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"LESSONS LEARNED FROM THE TRANSFORMER FIRE AT THE BINGHAMTON (NY) STATE OFFICE BUILDING"

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I bring you greetings from New York State, the home of interesting but--Love Canal notwithstanding--by no means unique environmental contamination problems.

The tallest building and most prominent landmark in Binghamton, a city of some 60,000 people in southeastern New York, near the Pennsylvania border, is the 18-story State Office Building.

In February of 1981, an intense fire occurred in the electrical switching equipment in the basement mechanical room of the building. The switching equipment was located adjacent to two electrical transformers which were filled with a non-flammable insulating compound. Sixty-five percent of this material consisted of polychlorinated biphenyls which contained 54 percent chlorine (PCB-1254) and 35 percent was chlorinated benzenes.

The heat from the fire cracked a ceramic bushing on one of the transformers, and about 180 gallons of the insulating oil sprayed onto the floor and into the hot switchgear. The fire produced a fine soot that spread up the open vertical chase that carried exhaust from the men's room on every floor and thence throughout every floor of the building.

Analysis of soot samples recovered from the building revealed high concentrations of PCBs, and the presence of polychlorinated dibenzofurans, dibenzo-p-dioxins and biphenylenes at lower concentrations. These additional chemicals were apparently formed by the pyrolysis of the PCBs and chlorinated benzenes that leaked from the transformer.

After careful study, including extensive sampling and analysis of various components, materials and surfaces in order to access levels and patterns of contamination, a plan was generated and implemented to decontaminate the building. A systematic combination of removal/disposal and cleaning has been conducted under a stringent health and safety program. The goal is to achieve levels of cleanliness prescribed by a panel of expert scientific advisors not associated in any way with New York State government.

The building was closed and sealed shortly, but not immediately after the fire, and remains closed today, as cleaning operations continue. The building's 700 employees are temporarily working at various sites scattered in and around Binghamton. The target date for reopening the building is next summer, by which time the cost of the cleaning operation is estimated at close to $22 million, which exceeds the building's original cost of $20 million.

Estimates of the cost of tearing down the building, safely disposing of the contaminated materials, and building a replacement building reached as high as $100 million.

Contamination of the air around the building has been prevented during the cleanup by routing all exhaust air from the building through air pollution control units that were installed on the roof. These units have special filters that trap PCBs and other toxic chemicals. No untreated air will be released from the building until the air is so clean that people cleaning and restoring the building can work safely without using respirators.

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Based on an exposure assessment carried out by the Bureau of Toxic Substance Assessment of the New York State Department of Health, the use of respirators will no longer be required when it can be demonstrated that the level of contaminants in the air of the building results in a toxicity less than that which would result from the presence of 14 pg/m^3 2,3,7,8-TCDD. This corresponds to the expert advisory panel recommendation that the building not be reoccupied until exposure by all routes to the toxic chemicals be limited to a level no greater than that which would result from ingestion of 2 picrograms of 2,3,7,8-TCDD per kilogram of body weight per day.

We have developed and adopted a concept of "2,3,7,8-TCDD equivalents" as a measure of the effective toxicity of all chemicals present in the Binghamton State Office Building. This parameter is utilized as the determinant for assessing exposure and risk. The algorithm for calculating this equivalent incorporates factors for the relative toxicity of individual chemicals, congeners, and isomers.

In September (1984) we began the first of three rounds of air sampling to determine whether the cleanup, which is now substantially complete for floors 2 through 18 of the building, has reduced the level of toxic contaminants sufficiently to allow workers to remove their respirators and to allow untreated air to be vented from the building. The air samples will be analyzed by two different laboratories.

The toxicity of the soot of the building, expressed in terms of 2,3,7,8-TCDD equivalents, was measured by scientists associated with the Wadsworth Center for Laboratories and Research of the State Health Department, who administerd an aqueous suspension of the soot to guinea pigs. The toxicity of the soot, compared to that of a soot sample containing only 2,3,7,8-TCDD administered under identical conditions, was equivalent to a 2,3,7,8-TCDD concentration of 58 ppm.

For comparison purposes, a mathematical estimate of the 2,3,7,8-TCDD equivalents in the soot was also made. Using the known concentration of chlorinated dioxins, furans and biphenylenes in the soot and making certain assumptions about their toxicity as compared to 2,3,7,8-TCDD, the toxicity of the soot was calculated to be approximately 44 ppm of 2,3,7,8-TCDD equivalents. This value closely correlates with the observed value of 58 ppm.

At this point, I would like to backtrack and insert some chronological information about the fire and its aftermath.

In the days immediately following the fire of February 5, 1981, before the extent and nature of toxic contamination became known, more that 300 people reentered the building to help with the cleanup, or to retrieve documents and personal effects. A cleanup effort was begun, involving State workers and employees of a private firm.

Not until three weeks after the fire, on February 26, when the extent of toxic contamination was discovered, was the building closed and secured, and the decision made to engage the services of a firm with specialized knowledge in the field of toxic removal and cleanup.

On April 1, 1981, the State Office of General Services hired Versar, Inc., of Springfield, Virginia, to oversee the planning, preparation and conduct of the cleanup operations. To give you an idea of the extent of the cleanup effort, through February of this year solid waste disposal from the site reached a total of 4,676 cubic yards of materiel. This materiel filled 1,464 barrels which were buried in an approved secure landfill site. All of the furniture in the building was removed, destroyed and buried, and will heve to be replaced.

A 14-member panel of scientific experts who are not State employees, and are knowledgeable in the area of epidemiology, medicine, and toxicology, was convened, and held its first meeting in April, less than two months after the fire. The panel has reviewed and approved the State standards for ventilating the building, for working and protective devices, and for reoccupancy. They also approved the plan of medical surveillance of persons exposed to the soot.

One of the lessons we learned earlier in the Love Canal landfill episode in Niagara Falls is the importance of maintaining an open line of communication with the community and with local political officials. Beginning on June 8, 1981, State officials representing

agencies involved in the cleanup and followup of the fire, met with city and county officials in what has been a continuing dialogue on the State's plans, intentions and progress in dealing with fire and its sequelae.

Also, in June, the State Health Department began to implement a plan designed to assess the health consequences of the fire. This plan complemented and extended health monitoring efforts launched by the Broome County Health Department soon after the fire.

The State Health Department administers the Binghamton State Office Building Medical Surveillance Program. At the State's request, the supervision and direction of the program was made the responsibility of the National Institute of Occupational Safety and Health.

The plan entails a multi-stage process contingent upon an individual's probable level of exposure. Anyone who entered the building on or after the date of the fire was requested to have a series of laboratory tests performed. Laboratory tests were also offered as a public service to those who felt that, because of their proximity to the fire or the site of the fire, they may have been exposed to contaminants.

The laboratory tests were performed at a local hospital, and entailed a serum biochemistry profile of 20 analyses, including liver function tests, together with a complete blood count with platelets and differential. These tests were nearly identical to those ordered by the Broome County Health Department several months earlier.

Physical examinations and interval medical histories were conducted on those persons who remained in the building for at least 25 hours during and/or after the fire.

The rationale for this schema is the belief that if health problems did occur as a result of exposure to PCB, dioxin, or dibenzofurans, they would probably affect persons who had the greatest exposure such as those who had entered the contaminated building. The likelihood of exposure also increased with duration, so that most intensive efforts were focussed on individuals who were in the building 25 hours or longer.

The most recent enumeration of the targeted population for health follow-up is 521 Three hundred and eighteen of this number actually entered the building during or after the fire. The remaining 203 persons were predominately those who worked in adjacent buildings and felt that they may have been exposed through secondary sources.

Of the 318 who reentered the building, 185 remained there for at least 25 hours. This group included 47 State employees who were involved in the initial cleanup, approximately 33 private electricians who removed and replaced the destroyed transformer, and 48 professional pollution control workers. While 33 firemen who fought the fire were not exposed for as long as 25 hours, they, too, were given physical examinations, since they were exposed at a time when the chemicals were in a volatile state.

The first round of the medical surveillance program, which began in September of 1981, was largely completed by the end of January 1982. A second round of questions and medical follow-up will be complete in December 1984.

Copies of the results of the tests and examinations were sent to the personal physicians of persons in the program. The workers were sent letters asking them to contact their personal physicians and discuss the reported findings. Informational brochures were published and distributed. Beginning in the fall of 1981, for as long as there was local interest, a State Health Department representative traveled to Binghamton from Albany (120 miles) twice a week to serve as liaison between the Department and the community.

For the past several months, the Department has been represented in Binghamton by a full-time ombudsperson.

A health registry has been established for the 482 persons tested or examined for exposure in the Binghamton fire, to determine if, over time, any adverse health effects resulted from exposure to the contaminants released in the fire. The future use of this registry will be an agenda item for the next expert panel meeting.

To date, analysis of the medical data has not revealed any clinically significant abnormalities related to the fire. No cases of chloracne, a common consequence of elevated dioxin exposure, have been found. Only ten persons were found to have modestly increased serum PCB levels (20 ppb or greater). In six of these individuals, other factors may account for the elevation.

Liver enzymes and lipid levels increased with serum PCB concentrations, but they were unrelated to the degree of exposure and generally were within normal limits.

The principal, detectable health impact of the Binghamton episode, as was the case at the Love Canal, was the psychological effect on those involved. Exposure to a toxic chemical with the notoriety of dioxin presumably carries with it a high level of emotional stress.

In the three-and-one-half years that have passed since the fire, four of the study population have expired. Two of those who died succumbed to heart attacks, one died of a brain tumor, and one committed suicide. In a cohort of this size and age range, we find nothing unusual in this mortality rate.

Although NIOSH does not see the need for further testing, the New York State Health Commissioner has promised the Mayor of Binghamton that the registry will serve as a vehicle for the longitudinal health follow-up of the study population. We will, for example, examine the relative incidence of cancer and untoward birth events

What are the lessons learned as a consequence of the Binghamton fire?.

Some seem obvious, and others will become apparent with time. Of those learned thus far, I believe a few are worthy of mention.

One of the more obvious achievements is that our Wadsworth Laboratory scientists now are able to accurately measure dioxins and furans in air at very low levels. We've also learned a lot about in vitro biological testing for dioxin and its congeners. We believe we have made significant contributions to risk-assessment methodology.

From a medical standpoint, levels of exposure were so low that we were unable to measure them and it is highly unlikely that effects will ever be observed.

Once again, we learned that episodes of this kind create all kinds of political fallout.

We constantly had to reassure the public and local officials that we were being absolutely candid in our dealings with them. Despite our best efforts, doubts lingered, and the local news media commonly fanned the flames of these controversies. We ultimately went to the length of placing all published reports and information bulletins in the public libraries and other places where the public would have convenient access to them.

We also had to meet and communicate on a regular basis with labor union officials representing State workers displaced by the fire

All in all, we learned in Binghamton what we previously learned at the Love Canal.. that an event of this kind is a socio-political problem as much as it is a scientific one.

Thank you.

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