SOUTH CAROLINA DEPARTMENT OF LABOR, LICENSING AND REGULATION

DIVISION OF LABOR
110 Centerview Drive
Post Office Box 11329
Columbia, SC 29211-1329
(803) 896-7744

October 24, 2016

Ms. Hope Blackley
Clerk of Court
Spartanburg County Judicial Center
180 Magnolia Street
PO Box 3483
Spartanburg, SC 29304

Dear Ms. Blackley:

In response to your request, Greg Dees conducted an Initial Hazard Survey for the purpose of evaluating indoor air quality and possible chemical exposure at your facility on August 31, 2016.

The Indoor Air Quality (IAQ) results and recommendations are contained within this report.

OSHA Voluntary Programs' response to IAQ situations is to determine if there are any obvious factors such as, visible mold, water intrusion, chemical hazards and HVAC problems. OVP does not perform "invasive" IAQ assessment procedures. The information obtained from a non-invasive approach provides information as to whether general air sampling may be helpful. Also the information can be used to determine if there is a need for employers to seek specialized assistance from private sector IAQ specialist(s).

We encourage you to inform your employees of any actions you taken as a result of this visit. This knowledge will help them to better do their part in maintaining a safe and healthful workplace, and it will let them know about your concern for their protection.

We appreciate your seeking our assistance. If you wish any additional information or if we can help you further, we encourage you to contact us.

Sincerely,

Harvey M. Jessup, Program Manager
Office of OSHA Voluntary Programs

CONSULTATION REPORT

For

Spartanburg County Judicial Center
180 Magnolia Street
PO Box 3483
Spartanburg, SC 29304-3483

Submitted By:

SC
Department of Labor, Licensing, & Regulation
Division of Labor
Office of OSHA Voluntary Programs
110 Centerview Drive
PO Box 11329
Columbia, SC 29211-1329
(803) 896-7744

TABLE OF CONTENTS

Executive Summary

Introduction

This report provides the results of a Limited Service Health Consultation visit conducted at your facility on August 31, 2016 by Mr. Greg Dees. The visit consisted of an Indoor Air Quality Assessment for the Judicial Center. When referring to this report, please reference the Visit Number 507086940.

The opening conference was held with Ms. Hope Blackley, Clerk of Court, and Katherine O'Neill, County Administrator. The opening conference included a discussion of the scope of the visit, the employer's responsibilities on hazards and abatement dates.

The second phase consisted of a walk around of the applicable area, including speaking with employees and management. The walk around was conducted with Ms. Blackley and Ms. O'Neill.

Indoor air samples were taken on September 1, 2016. The result of this monitoring is contained in the Monitoring Data section of this report.

A telephone closing conference was held with Ms. Blackley on October 4, 2016 to discuss the mold spore and chemical sampling results.

Notice of Obligation

In the event of a SCOSHA 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 are, however, required to furnish any employee exposure data from this report as required by 29 CFR 1910.1020.

Harvey M. Jessup, Program Manager

Attachment A – Monitoring/Sample Data

AIR MONITORING RESULTS

Mold Spore Sampling

Air monitoring was conducted in conformance with OSHA/NIOSH recommendations and requirements. These results are representative of conditions existing on the day of monitoring. Exposure levels may vary from day to day. The results are as follows:

Location	Mold Spores	Exposure Level
Probate Court Office	Basidiospores	840 per m3
	Miscellaneous unidentified	350 per m3
	Aspergillus/Penicillium	200 per m3
	Hyphae	170 per m3
	Ascospores	170 per m3
	Myxomycetes/Rusts	120 per m3
	Curvularia species	120 per m3
	Cladosporium species	120 per m3
	Zygomycetes	87 per m3
	Fusarium species	58 per m3
	Alternaria species	29 per m3
	Total Spores	**2300 per m3**
Magistrate's Court	Miscellaneous unidentified	730 per m3
	Cladosporium species	170 per m3
	Aspergillus/Penicillium	170 per m3
	Basidiospores	150 per m3
	Curvularia species	120 per m3
	Zygomycetes	120 per m3
	Bipolaris/Helminthosporium species	58 per m3
	Paecilomyces-like species	29 per m3

	Ascospores	29 per m3
	Total Spores	**1300 per m3**

Location	Mold Spores	Exposure Level
Security Office	Basidiospores	730 per m3
	Miscellaneous unidentified	550 per m3
	Hyphae	380 per m3
	Aspergillus/Penicillium species	170 per m3
	Myxomycetes/Rusts	150 per m3
	Curvularia species	150 per m3
	Cladosporium species	87 per m3
	Zygomycetes	58 per m3
	Pithomyces species	58 per m3
	Periconia species	58 per m3
	Ascospores	58 per m3
	Epicoccum species	29 per m3
	Bipolaris/Helminthosporium species	29 per m3
	Total Spores	**2500 per m3**
Judge Paslay's Office	Basidiospores	1800 per m3
	Cladosporium species	350 per m3
	Aspergillus/Penicillium species	150 per m3
	Ascospores	120 per m3
	Curvularia species	87 per m3
	Miscellaneous unidentified	87 per m3

	Zygomycetes	29 per m3
	Stachybotris species	29 per m3
	Epicoccum species	29 per m3
	Total Spores	**2700 per m3**
Judge Cole's Courtroom "West A"	Basidiospores	1800 per m3
	Cladosporium species	350 per m3
	Aspergillus/Penicillium	150 per m3
	Ascospores	120 per m3*
	Curvularia	87 per m3
	Miscellaneous unidentified	87 per m3
	Zygomycetes	29 per m3
	Stachybotris species	29 per m3
	Epicoccum species	29 per m3
	Total Spores	**2700 per m3**
EOC Area	Miscellaneous unidentified	260 per m3
	Basidiospores	230 per m3
	Cladosporium species	200 per m3
	Hyphae	120 per m3*
	Aspergillus/Penicillium	120 per m3
	Zygomycetes	87 per m3
	Acremonium-like species	87 per m3

	Ascospores	58 per m3
	Myxomycetes/Rusts	29 per m3
	Curvularia species	29 per m3
	Total Spores	**1200 per m3**

Location	Mold Spores	Exposure Level
Outdoor Comparison	Basidiospores	38,000 per m3
	Aspergillus/Penicillium	1800 per m3
	Cladosporium Species	1300 per m3
	Ascospores	1100 per m3
	Miscellaneous unidentified	350 per m3
	Hyphae	320 per m3
	Curvularia species	150 per m3
	Myxomycetes/Rusts	120 per m3
	Alternaria species	58 per m3
	Fusarium species	58 per m3
	Torula species	29 per m3
	Pithomyces species	29 per m3
	Periconia species	29 per m3
	Epicoccum species	29 per m3
	Bipolaris/Helminthosporium species	29 per m3
	Total Spores	**43,000 per m3**

Note: During growing seasons, outdoor fungus spore levels can range from 1000-100,000 cfu/m3 of air.

Interpretation of Mold Spore Air Monitoring Results

1. The presence of "uncommon" molds (see attachment B)

2. The difference in concentrations and types of molds when indoor and outdoor areas are compared (see attachment B)

Carbon Dioxide, Temperature and Humidity

(Locations chosen by the employer, representing highest "complaint" areas)

Location	Carbon Dioxide (ppm)	Humidity (%)	Temperature (F)
Probate Court Office	959 (offices) 987 (lobby)	48.2	73.4
Magistrate's Court	855	46.9	72
Security Office	**1194**	48.8	71.9
Judge Paslay's Office	900	39.5	72.6
EOC Area	**2000**	50.7	71.8
Judge Cole's Courtroom (West A) (no occupants)	567	40.5	70.0

bolded numbers = notable levels for that category
ppm – parts per million

Carbon dioxide measurement is a useful screening technique which is often helpful in determining whether adequate quantities of "fresh air" have been introduced and distributed into the building.

NIOSH Recommendations:

250-350 ppm - normal outdoor ambient concentrations

350- 600 ppm - adequate outdoor air intake. Minimal air quality complaints

600 ppm – 1000 ppm - less clearly interpreted; marginally acceptable levels

over 1000 ppm - indicates inadequate ventilation and complaints such as headaches, fatigue, and eye and throat irritation will be more widespread; 1000 ppm should be used as an upper limit for indoor levels.

These levels are only guidelines. If carbon dioxide levels exceed 1000 ppm it does not necessarily indicate that the building is hazardous. Rather this level should be used as a guideline that helps maximize comfort for all occupants.

The data shows that the CO2 levels in some areas exceed an indirect "comfort level". CO2 in IAQ assessment is used as an "indirect indicator" of whether the HVAC system is providing enough fresh air.

- Humidity control in a range of 20-60% is acceptable.

- Temperature control in the range of 68-76F is ideal for indoor environments.

Chemical Monitoring Results

Air monitoring was conducted in conformance with OSHA/NIOSH recommendations and requirements. These results are representative of conditions existing on the day of monitoring. Exposure levels may vary from day to day.

Note: These locations were chosen by the employer based upon their overall knowledge of the worker "factors" within the building(s) (in relation to the sealant use). "Area" Sampling was performed. Samples were evaluated by a laboratory for the chemical Chlorothalonil, a primary component of IAQ 7500 No. 8375 Clear (Sealant) used in the HVAC systems.

The results are as follows:

Location	Sample Result
Judge Beatty's Office	0.00082 mg/m3
Evidence Room (Admin Area)	ND
Jury Assembly Room	ND
Court Division Security Office	ND

Abbreviations
mg/m3 = milligrams of air contaminant per cubic meter of air
ND = less than the limit of detection

Occupational Exposure Limits

Chlorothalonil does not have an established OSHA or ACGIH occupational exposure limit. NIOSH does support a Recommended Exposure Limit (REL) of 0.1 mg/m3.

Attachment B – Indoor Air Quality Assessment Findings and Recommendations

Summary of Findings

1. The presence of "uncommon" molds:

   Most indoor molds are "typical" for these samples. Note: Zygomycetes, Paecilomyces-like species and Acremonium-like species were found in indoor samples (at low levels), but not in outdoor samples. Results showing molds indoors that are not in the outdoor sample are typical and usually not a concern unless the level is greatly elevated with respect to the sample overall.

   Stachybotrys chartarum was found in two samples, Magitrate's Court and Judge Cole's Courtroom (West A). Sometimes called S. chartarum or Stachybotrys atra, and popularly known as "black mold," this toxigenic mold is a greenish-black fungus that requires a moist environment in which to grow and is most commonly found in buildings that have experienced water damage, excessive humidity, water leaks and flooding. Spore levels for these two samples are low with respect to the overall samples.

2. The difference in concentrations and types of molds when indoor and outdoor areas are compared:

   The Total spore levels outdoor concentrations are well above any of the total indoor concentrations.

   Magistrate's Court results showed two individual spores which exceed the outdoor level (Miscellaneous/Unidentified and Bipolaris/Drechslera/Helminthosprium species).

   The Security Office results showed five individual spores which exceed the outdoor level (Miscellaneous/Unidentified, Hyphae, Myxomycetes/Rusts, Pithomyces, and Periconia.

<u>Carbon Dioxide, Temperature, Humidity</u>

Carbon Dioxide – Mostly, levels are in the acceptable range. Two areas did exceed the "1000 ppm threshold" for worker comfort. Refer to the table above.

Most notable Carbon Dioxide readings were :

1) the 2000 ppm reading for the EOC room. This room was currently being used as a relocation area for 30+ workers during building renovations. Employees will return to their normal work areas when the work is completed.

2) the 1194 ppm for the Security Office.

Humidity – all building areas checked were determined to be acceptable.

Temperatures – all building areas checked were in the acceptable range.

Chemical Exposure and Sampling

At the time of this visit, as explained to OVP, the Environmental contractor, JMAC Environmental, had been applying a sealant (for potential mold/mildew) within the HVAC systems at the building. Upon discussion with JMAC, it was learned that the chemical IAQ 7500 was originally sprayed onto the surfaces of the HVAC units. However, JMAC determined that the application would be changed to a brush/roller process.

The Safety Data Sheet for the IAQ 7500 was used to determine a sampling strategy. Chlorothalonil and Bicyclic Oxazolidine are the only ingredients listed. Chlorothalonil was able to be sampled and analyzed. It should be noted that the SDS lists the amount (by weight) of Chlorothalonil in this product as 0.1 – 1%. The only listed Occupational Exposure Limit for Chorothalonil is a NIOSH limit of 0.1 mg/m3. There is no OSHA limit for this chemical.

Four locations were chosen for sampling based on the recent complaint areas and application of the IAQ 7500 sealant in the building. The four locations are listed above under the Chemical Monitoring Results section.

Three out of the four samples were "non-detectable" for Chlorothalonil. Judge Beatty's office did show a trace amount at 0.0008 mg/m3 that would stand as an eight-hour time-weighted average.

Of the three non-detectable samples, the Jury Assembly Room and the Evidence Room were unoccupied rooms at the time of sampling. The EOC room was occupied by 35+ workers (as a relocation area due to the possible chemical exposure and mold remediation efforts). At the time of sampling, Judge Beatty's office was occupied.

Overall Visit Summary

At the time of this visit, the Judicial Center Building(s) were undergoing significant renovations which were part of a plan to "extend the 'life' of the dwelling for approximately 5 to 6 years. The employer states that it is planned that this Judicial Center will be replaced by a new building in the future.

The renovations being conducted were noted to be in response to an Indoor Air Quality and interior mold assessment performed prior to this OVP visit. Mold spore testing, that included a total of 87 bioaerosol samples, had already been performed by a private sector Environmental company (JMAC Environmental, which specializes in Indoor Air Quality issues). It should be noted that JMAC reported that only two of the eighty-seven samples were deemed to be outliers.

JMAC's additional efforts focused on assessing the buildings' "exterior curtain", window sealants , and flashing. These were deemed to be "failing", allowing moisture intrusion into the building. JMAC stated that the lack of a vapor barrier or vapor retarder also provides the means for leaks into the building. During OVPs visit to the building, workers and officials noted that water leaks have been occurring for a long time at this facility.

JMAC was hired prior to this visit to begin mold remediation throughout the facility. A "listing" of specific target areas was provided to the employer by JMAC. This remediation would include (not all inclusive items are listed here): Removal and replacement of sheetrock which could include additional

mold spore testing and a "sealant" would be applied within appropriate ventilation systems. The use of this sealant allegedly caused various indirect exposures to workers within the building.

During OVP's courtesy visit, occupants/employees expressed concerns about indoor air quality and most notably concern for "a chemical smell" that was in the building. Employees reported a wide range of health effects and/or observations. Employees stated that the following situations (not all inclusive) occurred:

- Opening a door and a chemical (in the air) "hit me in the face and took my breath away"
- Sinus infections
- Leg rashes
- Sore throats
- Headaches
- Dizziness
- Eye, nose , throat irritation (or even burning sensations)
- Employees reported having to leave the building (went home)

A notable aspect regarding the overall situation at this site, at the time of this visit, was communication between JMAC environmental and building officials. It became apparent that coordination, planning and communication of both the mold remediation and the chemical application of the HVAC units was not ideal. It was noted, through consultant conversations with Ms. Blackley, that several meetings occurred after this consultation visit between building officials and JMAC Environmental which ultimately assisted with reducing or alleviating these problems.

The challenge that the employer was facing with the mold remediation efforts (due to a long history of building water intrusion), was attempting to maintain building occupancy while modifications were being performed.

Employees began experiencing health effects apparently from a chemical being used to "seal" ventilation units. The remediation contractor stated that, "we have used this chemical many times in the past, with few problems. We have not seen this level of sensitivity in a building population before".

Recommendations

1. Building maintenance and other designated personnel should remain pro-active regarding moisture events/leaks, via a "water leak response effort": Prompt clean-up/repair of leaks and removal or rapid drying of all wet material (such as ceiling tiles, wet carpet, etc.) must be provided. Wall repair(s) should be made within a "reasonable" time-frame.

   Leak Response Program efforts should address:

   - Fix leaky plumbing and leaks in the building envelope as soon as possible.
   - Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
   - Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air

circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).

- Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside where possible.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30 – 50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Provide drainage and slope the ground away from the foundation.
- All changes deemed necessary should take into consideration "ASHRAE guidelines".
- Reference the ASHRAE guidelines under "Recommended Ventilation Rates" below

2. Determine whether additional mold clean-up efforts are needed in the Magistrate's Court (due to the mold findings (above). Note: As this report was being generated, OVP learned that all mold remediation efforts had ended at the building.

3. Because the Security Office comes up twice in OVP findings: 1) Under comparison of indoor vs. outdoor molds, and 2) CO2 levels exceeding 1000 ppm; The recommendation is to determine whether additional mold clean-up efforts are needed for this small room.
   Note: As this report was being generated, OVP learned that additional mold remediation had occurred in the Security Office (since OVP was at the site), and that mold remediation efforts overall had ended at the building.

   Additionally, it is recommended that the ventilation system for this office should be checked for proper air flow, return air, outside fresh air, etc. (flow rates per ASHRAE guidelines are recommended).

4. Because chemical sampling resulted in "trace" or "non-detectable" levels. Additional sampling may be necessary and is generally recommended if symptoms re-occur for building occupants.

5. Communication between County officials and building contractors must be clearly and precisely detailed at all times. Defined policies and procedures for contractor work at the buildings should be a priority for the future.

Attachment C – General Information on Indoor Air Quality

The following information is not directly related to this consultation or this site. It is for information only

Causal Factors

Modern buildings are generally considered safe and healthful working environments. However, energy conservation measures instituted during the early 1970's have minimized the infiltration of outside air and contributed to the build-up of indoor air contaminants.

Investigations of indoor air quality (IAQ) often fail to identify any harmful levels of specific toxic substances. Often employee complaints result from "comfort" items such as cigarette smoke, odors, low level contaminants, poor air circulation, thermal gradients, humidity, job pressures, lighting, work station design, or noise.

Incidence

The range of investigations of indoor air quality problems encompasses complaints from one or two employees to episodes where entire facilities are shut down and evacuated until the events are investigated and problems corrected.

Complaints are often of a subjective, non-specific nature and are associated with periods of occupancy. These symptoms often disappear when the employee leaves the workplace. They include headache, dizziness, nausea, tiredness, lack of concentration, and eye, nose and throat irritation.

In approximately 500 indoor air quality investigations in the last decade, the National Institute for Occupational Safety and Health (NIOSH) found that the primary sources of indoor air quality problems are:

Inadequate ventilation	52%
Contamination from inside the building	16%
Contamination from outside building	10%
Microbial contamination	5%
Contamination from building fabric	4%
Unknown sources	13%.

Recommended Ventilation Rates

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) established recommended ventilation rates for indoor environments in 1973.

ASHRAE amended this standard in 1975 to specify the minimum value of 5 cubic feet per minute (CFM) of outdoor air per person be used in building design. This standard has been incorporated into the building codes of many cities and states.

The 62-1999 standard recommends a minimum of 15 to 20 CFM of outdoor air per person for offices and reception areas. Sixty cubic feet per minute per person is recommended for smoking lounges with local mechanical exhaust ventilation and no air recirculation.

Types of Building Problems.

Employee complaints can be due to two types of building problems: sick or tight building syndrome and building related illnesses.

Sick building syndrome is a condition associated with complaints of discomfort including headache; nausea; dizziness; dermatitis; eye, nose, throat, and respiratory irritation; coughing; difficulty concentrating; sensitivity to odors; muscle pain; and fatigue. The specific causes of the symptoms are often not known but sometimes are attributed to the effects of a combination of substances or individual susceptibility to low concentrations of contaminants. The symptoms are associated with periods of occupancy and often disappear after the worker leaves the worksite.

Building related illnesses are those for which there is a clinically defined illness of known etiology and include infections such as legionellosis and allergic reactions such as hypersensitivity diseases and are often documented by physical signs and laboratory findings. A more thorough description of these illnesses can be found in the American Conference of Governmental Industrial Hygienists (ACGIH) guidelines on evaluating bio-aerosols.

Tobacco smoke is a major contributor to indoor air quality problems. Tobacco smoke contains several hundred toxic substances including carbon monoxide, nitrogen dioxide, hydrogen sulfide, formaldehyde, ammonia, benzene, benzo(a)pyrene, tars, and nicotine. Most indoor air particulates are due to tobacco smoke and are in the respirable range.

Recommendations for Maintenance of Acceptable Indoor Air Quality

The following are general recommendations, which, where relevant, should be standard procedure. If followed, they will help prevent or alleviate many indoor air quality problems:

Engineering recommendations

Includes the use of natural, dilution, local exhaust, or increased ventilation efficiency).

1. The most effective engineering control for prevention of indoor air quality problems is assuring an adequate supply of fresh outdoor air through natural or mechanical ventilation.

2. *ASHRAE in its 62-1999 standard recommends 15 to 20 cubic feet per minute (CFM) of outdoor air per occupant for offices. For smoking lounges, up to 60 CFM of outdoor air per occupant should be provided.*

3. When possible, use local exhaust ventilation and enclosure to capture and remove contaminants generated by specific processes. Room air in which contaminants are generated should be discharged directly outdoors rather than re-circulated.

4. Efficiency. Ventilation efficiency can be improved by:

   a. Ensuring that outdoor air supply dampers and room air vents are open

   b. Removing or modifying partitions or obstructions which block fresh air flow

   c. Balancing the system to prevent inflow or outflow of contaminated air due to pressure differentials between rooms

   d. Preventing poor distribution of make-up air by proper placement of air inlets and exhausts

   e. Using room fans to improve mixing and dilution of pollutants.

   f. Outside air intakes should not be located in close proximity to potential, roadways). sources of contamination (automobile garages, cooling towers, building exhausts

Air treatment (the removal of air contaminants and/or the control of room temperature and humidity).

1. The use of filtration, electronic cleaners, chemical treatment with activated charcoal or other sorbets

2. Humidity control in range of *20-60%*

3. Temperature control in the range of *68-76F*

4. Source controls include substitution, removal, encapsulation, local exhaust ventilation, and use of physical barriers.

Preventive maintenance (P.M.)

A. P.M. plans for humidifiers, water spray and other HVAC system components should include:

1. Checking damper positions and functioning belts, baffles, ductwork, and system balance

2. Measuring airflow and performing necessary adjustment if necessary to meet ASHRAE recommendations

3. Replacing filters on air handling units at regular intervals

4. Cleaning air distribution ducts and dampers

5. Replacing damaged insulation.

B. Microbial contamination. Eliminate or control all known and potential sources of microbial contaminants by prompt cleanup and repair of all areas where water collection and leakage has occurred including floors, roofs, HVAC cooling coils, drain pans, humidifiers containing reservoirs of stagnant water, air washers, fan coil units, and filters.

1. Remove and discard porous organic materials that are contaminated (e.g., damp insulation in ventilation system, moldy ceiling tiles, and mildewed carpets).

2. Clean and disinfect non-porous surfaces where microbial growth has occurred with detergents, chlorine-generating slimicides, or other biocides and insuring that these cleaners have been removed before air handling units are turned on.

3. Maintain indoor air relative humidity below 60% (50% where cold surfaces are in contact with room air).

4. Adjust intake of outdoor air to avoid contamination from nearby soil, vegetable debris, cooling towers, or sanitary stacks unless air is adequately conditioned.

C. Adjust combustion sources such as furnaces or water heaters to assure proper burning and exhaust to an area where re-entrainment will not occur.

Minimize exposure by limiting occupancy of contaminated airspace, limiting use of offending sources to specific areas or times, or evacuating contaminated areas until they can be ventilated adequately.

D. Isolate, if feasible, areas of renovation, painting, carpet laying, pesticide application, etc., from occupied areas that are not under construction.

E. If possible, perform this work during evenings and weekends. If ventilation is turned off during weekends or other periods, ensure that system is on so that contaminant concentrations are sufficiently diluted prior to occupancy.

F. Supply adequate ventilation during and after completion of work to assist in diluting the contaminant levels.

G. Personnel affected with hypersensitivity should be thoroughly evaluated and the problem identified and corrected before returning them to the workplace. If, after the remedial action, the illness persists in the workplace, the affected personnel should be considered for permanent reassignment to another area.

Eliminate or reduce contamination of the air supply with cigarette smoke by banning smoking or restricting smoking to designated areas which have their air discharged directly to the outdoor rather than re-circulated.

REFERENCES

American Society for Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 1973. ASHRAE Standard 62-73: Standards for Natural and Mechanical Ventilation. New York: ASHRAE.

American Society for Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 1975. ASHRAE Standard 90-75: Energy Conservation in New Building Design. New York: ASHRAE.

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 1999. ASHRAE 62-1999: Standards; Ventilation for Acceptable Indoor Air Quality. Atlanta: ASHRAE.