



CONSULTATION REPORT

for

**State of Connecticut
Department of Public Works
165 Capitol Avenue
Hartford, CT 06106**

SITE VISITED

**State of Connecticut
Department of Social Services
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Submitted By:

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TABLE OF CONTENTS

SUMMARY	1
PURPOSE	1
CONCLUSIONS	1
RECOMMENDATIONS	1
DISCUSSION	1
Notice of Obligation	2
Attachments	
A - Safety and Health Program Management	1
Safety and Health Program Management, with Employee Involvement	1
Management Leadership and Employee Involvement	2
Worksite Analysis	2
Hazard Prevention and Control	2
Training	2
B - Training Provided by Consultant	1
C - Monitoring Report	1

SUMMARY

PURPOSE

An initial, limited industrial hygiene consultation visit was made in response to a request from Jacquelyn Brown of the State of Connecticut, Department of Public Works, to evaluate employee exposure to the possible presence of chemical contaminants and airborne fungi on the 7th and 10th floors of a state-owned high rise building.

An opening conference was held on July 10, 2001 with Ms. Brown to discuss the scope of the survey and to reiterate the employer's rights and responsibilities, especially to correct imminent danger or serious hazards.

Following the opening conference, the consultant conducted a walk-through of the areas included in the consultation. A staff member had complained of temperature comfort issues in her work area. She informed the consultant that she had bronchitis several times during the past year. There were also complaints of respiratory symptoms from a number of staff members.

CONCLUSIONS

Summary of Monitoring Data

Monitoring of several substances commonly evaluated to assess indoor air quality was conducted. The sampling strategy utilized included carbon dioxide, carbon monoxide, temperature and relative humidity. Additionally, screening measurements were conducted for formaldehyde, nitrogen dioxide, petroleum hydrocarbons, and sulfur dioxide. None of the substances evaluated resulted in concentrations exceeding limits found in the State of Connecticut Department of Labor, Division of Occupational Safety and Health (CONN-OSHA) regulations. The results are detailed in Tables I and II of the Monitoring Report section.

Air sampling was performed to evaluate the levels of fungi. "Malt Extract Agar" media was utilized to conduct the sampling. Current reference sources indicate that indoor air fungal levels should be equal to or less than outdoor air fungal levels. The results of the air sampling revealed that the majority of indoor air fungal levels were none detected. However, Zone 5 on the 10th floor had an indoor air fungal level of 24 colony forming units per cubic meter of air (CFU/M³). The results are detailed in Table III of the Monitoring Report section.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

- Carbon dioxide levels did not exceed the CONN-OSHA Permissible Exposure Limit (PEL) of 10,000 ppm in any of the locations monitored. Carbon dioxide levels also did not exceed the comfort level of 1000 ppm in any of the locations monitored. The 1000 ppm comfort level for carbon dioxide is recommended by the National Institute for Occupational Safety and Health (NIOSH). Typically, there may be a problem with inadequate ventilation in facilities where the indoor carbon dioxide levels exceed 1000 ppm. Complaints of headaches, fatigue, eye irritation, and throat irritation are common in areas with carbon dioxide levels above 1000 ppm.

It is recommended that the ASHRAE Standard entitled "Ventilation for Acceptable Indoor Air Quality", ASHRAE 62-1999, be followed to ensure that carbon dioxide levels are maintained below the 1000 ppm level. The ASHRAE Standard recommends that 20 cubic feet of outdoor air be provided per minute (cfm) for each person present in office spaces.

- It is recommended in the OSHA Technical Manual that relative humidity be maintained in the range of 20-60%, and that temperature be maintained between 68-76°F. The air sampling results revealed that the temperature ranged from 71-75°F, and that the relative humidity ranged between 45-53%.
- Current reference sources indicate that indoor air fungal levels should be equal to or less than outdoor air fungal levels. Air sampling results revealed that the indoor air fungal levels were less than the outdoor air fungal level. There is, however, a potential for fungal amplification in areas where there are sources of moisture incursion.

The following steps are recommended to ensure that conditions which have the potential to support fungal amplification are prevented and controlled. Current microbial remediation guidelines, such as the "Guidelines on Assessment and Remediation of Fungi in Indoor Environments" published by the New York City Department of Health, should be followed during fungal remediation activities.

- Continue to identify and eliminate sources of moisture incursion (i.e. pipe leaks, window leaks, water incursion through building envelopes).
- Inspect all materials in areas which have been subject to moisture incursion for signs of water damage, fungal growth, and odors.
- Clean and disinfect non-porous materials (i.e. metals, glass, and hard plastics) which have been subject to moisture incursion. These materials include file cabinets, desks, chairs, and any other furniture. Attention should be given to surfaces which may have come in direct contact with moisture/water (i.e. areas underneath furniture and file cabinets). A detergent solution is recommended to clean these types of materials.
- Discard and replace porous materials (i.e. ceiling tiles, books, papers, insulation, and wallboard) which shows signs of water damage, fungal growth, and/or odors. For example, there was a ceiling tile which appeared to have possible water damage in the 7th floor Conference Room adjacent to the Employee Lounge.
- Semi-porous materials (i.e. wood, concrete) which have been subject to moisture and/or have visible fungal growth can be cleaned and reused as long as their structural integrity has not been compromised. A detergent solution is recommended to clean these types of materials.
- Periodically inspect areas which have been subject to moisture incursion to verify the effectiveness of remediation efforts.

DISCUSSION - Facility Walk-through

The Department of Social Services occupies several floors of a twenty story building. The scope of this consultation was limited to the 7th and 10th floors of the building. The building was constructed primarily from masonry and metal approximately fifteen years ago. The first four levels of the building are used as a parking garage. In 1994, the building was purchased by the State of Connecticut and has since been maintained by the Connecticut Department of Public Works (DPW) and an on-site building manager, the Tunxis Management Company.

The heating, ventilating, and air conditioning (HVAC) system consists of a rooftop fanhouse which serves as the mechanism for introducing outdoor air into the building. There are two air handling units rooms on each floor which

serve to distribute supply air through a seven-zone variable air volume (VAV) system. Prior to the consultant's visit, Wing's Testing and Balancing Company, Inc. was contracted by DPW to determine the amount of outdoor air being provided throughout the building. The results of the testing revealed that the amount of outside air provided throughout the building exceeded the ASHRAE guideline of 20 cubic feet of outdoor air per minute (cfm) per person.

Johnson Controls, Inc. was contracted by DPW to inspect the VAV boxes throughout the building to ensure that they are functioning properly. Adjustments were made to a number of VAV boxes on each floor. DPW further indicated that the Tunxis Management Company would also be conducting inspections and calibrating the VAV boxes throughout the year.

Maurice Hall of the Tunxis Management Company informed the consultant that bag filters are changed on an annual basis; pre-filters are changed twice a year; and supply air filters are changed on a quarterly basis. In addition, the use of a higher efficiency "Villadon" filter is being phased into the system as replacements occur.

Jackie Brown informed the consultant that there have not been significant problems with water infiltration on the 7th and 10th floors. She further indicated that most of the water infiltration in the building has been identified on floors which have balconies. The floors with balconies are occupied by another state agency and were not included in the scope of this visit.

Hoffman Architects was contracted by DPW to evaluate construction-related deficiencies related to the exterior building structure which may have contributed to water infiltration. DPW is currently in the process of hiring a contractor to execute the building repairs identified by Hoffman Architects.

Ms. Brown stated that there was a small area on the 10th floor which had been subject to water leakage. Mr. Hall informed the consultant that a section of wallboard material in the water-affected area had been replaced. Water-damaged wallboard material has also been identified in the 7th floor Employee Lounge and is scheduled to be remediated.

The consultant noted a ceiling tile which appeared to be water-damaged in the 7th floor Conference Room adjacent to the Employee Lounge. Mr. Hall indicated that this damage was due to a plumbing leak, and that the ceiling tile would be replaced. The consultant did not observe any other signs of potential water damage, detect any odors or observe visible fungal growth in the areas surveyed on the day of the consultation.

Notice of Obligation

In the event of a CONN-OSHA enforcement inspection, it is important to remember that the Compliance Officer is not legally bound by the consultant's advice or by the consultant's failure to point out a specific hazard. You may, but are not required to, furnish a copy of this report to the Compliance Officer, who may use it to determine your good faith efforts toward safety and health and reduce any proposed penalties. You are, however, required to furnish any employee exposure data from this report as required by 31-372-101- 1910.20.

Michelle M. Major, Occupational Hygienist

Attachments

A - Safety and Health Program Management

The following are the basic elements of an effective employee safety and health program.

- **MANAGEMENT LEADERSHIP AND EMPLOYEE INVOLVEMENT** assigns safety and health responsibility and authority to supervisors and employees and hold them accountable. It includes policy formulation; program review; and encouragement of employee involvement.
- **WORKSITE ANALYSIS** identifies current and potential hazards. It includes a thorough baseline survey, to review work processes and individual potential hazards; management of change (to deal with facilities; equipment; and the physical, economic and regulatory environment); job hazard analysis (written safe operating procedures for major tasks); a self-inspection program, using checklists to determine whether facilities and equipment are hazardous, and pairing inspectors to facilitate employee training and participation and to increase the possibility that new observers will find overlooked conditions; a system for reporting hazards; accident and incident investigation; and analysis of injuries and illnesses.
- **HAZARD PREVENTION AND CONTROL.** Prevention consists of regular maintenance and housekeeping; emergency planning and preparation; first aid; ready access to emergency care; when required, medical surveillance; and, at the employer's option preventive healthcare (e.g., group health insurance, smoking cessation, and wellness programs). Control includes guards, enclosures, locks, protective equipment, safe work procedures (the result of job hazard analysis), and administrative placement of personnel so as to minimize hazards.
- **TRAINING** of all personnel, from managers through supervisors to employees, about the hazards they may be exposed to, and their identification, prevention, and control. Managers and supervisors also need training in program management (e.g., enforcing rules, conducting drills). Training can demonstrate management leadership and facilitate employee involvement.

In assessing program effectiveness, a consultant looks first at written materials (e.g., statement of purpose, goals and objectives, emergency plan) for clarity, completeness, and currency, then for evidence that the written materials have been effectively implemented.

Safety and Health Program Management, with Employee Involvement

A safe and healthful workplace depends on effective management, to involve line workers, supervisors and managers in ensuring that hazards are identified and that effective physical and administrative protections are established and maintained.

The following observations page may help you avoid the recurrence of the hazards and other findings noted during the survey, and prevent the occurrence of other hazards.

Management Leadership and Employee Involvement

Employer and employee interviews suggested that management is committed to employee safety and health. Lines of communication for safety and health concerns have been established, and authority and responsibility for such concerns have been defined. Management does appear to set an example for safe and healthful behavior.

Worksite Analysis

In the past several years a number of consultative services, including the CONN-OSHA consultation program, have been utilized to address indoor air quality concerns in the facility.

Hazard Prevention and Control

Work is ongoing in the area of hazard prevention and control. Preventive maintenance of the HVAC system is completed on a regular basis. Sources of moisture incursion also continue to be identified and remediated.

Training

Employee training should be conducted routinely to inform employees about the building's air quality issues.

B - Training Provided by Consultant

The consultant provided informal training on indoor air quality. The CONN-OSHA Air Contaminants Standard, 1910.1000, the guideline developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) entitled "Ventilation for Acceptable Indoor Air Quality - ASHRAE 62-1999" and the guideline produced by the National Institute for Occupational Safety and Health (NIOSH) entitled "Guidance for Indoor Air Quality" were discussed. The guidelines explain the methods used to evaluate general ventilation in a building, detail recommended quantities of fresh air to different work areas, and identify recommended concentrations of airborne chemicals potentially identified during indoor air quality surveys.

The consultant reviewed the methods for eliminating potential and known sources of fungal contamination in indoor environments. The latest guidelines on fungal remediation, including the "Guidelines on Assessment and Remediation of Fungi in Indoor Environments" published by the New York City Department of Health, were discussed with management.

C - Monitoring Report

On July 10, 2001, general air samples for assessing airborne chemical contaminants were collected. A "TSI Q-Trak IAQ Monitor, Model 8551" was employed to evaluate carbon dioxide (CO₂), carbon monoxide (CO), temperature, and relative humidity levels. The CO₂/CO analyzer was calibrated before and after use with 1000 parts per million (ppm) and 100 ppm span gases respectively. The results are summarized in Table I.

Table I. Carbon Dioxide and Carbon Monoxide Levels, Temperature, and Relative Humidity Approximately 5 Feet Above Floor Level					
Location of Reading	Time	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temperature (degrees Fahrenheit)	Relative Humidity (percent)
7 th Floor, Zone 1 (Las Gayle)	9:40 AM	630	0	74	48
	1:55 PM	606	0	71	53
7 th Floor, Zone 1 (Nancy Lesniaski)	9:45 AM	607	0	74	47
	2:00 PM	612	0	71	51
7 th Floor, Zone 2 (Mary Aubin)	9:50 AM	611	0	74	48
	2:05 PM	625	0	73	48
7 th Floor, Zone 3 (Steve Greenslade)	9:55 AM	621	0	73	47
	2:10 PM	578	0	73	47
7 th Floor, Zone 4 (Pauline Meade)	10:00 AM	638	0	72	48
	2:15 PM	593	0	73	47
7 th Floor, Zone 5 (Ann Carone)	10:05 AM	645	0	72	48
	2:20 PM	590	0	72	47
7 th Floor, Zone 6 (Laura Beebe)	10:10 AM	604	0	73	48
	2:23 PM	578	0	73	47
7 th Floor, Zone 7 (Marge Downey's office)	10:15 AM	522	0	74	47
	2:27 PM	492	0	72	47
7 th Floor, Zone 7 (Dennis Beebe)	10:20 AM	582	0	73	47
	2:32 PM	560	0	72	48
7 th Floor, Zipper Area (Hallway outside of Smart Room)	10:22 AM	602	0	72	49
	2:35 PM	582	0	72	49

Table 1. Carbon Dioxide Air Sampling Results - July 10, 2001					
Appendix A - Air Sampling Results					
Location of Reading	Time	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temperature (Fahrenheit)	Relative Humidity (%)
10 th Floor, Zone 1 (Lynne Noyes' office)	10:33 AM	616	0	75	46
	3:00 PM	570	0	72	48
10 th Floor, Zone 1 (Chris Lewis' office)	10:36 AM	575	0	74	46
	3:07 PM	542	0	72	47
10 th Floor, Zone 2 (Roxanne Aaron-Selph's office)	10:55 AM	573	0	72	47
	3:12 PM	585	0	74	45
10 th Floor, Zone 3 (Diane Quinones)	10:42 AM	642	0	73	48
	3:20 PM	645	0	74	45
10 th Floor, Zone 5 (Jannie Matthews-Webb)	10:47 AM	540	0	73	49
	3:25 PM	595	0	73	47
10 th Floor, Zone 7 (Elsa Lopez-Rodriguez)	10:52 AM	576	0	73	47
	3:30 PM	592	0	73	48
10 th Floor, Zipper Area (Lucille Evans)	11:00 AM	604	0	72	50
	3:35 PM	600	0	72	48
Outdoor Ambient Air, Ground Level, Front Entrance of Building	11:07 AM	350	0	88	36

* ppm = Parts Per Million Parts of Air

The Permissible Exposure Limits (PELs) for carbon monoxide and carbon dioxide established in the State of Connecticut Department of Labor Occupational Safety and Health Division (CONN-OSHA) standard 1910.1000 Table Z-1-A are 35 ppm and 10,000 ppm respectively. The concentrations of carbon monoxide and carbon dioxide that were detected in the areas surveyed were well below the CONN-OSHA PELs.

The following rationale explains why carbon dioxide gas concentrations were monitored to help evaluate indoor air quality. It is excerpted from Guidelines for Indoor Air Quality, published by the National Institute for Occupational Safety and Health (NIOSH):

Carbon dioxide (CO₂) is a normal constituent of exhaled breath and, if monitored, can be used as a screening technique to evaluate whether adequate quantities of fresh outdoor air are being