Gilsenan, Michael

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Sent: Wednesday, June 19, 2002 3:37 PM
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Cc: Radhakrishnan, Krish; Gilsenan, Michael; callahan.kathy@epamail.epa.gov; Basso.Ray@epamail.epa.gov
Subject: Analytical Issues

wtc0009.wpd

Please find attached the information that Krish asked for regarding the analytical timelines and procedures. Please let me know if you have any questions or need any more information. Thank you

(See attached file: wtc0009.wpd)

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Timeline for receiving analytical results

Asbestos - 3 days from receipt of samples
Metals - 5 days from receipt of samples

Calculation of .0009f/cc as 30 year risk value:

The IRIS inhalation unit risk for asbestos is 2.3 E-01 per f/cc. Here's how this unit risk is interpreted. Exposure over a lifetime (i.e., 70 yrs) to 1 f/cc of asbestos results in a cancer risk of 2.3 E-1. (This is an upper bound estimate- and it is based on a substantial data base of occupational cohorts.) To get the fiber concentration equating to a 1 E-04 (one-in ten thousand risk - for lifetime exposure) set up the following equation:

$$\frac{.23}{1 \text{ f/cc}} = \frac{.0001}{x}$$

$$x = \frac{.0001}{.23}$$

x = .0004 f/cc This is the fiber concentration that equates to 1 E-04 risk for 70 yr exposure.

To adjust the exposure duration to 30 yrs, multiply .0004 f/cc by $\frac{70}{30}$ = .0009 f/cc

Explanation of how the lab will achieve .0009f/cc:

The ultimate sensitivity of the asbestos TEM analysis is based upon two factors: (1) the volume of air sampled, and (2) the area of the sample filter that is looked at with the TEM - this is referred to as number of grid openings that are scanned under the electron microscope.

in theory, the sensitivity for the TEM is extremely low, but in reality the "practical" sensitivity depends upon how much air can be drawn through a filter before the filter gets "clogged" with non asbestos particulates, and how much you willing to pay the lab to analyze a large number of grid openings (for AHERA, 10 grid openings are usually scanned).

For our needs in the WTC, we desire to reach a sensitivity of .0009. If we were to collect 1200 liters of air (recommended by AHERA), the lab would have to scan 30 grid openings to reach the 0.0009. This constitutes about 3 times more laboratory effort to reach our sensitivity needs than would be needed for typical AHERA. To keep the laboratory effort at a minimum, we have recommended that 4000 liters of air be sampled. At this volume, the lab only has to read 9 grid openings to get to 0.0009.

There is the possibility that we will not be able to sample 4000 liters of air in the indoor studies. Efforts at Libby have shown that the typical filter used for asbestos analysis (0.45 micron) became easily clogged in homes where the residents were smokers. In these cases, they switched over to 0.8 micron filters, and in many instances, these also became clogged. In those cases where we will not be able to sample 4000 liters, then we will either have to have the lab scan more grid openings or report a higher sensitivity. For example if we can only collect 2000 liters, the lab will have to scan 18 grid openings to reach the 0.0009.

FYI: The calculation for sensitivity is

{[1fiber / (area of grid opening X number of grid openings)] X total area of filter} / (volume of air in cm3)
{[1 fiber / (0.0125 mm2 x 9)] X 385 mm2} / 4,000,000 cm3 = 0.0009 f/cm3

Justification for the default of 0.005 s/cc if we can't achieve .0009f/cc:

The 0.005 is a mandatory sensitivity value taken from the AHERA method. When the AHERA was developed many years ago, the 0.005 s/cc was the sensitivity needed to ensure that the instrument was capable of detecting asbestos concentration values greater than the 70 s/mm2.