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BINGHAMTON STATE OFFICE BUILDING:
DECONTAMINATION OF THE BASEMENT MECHANICAL ROOM

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On February 5, 1981 an intense transformer fire in the basement mechanical room of the Binghamton State Office Building (BSOB) spread soot throughout the 18-story office building. The soot contained high levels of polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). Building decontamination has been a very slow process.

Before 1985, decontamination efforts concentrated on the upper floors of the building. Decontamination of the lower zone of the building (subbasement, basement and first floor) began in earnest in 1985 and continued through 1987. Test data from December 1987 suggested that the lower zone of the building was thoroughly cleaned (1), and in the spring of 1988 reconstruction in the lower zone began.

In June 1988, air and surface wipe samples were collected throughout the BSOB to compare to cleanup guidelines for final reoccupancy. Air samples from the basement mechanical room detected PCDD/F levels at 17 pg/m^3 , in excess of the reconstruction guideline of 14 pg/m^3 and the re-entry guideline of 10 pg/m^3 (2)- PCDD/Fs are reported as 2,3,7,8-TCDD equivalents, calculated using toxicity equivalence factors developed for the Binghamton State Office Building (3).

Thus, in August 1988, the basement mechanical room was again sealed off from the rest of the building, entry into that room required full respiratory protection, and reconstruction was soon stopped. In September 1988, additional sampling revealed significant PCDD/F contamination on overhead pipes and under heavy stationary equipment (4).

PCDD/F levels in the air of the mechanical room remained elevated despite efforts to clean contaminated surfaces and repaint the floor with epoxy paint. Thus, in October 1989, extensive sampling included cores of the floor and walls in the mechanical room. The concrete block wall behind the elevator shafts had PCDD/F levels as high as 108 ppb ($\mu\text{g/kg}$) and PCBs as high as 340 ppm (mg/kg) in the surface 20 mm of material. The surface 13 mm of the concrete floor also had elevated PCB and PCDD/F levels (5).

In December, an air pollution control (APC) unit (an exhaust fan with carbon filters) was connected to the west end of the room. In addition, a garage ventilation fan on the northeast end of the room was connected through carbon filters to exhaust air from the room. Perfluorocarbon

tracers (PFTs) were used to measure ventilation rates in the room with and without the fans operating (6) Without the fans operating, the ventilation rate was 3 air changes per hour (ACH), the PCB concentration was $0.11 \mu\text{g}/\text{m}^3$, and the PCDD/F concentration was $19 \text{ pg}/\text{m}^3$. With full ventilation, the ventilation rate was 9 ACH, but the PCDD/F concentration was $15 \text{ pg}/\text{m}^3$ (7). Measurement of the PCDD/F concentration in the east and west ends of the room indicated that 80-90% of the PCB and PCDD/F source(s) were located in the eastern portion of the room, the portion of the room containing the contaminated wall and most contaminated floor.

In response to these results, extensive additional cleanup work was begun in early February, 1990. The elevator shafts were sealed above and below the basement level, an entry portal to the room and other temporary containment walls were constructed, and several items of unnecessary stationary equipment were removed from the room. About 130 m^2 of concrete block wall was dismantled, and the surfaces of remaining walls, floor and ceiling were removed with several precautions taken to reduce dust and to confine any dust that was generated.

In July 1990, after this extensive additional demolition, PCB and PCDD/F levels in the room air were greater than before the work, $0.30 \mu\text{g}/\text{m}^3$ and $80 \text{ pg}/\text{m}^3$, respectively (7).

Two different approaches were undertaken in order to localize the source of PCBs and PCDD/Fs to the room air. First, the room was divided into five zones using polyethylene sheeting, and PCB source (emission) rates were measured for each zone using five different PFTs. In addition, a one-square-meter hood was fabricated to measure the flux of PCBs from several locations on the floor. Both tests implicated the floor in the vicinity of the original transformer as the primary source of PCBs and PCDD/Fs to the room air (8)

In January 1991, chip samples found PCBs as high as 9,700 ppm (almost 1%) and PCDD/Fs as high as 4.9 ppb at the transformer site. A small crack immediately adjacent to the highest sample extended through the entire 6-inch-thick floor slab. Two chip samples from the lower surface of the floor (ceiling in the subbasement) at this crack contained 12,000 and 33,000 ppm PCBs (9).

In June 1991, the entire floor at the crack (an area of about 1 m^2) was removed. Additional floor surface was removed to a depth of another inch over a 15 m^2 area and approximately 13 mm was also removed over another 36 m^2 . After the removal was completed,

the floor surface over the entire room was restored using high-density epoxy mortar. In July 1991, after this work was completed, the PCDD/F concentration in air still exceeded the cleanup guidelines; however, the ventilation rate in the room was very low (1.2 ACH). The source of PCBs and PCDD/Fs in the eastern portion of the room no longer existed, but the sources in the western part of the room remained. Additional efforts have begun to identify these sources, and to determine whether forced-ventilation can keep the PCDD/F concentration in the room air below the cleanup guidelines.

The use of PFTs to measure ventilation rates has been a powerful tool to identify and quantify remaining sources of PCBs and PCDD/Fs to the air in the mechanical room. Results of this testing have helped identify strategies for remediation of the contamination in the room.

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