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ASBESTOS

Considerations for using the asbestos "1% rule" for cleaning up bulk contamination associated with the World Trade Center terrorists attacks.

Purpose: The purpose of this fact sheet is to discuss the basis of the 1% rule for asbestos containing material (ACM) and suggest how it may be applied to cleaning up asbestos contaminated debris from the World Trade Center collapse. The intent is to provide guidance for the use of bulk sampling results that will be protective of public health.

Background: The definition of asbestos containing material was first found in the Asbestos Hazard Emergency Response legislation of the United States Code. The term "asbestos-containing material" means any material which contains more than 1 percent asbestos by weight (see, United States Code, Title 15 - Commerce and Trade, Chapters 53 - Toxic Substances Control, Subchapter II - Asbestos Hazard Emergency Response, Sec. 2642. Definitions; which can be found at <http://www4.law.cornell.edu/uscode/15/2642.html>).

This definition was codified in the Code of Federal Regulations (40 CFR Ch1, Part 763 [7-1-00]) where a counting technique using polarized light microscopy (PLM) is used to determine percent asbestos.

% asbestos = (a/n) X 100% where

a = number of asbestos counts,

n = number of nonempty points counted (400),

If a = 0, report "No asbestos detected",

If 0 < a ≤ 3 report "<1% asbestos".

Historical derivation of the definition of "asbestos containing material": Two different accounts of the discussions leading to the definition of asbestos-containing material (containing greater than 1% asbestos) were identified.

The first account suggest that in the late 1970's when EPA was looking at the different methods to examine bulk material for asbestos they considered several different methods including polarized light microscopy (PLM), electron microscopy, x-ray diffraction (XRD), and others. EPA eventually settled upon XRD. XRD had a detection limit of approximately 1% asbestos in bulk material. Eventually the limitations of XRD became an obstacle to reliable asbestos determinations and EPA looked toward PLM to replace XRD as the analytical tool of choice. However, even though PLM can detect well below 1% asbestos, the 1% number had become well accepted and had been written into legislation, and so therefore 1% remained the legally enforceable number.

The second account suggests that the 1% rule has a political basis and resulted as a compromise between regulators and the regulated industry. An account of the politics and decision process leading to the selection of the 1% rule has been well described by Michael Moss and Adrienne Appel in an investigative report in the July 9, 2001 edition of the New York Times.

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Regardless of which account is most accurate or even if the two accounts actually emerged about the same time resulting in the final definition of asbestos containing material, neither account indicates that the derivation of the 1% rule was in a manner that employed considerations of human health. The 1% rule is not based on health.

Two main short-comings of the 1% rule exist.

- ▶ The 1% rule is not derived from a risk assessment or any other type of health based analysis.
- ▶ The 1% rule does not insure that asbestos air levels will be at levels that are protective of human health.

Some kind of cost benefit and risk assessment should have been done because federal rules require for promulgation

The second point is not well documented in the literature. But two personal communications indicate this is a major problem with the 1% rule. OSHA (personal communication with Dan Krane, OSHA) has examined over 6000 work places in which asbestos existed in bulk material between 0% and 1 %. Four percent of these work places had asbestos air levels at or above the OSHA permissible exposure limit (PEL) of 0.1 f/cc. The measurements were point determinations and not 8 hour time weighted averages (TWA). But had the exposures continued for 8 hours, 4 % of the work places would have exceeded the PEL even though materials in these work places did not exceed 1% asbestos w/w.

The second indication of the limits of the 1% rule comes from Libby, Montana (personal communication with Chris Weis, EPA). Preliminary data from investigations into different types of activities show that tilling the soil in gardens with < 1% detectable levels of asbestos resulted in air levels close to the OSHA PEL.

Conclusion: The 1% rule has the advantage of being a legally enforceable level and precedence for its use is available. However the rule is not health based and may not provide adequate protection from airborne asbestos under a variety of conditions. Because of these limitations great care should be used in using any type of w/w percentage as guidance to protect human health. If percent determinations have to be made, they should be used only to confirm the presence or absence of asbestos or to recommend clean-up followed by further air testing. A possible guideline is suggested below.

Interpretation of bulk and air samples: The following table provides a general guide for determining public health actions based upon sampling of both bulk material and indoor air. The table integrates the Environmental Assessment Workgroup multi-agency recommendations for reoccupation of residences in lower Manhattan (see attachment 1). It is important to note that the ultimate decision criteria for reoccupation is the ambient air level of asbestos. Bulk asbestos determinations are useful for (1) determining the potential for recontaminating ambient air and (2) for determining the type of further sampling needed.

In general the sampling and resampling strategy encompasses testing of bulk material and clean up until such a time that further clean up will not lower bulk asbestos levels. Confirmation is

2

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Follow up Recommendations Based on Sampling Results from ATSDR's Residential Sampling

Asbestos level (bulk and air)	Sequential steps for follow up	CommentsNotes:
Settled dust > 1% asbestos w/w (PLM) air any level	1. Clean-up 2 Resample air and bulk 3 Evaluate data 4 Determine next actions based on follow up recommendations	Clean-up should follow OSHA standards for training and worker protection and any state laws for licensing. Consideration should be given to removing hard to clean furnishings, like carpet and upholstery, if sampling data remains elevated after repeated cleaning
Settled dust >Detection Limit - ≤ 1% w/w (PLM) air > 0.01 f/cc (TEM) ➤	1. Clean-up 2. Resample air and bulk 3. Evaluate data 4. Determine next actions based on follow up recommendations	Consideration should be given to removing hard to clean furnishings, like carpet and upholstery, if sampling data remains elevated after repeated cleaning
Settled dust >Detection Limit - ≤ 1% w/w (PLM) air <0.01 f/cc (TEM)	1. Evaluate all appropriate data related to asbestos (air, bulk, personal monitors - PLM, XRD, PCM, TEM) 2. Determine appropriate follow up based on professional judgement 3. If clean up is recommended, resample and reevaluate results	Special attention should be paid to hard to clean surfaces. (e.g., certain fabrics, furniture, carpet, and curtains).
Settled dust Non-detect (PLM) air > 0.01 f/cc (TEM)	1. Clean-up 2. Resample air 3. Evaluate air data 4. Determine follow up actions	Remain advised of outdoor levels. If high levels are frequent retesting may be appropriate.
Settled dust Non-detect (PLM) air <0.01 f/cc (TEM)	No further action	

Attachment 1

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IV. Sampling Parameters:

<u>Parameter</u>	<u>Sample Type</u>	<u>Indoor/Outdoor</u>	<u>Rationale for Selection</u>
Asbestos	breathing ht., time-weighted air	I/O	known use in building construction, evidence of presence in early air sampling and in settled dust, known inhalation carcinogen
Total Suspended particulates	breathing ht., Continuous, real- time, air	O	Characterize amount of airborne dust that is inhalable ($\leq 100 \mu\text{m}$ aerodynamic diameter)
PM10 and PM2.5	breathing ht., Continuous, real- time, air	O	Characterize the amount of airborne dust that is respirable
Inhalable ($<100\mu\text{m}$)* thoracic ($<10\mu\text{m}$)* respirable ($<4\mu\text{m}$)*	breathing ht., time-weighted, air	I/O	To determine relative amounts of each fraction present and to have each fraction analyzed for silica, gypsum, asbestos, mica, fiberglass, and calcite to qualitatively determine potential hazards.
Respirable crystalline silica	breathing ht., time-weighted, air	I/O	Known component of concrete, evidence of presence in some settled dust samples, known inhalation carcinogen.
pH**	dust	I/O	Concrete has a high pH, if dust has a high pH, it may be contributing to reported symptoms of ENT irritation
Asbestos**	dust	I/O	Determine if asbestos is present in dust
gypsum,silica, mica, fiberglass, calcite**	dust	I/O	Associated with building materials (concrete, drywall) and known to be irritating to ENT
magnesium	dust	I/O	May act as a tracer for WTC-related dust, levels found in metals analysis of settled dust from 16,000-29,000 ppm

* results will be used to better understand the potential for ENT and respiratory irritation, and possibly for determining the possibility of acute/chronic health problems. Results will assist in providing information/recommendations to the public (e.g., what is contributing to irritation, how to reduce exposures)

** to assist in characterizing dust that can become airborne (re-entrainment of settled dust that may be the source of continuing air contamination), and to make recommendations for outdoor dust remediation

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Sample/Analytical Methods

<u>Parameter</u>	<u>Environmental Media</u>	<u>Sampling/Analytical Method</u>	<u>Sample Flow/time</u>	<u>Analytical LOD / LOQ*</u>
Asbestos	I/O** air	NIOSH 7400, NIOSH 7402 Breathing zone sample height	16 L/min -4 hr (3840L) 5 hr (4800L) 6 hr (5760L)	0.010 f/cc (LOQ) 0.008 f/cc 0.007 f/cc
Total Suspended Particulates	O air	EPA Method # (continuous realtime) Breathing zone sample height	12-hr	
PM10 and PM2.5	O air	EPA Method # (continuous real-time) Breathing zone sample height	12-hr	
Inhalable (<100µm) thoracic (<10µm) respirable (<4µm)	I/O air	IOM personal sampler. Analyze each fraction for asbestos,(TEM), and for crystalline silica, gypsum, fiberglass calcite (XRD)	2 L/min -5 hr (600L)	30 ug / 50 ug/m ³
Respirable crystalline silica	I/O air	NIOSH 7500	2.5 L/min-5.3 hr(800L)	5 ug / 6 ug/m ³
pH	I/O dust	EPA SW 846 Mtd 9045C (soils)	10-25 g	
asbestos	I/O dust	PLM, and if <1% TEM	"	
silica, gypsum, gypsum, fiberglass, calcite	I/O dust	XRD	"	

* LOD:Limit of analytical detection; LOQ: Limit of analytical quantitation

** I: indoor; O: outdoor