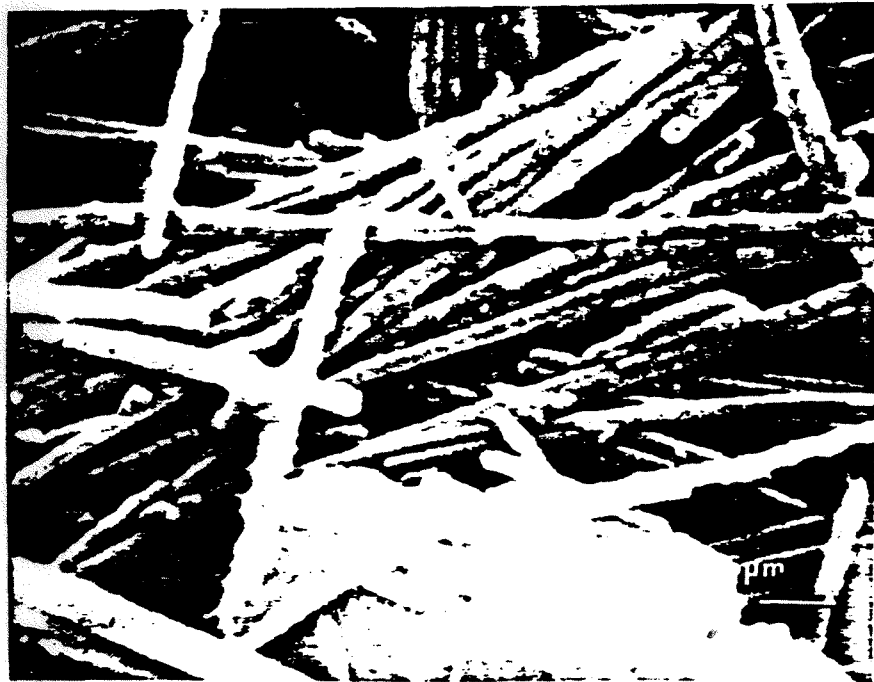


Figure 29 SEM Photomicrograph of Flosal @ 50,000 X prepared from dilute aqueous suspension.

The suspension characteristics of Flosal and Supervisbestos are demonstrated in Figure 30. Tungsten oxide was used as a weighting agent. The suspension capabilities of Flosal exceeded that of Supervisbestos, both at the high and low solids concentrations for slurries mixed 10 minutes in the multi-mixer. Settling characteristics of the two products were relatively the same when mixed for 40 minutes as shown in Figure 31. The properties of asbestos suspensions prepared without bentonite are shown in Figure 32. Again, Flosal demonstrated a marked advantage at high solids concentrations. Settling was approximately the same for the two products in dilute suspensions.

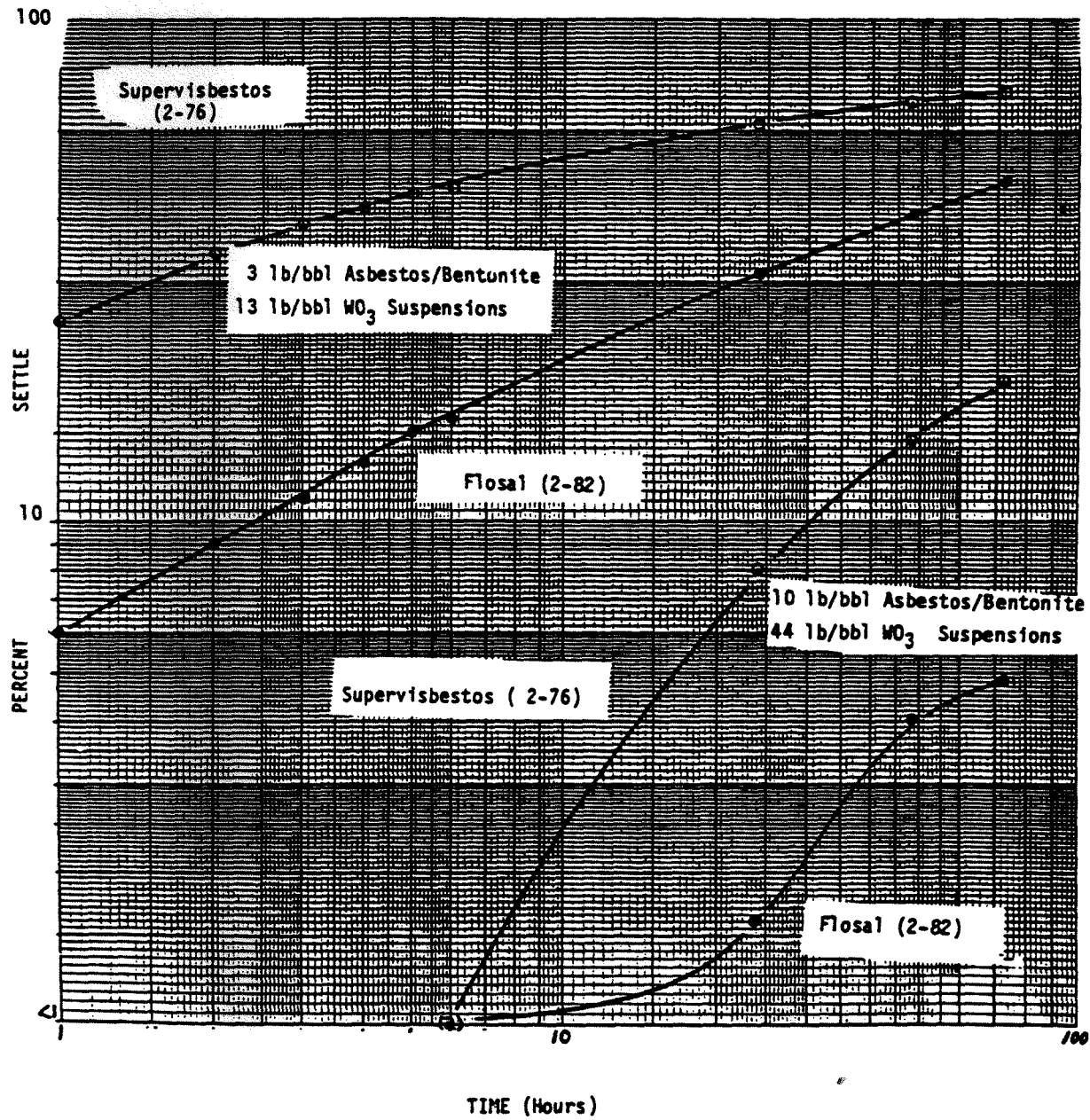
The superior performance characteristics of Flosal are surprising considering that Supervisbestos has a finer particle size distribution and a surface area $\sim 1-1/2$ times that of Flosal. Flosal is mechanically liberated much easier than Supervisbestos (reference Figure 7). Although this may be an advantage in some instances, it is not the major reason for performance differences. Flosal aqueous suspensions tend to exhibit a much higher degree of flocculation than supervisbestos. This may be due in part to the slightly higher pH of Flosal. This is most likely due to a higher Brucite ($Mg(OH)_2$) content. Much of the naturally occurring Brucite in Calidria ore is removed during aqueous processing. The principle mechanism, however, appears to be related to the fiber length distribution of Flosal. The long fiber fraction (20-100 μm) enhances the cohesion of fibrous structure physically, and appears to extenuate the effect of particle electrical forces. This contributes to pseudoplastic and strong rheopectic properties.

The rheopectic property of Flosal is evident at shear-rates as high as 170 sec^{-1} as demonstrated in Figures 33 & 34. Viscosity increased with time at constant shear for Flosal/bentonite suspensions mixed for periods up to 20 minutes. Suspensions mixed longer than 20 minutes began to behave thixotropically at 170 sec^{-1} . However, at low shear rates 5-10 sec^{-1} , all Flosal suspensions exhibited rheopectic property.

The significance of rheopectic property is further demonstrated in Figure 35. The Supervisbestos (2-76) suspensions were mixed for 40 minutes in the multi-mixer. Flosal was mixed 20 minutes. Each set of instantaneous ($t=0$) and steady state readings ($t=5$ minutes) were obtained on individual slurries over the entire range of shear-rates. For example, the initial Fann reading at 1022 sec^{-1} was obtained first; and then the sample was sheared at 170 sec^{-1} for 5 minutes and the stress again recorded at 1022 sec^{-1} . The shear stress values for the Flosal suspensions increased dramatically where as the Supervisbestos suspensions decreased by approximately the same order of magnitude. The time-dependent effects on Apparent Viscosity over the range of shear-rates is further illustrated in Figures 36 and 37.

The relationship between Av & Y_p and settling characteristics is shown in Figure 38. The correlation between Av and Y_p and settling property is poor when comparing Flosal and Supervisbestos because of the differences in their time-dependent properties at low shear rates. This is supported by observation of K values at high and low shear-rates, refer to Figure 39. K constants developed at shear rates in the region of $1022-170 \text{ sec}^{-1}$ show little correlation with settling properties when comparing the Flosal and Supervisbestos suspensions. On the other hand, K values based on $10-5 \text{ sec}^{-1}$ demonstrated excellent correlation with settling property for both Supervisbestos and Flosal suspensions.

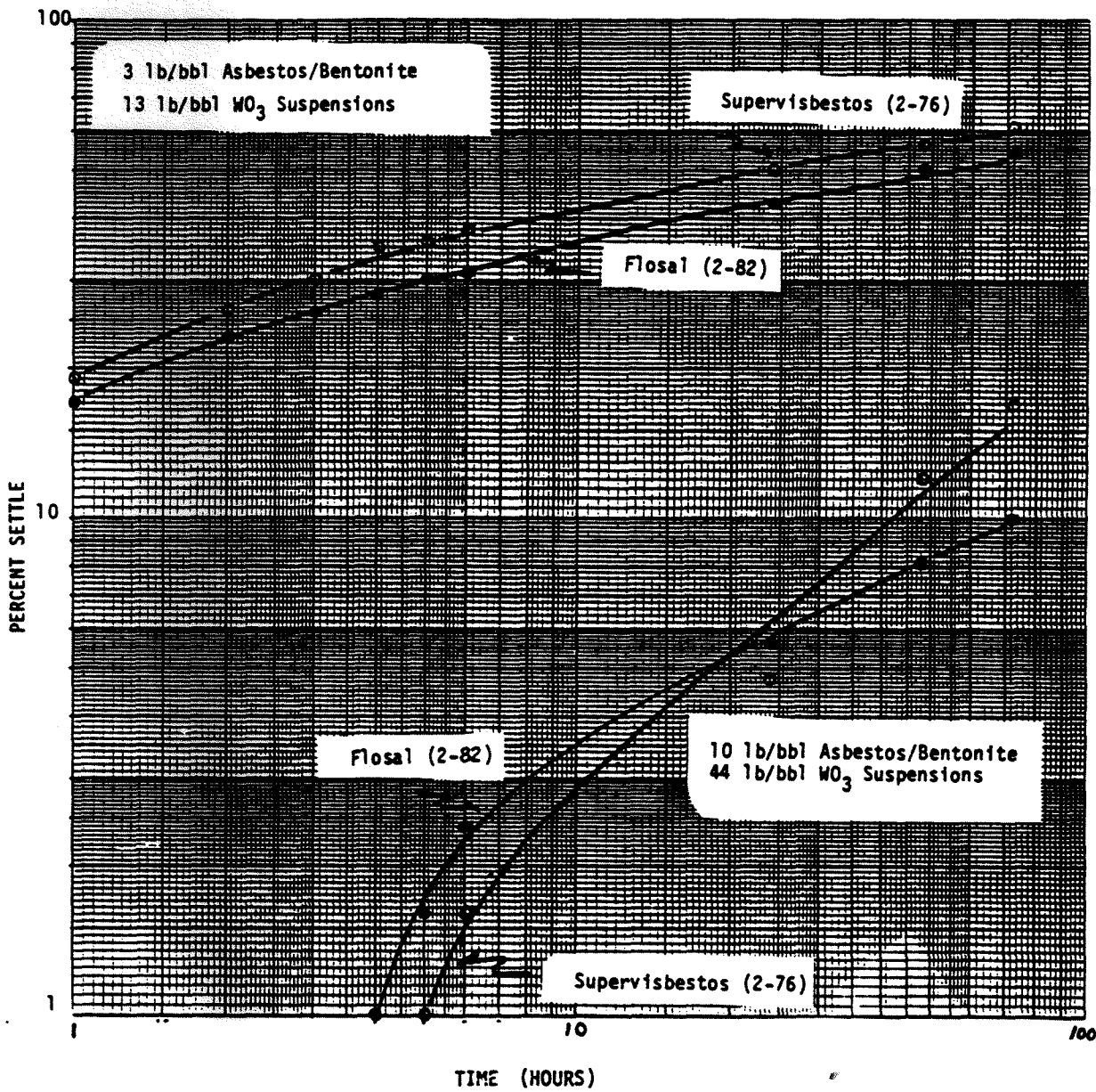
FIGURE 30
FLOSAL AND SUPERVISBESTOS COMPARISONS
SETTLING TEST (1:1) ASBESTOS/BENTONITE SUSPENSIONS
(10 minute mix in Multi-mixer)



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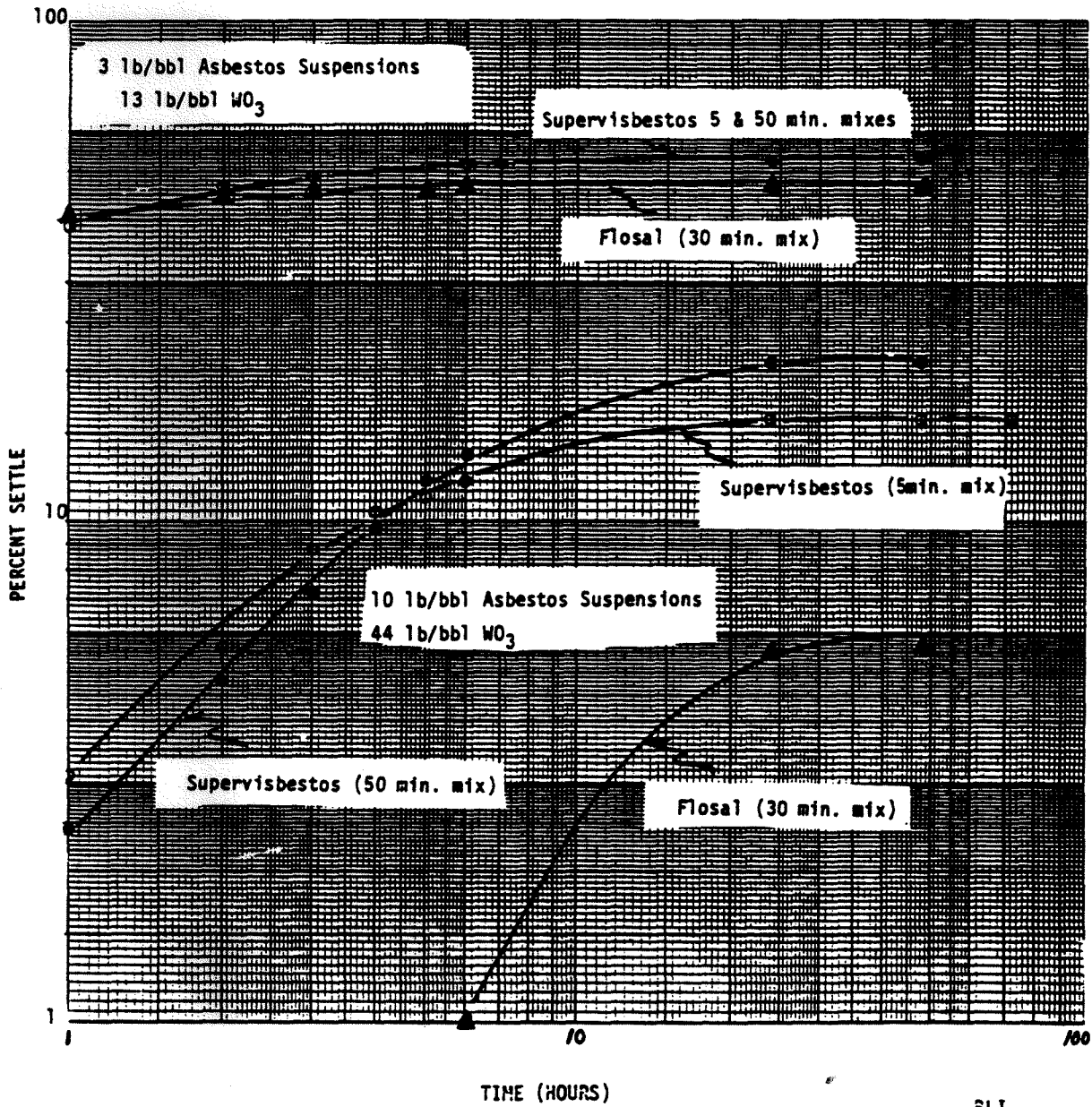
FIGURE 31

FLOSAL AND SUPERVISBESTOS COMPARISONS SETTLING TESTS
1:1 ASBESTOS/BENTONITE SUSPENSIONS
(40 MINUTE MIXING IN MULTI-MIXER)



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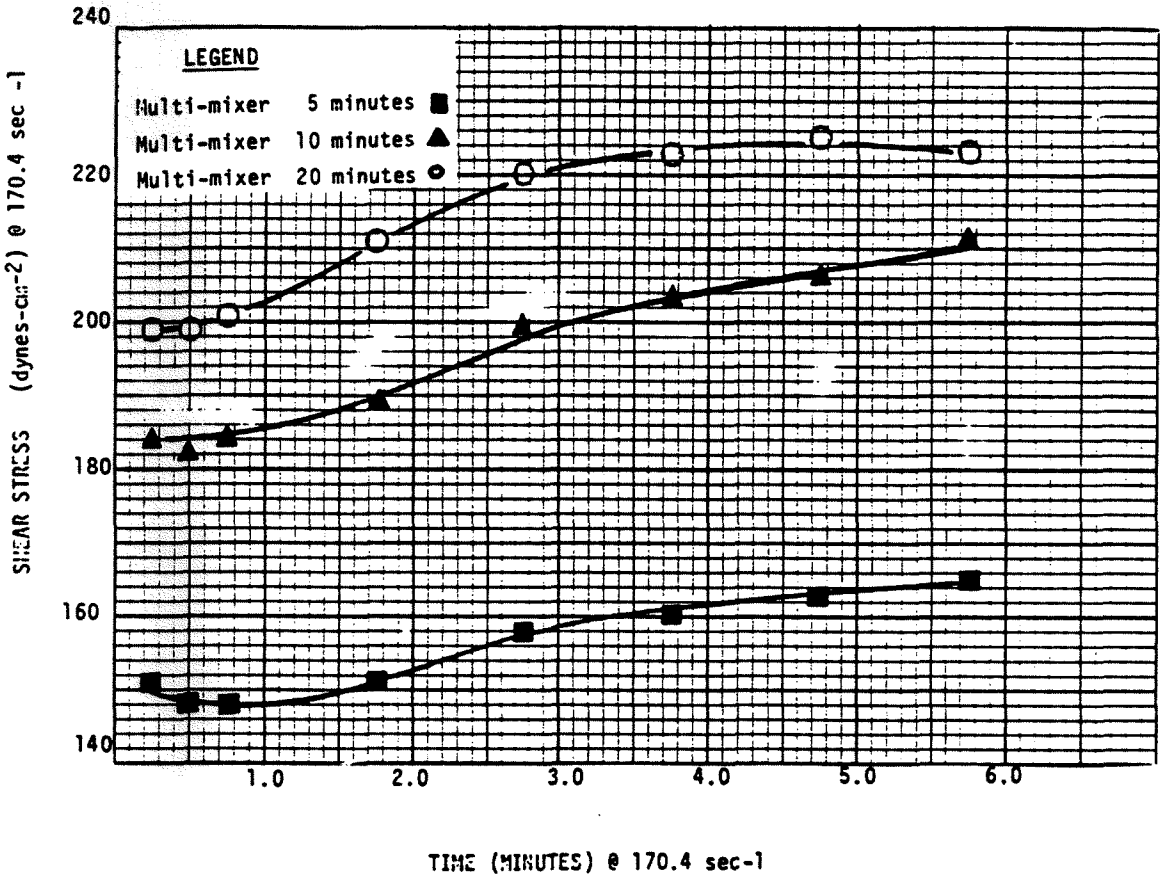
FIGURE 32
FLOSAL AND SUPERVISBESTOS COMPARISONS
SETTLING TESTS ASBESTOS SUSPENSIONS



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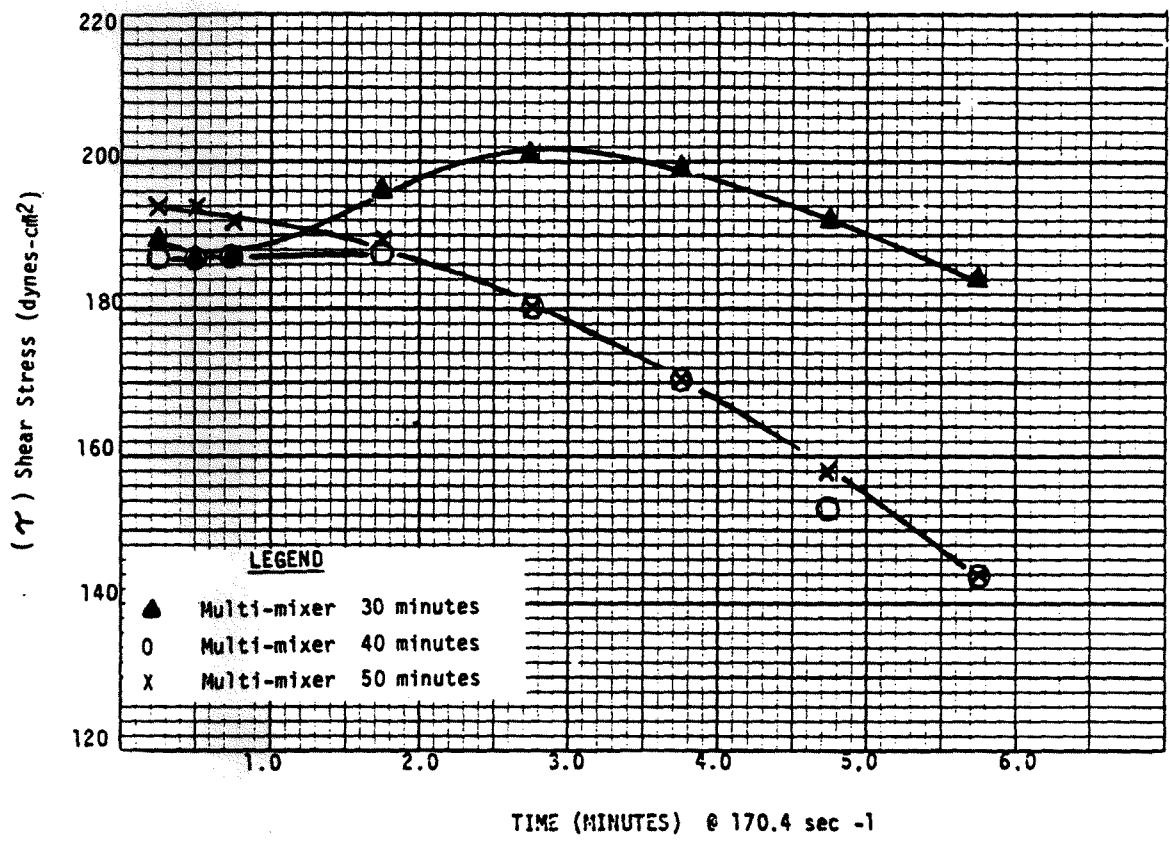
FIGURE 33

TIME DEPENDENT PROPERTIES AT 170.4 sec ⁻¹ of 10 lb/bbl
(1:1) FLOSAL/DENTONITE SUSPENSIONS PREPARED WITH
MULTI-MIXER FOR 5 TO 20 MINUTES



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FIGURE 34
TIME DEPENDENT PROPERTIES AT 170.4 sec ⁻¹ of 10 lb./bb1
(1:1) FLOSAL/DENTONITE SUSPENSIONS PREPARED WITH MULTI-
MIXER FOR 30 - 50 MINUTES



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FIGURE 35

TIME DEPENDENT SHEAR-STRESS RESPONSE OF 1:1 ASBESTOS/BENTONITE SUSPENSIONS

FIGURE (a) SUPERVISBESTOS SUSPENSIONS

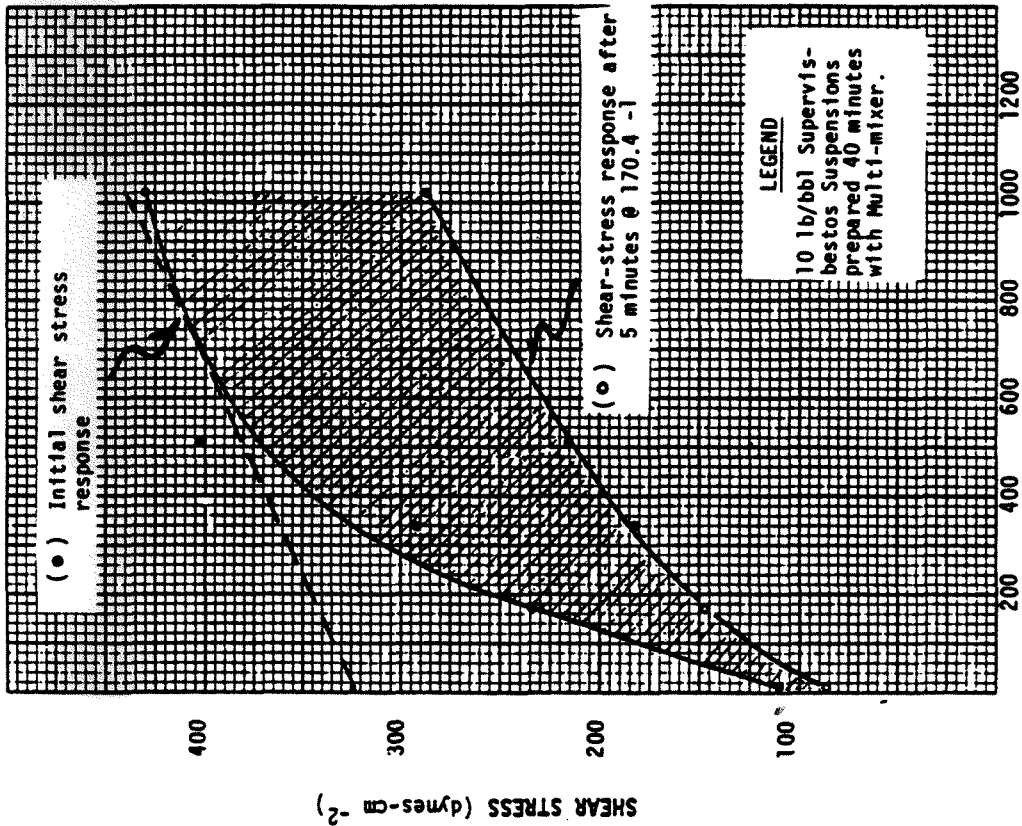
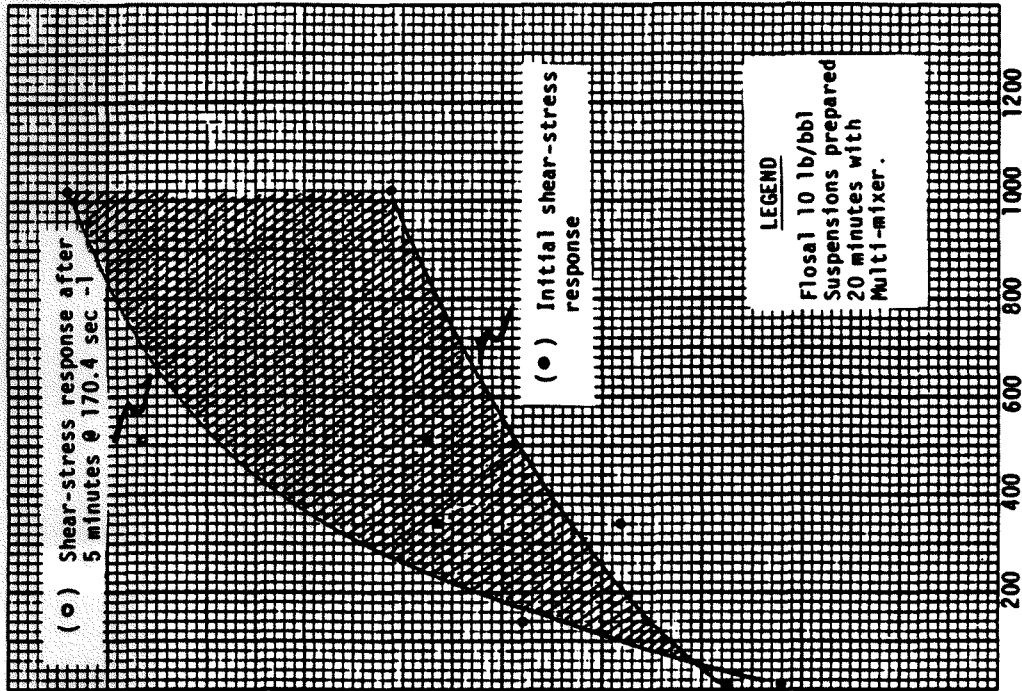


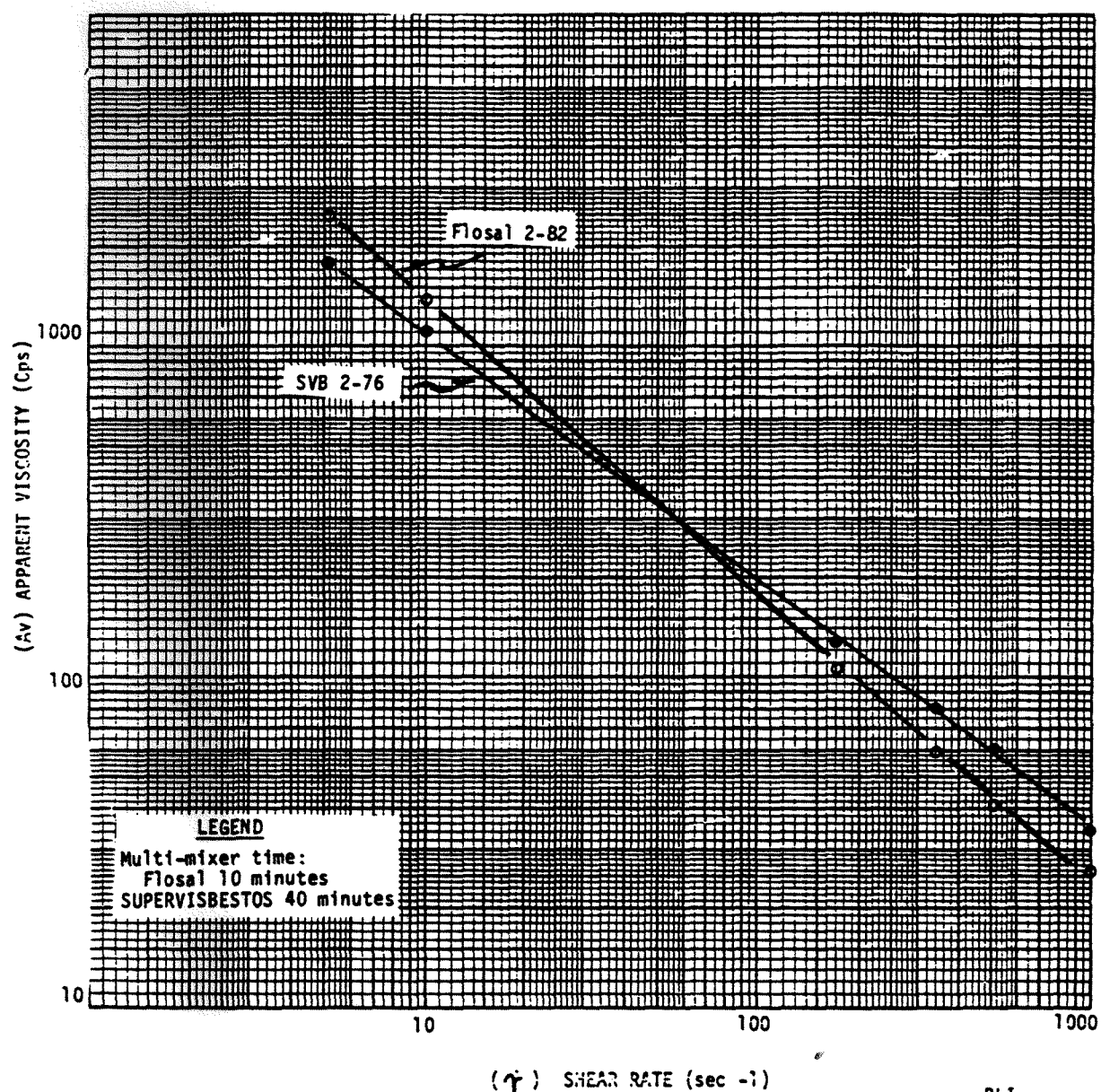
FIGURE (b) FLOSAL SUSPENSIONS



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FIGURE 35
 PSEUDOPLASTIC (SHEAR DEPENDENT) PROPERTIES OF SUPERVISBESTOS & FLOSAL
 BENTONITE SUSPENSIONS (5 lbs ASBESTOS & 5 lbs/BENTONITE PER BARREL)

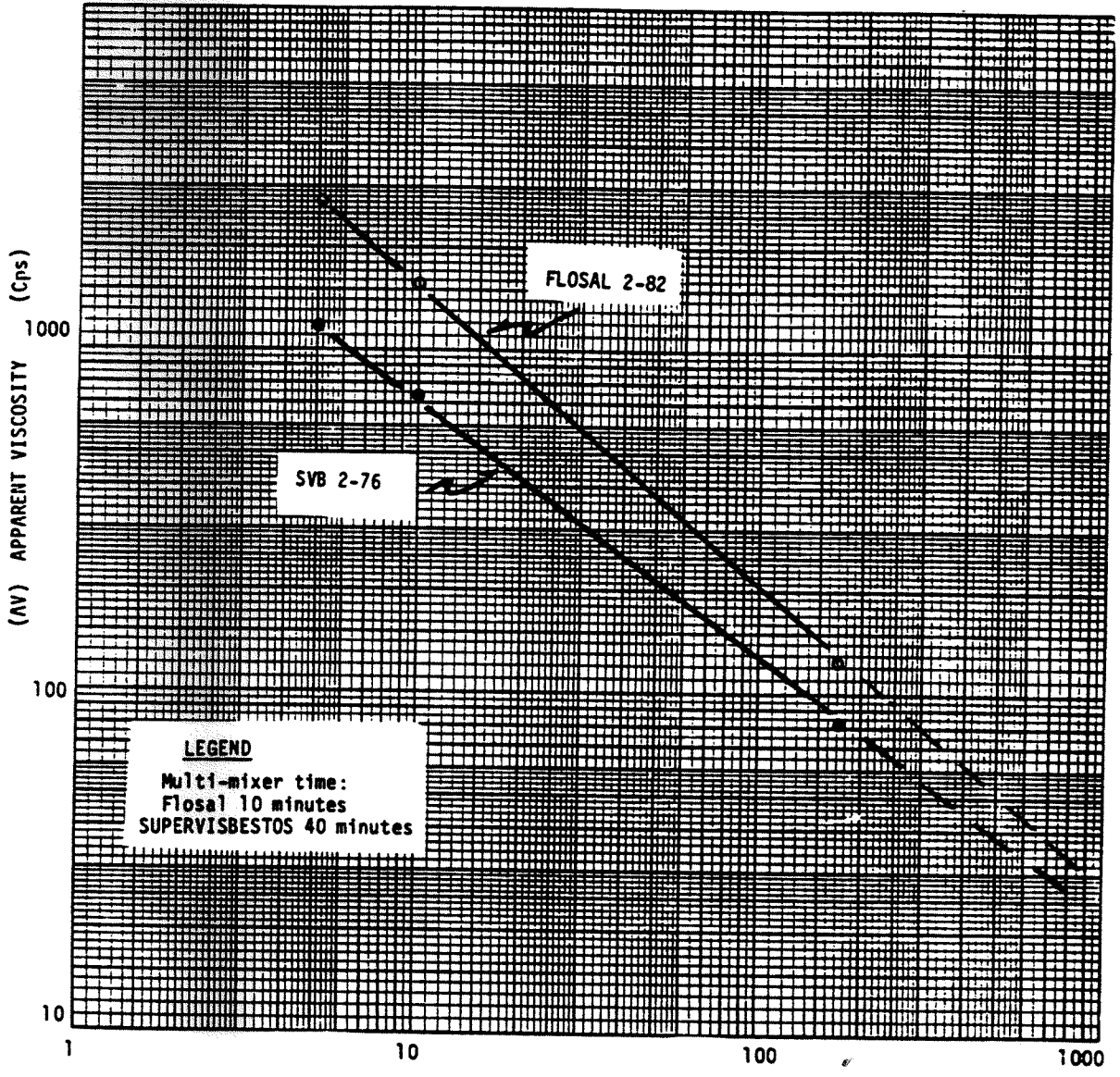
INSTANTANEOUS READINGS



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FIGURE 37

PSEUDOPLASTIC (SHEAR DEPENDENT) PROPERTIES OF SUPERVISBESTOS
& FLOSAL BENTONITE SUSPENSIONS AFTER SHEARING @ 170.4 sec-1
FOR 5 MINUTES (5 lbs. ASBESTOS, 5 lbs. BENTONITE PER BARREL)
"STEADY STATE" READINGS



(γ) SHEAR RATE (sec -1)

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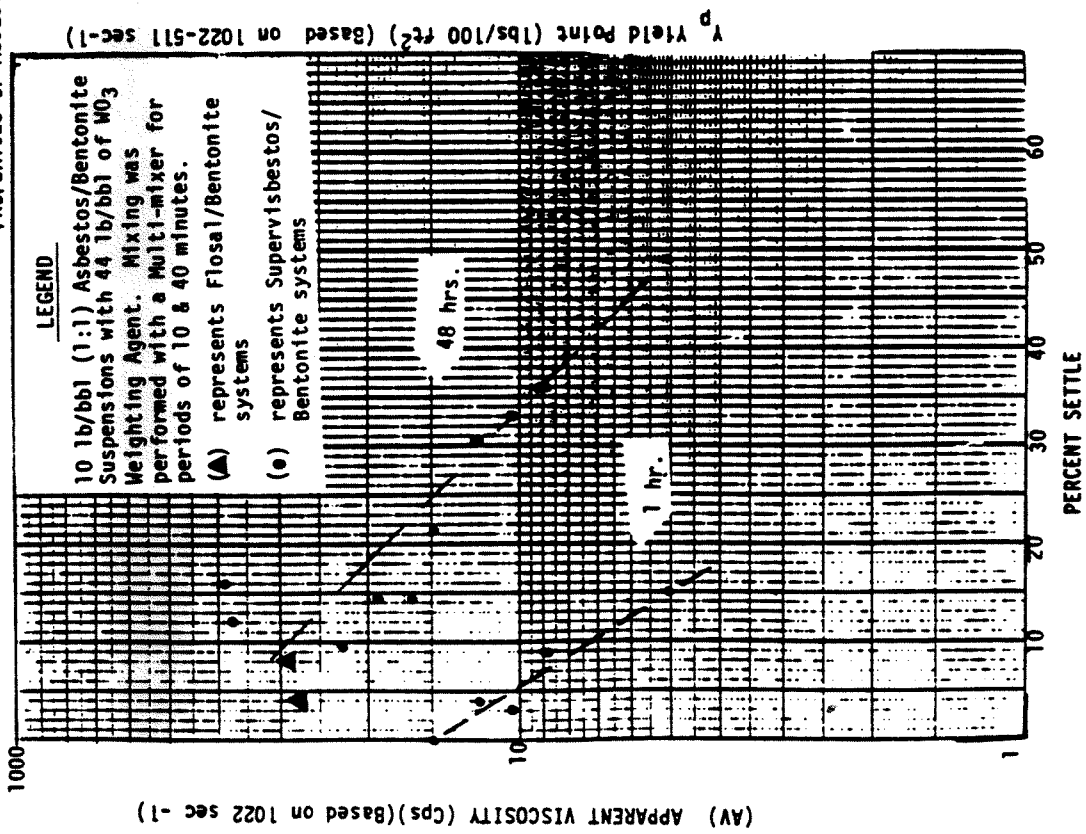
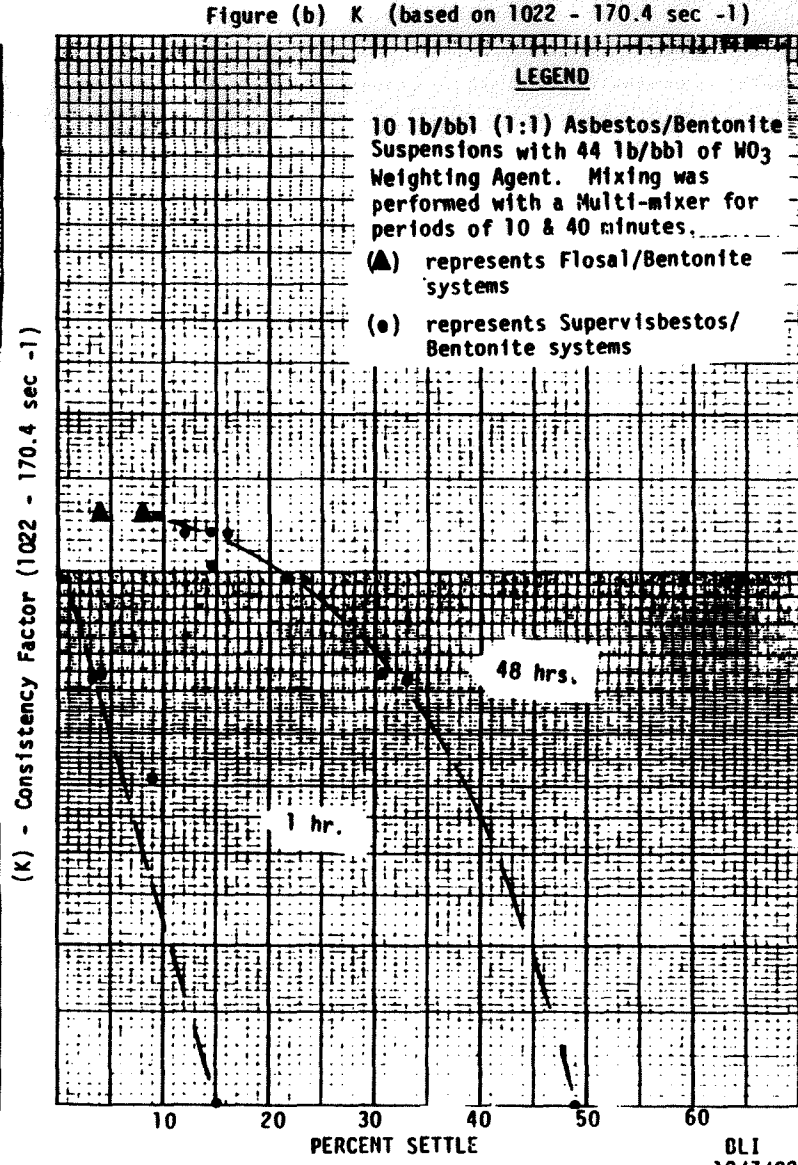
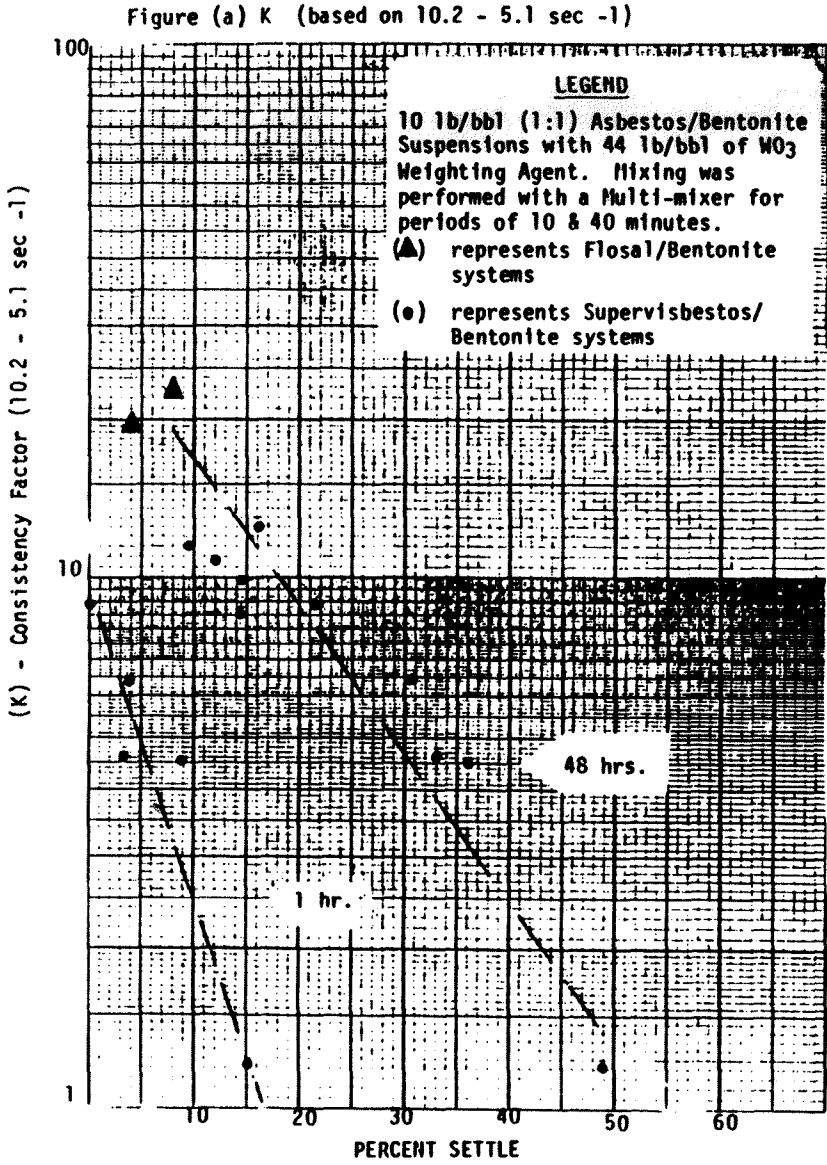
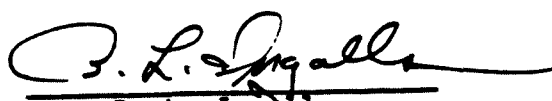
Figure (b) Yield Point
@ 1022 & 511 sec -1FIGURE 38
RELATIONSHIP BETWEEN SETTLING CHARACTERISTICS AND THE RHEOLOGICAL
PROPERTIES OF ASBESTOS AQUEOUS SUSPENSIONSFigure (a) Apparent
Viscosity @ 1022 sec -1DLI
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FIGURE 39
RELATIONSHIP BETWEEN SETTLING CHARACTERISTICS AND THE RHEOLOGICAL
PROPERTIES OF ASBESTOS AQUEOUS SUSPENSIONS



The performance characteristics of Supervisbestos and Flosal demonstrated herein are based on the most stringent of conditions and do not reflect conditions typical of most drilling operations. Both products exhibit excellent viscosity building and suspension properties. Although Flosal exhibits some advantages at low shear rates, its high pseudoplastic property could adversely affect its relative sweeping capabilities at high shear rates existing at the bottom of the hole. Flosal is also more sensitive to pH conditions compared to Supervisbestos (data not shown).

The relationships between rheological properties and fiber length distribution is of academic significance. Within limits of proper fiber length distributions, viscosity and time-dependent property could be improved. Although unsubstantiated, fiber aspect ratio may be a contributing factor as well. Dimensional properties influencing rheological behavior in aqueous systems may also relate in some instances to polymer suspensions. These factors should be given serious consideration in future developmental programs.


B. L. Ingalls

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Ingalls, B. L. "Interlaboratory AEC Test Variance for CSV". letter to J. L. Myers, July 23, 1982.
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APPENDIX I

Production Data & Statistical Computations

TABLE IV

AEC #2 FANN TEST RESULTS ON KING CITYSUPER VISBESTOS MONTHLY COMPOSITES FOR YEARS 1970 - 1982

<u>Month</u>	<u>Year</u>	<u>Av</u>	<u>Yp</u>	<u>Data Source</u>
Feb.	70	17.5	27	BLI June 82
March	71	20	33	HBR Aug. 71
June	71	17	26	" " "
Aug.	71	18.5	31	HBR Oct. 74
Sep.	71	19.5	33	" " "
Oct.	71	16.2	18.5	" " "
Jan.	72	21.5	37	" " "
Feb.	72	17	28	" " "
March	72	16	26	" " "
April	72	18	30	" " "
May	72	16.5	27	" " "
Sep.	72	15	24	" " "
Nov.	72	10	15	BLI June 82
Dec.	72	18.5	31	" " "
March	73	5.3	5.5	HBR Oct. 74
April	73	20	31	" " "
June	73	23	37	" " "
July	73	20	34	" " "
Aug.	73	13.5	21	BLI June 82
Sep.	73	8	10	" " "
Oct.	73	13	20	" " "
Nov.	73	10	13	HBR Oct. 74
Dec.	73	13.5	21	" " "
Jan.	74	12	18	" " "
Feb.	74	14	22	" " "
March	74	14	23	" " "
April	74	11.5	17	BLI June 82
June	74	11	16	" " "
July	74	16.5	25.5	HBR Oct. 74
Sep.	74	12	18	BLI June 82
Nov.	74	13	20	" " "

TABLE IV (cont'd)

<u>Month</u>	<u>Year</u>	<u>Av</u>	<u>Yp</u>	<u>Data Source</u>
March	75	13.5	21	BLI Mar. 79
July	75	13	18	" " "
Sep.	75	13.5	21	BLI June 82
Nov.	75	14.5	21	BLI Mar. 79
Dec.	75	13.5	21	BLI June 82
Feb.	76	16.5	27	" " "
July	76	15.5	25	" " "
Nov.	76	13	20	" " "
May	77	15.5	23	BLI Mar. 79
Aug.	77	17	26	" " "
Dec.	77	18	28	" " "
Jan.	78	15.5	25	" " "
July	78	15	22	" " "
Oct.	78	15.8	23.5	" " "
Feb.	79	15.5	25	BLI June 82
Mar.	79	17.3	27.5	" " "
April	79	16	26	" " "
Dec.	79	15.5	23	" " "
Jan.	80	14.5	23	" " "
Mar.	80	15.5	23	" " "
May	80	15.5	25	" " "
June	80	15	24	" " "
July	80	14.5	23	" " "
Aug.	80	15.5	25	" " "
Sep.	80	14	22	" " "
Dec.	80	12.5	19	" " "
Dec.	81	13	20	" " "
Jan.	82	14.5	23	" " "
Feb.	82	13	21	" " "

*AEC #2 Test: 5 gms. asbestos & 5 gms. bentonite mixed 4 minutes in 350 ml. distilled water @ 25°C with multimixer (3 discs).

Measurements were obtained with a Model 35 FANN Viscometer @ 600 & 300 rpm.

Apparent Viscosity (Av) = $\frac{600\theta}{2}$ = cps.

Plastic Viscosity (Pv) = 600 θ - 300 θ = cps.

Yield Point (Yp) = 300 θ - Pv = lb./100 ft.²

TABLE V
STATISTICAL DATA REFERENCE FOR
Figure 2

MEDIAN OF COLUMN C2
 MEDIAN = 15.250
 AVERAGE OF COLUMN C2
 AVERAGE = 15.052
 STANDARD DEVIATION OF COLUMN C2
 ST.DEV. = 3.0947
 MAXIMUM OF THE VALUES IN COLUMN C2
 MAXIMUM = 23.000
 MINIMUM OF THE VALUES IN COLUMN C2
 MINIMUM = 5.3000

INTERVAL 50 PERCENT CONFIDENCE, SIGMA=3.0947, DATA IN C2
 C2 N = 60 MEAN = 15.052 ST.DEV. = 3.09

THE ASSUMED SIGMA = 3.0947

A 50.00 PERCENT C.I. FOR MU IS (14.7822, 15.3211)

INTERVAL 95 PERCENT CONFIDENCE, SIGMA=3.0947, DATA IN C2
 C2 N = 60 MEAN = 15.052 ST.DEV. = 3.09

THE ASSUMED SIGMA = 3.0947

A 95.00 PERCENT C.I. FOR MU IS (14.2673, 15.8358)

INTERVAL 99 PERCENT CONFIDENCE, SIGMA=3.0947, DATA IN C2
 C2 N = 60 MEAN = 15.052 ST.DEV. = 3.09

THE ASSUMED SIGMA = 3.0947

A 99.00 PERCENT C.I. FOR MU IS (14.0204, 16.0829)

BLI
12/7/82

TABLE VI
STATISTICAL DATA REFERENCE FOR
Figure 3

REGRESS C2 ON 1 PREDICTOR IN COL C1				
THE REGRESSION EQUATION IS				
Y = 26.0 - 0.145 X1				
	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	25.951	9.082	2.86
X1	C1	-0.145	0.120	-1.20
THE ST. DEV. OF Y ABOUT REGRESSION LINE IS				
S = 3.083				
WITH (60- 2) = 58 DEGREES OF FREEDOM				
R-SQUARED = 2.4 PERCENT				
R-SQUARED = 0.7 PERCENT. ADJUSTED FOR D.F.				
ANALYSIS OF VARIANCE				
DUE TO	DF	SS	MS=SS/DF	
REGRESSION	1	13.716	13.716	
RESIDUAL	58	551.334	9.506	
TOTAL	59	565.049		

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12/7/82

TABLE VII
STATISTICAL DATA REFERENCE FOR

Figure 4

MEDIAN OF COLUMN C3
 MEDIAN = 23.000
 AVERAGE OF COLUMN C3
 AVERAGE = 23.492
 STANDARD DEVIATION OF COLUMN C3
 ST.DEV. = 5.8581
 MAXIMUM OF VALUES IN COLUMN C3
 MAXIMUM = 37.000
 MINIMUM OF VALUES IN COLUMN C3
 MINIMUM = 5.5000

ZINTERVAL 50 PERCENT CONFIDENCE, SIGMA=5.8581, DATA IN C3
 C3 N = 60 MEAN = 23.492 ST.DEV. = 5.86

THE ASSUMED SIGMA = 5.8581

A 50.00 PERCENT C.I. FOR MU IS (22.9816, 24.0017)

ZINTERVAL 95 PERCENT CONFIDENCE, SIGMA=5.8581, DATA IN C3
 C3 N = 60 MEAN = 23.492 ST.DEV. = 5.86

THE ASSUMED SIGMA = 5.8581

A 95.00 PERCENT C.I. FOR MU IS (22.0073, 24.9761)

ZINTERVAL 99 PERCENT CONFIDENCE, SIGMA=5.8581, DATA IN C3
 C3 N = 60 MEAN = 23.492 ST.DEV. = 5.86

THE ASSUMED SIGMA = 5.8581

A 99.00 PERCENT C.I. FOR MU IS (21.5396, 25.4437)

BLI
12/7/82

TABLE VIII

STATISTICAL DATA REFERENCE FOR

Figure 5

REGRESS C3 ON 1 PREDICTOR IN COLUMN C1

THE REGRESSION EQUATION IS
 $Y = 41.2 - 0.236 X1$

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
		41.24	17.25	2.39
X1	C1	-0.236	0.229	-1.03

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
 $S = 5.855$
 WITH (60- 2) = 58 DEGREES OF FREEDOM

P-SQUARED = 1.8 PERCENT

F-SQUARED = 0.1 PERCENT, ADJUSTED FOR D.F.

ANALYSIS OF VARIANCE

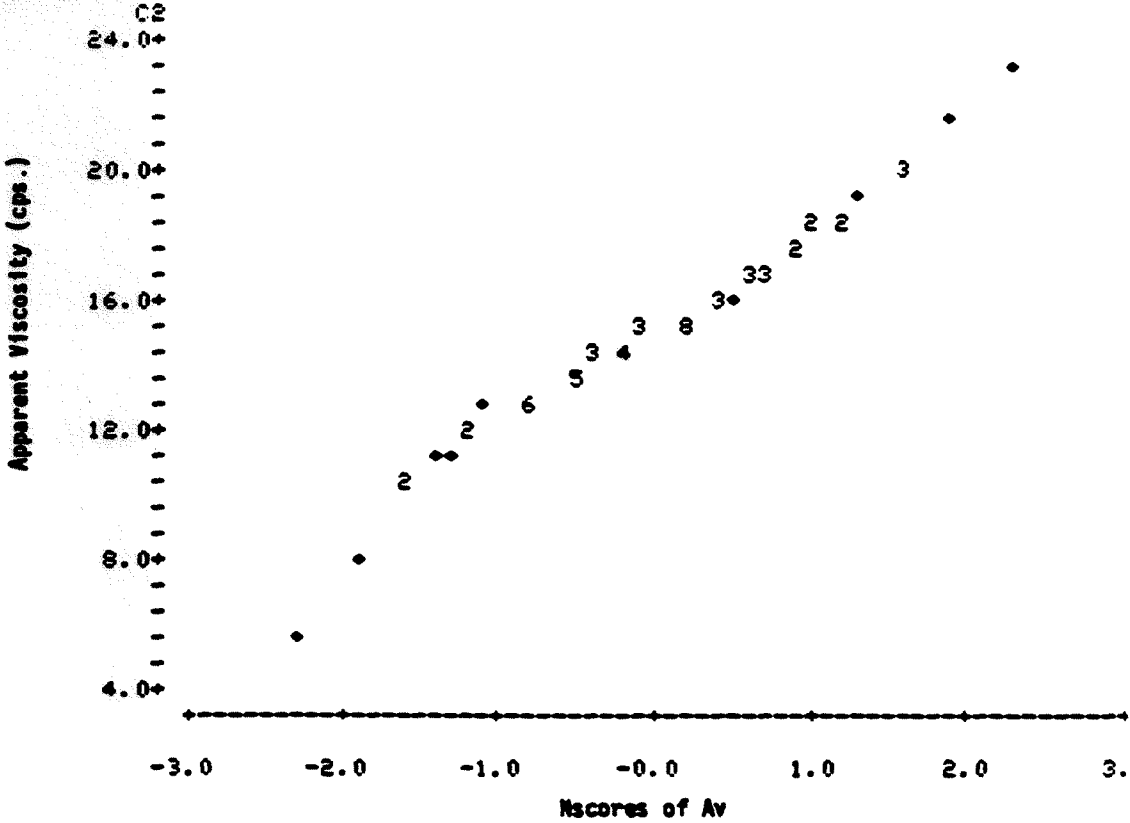
DUE TO	DF	SS	MS=SS/DF
REGRESSION	1	36.37	36.37
RESIDUAL	58	1988.38	34.28
TOTAL	59	2024.74	

BLI

12/7/82

NOTE THE FOLLOWING IS A NORMAL PROBABILITY PLOT FOR C2- APPARENT VISCOSITY

NSCORES OF C2 PUT IN C4
PLOT C2 VS C4



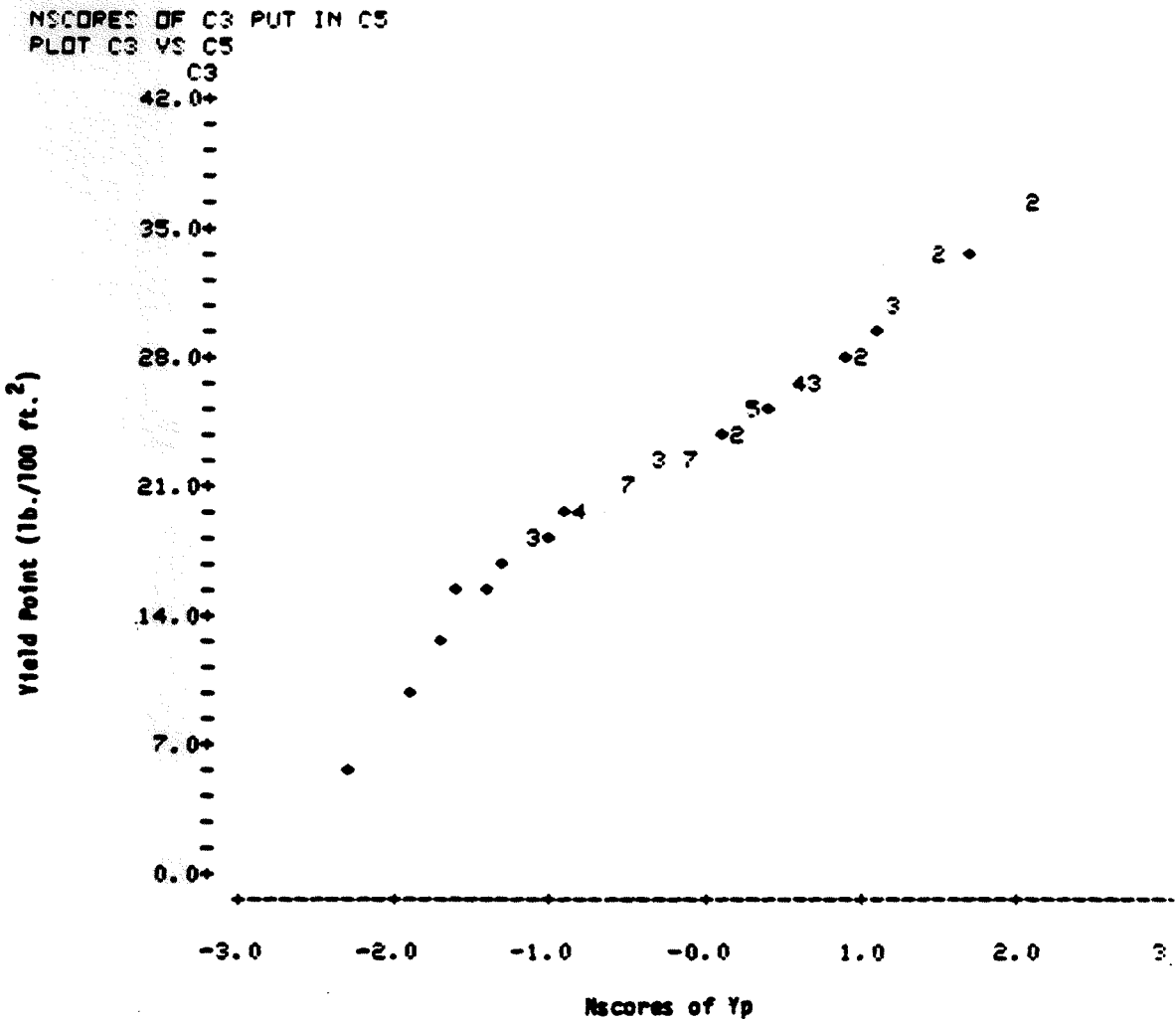
HISTOGRAM OF C2

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS
6.	1
8.	1
10.	2
12.	5
14.	18
16.	18
18.	9
20.	4
22.	1
24.	1

Figure 41

NOTE THE FOLLOWING IS A NORMAL PROBABILITY PLOT FOR C3. YIELD POINT

Figure 42



HISTOGRAM OF C3 (Yp)

Figure 43

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
4.	1	•
8.	0	
12.	2	••
16.	3	•••
20.	16	••••••••••••••••
24.	19	•••••••••••••••••
28.	10	••••••••••
32.	6	••••••

APPENDIX II

Tabulated Fann Viscosity & Settling Data

TABLE IX

DLI
12/7/82

FAHN VISCOSITY AND SETTLING TEST RESULTS (Fann Data Based on 10 lb/bbl Suspensions)

Sample Identification	% Bentonite	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
		Mixer Time	Av	Y _p	K	K	% Settle		% Settle	
		minutes	Cps	lb/100ft	lb/100ft	lb/100ft	1 hr.	48 hr.	1 hr.	48 hr.
SVB 2-76	50	10	19	33	11.9	9.9	0	14.4	25	69
	50	40	37	57	11.9	10.7	0	12	19	57
SVB 11-76	50	10	16.3	26.5	10.3	8.5	0	14.4	27	69
	50	40	38.3	60.5	11.8	12.4	0	16	22	61
SVB 6- 74	50	10	12	19	6.4	6.4	4	30.4	24	71
	50	40	22.3	39.5	12.9	11.4	0	9.6	27	71
SVB 9-73	50	10	10.3	16.5	6.3	4.6	3.2	33	51	79
	50	40	14.8	24.5	9.7	8.9	0.8	21.6	27	70
SVB 3-73	50	10	5	5	0.7	1.2	15.2	48.8	67	80
	50	40	8.8	12.5	4.1	4.5	8.8	36	58	77
SVB 2-76	0	5	25.8	22.5	1.2	12.9	3.2	16	39	53
	0	50	30	27	3.8	6.1	2.4	20.8	39	54
Flosal 2-82	50	10	27.3	33.5	12.9	19.3	0	4	6	41
	50	30	29	40	13.0	23.6	0	8	15	49
	50	40	28.5	41	12.7	22.8	0	8	17	50
Flosal 2-82	0	30	26.5	15	2.0	20.0	0	5.6	41	47
SVB 3-73	0	5	16	14	0.7	10.5	16	36	64	70

(1) Suspension prepared with Multi-mixer (3 discs)

(2) Av = centipoise @ 1022 sec -1

(3) Y_p = lb/100 ft.² based on 1022 and 511 sec -1(4) K = lb/100 ft.² based on 1022-170 sec -1(5) K = lb/100 ft.² based on 10.2 -5.1 sec -1(6) % Settle of 10 lb/bbl Suspensions containing 44 lb/bbl W₀₃(7) % Settle of 3 lb/bbl suspensions containing 13 lb/bbl W₀₃

(44 1b/bb1 WO₃ WEIGHTING AGENT)

Sample Identification	Prepared in Multi-Mixer (Minutes)	PERCENT SETTLE								
		1 hr.	2 hr.	3 hr.	4 hr.	5 hr.	6 hr.	24 hr.	48 hr.	72 hr.
Flosal/Bent. 2-82	10	0	0	0	0	0	0.8	1.6	4.0	4.8
Flosal/Bent. 2-82	30	0	0	0	0	0	0.8	4.8	8.0	
Flosal/Bent. 2-82	40	0	0.8	0.8	0.8	1.6	2.4	5.6	8.0	10.4
Flosal only	30	0	0	0	0	0	0.8	5.6	5.6	
SVB/Bent. 2-76	10	0	0	0	0	0	0	8.0	14.4	20.0
SVB/Bent. 11-76	10	0	0	0.8	1.6	1.6	1.6	8.8	14.4	20.0
SVB/Bent. 6-74	10	4.0	8.0	10.4	12.0	13.6	14.4	24.0	30.4	34.4
SVB/Bent. 9-73	10	3.2	5.6	7.2	8	-	-	33	33	33
SVB/Bent. 3-73	10	15.2	20.8	24.8	27.2	28.8	30.4	42.4	48.8	53.6
SVB/Bent. 2-76	40	0	0	0.8	0.8	0.8	1.6	4.8	12.0	16.8
SVB/Bent. 11-76	40	0	1.6	2.4	3.2	4.0	4.8	12.0	16.0	19.2
SVB/Bent. 6-74	40	0	0	0	0	0	0.8	4.8	9.6	13.6
SVB/Bent. 9-73	40	0.8	1.6	2.4	3.2	4.8	4.6	16.0	21.6	26.4
SVB/Bent. 3-73	40	8.8	12.8	15.2	16.8	18.4	20.0	29.6	36.0	40.0
SVB only/2-76	5	3.2	5.6	8.8	10.4	11.2	12.0	16.0	16.0	16
SVB/only/2-76	50	2.4	4.8	7.2	9.6	12.0	13.6	20.8	20.8	
SVB only/ 3-73	5	16	26	32	34	-	-	36	36	

SETTLING TESTS 3 1b/bb1 ASBESTOS AQUEOUS SUSPENSIONS (13 1b/bb1 WO₃ WEIGHTING AGENT)

Sample Identification	Prepared in Multi-Mixer (Minutes)	PERCENT SETTLE								
		1 hr.	2 hr.	3 hr.	4 hr.	5 hr.	6 hr.	24 hr.	48 hr.	72 hr.
Flosal/Bent. 2-82	10	6	9	11	13	15	16	31	41	47
Flosal/Bent. 2-82	30	15	20	23	26	28	29	42	49	
Flosal/Bent. 2-82	40	17	23	26	28	30	31	43	50	54
Flosal/only/2-82	30	41	45	46	46	46	47	47	47	
SVB/Bent. 2-76	10	25	34	39	42	45	46	62	69	72
SVB/Bent. 11-76	10	27	36	41	45	47	49	63	69	73
SVB/Bent. 6-74	10	24	36	43	47	50	51	65	71	75
SVB/Bent. 9-73	10	51	60	64	64	-	-	79	79	79
SVB/Bent. 3-73	10	67	67	70	71	72	73	79	80	81
SVB/Bent. 2-76	40	19	26	30	35	36	38	50	57	61
SVB/Bent. 11-76	40	22	27	33	36	38	40	54	61	65
SVB/Bent. 6-74	40	27	37	41	44	47	49	63	71	73
SVB/Bent. 9-73	40	27	38	43	47	50	52	64	70	73
SVB/Bent. 3-73	40	58	62	65	66	67	68	74	77	78
SVB only 2-76	5	39	46	49	51	52	52	53	53	53
SVB/only/2-76	50	39	46	50	52	52	53	54	54	
SVB/only 3-73	5	64.4	66.4	68	68.8	-	-	70	70	

TABLE A-1

FANN RHEOLOGICAL PROPERTIES OF (1:1) RATIO SUPERVISBESTOS (Feb.-76)/BENTONITE AQUEOUS SUSPENSIONS
(10 lb/bbl SUSPENSION -11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)								
		5	10	15	20	25	30	35	40	50
SYB - Feb. 76	Initial Temp °C after mixing	25	29	30	35.5	38.5	40	44	45	49
	Allowed to Stand	18	18	18	18	18	18	18	18	18
	600 @ 15 sec.	27.5	37	44.5	52	58	66	72	72	82.5
	300 @ 30 sec.	23.5	33	41.5	49.5	54	62	67	67	74.5
	200 @ 45 sec.	21	30	38	45	49.5	55	59	59	65
	100 @ 60 sec.	18	26	32	37	40.5	45	48	48	52.5
	6 @ 75 sec.	9	12	15	20	21	23.5	25	24.5	27.5
	3 @ 90 sec.	8	11	14	17	18	20	20.5	20.5	21
	Temp. °C	23.5	24.5	24.5	24.5	24.5	24.5	24.5	23	23.5
	remixed	2	2	2	2	2	2	2	2	2
	600 @ 15 sec.	32	38	47	54	59.5	69	75	74	85.5
	300 @ 30 sec.	29	35.5	44	51	56.5	63.5	67	65.5	74
	200 @ 45 sec.	27	33	41	46.5	51	56.5	58.5	57.5	64.5
	100 @ 60 sec.	23	28	33.5	38	41	45.5	47	46	49
	6 @ 75 sec.	12	13	17	20	21.5	22.5	24	23.5	25.5
	3 @ 90 sec.	10	12	15	17	17.5	19	18	19	19
	100 @ 105 sec.	23	28	42	27	12				

-64-

013913

[illegible]

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TABLE XIII

FANN RHEOLOGICAL PROPERTIES OF (1:1) RATIO SUPERVISBESTOS (Nov.-76)/BENTONITE AQUEOUS SUSPENSIONS

(10 lb/bbl SUSPENSION - 11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)								
		5	10	15	20	25	30	35	40	50
SYB - Nov. 76	Initial Temp °C after mixing	26	28		30		40		40	46
	Allowed to Stand	18	18		18		18		18	18
	600@ @ 15 sec.	22	30.5		45		60.5		73	77.5
	300@ @ 30 sec.	18.5	27		42		57.5		69	71.5
	200@ @ 45 sec.	16.5	24.5		39.5		52		61	63
	100@ @ 60 sec.	14	21		33		42.5		49	51
	6@ @ 75 sec.	7.5	11		17		22		26	26.5
	3@ @ 90 sec.	6.5	9.5		15		18.5		21	21
	Temp. °C	24	24		24		24		24	24
	remixed	2min.	2		2		2		2	2
	600 @ @ 15 sec.	24.5	32.5		46.5		63		76.5	80.5
	300 @ @ 30 sec.	21.5	29.5		44		59		68.5	71
	200 @ @ 45 sec.	20	28		41		52.5		60	62
	100@ @ 60 sec.	17.5	24		34		42.5		47	48
	6@ @ 75 sec.	8.5	11.5		18		22		24.5	25
	3@ @ 90 sec.	8	10.5		15		19		20	20
	100@ @ 105 sec.	18	24		34		40		40	40

TABLE XIII
CONTINUED

DLI
12/7/82

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)								
		5	10	15	20	25	30	35	40	50
SVB-Nov. 76	100 @ 120 sec.	18	24		33.5		38.5		39.5	40
	100 @ 135 sec.	18	24		33.5		37.5		38	38
	100 @ 195 sec.	18.5	24.5		33		34		33.5	34
	100 @ 255 sec.	18	24.5		32		31.5		31	31
	100 @ 315 sec.	18	24		30.5		30		28.5	29
	100 @ 375 sec.	18	23		29.5		28.5		26.5	27
	100 @ 435 sec.	17.5	23		29		27		25	25.5
	6 @ 450 sec.	8	10.5		13.5		14		13	14
	3 @ 465 sec.	7	10		12		12		10	10
	600 @ 480 sec.	24	32		46		56		65	68
	300 @ 495 sec.	22	30		43		52		58.5	60.5
	Temp. °C	25	25		25		25.5		26	26
	pH	9.34	9.30		9.23		9.20		9.16	9.16

-67-

013915

FANN RHEOLOGICAL PROPERTIES OF (1:1) RATIO SUPERVISBESTOS (June-74) /BENTONITE AQUEOUS SUSPENSIONS
(10 lb/bbl SUSPENSION -11.4 gm./400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)								
		5	10	15	20	25	30	35	40	50
SVB - June 74	Initial Temp. °C after mixing	27	29		33		39		40	43
	Allowed to stand	23.5	23.5		23.5		23.5		24	23.5
	600 @ 15 sec.	18	24.5		31.5		39		44.5	53
	300 @ 30 sec.	14.5	20.5		28		35		41.5	50
	200 @ 45 sec.	13	18.5		25.5		33		38	45.5
	100 @ 60 sec.	11	16		22		27.5		32	37.5
	6 @ 75 sec.	5.5	8		11.5		14.5		16.5	19
	3 @ 90 sec.	5	7		10		13		14	16.5
	Temp °C	23.5	23.5		23.5		23.5		23.5	23.5
	Redispersed in Multi-mixer	2 min.	2 min.	2 min.	2 min.	2 min.				
	600 @ 15 sec.	19.5	24		31		38.5		44.5	54
	300 @ 30 sec.	16.5	21.5		28		36		42	51
	200 @ 45 sec.	15.5	20		26		33.5		38.5	46.5
	100 @ 60 sec.	13	17		22		28		32	38
	6 @ 75 sec.	6.5	8		11.5		15		14.5	20
	3 @ 90 sec.	5.5	7.5		10		12.5		13.5	16.5
	100 @ 105 sec.	13	17		22.5		28		31.5	37

[illegible]

FANN RHEOLOGICAL PROPERTIES OF (1:1) RATIO SUPERVISBESTOS (Sept.-73) /BENTONITE AQUEOUS
SUSPENSIONS (10 lb/bbl SUSPENSION -11.4 gm/450 ml WATER)

Sample Identification	Test Performed	MULTI-MIXER TIME (MINUTES)							
		10	40						
SVB - Sept. 73	Initial Temp. °C after mixing	27	29						
	Allowed to stand	24 hr.	24 hr						
	600 @ 15 sec.		30.5						
	300 @ 30 sec.		27.5						
	200 @ 45 sec.		25						
	100 @ 60 sec.		22						
	6 @ 75 sec.		10						
	3 @ 90 sec.		10						
	Temp °C	21	21						
	Redispersed in Multi-mixer	2 min.	2 min.	2 min.	2 min.	2 min.			
	600@ 15 sec.	20.5	29.5						
	300@ 30 sec.	18.5	27						
	200@ 45 sec.	17.5	25.5						
	100@ 60 sec.	15	22						
	6 @ 75 sec.	7.5	10.5						
	3 @ 90 sec.	6.5	10						

-70-

018919

TABLE XVI
FANN RHEOLOGICAL PROPERTIES OF (1:1) RATIO SUPERVISBESTOS (Mar.-73)/BENTONITE AQUEOUS SUSPENSIONS
(10 lb/bbl SUSPENSION - 11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)								
		5	10	15	20	25	30	35	40	50
SVB - Mar. 73	Initial Temp °C after mixing	25.5	26		29		30		28.5	35
	Allowed to Stand	ON	ON	ON	ON	ON	ON		ON	ON
	600ø @ 15 sec.	10	10.5		12.5		15.5		18.5	23.5
	300ø @ 30 sec.	7	7.6		9.5		12.5		15.5	21
	200ø @ 45 sec.	5.5	6.5		9		11.5		14	19.5
	100ø @ 60 sec.	4	5		7.5		10		12.5	17
	6ø @ 75 sec.	2	2.5		3.5		5		6	8.5
	3ø @ 90 sec.	1.5	2		3		4		5.5	7.5
	Temp. °C	24	24		24		24		24	24
	remixed	2 min.	2		2		2		2	2
	600 ø@ 15 sec.	9.5	10		12		15		17.5	23
	300 ø@ 30 sec.	7	7.5		9		12.5		15	20.5
	200 ø@ 45 sec.	6	6.5		8.5		11.5		14	19
	100ø @ 60 sec.	4.5	5		7		10		12	16.5
	6ø @ 75 sec.	2	2.5		3.5		5		6	8
	3ø @ 90 sec.	1.5	2		3		4.5		5.5	7
	100ø @ 105 sec.	4.5	5		7		10		12	17

-71-

013920

TABLE XVI
CONTINUED

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)									
		5	10	15	20	25	30	35	40	50	
SVB Mar. 73	100 @ 120 sec.	4.5	5		7		10		12	17	
	100 @ 135 sec.	4.5	5		7.5		10		12	17	
	100 @ 195 sec.	4.5	5		7		10		13	17	
	100 @ 255 sec.	4.5	5		7.5		10		13	17	
	100 @ 315 sec.	4.5	5		7.5		10		12.5	17	
	100 @ 375 sec.	5	5.5		7		10		12	16	
	100 @ 435 sec.	5	5.5		7		10		12	16	
	6 @ 450 sec.	2.5	4.5		3.5		4.5		6	7.5	
	3 @ 465 sec.	2	2		3		4		5	7	
	600 @ 480 sec.	10	10.5		12.5		16		18	23	
	300 @ 495 sec.	7	8		9.5		13		15.5	20.5	
	Temp. °C	24	24.5		24.5		24.5		24.5	25.0	
	pH	9.35	9.31		9.20		9.20		9.14	9.10	

DL3921

FANN RHEOLOGICAL PROPERTIES OF SUPERVISBESTOS (Feb.-76) AQUEOUS SUSPENSIONS

(10 lb/bbl SUSPENSION - 11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)									
		5	10	20	30	50					
SVB Feb.-76	Initial Temp. °C after mixing	27	30	35	42°C	44					
	Allowed to stand	ON	ON	ON	ON	ON					
	600 @ 15 sec.	48.5	51.5	53	52.5	59					
	300 @ 30 sec.	35	37	38.5	39	43.5					
	200 @ 45 sec.	28	29	31.5	32	36					
	100 @ 60 sec.	19.5	21.5	25	26.5	30.5					
	6 @ 75 sec.	19	18.5	21.5	23	22					
	3 @ 90 sec.	18.5	16	16	15.5	16					
	Temp °C	21	21	21	21	21					
	Redispersed in Multi-mixer	2 min.	2 min.	2 min.	2 min.	2 min.					
	600 @ 15 sec.	47.5	51.5	53	52	60					
	300 @ 30 sec.	33.5	37	39	38	43.5					
	200 @ 45 sec.	26.5	30	32	31	35					
	100 @ 60 sec.	18.5	22.5	25.5	25.5	30					
	6 @ 75 sec.	16	18	18.5	19	18					
	3 @ 90 sec.	15	15	15.5	14	13					
	100 @ 105 sec.	17.5	21.5	24.5	24	31.5					

TABLE XVI.
CONTINUED

Sample Identification	Test Performed	5	10	20	30	50			
SVB Feb. 76	100 @ 120 sec.	17	20.5	24	24	31			
	100 @ 135 sec.	16	20.5	24	23.5	30			
	100 @ 195 sec.	15.5	19	23	23.5	26			
	100 @ 255 sec.	15	17.5	20	20	23			
	100 @ 315 sec.	14.5	17.5	18.5	18.5	21.5			
	100 @ 375 sec.	15	17.5	18	18	20.5			

013923

	6 @ 540 sec.	12	10	11.5	-	12			
	3 @ 555 sec.	12	10	8.5	-	7			
	Temp. °C	22	22.5	22.5	26	23			
	pH	9.43	9.45	9.45	9.45	9.45			

FANN RHEOLOGICAL PROPERTIES OF SUPERVISBESTOS (Nov-76) AQUEOUS SUSPENSIONS

(10 lb/bbl SUSPENSION - 11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi - Mixer Time (Minutes)							
		5	10	20	30	50			
SVB Nov-76	Initial Temp. °C after mixing	27	30	30	40	44			
	Allowed to stand	24 hrs	24 hrs	24 hrs	24 hrs	24 hrs.			
	600 @ 15 sec.	43.5	46	49.5	52.5	56			
	300 @ 30 sec.	32.5	33.5	37.5	39.5	42			
	200 @ 45 sec.	25.5	27	31	32	34			
	100 @ 60 sec.	17.5	18.5	23	26	29			
	6 @ 75 sec.	18	16	17.5	20	17			
	3 @ 90 sec.	14	15	13.5	14.5	12.5			
	Temp °C	22	22	22	22	22			
	Redispersed in Multi-mixer	2 min.	2 min.	2 min.	2 min.	2 min.			
	600 @ 15 sec.	42.5	45.5	48.5	52	55.5			
	300 @ 30 sec.	32	34	37	39.5	41			
	200 @ 45 sec.	25.5	27.5	29	32	32.5			
	100 @ 60 sec.	17.5	19	20.5	26.5	27.5			
	6 @ 75 sec.	13.5	14	16	19.5	15			
	3 @ 90 sec.	12	13.5	14	14	12			
	100 @ 105 sec.	17.5	19.5	22	26	28			

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)						
		5	10	20	30	50		
	100 @ 120 sec.	17.5	19.5	21	26	27		
	100 @ 135 sec.	17.5	19	21	25.5	26		
	100 @ 195 sec.	16	17.5	18.5	21.5	22.5		
	100 @ 255 sec.	15	15.5	16.5	18.5	19		
	100 @ 315 sec.	15	15.5	16.5	17	18		
	100 @ 375 sec.	15	15	16.5	17	18.5		
	100 @ 435 sec.	14.5	15	16.5	17	18.5		
	6 @ 450 sec.	9	9.5	10	9	8		
	3 @ 465 sec.	9	10	10	8	7.5		
	600 @ 480 sec.	40.5	41.5	43	45.5	46		
	300 @ 495 sec.	30	31	33	34	36		
	200 @ 510 sec.	23	24.5	26	28	29.5		
	100 @ 525 sec.	16.5	17.5	19	21	23		
	6 @ 540 sec.	10.5	12	13	13	10		
	3 @ 555 sec.	11	11	12	11	7		
	Temp. °C	23.5	24	23.5	24	24		
	pH	9.34	9.49	9.45	9.40	9.35		

013925

FANN RHEOLOGICAL PROPERTIES OF SUPERVISBESTOS (June-74) AQUEOUS SUSPENSIONS

(10 lb/bbl SUSPENSION - 11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)							
		5	10	20	30	50			
SVB --June 74	Initial Temp °C after mixing	22	22	22	22	21.5			
	Allowed to Stand	ON	ON	ON	ON	ON			
	600@ @ 15 sec.	41	43	45	48.5	51.5			
	300@ @ 30 sec.	28	30	31.5	34	38.5			
	200@ @ 45 sec.	22.5	24.5	26	28	33			
	100@ @ 60 sec.	15.5	17	18.5	21	26			
	6@ @ 75 sec.	14.5	17	16.5	19.5	24			
	3@ @ 90 sec.	14	16	15.5	18.4	19			
	Temp. °C	22	22	22	21.5	21.5			
	remixed	2 min.	2	2	2	2			
	600 @ @ 15 sec.	40	42	45	47	51			
	300 @ @ 30 sec.	28	29.5	33	34	37.5			
	200 @ @ 45 sec.	22	24	27	29	31			
	100@ @ 60 sec.	15.5	16	19.5	22.5	26.5			
	6 @ @ 75 sec.	15	13.5	16.5	17.5	18			
	3 @ @ 90 sec.	13.5	13	15	14.5	14.5			
	100@ @ 105 sec.	14.5	15	19.5	22	25			

TABLE (continued)

XIX

Sample Identification	Test Performed								
		5	10	20	30	50			
SYB June - 74	100 @ 120 sec.	14.5	15	19	21	25			
	100 @ 135 sec.	14.5	14.5	19	21.5	25			
	100 @ 195 sec.	14	14.5	17.5	20	23.5			
	100 @ 255 sec.	14	14.5	15	18	19			
	100 @ 315 sec.	14	14.5	15.5	17	17.5			
	100 @ 375 sec.	14	14	15.5	17	17.5			
	100 @ 435 sec.	14	14.5	15.5	17	17.5			
	6 @ 450 sec.	11	10	11	12	11.5			
	3 @ 465 sec.	11.5	11	10	11	10			
	600 @ 480 sec.	37.5	38.5	42	42	46			
	300 @ 495 sec.	27.5	29	31	32.5	35			
	200 @ 510 sec.	21.5	23.5	25.5	26	28.5			
	100 @ 525 sec.	15	17	18.5	19	21.5			
	6 @ 540 sec.	11	13	14	12	14			
	3 @ 555 sec.	12	12.5	14	11.5	12			
	Temp. °C	23	23	23	23	23.5			
	pH	9.29	9.41	9.41	9.32	9.42			

013927

FANN RHEOLOGICAL PROPERTIES OF SUPERVISBESTOS (March-73) AQUEOUS SUSPENSIONS

(10 lb/bbl SUSPENSION - 11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)					
		5	10	20	30	50	
SVB March-73	Initial Temp °C after mixing	22.5	22	22	22	22	
	Allowed to Stand	ON	ON	ON	ON	ON	
	600 @ 15 sec.	29.5	33.5	38	41.5	47	
	300 @ 30 sec.	21	24	27	29	33	
	200 @ 45 sec.	15	17.5	21.5	22.5	26.5	
	100 @ 60 sec.	10.5	12	15	15.5	19	
	6 @ 75 sec.	9.5	11.5	13.5	14.5	16	
	3 @ 90 sec.	8	10.5	12	13.5	15	
	Temp. °C	22	22	22	22	22	
	remixed	2 min.	2	2	2	2	
	600 @ 15 sec.	32	34	38	41.5	47.5	
	300 @ 30 sec.	23	24	27	30	33.5	
	200 @ 45 sec.	16.5	19	21	24	26.5	
	100 @ 60 sec.	12	13.5	14.5	16.5	18.5	
	6 @ 75 sec.	10.5	13	14.5	14	14	
	3 @ 90 sec.	10.5	12	14	14.5	14.5	
	100 @ 105 sec.	11	13	13.5	15.5	17.5	

013928

TABLE XX
(continued)

BLI
12/7/82

Sample Identification	Test Performed								
		5	10	20	30	50			
SVB-March 73	100 @ 120 sec.	11	13	14	15.5	17.5			
	100 @ 135 sec.	11	13	14	15.5	17			
	100 @ 195 sec.	11	12.5	13.5	15.5	16.5			
	100 @ 255 sec.	11	13	13.5	15.5	17			
	100 @ 315 sec.	11.5	13	13.5	15.5	17			
	100 @ 375 sec.	11.5	13.5	14	15.5	17.5			
	100 @ 435 sec.	9	10	9	10.5	10			
	6 @ 450 sec.	9	10.5	10.5	9.5	9.5			
	3 @ 465 sec.	32.5	33.5	37	39	42.5			
	600 @ 480 sec.	22.5	25	27	29.5	31.5			
	300 @ 495 sec.	16	18.5	21	22.5	25			
	200 @ 510 sec.	11.5	13.5	14.5	16	18			
	100 @ 525 sec.	9.5	11	12	12	10.5			
	6 @ 540 sec.	10	10.5	12	10	9			
	3 @ 555 sec.	23	23.5	23	23.5	24			
	Temp, °C	9.38	9.38	9.38	9.37	9.38			
	pH								

013921

TITRE :

FANN RHEOLOGICAL PROPERTIES OF (1:1) RATIO FLOSAL (Feb.-82) BENTONITE AQUEOUS SUSPENSIONS
(10 lb/bbl SUSPENSION - 11.4gm/400 ml WATER)

Sample Identification	Test Performed	Multi-Mixer Time (Minutes)								
		5	10	15	20	25	30	35	40	50
Flosal-Feb.82	Initial Temp °C after mixing	27	32		39		47		50	46
	Allowed to Stand	ON	ON	ON	ON		ON		ON	ON
	600e @ 15 sec.	46	55	54.5	59		58		59	61.5
	300e @ 30 sec.	34.5	43	42.5	48		50.5		46.5	51.5
	200e @ 45 sec.	29.5	39	39.5	44.5		46		44	48
	100e @ 60 sec.	26	34	35.5	38.5		40		39.5	40.5
	6e @ 75 sec.	20	22	29	28.5		28.5		23.5	27
	3e @ 90 sec.	16	20	25	24		25		21	24.5
	Temp. °C	24	24	24	24		24		24	24
	remixed	2 min.	2	2	2		2		2	2
	600 e@ 15 sec.	49	54.5	54.5	58		58		57	60
	300 e@ 30 sec.	38.5	44	44	50		49		49	52.5
	200 e@ 45 sec.	33	42	41.5	47		45		45.5	48
	100e @ 60 sec.	28.5	37.5	36.5	41		39.5		38.5	40.5
	6e @ 75 sec.	21.5	29.5	28.5	29		20		27.5	26
	3e @ 90 sec.	18.5	26	25	25		21		26	24
	100e @ 105 sec.	31.5	38.5	57	41.5		39.5		39	40.5

-82-

RHEOLOGICAL PROPERTIES OF FLOSAL (Feb. 2-82) AQUEOUS SUSPENSIONS (10 lb/bbl SUSPENSION-11.4 gm/400 ml WATER)

Sample Identification	Test Performed	Multi-mixer Time (Minutes)							
		30							
Flosal 2-82	Initial Temp. °C after mixing	43°C							
	Allowed to stand	24 hrs.							
	600 @ 15 sec.	56							
	300 @ 30 sec.	36.5							
	200 @ 45 sec.	31							
	100 @ 60 sec.	29							
	6 @ 75 sec.	25							
	3 @ 90 sec.	24							
	Temp °C	24							
	Redispersed in Multi-mixer	2 min.							
	600 @ 15 sec.	53							
	300 @ 30 sec.	34							
	200 @ 45 sec.	28.5							
	100 @ 60 sec.	23							
	6 @ 75 sec.	20							
	3 @ 90 sec.	20							
	100 @ 105 sec.	16							

TABLE XXII
(continued)

SLI
12/7/82

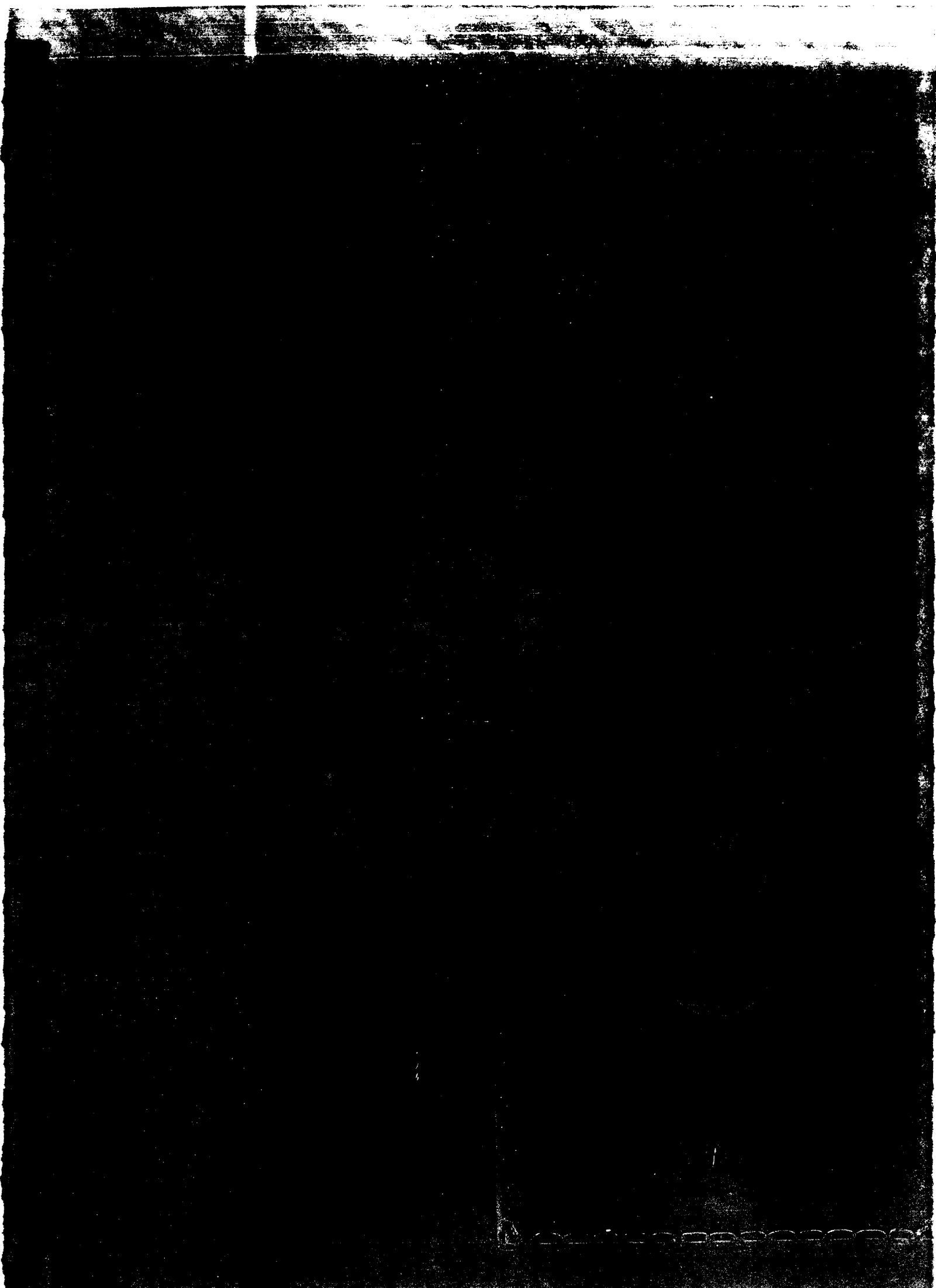
Sample Identification	Test Performed	Multi-mixer Time Minutes								
		30								
Flosal 2-82	100 @ 120 sec.	15								
	100 @ 135 sec.	15								
	100 @ 195 sec.	11.5								
	100 @ 255 sec.	11.5								
	100 @ 315 sec.	11								
	100 @ 375 sec.	10								
	100 @ 435 sec.	9.5								
	6 @ 450 sec.	5.5								
	3 @ 465 sec.	5								
	600 @ 480 sec.	485								
	300 @ 495 sec.	33.5								
	Temp. °C	26								
	pH	9.53								

-84-

013933

(1) After shearing at 170.4 sec -1 for 5 minutes

[illegible]



Fann dial reading = $(\Phi \text{ or } \tau)$ = Shear Stress
expressed as lbs/100 ft.²

Fann speed (rpm) Times 1.7034 = $(\dot{\gamma})$ = Shear Rate
expressed as sec⁻¹

Apparent Viscosity (μ_a) = $\frac{\text{Shear Stress}}{\text{Shear Rate}} = \frac{\tau}{\dot{\gamma}}$

$$\mu_a = \frac{(\tau)}{(\dot{\gamma})} \frac{\text{lbs./100 ft.}^2}{\text{sec}^{-1}} = \frac{\text{lb.} \cdot \text{sec}}{100 \text{ ft.}^2} \times 478.8 = \frac{\text{dynes} \cdot \text{sec}}{\text{cm}^2} = \text{cps}$$

Yield Point (γ_p) represents that point where the slope of the shear stress - shear rate curve intersects the shear stress axis and is expressed in lbs./100 ft.²

Plastic Viscosity (μ_p) represents the tangential slope at any given point on the shear stress - shear rate curve and is expressed as cps.

$$\mu_p = \frac{(\tau - \gamma_p)}{\dot{\gamma}}$$

Power Law - applies to logarithmic plot of shear stress and shear rate where a linear relationship exists and is defined as:

$$\tau = K \dot{\gamma}^n$$

where τ = shear stress

$\dot{\gamma}$ = shear rate

K is a measure of fluid consistency; the higher K the more viscous the fluid.

n is the slope of the shear stress - shear rate plot and a measure of the degree of non-Newtonian properties of the fluid. $n < 1$ for pseudoplastics and $n = 1$ for Newtonian systems.

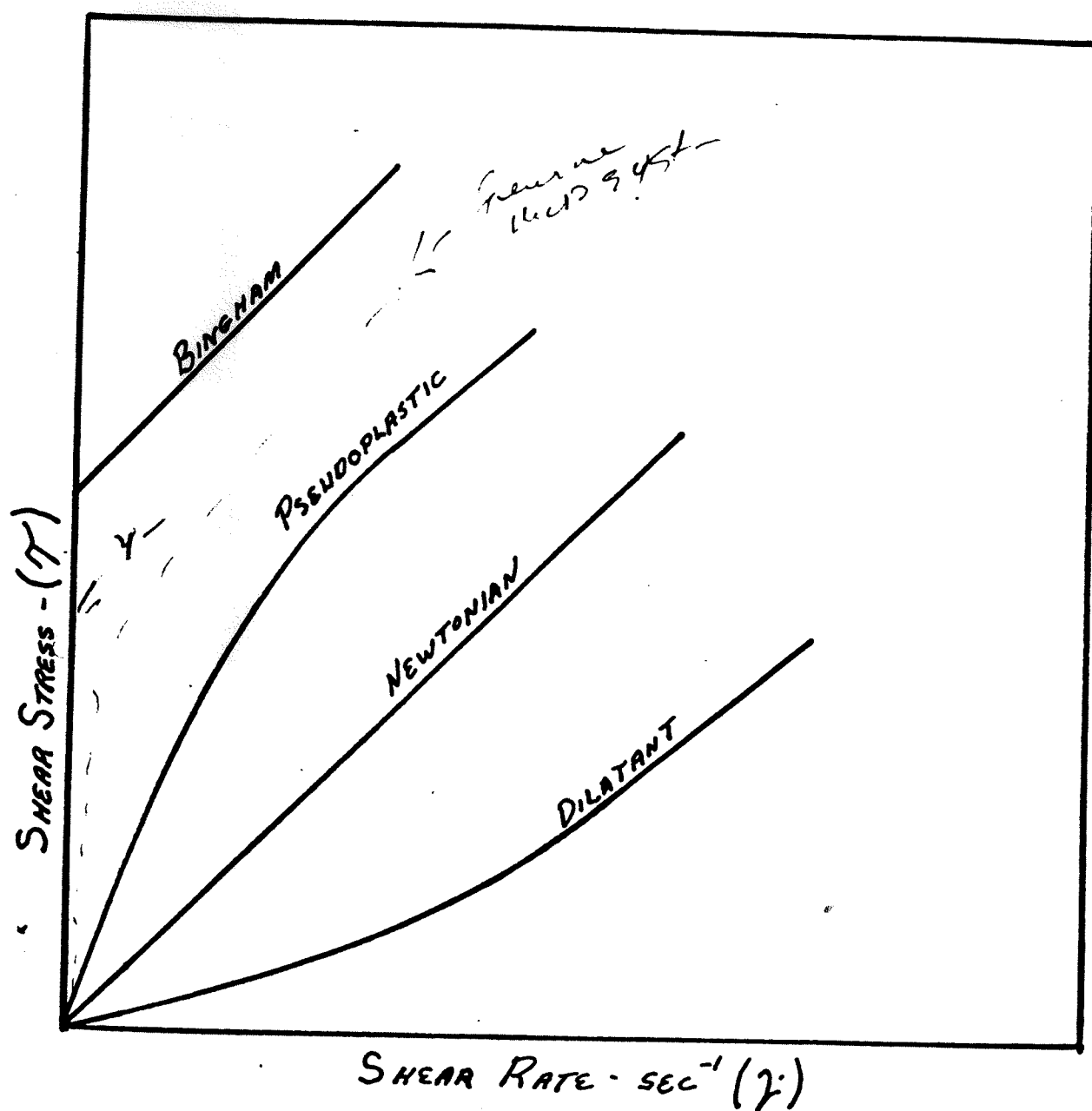
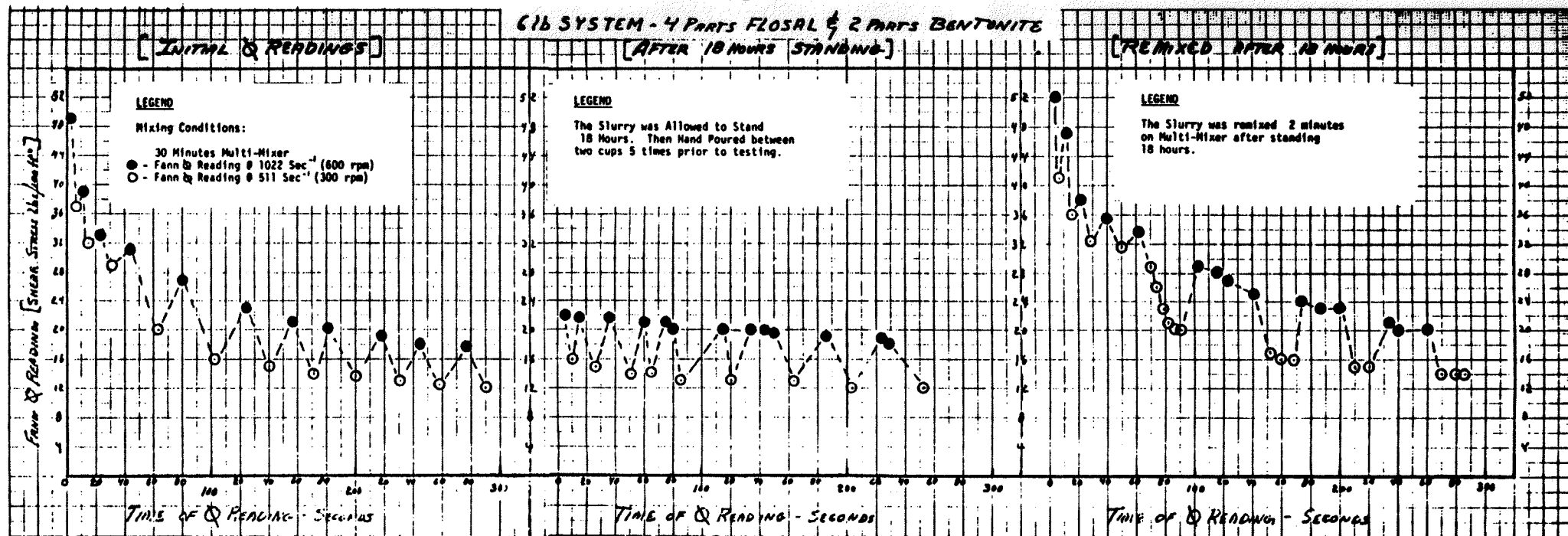
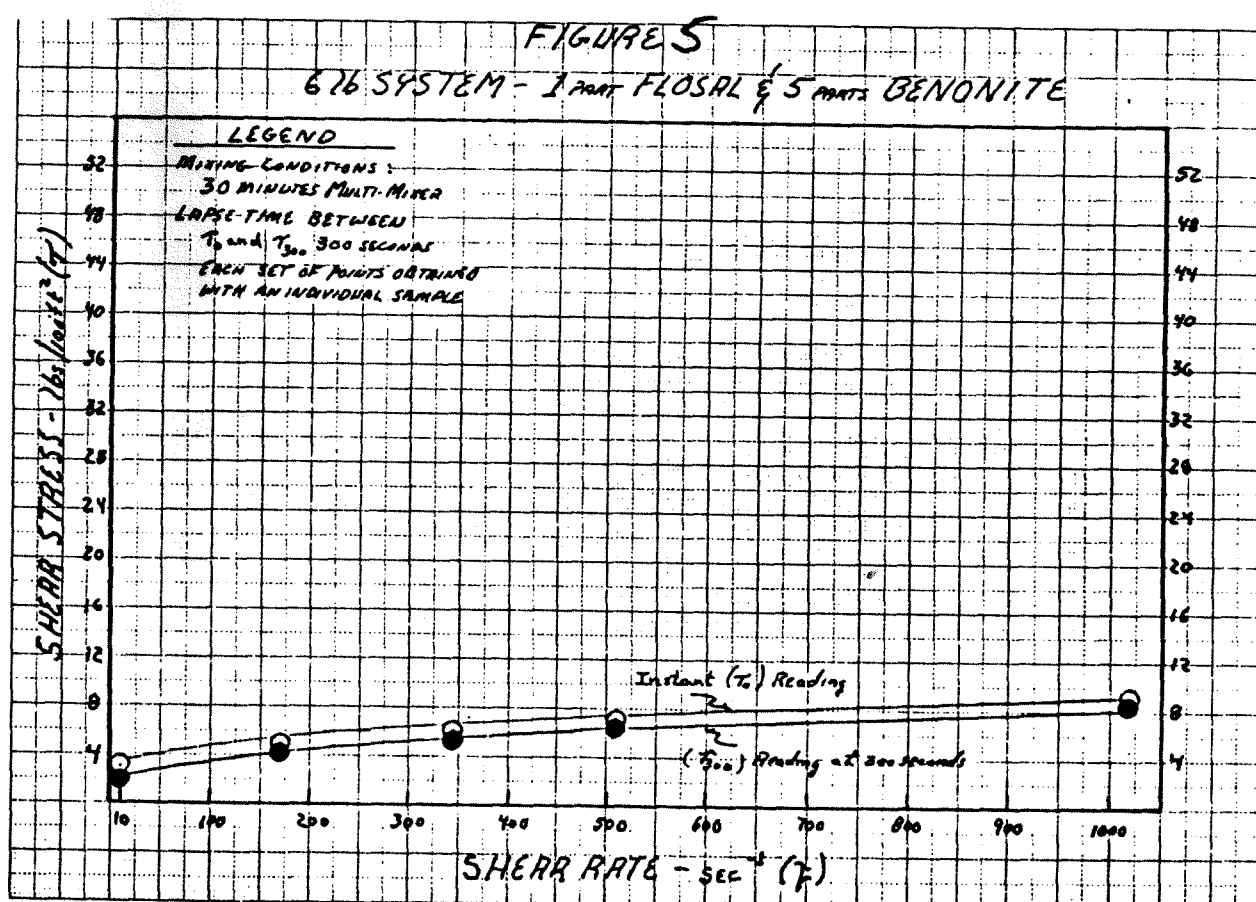
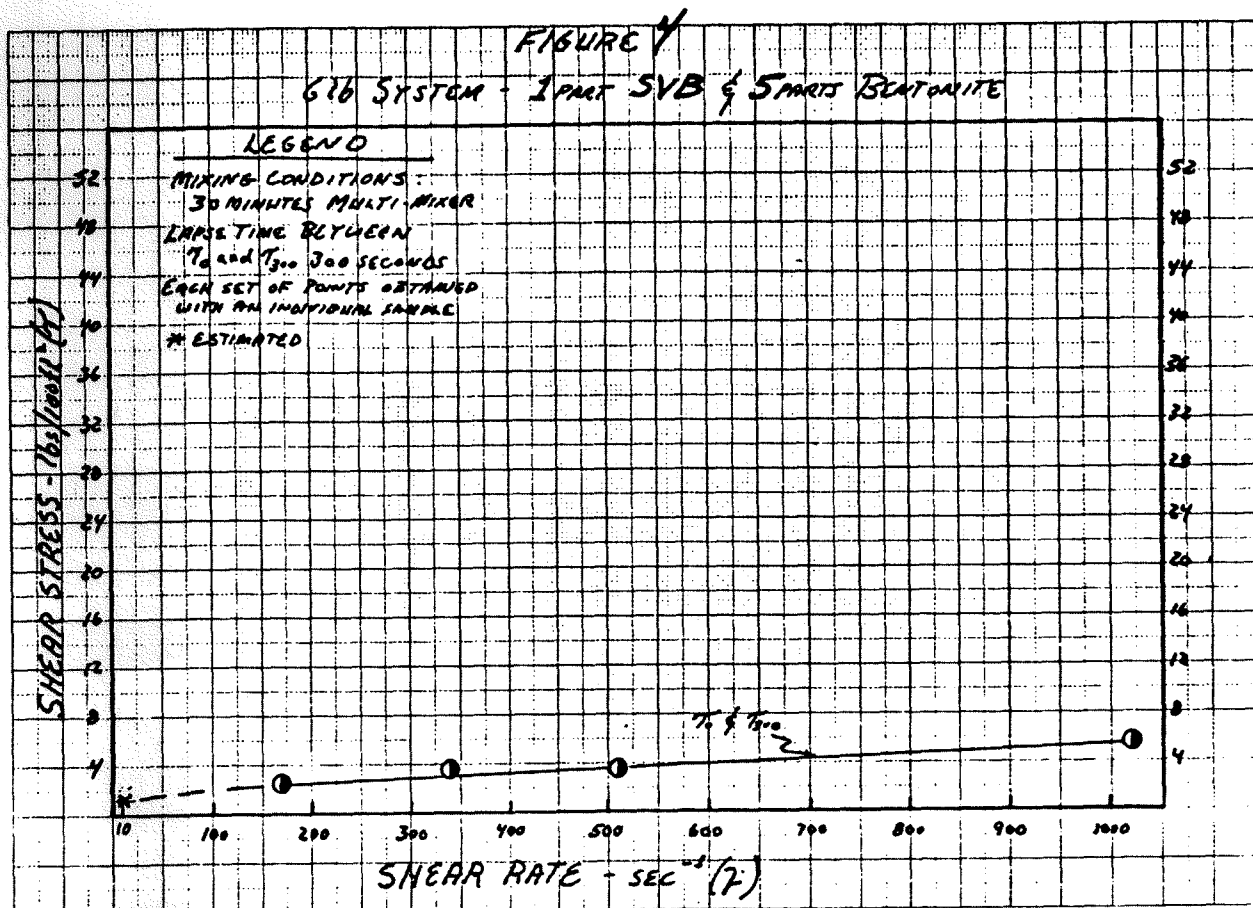


FIGURE 3



*5 Min 4 sec
1000 number 5000
on 18 hours*



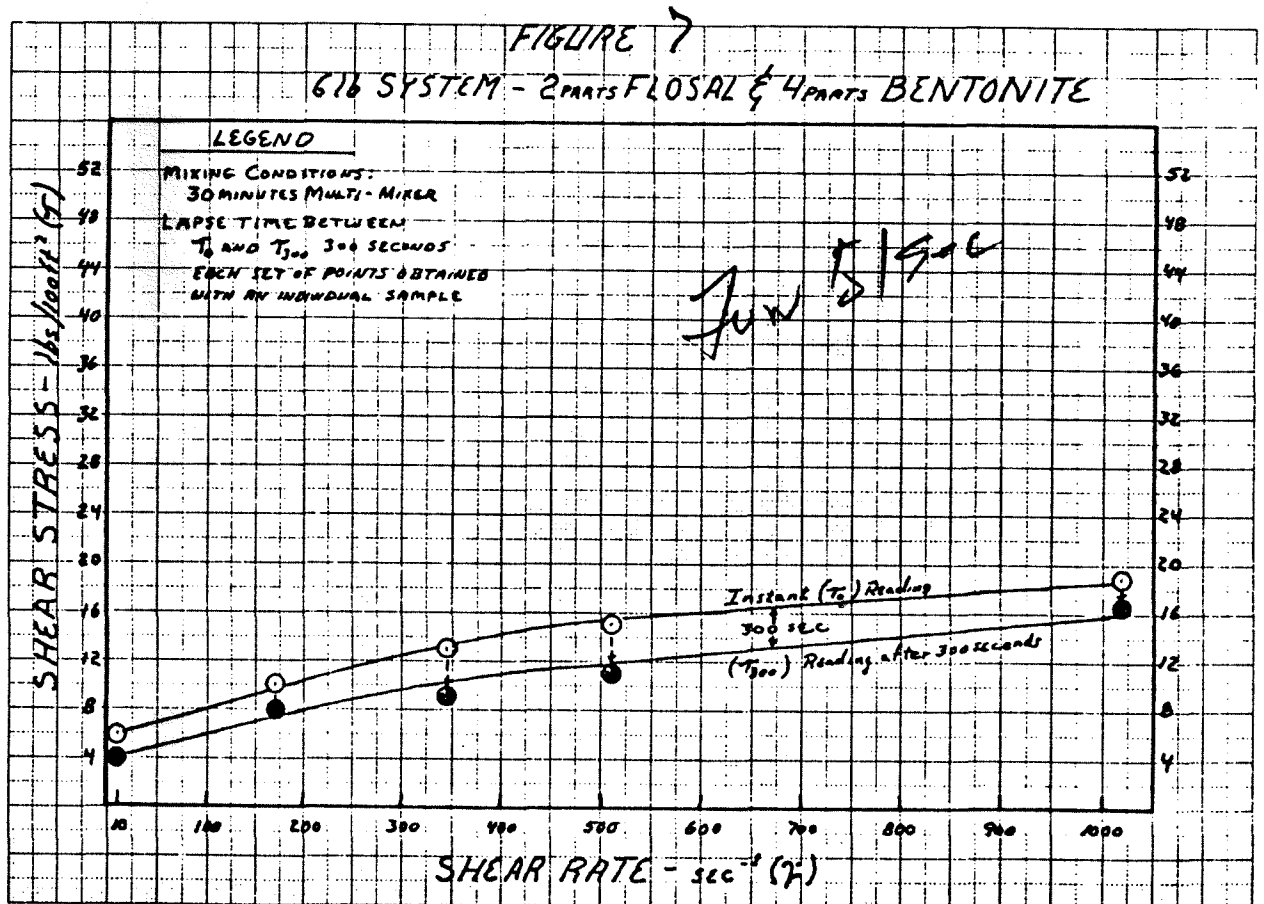
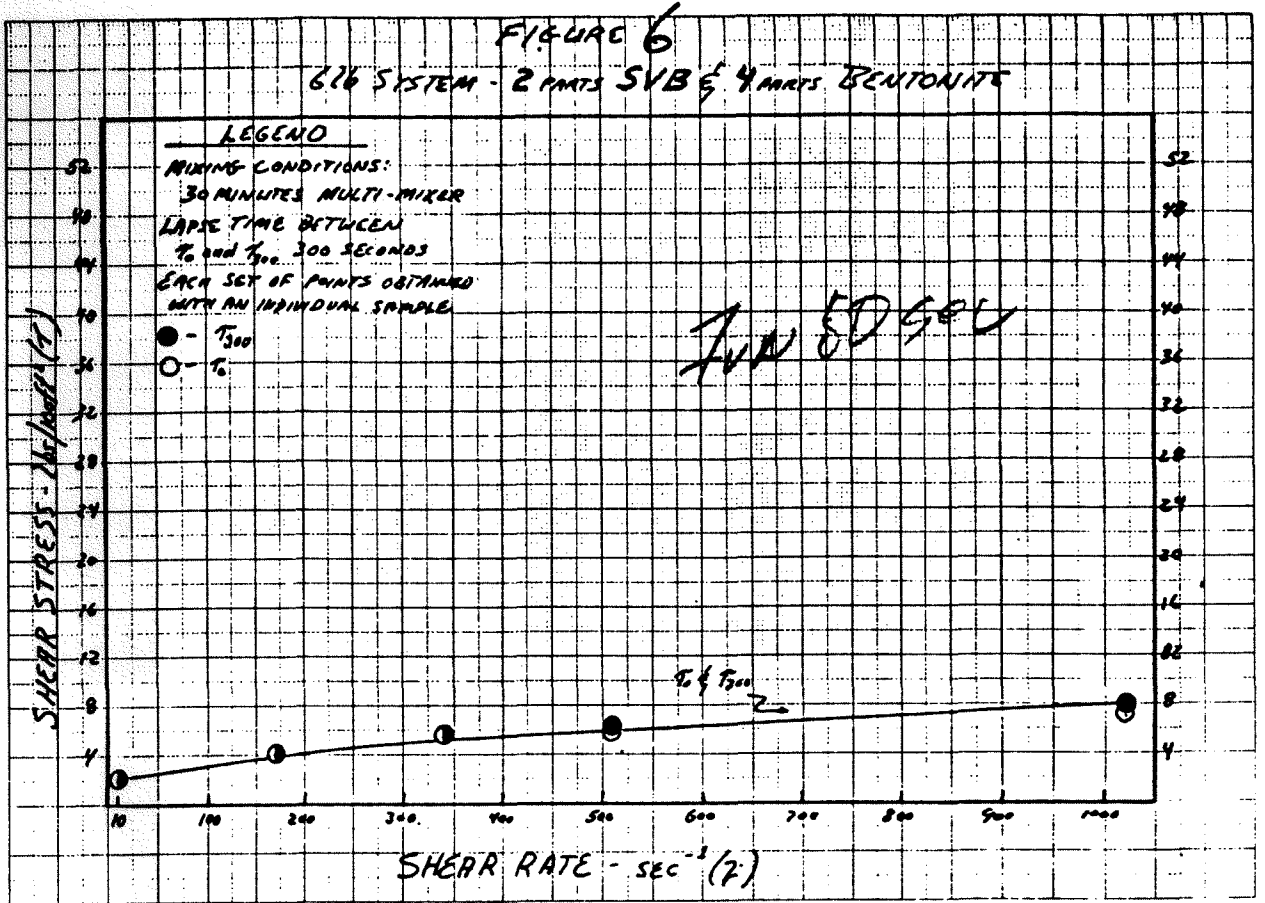


FIGURE 8
G16 SYSTEM - 3 PARTS SVB & 3 PARTS BENTONITE

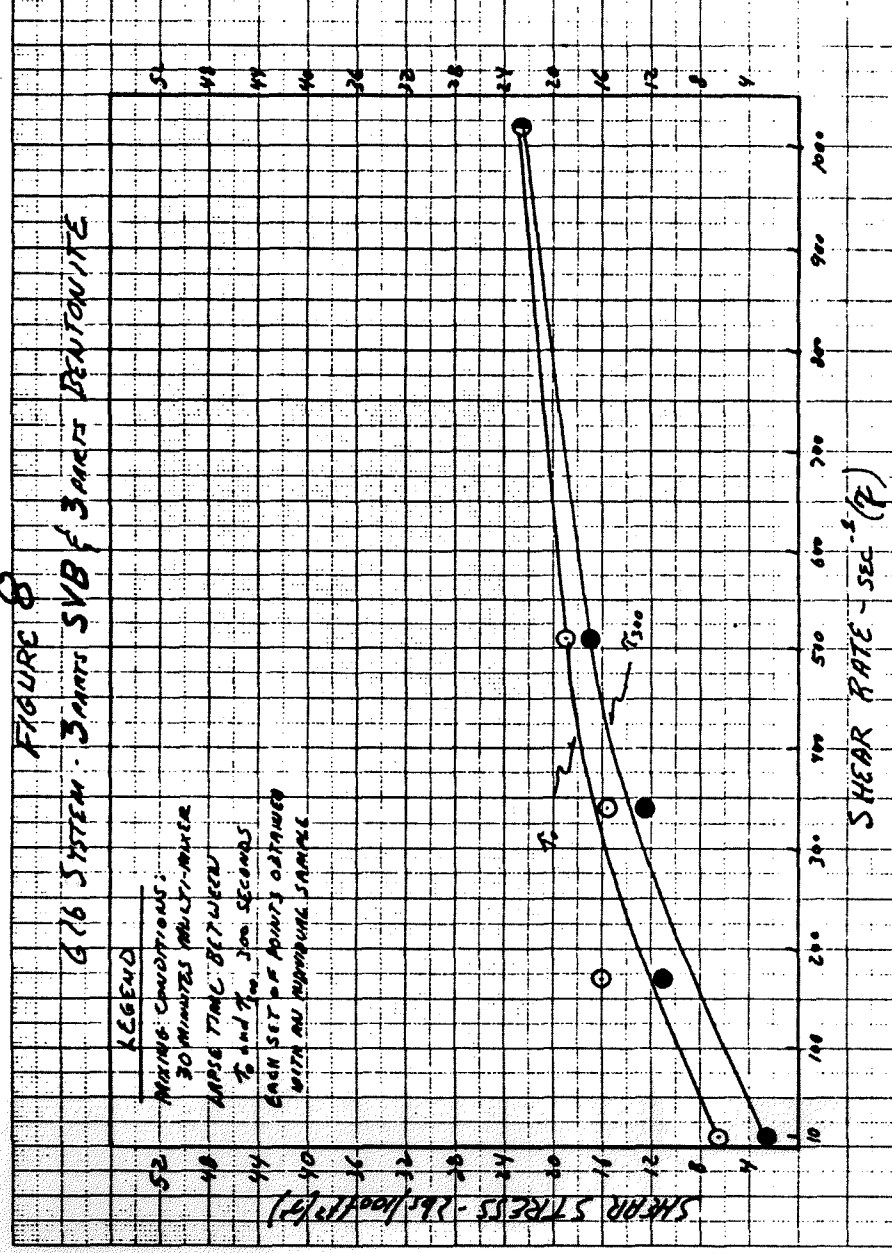
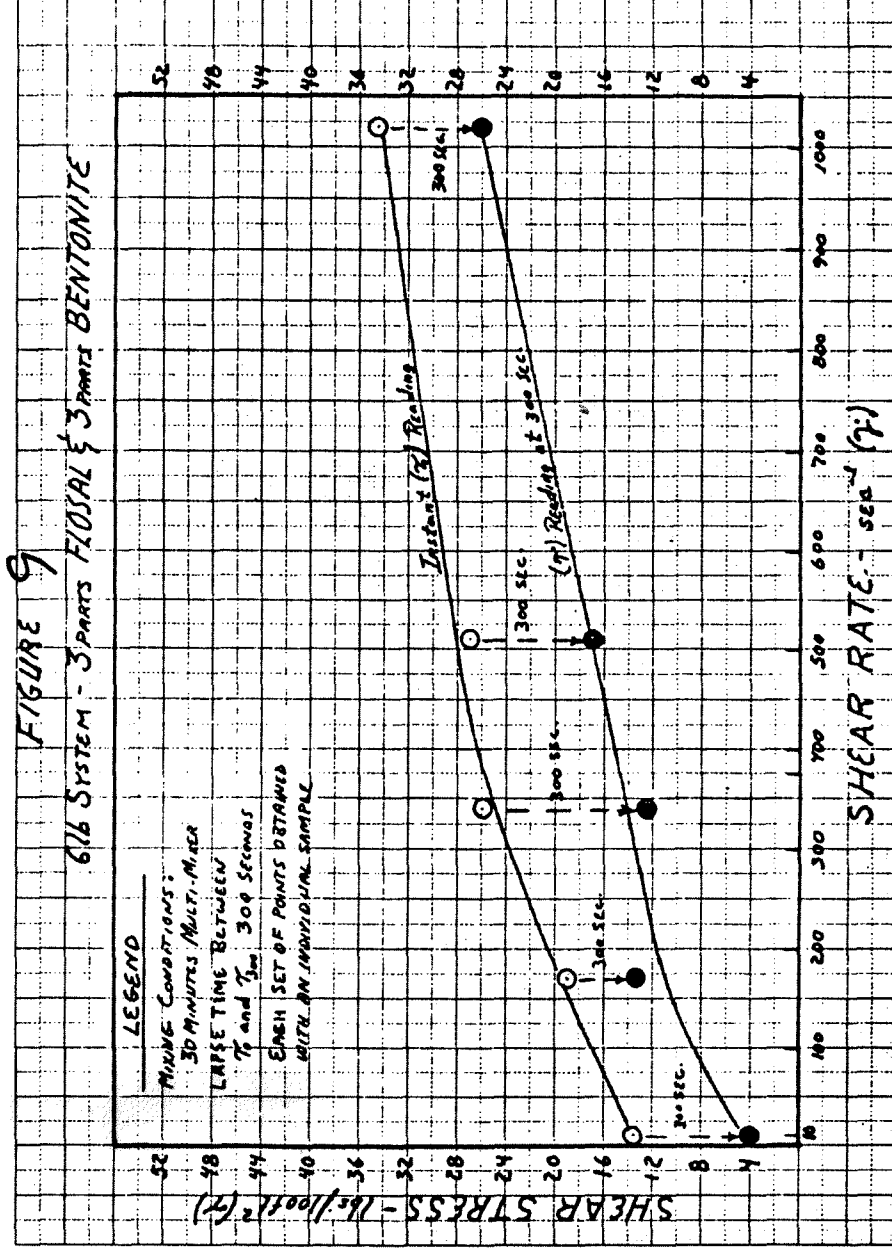
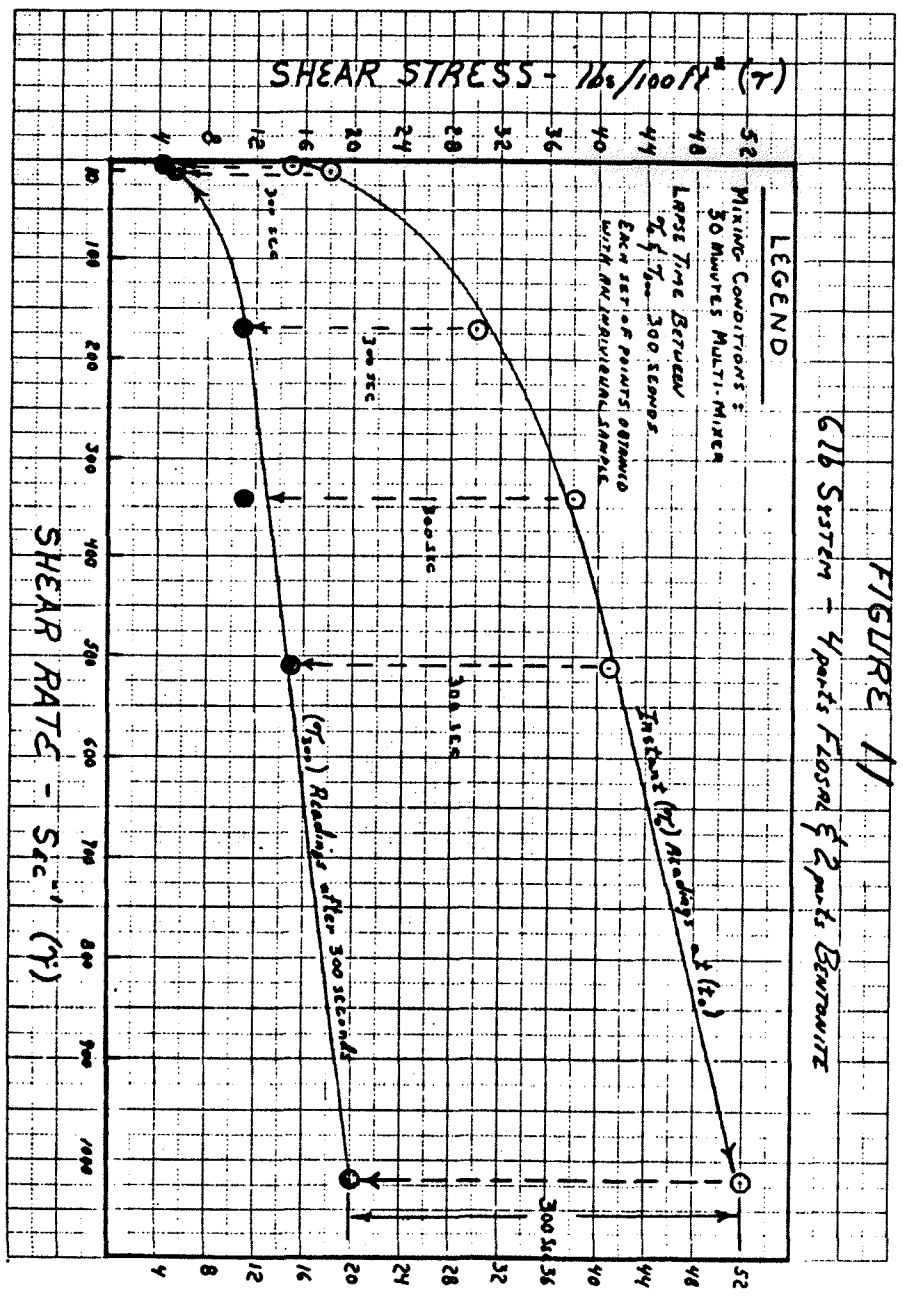
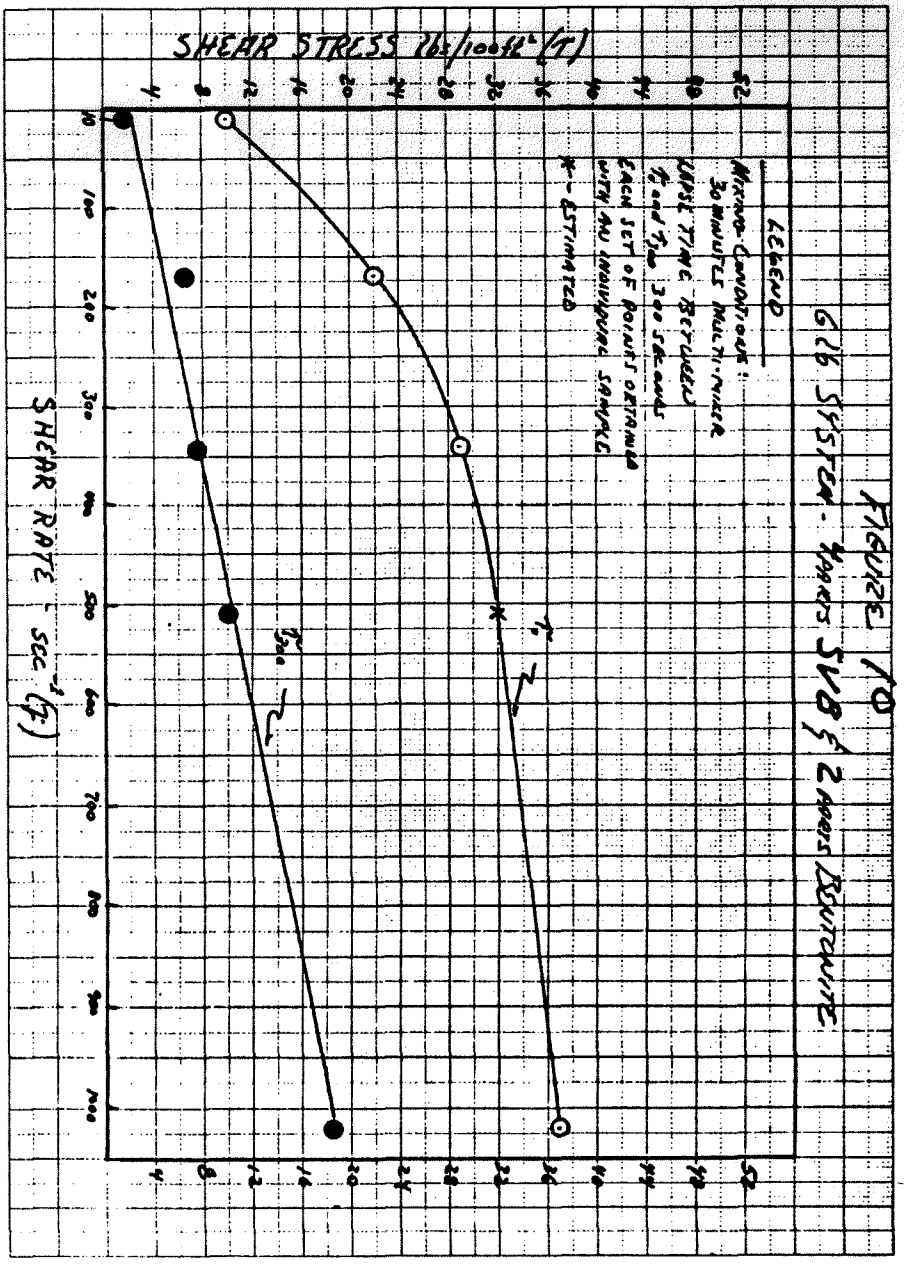


FIGURE 9
G16 SYSTEM - 3 PARTS FIDAL & 3 PARTS BENTONITE





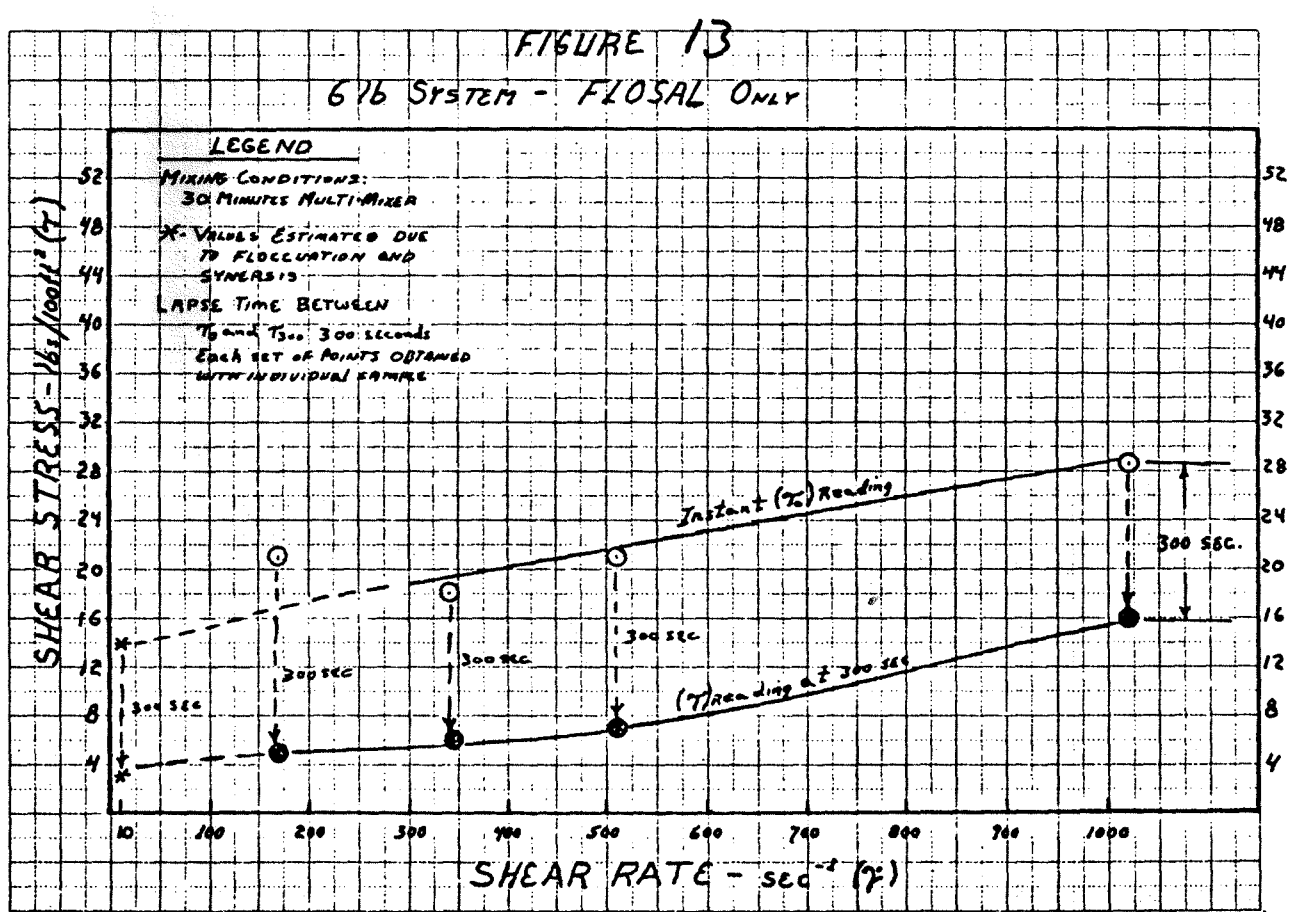
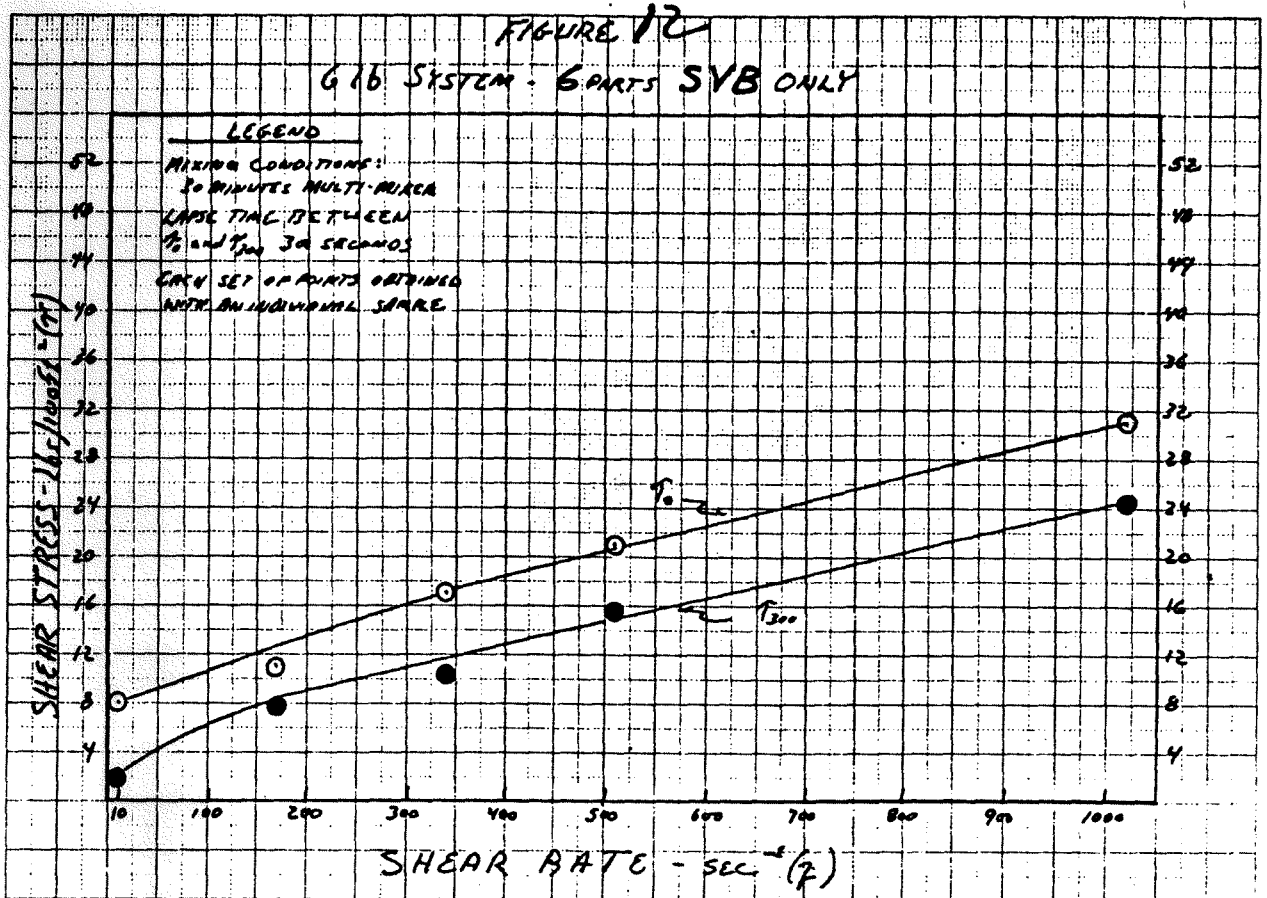
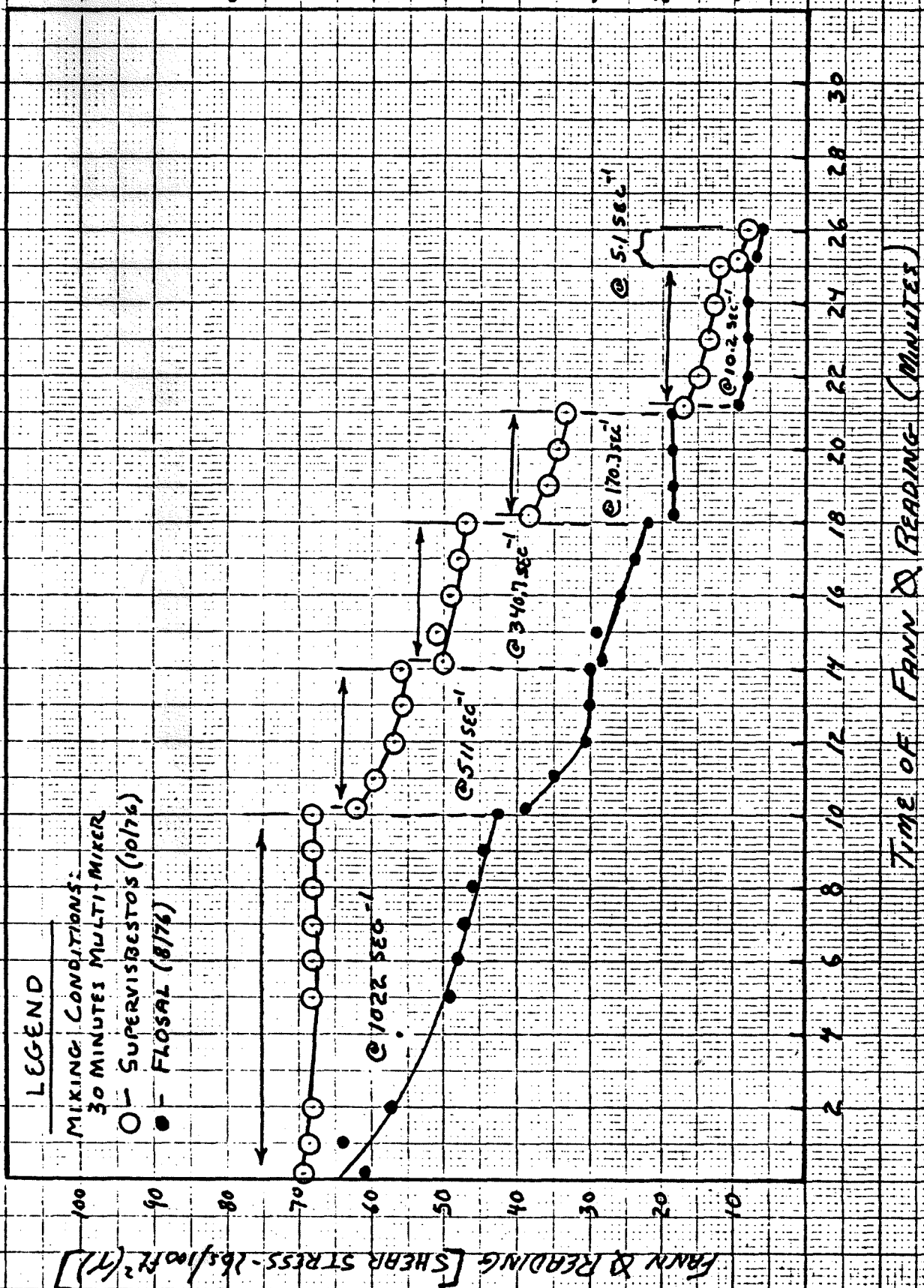


FIGURE 14
10:16 SYSTEM - 5 PARTS ASBESTOS & 5 PARTS BENTONITE



461510

K-E 10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

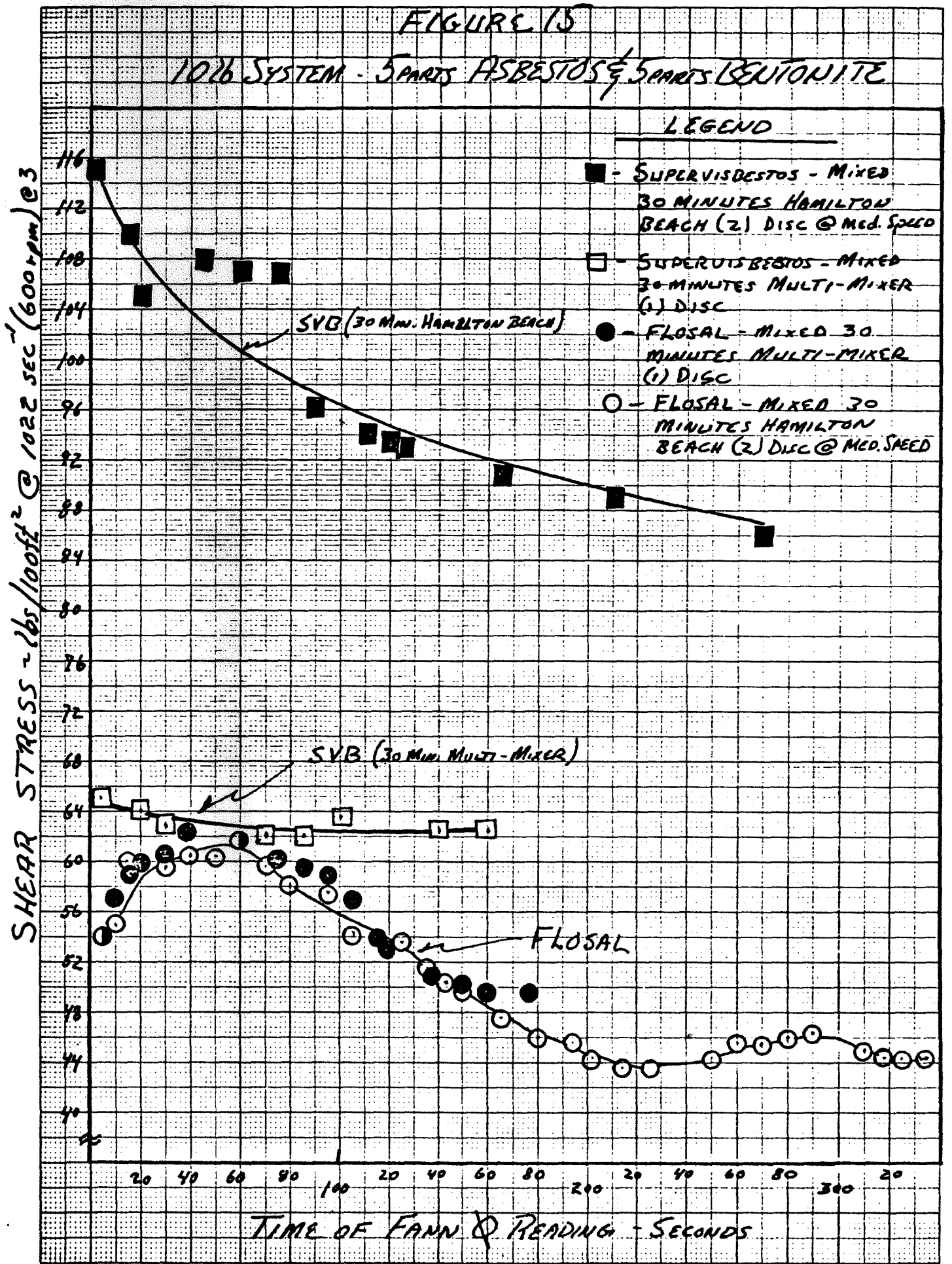


FIGURE 16

626 SYSTEM - 2 parts SVB & 4 parts BENTONITE

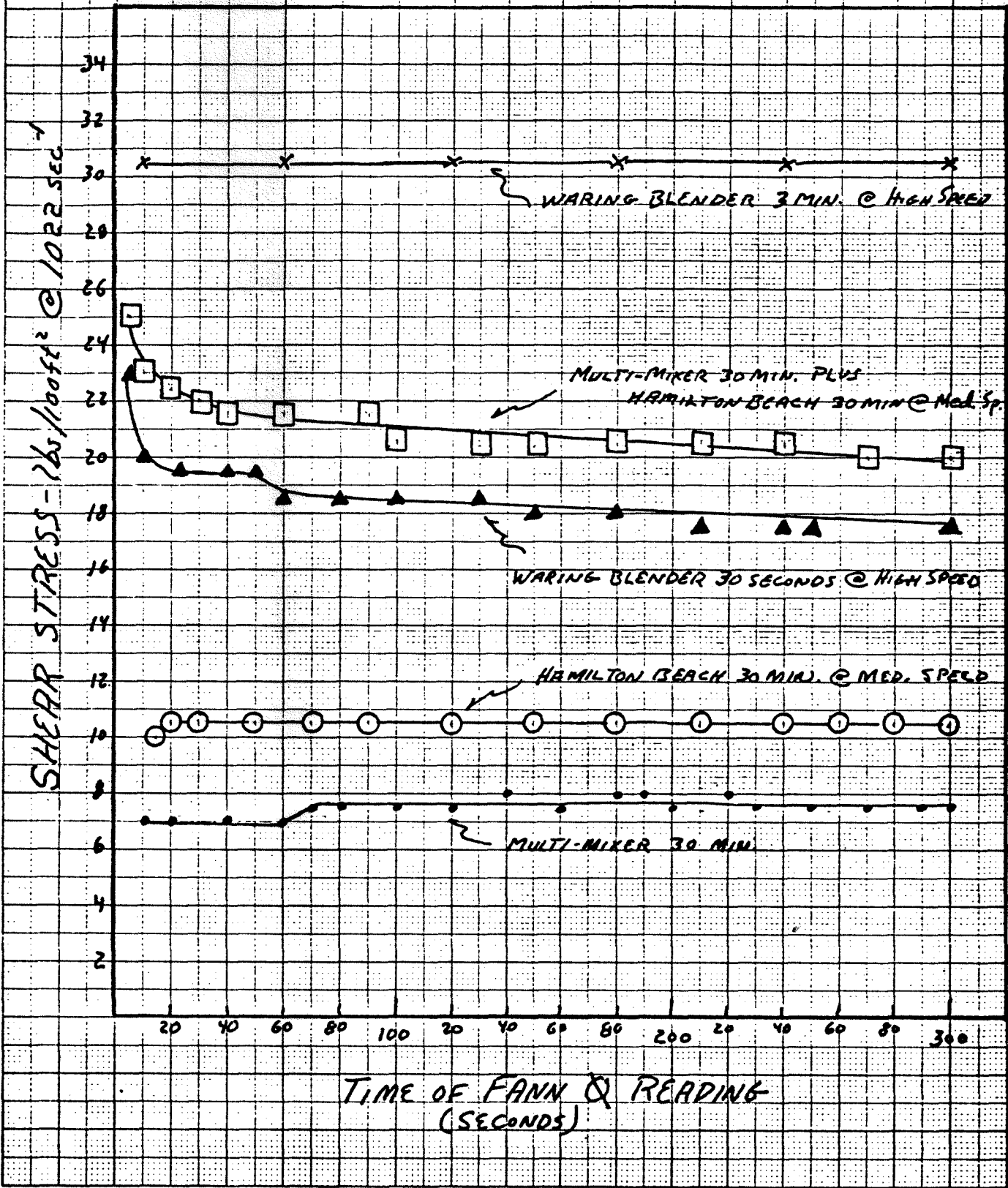
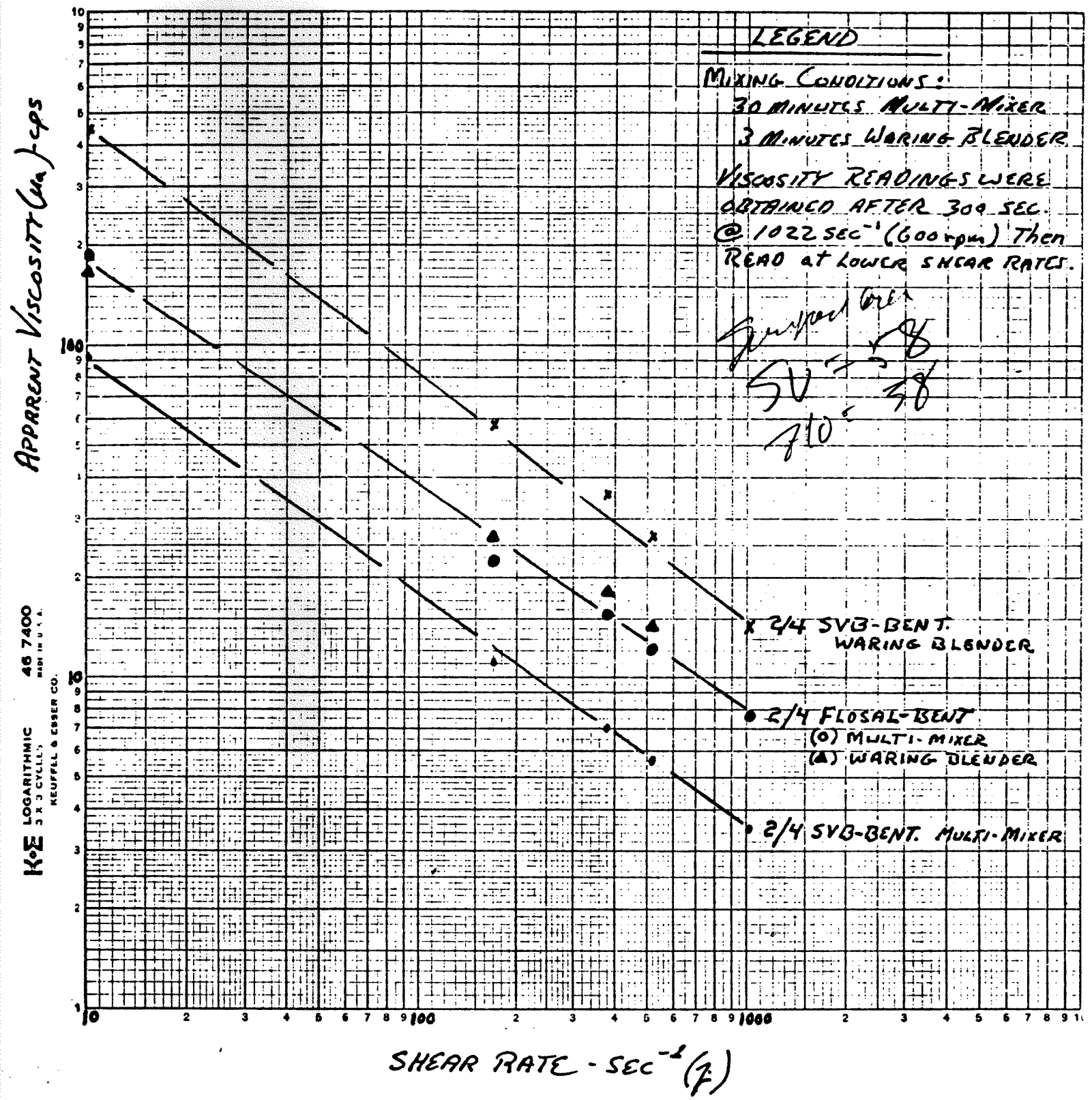


FIGURE 17
676 SYSTEM - 2 PARTS ASBESTOS & 4 PARTS BENTONITE



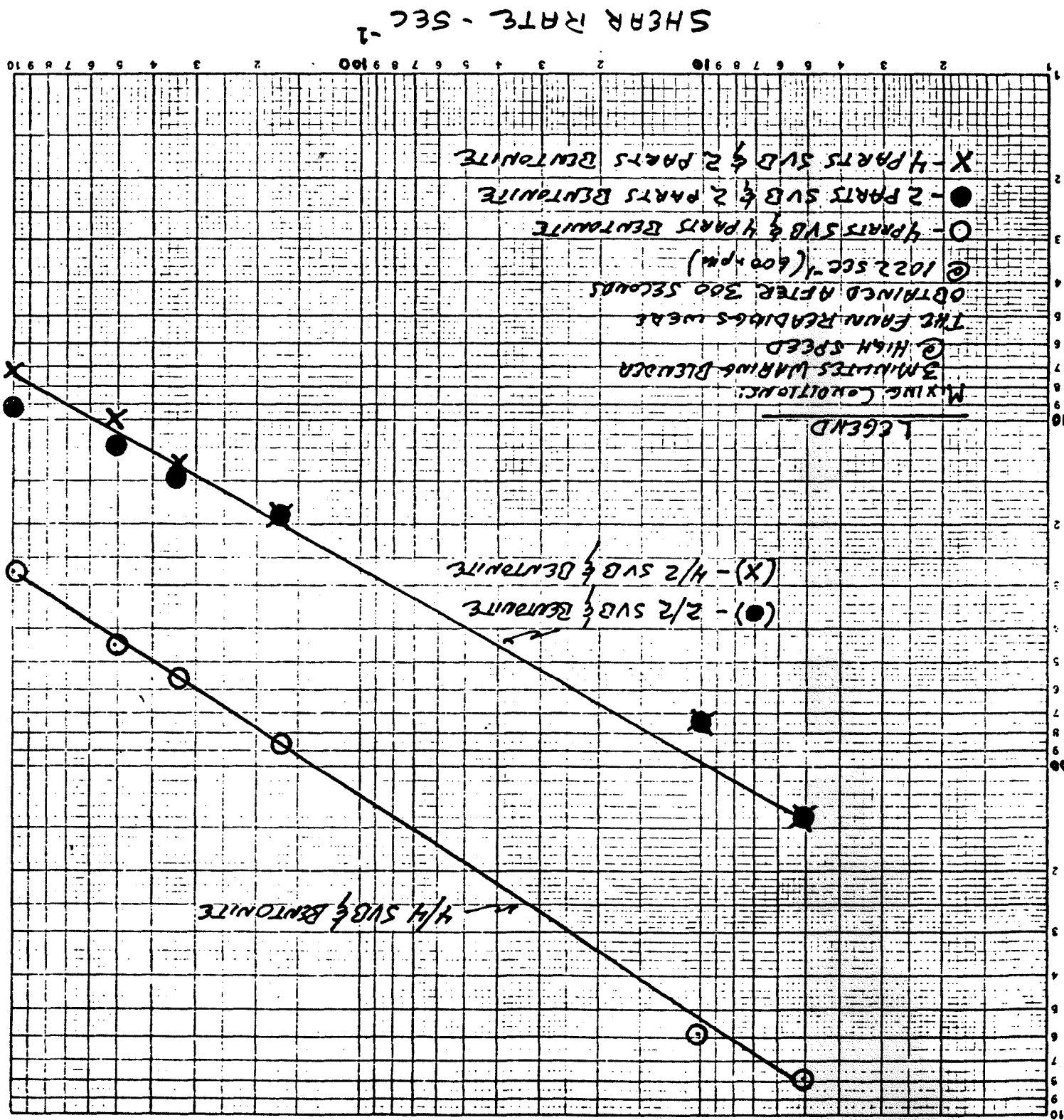


FIGURE 18

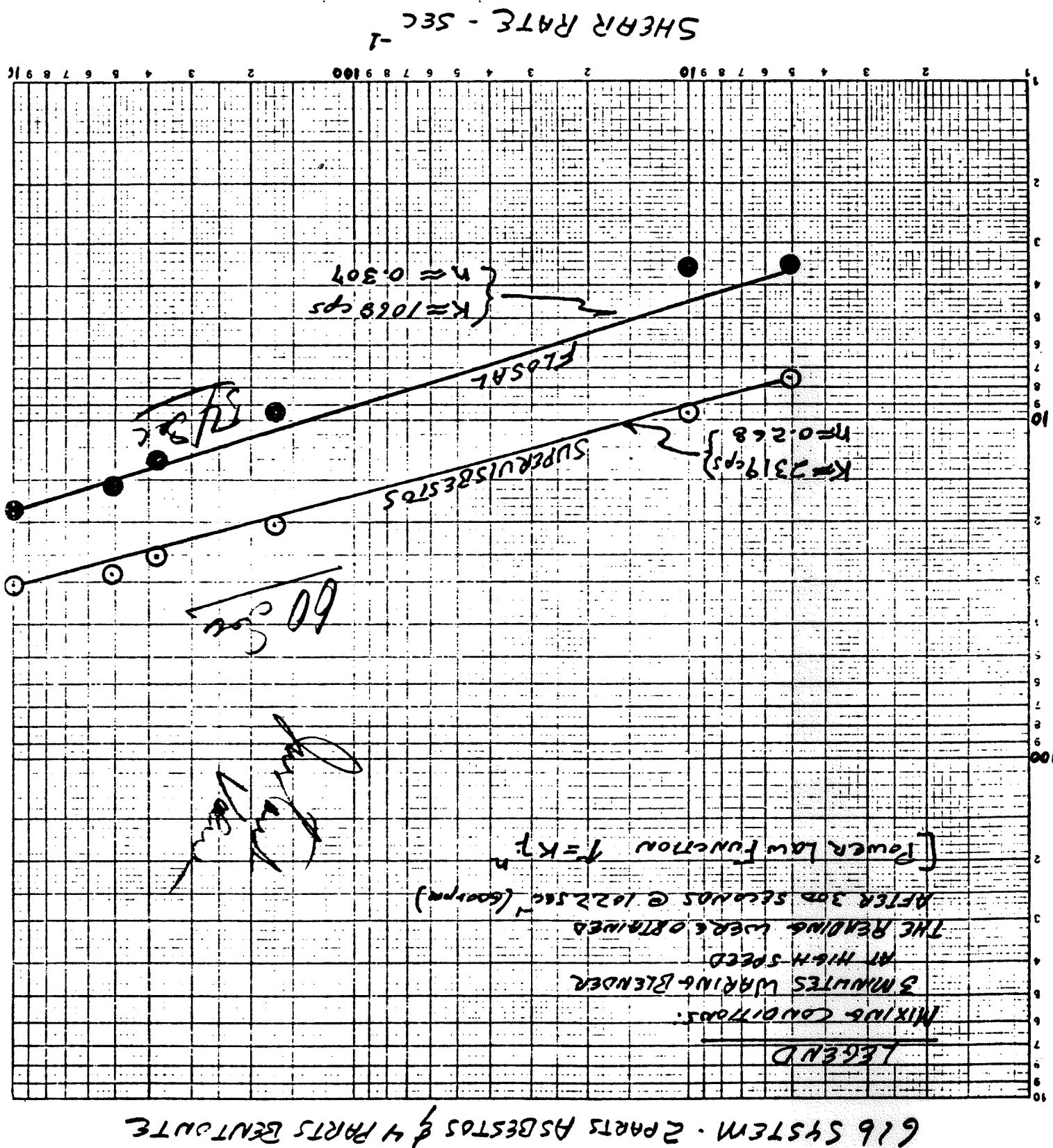


FIGURE 21
G/LB SYSTEM - FLOSAL

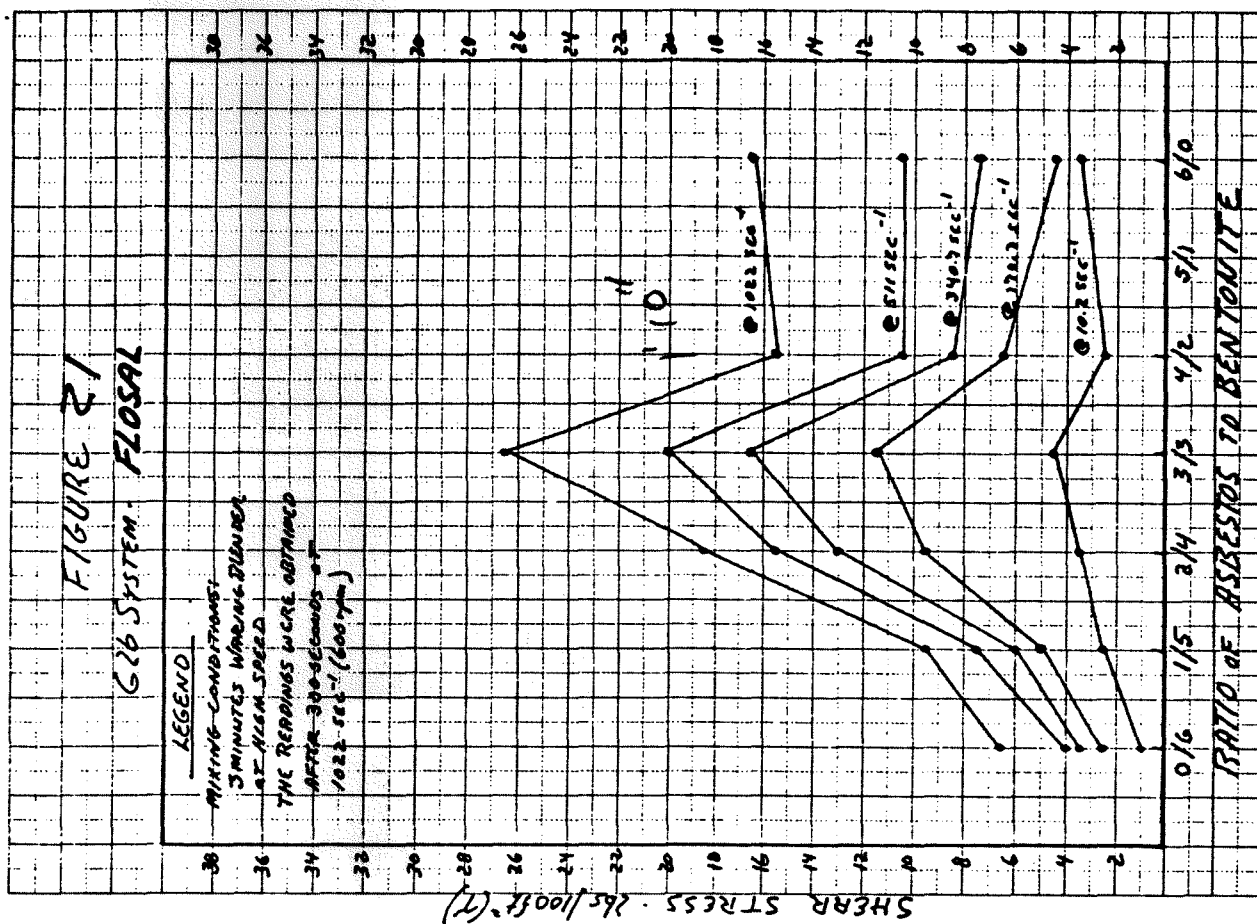


FIGURE 20
G/LB SYSTEM - SUPERVISASSTOS

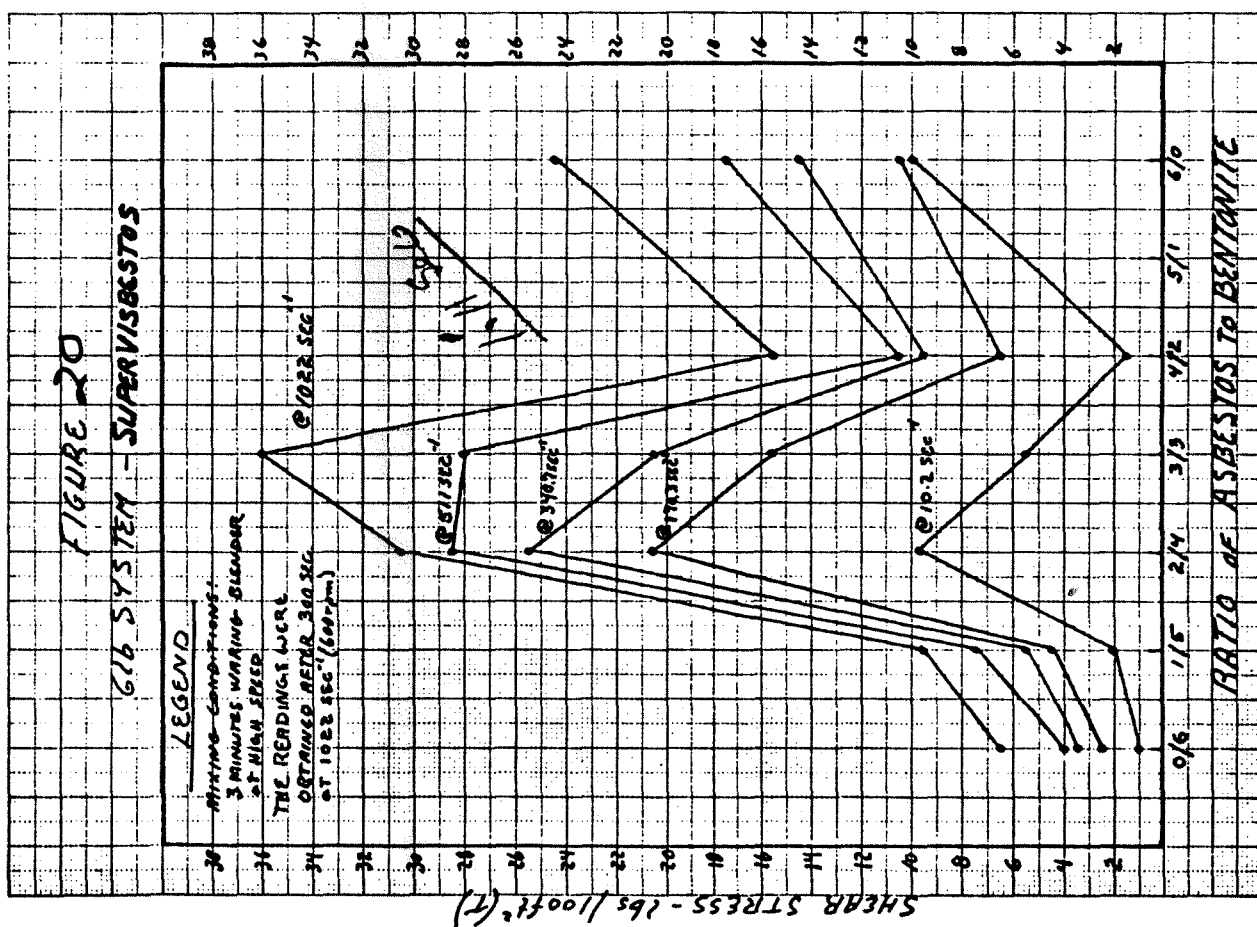


FIGURE 23

CHARACTERISTICS OF 50/50

FLOSAL/BENTONITE SYSTEMS

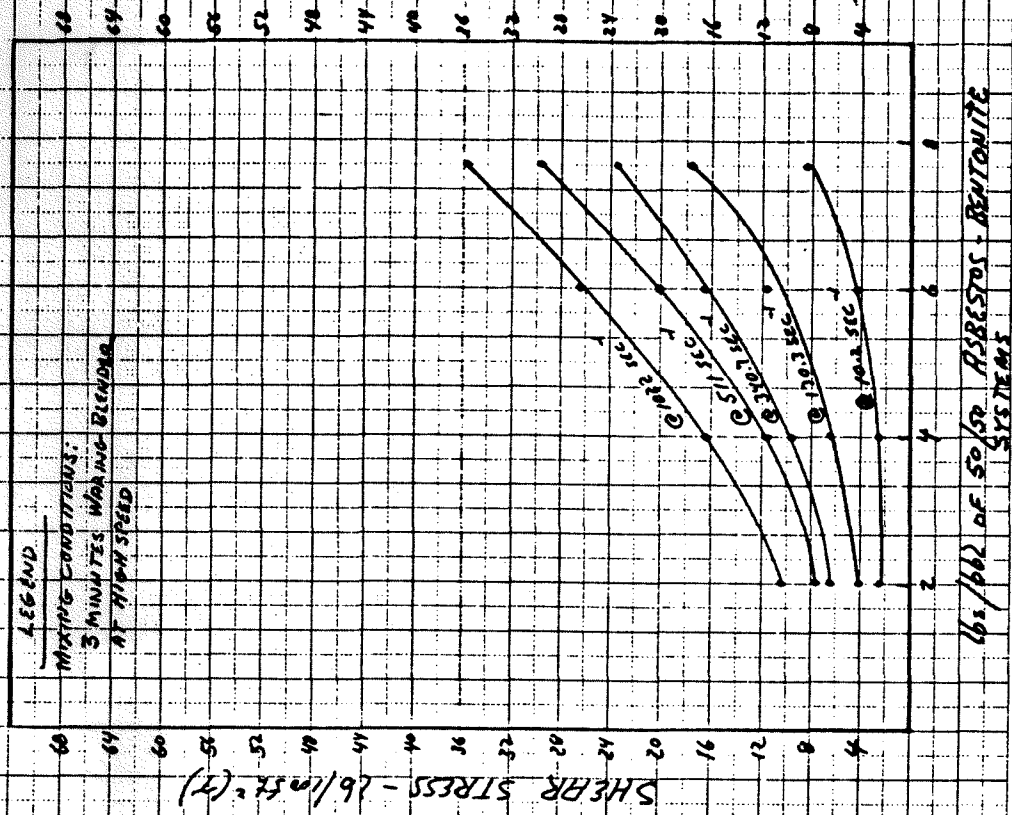


FIGURE 22

CHARACTERISTICS OF 50/50

SUPERVISASBESTOS/BENTONITE SYSTEMS

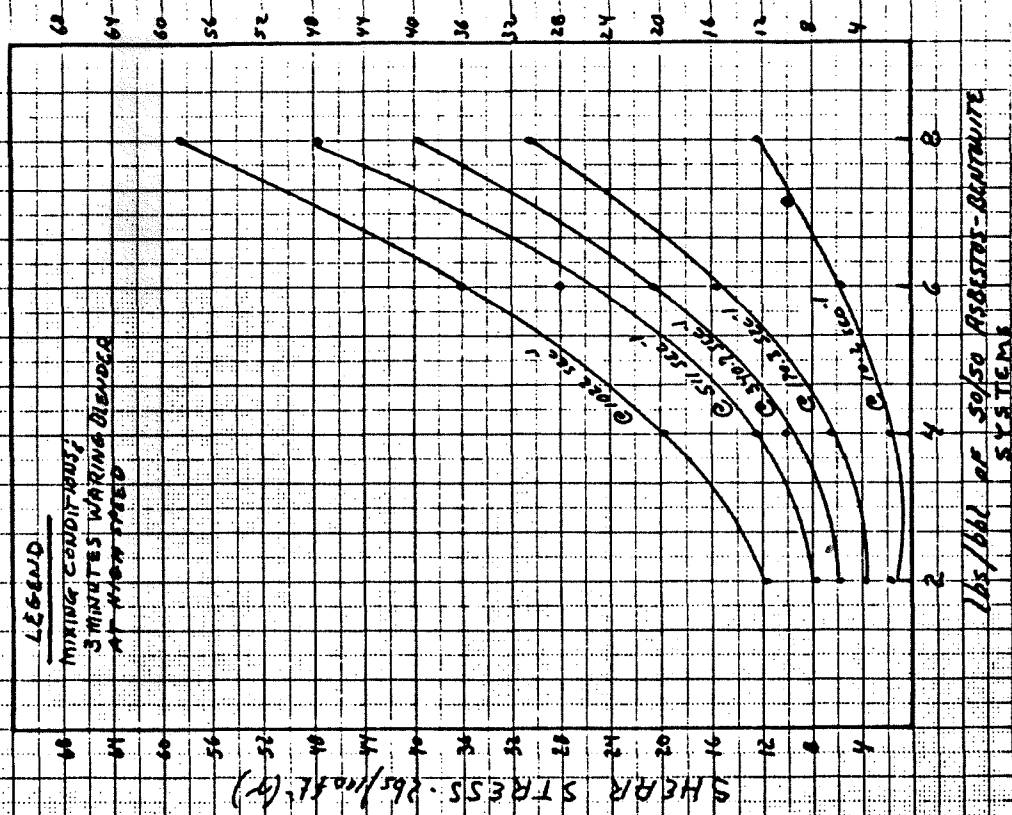


FIGURE 24
6 LB SYSTEM - 2 PARTS ASBESTOS & 4 PARTS BENTONITE

LEGEND

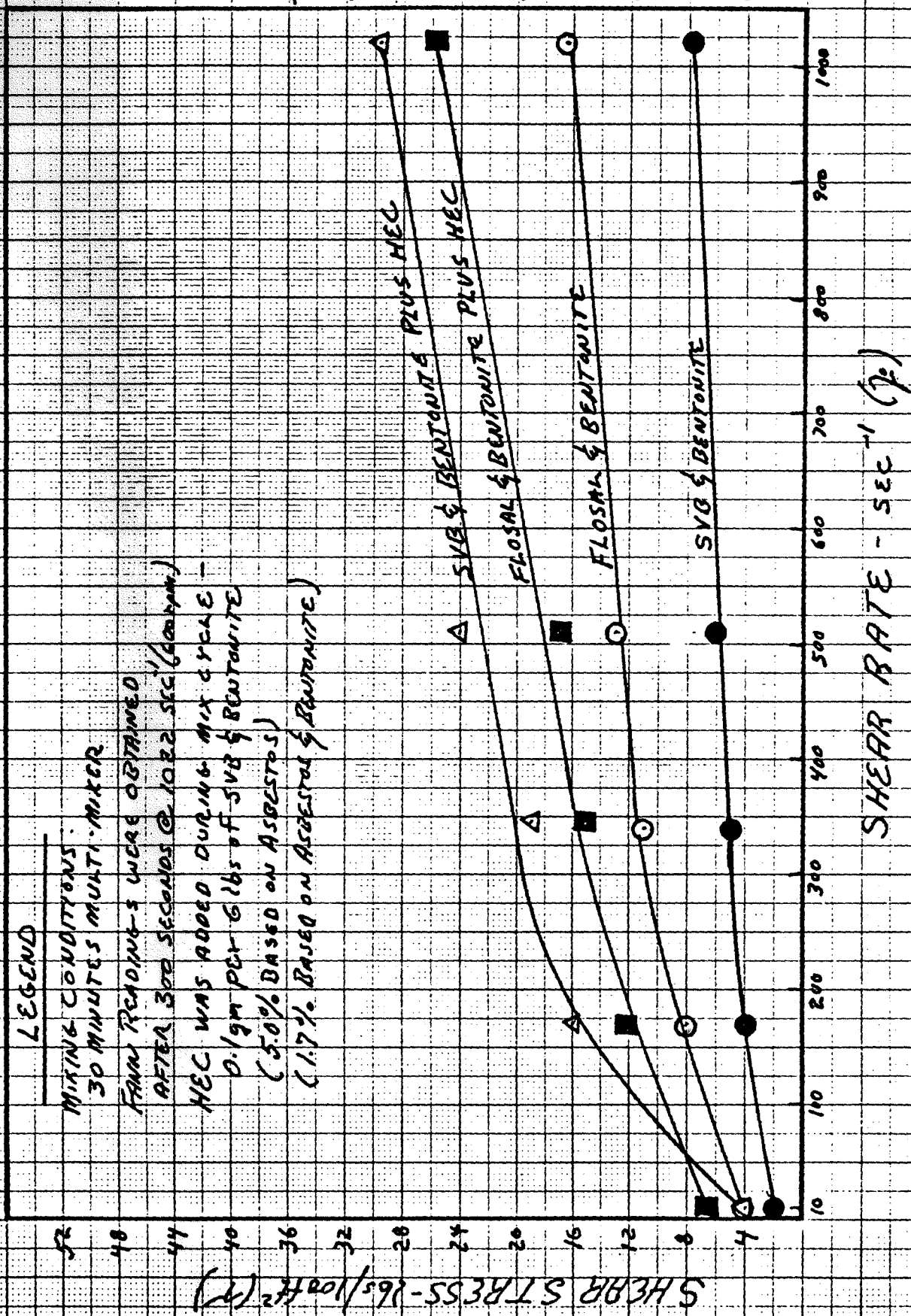
MIXING CONDITIONS
30 MINUTES MULTI-MIXER

FANN READINGS WERE OBTAINED
AFTER 300 SECONDS @ 1000 SEC (600 RPM)

HEC WAS ADDED DURING MIX CYCLE -

0.1 gm PER 6 LBS OF SVB & BENTONITE
(5.0% BASED ON ASBESTOS)

(1.7% BASED ON ASBESTOS & BENTONITE)



ASBESTOS PRODUCTS FOR DRILLING FLUIDS -
SUMMARY OF PHYSICAL PROPERTIES

PROPERTY	SUPERVISBESTOS				VISBESTOS				OLD FLOSAL			NEW	ATLAS	ATLAS	PACIFIC	
	1973 Q.C. Samples				1973 Q.C. Samples				Okla.			FLOSAL	AZ-20	#1092	7EX2	7EX3
	June	July	Aug.	Sept.	Feb.	March	June	Aug.	City	Wdwd.	Enid	8/73	8/71	10/73	9/73	9/73
Reflectance (%)	70.0	70.0	70.5	71.0	67.0	67.5	67.5	69.0	72.0	71.0	70.0	71.0	68.0	70.5	58.0	61.0
Magnitite (%)	2.0	1.6	1.4	1.5	1.9	1.8	1.6	1.4	3.0	3.1	3.6	2.1	2.0	1.2	5.1	5.0
Dry Bulk (lb./ft. ³)	26.4	24.7	26.8	28.4	9.2	9.0	8.5	8.9	8.5	8.9	8.8	5.8	9.6	6.4	9.9	7.2
Wet Bulk (10g./250 ml.)	-	-	-	-	186	162	167	165	100	201	99	177	86	111	183	233
Wet Bulk (2g./L.)	820	675	800	520	365	320	400	465	195	200	-	280	185	245	250	455
Wet Screen (Floc.)																
Cum. % +65	7.0	6.9	6.1	8.9	12.6	8.5	14.1	9.2	44.3	52.5	38.5	7.4	35.3	19.2	16.2	29.4
" " +100	11.3	12.1	9.2	14.3	15.1	15.9	18.8	14.2	53.6	58.4	44.8	20.1	44.6	29.5	27.2	37.5
" " +200	28.4	28.5	24.7	31.7	28.7	30.8	34.8	30.0	67.9	68.6	50.0	39.0	56.6	46.8	41.1	54.1
" " +325	45.5	50.9	40.2	43.9	42.5	43.9	46.9	44.2	74.4	77.1	66.8	51.7	67.0	57.3	51.4	64.5
Wet Screen (Disp.)																
Cum. % +65	5.6	6.0	5.0	5.8	6.4	5.3	9.0	4.2	13.1	18.3	13.6	3.7	4.1	2.2	14.3	26.4
" " +100	9.4	8.7	7.6	10.0	9.5	7.6	12.2	8.0	16.2	21.8	16.8	7.7	6.6	4.0	16.9	30.3
" " +200	21.6	19.2	17.1	22.5	18.7	16.8	23.2	18.0	29.8	30.2	27.0	17.6	13.7	11.9	31.6	45.2
" " +325	31.2	28.7	26.1	29.4	28.8	22.5	34.3	27.8	37.9	36.4	35.7	27.2	27.4	18.7	46.2	62.3
Available Fiber (%)	49.8	54.5	53.6	49.4	44.1	48.4	45.0	46.5	48.0	46.7	44.7	48.4	54.0	60.3	96.2 ⁽⁴⁾	99.2 ⁽⁴⁾
Ultimate Fiber (%)	93.4	92.2	79.1	80.5	80.1	83.0	85.6	79.2	77.2	80.2	71.5	88.5	72.0	84.6	67.7	95.1
AEC #1 ⁽²⁾ (ml.)	0	-	-	-	-	-	-	-	-	-	-	52	-	80	0	0
AEC #2 ⁽³⁾ or Fann (F-S) ⁽¹⁾					F.	S.	F.	S.	F.	S.	F.	S.				
AV	23	20	13	12	9	15	9	15	22	7	13	6	-	5	14	20
PV	4	3	2	3	6	8	7	10	11	16	5	4	-	3	8	14
YP	37	34	22	18	5	13	4	10	7	12	4	4	-	4	11	12

Long Long
Fibers Fibers

(1) Fann F&S is the Fann viscosity at 5 lb./bb1. in fresh water or in 125 lb./bb1. NaCl.

(2) AEC #1 Specification - 20 ml. max.

(3) AEC #2 Specification - YP = 15 max. AV = 15 min.

(4) AF & UF tests do not really apply to "Canadian" type asbestos.

11/27/73
H. B. Rhodes

SUPER VISBESTOS - TYPICAL CHEMICAL ANALYSIS

<u>Component</u>	<u>Weight %</u>
MgO	41.9
SiO ₂	41.8
Al ₂ O ₃	0.5
Fe ₂ O ₃	1.4
Loss on Ignition (CO ₂ & H ₂ O)	14.0
	<u>99.6</u>

SUPER VISBESTOS - TYPICAL SPECTROGRAPHIC ANALYSIS

<u>Component</u>	<u>Detection Limit, Wt. %</u>	<u>Analysis, Wt. %</u>	<u>Component</u>	<u>Detection Limit, Wt. %</u>	<u>Analysis, Wt. %</u>
Ag	0.001	0.0002-0.002	Ni	0.003	0.08-0.8
Al	0.003	0.08-0.8	Os	0.03	N.D.
As	0.01	N.D. (2)	P	0.08	N.D.
Au	0.002	N.D.	Pb	0.003	N.D.
B	0.006	N.D.	Pd	0.005	N.D.
Ba	0.003	N.D.	Pt	0.005	N.D.
Be	0.001	N.D.	Rb	N.A.	----
Bi	0.005	N.D.	Re	0.03	N.D.
Ca	0.002	0.008-0.08	Rh	0.02	N.D.
Cb	0.006	N.D.	Ra	0.03	N.D.
Cd	0.01	N.D.	Sb	0.01	N.D.
Co	0.01	0.008-0.08	Sc	0.01	N.D.
Cr	0.003	0.02-0.2	Se	N.A.	----
Cs	N.A. (1)	----	Si	0.001	Major
Cu	0.001	0.004-0.04	Sn	0.002	N.D.
Fe	0.006	0.8-8.0	Sr	0.01	N.D.
Ga	0.01	N.D.	Ta	0.01	N.D.
Ge	0.005	N.D.	Te	0.05	N.D.
Hf	0.03	N.D.	Th	0.03	N.D.
Hg	0.02	N.D.	Ti	0.003	0.004-0.04
In	0.03	N.D.	Tl	0.2	N.D.
Ir	0.03	N.D.	U	0.1	N.D.
K	N.A.	----	V	0.003	N.D.
La	0.01	N.D.	W	0.01	N.D.
Li	0.1	N.D.	Y	0.01	N.D.
Mg	0.001	Major	Yb	0.01	N.D.
Mn	0.003	0.008-0.08	Zn	0.02	N.D.
Mo	0.003	N.D.	Zr	0.006	N.D.
Na	0.03	N.D.			

¹ N.A. - Not analyzed.

² N.D. - Not detected.