



## Engineering Sciences Section - 2012

### C28 A Review of the World Trade Center (WTC) Dust Screening Procedure

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After attending this presentation, attendees will gain insight into the process used by EPA and others to develop a procedure to screen dust samples for the presence of particles unique to the collapse of the World Trade Center after the September 11, 2001 terrorist attack.

This presentation will impact the forensic science community by showing the practical limitations built into the method and based on the instrumentation chosen to carry out the analysis ultimately prevented the method from being adopted by the EPA.

It was evident during a meeting of experts sponsored by the EPA that a substantial amount of time, labor and resources had been invested in the "Dust Screening Procedure" developed by USGS and EPA scientists and staff in their attempt to produce a cost effective analytical procedure to determine the presence of WTC dust particles in settled dust samples that could be followed by a commercial laboratory. During the day and a half "Dust Screening Procedure" evaluation meeting, the purpose of the procedure, the details of the procedure, and discussions about the procedure were presented. This proved to be an excellent way to reveal any potential problems with the procedure and suggest ways to correct them. A set of 32 samples would ultimately be distributed to the eight participating laboratories, (three government and five commercial) for analysis according to the procedure adopted with any modifications. The results would be reported back to EPA for compilation.

Scanning electron microscopy-energy dispersive x-ray spectrometry (SEM-EDS) was the method of choice. The SEM-EDS analysis was manual and labor intensive, using x-ray maps or to perform quantitative analysis of particles dispersed in a field of view. This technique was based on an approach that could be applied to polished sections but was not appropriate for the analysis of particulate dispersed on a sample stub. Automated scanning electron microscopy, a technique that has been available to the forensic community for over 25 years, was discussed, but the fact that automated SEM-EDS was not generally available to the participating laboratories prevented its incorporation into the method. Polarized light microscopy (PLM), the work-horse of settled dust sample characterization, was not well represented. Many of the participating laboratories also did not have this capability (government labs included) and there was little confidence within the government agencies that PLM would be able to produce verifiable and reproducible data.

Time requirements of the analytical procedures incorporated into the method were such that collecting the x-ray maps (or x-ray images) required over 6.5 hours of instrument time. This did not include the time required for off line processing of collected digital images, manual SEM-EDS measurement and analysis of any glass fibers that may have been present and the time required to generate a report. The allocation of instrument time, analyst time and sample turnaround time were not well considered in the planning stages of the method development. The procedure that was eventually adopted took well over an eight hour work day to complete a single sample analysis by SEM-EDS. Instruments capable of automated analysis using motorized stages and available software were not an option due to the limited availability of such automated instrumentation in the government labs and in many of the commercial laboratories that participated in the study.

Overall, the study was limited by a singular approach to the analysis of a very complex sample. The "Dust Screening Procedure" was the result of existing USGS capabilities and was limited to the analytical capabilities available at USGS and the experience of the analysts with respect to multi-component dust sample analysis. Had the participating laboratories been allowed the opportunity to modify the procedure based on the sample constituents and known and widely accepted analytical methods, a more streamlined and thus cost-effective procedure may have been produced and ultimately accepted by the EPA.

**WTC Dust, SEM-EDS, Microscopy**