As a requirement of earning a Master of Environmental Science degree, I interned with the Environmental/General Services division of the Fort Wayne-Allen County Department of Health in Fort Wayne, Indiana from December 10, 2001 to June 10, 2002. During my internship I was responsible for determining the environmental source of poisoning for children poisoned with lead as well providing parents and landowners with suggestions to eliminate the found sources. In addition, I was designated as the Indoor Air Quality Specialist, requiring me to provide education and complaint investigation of indoor air quality issues. I was also responsible for providing GIS and GPS map production for the entire department. Other duties included assisting during investigations of adult and child neglect cases, inspecting local tattoo and body piercing establishments, presenting a bi-annual blood-borne pathogen course to local tattoo and body piercing artists, and weekly sampling of public pools.
REPORT ON AN INTERNSHIP WITH THE
FORT WAYNE-ALLEN COUNTY DEPARTMENT OF HEALTH,
FORT WAYNE, INDIANA

An Internship

Submitted to the
Faculty of Miami University
in partial fulfillment of
the requirements for the degree of
Master of Environmental Science
Institute of Environmental Sciences

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2004

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I. FORT WAYNE-ALLEN COUNTY DEPARTMENT OF HEALTH

**History**

A relatively young organization, the current Fort Wayne-Allen County Department of Health (FW-ACDOH) was born from two parent organizations. The current FW-ACDOH was created in 1973 as a result of a merger between the City of Fort Wayne’s Department of Public Health and the Allen County Board of Health.

The Fort Wayne Board of Health was established in 1842 as a result of a state law requiring cities to monitor public health. At the time, the primary responsibilities of the health department were monitoring slaughterhouses and monitoring communicable diseases. It is unclear when the county department was established, although it can presumably have been established during a similar time. The city was responsible for the public health within the Fort Wayne city limits while the county health department monitored public health within Allen County.

In 1965, Indiana House Bill 1871 mandated the unification of city and county health departments. This idea was highly opposed by city and county health officials and did not occur until January 1, 1973. At that time, the city integrated the city board of public health into the county, forming the Fort Wayne-Allen County Board of Public Health. Most health departments are either run on a city or county basis, therefore making the FW-ACDOH unique. The name was soon shortened to the Fort Wayne-Allen County Board of Health. Then, in 1986 the Fort Wayne-Allen County Board of Health changed its name to the Fort Wayne-Allen County Department of Health as a result of confusion regarding the actual Health Board that governs the department’s financial and operational procedures.

**Fort Wayne-Allen County Department of Health**

Located in Fort Wayne, Allen County, Indiana, the Fort Wayne-Allen County Department of Health (FW-ACDOH) is responsible for the public health of the City of Fort Wayne and Allen County residents. To better promote and monitor a healthy community by providing effective public health services and working toward a hazard free environment, the Department is composed of nine separate divisions that individually focus on specific aspects of
public health. Table 1 lists the nine different divisions and explains their role in the FW-ACDOH.

Table 1. Departmental division of the FW-ACDOH.

<table>
<thead>
<tr>
<th>Division</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td><strong>Food Protection</strong></td>
<td>Monitors sanitation, preparation, and storage of food products</td>
</tr>
<tr>
<td><strong>Pollution Control</strong></td>
<td>Monitors septic system discharge and environmental spills</td>
</tr>
<tr>
<td><strong>Vector Control</strong></td>
<td>Monitors and controls health vectors such as rats and mosquitoes</td>
</tr>
<tr>
<td><strong>Vital Records</strong></td>
<td>Records and issues births and deaths within Allen County</td>
</tr>
<tr>
<td><strong>Public Health Nurses</strong></td>
<td>Immunizations and medical education, disease surveillance</td>
</tr>
<tr>
<td><strong>Sexually Transmitted Disease Clinic</strong></td>
<td>Tests, monitors, and educates citizens on STDs</td>
</tr>
<tr>
<td><strong>Tuberculosis Clinic</strong></td>
<td>Tests, monitors, and educates citizens on tuberculosis</td>
</tr>
<tr>
<td><strong>Laboratory Services</strong></td>
<td>Analysis of dairy products, water samples, cultural and serological samples, insect identification, food product complaints, pollen counts</td>
</tr>
<tr>
<td><strong>Environmental/General Services</strong></td>
<td>Monitors public swimming pools and spas, lead investigations, indoor air complaints, monitors tattoo and body piercing industry, assists with child and adult endangerment cases</td>
</tr>
</tbody>
</table>

A Health Administrator, Loren Robertson, and a Health Commissioner, Dr. Debra McMahan, oversee the operations and procedures of the FW-ACDOH. Their responsibilities include making sure the department has a budget and making sure the agency works as a department and accomplishes its tasks. In turn, the Health Administrator and Health Commissioner are overseen by three governing bodies: three Allen County Commissioners, a board of elected officials called the Allen County Council, and the Allen County Health Board which is comprised of health professionals from throughout the community, some of which are appointed by the mayor of the City of Fort Wayne.

**Environmental Services**

The Environmental/General Services Division is comprised of seven staff members, which is illustrated in chart 1. Chadwick Appleman directs the division, while Amy Hesting is
the assistant director. The department employs four environmental technicians, Ray Capps as the field supervisor, and Ray Navarro, Mike Jones, and Cindy Wable. I occupy the position of Environmental Health Specialist within the Environmental/General Services Division. I started my internship on December 10, 2001. During my six-month internship at the Fort Wayne-Allen County Department of Health my job responsibilities included: assisting and conducting environmental investigations on homes of children with elevated blood lead levels, investigating indoor air quality complaints pertaining to mold, lead, asbestos, and general air quality, creating Geographical Information System maps for various divisions within the Department, collecting Global Positioning System data, becoming familiar with the applicable county codes regulating tattoo and body piercing studios and public pools and spas so I could enforce the codes during inspections, collecting water samples from pools and spas, assisting in child and adult endangerment cases, and assisting other staff members as needed.

![Environmental/General Services Divisions flow chart.](image)

**Safety Precautions**

Our daily activities at the FW-ACDOH require us to enter people’s homes and businesses, sometimes into situations that have the potential to become dangerous. To protect ourselves, we always conduct investigations in pairs. Not only does this protect our personal safety, it also protects us if we are ever accused of stealing or acting inappropriately.
In addition to a partner, a handheld two-way radio remains with us at all times while we are in the field. The radio allows us to have continuous contact with the office and other field officers in case something were to go wrong and additional assistance was required.

When entering a facility, no personal protective equipment (PPE) such as masks, goggles, or gloves is used. Typically, the odor in many of these locations can be overpowering. Discussion has occurred as to the health risks we take when entering these homes and if use of PPE is warranted in these situations. At this time, no resolution has been made. One of the primary concerns is that if we enter a home or facility wearing PPE, the people might feel alienated and be less willing to work with us.

**Working with Other Agencies**

An important part of our job includes working with a number of different agencies to protect public health. The Indiana State Department of Health (ISDH) is our governing agency. The ISDH provides direction for our ordinances as well as state organization of all county health departments. Throughout my internship, I have worked closely worked with the Indoor Air and Radiological Health division of ISDH.

We also work closely with the Indiana Department of Environmental Management (IDEM). The IDEM regulates Indiana’s environmental health. IDEM is also responsible for the licensing of lead inspectors, lead risk assessors, lead abatement workers, as well as asbestos licensing. During some rare instances, we also work with Federal agencies such as the Environmental Protection Agency (EPA), Housing and Urban Development (HUD), and Occupational Safety and Health Agency (OSHA).

Locally, we work in conjunction with a number of agencies. Neighborhood Code Enforcement (NCE) and Allen County Building Department (ACBD) are the two agencies we work with in assuring structures such as homes and buildings are safe for human habitation. During cases with child and adult endangerment we work closely with Child Protective Services (CPS) and Adult Protective Services (APS). Many of the endangerment cases are often referred from the Fort Wayne Police Department (FWPD), Allen County Sheriff (ACS) or the Fort Wayne Fire Department (FWFD). In cases of chemical storage or hazardous materials, we closely work with the FWFD.
Public Record

Permits, inspection reports, and any complaint received, as well as any information obtained during the complaint investigation, is public record. Any member of the public can obtain copies of reports and inspections at any time provided they fill out the proper request forms and that the requested information does not contain protected health information. Occasionally the FW-ACDOH’s records become part of litigation between individuals, which mandates clear and precise accounts of the investigation.
Background and History of Lead

Lead, a naturally occurring element, has been used for centuries in various forms. Lead is a heavy, soft, flexible, blue-gray metal that has numerous appealing properties such as corrosion resistance, flexibility, strength, weight, and provides protection against radiation. It was common practice within the paint industry to add lead to paint for pigmentation and to aid the paint in drying more quickly. Because lead-based paint is self-cleaning, it forms a chalk as it ages.

In 1978, lead-based paint was banned in the United States, although other countries had been banning lead-based paint (LBP) as early as 1840 (Georgia Tech Research Institute, 1998). The use of LBP was banned in houses, hospitals, schools, parks, playgrounds, and public buildings in 1978, although stores were allowed to sell out their remaining stock of lead-based paint until 1980 (Georgia Tech Research Institute, 1998).

The EPA has stated that in the United States, 88% of homes built before 1940 have LBP in them, while 76% of homes built between 1960 and 1979 have LBP. After 1950, latex paints became more popular and LBP began to be phased out and was used less regularly. Although prominent in lower income families, lead poisoning is not merely a problem related to poverty. Because of less available money in poverty areas to maintain the homes, lead poisoning is more prominent in areas with significantly older housing stock in which lower income families reside.

Sources of Environmental Lead Contamination

In addition to lead being added to paint, it has also been added to the environment through other sources. One example is lead being added to gasoline as an anti-knocking agent. Car exhaust would release the lead into the air, and due to the heaviness of lead, it would fall to the ground and pollute the soil in which children play. In 1978, the EPA reduced the amount of lead that could be added to gasoline and subsequently the average person’s blood lead level dropped by 37%. Today, with the exception of gasoline used in some farm equipment, gasoline is only allowed to contain .05 grams of lead (Georgia Tech Research Institute, 1998).
Soil has also been polluted by lead when the exterior of a house contains LBP and is not maintained properly. The self-cleaning nature of lead-based paint creates a dust and eventually, if not maintained, begins chipping and falling into the soil. Similarly, lead can also be found in the dust within a home.

Some hobbies also use lead. Fishing involves using lead sinkers to hold the fishing line in the water, bullet casting typically uses lead for the bullet, and car batteries contain lead. Stained glass productions, as well as some glazes used in pottery and ceramics, contain lead to allow for the radiant color effect.

Lead is also a byproduct of many smelting processes. Toxic lead fumes are byproducts of industry. The tall stack in industry pushes the lead waste up out of the factory and then disperses the lead into the air, soil, and water.

Lead has also been used for plumbing pipes that carry water directly into the home. Water sources can also be contaminated with lead. Approximately 90,000 bridges in the United States are coated with lead-based paint because of the paint’s anti-corrosiveness. The simplest of repairs to these bridges produces large amounts of lead dust, which is more than likely dropped directly down into the water system, which the bridge spans. This allows lead to directly enter the drinking water supply (Georgia Tech Research Institute, 1998).

**Health Risks**

**Children**

Environmental lead has become a rising issue because studies have shown that lead in the blood of children can cause permanent and irreversible physiological and mental stunting. Children are most at risk between six months and six years of age. Children are at a greater risk for lead poisoning than adults because it takes a smaller amount of lead to poison a child than an adult. Children absorb up to 50 percent of the lead they ingest or inhale (Georgia Tech Research Institute, 1998).

**Paths of Entry**

Lead can enter into a child’s body through two main paths: ingestion and inhalation. Ingestion is the process by which a child directly eats lead either by eating a LBP chip or sticking an item, such as their hand or a toy, covered with lead dust into their mouth. This is not unusual with a condition known as pica, an eating disorder in which a child eats non-food items such as soil, paint chips, etc.
Inhalation of lead occurs when the child breathes in dust containing lead. Playing or crawling on a floor that contains lead dust, as well as playing with toys in window troughs where lead dust may be present, can stir up the lead dust into the air, making it readily inhaled through normal respiration. Children’s smaller bodies have a higher respiration ratio, meaning for their body size they breathe in many more times than an adult. Playing outdoors in lead contaminated soil, constant hand-to-mouth activity, and a developing central nervous system, also contribute to children’s higher risk of lead poisoning.

**Symptoms/Effects**

Although there are no obvious outwards signals that a child is lead poisoned, elevated levels of lead can have catastrophic effects. The largest concern is that lead affects a child’s intelligence. Once lead enters the body, it can kill brain cells and disrupt nerve signals. Lead poisoned children are also known to have poor muscle and bone growth, poor hearing, speech and language problems, and coordination problems. Children with lead poisoning have been found to have attention deficit disorder, hyperactivity, and lack socialization skills (Georgia Tech Research Institute, 1998).

Many children that are lead poisoned also have anemia, an iron deficiency. In addition, lead poisoned children are lacking calcium. The body mistakes lead as calcium and readily absorbs the lead into the child’s bones, thus stunting the body’s growth due to insufficient calcium. Proper diet and nutrition can lessen the impact of lead poisoning.

Severe cases of lead poisoning can affect the kidney system, nervous system, and cause stomach aches. In rare cases where a child’s lead level is extremely high, seizures or death could occur.

**Adults**

Although there is not as great of a concern of lead poisoning in adults, it is still a concern. Adult bodies are fully developed and lead is not as readily absorbed into bones or the blood system. Studies have shown that lead poisoned pregnant woman can transmit lead poisoning to their unborn fetus through their placenta. Awareness of possible contamination as well as a proper diet is important to preventing adult lead poisoning (Georgia Tech Research Institute, 1998).
**Paths of Entry**

Similar to children, lead can enter into the body through either inhalation or ingestion. Most lead poisoned adults become poisoned through occupational exposure in their work environment. Some trades that are most susceptible to lead poisoning include painters, construction workers, individuals that work in metal smoldering plants, mechanics, plumbers, machinists, and stained glass makers.

Some lifestyle choices also increase the risk associated with adult lead poisoning. Smoking can increase the risk of lead poisoning. In addition to cigarettes containing lead, leaded dust from the adults work or home environment may be on the individual’s hand. When smoking, the adult’s mouth comes in direct contact with the cigarette butt that has been touched by a hand that has lead dust on it. Similarly, poor hygiene and lack of hand washing can allow food to get lead dust on it.

**Symptoms/Health Effects**

Although lead poisoning often does not have symptoms, in adults some symptoms may include fatigue, sleep problems, dizziness, irritability, nervousness, headaches, depression, lack of concentration, forgetfulness, numbness, weakness, joint and muscle pain, loss of appetite, stomach aches, constipation, or a metallic taste in the mouth. For adults, health effects associated with lead poisoning include anemia, high blood pressure, damage to blood cell formation, kidney disease, brain damage, seizures, nerve damage, decreased fertility for both men and women, premature births, and miscarriages. Some of these effects are reversible while others can cause permanent damage (Georgia Tech Research Institute, 1998).

**Testing for Elevated Blood Lead Level**

In order to determine if an individual is lead poisoned, be it a child or an adult, a blood test must be taken to determine the blood lead level (BLL). Once a sample is taken, it is analyzed at a lab and a level is determined in micrograms per deciliters (µg/dL). To understand this unit, one must imagine a penny that weighs two grams. In one gram there are 1 million micrograms. Cutting the penny into two million pieces and weighing one of those pieces would be the weight of one microgram. A deciliter is just less than half a cup of liquid (Georgia Tech Research Institute, 1998).

Blood samples can be taken in one of two primary ways, either a capillary draw or a venous draw. A capillary draw uses a small lancet to poke the fingertip. Once the fingertip
starts bleeding, the blood is collected in a sample tube or onto filter paper. Venous draws collect a sample directly from the vein.

Each process has its benefits and restrictions. Capillary tests are less intrusive, but tend to produce higher results because of potential cross contamination of environmental lead during sample collection. If the finger is not cleaned properly, residual lead may be present on the skin or underneath the nail. While trying to sample the blood, the sampler could inadvertently collect lead from the skin or nail. A venous draw is taken directly from a vein, eliminating environmental contamination of the sample. This procedure is more intrusive and requires a trained phlebotomist to do the procedure.

During one case, the FW-ACDOH observed a significant difference between the two collection types. When assigned the case, the child’s BLL, which was drawn by the capillary method, was 34 µg/dL. When we arrived at the home to conduct an environmental assessment, the mother informed us that the child had recently had a venous draw done and her BLL was down to 3 µg/dL.

Elevated Levels

Currently, a child is considered to have an elevated BLL if their level is 10 µg/dL or higher. The EPA and the CDC have determined an action level of 20 µg/dL or two consecutive samples of 15 µg/dL. The action level requires that an environmental investigation be conducted. When a BLL rises above 100 µg/dL, the child becomes in danger of brain swelling, seizures, coma, or death. Typically, a child with a BLL of 45 µg/dL or higher is treated medically with chelation therapy (see Childhood Lead Poisoning Prevention) (Georgia Tech Research Institute, 1998).

Lead Reduction Actions, Laws, Rules, and Regulations

With the growing concern and acknowledgement of the health risk associated with lead poisoning, especially in children, lead rules, regulations, and standards were introduced and have evolved extensively over the past 60 years. In 1960, paint manufacturers voluntarily lowered the standard of lead in paint to five percent. At that time the acceptable BLL was near 60 µg/dL, which was the concentration at which symptoms were observable.

In 1971, the Lead-based Paint Poisoning Prevention Act (LBPPPA) required housing authorities to conduct random inspections of public and Indian housing for LBP hazards. These efforts increased LBP screening in residential structures and prohibited the use of LBP
containing more than 1 percent of lead by weight in residential structures receiving federal assistance. In 1973, the LBPPPA lowered the standard of lead in paint to 0.5 percent.

The Safe Drinking Water Act (SDWA) was introduced in 1974. In addition to providing protection for public drinking water supplies, this act set standards for allowable levels of contaminants. The SDWA established the standard that 50 parts per million (ppm) of lead was allowable in public drinking supplies. Later amendments to the SDWA established requirements for treatment facilities, employees, and lowered some standards.

In 1976, the LBPPPA was once again amended to lower the standard of lead in paint to .06 percent. During this same year, the EPA enacted the Toxic Substance Control Act (TSCA) to replace the Resource Conservation and Recovery Act (RCRA) in regulating LBP disposal.

In 1978, numerous actions were taken to reduce the risk of lead exposure. The Clean Air Act (CAA) 40 CFR 50 was enacted, by adding lead as an amendment to the original 1971 ruling regarding clean air. The regulation set an ambient air standard of 1.5 µg/m$^3$, reducing lead exposure through car exhaust. This regulation led to the phasing out of leaded gasoline.

1978 also saw the US Consumer Product Safety Commission (CPSC) officially banned residential paint in new homes that contained paints containing .06%, or 600 ppm, or more of lead. The same year, the acceptable BLL was lowered to 30 µg/dL. In 1985, this level would once again be lowered to 25µg/dL.

In efforts to reduce childhood lead poisoning, lead pipes were banned and the use of lead in brass faucets fixtures was limited in 1986. A year later in 1987, LBPPPA was amended again and established stricter requirements on testing and abatement of LBP. In 1988, strides were being made to increase funding for screening of infants and children, ensure referral for medical and environmental intervention, and to provide education about childhood lead poisoning through the Lead Contamination Control Act (LCCA).

In 1991, the acceptable blood level was lowered to 10 µg/dL, the current threshold of concern. In 1992 the limit of lead in public drinking water was drastically lowered from 50 ppm to the current standard of 15 ppm.

In 1992, the Residential LBP Hazard Reduction Act (Title X) was signed into law making it the most comprehensive and extensive LBP action plan. Title X required the HUD, EPA, and OSHA to issue lead regulations. Title X also placed the focus of lead onto LBP hazards such as chipping and peeling paint, impact, friction, and chewable surfaces, and
excessive amounts of lead in surface dust and soil and reducing or eliminating the hazards within all residential structures built before 1978. In 1995, Title X was amended to require all homeowners that were aware of lead hazards in their home to disclose the information to renters or buyers (Georgia Tech Research Institute, 1998).

**Fort Wayne-Allen County Department of Health Lead Program**

In Allen County, five prime zip codes have been identified as being at having an elevated risk of lead poisoning children. These zip codes have become a target zone for the lead screening of children, and coined Allen County’s target zip codes. This determination was based on the age of housing stock within the zip code, with the majority of the homes being built before 1950, in addition to a larger number of children under the age of five years living in these zip codes. The five zip codes identified as at risk zip codes in Allen County are 46802, 46803, 46806, 46807, and 46808 (Appendix A).

These five zip codes surround the downtown area of Fort Wayne. These zip codes are lower income neighborhoods. Houses built before 1950 are present in other zip codes within the county, but the upkeep of homes in the other zip codes tends to be better. Approximately 80 percent of the housing stock in the targeted zip codes is rental property, usually experiencing a large turnover ratio.

**Identifying Children with Elevated Blood Lead Levels**

The population that lives in the targeted zip codes tends to be a migrant population, meaning that often times one family may have multiple residences in a short amount of time. In addition, the majority of the children living in the targeted zip codes receive federal assistance for health insurance, housing needs, or food needs. The Women, Children, and Infants Program (WIC) provides services for women with children under three years of age. Medicaid is insurance for children living in poverty. As a part of Medicaid’s requirements, Medicaid providers are required to screen children for lead poisoning at the ages of 12 and 24 months. Currently in Allen County, many Medicaid providers are not screening their patients at the appropriate time intervals, if at all.

In addition to Medicaid providers not screening children, the high-risk population tends to move frequently. Most of the children living in the high-risk zip codes do not attend regular checkups. The mobility of the population and lack of screening by Medicaid providers allows for some high-risk children to never be screened. Fortunately, Fort Wayne has a Neighborhood
Health Clinic, which is strictly a Medicaid provider and a strong screening location. The majority of the FW-ACDOH’s lead poisoning cases come from this clinic.

Once a child’s BLL has been determined, a copy of the laboratory report is sent to the FW-ACDOH as well as the medical provider. If a child’s BLL is below 10 µg/dL, the child is not considered to be lead poisoned and their name is entered into the ISDH’s Childhood Lead Poisoning Prevention Program’s (ICLPPP) Stellar database. If a child’s BLL is above 10 µg/dL, but below 15 µg/dL, the case is assigned to a public health nurse who then conducts a telephone call to the child’s parents to discuss nutrition and the basics of lead poisoning. If a child’s BLL is 15 µg/dL or above, the case is assigned to a public health nurse and also the Environmental Division. The public health nurse makes a home visit to discuss the health aspects of lead poisoning and the Environmental Division conducts an environmental investigation of the child’s primary occupancy.

Childhood Lead Poisoning Prevention

Currently the FW-ACDOH has a secondary prevention program. Secondary prevention occurs after a child is lead poisoned. Our interaction begins once a child has been identified as having an elevated BLL. At that point, we attempt to lower the child’s BLL to under 10 µg/dL by identifying hazards in the home, attempting to locate and reduce exposure to the source, and providing nutritional counseling.

In cases with children that have extremely high BLL, tertiary prevention is required. Tertiary prevention is medical care such as chelation therapy. During chelation therapy, a chemical is injected into the child. This chemical then absorbs the lead in the blood. The chemical, along with the lead, is then excreted from the body through urination. The effects of the chelation therapy can be harsh on the child’s body because the chelation chemical not only absorbs the lead, but also other nutrients such as iron and calcium, thus draining the body of vital nutrients. Typically this method of treatment is reserved for BLL above 45 µg/dL.

The CDC has established a goal of nearly eliminating childhood lead poisoning by the year 2010. In order for this to happen, a stronger emphasis and focus must be placed on primary prevention. Primary prevention involves increasing public awareness of the health hazards lead presents. Primary prevention also involves fixing known lead hazards in homes so future generations of children do not face the same lead risks. The banning of LBP and removal of lead
from gasoline and other air sources are examples of primary prevention techniques. Primary prevention reduces the chances that a child will become poisoned.

My Role

Environmental Investigations

My primary role in the ACCLPPP program has been in assisting and conducting environmental lead investigations of lead poisoned children’s homes. The purpose of these investigations is to determine the source of lead that is poisoning the child. Once a source has been identified, exposure to the source may be reduced and ultimately lower the child’s BLL.

There are two primary types of investigations, a lead inspection or lead risk assessment. A lead inspection is a surface-by-surface investigation to determine where LBP is present. A lead inspection does not give options for ways to eliminate lead hazards. A lead risk assessment provides detailed information about where lead hazards may exist and what options are available for eliminating those hazards.

Depending on the type of investigation, it can be conducted only by either a licensed LBP inspector or LBP risk assessor. An inspector can do almost everything a assessor can do, since the inspection is part of conducting a risk assessment; however, an inspector cannot provide options on how to reduce or remove the hazards.

Training

Lead Inspector/Risk Assessor License

During the week of February 11 through February 15 I attended two certification courses in Indianapolis, IN. The first course was a three-day class on being a Lead Inspector. The second course, which lasted two days, was a complementary course on being a Lead Risk Assessor. The classes focused on the techniques, guidelines, and corrective actions entailed when assessing a home for lead-based paint or lead hazards. Participants in the class were from various occupations ranging from health department employees to housing and urban development groups and general contractors.

The role of an inspector is to conduct a surface-by-surface analysis to determine if lead-based paint is present in a home. Inspectors are not able to suggest corrections to the problem; they are only allowed to say if lead is present. The class taught participants how to identify target housing, homes built before 1978, and exposed us to different regulations and guidelines
put forth by the Environmental Protection Agency (EPA), Housing and Urban Development (HUD), and Occupational Safety and Health Administration (OSHA).

A risk assessor’s job is to determine where lead hazards may potentially be. In addition to determining where lead hazards are, a risk assessor makes suggestions as to what actions can be taken to correct or eliminate the hazards. Within an assessor’s report, a hazard control plan is established. Three options are given: 1.) do nothing, 2.) interim controls, and 3.) abatement. With the exception of HUD housing, there are no regulations requiring the removal of lead hazards from a home. Interim controls are short-term solutions to long-term problems. Interim controls reduce the risk, but do not alleviate the problem forever. Abatement is the permanent, 20 years or more, removal of lead-based paint from a home. Only a licensed contractor can conduct lead abatement. The contractors must follow OSHA, HUD, and EPA requirements. Abatement is expensive and time consuming, considering the area being worked on must be unoccupied and pass a clearance exam after the abatement work has been completed.

At the conclusion of each class, I had to take and pass a test on each class topic in order to get my certification so that I could take the IDEM’s third party exam. On April 9, I traveled to IDEM to take the lead inspector and lead risk assessor third party exams. The lead inspector exam consisted of 100 questions regarding what a lead inspector should do and understand during the process of an inspection. The lead risk assessor exam consisted of 110 questions regarding the role and procedures to be followed by a lead risk assessor. Typically people do not pass these exams on their first attempt. Six days after taking the exams, I received a letter informing me that I had passed both tests.

By passing these exams, I was able to apply for my lead inspector and risk assessor licenses. After receiving my licenses, I was able to perform my own lead inspections and risk assessments.

Types of Testing

During a lead risk assessment or lead investigation, there are four testing methods to determine the extent of the lead hazards in the home: paint testing, dust testing, soil testing, and water testing.

Paint

Paint can be tested for lead by either collecting paint chip samples and sending them to the laboratory or by using a portable x-ray fluorescence (XRF) machine. The XRF sends
radiation through the various paint layers on the wall, then the machine measures how much radiation is returned back into the machine. The machine then produces a result of positive or negative for LBP as well as producing a numeric value with the units of milligrams per square centimeter (mg/cm²). The XRF can penetrate numerous paint layers so that the entire paint history is examined. XRF testing provides immediate results as to where LBP hazards occur, while paint chip sampling requires more time due to the laboratory analyses.

Dust

Dust found in the residence is also tested for lead content. Window troughs, windowsills, and floors are the most commonly tested areas, but other areas of concern can also be sampled. Dust samples are collected using a dust wipe, which resembles a baby wipe. After the sample is taken, the area is measured in square inches, which is then converted into square feet (ft²). The samples are analyzed by a lab that provides the FW-ACDOH with a measurement of lead in the sample in micrograms (µg). A calculation must then be done to determine the µg/ft², the unit of measurement established under EPA and HUD standards. The standards determine whether or not the lead levels in the dust exceed safe levels. Floors have a standard of 40 µg/ft², windowsills are 250 µg/ft², and window troughs are 400 µg/ft².

Soil

Lead often collects and produces the most risk when it collects in bare soil surrounding the home. In older homes where the exterior is painted with LBP, the paint chips and flakes with age, falling directly into the house’s drip line below the gutters. When young children play in the contaminated soil they directly ingest LBP as well as inhale it. Soil is sampled by taking three to five, two-inch deep, aliquots for each sample. Soil is then tested and lead content is reported in parts per million (ppm). The standard for play areas is 400 ppm and the standard for other bare soil areas that are not play areas is 1,200 ppm. A mandatory soil abatement level has been established at 5,000 ppm for HUD-funded homes. Any time soil is found to have at least 5,000 ppm of lead present, the soil must either be covered or completely removed.

Water

Water samples are also taken in the home. In order to collect a water sample, the water line to the sample source must not be used for at least 8 hours before sampling occurs. Lead frequently leaches into the stagnant water in the pipe. Two samples are taken, an initial draw and then a second draw after the water has run for five minutes. If the first sample exceeds the
lead in water standard of 15.0 parts per billion (ppm) or 15.0 micrograms per liter (µg/l), the pipes within the home contain lead. If the second sample is positive, the problem is either in the pipes from the public water supply or that too much lead is present in the public water source.

Clearance

A third type of environmental lead testing is clearance sampling. Only a licensed LBP inspector, risk assessor, or a clearance technician can perform a clearance inspection. Clearance inspections are performed after lead abatement work to remove lead hazards permanently has been conducted. Clearance investigations require fewer dust samples to be taken because the purpose of the inspection is to ensure all lead dust caused by any construction process has been cleaned up before the family is able to re-occupy the home. The sampling locations within the home are random, but require a minimum of a floor, windowsill, and window trough in at least four rooms where work occurred in addition to one sample outside of the containment area if containment was used.

Hazard Reduction

Once a lead hazard has been identified through a lead risk assessment, the tenants and landlords are presented with two options: interim controls or abatement. Both methods reduce lead dust generation and/or exposure to the dust.

Interim controls are meant to reduce the exposure to lead but do not remove the lead from the environment. Interim controls vary in possibilities and costs associated with the measurement. Some examples of interim controls that are relatively simple and cost very little include things as simple as a weekly cleaning of areas contaminated with leaded dust or moving a couch in front of a window so a child cannot play in the window. More cost-inhibitive interim controls include stabilizing deteriorated paint by painting over it, installing drywall or paneling on top of the existing wall, or adding trough and jamb liners to windows and doorways. Covering contaminated soil with more soil, mulch, or planting vegetation in bare soil spots reduces a child’s risk of coming in contact with lead in soil.

Abatement is a much more cost-prohibitive process that requires the skills of a licensed lead abatement contractor. Abatement removes the lead permanently, in comparison to interim controls in which the lead is still present, but covered up. Abatement rules are unique in the fact that if you are doing work with the sole purpose of removing lead, then the work must be
considered abatement, but if you are doing renovation or remodeling it is not abatement and licensed personnel are not required.

It is thought that the greatest production of lead dust is caused by friction surfaces in which two surfaces make contact with each other while rubbing together. An example of a friction surface is a window being opened and closed. The window sash and the window jamb rub against each other. If lead-based paint is present on either surface, it will begin to deteriorate and a dust that can be readily inhaled or ingested will be formed. Another example of a friction surface is a doorway. The doorjamb and edge of the door act in a way similar to the window. Impact surfaces are surfaces that frequently get bumped into by another surface. Impact surfaces are also responsible for increasing the lead dust levels in a home. An example of an impact surface is a floor.

**Internship Activities**

**Home Cleaning Program (HCP)**

On February 19, 2002, Amy Hesting, Cindy Wable, and I visited a home to initiate the FW-ACDOH home-cleaning program. The program was designed to show families of lead-poisoned children how to properly clean their homes so as not to agitate lead-laden dust.

We started with a family that had a long case history with the ACCLPPP. The family had seven children of whom at least two had been diagnosed with elevated BLL’s. A previous lead inspection had already been conducted on the residence; therefore, baseline data had already been established. The HCP provided families of lead-poisoned children with buckets, rags, and dish soap to clean their homes in an effort to limit lead dust. After cleaning, a dust sample was taken to make sure the cleaning was effective and that leaded dust was not present in the cleaned area.

On our initial visit, we showed the family the proper cleaning technique with a two-bucket system to prevent contaminating clean water with dirty leaded dust. The family was receptive to us coming into their home and allowed us to show them proper cleaning techniques and materials. The cleaning was focused on areas where leaded dust was previously found.

Cindy Wable returned to the home in late March to perform clearance sampling, but the family was not home. After a few failed attempts of getting back into the home, the family moved and clearance samples could never be obtained in the residence to determine if the HCP
was effective. Due to staffing concerns, no other homes were initiated in the program, although supplies were provided to families with lead-poisoned children.

Special Projects

During late April and early May of 2002, the Health Commissioner wanted to examine previous lead cases and examine the homes to determine if window replacement or soil abatement had been done at the homes where lead hazards were found. A list of approximately 45 homes, that as a result of XRF analysis and dust wipe testing showed previous lead hazards in the windows, was divided between Mike Jones, Cindy Wable, and myself. We were to drive by the homes and visually assess if any window replacement or soil abatement had been done.

On May 8, 2002, I went to 11 different homes to determine if any abatement had occurred. To the best of my knowledge, no window replacement had been done at any of the homes I looked at. These homes were evaluated in an effort to gather data that can be used in grant applications for lead abatement.

BLL Screening

On May 21st, 23rd, and 28th, 2002, Amy Hesting and I assisted the immunization nurses in conducting lead screening of children at three different daycare centers within the high-risk zip codes. Approximately 60 children under seven years of age had their blood drawn and tested for lead during this time.

My role was to hold the children and keep them still while the nurses poked them with a needle to initiate blood flow. After the blood started flowing, the nurses collected 200 µL of blood into a 10-g microvette containing Lithium-Heparin, a solution that prevents blood from clotting. After the 200 µL of blood was collected, the samples were sent to the Indiana State Department of Health laboratory to be tested for lead.

After approximately one month, we received the results and only a handful of the children had an elevated BLL. The positive response of parents in the daycare centers was encouraging. Screening in these situations may be an optimum way of screening at-risk children. Going to the children to screen places fewer burdens on the parents because they do not have to find time to take their child to the doctor to get a blood draw ordered or drive to the laboratory to get the blood drawn. Figure 2 compares the number of elevated children tested and non-elevated children tested from 12/10/01 to 6/10/02.
Comparison of Elevated (> or = 10 &micro;g/dL) Blood Lead Levels of Children to Non-Elevated by Zip Code from 12/10/01 to 6/10/02

Figure 3. Results of children tested during internship by zip code.
III. INDOOR AIR QUALITY

Introduction

Within the past two years, the Department of Health has received over 100 complaints regarding indoor air quality (IAQ) concerns including mold, radon, asbestos, secondhand smoke, combustible appliances, dustmites, pesticides, and various allergens. Although many of these calls were mold related, numerous other calls are fielded weekly from homeowners regarding other indoor air quality issues. Unfortunately, the Department of Health is very limited in the resources available for this issue. Because of landlord requirements of providing safe housing, only tenant situations are investigated, although there have been a few exceptions.

My Role

Within the second month of my internship, and after reading numerous articles and pamphlets on IAQ, I was deemed the indoor air quality specialist. This meant that any question or complaint that came into the FW-ACDOH regarding indoor air quality was directed to me. With this responsibility also came the responsibility of investigating all indoor air complaints.

Most of the calls were general questions about mold. A general mold information packet was designed to provide people with the basic information they may need. This information packet had general information about companies that test for mold and perform mold remediation. After receiving a call from someone that got the information, she informed me that some of the contact information was out of date. After speaking with my supervisor I reviewed the list and updated it from three mold testers to 11 individuals or companies that test for mold.

The next most frequent indoor air quality concern is radon. Currently an information packet similar to the mold packets is being put together to explain the risks of radon to residents. In addition, a list of radon testers and mitigators throughout the state of Indiana is also provided for individuals that are concerned about the risk of radon.

The third most frequent concern with IAQ is asbestos. Asbestos received a lot of attention about ten years ago, but since then, concern for the material has diminished greatly. Very few informational brochures are available on the subject. An important task of the indoor
air quality specialist is answering people’s questions about asbestos and sampling suspect materials for asbestos content.

Occasionally an IAQ complaint will arise which we need to refer to the ISDH to provide us with guidance or sampling equipment. During these times, we work closely with the ISDH Air and Radiological Health division. During my internship, I was able to meet with an inspector from the state. He guided me through an apartment complaint and I was able to observe him conducting an IAQ study on a local elementary school.

The symptoms and health effects of indoor air quality pollutants are very similar to each other, therefore causing confusion in determining which indoor air pollutant is causing the ailment. Most indoor air issues are also triggers for asthma attacks. During my internship, I was asked to develop information about indoor air quality for the FW-ACDOH’s Web site. This information can be found in Appendix B. I was also asked to create facts, Appendix C, that could be placed on the homepage of the FW-ACDOH’s Web site. These facts would change as the homepage was reopened. In this chapter, I will focus on the three primary indoor air pollutants that receive the most attention, the health effects of each pollutant, and some of the cases I have been involved in.

**Mold/Bioaerosals**

**Background**

Mold is a naturally occurring decomposer that is ubiquitous. Molds are frequently found in indoor environments, evident by the unattended white bread that turns black and green. Mold’s role in the big picture is to decompose organic matter. Mold is what helps trees become soil again. The mere presence of mold within a home or building is not a problem because some background level of mold should be expected in any environment, but when it becomes a strong, noxious presence in the home which far exceeds the levels outside of the home, it can become dangerous to one’s health and to the stability of the residential structure.

The word ‘mold’ represents hundreds of different species. Mold typically is an indicator of a greater problem, water damage. Not all species of mold are harmful to human health, but all molds are destructive to structures. The different species of molds have very specific habitat requirements depending on their species. The molds that tend to be most dangerous to human health prefer moist environments. Molds can begin invading an area within 24-48 hours after saturation of water (United States Environmental Protection Agency, 2004). Therefore cleanup
after water damage is of the highest importance within the first 48 hours. Keeping relative humidity between 40% and 60% helps reduce the risk of mold overtaking an area (United States Environmental Protection Agency$^3$, 2003).

Molds also prefer areas with a moderate temperature, preferring warm over cold. An ample food source is also important to the mold’s survival. Without these three requirements, mold infestations could not survive. To grow, mold reproduces by sending spores into the airstream. The air carries these lightweight and highly viable spores to other areas that may support mold growth. Once the spore comes in contact with a moist surface it begins to grow, forming its own colony, and reproducing.

Once a mold colony has become established, its requirements can change. Mold infestations can survive after the initial saturation of water has dissipated because their water requirements are not as specific or focused. This means that even if water damage is fixed and the water source is removed, if the mold is still present it can continue to grow. Assuring excess water moisture has been removed from the home is the best option in limiting mold growth (United States Environmental Protection Agency$^3$, 2003).

Health Risks

High levels of mold growth have been shown to be allergens and asthma triggers. Currently there are no regulations or guidelines as to what are considered dangerous levels of mold exposure as a result of the different species of mold and individual sensitivity to mold allergens. Some species have been coined “toxic” molds because they can cause severe headaches, watery and irritated eyes, nausea, respiratory illness, rashes, and can trigger asthma attacks.

Not all molds are “toxic” to human health. Some species, such as Stacyhbatrous, produce mycotoxins, a defense mechanism against other molds. These mycotoxins are produced as a toxin to kill off other mold species that may be fighting for the same resources. Unfortunately, these mycotoxins are so strong that they affect some humans too (United States Environmental Protection Agency$^3$, 2003).

Cases

Standard Operating Procedure (SOP)

Currently in the state of Indiana and within Allen County, there is no governing law or ordinance restricting mold growth within a home. This has left the FW-ACDOH with limited
enforcement abilities regarding mold complaints. The majority of mold complaints result from tenant situations.

My Role

When a complaint is filed with the FW-ACDOH, it passed to me and I make initial contact with the complainant. At that point, I get the background history of the mold problem, such as when it began, where the mold growth is, and how extensive it is. At that time, an appointment is scheduled for me to visit the property.

While at the property, I document what I have found, take pictures if necessary, and obtain landlord information from the tenant. At the time of the investigation, I also attempt to look for potential sources of moisture infiltration and try to provide the tenant with some solutions that may resolve the problem. I also provide them with a mold information packet.

After the visit is conducted, I obtain owner information from the township assessor’s office. Once owner information is obtained, a letter, as well as a mold information packet, is mailed to the landlord. At this point, the case is closed. In rare instances, the case is referred to NCE or ACBD for possible condemnation of the property.

Findings

Over my six-month internship, I investigated at least 12 mold complaints. The majority of the complaints contained minor mold contamination or were a result of excessive moisture in the home. Most mold-contaminated surfaces were on exterior walls or near aluminum windows, areas that experience drastic temperature changes. Many mold contaminations are surface contaminations that can be cleaned with a solution of water and strong detergent. If the mold returns or never goes away, it usually is an indicator of a water leak somewhere in the home and it becomes a greater concern. Drywall, the prominent substrate for many homes, tends to absorb water and is a strong media for mold growth. Once the water source and damage has been repaired, and water is no longer able to enter the home, removal and replacement of the contaminated drywall will usually solve the problem.

One investigation of a mold complaint led to an unusual situation. Upon entering the home, the house’s air was hot and humid. After looking around, it was observed that the complainant’s dryer vent was not hooked up, and all of the hot, moist air from drying the clothes was being pushed directly into the home. Although the tenant stated that the separation of the dryer vent from the dryer had just occurred, it raised concern about the manner in which the
tenant maintained the home. The tenant was reminded of mold’s basic water requirement and the importance of making sure the dryer vent was connected properly.

Another case showed mold/mildew growth around the bathtub caulk in the bathroom. After conversing with the complainant, it was determined that they did not use their bathroom ventilation fan to remove the excess moisture when taking showers or baths.

The most drastic mold complaint we received was in conjunction with an adult endangerment complaint. The manager of an apartment complex, a complex that the FW-ACDOH had received and investigated numerous mold complaints on, filed a complaint of excessive mold growth and a disabled elderly woman lying on a mattress on the floor. Because of the adult endangerment connection, Ray Capps and Ray Navarro initially investigated this complaint. Once they arrived on the scene and gained entry into the home, they called me to investigate the mold aspect of the complaint. Once at the scene, I entered the premises to discover almost every inch of available wall covered with mold. The carpet was saturated with water, which was expelled with each step taken. The odor in the home was overwhelming.

Apparently, a leak had occurred in the second floor tenant’s washing machine, causing an overflow into the lower level apartment. The tenant was unclear as to his rights and never called maintenance to get the problem resolved. Our department called in ACBD to condemn the property. We then scheduled an appointment with the complex manager to discuss the numerous mold complaints we had received from that particular complex. It was agreed that an industrial hygienist would be consulted for the remediation and that the air quality of the home would be tested before another tenant would be allowed to move in.

**Literature Review**

During the first month of my internship, I conducted a literature review of health effects associated with mold as well as sampling and testing techniques for mold. A summary of the articles found, along with their similarities, was written and submitted to the division director. The literature review can be found in Appendix D.

**Mold Information Packet**

During the third month of my internship, I received a call from a woman who had received a mold information packet (Appendix E) from our department. She informed me that some of the references of companies that Test for Mold section were incorrect. As a result of this call, I spoke to my supervisor and asked if it would be okay for me to update the
information. I was told to go ahead and update the list. I looked in the phone book under environmental consulting and called every consulting firm that was listed. From these phone calls, the list of potential mold testers increased from four to nine. The information packet is always changing as I am made aware of new testers and mitigators.

**Radon**

**Background**

Radon is a naturally occurring gas that results from the breakdown of the element uranium, which is commonly found in rocks in northeastern Indiana. The uranium decomposes into radium, and then further decomposes into radon. The radon gas seeps into the home through cracks in the foundation. It is a common misconception that only homes that have basements have a problem with radon. Although homes with basements are more prone to radon infiltration due to the basement being in the ground and surrounded by uranium containing soil, homes without basements are also affected (National Environmental Health Association, 2002).

**Health Effects**

The EPA has classified radon as a Class A carcinogen and has determined that excessive radon exposure is the second leading cause of lung cancer in the United States. Radon gas is not as much of a problem as is the by-product of radon decomposition. When radon decomposes, it produces alpha particles that, when inhaled, decompose and release particles that damage cells within the lungs. Smoking in a home with elevated radon levels also increases the risk of lung cancer because the radon gas attaches to lingering smoke particles in the air, which are more readily breathed in, increasing exposure (National Environmental Health Association, 2002).

**Testing**

The EPA has established a radon exposure limit of 4 picocuries per liter (pCi/L). Homes can be tested through various means. Four primary testing methods are available: short-term passive test, short-term active test, long-term passive test, and long-term active test. The differences between the testing methods include the devices used during sampling as well as the duration of the sampling period.

Short-term tests only last for three to five days. The area being tested is to be closed off to daily activities, which means doors and windows are to be shut, and no entry by people is allowed in order to prevent the influence of air currents. These tests provide a concentration amount of radon gas exposure during that three to five day period. These tests are valuable in
determining the amount of radon gas present at a certain period, but are not helpful in
determining long-term exposure. Infiltration rates of radon gas can vary depending on the
weather, the air-flow, and the use of the room.

Long-term tests last from nine to twelve months. The longer time period allows for a
deeper understanding of the actual radon level of the home throughout the year, taking into
account the seasonal fluxes as well as activities within the area. Opening of doors and windows
increases airflow, which can dilute or redirect the radon gas to the exterior or move more radon
into the home (United States Environmental Protection Agency, 2000).

Passive sampling does not use electricity and is conducted by placing a sampling unit in
the test area. After the preferred time, the sampling unit is sent off to a laboratory for analysis.
Licensed radon testers are not permitted to analyze the units for radon level results. Passive
radon samples are usually obtained through charcoal cartridges but can also be conducted with
alpha track detectors, liquid scintillation detectors, or electret ion chamber detectors. Active
samplers require electricity are continuously collecting radon levels within the sampling area and
can only be performed by a primary radon tester. Active sampling units require interpretation
due to the large data production by a continuous radon monitor or a continuous working level
monitor (Indiana State Department of Health, 2003).

The EPA has established three distinct radon zones. Allen County is in Zone 1, the
elevated zone, in which the EPA predicted an average indoor radon screening level greater than 4
pCi/L. The other two zones identified are Zone 2, which are counties that have a predicted
average indoor radon screening level between 2 and 4 pCi/L, and Zone 3, counties that have a
predicted average indoor radon screening level less than 2 pCi/L (United States Environmental
Protection Agency, 2003). If a home is found to have elevated levels of radon, a radon
mitigation system can be installed to remedy the problem. The system is a flow system that traps
the radon gas before it enters the home, and directs it through a pipe and extracts it to the
outdoors. Installation of a radon mitigation system into an existing home costs approximately
$1500, while installation of a system into the construction of a new home only costs
approximately $500 (National Environmental Health Association, 2002).

Cases

The FW-ACDOH does not provide testing for radon gas. Most calls received about
radon are general questions about radon as well as inquiries into how to obtain sampling kits or a
list of testers and mitigators. In Indiana, testers and mitigators must be licensed by the ISDH. When a call is received, I discuss the risks of radon as well as the sampling techniques and resources available to the individual. Typically, I send them brochures on the testing methods, a list of who can test their home’s radon levels, as well as information on mitigation systems. Currently, I plan to put together a radon information packet to send out to residents that call with questions. The list of testers and mitigators provided by the Indiana State Department of Health will be provided to local residents.

**Asbestos**

**Background**

Similar to radon, asbestos, a Class A carcinogen, is a naturally occurring mineral found in the environment. This mineral was found to be very useful in producing products because of its thermal insulation, chemical and thermal stability, and high tensile strength. In addition, asbestos was found to not be volatile or soluble, making it an ideal flame retardant. Because of its ability to withstand intense heat, asbestos materials were added to many building components, such as ceiling and floor tiling, roofing shingles, siding, and various insulation products (United States Environmental Protection Agency, 2004).

Three main types of asbestos are frequently found: chrysotile, amosite, and crocidolite. Chrysotile asbestos is the most common type of asbestos found in buildings, making up approximately 90%-95% of all asbestos material found in the United States. Crystal development is a unique property of asbestos. The crystal development process forms long thin fibers that ultimately make asbestos a health risk when decomposition or disruption of the material is initiated. Due to the small size of asbestos fibers, a microscopic analysis of the material is the only method to determine the presence of asbestos fibers (United States Environmental Protection Agency, 2004).

In 1989, the EPA banned asbestos-containing materials from being used within the United States. This rule was found to be overwhelming and difficult to enforce. In 1991, the restrictions were lessened to only include flooring felt, rollboard, and corrugated, commercial, or specialty paper (United States Environmental Protection Agency, 2004). The rules that regulate asbestos materials are the Toxic Substance Control Act (TSCA) and the Clean Air Act (CAA).
Health Effects

Currently, there is no set standard for a permissible exposure level of asbestos or official listing of acute symptoms related to asbestos exposure. However, studies have shown that smokers are at greater risk of developing diseases associated with asbestos exposure. In addition, studies have shown that long and intermediate fibers with a length greater than 5 µm are more carcinogenic than short fibers that are less than 5 µm. Known chronic effects of asbestos exposure include pulmonary hypertension and immunological effects. Long-term asbestos exposure is known to cause two different diseases: asbestosis and mesothelioma.

Asbestosis is a lung disease caused by inhalation of the asbestos fibers. After a latency period of 25 to 40 years, asbestosis is characterized by a shortness of breath and a cough, and may lead to severe respiratory impairment. Inhaled fibers become caught in lung tissues. In response, the body produces an acid in attempt to dissolve the fibers, which have strong chemical resistance. The acid production scars the surrounding lung tissue, becoming so severe that the lungs are unable to function.

Mesothelioma is a rare form of cancer that is only caused by asbestos exposure. Mesothelioma causes cancer of the thin membrane lining of the abdominal cavity, the peritoneum, and surrounding internal organs. Mesothelioma may possibly lead to other gastrointestinal cancers. Mesothelioma has a shorter latency period, 15-30 years, than asbestosis (United States Environmental Protection Agency, 2004).

Urine, feces, and mucus samples can be obtained and analyzed to determine if asbestos fibers are present to establish personal exposure. Chest x-rays can also be used to determine if cancer cells are beginning to form, though x-rays will not reveal the presence of asbestos fibers (United States Environmental Protection Agency, 2004).

Cases

Standard Operating Procedure

Similar to mold complaints and all complaints that enter the Environmental/General Services Division, the complaint is filed, documenting what type of material, (i.e., insulation, siding) they want tested for asbestos content. Typically, the secretaries receive the initial call and pass it on to me. I respond to the person’s questions regarding general information about asbestos, including the risks, and set an appointment to obtain an asbestos sample. Surprisingly,
many people do not understand the risks associated with asbestos, but they know it is a “bad” thing.

When I arrive at the site, I have my gloves, mask, water bottle, cutting utensil, and sample bag. After donning my PPE, I spray down the sample area with water to limit the potential spread of asbestos fibers during the sample process. I then cut a piece of the material and place it in the sample bag. I label each bag with the sample location and type of material, such as floor tiling, wall insulation, or pipe insulation, etc. I then fill out a request form and mail it to the ISDH Indoor Air Lab for analysis.

After receiving the results in a few weeks, I write a letter to the requestor of the sample and the landlord, if there is one, stating if the samples contain asbestos or not. At that point, the case is closed out unless further contact occurs, such as questions regarding removal or remediation. If a material is determined to contain asbestos material, the homeowner is provided with a list of asbestos contractors that are licensed through the IDEM.

Findings

During my internship, I investigated two asbestos cases, taking six asbestos samples. Of these six samples, 2 were determined to contain asbestos materials. Of the two asbestos-containing samples, both were determined to be chrysotile asbestos.

My first asbestos investigation dealt with a tenant whose landlord had told them on three different occasions that the insulation around the piping in their basement apartment was not asbestos. After removing a large amount of the insulation, a friend informed them that it appeared to be asbestos and told them they should have it analyzed.

As a result of this case, I learned that asbestos rules do not apply to residential structures with less than five apartment units. Most of the requests I receive for asbestos sampling come from disgruntled tenants, although at least two were from concerned homeowners who were either conducting or planning renovation activities.

Miscellaneous IAQ Complaint

Weisser Park School

On March 6, 2002 I received a complaint about the cleanliness of a local elementary school. The complaint cited that 150 students were absent the day before and that the bathrooms were dirty and did not have soap or paper towels in them. I went to the school and spoke with
the principal and the head custodian. They confirmed that about a quarter of their student population was absent due to illness.

The head custodian showed me around the school and took me to each restroom. All restrooms had soap, toilet paper, and paper towels in the dispensers. Each boy’s restroom had a strong urine smell. I suggested to the head custodian that they take special care in mopping under the urinals in the boy’s restrooms after lunch, since that was when boy’s restrooms seemed to get the most use. I credited the odor to little boys being boys, especially after the male principal commented that the boys “like to play firefighter.” One boy’s restroom had a dirty wall, so I suggested cleaning the walls daily because of the hand-to-wall and hand-to-mouth contact of children. I also suggested that special care be given to dusting areas that can easily be overlooked, such as windowsills and heater vents.

I revisited the school a week later and the strong urine smell was not as obvious and care had been taken to dust the areas I suggested. The boy’s restroom walls were cleaned. The school was very clean, even during my first visit.

As of July 1, 2002 any IAQ school complaint can be referred to the ISDH to be investigated. A new Indiana State law gave the State Health Department the ability to work with local health departments to solve IAQ problems in Indiana.
IV. GEOGRAPHICAL INFORMATION SYSTEMS AND GEOGRAPHICAL POSITIONING SYSTEMS

Maps can be useful in aiding public health decisions such as determining areas of need for health clinics or determining where viral activity of a mosquito-borne illness is occurring. During my internship, one of my critical roles at the FW-ACDOH was producing maps and collecting data using Geographical Positioning System (GPS) technology for map interpretation for various divisions within the DOH. Every division has data that can be mapped, but thus far the largest users of the technology are Pollution Control and Vector Control. This chapter will discuss the equipment, programs, and projects that I have worked with.

**Geographic Information Systems (GIS)**

Currently the FW-ACDOH uses ArcView 3.2 for map production. I was introduced to the software by completing the tutorial that is provided with the program. This program allows for data manipulation on a visual plane. Most of the maps produced used geographic references such as street addresses and zip codes. Although the program is different from MapInfo, the program I used at Miami University, many of the concepts are similar so I had no problem catching on to the program.

Maps are produced in a variety of formats. Because the most common purpose of a map is to display information to a large audience, many of the maps are printed on 34 inch by 44 inch sheets of paper. This allows for easy visibility in a large setting such as a meeting. Sometimes the maps are produced on 8.5 inch by 11 inch sheets. The intended use of the map determines the format in which the maps are produced.

**Geographic Positioning Systems (GPS)**

Geographic Positioning Systems allow for field data collection in digital form. This data can then be transferred into a GIS program to produce a visual reference. Currently the FW-ACDOH uses Pathfinder Office to create data dictionaries that are used to collect data. Data is collected using Trimble receivers and IPac data loggers. It is my responsibility to create the data dictionaries, load the data into the data logger, download the field data from the data logger into the computer, differentially correct the data, and transfer it to GIS to produce a map.
Data

I receive map requests through verbal communication. The contact person, also known as the user, tells me specifically what they need, and then I produce it with data they supply to me. On occasion, communication has faltered between the user and me, primarily due to a lack of knowledge of the common jargon used in this field. Most users within the FW-ACDOH have little if any GIS/GPS experience, thus sometimes causing confusion between what they ask for and what they really want. To help eliminate some confusion, I have begun to develop a GIS/GPS request form by which users will submit a formal request to me regarding the details of the map or project they wish to have produced.

Each division is responsible for data management. My only job is to take their data and produce a map from it. Previously, I have spent hours manipulating raw data into a form readily used by ArcView 3.2. With clearer instructions from the users as well as “cleaner” data, less of my time will be spent cleaning up data, allowing me to produce more maps in a shorter amount of time.

Examples of Projects

Almost immediately upon starting my internship, I was assigned the project of creating a map indicating the new location for the FW-ACDOH’s Tuberculosis Clinic, which was in the process of moving its office. This seemingly simple mapping project took approximately one week to create, due to my lack of knowledge and training on the ArcView 3.2 program.

During my second month, training began for approximately ten people that were going to be involved in using the GPS for a Pollution Control project. The individual’s involvement with the project varied from data collection to GIS/GPS program work. My primary role in the project was creating the ditch sampling location data dictionary database used in the GPS data logger, transporting the data dictionary database into the data logger, downloading data from the data logger into the PathFinder Office program, performing differential correction on the data, transporting it to GIS, and outputting a map based on the data. The project was a large collaboration between the General Services and Pollution Control divisions within the FW-ACDOH.

On February 8, 2002, Chad Appleman conducted an in-house GPS training session. During this in-service, the principles of GPS were discussed as well how databases were created. A database was created using PathFinder Office 2.8. A data dictionary was established so that
field data to be collected were already predetermined. We tested the equipment by going to a local park. This allowed everyone to become familiar with the equipment and the program involved.

Two primary GPS projects occupied my time. The first one started on February 26, 2002. The Vector Control division, which is responsible for monitoring mosquito-borne illnesses, used GPS to plot ponds or standing water sites that were potential mosquito breeding spots. If a location can sustain fish, the FW-ACDOH provides mosquito-eating fish. There are approximately 150 sites that needed to be located.

On February 26, 2002, Environmental/General Services Director Chad Appleman, Technician Mike Jones, Vector Control Assistant Director Dave Fiess, and I began collecting data. My primary purpose of going was to record the process taken to use the GPS in the field. Four locations were sampled and recorded. Once back in the office, I began a protocol for using the data logger and the GPS receiver. The purpose of the protocol is to allow someone with minimal or no experience with GPS to be able to use the data logger and receiver to collect data in the field. After I created the protocol, Appendix F, it was tested with four different people that are primary users of the GPS equipment.

Pollution Control’s project began on February 27, 2002. I assisted Mark Herber, Pollution Control Environmental Health Specialist, on the second project. Pollution Control is responsible for water quality, septic systems, and ordering sewage connections. For the past three years, Pollution Control has implemented a water quality study in which they sample different sites over a ten-week period. This allows them to collect long-term data on water quality that is directly affected by failing septic systems. They intended to utilize the GPS by recording the locations of approximately 222 sampling sites. This allowed them to map where they have sampled and suggested trends impacting water quality. In addition, by using GPS to locate the sites, GPS can be utilized to find the exact locations of where the samples are to be taken.

On February 27, 2002, Mark and I spent the entire day collecting GPS information on 36 sampling sites. We conducted field work on two additional days, March 4 and March 5, 2002, when information on 50 additional sites was collected.

The GPS receiver the FW-ACDOH used was borrowed from the Sheriff’s Department. In mid-March, the Sheriff’s Department asked to have their receiver back as they were starting
projects. As a result of two projects within the FW-ACDOH needing completion and only the use of only one receiver, which would soon be gone, sharing the receiver became an issue. Pollution Control’s Mark Herber and I were close to completing the first phase of the Water Quality Initiative study, while the Vector Control project still had a significant number of sites to sample. Therefore, Pollution Control’s project took precedence; we were able to finish collecting the ditch sample sites while the Vector Control Project was incomplete before the receiver was returned.

To help alleviate the problem of not having our own receiver during high usage periods within the FW-ACDOH, a new system was requested from the county commissioners. The request included a backpack receiver, a new GIS/GPS workstation, new handhelds, and less cumbersome receivers. The equipment request was approved and the FW-ACDOH was able to obtain our own equipment.

Two days were spent trying to differentially correct the Pollution Control data. To do this, we had to access internet files from a local base station. Differential correction of the data produces sub-meter accuracy. Without differential correction, inaccuracy can be as great as 30 meters. After trying unsuccessfully for two days to correct the Pollution Control data, my supervisor suggested trying to export the data from GPS to GIS without correcting it. It was decided that not correcting the data at this point would not harm it because sub-meter accuracy was not required in this project. We came to the conclusion that the base files from the base stations for the timeframes we needed were deleted because after approximately a month the base station deletes old files to make room for new files. By the time we attempted to differentially correct our data, the base files had already been deleted from the base station, therefore not allowing us to differentially correct the data.

A map, found in Appendices G and H respectively, was produced for both the Pollution Control and Vector Control projects. As a result of not being able to differentially correct the Pollution Control data, it was decided that whenever data came in from the field it would be differentially corrected that same day or the following morning, so that the appropriate base files would be at the base stations.

iMAP

Allen County has its own mapping department. This department is working on a project called iMAP. On May 2, 2002 I attended a user information meeting presented by the iMap
Management Board. iMap is a project the county has been working on for a few years. They are mapping the entire county, by centerlines, addresses, and taking orthophotos. These different layers will be available to all people throughout the county. These different layers are provided and kept up-to-date by the iMap board and will provide valuable basemap images.

A second meeting was attended which discussed the project in more detail and provided a demonstration of the new Allen County iMAP system. Different departments discussed how these databases would be utilized in their department. Much of the focus of the meeting was from first responders, such as police officers, firefighters, and paramedics, who will use the database regularly.

As a result of a director’s staff meeting occupying the Health Administrator’s and my director’s time, I was the only one from the Health Department that attended the meeting. Thus, Loren Robertson, the Health Administrator, wanted to meet with me to discuss what information was provided. We began talking about the role GIS is going to begin taking in the Health Department. He asked me to find out how GIS has been used in emergency circumstances, such as monitoring chemical spills, as well as how GIS can be utilized as a modeling tool to determine plumes.

**Problems**

A significant amount of problems that I encountered while producing maps occurred as a result of no professional training on the programs I used. Many times I had to figure things out on my own, which was accomplished by practicing with the ArcView 3.2 program. My map production capacity, as well as the quality of my maps, improved immensely over my six-month internship.

Data quality was another issue that I had to struggle with. I spent many hours formatting the different division’s data for compatibility with ArcView 3.2. Removing extra lines from databases and editing address columns occupied a lot of time.

Another significant problem I ran into was the geocoding of street addresses to a street layer. I quickly learned that using the iMAP street centerline data was much more accurate than using the free tiger data files that came with the ArcView 3.2 program. Utilization of GPS to gather locations rather than using street addresses also helped combat this problem.
V. TATTOO AND BODY PIERCING ENFORCEMENT

As the tattooing and body piercing industry continues to grow, so does the concern for the sanitation and sterilization of these parlors and their equipment. Allen County tattoo and body piercing studios are regulated under Allen County Code Title 10 Article 7: Tattoo and Body Piercing Ordinance (ACC 10-7). This ordinance, along with Indiana Administrative Code Title 410 Indiana State Department of Health, Article 1. Communicable Disease Control, Rule 5. Sanitary Operation of Tattoo Parlors (410 IAC 1-5), aids in preventing the spread of bloodborne pathogens (BBP) and communicable diseases.

Currently there are 18 permitted tattoo and body piercing establishments in Allen County. Four of these 18 establishments are mobile units, which permits them to be able to move their operations. Each establishment and artist is classified on their permit as either a tattoo artist/establishment, body piercing artist/establishment, or a tattoo and body piercing artist/establishment. Of the 14 stationary establishments, eight are only permitted to perform tattoos. The other six establishments, as well as all the mobile units, are permitted to perform both tattooing and body piercing.

Providing these services are 39 permitted artists, nine of which are guest artists that are not employed full time in Allen County. Of the remaining 30 artists, 19 are permitted to perform tattoos only, five may carryout body piercing, and six are allowed to perform both tattooing and body piercing. Since 1991, there have been approximately 130 artist permits issued.

Although the primary fluid of concern is blood, there are other potentially infectious materials (OPIM) that can result from tattooing or body piercing. This code was designed to prevent the spread of infection by limiting the amount of exposure to blood and OPIM.

Inspections

ACC 10-7 requires that all tattoo and body piercing studios undergo inspections at least twice a year. Inspections are also conducted after a complaint against an establishment has been filed. Currently, the technicians are conducting the tattoo/body piercing inspections.

When an inspection is performed, it must be done during operating hours. Ideally, the inspection should be done when a patron is receiving a tattoo or piercing to assure that proper handwashing techniques, sterilized equipment, and proper disinfecting methods and materials are
being used. Unfortunately, this is difficult to do because most of the establishments are privately owned shops that have various hours and do not open up until after noon, sometimes after four, which makes finding a time to conduct a surprise inspection difficult.

During an inspection, the inspector has an inspection form that aids as a reference guide to the code. The inspection form covers the major health-related aspects of the code and assures that the studio is in compliance with the code.

**Records**

Proper and up-to-date record storage is very important in assuring public health safety. Studios must have numerous files on record and also posted in the establishment. The code requires that patron records must be kept on file for a minimum of two years. The patron record must contain the patron’s name, age, address, two forms of id, date of procedure, design of tattoo, location on body, artist name, jewelry, and parental consent for minors.

The studio must also have a current bloodborne pathogen training certificate on file for each artist. Each artist is required to attend bloodborne pathogen training annually.

Written records showing the use of the studio’s autoclave must be available. The record must document the date, duration, and temperature that the autoclave was run at each time it was used to sterilize equipment. In addition, records need to be readily available to prove that the establishment’s autoclave has passed a monthly spore test, verifying that the autoclave is sterilizing equipment properly.

Records must also be kept on the disposal of bio-hazardous waste. Studios have three primary means of bio-hazardous waste disposal: incineration, contracting with a bio-hazardous waste hauler, or sterilization and disposal in municipal waste. Documentation is required for whichever process they use, explaining date disposed of, how disposed of, and who disposed of it.

The studio must also have a written policy available to all employees regarding the sanitary operation of the studio, also known as an exposure control plan. The ISDH has produced a fill-in-the-blank form for studio owners to fill in for employees. This form is a result of OSHA’s bloodborne pathogen standard (OSHA 29 CFR 1910.1030) which requires employers to provide employees with the proper equipment and knowledge when dealing with bloodborne pathogens.
Records that must be visible to patrons are the establishment permit as well as each individual artist’s permit issued by the FW-ACDOH. Materials stating the universal precautions as well as a poster stating where patrons can report violations also must be posted for patrons.

**Equipment**

During inspections, it is also determined if the studio contains the right tattooing equipment. Handwashing sinks with warm water must be accessible to the artist while tattooing occurs. Most equipment in the studio must be single use to prevent the transmission of any BBP. Towels, disposable gloves, razors, stencils, pens, corks, and needles must be single use and disposed of immediately after use.

Some equipment is reusable after undergoing cleaning and sterilization. This equipment includes bars, clasps, and receiving tubes. The items must be placed in a labeled bio-hazard puncture resistant container until they can be cleaned. Once cleaned, they then are placed into single use packages and sterilized in the autoclave. The packages are not opened until the time of use.

The autoclave is the machine that is used to sterilize tattooing and body piercing equipment. Because some BBP are persistent and can sustain life outside the host, it is important to make sure that all potential living organisms are killed before that equipment is used again. Sterilization uses a high-temperature, high-pressure approach to kill all living organisms. Biological indicators are often used to determine the proper operation of an autoclave. Spores are one of the hardest organisms to destroy; therefore, spore tests are preformed as a biological indicator. The studio is sent a sample containing spores. After the sample is run through the autoclave, the laboratory determines if the autoclave killed all the spores.

Each single use package contains a chemical indicator to be used as an intermediate checking point. A chemical indicator is placed on the single use package. Typically it is a blue or green dot. After autoclaving has occurred, if sterilization has occurred, the dot becomes black.

High-level disinfection, on the other hand, is important in cleaning surfaces and equipment with no blood or bodily fluid contact, but does not destroy the large array of organisms that sterilization does. High-level disinfection is utilized in cleaning countertops surrounding potential blood splatter and equipment that was used, but did not come into direct contact with broken skin or body fluids.
Environment

During an inspection, the studio’s environment is also evaluated. Visual assessment is made of any artist to determine if they are experiencing any acute disease symptoms that would be related to having a cold. If so, they are not allowed to perform any tattoo or body piercing. We also check to make sure the area is clear of reservoirs that will foster pathogen or bacterial growth. All work surfaces must be nonabsorbent, smooth, easily cleaned, and in good condition. This includes the area directly below the artist chair.

Food, beverages, smoking, or unauthorized animals are not allowed in the work area due to risks of hand-to-mouth contact and possible splatter. In addition, these actions could result in carelessness, therefore increasing the risk of spreading BBP.

Each studio must provide the proper personal protective equipment (PPE). A proper set of PPE includes a mask, goggles, an apron, and heavy-duty rubber gloves. An artist must wear this equipment whenever they suspect there is a risk of splatter occurring. When performing a tattoo or body piercing or cleaning equipment, disposable gloves must be worn.

When disinfecting an environment or equipment, only a hospital grade, tuberculocidal EPA-registered disinfectant, or a ten- percent bleach solution can be used-- as long as it is dated and used within 24 hours. All equipment and surfaces that contact or may have contacted blood or OPIM must be disinfected.

Violations

If violations are found during an inspection, it is documented the studio is ordered to correct the problem. Each studio receives a copy of their inspection report immediately afterwards. If a violation is found to be a willful and/or continuous problem, it is sufficient reason for the permit to be suspended or revoked.

A suspension or revocation cannot occur until a hearing is held. The Hearing officer is either the Health Commissioner or the Health Commissioner’s designee. A decision can be appealed by going through the Health Board. Anyone who willfully violates the ordinance can be fined up to five hundred dollars for each violation.

My Role

Inspections

During the internship, I assisted in inspecting 6 tattoo studios and conducted two inspections myself. The most difficult part was trying to do the inspection in a logical order,
meaning looking at all the records first. The inspection form is not laid out very well and causes a very disorganized inspection if followed. Every studio we were at was very cooperative and understanding.

When inspections were occurring, there was a question of whether or not all new jewelry that was placed into old openings would need to be sterilized. This caused concern over some of the ceramic jewelry that would break in the high temperatures and pressure in the autoclave. After discussion with the ISDH, it was determined that if the jewelry is placed into an existing opening, then sterilization of the jewelry is not required, but if it is placed into a new opening, then sterilization is required.

It was also determined that any reusable equipment that came into contact with OPIM would have to be sterilized rather than just treated with a high-level disinfectant. This meant that tongue clasps would require sterilization. Most studios had already been sterilizing all their equipment, but a couple had not been.

The largest problem found in most studios was that proper records were not being kept for the operation of the studio’s autoclave. Another problem was that they had not yet completed their exposure control plan.

**BBP Training**

Twice a year, the FW-ACDOH provides free BBP training for artists. This past spring Amy Hesting and I completely revamped the presentation and started from scratch. Ten people had signed up for the class, but 22 ended up participating. The training discusses what precautions should be taken during the tattooing/piercing process as well as what BBPs are at risk. We also created an assessment test for the end of the class to determine how effective the class was in addressing bloodborne pathogens, Appendix I. The results of the test were relatively strong, which gave us more confidence in the local artists’ ability to prevent the spread of communicable disease in their work.

**Assessment Test**

During the first quarter of the year, the technicians were responsible for inspecting the tattoo and body piercing studios. Due to uncertainties concerning their knowledge of the code, I was asked to create an assessment test to determine if the technicians knew their code. I created a test, similar to the BBP class test, that just focused on the code. Unfortunately due to time restraints and the beginning of pool season, the test was never administered.
Future Direction

While preparing for the BBP training class, it was found that there are no good BBP videocassettes that deal with the tattoo and body piercing industry. Our goal over the next year is to create a BBP tape that deals specifically with the tattoo and body piercing industry. This will be able to be accomplished utilizing the local public library’s audiovisual department.
VI. PUBLIC POOLS AND SPAS

Throughout the year, Allen County has approximately 246 public pools or spas operating at one time or another. The Indiana State Department of Health Rule 410 IAC 6-2 Swimming and Wading Pool Operation as well as Allen County Code Title 10, Article 5 gives the FW-ACDOH the authority to regulate and inspect these facilities.

These 246 pools or spas are located at 165 different locales throughout the county. Some locations have only one pool or spa, while others have up to four different pools or spas at the same location. Only 46 of 165 locations have a pool or spa that operates year-round. The other pools or spas only operate on a seasonal basis and are allowed to be open for public use a maximum of four months out of a calendar year.

The FW-ACDOH is responsible for assuring that the mechanical operations and cleanliness of these pools or spas are being maintained in a reasonable fashion at all times. This is accomplished with biannual inspections of the facilities and weekly sampling and testing of the water. During my internship, I assisted with the collection of water samples and only observed the inspection process.

**Sampling and Water Testing**

Various times during my internship, I assisted in collecting pool and spa water samples. To collect a water sample, a 175-ml High Density PolyEthylene (HDPE) sample bottle containing a 1/10 ml of 10% Sodium Thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3\cdot \text{5H}_2\text{O}$) solution is submerged into the pool or spa water approximately 18 inches, normally elbow deep. The bottle is then brought up out of the water and gently tapped to remove excess water; only 100 ml is needed to run a lab analysis on the sample.

A field test is also conducted using “Insta-test” water quality test strips. The strips are placed into the water, swirled three times, then removed from the water and read instantly. The strips test for free chlorine or bromine, total chlorine, alkalinity, pH, and total hardness. We are most concerned with the free chlorine/bromine reading and the pH, as these two tests are usually indicators of water quality. Often, when there is no chlorine or bromine present, there will be bacterial or coliform growth. The pH also needs to be in balance for water quality to be optimal.
Back in the lab, the 1/10 ml of 10% Sodium Thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3\cdot5\text{H}_2\text{O}$) solution added to the sample bottle is used to neutralize the chlorine in the water sample, allowing for more accurate analysis to determine if bacteria and/or coliform are present. Adding 50 grams of Sodium Thiosulfate into 500 ml of distilled water composes the 10% solution. Less than 100 ml of the solution then goes into a glass media bottle, loosely capped, and autoclaved for 15 minutes at 121 °C.

The Fort Wayne-Allen County Department of Health has its own in-house lab that analyzes pool and spa water samples, ditch water samples, and tests of potentially harmful food such as milk and meat. Once the pool samples are collected, they are brought back to the lab and then turned over to the laboratory staff for analyses. Twenty-four hours after the sample has been set up, the sample can be examined to determine the presence or absence of coliform. Forty-eight hours after the initial setup, the water sample can be examined for presence of bacteria.

If a sample is found to have coliform present or have a bacteria plate count of more than 200 colonies or too numerous to count (tntc) present; the sample is designated bad. The pool or spa is then notified immediately to close to the public and super chlorinate or shock the pool or spa. If two bad samples are collected in an eight week period, the pool is ordered closed, drained, cleaned, and cannot reopen until a good water sample is collected, typically the following Monday. If this sample comes back free of coliform and/or less than 200 bacterial colonies, the pool is then allowed to reopen. This process is repeated weekly.

**Maximum Temperature Levels**

According to ACC 10-5-2-3, the maximum temperature of a pool is 90 degrees Farenheit (°F) or 32° Celsius (°C). The facility must provide a thermometer that has a range of 68° F (20° C) to 100° F (38° C). A spa cannot exceed 104° F (40° C) and must provide a thermometer that reads temperatures between 80° F (27° C) to 120° F (49° C).

The code also states that spa’s high-speed jet pumps must be connected to a timer which is away from the spa and does not exceed fifteen minutes. This is in effort to control people’s risks of remaining in the spa too long. If a pool or spa exceeds the acceptable temperature limit, then the pool operator is notified and asked to reduce the temperature.
**Inspections**

The FW-ACDOH is required to perform two full inspections during a year. All areas and records must be made available to the inspector at the time of inspection. Inspections are also conducted whenever a complaint is issued with the FW-ACDOH. During the inspections, the general environment, equipment, and mechanical machinery are inspected to assure public health safety. During the inspection, the chlorine or bromine levels, as well as the pH and temperatures, are tested using the insta-test strips.

The inspector uses a Public Swimming Pool Inspection form to document any non-compliant issues the pool may be having. The inspection form is divided into six general sections; pool, mechanical area, bathhouses, signs, safety equipment, and supervision/lifeguards/records.

**Pool**

The pool section looks at the overall appearance and cleanliness of the pool and spectator areas. There are to be no breakable containers allowed in the pool or spectator areas. Refuse containers must also be provided in the spectator area. The compliance of the pool area being enclosed by a self-latching door is also evaluated.

Drains are also examined during this section. Main drains inside the pool must have all the covers present and must be visible from the deck. Poor water clarity is often an indicator of poor water quality. If the drains are not visible, the risk of an accident occurring is increased. It is also important that all the deck drain covers are in good condition to prevent accidents or poor drainage.

The code requires that depth markings are present and must be at least four inches tall and visible when facing the pool. Depth markings are to be installed at the minimum and maximum water depths and at two feet intervals to indicate change in depth.

The pool section also evaluates if there is enough lighting to be able to always see the main drain. The acoustics of competition pools only are also evaluated to determine if it is too noisy to be able to hear whistles or lifeguards.

The code requires that a working telephone is present within 200 feet of the pool. The presence of a telephone allows accessibility to 911 in case of an emergency.
Mechanical Area

The mechanical area is to be kept clean and in good condition. Chemicals are to be stored properly. Filters are to be in good repair, and free of leaks and cracks and clean. At this time, the chlorinator or brominator, depending on the system, is checked to make sure there are no leaks and the equipment is working properly. The flow meter is also examined to determine if the water is being turned over at the correct intervals.

Bathhouses

Bathhouses and shower facilities are to be provided for each sex and shall be sanitary and provided within 300 feet of the pool for all facilities that do not contain housing units on site. This applies to country clubs, health clubs, public park pools, and schools.

Signs

A variety of warning placards and signage must be present in and around the pool area. No diving signage in four inch lettering must be posted where the water depth is under 5 feet deep. A lifeguard warning must also be present if there is no lifeguard on duty to oversee the pool activities. There must be a lifeguard warning at the entrance and within the pool perimeter.

There must be a notification warning about hazardous chemicals in the storeroom. If the pool is closed, there must be a “Pool Closed” sign with four-inch letters affixed to the entrance of the pool area. Personal conduct placards must also be present to inform patrons of the pool’s groundrules, such as no running, etc. Finally, signs must be present to indicate where a telephone is in case of an emergency.

Safety Equipment

Certain safety equipment must be available to bathers at all times. The equipment required at a pool and accessible to bathers are: a ring buoy not more than 20 inches in diameter with at least 45 feet of at least ¼ inch diameter throw line, a shepherd’s crook or life pole at least 12 feet long with blunted ends, spine board with ties that would secure a human once attached and lifted upside down, a rigid cervical collar for every 2000 square feet of surface area, first aid kit, and a transition line indicating where the water depth exceeds five feet.

Supervision/Lifeguards/Records

The code requires that for every 2,000 square feet, there is one lifeguard. The lifeguard on duty must be equipped with a whistle, access to a rescue tube when water depth exceeds 3.5 feet, resuscitation mask, and an elevated chair or platform. A pool operator must be on duty.
whenever the pool is open. The pool operator is required to maintain log sheets of water temperature, pH, Cl/Br levels a minimum of twice daily. The pool’s permit must be posted and visible.

**My Role**

My interaction with the pool program has been minimal as a result of other duties. During my internship, I did assist with weekly water sample collections when the division was short staffed. I also assisted in developing a new pool/spa sign off-sheet, Appendix J, which will be developed in conjunction with the Allen County Building Department. This sign-off sheet will aid in assuring that new construction pools or spas will be built in compliance with 410 IAC 6-2, ACC 10-5, and 675 IAC 20. In the past, there have been problems with new construction pools not being built to code and the problem was not resolved until after the construction was complete.
Occasionally the FW-ACDOH receives complaints regarding the sanitation and welfare of children and adults. Many of these complaints are referrals from emergency responders. The FW-ACDOH is notified to inspect the sanitary conditions of the environment. If warranted, the FW-ACDOH is able to request assistance from Child Protective Services (CPS) or Adult Protective Services (APS) depending on whether the jeopardized individual is a child or an adult.

Whenever available, Ray Capps is the investigating officer on these types of complaints. It is his job to determine if the conditions are unsanitary to be lived in and if the child or adult should be removed. If he feels it is warranted, he will call CPS or APS to come investigate. Since January 1, 2002, 58 APS complaints have been filed with the FW-ACDOH, compared to 36 CPS complaints. Many of these complaints cite deplorable living conditions, which result from poor housekeeping related to the presence of one or more animals.

Most of the APS cases are resolved with requesting the individual to clean up their home. Frequently, the individuals comply and the case is closed. Occasionally, the individuals have a lack of regard for public health and do not clean up the home. When this occurs, either NCE or ACBD is called in to deem the building uninhabitable and condemn the property.

**My Role**

Occasionally I assisted with both CPS and APS cases. During my observation of Ray and the interactions with the individuals, I have learned that the success of these cases is based on social interactions. Talking your way into a house, which you are there to investigate, can be challenging. Our job with the case end once APS or CPS takes over because they are the governing power in these situations. We primarily make sure that the home is safe for human habitation from a health perspective.

**Cases**

On February 28, 2002, Ray Capps received a complaint from the Fort Wayne-Allen County Department of Health’s Vector Control division about an 8-9 year old child being chained in the upstairs of a home. I, along with Cindy Wable, assisted him on this call. When we arrived at the home, we were met by a Fort Wayne Police Officer who explained that it was not a boy, but a 24-year-old severely mentally handicapped man. The night before, he had gone
down to a local Walgreens with a broken 1800s gun threatening to kill someone. When we arrived at the home, we found the gentleman chained to the stairwell banister. The chain was long and allowed him to readily move around the upstairs of the home.

The grandmother explained that he keeps sneaking out of the house, putting himself in jeopardy. APS came out to the house. They had been looking for the gentleman since the middle of January. They attempted to find a bed for him to stay somewhere else, but to no avail. We left the house, with the understanding that he was not to be chained up. APS now has the case and has attempted to get him help, but has faced resistance from the family.
VIII. ASSOCIATIONS AND SPECIAL TRAINING

Associations

IEHA

During my internship and throughout my employment at the FW-ACDOH, I have been involved with a few professional organizations. During the months of October through May, a monthly meeting is held for the Indiana Environmental Health Association (IEHA). This meeting consists of public health professionals throughout Indiana. Since the state is so large, IEHA is divided into different chapters. FW-ACDOH is in the Northeastern Chapter of IEHA. Each month we meet in a different county and discuss different issues pertaining to public health. The members are from different counties and divisions throughout the Northeastern part of Indiana.

Meeting topics vary from month to month. Some of the topics have included healthy homes, lead research, septic system information, weights and measures, chicken processing operations, neighborhood code, and many more. The purpose of this group is to expand our knowledge and awareness of environmental health issues while building personal connections.

Directory

During the fifth month of my internship, my division direct assigned Amy Hesting and I to create a Northeast Chapter IEHA member directory with contact information and the members’ pictures. This project proved to be very time consuming. We used Microsoft Access to create the document. We found difficulty in trying to insert the members’ photos into the correct name spot. Mindy Waldron, director of the food division, showed me how to crop the pictures and then insert them into the table. After this was done, the 33-page document was complete, except for numerous missing pictures.

Healthy Homes Coalition

The FW-ACDOH Environmental/General Services division is also a member of the Allen County Healthy Homes Coalition. Initially this coalition began as the Allen County Lead Safe Coalition, but due to a growing awareness and concern for overall indoor air quality, the coalition changed its name and focus. Although a large portion of the focus is still on lead, the spectrum has been enlarged to also include mold, dustmites, and other allergens or asthma
triggers. The goals for this organization are to increase education and awareness of these problems and try to correct them.

On March 27, 2002, Healthy Homes Coalition held a Healthy Homes Program. All types of professionals were invited to the event to aid in creating awareness of all the potential health risks associated with a home and to introduce them to the coalition. Many of these professionals were from agencies such as HUD, CPS, APS, Township Trustees, and education professionals. I was asked to make an education board on indoor air quality. I incorporated the information I compiled for the FW-ACDOH Web site and placed it onto an information board. I also gathered information booklets to have available to the participants. Approximately 45 people showed up at the meeting. One guest speaker talked about indoor air quality while the other one talked about lead-based paint. The participants seemed to enjoy the presentations and had many questions. This meeting seemed to have inspired a large interest in outside groups.

Other Special Training

OSHA BBP

I attended many orientation meetings during my first month of work. I was required to attend a bloodborne pathogen class because my job possesses a risk of contact with human blood. In addition to taking the class, I was vaccinated against Hepatitis B.

Weapons of Mass Destruction

On January 25, I attended an all-day seminar called “Weapons of Mass Destruction Health and Medical Course.” This training session focused on what should be done in the health profession if a weapon of mass destruction was utilized. Five different session groups informed all participants of what types of attacks could occur, how to react to an attack, what safety measures should be in force, and a general plan of action if an attack were to occur. Many of the seminar attendees were medical professionals from local hospitals. The training was educational and fun, but at the same time surreal. The amount of damage to property and lives that would occur if any of the attendees were to utilize their knowledge was unreal.

Incident Command System

On January 4, 2002, I attended an all-day satellite seminar that discussed bioterrorism and chemical warfare. This seminar stressed the importance of community preparedness and communication with various enforcement agencies in the event of a catastrophe.
As a result of that seminar, a meeting was scheduled in which Bruce Zeiger of the FWFD provided a presentation on Incident Command Systems (ICS). The FWFD currently has an incident command system in place that they follow every time they are called onto the scene of a fire. The incident command system designates a chain of command in the case of an emergency. The presentation was very informative and the information gathered from the meeting is being utilized in establishing a Health Department ICS in the case of a large emergency.

NEHA Indoor Air and Asthma Trigger Workshop

During the month of June, I was able to attend a National Environmental Health Association (NEHA) training session on Indoor Air Quality and Asthma Triggers. This all-expense-paid three-day training session in Minneapolis, Minnesota was funded by a grant. The training was over a wide array of indoor air quality issues and proved to be very useful. I was able to learn more about ventilation systems and the importance of proper airflow in indoor environments. The radon training, as well as training on heating systems, are the topics that were the most useful for me. My intention for the next year is to begin a radon program in which we work with homebuilders, realtors, and citizens to monitor radon levels in Allen County and to incorporate radon mitigation systems into the construction of new homes.
IX. APPLICATION OF COURSE WORK

My education from Miami University has been very influential and important in my job at the FW-ACDOH. The skills learned in the IES CORE classes, especially Environmental Methodology, Environmental Measurements, the Public Service Project, Environmental Policy and Administration, and Environmental Statistics, are utilized daily.

Environmental Methodology and the Public Service Project taught me the decision-making process, which I utilize to the greatest extent possible. These classes taught me how to plan, manage, and implement a plan, skills of the utmost importance. Daily, the FW-ACDOH is faced with new challenges concerning health issues that must be addressed in Allen County in a timely manner.

I am often confronted with a health issue that I may not have any knowledge of and I must figure out what the problem is. In doing so, I must educate myself on the topic, figure out what to test for, interpret the lab results, and write a concise report to the complainant regarding what I found, a process similar to that which was carried out in Environmental Measurements.

Environmental Statistics has been very important when interpreting data that is collected on lead houses. Although I do not use the knowledge from this class as frequently, the instances when it is utilized are very important in getting the message across in numbers.

In addition, Aerial Photo Interpretation, Geographical Information Systems, and Remote Sensing have been beneficial in my career. The geography background I gained at Miami has enabled me to succeed in my position. With these skills, I am able to understand and therefore create more useful and insightful maps that geographically represent real-life data.

Environmental Policy and Administration directly increased my knowledge of how governmental agencies create and enforce federal, state, and local rules, laws, codes, and ordinances. This understanding has been very useful when trying to interpret and utilize HUD, EPA, IDEM, and local regulations. Although many of my performed tasks were directly enforcement tasks, I also had to understand what regulations I was governed under for my lead risk assessor and inspector license.

The interdisciplinary studies program Miami University provided has also aided me, because within my job and role with GIS, I have to be multi-talented and deal with many
different divisions and health issues. In very few instances have I ever had to complete a project
without the cooperation of team members, a fundamental practice that was instilled in the
Environmental Science program at Miami University.

I have seen the problem-solving strategy invoked numerous times during planning
processes; more importantly, I have seen it not used and projects fail. The FW-ACDOH has o
deal with numerous public health problems on a daily basis. The problem solving strategy has
come in very useful when trying to determine how to tackle public health issues as simple as
creating a successful lead education program. Without the framework established at Miami
University, these major hurdles would be very difficult to overcome.

I took for granted the skills I was learning while working towards my master’s degree.
Once in the work force, I fully understood how important these skills were, and how others
without these skills were just spinning their wheels and making projects much more difficult for
themselves.
X. CRITICAL ANALYSIS OF INTERNSHIP

Working for the Fort Wayne-Allen County Department of Health has provided me with a wonderful learning experience as well as increased my knowledge base of various issues that threaten public health. Throughout the experience I have gained insight into working for a governmental agency and the general workforce.

During discussions with other public health specialists, I have learned that the FW-ACDOH is a larger organization, primarily due to the size of city and county that is served. Many health departments within the state are smaller with fewer staff. The ability to have a larger staff allows for the divisional separations, allowing for more focused services (i.e. food protection, pollution control, etc.). This allows the individuals an opportunity to become more specialized. In many counties, the same people deal with inspecting the food establishments, septic system inspections, as well as lead poisoning, making their attention to each individual subject minimal. My division in the department is unique because we are pulled in so many different directions with all the various topics we cover, but I couldn’t imagine attempting to do my job as well as being responsible for food safety and pollution control.

A benefit of the internship is that I have gained an extensive amount of knowledge about public health. The health department is a prime example of how interdisciplinary studies are applied in the real world. In my indoor air quality role specifically, I had to understand the basics of building structures and ventilation systems to better understand how mold contamination potentially occur.

Although the health department has significant responsibilities, there are flaws in the system. County government is primarily based on defined rules and regulations, which allow for easy assessment of what needs to be done. If these rules and regulations are not followed, the individuals or businesses are in violation and must correct the situation to be in compliance. Unfortunately, it is not always as clear-cut as it should be.

In some situations there is a lack of enforcement if a code is blatantly violated. To an extent this is acceptable; it is difficult to prove someone is violating a code if you do not witness the activity yourself. However, once a situation is known and confirmed by someone in the
agency, there are still times when nothing is done. The logic is that an individual must be educated first, and then cited with the violation if it occurs again.

A prime example of this happened recently. A tattoo artist from a neighboring county was performing tattoos and body piercings on a local radio show. Both this particular radio station and this artist had received permits from Allen County for tattooing in the past, indicating that they were aware of the existence of the tattoo code. At the time of the event, neither the radio station, nor the artist held a valid tattooing or body piercing permit in Allen County. As a result of the incident, a letter was written to the artist informing them that they must obtain a permit before doing tattooing or body piercing in Allen County.

This example is very frustrating because it shows that the agency is not serious about protecting public health as well as opens doorways for others to violate the code. In this instance, the only people getting punished are the ones who abide by the code and are under scrutiny from the health department. At the same time, it casts a further separation between establishments that are following the code and the health department because it makes the health department look weak.

Codes have nuances that can be interpreted various ways. Many state and federal laws refer to other laws, which then refer to yet another law. Once you finally read the initial law, it is either lost in translation or you forget what original question you were trying to answer. Codes are not written for the common person since lawyers approve them. In addition, different agencies do not agree on what a definition means.

This leads to another issue, a lack of good working relationships between governmental agencies on local, state, and federal levels. This is caused by a lack of communication between the agencies. If working relationships were developed, the public would be much better served by each agency. Within various agencies, I have observed a lack of motivation. If they do not deal with your problem, there is a lack of attention in connecting you with the proper agency. This comes full circle from the lack of working relationships between agencies. So often a person could get discouraged from getting transferred from agency to agency that they might give up, thus not being served by the people who are paid to serve them.

I personally believe that this results directly from a lack of training in many agencies. For example, within my second month I was coined the indoor air quality specialist without ever receiving any proper training on indoor air quality. How can someone uneducated in the topic
rightfully give advice to the public when they themselves do not know the issues? A prime example of this is the pool program. One of my jobs is to be able to inspect local pools. To inspect a pool I must understand the mechanical operations of the pool, such as turnover rate and how the pH and chlorine levels effect the water quality. If any of these are not working properly, I am to advise the pool manager on how to fix the problem. Without a proper pool operator course, I have no basis for the advice I give.

In addition, everything legal, such as violations of the code or the writing of consent forms must go through a lawyer. The FW-ACDOH lawyer is on contract and has his own practice, typically pushing aside documents the health department needs examined. Frequently, documents or protocols are created in a hurry up and wait manner. This is very frustrating while trying to complete projects because they can get placed on the back burner and forgotten.

Another issue that interferes with the protection of public health is the lack of resources. Both the fiscal resources and the knowledge resources need to produce an effective organization. Within our county government, the county council must approve budgets and any large ticket items. This limits our agency in applying for grants or classes we may find shortly before the application deadline. This process could take well over a month, delaying the process even further. Knowledge resources are severely limited, therefore requiring the department to use outdated materials.

An extremely large obstacle that my division works through is working with the public. Oftentimes we are working with poverty stricken people that have a different set of values. We have been in homes where there are no beds, but yet there is a large screen television and an elaborate entertainment center. Trying to relate can be difficult and trying to explain the importance of lead poisoning is even more so.

Although there are many struggles and obstacles within county government, the best part of my experience was that at the end of the day, even if I wasn’t able to get results for an individual, I was able to inform them a little bit more. I realize my role is to function as a public servant and I work for the residents of Allen County. At the end of the day, as long as I have exhausted my resources in attempting to find an answer for them, I have done my job. Being able to test siding for asbestos or lead before a big renovation project is helping reduce the health risks, not only for that family, but for the families surrounding them. Even with its wrinkles, the
health department is crucial in protecting the public’s health and does so effectively, making it worthwhile.
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ALLEN COUNTY CHILDHOOD LEAD POISONING PREVENTION PROGRAM’S HIGH RISK ZIP-CODES

Allen County Lead Poisoning High-Risk Zip Codes

Legend

- Zip Codes
- Cities
- Streets

Total Width Approximately 40 miles

Source: Centerline data created by the Allen County ISPG, Zip Code and City Boundary data provided by Tiger Files.
APPENDIX B

INDOOR AIR QUALITY WEBSITE INFORMATION

Healthy Homes and Indoor Air Quality (IAQ)

Introduction

IAQ

In the past few decades focus has been given to cleaning up the Earth’s outdoor air quality by removing air pollution. Because of health problems attributed to pollution, the campaign for a cleaner environment has been successful. What is frequently overlooked is the quality of indoor air. Some people spend as much as 90% of their time indoors, either in their home, office building, school, or day care center. Studies have recently shown that indoor air quality plays a critical role on human’s health, especially the health of young children.

Health effects associated with poor IAQ include irritation of the eyes, nose, and throat, headaches, dizziness, fatigue, frequent common colds, flu-like symptoms. Some symptoms are short term and easily treatable. Other cause more long-term serious health conditions such as asthma, allergies, and in some cases slows mental development in children, respiratory disease, heart disease, and cancer. Air quality is composed of lead, biological pollutants such as mold, mildew and dust, second hand smoke, radon, asbestos, carbon monoxide, and hazardous household products.

“There’s No Place Like Home”

Having A Healthy Home for You and Your Children

More and more Americans are becoming more aware of their health, eating better foods, exercising more, and leading healthier lifestyles. Often, people overlook their own homes as being unhealthy. Even the most expensive and cleanest homes can be unhealthy. Potential health risks in the home include lead, dust, biological pollutants such as mold or mildew, second-hand smoke, radon, asbestos, hazardous household products, and drinking water.

Children are at greater risk of becoming sick than adults because of their smaller and undeveloped bodies. After birth, babies respiratory, nervous, reproductive, and immune systems are still developing. Young children breathe more rapidly and take in more air in proportion to their body weights than do adults. Higher metabolic rates and intake of food and liquid for their weight also puts young children at a higher risk for pollution. For example, an average infant consumes six ounces of formula per kilogram of body weight daily, this is the same as an adult male drinking 50 eight ounce glasses of milk a day.

Since children’s systems are not fully developed yet, they are more vulnerable to toxins because they are not able to excrete toxins as well as adults. Toxins are foreign substances that pose considerable health risks to humans. Early childhood development includes a great deal of hand-to-mouth interaction. How often do you see a baby chewing on a toy, its hand, furniture, anything that will fit in its mouth? This chewing action in addition to spending more time on and near the ground exposes babies and young children to more toxins. Contaminants are transported through many media, including air, water, soil and food. The occurrence of acute
lymphocytic leukemia has risen 10% while brain tumors in children have risen 30% in the past 15 years.

THE KEY TO PROTECTION IS AWARENESS AND PREVENTION!!!
Knowing where hazards are and how to fix the hazards is the first step in making your home a healthy home!

Lead
Lead poisoning of children is a growing concern. Lead poisoning, one of the largest threats to young children under six (6) years of age, happens when children get too much lead in their blood. High lead levels can have many negative effects such as producing learning and behavior problems, damaging hearing, respiratory, nervous systems and the brain. One in 20 American children have too much lead in their bodies. In cities, the average increases.

- Checklist- Do I Have A Lead Hazard?
- Does Your Child Need To Be Screened for Lead Poisoning?
  - Children With Lead Poisoning
  - What Is Lead And Where Is It Found?
    - Blood Lead Level (BLL)
  - How To Safely Remodel Or Remove Lead From Homes
    - Cleaning Tips
    - Lead Testing

Checklist- Do I Have A Lead Hazard?
♦ Was my home built before 1978? Before 1950?
♦ Is there cracking, chipping or flaking paint in my home?
♦ Has my home been recently remodeled or renovated?
♦ Are my water pipes made of lead?
♦ Is lead in the soil outside my home?
♦ Does someone that is around my children or frequently visits my house work or have a hobby where lead is used?

Does Your Child Need To Be Screened For Lead Poisoning?
If you answered yes to any of the above or following questions, then it is in the best interest of your child to have a blood level screening done.

✔ Is your child eligible for or receiving benefits from WIC or Medicaid?
✔ Does the child live in or regularly visit a ZIP code determined to be a high risk based on the age of housing stock? (Allen County’s High-risk zip codes are 46802, 46803, 46806, 46807, 46808).
✔ Does your child live in or regularly visit a home or daycare center built before 1978 with peeling and/or chipping paint, or been renovated within the last six months or ongoing or planned renovation?
✔ Does your child have a brother or sister, housemate, or playmate being followed or treated for lead poisoning with a blood level of 10 µg/dL or higher?
✓ Does your child live with an adult whose job or hobby involves exposure to lead (includes home repairs, auto repairs, furniture refinishing, firing ranges, casting lead fishing sinkers, boat repairs, bullet making).
✓ Does your child live near a busy street, and active lead smelter, or other industry likely to release lead?
✓ Does your family use imported or glazed ceramics for food preparation, storage, or as dinnerware?
✓ Does your child have medical findings consistent with lead poisoning (this includes any developmental delays, growth failure, anemia, hyperactivity, or undiagnosed seizures)?

Children With Lead Poisoning

Children with too much lead in their bodies don’t appear to be sick. They don’t have a cough, or cold, temperature or any other illness symptoms. Instead, they can have developmental problems such as delayed development, reading and learning problems, lowered IQ, hyperactivity and discipline problems. Higher doses can cause high blood pressure, anemia, and other problems in both children and adults.

The only way to tell if a child is lead poisoned is to have your health care provider test them. A small blood sample is taken to tell if lead is present in your child’s blood. The test is as simple as pricking the child’s finger. To get a more accurate account of the child’s blood lead level a sample can be taken through the vein.

Usually children with lead in their body are also iron deficient. The body is seeking out iron, but confuses lead for the iron and absorbs the lead more readily. It is very important that lead poisoned children eat a well-balanced healthy diet containing foods with vitamin C, calcium, and iron.

What Is Lead And Where Is It Found?

Lead is a metallic element that occurs naturally. Lead has been used in paint, gasoline, pottery, crystal, construction, plumbing, battery recycling, car repair, and foundry casting, just to name a few. Lead was banned from household paint in 1978. Older houses, especially those built before 1950, pose a larger risk of having lead hazards because paint contained as much as 50% lead. Houses built after 1978 are not of concern for lead-based paint on the walls or exterior of the house, but may have lead hazards in older furniture or toys that used lead-based paint.

Not all lead-based paint is hazardous. If the paint is in good condition and not peeling or chipping, the risk of getting lead poisoning is not immediate, but does become a risk for the future. Once the paint starts to deteriorate it breaks down and forms a dust. Most lead poisoning doesn’t come from the paint, but rather dust that contains lead. Windowsills tend to contain more chipping lead paint and lead dust. The opening and closing of the window causes friction between the window and the sill. This friction rubs the paint off, forming a dust. A tell tail sign of a lead-based paint hazard is a checkerboard pattern of dry, flaked paint in the windowsill.

Lead is also commonly found in soil. As a result of lead being used in gasoline, locations near busy streets tend to have higher amounts of lead in the soil. In addition, older homes with lead-based paint on the outside of the house that has not been kept up, will peel and chip. The chips and dust fall onto the ground, also making the soil a media for lead. Young children that play outside get dirty, put their hands in their mouth, and ingest dust, dirt, and potentially lead.
In addition, people that work with or near lead have it on their skin and clothing. When they enter a house they can bring lead in shoes, clothes and skin. If children play, hug, or jump on this person, they are coming into direct contact with lead. To avoid this, make sure lead soiled clothes are kept away from children and washed separately. Taking shoes off at the house entrance also reduces the chance of soil being dragged through the house.

Blood Lead Level (BLL)

Blood lead levels (BLL) are measured in micrograms per deciliter (µg/dL). If a child’s blood lead level is 10 µg/dL or higher it is too high. Different concentrations of lead have different effects. The higher the concentration of BLL, the worse the damage caused to the body is. The damage caused by lead is irreversible, but very preventable. There is no medication for lead poisoning until the BLL reaches numbers as high as 40. This is a very serious state. Chelation therapy is very hard on the body and the child may never return to a lead environment, or their BLL will skyrocket back up. Regular cleaning helps reduce lead hazards.

How To Safely Remodel Or Remove Lead From Homes

Special care should be taken when trying to remodel or renovate a home with lead-based paint or dust. Trying to remove the paint will cause more dust and create more of a hazard. Rather than trying to completely remove the lead risk, covering it up makes a safer environment. For example, if an outside of a house is chipping and flaking because the lead-based paint is breaking down, rather than scrapping the paint off, consider siding the house. Remodeling using drywall and paneling to cover up the lead-based paint prevents the paint from entering the air. If renovations must be done, special care should be taken. First and foremost, children should be removed during the renovation until after all of the debris and dust is cleaned up. Hiring a contractor that is certified in lead abatement is expensive, but comfort can be taken in the fact that the job is done correctly. If this is not feasible, make sure any work done is in a moist environment. Blasting the paint of the side of the house causes more dust. If you moisten the paint before blasting it, less dust will be produced.

Cleaning Tips

♦ Do not vacuum, dry dust, or sweep in a room known to have lead dust, instead frequently use damp mopping to control dust.
♦ Pick up loose paint chips with duct tape
♦ Frequently wash your children’s hands, face, and toys, especially before dinner
♦ Do not sand or scrape paint, it will cause dust
♦ Wipe surfaces, such as windowsills and floors, with paper towels, warm water and soap once a week, rinse well
♦ Use a high phosphate content cleaner. Liquid dishwashing soaps generally contain high phosphate amounts
♦ Let the water from the spout run for a couple of minutes before you get what you need. Never use hot water for cooking or drinking, it contains more lead.
♦ People that work with lead should shower, change clothes and shoes before they enter the house. Wash these clothes separately
♦ Plant grass and other plants in bare soil to reduce children’s exposure to soil
If you have to vacuum, use a vacuum with a HEPA filter. HEPA filter vacuums are found in most stores and are labeled as having a HEPA filter. The HEPA filter prevents dust and dirt from being pushed into the air.

Lead Testing
If you are concerned about your child being lead poisoned, make an appointment with your health care provider to get your child screened. If you do not have a health care provider, call 449-7514 and inquire about the availability of lead screening. Currently, lead screening is being conducted free of charge for children six years or younger at the Ft. Wayne-Allen County Department of Health on Fridays from 9:00 am-11:00 am and 1:00-4:00 pm. The biggest concern is getting your child tested quickly.

If you are concerned about your home containing lead hazards, you can either hire a certified lead risk assessor from the list provided by the IDEM. Call 449-7125 for more information.

Biological Pollutants, Mold Mildew And Dust

- What Biological Problems Are Of Concern
- Health Effects Of Biological Pollutants
  - “That Makes Me Sick!”
  - Mold And Dust Mite Growth
  - Controlling Biological Contaminants
- Quick Tips For Reducing Mold And Mildew
- Quick Tips For Helping With Allergies
  - For More Information

What Biological Problems Are Of Concern
Molds, mildew, fungi, bacteria, dust mites, and pet dander are examples of biological pollutants found in homes. Mold and mildew have recently been in the spotlight of producing adverse health effects. High humidity levels, such as excessive moisture, bathrooms, kitchens, laundry rooms, and basements produce an environment that aids mold and mildew growth.

Health Effects Of Biological Pollutants
Allergic reactions and asthma are the most noted health effects associated with biological pollutants. In the past 10 years, the number of children with asthma has doubled, now with 1 in 15 children under the age of 18 having asthma. Symptoms include watery eyes, runny nose, sneezing, nasal congestion, irritated skin, coughing, wheezing, difficulty in breathing, headaches, dizziness, and fatigue. Mold effects low birth weight babies and people with weakened immune systems including individuals infected with HIV, cancer patients being treated with chemotherapy, bone marrow and organ transplant patients, and critically ill patients. Research has shown that 93% of chronic sinus infections were a result of mold exposure.

Some species of mold are being identified as potentially effecting memory, learning, and concentration of children, possible brain damage, and even a cause of cancer. Infants have been identified as a high-risk group because of incidences of pulmonary hemorrhage or bleeding from the lungs, which are indicated by the infant coughing up blood or having nosebleeds.
Preschool and school children have also been identified as having harmful effects of mold exposure. Effects include increase risk of nausea, difficulties in concentration, risk of hoarseness, cough without phlegm, nocturnal cough, sore throat, eczema, and higher number of doctor visits than unexposed children.

“That Makes Me Sick!”
Exposure to mold can occur through skin contact, swallowing, and inhalation of mold spores. Spores are the mold’s means of reproducing. Some molds produce chemical compounds called mycotoxins. These mycotoxins are similar to fumes produced by house cleaning agents and are harmful to human health.

Mold And Dust Mite Growth
Both mold and dust mites thrive in areas where there is a lot of water. Mold needs a food source such as paper, textiles, grease, dirt, and soap scum. Once a mold colony has grown, it spreads by releasing spores into the air where it floats throughout the house until it finds a food source where it then grows a new colony. Dust mites, pollen, and animal dander become airborne by simple actions of walking on carpet, making beds, sitting on the couch, and vacuuming.

Controlling Biological Contaminants
It is difficult to test for mold growth. The best detection is by sight and smell. Key places to look for mold are water stained areas, standing water, or moist surfaces, places like bathrooms and basements. Keeping rooms clean and dry can deter mold from growing.

If you find a mold colony growing, it can be cleaned using a disinfectant to clean the surfaces that have mold. Using a solution of 1 part bleach to 3 parts water is common. Care should be taken to not mix chemicals when cleaning because of harmful fumes that are produced. If surfaces, such as carpeting or furniture become wet, they should quickly and thoroughly be dried or discarded. Humidifiers, dehumidifiers and air conditioning condensing units should be cleaned regularly. Humidity levels should be kept under 50%, with 30% being ideal.

Ventilation systems sometimes harbor mold and assist it in spreading throughout the home because of the forced air. Having you system cleaned by professionals assists in reducing the mold and mildew growth.

Quick Tips For Reducing Mold And Mildew
♦ Do not let water stand in basements, drop pans of refrigerators, or air conditioners
♦ Fix leaks right away
♦ Make sure rainwater drains away from your home
♦ Use fans that vent air to the outside when bathing, showering, or cooking
♦ Use dehumidifiers and/or air conditioners to remove excess moisture in warm, humid weather
♦ If you use humidifiers, clean them often to keep mold from growing
♦ Limit houseplants

Quick Tips For Helping With Allergies
♦ Keep the house clean
♦ Remove pets, or at least keep them out of bedrooms
Use washable covers for mattresses and pillows
Wash sheets and other bedding once a week with hot water to kill dust mites
Reduce the amount of carpets, upholstered furniture, and things that collect dust
Reduce moisture

For More Information
Downloadable Information Packet or contact the Fort Wayne-Allen County Department Of Health at (260) 449-7126.

Indoor Air Quality (IAQ)

Most people spend at least half of their lives inside their homes. Indoor air quality (IAQ) plays a role in human health. If the air inside a home is not clean, then adverse health effects may occur. Clean air is especially important for young children who breathe in 50%-100% more air than adults because of their size. Asthma and allergies may be caused or made worse because of the air you breathe. Pets, tobacco smoke, cockroaches, and damp air make asthma worse. Gases, such as carbon monoxide and radon are especially harmful because they are colorless and odorless.

- Secondhand Smoke
- Radon
- Asbestos
- Carbon Monoxide And Combustion Appliances
- Hazardous Household Products

Secondhand Smoke
Secondhand smoke, known as environmental tobacco smoke and involuntary or passive smoking, is a mixture of the smoke given off by the burning end of a cigarette, pipe, or cigar and the smoke exhaled from the lungs of smokers. Secondhand smoke has been classified by the U.S. Environmental Protection Agency as a known cause of lung cancer in humans. EPA estimates that environmental tobacco smoke causes approximately 3,000 lung cancer deaths in nonsmokers each year.

Children under the age of 18 months exposed to smoke results in between 7,500 and 15,000 hospitalizations each year. Children exposed to secondhand smoke are also more likely to have reduced lung function and symptoms of respiratory irritation like cough, excess phlegm and wheeze. Passive smoking may also cause non-asthmatic pre-school-aged children to develop the condition.

To reduce the risks associated with secondhand smoke do not allow smoking in your home or car, especially when children are present. If smoking is permitted, make sure proper ventilation is available where smoking takes place.

Radon
As many as six (6) million homes throughout the United States have elevated amounts of radon. Radon, the second leading cause of lung cancer, is an odorless, colorless radioactive gas
that comes from the breakdown of uranium. Uranium is present in soil and rocks around the United States. The largest amounts of radon are found where granite, shale, phosphate, and pitchblende are the prominent subsurface. Exposure to radon can increase the chances of getting lung cancer. When smoking is combined with radon exposure the health risks increase dramatically because the radon gas is more easily inhaled when it attaches to lingering smoke particles in the air.

The breakdown of uranium forms a gas that can seep through cracks and crevices in a house’s foundation. When breathing, these particles are drawn into your lungs and release bursts of energy that can damage lung tissue and lead to lung cancer.

Home tests kits are available at most local hardware stores. A purchased test kit should be labeled “Meet EPA Requirements.” These kits meet the high standards of the EPA. The kits are relatively inexpensive, but some can take time to get the results. The amount of radon being released varies over time, therefore long-term monitoring systems produce a more accurate account of how much radon you and your family are exposed to. Professional testing can also be conducted by hiring a radon monitoring service.

If your home does have radon in it, there are different things you can do to reduce your family’s exposure. Contacting a local radon contractor offers the best advice and guidance when considering how to limit your family’s radon exposure.

Asbestos

Until the late 1970’s Asbestos was used common building materials because it was so fire resistant. Today it is known that exposure to asbestos is associated with the development of lung cancer. Asbestos is found in heating systems, acoustic insulation materials, floor and ceiling tiles, and shingles.

When asbestos-containing materials are damaged or disintegrate with time, microscopic fibers may be dispersed into the air. Over an extended period (20-40 years), asbestos fibers remain in the lungs, causing cancer. Asbestos exposure in addition to tobacco smoke increases a person’s risk of lung cancer fivefold.

If you are concerned that your home contains asbestos material, consult a local asbestos contractor or bring a residential sample into the Ft. Wayne-Allen County Department of Health to be tested. If you remove the asbestos take caution to spray the material down with water before removing it to limit the release of asbestos containing fibers. Double bag the sample in an air tight baggie. Wearing personal protection equipment such as goggles, masks, and gloves will also lower your risk of exposure. Call 449-7104 before you bring in the sample to assure the service is still available.

Periodically, the manufacturer of the material will also have more information about the product. Replacing or removing asbestos can increase the risk of exposure if it is not done properly. Disruptions of asbestos materials produce airborne fibers. If asbestos is found and is in good condition, it is better to leave the materials alone. Similar to lead, asbestos hazards can be contained by covering or sealing the materials.

Carbon Monoxide And Combustion Appliances
Carbon monoxide comes from combustion appliances such as gas heaters, furnaces, stoves, dryers, and car exhausts. When appliances are not maintained correctly, the gas leaks, posing a large risk to health, sometimes even causing death. Distinguishing if carbon monoxide is responsible for illnesses is sometimes difficult because the symptoms are similar to a cold or the flu. Low levels of carbon dioxide can cause nausea, dizziness, weakness, muscle ache, upper respiratory irritation, and a persistent cough. Higher, more concentrated exposure can impair judgement or cause paralysis, coma or death. Elderly people, unborn babies, and people with heart disease are the most susceptible to carbon monoxide.

To lessen your exposure to carbon monoxide make sure your combustion appliances are properly vented to the outside. Having your appliances checked annually also lowers the risks of having carbon monoxide poisoning. Eliminating the use of kerosene heaters or gas stoves to heat your home will reduce the chance of carbon monoxide poisoning. Monitoring devices, similar to smoke detectors, are available from local hardware stores to detect elevated levels of carbon monoxide.

Hazardous Household Products

Hazardous household products include pesticides, cleaning agents, and solvents used in and around the home. Health effects of exposure to hazardous household products include eye, nose and throat discomfort or irritation, headache, allergic skin reaction, nausea, fatigue, difficult or labored breathing, and dizziness. Volatile organic compounds (VOCs) are dangerous and common in any home. VOCs are especially dangerous because the solvents easily evaporate into the air and may be flammable. VOCs can be found in personal items such as scents and hair sprays, household products such as finishes, rug and oven cleaners, paint and paint thinner, dry-cleaning liquids, and building materials and home furnishings.

Pesticides such as bug spray, pet flea collars, rat poison, bleach, garden weed killer, or anything that is used to kill pests can be a hazard to your families health. Some pesticides are known to cause poisoning, birth defects, nerve damage, and even cancer if used improperly. Children are at special risk because they place objects in their mouths. If they put a pesticide-coated object into their mouth, they are introducing the pesticide directly into their system.

To protect your family from hazardous household products, make sure the products are stored in a secure location that is not accessible to children. Keep the product in the container it came in. If you have to change containers make sure it is properly labeled. Never use products near a heat source or fire. Storing flammable chemicals like gasoline in the shade, away from direct sunlight. Working in well-ventilated areas will help reduce the risk of getting sick from the fumes.

Drinking Water

Each day Americans drink more than one billion glasses of water. Water is used for a number of activities, cleaning, cooking, bathing, and fixing baby food and formula. Public water supplies take extra precautions to make sure the water that comes out of your faucet is free of bacteria, viruses, and nitrate. However, sometimes water can be a health hazard, especially for children who drink more liquid than adults and whose bodies are more harmed by chemicals because their immune systems are still developing. If your home’s water comes from a well, then it is up to you to make sure your water is safe for drinking.
Sometimes bacteria and viruses reach water sources and can cause illness. Symptoms related to contaminated water are upset stomachs, diarrhea, or more serious illnesses. Children, pregnant women, and sick or older people have a higher risk of becoming ill from contaminated water. Another contaminant of water is nitrate. Nitrate is a byproduct of human and animal waste as well as fertilizers. High levels of nitrate in water are thought to cause “blue baby” syndrome in infants under 6 months old and may also result in birth defects and miscarriages.

Lead and copper are metals that can enter your drinking water through your house’s pipes. If your home was built before 1988 it may have lead pipes. Identifying the type of pipes will help determine if metals in your water are a problem. Lead pipes are dull gray and scratch easily with a key, while copper pipes are a reddish-brown color. Lead in drinking water has been found to cause learning, attention, and behavior problems in children. Copper has been identified with colic babies and a cause of babies spitting up more than normal amount. In older children and adults, copper may upset their stomachs or give them diarrhea.

If you think your water may be contaminated by lead or copper pipes there are a few things you can do to limit your risk. After the water has not been used for awhile turn on the cold spigot and let the water run for a few minutes. This cleans out the pipe and gets rid of any water that was standing in the pipes. Using cold water instead of hot water from the tap for cooking, drinking, or making formula. The hot water helps dissolve the metals found in the pipes faster. Using cold water and warming it on the stove is the best alternative.

Various steps can be taken to keep the public water supply clean

♦ Follow the directions on labels on pesticides and detergents. Never use more than they say
♦ Close chemical bottles tightly, store away from water source
♦ Do not throw chemicals in garbage or down the drain
♦ Clean up pet waste. When it rains, the waste is washed into rivers and lakes, which is where the public water supply comes from.
In the 1970s Sick Building Syndrome (SBS) was used to describe building occupants symptoms that were temporally associated with their presence in the building. Lethargy, fatigue, headaches, dizziness, nausea, eye, nose and throat irritation, sensitivity to odors, nasal congestion, and an inability to concentrate were common complaints of office building occupants. SBS is a result of poor design, maintenance, and/or operation of the structure’s ventilation system. Many office building are very tightly sealed and re-circulate the air inside of them. Partitions, cubicles, or large office equipment may also be a culprit for poor airflow.

If problems occur while you are in the building, then lessen after you leave the building, or if co-workers and peers have similar symptoms then there may be a problem with the work environment. Having a “clean” building is important because when SBS is around productivity and moral is lowered. When people are tired or hot they will not work as well as if their environment was comfortable. It’s important to distinguish SBS from problems of building related airborne illness such as the flu.

Available Publications and Information

Fort Wayne-Allen County Department of Health.
Call (260) 449-7126 or email jana.farrell@co.allen.in.us
Documents provided by EPA are downloadable from their website
** Indicates publication available in Spanish.

- Lead
- Radon
- Asbestos
- Indoor Air Quality (IAQ)

LEAD

“What you should know about Your Child’s Blood Lead Level.” Indiana State Department of Health (ISDH), 1996.
“Protect Your Family From Lead In Your Home” U.S. Environmental Protection Agency (EPA), U.S. Consumer Product Safety Commission (CPSC), and U.S. Department of Housing and Urban Development (HUD), 1999.
“Cleaning Checklist.” Fort Wayne-Allen County Department of Health (FWACDH).
(DOWNLOADABLE)
“Foods That Fight Lead Poisoning.” FWACDH (DOWNLOADABLE)

Other available lead information

HUD, 1999.
“What You Should Know About Lead In Your Water.” ISDH, 1990
“What every parent should know about Lead Levels In Children.” from ISDH, 1994
“Lead Poisoning And Your Children.” EPA, 1995
“Lead- Is Your Child At Risk?” (Available in Spanish only), ISDH, 1992
“Lead Paint Can Poison: Learn The Facts.” HUD
“Caution: Lead Paint Handle With Care.” HUD

RADON- Information brochures available by calling 449-7126

ASBESTOS- Information brochures available by calling 449-7126
“Asbestos in Your Home.” CPSC, EPA, American Lung Association

INDOOR AIR QUALITY (IAQ)
“Indoor Air Hazards Every Homeowner Should Know About…” EPA, 2001
More Information Available Over The World Wide Web

- Lead
- Mold, Mildew, Dust
- Second Hand Smoke
  - Radon
  - Asbestos
- Carbon Monoxide and Combustion Appliances
- Hazardous Household Products
  - Drinking Water
- Children’s Health

Lead

National Lead Information Center
www.epa.gov/lead/nlic.htm
Environmental Protection Agency (EPA) Lead Programs
www.epa.gov/opptintr/lead/
Alliance To End Childhood Lead Poisoning
www.aeclp.org
HomeSafe Lead Testing
www.leadpro.com

Mold, Mildew, Dust

EPA
www.epa.gov/iaq
Center for Disease Control and Prevention (CDC)
www.cdc.gov/nceh/asthma/factsheets/molds/molds.htm
City of New York

Second Hand Smoke, Radon, Asbestos, Carbon Monoxide, and Hazardous Household Chemicals

EPA
www.epa.gov/iaq

Drinking Water

EPA Office of Ground Water and Drinking Water
www.epa.gov/OGWDW

Children’s Health

U.S. Department of Housing and Urban Development (HUD)
www.hud.gov/healthy/mainmenu.html
U.S. Environmental Protection Agency
www.epa.gov/children/
National Institute of Environmental Health Sciences
Children’s Environmental Health Network
www.cehn.org
National Safety Council
www.nsc.org/ehc/chldhlth.htm
US Centers for Diseases Control and Prevention
www.cdc.gov/od/oc/childhealth/
US Consumer Products Safety Commision
www.cpsc.gov
National Lead Information Center
www.epa.gov/lead/nlic.htm
National SAFE KIDS Campaign
www.safekids.org
Healthy Indoor Air For America’s Homes
www.montana.edu/wwwcxair
APPENDIX C

INDOOR AIR QUALITY WEBSITE FACTS

IAQ

♦ Most people spend over 90% of their time indoors.

♦ The number of children with asthma has doubled in the past 10 years. 1 in 15 children under age 18 years of age have asthma.

♦ 1 in 20 American children have too much lead in their bodies.

♦ Thousands of children die each year from exposure to chemicals stored and used improperly in the home.

♦ Almost one-half of houses with a child under 5 had pesticides stored within reach of children (under sinks).

♦ For their size, children breathe in 50%-100% more air than adults do.

♦ 1 in 20 American children have too much lead in their bodies. The rate is even higher in cities.

♦ In 1995, almost 20,000 children were exposed to or poisoned by household chlorine bleach.

♦ Gas appliances, cars running in a closed area such as an attached garage, kerosene heaters, and gas fireplaces can cause carbon monoxide exposure.

Biological Contaminants

♦ It is estimated that humans shed about seven million skin cells per minute. Dust mites feed on these dead cells found in rugs, carpets, sheets, mattresses, pillows, and upholstered furniture.

♦ Ten to 15 percent of people are allergic to dust mites.

♦ A room temperature of 70 degrees Fahrenheit and relative humidity of 70% provides the best conditions for mold growth; humidity should be lowered to 30%-50%.
35% of all properties have water infiltration each year; of that 35%, 13% is a result of water from the interior of the home (plumbing) and 21% is a result from the exterior of the home (roofing, siding).

People that are more susceptible to mold are infants and children, elderly people, people with asthma or allergies, and people with weakened immune systems.

Excessive moisture in a home is one of the primary causes of mold.

Mold reproduces by forming spores and spreading them through the air.

Mold can be cleaned with a 1-part chlorine bleach to 3-part water solution.

**Radon**

Radon is the second leading cause of lung cancer, smoking is the leading cause.

Radon is a radioactive gas that is formed by the break down of uranium.

Radon is a colorless, odorless gas that can seep into your home through foundation cracks.

Smoking increases the risks associated with radon exposure.

**Asbestos**

Asbestos is a construction material that was used as a fire resistant insulation until 1975 when it was banned.

Asbestos can be found in ceiling tiles, floor tiles, wall insulation, and pipe insulation.

If asbestos materials are not disrupted or exposed, it is best to leave the material alone.

Asbestos is a threat to health when exposed and made airborne.

Certain precautions should be taken when removing asbestos; it is best to hire a professional to remove asbestos.

Smoking increases the risks of asbestos.
MOLD LITERATURE REVIEW

Mold: Health Effects and Testing Procedures

Health Effects Associated With Mold and/or Excessive Moisture Exposure

Numerous studies and literature have documented various health risks associated with mold exposure. Mold particles smaller than 10 microns are respirable and are a health threat because they are small enough to lodge into the lungs and resist removal by the body’s natural mechanisms (Wilkinson, 2000). Children, especially infants with less than or equal to 1500 grams of birthweight, tend to be more susceptible to indoor air contaminants than adults (Savilahti et al., 2000). An exception is susceptible adults who have weakened immune systems including individuals infected with HIV, cancer patients being treated with chemotherapy, bone marrow and organ transplant patients, and critically ill patients (Dixon et al., 1996).

Many common health effects associated with mold are chronic sinus infections, recurring cold and flulike symptoms, allergic reactions such as dermatitis, eye irritation. Respiratory ailments such as asthma, bronchitis, pneumonia, wheezing and coughing (Albright, 2001; Hamilton, 2001; Savilahti et al., 2000, Koskinen et al., 1999) in addition to inflammation of the airways (Rylander, 1997) were found to be a result of mold exposure. Research has shown that 93 percent of all chronic sinusitis was mold induced (Underwood, 2000). Some species of mold are being identified as potentially effecting memory, learning, and concentration of children, possible brain damage, and even a cause of cancer (Hamilton, 2001). Excessive fatigue, diarrhea, headaches, and sore throats have also been documented as common effects of mold exposure (Albright, 2001). Fungi exposure has also been identified as being responsible for approximately ten percent of nosocomial bloodstream infections (Dixon et al., 1996).

Infants have been identified as a high risk group because of incidences of pulmonary hemorrhage or bleeding from the lungs which are indicated by the infant coughing up blood or having nosebleeds (“Indoor mold growth and infant pulmonary hemorrhage, 1997). Preschool and school children have also been identified as having harmful effects of mold exposure. Effects include increase risk of nausea, difficulties in concentration, risk of hoarseness, cough without phlegm, nocturnal cough, sore throat, eczema, and higher number of doctor visits than unexposed children (Koskinen et al., 1999). One study found that cultured fungi produced VOCs similar to those produced by solvent-based building materials and cleaning supplies such as hexane, methylene chloride, benzene and acetone, which are responsible for Sick Building Syndrome (“Emissions from mold/fungus may be culprits in IAQ, 1995).
Testing For Mold

Many of the mold testing protocols observed required sending samples to an accredited American Industrial Hygiene Association lab that ensures personnel, equipment, and procedures comply with strict quality control standards. Sampling tends to be costly, both monetarily and time wise. A primary theme flowing throughout the majority of testing articles contend that visual inspection is the most important initial step in identifying a potential contamination problem. The primary means of testing prominent throughout the articles included gravity sampling using agar-enriched plates, bioaerosol sampling, swab sampling and bulk sampling. Agar plate samples used included malt extract agar (MEA), malt tryptic soy agar (TSA), sabouraud dextrose agar (SDA), and corn meal agar (CMA). Some samples were taken by simply leaving the plate exposed for a certain amount of time, allowing air particles to fall onto the plate. Almost all plates were sent off to labs where they were then incubated, between 25 and 40 degrees Celsius, and cultured. After a determined number of days, ranging from three to seven days, the samples were examined for colonization.

Gravity sampling depends on inertia and air currents to deposit microorganisms on the surface of the growth medium. Air currents and the sampling location play a vital role and can be the downfall of this technique. A person walking past a sampler could create air currents of 25-50 feet per minute, enough current to interrupt free fall of microorganisms and disperse them to other areas. In addition, since no volume of air is collected, no correlation colony counts from growth to specific airborne concentration or dose can be made (Spicer, 1997).

Other samples were taken using an Anderson sampler, a specialized air pump that sucks air through a plate for ten minutes at a designated rate and impinges all airborne particles onto the plate. These samples are also sent off to the lab. A downfall to this process is that after each sample the sampler and gloves have to be sterilized. This technique tends to sample 50-100 plates for which analysis ranges from $5,000 to $10,000 (Wilkinson, 2000).

One study examined different sampling techniques for *Stachybotrys chartarum*. They found that bioaerosol samples detected lower levels of S. chartarum than bulk or swab samples. Four buildings were studied, and in all four bioaerosol sampling produced a false negative conclusion, even though the fungus was present (Tiffany and Bader, 2000).
References:


Savilahti, Risto; Uitti, Jukka; Laippala, Pekka; Husman, Tuula; and Pekka Roto. 2000. “Respiratory morbidity among children following renovation of a water-damaged school.” Archives of Environmental Health, Vol. 55, Iss. 6, p.405.


Other Potential Sources For Information on Mold Testing Not On The Shelf In Fort Wayne


Do you have questions about mold? Are you concerned about the possible health affects related to exposure to mold? This document is intended to help answer your basic questions about mold. This document also provides information about other resources that are available.

**What is Mold?**
Mold is a fungus that grows everywhere, both in nature and in the home. Molds produce spores that are very small and spread easily. In nature, molds are beneficial as they help break down dead materials. Molds convert leaf matter into rich organic matter for fertile soil formation.

**What does mold need to grow?**
Mold does not need much to help grow. The key ingredients are:

- Moisture
- Nutrients
- Stable environment

With ideal conditions, molds can rapidly spread and infest a large area. Of all the ingredients needed, moisture is the most important. Eliminating moisture is the most effective means of hindering mold growth.

**What are the hazards of mold in the home?**
Mold can be problematic in the home. Excessive mold growth can be hazardous to your health. Mold also destroys building materials and home furnishings. So, it is important to stop mold growth.

As mentioned, mold can affect your health. The type and severity of symptoms varies as a function of a person’s susceptibility and the degree of exposure. Exposure is mainly through the inhalation of mold spores and other tiny “hyphal” fragments. Exposure can also occur by skin contact and swallowing.

**What are the health symptoms?**
Allergy symptoms are the most common health problem associated with mold in the home. Asthmatic people can be especially vulnerable. More serious health problems can occur. The most common problems are:

- Cough
- Nasal and sinus congestion
- Wheezing and breathing difficulties
- Sore throat
- Skin and eye irritation
- Upper respiratory infections, including the sinuses
Are some people at greater risk?
The long-term presence of indoor mold growth may eventually become unhealthy for anyone. However, the following types of people may be affected more severely and more quickly than others:

- Infants and children
- Elderly people
- People with respiratory conditions or sensitivities such as allergies or asthma
- People with weakened immune systems such as people with AIDS, HIV, chemotherapy patients and organ transplant recipients.

Those people with special health concerns should consult a doctor if they feel their health is affected by mold.

Are there molds that are more hazardous than others?
Some types of mold produce chemical compounds called mycotoxins, although they do not always do so. Mycotoxins are produced as a result of limited resources and are meant to affect other mold species. Molds that are able to produce these toxins are common and they can cause human health problems. *All indoor molds are potentially harmful and should be removed immediately*, no matter what types of mold are present or whether they produce mycotoxins. However, the following types of mold are of special concern:

- *Stachybotrys atra*
- *Aspergillus versicolor*
- Some species of *Penicillium*

How do I attack a mold problem?
Excessive moisture in the home is the main cause of indoor mold. The most important step in solving a mold problem is to identify and correct the moisture sources that allowed the growth in the first place. The following are recommendations to prevent and eliminate indoor mold problems:

1. Reduce the relative humidity in your living space, basement, or crawl space. Purchasing a hydrometer, an instrument that reads % humidity, at local retail stores allows monitoring of humidity levels. To discourage mold growth, humidity levels should range between 30-50% humidity. Buy a good dehumidifier. Empty the water collection tank often.
2. Get up in the attic and check for leaks around windows, gutters, soffets, and foundations. Make your basement leak proof. Install foundation drains and make sure your sump pump works.
3. If you have moderate mold growth, scrub the mold with a solution of strong detergent and water. Typically 4 parts to 1 part household bleach has been used, but as a result health effects have occurred from people using too much bleach, toxic fumes, and mixing with other chemicals. If a bleach solution is used, DO NOT MIX WITH OTHER CHEMICALS and make sure adequate ventilation is provided!
4. Have your heating ducts cleaned by a reputable company. This should be a last step, not the first. The ventilation system provides a favorable habitat for mold and mold growth.
Once in the ventilation system, the mold spores will be passed throughout the home any time the forced-air heat or air conditioning is used.

5. Install a HEPA filter in your heating system. If you do not have a forced-air heating system, portable HEPA filters are widely available at department stores, home improvement stores, and over the Internet.

6. SEE A PHYSICIAN if you or your children are experiencing health ailments.

7. Test your home. A number of private companies test for mold and can help identify sources of mold. If money is a limited resource, and there is visible mold growth, the money would be better allocated towards fixing the problem, rather than testing the home. Some home test kits are also available over the Internet. Presently, there are no current limits for recommended levels of mold nor are there any regulations for people who test for mold.

8. If testing reveals a serious mold problem, consider having a professional repair leaks and remove contaminated building components. If the mold infestation is severe, it may be necessary for you to move out of the home until it has been made safe again.

**When should I test for mold?**

*You should assume there is a problem in your home if you see mold or smell mold odors. Testing your home for mold should never use up resources that could be spent correcting the problem.* Sometimes, however, mold growth is hidden or difficult to locate. In these cases it may be useful to have your home tested in order to determine the extent of the contamination and where cleaning is needed.

**If you decide to have your home tested, the following companies may be of help:**

**Companies that Test for Mold**

(This list is not an all-inclusive list, nor does the Ft. Wayne-Allen County Department of Health endorse any services or products these companies offer. Other companies that perform mold testing can be added to the list by contacting 260-449-7104)

ACI Environmental Services  
1329 County Road 68  
Garrett, Indiana  
260-637-3546 Contat: Gary Kruger

ACM Environmental Services  
2100 Goshen Rd., Suite 200  
Fort Wayne, IN  46808  
260-483-9795 Contact: Michael Dials

Alan Environmental  
733 West Wayne Street, Suite 105  
Fort Wayne, IN  46808  
260-420-5352 or 260-437-6025

Allied Environmental Services Inc  
1867 S. Dixie Highway  
Lima, Ohio  
800-992-5781 Contact: Steve Carr or Keith Boyd

Clean Air+ Indoor Environmental Solutions  
P.O. Box 991233  
Louisville, KY  40269-1233  
888-401-0832 Contact: Jeremy Fuller

Environment Technology Consulting  
2701 Coliseum Blvd Suite 1219  
Fort Wayne, IN  
260-422-7784 Contact: Leemon Ward

Greentree Environmental Services, Inc.  
5287 Central Ave.  
Portage, IN  46368  
219-764-2828 or 877-476-8733

Home Inspection Services  
5110 Nassau Dr.  
Fort Wayne, IN  46815  
260-485-0615 Contact: James Goddard
Dr. Thad Godish
Ball State University
Muncie, IN 47305
765-285-5782

Industrial Solutions Group
13127 Bent Lane
Fort Wayne, IN
260-338-0162  Contact: Joe Steensma

Protechs Incorporated
2777 Sherman Blvd.
Fort Wayne, IN 46808
260-672-8700

Radon Protection Services
12101 Amber Ridge Dr.
Fort Wayne, IN
260-672-8700

Companies that Perform Mold Remediation
(This list is not an all-inclusive list, nor does the Ft. Wayne-Allen County Department of Health endorse any services or products these companies offer. Other companies that perform mold remediation can be added to the list by contacting 260-449-7104)

Air Quality Duct Cleaning Services
260-492-4247

Beanie’s Duct Cleaning
419-238-1310

Best Air Care
7621 Westminster Dr.
Fort Wayne, IN 46835
260-486-2587

The Dirt Destroyers
260-489-2587

Clean Air+ Indoor Environmental Solutions
P.O. Box 991233
Louisville, KY 40269-1233
888-401-0832 Contact: Jeremy Fuller

Enviro Clean Solutions
260-637-9414

Environmental Management Specialist, Inc.
2409 Hunter
Huntertown, IN
260-637-9414

Talon Restoration & Cleaning
1750 Summit St.
New Haven, IN 46744
260-748-4545  Contact: Denny Metzger

Three Rivers Environmental
Churubusco, IN
260-693-9855

Heritage Industrial Services, L.L.C.
7525 E. 39th St., Suite 1100
Indianapolis, IN 46226
888-777-3241 or 317-541-9290
Contact: Rodney Muller

Pro Clean Building Service
260-637-6200

Protechs Incorporated
2777 Sherman Blvd.
Fort Wayne, IN 46808
260-672-8700

Radon Protection Services
12101 Amber Ridge Dr.
Fort Wayne, IN
260-672-8700

Rolf & Griffin
1702 Fairfield Ave.
Fort Wayne, IN 46802
260-744-2151

Quality Air Duct Cleaning Service
7929 Wildwood Dr.
Fort Wayne, IN 46835
260-492-4247
Talon Restoration & Cleaning
1750 Summit St.
New Haven, IN 46744
260-748-4546  Contact: Denny Metzger

Stanley Steemer Carpet Cleaner
2020 Research Dr.
Fort Wayne, IN 46808
260-482-03543

Steamatic of Fort Wayne, Inc.
1220 Edsall Ave.
Fort Wayne, IN 46803
260-422-7447
APPENDIX F

GPS EQUIPMENT PROTOCOL

Using the GPS Data Logger in the Field

Turn on Machine (silver button on top right of face-plate)
Remove wand from casing (silver button on top of unit)

Starting A File

1. Open Terra Sync
2. Click the Status button
3. Click on the Setup button in the top left of screen
4. Click Connect (tells the antenna that the data logger is connected and ready to receive data)
5. Click OK (if it asks for it)
6. Click Setup, then Status (shows PDOP, must be below 6 or the antenna will not record data; the lower the PDOP, the more accurate the data)
7. Click Status, then Setup
8. Click Logging Setting to adjust settings
9. Click Antenna Height to adjust or change antenna setting (this height is the distance from the antenna to the floor when on the recorder’s back)
10. Click OK (this takes you back to the skyplot)

Collecting Data

1. Click Setup
2. Click Data
3. Scroll through list to choose the correct Data Dictionary Name (*note the file name (as a number), this is of critical importance when entering new data into a file*)
4. Click Create
5. Determine what feature you ant to sample, Click on desired feature
6. Click Create
7. Fill out the feature’s attributes while you are collecting the data from the satellites; you need approximately 12-20 positional readings from satellites to get the most accurate position of feature
8. Click OK
9. if it asks you if you want to save click Yes
10. Now you are back to the data dictionary
Closing A File/Disconnect the Data Logger

1. Once you are back to the data dictionary, to close a file click Close
2. if it ask if you want to save or not, answer yes
3. Click Data
4. Click Setup
5. Click Disconnect
6. It will ask “Are you sure you want to close” Click Yes
7. Click the X in the top right corner (this closes Terra Sync)
8. It will ask “Are you sure you want to exit Terry Sync?” Answer Yes
9. Now you are back to the desktop

Enter New Location Into An Old File (Same Recorder)

1. Turn on data logger
2. Open Terra Sync
3. Click Status, Setup, Connect
4. To check the PDOP click Setup, Status
5. To open an existing file click Status, Data
6. Click on New File in the top left corner of screen, this should produce a pull down menu
7. Select Existing File
8. Select the number or name of desired file (from Collecting Data #3 above)
9. Select Open
10. Under Update select Collect Feature
NEVER UPDATE FEATURES AT THIS POINT! (This will overwrite any information previously collected)
11. Select Create
12. Select Collect Features
13. Begin entering data
14. When finished, save data, exit file, disconnect data logger, exit Terra Sync
   *note: If a different recorder, adjust the antenna height accordingly*

Correcting Incorrectly Entered Data

1. Select Site
2. Update Features
3. Begin
4. Edit whatever field needs to be edited
5. OK
6. To Change location hit Log

Using Data Logger and GIS Workstation
Starting a New Project
1. Open Pathfinder Office 2.8
2. Select Project window appears; Click on New
3. Enter project name (make sure project folder is S:\GIS\Pathfinder Office 2.8)
4. Create Data Dictionary

*Before importing or exporting data make sure data logger is in the holder and the cord is connected to any USB port on the GIS workstation*

Loading Pathfinder Office 2.8 Data Dictionary Into Data Logger
1. Open desired File
2. Click Data Transfer
3. Add the desired data dictionary
4. Click Transfer All
The computer lets you know when all the information is downloaded
APPENDIX G

POLLUTION CONTROL DITCH SAMPLING LOCATIONS MAP

Pollution Control Yearly Ditch Sampling Locations

Legend
Ditch Sampling Location
YEAR
- 2000
- 2001
- 2002
- Yearlong

Streets

APPENDIX I

BLOODBORNE PATHOGEN CLASS EXAM

Fort Wayne-Allen County DOH
BBP Training Certification Exam

1. What is a BBP?
   a. Blunt Bodily Production
   b. Bloodborne Pathogen
   c. Bacteria building population
   d. None of the above

2. Which of the following is a BBP?
   a. Jaundice
   b. Cirrhosis
   c. HBV
   d. YMCA

3. Contact with blood is an example of which path of transmission?
   a. Direct Contact
   b. Indirect Contact
   c. Airborne Contact
   d. Vector-borne Contact

4. An example of indirect contact would be?
   a. Coughing
   b. Being bitten by a mosquito
   c. Itching your nose while wearing contaminated gloves
   d. None of the above

5. Viral infections…
   a. Can be cured by taking antibodies
   b. Have symptoms that show up immediately
   c. Are caused by viruses
   d. Are caused by bacteria

6. HBV is…
   a. 100 times more infectious that HIV
   b. The second leading cause of cancer
   c. Transmitted through blood and OPIM
   d. All of the above

7. Chronic Active Hepatitis is when…
   a. A person is infected and their body has not built up antibodies, therefore making them a carrier
   b. A person is infected and their body has built up antibodies
   c. A previously infected person is no longer infected
   d. None of the above
8. Chronic Active Hepatitis can lead to
   a. Multiple personalities
   b. Chicken pox
   c. Liver disease
   d. None of the above
9. A vaccination exists for…
   a. HIV
   b. HBV
   c. HCV
   d. AIDS
10. OPIM is…
    a. Other potentially infectious material
    b. Other people’s infidelity in their marriage
    c. Occasional projected infected material
    d. None of the above
11. An example of OPIM is…
    a. Vaginal secretion
    b. Mucous
    c. Semen
    d. All of the above
12. Who must have BBP training?
    a. Only those who think they need it
    b. Only tattoo artists and piercers
    c. Anyone with a reasonable anticipated risk of being exposed to blood
    d. No one
13. An Exposure Control Plan
    a. Identifies the people most likely to be infected with a BBP
    b. Explains what to do if left out in the elements too long
    c. Is a written policy outlining and explaining shop’s policies regarding BBP
    d. None of the above
14. Universal Precautions state
    a. Look both ways before crossing the street
    b. Treat all blood and OPIM as though it is infected
    c. Staying out in the sun too long will burn you
    d. None of the above
15. What is the single most important barrier between you and BBP?
    a. Shoes
    b. A wall
    c. Gloves
    d. Soap
16. What is the difference between sterilization and disinfection?
   a. Disinfection removes all living organisms including hardy spores while sterilization removes a few key disease causing organisms
   b. Disinfection removes a few key disease causing organisms while sterilization removes all living organisms including hardy spores
   c. Disinfection can be accomplished using an autoclave, while sterilization can not
   d. None of the above

17. What is the minimal amount of time one should wash their hands after removing infected gloves?
   a. 8 second
   b. 10 seconds
   c. 12 seconds
   d. 15 seconds

18. Where do handwashing facilities need to be located?
   a. Anywhere in the studio
   b. In a room separated by no more than one (1) door
   c. In the same room
   d. Handwashing facilities are not required

19. What items need to be single use?
   a. Needles
   b. Stencils
   c. Ink caps
   d. All of the above

20. Once a bar is soldered to a needle…
   a. The bar becomes part of the needle and must be disposed of along with the needle
   b. The bar can be bent and broken off the needle, disinfected, and then reused
   c. The bar can be bent or broken off the needle, sterilized, then reused
   d. The bar can be bent or broken off the needle, sanitized, then reused
Fill in the Blank/Short Answer
List three types of Personal Protective Equipment required by the code.
21. _______________________
22. _______________________
23. _______________________

What 8 pieces of information must be provided on the patron’s record?
24. _______________________
25. _______________________
26. _______________________
27. _______________________
28. _______________________
29. _______________________
30. _______________________
31. _______________________

List three symptoms of an acute illness which would prevent an artist or piercer from working
32. _______________________
33. _______________________
34. _______________________

After removing sterilized items from an autoclave what two things need to be done immediately?
35. _______________________
36. _______________________

What is the recommended time span that autoclaved items should be used in, otherwise needing to be resterilized?
37. _______________________

List three items or activities that are allowed in the work area
38. _______________________
39. _______________________
40. _______________________

What must infectious waste containers be labeled with?
41. _______________________

What two types of disinfectant solutions are approved to be used (no name brands)?
42. _______________________
43. _______________________

If infectious waste containers are stored before disposal, list one precaution that should be taken.
44. _______________________________________________________________________

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What three options are available for disposal of sharps containers?
45. __________________________
46. __________________________
47. __________________________

How much of a notification does the Health Department need before a mobile event is to occur?
48. __________________________

What three documents must be displayed in the studio so patrons can see them?
49. __________________________
50. __________________________
51. __________________________

If a willful violation of the code is found what is the maximum fine that can be charged for each violation?
52. __________________________

53. If infectious waster is treated at your facility and then disposed of in the municipal waste, it needs to be bagged and labeled with what information?
   __________________________
   __________________________
   __________________________

54. Which virus was responsible for the largest number of new cases in Allen County during the year 2001?
    __________________________

55. Between HIV and HBV, which of the two viruses is hearty and survives longer outside a living host? Which is more deadly?
    __________  :  __________
APPENDIX J
NEW POOL PERMIT SIGN-OFF SHEET AND CHECKLIST

This sheet must be signed by Allen County Building Department and returned to the Fort Wayne-Allen County Department of Health before your pool has its final permit inspection. It is your responsibility to contact the Building Department at (260) 449-7621 to obtain any necessary inspections, meet any applicable requirements, and get this sheet signed by a representative. No final inspections will be conducted and no pool permits will be issued until this sheet is completed.

<table>
<thead>
<tr>
<th>POOL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Establishment</td>
</tr>
<tr>
<td>Pool Address</td>
</tr>
<tr>
<td>Mailing Address (if different from above)</td>
</tr>
<tr>
<td># of Filtering Systems</td>
</tr>
<tr>
<td>Operation (check one): Year-round</td>
</tr>
<tr>
<td>Type: Main</td>
</tr>
<tr>
<td>Class: A</td>
</tr>
<tr>
<td>Contact</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BUILDING DEPARTMENT STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspectors Signature</td>
</tr>
<tr>
<td>Date</td>
</tr>
<tr>
<td>Items for Concern:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMPLIANCE ISSUES OF CONCERN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grounds</td>
</tr>
<tr>
<td>Fencing or other barrier</td>
</tr>
<tr>
<td>Gates self closing/latching</td>
</tr>
<tr>
<td>No less than 2 entry/exits from pool</td>
</tr>
<tr>
<td><strong>Fire and Safety</strong></td>
</tr>
<tr>
<td>Entrances and exits clearly marked</td>
</tr>
<tr>
<td>Emergency telephone location</td>
</tr>
<tr>
<td>Emergency signage</td>
</tr>
<tr>
<td>Emergency numbers</td>
</tr>
<tr>
<td>Chemical storage</td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
</tr>
<tr>
<td>Ground fault interrupters</td>
</tr>
<tr>
<td>Overhead lighting as needed</td>
</tr>
<tr>
<td>Underwater lightning as needed</td>
</tr>
<tr>
<td><strong>Plumbing</strong></td>
</tr>
<tr>
<td>1” airgap at backwash</td>
</tr>
<tr>
<td>Backflow prevention</td>
</tr>
<tr>
<td>Water Supply</td>
</tr>
<tr>
<td>Sewage</td>
</tr>
</tbody>
</table>
SOURCES CONSULTED


