January 25, 2008

EPA Response to Comments: Report on the Workshop to Peer Review EPA's Draft Report: Comparison of the Alternative Asbestos Control Method and the NESHAP Method for Demolition of Asbestos-Containing Buildings

Held at Cincinnati, OH
June 20–21, 2007

Office of Research and Development
U.S. Environmental Protection Agency (EPA)
Cincinnati, OH 45268

PREFACE

EPA expresses thanks for the time and effort given to this matter by the peer review panel members and the constructive comments they, as well as members of the public, submitted to EPA. This document summarizes the comments received and presents EPA's response to those comments as requested by the peer review panel.

First, EPA is no longer pursuing a rulemaking process for the Alternative Asbestos Control Method (AACM). It is EPA's intent to first scientifically investigate the effectiveness of the AACM technology, and then subject the science to full peer review, as was done for the first test of the AACM, before contemplating the initiation of any rulemaking. In doing so, EPA wishes to determine if the AACM process provides equivalent environmental protection to the current demolition work practice under the asbestos NESHAP in the face of a range of asbestos-containing materials and building/site configurations. Only after the scientific investigation and subsequent peer review are completed will the Agency consider potential policy options.

Many of the suggestions and comments that the peer review panel members and the public made during the peer review meeting in Cincinnati and in the draft peer review report have been and/or are being incorporated into additional tests of the AACM protocol (i.e., AACM2 and AACM3). Examples include:

- *The second test was on a two-story transite building with only pavement,*
- *The third test was on a two-story building with popcorn ceilings and troweled-on surfacing on the walls that was sited on both soil and pavement,*
- *No amended water pump was used; just a simple in-line eductors,*
- *A close-proximity wall was added in the second test to simulate nearby urban structure conditions,*
- *The soil amounts to be removed (if present) have been increased to 3 to 6 inches,*
- *NESHAP costs will be obtained by blind bid,*
- *Air flow rates could not be increased for fear of overloading (happened to high-flow samples in AACM2),*
- *Amended water was added throughout process,*
- *Amended water concentration was lowered to 0.5-percent minimum targeted concentration,*
- *Water usage was reduced to 15 gpm per hose,*
- *The second ring of samplers was eliminated,*
- *Particulate measurements were eliminated,*
- *Post-abatement soil sampling was added to the study protocol, where applicable,*
- *An additional Poisson distribution comparison statistical test was added to the toolbox to compare results to the background conditions, and*

- *Worker breathing zone sampling during the initial wetting was added to the study protocol.*

EPA has completed the demolition phase of AACM2, and is currently analyzing the data and preparing the draft report on that study. AACM2 was a two-story transite-covered building on a paved surface. A third study (AACM3) involves a two-story building with no attic, fully covered inside with asbestos-containing troweled-on surface material on the walls, popcorn ceilings, and some vinyl asbestos floor tile. The building has both soil and pavement surrounding it. EPA has also completed the demolition phase of AACM3, and is currently analyzing the data and preparing the draft report on that study. Both the AACM2 and AACM3 reports will be externally peer-reviewed.

SIGNIFICANT CONCERNS OF THE PEER PANEL

One of the most prevailing comments was that the report was somehow biased by the Agency using inflated cost figures to indicate a cost-advantage for the AACM process as compared to the NESHAP, when the cost advantage may in reality be less. EPA used the costs as documented in the study. These costs were based upon costs incurred from lowest-bid, competitively-derived contracts for the efforts that were conducted. Other reviewers presented estimates of what they thought the costs should have been and projected cost advantages for the AACM that were about one-third lower than the NESHAP, rather than the roughly 50-percent lower costs that EPA observed in the study. EPA clearly stated in the report that the costs for the AACM and for the NESHAP process would be highly site-specific and that the AACM may not always be more economical than the NESHAP. EPA cannot substitute hypothetical costs, no matter how well intentioned, for those that were documented. Nonetheless, and as indicated above, EPA will in the future obtain asbestos NESHAP costs by blind bid in connection with future comparison tests of the AACM.

The reviewers also expressed concern that the use of the term *de minimus* in describing the very low concentrations of airborne asbestos that were observed from both the AACM and the NESHAP processes connoted an assessment of risk. EPA agrees and has removed the *de minimus* term.

Many of the comments, both from the peer reviewers and the public, expressed concerns and provided suggestions relative to the implementation of the AACM process assuming that a rulemaking was imminent. As emphasized above, EPA is deferring any policy decisions relating to the AACM until after the scientific research is concluded and the results evaluated and externally peer reviewed. It is our intent to fully investigate the science of the effectiveness of the AACM technology, and subject the science to full peer review, as we did in the first study

before initiating policy making. We wish to determine if the AACM process provides equivalent environmental protection to the current demolition work practice under the asbestos NESHAP in the face of a range of asbestos-containing materials and building/site configurations. Only after our scientific investigation and peer review are completed, will the Agency consider potential policy options. Nonetheless, reviewer comments and suggestions relative to the rulemaking process are addressed in this response. In addition, all such comments and suggestions will be forwarded to the Office of Air Quality and Planning Standards (OAQPS) within EPA's Office of Air and Radiation for consideration at a future time if a rulemaking activity is ever initiated in connection with the AACM.

A fourth area of concern was the feeling on the part of the panel that the pre-existing soil contamination from the abatement of pipe insulation, performed many years earlier, had somewhat clouded some of the conclusions and that EPA had not sufficiently referenced this removal action in the report discussion. Although the removal of the pipe insulation in 1999 was clearly mentioned in the early part of the report, additional references have been made to its pre-existence as the reviewers suggested. In EPA's judgment, none of the samples from the site-assessment suggest that pre-existing contamination is a concern. While one might theorize the previous pipe-wrap removal could elevate soil levels, the site assessment sampling did not indicate that this was a concern. One would not anticipate an increase in soil asbestos concentrations as a result of abatement within a building. The reviewers' suggestion that the difference might simply be that AACM soils were cleaner because the AACM excavation procedure removed pre-contaminated soil that had existed at both sites essentially supports EPA's conclusion that soil removal is an apparent advantage of the AACM process. However, the abatement process for the NESHAP did not contribute the vinyl asbestos tile (VAT) fragments left in the soil, and the soil VAT content was higher in the NESHAP soil than in the AACM post-demolition soil. These VAT fragments resulted from the respective demolition processes.

In response to reviewer comments and suggestions, EPA made over 100 changes in the final report and is grateful to the reviewers, both panel members and the public commentors, for their significant contributions.

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MEETING COMMENTS

EPA has abstracted the closing remarks from the full minutes of the peer review meeting and is presenting those as part of this response since the closing remarks represent the culmination of the reviewers' assessment of the science of the report after two days of discourse on a wide variety of AACM-related topics. The following Chapter 9 is extracted verbatim from the full report.

9. Closing Remarks

At the end of the meeting, Webber (*Dr. Jim Webber, panel chairperson –comment added*) asked each reviewer to provide closing comments.

9.1 First Reviewer

This test provided good results. I am pleased with the low air counts from the test and the method, as long as EPA does not refer to them as de minimus. The reviewers have had many suggestions for improving the research methodology and the AACM itself. Nevertheless, the test results are good, interesting, and certainly worth proceeding with. I am not endorsing the method because I am not convinced it is endorsable at this point. However, the study has provided good data and we should recognize that. The results are good.

I am going to reference the December 19th, 2003, Office of Inspector General (OIG), Environmental Protection Agency, Significant Modifications Needed to Ensure Success of Fort Worth Asbestos Demolition Method. This started the ball rolling toward where we are today. OIG asked three questions:

> *1) Is the design and methodology of the Fort Worth Method - Phase II adequate to demonstrate protection of human health and the environment?*

The answer was "no."

> *2) Does the Fort Worth Method - Phase II meet EPA's key Project XL criteria, including superior environmental performance, regulatory flexibility, adequate stakeholder involvement, and transferability to other asbestos demolition projects?*

The answer was "no."

> *3) Has EPA's oversight to date ensured that the Fort Worth - Phase II project will allow EPA to reach valid conclusions on the effectiveness of such demolition techniques for each type of asbestos?*

The answer was "no."

Things have changed since then. The Agency has looked at the procedures, changed them, and run other tests. These three fundamental questions are still good guiding principles to future research, and the comments we have made at this workshop have largely fallen within these three categories. Our comments have largely addressed these good guiding principles, and I hope that they will be helpful to the Agency.

9.2 Second Reviewer

I agree. At this stage, the work is not "a be all and end all" or ready to serve as the basis to issue instructions for people to work by. However, with the type of input we have provided, it is definitely worth continuing to experiment on the system. Once the system is sufficiently refined to work right, it likely will have value and could be used in many places, particularly if the rules are not so rigid that they preclude improvisation.

Berms are one example. Do we tell people how high the berm should be and what it should be made of? How would that be handled in a major city where you cannot dig a berm? Supposing a berm is made out of rubber pieces that are assembled in 10-foot strips and covered with poly. When the job is over, if the berm was properly covered with poly, the contractor could pick up the rubber components and use them on the next project. This approach would work if the requirements specify that the berm must contain the water, but not how to build the berm.

More work should be done to develop the method because there will be places it can be used, save money, and not create pollution problems for either workers or the public.

9.3 Third Reviewer

I would like to provide a few specific comments I have not brought up yet. On page 2 (Introduction) of the report, 4th full paragraph, first sentence, it says: "The RACM is less likely to become friable when the wetting process…" I recommend this be changed to say: "The RACM is less likely to become airborne when the wetting process…" because friability is not the condition of the material. The RACM is less likely to become "airborne" instead of "friable."[1]

Concerning classification of materials in Table 1 of Exhibit 1 on page 6 of the report, the table classifies different materials according to the AHERA (Asbestos Hazard and Emergency Response Act) classification. Under AHERA, "mastic for flooring" and "window caulking" are not "surfacing materials" and should be moved to the "miscellaneous" category.[2]

"Vermiculite insulation," now under "miscellaneous material" should be under "thermal system."[3]

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[1] Other reviewers commented on this recommendation. A reviewer pointed out that RACM is not going to become airborne. Another reviewer agreed that RACM is less likely to release fibers and suggested the statement be changed to say: "the RACM is less likely to release fibers to the air when the wetting…"

[2] Webber confirmed this recommendation with the panel.

[3] Two reviewers disagreed, stating that "vermiculate insulation" is really a stand-alone item and does not fit there; it is found in free form in the wall cabinets and is not a thermal system.

On page 20, Section 3.3.1, EPA uses "RACM" when they should be using "ACM." EPA should replace the first sentence.…:

> *"A comprehensive pre-demolition inspection was conducted in accordance with the Asbestos Hazard Emergency Response Act (AHERA) (40 CFR §763) to identify the type, quantity, location, and condition of RACM in the buildings [§61.145(a)] (Kominsky 2005; Smith Aug 2005)."*

….with these sentences:

> *"A comprehensive pre-demolition inspection was conducted in accordance with the Asbestos Hazard Emergency Response Act (AHERA) (40 CFR 763) to identify the type, quantity, location and condition of Asbestos-Containing Materials [instead of only RACM] in the buildings (61.145 (a)). Under the EPA-NESHAP 40 CFR 61.145 (a) not only RACM must be identified prior to demolition or renovation but also Category I and Category II Nonfriable Asbestos-Containing Materials."*
>
> *Webber clarified that the sentence, "The inspection was conducted by a State of Arkansas Department of Environmental Quality (ADEQ) licensed Asbestos Abatement Consultant" should be left in.*

These recommendations are presented in Sections 2.2.3 and 2.2.3 of this report.

9.4 Fourth Reviewer

In the report, page 49, under AACM demolition and disposal, it says: "Prior to demolition of the AACM building (#3607), no asbestos-containing materials were removed." Actually, they were. TSI (Thermal System Insulation) was removed under the building. I think the intention there was to remove it before the AACM. This is said other places in the report, and worth clarifying and restating here.[4]

I think that the comments heard here are representative of what constitutes what we call the asbestos control industry consultants, contractors, and the like. We would be foolish not to always look at possible new "mouse traps" with a fair and scientific eye when they come along. However, the history of this industry suggests that, even with the best-laid plans and very professional people putting together well thought-out regulations and guidance documents, we still have an industry fraught with fraud and with people that seem to make sport of finding what they can get away to achieve a better bottom line in their business. If we are going to relax our work practices to allow additional techniques like the AACM, we need to be very careful to craft both the method itself and any other regulation-changing guidance documents, so that we know

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[4] Webber agreed and recommended that immediately before 4.4.2.1, the Agency add a sentence to that paragraph to this effect: "However, there was removal of TSI from the crawl spaces beneath the buildings in 1999 that appears to have left some residual ACM." This can be found in Section 2.3.3 of this report.

what we should expect from people when they use this method. Otherwise, we could simply create a bigger compliance problem that could affect public and worker safety, and have environmental impacts. For example, leaving visible emissions on sites could be a problem for building owners, both from a public health and liability perspective. However, overall, I think ORD should proceed with this study and examine as many things as needed to determine whether this method can be conducted in a safe and cost-effective manner.

Bringing people in to peer review this report is admirable. We all appreciate being here, but more work needs to be done in a step-by-step fashion before any rulemaking can be considered.

9.5 Fifth Reviewer

I appreciate the opportunity to interact with the EPA staff and panel members and review this document. I started out with the recognition that the comparative site had inherent limitations. Since this is a research project, I hope the points made by my colleagues do help EPA in critiquing where you are and where you might want to go in the future. It will be helpful to make available to interested parties detailed information about how you got from "point a" to "point b." For this and future related research projects, it will be very helpful to provide citations for applicable regulations, considering the variety of people who may read the reports. Hopefully, this project can set this kind of example for reports that fall under the auspices of EPA or OSHA and govern activities of people in the field.

9.6 Sixth Reviewer

When the final report comes out, we may wonder: "Did I really write that? That's incredibly comprehensive." Because we worked collaboratively from different perspectives and, through our discussions, reached agreement on so many points, people who read the workshop summary are likely going to think: "Those guys really did their homework and came up with a good product." I have been privileged to work with you. Together we accomplished a lot in the two days we had here.

9.7 EPA Closing Remarks

Wilmoth thanked the reviewers and offered appreciation for their comments. He said EPA would document its response to their input. This document would be published on EPA's website and be made publicly available after the completion of the final report. He emphasized that this is a transparent process and EPA is willing to answer any questions the reviewers may have about the Agency's response. He noted that the Agency may, at times, alter the specific language suggested by the reviewers. If so, the Agency would verify the final wording with the reviewers.

EPA SPECIFIC RESPONSES TO COMMENTS AS REQUESTED BY THE PEER REVIEWERS

The peer panel requested that EPA only respond to those comments through Chapter 2, therefore Chapter 1 and 2 are presented in their entirety below, along with the EPA responses.

1. Introduction

In April 2006, the U.S. Environmental Protection Agency (EPA) conducted a study to compare the effectiveness of the Alternative Asbestos Control Method (AACM) to the current demolition practice under EPA's Asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP), 40 CFR Part 61, Subpart M.

- The Asbestos NESHAP (a work practice standard) requires the removal of most regulated asbestos-containing materials (RACM) prior to the demolition of buildings that fall under the auspices of the NESHAP.
- The AACM allows most of the RACM to remain in the building during demolition and requires pre-wetting of the interior and exterior of the building with amended water (water with a wetting agent added), continuous wetting with amended water during demolition, containment of all runoff, removal of two or more inches of soil after demolition, disposal of all material as regulated asbestos-containing waste, and the use of respirators and protective garments throughout the entire demolition process.

This research, conducted by EPA's Office of Research and Development (ORD) in partnership with EPA Region 6, compared the relative environmental impacts and costs of the two methods to evaluate the appropriateness of including the alternate method in the current asbestos regulations contained in 40 CFR part 61 subpart M.

The comparison was conducted via a controlled demonstration on two architecturally nearly identical asbestos-containing buildings in a remote location at the Fort Chaffee Redevelopment Authority near Fort Smith, Arkansas. The buildings contained significant quantities of asbestos-containing wall systems and vinyl asbestos floor tile. Before the research began, the project's quality assurance project plan (QAPP), *Evaluation of an Alternative Asbestos Control Method for Building Demolition, March 2006,* was formally peer-reviewed and offered for public comment.

ORD's National Risk Management Research Laboratory in Cincinnati, Ohio, documented the research project and results in the April 17, 2007, draft report *Comparison of the Alternative Asbestos Control Method and the NESHAP Method for Demolition of Asbestos-Containing Buildings*.

Eastern Research Group, Inc. (ERG), an EPA contractor, organized an independent peer review, of the draft research report. The review was conducted by six nationally recognized experts (Appendix A),:

- Ronald Dodson, Dodson Environmental Consulting, Inc.
- Ron Dokell, Demolition Consultants
- Steve Hays, Gobbell Hays Partners, Inc.
- Tom Laubenthal, The Environmental Institute

- Fredy Polanco, Polanco Enterprises, Inc.
- James Webber (Chair), New York State Department of Health Wadsworth Center, Biggs Laboratory

The reviewers were provided with a charge (Appendix B), which asked for their comments on the executive summary and conclusions, the conduct of the research, data analysis, quality control/quality assurance, as well as any suggestions they had for improving the report. Reviewers were also provided with the project's QAPP and with complete copies of all written comments submitted during the public comment period, which they were asked to consider.

In the first stage of the review, the experts worked individually to prepare written pre-meeting comments (Appendix C), which were then provided to all reviewers and EPA. In the second stage, ERG convened a two-day peer review workshop, on June 20–21, 2007, at EPA's facility in Cincinnati, Ohio. The workshop was attended by 18 observers, including EPA staff and members of the public (Appendix D). Appendix E provides the workshop agenda, which was organized around the Charge Questions. The workshop provided an opportunity for public comment (Appendix F).

This report summarizes the workshop proceedings:

- Section 2 presents the reviewers' final recommendations and conclusions.

- Sections 3 through 9 provide a detailed summary of the entire meeting. Section 3 presents the opening remarks; Sections 4 through 8 summarize the reviewers' discussions organized by Charge Question; and Section 9 presents the reviewers' closing remarks. The discussions summarized in these sections were deliberative, and formed the basis for development of the conclusions and recommendations presented in Section 2. As such, they do not require a response from EPA, but rather are provided as a detailed record of discussion.

- The appendices provide the following materials: a list of peer reviewers (Appendix A); the charge to peer reviewers (Appendix B); reviewer pre-meeting comments (Appendix C); a list of observers (Appendix D); the workshop agenda (Appendix E); and public comment (Appendix F).

2. Recommendations and Conclusions

Peer reviewers at the workshop developed conclusions and recommendations that follow in three parts. Part I (Section 2.1) lists concerns the reviewers had about bias in the report, Part II (Section 2.2) references specific report sections, and Part III (Section 2.3) addresses issues that run through several sections of the report.

2.1 Part I: Indications of Bias in the Draft Report

The peer reviewers were concerned about signs of bias in the draft report that amplify the success of the AACM. Specifically, they were concerned about:

- Overstatement of NESHAP costs (see Section 2.3.6 below)
- Understatement of AACM costs (see Section 2.3.6 below)
- Emphasis on *de minimis* concentrations (see Section 2.2.1 below)
- Failure to mention pre-contaminated soil and its potential impact on conclusions (see Section 2.3.3 below)

EPA Response:

The costs reflected in the report are the actual costs incurred for this test. These costs reflected, in the case of the contracts and of the subcontracts, the fact that the bids for the contracts were acquired competitively and the tasks were awarded to the lowest bidder. As a result, EPA does not believe that it would be appropriate to modify the cost results. The main purpose of this test was to determine environmental equivalence of the AACM and the current NESHAP method. Information on costs is presented to give some idea of relative costs of the two methods. The actual costs shown are only applicable to this test, but they could provide information to potentially allow interested parties to identify the factors they need to consider to determine the relative costs of the AACM and the current NEHSAP for their particular situation. For future tests EPA is planning to submit blind bids to insure that costs are not influenced by the fact that they are associated with an EPA research project.

The reviewers expressed concern that the use of the term de minimus in describing the concentrations of airborne asbestos that were observed from both the AACM and the NESHAP processes connoted an assessment of risk. EPA agrees and has removed the de minimus term.

The report clearly states that previous removal of pipe wrap had reportedly occurred many years earlier from underneath both buildings. To address the reviewers' concerns, additional discussion of this was added to the section discussing soil sampling and the results. Since EPA thoroughly sampled the soil prior to the study and after the study, the pre-contamination is documented and comparisons can be made as to before and after conditions.

2.2 Part II: Reference to Specific Report Items

2.2.1 Executive Summary

Initial Paragraph

The reviewers recommend replacing the initial paragraph of the executive summary with the following:

The Asbestos NESHAP (National Emission Standard for Hazardous Air Pollutants) requires the removal of all Regulated Asbestos-Containing Materials (RACM) prior to the demolition of the buildings that fall under the auspices of the NESHAP. This removal process can be a costly and time-consuming endeavor and contributes to the growing crisis of abandoned buildings in this country while providing protection to workers and public health in the demolition process. The Alternative Asbestos Control Method (AACM) allows certain asbestos-containing materials to remain in the building during demolition. In addition to leaving the asbestos-containing gypsum board system in the building, the AACM process in this study differs from the NESHAP process in that it requires pre-wetting of the interior of the building with amended water (water with a wetting agent added), continuous wetting with amended water during demolition of the building, containment of all runoff, removal of two or more inches of soil after demolition, and disposal of all material as regulated asbestos-containing waste.

EPA Response: Rewritten as requested.

De Minimis

The summary devotes considerable text to the issue of *de minimis* airborne asbestos concentrations. This issue is not a stated objective of the research and *de minimis* is not defined by a consensus in the scientific community as it relates to health effects. Health effects and health risk were not part of the research design, and the report offers no support other than the opinion of the authors for declaring the measured concentrations to be *de minimis*. The insertion of a conclusion on a topic not related to a research objective intimates a research bias or hidden agenda. This project's objective was not to assess exposure levels but rather to determine if AACM airborne asbestos concentrations were elevated compared to the established NESHAP method. Thus the reviewers recommend that any discussion of *de minimis* be removed from the report.

EPA Response: The reviewers expressed concern that the use of the term de minimus in describing the concentrations of airborne asbestos that were observed from both the AACM and the NESHAP processes connoted an assessment of risk. EPA agrees and has removed the de minimus term.

Additional Comments

Once EPA has modified the report in response to reviewer recommendations, the executive summary should be adjusted to reflect these changes.

EPA Response: The Executive Summary was modified accordingly.

Under “Secondary Objectives” on p. xviii, add this as a non-bulleted prelude: “The most significant secondary findings are:”

EPA Response: This suggestion was added to the report.

Insert as a third paragraph of the executive summary immediately before “Conclusions”:

> This is a research project for comparison of AACM and NESHAP demolition processes. The intent is to compare information, and not to provide a different template for future work practices that differ from those that are governed by existing regulation. The EPA does not endorse the use of the AACM as an approved method for demolishing buildings with regulated asbestos-containing materials.

EPA Response: This section was rewritten as follows:

> ***This is a research project for comparison of the AACM and the NESHAP demolition processes. The EPA does not endorse the AACM at this time as an approved method under the asbestos NESHAP for demolishing buildings containing RACM.***

2.2.2 Section 1: Introduction

Replace Footnote 1 on page 1 with the following:

> Under Asbestos NESHAP [61.141], RACM means (a) friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material on the course of demolition or renovation operations regulated by this subpart.

EPA Response: The footnote was replaced as suggested.
Add the following to Footnote 2:

> Also, under 40 CFR 61.145 (c) ACM has to be removed if: (1) it is Category I nonfriable ACM that is in poor condition and is friable or (c)(1)(iv) it is Category II nonfriable ACM and there is a probability that the materials will become crumbled, pulverized, or reduced to powder during demolition. (These regulations may be supplanted by more stringent local governmental [state, city, etc.] regulations that govern such activities.)

EPA Response: Recommended text was added to Footnote 2 as follows:

Also, under 40 CFR 61.145 (c)(1) ACM has to be removed if, among other things, it is Category I nonfriable ACM that is in poor condition and is friable or it is Category II nonfriable ACM and there is a probability that the materials will become crumbled,

pulverized, or reduced to powder during demolition. (These regulations may be supplanted by more stringent local governmental [state, city, etc.] regulations that govern such activities).

Make the following changes to the last sentence in the second paragraph on page 1 (underlined text is the proposed added language):

> Section 61.150 of the Asbestos NESHAP requires owners to "discharge no visible emissions to the outside air" during the collection, processing, packaging, or transporting of any asbestos-containing waste material generated by the source.

EPA Response: The last sentence in the second paragraph was changed as suggested.

The first sentence of the fourth full paragraph on page 2 (which currently begins "The RACM is less likely to become friable…") should be changed to read "the RACM is less likely to release fibers to the air when the wetting process and demolition techniques specified in the AACM are used."

EPA Response: The first paragraph of the fourth paragraph was revised as suggested.

Table I of Exhibit 1 (page 6) shows mastic for flooring and window caulking as surfacing materials instead of miscellaneous materials. Under the Asbestos Hazard Emergency Response Act (AHERA) rules, asbestos-containing materials are classified as surfacing, thermal system insulation, and miscellaneous. These materials should be reclassified per AHERA.

EPA Response: Table 1 of Exhibit 1 was revised as suggested.

2.2.3 Section 3: Site Information

In Section 3.3.1 (page 20), replace the first sentence with these sentences:

> A comprehensive pre-demolition inspection was conducted in accordance with the Asbestos Hazard Emergency Response Act (AHERA) (40 CFR 763) to identify the type, quantity, location, and condition of Asbestos-Containing Materials in the buildings (61.145 (a) (Kominsky 2005; Smith Aug 2005). Under the NESHAP 40 CFR 61.145 (a), not only RACM must be identified prior to demolition or renovation but also Category I and Category II Nonfriable Asbestos-Containing Materials.

EPA Response: The recommended text replaced the first sentence in Section 3.3.1 as follows:

A comprehensive pre-demolition inspection was conducted in accordance with the Asbestos Hazard Emergency Response Act regulations (40 CFR Part 763, Subpart E) to identify the type, quantity, location, and condition of Asbestos-Containing Materials in the

buildings (Kominsky 2005; Smith Aug 2005). Under the asbestos NESHAP (40 CFR 61.145 (a)), not only RACM must be identified prior to demolition or renovation, but also Category I and Category II Nonfriable Asbestos-Containing Materials.

2.2.4 Section 6.1.3: Water

Discussion of 10-micron fibers is not relevant to airborne asbestos. Remove the last column in Table 6-9, remove the break-out for 10-micron fibers in Figure 6.8, and remove Figure 6.9 in its entirety. Remove discussion of 10-micron fibers throughout Section 6.1.3.

EPA Response: The potency of different sizes of asbestos continues to be a highly controversial subject, and therefore EPA should not be limited in its presentation of the data. Section 6.1.3 clearly states that the drinking water standards are not applicable to demolition efforts; however, there is a drinking water standard for asbestos fibers >10 microns and the information is provided to give the reader a sense of the relative concentrations allowable in drinking water as compared to the levels observed in the water collected during the demolition. This provides readers a sense of the magnitude of the observed concentrations.

2.3 Part III: Reference to Integrated Issues

2.3.1 AACM Amended Water Delivery and Collection Issues

Specifications for amended water delivery and mechanical collection: The AACM process described in the report utilizes expensive and seemingly effective equipment for the delivery and collection of amended water. Clear rulemaking and guidance on the performance specifications for amended water delivery equipment, surfactant (including necessity of use), and water collection/filtration/storage equipment will be essential to ensure correct implementation of the AACM process. Without these measures, demolition contractors may utilize substandard equipment and supplies that are inadequate to safely perform the work and meet expected federal and specification standards.

EPA Response: EPA used the equipment described in the report for the purpose of this research project only. In the second test of the AACM, which was completed before the receipt of this report, EPA noted the concerns of the peer panel and chose not to use the expensive amended water application system. In this second test, EPA used a simple eductor system alone, which was quite effective and easy to apply.

Space limitations: One of the biggest problems is the collection of water via the construction of berms. In the urban areas alluded to in the first paragraph of the executive summary, the space required by the current AACM specifications would be impractical, if not impossible.

EPA Response: EPA feels that the AACM specifications used in this research effort are a work-in-progress and certainly subject to revision, as appropriate, as new information becomes available. While the application of the AACM in close spaces does present a unique

challenge, EPA feels that this is not insurmountable. In fact, during informal discussions with the peer reviewers, suggestions were provided on how this might be readily accomplished, and EPA plans on exploring those suggestions as its research into the AACM moves forward.

Difficulty of water management and collection: Only a limited number of buildings will allow simple management and collection of the copious amounts of amended water used during the AACM process. Examples of buildings that pose collection challenges include buildings with basements or other spaces beneath the structure that can accumulate significant amounts of water that are not absorbed by the building components. Also, dilapidated structures can pose significant challenges for the collection and filtration of debris and fine particles from water.

EPA Response: The AACM requires capture and filtration of the water before disposal. This may be somewhat more problematic in situations where there are basements. If the AACM is to be used in these situations, the accumulated water must be pumped and filtered, and this process may or may not pose a significant challenge depending on the site. Also, local building codes may determine whether or not the basement can remain. If water accumulates in the basements, the AACM requires its removal and treatment. The AACM, if adopted, will not always be the most practical choice, and will depend on the specific situation.

Site contamination from water application: Effective application of amended water (as seen in the study) requires significant pressure from the delivery system to ensure that all building components are sufficiently wetted. This delivery force may push water-soaked asbestos-containing material outside the building envelope and past constructed berms. Given this concern, the issue of site contamination from the wetting process should be discussed in more detail.

EPA Response: The AACM does not require excessive pressures from the delivery system. In this first test, EPA chose a pressurized system to guarantee that the mixture of wetting agent and water was not a variable in the study. This process was for this research study only and would not be intended for day-to-day application of the AACM. In the second test of the AACM, which was completed before the receipt of this report, EPA noted the verbalized concerns of the peer panel and chose not to use the expensive amended water application system. In this second test, EPA used a simple eductor system alone, which was quite effective and easy to apply.

Water discussion: Discussion of 10-µm-long fibers should be removed from §6.1.3, since this is not a measurement of drinking water. Asbestos fibers of all lengths are important because of the possibility of their re-entrainment and inhalation. Accordingly, Figure 6-9 and the last column of Table 6-9 should be eliminated.

EPA Response: The potency of different sizes of asbestos continues to be a highly controversial subject, and therefore EPA should not be limited in its presentation of the data. Section 6.1.3 clearly states that the drinking water standards are not applicable to demolition efforts; however, there is a drinking water standard for asbestos fibers >10 microns and the

information is provided to give the reader a sense of the relative concentrations allowable in drinking water as compared to the levels observed in the water collected during the demolition. This provides readers a sense of the magnitude of the observed concentrations.

2.3.2 OSHA Issues

The sentence in §4.4.1, second to last paragraph, second line ("No respirators nor protective garments were worn by the workers since this is not required by the NESHAP or the OSHA regulations") is inaccurate. While NESHAP does not address personal protective equipment (PPE) requirements, OSHA does require the use of PPE in the absence of a negative exposure assessment. The authors should delete this section or properly craft the language to ensure that readers understand the OSHA implications for the use of PPE, as this is "Class II asbestos work."

The reviewers also had the following comment regarding the AACM method (Exhibit 1, Section 1 §7.0 Monitoring Requirements [p. 7] and §8.2 PPE [p. 8]): Since this work will always fall under OSHA's 29 CFR 1926.1101 in regards to work practice and controls (training, etc.) and additionally to 29 CFR 1910.134 (respiratory protection standard), §7.0 Monitoring Requirements and §8.2 PPE should properly cite the appropriate regulations in each area. The monitoring section should address OSHA-required personal air monitoring issues, and PPE should address those issues germane to respiratory protection, protective clothing, etc.

EPA Response: The demolition of the NESHAP building meets the definition of Class II asbestos work in 29 CFR 1926.1101(b). For Class II asbestos work, OSHA requires that respiratory protection be used under the following conditions:

- ***Class II asbestos work when the ACM is not removed in a substantially intact state. (29 CFR 1926.1101(h)(1)(ii))***
- ***Class II and III asbestos work that is not performed using wet methods, except for removal of ACM from sloped roofs when a negative-exposure assessment has been conducted and ACM is removed in an intact state. (29 CFR 1926.1101(h)(1)(iii))***
- ***Class II and III asbestos work for which a negative-exposure assessment has not been conducted. (29 CFR 1926.1101(h)(1)(iv))***

In this case, the floor tiles were removed intact, using the wet methods and in compliance with the standards of 29CFR 1926.1101(q)(8)(i), et Seq.

To conduct a negative exposure assessment for any one specific asbestos job performed by employees trained in compliance with the standard, the employer may demonstrate that employee exposures will be below the PELs using objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the TWA and excursion limit under those work conditions having the greatest potential for releasing asbestos. [29 CFR 1926.1101(f)(2)(iii)(A)]. OSHA's "Inspection Procedures for Occupational Exposure to

Asbestos Final Rule 29 CFR Parts 1910.1001, 1926.1101, and 1915.1001.", Directive Number CPL 02-02-063 - CPL 2-2.63 (REVISED), November 1995 states:

> *Based on the data in the rulemaking record, OSHA concludes that employee exposures will consistently be below the TWA and excursion limit during removal of intact (see 1101(b) and paragraph 2 of this Agreement) flooring material when compliant work practices are followed. Accordingly, without determining whether the data meet the criteria for "objective data" in 1101(f)(2)(iii)(A), OSHA concludes that employers may rely on the data in the rulemaking record to make negative exposure assessments for floor removal operations when: (1) only compliant work practices are used; (2) all workers engaged in the removal are trained in accordance with the provisions of 1101(k)(8); and (3) before removal begins, a competent person assesses the job and determines that the flooring material is "intact" within the meaning of 1101(b) and is likely to remain "intact" throughout the removal process. (See paragraph 2 of this Agreement for the meaning of "intact").*

Given OSHA's directive, and the fact that the work practices performed during the building demolition were compliant work practices, all workers were trained in accordance with 1101(k)(8), and a competent person assessed the job and determined that the floor tile was intact, the requirements for a negative exposure assessment were met and the work could be performed without respiratory protection.

Protective clothing is required when: [29 CFR 1926.1101(i)(1)]

- *employees are exposed to airborne concentrations of asbestos that exceed the TWA and/or excursion limit prescribed in paragraph (c) of this section, or*
- *for which a required negative exposure assessment is not produced, or*
- *for any employee performing Class I operations which involve the removal of over 25 linear or 10 square feet of TSI or surfacing ACM and PACM.*

As described above, a negative exposure assessment had been conducted for the demolition of the NESHAP building; therefore, protective clothing was not required.

Given the above, the statement in the draft report was accurate. Based upon the nature of the determination that the negative exposure assessment had been performed, and the fact that a peer reviewer made this comment, the statement will be revised to avoid further confusion as follows:

> *"Based upon the work practices employed, and a negative exposure assessment using objective data obtained by OSHA, neither respiratory protection nor protective garments were required during the demolition of the NESHAP building."*

OSHA promulgates work practice regulations that may be applicable to the performance of a wide range of projects that are regulated by the EPA and the EPA requires compliance with all OSHA requirements. The current draft of the AACM acknowledges the need to comply with all applicable OSHA regulations. Future revisions of the AACM will provide reference to OSHA and other asbestos-related regulations consistent with references contained in other parts of the Asbestos NESHAP. It is the responsibility of the practitioner/contractor to know and comply with all applicable OSHA regulations.

2.3.3 Pre-Existing Soil Contamination Issues

Figure 6-11 clearly shows high "background" levels of asbestos in soils, but this is omitted from Section 3.3.3 and Table 3-4. This severely compromised several findings:

- While the level in post-work soil at the AACM site was statistically significantly lower than at the NESHAP site, a logical explanation might simply be that AACM soils were cleaner because the AACM excavation procedure removed pre-contaminated soil that had existed at both sites.
- This also clouded any conclusions about airborne concentrations at either site—did this airborne asbestos come from the pre-existing contamination or from the abatement/demolition processes?
- Furthermore, soil samples should have been taken both pre- and post-abatement at the NESHAP site to compare possible impact of abatement versus demolition.

EPA Response: The fact that the TSI was removed in 1999 was noted in an earlier section, but has now been repeated in Section 3 as well as the reviewers suggest. None of the samples in Table 3-4, which were the site assessment samples, indicate any pre-existing contamination. One would not anticipate an increase in soil asbestos concentrations as a result of abatement within a building. The reviewers' suggestion that the difference might simply be that AACM soils were cleaner because the AACM excavation procedure removed pre-contaminated soil that had existed at both sites is the same conclusion that EPA made: soil removal is an apparent advantage of the AACM technology. However, the abatement process for the NESHAP did not contribute the VAT fragments that were left in the soil, and the soil VAT content was higher in the NESHAP soil than in the AACM post-demolition soil.

The measured airborne asbestos concentration levels from both the NESHAP and the AACM were below or near the detection limit. We would expect that the effect of any pre-contamination would be to elevate the measured asbestos concentrations. This does not appear to have occurred; therefore, the affect, if any, of any pre-contamination was not significant. As the reviewers suggest, in future studies comparing the NESHAP and AACM that involve abatement, soil samples will be taken before and after abatement for completeness.

Immediately before Section 4.4.2.1, the Agency should add a sentence: "However, there was removal of TSI from the crawl spaces beneath the buildings in 1999 that appears to have left some residual ACM."

EPA Response: The recommended sentence was added as requested.

2.3.4 Statistical Evaluation Issues

As the report discussed, the large number of non-detects (NDs) made statistical evaluation by traditional parametric methods difficult. The method of combining NDs for AACM Days 1 and 2, as outlined in §7.1.1, is not transparent (Table 7-1 provides no numerical detail) and was probably not appropriate; two days of NDs for one sampler ended up with the same value as one day of ND plus one day of one fiber counted for another sampler. While ND (assume zero) is statistically indistinguishable from one in a Poisson sense, an accumulation of one-fiber counts versus an accumulation of NDs can be significant. A more appropriate approach would have been to assign to each sample either the lower Poisson limit (see Table 6-1) for the structure count (0 for 0, 0.025 for 1, etc.) or the upper Poisson limit (3.689 for 0, 5.572 for 1, etc.) and then calculate the airborne concentration on this number. This would have provided some differentiation between NDs and low structure counts.

EPA Response: While the non-detects at very low analytical sensitivities (0.0005 s/cm^3) cause some difficulty in presenting and analyzing the data sets statistically, this is a problem that all environmental studies will have when there is very minimal asbestos detected. As explained in the text, few parametric tests were used as the non-parametric comparisons were judged to be far more appropriate for use. EPA felt it was more appropriate to combine days one and two for the AACM, as that represented the total application period of the AACM protocol.

As to how the two days were combined, the paragraph immediately preceding Table 7-1 defines how the data from the two days were combined. The choice of using the larger of the two individual days' values or using the sum (if both days were detects) is an environmentally conservative one.

While the report in §7.1.1 concludes that combined-day AACM airborne asbestos is significantly (p=0.006) greater than NESHAP, these data should be evaluated separately for AACM Day 1 and AACM Day 2. The Final QAPP did not prescribe a 90-percent-ND cut-point approach (described in the third bullet point in §7), so the authors should not be restricted from trying to glean additional information from their data.

EPA Response: The AACM required (because of the delay during exhaustive soil sampling) two days to complete. AACM Day 1 results were evaluated against the NESHAP results; there was not a statistical difference. Since the AACM involved a two-day operation, comparing the Day1 AACM with the NESHAP is not particularly useful, since it is already known that the slight elevation (four fibers on one filter) on Day 2 of the AACM caused the statistical test to indicate a significant difference in the two populations.

The conclusion in §7.4 that Secondary Objective 5 is proven (no difference in upwind/downwind airborne concentrations) is incomplete. By combining AACM Days 1 (little emission) and 2 (higher emission), the report may have obfuscated any gradient on either day. The data sets should be separated for AACM Days 1 and 2 and re-analyzed.

EPA Response: Based on the low asbestos concentrations reflected in the data and on the number of non-detects at such a low analytical sensitivity, this suggestion was not adopted.

For each of the statistical analyses, the report should include a brief table detailing how the ranking calculations determined any statistical significance. See Table 1 ("Asbestos in Settled Dust") and Table 2 ("Airborne Asbestos") in Webber's pre-meeting comments for an example. These tables can be found on pages C-65 and C-66 of this report.

EPA Response: For every Wilcoxon Rank-Sum test, the ranks of the observations have been included in the table with the observed measurements.

2.3.5 Phase-Contrast Microscopy (PCM) Issues

Airborne fiber concentrations determined by PCM should be downplayed. These, as the report correctly mentions twice ("PCM analysis is a poor indicator of asbestos concentrations" on page 83 and "It is apparent that PCM measurements have no relationship to the asbestos concentrations"), are unrelated to airborne asbestos concentrations. The report *then* incorrectly states on pages 84, 112, 115, and 127 "…the asbestos fiber (PCM) concentrations…" Remove "asbestos" to leave "…the fiber (PCM) concentrations…" in all of these occurrences. Additionally, PCME concentrations are not relevant to public health because they exclude thin and short asbestos fibers that play a role in toxicity. The report should include a short section detailing the percentage of asbestos fibers detected by TEM that would not have been resolvable by PCM.

EPA Response: EPA agrees. The referenced pages were corrected to indicate fiber, not asbestos, concentrations for PCM measurements. With respect to the relevancy of PCME concentrations, the current EPA IRIS approach to asbestos carcinogenicity is based upon the NIOSH PCM database and uses the PCM / PCME values to assess health risk and therefore the use of the PCME values is relevant and appropriate for inclusion for completeness. EPA's primary and secondary objectives in this comparison of the two methods are based solely on total asbestos structures, not on PCME structures. Also, the report was revised to include comments on the percentage of asbestos fibers detected by TEM that would not have been resolvable by PCM.

2.3.6 Abatement Cost Issues

The abatement cost is overstated and total cost for AACM is understated. Cost analyses are difficult when attempting to draw actual practice conclusions from research cost data. The cost for abatement in the NESHAP building is much too high. A more realistic project time to remove the drywall under abatement conditions is 3 to 4 days. The abatement cost should be about $30,000, or less. Contributing factors to the high cost and excessive time for abatement are numerous and include the following:

- Waste was loaded into metal barrels for disposal. This increased work time and weight of the waste.
- The bidders on this project knew it was a research project and knew there would be much official scrutiny. This increased the cost significantly above actual practice.
- Common practice in the industry is to add a cost increase factor when bidding government work.
- Abatement oversight and air monitoring costs are too high because the abatement took too long.
- See pre-meeting comments by Polanco (first paragraph, starting "I agree" to "specified in the project" [see Appendix C, page C-55] and Hays [Appendix C, pages C-19 and C-20, items 6, 7, and 8]).
- See Giguere, item 20.

The cost for the AACM is underestimated. Additional cost items that should have been included:

- Time and materials cost to wet the berms during excavation (this was not done in the field test).
- Work should have complied with OSHA 1926.1101 for Class II work.
- Construction of berms is not itemized, so whether that cost was included is unknown.

EPA Response: EPA documented the actual costs incurred and EPA feels it is not appropriate to substitute "estimated" costs for documented costs. The costs were obtained in all cases from the lowest bidder; other bidders were higher than those reported for the study. The cost of berm construction was included in the overall cost but was not broken out as a separate item. As the reviewers suggested, EPA did add some costs for the wetting of the berm during soil removal, even though this wetting was not done. EPA states in the cost discussion that the costs for the application of the AACM will be highly site specific and the AACM will not always have a cost advantage over the NESHAP. Further, EPA did not specify the use of barrels for the ACM disposal from the NESHAP abatement; their use was the choice of the low-bid abatement contractor. As previously covered, all efforts complied with OSHA regulations.

EPA's cost comparison between the NESHAP and wet methods is seriously flawed. The comparison erroneously assumes that "The AACM building at Fort Chaffee did not contain ACM that would require abatement prior to demolition" (report, p. 139). In fact, EPA admitted in its April 6, 2006, comments on the external peer review of the QAPP that "'[o]ld and friable

ACM used on heating pipes' has indeed been removed, but this would have been done as part of the AACM anyway" (Summary of External Peer Review, April 6, 2006, p. 2). Therefore, the chart on page 139 of the test report should not list the NESHAP abatement costs for the AACM building as "N/A," but instead include the costs of the pre-demolition NESHAP abatement of friable ACM.[5]

EPA Response: First, the composite wall systems for both buildings were positive (composite asbestos values greater than one percent) as documented in the text of the report, thus necessitating abatement prior to demolition under the requirements of the NESHAP. The comparison between the NESHAP and the AACM dealt with the buildings as they were at the time, not how they had been in the past. Second, inclusion of hypothetical costs for the removal of pipe wrap that had been accomplished many years earlier is not appropriate, because EPA does not know the quantity of pipe wrap that was removed nor the cost for removing it. If the amount of pipe wrap did not exceed the NESHAP limits (260 linear feet), then NESHAP would not have required it to be removed for the NESHAP building but the AACM would have required its removal prior to the AACM demolition. In this case, there would have been an extra cost for the AACM. If the amount of pipe wrap exceeded the NESHAP threshold, it would have been removed in both cases and the costs for TSI removal from each building likely would have been the same.

See Table 8-2 (below) in the written public comments submitted by Andrew F. Oberta (see Section 2.3.8 for Oberta's complete written comments).

[5] Excerpted from public comment submitted to EPA on June 11, 2007, by Jim Hecker, Environmental Enforcement Director, Public Justice, 1825 K Street, N.W. Suite 200, Washington, D.C. 20006. http://www.regulations.gov/fdmspublic/component/main, Document ID: EPA-HQ-ORD-2007-0362

Table 8-2. Adjusted costs for AACM

Cost Item	Cost		
	Owner's Representative	Demolition Contractor	Total
Pre-Demolition			
Project Design Survey per ASTM E2356	$3,000		
Asbestos abatement sections of demolition specifications (Preparation and bidding)	$3,500		
Site mobilization and demobilization		$5,000	
Training - OSHA Class II (8 hrs) for 14 workers ($40/hr)	$400	$4,480	
Training - OSHA Class II (12 hrs) for two supervisors ($50/hr)	$200	$1,200	
Sub-total	**$7,100**	**$10,680**	**$17,780**
Building Demolition			
Preparation oversight and monitoring (2 men, 1 day @ $500/man-day)	$1,000		
Demolition oversight and monitoring (2 men, 2 days @ $500/man-day)	$1,000		
Excavation oversight and monitoring (1 man, 1 day @ $500/man-day)	$500		
OSHA compliance monitoring		$1,000	
Excavator		$2,400	
Labor		$10,035	
Wetting surfactant		$2,165	
Foaming equipment rental		$1,000	
Conductivity testing rental		$500	
PPE (respirators and clothing)		$1,000	
Sub-total	**$2,500**	**$18,100**	**$20,600**
Construction Debris T&D (asbestos and non-asbestos)			
T&D oversight (1 day)	$500		
Transportation		$6,143	
Scaffold for lining of trucks and liners		$7,078	
Asbestos waste disposal		$18,660	
Non-asbestos waste disposal		$2,678	
Water collection and disposal		$570	
Close-out documentation	$500		
Sub-total	**$1,000**	**$35,129**	**$36,129**
TOTAL COST	**$10,600**	**$63,909**	**$74,509**

Source: Public comment submitted to EPA by Andrew F. Oberta, The Environmental Consultancy, 107 Route 620 South, Suite 102, MS 35E, Austin, TX 78734 on May 30, 2007. http://www.regulations.gov/fdmspublic/component/main, Document ID: EPA-HQ-ORD-2007-0362

- Cost for independent third-party oversight should be added to the AACM, as was done for the NESHAP project.
- The crew size was excessive, especially for the length of time.
- The removal was "gold-plated," especially given that the building was going to be demolished. For example, the latex-paint lockdown was not necessary.

EPA Response: EPA documented the actual costs incurred and feels that it is not appropriate to substitute "estimated" costs for documented costs. The costs were obtained in all cases from the lowest bidder; other bidders were higher than those reported for the study. As the reviewers suggested, EPA did add some costs for the wetting of the berm during soil removal, even though this wetting was not done. EPA states in the cost discussion that the costs for the application of the AACM will be highly site specific and the AACM will not always have a cost advantage over the NESHAP. While the reviewer feels that the use of the lockdown encapsulant was not necessary, EPA was told by local authorities that it was standard practice

in that locality. EPA did not specify crew size, the use of the lockdown encapsulant, nor the use of barrels for abatement waste disposal; therefore, the process used was the independent process of choice by the abatement contractor.

Many issues of application in actual practice would influence the cost of the AACM and its comparison to the standard NESHAP method:

- Distance to the landfill.
- The size of the building will have a major impact on how this cost compares to the standard NESHAP approach. The size of the building will determine the volume of construction debris that must go into an asbestos landfill. At some point, the increased landfill costs will cancel any savings afforded by the AACM.
- Union versus non-union labor.
- Geographical region of the country.
- Urban versus non-urban.
- Site size and conditions (e.g., soil composition) that influence the methods to contain water.
- Proximity to other structures.
- Some state and local jurisdictions would require wallboard systems and VAT removal before demolition.
- Decontamination of equipment.
- Decontamination of trucks after each load.
- Extra cost to use asbestos workers.
- Extra cost to monitor.
- Extra cost of amended water.
- Extra cost of pumps.
- If you remove thermal insulation, how much is left?

EPA Response: EPA agrees that there are many factors that influence cost and applicability of the AACM, just as there are with the NESHAP, and all costs will be highly site-specific as expressed in the report.

2.3.7 Implementation Issues

At present, the AACM is a "performance" report with an emphasis on the final product, but little guidance on the specifics of work performance. All subsequent versions of AACM need to amplify specific details of work execution, project oversight, and project completion. In various sections, a more "means-and-methods" approach should be crafted to specifically explain the methods of work execution, the duties of project oversight, and the particular aspects that would define project completion. (For an example of a means-and-methods specification, see the National Institute of Building Sciences' "Guideline Specification for Asbestos Abatement").

Examples of method amplification include:

- ***Berm construction:*** What constitutes a properly constructed berm? Would a 2-foot-tall sand structure be appropriate to contain the water used during the AACM process? Aspects to consider: height/width, what soils would be allowed for berm construction, physical strength for water containment (as with significant precipitation events).
- ***A specification for amended water application:*** What equipment is appropriate? A garden hose or the Kidde fire equipment demonstrated in the study (preferred!)?
- ***Wetting agent:*** what is an appropriate wetting agent for this process? A performance specification would be appropriate versus proprietary substance.
- ***Project completion:*** What constitutes project completion? Absence of visual debris? Who provides the inspection? What constitutes certification of evidence of completion?
- ***Training:*** A section should be added to ensure that all workers on site have successfully completed appropriate asbestos-related training programs as required by EPA/ASHARA and any OSHA-related issues governed by state or local authorities.

Examples of project-monitoring amplification include:

- Ensure that the required amended water process is applied previous to and continuously during the AACM process.
- Ensure that there are no visible emissions during the AACM process.
- Ensure that all work is performed as specified by the AACM.
- Ensure that no AACM-prohibited activities occur.
- Ensure that waste is properly containerized and disposed of in an appropriate landfill.
- Provide visual inspection during and at the completion of the AACM.

EPA Response: The asbestos NESHAP demolition requirement is a work-practice standard. EPA believes that the end result (an environmentally-protective demolition) is the desired goal and also feels that means and methods approaches limit innovation on the part of the demolition contractors. Most of these comments relate to any possible future rulemaking activity and will be forwarded to OAQPS for possible future consideration.

2.3.8 Public Comments

The comments submitted by Andrew F. Oberta (see the boxed section beginning on the next page) are thorough and well articulated. We believe that the EPA should consider Mr. Oberta's submission a base document for public comments and review and respond to all of his comments.

Comparison of the Alternative Asbestos Control Method and the NESHAP Method for Demolition of Asbestos-Containing Buildings

Summary of Comments by Andrew F. Oberta, MPH, CIH
The Environmental Consultancy

Mr. Oberta is an asbestos consultant with over 25 years of experience in the field. He submitted comments to the docket on May 30, 2007 and posted an illustrated and annotated version on his website at www.asbestosguru-oberta.com. The following is a summary of his comments.

****

If someone ground up twenty square feet of asbestos floor tile and spread the pieces over a quarter-acre of land, we would agree that they have contaminated the soil. That is exactly what EPA did in the Fort Chaffee AACM project – not one, but twice.

The results of the soil analyses demonstrated that the long-standing EPA policy of permitting flooring materials to remain in a building that is demolished may not have been a wise decision. It should be re-examined at least and perhaps rescinded.

Another unintended consequence of leaving 3,992 ft^2 of asbestos-containing floor tile and mastic plus 252 ft^2 of linoleum with friable asbestos-containing backing in the buildings is the introduction of a variable not discussed in the report. These materials represent a source of airborne fiber release that could have affected the air sampling results. The implied assumption that no such fiber release occurred or that it affected the results for both tests equally is not defensible.

EPA Response: Some local regulations exceed the requirements of the NESHAP and mandate the removal of vinyl asbestos floor tile (VAT); this was not the case at Fort Chaffee. If the VAT had been removed as required by several local statutes, the cost and time requirements of the abatement would have significantly increased, and the apparent cost and time advantages of the AACM observed in this study could have been far greater. A discussion of this has been added to the text. Again, the NESHAP does not currently require the removal of VAT prior to demolition. It is true that the source of any detected asbestos fibers is not known, and the VAT could have contributed some of the asbestos fibers observed in the air samples.

The amount of asbestos present in these flooring materials would far exceed that in the wallboard joint compound in the AACM building if the compound was limited to the spaces between the wallboard panels. However, the photos in the Draft Report and the EEG inspection report suggest that the walls were covered with a homogeneous surfacing material of constant thickness – perhaps plaster --without other discernable materials in the immediate area of the joint. We are left unsure of how much ACM was associated with the wallboard.

EPA Response: As explained in the report, the only asbestos in the wall system was found in the joint compound. The asbestos concentration in the joint compound was high enough to render the composite joint samples positive (> one percent) and require abatement (removal of all wallboard) prior to demolition.

The air sampling results used to compare the two methods were inconclusive, primarily due to the large percentage of samples with zero structure counts. If anything, the results faintly suggest that the AACM creates higher airborne asbestos concentrations than the NESHAP method. No effort was made to compare these concentrations during either demolition to background levels or prevailing urban ambient concentrations.

EPA Response: While the non-detects at very low analytical sensitivities (0.0005 s/cm^3) cause some difficulty in presenting and analyzing the data sets statistically, it is important that there was minimal asbestos detected. At the reviewer's request, a reference was added to background asbestos concentrations both at Fort Chaffee and in the US.

The AACM demolition was preceded by saturating the wallboard with water containing a foaming agent, which was also sprayed on the building as it was demolished. Whether a contractor demolishing a building for low bid would spend the time and money to use this method properly, or would be able to operate the spray equipment and calibrate the mixture, is very doubtful based on my experience with asbestos abatement. To ask such a contractor to measure and adjust the conductivity of the mixture for proper foaming properties when they have trouble maintaining paint sprayers in working condition is unreasonable. What happens when the nozzle gets dropped in the dirt and plugged up?

EPA Response: Fortunately, according to Kidde Firefighting Foam which supplied the wetting agent used in this study, the wetting agent is effective at concentrations as low as 0.1 percent by volume. EPA used 1.0 percent in this test and lowered the percent by volume to 0.5 percent in AACM2. Even at 0.5 percent, the foaming action was visible as the amended water contacts surfaces, so it is easy to see if the water contains surfactant. Conductivity tests were used in this research effort but would not be anticipated in a real-world application. Visual observation by an inspector will immediately tell if surfactant being added because if the surfactant is not being added you will not see any foaming.

The purported cost savings of 47% for the AACM compared to the NESHAP method are reduced to 31% when expenses for project design and oversight by the owner's representative and training of the contractor's workers are included. Unless the contractor is regularly engaged in asbestos abatement as well as demolition, their general liability insurance will exclude the work required by the AACM. Firms without asbestos coverage, which the owner would be foolish not to require, would not bid and the pool of potential contractors would be reduced. The biggest and most unpredictable cost variable, as acknowledged in the report, is the competitive nature of bidding for demolition work.

EPA Response: Also, as Mr. Oberta previously noted, areas that require the abatement of VAT would have higher cost advantages for the AACM. Again, costs are site-specific.

There are numerous technical errors, inconsistencies and questionable items in the report. ASTM and ISO methods for sampling and analysis are misrepresented. Prevailing industry practices described in ASTM asbestos control standards are not recognized.

EPA Response: The QAPP for this effort was generated by a team of EPA and industry asbestos experts, and was formally peer-reviewed, offered for public comment, and revised in response to those comments. Several analytical methodologies, including ISO, ASTM, and EPA methods, counting rules, and test protocols were modified to reflect the latest state-of- the art. None of these were ever intentionally misrepresented. Modifications were detailed in the QAPP. Additional clarification has been provided where deemed appropriate to more clearly reflect the methods performed.

The following statement appears on page 1 of the Introduction: "These data may be used to help EPA determine whether it is appropriate to include an alternative method in the current asbestos regulations contained in 40 CFR Part 61 Subpart M." If this statement signals EPA's intentions to amend the NESHAP to allow use of the AACM, it would be a serious mistake and compromise the protection of health and the environment. Exhibit 1 appears to represent a potential draft of the regulatory language that would describe how the AACM is to be used. This Exhibit has serious flaws, the foremost of which is allowing several asbestos-containing materials that should be removed to remain in the building during demolition. An equally serious omission from the exhibit is any consideration of vacating or protecting nearby residences and businesses, and measures to assure occupants of the safety of moving back into them.

I cannot endorse the AACM on the basis of this report any more than I could before the tests were conducted.

EPA Response: EPA is not involved at this time in any rulemaking activity concerning the asbestos NESHAP or the AACM.

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Oberta's Written Comments Submitted to EPA During the Public Comment Period

Docket ID No. EPA–HQ–ORD–2007–0362
Page 1 of 14
Comparison of the Alternative Asbestos Control Method and the NESHAP Method for Demolition of Asbestos-Containing Buildings
Comments by Andrew F. Oberta, MPH, CIH
The Environmental Consultancy
May 30, 2007

INTRODUCTION AND SUMMARY
The findings of my review are summarized below and explained in detail in the body of this submittal.

• Two 4,500 ft² buildings, each containing 3,992 ft² of asbestos-containing floor tile and mastic plus 252 ft² of linoleum with friable asbestos-containing backing, were demolished in a demonstration at Fort Chaffee, AR. The first building demolished had 20,700 ft² of asbestos-containing wallboard removed immediately before the demolition, which was performed essentially dry. The wallboard was not removed from the second building but was saturated before demolition. A foaming agent was added to the water for dust suppression during the second demolition.

• Soil samples collected after demolition of both buildings contained a substantial amount of asbestos containing debris from the floor tile, linoleum and possibly previously-removed pipe insulation. The samples from the first building demolished (the "NESHAP" building) had more debris than those from the second ("AACM") building. These results suggest that asbestos-containing flooring materials should be removed before demolition of a building, particularly if the minimal amount of water used for dust suppression during the NESHAP demolition represents customary practices.

EPA Response: Any substantive change to the NESHAP, such as requiring removal of VAT prior to demolition, would require rulemaking and public comment. At this time, no such rulemaking activity is underway.

• Leaving the flooring materials in the buildings introduced a variable not discussed in the report. These materials represent a source of airborne fiber release that could have affected the air sampling results. The implied assumption that no such fiber release occurred or that it affected the results for both tests equally is not defensible.

EPA Response: Some local regulations exceed the requirements of the NESHAP and mandate the removal of vinyl asbestos floor tile; this was not the case at Fort Chaffee. If the VAT had been removed as required by several local statutes, the cost and time requirements of the abatement would have significantly increased, and the apparent cost and time advantages of the AACM observed in this study would have been far greater. A discussion of this has been added to the text. Again, the NESHAP does not currently require the removal of VAT prior to demolition It is entirely possible that the VAT contributed some of the asbestos fibers observed in the air samples.

• The air sampling results used to compare the two methods were inconclusive, primarily due to the large percentage of samples with zero structure counts. If anything, the results faintly suggest that the AACM creates higher airborne asbestos concentrations than the NESHAP method. No effort was made to compare the airborne asbestos concentrations during either demolition to background levels or prevailing urban ambient concentrations.

EPA Response: While the non-detects at very low analytical sensitivities (0.0005s/cm^3) cause some difficulty in presenting and analyzing the data sets statistically, this is a problem that all environmental studies will have when there is very minimal asbestos detected. At the reviewer's request, a reference was added to background asbestos concentrations both at Fort Chaffee and in the US.

• The AACM demolition was preceded by saturating the wallboard with water containing a foaming agent, which was also sprayed on the building as it was demolished. Whether a contractor demolishing a building for low bid would spend the time and money to use this method properly, or would be able to maintain the spray equipment and calibrate the mixture, is very doubtful based on my experience on asbestos abatement projects.

EPA Response: Fortunately, according to Kidde Firefighting Foam which supplied the wetting agent used in this study, the wetting agent is effective at concentrations as low as 0.1 percent by volume. EPA used 1.0 percent in this test and lowered the percent by volume to 0.5 percent in a subsequent test. Even at 0.5 percent, the foaming action is visible as the amended water contacts surfaces, so it is easy to see if the water contains surfactant. Conductivity tests were used in this research effort but would not be anticipated in a real-world application. Visual observation by an inspector will immediately tell if surfactant being added because if the surfactant is not being added you will not see any foaming.

• The purported cost savings of 47% for the AACM compared to the NESHAP method are reduced to 31% when expenses for necessary preparation and oversight by the owner's representative and training

of the contractor's workers are included. The biggest and most unpredictable cost variable, as acknowledged in the report, is the competitive nature of bidding for demolition work.

EPA Response: As Mr. Oberta previously noted, areas that require the abatement of VAT would have higher cost advantages for the AACM. Again, costs are site-specific.

• There are numerous technical errors, inconsistencies and questionable items in the report. ASTM and ISO methods for sampling and analysis are misrepresented. Prevailing industry practices described in ASTM asbestos control standards are not recognized.

EPA Response: The QAPP for this effort was generated by a team of EPA and industry asbestos experts, and was formally peer-reviewed, offered for public comment, and revised in response to those comments. Several analytical methodologies, including ISO, ASTM, and EPA methods, counting rules, and test protocols were modified to reflect the latest state-of- the art. None of these were ever intentionally misrepresented. Modifications were detailed in the QAPP. Additional clarification has been provided where deemed appropriate to more clearly reflect the methods performed.

The following statement appears on page 1 of the Introduction: "These data may be used to help EPA determine whether it is appropriate to include an alternative method in the current asbestos regulations contained in 40 CFR Part 61 Subpart M." If this statement signals EPA's intentions to amend the NESHAP to allow use of the AACM, it would be a serious mistake and compromise the protection of health and the environment. Exhibit 1 appears to represent a potential draft of the regulatory language that would describe how the AACM is to be used. This Exhibit has serious flaws, the foremost of which is allowing several asbestos-containing materials (ACM) to remain in the building during demolition that should be removed. An equally serious omission from the exhibit is any consideration of vacating or protecting nearby residences and businesses, and measures to assure occupants of the safety of moving back into them.

EPA Response: EPA is not involved at this time in any rulemaking activity concerning the asbestos NESHAP or the AACM.

I cannot endorse the AACM on the basis of this report any more than I could before the tests were conducted. If the NESHAP is amended to allow its use, my recommendation to building owners would be to follow the advice of a qualified asbestos professional who has inspected the building according to ASTM E2356 Standard Practice for Comprehensive Building Asbestos Surveys (1) and made an informed decision as to whether any asbestos-containing materials can remain in place during the demolition. The project should be conducted in the same stringent manner as any other abatement project, which is what the AACM amounts to. This includes a project design and proper oversight by the owner's representative and compliance with applicable state and local asbestos regulations. This is the only way that health and the environment can be adequately protected and that the owner can avoid possible liability including citations from regulatory authorities.

EPA Response: EPA is not involved at this time in any rulemaking activity concerning the asbestos NESHAP or the AACM.

(1) All ASTM standards cited in these comments are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

DISCUSSION

Section 1 Introduction – A schedule showing the activities performed each day would help greatly in understanding the sequence and timing of events. Currently, this information has to be dug out of the text.

EPA Response: EPA feels that the text provides sufficient information on the sequence and timing of events.

Exhibit 1, 2.0 Applicability – Is there a limit on the size of a building (floor space) other than the height and number of stories? It is conceivable that a 100,000 ft² single-story building could be demolished under these requirements.

EPA Response: The current version of the AACM does not limit the horizontal size of a candidate building, only the vertical dimension.

Exhibit 1, 3.0 Building Inspection/Asbestos Assessment -- An "AHERA" inspection is not "comprehensive" because it allows exclusions for sampling and assessment based on friability and location of suspect materials. Exterior materials that are required to be sampled are specifically enumerated and non-friable materials are not assessed. Inspections for pre-demolition abatement projects should be done according to ASTM E2356 Standard Practice for Comprehensive Building Asbestos Surveys as Project Design Surveys, which requires all ACM regardless of friability and location to be identified.

EPA Response: EPA agrees and this was incorporated into the QAPP for the third demolition (AACM3).

Exhibit 1, 5.2 Wetting Process – Even amended water will not penetrate non-friable materials such as floor tile and asbestos-cement roofing or siding that the AACM allows to be left in place. A surfactant will, at best, allow the water to spread over the surface and contribute to the control of dust. However, the product used in this demonstration in no way resembles the amended water commonly used by abatement contractors.

EPA Response: Control of dust, including asbestos fibers, is an attribute of wetting agents that contributes positively to the performance concepts of the AACM process. EPA cannot respond to the comparison with amended water currently in use without information on the referenced amended water practice or composition.

This procedure assumes the existence of an attic, which I take to include a plenum above a lay-in or solid ceiling. Is the procedure modified if there is no attic or plenum?

EPA Response: No. The interior is still completely wetted the day before, the morning of, and during the demolition.

Exhibit 1, Table 1 – ASTM E2356 discusses some of these materials in Appendix X1. SAMPLING TECHNIQUES AND EQUIPMENT in ways that suggest they should be removed prior to demolition rather than left in place according to Table 1.

EPA Response: The idea of the AACM was to leave as much ACM as practical in the building. Your suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a rulemaking on the AACM.

Spray-applied surface coatings (popcorn ceiling) are covered in E2356 under X1.3.2.3 *Textured Finishes* and **Spray applied acoustical or decorative surfacing** is covered under *X1.3.2.2 Plaster* as friable materials. The ability to wet these inherently-dusty materials sufficiently to minimize the release of airborne fibers and debris with the AACM was not demonstrated. They should be removed before demolition.

EPA Response: AACM3 will investigate the practicality of the use of the AACM on these materials.

Troweled-on crows foot texture, splatter texture, and joint compound combines very dissimilar materials. Joint compound is covered under *X1.3.3.3 Wallboard Systems* as a friable miscellaneous material along with texturizer, or skim coat, and the tape covering the joint. OSHA posted an interpretation on May 14, 1998 titled "Asbestos standard: Joint compound is not a surfacing material." A decision on whether these materials must be removed before demolition should be made by the project designer on the basis of multi-layer sampling and analysis.

EPA Response: The idea of the AACM was to leave as much ACM as practical in the building. Your suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a rulemaking on the AACM.

Vibration-dampening cloths are covered under X1.3.3.5 *Vibration Dampeners* as a friable material. These items are woven from almost-pure chrysotile fiber and should be removed before demolition.

EPA Response: The idea of the AACM was to leave as much ACM as practical in the building. Your suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a rulemaking on the AACM.

Linoleum or other floor tile are distinctly different materials. Linoleum is covered under X1.3.3.4 *Sheet Vinyl Flooring* containing a woven or matted backing with a high chrysotile content that is very friable. If this backing is present the flooring should be removed before demolition as the amended water will not penetrate the vinyl facing.

EPA Response: It may not require penetration to prevent fiber release. The coating of the surfaces may be sufficient and constant misting with the amended water may be sufficient. It is unlikely that the amended water penetrated the large quantities of VAT at Fort Chaffee and yet the airborne asbestos concentrations associated with the AACM were minimal.

Ceiling tile is covered under *X1.3.3.1 Acoustical Ceiling Tiles* as a friable material, as are X1.3.3.2 *Glued-on Tiles*. The former often contain amosite and the latter may be attached to the deck or ceiling with asbestos-containing mastic. These tiles should be removed before demolition as the ability of the AACM wetting agent to penetrate to the substrate has not been demonstrated.

EPA Response: The idea of the AACM was to leave as much ACM as practical in the building. Your suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a rulemaking on the AACM.

The decision whether to remove any ACM or leave it in place during demolition should be left to the project designer with a default to removal if the possibility exists of generating debris or releasing fibers.

EPA Response: The idea of the AACM was to leave as much ACM as practical in the building. Your suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a rulemaking on the AACM.

Exhibit 1, 5.3 Demolition Process and 5.4 Visible Emissions – It may be naïve to expect the demolition contractor to "minimize breakage of asbestos-containing materials" and to expect the demolition contractor's NESHAP-trained individual "to stop work if visible emissions are observed." The AACM process suffers from the same lack of independent oversight by the owner's representative as the current NESHAP. Fortunately, such oversight is required by some state regulations as well as consensus standards such as ASTM E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects.

EPA Response: This suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a rulemaking on the AACM.

2.1 Primary Objectives – Primary Objective 2 states: "The AACM requires soil excavation following demolition and the NESHAP Method does not." Why not? As seen later, the soil around the NESHAP building was just as contaminated after demolition as the soil around the AACM building. Primary Objective 4 should be to compare airborne asbestos (TEM) concentrations during the NESHAP and AACM demolitions to the background TEM concentrations and to prevailing urban ambient concentrations.

EPA Response: This suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a revision of the asbestos NESHAP.

2.2.3 Worker -- Objective 9a should be to determine whether worker exposure using the AACM can be

statistically shown to comply with the OSHA Permissible Exposure Limits of 0.1 f/cc for an 8-hr TWA and 1.0 f/cc for the 30-minute excursion level. Comparisons are made later in the report (4.1.3.3.3 and 6.1.5.1) but no statistical analysis was performed.

EPA Response: Only one worker OSHA PCM sample reached the PEL, so a statistical analysis was not necessary.

3.2 Site Description – Most buildings that the AACM appears intended for will not have had the benefit of previous asbestos abatement. They may also have been subject to maintenance, vandalism, neglect and other activities that result in disturbance of asbestos-containing materials and the presence of debris that would need to be cleaned up before an AACM demolition began.

EPA Response: EPA agrees. There are many buildings that fit the description in the comment. These same conditions would apply if the building were demolished according to the NESHAP process. Whether the materials would require a pre-cleaning from the building prior to the demolition would be a site-specific decision. In this example, the AACM might prove to be advantageous, as extensive cleaning to remove residual asbestos contamination from all surfaces is very time-consuming and very expensive. The soil removal aspect of the AACM is considered to be a plus in these situations as well.

3.3.1 Asbestos Inspection of Buildings – Reference has previously been made to the limitations of an "AHERA" inspection and to ASTM E2356 Standard Practice for Comprehensive Building Asbestos Surveys. Figure 3-5 in the Draft Report has been cropped horizontally from Figure 1 in the EEG inspection report, which shows a section approximately 3.5" wide. As the EEG report states on page 9 that 2" and 3" hole saws were used to obtain the samples, the question is whether this picture is on a section through a joint that was not a sample but obtained separately.

What is labeled "joint compound" in the EEG Figure 1 is ~1/8" thick at the edges of the picture and does not appear to decrease in thickness. This suggests it may be a layer of plaster and not joint compound, which would make it surfacing material. Were any samples taken of this material between the joints? The answer affects the relative contributions of this layer and the flooring materials. If 20,700 ft² of wallboard is covered with 1/8" of plaster containing 10 – 19% asbestos, the amount of asbestos available for release from this plaster is roughly five times that in the 4,244 ft² of floor tile and linoleum backing of equal thickness with 10 - 25% asbestos. If, however, only the joint compound itself – between the wallboard sheets at four foot intervals – contains asbestos, the flooring materials constitute a much larger, even a predominant, amount of potential fiber release.

The EEG report also states "In the laboratory the full-depth core sample was separated into its discrete layers (***Figure 1***) for analysis." Was this done using the dimension d2 in Figure 3-5 of the Draft Report? What is the basis for the width of the seam in the absence of joint tape or other defining components of the wallboard system? The "Joint Interval Composite" percents in Table 3-1 calculated from these dimensions should not depend on an arbitrary reference point.

EPA Response: The picture in Figure 3-5 was generated by EPA in an earlier sampling event at the Fort Chaffee site to guide the analytical labs as to how much material to consider in calculating the composite asbestos concentration. The EEG used the picture provided by EPA in their report as an illustration, but it was not an EEG sample. There was no surfacing

material present with the exception of the joints, nail holes, and maintenance patches. It is joint compound. Unfortunately, the methodology used by the labs does not have a standard reference point.

Table 3-1 has a single line for mastic in each building, whereas the lab reports (EEG pages 110 – 115 of PDF file) show brown/tan for the linoleum and black for the tile. The latter was not gravimetrically analyzed as a separate layer, even though it qualifies as a non-friable organically bound (NOB) and has a high probability of containing asbestos.

EPA Response: The lab was not requested to report gravimetrically-determined asbestos content on that material.

The lab reports also list a white tape as part of the joint sample, which is not listed in Table 3-1 or in the body of the EEG report and is not apparent in the photos.

EPA Response: The white tape was present and is just not visible in the photograph.

3.3.3 Concentrations of Asbestos in Soil – When were these (nine) samples taken? They do not appear to be the same (ten) samples for each building that appear in the remainder of the report.

EPA Response: They were taken during the preliminary sampling event conducted January 11, 2006. The purpose of these samples was to verify the suitability of the site for the subject project. These sample results were not used in any of the comparisons performed for the study; additional samples were collected at the time of the demolitions for that purpose.

4.1.3.1 Background Air Monitoring – Are these the samples in Table A-4 that were taken on January 11, 2006? Where were these samplers in relation to those shown in Figure 4-1? The report states that these samples were taken "to collect data necessary for potential comparison of air concentrations of asbestos and total fibers during demolition." However, it is not clear what comparison is meant here, and the concentrations during the demolitions were not compared to background levels.

EPA Response: The samples referred to in the comment are not the ones taken on January 11th, but were taken prior to each demolition. If the background concentrations of asbestos would have been elevated, it might have been necessary to correct the concentrations during demolition for pre-existing background levels. This was not the case for asbestos as all samples were below the analytical sensitivity of 0.0005 s/cm^3.

4.1.3.2 Perimeter Air Asbestos, Total Fibers, Settled Dust, and Particulate Sampling During Demolition – Page 30, 5th paragraph: The pumps shown are capable of pulling more than 4 lpm. Although the 1920 – 2400 L volumes exceed that for ambient samples at many abatement sites, higher volumes would have increased the number of samples with one or more structures counted. Once it became apparent that filter over-loading was not a problem, was any consideration given to increasing the flow rate and thus the sample volumes?

EPA Response: While EPA was fortunate that overloading was not a problem in this study, overloading is always a concern. This study was designed for an analytical sensitivity for asbestos of 0.0005 s/cm^3; therefore lower air volumes required the counting of additional grids to achieve the required analytical sensitivity. It is not always possible to tell by visually observing the filter if the sample is indeed overloaded, so there was no real-time way to detect if they were or were not overloaded.

4.1.3.3.1 Discharge Air Sampling During Asbestos Abatement of NESHAP Building – In response to an inquiry, EPA informed me that the isokinetic sampling was done according to the following reference: Quantitative Evaluation of HEPA Filtration Systems at Asbestos Abatement Sites, Roger C. Wilmoth et al. *Environmental Choices Technical Supplement*, Vol. 2, No. 1, Fall 1993. Environmental Information Association, Chevy Chase, MD. This article describes a series of tests where samples were taken in ducts attached to HEPA-filtration units. To achieve isokinetic velocity, the cap was left on the 25mm cassettes, which presumably faced into the airstream, the plug removed and a tube inserted into the hole. The filters were analyzed by TEM with indirect preparation to overcome the problem (not discussed in the article) of uneven fiber distribution on the filter. This methodology is not described in this Draft Report and without information on the air flow rates through the HEPA-filtration units and the sampling cassettes, and the diameter of the inlet tube, the existence of isokineticity cannot be confirmed.

One learns from Table 4-1 that these filters were analyzed by TEM but Tables 5-1 and 5-2 do not mention them. However, Table 6-16 also gives results for PCM analysis in f/cm^3, which raises the question of how fiber counts were done on asymmetrically-loaded filters that were also indirectly prepped for TEM analysis. It is implied that ISO 10312 was used but that is a direct prep method.

EPA Response: The analysis was done by direct preparation TEM. New HEPA filters were purposely used in each of the four negative air units in this study. Not surprisingly with new filters, all asbestos and fiber measurements were non-detect. A reference to the article and to the fact that the TEM was done by direct prep has been added to the report. The impact of direct vs indirect preparations on these samples is not known.

4.1.3.3.2 Personal Breathing Zone Sampling During Abatement -- With ~81 man-days of abatement, why were only six personal samples collected for worker exposure? On which day out of the nine during which abatement was conducted were these samples taken?

EPA Response: The QAPP required these samples be taken by EPA under strict QA/QC conditions. OSHA routine performance samples were collected on the other workers but are not presented here, because they were not governed by the EPA QAPP. The EPA samples were spread out across the work functions and the duration of the abatement.

4.1.3.3.3 Personal Breathing Zone Sampling During Demolition – I believe the text should read: "For each of the two building demolitions, samples were collected during the sampling *demolition* periods to calculate the time-weighted average (TWA) concentration for comparison to the OSHA Permissible Exposure Limit for Asbestos (29 CFR §1926.1101).." However, Objectives 8 and 9 refer to comparing concentrations between the NESHAP and AACM methods – comparison to the OSHA PELs would be an additional objective, which is identified in my comment on 2.2.3.

EPA Response: EPA agrees and has corrected the text. An additional objective comparing the PCM readings to the OSHA PEL was not added; however, one abatement worker sample reached the OSHA PEL and reference to this event is made in the text.

No personal samples were taken during pre-wetting of the AACM building on the day before it was demolished. During this time the workers were dragging hoses through the building, moving ladders and doing other things that could have released airborne fibers from the asbestos-containing wallboard joint compound. Their exposure should have been monitored.

EPA Response: No monitoring of the workers was done during pre-wetting operations. This process will be incorporated into AACM3.

APPENDIX C Procedures for Visual Inspection and Clearance of Project Sequence of the EEG SPECIFICATIONS & DRAWINGS FOR ASBESTOS ABATEMENT PROJECT requires a visual inspection that closely follows the sequence in ASTM E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects and clearance by air sampling with PCM analysis. Other than a statement here that "The EPA and contractor staff inspected the abated area following acceptance …" and another in Section 8 about "… clearance testing by a licensed asbestos consultant;" there is no mention in this Draft Report that the visual inspection and clearance procedures in the specification were carried out. There are no air sample results for the clearance testing.

EPA Response: Both the clearance visual inspection and clearance testing were conducted by EEG. The inspection and clearance tests passed, but the data are not presented here, because they were not collected under the EPA QAPP. A statement has been added to the report to clarify this.

4.3.3 Cross-contamination control – Imagine yourself living in a house across the street from one being demolished by the AACM. You would ask the following questions: "Will my family be re-located during the work and at whose expense? Will my house and yard be covered with plastic as in Figure 4-16? Will my house and yard be inspected and cleaned if necessary so it is safe to move back in?" These questions may not have arisen in the context of this demonstration project but will undoubtedly be asked if an AACM demolition is proposed.

EPA Response: Your concern will be forwarded to OAQPS for their consideration if the Agency pursues a revision of the asbestos NESHAP.

4.4.2.1 Amended Water System – Page 49: The Kidde Fire Fighting NF-3000 Class "A" Foam Concentrate is a respiratory, eye and skin irritant according to the MSDS and handling it requires appropriate PPE. Figure 4-25 shows a worker wearing a full-facepiece negative pressure respirator with P100 cartridges during application of the foam, but would a demolition contractor have the necessary PPE for the workers who are handling the concentrate?

EPA Response: Demolition contractors would have to acquire the necessary PPE if they chose to use that particular wetting agent.

Page 50, 1st paragraph: What would the cost be for such a system if a contractor had to buy or rent it?

The remainder of page 50, Table 4-4 and Figure 4-22 describe conductivity measurements to calibrate the foam concentration. Is it realistic to expect a contractor to do this on an actual project under time and cost constraints?

EPA Response: The AACM does not require excessive pressures from the delivery system. In this first test, EPA chose a pressurized system to guarantee that the mixture of wetting agent and water was not a variable in the study. This process was for research use only and was not intended for day-to-day application of the AACM. In AACM2, which was completed before the receipt of this report, EPA incorporated the concerns of the peer panel in this regard and chose not to use the expensive amended water application system. In this second test, EPA used a simple eductor system alone, which was quite effective and easy to apply.

Fortunately, according to Kidde Firefighting Foam which supplied the wetting agent used in this study, the wetting agent is effective at concentrations as low as 0.1 percent by volume. EPA used 1.0 percent in this test and lowered the percent by volume to 0.5 percent in AACM2. Even at 0.5 percent, the foaming action was visible as the amended water contacts surfaces, so it is easy to see if the water contains surfactant. Conductivity tests were used in this research effort but would not be anticipated in a real-world application. Visual observation by an inspector will immediately tell if surfactant being added because if the surfactant is not being added you will not see any foaming.

4.4.2.2 AACM Pre-Wetting – Would ordinary amended or just soapy water have saturated the walls and ceilings equally as well as the foam? Is the foam necessary to penetrating the wallboard or does it just sit on the surface?

EPA Response: EPA believes that any surfactant would be similarly effective. The selection of the Kidde "foam" was solely for the wetting agent properties, not for any foaming aspects. The slight foaming action may help the penetration into the walls and ceilings, but the persistence of this product does not leave a visible foam for longer than seconds on vertical surfaces.

4.4.2.3 AACM Demolition Phase – Page 52, last paragraph, describes problems with the foaming nozzles, which appear related to the footnotes to Table 4-4 about "non-foam proportioning." Even the simple spray equipment used at abatement sites frequently malfunctions and workers are continually cleaning, adjusting and repairing the spray nozzles and pumps. If the AACM depends on using a complicated foaming device as was done on this project, contractors will not spend the time to keep it operating properly. They will just spray the building with amended (or plain) water, which may be adequate for the purpose intended, but this project did not show that to be the case.

EPA Response: The AACM does not depend on using a complicated foaming device. No pumps are required (and pumps were not used in the second and third tests), and the proportioning device is a simple inline eductor in each hose line of two fire hoses and respective nozzles. We did not have the types of problems described in this comment during our testing without the use of pumps.

5.2.4.1 Soil Preparation – Under what magnification was the soil examined for the presence of building debris? Was the mass of the debris pieces determined by weighing them or by inference from the PLM visual estimate?

EPA Response: The building debris was visually picked from the soil samples. The mass of the debris was determined by weighing it.

5.2.4.2 Soil Analysis (TEM and PLM) – The pieces of debris that were picked out of the soil don't seem to have been subjected to the same gravimetric and point-counting procedures as the soil, which included the pieces of debris that were not removed.

EPA Response: The building debris pieces were analyzed separately using PLM visual estimation.

5.2.5 Settled Dust Samples (TEM) – The reference to ASTM D5755 in this paragraph and Tables 5-1 and 5-2 is inappropriate. These samples were not collected, prepared or analyzed according to either D5755 or D1739 (referenced in 5.1.6) but a combination of methods loosely resembling both. D1739 requires gravimetric analysis, not TEM. It is meant to measure particulate fallout, not fibers or structures.

• D5755 requires microvacuum sampling of surfaces. There is no apparent reason why this could not have been done.

• The fallout container had a volume of 5555 cm^3, a surface area of 1642 cm^2 and was rinsed with 300 ml of solution. The cassette used in the D5755 method has a volume of 25 cm^3 and a surface area of 47 cm^2; it is filled with 10 ml of rinse solution and shaken, then this solution is added to 75 ml used to further rinse the cassette.

• D5755 uses an indirect preparation method for TEM analysis of aliquots from the rinse solution that are filtered; the cassette filter is not analyzed. ISO 10312 is a direct preparation method where the filter in the cassette is analyzed by TEM.

• D5755 and ISO 10312 have different grid opening requirements and stopping rules (Tables 5-1 and 5-2).

The settled dust (mud?) results are of little consequence to this study and the method certainly would not be used on an actual project. However, the deviations from the referenced ASTM and ISO methods should have been more fully explained.

EPA Response: Because of the lack of standard methods and the associated problems with measuring asbestos in soils, asbestos in settled dust was measured to support the soil data. The two applicable ASTM methods are ASTM D1739 (a method for gravimetrically determining the amount of settled dust) and ASTM D5755 (a method for determining the asbestos concentration of dust collected by the microvac technique). The method used in this study was indeed a combination of the two methods; this approach was recommended by the asbestos experts participating on the Technical Review Team convened in the planning phase of the study. Settled dust samples were collected using the sample collection procedure in ASTM D1739 and indirectly prepared for asbestos analyses using the principles described in ASTM D5755, as detailed in Section 5.2.5 of the report. The filters prepared from the indirect method were then subjected to the counting rules required in ISO 10312 for consistency. Clarifications have been made to the report in this regard.

Section 6 RESULTS – Due to the large number of non-detects, the conclusions are based more on the absence of asbestos structures in the samples than on their presence. The statement at the top of page 74 may be more candid and revealing than the authors intended: "…any conclusions that are based upon counts less than four, as almost all the ones in this study were, should be used with some caution."

EPA Response: We recognize that the fact that most of the results are based on the absence of fibers make the comparison less certain than if there were large numbers of fibers to count. It was anticipated that many or all of the air samples would potentially be non-detects, or be based on just a few fibers, so that we would be making a comparison based on the absence of fibers rather that specific fiber concentrations. For this reason we deliberately designed the air sampling to obtain an analytical sensitivity of 0.0005 s/cc, which we consider to be a low concentration. We also developed our statistical analysis based on the fact that we would be dealing with low numbers of fiber counts. ISO rules suggest that there is no difference between counts of zero and counts less than four. In this study, only one filter had a count of four asbestos structures on it, and the few additional filters that had detectable asbestos had three or less asbestos structures counted. The fact that the statistical evaluation indicates a difference in the very low concentrations does not really have much environmental significance as the concentrations are so low.

6.1.2.1.2 Demolition Air – The highest recorded concentrations are 0.0015 s/cm³ for the NESHAP building and 0.0019 f/cm³ for the AACM building. These are compared – favorably – on page 80 to various clearance limits in the US. Other countries have stricter limits, e.g. the guidance limit in Israel for asbestos in ambient air is 0.0014 f/cm³ measured by SEM. Moreover, the limits in the penultimate paragraph on page 80 are not directly comparable: the AHERA limit is based on analytical sensitivity and not a health-based standard; the AHERA, Katrina and WTC limits are for re-occupancy of indoor environments, not outdoor exposures. The last paragraph admits that the AACM demolition concentrations were statistically higher than the NESHAP values.

EPA Response: The application and comparison to the AHERA, Katrina, and WTC standards are fully explained in the text. The last paragraph clearly states that the AACM values were statistically higher than the NESHAP.

6.1.2.2 Asbestos in Settled Dust – A footnote to Table A-7 gives a surface area of 181.5 cm² that was presumably used to calculate the surface loading (not concentration as in the titles of Table 6-4 and Figure 6-6). This is the area of the bottom of the can. How were the bottoms of the cans rinsed without also rinsing the sides? It is hard to believe that all of the dust particles, water droplets and floating fibers fell straight down into the can without touching and sticking to the sides. If the sides were also rinsed, the total area of 1642 cm² should have been used in the calculations, which would reduce the surface loadings by almost an order of magnitude. This would place even the highest loadings below the WTC and Libby criteria, for what that is worth.

EPA Response: The purpose of the test was to determine the asbestos loading for particulate that fell into the sample container. The surface area of the sides of the can are not relevant in calculating the amount of dust that entered the cans. All interior surfaces of the sample container were rinsed; the rinsate was then filtered and the filter was analyzed for asbestos. The area of the bottom of the container was used in the calculations, as described in ASTM

Method D1739. The same procedure was used for both the NESHAP and AACM tests to ensure comparability. The discussion of asbestos concentration was changed to asbestos loading as suggested.

6.1.2.2.1.1 Background Air -- Table 6-5 is titled in part "…total fibers (PCM) prior to demolition…" and the units are f/cm³. However, Table A-4 lists five samples analyzed by TEM and none by PCM. No structures were counted on any of the filters, a fact not mentioned here. Nor is it stated that the samples were taken four months before the demolitions and not immediately preceding the work.

EPA Response: The five TEM samples referred to in Table A-4 were collected and analyzed months before the demolitions as part of site assessment activities. (Table A-4 indentifies the date of sample collection as January 11, 2006.) These sample results are discussed in Section 3.3.5 of the report. The PCM sample results presented in Table 6-5 are those collected in the days immediately preceding the demolitions. These PCM results, as well as the corresponding TEM results, are listed at the top of Table A-4.

6.1.4.2.1 Soil Fraction – Table 6-11 summarizes the analyses of the soil fraction (Fraction 01) from which rocks/organics (Fraction 02) and building debris (Fraction 03) had been removed. Thus, the soil in Fraction 01 was at least "visibly clean" and, if examined under magnification, even cleaner. Fraction 01 was then separated into sub-fractions for analysis by TEM and point-counting (1000 points) by PLM. The sub-fractions were gravimetrically reduced by ashing and acid-rinsing before the analyses.

The text on page 90 doesn't mention the two pre-demolition AACM samples (9 and 10) with 0.11% and 0.33% asbestos by PLM/point-counting. The latter represents 34 gm – over an ounce – of asbestos and if it consisted of one fragment of debris, or even a few fragments, it may have been visible debris that was not extracted from the sample before splitting it into the three fractions. Perhaps this material belongs in Fraction 03.

EPA Response: At the laboratory, visible debris was removed from the soil and analyzed separately. If visible fragments were seen in the two pre-demolition samples mentioned above, they would have been removed and included in Fraction 03. It should be noted that debris fragments would not be expected in the pre-demolition samples. Each of the ten composite samples consisted of 30 grab samples in an effort to provide representative soil samples for the different sampling events (e.g., PRE, POST, etc).

The conclusion that the pre-demolition debris came from pipe insulation is logical, as pipes ran in the crawl spaces under buildings such as these. This does not account for pre-demolition NESHAP sample 9, however, which was identified as VAT. The next italicized paragraph addresses Primary Objective 2, comparing post-excavation AACM soil to post-demolition NESHAP soil. First, I consider this a meaningless comparison. The comparison should have been to the post-demolition soil for both buildings.

EPA Response: The source of the minimal material identified as VAT in the pre-demolition NESHAP soil sample is not known. With respect to the soil comparison, the objective was to compare the NESHAP process with the AACM process. Since the AACM requires soil removal, it is appropriate to compare the final condition for the AACM to the final condition for the NESHAP.

Second, if post-demolition NESHAP sample 7 – which contained the equivalent of 32 gm of asbestos –

was a debris fragment (or fragments) that should have been extracted and put in Fraction 03, that would have changed the results in Table 6-11 and perhaps the conclusion for Primary Objective 2. This suggests that removing the building debris not only biased the analyses of Fraction 01 toward the low side but that it may have been done inconsistently. Needless to say, Fraction 03 was affected as well. There is a very poor correlation between the PLM point-counting results and the TEM results for the two samples just discussed when one calculates the mass of asbestos on the filters. For post-demolition NESHAP sample 7, the 0.34% asbestos by PLM translates to 4.42E-07 gm while the 110 structures by TEM in the same sample gives 7.33E-08 gm, a 6x difference. For pre-demolition AACM sample 10, 0.33% by PLM gives 3.63E-07 gm vs 1.18E-08 gm for the 136 structures by TEM, a 30x difference. Are such variations typical when comparing PLM point-counting and TEM results from similar samples?

EPA Response: As previously stated, soil sampling and analysis for asbestos can be unreliable. The entire process is further complicated in demolition situations where building fragments are left intermixed with the soil, so it is quite difficult to ascertain a "true" composite value for the soil as a whole when all the different soil fractions are considered. The entire process becomes one of a mixture of visual estimation and analytical counting/visual estimation and results in estimates of asbestos content that have a very high and undesirable variability.

6.1.4.2.3 Building Debris Fraction -- What method was used to visually estimate the asbestos content of Fraction 03 by PLM to two decimal places? Were the debris fragments gravimetrically reduced or was a stratified point-count method used, or both? If the asbestos content could be visually estimated to two decimal places, why are some shown as "<1" percent? If these were visually estimated between 0,01% and 0,99% they should be shown as such. If no asbestos fibers were found, they are "ND" or 0%. The <1% regulatory definition of ACM has no meaning here.

EPA Response: The asbestos concentrations of the Fraction 03 samples were determined by PLM visual estimation. The reported values were calculated using this visual estimate and the sample weights. Based on the accuracy of the method, results should be reported to a single digit. The report has been revised accordingly.

The text on pages 93 and 94 attributes nearly all of the soil contamination to the VAT. Table A-13, which is not discussed in the text, shows this to be an exaggeration for the NESHAP building. Dividing sums of the VAT and "other" ACM weights by the sum of the weights of all the original samples gives 90% for the VAT and 10% for the "other," not 98% and 2%. The "other" could have come from the backing on the linoleum or pipe insulation removed in 1999.

EPA Response: The reviewer is correct in that 90 percent of the debris was determined to be VAT, and the report will be revised accordingly. The key point is that the asbestos fragments left in the soil after both demolitions were largely VAT. The text stresses that the debris fraction of the soil was largely VAT for both processes, but there were less VAT fragments after the AACM than there were after the NESHAP.

If the percents of building debris in Table 6-12 were determined by visual estimation and those in Table 6-13 by weighing the VAT fragments, the numbers are not directly comparable. If they were,

one might conclude that the 0.28% mean weight of building debris in the NESHAP soil samples consisted of 0.07% VAT and 0.21% "other" debris. For the AACM samples it would be 0.07% VAT out of 0.87%, with 0.80% being "other" debris. This is not consistent with Table A-13.
Accepting the figures in Table 6-13, rough calculations show that the mean of 0.07% by weight of VAT fragments in the ½" deep post-demolition NESHAP soil samples is the equivalent of 18 ft² of VAT, or 0.46% of the total in the building. The AACM amount would be slightly higher. There would also be mastic associated with this debris. *This would seem to be an unacceptable degree of soil contamination regardless of the abatement and demolitions methods used.*

EPA Response: The whole point of the EPA discussion was that there were VAT fragments in the soil after both demolitions that were not there before. There were less after the AACM because of the soil removal. The above calculations are interesting but do not alter the VAT fragment observations in the soil.

The post-excavation AACM data in Table 6-13 and Figure 6-12 do not match the figures in Table A-13. The latter are identical to those for the post-demolition AACM samples immediately above, except for the number of decimal places. This appears to be an editorial mistake, but it renders comparison of these samples to any other sample set – for what it's worth – difficult.

EPA Response: In the summary table (6-13), the data were rounded. The raw data in Table A-13 contained typographical errors as noted and were corrected.

6.1.5.1.1 Demolition and Abatement Workers -- To compare the entire sequence of both methods, Table 6-16 should show the exposure of the workers who pre-wet the AACM building. Unfortunately, no worker monitoring was performed during pre-wetting. Therefore, the conclusions at the end of this section are based on an incomplete data set.
6.1.5.1.3 The statement in the second paragraph refers only to the TEM samples. Figure 6-15 is missing exposure data for AACM workers during pre-wetting and the conclusions in the last paragraph reflect this omission.

EPA Response: During the wetting process on the day before the demolition, the hose was dragged down a central hall and a short distance into each room. The whole process took about 15 minutes. On the morning of the demolition, the wetting took place from the exterior of the building only. Unacceptable asbestos exposures during the wetting process were not expected; however, no measurements were performed for confirmation. This doesn't invalidate the worker breathing zone data acquired during the significant activities in these demolitions. In AACM3, the workers who pre-wet the building were monitored.

SECTION 7 STATISTICAL ANALYSES – One of the primary objectives should have been to compare the airborne asbestos TEM concentrations during both demolitions to the background airborne asbestos TEM concentrations and to prevailing urban ambient air levels. Data for the background comparison, shown in Tables 6-5 and A-4, are unfortunately limited in number and all yielded zero structure counts. Still, the null hypothesis that the demolition did not raise airborne asbestos TEM concentrations above background should have been tested separately for both methods. *Rejecting the null hypothesis casts doubt on the advisability of leaving floor tile and linoleum in a building during demolition.*

EPA Response: It is clearly stated in the report that both preliminary site assessment samples collected in January and background samples collected immediately prior to each demolition were non-detect for asbestos. The Primary Objectives compared the two processes, as outlined in the fully peer-reviewed QAPP. It was not an objective to determine if the NESHAP method resulted in the elevation of asbestos concentrations above background levels. The comment about revising the NESHAP has been forwarded to OAQPS for consideration if the NESHAP is revised.

Data on asbestos TEM concentrations in urban air have been published for many years, including a compilation in the HEI-AR report of 1991. More recent compilations are no doubt available. A statistical comparison of published ambient concentrations to the levels measured during demolition of the buildings would be of interest.

EPA Response: Unfortunately, the HEI-AR report considered only asbestos fibers five microns and longer. Some recent data and a brief discussion were added to the text to address this point.

7.1 Primary Objective 1 – This objective compares airborne asbestos contamination during demolition of two buildings with 3,992 ft^2 of non-friable floor tile and its underlying mastic plus 252 ft^2 of linoleum with friable backing. The fact that the 20,700 ft^2 of wallboard in the NESHAP building had been "meticulously removed" had no bearing on contamination levels during demolition, assuming that the abatement, visual inspection and clearance testing were done according to the EEG specification. The wallboard remained in the AACM building but, unlike the NESHAP building, it was saturated and foamed during the demolition. Thus, the variables are the absence of the wallboard during essentially dry demolition (NESHAP) and presence of the wallboard during wet demolition (AACM) with the presence of floor tile, mastic and linoleum common to both.

EPA Response: The major variable was the removal of asbestos-containing wall systems from the NESHAP building. The abatement process was cleared by visual inspection and PCM clearance as required. PCM clearance is a poor indicator of whether there is asbestos remaining. That is why EPA in AHERA required TEM clearance and aggressive air sampling rather than PCM clearance and non-aggressive sampling. The commenter's initial assumption that all the asbestos (other than VAT and backing) had been removed by the abatement process is not supported by the existing EPA data. Also, the NESHAP demolition was far from "dry," as close to 3000 gallons of water were applied during the NESHAP demolition.

The statistical analysis dealt largely with the handling of the non-detects -- zero structure counts -- due to the small number of positive samples where at least (and usually) one structure was detected. Thus, the conclusions are based more on what was not found on the filters than what was (barely) found. For no reason other than referencing the QAPP, data from Ring 2 were not used in this analysis, so a value of 0.0015 s/cm^3 during the NESHAP demolition was ignored. The conclusion from the statistical analysis was that the airborne asbestos contamination generated during the AACM demolition was higher than during the NESHAP contamination. *This does not argue well for acceptance of the AACM.* How much the floor tile, fragments of which were found in the soil after demolition, and the linoleum backing contributed to the airborne concentrations is not known but could be significant as it may have affected the results of both demolitions differently. Was the assumption that the floor tile and linoleum

would not contribute to the contamination levels, or that it would be the same for both buildings? Either would be a dangerous assumption.

EPA Response: Ring 1 was used for the test comparison, because it was closest to the demolitions and thus more likely to capture maximum releases. While there was a statistical difference in the AACM and the NESHAP airborne asbestos concentrations, the reported values for both processes were incredibly low, with the highest being 0.0019 s/cm^3 in Ring One for the AACM. The objective of the study was to determine if there was a difference in asbestos releases between the two methods. It was not possible to determine specifically what contributed to any airborne asbestos.

7.2 Primary Objective 2 – The post-demolition NESHAP soil results for Fraction 01 on which this objective depends were questioned in my comments on 6.1.4.2.1. The other pertinent results are the post-excavation AACM Fraction 1 soil results. Table 7-3 shows the soil to be clean by the TEM results, but do the PLM results agree?

EPA Response: The commenter appears to indicate that PLM results do not agree with "clean" TEM results for the post-excavation Fraction 01 soil samples. However, based on Table 6-11 which summarizes the data presented in Table A-12, all PLM results for the post-excavation Fraction 01 soil samples were non-detect.

The data for Fraction 03 for post-demolition AACM soil and post-excavation AACM soil do indicate a difference in the average asbestos content by PLM visual estimation: 0.87% for the former vs 0.32% for the latter. (The "<1" values were changed to 0.01 for this calculation.) However, the distributions overlap. In a practical sense, could two inches of depth be expected to have much effect on samples of soil that has been run over by a tracked vehicle?

EPA Response: EPA agrees and has revised the AACM procedure to increase the suggested depth of removal to 3-6 inches.

7.7 Secondary Objective 8 – Table 7-19 does not include samples during pre-wetting of the AACM building because none were taken. Using data from Table A-9, a comparison of the samples during demolition only (without the walkers) affirms that the exposure during the AACM demolition (mean = 0.0098 f/cm^3; 95% UCL = 0.0180 f/cm^3) is much less than during the NESHAP demolition (mean = 0.0351 f/cm^3; 95% UCL = 0.0781 f/cm^3). Considering that a wet demolition is being compared to a dry one, this should surprise no one.

EPA Response: NESHAP demolitions are not dry; sufficient water is added to ensure that there are no visible emissions. As shown in Table 6-8, 2895 gallons of water were used during the NESHAP demolition. In theory, the AACM is thought to be an improvement over the NESHAP due mainly to increased wetting and the use of an amended water.

The abatement samples should not be included in the comparison. In Table A-10, the "ND" entries for the NESHAP abatement are <0.0017 f/cm^3 and <0.0032 f/cm^3 with both equal to the limit of detection. Excluding the sample for Worker 5 (<0.0032 f/cm^3) because of its very short duration (possibly a pump failure) gives a mean concentration of 0.0621 f/cm^3 and a 95% UCL of 0.1424 f/cm^3. Although comparison to the OSHA PEL is not an objective, this result suggests that the wallboard may not have

been “adequately wet” before removal.

EPA Response: EPA believes that the abatement samples should be part of the comparison. While the purpose of the NESHAP, and any potential alternative method, is to prevent the release of asbestos into the environment, we still believe this is useful information. It was an objective of this study to document potential asbestos exposures for both methods.

The duration of sampling is unclear. For the NESHAP abatement, an 8 to 10 hr work shift is mentioned in 4.1.1.3.1 and the flow rate for personal samples is given in 5.1.2 as “either one or two liters per minute. An air volume of approximately 480 to 960 liters was targeted for these samples.” The data in Table A-10 suggest that the samples were taken during a 10-hr work day. Because these workers had exposure for an entire 8-hr shift and then some, there is no “zero exposure time” by which to adjust their exposure. Based on the sample volumes, ASB-2, 3, 4 and 6 were apparently taken at 2 lpm and ASB-1 at 1 lpm; the 60-L ASB-5 could have been either and probably represents a pump failure. It is unclear from Table A-9 whether the AACM demolition took twice as long as the NESHAP demolition or whether the former samples were taken at 2 lpm and the latter at 1 lpm.

EPA Response: The ASB-5 worker was loading the materials from the exit of the containment into the roll-off unit. It was not a pump failure, but a short-duration event. Most of the AACM samples were taken at the two-lpm flow rate, but the demolition of the AACM building itself also took slightly longer than the NESHAP demolition, because one of the lead trucks got stuck at the landfill.

Although “All field blanks had non-detected asbestos concentrations at <7 s/mm,” (9.3.1.2) there is no record of blanks for the personal samples taken for worker monitoring having been analyzed by PCM as required by 29CFR1926.1101 Appendix A or by NIOSH Method 7400.

EPA Response: Section 9.3 summarizes QA/QC results for the asbestos samples, because these were used to support the primary objectives. The same field blanks associated with the worker samples were analyzed for PCM; all results were non-detect at <5 fibers/mm^2. These results can be made available upon request.

The personal sample results have implications for respiratory protection requirements under OSHA’s revisions to 29CFR1926.1101(h)(3)(iv) on August 24, 2006. Demolition of a building with asbestos containing wallboard is OSHA Class II work. It is Class I if friable materials such as “popcorn ceilings” are left in the building as contemplated in Exhibit 1, Table 1. In the latter case, the OSHA standard would require the demolition workers to use powered air-purifying respirators until exposure monitoring showed that the PELs were not likely to be exceeded.

EPA Response: The materials that the reviewer indicates would result in a project being classified as Class I were not present; the work performed during this study met the definition of Class II Asbestos Work in 29 CFR 1926.1101(b). This study and any subsequent evaluations of the AACM are intended to determine whether it is appropriate for these materials to remain in a building to be demolished using the AACM. Ultimately, the choice of respiratory protection will be the responsibility of the competent person under OSHA regulations. As is typical, existing data may be considered by the competent person in making his/her evaluation of the building to determine the necessary respiratory protection.

7.12 Additional Secondary Objective – There is room in Table 7-15 to add columns for the VAT and other debris before the column "%ACM BY WEIGHT," which I assume includes both. My calculations for the average %ACM (including VAT and other) using data in Table A-13 are reasonably close to the values in Table 7-15 for the post-demolition NESHAP soil: 0.075% vs 0.086%. The data for the post-excavation AACM soil, however, are not in Table A-13, nor are the soil sample weights or VAT/other debris weights (see comment on 6.1.4.2.3). If the lower half of Table 7-15 is correct, the average asbestos content of 0.014% is, in fact, lower than for the post-demolition NESHAP samples. These distributions do not overlap. The question remains, however, whether this is a meaningful comparison. Also, if the post-excavation AACM debris consists entirely of VAT fragments, it constitutes an additional 0.09% of the installed VAT in the building, for a total of 0.61% that found its way into the soil underneath and around the building. (See comments on 6.1.4.2.3)

EPA Response: This comparison is meaningful and shows that, while there were VAT fragments left after both demolitions that were not there before, there were less after the AACM because of the soil removal. The above calculations are interesting but do not alter the VAT soil fragment observations.

SECTION 8 COST COMPARISON – This section documents substantial savings for the AACM demolition over the NESHAP abatement and demolition. These savings were realized with the demolition contractor working under intensive scrutiny by EPA and their designees in the context of a research project. Absent such oversight and with the emphasis on productivity and cost control common to a competitive bidding environment, further savings could undoubtedly be achieved. The costs in Table 8-1 are well-documented in the text and mostly reflect actual or pro-rated charges. I do not challenge them *insofar as they pertain to this specific demonstration*. Table 8-2 on the following page, however, presents my estimate of what it would cost to demolish the AACM building under "real world" conditions.

EPA Response: As noted by the reviewer, the costs documented by EPA in the report pertain to this specific demonstration. While the reviewer's estimate of costs under "real world" conditions is appreciated, EPA can only state, as done so in the report, that costs will vary based upon site-specific situations.

This table breaks out costs for an owner's representative and a demolition contractor. The Draft Report emphasizes the demolition aspects of taking down the AACM building while down-playing the fact that this work includes removal of ACM from the building and its disposal, making the job an abatement project subject to not only EPA but OSHA and state regulations. Most states that regulate asbestos abatement will require that it be done under the cognizance of an owner's representative independent of the demolition contractor and that plans and specifications be prepared for the work. Some may require the work to be done by a licensed asbestos abatement contractor, an assumption that Table 8-2 does not make. Participation by an owner's representative in the capacity of a consultant and project monitor is required by ASTM E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects as well as the National Institute of Building Sciences *Asbestos Abatement and Management in Buildings: Model Guide Specification.*

EPA Response: No ACM was required to be removed from the AACM building at the time of the demolition. The costs that the EPA reported were the costs that were documented and incurred. Projection of costs to other conditions was beyond the scope of this project. EPA regulations do not require conformance to ASTM nor NIBS standards.

Pre-demolition
The NESHAP does not define a "thorough inspection" before a renovation or demolition. The industry standard for such an inspection is not an "AHERA survey" but a Project Design Survey according to ASTM E2356 Standard Practice for Comprehensive Building Asbestos Surveys. The cost of this survey in Table 8-2 has been increased to $3,000 to allow for collection of information to prepare the plans and specifications in addition to collecting and analyzing bulk samples

EPA Response: EPA has no data, nor did the reviewer offer data, to support the contention that the ASTM inspection is standard industry practice.

If and only if the Project Design Survey determines that no ACM needs to be removed by an abatement contractor and an accredited project designer so attests (which could be challenged and subject him to a citation and other liabilities) should demolition by the AACM proceed.

EPA Response: The reviewer's suggestion will be forwarded to OAQPS for their consideration if the Agency pursues a revision of the asbestos NESHAP.

Plans and specifications need to be prepared by the accredited project designer because ACM will be disturbed and removed in the course of demolishing the building. The procedures for pre-wetting the ACM, wetting it during demolition, loading the trucks, disposal at the landfill and all associated cleanup must be described. The cost of preparing the plans and specifications is reduced from the NESHAP figure to $3,500 in recognition that certain activities and requirements for conventional abatement need not be described.

Site mobilization by the contractor has been increased to $5,000 to allow for construction and operation of decontamination facilities for personnel.

OSHA would consider this Class II work under 29CFR1926.1101 and require that the workers receive 8 hours of training and the supervisors an additional 4 hours. This training can be provided by the owner's on-site representative (project monitor), for which a daily rate of $400 reflects the absence of air monitoring services on days while training is being conducted. The contractor's labor rates for 14 workers and two supervisors approximate the $45/hr average in paragraph 8.2.5. The demolition crew will need to be fit-tested for respirators and there are other costs to the employer such as medical examinations and training associated with a respiratory protection program.

Table 8-2. Adjusted costs for AACM

Cost Item	Cost		
	Owner's Representative	Demolition Contractor	Total
Pre-Demolition			
Project Design Survey per ASTM E2356	$3,000		
Asbestos abatement sections of demolition specifications (Preparation and bidding)	$3,500		
Site mobilization and demobilization		$5,000	
Training - OSHA Class II (8 hrs) for 14 workers ($40/hr)	$400	$4,480	
Training - OSHA Class II (12 hrs) for two supervisors ($50/hr)	$200	$1,200	
Sub-total	**$7,100**	**$10,680**	**$17,780**
Building Demolition			
Preparation oversight and monitoring (2 men, 1 day @ $500/man-day)	$1,000		
Demolition oversight and monitoring (2 men, 2 days @ $500/man-day)	$1,000		
Excavation oversight and monitoring (1 man, 1 day @ $500/man-day)	$500		
OSHA compliance monitoring		$1,000	
Excavator		$2,400	
Labor		$10,035	
Wetting surfactant		$2,165	
Foaming equipment rental		$1,000	
Conductivity testing rental		$500	
PPE (respirators and clothing)		$1,000	
Sub-total	**$2,500**	**$18,100**	**$20,600**
Construction Debris T&D (asbestos and non-asbestos)			
T&D oversight (1 day)	$500		
Transportation		$6,143	
Scaffold for lining of trucks and liners		$7,078	
Asbestos waste disposal		$18,660	
Non-asbestos waste disposal		$2,678	
Water collection and disposal		$570	
Close-out documentation	$500		
Sub-total	**$1,000**	**$35,129**	**$36,129**
TOTAL COST	**$10,600**	**$63,909**	**$74,509**

Building Demolition

Coverage by two on-site project monitors for the first three days of demolition, including air monitoring for the owner's purposes, is shown. This would not be nearly as extensive as during the demonstration and analysis of samples by PCM would be expected. Coverage by one project monitor during excavation on the fourth day is shown.

The contractor's costs are taken for excavation, labor and wetting surfactant directly from Table 8-1. OSHA compliance monitoring is reduced to $1,000 by eliminating lead – assuming the contractor actually gets it done by a third party (not the project monitor). As it is unlikely the local fire company will send a foaming truck, $1,000 is shown to rent this equipment. The necessary equipment for conductivity testing will have to be rented and this cost is shown as $500.

Construction Debris T&D
One day of project monitor oversight and final close-out documentation are the only costs for the owner's representative, shown as $500 each. The costs for the contractor are taken directly from Table 8-1. Not to dispute that the contractor spent $7,078 on scaffolding during the demonstration for lining the trucks, I question whether they would go to that effort and expense were they not under the watchful eye of the federal government.

Summary of costs
The total cost for the owner's representative is $10,600 and for the contractor is $63,909, for an overall total of $74,509. Instead of the $50,967 (47%) difference between the NESHAP and AACM costs in Table 8-1, the difference in Table 8-2 is $33,822 (31%). The 4,500 ft^2 floor space is not necessarily the most appropriate basis for calculating unit costs: they could also be figured on the basis of the 20,700 ft^2 of wallboard or the combined 4,244 ft^2 of floor tile and linoleum.

Other costs
Two costs of potentially major significance are not shown in either table. It may be necessary, for community relations purposes if no other reason, to temporarily re-locate occupants of buildings in the vicinity of the one(s) being demolished. The size of such a "buffer zone" will depend on many intangibles and affect the costs accordingly. Business interruption and temporary lodging of residents are two of the costs. Also, it may be necessary (or at least prudent) to cover buildings with plastic as shown in Figure 4-16, and to inspect the buildings after the demolition is complete, in a manner that will convince occupants it is "safe" to move back in.

This section concludes by recognizing the competitive factors in the construction industry – including abatement and demolition – that could drive the costs for either approach up or down. A major cost that is not shown as a direct expense in either table is the contractor's general liability insurance. Unless the firm is regularly engaged in asbestos abatement as well as demolition, its insurance will exclude the work required by the AACM. Firms without asbestos coverage, which the owner would be foolish not to require, would not bid and the pool of potential contractors would be reduced.

EPA Response: As the reviewer's comments on the costs indicate, EPA made an effort to document, identify, enumerate and identify the actual costs of conducting the two demolition projects. Clearly, as the reviewer states, EPA's reported costs "reflect actual or pro-rated charges…insofar as they pertain to this specific demonstration." For the most part, the reviewer's comments on the costs represent his estimate of the cost for him to complete a similar project. The following presents a discussion of the costs the reviewer has indicated should be added to the project. The EPA reported a cost of $57,364, and the reviewer estimated a cost of $74,509, a difference of about 25 percent.

The major source of the differences in the reviewer's modified cost tables presented in his comments on the draft report assumes that the property owner would need to engage an asbestos consultant as an owner's representative. The project organization for a demolition project will definitely vary depending on the property owner's needs, but not all property

owners will choose to engage a representative in this manner. Further, there is nothing to indicate that the cost of an owner's representative would only be applied to a building demolished under the AACM; indeed, a property owner likely to engage a representative on a property demolished under the AACM would also be one likely to engage an owner's representative under the NESHAP process. Should an owner's representative be engaged, the owner's representative's scope of work would likely be similar to that of the project survey and specifications for the abatement of the NESHAP building. The cost for those services would likely be similar to the $4,272 cost of these activities observed by EPA on the NESHAP building, a cost about 20 percent below the reviewer's $6,500 in his estimate. The reviewer adds another $3,000 for project monitoring during demolition and project close-out. These costs will vary among not only projects, but across different property owners.

The workers in the exclusion zone for the AACM building demolition wore proper personal protective equipment and left the site through a proper contamination reduction zone (decontamination facility). A proper decontamination facility was constructed as part of this project. The level of effort to construct and operate the decontamination facility was included in the documented mobilization and labor costs reported by EPA.

The reviewer applied the full cost of annual Class II asbestos employee training to a single, very short duration project. Further, the reviewer also indicates that medical monitoring will be required of the demolition workers, but did not include these costs. Given that a firm could train and conduct medical surveillance of their employees for asbestos work and use these employees on a number of projects throughout the year, these costs should not be applied directly to a short term (less than 1 week) project, but rather reflected as overhead in the hourly rates of the crew members.

As for other costs noted (lead monitoring; fire department and hydrant; conductivity meter), these were project-specific and are representative of the costs EPA's contractor incurred on this project. Different project monitors may handle lead monitoring differently, different communities handle the use of water from a fire hydrant differently, contractors will evaluate the purchase of foam generating gear and they will charge them to projects differently, and one can purchase a conductivity meter from most scientific suppliers at list prices below the tabulated $500 rental cost. These cost differences represent a relatively small percentage of the differences in the overall project costs.

Regarding the liner and scaffolding costs, the reported $7,078 cost was dominated by the cost of the truck liners ($6,878). As documented in the draft report, the contractor purchased 200 of the pre-formed truck liners for $9,688 and used 142 of them on this project. The contractor independently evaluated options for lining the trucks, including the use of sheet polyethylene film, and determined the liners to be cost competitive and easier to install in the trucks. The $200 balance of the reported cost was for scaffolding rental. Again, it was the contractor that determined that the use of scaffolding was more convenient and safer than using ladders to install the truck liners in the beds of the dump trucks.

The overall cost to implement the AACM on the subject property was documented by EPA in the draft AACM report. The reviewer's costs are the costs he would expect if he were

to conduct a similar project. The difference between EPA's actual costs, and the cost predicted by the reviewer is about $17,000. Based upon the above discussion, some of the costs the reviewer applied to the AACM might be overstated, which might reduce his estimate somewhat. It should be noted that even the reviewer's estimated costs were about 25 percent below the cost of implementing the NESHAP on this building.

The choice of what to base unit costs on is arbitrary. In this instance, the building was being demolished in total, so building square footage was a reasonable choice. For the abatement process of the NESHAP building, the square footage of wallboard would be reasonable. Further, it is standard in the construction industry to estimate the cost of the work based upon the specifications and then divide the bid amount by the number of units stated on the bid documents to give the unit price. This practice would result in the project costs being the same, but the unit cost would change.

Application of the cost of asbestos liability insurance to the overall project cost is similar to the inclusion of the cost of training a crew to perform asbestos work. Indeed, there may be other expenses such as higher workman's compensation insurance costs that would be included in the project costs indirectly. These additional costs may be significant to demolition contractors looking to add the ability to demolish buildings under the AACM and will be reflected in the total project costs. These overhead expenses would likely be borne by the contractor, and charged as an overhead cost incorporated in labor rates, or incorporated elsewhere in the cost estimation process.

CONCLUSIONS

The demonstration project did not provide conclusive evidence that the AACM is comparable to current NESHAP methods insofar as the most important metric of airborne fiber concentrations is concerned; in fact, the statistical analysis shows it to be slightly inferior. A major deficiency was the failure to compare fiber concentrations during the demolitions to previously-measured background levels or to prevailing urban concentrations.

EPA Response: As we noted in the report the airborne asbestos (TEM) concentrations from the AACM are not equal to the airborne asbestos (TEM) concentrations from the NESHAP Method. We believe this difference may have resulted from section of the berm not being adequately wetted during the soil excavation. In future tests we plan to insure the berm is adequately wet during soil removal to determine if this does appear to be the cause. We did not believe that a comparison of the measured asbestos concentrations to background levels would be likely to provide meaningful results, and none of the QAPP peer reviewers suggested this approach. We did take background samples to insure that any asbestos measured during the test came from the test itself, and not some other source. Future tests will incorporate comparisons to background.

To achieve even this level of fiber control required using a foaming method that is beyond the capabilities or inclinations of the contractors who would be doing this work. The "cost savings" are substantially reduced when the expense of adequate preparation, oversight and training are considered. If anything, the demonstration showed that leaving asbestos flooring materials in a building while it is demolished is not advisable, as high concentrations of debris were found in the soil after the

both buildings were demolished. The extent to which the presence of these materials in both buildings affected the airborne fiber levels on which the primary objectives depended cannot be known.

EPA Response: The reviewer offers no data to support his claim that the use of the AACM is beyond the capabilities of demolition contractors. In fact, EPA strongly disagrees with this statement. Further, the Asbestos NESHAP does not require the removal of VAT. Some local regulations do. Where they do, the cost and speed advantage of the AACM will increase as the tile removal will add additional time, labor cost, and disposal cost to the abatement phase of the NESHAP.

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The opinions expressed herein are entirely his own and these comments were prepared without financial or other support by, or in collaboration with, any individual or organization. A version of these comments has been posted on his website at www.asbestosguru-oberta.com/aacm.htm.

2.3.9 Needed Research

If EPA plans another AACM research attempt, they should apply lessons learned in their first project:

- Prove that the method works for all materials intended to be left in place during demolition, especially the spray-applied and textured products.
- Prove that the method works for the ACMs to be left in place in all intended building types, e.g., wood frame, steel frame, concrete frame, etc.
- How is release impacted by improper wetting?
- Does this process work for amphiboles?
- Prove that typical asbestos amended water systems work (versus the fire fighting foam systems used in this test).
- How much soil needs to be excavated (3 inches, 6 inches)? How will this depth be accurately measured, given the type of equipment being used?
- Follow all OSHA and local regulations and cite these precisely in the report.
- To get realistic NESHAP costs, put a NESHAP project out to bid initially as a (blind) non-research/oversight project.

- Include costs for bid preparation and site monitoring (non-research) in the AACM budget.
- During site-selection phase, check the soils (TEM structures per gram) to avoid using a site with pre-existing asbestos contamination.
- Focus on TEM analysis of total airborne asbestos concentrations.
- Increase air-monitor flow rates to increase sensitivity and reduce NDs.
- Ensure that the AACM site is kept wet during excavation!
- Costs can be reduced by:
  - Limiting air monitors to a single ring as close as practical to the site.
  - Omitting asbestos air sampling within NESHAP abatement barriers[6].
  - Omitting total particulate measurement.

2.3.10 Considerations for Future Research Methodology

EPA should consider the following with respect to methodology of future research on the AACM method:

- Consider how the outdoor air monitoring should be modified for other geographical/meteorological locations? Should the modeling be adjusted or further tested?
- Recognize the limitations of this research project and consider those in planning future research. This project has proven the AACM effective for drywall systems in one-story wood frame barracks construction.
- Improve the dust fall collection methodology.
- Recognize that there is no consensus threshold of exposure for asbestos.
- Test variables (e.g., product types) one at a time so action and response can be completely understood.
- Conduct soil sampling on the NESHAP building both pre- and post-abatement.
- In Section 9 of this report, which notes deviations from the QAPP, provide justification for all deviations, along with a discussion of the impact on research results. Lessons learned should be carried forward to the next research effort.
- Reconsider integrated air sampling. Sampling discrete activities may provide useful information.
- Report abatement clearance samples.
- Specify what measurement criteria will determine “environmentally acceptable.”
- Use an AACM-allowable ACM other than wallboard.
- Use a building type other than a small all-wood building. For example, use a building that has:
  - Two stories.
  - A footprint larger than 5,000 square feet.
  - A partial or full basement.

[6] In a post-meeting comment, Tom Laubenthal wrote: In Section 2.3.9, the panel suggested omitting asbestos air sampling within NESHAP abatement barriers. It is important to understand that this suggestion does not include omitting OSHA-required personal air sampling.

EPA Response: EPA appreciates the suggestions of the panel and has already incorporated several of them in the AACM2 test and will expand on that list in AACM3. As stated in the preface, the following are already included:

- ***The second test was on a two-story transite building with only pavement,***
- ***The third test was on a two-story building with popcorn ceilings and troweled-on surfacing on the walls and with soils and pavement,***
- ***No amended water pump was used; just a simple in-line eductors,***
- ***A close-proximity wall was added in the second test to simulate nearby urban structure conditions,***
- ***The soil amounts to be removed (if present) have been increased to 3 to 6 inches,***
- ***NESHAP costs will be obtained by blind bid,***
- ***Air flow rates could not be increased for fear of overloading (happened to high-flow samples in AACM2),***
- ***Amended water was added throughout process,***
- ***Amended water concentration was lowered to 0.5-percent minimum targeted concentration,***
- ***Water usage was reduced to 15 gpm per hose,***
- ***The second ring of samplers was eliminated,***
- ***Particulate measurements were eliminated,***
- ***Post-abatement soil sampling was added to the study protocol, where applicable,***
- ***An additional Poisson distribution comparison statistical test was added to the toolbox to compare results to the background conditions, and***
- ***Worker breathing zone sampling during the initial wetting was added to the study protocol.***

2.3.11 Execution

With respect to future execution of the AACM, EPA should consider and address the following:

- What activities are prohibited (e.g., driving vehicles over ACM)? Develop a list of these activities.
- Given that wetting of the berms was omitted in this research under high scrutiny, what will happen in actual practice?
- Will enforcement be effective? How?
- In the AACM description, address responses to variables that cannot be controlled (e.g., weather; failures, such as breach of the containment berm).

2.3.12 Potential Problems for Real-World Application of AACM

The research report does not address several areas that may restrict use of the AACM, such as:

- Requirement for adequate space (about 25 feet) around the building to contain all the necessary equipment required for this method.
- Buildings nearby protected from fugitive dust.
- Buildings protected from water spray that might contain asbestos.
- Berm: is there space to construct?
- What is berm material to be constructed of and where do you get it?
- How do you remove the berm?
- Is the berm contaminated?
- Poly that covers the berm is contaminated.
- What about the availability of a water source?
- What about space for tank and pump systems for amended water?
- The need for transportation offsite of filtered water when no sewers are present.
- Replacement of topsoil.
- Basements that remain.
- Hard debris cannot be used as basement backfill, a common practice on normal demolitions.
- Metals cannot be salvaged for recycling.
- Hand cleanup of post-excavation debris.
- Difficulty of pre-wetting (e.g., type/condition of asbestos-containing material, type of asbestos, etc.).
- Complications caused by snow or rain.
- For buildings on sites with major elevation changes, berms would be a problem.
- Site closure: determination of project completion.

EPA Response: The panel's suggestions and concerns will be forwarded to OAQPS for their consideration if the Agency pursues a revision of the asbestos NESHAP.

***This completes the responses requested of EPA by the Peer Review Panel*.**