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NEW MEXICO STATE HIGHWAY DEPARTMENT
GENERAL OFFICE BUILDING AND ANNEX
SANTA FE, NEW MEXICO

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## I. SUMMARY

In September 1987, the National Institute for Occupational Safety and Health (NIOSH) with assistance from the State of New Mexico Bureau of Occupational Health and Safety conducted a one year follow-up test in the New Mexico State Highway Department General Office Building and Annex in Santa Fe, New Mexico. The buildings were contaminated with polychlorinated biphenyls (PCBs) as a result of a transformer malfunction in June 1985; decontaminated during June 1985 through July 1986; and certified by NIOSH as acceptable for reoccupancy in August 1986. The objective of the test was to verify that the conditions, with regard to the contamination, did not change significantly since these buildings were judged to be acceptable for reoccupancy.

A total of 25 air samples were collected for the analysis of PCBs. Two of these samples were collected in the buildings fresh air intake plenums to determine the concentrations of PCBs entering the buildings through the ambient air; and 23 samples were collected in the workspace of the buildings. The ambient air samples did not show detectable concentrations of PCBs at a detection limit of <0.017 ug/m$^3$. Three of the 23 workspace samples showed detectable concentrations of PCBs. These three sample were collected in the basement of the General Office Building and ranged in concentration from 0.028 to 0.15 ug/m$^3$. These test results demonstrate that, since the time of certification, the airborne concentrations of PCBs have decreased to generally non-detectable concentrations (<0.019 ug/m$^3$)

in these buildings, and that all concentrations are significantly below the reoccupancy criteria of 0.5 ug/m3.

Based upon these test results, it is concluded that the New Mexico State Highway Department General Office Building and Annex are acceptable for occupancy, and that further follow-up environmental testing is not necessary.

KEYWORDS: SIC 9199 (Office Building), polychlorinated biphenyls, PCBs, air, indoor air.

## II. INTRODUCTION

On June 17, 1985 an electrical malfunction occurred in a 500 kva power transformer located in the basement of the New Mexico State Highway Department (NMSHD) General Office Building in Santa Fe, New Mexico [1]. The transformer overheated and vented a vaporous-liquid aerosol containing polychlorinated biphenyls (PCBs) and to a lesser extent, the associated pyrolysis products including polychlorinated dibenzofurans (PCDFs) and polychlorinated dibenzo-p-dioxins (PCDDs) throughout the General Office Building and Annex. (The Annex is a separate building connected at the southern end of the General Office Building.) During June 1985 through July 1986 the buildings were decontaminated according to the reoccupancy criteria developed by the Governor's Advisory Panel and certified by NIOSH as acceptable for reoccupancy in August 1986 [2].

On March 23, 1987, NIOSH received a request from the State of New Mexico Occupational Health and Safety Bureau for technical assistance in conducting a one year follow-up test in the NMSHD Building, as recommended by the Governor's Advisory Panel. The objective of the test was to verify that the conditions, with regard to the contamination, did not change significantly since these buildings were judged to be acceptable for reoccupancy. On September 14 -16, 1987, NIOSH with asssistance from the State of New Mexico Occupational Health and Safety Bureau conducted the one year verification test.

## III. STUDY DESIGN AND METHODS

### A. Study Design

The final results of the certification testing conducted by NIOSH [2] demonstrated that the residual concentrations of PCBs, and PCDFs and PCDDs (converted to 2,3,7,8-tetrachlordibenzo-p-dioxin equivalents) in air and on surfaces were all below the guidelines established by the Governor's Advisory Panel. Based upon these results, NIOSH concluded that the General Office Building and Annex were acceptable for occupancy and the contents contained therein were also safe and acceptable for use. The objective of the follow-up test was to determine if the conditions in the General Office Building and Annex, with regard to contamination, have not changed significantly since these buildings were judged as acceptable for reoccupancy based upon the guidelines established by the Governor's Advisory Panel.

The testing was limited to determining the airborne concentrations of PCBs. Air sampling for PCDFs and PCDDs was not conducted because the certification test results [2] showed that these contaminants were generally present below detectable concentrations, and in the case of the Annex, the ambient concentrations exceeded those present in the building. Furthermore, it is beleived that measurement of the airborne concentrations of PCBs would be the best indicator to detect a change in the environmental conditions in these buildings. Surface wipe samples were not collected for the following reasons: (1) The extensive renovation completed in the building after the NIOSH certification test resulted in the replacement or covering of most building surfaces. Thus, most of the existing surfaces would not have been representative of those present at the time of the certification test. (2) A large amount of the furniture and office equuipment present in the building at the time of the certification test has been replaced.

The sampling strategy was to test the General Office Building and Annex at the same locations as tested in the final certification tests by NIOSH [2]. The air samples were collected with the buildings heating, ventilation, and air-conditioning (HVAC) system operating under normal

occupancy conditions. The fresh air intake plenums for each building were tested to determine the concentrations of PCBs in the ambient air entering the buildings.

The number of air samples collected by building and location are summarized below:

| Building | Location | Number of Samples |
|---|---|---|
| General Office | Basement | 7 (includes 1 duplicate) |
| | 1st Floor | 6 |
| | 2nd Floor | 4 |
| | Air-Intake | 1 |
| | Field Blank | 2 |
| Annex | Basement | 2 |
| | 1st Floor | 2 |
| | 2nd Floor | 2 |
| | Air-Intake | 1 |
| | Field Blank | 2 |

B. Sampling and Analytical Methods

Air samples for PCBs were collected using NIOSH Method 5503 [3]. The method involves a two stage sampling device consisting of a 13 mm glass fiber particulate filter preceeded by 150 mg of florisil adsorbent (100 mg front and 50 mg back sections). The samples were collected using constant flow vacuum pumps operating at a flowrate of 1 liter per minute (L/min) for approximately 2880 minutes. The filter and sorbent tube were changed at approximately 1440 minutes. The two filters and sorbent tubes were then composited by the laboratory chemists' as a single sample. The use of this sampling train for extended sampling periods has been evaluated by a NIOSH investigator [4,5].

The florisil tubes were prepared for analysis by separating the paired tubes into two A and two B sections. Each section pair was desorbed in 1.5 ml of iso-octane with sonication for 1/2 hour. The glass fiber filters were desorbed in 1 ml of toluene with sonication for 1/2 hour.

The gas chromatographic analysis was performed on a Hewlett Packard Model 5730A gas chromatograph equipped with an electron capture detector and accessories for capillary column capabilities. A 30 m x 0.31 mm fused silica WCOT capillary column coated intdemally with DB-5 was used with temperature programming from 210 degrees celsius (held for two two minutes) to 310 degrees celsius at a rate of 8 degrees celsius per minute. Five percent methane in argon was used as the carrier gas. The injector was operated in the splitless mode of operation.

The presence of an Aroclor was determined by comparison with standard samples of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260 obtained from the EPA. Quantitation was performed by summing the peak heights of the five major peaks of the standards and comparing those sums to the sums of the same peaks in the sample. The limit of detection was 0.03 ug/sample for Aroclor 1260; and 0.05 ug/sample for Aroclors 1016, 1221, 1232, 1242, 1248, and 1254.

C. Quality Assurance

The laboratory quality assurance included (a) 10% replicate analysis; (b) 15% spiked audit

samples; and 16% field blanks. Replicate analysis of samples provides a measure of analytical precision. A second aliquot of the sample extract is analyzed and results are compared to evaluate the variability inherent in the analytical method. Analysis of spiked audit samples provides an assessment of analytical accuracy.

D. Sample Chain-of-Custody

Sample Chain-of-Custody procedures were an integral activity of both sampling and analytical activities. Chain-of-Custody procedures provided documentation of samples through all phases of activities from the time the sampling devices were prepared to be sent to the field through reporting of the analytical results. Sample Chain-of-Custody was initiated by the sampling personnel upon receipt of the sampling devices. Each sampling device was assigned a unique identification number. The Chain-of-Custody procedures were in accordance with those specified in NIOSH's Manual of Standard Operating Procedures for Industrial Hygiene Sampling and Chemical Analyses, SOP No. 019, December 19, 1984.

## IV. RESULTS AND DISCUSSION

A total of 25 air samples were collected for the analysis of PCBs (Table 1). Two of these samples were collected in the buildings fresh air intake plenums to determine the concentrations of PCBs entering the buildings through the ambient air; and 23 samples were collected in the workspace of the buildings.

The ambient air samples did not show detectable concentrations of PCBs at a volume adjusted detection limit of <0.017 ug/m3. In the Annex, none of the six samples showed concentrations above the limit of detection (<0.019 ug/$m^3$). By comparison, the samples collected at these same locations during the NIOSH Certification Test showed non-detectable concentrations (<0.02 ug/$m^3$) in four of six samples and detectable concentrations in two samples (0.03 ug/$m^3$ and 0.04 ug/$m^3$). In the General Office Building, three of the 17 samples showed concentrations above the detection (<0.019 ug/$m^3$). Two of the three samples were collected in the basement in Room B17 (0.028 ug/$m^3$ and 0.033 ug/$m^3$), and the other was collected in the basement mechanical room (0.15 ug/$m^3$). By comparison, the concentrations measured during the NIOSH Certification Test were 0.26 ug/$m^3$ in Room B5 (now Room B17) and 0.22 ug/$m^3$ in the mechanical room.

Overall, the data show that the concentrations of PCBs in the Annex and General Office Buildings are generally below detectable concentrations, and the three samples showing detectable concentrations are significantly below the 0.5 ug/$m^3$ reoccupancy guideline. Furthermore, these data demonstrate the air in the buildings is cleaner now than it was at the time of final certification.

## V. CONCLUSIONS

A one year follow-up test was conducted to determine if the conditions in the General Office Building and Annex, with regard to contamination, have changed significantly since these buildings were judged as acceptable for reoccupancy by NIOSH. On September 14 - 16, 1987, NIOSH with assistance from the State of New Mexico Occupational Health and Safety Bureau conducted the one year followup test. The results of the tests' demonstrate that, since the time of certification, the airborne concentrations of PCBs have decreased to generally non-detectable concentrations, and that all concentrations are significantly below the reoocupancy criteria. These test results reaffirm our opinion that these buildings are acceptable for occupancy and that further testing is not necessary.

## VI. REFERENCES


1. Centers for Disease Control. Polychlorinated Biphenyl Transformer Incident - New Mexico. MMWR 34: 557-559,1985.

2. Kominsky JR and Melius JM. Final Certification Report for the New Mexico State Highway Department Building in Sante Fe, New Mexico. Health Hazard Evaluation Report HETA 85-414-1805, June 1987. National Institute for Occupational Safety and Health, Cincinnati, Ohio 45226, 1987.

3. Eller PM. NIOSH Manual on Analytical Methods. 3rd ed. Cincinnati: U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, 1984; DHHS (NIOSH) publication no. 84-100:5503-1 to 5503-5.

4. Kominsky JR. Page Belcher Federal Building, Tulsa, Oklahoma. Health Hazard Evaluation Report HETA 85-289-1738. National Institute for Occupational Safety and Health, Cincinnati, Ohio 45226, 1987.

5. Kominsky JR. Commercial Office Buildings in Boston, Massachusetts. Health Hazard Evaluation Report HETA 86-472-1832, National Institute for Occupational Safety and Health, Cincinnati, Ohio 45226, 1987.


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## VIII. DISTRIBUTION AND AVAILABILITY OF REPORT

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Copies of this report have been sent to:

1. Safety Adminstrator, New Mexico State Highway Department, Santa Fe, New Mexico.
2. Chief, Bureau Health and Safety, Environmental Improvement Division, State of New Mexico, Santa Fe, New Mexico.
3. U.S. Environmental Protection Agency, Region V.
4. NIOSH Region

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Table 1
Airborne Concentrations of Polychlorinated Biphenyls (PCBs)
General Office Building and Annex
New Mexico State Highway Department
Santa Fe, New Mexico

September 14 - 16, 1987

| Sample Number | Sample Location | Sample Volume Liters | PCB Conc. ug/$m^3$ |
|---|---|---|---|
| GENERAL OFFICE BLDG.: | | | |
| 701AB | Room 203 | 2743 | ND* |
| 702AB | Room 205 | 2746 | ND |
| 703AB | Room 209 | 2707 | ND |
| 704AB | Room 222 | 2709 | ND |
| 705AB | Room 130 | 2707 | ND |
| 706AB | Room 134 | 2689 | ND |
| 707AB | Lobby 1st Floor | 2688 | ND |
| 708AB | Room 114 | 2864 | ND |
| 709AB | Room 111 | 2707 | ND |
| 710AB | Auditorium | 2669 | ND |
| 711AB | Room B-13 | 2689 | ND |
| 712AB | Room B-17 | 2502 | 0.028** |
| 713AB | Room B-17 | 2701 | 0.033** |
| 714AB | Bsmt. Mech. Room | 2609 | 0.15** |
| 715AB | Fresh Air Intake | 2688 | ND |
| 716AB | Room B-37 | 2678 | ND |
| 717AB | Room B-24 | 2699 | ND |
| 718AB | Room B-31C | 2817 | ND |
| ANNEX: | | | |
| 719AB | Room 123 | 2639 | ND |
| 720AB | Room 126 | 2617 | ND |
| 721AB | Room B-27 | 2658 | ND |
| 722AB | Room B-29 | 2613 | ND |
| 723AB | Fresh Air Intake | 2696 | ND |
| 724AB | Room 216 | 2608 | ND |
| 725AB | Room 214 | 2736 | ND |
| 726 | Field Blank | 0000 | ND |
| 727 | Field Blank | 0000 | ND |
| 728 | Field Blank | 0000 | ND |
| 729 | Field Blank | 0000 | ND |

* ND denotes none detected.
** PCB reported as Aroclor 1254 (commercial mixture of PCBs with approximately 54 weight percent chlorine).