

Appendix 10

Discussion of the EPA Residential Cleaning Study

Introduction

In May of 2003, the EPA published its Interim Final WTC Residential Confirmation Cleaning Study (WTC RCCS; EPA Region 2, 2003). This document described in detail the approach, cleaning procedures tested, COPC sampling, and analytical results of studies to determine effective cleaning methods for residences impacted by the WTC collapse. The studies took place in a five-story building at 110 Liberty Street that was directly impacted by the WTC collapse. Numerous windows were blown out of the 110 Liberty property resulting in impregnation of the building by WTC Dust and Hazardous Substances. The following discussion addresses the applicability of the WTC RCCS to the cleaning of the Building.

1.1 Comparison of locations evaluated at 110 Liberty with those in the Building

The WTC RCCS study evaluated the contamination of most surfaces within the commercial and residential units in the 110 Liberty building. These included floors (hard and carpeted), bare concrete or sheetrock walls, ceilings, counter tops, baseboards, stairwells, elevator shafts, and HVAC units. Cleaning methods included vacuuming with various types of cleaners (standard household uprights to industrial strength vacuums with HEPA filtration) and wet wiping with various cleaners or water alone. Some surfaces were sampled and samples analyzed for COPC prior to cleaning. Surfaces were re-sampled after each cleaning event to determine if COPC levels were successfully cleaned to below benchmark screening levels.

The contamination of the Building by WTC Dust and WTC Hazardous Substances was evaluated in much the same way as was the 110 Liberty building. However, the number and complexity of sampling locations within the Building was much greater than in the 110 Liberty property:

Floors: The Building contains 40 occupied floors of much greater square footage compared to only five floors at 110 Liberty. This represents a vastly larger space requiring a much larger number of sampling events. Due to the size of individual floors and the differing complexity of interior design, there is increased variability in the pattern of contamination throughout the Building compared to 110 Liberty that complicates cleaning and sampling to verify cleaning. WTC Dust and Hazardous Substances were found on every floor tested in the Building.

Walls: The Building has interior walls of multiple types. These include full-height insulated, full-height non-insulated, partial-height insulated, and partial-height non-insulated walls. Partial-height walls end at the ceiling and do not connect with the deck of the next floor above as do full-height walls. Non-insulated walls have a cavity in the middle that can act as a reservoir for contaminants that enter the cavity from the top (in the case of partial-height walls) or through interruptions such as doors, light switches, and data ports. Wall cavities of the 37 floors tested in the Building contain elevated levels of WTC Dust and Hazardous Substances. The presence of wall cavities and approaches to cleaning them were not addressed in the WTC RCCS of the 110 Liberty property.

In addition to interior walls, the Building also has curtain walls between the windows that form an additional protective barrier between the structure of the Building and provide a more aesthetically pleasing façade. Since the curtain wall interiors form shafts that traverse the Building vertically, they also provide another reservoir for contaminants that entered the Building following the collapse of the WTC. The interior and surfaces of the curtain walls in the Building contain elevated levels of WTC Dust and Hazardous Substances. The presence of curtain walls and approaches to cleaning them were not mentioned in the WTC RCCS.

Ceilings: Most floors in the Building have plenums between the ceilings and the deck of the floor above. These spaces act as reservoirs for WTC Dust and WTC Hazardous Substances. Due to the presence of partial-height walls, airborne contaminants could travel through the plenums to other areas of the same floor resulting in repeated exposure to the workers in the occupied spaces. Furthermore, fireproofing covering the deck of each floor is contaminated with WTC Hazardous Substances, providing another potential source of ongoing contamination. In EPA's WTC RCCS, the chiropractor's office was described to have a suspended ceiling from which the air conditioning system is suspended. No mention is made in the WTC RCCS of any sampling or cleaning activities by the EPA or any other cleaning contractor in spaces above the suspended ceiling of the chiropractor's office or any other unit in the building.

Elevator Shafts: The Building contains three main elevator shafts in the core that serve the low-, mid-, and high-rise levels of the Building. Including freight and other service elevators, there are a total of 30 elevators, all of which are contaminated with WTC Dust and Hazardous Substances. The 110 Liberty Street Building has one elevator. Since a single elevator services many floors, the impact of contaminated

elevators in the Building was a much more complex issue than that in the 110 Liberty studies.

HVAC Units: The Building is serviced by two main HVAC units that each provides airflow to approximately half the Building. The systems consist of complex air delivery and return flow systems that include perimeter induction units that are associated with the curtain wall interior spaces and provide air circulation through louvers located beneath the windows. The ductwork includes thousands of feet of high- and low-pressure ducts that were subject to the infiltration of WTC Dust during the collapse of the WTC towers. The Building's HVAC systems are vast, difficult to clean reservoirs for WTC Dust and Hazardous Substances. The only two units in the 110 Liberty property with HVAC systems that were cleaned in the RCCS were the Food Exchange and Lemongrass Grill. These units lacked the complexity and vastness of service area of the Building HVAC systems. In addition, the cleaning procedures used in the 110 Liberty HVAC systems were not adequately detailed in the WTC RCCS.

In addition to the locations sampled in both the Building and the 110 Liberty property, numerous other locations (some of which are mentioned above) were evaluated in the Building that were not evaluated at 110 Liberty or were not applicable to that building. These include:

- IT Equipment
- Basement Concrete
- Fireproofing
- Interior Wall Cavities
- Curtain Wall Cavities
- Curtain Wall Insulation
- Cell Systems and Risers
- Mechanical Equipment Rooms
- Perimeter Induction Units
- Structural Steel
- Roof

1.2 Comparison of pre-cleaning contaminant levels

The most applicable cleaning study for comparison to the Building would feature the cleaning of a building with similar contamination levels. The 110 Liberty property was professionally cleaned by the owner (Liberty Street Associates, LLC) before the WTC RCCS study was initiated. The EPA stated in the WTC RCC report:

“Those cleaning activities [performed by the owner] focused on the removal of gross dust and debris. Floors, walls and ceilings were cleaned using HEPA vacuums, AFDs and wet wiping using soap and water. Personal items, such as furniture, clothing, electronics and kitchenware were not cleaned...The cleaning performed during this period was limited to the residential units, the common areas, the basement, the roof, and the Baldwin Realty Company 12 office. None of the other commercial spaces had been cleaned.”

However,

“Although the cleaning discussed above took place prior to implementation of the study, there had been significant re-deposition of dust that had become airborne during the removal of the WTC-related debris. At project assignment, the Chiropractor's Office and the Mattress Store were covered with inches of dust. The New York City Fire Department vacuumed dust from these units just prior to commencement of the study, as part of the recovery operation. Prior to cleaning, each unit was inspected and photographed to document its condition and contents.”

Following are comparisons between the two buildings of pre-cleaning average concentrations of asbestos, dioxins, and lead in settled dust in Table 1 below:

Table 1 - Average “pre-clean” levels of asbestos, dioxins, and lead in the 110 Liberty building and the Building

Contaminant	110 Liberty	Building ¹	Ratio of Average Levels (DB:110 Liberty)
Asbestos	22,171 s/cm ²	2,257,000 s/cm ²	101.8
Dioxins	9.2 pg/100 cm ^{2*}	56.4 pg/100 cm ²	6.1
Lead	116 µg/ft ²	420 µg/ft ²	3.6

1 – RJ Lee, 2003. TP-01 Contamination Report

The Building contained more than 100-fold higher average concentrations of asbestos, more than 6-fold higher average concentrations of dioxins, and nearly 4-fold higher average concentrations of lead in settled dust than did the 110 Liberty property. Despite the EPA's claim that significant settled dust had been re-deposited as a result of debris removal, the levels of primary contaminants in the 110 Liberty building were still drastically lower than those found in the Building.

1.3 Other observations

a) Pre-cleaning wipe samples of non-porous surfaces from floors, walls, and horizontal surfaces were analyzed for all COPC. However, ceiling surfaces were only analyzed for asbestos. Micro-vacuum samples of porous surfaces were only tested for asbestos and lead. It is unclear why dioxins, PAH, and other COPC were omitted from these analyses. Furthermore, since the COPC Committee failed to assign a health-based benchmark screening level for asbestos in settled dust, there was no benchmark for comparison of asbestos wipe samples in this study to begin with. Due to the potential for human exposure to other COPC on ceilings and from porous surfaces and for the sake of a consistent cleaning evaluation, the analyses of these surfaces should have included all COPC.

b) The EPA stated in the WTC RCCS that the use of aggressive sampling to verify cleanup was causing an overload problem with sampling equipment. This was the reason for using the modified-aggressive sampling technique, to correct the overloading problem. However, the EPA suggested that the conditions created during the aggressive sampling procedure (in which high enough concentrations of dust were created to overload equipment) were not typical of residential living situations. However, if enough dust remained to cause equipment overloading during aggressive sampling techniques, it is questionable as to whether the cleaning methods were effective to reduce dust levels below screening levels. Likewise, it is uncertain as to whether the risk of future residential exposure to WTC Dust was sufficiently abated.

c) For dioxins, the primary clearance criterion is listed as 4 ng/m² or 40 pg/100 cm², the same level as presented for peer review by the COPC Committee in their Draft report of September 2002 (COPC Committee, 2002). However, the COPC Committee's final clearance criterion for dioxins is 17 pg/100 cm² (COPC Committee, 2003a). Since the WTC RCCS was also published in May 2003, it is unclear why the EPA did not adopt the revised final criterion for dioxins from the COPC Committee's Final report. The EPA

did adopt the final conclusion of the COPC Committee to omit a health-based benchmark for asbestos in settled dust. There appears to have been no consistency in the adaptation of screening levels in the WTC RCCS. Interestingly, dioxins in one wipe sample from Unit 4B in the 110 Liberty property were measured at a concentration of 20 pg/100 cm². This value, though reported to be below the screening level for that study, was in excess of the final revised

COPC Committee's screening level for dioxins of 17 pg/100 cm².

d) The EPA summed and ranked the units that were cleaned in the WTC RCCS according to the WTC Dust that was visually present prior to cleaning and the levels of contaminants found in the units prior to cleaning. The study authors, using a sum of ranks comparison, concluded that the more heavily a unit was impacted by WTC Dust (by visual observation), the more impacted by individual COPC. However, their analysis showed that great variability exists between the amount of visible WTC Dust and the levels of certain COPC in the unit. For example, Unit 5A was judged to have minimal dust by visual observation, yet it ranked first in average levels of lead and asbestos determined by wipe sampling. Unit 5D, though judged to have significant dust accumulation, ranked 9th overall in levels of all contaminants, and averaged 9th for lead and asbestos. This is another example of the variability of contamination in buildings impacted by the collapse of the WTC and adds more uncertainty to the cleaning evaluation.

e) In the WTC RCCS, the sampling of the Lemongrass Grill showed asbestos wipe samples from the HVAC system post-cleaning were below the detection limit (BDL). However, the detection limit for those samples was over 12,000 s/cm² as opposed to the usual 3000 s/cm². It is uncertain whether these samples are reliable measurements of the asbestos levels in the HVAC system. In addition, lead wipe samples post-cleaning were both above the 25 µg/ft² screening level in the HVAC system. The authors of the WTC RCCS stated that this was attributed to the composition of the construction materials. The meaning of this statement and its applicability to the presence of lead in settled dust in the Lemongrass Grill HVAC system is unclear.

f) Construction and repair activities commenced prior to the initiation of the WTC RCCS and were ongoing throughout the duration of the studies. Regarding the independent repair contractors working in the 110 Liberty building during the study, the EPA stated:

“Prior to commencing cleaning, signs were erected and caution tape was placed around the areas undergoing cleaning, to avoid interference by other contractors. Unfortunately, work conducted by window repair and floor contractors created dirt and debris that necessitated re-cleaning of some units.”

This lack of control of the study areas adds additional uncertainty to the results of the studies and to the evaluation of the cleaning methods used.

g) The EPA used different cleaning methods in various units and common areas of the building. On occasion, multiple cleaning methods were used in the same unit. Since the authors reported the variation in impact of the contamination from one unit to another, these factors made comparison of the success of different cleaning methods nearly impossible.

Each of these observations adds to the uncertainty surrounding the utility and success of the cleaning methods used in the WTC RCCS.

In summary, the studies performed at 110 Liberty by the EPA are not applicable to the Building for several reasons. First, there are locations in the Building that require cleaning for which no cleaning approaches were provided in the WTC RCCS report. Second, the variety of locations within the Building for which cleaning must be considered is not matched by the 110 Liberty property, and is beyond the scope of the WTC RCCS. Third, the 110 Liberty property was not as heavily impacted by WTC Hazardous Substances as the Building. Finally, numerous uncertainties and inconsistencies are present in the WTC RCCS that bring to question the success of the cleaning methods used in the study.