

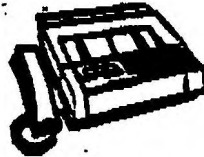
JAN-31-2003 11:04

P.01/03

file



**EPA
REGION II
290 BROADWAY
NEW YORK, NY 10007-1866**



FACSIMILE REQUEST AND COVER SHEET

**OFFICE OF THE ASSISTANT REGIONAL
ADMINISTRATOR FOR POLICY & MANAGEMENT**

**Telephone Number: 212-637-3556
Fax Number: 212-637-5045**

.....

TODAY'S DATE:

1/31

TO:

MIKE GILSEMAN

OFFICE #:

FAX #:

718 595-4544

.....

FROM:

M. MADRALON

OFFICE:

NUMBER OF PAGES SENT INCLUDING THIS COVER SHEET:

3

MESSAGE:

JAN-31-2003 11:04

P.02/03

Laboratory Contract Requirements

August 8, 2002

FAX
718 595-4544
MICHAEL GILSENAN
NYC GOV. DEPT.
MGILSENAN@
DEPT. NYC. GOV

1) Three Analytical results are required**1. PCM count by method 7400****2. TEM analysis**a. TEM total count per the AHERA counting method, fibers $>0.5\mu$ b. PCM Equivalent for asbestos only, fibers $>5\mu$ that meet the length and width ratio

2) The laboratory shall scan analytical data using a high speed scanner to enable the transfer of data electronically for rapid turnarounds (i.e. 24 hours). Data to be scanned is identified in Table 1.

3) All analytical data shall be reported electronically unless specified. In addition, all analytical data shall be reported in the order identified below, exceptions shall be approved by EPA Region 2. Complete data packages is requested for 20% of the Residential Clean-up wipe samples analyzed for metals, mercury, and dioxins. These packages will be selected randomly. Upon receipt of notification, the laboratory shall send complete hardcopy data as described in Table 1 within five (5) business days. Upon request, complete data packages shall be sent to QATS at:

Shaw Environmental & Infrastructure

Attn: Mike Lenkauskas

2700 Chandler Bldg C

Las Vegas, Nevada 89120

4) The laboratory shall communicate with EPA and the QATS contractor to document sample tracking. The laboratory shall identify a point of contact with telephone number for each facility for this information along with an alternate. The laboratory shall inform QATS via electronic transmission of the samples received and which facility will analyze the samples by noon the following day of receipt of samples. This information shall be documented on the laboratory's signed chain-of-custody, scanned and sent to QATS via email. The laboratory shall also notify QATS if any changes are implemented after such notification.

5) The laboratory shall report analytical results with the following applicable units. All results shall be submitted to Region 2 and QATS via electronic submission unless otherwise approved by Region 2.

Analyte Code	Micro Vacuum	Wipes	Air	Bulk
Dioxin	NA	ng/m ²	ng/m ³	ng/g
PAHs	NA	ug/m ²	ug/m ³	ug/kg
Total Dust	NA	ug/m ²	ug/m ³	ug/kg

JAN-31-2003 11:05

P.03/03

	<i>air, surf</i> f/cm ²	<i>wipe</i> f/cm ²	<i>air</i> f/cc <i>5/ft</i>	<i>Bulk</i> % by weight
Asbestos/MMVF	f/cm ²	f/cm ²	f/cc <i>5/ft</i>	% by weight
Metals ¹ & Mercury	ug/m ²	ug/m ²	ug/m ³	mg/kg
Silica, calcite, gypsum	N/A	mg/m ²	mg/m ³	% by weight

¹ Report lead as both ug/m² and ug/ft².

6) Due to the sensitive nature of this project, all data is to be reported on time. Should data be received beyond the due date the laboratory shall assume the appropriate late charges as agreed between the Contracting Officer and Region 2.

7) Data turnaround times shall be as follows.

Analyte Code	Analysis Fields Background and Residential	Collection Method	Data Turnaround
Asbestos*	NIOSH 7400 PCM > 5 um	Micro vacuum-ASTM D 5755-95, wipe-ATSM D 6480-99, air-NIOSH 7400, and bulk	24 hours
	PCMe by TEM asbestos only > 5 um		Standard (3 days)
	TEM by AHERA > 0.5 um		
Dioxins	EPA Method SW-846 8290	Wipe ASTM D 6661-01 and bulk	14 days
Total Dust	EPA Method SW-846 8290	Wipe HUD Appendix 13.1	14 days
PAH	EPA Method SW-846 8270C	Wipe ASTM D 6661-01, bulk	14 days
Metals	EPA Method SW-846 6010B	Micro-Vacuum ASTM E 1973-99, Wipe HUD Appendix 13.1, Air NIOSH 7300, and bulk	14 days
Mercury	EPA Method SW-846 7471A	Wipe HUD Appendix 13.1,	14 days
Silica, Calcite, Gypsum	NIOSH 7500 (XRD)	Wipe HUD Appendix 13.1, Air NIOSH 7500, and bulk	21 days
MMVF	EMSL MSD.0300	Collected with asbestos, Micro-Vacuum ASTM D 5755-95, Wipe ATSM D 6480-99, NIOSH 7400	14 days
MMVF	PLM NYS 198.1/EMSL MSD.0300	Collected with asbestos, Bulk	14 days

*PCM NIOSH 7400, TEM by AHERA method reporting both TEM and PCMe. Samples are collected using a 0.8 um filter pore size.

8) All laboratories analyzing asbestos samples shall be available seven (7) days a week to receive and analyze samples requested within 24 hours. Results of these analyses must be submitted

Hvac

Silica

5 day

trans n

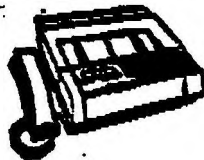
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P.03/03

	<i>air</i> f/cm ²	<i>wipe</i> f/cm ²	<i>air</i> f/cc <i>5/ce</i>	<i>Bulk</i> % by weight
Asbestos/MMVF	f/cm ²	f/cm ²	f/cc <i>5/ce</i>	% by weight
Metals ¹ & Mercury	ug/m ²	ug/m ²	ug/m ³	mg/kg
Silica, calcite, gypsum	N/A	mg/m ²	mg/m ³	% by weight

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	PCMe by TEM asbestos only > 5 um		Standard (3 days)
	TEM by AHERA > 0.5 um		
Dioxins	EPA Method SW-846 8290	Wipe ASTM D 6661-01 and bulk	14 days
Total Dust	EPA Method SW-846 8290	Wipe HUD Appendix 13.1	14 days
PAH	EPA Method SW-846 8270C	Wipe ASTM D 6661-01, bulk	14 days
Metals	EPA Method SW-846 6010B	Micro-Vacuum ASTM E 1973-99, Wipe HUD Appendix 13.1, Air NIOSH 7300, and bulk	14 days
Mercury	EPA Method SW-846 7471A	Wipe HUD Appendix 13.1,	14 days
Silica, Calcite, Gypsum	NIOSH 7500 (XRD)	Wipe HUD Appendix 13.1, Air NIOSH 7500, and bulk	21 days
MMVF	EMSL MSD.0300	Collected with asbestos, Micro-Vacuum ASTM D 5755-95, Wipe ATSM D 6480-99, NIOSH 7400	14 days
MMVF	PLM NYS 198.1/EMSL MSD.0300	Collected with asbestos, Bulk	14 days

* PCM NIOSH 7400, TEM by AHERA method reporting both TEM and PCMe. Samples are collected using a 0.8 um filter pore size.

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Hvac

Silica

5 day

trans n

C

TOTAL P.03

Gilsenan, Michael

From: Raffo, Barbara
Sent: Thursday, November 07, 2002 12:45 PM
To: Gilsenan, Michael
Subject: FW: Air Monitoring Results

-----Original Message-----

From: Melendres, Janet
Sent: Thursday, November 07, 2002 12:48 PM
To: Raffo, Barbara
Subject: Air Monitoring Results



Sample.xls

NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION
NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF ENVIRONMENTAL COMPLIANCE

RESULTS OF ASBESTOS AIR MONITORING				REGULATORY LIMIT 0.01 f/cc & 70 s/sqmm	
No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
1	10/04/01	< 0.002 f/cc	< 0.002 f/cc	< 0.002 f/cc	0.003 f/cc
2	10/05/01	0.004 f/cc	0.003 f/cc	< 0.002 f/cc	< 0.002 f/cc
3	10/06/01	< 0.002 f/cc	< 0.002 f/cc	< 0.002 f/cc	< 0.002 f/cc
4	10/07/01	< 0.002 f/cc	< 0.002 f/cc	< 0.002 f/cc	.018 f/cc (40 s/sqmm)
5	10/08/01	0.005 f/cc	< 0.002 f/cc	< 0.002 f/cc	0.007 f/cc
6	10/09/01	< 0.002 f/cc	0.004 f/cc	< 0.002 f/cc	0.003 f/cc
7	10/10/01	0.003 f/cc	0.003 f/cc	0.003 f/cc	0.004 f/cc
8	10/11/01	0.003 f/cc	0.003 f/cc	< 0.002 f/cc	0.003 f/cc
9	10/12/01	< 0.002 f/cc	< 0.002 f/cc	0.007 f/cc	0.003 f/cc
10	10/13/01	< 0.002 f/cc	< 0.002 f/cc	< 0.002 f/cc	< 0.002 f/cc
11	10/14/01	< 0.002 f/cc	< 0.002 f/cc	0.004 f/cc	0.005 f/cc
12	10/15/01	0.005 f/cc	0.003 f/cc	< 0.002 f/cc	< 0.002 f/cc
13	10/16/01	0.004 f/cc	0.002 f/cc	0.003 f/cc	< 0.002 f/cc
14	10/17/01	0.003 f/cc	0.003 f/cc	0.002 f/cc	0.004 f/cc
15	10/18/01	0.004 f/cc	< 0.002 f/cc	< 0.002 f/cc	< 0.002 f/cc
16	10/19/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
17	10/20/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
18	10/21/01	< 13.33 s/sqmm	< 13.33 s/sqmm	13.33 sq/mm	< 13.33 s/sqmm
19	10/22/01	13.33 s/sqmm	*< 13.33 s/sqmm	13.33 s/sqmm	< 13.33 s/sqmm
20	10/23/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm

3/14/2003

NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION

No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
21	10/24/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
22	10/25/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
23	10/26/01	< 13.33 s/sqmm	13.33 s/sqmm	< 13.33 s/sqmm	13.33 s/sqmm
24	10/27/01	40 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
25	10/28/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
26	10/29/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
27	10/30/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
28	10/31/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	13.33 s/sqmm
29	11/01/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
30	11/02/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
31	11/03/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	13.33 s/sqmm
32	11/04/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
33	11/05/01	13.33 s/sqmm	13.33 s/sqmm	26.67 s/sqmm	13.33 s/sqmm
34	11/06/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
35	11/07/01	< 13.33 s/sqmm	< 13.33 s/sqmm	40 s/sqmm	< 13.33 s/sqmm
36	11/08/01	< 13.33 s/sqmm	< 26.67 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
37	11/09/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
38	11/10/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
39	11/11/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
40	11/12/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
41	11/13/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 8.89 s/sqmm
42	11/14/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
43	11/15/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm

3/14/2003

NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION

No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
44	11/16/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
45	11/17/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
46	11/18/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
47	11/19/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
48	11/20/01	< 13.33 s/sqmm	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
49	11/21/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
50	11/22/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
51	11/23/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	28.67 s/sqmm
52	11/24/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
53	11/25/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	13.33 s/sqmm
54	11/26/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
55	11/27/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
56	11/28/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
57	11/29/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
58	11/30/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
59	12/01/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
60	12/02/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
61	12/03/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
62	12/04/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
63	12/05/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
64	12/06/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
65	12/07/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
66	12/08/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 8.89 s/sqmm

3/14/2003

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No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
67	12/09/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
68	12/10/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
69	12/11/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
70	12/12/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
71	12/13/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
72	12/14/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
73	12/15/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
74	12/16/01	< 13.33 s/sqmm	< 13.33 s/sqmm	13.33 s/sqmm	13.33 s/sqmm
75	12/17/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	13.33 s/sqmm
76	12/18/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
77	12/19/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
78	12/20/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
79	12/21/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
80	12/22/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
81	12/23/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
82	12/24/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
83	12/25/01	< 13.33 s/sqmm	< 15.15 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
84	12/26/01	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
85	12/27/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
86	12/28/01	< 16.00 s/sqmm	< 16.00 s/sqmm	< 16.00 s/sqmm	< 16.00 s/sqmm
87	12/29/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
88	12/30/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
89	12/31/01	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm

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No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
90	01/01/02	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
91	01/02/02	13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
92	01/03/02	26.67 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	26.67 s/sqmm
93	01/04/02	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
94	01/05/02	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
95	01/06/02	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
96	01/07/02	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
97	01/08/02	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
98	01/09/02	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm	< 13.33 s/sqmm
99	01/10/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
100	01/11/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
101	01/12/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
102	01/13/02	< 14.3 s/sqmm	< 14.3 s/sqmm	14.3 s/sqmm	28.6 s/sqmm
103	01/14/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
104	01/15/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
105	01/16/02	< 14.3 s/sqmm	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
106	01/17/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
107	01/18/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
108	01/19/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
109	01/20/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
110	01/21/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
111	01/22/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
112	01/23/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm

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No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
113	01/24/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
114	01/25/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
115	01/26/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
116	01/27/02	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
117	01/28/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
118	01/29/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
119	01/30/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
120	01/31/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
121	02/01/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
122	02/02/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
123	02/03/02	< 14.3 s/sqmm	28.6 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
124	02/04/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
125	02/05/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
126	02/06/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
127	02/07/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
128	02/08/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
129	02/09/02	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
130	02/10/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
131	02/11/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
132	02/12/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
133	02/13/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
134	02/14/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
135	02/15/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm

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No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
136	02/16/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
137	02/17/02	< 14.3 s/sqmm	< 14.3 s/sqmm	14.3 s/sqmm	< 14.3 s/sqmm
138	02/18/02	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
139	02/19/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
140	02/20/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
141	02/21/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
142	02/22/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
143	02/23/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
144	02/24/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
145	02/25/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
146	02/26/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
147	02/27/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
148	02/28/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
149	03/01/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
150	03/02/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
151	03/03/02	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
152	03/04/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
153	03/05/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
154	03/06/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
155	03/07/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
156	03/08/02	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
157	03/09/03	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
158	03/10/02	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm

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No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
159	03/11/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
160	03/12/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
161	03/13/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
162	03/14/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
163	03/15/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
164	03/16/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
165	03/17/02	14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
166	03/18/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
167	03/19/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
168	03/20/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
169	03/21/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
170	03/22/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
171	03/23/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
172	03/24/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
173	03/25/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
174	03/26/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
175	03/27/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
176	03/28/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
177	03/29/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
178	03/30/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
179	03/31/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
180	04/01/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
181	04/02/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm

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No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
182	04/03/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
183	04/04/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
184	04/05/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
185	04/06/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
186	04/07/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
187	04/08/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
188	04/09/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
189	04/10/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
190	04/11/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
191	04/12/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
192	04/13/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
193	04/14/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	14.3 s/sqmm
194	04/15/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
195	04/16/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
196	04/17/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
197	04/18/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
198	04/19/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
199	04/20/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
200	04/21/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
201	04/22/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
202	04/23/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
203	04/24/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
204	04/25/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm

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No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
205	04/26/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
206	04/27/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
207	04/28/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
208	04/29/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
209	04/30/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
210	05/01/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
211	05/02/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
212	05/03/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	14.3 s/sqmm
213	05/04/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
214	05/05/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
215	05/06/02	< 12.5 s/sqmm	< 12.5 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
216	05/07/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
217	05/08/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
218	05/09/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
219	05/10/02	< 14.3 s/sqmm	< 25 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
220	05/11/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
221	05/12/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
222	05/13/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
223	05/14/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
224	05/15/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
225	05/16/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
226	05/17/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
227	05/18/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm

NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION

No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
228	05/19/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
229	05/20/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
230	05/21/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
231	05/22/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
232	05/23/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
233	05/24/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
234	05/25/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
235	05/26/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
236	05/27/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
237	05/28/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
238	05/29/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
239	05/30/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
240	05/31/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
241	06/01/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
242	06/02/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
243	06/03/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
244	06/04/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
245	06/05/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
246	06/06/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
247	06/07/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
248	06/08/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
249	06/09/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
250	06/10/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm

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NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION

No	Date	H.S. E.F 100 Trinity Place	P.S. 234 282 Grennwich St.	Stuyvesant H.S. 345 Chambers St.	I.S. 89 201 Warren St.
251	06/11/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
252	06/12/02	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm	< 14.3 s/sqmm
253	06/13/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
254	06/14/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
255	06/15/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
256	06/16/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
257	06/17/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
258	06/18/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
259	06/19/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
260	06/20/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
261	06/21/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
262	06/22/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
263	06/23/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
264	06/24/02	< 13.3 s/sqmm	Overloaded	< 13.3 s/sqmm	< 13.3 s/sqmm
265	06/25/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
266	06/26/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
267	06/27/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
268	06/28/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
269	06/29/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm
270	06/30/02	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm	< 13.3 s/sqmm

Total Volume= 1200 liters

Sampling Time= 8hrs.

3/14/2003

Gilsenan, Michael

From: Atteloney, Leonard
Sent: Friday, November 01, 2002 11:37 AM
To: Gilsenan, Michael
Subject: Invoice Processing



invoice955495.doc

MEMORANDUM

To: Mike Nolan, Project Manager
Warren & Panzer Engineers, P.C.

From: Leonard Atteloney, Director of Laboratory Services
Bureau of Environmental Compliance

Date: November 1, 2002

Topic: Documents Needed for Processing Invoice

In order to approve the invoices that were submitted the following documents are needed:

Invoice # 955495

1. Need explanation of hours and or laboratory report for employee # 432 on 08/26/02.
2. Need explanation of hours and or laboratory report for employee # 377 on 08/28/02.

Invoice #955496

3. Need explanation of hours and or laboratory report for employee # 377 on 09/08/02.
4. Need explanation of hours and or laboratory report for employee # 438 on 0-09/07/02.

c: M. Gilsenan, Asst. Commissioner BEC

Gilsenan, Michael

From: Gerald Pryor [gp1@nyu.edu]
Sent: Wednesday, October 23, 2002 9:29 PM
To: Fitzpatrick.Robert@epa.gov
Cc: Gilsenan, Michael; egesmer@gulges.com
Subject: 7S cleaning

Dear Bob,

It has come to my attention that our bookshelves were NOT removed so that cleaning could take place behind the shelves and fake walls that back the bookshelves. This was a definite special cleaning request by me in writing. There was so much debris on and inside the 400 books on these shelves, the decision was made to throw out all the books because of health concerns. Therefore, the shelves need to be removed and cleaned (as well as the spaces behind the shelves) in order for the health risks not to be a problem for me and my family. Since the bookshelves are still intact, it is apparent that they were never removed and cleaned. Please confirm to me ASAP that this will be attended to . Please contact me as soon as you can regarding these concerns . Thank you.

Gerry Pryor

Gilsenan, Michael

From: Radhakrishnan, Krish
Sent: Friday, August 09, 2002 2:16 PM
To: Gilsenan, Michael
Subject: FW: laboratory requirements as requested



lab-valRequirement
s2.wpd



e21.pdf



7400.pdf

-----Original Message-----

From: Santella.Dennis@epamail.epa.gov
[mailto:Santella.Dennis@epamail.epa.gov]
Sent: Friday, August 09, 2002 10:13 AM
To: krishr@dep.nyc.gov; virginias@dep.nyc.gov
Cc: Mitchell.Tanya@epamail.epa.gov; Maddaloni.Mark@epamail.epa.gov;
Rotola.Joe@epamail.epa.gov
Subject: laboratory requirements as requested

(See attached file: lab-valRequirements2.wpd)

(See attached file: e21.pdf) AHERA

(See attached file: 7400.pdf) NIOSH

Laboratory Contract Requirements

August 8, 2002

1) Three Analytical results are required

1. PCM count by method 7400

2. TEM analysis

a. TEM total count per the AHERA counting method, fibers >0.5 um

b. PCM Equivalent for asbestos only, fibers >5 um that meet the length and width ratio

2) The laboratory shall scan analytical data using a high speed scanner to enable the transfer of data electronically for rapid turnarounds (i.e. 24 hours). Data to be scanned is identified in Table 1.

3) All analytical data shall be reported electronically unless specified. In addition, all analytical data shall be reported in the order identified below, exceptions shall be approved by EPA Region 2. Complete data packages is requested for 20% of the Residential Clean-up wipe samples analyzed for metals, mercury, and dioxins. These packages will be selected randomly. Upon receipt of notification, the laboratory shall send complete hardcopy data as described in Table 1 within five (5) business days. Upon request, complete data packages shall be sent to QATS at:

Shaw Environmental & Infrastructure
Attn: Mike Lenkauskas
2700 Chandler Bldg C
Las Vegas, Nevada 89120

4) The laboratory shall communicate with EPA and the QATS contractor to document sample tracking. The laboratory shall identify a point of contact with telephone number for each facility for this information along with an alternate. The laboratory shall inform QATS via electronic transmission of the samples received and which facility will analyze the samples by noon the following day of receipt of samples. This information shall be documented on the laboratory's signed chain-of-custody, scanned and sent to QATS via email. The laboratory shall also notify QATS if any changes are implemented after such notification.

5) The laboratory shall report analytical results with the following applicable units. All results shall be submitted to Region 2 and QATS via electronic submission unless otherwise approved by Region 2.

Analyte Code	Micro Vacuum	Wipes	Air	Bulk
Dioxin	NA	ng/m ²	ng/m ³	ng/g
PAHs	NA	ug/m ²	ug/m ³	ug/kg
Total Dust	NA	ug/m ²	ug/m ³	ug/kg

Asbestos/MMVF	f/cm ²	f/cm ²	f/cc	% by weight
Metals ¹ & Mercury	ug/m ²	ug/m ²	ug/m ³	mg/kg
Silica, calcite, gypsum	N/A	mg/m ²	mg/m ³	% by weight

¹ Report lead as both ug/m² and ug/ft².

6) Due to the sensitive nature of this project, all data is to be reported on time. Should data be received beyond the due date the laboratory shall assume the appropriate late charges as agreed between the Contracting Officer and Region 2.

7) Data turnaround times shall be as follows.

Analyte Code	Analysis Fields Background and Residential	Collection Method	Data Turnaround
Asbestos*	NIOSH 7400 PCM > 5 um	Mico vacuum-ASTM D 5755-95, wipe-ATSM D 6480-99, air-NIOSH 7400, and bulk	24 hours
	PCMe by TEM asbestos only > 5 um		Standard (3 days)
	TEM by AHERA > 0.5 um		
Dioxins	EPA Method SW-846 8290	Wipe ASTM D 6661-01 and bulk	14 days
Total Dust	EPA Method SW-846 8290	Wipe HUD Appendix 13.1	14 days
PAH	EPA Method SW-846 8270C	Wipe ASTM D 6661-01, bulk	14 days
Metals	EPA Method SW-846 6010B	Micro-Vacuum ASTM E 1973-99, Wipe HUD Appendix 13.1, Air NIOSH 7300, and bulk	14 days
Mercury	EPA Method SW-846 7471A	Wipe HUD Appendix 13.1,	14 days
Silica, Calcite, Gypsum	NIOSH 7500 (XRD)	Wipe HUD Appendix 13.1, Air NIOSH 7500, and bulk	21 days
MMVF	EMSL MSD.0300	Collected with asbestos, Micro-Vacuum ASTM D 5755-95, Wipe ATSM D 6480-99, NIOSH 7400	14 days
MMVF	PLM NYS 198.1/EMSL MSD.0300	Collected with asbestos, Bulk	14 days

*PCM NIOSH 7400, TEM by AHERA method reporting both TEM and PCMe. Samples are collected using a 0.8 um filter pore size.

8) All laboratories analyzing asbestos samples shall be available seven (7) days a week to receive and analyze samples requested within 24 hours. Results of these analyses must be submitted electronically to Region 2 and QATS within the 24 requirement.

Table 1

Analytical Method	Information Needed from the Laboratory for Data Validation		
	Limited Validation		Full Validation
	Electronic (F2L)	Scanned	Hardcopy Data
PCM (NIOSH 7400)	Sample Volume Result w/units Sample Number Lab Sample ID	Result Form: Volume collected Sample Number Lab Sample ID Result Units	N/A
		Count Sheet: Fibers counted Fields analyzed Field area Filter size	
		Signed COC	
TEM (AHERA)	Sample Volume/Area Result w/units Sample Number Lab Sample ID Fiber Type	Result Form: Volume collected or area wiped Sample Number Lab Sample ID Result Units	N/A
		Count Sheet: Volume used (microvac) Grids openings counted Structures counted Asbestos type Average size of grid openings Filter size	
		Signed COC	
MMVF (NYS 198.1/EMSL MSD.0300)	Sample Volume Result w/units Sample Number Lab Sample ID Fiber Type	Result Form: Sample Number Lab Sample ID Result Units Volume Structures Structure Type(s)	Result Form: Sample Number Lab Sample ID Result Units Volume Structures Structure Type(s)
		Other: Volume used for SEM Prep Optical properties Structures counted Asbestos type	Other: Volume used for SEM Prep Optical properties Structures counted Asbestos type coc

Analytical Method	Information Needed from the Laboratory for Data Validation		
	Limited Validation		Full Validation
	Electronic (F2L)	Scanned	Hardcopy Data
		Signed COC	QC Results: Duplicates Replicates Blanks
XRD (NIOSH 7500)	Sample Volume Result w/units Sample Number Lab Sample ID	Result Form: Sample Number Lab Sample ID Result Units Volume	Result Form: Sample Number Lab Sample ID Result Units Volume
		Other: Preparation volumes Signed COC	Other: Preparation volumes Calibration data Standard prep logs coc
		QC Results: Duplicates Blanks Control Sample	QC Results: Duplicates Blanks Controls Sample
Inorganics (metals, mercury)	Sample Volume/Area Result w/units Sample Number Lab Sample ID	Result Forms: Sample Number Lab Sample ID Result Date Collected Prep Date Date Analyzed Detection Limits Lab Qualifiers Dilution Factor Units	Result Forms: Sample Number Lab Sample ID Result Date Collected Prep Date Date Analyzed Detection Limits Lab Qualifiers Dilution Factor Units
		QC Summary: MB results LCS recoveries MS recoveries DUP RPD's Serial dilution %Ds PS %Rs	QC Summary: MB results LCS recoveries MS recoveries DUP RPD's Serial dilution %Ds PS %Rs
		Signed COC	Calib.Summary: (ICV, CCV, ICB, CCB, ICSA&B, LDR and IDLs) Other: COC Prep Logs Run Logs Raw data

Analytical Method	Information Needed from the Laboratory for Data Validation		
	Limited Validation		Full Validation
	Electronic (F2L)	Scanned	Hardcopy Data
Organics (Dioxins, PAH)	Sample Voume/Area Result w/units Sample Number Lab Sample ID	Result Forms: Sample Number Lab Sample ID Result Date Collected Prep Date Date Analyzed Detection Limits Lab Qualifiers Dilution Factor Units	Result Forms: Sample Number Lab Sample ID Result Date Collected Prep Date Date Analyzed Detection Limits Lab Qualifiers Dilution Factor Units
Organics (dioxins, PAH)		QC Summary: MB results LCS recoveries MS/MSD Recoveries and RPDs Surrogate recoveries Internal Standards	QC Summary: MB results LCS recoveries MS/MSD recoveries and RPDs Surrogate recoveries Internal Standards
		Signed COC	Calib.Summary: Tune Initial Cal Continuing Cal
			Other: COC Prep Logs Run Logs Raw data

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contaminated surface used in the validation study. Record and keep the results of the validation study as an appendix to the SOP. Include in this appendix, the solvent used to make the spiking solution, the PCB concentration of the spiking solution used to contaminate the surfaces in the validation study, and all of the validation study testing parameters and experimental conditions.

PART 763—ASBESTOS

Subparts A-C [Reserved]

Subpart D [Reserved]

Subpart E—Asbestos-Containing Materials in Schools

- Sec.
- 763.80 Scope and purpose.
- 763.83 Definitions.
- 763.84 General local education agency responsibilities.
- 763.85 Inspection and reinspections.
- 763.86 Sampling.
- 763.87 Analysis.
- 763.88 Assessment.
- 763.90 Response actions.
- 763.91 Operations and maintenance.
- 763.92 Training and periodic surveillance.
- 763.93 Management plans.
- 763.94 Recordkeeping.
- 763.95 Warning labels.
- 763.97 Compliance and enforcement.
- 763.98 Waiver; delegation to State.
- 763.99 Exclusions.

APPENDIX A TO SUBPART E—INTERIM TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL METHODS—MANDATORY AND NONMANDATORY—AND MANDATORY SECTION TO DETERMINE COMPLETION OF RESPONSE ACTIONS

APPENDIX B TO SUBPART E—WORK PRACTICES AND ENGINEERING CONTROLS FOR—SMALL-SCALE, SHORT-DURATION OPERATIONS MAINTENANCE AND REPAIR (O&M) ACTIVITIES INVOLVING ACM

APPENDIX C TO SUBPART E—ASBESTOS MODEL ACCREDITATION PLAN

APPENDIX D TO SUBPART E—TRANSPORT AND DISPOSAL OF ASBESTOS WASTE

APPENDIX E TO SUBPART E—INTERIM METHOD OF THE DETERMINATION OF ASBESTOS IN BULK INSULATION SAMPLES

Subpart F [Reserved]

Subpart G—Asbestos Abatement Projects

- 763.120 Scope.
- 763.121 Regulatory requirements.
- 763.122 Exclusions for States.

- 763.124 Reporting.
- 763.125 Enforcement.
- 763.126 Inspections.

Subpart H [Reserved]

Subpart I—Prohibition of the Manufacture, Importation, Processing, and Distribution in Commerce of Certain Asbestos-Containing Products; Labeling Requirements

- 763.160 Scope.
- 763.163 Definitions.
- 763.165 Manufacture and importation prohibitions.
- 763.167 Processing prohibitions.
- 763.169 Distribution in commerce prohibitions.
- 763.171 Labeling requirements.
- 763.173 Exemptions.
- 763.175 Enforcement.
- 763.176 Inspections.
- 763.178 Recordkeeping.
- 763.179 Confidential business information claims.

AUTHORITY: 15 U.S.C. 2605, 2607(c), 2643, and 2646.

Subparts A-C [Reserved]

Subpart D [Reserved]

Subpart E—Asbestos-Containing Materials in Schools

SOURCE: 52 FR 41846, Oct. 30, 1987, unless otherwise noted.

§ 763.80 Scope and purpose.

(a) This rule requires local education agencies to identify friable and nonfriable asbestos-containing material (ACM) in public and private elementary and secondary schools by visually inspecting school buildings for such materials, sampling such materials if they are not assumed to be ACM, and having samples analyzed by appropriate techniques referred to in this rule. The rule requires local education agencies to submit management plans to the Governor of their State by October 12, 1988, begin to implement the plans by July 9, 1989, and complete implementation of the plans in a timely fashion. In addition, local education agencies are required to use persons who have been accredited to conduct inspections, reinspections, develop management plans, or perform response actions. The rule also includes

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recordkeeping requirements. Local education agencies may contractually delegate their duties under this rule, but they remain responsible for the proper performance of those duties. Local education agencies are encouraged to consult with EPA Regional Asbestos Coordinators, or if applicable, a State's lead agency designated by the State Governor, for assistance in complying with this rule.

(b) Local education agencies must provide for the transportation and disposal of asbestos in accordance with EPA's "Asbestos Waste Management Guidance." For convenience, applicable sections of this guidance are reprinted as Appendix D of this subpart. There are regulations in place, however, that affect transportation and disposal of asbestos waste generated by this rule. The transportation of asbestos waste is covered by the Department of Transportation (49 CFR part 173, subpart J) and disposal is covered by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR part 61, subpart M).

§ 763.83 Definitions.

For purposes of this subpart:

Act means the Toxic Substances Control Act (TSCA), 15 U.S.C. 2601, *et seq.*

Accessible when referring to ACM means that the material is subject to disturbance by school building occupants or custodial or maintenance personnel in the course of their normal activities.

Accredited or accreditation when referring to a person or laboratory means that such person or laboratory is accredited in accordance with section 206 of Title II of the Act.

Air erosion means the passage of air over friable ACM which may result in the release of asbestos fibers.

Asbestos means the asbestiform varieties of: Chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonitegrunerite); anthophyllite; tremolite; and actinolite.

Asbestos-containing material (ACM) when referring to school buildings means any material or product which contains more than 1 percent asbestos.

Asbestos-containing building material (ACBM) means surfacing ACM, thermal system insulation ACM, or miscella-

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neous ACM that is found in or on interior structural members or other parts of a school building.

Asbestos debris means pieces of ACBM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.

Damaged friable miscellaneous ACM means friable miscellaneous ACM which has deteriorated or sustained physical injury such that the internal structure (cohesion) of the material is inadequate or, if applicable, which has delaminated such that its bond to the substrate (adhesion) is inadequate or which for any other reason lacks fiber cohesion or adhesion qualities. Such damage or deterioration may be illustrated by the separation of ACM into layers; separation of ACM from the substrate; flaking, blistering, or crumbling of the ACM surface; water damage; significant or repeated water stains, scrapes, gouges, mars or other signs of physical injury on the ACM. Asbestos debris originating from the ACBM in question may also indicate damage.

Damaged friable surfacing ACM means friable surfacing ACM which has deteriorated or sustained physical injury such that the internal structure (cohesion) of the material is inadequate or which has delaminated such that its bond to the substrate (adhesion) is inadequate, or which, for any other reason, lacks fiber cohesion or adhesion qualities. Such damage or deterioration may be illustrated by the separation of ACM into layers; separation of ACM from the substrate; flaking, blistering, or crumbling of the ACM surface; water damage; significant or repeated water stains, scrapes, gouges, mars or other signs of physical injury on the ACM. Asbestos debris originating from the ACBM in question may also indicate damage.

Damaged or significantly damaged thermal system insulation ACM means thermal system insulation ACM on pipes, boilers, tanks, ducts, and other thermal system insulation equipment where the insulation has lost its structural integrity, or its covering, in whole or in part, is crushed, water-stained, gouged, punctured, missing, or not intact such that it is not able to

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contain fibers. Damage may be further illustrated by occasional punctures, gouges or other signs of physical injury to ACM; occasional water damage on the protective coverings/jackets; or exposed ACM ends or joints. Asbestos debris originating from the ACBM in question may also indicate damage.

Encapsulation means the treatment of ACBM with a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent the release of fibers, as the encapsulant creates a membrane over the surface (bridging encapsulant) or penetrates the material and binds its components together (penetrating encapsulant).

Enclosure means an airtight, impermeable, permanent barrier around ACBM to prevent the release of asbestos fibers into the air.

Fiber release episode means any uncontrolled or unintentional disturbance of ACBM resulting in visible emission.

Friable when referring to material in a school building means that the material, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure, and includes previously nonfriable material after such previously nonfriable material becomes damaged to the extent that when dry it may be crumbled, pulverized, or reduced to powder by hand pressure.

Functional space means a room, group of rooms, or homogeneous area (including crawl spaces or the space between a dropped ceiling and the floor or roof deck above), such as classroom(s), a cafeteria, gymnasium, hallway(s), designated by a person accredited to prepare management plans, design abatement projects, or conduct response actions.

High-efficiency particulate air (HEPA) refers to a filtering system capable of trapping and retaining at least 99.97 percent of all monodispersed particles 0.3 µm in diameter or larger.

Homogeneous area means an area of surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture.

Local education agency means:

(1) Any local educational agency as defined in section 198 of the Element-

tary and Secondary Education Act of 1965 (20 U.S.C. 3381).

(2) The owner of any nonpublic, non-profit elementary, or secondary school building.

(3) The governing authority of any school operated under the defense dependent's education system provided for under the Defense Dependents' Education Act of 1978 (20 U.S.C. 921, et seq.).

Miscellaneous ACM means miscellaneous material that is ACM in a school building.

Miscellaneous material means interior building material on structural components, structural members or fixtures, such as floor and ceiling tiles, and does not include surfacing material or thermal system insulation.

Nonfriable means material in a school building which when dry may not be crumbled, pulverized, or reduced to powder by hand pressure.

Operations and maintenance program means a program of work practices to maintain friable ACBM in good condition, ensure clean up of asbestos fibers previously released, and prevent further release by minimizing and controlling friable ACBM disturbance or damage.

Potential damage means circumstances in which:

(1) Friable ACBM is in an area regularly used by building occupants, including maintenance personnel, in the course of their normal activities.

(2) There are indications that there is a reasonable likelihood that the material or its covering will become damaged, deteriorated, or delaminated due to factors such as changes in building use, changes in operations and maintenance practices, changes in occupancy, or recurrent damage.

Potential significant damage means circumstances in which:

(1) Friable ACBM is in an area regularly used by building occupants, including maintenance personnel, in the course of their normal activities.

(2) There are indications that there is a reasonable likelihood that the material or its covering will become significantly damaged, deteriorated, or delaminated due to factors such as changes in building use, changes in operations and maintenance practices,

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changes in occupancy, or recurrent damage.

(3) The material is subject to major or continuing disturbance, due to factors including, but not limited to, accessibility or, under certain circumstances, vibration or air erosion.

Preventive measures means actions taken to reduce disturbance of ACBM or otherwise eliminate the reasonable likelihood of the material's becoming damaged or significantly damaged.

Removal means the taking out or the stripping of substantially all ACBM from a damaged area, a functional space, or a homogeneous area in a school building.

Repair means returning damaged ACBM to an undamaged condition or to an intact state so as to prevent fiber release.

Response action means a method, including removal, encapsulation, enclosure, repair, operations and maintenance, that protects human health and the environment from friable ACBM.

Routine maintenance area means an area, such as a boiler room or mechanical room, that is not normally frequented by students and in which maintenance employees or contract workers regularly conduct maintenance activities.

School means any elementary or secondary school as defined in section 198 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 2854).

School building means:

(1) Any structure suitable for use as a classroom, including a school facility such as a laboratory, library, school eating facility, or facility used for the preparation of food.

(2) Any gymnasium or other facility which is specially designed for athletic or recreational activities for an academic course in physical education.

(3) Any other facility used for the instruction or housing of students or for the administration of educational or research programs.

(4) Any maintenance, storage, or utility facility, including any hallway, essential to the operation of any facility described in this definition of "school building" under paragraphs (1), (2), or (3).

(5) Any portico or covered exterior hallway or walkway.

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(6) Any exterior portion of a mechanical system used to condition interior space.

Significantly damaged friable miscellaneous ACM means damaged friable miscellaneous ACM where the damage is extensive and severe.

Significantly damaged friable surfacing ACM means damaged friable surfacing ACM in a functional space where the damage is extensive and severe.

State means a State, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the Northern Marianas, the Trust Territory of the Pacific Islands, and the Virgin Islands.

Surfacing ACM means surfacing material that is ACM.

Surfacing material means material in a school building that is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

Thermal system insulation means material in a school building applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain, or water condensation, or for other purposes.

Thermal system insulation ACM means thermal system insulation that is ACM.

Vibration means the periodic motion of friable ACBM which may result in the release of asbestos fibers.

§ 763.84 General local education agency responsibilities.

Each local education agency shall:

(a) Ensure that the activities of any persons who perform inspections, re-inspections, and periodic surveillance, develop and update management plans, and develop and implement response actions, including operations and maintenance, are carried out in accordance with subpart E of this part.

(b) Ensure that all custodial and maintenance employees are properly trained as required by this subpart E and other applicable Federal and/or

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State regulations (e.g., the Occupational Safety and Health Administration asbestos standard for construction, the EPA worker protection rule, or applicable State regulations).

(c) Ensure that workers and building occupants, or their legal guardians, are informed at least once each school year about inspections, response actions, and post-response action activities, including periodic reinspection and surveillance activities that are planned or in progress.

(d) Ensure that short-term workers (e.g., telephone repair workers, utility workers, or exterminators) who may come in contact with asbestos in a school are provided information regarding the locations of ACBM and suspected ACBM assumed to be ACM.

(e) Ensure that warning labels are posted in accordance with § 763.95.

(f) Ensure that management plans are available for inspection and notification of such availability has been provided as specified in the management plan under § 763.93(g).

(g)(i) Designate a person to ensure that requirements under this section are properly implemented.

(2) Ensure that the designated person receives adequate training to perform duties assigned under this section. Such training shall provide, as necessary, basic knowledge of:

(i) Health effects of asbestos.

(ii) Detection, identification, and assessment of ACM.

(iii) Options for controlling ACBM.

(iv) Asbestos management programs.

(v) Relevant Federal and State regulations concerning asbestos, including those in this subpart E and those of the Occupational Safety and Health Administration, U.S. Department of Labor, the U.S. Department of Transportation and the U.S. Environmental Protection Agency.

(h) Consider whether any conflict of interest may arise from the interrelationship among accredited personnel and whether that should influence the selection of accredited personnel to perform activities under this subpart.

§ 763.85 Inspection and reinspections.

(a) *Inspection.* (1) Except as provided in paragraph (a)(2) of this section, be-

fore October 12, 1988, local education agencies shall inspect each school building that they lease, own, or otherwise use as a school building to identify all locations of friable and nonfriable ACBM.

(2) Any building leased or acquired on or after October 12, 1988, that is to be used as a school building shall be inspected as described under paragraphs (a) (3) and (4) of this section prior to use as a school building. In the event that emergency use of an uninspected building as a school building is necessitated, such buildings shall be inspected within 30 days after commencement of such use.

(3) Each inspection shall be made by an accredited inspector.

(4) For each area of a school building, except as excluded under § 763.99, each person performing an inspection shall:

(i) Visually inspect the area to identify the locations of all suspected ACBM.

(ii) Touch all suspected ACBM to determine whether they are friable.

(iii) Identify all homogeneous areas of friable suspected ACBM and all homogeneous areas of nonfriable suspected ACBM.

(iv) Assume that some or all of the homogeneous areas are ACM, and, for each homogeneous area that is not assumed to be ACM, collect and submit for analysis bulk samples under §§ 763.86 and 763.87.

(v) Assess, under § 763.88, friable material in areas where samples are collected, friable material in areas that are assumed to be ACBM, and friable ACBM identified during a previous inspection.

(vi) Record the following and submit to the person designated under § 763.84 a copy of such record for inclusion in the management plan within 30 days of the inspection:

(A) An inspection report with the date of the inspection signed by each accredited person making the inspection, State of accreditation, and if applicable, his or her accreditation number.

(B) An inventory of the locations of the homogeneous areas where samples are collected, exact location where each bulk sample is collected, dates

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that samples are collected, homogeneous areas where friable suspected ACBM is assumed to be ACM, and homogeneous areas where nonfriable suspected ACBM is assumed to be ACM.

(C) A description of the manner used to determine sampling locations, the name and signature of each accredited inspector who collected the samples, State of accreditation, and, if applicable, his or her accreditation number.

(D) A list of whether the homogeneous areas identified under paragraph (a)(4)(vi)(B) of this section, are surfacing material, thermal system insulation, or miscellaneous material.

(E) Assessments made of friable material, the name and signature of each accredited inspector making the assessment, State of accreditation, and if applicable, his or her accreditation number.

(b) *Reinspection.* (1) At least once every 3 years after a management plan is in effect, each local education agency shall conduct a reinspection of all friable and nonfriable known or assumed ACBM in each school building that they lease, own, or otherwise use as a school building.

(2) Each inspection shall be made by an accredited inspector.

(3) For each area of a school building, each person performing a reinspection shall:

(i) Visually reinspect, and reassess, under § 763.88, the condition of all friable known or assumed ACBM.

(ii) Visually inspect material that was previously considered nonfriable ACBM and touch the material to determine whether it has become friable since the last inspection or reinspection.

(iii) Identify any homogeneous areas with material that has become friable since the last inspection or reinspection.

(iv) For each homogeneous area of newly friable material that is already assumed to be ACBM, bulk samples may be collected and submitted for analysis in accordance with §§ 763.86 and 763.87.

(v) Assess, under § 763.88, the condition of the newly friable material in areas where samples are collected, and newly friable materials in areas that are assumed to be ACBM.

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(vi) Reassess, under § 763.88, the condition of friable known or assumed ACBM previously identified.

(vii) Record the following and submit to the person designated under § 763.84 a copy of such record for inclusion in the management plan within 30 days of the reinspection:

(A) The date of the reinspection, the name and signature of the person making the reinspection, State of accreditation, and if applicable, his or her accreditation number, and any changes in the condition of known or assumed ACBM.

(B) The exact locations where samples are collected during the reinspection, a description of the manner used to determine sampling locations, the name and signature of each accredited inspector who collected the samples, State of accreditation, and, if applicable, his or her accreditation number.

(C) Any assessments or reassessments made of friable material, the name and signature of the accredited inspector making the assessments, State of accreditation, and if applicable, his or her accreditation number.

(c) *General.* Thermal system insulation that has retained its structural integrity and that has an undamaged protective jacket or wrap that prevents fiber release shall be treated as nonfriable and therefore is subject only to periodic surveillance and preventive measures as necessary.

§ 763.86 Sampling.

(a) *Surfacing material.* An accredited inspector shall collect, in a statistically random manner that is representative of the homogeneous area, bulk samples from each homogeneous area of friable surfacing material that is not assumed to be ACM, and shall collect the samples as follows:

(1) At least three bulk samples shall be collected from each homogeneous area that is 1,000 ft² or less, except as provided in § 763.87(c)(2).

(2) At least five bulk samples shall be collected from each homogeneous area that is greater than 1,000 ft² but less than or equal to 5,000 ft², except as provided in § 763.87(c)(2).

(3) At least seven bulk samples shall be collected from each homogeneous

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area that is greater than 5,000 ft², except as provided in § 763.87(c)(2).

(b) *Thermal system insulation.* (1) Except as provided in paragraphs (b) (2) through (4) of this section and § 763.87(c), an accredited inspector shall collect, in a randomly distributed manner, at least three bulk samples from each homogeneous area of thermal system insulation that is not assumed to be ACM.

(2) Collect at least one bulk sample from each homogeneous area of patched thermal system insulation that is not assumed to be ACM if the patched section is less than 6 linear or square feet.

(3) In a manner sufficient to determine whether the material is ACM or not ACM, collect bulk samples from each insulated mechanical system that is not assumed to be ACM where cement or plaster is used on fittings such as tees, elbows, or valves, except as provided under § 763.87(c)(2).

(4) Bulk samples are not required to be collected from any homogeneous area where the accredited inspector has determined that the thermal system insulation is fiberglass, foam glass, rubber, or other non-ACBM.

(c) *Miscellaneous material.* In a manner sufficient to determine whether material is ACM or not ACM, an accredited inspector shall collect bulk samples from each homogeneous area of friable miscellaneous material that is not assumed to be ACM.

(d) *Nonfriable suspected ACBM.* If any homogeneous area of nonfriable suspected ACBM is not assumed to be ACM, then an accredited inspector shall collect, in a manner sufficient to determine whether the material is ACM or not ACM, bulk samples from the homogeneous area of nonfriable suspected ACBM that is not assumed to be ACM.

§ 763.87 Analysis.

(a) Local education agencies shall have bulk samples, collected under § 763.86 and submitted for analysis, analyzed for asbestos using laboratories accredited by the National Bureau of Standards (NBS). Local education agencies shall use laboratories which have received interim accreditation for polarized light microscopy (PLM) anal-

ysis under the EPA Interim Asbestos Bulk Sample Analysis Quality Assurance Program until the NBS PLM laboratory accreditation program for PLM is operational.

(b) Bulk samples shall not be composited for analysis and shall be analyzed for asbestos content by PLM, using the "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" found at appendix E to subpart E of this part.

(c)(1) A homogeneous area is considered not to contain ACM only if the results of all samples required to be collected from the area show asbestos in amounts of 1 percent or less.

(2) A homogeneous area shall be determined to contain ACM based on a finding that the results of at least one sample collected from that area shows that asbestos is present in an amount greater than 1 percent.

(d) The name and address of each laboratory performing an analysis, the date of analysis, and the name and signature of the person performing the analysis shall be submitted to the person designated under § 763.84 for inclusion into the management plan within 30 days of the analysis.

[52 FR 41846, Oct. 30, 1987, as amended at 60 FR 31922, June 19, 1995]

§ 763.88 Assessment.

(a)(1) For each inspection and reinspection conducted under § 763.85 (a) and (c) and previous inspections specified under § 763.99, the local education agency shall have an accredited inspector provide a written assessment of all friable known or assumed ACBM in the school building.

(2) Each accredited inspector providing a written assessment shall sign and date the assessment, provide his or her State of accreditation, and if applicable, accreditation number, and submit a copy of the assessment to the person designated under § 763.84 for inclusion in the management plan within 30 days of the assessment.

(b) The inspector shall classify and give reasons in the written assessment for classifying the ACBM and suspected ACBM assumed to be ACM in the school building into one of the following categories:

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(1) Damaged or significantly damaged thermal system insulation ACM.
 (2) Damaged friable surfacing ACM.
 (3) Significantly damaged friable surfacing ACM.
 (4) Damaged or significantly damaged friable miscellaneous ACM.
 (5) ACBM with potential for damage.
 (6) ACBM with potential for significant damage.
 (7) Any remaining friable ACBM or friable suspected ACBM.
 (c) Assessment may include the following considerations:
 (1) Location and the amount of the material, both in total quantity and as a percentage of the functional space.
 (2) Condition of the material, specifying:
 (i) Type of damage or significant damage (e.g., flaking, blistering, water damage, or other signs of physical damage).
 (ii) Severity of damage (e.g., major flaking, severely torn jackets, as opposed to occasional flaking, minor tears to jackets).
 (iii) Extent or spread of damage over large areas or large percentages of the homogeneous area.
 (3) Whether the material is accessible.
 (4) The material's potential for disturbance.
 (5) Known or suspected causes of damage or significant damage (e.g., air erosion, vandalism, vibration, water).
 (6) Preventive measures which might eliminate the reasonable likelihood of undamaged ACM from becoming significantly damaged.
 (d) The local education agency shall select a person accredited to develop management plans to review the results of each inspection, reinspection, and assessment for the school building and to conduct any other necessary activities in order to recommend in writing to the local education agency appropriate response actions. The accredited person shall sign and date the recommendation, provide his or her State of accreditation, and, if applicable, provide his or her accreditation number, and submit a copy of the recommendation to the person designated under § 763.84 for inclusion in the management plan.

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(a) The local education agency shall select and implement in a timely manner the appropriate response actions in this section consistent with the assessment conducted in § 763.88. The response actions selected shall be sufficient to protect human health and the environment. The local education agency may then select, from the response actions which protect human health and the environment, that action which is the least burdensome method. Nothing in this section shall be construed to prohibit removal of ACBM from a school building at any time, should removal be the preferred response action of the local education agency.
 (b) If damaged or significantly damaged thermal system insulation ACM is present in a building, the local education agency shall:
 (1) At least repair the damaged area.
 (2) Remove the damaged material if it is not feasible, due to technological factors, to repair the damage.
 (3) Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition.
 (c)(1) If damaged friable surfacing ACM or damaged friable miscellaneous ACM is present in a building, the local education agency shall select from among the following response actions: encapsulation, enclosure, removal, or repair of the damaged material.
 (2) In selecting the response action from among those which meet the definitional standards in § 763.83, the local education agency shall determine which of these response actions protects human health and the environment. For purposes of determining which of these response actions are the least burdensome, the local education agency may then consider local circumstances, including occupancy and use patterns within the school building, and its economic concerns, including short- and long-term costs.
 (d) If significantly damaged friable surfacing ACM or significantly damaged friable miscellaneous ACM is present in a building the local education agency shall:
 (1) Immediately isolate the functional space and restrict access, unless

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isolation is not necessary to protect human health and the environment.

(2) Remove the material in the functional space or, depending upon whether enclosure or encapsulation would be sufficient to protect human health and the environment, enclose or encapsulate.

(e) If any friable surfacing ACM, thermal system insulation ACM, or friable miscellaneous ACM that has potential for damage is present in a building, the local education agency shall at least implement an operations and maintenance (O&M) program, as described under § 763.91.

(f) If any friable surfacing ACM, thermal system insulation ACM, or friable miscellaneous ACM that has potential for significant damage is present in a building, the local education agency shall:

(1) Implement an O&M program, as described under § 763.91.

(2) Institute preventive measures appropriate to eliminate the reasonable likelihood that the ACM or its covering will become significantly damaged, deteriorated, or delaminated.

(3) Remove the material as soon as possible if appropriate preventive measures cannot be effectively implemented, or unless other response actions are determined to protect human health and the environment. Immediately isolate the area and restrict access if necessary to avoid an imminent and substantial endangerment to human health or the environment.

(g) Response actions including removal, encapsulation, enclosure, or repair, other than small-scale, short-duration repairs, shall be designed and conducted by persons accredited to design and conduct response actions.

(h) The requirements of this subpart E in no way supersede the worker protection and work practice requirements under 29 CFR 1926.58 (Occupational Safety and Health Administration (OSHA) asbestos worker protection standards for construction), 40 CFR part 763, subpart G (EPA asbestos worker protection standards for public employees), and 40 CFR part 61, subpart M (National Emission Standards for Hazardous Air Pollutants—Asbestos).

(i) Completion of response actions. (1) At the conclusion of any action to remove, encapsulate, or enclose ACBM or material assumed to be ACBM, a person designated by the local education agency shall visually inspect each functional space where such action was conducted to determine whether the action has been properly completed.

(2)(i) A person designated by the local education agency shall collect air samples using aggressive sampling as described in appendix A to this subpart E to monitor air for clearance after each removal, encapsulation, and enclosure project involving ACBM, except for projects that are of small-scale, short-duration.

(ii) Local education agencies shall have air samples collected under this section analyzed for asbestos using laboratories accredited by the National Bureau of Standards to conduct such analysis using transmission electron microscopy (TEM) or, under circumstances permitted in this section, laboratories enrolled in the American Industrial Hygiene Association Proficiency Analytical Testing Program for phase contrast microscopy (PCM).

(iii) Until the National Bureau of Standards TEM laboratory accreditation program is operational, local educational agencies shall use laboratories that use the protocol described in appendix A to subpart E of this part.

(3) Except as provided in paragraphs (i)(4), and (i)(5), of this section, an action to remove, encapsulate, or enclose ACBM shall be considered complete when the average concentration of asbestos of five air samples collected within the affected functional space and analyzed by the TEM method in appendix A of this subpart E, is not statistically significantly different, as determined by the Z-test calculation found in appendix A of this subpart E, from the average asbestos concentration of five air samples collected at the same time outside the affected functional space and analyzed in the same manner, and the average asbestos concentration of the three field blanks described in appendix A of this subpart E is below the filter background level, as defined in appendix A of this subpart E, of 70 structures per square millimeter (70 s/mm²).

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(4) An action may also be considered complete if the volume of air drawn for each of the five samples collected within the affected functional space is equal to or greater than 1,199 L of air for a 25 mm filter or equal to or greater than 2,799 L of air for a 37 mm filter, and the average concentration of asbestos as analyzed by the TEM method in appendix A of this subpart E, for the five air samples does not exceed the filter background level, as defined in appendix A, of 70 structures per square millimeter (70 s/mm²). If the average concentration of asbestos of the five air samples within the affected functional space exceeds 70 s/mm², or if the volume of air in each of the samples is less than 1,199 L of air for a 25 mm filter or less than 2,799 L of air for a 37 mm filter, the action shall be considered complete only when the requirements of paragraph (i)(3) or (i)(5), of this section are met.

(5) At any time, a local education agency may analyze air monitoring samples collected for clearance purposes by phase contrast microscopy (PCM) to confirm completion of removal, encapsulation, or enclosure of ACBM that is greater than small-scale, short-duration and less than or equal to 160 square feet or 260 linear feet. The action shall be considered complete when the results of samples collected in the affected functional space and analyzed by phase contrast microscopy using the National Institute for Occupational Safety and Health (NIOSH) Method 7400 entitled "Fibers" published in the NIOSH Manual of Analytical Methods, 3rd Edition, Second Supplement, August 1987, show that the concentration of fibers for each of the five samples is less than or equal to a limit of quantitation for PCM (0.01 fibers per cubic centimeter (0.01 f/cm³) of air). The method is available for public inspection at the Office of the Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, DC, 20408, and the Non-Confidential Information Center (NCIC) (7407), Office of Pollution Prevention and Toxics, U.S. Environmental Protection Agency, Room B-607 NEM, 401 M Street, SW., Washington, DC, 20460, between the hours of 12 p.m. and 4 p.m. weekdays excluding legal holidays. This incorporation by ref-

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erence was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The method is incorporated as it exists on the effective date of this rule, and a notice of any change to the method will be published in the FEDERAL REGISTER.

(6) To determine the amount of ACBM affected under paragraph (i)(5) of this section, the local education agency shall add the total square or linear footage of ACBM within the containment barriers used to isolate the functional space for the action to remove, encapsulate, or enclose the ACBM. Contiguous portions of material subject to such action conducted concurrently or at approximately the same time within the same school building shall not be separated to qualify under paragraph (i)(5), of this section.

[52 FR 41846, Oct. 30, 1987, as amended at 53 FR 12525, Apr. 15, 1988; 60 FR 31922, June 19, 1995; 60 FR 34465, July 3, 1995]

§ 763.91 Operations and maintenance.

(a) *Applicability.* The local education agency shall implement an operations, maintenance, and repair (O&M) program under this section whenever any friable ACBM is present or assumed to be present in a building that it leases, owns, or otherwise uses as a school building. Any material identified as nonfriable ACBM or nonfriable assumed ACBM must be treated as friable ACBM for purposes of this section when the material is about to become friable as a result of activities performed in the school building.

(b) *Worker protection.* The protection provided by EPA at 40 CFR 763.121 for worker protection during asbestos abatement projects is extended to employees of local education agencies who perform operations, maintenance, and repair (O&M) activities involving ACM and who are not covered by the OSHA asbestos construction standard at 29 CFR 1926.58 or an asbestos worker approved by OSHA under section 19 of the Occupational Safety and Health Act. Local education agencies may consult appendix B of this subpart if their employees are performing operations, maintenance, and repair activities that are of small-scale, short-duration.

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(c) *Cleaning*—(1) *Initial cleaning*. Unless the building has been cleaned using equivalent methods within the previous 6 months, all areas of a school building where friable ACBM, damaged or significantly damaged thermal system insulation ACM, or friable suspected ACBM assumed to be ACM are present shall be cleaned at least once after the completion of the inspection required by § 763.85(a) and before the initiation of any response action, other than O&M activities or repair, according to the following procedures:

(i) HEPA-vacuum or steam-clean all carpets.

(ii) HEPA-vacuum or wet-clean all other floors and all other horizontal surfaces.

(iii) Dispose of all debris, filters, mopheads, and cloths in sealed, leak-tight containers.

(2) *Additional cleaning*. The accredited management planner shall make a written recommendation to the local education agency whether additional cleaning is needed, and if so, the methods and frequency of such cleaning.

(d) *Operations and maintenance activities*. The local education agency shall ensure that the procedures described below to protect building occupants shall be followed for any operations and maintenance activities disturbing friable ACBM:

(1) Restrict entry into the area by persons other than those necessary to perform the maintenance project, either by physically isolating the area or by scheduling.

(2) Post signs to prevent entry by unauthorized persons.

(3) Shut off or temporarily modify the air-handling system and restrict other sources of air movement.

(4) Use work practices or other controls, such as, wet methods, protective clothing, HEPA-vacuums, mini-enclosures, glove bags, as necessary to inhibit the spread of any released fibers.

(5) Clean all fixtures or other components in the immediate work area.

(6) Place the asbestos debris and other cleaning materials in a sealed, leak-tight container.

(e) *Maintenance activities other than small-scale, short-duration*. The response action for any maintenance activities disturbing friable ACBM, other than

small-scale, short-duration maintenance activities, shall be designed by persons accredited to design response actions and conducted by persons accredited to conduct response actions.

(f) *Fiber release episodes*—(1) *Minor fiber release episode*. The local education agency shall ensure that the procedures described below are followed in the event of a minor fiber release episode (i.e., the falling or dislodging of 3 square or linear feet or less of friable ACBM): 5

(i) Thoroughly saturate the debris using wet methods.

(ii) Clean the area, as described in paragraph (e) of this section.

(iii) Place the asbestos debris in a sealed, leak-tight container.

(iv) Repair the area of damaged ACM with materials such as asbestos-free spackling, plaster, cement, or insulation, or seal with latex paint or an encapsulant, or immediately have the appropriate response action implemented as required by § 763.90.

(2) *Major fiber release episode*. The local education agency shall ensure that the procedures described below are followed in the event of a major fiber release episode (i.e., the falling or dislodging of more than 3 square or linear feet of friable ACBM):

(i) Restrict entry into the area and post signs to prevent entry into the area by persons other than those necessary to perform the response action.

(ii) Shut off or temporarily modify the air-handling system to prevent the distribution of fibers to other areas in the building.

(iii) The response action for any major fiber release episode must be designed by persons accredited to design response actions and conducted by persons accredited to conduct response actions.

§ 763.92 Training and periodic surveillance.

(a) *Training*. (1) The local education agency shall ensure, prior to the implementation of the O&M provisions of the management plan, that all members of its maintenance and custodial staff (custodians, electricians, heating/air conditioning engineers, plumbers, etc.) who may work in a building that contains ACBM receive awareness

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training of at least 2 hours, whether or not they are required to work with ACBM. New custodial and maintenance employees shall be trained within 60 days after commencement of employment. Training shall include, but not be limited to:

- (i) Information regarding asbestos and its various uses and forms.
- (ii) Information on the health effects associated with asbestos exposure.
- (iii) Locations of ACBM identified throughout each school building in which they work.
- (iv) Recognition of damage, deterioration, and delamination of ACBM.
- (v) Name and telephone number of the person designated to carry out general local education agency responsibilities under § 763.84 and the availability and location of the management plan.

(2) The local education agency shall ensure that all members of its maintenance and custodial staff who conduct any activities that will result in the disturbance of ACBM shall receive training described in paragraph (a)(1) of this section and 14 hours of additional training. Additional training shall include, but not be limited to:

- (i) Descriptions of the proper methods of handling ACBM.
 - (ii) Information on the use of respiratory protection as contained in the EPA/NIOSH *Guide to Respiratory Protection for the Asbestos Abatement Industry*, September 1986 (EPA 560/OPPTS-86-001), available from the Director, Environmental Assistance Division (7408), Office of Pollution Prevention and Toxics, U.S. Environmental Protection Agency, Room E-543B, 401 M St., SW., Washington, DC, 20460, Telephone: (202) 554-1404, TDD: (202) 544-0551 and other personal protection measures.
 - (iii) The provisions of this section and § 763.91, Appendices A, B, C, D of this subpart E of this part, EPA regulations contained in 40 CFR part 763, subpart G, and in 40 CFR part 61, subpart M, and OSHA regulations contained in 29 CFR 1926.58.
 - (iv) Hands-on training in the use of respiratory protection, other personal protection measures, and good work practices.
- (3) Local education agency maintenance and custodial staff who have at-

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tended EPA-approved asbestos training or received equivalent training for O&M and periodic surveillance activities involving asbestos shall be considered trained for the purposes of this section.

(b) *Periodic surveillance.* (1) At least once every 6 months after a management plan is in effect, each local education agency shall conduct periodic surveillance in each building that it leases, owns, or otherwise uses as a school building that contains ACBM or is assumed to contain ACBM.

(2) Each person performing periodic surveillance shall:

- (i) Visually inspect all areas that are identified in the management plan as ACBM or assumed ACBM.
- (ii) Record the date of the surveillance, his or her name, and any changes in the condition of the materials.
- (iii) Submit to the person designated to carry out general local education agency responsibilities under § 763.84 a copy of such record for inclusion in the management plan.

[52 FR 41846, Oct. 30, 1987, as amended at 60 FR 34465, July 3, 1995]

§ 763.93 Management plans.

(a)(1) On or before October 12, 1988, each local education agency shall develop an asbestos management plan for each school, including all buildings that they lease, own, or otherwise use as school buildings, and submit the plan to an Agency designated by the Governor of the State in which the local education agency is located. The plan may be submitted in stages that cover a portion of the school buildings under the authority of the local education agency.

(2) If a building to be used as part of a school is leased or otherwise acquired after October 12, 1988, the local education agency shall include the new building in the management plan for the school prior to its use as a school building. The revised portions of the management plan shall be submitted to the Agency designated by the Governor.

(3) If a local education agency begins to use a building as a school after October 12, 1988, the local education agency shall submit a management plan for

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the school to the Agency designated by the Governor prior to its use as a school.

(b) On or before October 17, 1987, the Governor of each State shall notify local education agencies in the State regarding where to submit their management plans. States may establish administrative procedures for reviewing management plans. If the Governor does not disapprove a management plan within 90 days after receipt of the plan, the local education agency shall implement the plan.

(c) Each local education agency must begin implementation of its management plan on or before July 9, 1989, and complete implementation in a timely fashion.

(d) Each local education agency shall maintain and update its management plan to keep it current with ongoing operations and maintenance, periodic surveillance, inspection, reinspection, and response action activities. All provisions required to be included in the management plan under this section shall be retained as part of the management plan, as well as any information that has been revised to bring the plan up-to-date.

(e) The management plan shall be developed by an accredited management planner and shall include:

(i) A list of the name and address of each school building and whether the school building contains friable ACBM, nonfriable ACBM, and friable and nonfriable suspected ACBM assumed to be ACM.

(2) For each inspection conducted before the December 14, 1987:

(i) The date of the inspection.

(ii) A blueprint, diagram, or written description of each school building that identifies clearly each location and approximate square or linear footage of any homogeneous or sampling area where material was sampled for ACM, and, if possible, the exact locations where bulk samples were collected, and the dates of collection.

(iii) A copy of the analyses of any bulk samples, dates of analyses, and a copy of any other laboratory reports pertaining to the analyses.

(iv) A description of any response actions or preventive measures taken to reduce asbestos exposure, including if

possible, the names and addresses of all contractors involved, start and completion dates of the work, and results of any air samples analyzed during and upon completion of the work.

(v) A description of assessments, required to be made under §763.88, of material that was identified before December 14, 1987, as friable ACBM or friable suspected ACBM assumed to be ACM, and the name and signature, State of accreditation, and if applicable, accreditation number of each accredited person making the assessments.

(3) For each inspection and reinspection conducted under §763.85:

(i) The date of the inspection or reinspection and the name and signature, State of accreditation and, if applicable, the accreditation number of each accredited inspector performing the inspection or reinspection.

(ii) A blueprint, diagram, or written description of each school building that identifies clearly each location and approximate square or linear footage of homogeneous areas where material was sampled for ACM, the exact location where each bulk sample was collected, date of collection, homogeneous areas where friable suspected ACBM is assumed to be ACM, and where nonfriable suspected ACBM is assumed to be ACM.

(iii) A description of the manner used to determine sampling locations, and the name and signature of each accredited inspector collecting samples, the State of accreditation, and if applicable, his or her accreditation number.

(iv) A copy of the analyses of any bulk samples collected and analyzed, the name and address of any laboratory that analyzed bulk samples, a statement that the laboratory meets the applicable requirements of §763.87(a) the date of analysis, and the name and signature of the person performing the analysis.

(v) A description of assessments, required to be made under §763.88, of all ACBM and suspected ACBM assumed to be ACM, and the name, signature, State of accreditation, and if applicable, accreditation number of each accredited person making the assessments.

(4) The name, address, and telephone number of the person designated under

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§763.84 to ensure that the duties of the local education agency are carried out, and the course name, and dates and hours of training taken by that person to carry out the duties.

(5) The recommendations made to the local education agency regarding response actions, under §763.88(d), the name, signature, State of accreditation of each person making the recommendations, and if applicable, his or her accreditation number.

(6) A detailed description of preventive measures and response actions to be taken, including methods to be used, for any friable ACBM, the locations where such measures and action will be taken, reasons for selecting the response action or preventive measure, and a schedule for beginning and completing each preventive measure and response action.

(7) With respect to the person or persons who inspected for ACBM and who will design or carry out response actions, except for operations and maintenance, with respect to the ACBM, one of the following statements:

(i) If the State has adopted a contractor accreditation program under section 206(b) of Title II of the Act, a statement that the person(s) is accredited under such plan.

(ii) A statement that the local education agency used (or will use) persons who have been accredited by another State which has adopted a contractor accreditation plan under section 206(b) of Title II of the Act or is accredited by an EPA-approved course under section 206(c) of Title II of the Act.

(8) A detailed description in the form of a blueprint, diagram, or in writing of any ACBM or suspected ACBM assumed to be ACM which remains in the school once response actions are undertaken pursuant to §763.90. This description shall be updated as response actions are completed.

(9) A plan for reinspection under §763.85, a plan for operations and maintenance activities under §763.91, and a plan for periodic surveillance under §763.92, a description of the recommendation made by the management planner regarding additional cleaning under §763.91(c)(2) as part of an operations and maintenance program, and the response of the local

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education agency to that recommendation.

(10) A description of steps taken to inform workers and building occupants, or their legal guardians, about inspections, reinspections, response actions, and post-response action activities, including periodic reinspection and surveillance activities that are planned or in progress.

(11) An evaluation of the resources needed to complete response actions successfully and carry out reinspection, operations and maintenance activities, periodic surveillance and training.

(12) With respect to each consultant who contributed to the management plan, the name of the consultant and one of the following statements:

(i) If the State has adopted a contractor accreditation plan under section 206(b) of Title II of the Act, a statement that the consultant is accredited under such plan.

(ii) A statement that the contractor is accredited by another State which has adopted a contractor accreditation plan under section 206(b) of Title II of the Act, or is accredited by an EPA-approved course developed under section 206(c) of Title II of the Act.

(f) A local education agency may require each management plan to contain a statement signed by an accredited management plan developer that such person has prepared or assisted in the preparation of such plan or has reviewed such plan, and that such plan is in compliance with this subpart E. Such statement may not be signed by a person who, in addition to preparing or assisting in preparing the management plan, also implements (or will implement) the management plan.

(g)(1) Upon submission of a management plan to the Governor for review, a local education agency shall keep a copy of the plan in its administrative office. The management plans shall be available, without cost or restriction, for inspection by representatives of EPA and the State, the public, including teachers, other school personnel and their representatives, and parents. The local education agency may charge a reasonable cost to make copies of management plans.

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(2) Each local education agency shall maintain in its administrative office a complete, updated copy of a management plan for each school under its administrative control or direction. The management plans shall be available, during normal business hours, without cost or restriction, for inspection by representatives of EPA and the State, the public, including teachers, other school personnel and their representatives, and parents. The local education agency may charge a reasonable cost to make copies of management plans.

(3) Each school shall maintain in its administrative office a complete, updated copy of the management plan for that school. Management plans shall be available for inspection, without cost or restriction, to workers before work begins in any area of a school building. The school shall make management plans available for inspection to representatives of EPA and the State, the public, including parents, teachers, and other school personnel and their representatives within 5 working days after receiving a request for inspection. The school may charge a reasonable cost to make copies of the management plan.

(4) Upon submission of its management plan to the Governor and at least once each school year, the local education agency shall notify in writing parent, teacher, and employee organizations of the availability of management plans and shall include in the management plan a description of the steps taken to notify such organizations, and a dated copy of the notification. In the absence of any such organizations for parents, teachers, or employees, the local education agency shall provide written notice to that relevant group of the availability of management plans and shall include in the management plan a description of the steps taken to notify such groups, and a dated copy of the notification.

(h) Records required under § 763.94 shall be made by local education agencies and maintained as part of the management plan.

(i) Each management plan must contain a true and correct statement, signed by the individual designated by the local education agency under § 763.84, which certifies that the gen-

eral, local education agency responsibilities, as stipulated by § 763.84, have been met or will be met.

§ 763.94 Recordkeeping.

(a) Records required under this section shall be maintained in a centralized location in the administrative office of both the school and the local education agency as part of the management plan. For each homogeneous area where all ACBM has been removed, the local education agency shall ensure that such records are retained for 3 years after the next reinspection required under § 763.85(b)(1), or for an equivalent period.

(b) For each preventive measure and response action taken for friable and nonfriable ACBM and friable and nonfriable suspected ACBM assumed to be ACM, the local education agency shall provide:

(1) A detailed written description of the measure or action, including methods used, the location where the measure or action was taken, reasons for selecting the measure or action, start and completion dates of the work, names and addresses of all contractors involved, and if applicable, their State of accreditation, and accreditation numbers, and if ACBM is removed, the name and location of storage or disposal site of the ACM.

(2) The name and signature of any person collecting any air sample required to be collected at the completion of certain response actions specified by § 763.90(i), the locations where samples were collected, date of collection, the name and address of the laboratory analyzing the samples, the date of analysis, the results of the analysis, the method of analysis, the name and signature of the person performing the analysis, and a statement that the laboratory meets the applicable requirements of § 763.90(i)(2)(ii).

(c) For each person required to be trained under § 763.92(a)(1) and (2), the local education agency shall provide the person's name and job title, the date that training was completed by that person, the location of the training, and the number of hours completed in such training.

(d) For each time that periodic surveillance under § 763.92(b) is performed,

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the local education agency shall record the name of each person performing the surveillance, the date of the surveillance, and any changes in the conditions of the materials.

(e) For each time that cleaning under § 763.91(c) is performed, the local education agency shall record the name of each person performing the cleaning, the date of such cleaning, the locations cleaned, and the methods used to perform such cleaning.

(f) For each time that operations and maintenance activities under § 763.91(d) are performed, the local education agency shall record the name of each person performing the activity, the start and completion dates of the activity, the locations where such activity occurred, a description of the activity including preventive measures used, and if ACBM is removed, the name and location of storage or disposal site of the ACM.

(g) For each time that major asbestos activity under § 763.91(e) is performed, the local education agency shall provide the name and signature, State of accreditation, and if applicable, the accreditation number of each person performing the activity, the start and completion dates of the activity, the locations where such activity occurred, a description of the activity including preventive measures used, and if ACBM is removed, the name and location of storage or disposal site of the ACM.

(h) For each fiber release episode under § 763.91(f), the local education agency shall provide the date and location of the episode, the method of repair, preventive measures or response action taken, the name of each person performing the work, and if ACBM is removed, the name and location of storage or disposal site of the ACM.

(Approved by the Office of Management and Budget under control number 2070-0091)

§ 763.95 Warning labels.

(a) The local education agency shall attach a warning label immediately adjacent to any friable and nonfriable ACBM and suspected ACBM assumed to be ACM located in routine maintenance areas (such as boiler rooms) at each school building. This shall include:

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(1) Friable ACBM that was responded to by a means other than removal.

(2) ACBM for which no response action was carried out.

(b) All labels shall be prominently displayed in readily visible locations and shall remain posted until the ACBM that is labeled is removed.

(c) The warning label shall read, in print which is readily visible because of large size or bright color, as follows: CAUTION: ASBESTOS. HAZARDOUS. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT.

§ 763.97 Compliance and enforcement.

(a) *Compliance with Title II of the Act.*
(1) Section 207(a) of Title II of the Act (15 U.S.C. 2647) makes it unlawful for any local education agency to:

(i) Fail to conduct inspections pursuant to section 203(b) of Title II of the Act, including failure to follow procedures and failure to use accredited personnel and laboratories.

(ii) Knowingly submit false information to the Governor regarding any inspection pursuant to regulations under section 203(i) of Title II of the Act.

(iii) Fail to develop a management plan pursuant to regulations under section 203(i) of Title II of the Act.

(2) Section 207(a) of Title II of the Act (15 U.S.C. 2647) also provides that any local education agency which violates any provision of section 207 shall be liable for a civil penalty of not more than \$5,000 for each day during which the violation continues. For the purposes of this subpart, a "violation" means a failure to comply with respect to a single school building.

(b) *Compliance with Title I of the Act.*
(1) Section 15(1)(D) of Title I of the Act (15 U.S.C. 2614) makes it unlawful for any person to fail or refuse to comply with any requirement of Title II or any rule promulgated or order issued under Title II. Therefore, any person who violates any requirement of this subpart is in violation of section 15 of Title I of the Act.

(2) Section 15(3) of Title I of the Act (15 U.S.C. 2614) makes it unlawful for any person to fail or refuse to establish or maintain records, submit reports, notices or other information, or permit

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access to or copying of records, as required by this Act or a rule thereunder.

(3) Section 15(4) (15 U.S.C. 2614) of Title I of the Act makes it unlawful for any person to fail or refuse to permit entry or inspection as required by section 11 of Title I of the Act.

(4) Section 16(a) of Title I of the Act (15 U.S.C. 2615) provides that any person who violates any provision of section 15 of Title I of the Act shall be liable to the United States for a civil penalty in an amount not to exceed \$25,000 for each such violation. Each day such a violation continues shall, for purposes of this paragraph, constitute a separate violation of section 15. A local education agency is not liable for any civil penalty under Title I of the Act for failing or refusing to comply with any rule promulgated or order issued under Title II of the Act.

(c) *Criminal penalties.* If any violation committed by any person (including a local education agency) is knowing or willful, criminal penalties may be assessed under section 16(b) of Title I of the Act.

(d) *Injunctive relief.* The Agency may obtain injunctive relief under section 208(b) of Title II of the Act to respond to a hazard which poses an imminent and substantial endangerment to human health or the environment or section 17 (15 U.S.C. 2616) of Title I of the Act to restrain any violation of section 15 of Title I of the Act or to compel the taking of any action required by or under Title I of the Act.

(e) *Citizen complaints.* Any citizen who wishes to file a complaint pursuant to section 207(d) of Title II of the Act should direct the complaint to the Governor of the State or the EPA Asbestos Ombudsman, 401 M Street, SW., Washington, DC 20460. The citizen complaint should be in writing and identified as a citizen complaint pursuant to section 207(d) of Title II of TSCA. The EPA Asbestos Ombudsman or the Governor shall investigate and respond to the complaint within a reasonable period of time if the allegations provide a reasonable basis to believe that a violation of the Act has occurred.

(f) *Inspections.* EPA may conduct inspections and review management plans under section 11 of Title I of the

Act (15 U.S.C. 2610) to ensure compliance.

§ 763.98 Waiver; delegation to State.

(a) *General.* (1) Upon request from a State Governor and after notice and comment and an opportunity for a public hearing in accordance with paragraphs (b) and (c) of this section, EPA may waive some or all of the requirements of this subpart E if the State has established and is implementing or intends to implement a program of asbestos inspection and management that contains requirements that are at least as stringent as the requirements of this subpart E.

(2) A waiver from any requirement of this subpart E shall apply only to the specific provision for which a waiver has been granted under this section. All requirements of this subpart E shall apply until a waiver is granted under this section.

(b) *Request.* Each request by a Governor to waive any requirement of this subpart E shall be sent with three complete copies of the request to the Regional Administrator for the EPA Region in which the State is located and shall include:

(1) A copy of the State provisions or proposed provisions relating to its program of asbestos inspection and management in schools for which the request is made.

(2)(i) The name of the State agency that is or will be responsible for administering and enforcing the requirements for which a waiver is requested, the names and job titles of responsible officials in that agency, and phone numbers where the officials can be contacted.

(ii) In the event that more than one agency is or will be responsible for administering and enforcing the requirements for which a waiver is requested, a description of the functions to be performed by each agency, how the program will be coordinated by the lead agency to ensure consistency and effective administration in the asbestos inspection and management program within the State, the names and job titles of responsible officials in the agencies, and phone numbers where the officials can be contacted. The lead agency

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will serve as the central contact point for the EPA.

(3) Detailed reasons, supporting papers, and the rationale for concluding that the State's asbestos inspection and management program provisions for which the request is made are at least as stringent as the requirements of this subpart E.

(4) A discussion of any special situations, problems, and needs pertaining to the waiver request accompanied by an explanation of how the State intends to handle them.

(5) A statement of the resources that the State intends to devote to the administration and enforcement of the provisions relating to the waiver request.

(6) Copies of any specific or enabling State laws (enacted and pending enactment) and regulations (promulgated and pending promulgation) relating to the request, including provisions for assessing criminal and/or civil penalties.

(7) Assurance from the Governor, the Attorney General, or the legal counsel of the lead agency that the lead agency or other cooperating agencies have the legal authority necessary to carry out the requirements relating to the request.

(c) *General notice—hearing.* (1) Within 30 days after receipt of a request for a waiver, EPA will determine the completeness of the request. If EPA does not request further information within the 30-day period, the request will be deemed complete.

(2) Within 30 days after EPA determines that a request is complete, EPA will issue for publication in the FEDERAL REGISTER a notice that announces receipt of the request, describes the information submitted under paragraph (b) of this section, and solicits written comment from interested members of the public. Comments must be submitted within 60 days.

(3) If, during the comment period, EPA receives a written objection to a Governor's request and a request for a public hearing detailing specific objections to the granting of a waiver, EPA will schedule a public hearing to be held in the affected State after the close of the comment period and will announce the public hearing date in

the FEDERAL REGISTER before the date of the hearing. Each comment shall include the name and address of the person submitting the comment.

(d) *Criteria.* EPA may waive some or all of the requirements of subpart E of this part if:

(1) The State's lead agency and other cooperating agencies have the legal authority necessary to carry out the provisions of asbestos inspection and management in schools relating to the waiver request.

(2) The State's program of asbestos inspection and management in schools relating to the waiver request and implementation of the program are or will be at least as stringent as the requirements of this subpart E.

(3) The State has an enforcement mechanism to allow it to implement the program described in the waiver request.

(4) The lead agency and any cooperating agencies have or will have qualified personnel to carry out the provisions relating to the waiver request.

(5) The State will devote adequate resources to the administration and enforcement of the asbestos inspection and management provisions relating to the waiver request.

(6) When specified by EPA, the State gives satisfactory assurances that necessary steps, including specific actions it proposes to take and a time schedule for their accomplishment, will be taken within a reasonable time to conform with applicable criteria under paragraphs (d) (2) through (4) of this section.

(e) *Decision.* EPA will issue for publication in the FEDERAL REGISTER a notice announcing its decision to grant or deny, in whole or in part, a Governor's request for a waiver from some or all of the requirements of this subpart E within 30 days after the close of the comment period or within 30 days following a public hearing, whichever is applicable. The notice will include the Agency's reasons and rationale for granting or denying the Governor's request. The 30-day period may be extended if mutually agreed upon by EPA and the State.

(f) *Modifications.* When any substantial change is made in the administration or enforcement of a State program

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for which a waiver was granted under this section, a responsible official in the lead agency shall submit such changes to EPA.

(g) *Reports.* The lead agency in each State that has been granted a waiver by EPA from any requirement of subpart E of this part shall submit a report to the Regional Administrator for the Region in which the State is located at least once every 12 months to include the following information:

(1) A summary of the State's implementation and enforcement activities during the last reporting period relating to provisions waived under this section, including enforcement actions taken.

(2) Any changes in the administration or enforcement of the State program implemented during the last reporting period.

(3) Other reports as may be required by EPA to carry out effective oversight of any requirement of this subpart E that was waived under this section.

(h) *Oversight.* EPA may periodically evaluate the adequacy of a State's implementation and enforcement of and resources devoted to carrying out requirements relating to the waiver. This evaluation may include, but is not limited to, site visits to local education agencies without prior notice to the State.

(i) *Informal conference.* (1) EPA may request that an informal conference be held between appropriate State and EPA officials when EPA has reason to believe that a State has failed to:

(i) Substantially comply with the terms of any provision that was waived under this section.

(ii) Meet the criteria under paragraph (d) of this section, including the failure to carry out enforcement activities or act on violations of the State program.

(2) EPA will:

(i) Specify to the State those aspects of the State's program believed to be inadequate.

(ii) Specify to the State the facts that underlie the belief of inadequacy.

(3) If EPA finds, on the basis of information submitted by the State at the conference, that deficiencies did not exist or were corrected by the State, no further action is required.

(4) Where EPA finds that deficiencies in the State program exist, a plan to correct the deficiencies shall be negotiated between the State and EPA. The plan shall detail the deficiencies found in the State program, specify the steps the State has taken or will take to remedy the deficiencies, and establish a schedule for each remedial action to be initiated.

(j) *Rescission.* (1) If the State fails to meet with EPA or fails to correct deficiencies raised at the informal conference, EPA will deliver to the Governor of the State and a responsible official in the lead agency a written notice of its intent to rescind, in whole or part, the waiver.

(2) EPA will issue for publication in the FEDERAL REGISTER a notice that announces the rescission of the waiver, describes those aspects of the State's program determined to be inadequate, and specifies the facts that underlie the findings of inadequacy.

§ 763.99 Exclusions.

(a) A local education agency shall not be required to perform an inspection under § 763.85(a) in any sampling area as defined in 40 CFR 763.103 or homogeneous area of a school building where:

(1) An accredited inspector has determined that, based on sampling records, friable ACBM was identified in that homogeneous or sampling area during an inspection conducted before December 14, 1987. The inspector shall sign and date a statement to that effect with his or her State of accreditation and if applicable, accreditation number and, within 30 days after such determination, submit a copy of the statement to the person designated under § 763.84 for inclusion in the management plan. However, an accredited inspector shall assess the friable ACBM under § 763.88.

(2) An accredited inspector has determined that, based on sampling records, nonfriable ACBM was identified in that homogeneous or sampling area during an inspection conducted before December 14, 1987. The inspector shall sign and date a statement to that effect with his or her State of accreditation and if applicable, accreditation number

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and, within 30 days after such determination, submit a copy of the statement to the person designated under §763.84 for inclusion in the management plan. However, an accredited inspector shall identify whether material that was nonfriable has become friable since that previous inspection and shall assess the newly-friable ACBM under §763.88.

(3) Based on sampling records and inspection records, an accredited inspector has determined that no ACBM is present in the homogeneous or sampling area and the records show that the area was sampled, before December 14, 1987 in substantial compliance with §763.85(a), which for purposes of this section means in a random manner and with a sufficient number of samples to reasonably ensure that the area is not ACBM.

(i) The accredited inspector shall sign and date a statement, with his or her State of accreditation and if applicable, accreditation number that the homogeneous or sampling area determined not to be ACBM was sampled in substantial compliance with §763.85(a).

(ii) Within 30 days after the inspector's determination, the local education agency shall submit a copy of the inspector's statement to the EPA Regional Office and shall include the statement in the management plan for that school.

(4) The lead agency responsible for asbestos inspection in a State that has been granted a waiver from §763.85(a) has determined that, based on sampling records and inspection records, no ACBM is present in the homogeneous or sampling area and the records show that the area was sampled before December 14, 1987, in substantial compliance with §763.85(a). Such determination shall be included in the management plan for that school.

(5) An accredited inspector has determined that, based on records of an inspection conducted before December 14, 1987, suspected ACBM identified in that homogeneous or sampling area is assumed to be ACM. The inspector shall sign and date a statement to that effect, with his or her State of accreditation and if applicable, accreditation number and, within 30 days of such de-

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termination, submit a copy of the statement to the person designated under §763.84 for inclusion in the management plan. However, an accredited inspector shall identify whether material that was nonfriable suspected ACBM assumed to be ACM has become friable since the previous inspection and shall assess the newly friable material and previously identified friable suspected ACBM assumed to be ACM under §763.88.

(6) Based on inspection records and contractor and clearance records, an accredited inspector has determined that no ACBM is present in the homogeneous or sampling area where asbestos removal operations have been conducted before December 14, 1987, and shall sign and date a statement to that effect and include his or her State of accreditation and, if applicable, accreditation number. The local education agency shall submit a copy of the statement to the EPA Regional Office and shall include the statement in the management plan for that school.

(7) An architect or project engineer responsible for the construction of a new school building built after October 12, 1988, or an accredited inspector signs a statement that no ACBM was specified as a building material in any construction document for the building, or, to the best of his or her knowledge, no ACBM was used as a building material in the building. The local education agency shall submit a copy of the signed statement of the architect, project engineer, or accredited inspector to the EPA Regional Office and shall include the statement in the management plan for that school.

(b) The exclusion, under paragraphs (a) (1) through (4) of this section, from conducting the inspection under §763.85(a) shall apply only to homogeneous or sampling areas of a school building that were inspected and sampled before October 17, 1987. The local education agency shall conduct an inspection under §763.85(a) of all areas inspected before October 17, 1987, that were not sampled or were not assumed to be ACM.

(c) If ACBM is subsequently found in a homogeneous or sampling area of a local education agency that had been identified as receiving an exclusion by

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an accredited inspector under paragraphs (a) (3), (4), (5) of this section, or an architect, project engineer or accredited inspector under paragraph (a)(7) of this section, the local education agency shall have 180 days following the date of identification of ACBM to comply with this subpart E.

APPENDIX A TO SUBPART E—INTERIM TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL METHODS—MANDATORY AND NONMANDATORY—AND MANDATORY SECTION TO DETERMINE COMPLETION OF RESPONSE ACTIONS

I. Introduction

The following appendix contains three units. The first unit is the mandatory transmission electron microscopy (TEM) method which all laboratories must follow; it is the minimum requirement for analysis of air samples for asbestos by TEM. The mandatory method contains the essential elements of the TEM method. The second unit contains the complete non-mandatory method. The non-mandatory method supplements the mandatory method by including additional steps to improve the analysis. EPA recommends that the non-mandatory method be employed for analyzing air filters; however, the laboratory may choose to employ the mandatory method. The non-mandatory method contains the same minimum requirements as are outlined in the mandatory method. Hence, laboratories may choose either of the two methods for analyzing air samples by TEM.

The final unit of this Appendix A to subpart E defines the steps which must be taken to determine completion of response actions. This unit is mandatory.

II. Mandatory Transmission Electron Microscopy Method

A. Definitions of Terms

1. *Analytical sensitivity*—Airborne asbestos concentration represented by each fiber counted under the electron microscope. It is determined by the air volume collected and the proportion of the filter examined. This method requires that the analytical sensitivity be no greater than 0.005 structures/cm³.
2. *Asbestiform*—A specific type of mineral fibrosity in which the fibers and fibrils possess high tensile strength and flexibility.
3. *Aspect ratio*—A ratio of the length to the width of a particle. Minimum aspect ratio as defined by this method is equal to or greater than 5:1.
4. *Bundle*—A structure composed of three or more fibers in a parallel arrangement

with each fiber closer than one fiber diameter.

5. *Clean area*—A controlled environment which is maintained and monitored to assure a low probability of asbestos contamination to materials in that space. Clean areas used in this method have HEPA filtered air under positive pressure and are capable of sustained operation with an open laboratory blank which on subsequent analysis has an average of less than 18 structures/mm² in an area of 0.057 mm² (nominally 10 200-mesh grid openings) and a maximum of 53 structures/mm² for any single preparation for that same area.

6. *Cluster*—A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group. Groupings must have more than two intersections.

7. *ED*—Electron diffraction.

8. *EDXA*—Energy dispersive X-ray analysis.

9. *Fiber*—A structure greater than or equal to 0.5 μ m in length with an aspect ratio (length to width) of 5:1 or greater and having substantially parallel sides.

10. *Grid*—An open structure for mounting on the sample to aid in its examination in the TEM. The term is used here to denote a 200-mesh copper lattice approximately 3 mm in diameter.

11. *Intersection*—Nonparallel touching or crossing of fibers, with the projection having an aspect ratio of 5:1 or greater.

12. *Laboratory sample coordinator*—That person responsible for the conduct of sample handling and the certification of the testing procedures.

13. *Filter background level*—The concentration of structures per square millimeter of filter that is considered indistinguishable from the concentration measured on a blank (filters through which no air has been drawn). For this method the filter background level is defined as 70 structures/mm².

14. *Matrix*—Fiber or fibers with one end free and the other end embedded in or hidden by a particulate. The exposed fiber must meet the fiber definition.

15. *NSD*—No structure detected.

16. *Operator*—A person responsible for the TEM instrumental analysis of the sample.

17. *PCM*—Phase contrast microscopy.

18. *SAED*—Selected area electron diffraction.

19. *SEM*—Scanning electron microscope.

20. *STEM*—Scanning transmission electron microscope.

21. *Structure*—a microscopic bundle, cluster, fiber, or matrix which may contain asbestos.

22. *S/cm³*—Structures per cubic centimeter.

23. *S/mm²*—Structures per square millimeter.

24. *TEM*—Transmission electron microscope.

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B. Sampling

1. The sampling agency must have written quality control procedures and documents which verify compliance.
2. Sampling operations must be performed by qualified individuals completely independent of the abatement contractor to avoid possible conflict of interest (References 1, 2, 3, and 5 of Unit II.J.).
3. Sampling for airborne asbestos following an abatement action must use commercially available cassettes.
4. Prescreen the loaded cassette collection filters to assure that they do not contain

concentrations of asbestos which may interfere with the analysis of the sample. A filter blank average of less than 18 s/mm² in an area of 0.057 mm² (nominally 10 200-mesh grid openings) and a single preparation with a maximum of 53 s/mm² for that same area is acceptable for this method.

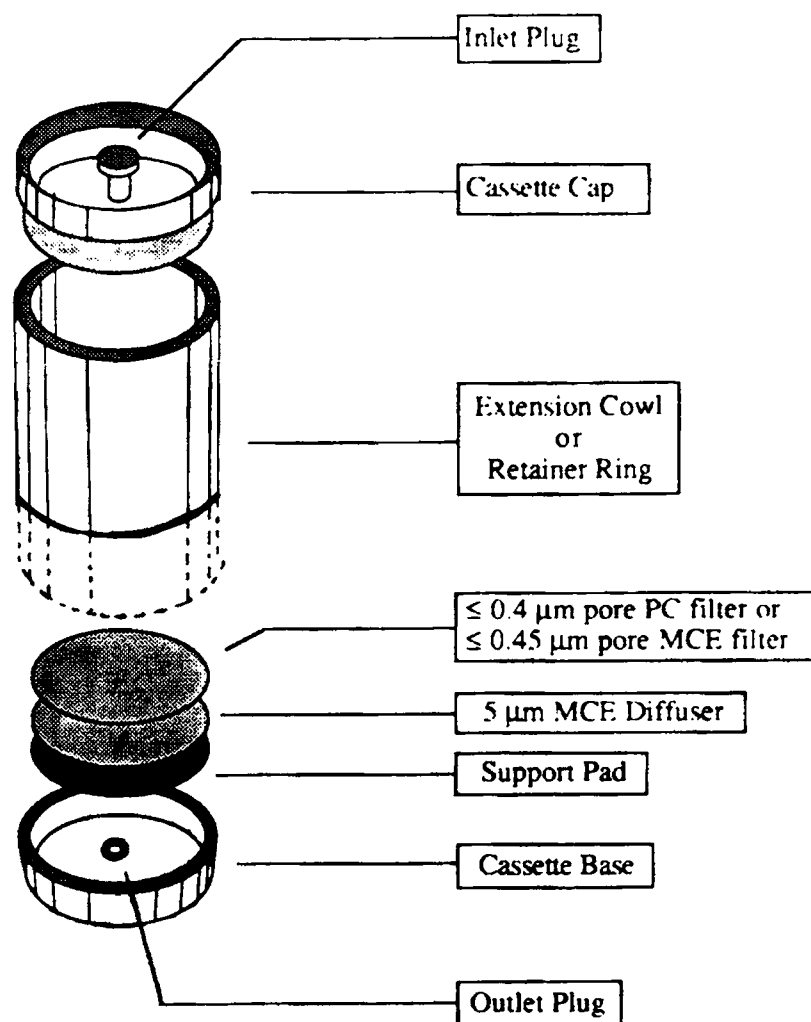
5. Use sample collection filters which are either polycarbonate having a pore size less than or equal to 0.4 µm or mixed cellulose ester having a pore size less than or equal to 0.45 µm.

6. Place these filters in series with a 5.0 µm backup filter (to serve as a diffuser) and a support pad. See the following Figure 1:

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FIGURE I--SAMPLING CASSETTE CONFIGURATION



7. Reloading of used cassettes is not permitted.

8. Orient the cassette downward at approximately 45 degrees from the horizontal.

9. Maintain a log of all pertinent sampling information.

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10. Calibrate sampling pumps and their flow indicators over the range of their intended use with a recognized standard. Assemble the sampling system with a representative filter (not the filter which will be used in sampling) before and after the sampling operation.

11. Record all calibration information.

12. Ensure that the mechanical vibrations from the pump will be minimized to prevent transferral of vibration to the cassette.

13. Ensure that a continuous smooth flow of negative pressure is delivered by the pump by damping out any pump action fluctuations if necessary.

14. The final plastic barrier around the abatement area remains in place for the sampling period.

15. After the area has passed a thorough visual inspection, use aggressive sampling conditions to dislodge any remaining dust. (See suggested protocol in Unit III.B.7.d.)

16. Select an appropriate flow rate equal to or greater than 1 liter per minute (L/min) or less than 10 L/min for 25 mm cassettes. Larger filters may be operated at proportionally higher flow rates.

17. A minimum of 13 samples are to be collected for each testing site consisting of the following:

a. A minimum of five samples per abatement area.

b. A minimum of five samples per ambient area positioned at locations representative of the air entering the abatement site.

c. Two field blanks are to be taken by removing the cap for not more than 30 seconds and replacing it at the time of sampling before sampling is initiated at the following places:

i. Near the entrance to each abatement area.

ii. At one of the ambient sites. (DO NOT leave the field blanks open during the sampling period.)

d. A sealed blank is to be carried with each sample set. This representative cassette is not to be opened in the field.

18. Perform a leak check of the sampling system at each indoor and outdoor sampling site by activating the pump with the closed sampling cassette in line. Any flow indicates a leak which must be eliminated before initiating the sampling operation.

19. The following Table I specifies volume ranges to be used:

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TABLE 1--NUMBER OF 200 MESH EM GRID OPENINGS
(0.0057 MM²) THAT NEED TO BE ANALYZED TO
MAINTAIN SENSITIVITY OF 0.005 STRUCTURES/CC
BASED ON VOLUME AND EFFECTIVE FILTER AREA

Effective Filter Area 385 sq mm		Effective Filter Area 855 sq mm	
Volume (liters)	# of grid openings	Volume (liters)	# of grid openings
560	24	1,250	24
600	23	1,300	23
700	19	1,400	21
800	17	1,600	19
900	15	1,800	17
1,000	14	2,000	15
1,100	12	2,200	14
1,200	11	2,400	13
1,300	10	2,600	12
1,400	10	2,800	11
1,500	9	3,000	10
1,600	8	3,200	9
1,700	8	3,400	9
1,800	8	3,600	8
1,900	7	3,800	8
2,000	7	4,000	8
2,100	6	4,200	7
2,200	6	4,400	7
2,300	6	4,600	7
2,400	6	4,800	6
2,500	5	5,000	6
2,600	5	5,200	6
2,700	5	5,400	6
2,800	5	5,600	5
2,900	5	5,800	5
3,000	5	6,000	5
3,100	4	6,200	5
3,200	4	6,400	5
3,300	4	6,600	5
3,400	4	6,800	4
3,500	4	7,000	4
3,600	4	7,200	4
3,700	4	7,400	4
3,800	4	7,600	4

Note minimum volumes required:
25 mm : 560 liters
37 mm : 1250 liters

Filter diameter of 25 mm = effective area of 385 sq mm
Filter diameter of 37 mm = effective area of 855 sq mm

20. Ensure that the sampler is turned up-right before interrupting the pump flow.
21. Check that all samples are clearly labeled and that all pertinent information has been enclosed before transfer of the samples to the laboratory.

22. Ensure that the samples are stored in a secure and representative location.
23. Do not change containers if portions of these filters are taken for other purposes.
24. A summary of Sample Data Quality Objectives is shown in the following Table II:

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TABLE II--SUMMARY OF SAMPLING AGENCY DATA QUALITY OBJECTIVES

This table summarizes the data quality objectives from the performance of this method in terms of precision, accuracy, completeness, representativeness, and comparability. These objectives are assured by the periodic control checks and reference checks listed here and described in the text of the method.

Unit Operation	QC Check	Frequency	Conformance Expectation
Sampling materials	Sealed blank	1 per I/O site	95%
Sample procedures	Field blanks	2 per I/O site	95%
	Pump calibration	Before and after each field series	90%
Sample custody	Review of chain-of-custody record	Each sample	95% complete
Sample shipment	Review of sending report	Each sample	95% complete

C. Sample Shipment

Ship bulk samples to the analytical laboratory in a separate container from air samples.

D. Sample Receiving

1. Designate one individual as sample coordinator at the laboratory. While that individual will normally be available to receive samples, the coordinator may train and supervise others in receiving procedures for those times when he/she is not available.

2. Bulk samples and air samples delivered to the analytical laboratory in the same container shall be rejected.

E. Sample Preparation

1. All sample preparation and analysis shall be performed by a laboratory independent of the abatement contractor.

2. Wet-wipe the exterior of the cassettes to minimize contamination possibilities before taking them into the clean room facility.

3. Perform sample preparation in a well-equipped clean facility.

NOTE: The clean area is required to have the following minimum characteristics. The area or hood must be capable of maintaining a positive pressure with make-up air being HEPA-filtered. The cumulative analytical blank concentration must average less than 18 s/mm² in an area of 0.057 mm² (nominally 10 200-mesh grid openings) and a single preparation with a maximum of 53 s/mm² for that same area.

4. Preparation areas for air samples must not only be separated from preparation areas for bulk samples, but they must be prepared in separate rooms.

5. Direct preparation techniques are required. The object is to produce an intact film containing the particulates of the filter surface which is sufficiently clear for TEM analysis.

a. TEM Grid Opening Area measurement must be done as follows:

i. The filter portion being used for sample preparation must have the surface collapsed using an acetone vapor technique.

ii. Measure 20 grid openings on each of 20 random 200-mesh copper grids by placing a grid on a glass and examining it under the PCM. Use a calibrated graticule to measure the average field diameters. From the data, calculate the field area for an average grid opening.

iii. Measurements can also be made on the TEM at a properly calibrated low magnification or on an optical microscope at a magnification of approximately 400X by using an eyepiece fitted with a scale that has been calibrated against a stage micrometer. Optical microscopy utilizing manual or automated procedures may be used providing instrument calibration can be verified.

b. TEM specimen preparation from polycarbonate (PC) filters. Procedures as described in Unit III.G. or other equivalent methods may be used.

c. TEM specimen preparation from mixed cellulose ester (MCE) filters.

i. Filter portion being used for sample preparation must have the surface collapsed using an acetone vapor technique or the Burdette procedure (Ref. 7 of Unit II.J.)

ii. Plasma etching of the collapsed filter is required. The microscope slide to which the collapsed filter pieces are attached is placed in a plasma asher. Because plasma ashers vary greatly in their performance, both from unit to unit and between different positions in the asher chamber, it is difficult to specify the conditions that should be used. Insufficient etching will result in a failure to expose embedded filters, and too much etching may result in loss of particulate from the surface. As an interim measure, it is recommended that the time for ashing of a

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known weight of a collapsed filter be established and that the etching rate be calculated in terms of micrometers per second. The actual etching time used for the particulate asher and operating conditions will then be set such that a 1-2 μm (10 percent) layer of collapsed surface will be removed.

iii. Procedures as described in Unit III. or other equivalent methods may be used to prepare samples.

F. TEM Method

1. An 80-120 kV TEM capable of performing electron diffraction with a fluorescent screen inscribed with calibrated gradations is required. If the TEM is equipped with EDXA it must either have a STEM attachment or be capable of producing a spot less than 250 nm in diameter at crossover. The microscope shall be calibrated routinely for magnification and camera constant.

2. *Determination of Camera Constant and ED Pattern Analysis.* The camera length of the TEM in ED operating mode must be calibrated before ED patterns on unknown samples are observed. This can be achieved by using a carbon-coated grid on which a thin film of gold has been sputtered or evaporated. A thin film of gold is evaporated on the specimen TEM grid to obtain zone-axis ED patterns superimposed with a ring pattern from the polycrystalline gold film. In practice, it is desirable to optimize the thickness of the gold film so that only one or two sharp rings are obtained on the superimposed ED pattern. Thicker gold film would normally give multiple gold rings, but it will tend to mask weaker diffraction spots from the unknown fibrous particulate. Since the unknown d-spacings of most interest in asbestos analysis are those which lie closest to the transmitted beam, multiple gold rings are unnecessary on zone-axis ED patterns. An average camera constant using multiple gold rings can be determined. The camera constant is one-half the diameter of the rings times the interplanar spacing of the ring being measured.

3. *Magnification Calibration.* The magnification calibration must be done at the fluorescent screen. The TEM must be calibrated at the grid opening magnification (if used) and also at the magnification used for fiber counting. This is performed with a cross grating replica (e.g., one containing 2,160 lines/mm). Define a field of view on the fluorescent screen either by markings or physical boundaries. The field of view must be measurable or previously inscribed with a scale or concentric circles (all scales should

be metric). A logbook must be maintained, and the dates of calibration and the values obtained must be recorded. The frequency of calibration depends on the past history of the particular microscope. After any maintenance of the microscope that involved adjustment of the power supplied to the lenses or the high-voltage system or the mechanical disassembly of the electron optical column apart from filament exchange, the magnification must be recalibrated. Before the TEM calibration is performed, the analyst must ensure that the cross grating replica is placed at the same distance from the objective lens as the specimens are. For instruments that incorporate a eucentric tilting specimen stage, all specimens and the cross grating replica must be placed at the eucentric position.

4. While not required on every microscope in the laboratory, the laboratory must have either one microscope equipped with energy dispersive X-ray analysis or access to an equivalent system on a TEM in another laboratory.

5. Microscope settings: 80-120 kV, grid assessment 250-1,000X, then 15,000-20,000X screen magnification for analysis.

6. Approximately one-half (0.5) of the predetermined sample area to be analyzed shall be performed on one sample grid preparation and the remaining half on a second sample grid preparation.

7. Individual grid openings with greater than 5 percent openings (holes) or covered with greater than 25 percent particulate matter or obviously having nonuniform loading must not be analyzed.

8. Reject the grid if:

a. Less than 50 percent of the grid openings covered by the replica are intact.

b. The replica is doubled or folded.

c. The replica is too dark because of incomplete dissolution of the filter.

9. *Recording Rules.*

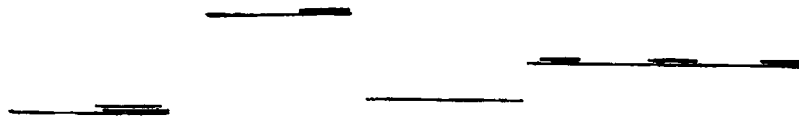
a. Any continuous grouping of particles in which an asbestos fiber with an aspect ratio greater than or equal to 5:1 and a length greater than or equal to 0.5 μm is detected shall be recorded on the count sheet. These will be designated asbestos structures and will be classified as fibers, bundles, clusters, or matrices. Record as individual fibers any contiguous grouping having 0, 1, or 2 definable intersections. Groupings having more than 2 intersections are to be described as cluster or matrix. An intersection is a non-parallel touching or crossing of fibers, with the projection having an aspect ratio of 5:1 or greater. See the following Figure 2:

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FIGURE 2--COUNTING GUIDELINES USED IN
DETERMINING ASBESTOS STRUCTURES

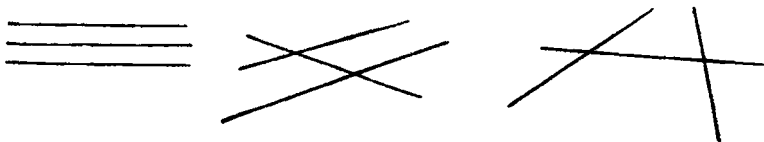
Count as 1 fiber; 1 Structure; no intersections.



Count as 2 fibers if space between fibers is greater than width of 1 fiber diameter or number of intersections is equal to or less than 1.



Count as 3 structures if space between fibers is greater than width of 1 fiber diameter or if the number of intersections is equal to or less than 2.



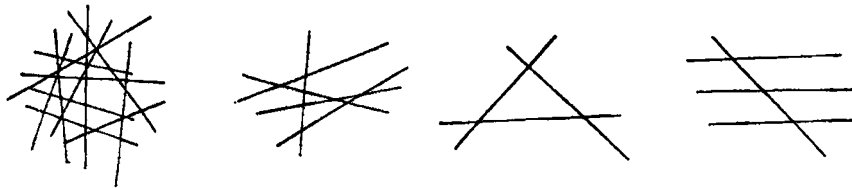
Count bundles as 1 structure; 3 or more parallel fibrils less than 1 fiber diameter separation.



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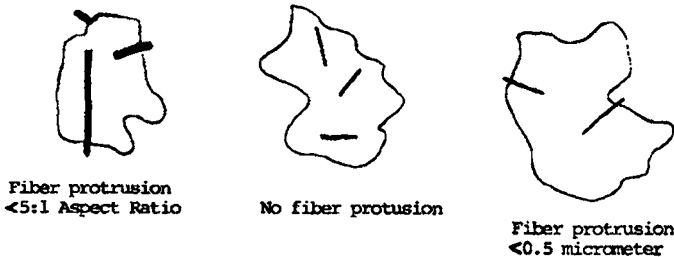
Count clusters as 1 structure; fibers having greater than or equal to 3 intersections.



Count matrix as 1 structure.



DO NOT COUNT AS STRUCTURES:



Fiber protrusion
<5:1 Aspect Ratio

No fiber protrusion

Fiber protrusion
<0.5 micrometer

— <0.5 micrometer in length
— <5:1 Aspect Ratio

i. *Fiber*. A structure having a minimum length greater than or equal to 0.5 μm and an aspect ratio (length to width) of 5:1 or greater and substantially parallel sides. Note the appearance of the end of the fiber, i.e., whether it is flat, rounded or dovetailed.

ii. *Bundle*. A structure composed of three or more fibers in a parallel arrangement with each fiber closer than one fiber diameter.

iii. *Cluster*. A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated

from the group. Groupings must have more than two intersections.

iv. *Matrix*. Fiber or fibers with one end free and the other end embedded in or hidden by a particulate. The exposed fiber must meet the fiber definition.

b. Separate categories will be maintained for fibers less than 5 μm and for fibers equal to or greater than 5 μm in length.

c. Record NSD when no structures are detected in the field.

d. Visual identification of electron diffraction (ED) patterns is required for each asbestos structure counted which would cause the

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analysis to exceed the 70 s/mm² concentration. (Generally this means the first four fibers identified as asbestos must exhibit an identifiable diffraction pattern for chrysotile or amphibole.)

e. The micrograph number of the recorded diffraction patterns must be reported to the client and maintained in the laboratory's quality assurance records. In the event that examination of the pattern by a qualified individual indicates that the pattern has been misidentified visually, the client shall be contacted.

f. Energy Dispersive X-ray Analysis (EDXA) is required of all amphiboles which would cause the analysis results to exceed the 70 s/mm² concentration. (Generally speaking, the first 4 amphiboles would require EDXA.)

g. If the number of fibers in the non-asbestos class would cause the analysis to exceed the 70 s/mm² concentration, the fact that they are not asbestos must be confirmed by EDXA or measurement of a zone axis diffraction pattern.

h. Fibers classified as chrysotile must be identified by diffraction or X-ray analysis and recorded on a count sheet. X-ray analysis alone can be used only after 70 s/mm² have been exceeded for a particular sample.

i. Fibers classified as amphiboles must be identified by X-ray analysis and electron diffraction and recorded on the count sheet. (X-ray analysis alone can be used only after 70 s/mm² have been exceeded for a particular sample.)

j. If a diffraction pattern was recorded on film, record the micrograph number on the count sheet.

k. If an electron diffraction was attempted but no pattern was observed, record N on the count sheet.

l. If an EDXA spectrum was attempted but not observed, record N on the count sheet.

m. If an X-ray analysis spectrum is stored, record the file and disk number on the count sheet.

10. Classification Rules.

a. *Fiber*. A structure having a minimum length greater than or equal to 0.5 µm and an aspect ratio (length to width) of 5:1 or greater and substantially parallel sides. Note the appearance of the end of the fiber, i.e., whether it is flat, rounded or dovetailed.

b. *Bundle*. A structure composed of three or more fibers in a parallel arrangement with each fiber closer than one fiber diameter.

c. *Cluster*. A structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group. Groupings must have more than two intersections.

d. *Matrix*. Fiber or fibers with one end free and the other end embedded in or hidden by a particulate. The exposed fiber must meet the fiber definition.

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11. After finishing with a grid, remove it from the microscope, and replace it in the appropriate grid holder. Sample grids must be stored for a minimum of 1 year from the date of the analysis; the sample cassette must be retained for a minimum of 30 days by the laboratory or returned at the client's request.

G. Sample Analytical Sequence

1. Under the present sampling requirements a minimum of 13 samples is to be collected for the clearance testing of an abatement site. These include five abatement area samples, five ambient samples, two field blanks, and one sealed blank.

2. Carry out visual inspection of work site prior to air monitoring.

3. Collect a minimum of 5 air samples inside the work site and 5 samples outside the work site. The indoor and outdoor samples shall be taken during the same time period.

4. Remaining steps in the analytical sequence are contained in Unit IV of this Appendix.

H. Reporting

1. The following information must be reported to the client for each sample analyzed:

a. Concentration in structures per square millimeter and structures per cubic centimeter.

b. Analytical sensitivity used for the analysis.

c. Number of asbestos structures.

d. Area analyzed.

e. Volume of air sampled (which must be initially supplied to lab by client).

f. Copy of the count sheet must be included with the report.

g. Signature of laboratory official to indicate that the laboratory met specifications of the method.

h. Report form must contain official laboratory identification (e.g., letterhead).

i. Type of asbestos.

I. Quality Control/Quality Assurance Procedures (Data Quality Indicators)

Monitoring the environment for airborne asbestos requires the use of sensitive sampling and analysis procedures. Because the test is sensitive, it may be influenced by a variety of factors. These include the supplies used in the sampling operation, the performance of the sampling, the preparation of the grid from the filter and the actual examination of this grid in the microscope. Each of these unit operations must produce a product of defined quality if the analytical result is to be a reliable and meaningful test result. Accordingly, a series of control checks and reference standards are to be performed along with the sample analysis as indicators that the materials used are adequate and the

ASBESTOS and OTHER FIBERS by PCM

7400

Various

MW: Various

CAS: Various

RTECS: Various

METHOD: 7400, Issue 2

EVALUATION: FULL

Issue 1: Rev. 3 on 15 May 1989

Issue 2: 15 August 1994

OSHA : 0.1 asbestos fiber (> 5 µm long)/cc;
1 f/cc/30 min excursion; carcinogen

MSHA: 2 asbestos fibers/cc

NIOSH: 0.1 f/cc (fibers > 5 µm long)/400 L; carcinogen

ACGIH: 0.2 crocidolite; 0.5 amosite; 2 chrysotile and other
asbestos, fibers/cc; carcinogen

PROPERTIES: solid, fibrous, crystalline, anisotropic

SYNONYMS [CAS #]: actinolite [77536-66-4] or ferroactinolite [15669-07-5]; amosite [12172-73-5]; anthophyllite [77536-67-5]; chrysotile [12001-29-5]; serpentine [18786-24-8]; crocidolite [12001-28-4]; tremolite [77536-68-6]; amphibole asbestos [1332-21-4]; refractory ceramic fibers [142844-00-6]; fibrous glass.

SAMPLING		MEASUREMENT	
SAMPLER:	FILTER (0.45- to 1.2-µm cellulose ester membrane, 25-mm; conductive cowl on cassette)	TECHNIQUE:	LIGHT MICROSCOPY, PHASE CONTRAST
FLOW RATE*:	0.5 to 16 L/min	ANALYTE:	fibers (manual count)
VOL-MIN*:	400 L @ 0.1 fiber/cc	SAMPLE PREPARATION:	acetone - collapse/triacetin - immersion method [2]
-MAX*:	(step 4, sampling) *Adjust to give 100 to 1300 fiber/mm ²	COUNTING RULES:	described in previous version of this method as "A" rules [1,3]
SHIPMENT:	routine (pack to reduce shock)	EQUIPMENT:	1. positive phase-contrast microscope 2. Walton-Beckett graticule (100-µm field of view) Type G-22 3. phase-shift test slide (HSE/NPL)
SAMPLE STABILITY:	stable	CALIBRATION:	HSE/NPL test slide
BLANKS:	2 to 10 field blanks per set	RANGE:	100 to 1300 fibers/mm ² filter area
ACCURACY		ESTIMATED LOD:	7 fibers/mm ² filter area
RANGE STUDIED:	80 to 100 fibers counted	PRECISION ($\bar{S}_r$):	0.10 to 0.12 [1]; see EVALUATION OF METHOD
BIAS:	see EVALUATION OF METHOD		
OVERALL PRECISION ($\bar{S}_{rt}$):	0.115 to 0.13 [1]		
ACCURACY:	see EVALUATION OF METHOD		

APPLICABILITY: The quantitative working range is 0.04 to 0.5 fiber/cc for a 1000-L air sample. The LOD depends on sample volume and quantity of interfering dust, and is <0.01 fiber/cc for atmospheres free of interferences. The method gives an index of airborne fibers. It is primarily used for estimating asbestos concentrations, though PCM does not differentiate between asbestos and other fibers. Use this method in conjunction with electron microscopy (e.g., Method 7402) for assistance in identification of fibers. Fibers < ca. 0.25 µm diameter will not be detected by this method [4]. This method may be used for other materials such as fibrous glass by using alternate counting rules (see Appendix C).

INTERFERENCES: If the method is used to detect a specific type of fiber, any other airborne fiber may interfere since all particles meeting the counting criteria are counted. Chain-like particles may appear fibrous. High levels of non-fibrous dust particles may obscure fibers in the field of view and increase the detection limit.

OTHER METHODS: This revision replaces Method 7400, Revision #3 (dated 5/15/89).

REAGENTS:

1. Acetone,* reagent grade.
2. Triacetin (glycerol triacetate), reagent grade.

* See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: field monitor, 25-mm, three-piece cassette with ca. 50-mm electrically conductive extension cowl and cellulose ester filter, 0.45- to 1.2- μ m pore size, and backup pad.

NOTE 1: Analyze representative filters for fiber background before use to check for clarity and background. Discard the filter lot if mean is ≥ 5 fibers per 100 graticule fields. These are defined as laboratory blanks. Manufacturer-provided quality assurance checks on filter blanks are normally adequate as long as field blanks are analyzed as described below.

NOTE 2: The electrically conductive extension cowl reduces electrostatic effects. Ground the cowl when possible during sampling.

NOTE 3: Use 0.8- μ m pore size filters for personal sampling. The 0.45- μ m filters are recommended for sampling when performing TEM analysis on the same samples. However, their higher pressure drop precludes their use with personal sampling pumps.

NOTE 4: Other cassettes have been proposed that exhibit improved uniformity of fiber deposit on the filter surface, e.g., bellmouthed sampler (Envirometrics, Charleston, SC). These may be used if shown to give measured concentrations equivalent to sampler indicated above for the application.

2. Personal sampling pump, battery or line-powered vacuum, of sufficient capacity to meet flow-rate requirements (see step 4 for flow rate), with flexible connecting tubing.
3. Wire, multi-stranded, 22-gauge; 1", hose clamp to attach wire to cassette.
4. Tape, shrink- or adhesive-.
5. Slides, glass, frosted-end, pre-cleaned, 25 x 75-mm.
6. Cover slips, 22- x 22-mm, No. 1-1/2, unless otherwise specified by microscope manufacturer.
7. Lacquer or nail polish.
8. Knife, #10 surgical steel, curved blade.
9. Tweezers.

EQUIPMENT:

10. Acetone flash vaporization system for clearing filters on glass slides (see ref. [5] for specifications or see manufacturer's instructions for equivalent devices).
11. Micropipets or syringes, 5- μ L and 100- to 500- μ L.
12. Microscope, positive phase (dark) contrast, with green or blue filter, adjustable field iris, 8 to 10X eyepiece, and 40 to 45X phase objective (total magnification ca. 400X); numerical aperture = 0.65 to 0.75.
13. Graticule, Walton-Beckett type with 100- μ m diameter circular field (area = 0.00785 mm²) at the specimen plane (Type G-22). Available from Optometrics USA, P.O. Box 699, Ayer, MA 01432 [phone (508)-772-1700], and McCrone Accessories and Components, 850 Pasquinelli Drive, Westmont, IL 60559 [phone (312) 887-7100].
NOTE: The graticule is custom-made for each microscope. (see APPENDIX A for the custom-ordering procedure).
14. HSE/NPL phase contrast test slide, Mark II. Available from Optometrics USA (address above).
15. Telescope, ocular phase-ring centering.
16. Stage micrometer (0.01-mm divisions).

SPECIAL PRECAUTIONS: Acetone is extremely flammable. Take precautions not to ignite it. Heating of acetone in volumes greater than 1 mL must be done in a ventilated laboratory fume hood using a flameless, spark-free heat source.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. To reduce contamination and to hold the cassette tightly together, seal the crease between the cassette base and the cowl with a shrink band or light colored adhesive tape. For personal sampling, fasten the (uncapped) open-face cassette to the worker's lapel. The open face should be oriented downward.
NOTE: The cowl should be electrically grounded during area sampling, especially under conditions of low relative humidity. Use a hose clamp to secure one end of the wire (Equipment, Item 3) to the monitor's cowl. Connect the other end to an earth ground (i.e., cold water pipe).
3. Submit at least two field blanks (or 10% of the total samples, whichever is greater) for each set of samples. Handle field blanks in a manner representative of actual handling of associated samples in the set. Open field blank cassettes at the same time as other cassettes just prior to sampling. Store top covers and cassettes in a clean area (e.g., a closed bag or box) with the top covers from the sampling cassettes during the sampling period.
4. Sample at 0.5 L/min or greater [6]. Adjust sampling flow rate, Q (L/min), and time, t (min), to produce a fiber density, E, of 100 to 1300 fibers/mm² ($3.85 \cdot 10^4$ to $5 \cdot 10^5$ fibers per 25-mm filter with effective collection area $A_c = 385$ mm²) for optimum accuracy. These variables are related

to the action level (one-half the current standard), L (fibers/cc), of the fibrous aerosol being sampled by:

$$t = \frac{A_c \cdot E}{Q \cdot L \cdot 10^3}, \text{ min.}$$

NOTE 1: The purpose of adjusting sampling times is to obtain optimum fiber loading on the filter. The collection efficiency does not appear to be a function of flow rate in the range of 0.5 to 16 L/min for asbestos fibers [7]. Relatively large diameter fibers (>3 μm) may exhibit significant aspiration loss and inlet deposition. A sampling rate of 1 to 4 L/min for 8 h is appropriate in atmospheres containing ca. 0.1 fiber/cc in the absence of significant amounts of non-asbestos dust. Dusty atmospheres require smaller sample volumes (≤ 400 L) to obtain countable samples. In such cases take short, consecutive samples and average the results over the total collection time. For documenting episodic exposures, use high flow rates (7 to 16 L/min) over shorter sampling times. In relatively clean atmospheres, where targeted fiber concentrations are much less than 0.1 fiber/cc, use larger sample volumes (3000 to 10000 L) to achieve quantifiable loadings. Take care, however, not to overload the filter with background dust. If $\geq 50\%$ of the filter surface is covered with particles, the filter may be too overloaded to count and will bias the measured fiber concentration.

NOTE 2: OSHA regulations specify a minimum sampling volume of 48 L for an excursion measurement, and a maximum sampling rate of 2.5 L/min [3].

5. At the end of sampling, replace top cover and end plugs.
6. Ship samples with conductive cowl attached in a rigid container with packing material to prevent jostling or damage.

NOTE: Do not use untreated polystyrene foam in shipping container because electrostatic forces may cause fiber loss from sample filter.

SAMPLE PREPARATION:

NOTE 1: The object is to produce samples with a smooth (non-grainy) background in a medium with refractive index ≤ 1.46 . This method collapses the filter for easier focusing and produces permanent (1 - 10 years) mounts which are useful for quality control and interlaboratory comparison. The aluminum "hot block" or similar flash vaporization techniques may be used outside the laboratory [2]. Other mounting techniques meeting the above criteria may also be used (e.g., the laboratory fume hood procedure for generating acetone vapor as described in Method 7400 - revision of 5/15/85, or the non-permanent field mounting technique used in P&CAM 239 [3,7,8,9]). Unless the effective filtration area is known, determine the area and record the information referenced against the sample ID number [1,9,10,11].

NOTE 2: Excessive water in the acetone may slow the clearing of the filter, causing material to be washed off the surface of the filter. Also, filters that have been exposed to high humidities prior to clearing may have a grainy background.

7. Ensure that the glass slides and cover slips are free of dust and fibers.
8. Adjust the rheostat to heat the "hot block" to ca. 70 °C [2].
NOTE: If the "hot block" is not used in a fume hood, it must rest on a ceramic plate and be isolated from any surface susceptible to heat damage.
9. Mount a wedge cut from the sample filter on a clean glass slide.
 - a. Cut wedges of ca. 25% of the filter area with a curved-blade surgical steel knife using a rocking motion to prevent tearing. Place wedge, dust side up, on slide.
NOTE: Static electricity will usually keep the wedge on the slide.

- b. Insert slide with wedge into the receiving slot at base of "hot block". Immediately place tip of a micropipet containing ca. 250 μL acetone (use the minimum volume needed to consistently clear the filter sections) into the inlet port of the PTFE cap on top of the "hot block" and inject the acetone into the vaporization chamber with a slow, steady pressure on the plunger button while holding pipet firmly in place. After waiting 3 to 5 sec for the filter to clear, remove pipet and slide from their ports.

CAUTION: Although the volume of acetone used is small, use safety precautions. Work in a well-ventilated area (e.g., laboratory fume hood). Take care not to ignite the acetone. Continuous use of this device in an unventilated space may produce explosive acetone vapor concentrations.

- c. Using the 5- μL micropipet, immediately place 3.0 to 3.5 μL triacetin on the wedge. Gently lower a clean cover slip onto the wedge at a slight angle to reduce bubble formation. Avoid excess pressure and movement of the cover glass.

NOTE: If too many bubbles form or the amount of triacetin is insufficient, the cover slip may become detached within a few hours. If excessive triacetin remains at the edge of the filter under the cover slip, fiber migration may occur.

- d. Mark the outline of the filter segment with a glass marking pen to aid in microscopic evaluation.
- e. Glue the edges of the cover slip to the slide using lacquer or nail polish [12]. Counting may proceed immediately after clearing and mounting are completed.

NOTE: If clearing is slow, warm the slide on a hotplate (surface temperature 50 $^{\circ}\text{C}$) for up to 15 min to hasten clearing. Heat carefully to prevent gas bubble formation.

CALIBRATION AND QUALITY CONTROL:

10. Microscope adjustments. Follow the manufacturers instructions. At least once daily use the telescope ocular (or Bertrand lens, for some microscopes) supplied by the manufacturer to ensure that the phase rings (annular diaphragm and phase-shifting elements) are concentric. With each microscope, keep a logbook in which to record the dates of microscope cleanings and major servicing.
 - a. Each time a sample is examined, do the following:
 - (1) Adjust the light source for even illumination across the field of view at the condenser iris. Use Kohler illumination, if available. With some microscopes, the illumination may have to be set up with bright field optics rather than phase contract optics.
 - (2) Focus on the particulate material to be examined.
 - (3) Make sure that the field iris is in focus, centered on the sample, and open only enough to fully illuminate the field of view.
 - b. Check the phase-shift detection limit of the microscope periodically for each analyst/microscope combination:
 - (1) Center the HSE/NPL phase-contrast test slide under the phase objective.
 - (2) Bring the blocks of grooved lines into focus in the graticule area.

NOTE: The slide contains seven blocks of grooves (ca. 20 grooves per block) in descending order of visibility. For asbestos counting the microscope optics must completely resolve the grooved lines in block 3 although they may appear somewhat faint, and the grooved lines in blocks 6 and 7 must be invisible when centered in the graticule area. Blocks 4 and 5 must be at least partially visible but may vary slightly in visibility between microscopes. A microscope which fails to meet these requirements has resolution either too low or too high for fiber counting.
 - (3) If image quality deteriorates, clean the microscope optics. If the problem persists, consult the microscope manufacturer.
11. Document the laboratory's precision for each counter for replicate fiber counts.
 - a. Maintain as part of the laboratory quality assurance program a set of reference slides to be used on a daily basis [13]. These slides should consist of filter preparations including a range of loadings and background dust levels from a variety of sources including both field

and reference samples (e.g., PAT, AAR, commercial samples). The Quality Assurance Officer should maintain custody of the reference slides and should supply each counter with a minimum of one reference slide per workday. Change the labels on the reference slides periodically so that the counter does not become familiar with the samples.

- b. From blind repeat counts on reference slides, estimate the laboratory intra- and intercounter precision. Obtain separate values of relative standard deviation (S_r) for each sample matrix analyzed in each of the following ranges: 5 to 20 fibers in 100 graticule fields, >20 to 50 fibers in 100 graticule fields, and >50 to 100 fibers in 100 graticule fields. Maintain control charts for each of these data files.

NOTE: Certain sample matrices (e.g., asbestos cement) have been shown to give poor precision [9]

12. Prepare and count field blanks along with the field samples. Report counts on each field blank.

NOTE 1: The identity of blank filters should be unknown to the counter until all counts have been completed.

NOTE 2: If a field blank yields greater than 7 fibers per 100 graticule fields, report possible contamination of the samples.

13. Perform blind recounts by the same counter on 10% of filters counted (slides relabeled by a person other than the counter). Use the following test to determine whether a pair of counts by the same counter on the same filter should be rejected because of possible bias: Discard the sample if the absolute value of the difference between the square roots of the two counts (in fiber/mm²) exceeds $2.77 (X)S_r$, where X = average of the square roots of the two fiber counts (in

fiber/mm²) and $S_r = \frac{S_r}{2}$, where S_r is the intracounter relative standard deviation for the

appropriate count range (in fibers) determined in step 11. For more complete discussions see reference [13].

NOTE 1: Since fiber counting is the measurement of randomly placed fibers which may be described by a Poisson distribution, a square root transformation of the fiber count data will result in approximately normally distributed data [13].

NOTE 2: If a pair of counts is rejected by this test, recount the remaining samples in the set and test the new counts against the first counts. Discard all rejected paired counts. It is not necessary to use this statistic on blank counts.

14. The analyst is a critical part of this analytical procedure. Care must be taken to provide a non-stressful and comfortable environment for fiber counting. An ergonomically designed chair should be used, with the microscope eyepiece situated at a comfortable height for viewing. External lighting should be set at a level similar to the illumination level in the microscope to reduce eye fatigue. In addition, counters should take 10-to-20 minute breaks from the microscope every one or two hours to limit fatigue [14]. During these breaks, both eye and upper back/neck exercises should be performed to relieve strain.

15. All laboratories engaged in asbestos counting should participate in a proficiency testing program such as the AIHA-NIOSH Proficiency Analytical Testing (PAT) Program for asbestos and routinely exchange field samples with other laboratories to compare performance of counters.

MEASUREMENT:

16. Center the slide on the stage of the calibrated microscope under the objective lens. Focus the microscope on the plane of the filter.

17. Adjust the microscope (Step 10).

NOTE: Calibration with the HSE/NPL test slide determines the minimum detectable fiber diameter (ca. 0.25 μ m) [4].

18. Counting rules: (same as P&CAM 239 rules [1,10,11]: see examples in APPENDIX B).

- a. Count any fiber longer than 5 μ m which lies entirely within the graticule area.
 - (1) Count only fibers longer than 5 μ m. Measure length of curved fibers along the curve.
 - (2) Count only fibers with a length-to-width ratio equal to or greater than 3:1.
- b. For fibers which cross the boundary of the graticule field:

- (1) Count as 1/2 fiber any fiber with only one end lying within the graticule area, provided that the fiber meets the criteria of rule a above.
 - (2) Do not count any fiber which crosses the graticule boundary more than once.
 - (3) Reject and do not count all other fibers.
 - c. Count bundles of fibers as one fiber unless individual fibers can be identified by observing both ends of a fiber.
 - d. Count enough graticule fields to yield 100 fibers. Count a minimum of 20 fields. Stop at 100 graticule fields regardless of count.
19. Start counting from the tip of the filter wedge and progress along a radial line to the outer edge. Shift up or down on the filter, and continue in the reverse direction. Select graticule fields randomly by looking away from the eyepiece briefly while advancing the mechanical stage. Ensure that, as a minimum, each analysis covers one radial line from the filter center to the outer edge of the filter. When an agglomerate or bubble covers ca. 1/6 or more of the graticule field, reject the graticule field and select another. Do not report rejected graticule fields in the total number counted.
- NOTE 1: When counting a graticule field, continuously scan a range of focal planes by moving the fine focus knob to detect very fine fibers which have become embedded in the filter. The small-diameter fibers will be very faint but are an important contribution to the total count. A minimum counting time of 15 seconds per field is appropriate for accurate counting.
- NOTE 2: This method does not allow for differentiation of fibers based on morphology. Although some experienced counters are capable of selectively counting only fibers which appear to be asbestiform, there is presently no accepted method for ensuring uniformity of judgment between laboratories. It is, therefore, incumbent upon all laboratories using this method to report total fiber counts. If serious contamination from non-asbestos fibers occurs in samples, other techniques such as transmission electron microscopy must be used to identify the asbestos fiber fraction present in the sample (see NIOSH Method 7402). In some cases (i.e., for fibers with diameters >1 µm), polarized light microscopy (as in NIOSH Method 7403) may be used to identify and eliminate interfering non-crystalline fibers [15].
- NOTE 3: Do not count at edges where filter was cut. Move in at least 1 mm from the edge.
- NOTE 4: Under certain conditions, electrostatic charge may affect the sampling of fibers. These electrostatic effects are most likely to occur when the relative humidity is low (below 20%), and when sampling is performed near the source of aerosol. The result is that deposition of fibers on the filter is reduced, especially near the edge of the filter. If such a pattern is noted during fiber counting, choose fields as close to the center of the filter as possible [5].
- NOTE 5: Counts are to be recorded on a data sheet that provides, as a minimum, spaces on which to record the counts for each field, filter identification number, analyst's name, date, total fibers counted, total fields counted, average count, fiber density, and commentary. Average count is calculated by dividing the total fiber count by the number of fields observed. Fiber density (fibers/mm²) is defined as the average count (fibers/field) divided by the field (graticule) area (mm²/field).

CALCULATIONS AND REPORTING OF RESULTS

20. Calculate and report fiber density on the filter, E (fibers/mm²), by dividing the average fiber count per graticule field, F/n_f , minus the mean field blank count per graticule field, B/n_b , by the graticule field area, A_f (approx. 0.00785 mm²):

$$E = \frac{\left(\frac{F}{n_f} - \frac{B}{n_b} \right)}{A_f}, \text{ fibers/mm}^2.$$



NOTE: Fiber counts above 1300 fibers/mm² and fiber counts from samples with >50% of filter area covered with particulate should be reported as "uncountable" or "probably biased." Other fiber counts outside the 100-1300 fiber/mm² range should be reported as having "greater than optimal variability" and as being "probably biased."

21. Calculate and report the concentration, C (fibers/cc), of fibers in the air volume sampled, V (L), using the effective collection area of the filter, A_c (approx. 385 mm² for a 25-mm filter):

$$C = \frac{(E)(A_c)}{V \cdot 10^3}$$

NOTE: Periodically check and adjust the value of A_c, if necessary.

22. Report intralaboratory and interlaboratory relative standard deviations (from Step 11) with each set of results.

NOTE: Precision depends on the total number of fibers counted [1,16]. Relative standard deviation is documented in references [1,15-17] for fiber counts up to 100 fibers in 100 graticule fields. Comparability of interlaboratory results is discussed below. As a first approximation, use 213% above and 49% below the count as the upper and lower confidence limits for fiber counts greater than 20 (Fig. 1).

EVALUATION OF METHOD:

- A. This method is a revision of P&CAM 239 [10]. A summary of the revisions is as follows:

1. Sampling:

The change from a 37-mm to a 25-mm filter improves sensitivity for similar air volumes. The change in flow rates allows for 2-m³ full-shift samples to be taken, providing that the filter is not overloaded with non-fibrous particulates. The collection efficiency of the sampler is not a function of flow rate in the range 0.5 to 16 L/min [10].

2. Sample Preparation Technique:

The acetone vapor-triacetin preparation technique is a faster, more permanent mounting technique than the dimethyl phthalate/diethyl oxalate method of P&CAM 239 [2,4,10]. The aluminum "hot block" technique minimizes the amount of acetone needed to prepare each sample.

3. Measurement:

- a. The Walton-Beckett graticule standardizes the area observed [14,18,19].
- b. The HSE/NPL test slide standardizes microscope optics for sensitivity to fiber diameter [4,14].
- c. Because of past inaccuracies associated with low fiber counts, the minimum recommended loading has been increased to 100 fibers/mm² filter area (a total of 78.5 fibers counted in 100 fields, each with field area = .00785 mm².) Lower levels generally result in an overestimate of the fiber count when compared to results in the recommended analytical range [20]. The recommended loadings should yield intracounter S_r in the range of 0.10 to 0.17 [21,22,23].

- B. Interlaboratory comparability:

An international collaborative study involved 16 laboratories using prepared slides from the asbestos cement, milling, mining, textile, and friction material industries [9]. The relative standard deviations (S_r) varied with sample type and laboratory. The ranges were:

	<u>Intralaboratory S_r</u>	<u>Interlaboratory S_r</u>	<u>Overall S_r</u>
AIA (NIOSH A Rules)*	0.12 to 0.40	0.27 to 0.85	0.46
Modified CRS (NIOSH B Rules)**	0.11 to 0.29	0.20 to 0.35	0.25

* Under AIA rules, only fibers having a diameter less than 3 µm are counted and fibers attached to particles larger than 3 µm are not counted. NIOSH A Rules are otherwise similar to the AIA rules.

** See Appendix C.

A NIOSH study conducted using field samples of asbestos gave intralaboratory S_r in the range 0.17 to 0.25 and an interlaboratory S_r of 0.45 [21]. This agrees well with other recent studies [9,14,16].

At this time, there is no independent means for assessing the overall accuracy of this method. One measure of reliability is to estimate how well the count for a single sample agrees with the mean count from a large number of laboratories. The following discussion indicates how this estimation can be carried out based on measurements of the interlaboratory variability, as well as showing how the results of this method relate to the theoretically attainable counting precision and to measured intra- and interlaboratory S_r. (NOTE: The following discussion does not include bias estimates and should not be taken to indicate that lightly loaded samples are as accurate as properly loaded ones).

Theoretically, the process of counting randomly (Poisson) distributed fibers on a filter surface will give an S_r that depends on the number, N, of fibers counted:

$$S_r = 1/(N)^{1/2} \quad (1)$$

Thus S_r is 0.1 for 100 fibers and 0.32 for 10 fibers counted. The actual S_r found in a number of studies is greater than these theoretical numbers [17,19,20,21].

An additional component of variability comes primarily from subjective interlaboratory differences. In a study of ten counters in a continuing sample exchange program, Ogden [15] found this subjective component of intralaboratory S_r to be approximately 0.2 and estimated the overall S_r by the term:

$$\frac{[N + (0.2 \cdot N)^2]^{1/2}}{N} \quad (2)$$

Ogden found that the 90% confidence interval of the individual intralaboratory counts in relation to the means were +2 S_r and - 1.5 S_r. In this program, one sample out of ten was a quality control sample. For laboratories not engaged in an intensive quality assurance program, the subjective component of variability can be higher.

In a study of field sample results in 46 laboratories, the Asbestos Information Association also found that the variability had both a constant component and one that depended on the fiber count [14]. These results gave a subjective interlaboratory component of S_r (on the same basis as Ogden's) for field samples of ca. 0.45. A similar value was obtained for 12 laboratories analyzing a set of 24 field samples [21]. This value falls slightly above the range of S_r (0.25 to 0.42 for 1984-85) found for 80 reference laboratories in the NIOSH PAT program for laboratory-generated samples [17].

A number of factors influence S_r for a given laboratory, such as that laboratory's actual counting performance and the type of samples being analyzed. In the absence of other information, such as from an interlaboratory quality assurance program using field samples, the value for the subjective component of variability is chosen as 0.45. It is hoped that the laboratories will carry out the recommended interlaboratory quality assurance programs to improve their performance and thus reduce the S_r.

These rules are sometimes referred to as the "A" rules.

<u>FIBER COUNT</u>		
<u>Object</u>	<u>Count</u>	<u>DISCUSSION</u>
1	1 fiber	Optically observable asbestos fibers are actually bundles of fine fibrils. If the fibrils seem to be from the same bundle the object is counted as a single fiber. Note, however, that all objects meeting length and aspect ratio criteria are counted whether or not they appear to be asbestos.
2	2 fiber	If fibers meeting the length and aspect ratio criteria (length >5 µm and length-to-width ratio >3 to 1) overlap, but do not seem to be part of the same bundle, they are counted as separate fibers.
3	1 fiber	Although the object has a relatively large diameter (>3 µm), it is counted as fiber under the rules. There is no upper limit on the fiber diameter in the counting rules. Note that fiber width is measured at the widest compact section of the object.
4	1 fiber	Although long fine fibrils may extend from the body of a fiber, these fibrils are considered part of the fiber if they seem to have originally been part of the bundle.
5	Do not count	If the object is ≤5 µm long, it is not counted.
6	1 fiber	A fiber partially obscured by a particle is counted as one fiber. If the fiber ends emanating from a particle do not seem to be from the same fiber and each end meets the length and aspect ratio criteria, they are counted as separate fibers.
7	1/2 fiber	A fiber which crosses into the graticule area one time is counted as 1/2 fiber.
8	Do not count	Ignore fibers that cross the graticulate boundary more than once.
9	Do not count	Ignore fibers that lie outside the graticule boundary.

APPENDIX C. ALTERNATE COUNTING RULES FOR NON-ASBESTOS FIBERS

Other counting rules may be more appropriate for measurement of specific non-asbestos fiber types, such as fibrous glass. These include the "B" rules given below (from NIOSH Method 7400, Revision #2, dated 8/15/87), the World Health Organization reference method for man-made mineral fiber [24], and the NIOSH fibrous glass criteria document method [25]. The upper diameter limit in these methods prevents measurements of non-thoracic fibers. It is important to note that the aspect ratio limits included in these methods vary. NIOSH recommends the use of the 3:1 aspect ratio in counting fibers.

It is emphasized that hybridization of different sets of counting rules is not permitted. Report specifically which set of counting rules are used with the analytical results.

"B" COUNTING RULES:

1. Count only ends of fibers. Each fiber must be longer than 5 μm and less than 3 μm diameter.
2. Count only ends of fibers with a length-to-width ratio equal to or greater than 5:1.
3. Count each fiber end which falls within the graticule area as one end, provided that the fiber meets rules 1 and 2 above. Add split ends to the count as appropriate if the split fiber segment also meets the criteria of rules 1 and 2 above.
4. Count visibly free ends which meet rules 1 and 2 above when the fiber appears to be attached to another particle, regardless of the size of the other particle. Count the end of a fiber obscured by another particle if the particle covering the fiber end is less than 3 μm in diameter.
5. Count free ends of fibers emanating from large clumps and bundles up to a maximum of 10 ends (5 fibers), provided that each segment meets rules 1 and 2 above.
6. Count enough graticule fields to yield 200 ends. Count a minimum of 20 graticule fields. Stop at 100 graticule fields, regardless of count.
7. Divide total end count by 2 to yield fiber count.

APPENDIX D. EQUIVALENT LIMITS OF DETECTION AND QUANTITATION

<u>fiber density on filter*</u>		<u>fiber concentration in air, f/cc</u>	
<u>fibers</u>		<u>400-L air</u>	<u>1000-L air</u>
<u>per 100 fields</u>	<u>fibers/mm²</u>	<u>sample</u>	<u>sample</u>
200	255	0.25	0.10
100	127	0.125	0.05
LOQ.....80.....	102.....	0.10.....	0.04.....
50	64	0.0625	0.025
25	32	0.03	0.0125
20	25	0.025	0.010
10	12.7	0.0125	0.005
8	10.2	0.010	0.004
LOD.....5.5.....	7.....	0.00675.....	0.0027.....

* Assumes 385 mm² effective filter collection area, and field area = 0.00785 mm², for relatively "clean" (little particulate aside from fibers) filters.

$$d_c = \frac{L_a}{L_o} \times D. \quad (5)$$

Example: If $L_o = 112 \mu\text{m}$, $L_a = 4.5 \text{ mm}$ and $D = 100 \mu\text{m}$, then $d_c = 4.02 \text{ mm}$.

8. Check the field diameter, D (acceptable range $100 \mu\text{m} \pm 2 \mu\text{m}$) with a stage micrometer upon receipt of the graticule from the manufacturer. Determine field area (acceptable range 0.00754 mm^2 to 0.00817 mm^2).

APPENDIX B: COMPARISON OF COUNTING RULES:

Figure 2 shows a Walton-Beckett graticule as seen through the microscope. The rules will be discussed as they apply to the labeled objects in the figure.

Figure 2. Walton-Beckett graticule with fibers.

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METHOD WRITTEN BY:

Paul A. Baron, Ph.D., NIOSH/DPSE.

APPENDIX A: CALIBRATION OF THE WALTON-BECKETT GRATICULE:

Before ordering the Walton-Beckett graticule, the following calibration must be done to obtain a counting area (D) 100 μm in diameter at the image plane. The diameter, d_o (mm), of the circular counting area and the disc diameter must be specified when ordering the graticule.

1. Insert any available graticule into the eyepiece and focus so that the graticule lines are sharp and clear.
2. Set the appropriate interpupillary distance and, if applicable, reset the binocular head adjustment so that the magnification remains constant.
3. Install the 40 to 45X phase objective.
4. Place a stage micrometer on the microscope object stage and focus the microscope on the graduated lines.
5. Measure the magnified grid length of the graticule, L_o (μm), using the stage micrometer.
6. Remove the graticule from the microscope and measure its actual grid length, L_a (mm). This can best be accomplished by using a stage fitted with verniers.
7. Calculate the circle diameter, d_o (mm), for the Walton-Beckett graticule:

The above relative standard deviations apply when the population mean has been determined. It is more useful, however, for laboratories to estimate the 90% confidence interval on the mean count from a single sample fiber count (Figure 1). These curves assume similar shapes of the count distribution for interlaboratory and intralaboratory results [16].

For example, if a sample yields a count of 24 fibers, Figure 1 indicates that the mean interlaboratory count will fall within the range of 227% above and 52% below that value 90% of the time. We can apply these percentages directly to the air concentrations as well. If, for instance, this sample (24 fibers counted) represented a 500-L volume, then the measured concentration is 0.02 fibers/mL (assuming 100 fields counted, 25-mm filter, 0.00785 mm² counting field area). If this same sample were counted by a group of laboratories, there is a 90% probability that the mean would fall between 0.01 and 0.08 fiber/mL. These limits should be reported in any comparison of results between laboratories.

Note that the S_r of 0.45 used to derive Figure 1 is used as an estimate for a random group of laboratories. If several laboratories belonging to a quality assurance group can show that their interlaboratory S_r is smaller, then it is more correct to use that smaller S_r . However, the estimated S_r of 0.45 is to be used in the absence of such information. Note also that it has been found that S_r can be higher for certain types of samples, such as asbestos cement [9].

Quite often the estimated airborne concentration from an asbestos analysis is used to compare to a regulatory standard. For instance, if one is trying to show compliance with an 0.5 fiber/mL standard using a single sample on which 100 fibers have been counted, then Figure 1 indicates that the 0.5 fiber/mL standard must be 213% higher than the measured air concentration. This indicates that if one measures a fiber concentration of 0.16 fiber/mL (100 fibers counted), then the mean fiber count by a group of laboratories (of which the compliance laboratory might be one) has a 95% chance of being less than 0.5 fibers/mL; i.e., $0.16 + 2.13 \times 0.16 = 0.5$.

It can be seen from Figure 1 that the Poisson component of the variability is not very important unless the number of fibers counted is small. Therefore, a further approximation is to simply use +213% and -49% as the upper and lower confidence values of the mean for a 100-fiber count.

Figure 1. Interlaboratory Precision of Fiber Counts

The curves in Figures 1 are defined by the following equations:

$$UCL = \frac{2X + 2.25 + [(2.25 + 2X)^2 - 4(1 - 2.25S_r^2)X^2]^{1/2}}{2(1 - 2.25S_r^2)} \quad (3)$$

$$LCL = \frac{2X + 4 - [(4 + 2X)^2 - 4(1 - 4S_r^2)X^2]^{1/2}}{2(1 - 4S_r^2)} \quad (4)$$

where S_r = subjective interlaboratory relative standard deviation, which is close to the total interlaboratory S_r when approximately 100 fibers are counted.

X = total fibers counted on sample

LCL = lower 95% confidence limit.

UCL = upper 95% confidence limit.

Note that the range between these two limits represents 90% of the total range.

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Variables Needed When Submitting Sampling Results

related to WTC ~~monitoring~~ monitoring

1. Name of Agency
2. Contact name, contact telephone number, contact fax number, contact email
3. Type of Sample (e.g. water, air, bulk, personal breathing zone)
4. Ambient Outdoor air vs. Ambient indoor air vs. Personal air monitoring
5. Substance/Analyte (asbestos, PM10, PM2.5, freon, phosgene)
6. Exact location of sample
7. Lab Method (e.g. TEM, PCM)
8. Limit of Detection
9. Results and units
10. Laboratory
11. Date and time of sample
12. Date/Time of analysis
13. Lab id/Assessment #

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**THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF ENVIRONMENTAL COMPLIANCE**

To: Mike Nolan, Project Manager
Warren & Panzer Engineers, P.C.

From: Leonard Atteloney, Director of Laboratory Services
Bureau of Environmental Compliance

Date: June 25, 2002

Topic: Laboratory Reports and Chain of Custody Forms to be corrected

The following laboratory reports and chain of custody sheets have been reviewed and found to be incorrect:

ATC Group # s:

- 1) 8177 – The chain of custody has “Beeckman.” It should read “Beekman.”
- 2) 8111 – The report has “116.” It should read “116 Nassau St.”
- 3) 8092 – The report and chain of custody has “160 Nassau St.” It should read “116 Nassau St.”
- 4) 8091 and 8103 – These reports are missing the address 23 Trinity/47 Broadway.
- 5) 8043 – The report and chain of custody has “Building 49-A.” It should read “49 Ann St.”
- 6) 8144 – The report is missing the address 156 Chambers St.
- 7) 8105 – The report is missing the address 118-120 Fulton St. and missing results for samples # 04 and 05.
- 8) 8253 – The chain of custody is missing a large part of information. This seemed to be a problem with the fax machine. Needs to be faxed again.
- 9) 8217 and 8198 – The chain of custody sheets have “TEM EPA LEVEL II circled. It should be “TEM AHERA.” 8198 – The address on the chain of custody states “5 Beeckman.” It should read “5 Beekman.” The report is missing the address.
- 10) 8200 – The report and chain of custody states “122 Fulton Ave.” It should read “122 Fulton St.”
- 11) 8216 – The report is missing the last digit in each of the 5 sample numbers.
- 12) 8246 – The report is missing the address “114 Liberty St.”
- 13) 8231 – The report is missing the “0.”

Please have these reports and chain of custody sheets corrected and resubmit by June 30, 2002 with affidavits explaining the reasons for the revised reports and chain of custody sheets.

C: M. Gilsenan, Asst. Commissioner BEC
K. Radhadkrishnan, Director Asbestos Control Program

Number of Sites Sampled since 9/11/01: (By DEP or Contractors)

Location

Samples Taken

37 sites surrounding lower Manhattan = 2980

4 Schools in Vicinity of Ground Zero = 476

Outer borough Samples = 408

Total = 3864

Total # Samples found with TEM > 70 = 9 Or 0.2%

Overload Sites = 19



1. DEP doesn't issue permits. Building owners are required to submit notifications when they conduct an asbestos project (which includes clean up of asbestos containing material). Since 9/11 DEP received a total of about 34 notifications from the WTC area.
2. All the jobs for which notifications were submitted were inspected at least once during the clean up. DEP also responded to all the complaints.
3. DEP conducted survey of about 450 buildings. During the survey DEP inspected the exterior surfaces such as roofs, facades, setbacks, etc. for visible debris from WTC. About 211 of the buildings contained varying amount of WTC debris.
Based on our request to building owners for information regarding the interior air and bulk sampling DEP received responses from 269 building owners. Following are the results.

	Total	Positive(asbestos)	
Bulk Sample	2622	169	6.4%
AIR			
PCM	77,675	863	PCM- Phase Contrast Microscopy 1.12%
TEM	41,425	197	TEM- Transmission Electron Microscopy .48%

4. Total number of calls recd. By OEM hot line = 546
Number of calls referred to DEP = 60
Number complaints resolved to date = 53
5. As a result of the DEP's letter the Department recd. the above information. That letter was dated Feb. 2002 and not Sep. 14.

WTC hotline 546
DEP refer 60
53 resolved

DEP Help
~~WTC~~ 99
1

99
53
152

99
60
159



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AIR			
PCM	77,675	863	PCM- Phase Contrast Microscopy
TEM	41,425	197	TEM- Transmission Electron Microscopy

4. Total number of calls recd. By OEM hot line = 546
Number of calls referred to DEP = 60
Number complaints resolved to date = 53
5. As a result of the DEP's letter the Department recd. The above information. That letter was dated Feb. 2002 and not Sep. 14.

- DEP's Emergency Response Unit tested for volatile organic compounds, metal and acid gasses using direct field.
- DEP's Division of Emergency Response and Technical Assistance (DERTA) performed air monitoring at ground zero from 9/12 - 10/5/01 using field instruments. They tested for photoionizable organic compounds, flame ionizable organic compounds, carbon monoxide, dihydrogen sulfide, oxygen for explosive atmospheric conditions, hydrogen cyanide, chlorine, ammonia and freon 22. All results were background or non-detectable levels.
- DEP's DERTA also established air monitoring in the surrounding boroughs from 9/13 - 11/16/01. Air monitoring for volatile organic compounds, acid gasses and metal were performed daily at these locations:

Manhattan – Central Park & Lenox Avenue
 Queens – Broadway & 31st Street
 Bronx - 138th Street & 3rd Avenue
 Brooklyn – Berry Street & North 11th Street
 Atlantic Avenue & Smith Street
 Staten Island – Bay Street & Victory Boulevard

All results were below regulatory levels.

- While there are Federal and State standards for selected particles in outdoor air and the work place, there are no standards for particles in a residential setting. This is because of the range of activities that introduce particles into the air (i.e., smoking, cooking, candle & incense burning, and cleaning). These activities, coupled with a home's ventilation system's status, will determine airborne particle concentration in a home at a specific time.

New York City Department of Environmental Protection

Comments on the Clearance Criteria

According to the information in the IRIS database and USEPA web site, the USEPA “estimates that breathing air containing 0.0004 f/cc during a lifetime would result in not greater than a one in ten thousand increased chance of developing cancer”. “Reference concentrations and reference doses have not been established.”

The information on limitations in the IRIS database indicates that “alterations in the unit risk invalidates and distorts their application in estimating the potential risk”. “The figure is based on a lifetime exposure and may not be appropriately applied to less than lifetime exposure situations.” The calculation to a 30-year exposure based on the information in IRIS may not be valid.

“The unit risk is based on fiber counts made by PCM and should not be applied directly to measurements made by other analytical techniques”. “The correlation between PCM fiber counts and TEM measurements is very poor.” “The correlation between PCM fiber counts and TEM fiber counts is very uncertain and no generally applicable conversion factor exists for these two measurements”. The adopted conversion factor was based on the geometric mean from data sets that included both measurements and had a wide range of values for the conversion.

The collection of 4000 liters of air will result in clogged filters. In addition, the increased sampling time and inconvenience to unit occupants should be considered. The laboratory effort (interpreted from the cost per sample increase) does not justify the increased air volume collection. Based on conversations with laboratories, the cost per sample increase would be between \$15 and \$25. The air sampling technician costs are typically in the range of \$35 per hour and the inconvenience to the concerned citizens is not measurable.

The 3-day turnaround time is high if we are to consider the receipt of elevated levels and need for further action.

6/20/02

Gilsenan, Michael (ex)

From: Atteloney, Leonard
Sent: Friday, July 05, 2002 12:31 PM
To: Gilsenan, Michael (ex)
Cc: Radhakrishnan, Krish
Subject: New York City Department of Environmental Protection

Importance: High



wrnpnzrwtc2.doc

**THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF ENVIRONMENTAL COMPLIANCE**

To: Mike Nolan, Project Manager
Warren & Panzer Engineers, P.C.

From: Leonard Atteloney, Director of Laboratory Services
Bureau of Environmental Compliance

Date: July 5,2002

Topic: Laboratory Reports and Chain of Custody Forms to be corrected

The following laboratory reports and chain of custody sheets have been reviewed and found to be incorrect:

ATC Group # s:

- 1) 8043 – The chain of custody has “Building 49-A.” It should read “49 Ann St.”
- 2) 8050 - The address on the report reads “185 BRDWY” and the address on the chain of custody reads “183 BRDWY.”
- 3) 8200 – The chain of custody reads “122 Fulton Ave.” It should read “122 Fulton St.”
- 4) 8271 – The project address on the report and the chain of custody does not match.
- 5) 8282 – The address on the report should read “114/116 Fulton Street.”
- 6) 8314 – The chain of custody is missing information in the bottom left box.
- 7) 8308 - The address should read “7 Dutch St.”
- 8) 8320 – The address should read “ 109 Reade St.”
- 9) 8326 – The chain of custody is missing information on the sample locations.
- 10) 8338 – The report reads “30 Wall Street, Side Win Dems.” Please check with Air Tech for verification.
- 11) 8352 – There are no dates recorded in the bottom left box on the chain of custody.
- 12) 8353 – No stop flow rates are recorded.
- 13) 8365 – The address should read “67 Greenwich Street” on both chain of custody and report.
- 14) 8380 – The report is missing the address.
- 15) 8382 – The report is missing the last digit in the sample numbers.

Please have these reports and chain of custody sheets corrected and resubmit by July 12,2002 with affidavits explaining the reasons for the revised reports and chain of custody sheets. I still have not received affidavits for the earlier incorrect reports and chain of custody sheets (see memo dated June 25,2002. Please submit these affidavits by July 12,2002.

C: M. Gilsenan, Asst. Commissioner BEC
K. Radhadkrishnan, Director Asbestos Control Program

Ambient and Indoor Sampling for Public Health Evaluations of Residential Areas Near World Trade Center - Sampling Protocol

Following the WTC disaster, the New York City Department of Health working with the Agency for Toxic Substances and Disease Registry and the New York State Department of Health conducted indoor and dust sampling in 30 residential buildings in Lower Manhattan. The sampling plan for this investigation is provided below.

Foreword - February 26, 2002

This protocol was used by the New York City Department of Health in collaboration with the U.S. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service Commissioned Corps, and the federal World Trade Center Environmental Assessment Working Group to conduct a limited investigation (November 4 - December 11, 2001) of residential areas near and around the World Trade Center. Prior to implementing the investigation, this protocol was reviewed by members of the federal World Trade Center Environmental Assessment Working Group. Formed on September 15, 2001, the working group is made up of representatives from the U.S. Department of Health and Human Services, the U.S. Environmental Protection Agency, and the U.S. Department of Labor. The purpose of the group is to coordinate public health and occupational sampling and data review among the three federal agencies in support of the New York City Department of Health and the New York State Department of Health. In addition, the protocol was reviewed by representatives of the New York State Department of Health, New York State Department of Environmental Conservation, the New York City Department of Environmental Protection, and the New York City Department of Health. On October 26, 2001, the New York City Department of Health, Institutional Review Board approved the protocol.

Sampling of the residential areas occurred from November 4 through December 11, 2001, and was conducted by U.S. Public Health Service Commissioned Officers detailed to the New York City Department of Health with assistance from the New York City Department of Health. It is anticipated that the final report concerning this limited pilot investigation will be available in May 2002. However, the New York City Department of Health will provide participants in this investigation and the public with relevant public health information as soon as data analysis and interpretation permit. On February 8, 2002, the New York City Department of Health did provide the participants with preliminary results regarding the amount of asbestos detected in air and settled dust. This information, along with the amount of fibrous glass detected in settled dust, was also provided to the general public.