UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

DATE: December 3, 2001

SUBJECT: **WORD TRADE CENTER ASBESTOS**

TO: Lillian Bagus, Chief, Waste Identification Branch
HWID, Office of Solid Waste, US EPA

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Office of Solid Waste, US EPA

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This memorandum will bring you up to date on the World Trade Center asbestos situation and my efforts supplying information. The following topics are addressed:

1. HISTORY, including recent official EPA statements compared to EPA's established scientific policies and regulatory precedents on asbestos.

2. NEED FOR SAFE CLEANUP METHODS to protect citizens by utilizing the strict, science-based EPA national standards for asbestos cleanup and abatement.

HISTORY

9/11/01 - World Trade Center (WTC) towers collapse

On September 11, 2001, the World Trade Center (WTC) towers collapsed after the impact of heavily fuel laden passenger jets. The implosion pulverized asbestos to ultra-fine particles, spreading them over a large area in lower Manhattan.

The WTC was built from 1968 to 1972. A slurry mixture of asbestos and cement was sprayed on as fireproofing. This practice was halted in 1971 because of legislation. Some, but not all of the asbestos was removed in a later abatement program.

9/13/01 - EPA Administrator claims no apparent asbestos hazard

In a 9/13/01 press release, Governor Whitman, the EPA Administrator, announces no hazard, with incomplete knowledge:

> "EPA is greatly relieved to have learned that there appears to be no significant levels of asbestos dust in the air in New York City. . .
> "Public health concerns about asbestos contamination are primarily related to long-term exposures. Short-ter, low-level exposure of the type that might have been produced by the collapse of the World Trade Center buildings is unlikely to cause significant health effects."
> (www.epa.gov/epahome/newsroom.htm)

9/14/01 - EPA finds asbestos over 1% at Ground Zero

9/14/01 - Press article quotes EPA that some dust levels were over 1% asbestos, but only at Ground Zero. (9/14/01, Asbestos Alert, Newsweek, www.msnbc.com, also posted at www.nycosh.org/linktopics/WTC-catastrophe.html)

9/18/01 and 9/21/01 - EPA Administrator reiterates no asbestos hazard

Governor Whitman states in a 9/18/01 press release:

> "We are very encouraged that the results from our monitoring of air quality and drinking water conditions in both New York and near the Pentagon show that the public in these areas is not being exposed to excessive levels of asbestos or other harmful substances . . . I am glad to reassure the people of New York and Washington, D.C. that their air is safe to breathe and their water is safe to drink".
> (www.epa.gov/epahome/newsroom.htm)

In a 9/21/01 press release, Governor Whitman states:

> "EPA has been very aggressive in monitoring for potential environmental problems in the aftermath of the World Trade Center attack, and I am very pleased by what we've discovered. New Yorkers and New Jersians need not be concerned about environmental issues as they return to their homes and workplaces."
> "Only seven samples taken at or near ground zero have had marginally higher levels of asbestos that exceed EPA's level of concern for long-term exposure."
> (www.epa.gov/epahome/newsroom.htm)

10/3/01 - EPA Administrator claims no hazard, despite concurrent release of data showing 1% or over asbestos 5 to 7 blocks from Ground Zero

Governor Whitman's 10/3/01 press release states

> ". . . no evidence of any significant public health hazard to residents, visitors or workers beyond the immediate World Trade Center area." (www.epa.gov/epahome/newsroom.htm)

This same press release states that available EPA data now shows that 48 of 177 bulk dust and debris samples showed asbestos over 1 %. These locations were up to 5 to 7 blocks from Ground Zero. The press release made no comment on the significance of these findings. (www.epa.gov/enviro/nyc/bulkdust/)

The action level under the Clean Air Act (CAA) for asbestos is 1% in surface dusts, debris, and other materials. The CAA regulations for asbestos are under the National Emission Standards for Hazardous Air Pollutants (NESHAP).

The hazard and the regulations are tied to the concentrations in the dusts and other materials themselves,, not in the air, because it is what you do with the dust/material that determines the exposure levels. If the dust is stirred up during an uncontrolled cleanup operation indoors, it will generate higher airborne asbestos levels. That is why the asbestos NESHAP does not give any safe air concentrations in the standard itself, only concentrations in the surface dust itself. These national standards are science-based, peer reviewed, and have been subjected to and withstood numerous court challenges.

EPA took its airborne asbestos readings outdoors where the air is diluted. Thus, EPA's outdoor air readings are irrelevant in determining whether there are any hazards inside during a cleanup or other normal activities.

It was contrary to the legally-binding applicable CAA NESHAP standards for Governor Whitman to claim that there was no significant health hazard beyond the immediate vicinity of Ground Zero, because she had data at this time showing asbestos in surface dusts at 1% or more beyond Ground Zero.

10/3/01 - Study by HP Environmental uses more sensitive test methods, finds higher asbestos than EPA, and smaller particle sizes

Press articles report on new study by HP Environmental, which used a more sensitive test method than EPA. The EPA method could only detect asbestos particles greater than 0.5 microns in size, a size which is less hazardous. HP Environmental also found uniquely elevated concentrations of very small-sized asbestos particles, more easily aerosolized, "an asbestos fiber size distribution not previously encountered".

As an example, when HP Environmental tested air in two buildings that were up to 3 blocks from Ground Zero, only 2 of 11 samples showed asbestos above the limit using the EPA method, but

the more sensitive method by HP Environmental showed 7 of 11 samples had hazardous levels.

The complete study was posted on the American Industrial Hygiene Association (AIHA) website for a total of 5 hours on 9/3/01 before it was removed. The AIHA has not admitted its removal was motivated by the fact that it conflicted with Governor Whitman's press release of the same day claiming no hazardous exposures to asbestos except at Ground Zero.

HP Environmental is in Herndon, VA, Dr. Granger, lead investigator. It also performed the asbestos studies when the Trade Towers were bombed in 1993, and many other asbestos studies for the government. The complete study will soon be posted at www.nycosh.org/linktopics/WTC-catastrophe.html, www.nyenvirolaw.org and other sites. Press articles may be found by using the following search string: <<asbestos world trade "HP Environmental">>.

10/12/01 - Ground Zero Elected Officials Task Force commissioned study shows hazardous asbestos levels in apartments

The Ground Zero Elected Officials Task Force includes U.S. Congress members, NY State Assembly and Senate members, and New York City Council members and other officials representing citizens affected by the Trade Tower collapse. They commissioned a study by Chatfield Technical Consulting Ltd. and Environmental Quality Management, Inc. (Posted at www.nycosh.org/linktopics/WTC-catastrophe.html)

The air inside and surface dusts in and around two apartment buildings were tested. A "low exposure building" (45 Warren St.) was 4 blocks from the World Trade Center had all the windows intact. A dust layer was present inside the closed apartments, even though the windows had been closed. A "high exposure" building close to Ground Zero (250 South End Ave) had several windows broken by the blast. The following are some of the results, along with the concentrations that EPA found in surface dust and air near these two buildings:

LOW EXPOSURE BUILDING ASBESTOS LEVELS:
highest inside airborne asbestos - 316 structures/square mm
dust on roof outside building - 1.05%
EPA dust level, Warren & W. Bdwy - none detected
EPA dust level, Chambers & W. Bdwy - none detected
EPA air levels, Church & Duane, none detected to
59.4 structures/sq. mm.

HIGH EXPOSURE BUILDING ASBESTOS LEVELS:
highest inside airborne asbestos - 10620 structures/sq. mm
dust, exterior window ledge - 2.25%
dust, ground level courtyard, top of wall - 2.05%
EPA dust level, Albany & West - 3%
EPA dust level, 225 Rector - 1.3%
EPA air levels, Albany & West - none detected to
296.3 structures/sq. mm

The airborne levels can be compared to the standard used to determine whether children may re-enter a school building after asbestos has been removed or abated under the Asbestos Hazard Emergency Response Act (AHERA). This standard is 70 or fewer structures asbestos per square millimeter, which is a test using a specific type of filter through which a certain amount of air is drawn. The low exposure building exceeded this standard by 4.5 times at one location.

The high exposure building exceeded this standard 152 times at one location. The study noted that these levels could be many times higher when normal activities in the apartments resumed, or during cleanup operations, as the dusts became stirred up.

The concentration of asbestos in the surface dusts outside the low exposure building were only 1.05% in this study. One percent is the level which triggers the rigorous cleanup standards under the CAA asbestos NESHAP. However, the airborne levels inside the building exceeded the AHERA level several times. Thus, even lower concentrations than 1% in the surface dusts could still be generating airborne levels exceeding the AHERA standard. Alternatively, dusts outside may have become diluted over time by mixing with other dusts and wind dispersal, while inside the building the dusts were more concentrated. (The study did not provide concentrations in the dust itself inside the buildings.)

11/1/01 - EPA Acting Deputy Regional Administrator claims no hazard, recommends unsafe cleanup methods

Ms. Kathleen Callahan, Acting Deputy Regional Administrator, EPA Region 2 in New York City, addressed the New York City Council Environmental Protection Committee on 11/1/01. She stated:

> "[T]he vast majority of our tests find levels of these contaminants that pose no significant long-term health risks to residents, business employees and visitors beyond ground zero. And despite recent press accounts which suggest otherwise, these findings have not changed."
> (www.epa.gov/region2/news/speeches/011101k.htm)

She did admit to asbestos levels at 1% or more in areas outside of Ground Zero in this speech. However, she was silent about the fact that this level is the science-based level found to be hazardous under the CAA, triggering the rigorous, safe cleanup methods of the asbestos NESHAP.

Ms. Callahan also recommended in her speech that people returning to dusty homes and businesses follow the recommendations of the New York City Department of Health (NYC DOH). (www.ci.nyc.ny.us/html/doh/html/alerts/wtc3.html)
The EPA website set up earlier on about 10/3/01 also refers residents to the extremely lenient, unsafe cleanup methods of the NYC DOH. (See EPA pages giving the actual asbestos concentrations that are linked to the map at www.epa.gov/enviro/nyc/bulkdust/)

Ms. Callahan also neglected to mention that the lenient NYC DOH guidelines she recommended contradict her own Region's recommendations. The EPA Region 2 web page

refers homeowners to the national guidance. This national guidance for private homeowners of single-family dwelling states:

> "Levels in Homes: Elevated levels can occur in homes where asbestos-containing materials are damaged or disturbed. . .
> Use trained and qualified contractors for control measures that may disturb asbestos and for cleanup. .
> When you need to remove or clean up asbestos, use a professionally trained contractor."
> (Region 2 page at www.epa.gov/region02/air/asbestos.htm, links to this national guidance at links to www.epa.gov/iaq/asbestos.html)

11/20/01 - EPA Region 2 Counsel claims CAA standards not applicable to disasters

Walter Mugdan, Regional Counsel for EPA Region 2 is quoted as claiming the following:

> "She [Jenkins] assumes that they [the CAA NESHAP regulations] apply to the cleaning up of dust in residential or office buildings in lower Manhattan. . .
> When they were written, they were never intended to apply to something like a terrorist act. These regulations apply to owners and operators of a facility who are carrying out a demolition or renovation. They were never contemplated to apply to someone cleaning an apartment . . . were never intended to apply to something like a terrorist act."
> (Feds, City Ignore Asbestos Cleanup Rules, Says EPA Vet, 11/20/01 NY Daily News, www.nydailynews.com, also posted at www.nycosh.org/linktopics/WTC-catastrophe.html)

This is false. In 1989, after the asbestos hazards created by the explosion of a steam pipe in Gramercy Park, NY, Hurricane Hugo, and the San Francisco earthquake, EPA issued its Guidelines for Catastrophic Emergency Situations Involving Asbestos. This document explicitly states that it was in response to these three specific disasters. The following quotation is relevant:

> "The applicability of the asbestos NESHAP is not altered as the result of a disaster. With a few exceptions for emergency renovations and government-ordered demolitions, all of the NESHAP requirements are applicable in emergency situations. . . Communications are needed between the asbestos NESHAP coordination and the other emergency response agencies and related agencies. The first step is for the Regional asbestos Neshap coordinator to discuss this matter with Regional FEMA personel . . ."
> (Available on the internet at www.epa.gov/ncepihom/nepishom)

The three asbestos disasters, Gramercy Park, Hugo, and the San Francisco earthquake are comparable on a legal standpoint to the 9/11/01 act of terrorism. These disasters were not related to the intentional demolition or renovation of a building.

Say that, for the sake of argument, that the CAA standards do not apply to the World Trade Center disaster. The question is, what other standards would apply? Is there any reason to afford citizens less protection? We are not in an emergency situation. There is no justification for any lesser degree of protection.

11/26/01- Claim that EPA has no authority over private home asbestos cleanups, and that a hose would be required if it were performed according to the NESHAP standard

On 11/26/01, Ms. Callahan of EPA Region 2 provided testimony to the joint New York State Assembly Committees on Environmental Conservation, Health, and Labor. She is quoted as claiming that the EPA had no authority to clean up residences and business using the science-based NESHAP standards under the CAA.

However, Ms. Callahan failed to provide testimony that EPA is taking action in another part of the country to remove asbestos contamination from private homes. Private homes in Libby, Montana were contaminated inside as the result of adjacent mining activities. She neglected to mention that EPA is utilizing the Superfund statute, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as its authority to perform the cleanup in Libby, which will adhere to the stringent science-based standards in the CAA NESHAP standards.

Of interest may be the fact that Governor Whitman visited Libby, Montana on 9/7/01 to familiarize herself with the situation and the planned cleanup of private homes. It is not as though the Libby, Montana cleanup was unknown to high EPA officials. (See Q/A pages at the EPA Libby website at www.epa.gov/region8/superfund/libby/lbbyfaq.html)

In fact, EPA does not even have to designate homes, businesses and schools as Superfund sites by putting them on the National Priorities List before it has the authority to clean them up at public expense. All that is required is to declare a public health emergency.

EPA has exercised its authority to come into private homes for cleanup of hazardous substances on numerous occasions. For example, in 1997, when the banned pesticide methyl parathion had been used illegally, EPA cleaned up homes at no cost to homeowners. (http://es.epa.gov/oeca/osre/970801.html) Most people recollect the rigorous remedial action taken by EPA in the case of Times Beach, where some homes were merely cleaned up, and some were condemned as uninhabitable by EPA. Years ago, I was in an advisory status for a Superfund site in the northwest where EPA cleaned up homes contaminated inside by the overland flow of water from a wood preserving site.

Ms. Callahan is also quoted as testifying that if EPA were to conduct a cleanup inside buildings in lower Manhattan, then they would have to use hoses to wet the area down in order to follow the CAA NESHAP standards. This is false. There are many safe cleanup methods for asbestos

besides the use of large volumes of water. Proposed methods not specified in the asbestos NESHAP are routinely approved by the EPA regions through the variance process, which is initiated when the responsible party notifies EPA of the intent to commence a cleanup.

NEED FOR A SAFE CLEANUP TO PROTECT CITIZENS NOW AND LATER

Students and others unaware of exposures due to official claims of "no hazard"

Because of EPA's official pronouncements that there is no asbestos hazard except right at Ground Zero, the following types of activities are taking place:

On Thanksgiving Day, National Public Radio's Linda Wertheimer interviewed a group of 90 college students taking part in the "World Changers Thanksgiving Dust-Out" in New York City, part of the Southern Baptist Convention. This news broadcast may be found at www.npr.org/archives.

The students were cleaning out evacuated apartments in the Gateway Complex near the World Trade Center from Thursday to Saturday. The windows had been blown out of the apartment, which faced Ground Zero. Dust was 3 inches thick inside the apartment with the students. The students were only wearing dust masks, not approved and grossly inadequate to filter out the ultra-fine hazardous asbestos particles.

Many of us tried to get action to get the young people out, but we failed due to the inaccessibility of officials over the holiday weekend and the failure to act by other officials.

Inadequate respiratory protection in violation of NESHAP standard recommended by NYC DOH

Simple dust masks were recommended by the New York City Department of Health (NYC DOH) for cleaning up homes and businesses. (www.ci.nyc.ny.us/html/doh/html/alerts/wtc3.html.) However, this recommendation violates the NESHAP standards. As part of the standards, EPA published its recommendations for the proper use of respirators during any asbestos cleanup or abatement. These science-based recommendations were challenged in court by industries wanting more lenient standards, but remained intact. Only certain types of HEPA respirators are approved. Dust masks of any type are not approved, and deemed inadequate based on scientific studies. (EPA Publication No. 560-OPTS-86-001, A Guide to Respiratory Protection for the Asbestos Abatement Industry, not available on the internet as yet, but ordering information at no charge available at www.epa.gov/ncepihom.)

Unsafe cleanup methods recommended by NYC DOH, in violation of NESHAP

The NYC DOH recommendations state that you don't even need to wear these inadequate dust masks to clean out residences and businesses if you just follow the cleanup methods in the recommendations. What are these NYC DOH cleanup methods that obviate even the need for a dusk mask, much less any other type of respiratory protection? They state that if curtains are

dusty, you only need to lower them to the ground slowly to avoid exposures. They state that although a HEPA room air purifier is preferable, any type of air purifier could be used, with no specification as to the quantity of air that it can handle. Using a common room air conditioner to recirculate the air is recommended with changing the filter frequently, even though these filters cannot even begin to capture the dangerous ultra-fine asbestos particles.

There are many other problems with the NYC DOH cleanup methods. My concerns over the lenient NYC DOH recommendations for cleaning up asbestos were detailed in my 10/16/01 memorandum to Arts, Crafts, and Theater Safety in NYC. (posted at www.nyenvirolaw.org and soon at www.nycosh.org/linktopics/WTC-catastrophe.html)

Unsubstantiated EPA claim that exposures are only short term, and that short term exposures not dangerous

Governor Whitman and Ms. Callahan of EPA's Region 2 claimed that there would be no health hazards from only short-term high level exposures to asbestos in their many press releases and speeches, above. However, unless the asbestos is cleaned up according to the methods specified in the CAA regulations, there will in fact be those sustained hazardous long-term exposures over a lifetime for citizens living in lower Manhattan.

Consider this as well: We do not know what the health effects are for inhaling the type of asbestos found from the WTC at high concentrations for a short period of time. Since the ultra-fine asbestos particles lodge in the lung and are not eliminated, the effects could be the same. The asbestos is highly unusual in that it has been pulverized into ultra-fine particles. See earlier discussion of the HP Environmental study.

EPA has determined that even high asbestos exposures of relatively short duration are harmful through its regulatory and advisory system. The EPA recommendations for cleaning up private residences by homeowners require the use of qualified trained contractors (www.epa.gov/iaq/asbestos.html, discussed earlier). In making these recommendations, EPA would have assumed that the homeowner would not otherwise be constantly engaged in high asbestos exposure home renovations. Even with making this assumption, EPA still found it necessary to prevent exposures during these highly infrequent occasions of home asbestos removal and cleanup, requiring the use of trained qualified professionals.

Failure to acknowledge EPA determination that asbestos below 1% could be hazardous

The EPA has officially stated that asbestos levels LOWER than 1% could present health hazards :

> "Levels at 1% or less may be safe. Even higher levels could be considered safe at remote locations where no one comes in contact with the material. The key to determining whether there is a risk is exposure. If there is no exposure pathway i.e., a way for the asbestos to get into your body, such as contact with the material, or people driving over the material so that they breathe in the fibers, there is no

> risk. Levels of 1% or less could present a risk where there is enough activity to stir up soil and cause asbestos fibers to become airborne."
> (www.epa.gov/region8/superfund/libby/qsafe.html)

At no time have either Governor Whitman or Ms. Callahan acknowledged that the 1% level presented a hazard, much less levels below 1%.

The Ground Zero Task Force study confirms that asbestos concentrations at less than 1% in surface dusts can lead to airborne concentrations over established limits (see above).

CONCLUSIONS

The cleanup of all affected homes in lower Manhattan should be performed by EPA or other governmental bodies at public expense, utilizing the methods in the NESHAP or as proposed by certified asbestos abatement experts and approved by EPA regional NESHAP coordinators as meeting all CAA requirements. The criteria for areas receiving such cleanups should include an adequate margin of safety, possibly relating to distance zones around contaminated areas over 0.1% asbestos or even lower.

This memorandum represents my best professional judgement. Any conclusions or opinions do not necessarily reflect the many different, conflicting, contradictory official positions taken by EPA in this matter.

cc: To Whom it May Concern

REGION 1's BENCHMARK FOR SETTLED ASBESTOS DUST

EPA Region 1 derived a benchmark, or a safe level, for asbestos in settled dust in order to justify asbestos levels found in the Brookfield, Connecticut school system.[24] A level of 45,000 structures asbestos per square centimeters (s/cm^2) was derived as the benchmark. This is remarkably high considering the universally accepted level of 1000 s/cm^2 as low. (See Table 2.)

As discussed later, the Brookfield School System has roundly rejected EPA Region 1's unsafe level of 45,000 s/cm^2 asbestos dust, and has instead chosen a tentative cleanup level of 5000 s/cm^2 for the schools to be occupied by its children.

Description of Region 2's risk assessment for settled asbestos dust: Use of a "K-factor" to back-calculate dust levels from background air levels

EPA Region 1 calculated its benchmark by first assigning a level for background ambient outside air. Then, it used a study[25] which found different ratios between the amount of dust on surfaces with the amount of asbestos in the air, depending on the activities going on in a room that would stir up dusts. The ratios of dust levels to air levels are called "K-factors."

For its calculations, Region 1 assigned a false value of 0.045 structures per milliliter (s/mL) as the supposed background ambient outside air level. Then, then chose an incorrect K-factor of 0.000001 (which is the same as 10^{-6} if expressed as an exponential) as the ratio between air levels and dusts. The result was 45,000 structures per square centimeter (s/cm^2) dust on surfaces, using the following formula.

Benchmark for asbestos in Dust, structures per square	x	K-Factor	[K-Factor expressed as exponential	=	Air Level, structures per milliliter (s/mL)
45,000	x	**0.000001**	**[10 (-6)]**	=	**0.045**
This is the level derived from the formula by Region 1		This is the K-factor, or multiplier, chosen by Region 1			This is the alleged background outdoor air level put into the formula by Region 1. This value is the one highest outlier measurement found in an early 1983 study.

Region 1's Technical Appendix for the Brookfield School System[26] states the following:

> The results ... of the fifty-one (51) Method D5755-95 samples were compared to the benchmark chosen by EPA based on the asbestos fiber levels found in ambient (outside) air measured by Transmission Electron Microscopy (TEM), within the range 0.01 - 0.045 fibers/structures per cubic centimeter (f/cc) *[this is the same as structures per milliliter, or s/mL]*... In order to compare the benchmark levels from cubic centimeter(cc) to settled dust levels in square centimeter (cm2) and allowing for the aerodynamic properties of these fibers, a K-factor must be applied. After the application of the appropriate K-factor we calculated a benchmark of 45,000 structures per square centimeter (s/cm2).
>
> ...
>
> EPA established benchmark levels of ambient (outside) air measured by Transmission Electron Microscopy (TEM) within the range 0.01 - 0.045 fibers/structures per cubic centimeter (f/cc)
>
> ...
>
> More recent studies in which asbestos air and surface dust levels were measured by TEM have been used to calculate additional K-factors. Based on these controlled studies for reentrainment of settled fibers into air, the K-factor of 10-6 [ten to the minus six, or 0.000001] was used. As shown in Section 7.0, the 0.045 f/cc corresponds to 45,000 s/cm2 after the application of the K-factor.

The problems with Region 1's risk assessment are discussed below:

Region 1 misrepresentation of background air levels and safety levels

Region 1 knowing used a false value for the average or background level of asbestos in "ambient" outside air for its risk assessment. The level of 0.045 s/mL came from the one, outlying highest level found in an early 1983 study of outside air.[27] There was actually a wide range of values, most of which showed no detectable asbestos whatsoever. This one high value of 0.045 s/mL was an outlier, the highest recorded. It could well have been measured near an asbestos mine or processing facility, or near a natural rock outcropping of an asbestos mineral deposit.

It is unconscionable for Region 1 to have used the 0.045 s/mL highest outlier value from the study. At a minimum, it should have used the mean (average) for all of the measurements, most of which showed no asbestos at all.

Since 1983, however, much more definitive studies with increased sensitivity have become available for background air levels. Region 1 should have used the peer reviewed level for ambient outside air from these more recent studies established by the Agency for Toxic Substances and Disease Registry (ATSDR) of the Centers for Disease Control (CDC). The ATSDR is an authoritative source for this information for EPA, and is funded through EPA statutes to develop this information in a Toxicological Profile for Asbestos.[28] The early 1983 study used by Region 1 was not even mentioned by the ATSDR.

ATSDR's findings are given in Table 3, along with asbestos levels found in buildings with and without asbestos contamination problems. The level for rural areas is 0.00001 s/mL, and urban air is 0.0001 s/mL.[29] (These levels would be the equivalent of 0.0000002 PCM f/mL and 0.000002 PCM f/mL.) Compare 0.00001 s/mL and 0.0001 s/mL with the level of 0.045 s/mL used by Region 1 for the Brookfield schools!

This 0.045 s/mL level is not a safe level, much less a background level. It is even higher than EPA found for air inside of 41 schools where there was an asbestos contamination problem (0.03 s/mL). It is also more than 2 times higher than the AHERA TEM air clearance test level of 70 structures/square millimeter (which is the same as 0.02 s/mL, or about 0.01 f/mL-PCM), which itself is not a safety level.[30] See Appendix B of this memorandum for the cancer risks associated with different air asbestos levels.

Region 1 also falsely claimed that 0.01 to 0.045 s/mL asbestos in air is the EPA benchmark for ambient air.[31] The fact is, EPA has no benchmark or ambient air standard for asbestos. This is made clear in EPA statutes, regulations, and publications.[32] As stated earlier, EPA does not consider any exposure level to asbestos to be safe. The only benchmark is zero asbestos levels, zero exposure.

Region 1 chose an inapplicable K-factor to justify a higher dust level

Region 1 needed to do more than use an incorrect value for background air in order to make its risk level for settled dust high enough to cover existing contamination levels in the Brookfield School System. To do this, Region 1 also intentionally chose an inappropriate, low K-factor for its calculations. The study used by Region 1 for K-factors had data for 6 different controlled, real world situations. See the endnotes/references for a table of all the K-factors from this study.[33] Region 1 chose the K-factor at the 10^{-6} level (0.000001) associated with cleaning a storage area and cleaning a carpet with a conventional vacuum cleaner. However, there were two activities which were much more likely to be associated with a school, namely gymnastic activities and cleaning with a broom, where the K-factor was at the 10^{-5} level (0.00001). Region 1 chose to ignore this more applicable K-factor, because it would have resulted in a dust benchmark 10 times lower! See Table 4.

Because of the uncertainty of the data in the K-factor study, Region 1 also should have allowed for a large margin of error, or should at least have used the average for all six K-factors. If it had used the average of the six, then the K-factor would have been 10^{-4}, or 0.000001. This would make dust benchmark 100 times lower! See Table 4.

Table 3. ATSDR AIR LEVEL FINDINGS COMPARED TO LEVEL CHOSEN BY REGION 1

Background ambient air levels are from studies determined to be the most credible by the ATSDR[34]

	Concentration in TEM structures per milliliter (s/mL). This includes all asbestos fibers and bundles of fibers, and so is higher than "PCM" fibers.		Equivalent concentration in PCM fibers per milliliter (PCM f/mL). PCM fibers are only those single fibers which are longer than 5 micrometers with a certain aspect ratio.	
		expressed as exponential		expressed as exponential
ATSDR finding: outside air, rural, no known source of asbestos contamination nearby	0.00001	(1×10^{-5})	0.0000002	(2×10^{-7})
ATSDR finding: outside air, urban, no know source of asbestos contamination nearby	0.0001	(1×10^{-4})	0.000002	(2×10^{-6})
ATSDR finding: 1988 EPA survey of 94 public buildings containing asbestos materials, mean concentration	0.006	(6×10^{-3})	0.0001	(1×10^{-4})
ATSDR finding: 1988 EPA survey of 41 schools containing asbestos materials, mean concentration	0.03	(3×10^{-2})	0.005	(5×10^{-4})
AHERA TEM clearance test level, the "70 structures per square centimeter" level, converted to s/mL and PCM equivalent f/mL. This is an unsafe level for long term exposures.[35]	0.02	(2×10^{-2})	0.01 approximately	(1×10^{-2})
Region 1 level for background outside air, used for risk assessment	0.045	(4.5×10^{-2})	unknown	

Region 1 failed to use real-world background dust levels

There was no reason for Region 1 to have gone through any calculation process to project background dust levels from air levels. Typical background dust levels are well established, just like typical air levels.

Region 1 chose to ignore the fact that the same reference[36] they used for K-factors also contained real world data for typical dust levels, which are widely recognized by industrial hygienists and other asbestos abatement specialists. See Table 2 for typical dust levels for buildings with or without asbestos contamination problems. Compare 200 s/cm^2, a real world background level for buildings that do not contain asbestos materials, with Region 1's calculated level of 45,000 s/cm^2.

Even if Region 1 did not want to use this published data on typical dust levels, it had it own data, developed during the testing of the Brookfield schools, that showed that clean surfaces and clean schools had much, much lower background dust levels.

Re-calculation of Region 1 dust benchmark with more appropriate values

Table 4 gives re-calculated values for dust benchmarks using more appropriate, accurate, and defensible values for ambient background air and K-factors. A range of different calculations is given, showing the effect of substituting several different values. In all cases, the result is a much lower dust benchmark than the one contrived by Region 1.

Brookfield School System and community rejection of EPA Region 1 benchmark of 45,000 s/cm^2 for dust

The Brookfield School System in Connecticut and the community has rejected EPA Region 1's benchmark for dust of 45,000 s/cm^2 as not being well founded or protective. It has been tentatively decided that a level of 5000 s/cm^2 is the cleanup goal.[37] Because data clearly demonstrate that a cleaned surface, even in an asbestos-contaminated building, will only have 86 to 320 s/cm^2 asbestos (see Table 2) there is no reason why the cleanup standard should not be much lower.

As a brief history of the problem, recently teachers at the Huckleberry Hill elementary school in Brookfield, Connecticut were concerned with an asbestos abatement in the year 2000 where the Region 1 benchmark of 45,000 s/cm^2 was the standard. The teachers hired an independent industrial hygienist. Side-by-side testing was performed with the school system's testing consultant. High levels of asbestos were found by the ASTM 5755 microvacuum method in two carpets (over 462,240 and 329,560 s/cm^2) as well as on top of a fire alarm box (over 3 million s/cm^2) and on bare floors in another corridor (around 150,000 s/cm^2).[38]

The students were to be transferred to a middle school to finish the year, but this school was tested and also found to have high asbestos dust levels, and failed the AHERA air test. At another school, asbestos was found in surface dusts at concentrations as high as 14 million s/cm^2. The whole school system was then shut down for the rest of the school year for further testing and inspection.[39]

Table 4. RE-CALCULATION OF REGION 1 DUST BENCHMARKS USING MORE VALID VALUES

FORMULA USED BY REGION 1:

Benchmark for asbestos in Dust (s/cm2)	x	K-Factor	(K-Factor expressed as an exponential)	=	Air Level, structures per milliliter (s/mL)
45,000	x	0.000001	(10^{-6})	=	0.045
This is the level derived from the formula by Region 1		This is the K-factor chosen by Region 1 for their calculations, from the 2 highest ones from a total of six K-factors. A higher K-factor results in a calculation of a higher, less protective dust level. The two K-factors with 10(-6) values were for a person cleaning out a storage room and for a person vacuum cleaning.			This is the alleged background outdoor air level put into the formula by Region 1. This value is the one highest measurement found in an early 1983 study. For most of the measurements, asbestos was not even detectable.
1,000	x	0.00001	(10^{-5})	=	0.01
Dust level if detection limit of the early 1983 study is used, and K-factors more applicable to a school are used.		This is the K-factor more applicable to a school, representing gym activities and a person sweeping floors with a broom			This is the detection limit of the study cited. Most of the actual measure air levels were below this detection limit
100	x	0.000001	(10^{-6})	=	0.0001
Dust level if air concentration is urban level cited by the CDC's ATSDR, but still using the inappropriate K-factor.		This is STILL the inappropriate K-factor chosen by Region 1 for their calculations			Outside ambient air level, urban areas, found credible by the CDC's ATSDR
10	x	0.000001	(10^{-6})	=	0.00001
Dust level if air concentration is rural level cited by the CDC's ATSDR, but still using the inappropriate K-factor.		This is STILL the K-factor chosen by Region 1 for their calculations			Outside ambient air level, rural areas, found credible by the CDC's ATSDR
10	x	0.00001	(10^{-5})	=	0.0001
Dust level if K-factors more relevant to school used, and ATSDR value for urban outdoor air used.		This is the K-factor more applicable to a school, representing gym activities and a person sweeping floors with a broom			Outside ambient air level, urban air, found by the CDC's ATSDR
1	x	0.00001	(10^{-5})	=	0.00001
Dust level if K-factors more relevant to school used, and ATSDR value for rural outdoor air used.		This is the K-factor more applicable to a school, representing gym activities and a person sweeping floors with a broom			Outside ambient air level, rural areas, found by the CDC's ATSDR
1	x	0.0001	(10^{-4})	=	0.0001
Dust level if average of the six K-factors used, and ATSDR value for urban outdoor air used.		Average of six different K-factors in study, allowing for a safety margin of error			Outside ambient air level, urban air, found by the CDC's ATSDR
0.1	x	0.0001	(10^{-4})	=	0.00001
Dust level if average of the six K-factors used, and ATSDR value for rural outdoor air used.		Average of six different K-factors in study, allowing for a safety margin of error			Outside ambient air level, urban areas, found by the CDC's ATSDR

EPA REGION 2 BENCHMARK OF 1% ASBESTOS IN WTC DUST

Unfortunately, the different EPA regions are autonomous in many ways, and are free to set health standards to meet the needs of individual situations. There is no oversight or control by the experts in EPA's Headquarters or other centers of technical excellence, such as EPA's Office of Research and Development satellite campuses in Cincinnati and Research Triangle Park. Thus, the unilateral setting of an incorrect health standard in direct conflict with EPA regulations, statutes, and precedents by perhaps one lone toxicologist at an isolated regional office is not uncommon.

The preceding section described Region 1's actions in the case of the Brookfield School System, setting an asbestos dust benchmark of 45,000 s/cm^2. This section will describe what Region 2 did in setting a completely different, but also false, unsupported health standard for asbestos dust after the collapse of the World Trade Center (WTC). The Region 2 asbestos dust benchmark is 1%. The NYC Department of Environmental Protection (NYC DEP) also decided to set their benchmark at 1% asbestos. It is obvious that the Region 1 and Region 2 benchmarks are quite different from each other. This fact alone demonstrates that there is no consistency between health standards set by the different EPA regions.

The following statements are made at the EPA web site relating to the WTC disaster.[40] Region 2 clearly states that 1% is the "level of concern for health."

> If a substance contains 1% or more asbestos, it is considered to be an "asbestos-containing material." EPA is using the 1% definition in evaluating dust samples from in and around ground zero and other areas potentially impacted by the World Trade Center collapse. The majority of areas in which EPA has found levels of asbestos in dust above 1% are in the vicinity of the World Trade Center work zone. Daily summaries of this data and how it compares to the level of concern for health are also available. *[emphasis added]*
>
> In Dust. If a substance contains 1% or more asbestos, it is considered to be an "asbestos-containing material." There are federal regulations in place to ensure the proper handling and disposal of asbestos-containing material. If a substance contains less than 1% asbestos, these regulations do not apply.
>
> EPA is using the 1% definition in evaluating dust samples from in and around ground zero. The vast majority of the samples taken to date have levels of asbestos below 1%. In fact, in an urban environment like New York City, we can expect the presence of a low level of asbestos under normal circumstances (these low everyday levels are called "background levels").

Counsel for Region 2 supported the choice of this benchmark by claiming that only asbestos over 1% was "significant":[41]

> One of the first decisions that EPA had to make when sampling for asbestos in the dust from the WTC collapse was what reference value to use when reporting the data – in other words, at what concentration of asbestos in the bulk dust samples would the Agency characterize the dust as containing asbestos in quantities of significance? EPA elected to use the definition of ACM [asbestos containing material] from the NESHAPs regulations – *i.e.*, the 1% asbestos content standard.

The NYC DEP also claimed that only 1% or higher asbestos inside of buildings was regulated.[42] The following is an excerpt from a notice to building owners in Lower Manhattan:

> If a substance contains more than 1% asbestos, it is considered to be an "asbestos-containing material." There are Federal, State, and City regulations in place to ensure the proper handling and disposal of asbestos-containing material. If a substance contains 1% of less asbestos, these regulations do not apply.
>
> EPA is using the 1% definition in evaluating exterior dust samples in the Lower Manhattan area near the World Trade Center. All affected landlords have been instructed to test dust samples within their buildings utilizing this standard.

Region 2 cafeteria-style derivation of 1% asbestos dust standard from out-of-context NESHAP regulations

Region 2 derived the 1% standard for dust by selecting a non-applicable part of the Clean Air Act asbestos National Emission Standards for Hazardous Air Pollutants (NESHAPs). Region 2 first concluded that the asbestos NESHAP did not apply to the WTC collapse. After that, they went on to conclude that if it did, then the dusts should be regulated just like intact "asbestos containing materials" (ACM) under the NESHAP.[43] ACM is a technical term in the NESHAP regulations that defines ACM as intact building materials themselves made with asbestos. Examples would be asbestos acoustical ceiling tiles, insulation on pipes, asbestos containing floor tiles, and sprayed on asbestos fireproofing.

Since Region 2 said that the NESHAP regulations did not apply, they felt free to take only what supported their position from these regulations. Region 2 ignored the other, much more applicable parts of the asbestos NESHAP. These parts require first removal/encapsulation of any 1% or greater intact "asbestos containing building materials" followed by cleanup of the site and the surrounding soils **to background levels**.[44]

The fallout from the World Trade Center, contaminating the surrounding area, is much more analogous to the NESHAP requirements for soil, debris, and emissions from a demolition site, than it is to specific types of intact asbestos-containing building materials. If Region 2 had drawn the analogy to the soil, debris, and emissions covered by the NESHAP regulations for a demolition site, then their WTC dust benchmark would have been much lower than 1%.

Background levels of asbestos in dusts and soils are much, much lower than 1%.

Even better would be for Region 2 to use the comprehensive authority of the National Contingency Plan (NCP) statutory authority. Then it would have flexible regulations that would apply to the situation, namely a major release of hazardous substances requiring the expertise and resources of the federal government for cleanup. Then Region 2 would have been obligated to look at the true hazards posed by any asbestos, and require cleanup to these levels, not to the unsafe level of 1%.

EPA has established that 1% asbestos is not a safe level

In the NESHAP regulation guidance documents, EPA has made definitive statements that the 1% level for asbestos containing materials is not in any way a safety standard or a health benchmark.[45]

> In April 1973, the US Environmental Protection Agency (EPA) issued the National Emission Standards for Hazardous Air Pollutants (NESHAP) for asbestos (38 FR 8820). The NESHAP regulation governs the removal, demolition and disposal of asbestos containing bulk waste. An asbestos-containing product, as stated by the regulation was defined for the first time to be a product with greater than 1% asbestos, by weight. The intent of the 1% limit was:
>
> ... to ban the use of materials which contain significant quantities of asbestos, but to allow the use of materials which would (1) contain trace amounts of asbestos which occur in numerous natural substances, and (2) include very small quantities of asbestos (less than 1 percent) added to enhance the material's effectiveness. (38 FR 8821).
>
> It most be clearly understood that the EPA NESHAP definition of 1% by weight was not established to be a health-based standard. [*emphasis added*]

Even the legal counsel for EPA Region 2 has stated in writing several months after the WTC collapse (but only after exposing large numbers of people) that the 1% level is not in any way related to safety or health.[46]

> Note that the 1% standard is not necessarily health- or risk-based, but rather keyed to the detection limits of the specified analytical method.

EPA has also made it clear in Superfund guidance that 1% asbestos in soils is not a safe level, if the soils are stirred up and asbestos gets in the air.[47]

Questions and Answers about Asbestos and EPA's Libby Investigation

> Q : I recently read that EPA found less than 1% (or trace levels) asbestos at Fireman's Park and other locations that were sampled. Is that a safe level?
>
> A : This is a very difficult question, and at this time we are not sure. Levels at 1% or less may be

> safe. Even higher levels could be considered safe at remote locations where no one comes in contact with the material. The key to determining whether there is a risk is exposure. If there is no exposure pathway i.e., a way for the asbestos to get into your body, such as contact with the material, or people driving over the material so that they breathe in the fibers, there is no risk. Levels of 1% or less could present a risk where there is enough activity to stir up soil and cause asbestos fibers to become airborne.

A research study found that soils containing as little as 0.001% asbestos can lead to hazardous air concentrations.[48]

> Suitable Action Levels ... Airborne dust clouds were generated from mixtures of soils with different asbestos varieties in bulk concentrations ranging from 1 to 0.001 % asbestos. ... The experiments showed very clearly that even the lowest bulk amphibole asbestos content tested (0.001%) was still capable of producing measurable airborne asbestos concentrations (greater than 0.01 fibers mL^{-1}).

EPA always regulates toxic dusts on interior surfaces by the amount per surface area, not the % in a dust

Region 2 and the NYC DEP benchmark for asbestos dust inside buildings is flawed on its face just because it is based on a percentage, and not on a concentration per surface area. There are no EPA standards for dusts or other solid contaminants inside buildings that are expressed in terms of mass/mass or volume/volume, such as percent or parts per million. Instead, EPA sets safety standards based on the amount of solid toxic material on a given surface area for inside exposures. This is because that is the way exposures occur. Consider the following:

> A child puts her tongue on a certain area of a window sill.
> Which is worse, Example A or B?
> A: The window sill has a layer of dust 1/100 inch thick. The dust is 0.5% lead.
> B: The window sill has a layer of dust 1/10,000 inch thick. The dust is 5% lead.
> Answer: Example A is worse, even though the absolute concentration of the lead in the dust itself is lower. The exposure, or the total amount of lead, is 10 time higher in Example A, even though the concentration of the lead in the dust itself is lower in Example A.
>
> A room is covered with asbestos-contaminated dust. Children come into the room to practice gymnastics. The activity level is enough to stir up all of the dust on the floor causing it to be airborne, whether it is 1/1000 or even 1/10 inch thick.
> Which is worse, Example C or D?
> C: The floor is covered with 1/100 inch of dust containing 0.5% asbestos.
> D: The floor is covered with 1/10,000 inch of dust containing 5% asbestos.
> Answer: Example C is worse, since 10 times as much asbestos will become airborne in Example C compared to Example D, even though the concentration of the asbestos in the dust itself is lower in Example C.

The "surface concentration" is what is important for solid toxics like asbestos inside homes, businesses, and schools. The concentration of the asbestos in the dust itself is less relevant. What is important is the total amount of asbestos on a given surfaces. Although EPA does not have any regulations for the surface concentration of asbestos in interior dusts, it does have

APPENDIX B :
ASBESTOS AIR CONCENTRATIONS AND RISKS

Table B gives the cancer risks for exposures to asbestos at different air concentrations. There are 3 different calculations that you must do before using this chart.

1. Estimate the air exposure

From Appendix A, you can estimate the air exposure using the settled dust level. As an alternative, you can use an actual measured air level. Note that the AHERA TEM clearance test level of 70 structures per square millimeter is the same as 0.01 PCM-equivalent f/mL, and is given directly on Table B.

2. Convert the air levels to "PCM-equivalent fibers per milliliter"

The "PCM equivalent" fraction of asbestos fibers are those asbestos fibers at least 5 micrometers (μm) long, with a width greater than 0.25 μm, and an aspect ratio greater than or equal to 3 to 1. These are fibers small enough to be inhaled deeply into the lungs ("respirable size"), but also large enough to be retained by the lungs. It is believed that fibers shorter than 5 μm can be engulfed by macrophages and carried out of the lungs, and do not contribute to cancer.

The older studies upon which the EPA risk assessment levels are based used analytical methods which could only detect the larger, PCM-equivalent fibers. Presumably, the smaller asbestos fibers were also present in the populations addressed by these early studies as well. Thus, it would be incorrect to directly compare newer studies where all sizes of fibers are detected with older studies where only the larger fibers were detected. The way to make the studies comparable is to convert the newer studies data to PCM-equivalents, the units used in the older studies. When the PCM-fraction is unknown for transmission electron microscopy (TEM) levels, a good rule of thumb is to divide by at least 2, if not 4 or more.

3. Convert the 70-year exposure risk level to shorter exposures

If an exposure is for a shorter period of time than 70 years, multiply the risk level by the fraction of 70 years exposure. For example, if a person is only exposed for 35 years, 24 hours per day, multiply the risk by ½ (multiply by 0.5). If the person is only exposed for 1 year, multiply by 1/70 (multiply by 0.014).

ENDNOTES AND REFERENCES

1. Millette, J.R.; Clark, P.J.; Brackett, K.A.; Wheeles, R.K. (1993) Methods for the analysis of carpet samples for asbestos. Environmental Protection Agency, Cincinnati, OH (United States). Risk Reduction Engineering Lab. (6 pages) NTIS Report Number: PB-93-194355/XAB , EPA Publication Number EPA--600/J-93/167. Available from the National Technical Information Service (NTIS) online for no charge at www.NTIS.gov

Millette, J. R., *et al.* (1994) Appendix 4, Methods for the Analysis of Carpet Samples for Asbestos. In: *Settled Asbestos Dust. Sampling and Analysis*, Lewis Publishers, CRC Press.

2. Millette, J.R.; Clark, P.J.; Brackett, K.A.; Wheeles, R.K. (1993), *op. cit.*

Millette, J. R., *et al.* (1994), *op. cit.*

3. US EPA (November 1, 2000) United States Environmental Protection Agency Technical Appendix, Brookfield School System, Brookfield, Connecticut, with accompanying letter from Mary Rosenstein, Associate Director, Office of Ecosystems Protection, EPA Region 1 - New England, to Tom Furgalack, Director, Division of Environmental Health, Department of Public Health, Connecticut.

4. See series of news articles in News Times, Danbury, CT., posted at www.newstimes.com . In the upper right-hand scroll box, choose "Brookfield" to get to the relevant series of news articles. Use the key words Huckleberry school and Brookfield schools.

5. Rhode, V. (May 19 and 22, 2002) Personal communication. Results of dust and AHERA air testing in music room at the Huckleberry Hill Elementary School in Brookfield, CT. Vernon Rhode, Industrial Hygienist, S & B Environmental, 40 Valley Field Road S., Sandy Hook, CT 06482, (203) 426-3704, vernonrohde@earthlink.net.

> In the school music room, carpet tested by the ASTM microvacuum method showed over 460,000 s/cm^2, and the dust on the top of a fire alarm was over 3 million s/cm^2. However, only 1 out of 6 AHERA aggressive air tests using a leaf blower found any levels over 70 s/mm^2. Only 3 out of 6 air samples taken in the music room at the same time showed any asbestos at all; the other three were non-detectable for asbestos.

6. Millette, J. R. (June 4, 2002) Personal communication. MVA Inc., Norcross, GA. http://www.mvainc.com

Granger, R. H., McKee, T. R., Millette, J. R., Chmielinski, P., and Pineda, G. (October 2, 2001) Preliminary Health Hazard Assessment: World Trade Center, HP Environmental, Inc., 104 Elden St., Herndon, VA 20170. Paper submitted to the American Industrial Hygiene Association. See Figures 7 and 8 for the fiber widths of asbestos from the WTC. Posted at

www.NYenviroLAW.org .

Dr. Millette was EPA's principal investigator in developing EPA's carpet ultrasonication method. In an email he stated the following:

> This is an old claim [that the ultrasonication breaks down bundles of asbestos fibers into individual fibers, thus resulting in a higher count] developed by experts in litigation to try and discredit the dust method. There are ultrasonic instruments that range in power from those that are used to break up kidney stones to those that allow a mother to see her baby in the womb. The ultrasonic bath used in the carpet procedure is a mild mixing type that you can put your hand in. Because of the nature of the material (carpet) you cannot analyze it directly. You must put the particles into suspension and mix them to get a good subsample for filtration and analysis. The ultrasonic mixing was adapted from the EPA water methods that were developed the 1970s. It represents the best technically feasible way to analyze the sample of dust/dirt presented. ... The EPA carpet sonication method is the best technique available to assess carpet contamination.

The study by Granger, *et al.*, HP Environmental, found that asbestos fibers in WTC fallout were already finely divided to such an extent by the explosion that no further separation of the fibers occurred with the use of ultrasonication.

In addition, ultrasonication is also used in other established asbestos methods, such as EPA's indirect preparation method of air samples, as well as the ASTM microvacuum method 5755. Thus, nothing unusual in the carpet sonication procedure.

7. National Institute for Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP). National Laboratory Accreditation Administration, Gaithersburg, MD 20899, telephone 301-975-4016) http://ts.nist.gov/ts/htdocs/210/214/scopes/temtm.htm .

8. Millette, J.R.; Clark, P.J.; Brackett, K.A.; Wheeles, R.K. (1993), *op. cit.*

9. Millette, J. R., *et al.* (1994), *op. cit.*

10. Kupferman, Joel (June 4, 2002) Personal communication. New York Environmental Law and Justice Project, 315 Broadway Suite #200, New York, New York 10007-1121, www.NYenviroLAW.org

11. Kupferman, Joel (June 4, 2002), *op. cit.*

12. EPA (September 11, 2001) EPA Monitoring Site: Reade & Hudson, Asbestos in Bulk Dust. EPA response to September 11. Posted at http://www.epa.gov/enviro/nyc/bulkdust .

13. Jenkins, C. (April 30, 2002, with May 7 update) TEM vs. PLM METHODS FOR ASBESTOS DUSTS: TEM found over 1% asbestos, but PLM tests showed NONE; EPA PLM tests of WTC fallout dust may have underestimated area of asbestos contamination; EPA Region 2 knew TEM was required and needed, had it after the WTC collapse for their own building,

used it in past, but refused to use it for the rest of NYC. Memorandum addressed to Affected Parties and Responsible Officials from Cate Jenkins, Hazardous Waste Identification Division, OSW, EPA. Posted at www.NYenviroLAW.org .

> The New York Environmental Law and Justice Project, as well as the New York City Department of Environmental Protection and the US EPA Region 2 tested dust from the roof and in an open elevator shaft of an apartment at 150 Franklin St. in April, 2002. Testing by PLM showed no asbestos. But when the exact same samples were retested using transmission electron microscopy (TEM), the dust had asbestos over 1%, and in one case at a level of 5%. Franklin St. is about 2 blocks north of the Hudson St. apartment building.

14. Pending release of the information from the client, at this time, I cannot cite the source of this information.

15. Kominsky, J. R., et al. (1993) Evaluation of Three Cleaning Methods for Removing Asbestos from Carpet: Determination of Airborne Asbestos Concentrations Associated with Each Method, US EPA Risk Reduction Engineering Laboratory, Cincinnati, OH 45268, EPA Publication No. EPA/600/SR-93/155, Posted at www.epa.gov/ncepihom/nepishom/

> This study was for real-world asbestos contaminated carpet:
>
> A study was conducted to compare the effectiveness of three cleaning methods for removal of asbestos from contaminated carpet and to determine the airborne asbestos concentrations associated with each. Baseline measurements before cleaning showed an average concentration of 1.6 billion asbestos structures per square foot (s/ft^2) of carpet. The effectiveness of dry vacuuming using cleaners with and without a high-efficiency particulate air filter was compared with that of wet cleaning with a hot-water extraction cleaner. The wet cleaning method reduced the level of asbestos contamination in the carpet by approximately 60%, whereas neither dry cleaning method had any notable effect on the asbestos level. The type of cleaner used had little effect on the difference between the airborne asbestos concentration before and during cleaning.

Kominsky, J. R., et al. (1991) Evaluation of Two Cleaning Methods for Removal of Asbestos Fibers from Carpet, US EPA Risk Reduction Engineering Laboratory, Cincinnati, OH 45268, EPA Publication No. EPA/600/S2-90/053, posted at www.epa.gov/ncepihom/nepishom/

> This study was for artificially asbestos contaminated carpet
>
> The effectiveness of dry-vacuuming and wet-cleaning for the removal of asbestos fibers from carpet was examined, and the potential for fiber reentrainment during carpet cleaning activities was evaluated. Routine carpet cleaning operations were simulated by using high-efficiency particulate air (HEPA) filtered dry vacuum cleaners and HEPA-filtered hot-water extraction cleaners on carpet artificially contaminated with asbestos fibers. Overall, wet-cleaning with a hot water extraction cleaner reduced the level of asbestos contamination in the carpet by approximately 70%. There was no significant change in carpet asbestos concentration after dry-vacuuming. The level of asbestos contamination had no significant effect on the difference between the asbestos

concentrations before and after cleaning. Airborne asbestos concentrations were two to four times greater during than before the carpet cleaning activities. Neither the level of asbestos contamination in the carpet nor the type of cleaning method used greatly affected the difference between the airbone asbestos concentration before and during cleaning.

16. U.S. Army Corps of Engineers (1992) Asbestos Abatement Guideline Detail Sheets, Engineer Pamphlet 1110-1-11. Posted on the internet at http://www.usace.army.mil/inet/usace-docs/eng-pamphlets/ep1110-1-11/entire.pdf

See page 11 of the Corps of Engineer's publication for a table which states that removal is the only option for carpet, and pages 48 and 49 for the procedures for removal. These guidelines are for carpet that is only contaminated with low levels of asbestos, as well as carpet defined as "asbestos containing" having over 1% asbestos. The carpet must be HEPA vacuumed before disposal. This is not to make it free of asbestos, or decontaminated, but instead just to reduce the levels. The carpet must still be removed and replace.

17. EPA (1997) Rules of thumb for superfund remedy selection. Publication No. EPA 540-R-97-013, NTIS PB97-963301. Posted at www.epa.gov/superfund/resources/rules/

EPA (2000) Presenter's manual for: "Superfund Risk Assessment and How you Can Help". Publication No. EPA/540/R-99/013. Posted at www.epa.gov/superfund/programs/risk/vdmanual.pdf

The EPA does not consider any exposure to a man-made carcinogen to be acceptable, but does base its actions in existing exposure situations according to the degree of elevated risk. The EPA chooses a degree of protection, or risk level, as a criteria for abating exposures.

18. U.S. EPA (April 25, 1986) Toxic Substances; Asbestos Abatement Projects. Final Rule. *Federal Register*, Volume 51, p. 15722 ff.

19. Asbestos School Hazard Detection and Control Act (June 14, 1980) Public Law (P.L.) 96-270, § 1, 94 Stat. 487, 20 USCS § 3601 (2001). Available at http://www.findlaw.com/ or http://uscode.house.gov/

§ 3601. Congressional statement of findings and purposes (a) The Congress finds that-- (1) exposure to asbestos fibers has been identified over a long period of time and by reputable medical and scientific evidence as significantly increasing the incidence of cancer and other severe or fatal diseases, such as asbestosis; (2) medical evidence has suggested that children may be particularly vulnerable to environmentally induced cancers; (3) medical science has not established any minimum level of exposure to asbestos fibers which is considered to be safe to individuals exposed to the fibers...

20. U.S. EPA, Code of Federal Regulations, Title 40, Part 763 (40 CFR § 763). Appendix B to Subpart E to Part 763 -- Asbestos Model Accreditation Plan. The Code of Federal Regulations are available from most larger libraries, all law libraries, and also online at: http://www.access.gpo.gov/nara/cfr/index.html, or for EPA regulations only (faster) at http://www.epa.gov/epahome/cfr40.htm

21. US EPA (1994) Asbestos/NESHAP Demolition Decision Tree. EPA Manufacturing, Energy, and Transportation Division, Office of Compliance. Available from the EPA OPPTS Ombudsman's office.

"Decontamination of Demolition Site

If the surrounding soil has been contaminated by the demolition activities at the site, the site must be cleaned up to background levels of asbestos contamination. ...To clean up the site to background levels, it will probably be necessary to remove all the asbestos contaminated soil. The contaminated soil should be treated and disposed of as asbestos-containing waste material."

22. Millette, J. R., and Hays, S. M. (1994) Chapter 8. Resuspension of Settled Dust. In: *Settled Dust Sampling and Analysis*, Lewis Publishers, CRC Press.

23. Millette, J. R., and Hays, S. M. (1994) Chapter 6. Data: Levels of asbestos in dust, pages 49-50. In: *Settled Dust Sampling and Analysis*, Lewis Publishers, CRC Press.

24. US EPA (November 1, 2000) United States Environmental Protection Agency Technical Appendix, Brookfield School System, Brookfield, Connecticut, with accompanying letter from Mary Rosenstein, Associate Director, Office of Ecosystems Protection, EPA Region 1 - New England, to Tom Furgalack, Director, Division of Environmental Health, Department of Public Health, Connecticut.

25. Millette, J. R., and Hays, S. M. (1994) Chapter 8. Resuspension of settled dust. Pages 59-65 In: *Settled Dust Sampling and Analysis*, Lewis Publishers, CRC Press.

26. US EPA (November 1, 2000), *op. cit.*

27. Chatfield, E. (1983) ambient air concentrations measured by transmission electron microscopy. [the reference citation by EPA Region 1 was incomplete. This was all that was given.]

28. ATSDR (2000) Section 5.4 – Levels Monitored or Estimated in the Environment. Toxicological Profile for Asbestos, Agency for Toxic Substances and Disease Registry, Centers for Disease Control, ATSDR. Available by calling 1-888-42-ATSDR. Currently, only the final draft version is posted at www.atsdr.cdc.gov/toxprofiles/tp61.html]

29. Health Effects Institute (1991) Asbestos in public and commercial buildings: A literature review and synthesis of current knowledge. Report of the asbestos literature review panel.

Cambridge, MA: Health Effects Institute.

30. The AHERA TEM level of 70 structures per square millimeter is the same as 0.02 structures per milliliter. This translates to about 0.01 PCM-equivalent fibers per milliliter. For a lifetime exposure, this would result in an excess cancer risk of over 2 per 1000. See EPA's Integrated Risk Information System for asbestos at http://www.epa.gov/iris/subst/0371.htm .

Even the NYC Department of Environmental Protection testified that this would be safe for only short periods of time. The following is a quote from Frieden, NYC Commissioner:

> Health professionals have stated that short-term exposure to airborne asbestos, at levels equal to or lower than 0.01 [*fibers per milliliter, PCM equivalent*], carries an extremely low risk of causing asbestos-related illness.
>
> [Frieden, T. R., and Miele, J. A. (February 11, 2002) Testimony before the U. S. Senate Committee on Environment and Public Works Subcommittee on Clean Air, Wetlands, and Climate Change. Alexander Hamilton U. S. Customs House, New York City. Thomas R. Frieden, Commissioner, New York City Department of Health, Joel A. Miele Sr., Commissioner, New York City Department of Environmental Protection]

See discussions and chart of different air asbestos levels with associated risks in the following memorandum:

> Jenkins, C. (March 11, 2002) Status of air and dust asbestos testing after WTC collapse: 1. Misrepresented "safe levels" and standards for asbestos; 2. Failure to test at low levels related to safety; 3. Region 2 relied on more sensitive TEM tests for settled dusts in own building, required by EPA policy, did not provide same sensitive testing for rest of NYC, and refused Region 8 offer of free sensitive testing for rest of NYC. Cate Jenkins, Hazardous Waste Identification Division, OSW, EPA, memorandum addressed to affected parties and responsible officials. Posted at www.NYenviroLAW.org

31. US EPA (November 1, 2000), *op. cit.*

32. US EPA (1990) Common Questions on the Asbestos NESHAP. EPA Publication No. 340/1-90-021. Available online at: http://www.epa.gov/ncepihom/nepishom/

> Q: What is the acceptable exposure/ambient air standard for asbestos?
> A: EPA does not specify an acceptable exposure/ambient air standard.

33. Millette, J. R., and Hays, S. M. (1994) Chapter 8. Resuspension of settled dust. Pages 59-65 In: *Settled Dust Sampling and Analysis*, Lewis Publishers, CRC Press.

Resuspension K-Factors for settled asbestos dusts determined from controlled asbestos studies.			
ACTIVITY	SETTLED DUST LEVEL structures/square centimeter (s/cm²)	AIR LEVEL structures/milliliter (s/mL)	K-FACTORS [multiply the settled dust level by this number to get the air level]
Carpet cleaning [ordinary vacuum]	23,000	0.09	3.9×10^{-6} (0.0000039)
Broom Sweeping	760,000	53.6	7.1×10^{-5} (0.000071)
Cleaning Storage Area	870,000	2.7	3.1×10^{-6} (0.0000031)
Gym-Athletic Activities	9,700	0.23	2.4×10^{-5} (0.000024)
Cable Pull [pulling cable through suspended ceiling space]	2,000,000	28.9	1.4×10^{-5} (0.000014)
Warehouse (with forklift)	8,200	29.7	3.6×10^{-3} (0.0036)

34. ATSDR (2000) Section 5.4 – Levels Monitored or Estimated in the Environment. Toxicological Profile for Asbestos, Agency for Toxic Substances and Disease Registry, Centers for Disease Control, ATSDR. Available by calling 1-888-42-ATSDR. Currently, only the final draft version is posted at www.atsdr.cdc.gov/toxprofiles/tp61.html]

35.The AHERA TEM level of 70 structures per square millimeter is the same as 0.02 structures per milliliter. This translates to about 0.01 PCM-equivalent fibers per milliliter. For a lifetime exposure, this would result in an excess cancer risk of over 2 per 1000. See EPA's Integrated Risk Information System for asbestos at http://www.epa.gov/iris/subst/0371.htm .

Even the NYC Department of Environmental Protection testified that this would be safe for only short periods of time. The following is a quote from Frieden, NYC Commissioner:

> Health professionals have stated that short-term exposure to airborne asbestos, at levels equal to or lower than 0.01 [*fibers per milliliter, PCM equivalent*], carries an extremely low risk of causing asbestos-related illness.
>
> [Frieden, T. R., and Miele, J. A. (February 11, 2002) Testimony before the U. S. Senate Committee on Environment and Public Works Subcommittee on Clean Air, Wetlands, and Climate Change. Alexander Hamilton U. S. Customs House, New York City. Thomas R. Frieden, Commissioner, New York City Department of Health, Joel A. Miele Sr., Commissioner, New York City Department of Environmental Protection]

See discussions and chart of different air asbestos levels with associated risks in the following memorandum:

Jenkins, C. (March 11, 2002) Status of air and dust asbestos testing after WTC collapse: 1. Misrepresented "safe levels" and standards for asbestos; 2. Failure to test at low levels related to safety; 3. Region 2 relied on more sensitive TEM tests for settled dusts in own building, required by EPA policy, did not provide same sensitive testing for rest of NYC, and refused Region 8 offer of free sensitive testing for rest of NYC. Cate Jenkins, Hazardous Waste Identification Division, OSW, EPA, memorandum addressed to affected parties and responsible officials. Posted at www.NYenviroLAW.org

36. Millette, J. R., and Hays, S. M. (1994) Chapter 6. Data: Levels of asbestos in dust, pages 49-50. In: *Settled Dust Sampling and Analysis*, Lewis Publishers, CRC Press.

37. Barr, H. (June 4, 2002) Feeling fallout of asbestos
Brookfield could spend $3M on cleanup, tests. THE NEWS-TIMES. www.newstime.com .

McKinney, M. P. (June 5, 2002) Experts weigh in on asbestos risk
Should parents be worried? Depends who you ask. THE NEWS-TIMES. www.newstime.com .

38. Rhode, V. (May 19 and 22, 2002) Personal communication. Results of dust and AHERA air testing in music room at the Huckleberry Hill Elementary School in Brookfield, CT. Vernon Rhode, Industrial Hygienist, S & B Environmental, 40 Valley Field Road S., Sandy Hook, CT 06482, (203) 426-3704, vernonrohde@earthlink.net.

39. See series of news articles in News Times, Danbury, CT., posted at www.newstimes.com . In the upper right-hand scroll box, choose "Brookfield" to get to the relevant series of news articles.

40. EPA website on September 11 Response. See page posted at http://www.epa.gov/epahome/wtc/activities.htm and every individual data page linked to the map of bulk dust sampling at http://www.epa.gov/enviro/nyc/bulkdust/

41. Mugdan, Walter E., Esq., Regional Counsel for EPA Region 2 (January 25, 2002) Environmental law issues raised by terrorist events in 2001. Speech before the NY Bar Association. Posted at www.NYenviroLAW.org

42. Miele, J. A., Commissioner, Department of Environmental Protection, City of New York (October 25, 2001) letter to Residents of Lower Manhattan. Posted on the internet at www.nyeljp.org.

43. Mugdan, Walter E., Esq., Regional Counsel for EPA Region 2 (January 25, 2002), *op. cit.*

Counsel for Region 2 described the selective use of the definition of "asbestos containing material"in a speech:

> One of the first decisions that EPA had to make when sampling for asbestos in the dust from the WTC collapse was what reference value to use when reporting the data – in other words, at what concentration of asbestos in the bulk dust samples would the Agency characterize the dust as containing asbestos in quantities of significance? EPA

elected to use the definition of ACM [asbestos containing material] from the NESHAPs regulations – *i.e.*, the 1% asbestos content standard.

44. US EPA (1994) Asbestos/NESHAP Demolition Decision Tree. EPA Manufacturing, Energy, and Transportation Division, Office of Compliance. Available from the EPA OPPTS Ombudsman's office

Decontamination of Demolition Site

If the surrounding soil has been contaminated by the demolition activities at the site, the site must be cleaned up to background levels of asbestos contamination. Alternatively, the site may be operated in accordance with section 61.154 (Standard for active waste disposal sites) and closed in accordance with section 61.151 (Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations). However, according to 40 CFR 61.05, the establishment of an active waste site requires prior approval from EPA or the delegated State program. To clean up the site to background levels, it will probably be necessary to remove all the asbestos contaminated soil. The contaminated soil should be treated and disposed of as asbestos-containing waste material.

Decontamination of Area Surrounding Demolition Site

If a site assessment detects contamination of soil surrounding a demolition site, the site must be cleaned up to background levels of asbestos contamination. Alternatively, the site may be operated in accordance with section 61.154 (Standard for active waste disposal sites) and closed in accordance with section 61.151 (Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations). However, according to 40 CFR 61.05, the establishment of an active waste site requires prior approval from EPA or the delegated State program. To clean up the site to background levels, it will probably be necessary to remove all the asbestos contaminated soil. The contaminated soil should be treated and disposed of as asbestos-containing waste material.
[*emphasis added*]

45. US EPA (April 18, 1989) Interim Asbestos NESHAP Enforcement Guidance - "Friable asbestos" 1% by Area of Volume vs. 1% by Weight. Office of Enforcement and Compliance Monitoring EPA Publication No. EPA 560/5-88-001. Available online at: http://es.epa.gov/oeca/ore/aed/comp/ecomp/e6.html

46. Mugdan, Walter E. (January 25, 2002) Environmental law issues raised by terrorist events. Speech before the NY Bar Association, NYC. Walter Mugdan is Regional Counsel for EPA Region 2. Posted at www.NYenviroLAW.org

47. EPA web site at: www.epa.gov/region8/superfund/libby/qsafe.html

48. Addison, J. (1995) Vermiculite: A review of the mineralogy and health effects of vermiculite exploitation. Reg. Tox. and Pharm. 21: 397 - 405.

49. US EPA, Title 40 of the Code of Federal Regulations, Part 761.61 — PCB remediation waste. Posted at: http://www.epa.gov/epahome/cfr40.htm

> For non-porous surfaces in high occupancy areas, the level of polychlorinated dibenzodioxins must be less than or equal to 10 micrograms per 100 centimeters squared ($\leq$ 10 µg/100 cm ^{2}).

US EPA, Title 40 of the Code of Federal Regulations, Part 745.227 — Lead dust. Posted at: http://www.epa.gov/epahome/cfr40.htm

> A lead-dust hazard on interior surfaces is an average level of lead in dust that equals or exceed 50 µg/ft2 [micrograms per square foot] on uncarpeted floors and 250 µg/ft2 on interior window sills

50. Gonzales, J. (March 21, 2002) A Red Flag on Air Tests at WTC, NY Daily News.

51. Mugdan, Walter E. (January 25, 2002), *op. cit.*

52. EPA website on September 11 Response. See page posted at http://www.epa.gov/epahome/wtc/activities.htm and every individual data page linked to the map of bulk dust sampling at http://www.epa.gov/enviro/nyc/bulkdust/

53. Jenkins, C. (April 30, 2002, with May 7 update) TEM vs. PLM METHODS FOR ASBESTOS DUSTS: TEM found over 1% asbestos, but PLM tests showed NONE; EPA PLM tests of WTC fallout dust may have underestimated area of asbestos contamination; EPA Region 2 knew TEM was required and needed, had it after the WTC collapse for their own building, used it in past, but refused to use it for the rest of NYC. Memorandum addressed to Affected Parties and Responsible Officials from Cate Jenkins, Hazardous Waste Identification Division, OSW, EPA. Posted at www.NYenviroLAW.org .

> The New York Environmental Law and Justice Project, as well as the New York City Department of Environmental Protection and the US EPA Region 2 tested dust from the roof and in an open elevator shaft of an apartment at 150 Franklin St. in April, 2002. Testing by PLM showed no asbestos. But when the exact same samples were retested using transmission electron microscopy (TEM), the dust had asbestos over 1%, and in one case at a level of 5%. Franklin St. is about 2 blocks north of the Hudson St. apartment building.

54. Carlton, J. (May 9, 2002) Bureaucratic Buck-Passing Delayed Asbestos Cleanup After 9/11 Attacks. Wall Street Journal. www.wallstreetjournal.com Also posted at www.NYenviroLAW.org

> But Ms. Jenkins and other critics of her agency's performance have said that one of the EPA's failings was its unwillingness to urge New York to use the most-up-to-date method of asbestos testing -- a method employing electron microscopes that the EPA has used elsewhere. The city instead advised building owners to use only an older technique, in which testers search for contaminants using polarizedlight microscopes that work much like ones used in high-school chemistry labs. Electron microscopes, used with computers, can detect asbestos fibers that light