

Old Hickory, Tennessee
May 5, 1970

ASBESTOS DUST CONTROL

Asbestos dust is an industrial hazard! The dust can cause the disease, asbestosis and medical studies in recent years have linked asbestos dust exposure to the development of several varieties of cancer, particularly of the lungs.

Old Hickory sought to learn more about these hazards and how to eliminate them. We worked with a number of organizations to obtain a good grounding on the subject (See Attachment I). The establishment of the following policy was the result of this work.

OLD HICKORY'S POLICY

- o Control dust at it's source of generation.
- o Specify use of protective equipment where dust control alone is not sufficient.

Let us familiarize ourselves with the term Threshold Limit Value. Threshold limit value (TLV) is the concentration of airborne asbestos dust to which nearly all workers may be repeatedly exposed day after day without adverse effect on their health or comfort. Old Hickory has established a TLV tighter than the present industry standard. We have also gone a step further in the interest of safety in setting a short term exposure limit as well as the usual long term limit. (Controlling short term exposures will aid control of long term exposures).

OLD HICKORY'S TLV

- o Instantaneous, or short term (One hour or less) TLV = 12 fibers/ML of air, fibers greater than 5 microns in length.
- o Long term TLV = 6 fibers/ML of air, fibers greater than 5 microns in length.

Present Industry (A.C.G.I.H) TLV = 5 mppcf (million particles per cubic foot of air).

The membrane filter - Fibers/ML sample and count method is 189 used by Old Hickory as this method affords greater accuracy than the old impinger - mppcf method. This new method is gaining acceptance from the industry and ACGIH proposes to adopt it in preference to the old method.

DUP 0901401

2-12 87

In the beginning we sampled a number of job activities and sample results were categorized as shown in Attachment II. These readings lead us to discontinue use of the product, 'Unibestos', at Old Hickory because of its high dust counts. This was done without cost penalty to the plant but with great benefit to the insulator. Notice also that routine work assignments (long term), as expected, gave lower readings than short term jobs.

We found where steps were taken to more adequately control the dust, we could generally meet our TLV's. The one exception of Item 7 of Attachment III shows that control alone is not always enough. Wearing of a dust respirator for this and similar jobs is now a safety rule at Old Hickory.

Other dust control methods include outlawing insulation materials containing crocidolite (blue) asbestos and providing effective dust removal systems. In addition to controlling the dust, we set a number of safety rules for the areas to follow. The most important of these rules specifies the use of the dust respirators for several job activities. The MSA Company Dustloc 77 mask was selected for our insulators' use as it meets the stringent requirements of the U.S. Bureau of Mines schedule 21B.

The asbestos story was taken to the insulators to acquaint them with the hazards, the need of dust control and their need of protective equipment. They have indicated their appreciation for management presenting this information to them and are giving their cooperation and help in eliminating the hazards.

Old Hickory will continue to follow the progress of the various organizations in this field and will implement changes where applicable.

:od

DUP 0901402

25 11 88

DU 022798

Attachment 1

ORGANIZATIONS AND GROUPS CONTACTED

Mt. Sinai School of Medicine (Insulation Hygiene Progress Reports)
American Conference of Governmental Industrial Hygienists (A.C.G.I.H.)
U. S. Public Health Service (Department of H. E. W.)
U. S. Bureau of Mines (Department of Interior)
University of Pittsburgh
National Insulation Manufacturers Association, Inc.
(Recommended Health Safety Practices)
Du Pont Haskell Laboratory
Du Pont Engineering Test Center
Johns Manville Research and Engineering Center
The Torit Corporation
Annals of New York Academy of Science

DUP 0901403

4-11-54

DU 022799

Attachment 2

DUST SAMPLING TESTS

<u>GROUP</u>	<u>DURATION OF SAMPLE</u>	<u>FIBER COUNT FIB/ML, > 5μ</u>
1. Bandsaw - Unibestos	5-64 Minutes	99-759
2. Bandsaw - Other Thermal Insulations	10 Min.-7½ Hrs.	8-38
3. Routine Work	6-7 Hours	7-13

DUP 0901404

23.6 90

DU 022800

Attachment 3

DUST SAMPLING TESTS
(With Improved Control)

<u>LOCATION AND ACTIVITY</u>	<u>DURATION OF SAMPLE</u>	<u>FIBER COUNT (FIB./ML, > 5 μ)</u>
1. Dacron® Shop - Saw. "Thermobestos"	15 Min.	2.7
2. Dacron® Shop - Sawing	3 Min.	10
3. Dacron® Shop - Routine	6 Hrs. 10 Min.	6
4. Dacron® Shop - Routine	5 Hrs. 30 Min.	.7
5. Reemay® Shop - Sawing	10 Min.	11
6. Reemay® Shop - Routine	5 Hrs. 45 Min.	2
7. Central Shop - Empty Bags of #10 Asbestos Cement	5 Min.	105
8. Corfam® Shop - Sawing	5 Min.	1.5
9. Power Maint. - Routine	7 Hrs.	1
10. DMT Shop - Routine	6 Hrs.	5
11. Central Shops - Sawing "Kaylo"	5 Min.	3.4
12. Central Shops - Sawing "Kaylo"	20 Min.	8

DUP 0901404.001

DU 022801

5/6/70

Asbestos

EXHIBIT # Liab-7

5/7/70

uses

Jim

DATE 1-20-67 dt

W. J. FORMINI & FORMAROLI, INC.
CERTIFIED SHORTHAND REPORTERS

1. Thermal Insulation

7.5 m of insulating materials used

8.6 - 8.09% asbestos content

14% in masonry

Amorite and Elongate

8.67% Amorite only

Asbestos Cement - pipe, sheet, tile

Packings & gaskets

Boiler linings

Same use in products - Patina, Lister

Electrical insulation

Filters (air)

Gloves

Sheet

Radiator stop leaks

Translites in tile, up to 20%
asbestos-like

Agar wrapper

Methods of sampling

In Part will adopt Jany Lynak's
recommendation

Acceptable Limits 5/7/70 2

1968 revision 2 m p p c f. length
5 > 5m

1970 " 2 m p p c f length
2 > 5m 4

Currents 12 > 5m

* British

Haskell Lab and ESD joint study
on distinction of manufacturing
materials - George Lang of ESD
and John Morgan. Try to eliminate
calculator - measure relative hazard.
"Unilever" has poor history

Thermal much better for attraction in
shipping containers.

Thermistors during dismantling
"Dust" 272 218 Bureau of Standards

needed. Completely non-specific
retention history required

old history 9 out of 23 were old timers
one had 60% full capacity - fabricated

DUP 0901406

DU 022803

One lung cancer, one mesothelioma³
(not an insulator) Selidoff's article
stated by Levine. No difficulty in persuading
employees to use respirators then.
Check x-ray annually.

Selidoff's article - New York Times
Summaries - Walter J. Craig, head

De Port found to accept at 5 & Eng
particular TLV.

DUP 0901406.001

DU 022804

X

Dupont

Asbestos Conference

6 May 70

Widgwood Cn → Barley Room Ash
Widgwood Cn → Tomorrow

Types of Asbestos Minerals J. Morgan

- mineral silicates

- extremely small diameter compared to other fibers

Different types differ by: 1. Chemistry 2. Crystallography 3. Amount

a. origin

b. composition

eg. silicate

c. structure

d. properties

1, 2, 3, 4, 5, 6

Origin:

Types of rock ^{serpentine} ^{amphibole} ^{pyroxene} ^{feldspar} ^{H₂O} →

crystals → fibers

Serpentine → chrysotile

Amphibole → other types ^{actinolite} ^{hornblende} ^{crocidolite} ^{amosite}

Importance 1968

Canada (Chrysotile) 690,000 short tons \$65 million

South Africa crocidolite + amosite \$6 million

Characteristics - resistant to acids, as H₂O, heat insulation

spinnability

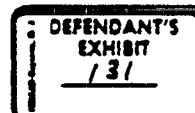
Chrysotile Properties

- yellow to greenish color → white fibers

- small fibers less than a inch to 2 inches

single hydrated magnesium silicate

190



120700

DUP 0901407

DU 022805

Teptale - inaptale - 2nd

Crocidolite

- $3H_2O \cdot 2Na_2O \cdot 6(FeMg)O \cdot 2Fe_2O_3 - 172C$
- 2-3% H_2O
- in Africa
- Australia
- Color is blue; known as Blue asbestos - due to the Na
- better resistance to acids, alkalis and sea water:
- used more in ship building

Amosite

- used by deposit for heat insulation

Robt. de Treville

- Paris

History - Medical Aspects

N.Y. Acad of Science - Asbestos effects Dec 31, 1955

Island Higgins Highlights 1955

Fibrosis and Publications of International

Higgins Foundation

first lung cancer in asbestos reported in 1935, Lynch U of
South Carolina

Asbestosis

1900's asbestos noted

- fibrosis similar in some respects to silicosis - fibrous
deposits in that silicosis has nodules - asbestosis is
more diffuse - accompanied by emphysema:
more difficult to recognize;
- no right heart failure or cor pulmonale often found
 - occurs with all types
 - 10 to 20 years required

128781

DUP 0901408

DU 022806

Asbestos

May 70

- Knopf in England found excess of deaths (100) from lung cancer in textile workers,
- Dr. O'Brien looked at Canada and did not find a clear cut differentiation
- Paul Kawan - N.A.
 - can produce CA in rats & caused chrysotile for 16 months (4070).
 - seems that the hammering of the chrysotile resulted in it picking up trace amounts from the hammer and these may be producing the CA.
- Knopf - cleaned up the shops - found that the excess lung CA no longer existed

Dr. Wagner

Mesothelioma - saw 7 around Cape May in S. Africa
 1/2 of exposure 40 yrs before; used as sand piles -
 along the roads; non occupational exposure



Thompson in S. Africa

- asbestos bodies - dumbbell bodies - stain blue, high ferritin

- 2570 people in S. Africa - Minnie had these asbestos bodies at post autopsy

- raised question of exposure from truck driver

Dr. Wagner:

non transparent water - false or pseudo bodies.
 transparent - true

Ferruginous body is better name unless you know what the core is

DUP 0901409

120702

DU 022807

Chrysotile



asbestos
mineral

iron

needle like ends and fibers in cells

breakdown dust - the chrysotile converted to ~~ferrous~~ ^{ferrous} ~~oxide~~ ^{oxide} which still contains some chrysotile and is capable of producing true asbestos bodies. The greatest amt is ferrous

Diseases caused by asbestos

1. pulmonary fibrosis - generally, epidemiologic and experimental

2. bronchogenic c.a. - epidemiologic; time dose dependent; 20-30 yr

3. mesothelioma - cocciolate; not of chrysotile andomite
uncommon time dose not known

? of smoking being synergistic; in c.a. seen for smokers and non smokers.

May get c.a. after short (few yrs.) exposure - metastatic
yrs later

- chronic bronchitis + emphysema - ^{damages for compensation} generally not
~~known~~ awarded; more information needed

- calcified pleural plaques

- asbestos body - if photo lung should be able
find body however the body by itself does not
mean fibrosis

can find ferruginous bodies in nearly 100% of
population - ? time & type. autopsy

Fibrosis does not free from pathogenicity

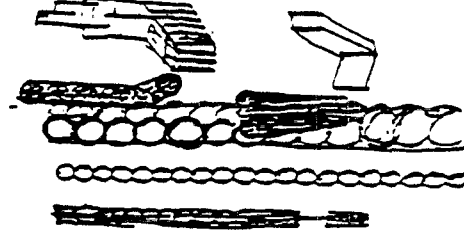
DUP 0901410

120703

DU 022808

Pulmonary function equipment - GSA's file

- X-ray
- Pulmonary function
- Smoking 4x



Lynch U.S.P.N.S.

- overall dust measurements used originally aerodynamic equivalent

Superior total count vs. membrane filter count ratio is a very weak correlation.

per million dust
Total fibers > 5 μ m fibers > 10 μ m fibers

Teflon	10.3	<u>5.9</u>	2.7
--------	------	------------	-----

T6U 5 million dust or 2 fibers > 5 μ m

Use > 5 μ m because must be thought that only long fibers cause difficulty and also mainly the visibility is better and permit a better count

Light microscope compared to electron microscope show that we only measure 10% of the total fibers even in oil immersion

Analysed for 4g. and converted to asbestos by multiplying by 4.

Mass Teflon 2 mg/1 cm³ = T6U = 12 fibers/cm³

DUP 0901411

120704

DU 022809

Asbestos
 84% of all fibers seen were respirable
 80% > 5 μ
 60% > 10 μ

W+
 Textile 35% respirable
 Friction 30%
 Paper 45%

	Asbestos in Productive Dust	
	Asbestos	Respirable
Textile	75-85 72	90%
Friction	30-60 22	22%
Paper	10-30 10	11%
Simulation	5-15 5	3%

Summary

- ① no practical absolute method
- ② fibers > 5 μ @ 430X is choice
- ③ Bulk samples & high volume sampler

Sampling
 - high vol sampler
 - size > 10 μ
 - membrane filter

Atmospheric exposure for these methods

Method membrane filter

DUP 0901412

120705

DU 022810

Amputation workers have high risk of exposure
during mixing. Difficult to monitor amputation
workers

Air Pollution

30 fibers per cc found in UK

Ferruginous bodies

17/10 had the ferruginous bodies
~~1904 found that there are true asbestos bodies is not known.~~



Clark Cooper examining sputum

1.30 A.M. Tomorrow -

DUP 0901414

120707

DU 022811

Asbestos

Wright G.W. Asbestos & health in 1969
Amer. Rev. Resp. Dis 100 457-79 Oct 1969 (52 ref)

DUP 0901415

120708

DU 022812

Dupont

Asbestos's Conference

6 May 70

Hedgewood Run → Barley Room Ash

Hedgewood Run → Tanager

Types of Asbestos Minerals J. Morgan

- mineral asbestos

- extremely small diameter compared to other fibers

Different types differ by: 1. Chemistry 2. Crystallite 3. Amount

4. origin

B. composition

mg. silicate

C. structure

D. properties

H₂O 12-15%

Origin:

Types of rock ^{serpentine, amphibole} ^{crystallite} → pressure, heat + H₂O →

crystallite → fibers

Serpentine →

chrysotile

not commercial

Amphibole →

Other two

trondhjemite, actinolite,

crocidolite + amosite

Imports 1968

Canada (Chrysotile) 690,000 short tons \$65 million

South Africa crocidolite + amosite \$6 million

Characteristics - resistant to acids, as H₂O, heat, irradiation
gamma stability

130

Chrysotile Properties

- yellow to greenish color → white fibers

- small fibers less than a inch to 2 inches

24% hydrated magnesium silicate



120700

DUP 0901416

DU 022813

Textile - inaptitude - 1207

Chondrochite

- $3H_2O \cdot 2Na_2O \cdot 6(FeMg)O \cdot 2Si_2O_5 - 17\% Cu$
- $2-3\% H_2O$
- in Africa
- Australia
- Color is blue; known as blue asbestos - due to the Na
- better resistance to acids, alkalies and sea water:
- used more in ship building

Amosite

- used by Dept for heat insulation

Bob. de Treville
- Paris

History - Medical Aspects

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Included Higgins & Highlights V&E

Fibrous Dust Publications of Industrial

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first lung cancer in asbestos reported in 1935, Lynch U of

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Asbestosis

1900's asbestos noted

fibrosis similar in some respects to silicosis - fibrosis
differs in that silicosis has nodules - asbestosis is
more diffuse - accompanied by emphysema
more difficult to recognize;

- see right heart failure or cor pulmonale often found
- occurs with all types
- 10 to 20 years required

DUP 0901417

120701

DU 022814

Asbestos

May 70

- Knox in England found excess of deaths (1962) from lung cancer in textile workers,
- Dr. J. Brown looked at Canada and did not find a clear cut differentiation
- Paul Kneave - M.D.
 - can produce CA in rats & caused chrysotile for 16 months (4070).
- ... assume that the hammering of the chrysotile resulted in it picking up these minerals from the hammer and these may be producing the C.A.
- Knox - cleaned up the shops - found that the excess lung C.A. no longer existed

Dr. Wagner

Neurothelioma - saw 7 around Cape Town in S. Africa
 1/2 of exposure 40 yrs before; used as sand piles - along the roads; non occupational exposure

Dr. ~~Thompson~~ Thompson in S. Africa

- asbestos bodies - dumbbell bodies - stain blue, high refractive
- 25% people in S. Africa - Haines had these asbestos bodies at post autopsy
- raised question of exposure from brickdrones

? then:

non transparent water - false or pseudo bodies.
 transparent " - true

most may

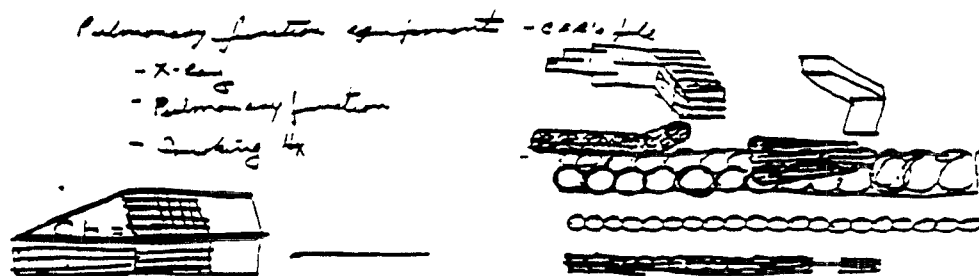
fibrogenous body is better name unless you know what the core is



DUP 0901418

120702

DU 022815



Lynch U.S.P.H.S.

- overall dust measurements used originally aerodynamic equivalent
 Impinger total count vs. membrane filter count
 return is a very weak correlation.

per million dust

	Total Fibers > 5µm fibers	> 10µm Fibers
Typhoid	10.3	<u>3.9</u> 2.7

TLV 5 million dust or 2 fibers > 5µm

Use > 5µm because must be thought that only long fibers cause difficulty and also mainly the visibility is better and permits a better count

Light microscope compared to electron microscope shows that we only measure 10% of the total fibers even in oil camera con

Analysed for 14g. and converted to asbestos by multiplying by 4

Mass Typhoid 2 mg/m³ = TLV = 12 fibers/2 mll

DUP 0901420

120104

DU 022816

Conclusion
 84% of all fibers seen were respirable
 80% > 5 μ m
 60% > 10 μ m

Summary
 Textile 35% respirable
 Fraction 30%
 Paper 45%
 Simulation 5-15 5 3 10

	Asbestos in Products Dust		
	Textile	Fraction	Paper
Textile	75-85	72	90%
Fraction	30-60	22	22%
Paper	10-30	10	11%
Simulation	5-15	5	3 10

- Summary
- ① no practical absolute method
 - ② fibers > 5 μ m @ 430X is choice
 - ③ Bulk samples & high volume sampler

Sampling

- high vol sampler
- size > 10 μ m
- membrane filter

Atomic absorption for trace metals

Millipore membrane filter

DUP 0901421

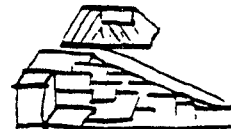
120705

DU 022817

Respiratory circuit
 & circuit



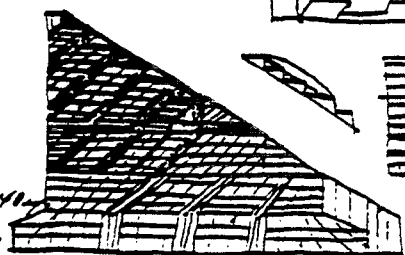
Personal air sampler 90 minutes @ 2 l/min.
 1 fiber per liter $\equiv$ 1 fiber per cc
 (make a gel out of it)
 1:1 dimethyl sulfoxide death/absolute 0.55 fraction
 of the membrane
 Sign up for reprint of method
 Colson millipore filter



Howard Lipson Standards

Dreessen

5 mppcf total dust
 inhalable
 - 94% 2-lay changes
 More CF in smokers



Dr. John Wells - Georgia

50-60 mppcf found asbestos & said that there is
 no safe level

Critical Medical Occupational Society 1968

Used risk of < 1%

2 fibers per cc 50 yrs

4 " " 25 yrs



Critical study found break rate preceding 1-lay
 75 mppcf on HF.

ACGIH

- Allowed to 2 million pcf or 12 fibers per cc > 5m

USPHS

2070 kcal dust & respir 5 to 10 fibers per cc

USPHS : 5 fibers per cc for industrial workers in mine
 Fed. with ceiling of 10 fibers per cc 15 min peak

DUP 0901422

120100

Sanitation workers have high level of exposure
during mixing. Difficult to monitor sanitation
workers

Air Pollution

50 fibers per cc found in NYC

Ferruginous bodies

97/100 had the ferruginous bodies
~~90% of these that are true asbestos bodies is not known.~~



Clark Cooper examining sputum

9:30 A.M. Tomorrow -



DUP 0901423

120707

DU 022819

Asbestos

Wright G.W. Asbestos & health in 1967
Am. Rev. Resp. Dis. 100 467-77 Oct 1969 (54 pp.)

DDF 0901424

120708

DU 022820

Exhibit # 131A
DATE 1-20-47
4 STRONG & TAYLOR ROLL INC
CERTIFIED SHORT-TO-REPORTERS

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CERTIFIED SHORT-TO-REPORTERS

DEPENDANT'S
EXHIBIT
131A

191
DUP 0901425
120709

Possible to apply 2 yrs at low C. include may develop long cont.
20-30 yrs later
those who showed delay calcification and more stable to cancer
Chondroblastoma most common (common)

Very typical
typical dist. range 1 in order
95% typical / USA range

Revised equation method for mg. Envelopes to sub,
 Asbestos Cans not equivalent to T & V Beliskaya. See p 4
 Textile
 Printer
 Paul
 2
 0.5

54% of flies above age removal
60% above 10 in paired clutch
normal days on 1st (85-92)
24-34% by 1st and 2nd clutch

390 negligible water depth in dirt/misulation from
his analysis not possible to see any as cause for the
disorder - subjective nature of it

No partial abstinence method you are able

Preferred under recommended 10-15% on very fine silt.
at 20% in sand, mounting 2-3% on hard micaceous
Co. 1, mixed with 10% silt - suspension also, etc.
True elements of silt, 10% H₂O, 1-2% at 1-2% of silt.
size 2A, intermediate, clumping. Silt mixed with
for 10 and 20.

Preferred index recommended by T.V. Conference, No. 75
in membrane fields at 430x for Ind. monitoring by phase con-
tact microscope - Mallory recommended lessening at con. be
cleared. Personal monitoring required 37 inches 2 1/2 min
for 94 mm 855 mm. better days, clay directly affected - a
better result - 0.5 min. near 10.5 min

yellowish - and green flimsy with C_{10} in green - white
 one even + green - P. and C. - deep purple / light green
 68 on millipede - 6,01 one down, retention limit (+ 90%)
 Gelman not closed by a liquid mixture (100% cellulose and
 millipede - a mixture of T. and C. + others

Howard, G. - Standard a. acceptable cone, in work place
 Herby of C. 1907
 no. 1930 - G. B. In 1939 / N.C.

P. and C. - P. and C. - (100% cellulose) - same firmness
 P. and C. 100 (100% cellulose) - 2 x 50 = limit
 by new recommended method
 4 x 25 =
 10 x 10 =

Air study 1964, material 1968 by USFAS

5 fibres > 5m / ml, C. and 10. Detail limit per ml
 (4.5/10) by 25 g. In G. B. after 30 years at
 4-6 fibres per ml, 25 long term

T. and C. - 100% cellulose - only one established on carbon an
 criteria 1964
 1 fibre per liter in Ray area - ambient

Collector Substitutes - 100% cellulose - 100% cellulose
 structure

20711

DUP 0901427

DU 022823