Appendix B

Hurricane Katrina Response

Approach for Conducting Source Emission Characterization Tests of Open Burning of Vegetative and Demolition Debris

Background

Given the enormous amount of vegetative, building, and demolition debris created by Hurricane Katrina, and the limited solid fuel capacity of industrial and commercial incineration facilities, open burning will be a key means of reducing the volume of waste to be disposed of. One of the more serious problems associated with Katrina is the huge number of homes, many of them older homes, that will have to be demolished and disposed of. Many of these homes likely contain asbestos, and safely demolishing the structures and disposing of the debris presents a significant challenge, particularly when using open burning as a means of disposal.

Unfortunately, there is relatively little reliable and quantitative information that can be used as a guide for ensuring that open burning processes are conducted so as to minimize the risk to health and the environment. Although there are reliable data on temperature requirements for thermal transformation of asbestos from chrysotile to the less harmful forsterite, there are no data that provide guidance on ensuring such temperatures in an open burning environment. There are also other pollutants that will be emitted from open burning sources that need to be characterized. In addition to criteria pollutants such as CO and PM (including PM_{10} and $PM_{2.5}$), it is likely that both vegetative and demolition debris will emit chlorinated organic compounds, including PCBs and polychlorinated dioxins, metals such as lead or mercury, and other gaseous pollutants such as HCl, SO2, and possibly H2S.

The purpose of this document is to outline an approach to developing the information needed to create effective and credible guidelines for open burning disposal of asbestos-contaminated demolition debris as well as for other materials that are likely to be disposed of via open burning. Such information must be developed with both the immediate needs in mind as well as future information needs, to ensure that EPA and other disaster response agencies are not in the same position of having inadequate information in the future. This information must also be developed within the context of minimizing interfering with ongoing restoration activities.

Required Measurements

Air Emissions Concentrations of the compounds below will be measured in the plume of the open burn pile, pit, or firebox:

Carbon monoxide (CO)	Carbon dioxide (CO_2)	Polychlorinated dioxins (PCDDs) and furans (PCDFs)
Particulate Matter mass (PM_{10}, $PM_{2.5}$)	Total hydrocarbons (THC)	
Lead (Pb)	Polycyclic aromatic hydrocarbons (PAHs)	Polychlorinated biphenyls (PCBs)
Mercury (Hg)	Benzene, toluene, ethylene, xylenes (BTEX)	Styrene
Asbestos (chrysotile and forsterite)	HCl, H2S, SO2	Phenol

Burning Debris Bed Temperature Temperature of the burning debris bed is a critical parameter in the transformation of asbestos to forms that are much less toxic than those in building materials. Mean temperatures (defined below) will be recorded during open burning operations, and are particularly important during emissions sampling activities.

Bottom Ash Analyses Materials that remain in the bottom ash will determine the appropriate solid waste disposal requirements. Samples of bottom ash remaining after (1) ash is removed from a pit or firebox; or (2) after a one-time burn at a pile or pit will be collected and analyzed for lead (Pb), mercury (Hg), and copper (Cu), and subjected to the Toxicity Characteristics Leaching Procedure (TCLP).

In addition, bottom ash will be analyzed for asbestos concentration and speciation (chrysotile and forsterite) through a modification to EPA bulk Method for Determination of asbestos in Bulk Building Material (EPA/600/R-93/116, July 1993). Under this modification, first examine the ash by PLM (Polarized Light Microscopy) for identification of any unburned chunks, followed by a washing step. Then filter the wash and examine that by Transmisssion Electron Microscopy (TEM) using ISO 10312:1995 Ambient Air-Determinations of Asbestos Fibres-Direct Transfer Transmission Electron Microscopy Method.

Debris Analysis It is expected that emissions will vary significantly as the composition of the debris varies. It is therefore critical to gain additional understanding of the debris composition. Given the physical size of the debris, standard solid grab sampling approaches are not likely to be appropriate. The debris must be characterized, in qualitative terms at a minimum, in terms of an estimated fraction of vegetative vs. building and demolition debris, estimates of wallboard, insulation, roofing, aggregate, blocks and bricks, and other major building components. Presence of electrical wiring, plumbing, furniture, and other debris should also be determined. The weight, volume, and degree of wetness of the debris will need to be measured or estimated.

Measurement Methods and Approaches

General Approaches Source sampling should be coordinated with ambient sampling to allow correlation between source and ambient concentrations to the extent possible. Testing will need to be coordinated with cleanup and recovery activities to ensure that source sampling does not interfere with proper disposal of debris.

Measurements should be collected for several different debris compositions (vegetative only, vegetative and demolition, and at least two demolition only) and for different open burning approaches (pit air curtain, firebox air curtain, and open pile). Given the heterogeneous nature of the debris, the transient nature of the ACD operation, and the inherent variability in open burning operations, it will be necessary to perform at least triplicate experiments on each individual run condition so that experimental precision can be assessed.

Air Emissions Direct sampling of the open burn plume is the desired approach. This can be achieved by use of a boom that holds the sampling system in the plume. The boom should have the capability to be moved to maintain the sampling probe as close to the center of the plume as

possible. It is not anticipated that a "traverse" approach will be taken, given the high variability that is expected to be seen even in a single location as the plume moves. The boom shall include both the sampling probe as well as temperature instrumentation.

Standard EPA sampling methods will be used to the extent possible, and will be modified or adapted as needed, in consultation with OAQPS Emissions Measurement Center . These methods were primarily designed for use in stack sampling situations and may need to be modified to operate as desired.

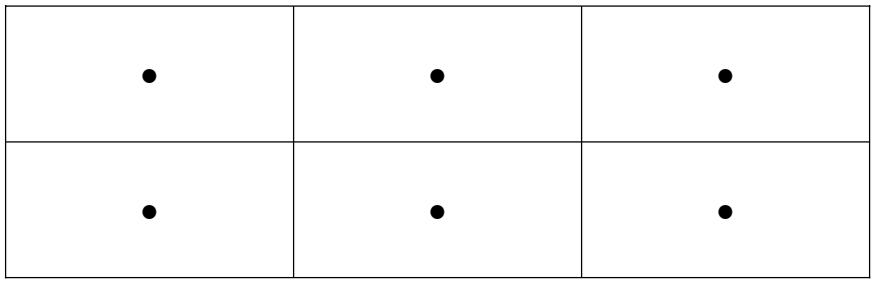
Continuous CO and CO_2 monitors can be used, as well as continuous monitors for total hydrocarbons (THCs).

PM will include both filterable and condensable fractions. PM size distribution measurements will be made using cascade impactors. If adequate power is available, mobility and aerodynamic particle sizers can provide valuable information, but are not as field-ready as impactors. PM samples will also be analyzed to determine the split between elemental and organic carbon.. It may be possible to perform additional physical/chemical analysis on the impactor stages, including assessment of airborne asbestos emissions.

Open-path remote sensing such as FTIR or DOAS can also be used to measure IR- and UV-absorbing VOC species, some two-ring PAHs, as well as HCl, CO, CO_2, nitrogen species, H_2S, and SO_2. These open-path methods can be installed across the top of the ACD, giving real-time measurements of the distribution of the pollutants in the plume.

Sampling of the ACD plume for asbestos is a challenge. An alternative approach to be considered is use of a long stainless steel tube to reach into the plume and continuously withdraw air. At ground level, the tube would be coiled a number of times and immersed in an ice bath to serve to cool the air before it entered the filter. Analysis would be by TEM using ISO 10312:1995 Ambient Air-Determinations of Asbestos Fibres-Direct Transfer Transmission Electron Microscopy Method.

Burning Debris Bed Temperature Measurements of temperatures in the burning debris bed will reflect the mean temperature across the bed. Remote IR thermometers will be used to take bed measurements at a minimum of six locations, equally spaced across the bed (see below). During plume sampling, temperature measurements will be taken every 15 minutes. The aiming locations of the measurements should remain the same for each 15 minute interval.



● – point at which temperature measurement will be taken

Bottom Ash Analyses Samples of the ash that accumulated during the burn from which emissions were sampled should be collected after completion of the burn. Samples should be collected from the center and each end of the firebox or burn pit, and from the top and bottom of the accumulated ash, and well mixed together. Equal amounts of ash should be collected from each point. Ash will be analyzed for asbestos, mercury, and lead, as well as for leachable toxic metals by TCLP. Ash samples will be archived for future analyses needs that may arise.

Debris Analysis At a minimum, mass/volume and visual analysis of the debris is necessary. Photographs of the debris piles from which the open burn is being fed would be very helpful in allowing more detailed visual evaluation of the debris composition. Where possible, samples of the debris should be pulled from the storage pile, choosing samples that appear to represent the composition of the larger pile. In the current situation, this may include sections of walls or other samples of similar size. While it is desirable to collect portions of the debris for detailed compositional analysis, care must be taken to follow adequate safety measures associated with handling and disposal of asbestos-containing materials. A qualitative assessment of the moisture content of the debris will be made.

Quality Assurance Requirements

In general, QA Level III requirements established by EPA/ORD/NRMRL will be used for field sampling activities. Although it is desired to perform these tests at a higher QA level, such as Level II, given the visibility and compliance implications of the tests, the fact is that the test methodologies will be largely based on adaptations and modifications of standard EPA test methods, so it will not be possible to satisfy all of the requirements of a Level II QA project. Close consultation with QA personnel will be ongoing throughout the process, and where possible, audits and test documentation will be performed similar to those done at Level II QA. A complete Quality Assurance Project Plan will be developed and approved prior to conducting actual testing.