

INDOOR ENVIRONMENTAL QUALITY INVESTIGATION

Dongola Unit School District No. 66
P.O. Box 190
Dongola, Union County, Illinois 62926
IDPH File No. 501160301



Illinois Department of Public Health
Division of Environmental Health
Toxicology Program
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PURPOSE

The Illinois Department of Public Health (IDPH) has performed an indoor environmental quality (IEQ) investigation of the Dongola Unit School in response to concerns from parents, students, staff, and administration about a number of students in the 6th grade class developing a rash while in the school building. It was reported that a few students also experienced respiratory problems. Information gathered indicated the problem initially began in the 6th grade class room. Subsequent occurrences of symptoms over the next few days appeared to be from occupants also in the grade school wing. Our investigation included a visual inspection of the school building and its heating, ventilation, and air conditioning (HVAC) system and environmental monitoring for ventilation assessment with an emphasis on the grade school wing. The Illinois Environmental Protection Agency (Illinois EPA) assisted IDPH by conducting additional environmental monitoring in the school. A letter dated January 16, 2003 was forwarded to the District Superintendent summarizing results of these actions. This report supplements the previous letter to the district and summarizes further conclusions and recommendations based on information gathered throughout the duration of the IDPH investigation.

BACKGROUND AND STATEMENT OF ISSUES

The information this office received indicated that on Monday, January 6, 2003, at the conclusion of exercising in PE at approximately 9:30 am, a 6th grade student experienced a severe asthmatic episode that required emergency room treatment. This student's skin color was also described to be very red and covered with welts. Sometime following this occurrence, on the same day, approximately 11 other students and the teacher in the 6th grade class experienced a sunburn-like rash that appeared on areas including the neck, arms, waistline, and upper legs. It was reported the rash disappeared when the affected individual left the school building. Following the initial occurrence on January 6, 2003, other students and staff also reported the occurrence of symptoms including rash, burning around the mouth and eyes, and respiratory problems. The principal reported approximately 25 students and 4 staff complained of symptoms.

The student population for grades kindergarten through 8th is approximately 220 students; the high school population is approximately 80 students for a total district population of approximately 300 students. Both the high school and the grade school are housed in the same building (Attachment A).

The continuing occurrence of symptoms prompted the administration to close the school at noon on Wednesday, January 8, 2003. The school was kept closed until Monday, January 13, 2003. Due to continuing parental concern, the school was again closed on Tuesday, January 14, 2003 thru Wednesday January 15, 2003. Snow days and a scheduled holiday kept the school closed until Tuesday, January 21, 2003. Classes were in session Tuesday and Wednesday, January 21 & 22, 2003, but snow again closed the school for the remainder of the week.

On January 7, 2003, a representative with the Southern Seven Health Department (SSHD) visited the school. During the SSHD inspection, an aerosol air freshener can (type used in metered dispensers) was noted in the 6th grade classroom. Metered air freshener machines were also noted in each restroom.

On January 8, 2003, accompanied by representatives with SSHD, staff from the IDPH Toxicology Section conducted a preliminary inspection at the Dongola school. IDPH conducted follow-up inspections on January 9, 10, 15, and 22, 2003.

The preliminary inspection included a visual inspection of the school building and its HVAC system. Particular attention was spent looking for areas of moisture damage, mold growth, and rodent problems in the building. Individuals experiencing symptoms generally occupied the grade school wing. This portion of the building houses grades kindergarten through 6th and includes a teachers workroom and the art room. This wing was newly constructed and was occupied at the beginning of the school year in August 2002. The two separate rooftop HVAC units were inspected as was the ceiling plenum in the new wing. A review of cleaning supplies and current use of these products was noted. It was noted the supplies are stored in a locked, ventilated room. An ozone-generating air cleaner was also stored in that area, but it was not operating at the time. Maintenance staff indicated the machine was used at the recommendation of an environmental consultant. It was apparently used on a limited basis when the school was unoccupied. Concerns with ozone-generating machines and pest control activities were discussed. Integrated Pest Management (IPM) by a licensed pest control company is used at the school. Breakfast and lunch menus for the days in question were examined.

On January 9, 2003, IDPH staff placed a Q-Trak Indoor Air Quality Monitor in the 6th grade classroom. The machine monitors carbon dioxide (CO₂), carbon monoxide (CO), relative humidity (%RH), and temperature (°F). The classroom and school were not occupied by students at that time. Preliminary results indicated CO₂ was at background level, no CO was detected, the %RH was approximately 15-20%, and the temperature was approximately 70-74 °F.

On January 10, 2003, IDPH staff met with representatives from the Regional Office of Education (ROE) #2, Dongola School board members and administration, the district architect and engineer, and the construction supervisor for the new grade school addition. Construction of the roof and walls is typical of school buildings; the addition is built on a slab with concrete block walls and a metal roof.

The HVAC units for the new addition are located on the roof of the building; one is above the art room and serves the north side of the building and the other is above the kindergarten room and serves the south side of the wing. The units appeared clean; no areas of standing water were noted near the units. High efficiency particulate air (HEPA) filters are used in the units and are dated and changed every three months. The units are monitored and computer controlled by Control Specialties, Inc. It was learned that although the HVAC units were operating (heat has been on since October), the fresh-air intakes for the units were not yet operational. This was

corrected on January 10, 2003 and IDPH was advised the fresh-air intake was set to provide 15 cubic feet of outdoor air per minute (cfm) per person as recommended by the standard set by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). This ventilation rate is expected to reasonably dilute odors and contaminants common to school classrooms.

On January 10, 2003, IDPH staff put additional ventilation assessment machines in other areas of the school including the art room, 4th grade classroom, 1st grade classroom, and the library. All the machines remained in the school building until Wednesday, January 22, 2003.

On January 15, 2003, IDPH staff and Illinois EPA staff conducted an investigation at the Dongola School. Although the complaint area appeared to be concentrated in the newly constructed grade school wing, the entire school including classrooms in the new grade school addition and the high school wing, hallways, cafeteria, and gymnasium were visually inspected and sampled. Instruments were used to sample for hydrogen sulfide (H₂S), carbon monoxide (CO), ammonia, methane, and volatile organic compounds (VOCs). Areas sampled included floor drains, ceiling plenums, storage cabinets, etc. With the instruments used, nothing was detected at levels that would be a health hazard in all areas sampled. No visible areas of moisture problems were noted except for a leaking sink drain in the science classroom.

Unit ventilators supply heat in most of the high school classrooms and air conditioning units have been installed on the outside walls for cooling the rooms during warm months. The ceiling plenum in these classrooms is not used for return air as it is in the newly constructed addition. Two new classrooms in the high school wing (math and science) were constructed at the same time as the grade school addition. An HVAC unit for these two rooms is on the roof.

On January 22, 2003, IDPH staff returned to the Dongola school to remove the ventilation assessment monitoring machines. It was at the conclusion of the school day; staff and students remaining in the building were not complaining of symptoms. The district superintendent reported few complaints from the students in attendance, but no students left the building early due to a rash or other complications.

While at the school, IDPH staff was asked to inspect the Spanish classroom in the high school. It was learned that in December, when a teacher complained of an unusual odor in the classroom, the district superintendent hired an environmental consulting company to check the classroom for a possible cause. IDPH staff contacted the consultant and learned the environmental consultant at that time noted in the Spanish classroom, visible evidence of microbial growth on the plastic insulation liner on the metal roof deck next to a rafter above the dropped-ceiling tiles and also an area of water spattering inside the unit ventilator. The consultant used tape to lift a sample from these areas for mold analysis. The consultant also collected three non-viable air samples onto filter cassettes for mold analysis. No outside air samples for comparison were collected. The samples were collected on December 10, 2002 and sent to a lab for analysis.

The laboratory results the district superintendent shared with IDPH reported the presence of mold species including Cladosporium and Aspergillus/Penicillium. The environmental consultant recommended they operate an ozone-generating machine in the classroom to kill the mold growth. The district superintendent indicated they operated the ozone-generating machine in the classroom for 24 hours over the weekend while the classroom was unoccupied. He said maintenance staff also cleaned the unit ventilator and repaired a leak around the air conditioner wall unit where it was believed water may have leaked in. He said they had no further complaints from occupants of that classroom and they believed the problem was corrected. He said parents, however, now fear the mold may be contributing to the current symptoms occurring in the school building.

Ventilation Assessment Monitoring Results

Ventilation assessment monitoring for CO₂, %RH, and temperature was conducted. Machines were placed in the following rooms:

1. 6th Grade Classroom #210
2. 1st Grade Classroom #204
3. 4th Grade Classroom #205
4. Library

Graphs illustrating results of the monitoring are attached to this report in Appendix 1. (Note: A machine was also placed in the art room; however, this machine malfunctioned).

Carbon dioxide is a normal constituent of exhaled breath and is commonly used as a screening tool to evaluate whether adequate volumes of fresh outdoor air are being introduced into a building. The outdoor level of CO₂ is usually 300 - 400 parts per million (ppm). If indoor levels are more than 1,000 ppm, there is probably inadequate ventilation; and complaints such as headaches, fatigue, and eye and throat irritation may be prevalent. The CO₂ itself is not responsible for the complaints, however, high CO₂ levels may indicate that other contaminants in the building may also be present at elevated levels and could be responsible for occupant complaints.

ASHRAE has developed standards for indoor air quality which can be found in the document *Ventilation for Acceptable Indoor Air Quality* (ASHRAE 55-1992). These guidelines recommend that school classroom areas be supplied with 15 cubic feet per minute (CFM) of outside air per person.

Relative humidity (%RH) is an important factor in indoor air quality because moisture levels are linked to occupant comfort and other considerations. High moisture levels impair the body's ability to lose heat, and can lead to microbial growth. This growth may lead to irritating odors, cause permanent damage to building components, and result in a variety of infectious or allergic

illnesses for building occupants. Excessively low moisture levels result in dry air that can irritate the lungs, eyes, nose, throat, and skin. ASHRAE (Standard 55-1992) recommends that %RH be maintained between 30% and 60%. The %RH measured in the school ranged from 15% to 28%.

Temperature is frequently identified in indoor air complaints because it is directly linked to occupant comfort. Excessively high or low temperatures can lead to general thermal discomfort and occupant dissatisfaction. ASHRAE (Standard 55-1992) recommends that temperatures be maintained between 68 and 75 degrees (71 degrees is optimal) during the winter months and between 73 and 79 degrees (76 degrees is optimal) during the summer months. These ranges are generally acceptable for sedentary or slightly active persons. Temperatures measured in the school generally ranged from 70 to 75 degrees during periods of occupancy.

CONCLUSIONS AND RECOMMENDATIONS

Based on the information gathered during visual inspections of the school building and its HVAC systems, environmental monitoring for temperature, %RH, CO₂, CO, H₂S, ammonia, methane and VOCs, discussions with the building maintenance staff, discussions with the district architect and engineer, and a review of the inspection summary by an architect with Illinois State Board of Education, we have the following conclusions and recommendations:

1. Original efforts were concentrated in the new grade school addition since complaints were from individuals occupying this area. Maintenance staff were advised to clean rooms and desks in these areas with soap and water. Directions for use of cleaning chemicals and material safety data sheets were reviewed and discussed with appropriate staff.
2. As illustrated on the enclosed graphs, there were periods when carbon dioxide levels measured in the classrooms exceeded 1000 ppm when the classrooms were occupied. Consultation with the HVAC control company should be completed to ensure the fresh-air intakes for the HVAC units are set at the recommended ASHRAE guidelines for the number of building occupants. The low relative humidity may be contributing to occupant discomfort. Portable humidifiers may alleviate some discomfort with dryness during the heating months; however, if humidifiers are used, these machines should be thoroughly cleaned at least every two or three days to discourage microbial growth in the machines.
3. A variety of deodorizers were noted throughout the school including the metered mist machines and deodorizers plugged into electrical outlets. Ingredients in these products can cause irritation for sensitive individuals and their use in the school should be discouraged.

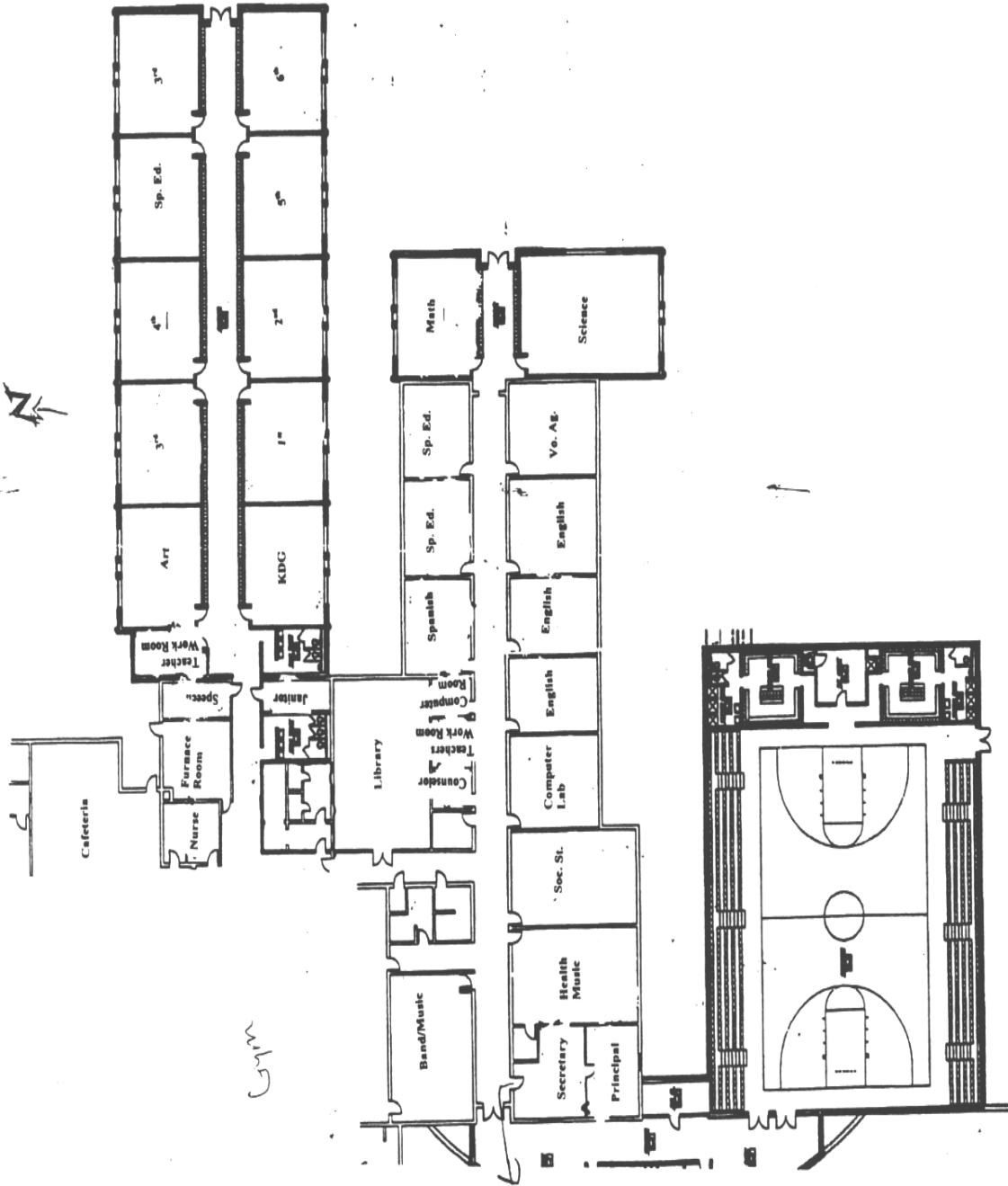
4. No visible areas of mold growth were noted during the inspection. The relative humidity in the school ranged from 15% to 28%. No active roof leaks or plumbing leaks were noted except for the leaking drain in the science room. The drain was leaking onto a tile floor and no mold growth was noted in that area. The leak should be repaired before tiles become warped or damaged. In December, mold growth was apparently noted near the metal roof decking in the high school Spanish classroom. Visible mold growth on the roof decking suggests a moisture problem such as condensation or a roof leak; however, the ceiling plenum in the affected classroom should not be a significant source of fungal exposure in the classroom air. Nevertheless, any mold should be cleaned using appropriate guidelines and the school should be regularly inspected for signs of roof leaks, such as water-stained or visibly moldy ceiling tiles. When leaks are identified, they should be addressed immediately. Heavily damaged, porous materials that cannot be thoroughly cleaned and dried, should be discarded and replaced. Non-porous surfaces and porous materials that cannot be removed should be cleaned using a soap or detergent solution. Any mold cleanup or remediation plan that does not address underlying moisture problems will ultimately fail. **There is no practical way to eliminate all mold and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.**
5. The district superintendent requested IDPH interpret the laboratory results for the mold samples that were collected by an independent environmental consultant in December 2002. As was explained to the district superintendent, IDPH does not generally recommend routine sampling for molds. Current evidence indicates that allergies are the type of diseases most often associated with molds. Since the susceptibility of individuals can vary greatly, sampling and culturing for mold are not reliable in determining health risks. A general rule of thumb is if mold is seen or smelled there is a potential health risk for susceptible individuals no matter what type of mold is present. The mold should be cleaned up and the underlying moisture problem should be corrected. Standards for judging what is an acceptable, tolerable, or normal quantity of mold have not been established. The laboratory results provided to IDPH described the tape sample concentrations with the adjectives low, medium, and high. These descriptors are relative comparisons with samples collected in other problem buildings and have no relation to health effects. The air samples were dominated by *Aspergillus/Penicillium* and *Cladosporium*. These are some of the most common indoor molds. Molds are very common in buildings and homes and will grow anywhere indoors where there is moisture.
6. The use of an ozone-generating air cleaner in the school can contribute to respiratory problems and should be prohibited. Ozone is a known respiratory irritant that can cause coughing, shortness of breath, and throat irritation. For your information, we have attached the U.S. Environmental Protection Agency's fact sheet "*Ozone Generators that are Sold as Air Cleaners: An Assessment of Effectiveness and Health Consequences*" to this report in Appendix 2.

7. Unit ventilators should be routinely inspected and cleaned. These units are subject to collecting dust and debris that can be a reservoir for allergens including dust mites and mold spores. The outside air intakes for these units should be open, operable and unobstructed. Filters should be properly installed and on a regular maintenance schedule. The unit ventilators should not be blocked by furniture or shelves. The use of the unit ventilators for storage should also be discouraged.
8. The U.S. Environmental Protection Agency has developed the *Indoor Air Quality (IAQ) Tools for Schools* kit. This kit shows schools how to carry out a practical plan of action to improve indoor air problems at little or no cost using straight forward activities and in-house staff. The kit includes checklists for school employees, a guide for coordinating the checklists, fact sheets on indoor air pollution issues, and sample policies and memos. Information in this kit may be helpful to the district in your continuing effort to address indoor air concerns. Further information about the kit is enclosed with this report in Appendix 3. IDPH has the kit and will send one to the school district office.
9. Based on the environmental monitoring and information gathered during the investigation at the school, we could not identify a clear origin or causative agent for the rashes experienced by the students and staff.
10. IDPH Infectious Diseases staff are working with the school administration in an effort to rule out any infectious agents that may be contributing to the described symptoms. A questionnaire that can be administered by parents has been distributed to students at the school. Before making any decisions regarding sampling by an independent consultant, we recommend the school administration first review results compiled from the questionnaire. These questionnaires may provide key answers to the etiology of the rash. Reliable sampling for agents such as mold can be expensive and standards for judging what is and what is not an acceptable quantity of mold have not been established.

Preparer of Report

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ATTACHMENT A



Appendix 1

Graphs illustrating CO₂, %RH & temperature in classrooms #210, 204, 205, library

Appendix 2

*Ozone Generators that are Sold as Air Cleaners:
An Assessment of Effectiveness and Health Consequences*

<http://www.epa.gov/iaq/pubs/ozonegen.html>

Appendix 3

USEPA Tools for Schools Information

<http://www.epa.gov/iaq/schools/toolkit.html>