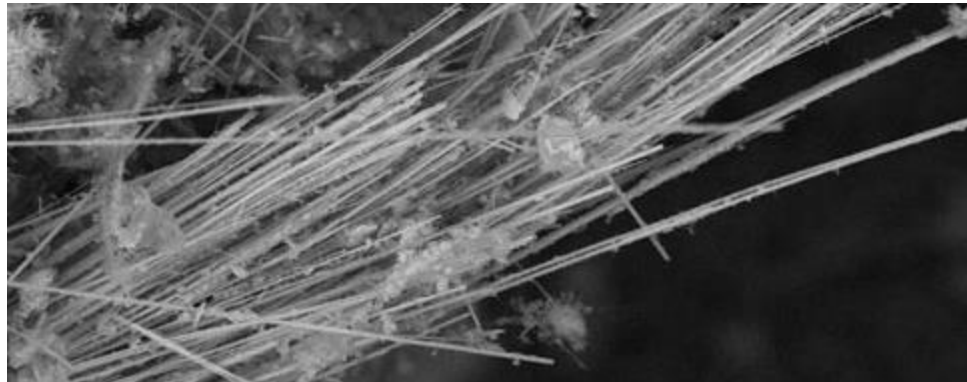


Case study

- TEM and PLM analysis of small, 3 dimensional, asbestos containing materials
 - Thermal System Insulation
 - Surfacing Material

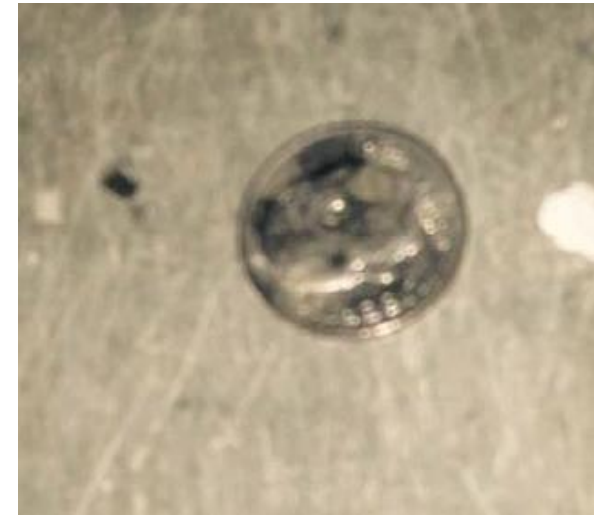


General Size of Asbestos Fiber



- Asbestos fibers range in size from **.1 to 10 microns** in length (a human hair is about 50 microns in diameter).
 - Example with assumptions
 - Width typically is 3:1 ratio (very large) (5 microns Length = 1.66 microns width)
 - Volume : $1.08e-5 \text{ mm}^3 / 0.0108 \text{ microns}$
- Size of Dime
 - 17.19 mm / 17910 microns in length
 - Volume: $340.24 \text{ millimeters}^3 / 340,110 \text{ microns}^3$
- So theoretically **31,491,666** asbestos fiber can be in the volume of a dime.

Thermal System Insulation



- TSI from steam pipes
 - TEM Results

Laboratory Sample	Customer Sample Number	Asbestos Components (%)	Non-Asbestos Components (%)
316605001	Bulk-TSI-1	Chrysotile 10-20%	Other 80-90%

- ACM material appears to be .25% of dime
 - 10-20% of material contains asbestos (15%)
 - **2,165,052** fiber theoretically can be in the picture shown above.

Surfacing Ma



- Surfacing Material covering

Laboratory Sample	Customer Sample Number	Asbestos Components (%)	Non-Asbestos Components (%)
316661001	20141114-01	Chrysotile 15-20% Amosite 5-10%	Other 70-75%

- ACM material appears to be $\sim .25\%$ of penny
 - 25-30% of material contains asbestos (27.5%)
 - **1,180,937** fibers theoretically can be in the picture shown above.

Slides from “Take-Home Asbestos Fibers Associated with Abatement of Non-Friable Flooring “

- Presentation by:

Sean Dyer

Senior Consultant- Director of Industrial Hygiene

American Management Resources Corporation

“Take Home” Asbestos Exposure



 AMA Analytical Services, Inc.



Dust Sample Analysis Interpretation

Settled Dust Sampling and Analysis

JR Millette and SM Hays, 1994

- “Levels are considered low if less than 1,000 s/cm².”
- “Levels above 10,000 s/cm² are considered generally above background.”
- “Levels above 100,000 s/cm² are considered high and in the range of a significant accidental release from an abatement site.”

Dust Sample Analysis Interpretation

LOWER MANHATTAN TEST AND CLEAN PROGRAM

Final Report November 2008

“The benchmark for asbestos in accessible areas is 5,000 structures per square centimeter (s/cm²) and 50,000 s/cm² for infrequently accessed areas. The use of a benchmark for infrequently accessed areas is intended to minimize the potential for recontamination of accessible areas.”

The benchmarks for asbestos in settled dust are not risk-based because there is no scientific consensus on how to determine if these fibers will ever be inhaled.

Sampling Project 1

Sample Identification	Sample Location	Sample Results
1	Abatement workers hat that was worn in the containment and prior to going home for the day	28,200 structures/cm ²
2	From the surface (neck) of the <u>outside</u> supervisors neck prior to going home for the day	348,000 structures/cm ²
3	Abatement workers hat that was worn in the containment and prior to going home for the day	889 structures/cm ²
4	Abatement workers polyspun suit that was worn in the containment.	20,500 structures/cm ²
5	From the surface of an abatement worker prior to going home for the day	None Detected
6	From the surface of an abatement worker prior to going home for the day	1,870 structures/cm ²
7	From the surface (shoulder) of an abatement worker upon arrival for work	None Detected
8	From the surface (shoulder) of an abatement worker prior to going home for the day	3,760 structures/cm ²
9	From the surface (head) of an abatement worker prior to going home for the day	3,760 structures/cm ²
10	From the surface (head) of an abatement worker prior to going home for the day	None Detected

Sample Identification	Sample Location	Sample Results
11	From the surface (shoulder) of an abatement worker upon arrival for work	None Detected
12	From the surface (shoulder) of an abatement worker prior to going home for the day	None Detected
13	Drivers seat of a abatement contractors box truck	18,800 structures/cm ²
14	Drivers seat of a abatement workers car	75,200 structures/cm ²
15	From the surface (shoulder) of an abatement worker upon arrival for work	107,000 structures/cm ²
16	From the surface (shoulder) of an abatement worker prior to going home for the day	3,760 structures/cm ²
17	Concrete floor leading up to work area entrance of a floor tile abatement project	762,000 structures/cm ²
18	Floor area inside the containment after floor tile was removed	1,540,000 structures/cm ²
19	From the surface (shoulder) of an abatement worker upon arrival for work	None Detected
20	Drivers seat of a abatement contractors box truck	None Detected

Sampling Project 2

Sample Identification	Sample Location	Sample Results
01	Concrete floor leading up to work area entrance of a floor tile abatement project	132,000 structures/cm ²
02	Floor area inside the containment after floor tile was removed	827,000 structures/cm ²
03	Driver's seat of a abatement workers car	No Asbestos Detected
04	From the surface (shoulder) of an abatement worker prior to going home for the day	1,880 structures/cm ²
05	Driver's seat of a abatement contractor 4-door pickup truck	No Asbestos Detected
27-01	Floor area inside the containment after sheet vinyl was removed	6,260 structures/cm ²
27-02	Floor area inside the containment after sheet vinyl was removed	602,000 structures/cm ²

Sample Identification	Sample Location	Sample Results
12-01	Driver's seat of a abatement contractors box truck	No Asbestos Detected
12-02	Rear bench seat of a abatement contractors box truck	No Asbestos Detected
12-03	Back side passenger seat of a abatement contractors box truck	No Asbestos Detected
07-01	Driver's seat of a abatement workers car	No Asbestos Detected
07-02	From the surface (shoulder) of abatement worker prior to going home for the day	No Asbestos Detected
27-01	From the surface (shoulder) of abatement worker prior to going home for the day	No Asbestos Detected
27-02	Driver's seat of a abatement workers car	No Asbestos Detected

Sample Identification	Sample Location	Sample Results
27-03	Driver's seat of abatement contractor 4-door pickup truck	No Asbestos Detected
31-01	Passenger seat of abatement contractor 2-door pickup truck	No Asbestos Detected
31-02	Driver's seat (back) of abatement contractor 2-door pickup truck	No Asbestos Detected
31-03	Passenger seat of abatement contractor 2-door pickup truck	No Asbestos Detected
31-04	Passenger seat (back) of abatement contractor 2-door pickup truck	No Asbestos Detected
4-01	Entry foyer of abatement contractor offices	No Asbestos Detected
4-02	Reception area chair of abatement contractor offices	No Asbestos Detected

Sample Identification	Sample Location	Sample Results
4-03	Director office chair in abatement contractor offices	No Asbestos Detected
4-04	Storage room floor of abatement contractor offices	No Asbestos Detected
4-05	Men's room rug of abatement contractor offices	No Asbestos Detected
4-01	From the surface (pants) of an abatement worker upon arrival for work	No Asbestos Detected
4-02	From the surface (back of neck) of an abatement worker prior to going home for the day	No Asbestos Detected
18-01	Front bench seat of a abatement contractor 4-door pickup truck	No Asbestos Detected
18-02	Rear bench seat of a abatement contractor 4-door pickup truck	No Asbestos Detected

Sampling Project 3

Sample Identification	Sample Location	Sample Results
3-01	From the surface (shoulder) of an abatement worker prior to going home for the day	196,000 structures/cm ²
3-02	From the surface (shoulder) of an abatement worker prior to going home for the day	78,100 structures/cm ²
3-03	From the surface (shoulder) of an abatement worker upon arrival for work	No Asbestos Detected
3-04	Driver's seat of abatement contractor box truck	156,000 structures/cm ²
3-05	From the surface (shoulder) of abatement contractor supervisor upon arrival for work	No Asbestos Detected
3-06	From the surface of "clean room" decontamination chamber	940,000 structures/cm ²

Sample Identification	Sample Location	Sample Results
3-07	From the surface (shoulder) of contractor supervisor prior to going home for the day	7,810 structures/cm ²
3-08	From the surface of floor in adjacent room to work area (background)	No Asbestos Detected
3-09	Driver's seat of a abatement worker car (personal)	391,000 structures/cm ²
3-10	Ceramic tile floor leading up to work area entrance of a floor tile abatement project	260,000 structures/cm ²
3-11	From equipment (box fan) situated outside of containment	781,000 structures/cm ²
3-12	Floor area inside the containment after floor tile was removed	1,880 structures/cm ²

Sample Identification	Sample Location	Sample Results
3-13	From the surface (shoulder) of an abatement worker upon arrival for work	No Asbestos Detected
3-14	Driver's seat of a abatement worker car (personal)	940 structures/cm ²
3-15	From the surface (shoulder) of an abatement worker prior to going home for the day	1,950 structures/cm ²
3-16	From the surface of floor in adjacent room to work area (background)	No Asbestos Detected
3-17	From the surface (shoulder) of consultant—at office following oversight	977 structures/cm ²
3-18	From the surface (shoulder) of consultant—at office following oversight	No Asbestos Detected