



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

OFFICE OF  
SOLID WASTE AND EMERGENCY  
RESPONSE

**MEMORANDUM**

**DATE:** April 30, 2002, data added May 7, 2002

**SUBJECT: 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**

**FROM:** Cate Jenkins, Ph.D.\*  
jenkins.cate@epa.gov  
Waste Identification Branch (Mail Code 5304 W)  
Hazardous Waste Identification Division, OSW

*C Jenkins*

This memorandum discusses side-by-side testing of the same dust samples (“bulk dust”) from WTC fallout. Two different test methods were used. One method is transmission electron microscopy (TEM), which is very sensitive, detecting the very thin asbestos fibers that are known to predominate in WTC dusts, and also capable of detecting fibers at levels as low as 0.0001%. The other method is polarized light microscopy (PLM), using a standard light microscope, which cannot detect the thin fibers found in WTC dusts, and which can only reliably detect 1% or higher levels of asbestos. TEM is a much more sensitive method than PLM.

After the WTC collapse, EPA Region 2 only used the less sensitive method, PLM, for bulk dusts in Lower Manhattan. This is despite the fact that official EPA guidance

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\* The conclusions and opinions in this memorandum are those of the author and do not necessarily reflect those of the U.S. Environmental Protection Agency.

requires the use of the more sensitive TEM methods when thin asbestos fibers are present, such as is the case for WTC fallout. EPA regulations and guidance require determining if any asbestos is present in dusts and other emissions from the original asbestos containing materials, by using the sensitive TEM method which can detect asbestos at concentrations much lower than 1%.

Astoundingly, on September 12, Region 2 even refused an offer from Region 8 for free TEM and other electron microscope testing of bulk WTC dusts. Region 8 had extensive laboratory contracts for the evaluation of asbestos in soils and dusts from the Libby, Montana Superfund site, and offered to divert those lab capabilities to WTC dusts.

In addition, Region 2 had positive TEM results, but negative PLM results on the exact same dust samples, for its own building after the WTC collapse, and abated for asbestos based on these TEM results. They were apparently sensitive about this fact. Region 2 failed to supply the relevant TEM dust and other data for their own building in response to a FOIA request. Region 2 also obscured the fact that TEM dust testing was performed on its building as part of a February 22, 2002 letter from EPA Administrator Whitman to Congressman Nadler. In an attachment to that letter, Region 2 indicated that only PLM testing was performed.

In the past, Region 2 had demanded the extensive use of TEM tests for settled dusts in a 1998 asbestos abatement. This shows that Region 2 personnel were well aware of the need and EPA requirements for TEM testing of dusts.

By the first of October, EPA also had the results of an independent study which showed that the majority of the asbestos in WTC fallout could not be detected by standard microscope techniques such as PLM.<sup>1</sup> The HP Environmental Report found that 95 to 96% of the asbestos fibers were too thin to be detected by PLM. This should have been an additional alert to Region 2 for the need of TEM dust testing.

On the open market, a PLM test costs about \$20, while a TEM test costs about \$50. For a large numbers of samples, the prices would be substantially lower. Region 2 only tested about 250 bulk dust samples from Lower Manhattan. Thus, there was no overwhelming cost incentive to restrict tests to PLM, certainly not for such an important matter as protecting citizens after the WTC collapse.

(If you submitted a bulk dust to a laboratory for analysis recently, you can call them up and have the dust re-analyzed using TEM. If there is sufficient sample left, the re-analysis can be quantitative, meaning that the percent asbestos in the sample can be found, not just the presence of asbestos. Most labs keep dust samples for about 2 months.)

## Comparison of results of side-by-side TEM and PLM tests on the same samples

The following table compares the results of TEM and PLM tests for the same samples of bulk dusts from the WTC collapse, tar and soils. More information on the materials and sampling is given after the table.

<b>COMPARISON OF TEM and PLM TESTS FOR SAME SAMPLES</b>				
	<b>DATE</b>	<b>PARTY SAMPLING</b>	<b>TEM - asbestos</b>	<b>PLM - asbestos</b>
<b>150 Franklin St., NYC<sup>2, 3</sup></b>				
debris on roof - 1	4/17/02	EPA/NYC DEP	<b>2.3 %</b>	<b>none detected</b>
debris on roof - 3	4/17/02	EPA/NYC DEP	<b>5.0 %</b>	<b>none detected</b>
debris, ledge, elevator shaft, 3 <sup>d</sup> floor-31	4/17/02	EPA/NYC DEP	<b>2.0 %</b>	<b>none detected</b>
debris, ledge, elevator shaft, 3 <sup>d</sup> floor - 33	4/17/02	EPA/NYC DEP	<b>2.2 %</b>	<b>none detected</b>
WTC dust, roof, front	4/15 & 21/02	NYELJP	<b>1.4 %</b>	<b>none detected</b>
WTC dust, roof, rear	4/15 & 21/02	NYELJP	<b>1.8 %</b>	<b>none detected</b>
WTC dust, third floor, widow sill inside elevator shaft with broken window	4/15 & 21/02	NYELJP	<b>1.2 %</b>	<b>2.9 % (probable lab problem, see below)</b>
tar under sink	3/18/98	NYELJP	<b>0.24</b>	<b>none detected</b>
tar from roof	3/18/98	NYELJP	<b>2.80</b>	<b>0.24</b>
<b>200 Rector Place, NYC<sup>4</sup></b>				
WTC dust, interior living room along left ledge of book case cabinet, after cleaning, Apt. 33F	12/17/01	Kallawaya, Inc.	<b>present, up to 1%</b>	<b>none detected</b>
WTC dust, living room, after cleaning, Apt. 33F	12/4/01	Kallawaya, Inc.	<b>present</b>	<b>none detected</b>
WTC dust, bedroom floor, after cleaning, Apt. 17 J	4/16/02	A. O. Lawrence	<b>present</b>	<b>none detected</b>
WTC dust, kitchen and dining room floor, after cleaning, Apt. 17J	4/16/02	A. O. Lawrence	<b>present</b>	<b>none detected</b>
<b>EPA Region 2 building at 290 Broadway, NYC<sup>5</sup></b>				
Inside lobby by the security	9/14/01	Stratus Corp/GSA	<b>present</b>	<b>none detected</b>
Inside lobby by the entrance to bathroom	9/14/01	Stratus Corp/GSA	<b>present</b>	<b>none detected</b>
Inside lobby by the entrance to building	9/14/01	Stratus Corp/GSA	<b>present</b>	<b>none detected</b>
Outside by the main entrance	9/14/01	Stratus Corp/GSA	<b>present</b>	<b>none detected</b>
Outside on the sidewalk	9/14/01	Stratus Corp/GSA	<b>present</b>	<b>none detected</b>
<b>Libby Montana Superfund site<sup>6</sup></b>				
soils		EPA Region 8	<b>"high levels" (scanning electron microscope, SEM, similar to TEM)</b>	<b>none detected</b>

### NYELJP samples from 150 Franklin St.

The New York Environmental Law and Justice Project (NYELJP)<sup>7</sup> collected dust samples from the roof and from an elevator shaft with broken windows at 150 Franklin St., a co-op building. This address is 7 blocks north of the area defined by EPA Region 2 as being contaminated by fallout from the WTC. EPA Region 2, the NYC Department of Environmental Protection (DEP), and the NYC Department of Health repeatedly claimed that no asbestos found from WTC fallout this far away.

After finding asbestos at over 1% in all three samples using TEM test methods, the NYELJP contacted the NYC DEP. The DEP collected their own samples, but used PLM analyses and found no asbestos.

The NYELJP then contacted EPA Region 2, telling them that the DEP was wrong to have used PLM methods. As a result, Region 2 re-analyzed the samples taken by DEP using the TEM method. Region 2 found asbestos from 2 to 5 % using TEM. This is the first time that I am personally aware of that Region 2 used TEM analyses for a bulk dust sample of WTC fallout.

The NYELJP then decided to have its own samples re-analyzed using the less sensitive PLM method, just to confirm the problem with using PLM. Two of the three samples had no detectable asbestos when re-analyzed using PLM. These 2 samples had over 1% asbestos when tested by TEM. One sample had 2.9% asbestos when re-analyzed by PLM, which was higher than the 1.2% found by TEM. This was either because of lab error or variability (PLM is very crude, subjective, and variable) or because the laboratory analyst took a different part of the sample the second time around, not having the opportunity of knowing beforehand that there would be a side-by-side comparison.

In 1998, the roofing tar from 150 Franklin St. was tested by both PLM and TEM. The results also showed higher asbestos concentrations by TEM compared to PLM, for the same samples, demonstrating again that a TEM analysis can often find asbestos, when PLM cannot.

### 200 RECTOR PLACE SAMPLES

Two tenants at 200 Rector Place, two blocks from Ground Zero, had surfaces in their 2 different apartments tested by both TEM and PLM.<sup>8</sup> The apartments had been cleaned before the tests. Asbestos was found to be present by TEM, but not PLM, for the same samples.

The management of the apartment building tested numerous dust samples on the roof of the building. However, the only method used was PLM. Out of 11 samples, only 3 had

detectable asbestos by PLM, at levels of approximately 1.1%. For all 3 samples where asbestos was detected, fiberglass was present at 40%. The other 8 samples with no detectable asbestos (PLM) also had fiberglass ranging from 3% to 40%. This high fiberglass concentration in dusts on the same roof would indicate that asbestos was probably present as well. However, it was not found using PLM.

#### REGION 2 BUILDING AT 290 BROADWAY

This sampling is discussed later in its own section. TEM tests found asbestos in dusts at the Region 2 building, while PLM did not find asbestos in the same samples.

#### LIBBY, MONTANA SUPERFUND SITE

Soils outdoors were tested by PLM at the Libby, Montana superfund site. Soils that had no detectable asbestos were also tested by scanning electron microscope (SEM) methods. SEM is a similar electron microscope method to TEM, but does not have quite as great a sensitivity as TEM. High concentrations of asbestos were found by SEM, while no detectable asbestos was found by PLM.

### **Reason why TEM will show higher amounts of asbestos than PLM in WTC dust**

There are two distinct reasons why PLM tests will not find asbestos, while TEM will, in WTC dust.

The most important reason why PLM cannot find asbestos, while TEM can, is because TEM can “see” the very thin asbestos fibers that predominate in WTC fallout. PLM cannot detect fibers that are thinner than 0.5 micrometers (0.5  $\mu\text{m}$ ). TEM can detect asbestos fibers thinner than 0.025  $\mu\text{m}$ .

WTC fallout contains extremely thin asbestos fibers. The HP Environmental Study<sup>9</sup> showed that 95 to 96% of the asbestos in WTC fallout has fibers thinner than 0.25  $\mu\text{m}$ . The majority of the fibers were even thinner than 0.25  $\mu\text{m}$ : 84 to 89% had widths smaller than 0.1  $\mu\text{m}$ . This means that 95% of the asbestos from the WTC would be undetected by PLM.

EPA recognizes the problem of using PLM for asbestos containing thin fibers. As explained later, EPA policy requires the use of TEM for bulk dusts when fibers are thin, which is typical for chrysotile fibers, the predominant form of asbestos found in WTC fallout.

The second reason is that PLM can only reliably detect, or find, asbestos that is present in concentrations of 1% or more. However, TEM can find asbestos at concentrations of

as low as 0.0001% in bulk dust.<sup>10</sup> PLM can never detect asbestos at these low concentrations, although occasionally it can quantify levels as low as 0.25%.

## **Implications of having only PLM results for WTC dusts**

The results of the side-by-side TEM and PLM tests shown in the section above have major implications. The asbestos contamination is/was probably more widespread in New York City than claimed by EPA Region 2. Any asbestos that was found by PLM is probably present at much higher concentrations, which would be shown by re-testing using the TEM method.

### **CONTAMINATION MAY BE MORE WIDESPREAD, OVER LARGER AREA, THAN EPA REGION 2 AND NYC DOH CLAIMED**

Both EPA Region 2 and the NYC Department of Health (DOH) claimed that the only contaminated zone of concern was west of Broadway and below Warren St. This may not be the case. Region 2 did not find any detectable asbestos immediately inside these boundaries, and did not find any detectable asbestos outside the boundaries north of Warren St. or east of Broadway, using the PLM method. The address at 150 Franklin St. where over 1% asbestos was found using TEM is about 7 blocks north of Warren St.

Readers should realize that the 1% asbestos level is not a safe level, and is not any EPA standard. Any detectable asbestos in dusts or other emissions from the original asbestos containing building materials is considered hazardous until demonstrated otherwise by EPA. This is discussed in detail at the end of this memo.

### **NEED FOR RETESTING BY EPA**

EPA Region 2 only used PLM to test WTC dust, and most samples had no detectable asbestos by PLM.<sup>11</sup> These “non-detect” samples probably contained asbestos, and should be re-tested by TEM. The other samples found to have asbestos probably actually contain much higher levels than shown by PLM, and should be re-tested using TEM.

In addition, Region 2 should sample additional dusts outside the perimeter of the zone they claimed to be contaminated, and test these dusts using quantitative TEM.

### **NEED FOR RETESTING BY PRIVATE PARTIES**

There were many samples of bulk dust tested by citizens and private industrial hygienists using PLM after the WTC collapse. If re-tested by TEM, these same samples may well show asbestos, or show much higher asbestos levels. Labs typically hold bulk dust samples for about 2 months. Retesting a sample by TEM would cost approximately \$50.

There could be a problem of having enough sample for retesting, however.

### **Region 2 was offered free TEM analyses for bulk dust by EPA Region 8 on September 12, but refused**

EPA's Region 8 in Denver called Region 2 on September 12, a day after the disaster. In a conference call, Region 8 offered Region 2 the free use of 30 to 40 TEM and SEM (scanning electron microscope) testing capabilities for WTC dusts. Region 8 had a contract with EMSL Laboratories for the TEM's and SEM's, which were being used to evaluate soils at the Libby, Montana Superfund site. Region 8 was willing to divert its resources to Region 2 to assist after the disaster. Twelve of the TEM/SEM's were close by and could have been in Lower Manhattan in 40 minutes.

Region 2 refused the offer. This is despite the fact that Region 2 had great familiarity with the need and EPA requirements for TEM testing of asbestos, explained below.

### **On the basis of positive TEM results, but negative PLM results on the same samples, Region 2 had its own building abated for asbestos after the WTC collapse**

EPA's Region 2 had positive results from sensitive TEM testing for its own building at 290 Broadway in Manhattan, and on this basis decided to abate for asbestos. The samples were taken on September 14, and Region 2 would have had the results by September 15. The PLM tests on the same samples were negative. See the table in an earlier section. In addition, all of the other tests were negative, with the exception of one air test that Region 2 dismissed as being below levels of concern.

But for the fact that Region 2 had the positive results of the more sensitive TEM method for dusts (which were negative by PLM), it would have taken no action to clean its building, or clean the lobbies of the other federal buildings in Manhattan with HEPA vacuum trucks. The Region 2 building was cleaned using wet-wiping methods among others. EPA employees were "displaced" for a week (employees evacuated from their offices) during these unusual cleaning operations.

Region 2 is reportedly offering as a defense that it was GSA who made the decision to use sensitive TEM tests on settled dusts in their building, not they. But it was EPA who acted upon the results, allowing its building to be cleaned with the unusual procedures, and taking upon itself the task of cleaning the lobbies of the other federal office buildings in the area. The following are quotes from the Stratus report, the GSA contractor, prepared on October 5, 2001.<sup>12</sup>

After the discovery of asbestos in the lobby of the building, the EPA informed the building management, that the EPA would be cleaning the lobby areas, of all the buildings in the

Additionally, building cleaning personnel also began performing cleaning inside the building lobbies.

Region 2 was also reminded at the time by the very laboratory data sheets showing the positive TEM results for its building that EPA required the use of TEM. At the bottom of every table giving the results of the analyses for the bulk dust analyses on the 290 Broadway building, SciLabs included the following statement, reminding its clients of the obligations under EPA guidance and NY State regulations to perform TEM for both floor covering and similar materials, and that TEM was the appropriate method:<sup>13</sup>

Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (see also EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94).

It is interesting and telling that Region 2 withheld the testing data on its building when responding to a 9/21/01 Freedom of Information Act (FOIA) request from the New York Environmental Law and Justice Project (NYELJP).<sup>14</sup> The testing at 290 Broadway would have been responsive, since the FOIA requested all documents meeting the following description:

... all monitoring data, studies and reports of air, dust, bulk (including but not limited to hazardous materials and water samples) taken from September 11, 2001 to present in response to the World Trade Center disaster (including but not limited to lower Manhattan and Staten Island land fills).

It is also interesting and telling that Region 2 omitted the fact that TEM testing of dusts was performed at its own building in a February 22, 2002 letter from EPA Administrator Whitman to Congressman Nadler. Ms. Whitman was explaining both the testing that had been performed at Region 2's offices in Manhattan, as well as the asbestos abatement which took place. In an attachment to her letter, the dust testing was "incorrectly" described as being only by the PLM method. In fact, both methods were used, TEM and PLM.

### **In 1998, Region 2 used TEM extensively for assessing the cleanup of another federal building**

Region 2 is reportedly offering the excuse of confusion and panic after the collapse of the WTC for only using PLM testing, instead of the required TEM testing of dusts. But this argument has no merit for the following reason:

Bob Fitzpatrick, the Region 2 Asbestos Coordinator, was directly involved in the oversight of an asbestos abatement for the INS at 26 Federal Plaza during the 1998 time

period, which extensively used TEM testing of dusts. After the WTC disaster, Bob Fitzpatrick was and is the Region 2 Asbestos Coordinator, responsible for the evaluation and oversight of asbestos abatement and control. Thus, Region 2 cannot claim to have no institutional knowledge of the need or requirements for TEM testing of bulk dusts. It is not as though they had to research the issue for the first time.

The following describes the 1998 abatement: Roofing work had resulted in the dropping of asbestos insulation onto the suspended ceiling tiles on the 16<sup>th</sup> floor at 26 Federal Plaza in Manhattan, the offices of the Immigration and Naturalization Service (INS). The General Service Administration hired an asbestos abatement firm who initially did a poor job, resulting in increased contamination of the offices. The INS requested that Region 2 as well as the Public Health Service (PHS) help oversee additional asbestos abatement.

On behalf of the INS, both Region 2 and the PHS demanded, and got, from 4000 to 5000 TEM tests of dusts from just the one floor of this office building. The following table compares Region 2's dust testing after the WTC with the dust testing Region 2 required for a single floor of an office building. It is obvious that additional costs were not the reason for not using TEM for dusts after the WTC disaster.

<b>EPA Region 2 Settled Dust Testing Requirements, Comparison of Two Abatements</b>			
	Asbestos Test Method	Number of Samples	Estimated Cost to Taxpayer (\$10-20 per PLM, \$25-50 per TEM)
Single floor of office building, 26 Federal Plaza, 1998	TEM	4000 to 5000	\$100,000 - \$250,000
Lower Manhattan after WTC collapse	PLM	about 250	\$2,500 - \$5,000

### **EPA Policy requires TEM for bulk dusts if small asbestos fibers present**

Even if all personnel in Region 2 had never encountered a situation where there was a need to test dust for asbestos, then Region 2 was still obligated to follow the official EPA policy guidance that requires the use of TEM methods for dusts. EPA advises that TEM should be used when the asbestos fibers are thin, since they cannot be detected by PLM. The fact that WTC dust is predominantly thin fibers that cannot be detected by PLM was discussed earlier. The following are excerpts from EPA's 1994 *Federal Register* notice which instituted the policy to use TEM:<sup>15</sup>

This notice announces the availability of an improved asbestos bulk sample analysis test method for use with bulk samples collected for identification of asbestos-containing materials

...

The test method provides clarifications and improvements to the 1982 EPA "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (as found in 40 CFR part 763 Appendix A to Subpart F). Specifically, use of the improved method can provide more precise analytical results especially at low asbestos concentrations ... which may contain thin asbestos fibers below the limits of resolution of the polarized light microscope (PLM)

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The 1982 [PLM] method is limited in that it does not provide guidance for analyzing materials that contain thin (<0.25 micrometers) asbestos fibers. As a consequence, floor tiles which were analyzed according to the 1982 method and for which negative results were reported may actually contain undetected asbestos. At this time EPA does not have data to support identification of other materials which may have thin fibers.

The improved method addresses the thin fiber limitation of the 1982 method by providing directions for using transmission electron microscopy (TEM).

...

In light of the availability of the improved method, EPA recommends that local education agencies (LEAs) use the improved method in place of the 1982 procedures [PLM method]

...

Before undertaking activities which might trigger asbestos NESHAP requirements, it is recommended that LEAs consider resampling multi-layered materials which have been found to be nonasbestos-containing for AHERA purposes or assume them to be asbestos-containing ... and in the improved analytical method to avoid potential violation of the asbestos NESHAP.

**The Occupational Safety and Health Administration (OSHA) also recommends the use of the more sensitive TEM tests for settled bulk dusts instead of PLM. The following are the relevant parts of the OSHA regulations:<sup>16</sup>**

When electron microscopy [TEM] was applied to asbestos analysis, hundreds of fibers were discovered present too small to be visible in any light microscope [such as PLM].

...

The TEM is a powerful tool to identify fibers too small to be resolved [seen] by light microscopy [PLM] ... Further, when optical techniques [PLM] are inadequate, there is ample indication that alternative techniques [TEM and SEM] should be used for complete identification of the sample.

## **Asbestos is hazardous at concentrations much lower than 1%**

The 1% level for asbestos is not a safe level of asbestos, and this needs to be repeated in this memorandum. See also my March 11, 2002 memo which addresses this issue.<sup>17</sup>

The EPA and the NYC Department of Environmental Protection (DEP) have clearly indicated that 1% asbestos in dust is the health standard or benchmark or "level of health concern." However, recently, EPA Region 2 has recanted, or reversed their claim, that 1% is safe.

## EPA AND DEP CLAIMS THAT 1% IS THE SAFE LEVEL

**EPA Region 2 has constantly claimed only dusts from the WTC collapse containing 1% or more asbestos should be treated as hazardous. Region 2 clearly states that 1% is the “level of concern for health.” The following statements are made at the EPA web site relating to the WTC disaster.<sup>18</sup>**

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.

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 also claimed that only asbestos over 1% was “significant”:<sup>19</sup>**

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 unsafe.<sup>20</sup> The NYC DEP advised building owners to test dusts inside buildings to see if they were over 1%, and that this was the “standard” for determining hazard:**

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% or 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.

## **RECENTLY REGION 2 REVERSES CLAIM THAT 1% IS SAFE LEVEL**

**EPA Region 2 has recently reversed their position that 1% asbestos in dusts is a safe level. In a March 21, 2002 statement to the press, EPA stated that the 1% level was only a “guideline,” but not a health standard.<sup>21</sup>**

In the days after Sept. 11, federal officials repeatedly referred to two "standards," one for asbestos in dust and debris and another for asbestos fibers in air. For dust and debris, the agency standard was 1% asbestos content. For air, it was usually 70 asbestos fibers per square millimeter of a testing filter.

...

But as Jenkins explains in her memo, federal regulations never meant the 1% figure to be considered a health standard or even to be applied to measure dust.

...

"We have never said it was a health standard," said the EPA's Mears about the 1%.  
"We're only using it as a guideline. We say clean up the dust and get rid of the dust regardless of whether it's 1% or below 1% — it doesn't matter."

**In a January 25, 2002 speech, Counsel for Region 2, Walter Mugdan, also stated that the 1% level was not a health standard, but only the detection limit of the PLM method:<sup>22</sup> Note that Walter Mugdan is also incorrect in claiming that PLM is the required analytical method for anything relating to asbestos.**

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

## **EPA REGULATIONS AND GUIDANCE STATE THAT 1% IS NOT A SAFE LEVEL**

**Even without the recent disclaimers by Region 2 that they never intended the 1% level as a safe level, health standard, or action level, the EPA regulations and guidance make it quite clear that 1% asbestos is not EPA’s action level for dusts or safety level.**

**1% only applies when defining the asbestos-containing building material itself, not to the dusts or contamination that results from the original building materials. In guidance under the Clean Air Act asbestos NESHAP, the EPA clearly states that the 1% level is only to be used to determine whether a building material itself contains asbestos, and that 1% is not a safe level, or a “standard,” as follows:<sup>23</sup>**

**Under the NESHAP, any dusts or contamination resulting from the use of building materials containing asbestos, which are called emissions, are regulated at much, much lower concentrations of asbestos in the dusts themselves.**

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 must be clearly understood that the EPA NESHAP definition of 1% by weight was not established to be a health-based standard.

*[emphasis added]*

**EPA's NESHAP, the surrounding soils around a demolition site must be cleaned up to background levels of asbestos, not to 1% asbestos.<sup>24</sup>**

#### 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.

#### 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. ... 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

**Under both the asbestos NESHAP and AHERA regulations, ZERO emissions of asbestos-containing dusts are required, not "emissions of dusts containing less than 1% asbestos." The requirement for zero emissions, not emissions of dusts containing less than 1% asbestos, is made clear in the following guidance and regulations:<sup>25</sup>**

[NESHAP] Q: Is there a numeric emission limit for the release of asbestos fibers during renovations or demolitions in the asbestos NESHAP regulation?

A: No, the Asbestos NESHAP relating to demolitions or renovations is a work practice standard. This means that it does not place specific numerical emission limitations for asbestos fibers on asbestos demolitions and removals. Instead, it requires specific actions be taken to control emissions. However, the Asbestos NESHAP does specify zero visible emissions to the outside air from activity relating to the transport and disposal of asbestos waste.

The NESHAP regulations themselves require the use of transmission electron microscopy (TEM) to determine whether wastes can be considered “asbestos free.” The standard for being asbestos free is not 1%, but instead no detectable asbestos at all, by the most sensitive test method, TEM, not PLM. See the excerpt of the regulations below:<sup>26</sup>

[NESHAP] 40 CFR §61.155. Standard for operations that convert asbestos-containing waste material into nonasbestos (asbestos-free) material.

...

(3) Results of analyses, using transmission electron microscopy [TEM], that document that the output materials are free of asbestos. Samples for analysis are to be collected as 8-hour composite samples (one 200-gram (7-ounce) sample per hour), beginning with the initial introduction of RACM or asbestos-containing waste material and continuing until the end of the performance test.

...

(h) Nonasbestos (asbestos-free) output material is not subject to any of the provisions of this subpart. Output materials in which asbestos is detected, or output materials produced when the operating parameters deviated from those established during the startup performance testing, unless shown by TEM analysis to be asbestos-free, shall be considered to be asbestos-containing waste  
[emphasis added]

The EPA guidance under other statutory authorities, such as the Comprehensive Environmental Response and Liability Act (CERCLA), which covers both Superfund and the National Contingency Plan (NCP) also clearly states that 1% asbestos is not a “safe” level:<sup>27</sup>

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.

### **STUDY SHOWS THAT EVEN 0.001% ASBESTOS IS UNSAFE**

A significant study found that soils containing only 0.001% asbestos can lead to air concentrations of 0.01 fibers per milliliter (f/mL).<sup>28</sup> Furthermore, this air level of 0.01 f/mL is many times over either the EPA one-in-a-million cancer risk level of 0.000004 f/mL (PCM), or the typical background levels of asbestos in outdoor air of 0.000002 f/mL (PCM); or typical indoor air levels of 0.000003 f/mL (PCM).

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<sup>-1</sup>).

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