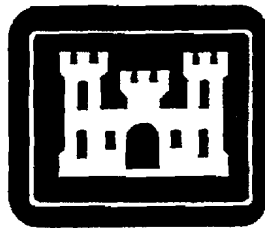


January 2002

# Indoor Air Quality (IAQ) Investigation Report

For

**Brittin Elementary School  
Building 7392  
Fort Stewart, Georgia**



Prepared for

**U.S. Army Corps of Engineers  
Ft. Worth District**

Under Contract

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*Prepared by*

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Indoor Air Quality Investigation  
Brittin Elementary School  
Fort Stewart, GA

## EXECUTIVE SUMMARY

Baker and Associates, Inc. (Baker) was contracted to perform an indoor air quality (IAQ) investigation and assessment in response to complaints at Brittin Elementary School (BES), located at Fort Stewart, Georgia. Complaints included odors, respiratory, skin and eye irritation, headache, nausea, and dizziness. Baker interviewed those persons reporting symptoms, visually inspected the building and the heating, ventilating, and air conditioning (HVAC) equipment in the complaint areas, and collected air and bulk samples for various analyses. The samples collected measured carbon dioxide, carbon monoxide, temperature, relative humidity, airborne fibers, volatile organic compounds, total microbial spores, viable microbial spores, airborne bacteria, aldehydes, and pesticides.

The HVAC units in each room recycle the air, and do not bring in any fresh air. This lack of fresh air to dilute and remove airborne contaminants inside the rooms will allow the buildup of odors, carbon dioxide, and any chemical which has a source in the room. This was evidenced by elevated carbon dioxide measurements – up to 2923 ppm in one room. Outdoor air was approximately 380 ppm. Carbon dioxide levels over 1000 ppm are associated with an increase in odor-related IAQ complaints.

Air samples did not indicate any unusually high concentrations of fungi or bacteria. Most of the fungi identified can produce an allergic reaction, irritation, dermatitis, or hypersensitivity pneumonitis in susceptible or sensitized people. *Alternaria*, identified in the air in Rooms A8, A11, and C 3, and cultured from the carpet in Room C3, can produce a stronger response than simple allergy-type symptoms. Some species can produce toxic metabolites which may be associated with disease in humans or animals.

Aldehyde screen air samples identified various aldehydes in the air. The level of formaldehyde measured exceeded the NIOSH REL. Formaldehyde is a primary irritant to the mucous membranes of the nasal and oral passages, the upper respiratory tract and exposed skin, and can elicit an allergic reaction upon repeated exposure, even at low levels.

Baker's conclusion is that the 100% recycling HVAC units are allowing the buildup of odors and aldehydes, which are causing the IAQ complaints. The recommended solution is to replace the

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existing HVAC system with one that meets the ventilation requirements of ASHRAE Standard 62-1999, and provides at least 15 cfm per person of conditioned outside air to each classroom. In the interim, continue implementation of Dr. Mancuso's recommendations, open the fire exits for fresh air, remove containers where water may accumulate, ensure that any leaks are repaired soon after their discovery, thoroughly dry any wet building materials, and perform periodic maintenance on the existing HVAC units.

## 1.0 INTRODUCTION

In our continuing service to the U.S. Army Corps of Engineers, Baker and Associates, Inc. (Baker) was contracted to perform an indoor air quality (IAQ) investigation and assessment of Brittin Elementary School (BES), located at Fort Stewart, Georgia. Baker's team of investigators consisted of Mr. Brian Karlovich, IHIT, Mr. Warren Lehew, CIH, CSP, and Mr. Dennis Myer, PE.

## 2.0 BUILDING DESCRIPTION AND BACKGROUND

### Building Description

Building 7392, the main building at Brittin Elementary School, was constructed in 1981. The exterior walls of this building are brick, and the interior walls are cinder block. Interior finishes in each classroom consist of carpeted floors and fiberglass ceiling tiles. The floors in the corridors are finished with vinyl floor tiles. The building is heated and cooled by air-to-water heat pumps located above the central corridor. The heating, ventilating, and air conditioning (HVAC) enclosure in each room consists of perforated corrugated metal that is lined on the inside with fiberglass. Each classroom has its own heat pump and fan unit. These units do not have any associated outside air intakes. Return air from a classroom is drawn into the over-corridor plenum where it is mixed with the return air from the classroom directly across the corridor. The air is then drawn through the heat pumps and sent back into the classrooms.

The building is in the beginning phases of a proposed mechanical systems renovation. At the time of the investigation, replacement of the existing HVAC system had not yet begun, however, the high windows and associated exhaust fans in the clerestory have been completely removed and replaced with aluminum, insulated panels and air intake / relief louvers. The louvers are part of the forthcoming mechanical renovation and are currently blanked off airtight pending the construction of the designed (but not currently funded) replacement HVAC system. In most of the classrooms, the only source of fresh (outside) air is through the fire exits – low windows located in the perimeter walls. In the past, these windows had frequently been left open to provide fresh air. Following the attacks on September 11, 2001, implementation of additional force protection requirements at Fort Stewart prohibited these fire exits being left open for ventilation.

### Background

On September 28, 2001, the instructor and aide in Room C3 officially reported their concerns that mold and dust in their classroom might be causing their problems with upper and lower respiratory infections. They cited past leaks in the ceiling and windows that had caused the carpet to become wet. They also reported that, "Sometimes large pieces of black dust can be seen coming from the air duct when the air conditioner turns on." On October 16, 2001, a representative of the Director of Health Services at Winn Army Community Hospital performed an IAQ evaluation of Room C3 and inspected the HVAC system. The report of this inspection, dated October 25, 2001, was submitted by Dr. (Captain) James Mancuso (see Attachment A). It concluded, "During this evaluation, evidence of a specific substance or condition that may cause an occupational health hazard in the classrooms was not identified. However, carpets can harbor allergens that may cause adverse reactions in some allergen-sensitive individuals. Therefore if feasible, replace the carpets with non-carpet floor covering to reduce the allergic risk potential. Also, removing the dust from the HVAC plenum area and allowing the door to remain open periodically during the day will provide a fresher and cleaner indoor air environment."

Additional complaints were received in October and November regarding Rooms C5 and B13. These rooms were evaluated by a representative of the Director of Health Services on November 26, 2001. The report of this inspection, dated November 27, 2001, and again submitted by Dr. Mancuso, contained the same conclusion (see Attachment A).

On November 27, 2001, the instructor in Room B6 reported an odor in the room after lunch, followed by the onset of physical symptoms. Similar odors and symptoms were reported to occur in Rooms B5, B8, and A11 on November 27, 28, and 29, 2001. Both the instructors and some students reported symptoms. These reports continued into December, including reports from Rooms B13 and C3 (the teacher in Room C5 retired in the interim). On December 5, 2001, Dr. Mancuso issued a memorandum for parents, staff, and administration of BES (see Attachment A). In this memorandum, he stated that on November 29, 2001, he had personally performed a walk-through survey to look for an obvious source of contamination and for immediate hazards. He determined that there was no immediate threat. A return visit with additional staff the next day revealed a

variety of odors from several potential sources, including cleaners, markers, nail polish, and insect repellent. He stated that teachers had not been permitted to open windows for several months, and that most cases of IAQ complaints arise from lack of outside ventilation, but he did not find any specific acute health hazards. Until the new HVAC system is installed, the memorandum recommended 16 interim steps to take to help reduce the occurrence of IAQ complaints, including eliminating potential odor sources such as markers, cleaners, tobacco smoke, and carpets; increasing fresh air ventilation and circulation; performing regular cleaning and HVAC maintenance; and taking individual responsibility for making sure that susceptible persons obtain a flu shot and are seen by their physician for proper treatment.

On December 5, 2001, BES received a notice of complaint from the U.S. Department of Labor regarding employee exposure to an unknown gaseous smell that is affecting their skin and respiratory systems (see Attachment A). BES and the Fort Stewart School System (FSSS) issued informational communications to BES parents and to Mr. Ron Heath, Chief of the Fort Stewart Safety Division, regarding the findings of Dr. Mancuso on December 7 and December 10, 2001, respectively (see Attachment A).

### 3.0 OCCUPANT INTERVIEWS AND REPORTED SYMPTOMS

Following Baker's arrival on site at BES and a brief walk-through, those teachers and staff who had reported physical symptoms or who wished to speak with the Baker team were individually interviewed in the conference room. Those present during each interview were the three Baker team members, Mr. Robert Heffley, Facilities, Security and Safety Manager of FSSS, Ms. Sherry Templeton, Principal of Brittin Elementary School, and Mr. John Edenfield, Mechanical Engineer with FSSS. The following sections outline the physical symptoms and items of note as described to the Baker team during each interview.

[ ] the teacher from Room B6, reported the most intense symptoms of those interviewed. [ ] reported the sudden onset of headache, nausea, and dizziness on November 27, 2001, and also noticed a chemical smell similar to a Sanford® permanent marker. Later, [ ] became flushed, and experienced itchy skin and burning eyes. On subsequent days, a skin rash was exhibited. The physical symptoms began to abate after [ ] left the school, but recurred each time [ ] returned to

b6

[ ] classroom. The associated odor was also later described as similar to paint thinner. [ ] and [ ] class relocated to one of the trailer units on November 28, 2001. [ ] returned to Room B6 only long enough to confirm that the symptoms recurred when [ ] approached the room, sometimes just by entering the corridor. [ ] reported known allergies that included Dial liquid soap (containing Triclosan, ammonium lauryl sulfate, and sodium laureth sulfate) and mothballs (containing naphthalene). Some of the students use Dial liquid soap in the classroom for washing.

[ ] the teacher from Room A10, also reported strong symptoms. [ ] noted that on November 29, 2001, some children in [ ] class reported an "acetone-like" smell and complained of respiratory, skin, and eye irritation, as did [ ]. Two of the children were treated at the nurse's office and were examined at the emergency room of Winn Army Community Hospital. [ ] did not work on November 30, 2001 due to the symptoms that occurred on the 29th. On Monday, December 3, 2001, some of the children complained of a "moldy/mildew" odor. They turned off the HVAC, opened the windows, and turned on fans. On December 4, 2001, the original odor returned, again causing irritation of the skin, eyes and respiratory tract. [ ] and [ ] class relocated to one of the trailer units, where they remained throughout this investigation. [ ] reports that [ ] still experiences some irritation now, even in the trailer.

[ ] the teacher in Room A11, reported that [ ] initial incident occurred on December 6, 2001, when a strong chemical smell was noted, along with eye irritation experienced by some of the children in [ ] class. On December 14, 2001, throat and eye irritation and a smell of "strong, cheap perfume" were reported by [ ] symptoms dissipate after [ ] leaves the school.

[ ] and [ ] the instructors in Room C3, reported no significant, sudden change in air quality since the force protection requirements were implemented. They have, however, had ongoing allergy-type symptoms and headaches since at least June. Both take allergy medication, and reported that black dust is emitted from the HVAC diffuser.

[ ] reported being in Room B8 for an hour on November 27, 2001, and experiencing headache, nausea, and skin and eye irritation which lasted for approximately two hours after she left the room. [ ] experienced similar symptoms while walking



down the B-wing corridor on November 28, 2001, and in Rooms A10 and B6 on December 4, 2001. The December 4, 2001 event was also accompanied by a "chemical" odor, similar to gasoline.

[ ] guidance counselor for grades K through 6, reported that on November 1, 2001 [ ] was in Room B13 when the HVAC came on. Within two minutes [ ] experienced respiratory irritation, headache, sore throat, and eye irritation. [ ] did not notice any odors at the time, or since. [ ] reports that [ ] experiences headaches daily when at the school.

b/c

[ ] in the office wing, has pre-existing diminished respiratory capacity. [ ] reported that [ ] experienced an intense headache and shortness of breath while walking down the A-wing corridor on an unspecified date. [ ] also reported an unpleasant odor, tingling skin, and a tightness in [ ] chest. These symptoms prompted [ ] to go to the emergency room of the base hospital. [ ] reports having no known allergies, and goes into the classroom areas only to summon children or deliver messages.

[ ] teacher in Room B12, reported in a private interview with one of the Baker team members that [ ] has had itchy skin on [ ] upper arms and the back of [ ] neck since August. [ ] has had it before, off and on, for several years.

Mr. Heffley, Facilities, Security and Safety Manager for FSSS, reported that in problem rooms (B6, A10, A11, and C3), following the report of complaints, maintenance staff cleaned the HVAC coils, changed air filters, and cleaned excess dust in the HVAC enclosures. He reported that Brittin Elementary School had been built on a filled swamp, and that they have had no significant rain during the preceding four months. In 2000, the high windows in the classrooms were removed and replaced, and are now airtight where before exhaust fans were present to provide ventilation.

#### 4.0 OBSERVATIONS

The school appeared to be in good condition and well-maintained with few exceptions. A janitorial contractor cleans each classroom nightly, emptying the trash and vacuuming the carpet. "Low level cleaning," dusting desks, bookshelves and other surfaces below seven feet high, is performed weekly in each classroom. "High level cleaning" is performed annually and consists of cleaning window

blinds and surfaces higher than seven feet. Rooms B6 and A10 have not been cleaned since the classes were relocated to the trailers, in anticipation of the Baker team's visit.

Dust accumulation was observed inside of the HVAC return air openings in the enclosures in most rooms. In some of the rooms (A10, A11, B6), evidence of an attempt to clean up this dust was observed. The insides of the HVAC supply ducts are not insulated beyond the area immediately around the diffuser. According to Dennis Myer, Baker's HVAC engineer, the insides of the supply ducts are clean for a 20-year old system. The fiberglass insulation around the diffuser does appear to be deteriorating in places, and is likely the source of the black dust that was reported by some of the teachers. Low density air filters are located over the heat pump coils where air is drawn in from the plenum space. The filters are changed at least quarterly or as needed, based on complaints. Upon observation, the filters were visually clean and dry.

The condensate drip pans below the heat pump coils were dry in some rooms and damp in others, depending on occupancy. Standing water was observed in the drip pan on the unit serving Room B8. Some of the drip pan drain tubes were sharply bent or curved slightly upward before bending down, potentially restricting the capacity of the drain, or allowing condensate to accumulate in the drip pans. The drain tube on the unit serving Room B5 had significant visible mold growth inside of it, with a slimy appearance.

The carpets in the classrooms were relatively clean for an elementary school – evidence of their being vacuumed every evening. One area of mold growth was observed in the northwest corner of Room A8, by the fire escape. The teacher here reported that this area of mold continually returned after it was cleaned. The area of this mold growth was located over an expansion joint in the concrete slab, which allowed outside air, and presumably moisture during rainy periods, to enter the room. At the time of the investigation, it was recommended that maintenance personnel seal this gap to prevent air and water infiltration.

Some of the classrooms had ceiling tiles which were water stained, indicating previous roof leakage. At the time of the investigation, these stains were tested with a Tramex Survey Encounter Moisture Meter and found to be dry.

## 5.0 DESCRIPTION OF SAMPLING AND ANALYSIS METHODS

Carbon dioxide, carbon monoxide, temperature, and relative humidity measurements were taken over several days in most of the classrooms. These direct-read measurements are "snapshot" measurements which identify the levels only at the time of testing. These parameters were measured using a TSI Q-Trak Model 8551 IAQ Monitor with CO. The concentrations were manually recorded at each sampling location after allowing the reading to stabilize. These measurements have been sorted and are listed in Table 1.

Samples to determine airborne fiber concentrations were collected by using electric sampling pumps to draw air through a 0.8 micron pore size mixed cellulose ester filter. The samples were sent to Schneider Laboratories, Inc., in Richmond, VA, for analysis using NIOSH<sup>1</sup> Method 7400 for airborne fibers. Sample results are given in fibers per cubic centimeter of air (f/cc), and are listed in Table 2.

Samples to determine airborne concentrations of volatile organic compounds were collected in inerted stainless steel canisters which had been purged with nitrogen and evacuated. A laboratory-cleaned, preset air flow regulator was attached to each canister and the valve was opened, allowing room air to flow into the canister, drawn by the vacuum. Upon completion of the designated sampling period (the entire school day), the valve was closed, the regulator was removed, and all canisters were sent to DataChem Laboratories in Cincinnati, OH, for analysis using EPA<sup>2</sup> Method TO-14 for volatile organic compounds. Sample results are given in parts of contaminant per billion parts of air (ppb). The concentrations of those chemicals that were detectable are listed in Table 3.

Bulk samples of material were collected for direct microscopic exam for fungal spores. The samples were collected by either scraping the material to be sampled from its substrate into a new zipper-close plastic bag, or using clear double-sided tape to adhere accumulated dust to a glass microscope slide. The samples were sent to Aerobiology Laboratory Associates, Inc., of Reston, VA, for

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<sup>1</sup> National Institute for Occupational Safety and Health

<sup>2</sup> Environmental Protection Agency

microscopic examination by trained and certified microbiologists. The results of these samples are listed in Table 4.

Bulk samples of material were collected for fungal culture and identification. The samples were collected by either scraping the material to be sampled from its substrate into a new zipper-close plastic bag, or by using sterile, medical cotton swabs to collect the material. The samples were sent to Aerobiology Laboratory Associates, Inc. for culture and incubation on a nutrient agar, followed by counting and identification by trained and certified microbiologists. The results of these samples are listed in Table 4.

Air samples for fungal culture and identification were collected by using an electric sample pump to draw a known volume of air through a single-stage N6 microbial sampler and allowing it to impact onto a petri dish filled with nutrient agar. At each sampling location, two petri dishes for fungi were exposed in this manner, one for average fungi and one for xerophyllic fungi (fungi which grow well under relatively dry conditions). The samples were sent to Aerobiology Laboratory Associates, Inc. for incubation, followed by counting and identification by trained and certified microbiologists. The results of these samples are listed in Table 5.

Air samples for bacterial culture and identification were collected by using an electric sample pump to draw a known volume of air through a single-stage N6 microbial sampler and allowing it to impact onto a petri dish filled with nutrient agar. The samples were sent to Aerobiology Laboratory Associates, Inc. for incubation, followed by counting and identification by trained and certified microbiologists. The results of these samples are listed in Table 6.

Air samples to evaluate the total concentration of airborne fungal spores and hyphal elements were collected by using an electric sample pump to draw a known volume of air through a narrow slit and allowing it to impact onto a glass microscope slide coated with a clear adhesive. The samples were sent to Aerobiology Laboratory Associates, Inc. for microscopic examination by trained and certified microbiologists. The results of these samples are listed in Table 7.

Carpet vacuum samples were collected by using an electric sample pump to draw air through 0.8 micron pore size mixed cellulose ester filters, and using the filter and housing as a vacuum cleaner

to collect dust and dirt from the carpets. The samples were sent to Aerobiology Laboratory Associates, Inc. for microscopic examination. The samples were then cultured and incubated on nutrient agar, followed by counting and identification by trained and certified microbiologists. The results of these samples are listed in Table 8.

Air samples for aldehydes were collected by using an electric sample pump to draw a known volume of air through a treated silica gel sample tube. The tubes were sent on ice to Aerotech Laboratories, Inc., of Phoenix, AZ, for aldehyde analysis using EPA Method TO-11A. The analysis reports the concentration of each aldehyde in parts of contaminant per million parts of air (ppm). The results of these samples are listed in Table 9.

Air samples for organochlorine and organophosphorus pesticides were collected by using an electric sample pump to draw a known volume of air through a polyurethane foam (PUF) filter. The filters were sent on ice to Aerotech Laboratories, Inc. for pesticide analysis using EPA Method TO-10A. The analysis reports the concentration of each pesticide in micrograms of contaminant per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ). The results of these samples are listed in Table 10 (organochlorine pesticides) and Table 11 (organophosphorus pesticides).

## 6.0 DISCUSSION OF SAMPLING RESULTS

The results of all samples have been compiled into Tables 1 through 11 for ease of reference, as described in Section 5. The laboratory Certificates of Analysis are located in Attachment B.

**IAQ Parameters:** (Table 1) temperature, relative humidity and carbon monoxide measurements were within acceptable bounds in all locations measured. Carbon dioxide levels are often used as an indicator of the quantity and effectiveness of a building's ventilation. The presence of carbon dioxide measurements above 800 to 1000 ppm during an IAQ investigation indicate that some IAQ complaints related to odors can be expected. The outdoor air was measured at approximately 380 ppm carbon dioxide. Indoor levels were consistently measured above 1000 ppm. Over three days, 41 of the 60 carbon dioxide measurements taken inside the building were higher than 1000 ppm, 22 of which were higher than 1500 ppm, and 4 of which were higher than 2000 ppm. One measurement

made in Room A3 was 2923 ppm, well over one half of the OSHA<sup>3</sup> Permissible Exposure Limit (PEL) of 5000 ppm for occupational exposure to carbon dioxide. These levels indicate that the current recirculating HVAC system is not providing any fresh outside air to dilute and purge the indoor air, thus allowing the buildup of carbon dioxide and any other gases or odors which have a source within the rooms. ASHRAE<sup>4</sup> Standard 62-1999 requires that 15 cubic feet per minute (cfm) per person of conditioned outside air be directly supplied to classroom spaces.

**Airborne Fibers:** (Table 2) all samples collected were below the proposed OSHA PEL for synthetic vitreous fibers of 1.0 f/cc by more than a factor of ten. One sample from Room C3 was overloaded and could not be analyzed. The presence of the airborne fibers counted by these samples does not by itself indicate any potential health hazard. The method used for analysis counts all fibers in the air – cellulose, fiberglass, etc. – that fit the length / width parameters. Airborne fiber levels in classrooms such as these are expected to be higher than background due to the presence of clothing fibers, carpet fibers, paper dust, curtains and other cloth finishes.

**Volatile Organic Compounds:** (Table 3) only a few VOCs were identified in the samples, and at very low levels (in the ppb range). These are isopropyl alcohol (IPA), acetone, hexane, methyl isobutyl ketone (MIBK) and toluene. Chloridifluoromethane, ethanol and limonene were tentatively identified in some samples. The concentrations measured are also below the accepted odor threshold concentrations for each chemical, which are in the ppm range<sup>5</sup>. Chemical information sheets for the identified compounds are included in Attachment C. Typical classroom sources for some of these VOCs may include dry erase board cleaner for IPA, dry erase markers for MIBK, and permanent markers (metal case style) for toluene<sup>6</sup>. Ensuring that all markers are tightly capped when not in use, and limiting the quantity and frequency of dry erase board cleaner use may help to reduce any buildup of some VOCs.

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3 Occupational Safety and Health Administration

4 American Society of Heating, Refrigerating and Air-conditioning Engineers

5 Odor Thresholds for Chemicals with Established Occupational Health Standards, 1989, American Industrial Hygiene Association

6 Information collected from Material Safety Data Sheets for Sanford® products

**Bulk Samples and Tape Lifts:** (Table 4) the sample of mold from the carpet in the northwest corner of Room A8 was dry at the time of sampling. *Stachybotrys* spores and algae were identified in the sample. Based on the location of this mold over an expansion joint, the sample result is not surprising. Both *stachybotrys* and algae are hydrophilic (grow best in wet areas), and the expansion joint may have allowed moisture from outside to infiltrate and be absorbed by the carpet. The spores identified on the two tape lifts from the duct linings correspond to the spores identified on the direct microscopic exam samples from the classrooms and from outside the building, and are not surprising. Most of the spores identified can produce an allergic reaction, irritation, dermatitis or hypersensitivity pneumonitis in susceptible or sensitized people. The presence of growing mold in the HVAC condensate drain tube in Room B6, and in the drip pan in Room B7 indicates the need for periodic maintenance for this equipment. All units should be inspected to ensure that drain tubes are not constricted or kinked, and that drip pans are adequately sloped to drain away the condensate. Any observed areas of mold growth in the drip pans or drain tubes should be treated with a biocide solution (such as a 10% solution of household bleach in water). If the biocide solution has potential human health effects, it should be rinsed away with clean water after it has served its purpose.

**Cultured Air Samples for Fungi:** (Table 5) the outdoor air sample had a much higher concentration of viable spores than did the indoor samples, by at least a factor of two. The predominant genus on the outdoor sample was *Cladosporium*, as it was on all of the indoor samples. *Penicillium* spores were present on the outdoor sample, as were *Sterilia Mycelia*, a group of fungi which do not produce asexual spores, but grow by producing thin, vegetative strands called hyphae. Both of these were also present on the indoor samples in similar relative concentrations. Two indoor samples had small quantities of *Curvularia* and *Aspergillus*, in Rooms A10 and C3, respectively. Spores for *Curvularia* were also present in most of the rooms on the direct microscopic exam samples. *Aspergillus* spores were not specifically identified on any other sample, including the total spore sample from Room C3. Any of these spores can produce an allergic reaction, irritation, dermatitis or hypersensitivity pneumonitis in susceptible or sensitized people.

**Cultured Air Samples for Bacteria:** (Table 6) three genera of bacteria were identified on the bacteria culture samples, *Micrococcus*, *Bacillus* and *Staphylococcus*. *Bacillus* is a common outdoor bacteria typically released from the surfaces of living plants. *Micrococcus* and *Staphylococcus* are common human-source or human-commensal bacteria. *Micrococcus* species usually do not produce

disease in humans. Some healthy persons may carry potentially pathogenic bacteria (e.g., *Staphylococcus aureus*) that can be transmitted to susceptible persons. Airborne *Staphylococcus* in houses, offices and schools is normal and is usually not considered a health risk in these environments. *Bacillus* species have been implicated in hypersensitivity pneumonitis outbreaks, but are common in indoor and outdoor air. The total bacteria concentrations on the indoor samples were comparable to or higher than that of the outdoor sample. This is typical of occupied buildings, where the majority of bacteria in air are shed from human skin and respiratory tracts<sup>7</sup>. The rooms with the lowest concentrations, B6, A10 and B13, were unoccupied during sampling. Rooms C3 and A3 were occupied during sampling.

**Direct Microscopic Exam Samples:** (Table 7) as is typical for this type of analysis, the outdoor sample had a much higher total concentration of spores and hyphal elements than did any of the indoor samples. *Cladosporium* spores, hyphal elements, and smuts, *Periconia* and *Myxomycetes* were the dominant groups identified on both the indoor and outdoor samples. Relatively low concentrations of some spores not identified on the outside sample were identified in some rooms (at concentrations representative of seeing only two or three spores on a sample). *Alternaria*, *Drechslera / Bipolaris* group, *Torula Herbarum*, *Ulocladium*, and *Taeliolella* were identified at low levels in some of the rooms. Each of these can produce an allergic reaction, irritation, dermatitis or hypersensitivity pneumonitis in susceptible or sensitized people. *Alternaria*, identified in Rooms A8, A11, and C3 can produce a stronger response than simple allergy-type symptoms. Some species can produce toxic metabolites which may be associated with disease in humans or animals<sup>8</sup>.

**Carpet Vacuum Samples:** (Table 8) these samples were analyzed first by direct microscopic exam, and were then cultured to allow any viable spores to grow. Due to the difficulty in obtaining a sufficient quantity of dirt and dust from the carpet, some samples could not be analyzed or only had a few spores observed. *Cladosporium* was cultured on samples from three rooms, A3, B8, and C3. *Alternaria* was also cultured in Room C3, one of the rooms where it was present in an air sample.

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7 Bioaerosols: Assessment and Control, 1999, ACGIH

8 Internet page "Indoor Fungi Resources," University of Minnesota, Updated June 28, 2001, [www.dehs.umn.edu](http://www.dehs.umn.edu)



The presence of spores in the carpet is expected, due to the frequency with which the children play outside, and from the settling of spores from the air.

**Aldehyde Screen Samples:** (Table 9) various aldehydes were identified in the collected samples, including formaldehyde, acetaldehyde, propionaldehyde, butyraldehyde, benzaldehyde, and others.

The highest concentrations identified were of formaldehyde: 0.0414 ppm in Room C3; 0.0382 ppm in Room B6; and 0.0271 ppm in Room A10. Each of these measurements exceeds the NIOSH Recommended Exposure Level (REL) for formaldehyde of 0.016 ppm. Although each sample was collected over a 30-minute period, it is assumed that the measured concentrations would not vary significantly over the course of the day. No other aldehyde exceeded any regulatory or recommended exposure limit, although most were present at detectable levels.

Formaldehyde and acetaldehyde are constituents of cigarette smoke. Formaldehyde is used in pressed wood products, textiles, glues, paints and coatings, and may be used as a preservative or disinfectant in cosmetics, foodstuffs (cheese), cleaning fluids, dyes, inks, medicinals and dentrifices.

Higher molecular weight aldehydes contribute characteristic flavors and odors to perfumes and essential oils. The low molecular weight aldehydes are primary irritants to mucous membranes of the nasal and oral passages, the upper respiratory tract and exposed skin. Aldehydes in general, and formaldehyde in particular, can elicit an allergic reaction upon repeated exposure. The exposure to formaldehyde need not be intense. Sensitization has arisen when exposure was incurred while wearing permanent press fabric impregnated with a formaldehyde-melamine resin<sup>9</sup>. According to the National Safety Council's IAQ Fact Sheet: Formaldehyde (January 7, 2002), some people are very sensitive to formaldehyde, and can experience symptoms at levels below 0.1 ppm. The World Health Organization's recommended limit for exposure to formaldehyde is 0.05 ppm.

The classrooms are finished with carpet and paint, and have tables that are likely made of pressed wood. The glues or inks in some of the textbooks may have been made with formaldehyde. Students or teachers may unknowingly be wearing permanent press fabrics or other fabrics that were treated with formaldehyde. Any or all of these may contribute some small part to the total formaldehyde concentration present in the tested rooms. It is notable that the sample collected in

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<sup>9</sup> Pattv's Industrial Hvgiene and Toxicology, Volume II, Part A, 4<sup>th</sup> Edition, 1993, John Wiley & Sons

Room C3 while occupied had a higher concentration of formaldehyde than the samples collected in the unoccupied Rooms B6 and A10. The presence of low-level sources can add up to an elevated formaldehyde concentration in locations such as these classrooms where there is no dilution ventilation and the HVAC air is 100% recirculated.

**Pesticide Samples:** (Tables 10 and 11) no pesticides were detectable on any of the organochlorine or organophosphorus pesticide samples.

## 7.0 CONCLUSIONS

The fiberglass insulation inside the HVAC supply duct diffuser is deteriorating in places, and is the likely source of the visible black dust which has been reported by some of the teachers. Airborne fiber levels measured in the classrooms did not indicate the presence of a health hazard related to this material.

The drain tubes and drip pans beneath some of the heat pump coils may not be draining properly, allowing accumulation of standing water in the drip pans. Some drain tubes and drip pans were observed to have mold growth, as evidenced by bulk sample results.

Visible dried mold was present in Room A8 at a location where moisture outside the building had a pathway to infiltrate into the building and wet the carpet. *Stachybotrys* spores and algae were identified in the dried mold. While on site, the Baker team recommended to FSSS personnel that the mold be removed and that this moisture pathway be sealed.

Temperature and relative humidity levels were within the acceptable range for human comfort. Carbon monoxide was not detected at levels above the  $\pm 3$  ppm measurement error range of the instrument. Carbon dioxide levels were consistently elevated above the level at which IAQ complaints would be expected due to odor build up, confirming an inadequate supply of fresh air to the classrooms because of the 100% recirculating HVAC system.

The VOCs identified were present at concentrations below accepted odor thresholds, as well as below any recommended or regulatory exposure limit.

Air samples for fungi and bacteria did not indicate any unusually high concentrations. *Alternaria* species was identified at low levels on the direct microscopic exam samples from Rooms A8, A11, and C3, but was not identified on any other air sample. *Alternaria* was also cultured from the carpet sample in Room C3. The presence of a few unusual spores on the carpet is expected due to the frequency with which the children play outside, but because of the potential for some species of *Alternaria* to produce toxic metabolites which may be associated with disease in humans, the potential for an indoor reservoir should not be discounted.

In each measured room, formaldehyde concentrations exceeded the NIOSH REL. Formaldehyde is a primary irritant as well as a sensitizing agent which can elicit an allergic reaction at low level exposures. Some potential sources of formaldehyde may be present in the classroom. Since the building is 20 years old, it is expected that the majority of the off-gassing of formaldehyde from these sources will have already occurred. However the potential presence of these sources combined with a 100% recycling HVAC system and the force protection requirements to keep the windows closed after September 11, 2001 may have allowed formaldehyde to accumulate in the classrooms to a level that could irritate an already sensitized person.

## 8.0 RECOMMENDATIONS

Based on the observations and sample results presented in the preceding sections, Baker makes the following recommendation.

- Replace the existing HVAC system with one that meets the requirements of ASHRAE Standard 62-1999, and provides at least 15 cfm per person of conditioned outside air to each classroom. It is Baker's understanding that the replacement system has been designed by Parkhill Smith and Cooper, Inc., that it meets the requirements of the ASHRAE standard, and that the only delay to performing the installation is the allocation of funds.

In the interim, until the new HVAC system is installed, the following recommendations may help to decrease the frequency and severity of the symptoms described by the teachers.

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- Continue to implement the recommendations of Dr. Mancuso as described in his IAQ Assessment Memorandum of December 5, 2001
- As temperatures and force protection requirements permit, open both fire exits in classrooms and force-ventilate with two box fans – one blowing in and one blowing out.
- Where mold exposure is a concern, remove plants, flowerpots and other containers where water may accumulate, intentionally or otherwise.
- To avoid water damage and mold growth, ensure that breaches in the building envelope are repaired on a timely basis after their discovery, and that any wet building materials are promptly and thoroughly dried.
- Perform periodic maintenance on the existing HVAC units. Inspect all units to ensure that drain tubes are not constricted or kinked, and that drip pans are adequately sloped to drain away the condensate. Any observed areas of mold growth in the drip pans or drain tubes should be treated with a biocide solution.

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*Laboratory Result Summary Tables*

**Table 1**  
**Carbon Dioxide, Carbon Monoxide, Temperature and Humidity Measurements**

Location	Date	Time	CO2 (ppm)	CO (ppm)	Temp. (F)	Humidity (%)	Comments
Room A 10	12/17/01	11:45	850	1	73	56	
Room B 8	12/17/01	15:10	2050	NR	NR	NR	
Room C 3	12/17/01	15:15	1150	NR	NR	NR	
Outside	12/17/01	15:20	380	0	75	62	
Room B 13	12/17/01	NR	1050	NR	NR	NR	
Room B 5	12/17/01	NR	1350	NR	NR	NR	
Room B 6	12/17/01	NR	1250	1	75	52	
Room C 3	12/18/01	9:05	1110	1	71	64	Occupied
Room B 6	12/18/01	9:50	940	1	72	53	Unoccupied
Room B 5	12/18/01	11:05	1330	1	73	50	Unoccupied
Room B 8	12/18/01	11:20	2200	1	73	52	Unoccupied
Room B 13	12/18/01	11:35	1815	1	70	51	Unoccupied
Room A 10	12/18/01	13:55	1400	1	73	55	Unoccupied
Room A 11	12/18/01	14:15	1530	1	74	51	Occupied
Room A 3	12/18/01	14:47	2923	2	75	50	Occupied
Outside	12/18/01	15:00	390	2	77	33	
Room C 3	12/19/01	8:10	680	1	66	60	Unoccupied
Room B 5	12/19/01	8:15	900	1	69	50	Occupied
Room A 11	12/19/01	8:25	975	1	71	51	Occupied
Room A 10	12/19/01	9:20	960	1	69	54	Unoccupied
Room B 6	12/19/01	10:35	1260	1	71	49	Unoccupied
Room B 7	12/19/01	10:45	2300	1	71	48	Occupied
7396B	12/19/01	11:00	470	1	72	47	Unoccupied
7396A	12/19/01	11:10	940	1	70	53	Occupied
Outside	12/19/01	11:11	375	1	65	38	
Room A 10	12/19/01	12:50	1575	1	72	50	Unoccupied
Room A 11	12/19/01	13:00	1710	1	72	51	Unoccupied
Room C 3	12/19/01	13:05	1350	1	72	49	Unoccupied
Room B 6	12/20/01	8:10	855	1	68	46	HVAC on
Room B 8	12/20/01	8:15	940	1	69	44	Occupied
Room B 13	12/20/01	8:20	855	1	68	46	Occupied
Room B 5	12/20/01	8:25	1030	1	66	45	Occupied
Room C 1	12/20/01	9:45	1462	1	68	53	Occupied
Room C 2	12/20/01	9:47	1432	1	70	52	Occupied

**Table 1**  
**Carbon Dioxide, Carbon Monoxide, Temperature and Humidity Measurements**

Location	Date	Time	CO2 (ppm)	CO (ppm)	Temp. (F)	Humidity (%)	Comments
Room C 4	12/20/01	9:49	1365	1	70	50	Occupied
Room C 6	12/20/01	9:50	953	1	71	44	Occupied, door open
Room C 7	12/20/01	9:52	580	1	71	37	Unoccupied, door open
Room C 9	12/20/01	9:55	624	1	70	39	3 Teachers, door open
Room C 10	12/20/01	9:56	481	1	71	41	Unoccupied
Room C 11	12/20/01	9:58	702	1	71	40	1 person
Room C 12	12/20/01	10:01	751	1	71	38	Occupied, door open
Room C 13	12/20/01	10:03	855	1	71	39	Occupied, door open
Room C 5	12/20/01	10:05	784	1	72	42	Occupied, door open
Room A 1	12/20/01	10:08	1814	1	70	45	Occupied
Room A 14	12/20/01	10:10	1148	1	70	43	Occupied, door open
Room A 2	12/20/01	10:12	1415	1	70	46	1 Teacher
Room A 3	12/20/01	10:14	761	1	71	40	Occupied
Room A 4	12/20/01	10:15	1472	1	71	45	1 Teacher, door open
Room A 5	12/20/01	10:17	1831	1	72	43	Unoccupied
Room A 6	12/20/01	10:20	1523	1	72	46	1 Teacher, door open
Room A 7	12/20/01	10:22	1543	1	72	47	1 Teacher, door open
Room A 8	12/20/01	10:23	1670	1	73	49	Occupied
Room A 9	12/20/01	10:25	1939	1	74	50	Occupied
Room A 12	12/20/01	10:27	1377	1	73	45	Occupied
Room A 13	12/20/01	10:29	1626	1	73	46	Occupied
Room B 2	12/20/01	10:31	1658	1	73	46	Occupied
Room B 15	12/20/01	10:33	1615	1	72	45	Occupied
Room B 3	12/20/01	10:35	1466	1	73	45	Occupied
Room B 4	12/20/01	10:39	1415	1	73	43	Occupied
Room B 10	12/20/01	10:42	1692	1	74	43	Occupied
Room B 9	12/20/01	10:44	1767	1	72	40	Occupied
Room B 11	12/20/01	10:47	1946	1	72	48	Occupied
Room B 12	12/20/01	10:49	1834	1	72	47	Occupied
Room B 14	12/20/01	10:52	1717	1	72	45	Occupied
Reception Area	12/20/01	10:58	893	1	69	41	Occupied
Outside	12/20/01	11:00	383	0	62	31	

Table 2  
Airborne Fiber Sample Results

Location	Date	Fiber Count (f/cc)	Comments
Room A 10	12/20/01	0.009	Unoccupied
Room A 11	12/20/01	0.007	Occupied
Room B 5	12/20/01	0.012	Occupied
Room B 6	12/20/01	0.004	Unoccupied
Room B 8	12/20/01	0.031	Occupied
Room B 13	12/20/01	0.008	Occupied
Room C 3	12/20/01	Overloaded	Occupied



Table 3  
Volatile Organic Compound Analyses

Chemical	Concentrations (in ppb)			
	Room C 3	Room B 5	Room A 11	Room B 6
Isopropyl Alcohol	24	95	29	110
Acetone	70	20	12	26
Hexane	ND	3	ND	3
Methyl Isobutyl Ketone	ND	4	3	4
Toluene	3	20	3	10
Tentatively Identified Compounds (in ppb)				
Chloridifluoromethane	11	25	-	26
Ethanol	43	-	-	-
Limonene	-	61	-	29
Unknown Alkane	-	13	-	23
Unknown Hydrocarbon	-	-	-	67

Table 4  
Results of Bulk and Tape Samples

Sample No.	Location	Sample Description	Sample Results
85971	Room A 8	Mold on carpet in NW Corner	Occasional Stachybotrys Spores Seen Occasional Algae Seen
T1	Room B 6	Tape lift from west return duct lining	Occasional Unidentified Brown Spores Seen Occasional Epicoccum Spores Seen Occasional Smuts Seen Few Hyphal Elements Seen
T2	Room A 11	Tape lift from supply duct lining	Occasional Drechslera Spores Seen Few Brown Unidentified Spores Seen Occasional Spegazzinia Spores Seen Occasional Epicoccum Spores Seen Occasional Curvularia Spores Seen Moderate Hyphal Elements Seen
85966	Room B 6	Material inside HVAC condensate drain tube of unit serving Room B 5	5800 CFU / gram Black Yeast - 59% Pithomyces species - 22% Acremonium-like species - 19%
85976	Room B7	Swab sample from HVAC condensate drip pan of unit serving Room B 8	3200 CFU / sample Yeast (mixed species) - 56% Cladosporium species - 44%

Samples 85971, T1 and T2 were analyzed by direct microscopic exam.  
Samples 85966 and 85976 were cultured, and the colonies counted and identified.

Table 5  
Results of Air Samples for Fungal Culture and Identification

Sample No.	Location	Sample Description	Sample Results
B6B	Room B 6	Air	580 CFU / m <sup>3</sup> Cladosporium Species - 72% Sterilia Mycelia - 19% Penicillium Species - 9%
A10B	Room A 10	Air	830 CFU / m <sup>3</sup> Cladosporium Species - 66% Penicillium Species - 16% Curvularia Species - 9%
C3B	Room C 3	Air	1100 CFU / m <sup>3</sup> Cladosporium Species - 61% Penicillium Species - 18% Sterilia Mycelia - 18% Aspergillus Species - 2%
B13B	Room B 13	Air	230 CFU / m <sup>3</sup> Cladosporium Species - 54% Penicillium Species - 23% Sterilia Mycelia - 15%
A3B	Room A 3	Air	870 CFU / m <sup>3</sup> Cladosporium Species - 76% Sterilia Mycelia - 13% Penicillium Species - 9%
OUTB	Outside	Air	2700 CFU / m <sup>3</sup> Cladosporium Species - 83% Penicillium Species - 11% Sterilia Mycelia - 6%

**Table 6**  
**Results of Air Samples for Bacterial Culture and Identification**

Sample No.	Location	Sample Description	Sample Results
B6A	Room B 6	Air	410 CFU / m <sup>3</sup> Bacillus Species - 50% Micrococcus Species - 32% Coag-negative Staphylococcus Species - 14%
A10A	Room A 10	Air	420 CFU / m <sup>3</sup> Bacillus Species - 65% Micrococcus Species - 26% Coag-negative Staphylococcus Species - 9%
C3A	Room C 3	Air	1200 CFU / m <sup>3</sup> Micrococcus Species - 66% Bacillus Species - 31% Coag-negative Staphylococcus Species - 3%
B13A	Room B 13	Air	110 CFU / m <sup>3</sup> Micrococcus Species - 50% Coag-negative Staphylococcus Species - 33% Bacillus Species - 17%
A3A	Room A 3	Air	650 CFU / m <sup>3</sup> Bacillus Species - 66% Micrococcus Species - 20% Coag-negative Staphylococcus Species - 14%
OUTA	Outside	Air	510 CFU / m <sup>3</sup> Bacillus Species - 79% Multiple Nonfermentative Gram-negative Rods - 21%

**Table 7**  
**Results of Air Samples for Direct Microscopic Exam (in Spores / m<sup>3</sup>)**

Spore Identification	Room A 3	Room A 8	Room A 10	Room A 11	Room B 5	Room B 6	Room B 8	Room B 13	Room C 3	Outdoor
Cladosporium	132	704	220	132	88	66	242	44	88	1408
Ascospores	308	44	176	-	22	66	22	-	176	440
Basidiospores	44	242	110	66	88	44	110	22	132	176
Smuts, Periconia, Myxomycetes	-	198	22	-	-	22	-	-	88	3168
Alternaria	-	22	-	22	-	-	-	-	22	-
Drechslera / Bipolaris Group	44	22	44	66	-	22	22	-	22	-
Colorless	-	-	-	-	88	66	-	22	44	220
Curvularia	110	154	154	-	88	88	-	44	66	88
Unknown	66	-	66	22	-	-	22	-	22	-
Hyphal Elements	396	660	440	44	242	88	330	132	528	1716
Torula Herbarum	-	-	-	44	-	-	-	-	-	-
Oldium	-	-	-	-	22	-	-	-	-	88
Epicoccum	22	-	-	22	22	22	22	-	-	44
Pithomyces	88	242	198	88	-	44	176	44	-	88
Ulocladium	44	-	-	-	-	-	-	-	-	-
Spagazzinia	-	-	22	-	22	-	-	-	-	44
Taeniocella	-	22	-	-	-	-	-	-	-	-
<b>Totals</b>	<b>1254</b>	<b>2310</b>	<b>1452</b>	<b>506</b>	<b>682</b>	<b>528</b>	<b>946</b>	<b>308</b>	<b>1188</b>	<b>7480</b>

**Table 8**  
**Results of Carpet Vacuum Samples - Direct Exam and Culture**

Sample No.	Location	Direct Exam Results	Culture Exam Results
85970	Room A 3	Occasional Budding Yeast Seen	40 CFU / sample Cladosporium Species - 50% Sterilia Mycelia - 50%
85969	Room A 10	No Fungal Spores Seen	60 CFU / Sample Unidentified Fungus
85965	Room B 6	Insufficient Quantity	Insufficient Quantity
85967	Room B 8	Occasional Yeast Cells Seen	50 CFU / Sample Curvularia Species - 60% Acremonium Species - 20% Cladosporium Species - 20%
85968	Room B 13	Insufficient Quantity	Insufficient Quantity
85964	Room C 3	Occasional Drechslera Spores Seen Occasional Epicoccum Spores Seen Occasional Cladosporium Spores Seen Occasional Hyphal Elements Seen	180,000 CFU / gram Cladosporium Species - 44% Sterilia Mycelia - 33% Alternaria Species - 23%

**Table 9**  
**Results of Aldehyde Screen Samples**

	Room C3	Room B6	Room A10	Exposure Standards (ppm)		
	ppm	ppm	ppm	ACGIH TLV	NIOSH REL	OSHA PEL
Formaldehyde	0.04148	0.03824	0.02716	0.3 Ceiling	0.016	0.75
Acetaldehyde	0.01257	0.01402	0.00918	25 Ceiling	Lowest Feasible	200
Propionaldehyde	<0.00039	0.00237	0.00129	20	N/A	N/A
Crotonaldehyde	<0.00226	<0.00229	<0.00229	0.3 Ceiling	2	2
Butyraldehyde	0.00236	0.00271	0.00191	N/A	N/A	N/A
Benzaldehyde	0.0016	0.00162	0.00108	N/A	N/A	N/A
Isovaleraldehyde	<0.00026	<0.00027	0.00033	N/A	N/A	N/A
Valeraldehyde	0.00237	0.00227	0.00133	50	50	N/A
o-Tolualdehyde	<0.00019	<0.00019	<0.00019	N/A	N/A	N/A
m-Tolualdehyde	0.0002	0.0002	<0.00019	N/A	N/A	N/A
p-Tolualdehyde	0.00009	0.00101	0.00109	N/A	N/A	N/A
Hexaldehyde	0.00308	0.00344	0.00183	N/A	N/A	N/A
2,5-Dimethylbenzaldehyde	<0.00042	<0.00043	<0.00043	N/A	N/A	N/A

**Table 10**  
**Results of Organochlorine Pesticide Screen Samples**

	Room B6	Room A10	Exposure Standards ( $\mu\text{g}/\text{m}^3$ )		
	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ACGIH TLV	NIOSH REL	OSHA PEL
alpha-Benzenehexachloride	<0.0705	<0.0688	N/A	N/A	N/A
gamma-Benzenehexachloride (Lindane)	<0.0705	<0.0688	500	500	500
beta-Benzenehexachloride	<0.0705	<0.0688	N/A	N/A	N/A
Heptachlor	<0.0705	<0.0688	50	500	500
delta-Benzenehexachloride	<0.0705	<0.0688	N/A	N/A	N/A
Aldrin	<0.0705	<0.0688	250	250	250
Heptachlor epoxide	<0.0705	<0.0688	50	N/A	N/A
Endosulfan I	<0.0705	<0.0688	100	100	N/A
4,4-DDE	<0.0705	<0.0688	N/A	N/A	N/A
Dieldrin	<0.0705	<0.0688	250	250	250
Endrin	<0.0705	<0.0688	100	100	100
4,4-DDD	<0.0705	<0.0688	N/A	N/A	N/A
Endosulfan II	<0.0705	<0.0688	N/A	N/A	N/A
4,4-DDT	<0.0705	<0.0688	1000	500	1000
Endrin aldehyde	<0.0705	<0.0688	N/A	N/A	N/A
Endosulfan sulfate	<0.0705	<0.0688	N/A	N/A	N/A
Methoxychlor	<0.141	<0.1378	10000	Lowest Feasible	10000
Chlordane	<0.7048	<0.688	500	500	500
Toxaphene	<1.4096	<1.378	500	Lowest Feasible	500



**Table 11**  
**Results of Organophosphorus Pesticide Screen Samples**

	Room C3 $\mu\text{g}/\text{m}^3$	Room B8 $\mu\text{g}/\text{m}^3$	Exposure Standards ( $\mu\text{g}/\text{m}^3$ )		
			ACGIH TLV	NIOSH REL	OSHA PEL
Chlorpyrifos	<2.867	<2.8369	200	200	N/A
Total Demeton	<2.867	<2.8369	110	100	100
Diazinon	<2.867	<2.8369	100	100	N/A
Disulfoton	<2.867	<2.8369	100	100	N/A
Ethion	<2.867	<2.8369	400	400	N/A
Malathion	<2.867	<2.8369	10000	10000	10000
Methyl parathion	<2.867	<2.8369	200	200	N/A
Parathion	<2.867	<2.8369	100	50	100

**Baker**

*Baker and Associates*  
**ATTACHMENT A**

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*Communications and Previous IAQ Assessments*

# SOUTH GEORGIA ALLERGY CLINIC, PC

NAME: \_\_\_\_\_

DATE: 9-6-01

<u>INHALENTS</u>	<u>PRICK</u>
1. DUST MITE #1 (D Far)	<u>2</u>
2. DUST MITE #2 (D Pier)	<u>2</u>
3. CAT PELT	<u>0</u>
4. DOG	<u>0</u>
✓ 5. COCKROACH	<u>2</u>
✓ 6. MITE MIX	<u>2</u>

<u>WEEDS</u>	<u>PRICK</u>
✓ 1. COCKLEBUR	<u>2</u>
2. DOCK/SORREL	<u>0</u>
✓ 3. LAMB'S QUARTER	<u>2</u>
✓ 4. MARSH ELDER	<u>2</u>
5. PIG WEED	<u>0</u>
✓ 6. ENGLISH PLANTAIN	<u>2</u>
7. RAGWEED	<u>1</u>
8. DOG FENNEL	<u>1</u>

<u>TREES</u>	<u>PRICK</u>
1. ELM	<u>0</u>
2. OAK	<u>0</u>
3. PINE	<u>0</u>
4. PECAN	<u>0</u>
5. CEDAR	<u>0</u>
✓ 6. COTTONWOOD	<u>2</u>
7. HACKBERRY	<u>2</u>
✓ 8. BIRCH	<u>2</u>
✓ 9. HICKORY	<u>2</u>
10. MAPLE	<u>2</u>
11. ASH	<u>2</u>
12. PRIVET	<u>2</u>
13. SWEETGUM	<u>1</u>
14. SYCAMORE	<u>1</u>
15. WALNUT	<u>2</u>
16. WILLOW	<u>2</u>
17. TREE MIX	<u>2</u>

<u>GRASSES</u>	<u>PRICK</u>
1. BAHIA	<u>0</u>
2. BERMUDA	<u>0</u>
3. RYE	<u>0</u>
4. TIMOTHY	<u>0</u>
5. RED TOP	<u>0</u>
6. KENTUCKY BLUE	<u>0</u>
7. MEADOW FESCUE	<u>0</u>

<u>MOLDS</u>	<u>PRICK</u>
1. ALTERNARIA	<u>2</u>
✓ 2. HORMODENDRUM	<u>2</u>
✓ 3. CURVULARIA	<u>2</u>
✓ 4. PULLULARIA	<u>2</u>
✓ 5. HELMINTHOSPORIUM	<u>2</u>
✓ 6. STEMPHYLIUM	<u>2</u>
✓ 7. RHIZOPUS	<u>2+</u>
8. EPICOCOM	<u>1</u>
✓ 9. ASPERGILLUS	<u>2</u>
10. FUSARIUM	<u>1</u>
11. PENICILLIUM	<u>1</u>
12. CEPHALOSPORIUM	<u>1</u>
13. TRICODERMA	<u>1</u>
14. BOTRYTIS	<u>2</u>
15. MONILLA/NEUROSPORA	<u>2</u>
16. MOLD MIX	<u>2</u>

<u>HISTAMINE</u>	<u>PRICK</u>
1. ERYTHEMA	<u>2 (2)</u>
2. INDURATION	<u>1</u>

<u>CONTROL</u>	<u>PRICK</u>
1. ERYTHEMA	<u>1 (1)</u>
2. INDURATION	<u>1</u>

LB

DILUENT: 1.0 ML

DATE PREPARED: \_\_\_\_\_ VIALS \_\_\_\_\_ EPISENT \_\_\_\_\_

MAIL TO: Dr. James Snow  
Marion, GA  
 PHONE #: \_\_\_\_\_

Sample for ✓

**MEMORANDUM FROM Director of Health Services**

**MEMORANDUM FOR Principal, Brittin Elementary School, ATTN: Ms. Sherry Templeton, Hero Road, Ft. Stewart, GA 31314-6000**

**SUBJECT: Evaluation of Indoor Air Quality (IAQ) Complaints in the Brittin Elementary School (BES), Building 7392, Ft. Stewart, GA**

- 1. REFERENCES: See Appendix A.**
- 2. PURPOSE: This evaluation was performed in response to a request from Mr. Robert Heffley, BES Facility Manager. He reported that employees in room C3 allege to have illnesses that they associate with poor IAQ.**
- 3. GENERAL: On 16 Oct 2001, Ms. Brenda Sherrod, Industrial Hygienist, performed an IAQ evaluation of room C3 of the BES. The heating, ventilation, and air conditioning (HVAC) system supplying room C3 was also inspected for suspect contaminants.**
- 4. FINDINGS AND DISCUSSION:**
  - a. There were no new carpets, furniture, or window treatments in the rooms that would emit vapors. The only chemical exposure was the residual cleaning products left behind from general housekeeping.**
  - b. Reportedly, the carpets have been in place approximately ten years. They appeared worn and soiled in many areas but showed no signs of mold/mildew growth.**
  - c. Reportedly, the rooms are vacuumed and low-level dusted daily. The rooms appeared to be relatively dust-free. However, an employee stated that black particles fall from the ventilation diffusers. Mr. Heffley provided a sample of the insulation material inside that ductwork which appeared to be a fiberglass substance with a black adhesive coating. This coating is apparently flaking from age deterioration thus explaining the black particles falling from the ventilation system.**
  - d. An individual HVAC air handling unit provides ventilation to the classroom. Mr. Heffley and Mr. Edenfield reported that the HVAC filter is changed at least every three months. The filters presently in the system had been in place approximately three weeks and showed no signs of dirt or debris buildup. Observation of the HVAC's AHU coils, filters, supply, return ventilation diffusers, and condensation drip trays revealed that an HVAC preventive maintenance program was in place. The ceiling space served as the plenum area for the AHU. The area was very dry and**

AFZP-HS

SUBJECT: Evaluation of Indoor Air Quality Complaints in the Brittin Elementary School, Bldg 7392, Ft. Stewart, GA

showed no signs of mold or mildew growth; however, there were signs of considerable dust buildup. There was no fresh air intake supplying this AHU.

Note: Reportedly, a design has been completed and is awaiting funds to replace the HVAC system. IAW ANSI/ASHRAE 62-1999 guidance, the new system has been designed with a fresh air intake allowance.

e. The windows in the room were recently replaced because of leakage. The only signs of the leakage was a small amount of efflorescence which is a normal occurrence from water damage to mortar, cinder block, and other/or surfaces containing cement.

f. Reportedly, most of the time the door and windows to the classroom remain closed.

#### 5. RECOMMENDATIONS:

a. Continue to replace or clean the HVAC filters at least every three months or as deemed necessary during monthly inspections.

b. Vacuum the ceiling area serving as the plenum area to reduce the potential risk of microscopic-sized dust particles penetrating the filter thus entering the classroom.

c. If feasible, remove the worn carpets and replace with tiles, sheet vinyl, or other kinds of non-carpet floor covering. In the meantime, continue to maintain a cleaning routine (vacuuming and shampoo) for the carpets as well as dusting and cleaning for the entire room.

d. Allow the door to remain open as much as feasible to allow fresh air to enter the room. Do not open the windows because this may allow outside allergens such as pollen to enter the room especially during high pollen months.

6. CONCLUSION: During this evaluation, evidence of a specific substance or condition that may cause an occupational health hazard in the classrooms was not identified. However, carpets can harbor allergens that may cause adverse reactions in some allergen-sensitive individuals. Therefore if feasible, replace the carpets with non-carpet floor covering to reduce the allergic risk potential. Also, removing the dust from the HVAC plenum area and allowing the door to remain open periodically during the day will provide a fresher and cleaner indoor air environment.

AFZP-HS

SUBJECT: Evaluation of Indoor Air Quality Complaints in the Brittin Elementary School, Bldg 7392, Ft. Stewart, GA

7. For additional assistance contact Ms. Brenda Sherrod at 370-5063, [Brenda.Sherrod@se.amedd.army.mil](mailto:Brenda.Sherrod@se.amedd.army.mil) or fax 370-5009.

FOR THE DIRECTOR OF HEALTH SERVICES:



JAMES D. MANCUSO  
CPT, MC  
Chief, Preventive Medicine Service

CF:  
Brittin Elem School Facility Manager  
Installation Safety, AFZP-DSS

AFZP-HS

SUBJECT: Evaluation of Indoor Air Quality Complaints in the Brittin Elementary School (BES), Building 7392, Ft. Stewart, GA

APPENDIX A

- a. Email message from Mr. Robert Heffley, Facility Manager, Ft. Stewart DOD Schools, to Ms. Brenda Sherrod, Industrial Hygienist, Industrial Hygiene Section, Preventive Medicine Service (PMS), USA MEDDAC, 4 Oct 2001, SAB.
- b. Discussion between Mrs. Sherry Templeton, BES Principal, and Ms. Sherrod, 16 Oct 2001, SAB.
- c. Discussion between Mr. John Edenfield, Maintenance Mechanic, Ft. Stewart DOD Schools, and Ms. Sherrod, 16 Oct 2001, SAB.
- d. U.S. Environmental Protection Agency (EPA), Dec 1991, Building Air Quality A Guide for Building Owners and Facility Managers, EPA/400/1-91/003, National Environmental Health Association, Denver Colorado.
- e. ANSI/ASHRAE Standard 62-1999, Ventilation for Acceptable Indoor Air Quality.
- f. ANSI/ASHRAE Standard 55-1992, Thermal Environmental Conditions for Human Occupancy.

**MEMORANDUM FROM Director of Health Services**

**MEMORANDUM FOR Principal, Brittin Elementary School,  
ATTN: (Ms. Sherry Templeton), Hero Road, Ft. Stewart, GA 31314-6000**

**SUBJECT: Evaluation of Indoor Air Quality (IAQ) Complaints in the Brittin  
Elementary School (BES), Building 7392, Ft. Stewart, GA**

**1. REFERENCES: See Appendix A.**

**2. PURPOSE: This evaluation was performed in response to a request from  
Mr. Robert Heffley, BES Facility Manager. He reported that an employee attending a  
meeting in room B13 and a teacher occupying room C5 allege to have illnesses that  
they associate with poor IAQ.**

**3. GENERAL: On 26 Nov 2001, Ms. Brenda Sherrod, Industrial Hygienist, performed  
an IAQ evaluation of room B13 and C5 of the BES. The heating, ventilation, and air  
conditioning (HVAC) system supplying these two rooms were also inspected for  
suspect contaminants.**

**4. FINDINGS AND DISCUSSION:**

**a. There were no new carpets, furniture, or window treatments in the rooms that  
would emit vapors. The only chemical exposure was the residual cleaning products  
left behind from general housekeeping.**

**b. Reportedly, the carpets have been in place approximately ten years. They  
appeared worn and soiled in some areas but showed no signs of mold/mildew  
growth.**

**c. Reportedly, the rooms are vacuumed and low-level dusted daily. The rooms  
appeared to be relatively dust-free.**

**d. Individual HVAC air handling units provide ventilation to the classrooms. Mr.  
Heffley reported that the HVAC filters are changed at least every three months. The  
filters presently in the system had been in place approximately 4 weeks and showed  
no signs of dirt or debris buildup. Observation of the HVAC's AHU coils, filters,  
supply, return ventilation diffusers, and condensation drip trays revealed that an  
HVAC preventive maintenance program was in place. However, in room C5 the top  
filter guide was missing causing a small gap between the coils and the filter. This  
caused a small strip of the coil to become dusty. Although the drip pans were  
flowing properly, there were signs of mild sediment buildup in the trays. The ceiling  
space served as the plenum area for the AHU. The area was very dry and showed  
no signs or mold or mildew growth; however, there were signs of considerable dust  
buildup. There was no fresh air intake supplying this AHU.**



AFZP-HS

SUBJECT: Evaluation of Indoor Air Quality Complaints in the Brittin Elementary School, Bldg 7392, Ft. Stewart, GA

Note: Reportedly, a design has been completed and is awaiting funds to replace the HVAC system. IAW ANSI/ASHRAE 62-1999 guidance, the new system has been designed with a fresh air intake allowance.

**5. RECOMMENDATIONS:**

a. Continue to replace or clean the HVAC filters at least every three months or as deemed necessary during monthly inspections. Also, replace the filter guide to ensure a tight fit for the filters and clean the dust from the coils.

b. Vacuum the plenum area to reduce the potential risk of microscopic-sized dust particles penetrating the filter thus entering the classrooms.

c. If feasible, remove the worn carpets and replace with tiles, sheet vinyl, or other kinds of non-carpet floor covering. In the meantime, continue to maintain a cleaning routine (vacuuming and shampoo) for the carpets as well as dusting and cleaning for the entire room.

d. Allow the door to remain open as much as feasible to allow fresh air to enter the room. Do not open the windows because this may allow outside allergens such as pollen to enter the room especially during high pollen months.

**6. CONCLUSION:** During this evaluation, evidence of a specific substance or condition that may cause an occupational health hazard in the classrooms was not identified. However, carpets can harbor allergens that may cause adverse reactions in some allergen-sensitive individuals. Therefore if feasible, replace the carpets with non-carpet floor covering to reduce the allergic risk potential. Also, removing the dust from the HVAC plenum area and allowing the door to remain open periodically during the day will provide a fresher and cleaner indoor air environment.

**7. For additional assistance contact Ms. Brenda Sherrod at 370-5063, [Brenda.Sherrod@se.amedd.army.mil](mailto:Brenda.Sherrod@se.amedd.army.mil) or fax 370-5009.**

**FOR THE DIRECTOR OF HEALTH SERVICES:**

**JAMES D. MANCUSO**  
CPT, MC  
Chief, Preventive Medicine Service

**CF:**  
Brittin Elem School Facility Manager  
Installation Safety, AFZP-DSS



DEPARTMENT OF DEFENSE  
DOMESTIC DEPARTMENT ELEMENTARY AND SECONDARY SCHOOLS  
FORT STEWART SCHOOL SYSTEM  
BRITTON ELEMENTARY SCHOOL, 2772 HERO  
FORT STEWART, Georgia 31315-1713  
912-368-7514/3334  
November 28, 2001

Dear Parents of Students in Ms. Cothran's Second Grade;

Some of you may know that yesterday Ms. Cothran experienced some unexplained physical symptoms, which she believes were related to an odor in her classroom. She was seen in the Preventative Medicine section of Winn yesterday afternoon. Before school this morning, the Industrial Hygiene and Environmental Specialist from the Preventative Medicine section, Ms. Sherrod, inspected and evaluated Ms. Cothran's classroom, an adjoining classroom, and the hallway. Ms. Sherrod, along with our Fort Stewart School System Safety Officer, his staff, Ms. Kipp, and I, could find nothing of any kind that might have caused the symptoms. Although no children experienced any physical symptoms, to be extra cautious, we moved Ms. Cothran and her students to another classroom for today. In conjunction with Ms. Sherrod, our Safety Officer closed off Ms. Cothran's room and has inspected it all day for any appearance of an odor. If nothing is detected, the room will be especially thoroughly cleaned this evening. Although we are expecting none, if there is any evidence of a further problem, the Industrial Hygiene and Environmental personnel will again be immediately notified.

Please know that your children's safety, as well as that of our staff, is our utmost concern, and we will continue to proactively monitor this situation. We thank you for your continuing support of our educational program.

SHERRY TEMPLETON  
Principal

Fort Stewart Association of Educators  
516 Davis Avenue  
Fort Stewart, GA 31315

November 28, 2001

Dr. Paul Ward, Superintendent  
Fort Stewart School System  
376 Davis Avenue  
Fort Stewart, GA 31315

AND

Ms. Sherry Templeton, Principal  
Brittin Elementary School  
2772 Hero Road  
Fort Stewart, GA 31315

Dr. Ward and Ms. Templeton,

I am requesting your assistance in trying to resolve a matter that has recently come to my attention. I have had bargaining unit members teaching at Brittin Elementary School tell me of unhealthy conditions in that building. There is a concern among bargaining unit members about bringing up these concerns for fear of retaliation from the administration. I visited the Brittin School and saw evidence of mold and mildew growing on the carpets in at least three rooms. I was also told of the incident that occurred yesterday, November 27, 2001, with the odor that affected the health of Mrs. Alix Cochran and other faculty members that entered her room to retrieve her's and the children's belongings.

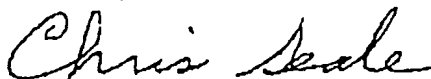
I was told by bargaining unit members that these conditions seem to have been caused by the window replacement project that occurred at Brittin last school year. During the replacement in at least one room the windows were removed and rain occurred prior to the replacement with the new windows. This caused the room's interior to get wet causing mold and mildew to grow in the carpet.

These conditions are causing some bargaining unit members to get sick enough to prevent them from doing their duties. Pursuant to Article 11 of the Master Labor Agreement management recognizes its responsibility to provide and maintain a healthy environment. To this end I believe it is my responsibility to bring the unhealthy conditions that affected the work environment for bargaining unit members to management's attention so they can be corrected as soon as possible.

If you need further information on the specific conditions, please let me know so that you may take the necessary corrective action to improve the work environment.

I would appreciate your cooperation in this matter so that it can be resolved at our level.

Sincerely,



Chris Seale, President

05 December 2001

MEMORANDUM FOR Parents, Staff, and Administration of  
Britton Elementary School

SUBJECT: Indoor Air Quality at Britton Elementary School

1. **Situation:** The Preventive Medicine Service at Winn Army Community Hospital was called last Thursday to investigate a situation regarding indoor air quality complaints at Britton Elementary. Three persons were known to have had symptoms in two different rooms—one adult and two children. The children's symptoms lasted approximately 15 minutes, and were associated with a foul odor. They did not persist. The adult's symptoms have been persistent and are being investigated further.

2. **Intervention:** The air quality at Britton has actually been monitored for some time (the past few months), and also at Diamond, by the Industrial Hygienists at Winn. There had been no specific health hazards identified previously. When called last Thursday, I saw one of the children in the ER, who at that time was without symptoms and had fully recovered. I then went to Britton myself to do a walk-through survey (the first step in any air quality assessment) to look for an obvious source of contamination and to look for immediate hazards that would threaten the health of the students or staff. After about 2 hours of inspection and deliberation, I felt assured that there was not an immediate threat, and recommended NOT to close the school. I then returned the next day to perform further evaluation with a team consisting of an industrial hygienist, an environmental science officer, an occupational health nurse, and myself. Investigations included the rooms in question, hallways, outdoor ventilation, HVAC (Heating, Ventilation, and Air Conditioning) system,

3. **Findings:**

- a. Complaints mainly included a variety of odors, irritation of the nose, throat, and eyes, headaches. Other less common complaints included rash, and respiratory symptoms. There were many complaints regarding dust, mold/mildew, and lack of ventilation as well as inability to open the windows.
- b. Objective findings by our staff revealed a variety of odors from a variety of potential sources. Many

cleaners were found (chalk board-containing methyl chloroform, floor, surface, etc.) and easily identifiable. Many markers were found in each room, as well as other items such as nail polish, and leaky insect repellent bottles. However, no single agent was identifiable for many of the odors. Dust and mold/mildew was deemed to be normal for the size and scope of the building, although it was noted that many rooms contained items stacked on top of furniture, making proper dusting difficult. The HVAC system is a recirculating kind, thus no outside (fresh) air is brought in, as is currently recommended by leading authorities. Also, teachers were not permitted to open windows due to the Force Protection requirements during the last few months.

- c. Testing for Carbon Dioxide and Carbon Monoxide, as well as temperature, humidity, and other chemicals revealed no abnormalities aside from lack of circulation of outside air.

4. **Assessment:** No specific acute health hazard was identified. The symptoms identified are typical of irritant and allergic effects commonly noted inside most buildings. Indoor air quality is a common problem in buildings. This particular building was built during a time when energy conservation was emphasized in building design, causing a "tight" air environment where little air circulated from the outside, in order to save money on heating. Since then, recommendations have changed to emphasizing the importance of fresh air to reduce these irritant and allergic type symptoms. Most cases (over half) of indoor air quality complaints arise from lack of outside ventilation.

5. **Recommendations:** The main solution to this type of problem is to increase the circulation of fresh outside air. The long-term solution to this problem is the complete replacement of the HVAC system, which is planned and which facilities have been reportedly trying to get accomplished over the past few years. Until this occurs, however, the following recommended steps should be taken:

- a. Open doors and windows whenever possible (within constraints of force protection requirements)
- b. Clean and dust rooms regularly as scheduled
- c. Remove stacks and debris from rooms to enable more effective dusting and cleaning
- d. Run HVAC fan continuously to circulate air

- c. Remove unnecessary chemicals and cleaners from rooms
- f. Remove carpets and replace with hard floors for better cleaning (less allergen trapping)—this is reportedly also planned
- g. Minimize use of markers with chemical odors
- h. Until carpets are removed, do not use carpet shampoo (more chemicals)
- i. Minimize use of laminating materials (strong chemical odors)
- j. Use weaker bleach solution to clean latrines and surfaces
- k. Maintain HVAC hygiene as scheduled
- l. Eliminate use of perfumes to cover up odors (more chemicals)
- m. Be aware that flu season is coming up, and kids will get sick with this and other common illnesses
- n. Don't smoke in a building where there are children (Really don't smoke at all!)
- o. Anyone with chronic medical conditions (like asthma) should get a flu shot
- p. Anyone with continued (chronic) symptoms should be seen by their physician for proper treatment

6. **Follow-up:** We will continue to follow the conditions at Britton to ensure a safe and healthful learning and working environment. We would encourage parents, staff, and administration to work together to solve this difficult problem and communicate concerns fully to each other. We recommend consideration of establishing a health committee, to ensure that not only this, but all other health concerns of staff and parents are heard and addressed.

James D. Mancuso  
CPT, MC  
Chief, Preventive Medicine  
"Team Winn"  
Ft. Stewart, GA

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration  
Savannah Area Office  
450 Mall Boulevard - Suite J  
Savannah, GA 31406  
TEL: (912) 652-4393  
FAX: (912) 652-4329



Brittin Elementary School  
2772 Hero Rd  
Fort Stewart, GA 31315

RE: Complaint No. 201530094

ATTN: Ron Heath:

On 11/30/2001, the Occupational Safety and Health Administration (OSHA) received a notice of health hazard at your worksite at:

2772 Hero Rd  
Fort Stewart, GA 31315

We notified you, by telephone, of this alleged hazard on 12/04/2001. The specific nature of the alleged hazard is as follows:

Employees are exposed to unknown gaseous smell that are effecting their skin and respiratory system.

We have not determined whether the hazard, as alleged, exist at your workplace; and we do not intend to conduct an inspection at this time. However, since allegations of violations and/or hazards have been made, we request that you immediately investigate the alleged conditions and make any necessary corrections or modifications. Within 5 days of the date of this letter, please advise me in writing regarding the results of your investigation. You must provide supporting documentation of your findings, including any applicable measurements or monitoring results, and photographs/video which you believe would be helpful, as well as a description of any corrective action you have taken or are in the process of taking, including of the corrected condition. Please FAX us your response, if possible, and direct it to the attention of the Customer Service Officer at (912) 652-4329.

This letter is not a citation or a notification of proposed penalty which, according to the OSH Act, may be issued only after an inspection or investigation of the workplace. It is our goal to assure that hazards are promptly identified and eliminated. Please take immediate corrective action where needed. We encourage employee participation in investigating and responding to any alleged hazard. If we do not receive a response from you by 12/11/2001 indicating that appropriate action has been taken or that no hazard exists and why, an OSHA inspection

Received  
Received  
Received

may be conducted. An inspection may include a review of the following: injury and illness records, hazard communication, personal protective equipment, emergency action or response, bloodborne pathogens, confined space entry, lockout and related safety and health issues.

Please note, however, that OSHA selects for inspection some cases where we have received letters in which employers have indicated satisfactory corrective action. This is to ensure that employers have actually taken the action stated in their letters.

We request that you post a copy of this letter where it will be readily accessible for review by all of your employees and return a copy of the signed Certificate of Posting (Attachment A) to this office. Also, you are requested to provide a copy of this letter and your response to it to a representative of any recognized employee union or safety committee if these are at your facility. Failure to do this may result in an on-site inspection. The complainant has been furnished a copy of this letter and will be advised of your response. Section 11(c) of the OSH Act provides protection for employees against discrimination because of their involvement in protected safety and health related activity.

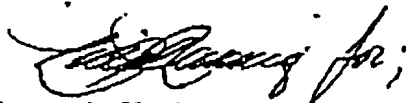
**IN ADDITION, OSHA REQUESTS THE FOLLOWING INFORMATION:**

- a) A statement providing your Employer I.D. Number (TAX ID/EIN).

The Savannah Area Office is processing this complaint utilizing a phone/fax procedure rather than conducting an inspection. The purpose of this is to abate potential hazards in the most expeditious way and, at the same time, relieve the employer of the burden of an inspection and additional paperwork. We would appreciate receiving written feedback from you regarding this new process and would welcome any suggestions for improvement. Please note that your feedback is voluntary, not required.

If you have any questions concerning this matter, please do not hesitate to contact the Area Office at the telephone number shown above in the letterhead and request that your call be directed to our customer service officer. If you would like to organize safety and/or health training for businesses in your area once this complaint allegation is completed and your casefile is closed, please let us know. Your personal support and interest in the safety and health of your employees is appreciated.

Sincerely,



Teresa A. Harrison  
Area Director

TAH/lar



### CERTIFICATE OF POSTING OSHA NOTIFICATION OF ALLEGED HAZARD(S)

Employer Name: Brittin Elementary School  
Complaint Nr: 201530094

Date of Posting: \_\_\_\_\_

Date Copy Given to  
an Employee Representative: \_\_\_\_\_

Employer Federal Tax Number: \_\_\_\_\_

On behalf of the employer, I certify that a copy of the complaint letter received from the Occupational Safety and Health Administration (OSHA) has been posted in a conspicuous place, where all affected employees will have notice, or near such location where the violation occurred, and such notice has been given to each authorized representative of affected employees, if any. This notice was or will be posted for a minimum of ten (10) working days or until any hazardous conditions found are corrected.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

Company Name:

U.S. Department of Labor-OSHA

Complaint Number:

450 Mall Blvd - Suite J

Savannah, GA 31406

Employer Federal Tax Number:

TEL: (912) 652-4393

FAX: (912) 652-4329

Reply to Attention of CSO

### Employer Complaint Response Form

You may use this form to respond to the alleged complaint item(s) in the boxes below and fax or mail the form back to the Area Office to expedite the closing of this complaint.

Item Number	Results of Investigation / Action Taken
Sample 1	Safety glasses now provided to employee, and employees are required to wear them.

\_\_\_\_\_  
Company Representative

\_\_\_\_\_  
Date

Additional Sheets May be Used



# THE BRITTIN BANNER

SY 2001-2002

Volume 18 NO. 15

7 Dec 01

<http://ft.stewart.odedodea.edu>

<http://ft-stewart.odedodea.edu/brittin/bes.htm>

Dear Parents,

We want to keep you informed about a current circumstance at Brittin Elementary. Last week, one Brittin teacher experienced some physical symptoms, which she believed were related to an odor in her classroom. The Industrial Hygiene and Environmental office from the Preventive Medicine section of Winn Army Hospital, which has been doing on-going monitoring of our air quality, inspected the teacher's classroom and found nothing that could have caused her symptoms.

To be especially cautious, the class was temporarily moved to another location while we continued observing the classroom. No classroom problem was found. Later in the week, some children in a different classroom reported symptoms they stated were related to an odor. The children's parents were requested to take the children to the Winn Army Hospital Emergency Room. The children were later reported to be fully recovered and without symptoms.

That evening Dr. Mancuso, Chief of Preventive Medicine at Winn, spent approximately two hours inspecting the Brittin building. He found nothing that was a threat to health and recommended continued use of the building. The next day, November 30, Dr. Mancuso returned to perform further evaluations with an industrial hygienist, an environmental science officer, and an occupational health nurse, in addition to himself. After a thorough evaluation, Dr. Mancuso again reported no health hazard had been found at Brittin.

Yesterday, December 6, the Chief of the Safety Division for Fort Stewart and Hunter inspected and evaluated our building. In his inspection, he also found no evidence of health hazards, and he will do even further testing. Additionally, the FSSS has requested funding from our headquarters for more detailed air quality testing to be accomplished by USACHPPM (Industrial Hygiene Field Service) or a private contractor.

Dr. Mancuso reported that the identified symptoms are typical of irritant and allergic effects commonly noted inside most buildings. He made a list of general recommendations, many of which are currently in place, and some of which will require the assistance of the entire school community. Among the latter are: minimize the use of markers with chemical odors; be aware that the flu season is coming and kids will get sick with this and other common illnesses; get a flu shot if you have a chronic medical condition; and see your physician if you have continued (chronic) symptoms. (The full report is available in the school office.)

Please know that your children's safety, as well as that of our staff, is our utmost concern. Even though all evaluations have reported finding no health hazard in our building, we will continue to diligently investigate this situation. We thank you for your continuing support of our educational program.

Dr. Paul E. Ward  
Superintendent, FSSS

Ms. Sherry Templeton  
Principal, Brittin Elementary School



DEPARTMENT OF DEFENSE  
DOMESTIC DEPENDENT ELEMENTARY AND SECONDARY SCHOOLS  
FORT STEWART SCHOOL SYSTEM  
376 DAVIS AVENUE, FORT STEWART, GEORGIA 31315-1033  
Telephone (912) 368-2742 Fax (912) 876-8417

December 10, 2001

Mr. Ron Heath  
Chief, Safety Division  
1042 William H. Wilson Ave.  
Suite 305  
Fort Stewart, GA 31314

Dear Mr. Heath:

Teachers at Brittin Elementary School have voiced concerns about an unknown smell in the school that they believe is linked to skin and respiratory problems.

In response to this complaint, Dr. Mancuso, Director of Health Services and Chief, Preventive Medicine at Fort Stewart's Winn Army Community Hospital, evaluated the indoor air quality of Brittin Elementary School along with an industrial hygienist, an occupational health nurse and an environmental science officer. The investigative team failed to find an immediate hazard that would threaten the health of the students or staff, and the administration was advised to keep the school open.

Although no problem was identified, Dr. Mancuso's report contained a list of general recommendations, which we have followed aggressively. For example, HVAC units are being operated at a moderate setting while the classrooms are occupied, the ceiling area was vacuumed to reduce the potential risk of dust particles entering the classroom through the filters, lights and walls were dusted and classrooms were cleared of unnecessary clutter. Other recommendations require funding to complete such as removing the carpets and replacing them with tiles, sheet vinyl or other non-carpet floor covering. A funding request for this project has been forwarded to headquarters. The main solution to this type of problem, according to Dr. Mancuso, is the complete replacement of the HVAC system. A project to replace the HVAC system has been designed and is awaiting funding.

Moreover, we continue to diligently investigate this situation. We have contracted with Baker Environmental to conduct more comprehensive indoor air quality monitoring. Test results will be provided to faculty and parents as soon as they are received.

Please let me know if you require any additional information.

Sincerely,

Paul E. Ward  
Superintendent

**Baker**

*Baker and Associates*  
**ATTACHMENT B**

---

*Sample Certificates of Analysis*



# AEROTECH LABORATORIES, INC.

Baker Environmental  
420 Rouser Road  
Coraopolis, PA 15108  
Attn: Warren Lehew

Lab Number: A-112-3472  
Project ID: 23970-011-0000-00001  
Date Received: 12/22/01  
Date Reported: 01/21/02

## Formaldehyde/Aldehyde Analysis - Air T011A

Lab Number	7		8		9		10	Limits
Sample Identification	(Room C3) 85961		(Room B6) 85962		(Room A10) 85963		Blank 85960	
Date Analyzed	12/28/01		12/28/01		12/28/01		12/28/01	
Volume (m <sup>3</sup> )	0.0216		0.0213		0.0213		N/A	
	Total µg	ppm	Total µg	ppm	Total µg	ppm	Total µg	Total µg
Formaldehyde	1.1	0.04148	1.0	0.03824	0.71	0.02715	0.240	0.100
Acetaldehyde	0.50	0.01257	0.55	0.01402	0.36	0.00916	0.120	0.040
Propionaldehyde	<0.020	<0.00039	0.12	0.00237	0.065	0.00129	0.026	0.20
Crotonaldehyde	<0.14	<0.00226	<0.14	<0.00229	<0.14	<0.00229	<0.14	0.140
Butyraldehyde	0.15	0.00236	0.17	0.00271	0.12	0.00191	0.23	0.04
Benzaldehyde	0.15	0.0016	0.15	0.00162	0.10	0.00108	0.054	0.03
Isovaleraldehyde	<0.020	<0.00026	<0.020	<0.00027	0.025	0.00033	<0.020	0.02
Valeraldehyde	0.18	0.00237	0.17	0.00227	0.10	0.00133	0.049	0.020
o-Tolualdehyde	<0.020	<0.00019	<0.020	<0.00019	<0.020	<0.00019	<0.020	0.020
m-Tolualdehyde	0.021	0.0002	0.021	0.0002	<0.020	<0.00019	0.041	0.020
p-Tolualdehyde	0.059	0.00056	0.17	0.00162	0.11	0.00108	0.029	0.020
Hexaldehyde	0.27	0.00305	0.300	0.00344	0.16	0.00183	0.066	0.030
2,5-Dimethylbenzaldehyde	<0.050	<0.00042	<0.050	<0.00043	<0.050	<0.00043	<0.050	0.050

Input By: *PL*  
CS Review: *gh*

Technical Review: *[Signature]*  
Final Review: *[Signature]*

A012 Page 1 of 1



# AEROTECH LABORATORIES, INC.

Baker Environmental  
 420 Rouser Road  
 Coraopolis, PA 15108  
 Attn: Warren Lehew

Lab Number: A-112-3472  
 Project ID: 23970-011-0000-00001  
 Date Received: 12/22/2001  
 Date Report Revised: 1/22/2002

## Organochlorine Pesticides - Air EPA TO-10A

Lab Number	2		4		6	Limits
Sample Identification	85973 Room B8		85975 Room A10		85978 Blank	
Date Analyzed	01/03/02		01/03/02		01/03/02	
Volume (m <sup>3</sup> )	0.70941		0.72675		..	
	Total µg	µg/m <sup>3</sup>	Total µg	µg/m <sup>3</sup>	Total µg	Total µg
alpha-BHC	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
gamma-BHC	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
beta-BHC	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Heptachlor	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
delta-BHC	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Aldrin	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Heptachlor epoxide	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Endosulfan I	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
4,4-DDE	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Dieldrin	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Endrin	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
4,4-DDD	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Endosulfan II	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
4,4-DDT	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Endrin aldehyde	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Endosulfan sulfate	<0.050	<0.0705	<0.050	<0.0688	<0.050	0.050
Methoxychlor	<0.10	<0.141	<0.10	<0.1276	<0.10	0.100
Chlordane	<0.50	<0.7048	<0.50	<0.688	<0.50	0.500
Toxaphene	<1.0	<1.4098	<1.0	<1.376	<1.0	1.000

Input By: *W*  
 CS Review: *JP*

Technical Review: *[Signature]*  
 Final Review: *[Signature]*



# AEROTECH LABORATORIES, INC.

Baker Environmental  
 420 Rouser Road  
 Caropolis, PA 15108  
 Attn: Warren Lehew

Lab Number: A-112-3472  
 Project ID: 23970-011-0000-00001  
 Date Received: 12/22/2001  
 Date Report Revisaed: 1/22/2002

## Organophosphorus Pesticides - Air EPA TO-10A

Lab Number	1		3		3
	85972 Room C3		85974 Room B8		85977 Blank
Date Analyzed	01/04/02		01/04/02		01/04/02
Volume (m <sup>3</sup> )	0.6976		0.70499		--
	Total µg	µg/m <sup>3</sup>	Total µg	µg/m <sup>3</sup>	Total µg
Chlorpyrifos	<2.0	<2.867	<2.0	<2.8369	<2.0
Total Demeton	<2.0	<2.867	<2.0	<2.8369	<2.0
Diazinon	<2.0	<2.867	<2.0	<2.8369	<2.0
Disulfoton	<2.0	<2.867	<2.0	<2.8369	<2.0
Etihion	<2.0	<2.867	<2.0	<2.8369	<2.0
Malathion	<2.0	<2.867	<2.0	<2.8369	<2.0
Methyl parathion	<2.0	<2.867	<2.0	<2.8369	<2.0
Parathion	<2.0	<2.867	<2.0	<2.8369	<2.0

Limits
Total µg
2.0
2.0
2.0
2.0
2.0
2.0
2.0
2.0

Input By: *WJL*  
 CS Review: *WJL*

Technical Review: *RVS*  
 Final Review: *RVS*



## Certificate of Laboratory Analysis

Michael Baker Corp. Date Received: 12/22/01  
420 Rouser Rd. Airport Business Park Bldg. 3 Date Reported: 12/31/01  
Corapolis, PA 15108 Page 1 of 6  
Attn: Job ID: 01 8102  
Project: 23970-011-0000-00001

---

Client Sample Number: 85964 Lab Sample Number: 01 8102-01  
Sampling Location: Room C3  
Date Collected: 12/18/01 Volume/Area:

**TEST REQUESTED:** 1050 BULK, Direct Microscopic Exam  
1033 BULK, Total FUNGAL Count w/identifications

**Results:** Occasional Drechslera spores seen.  
Occasional Epicoccum spores seen.  
Occasional Cladosporium spores seen.  
Occasional hyphal elements seen.

**Detection Limits:** N/A

**Date Analyzed:** 12/31/01

**Analyst:** Ann Atkinson, B.S., MT (ASCP)

Total FUNGAL Count: 180,000 cfu/g

FUNGUS Isolated: Cladosporium species 44%  
Sterilia mycelia 33%  
Alternaria species 23%

**Detection Limits:** 20,000 cfu/g

**Date Analyzed:** 12/31/01

**Analyst:** Patricia R. Vestal, M.S., SM (ASCP)

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## Certificate of Laboratory Analysis

Michael Baker Corp.

420 Rouser Rd. Airport Business Park Bldg. 3  
Corapolis, PA 15108

Attn:

Project: 23970-011-0000-00001

Date Received: 12/22/01

Date Reported: 12/31/01

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Job ID: 01 8102

---

**Client Sample Number:** 85965

**Lab Sample Number:** 01 8102-02

**Sampling Location:** Room B6

**Date Collected:** 12/18/01

**Volume/Area:**

**TEST REQUESTED:**

1050 BULK, Direct Microscopic Exam  
1033 BULK, Total FUNGAL Count w/Identifications

**Results:**

Quantity not sufficient for testing.

**Detection Limits:**

N/A

**Date Analyzed:**

12/31/01

**Analyst:**

Ann Atkinson, B.S., MT (ASCP)

**Results:**

Quantity not sufficient for testing.

**Detection Limits:**

**Date Analyzed:**

12/31/01

**Analyst:**

Patricia R. Vestal, M.S., SM (ASCP)

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## Certificate of Laboratory Analysis

Michael Baker Corp.  
 420 Rouser Rd. Airport Business Park Bldg. 3  
 Corapolis, PA 15108  
 Attn:  
 Project: 23970-011-0000-00001

Date Received: 12/22/01  
 Date Reported: 12/31/01  
 Page 3 of 6  
 Job ID: 01 8102

<b>Client Sample Number:</b> 85967	<b>Lab Sample Number:</b> 01 8102-03
<b>Sampling Location:</b> Room B8	
<b>Date Collected:</b> 12/18/01	<b>Volume/Area:</b>

**TEST REQUESTED:** 1050 BULK, Direct Microscopic Exam  
 1033 BULK, Total FUNGAL Count w/Identifications

**Results:** Occasional yeast cells seen.

**Detection Limits:** N/A

**Date Analyzed:** 12/31/01

**Analyst:** Ann Atkinson, B.S., MT (ASCP)

**Results:** Reported per plate due to low sample weight.

**Total FUNGAL Count:** 50 cfu/plt

<b>FUNGUS Isolated:</b>	Curvularia species	60%
	Acremonium species	20%
	Cladosporium species	20%

**Detection Limits:** 10 cfu/plt

**Date Analyzed:** 12/31/01

**Analyst:** Patricia R. Vestal, M.S., SM (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.

420 Rouser Rd. Airport Business Park Bldg. 3

Corapolis, PA 15108

Attn:

Project: 23970-011-0000-00001

Date Received: 12/22/01

Date Reported: 12/31/01

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Job ID: 01 8102

---

**Client Sample Number:** 85968

**Lab Sample Number:** 01 8102-04

**Sampling Location:** Room B13

**Date Collected:** 12/18/01

**Volume/Area:**

**TEST REQUESTED:**

1050 BULK, Direct Microscopic Exam  
1033 BULK, Total FUNGAL Count w/Identifications

**Results:** Quantity not sufficient for testing.

**Detection Limits:** N/A

**Date Analyzed:** 12/31/01

**Analyst:** Ann Atkinson, B.S., MT (ASCP)

**Results:** Quantity not sufficient for testing.

**Detection Limits:**

**Date Analyzed:** 12/31/01

**Analyst:** Patricia R. Vestal, M.S., SM (ASCP)

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## Certificate of Laboratory Analysis

Michael Baker Corp.

420 Rouser Rd. Airport Business Park Bldg. 3

Corapolis, PA 15108

Attn:

Project: 23970-011-0000-00001

Date Received: 12/22/01

Date Reported: 12/31/01

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Job ID: 01 8102

---

**Client Sample Number:** 85969

**Lab Sample Number:** 01 8102-05

**Sampling Location:** Room A10

**Date Collected:** 12/18/01

**Volume/Area:**

**TEST REQUESTED:**

1050 BULK, Direct Microscopic Exam  
1033 BULK, Total FUNGAL Count w/identifications

**Results:**

No fungal spores seen.

**Detection Limits:**

N/A

**Date Analyzed:**

12/31/01

**Analyst:**

Ann Atkinson, B.S., MT (ASCP)

**Results:**

Reported per plate due to low sample weight.

Total FUNGAL Count:

60 cfu/plt

**Detection Limits:**

10 cfu/plt

**Date Analyzed:**

12/31/01

**Analyst:**

Patricia R. Vestal, M.S., SM (ASCP)

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## Certificate of Laboratory Analysis

Michael Baker Corp.

420 Rouser Rd. Airport Business Park Bldg. 3  
Corapolis, PA 15108

Attn:

Project: 23970-011-0000-00001

Date Received: 12/22/01

Date Reported: 12/31/01

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Job ID: 01 8102

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**Client Sample Number:** 85970

**Lab Sample Number:** 01 8102-06

**Sampling Location:** Room A3

**Date Collected:** 12/18/01

**Volume/Area:**

**TEST REQUESTED:**

1050 BULK, Direct Microscopic Exam  
1033 BULK, Total FUNGAL Count w/Identifications

**Results:**

Occasional budding yeast seen.

**Detection Limits:**

N/A

**Date Analyzed:**

12/31/01

**Analyst:**

Ann Atkinson, B.S., MT (ASCP)

**Results:**

Reported per plate due to low sample weight.

Total FUNGAL Count:

40 cfu/plt

FUNGUS Isolated:

Cladosporium species

50%

Sterilia mycelia

50%

**Detection Limits:**

10 cfu/plt

**Date Analyzed:**

12/31/01

**Analyst:**

Patricia R. Vestal, M.S., SM (ASCP)

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## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
Corapolis, PA 15108	Page 1 of 12
Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 1	Lab Sample Number: 01 8075-01
Sampling Location: Room C3	
Date Collected: 12/18/01	Volume/Area: 90 L

**TEST REQUESTED:** 1054 NON-VIABLE, Spore Trap Analysis

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium	88	Spores/m <sup>3</sup>
Ascospores	176	Spores/m <sup>3</sup>
Basidiospores	132	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes	88	Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria	22	Spores/m <sup>3</sup>
Drechslera / Bipolaris group	22	Spores/m <sup>3</sup>
Colorless	44	Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	66	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown	22	Spores/m <sup>3</sup>
Hyphal Elements	528	Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum		Spores/m <sup>3</sup>
Pithomyces		Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 1188 Spores/m<sup>3</sup>

**Detection Limits:** 22 Spores/m<sup>3</sup>

**Date Analyzed:** 12/27/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
Corapolis, PA 15108	Page 2 of 12
Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 2	Lab Sample Number: 01 8075-02
Sampling Location: Room B6	
Date Collected: 12/18/01	Volume/Area: 90 L

**TEST REQUESTED:** 1054 NON-VIABLE, Spore Trap Analysis

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium	66	Spores/m <sup>3</sup>
Ascospores	66	Spores/m <sup>3</sup>
Basidiospores	44	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomyceles	22	Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group	22	Spores/m <sup>3</sup>
Colorless	66	Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	88	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown		Spores/m <sup>3</sup>
Hyphal Elements	88	Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum	22	Spores/m <sup>3</sup>
Pithomyces	44	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 528 Spores/m<sup>3</sup>

**Detection Limits:** 22 Spores/m<sup>3</sup>

**Date Analyzed:** 12/27/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)



## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
Corapolis, PA 15108	Page 3 of 12
Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 3	Lab Sample Number: 01 8075-03
Sampling Location: Room B5	
Date Collected: 12/18/01	Volume/Area: 90 L
<b>TEST REQUESTED:</b> 1054 NON-VIABLE, Spore Trap Analysis	

<u>SPORE IDENTIFICATION</u>	<u>RESULTS</u>	<u>UNITS</u>
Cladosporium	88	Spores/m <sup>3</sup>
Ascospores	22	Spores/m <sup>3</sup>
Basidiospores	88	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes		Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group		Spores/m <sup>3</sup>
Colorless	88	Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	88	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown		Spores/m <sup>3</sup>
Hyphal Elements	242	Spores/m <sup>3</sup>
Oidium	22	Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum	22	Spores/m <sup>3</sup>
Pithomyces		Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Spegazzinia	22	Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 682 Spores/m<sup>3</sup>

**Detection Limits:** 22 Spores/m<sup>3</sup>

**Date Analyzed:** 12/27/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
Corapolis, PA 15108	Page 4 of 12
Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 4	Lab Sample Number: 01 8075-04
Sampling Location: Room B8	
Date Collected: 12/18/01	Volume/Area: 90 L
<b>TEST REQUESTED:</b> 1054 NON-VIABLE, Spore Trap Analysis	

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium	242	Spores/m <sup>3</sup>
Ascospores	22	Spores/m <sup>3</sup>
Basidiospores	110	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes		Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group	22	Spores/m <sup>3</sup>
Colorless		Spores/m <sup>3</sup>
Arthrimum		Spores/m <sup>3</sup>
Curvularia		Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown	22	Spores/m <sup>3</sup>
Hyphal Elements	330	Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum	22	Spores/m <sup>3</sup>
Pithomyces	176	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

<b>TOTAL SPORES:</b>	<b>946</b>	<b>Spores/m<sup>3</sup></b>
<b>Detection Limits:</b>	22 Spores/m <sup>3</sup>	
<b>Date Analyzed:</b>	12/27/01	
<b>Analyst:</b>	Debra Gulick, B.S., MT (ASCP)	

## Certificate of Laboratory Analysis

Michael Baker Corp.  
 420 Rouser Rd. Airport Business Park Bldg. 3  
 Corapolis, PA 15108  
 Attn:  
 Project: 23970-011-0000-00001

Date Received: 12/22/01  
 Date Reported: 12/28/01  
 Page 5 of 12  
 Job ID: 01 8075

Client Sample Number: 5                      Lab Sample Number: 01 8075-05  
 Sampling Location: Room B13  
 Date Collected: 12/18/01                      Volume/Area: 90 L  
**TEST REQUESTED:** 1054 NON-VIABLE, Spore Trap Analysis

<u>SPORE IDENTIFICATION</u>	<u>RESULTS</u>	<u>UNITS</u>
Cladosporium	44	Spores/m <sup>3</sup>
Ascospores		Spores/m <sup>3</sup>
Basidiospores	22	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes		Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group		Spores/m <sup>3</sup>
Colorless	22	Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	44	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown		Spores/m <sup>3</sup>
Hyphal Elements	132	Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum		Spores/m <sup>3</sup>
Pithomyces	44	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 308 Spores/m<sup>3</sup>

Detection Limits: 22 spores/m<sup>3</sup>

Date Analyzed: 12/27/01

Analyst: Debra Gulick, B.S., MT (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
Corapolis, PA 15108	Page 6 of 12
Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 6	Lab Sample Number: 01 8075-06
Sampling Location: Room A10	
Date Collected: 12/18/01	Volume/Area: 90 L

**TEST REQUESTED:** 1054 NON-VIABLE, Spore Trap Analysis

<u>SPORE IDENTIFICATION</u>	<u>RESULTS</u>	<u>UNITS</u>
Cladosporium	220	Spores/m <sup>3</sup>
Ascospores	176	Spores/m <sup>3</sup>
Basidiospores	110	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes	22	Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group	44	Spores/m <sup>3</sup>
Colorless		Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	154	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown	66	Spores/m <sup>3</sup>
Hyphal Elements	440	Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum		Spores/m <sup>3</sup>
Pithomyces	198	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Spegazzinia	22	Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 1452 Spores/m<sup>3</sup>

**Detection Limits:** 22 Spores/m<sup>3</sup>

**Date Analyzed:** 12/27/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
Corapolis, PA 15108	Page 7 of 12
Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 7	Lab Sample Number: 01 8075-07
Sampling Location: Room A11	
Date Collected: 12/18/01	Volume/Area: 90 L
<b>TEST REQUESTED:</b> 1054 NON-VIABLE, Spore Trap Analysis	

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium	132	Spores/m <sup>3</sup>
Ascospores		Spores/m <sup>3</sup>
Basidiospores	66	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes		Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria	22	Spores/m <sup>3</sup>
Drechslera / Bipolaris group	66	Spores/m <sup>3</sup>
Colorless		Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia		Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown	22	Spores/m <sup>3</sup>
Hyphal Elements	44	Spores/m <sup>3</sup>
Torula herbarum	44	Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum	22	Spores/m <sup>3</sup>
Pithomyces	88	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

<b>TOTAL SPORES:</b>	<u>506</u>	<u>Spores/m<sup>3</sup></u>
<b>Detection Limits:</b>	22 Spores/m <sup>3</sup>	
<b>Date Analyzed:</b>	12/28/01	
<b>Analyst:</b>	Debra Gulick, B.S., MT (ASCP)	

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
Corappolis, PA 15108	Page 8 of 12
Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 8	Lab Sample Number: 01 8075-08
Sampling Location: Room A3	
Date Collected: 12/18/01	Volume/Area: 90 L

**TEST REQUESTED:** 1054 NON-VIABLE, Spore Trap Analysis

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium	132	Spores/m <sup>3</sup>
Ascospores	308	Spores/m <sup>3</sup>
Basidiospores	44	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes		Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group	44	Spores/m <sup>3</sup>
Colorless		Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	110	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown	66	Spores/m <sup>3</sup>
Hyphal Elements	396	Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum	22	Spores/m <sup>3</sup>
Pithomyces	88	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium	44	Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 1254 Spores/m<sup>3</sup>

**Detection Limits:** 22 Spores/m<sup>3</sup>

**Date Analyzed:** 12/28/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

*Certificate of Laboratory Analysis*

Michael Baker Corp. Date Received: 12/22/01  
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 Attn: Job ID: 01 8075  
 Project: 23970-011-0000-00001

Client Sample Number: 9 Lab Sample Number: 01 8075-09  
 Sampling Location: Outdoor  
 Date Collected: 12/18/01 Volume/Area: 90 L

TEST REQUESTED: 1054 NON-VIABLE, Spore Trap Analysis

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium	1408	Spores/m <sup>3</sup>
Ascospores	440	Spores/m <sup>3</sup>
Basidiospores	176	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes	3168	Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group		Spores/m <sup>3</sup>
Colorless	220	Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	88	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown		Spores/m <sup>3</sup>
Hyphal Elements	1716	Spores/m <sup>3</sup>
Oidium	88	Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum	44	Spores/m <sup>3</sup>
Pithomyces	88	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Spegazzinia	44	Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 7480 Spores/m<sup>3</sup>

**Detection Limits:** 44 Spores/m<sup>3</sup>

**Date Analyzed:** 12/28/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
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Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 10	Lab Sample Number: 01 8075-10
Sampling Location: Room A8	
Date Collected: 12/18/01	Volume/Area: 90 L
<u>TEST REQUESTED:</u> 1054 NON-VIABLE, Spore Trap Analysis	

<u>SPORE IDENTIFICATION</u>	<u>RESULTS</u>	<u>UNITS</u>
Cladosporium	704	Spores/m <sup>3</sup>
Ascospores	44	Spores/m <sup>3</sup>
Basidiospores	242	Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes	198	Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria	22	Spores/m <sup>3</sup>
Drechslera / Bipolaris group	22	Spores/m <sup>3</sup>
Colorless		Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia	154	Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown		Spores/m <sup>3</sup>
Hyphal Elements	660	Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum		Spores/m <sup>3</sup>
Pithomyces	242	Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Taeniocella	22	Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** 2310 Spores/m<sup>3</sup>

Detection Limits: 22 Spores/m<sup>3</sup>

Date Analyzed: 12/28/01

Analyst: Debra Gulick, B.S., MT (ASCP)



## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
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Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 11	Lab Sample Number: 01 8075-11
Sampling Location: Blank	
Date Collected: 12/18/01	Volume/Area: 0 L

**TEST REQUESTED:** 1054 NON-VIABLE, Spore Trap Analysis

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium		Spores/m <sup>3</sup>
Ascospores		Spores/m <sup>3</sup>
Basidiospores		Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes		Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group		Spores/m <sup>3</sup>
Colorless		Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia		Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown		Spores/m <sup>3</sup>
Hyphal Elements		Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum		Spores/m <sup>3</sup>
Pithomyces		Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** <11 Spores/m<sup>3</sup> Spores/m<sup>3</sup>

**Detection Limits:** 11 Spores/m<sup>3</sup>

**Notes:** Detection Limit = 0 when a field blank is submitted.

**Date Analyzed:** 12/28/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/28/01
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Attn:	Job ID: 01 8075
Project: 23970-011-0000-00001	

Client Sample Number: 12	Lab Sample Number: 01 8075-12
Sampling Location: Blank	
Date Collected: 12/18/01	Volume/Area: 0 L
<b>TEST REQUESTED:</b> 1054 NON-VIABLE, Spore Trap Analysis	

SPORE IDENTIFICATION	RESULTS	UNITS
Cladosporium		Spores/m <sup>3</sup>
Ascospores		Spores/m <sup>3</sup>
Basidiospores		Spores/m <sup>3</sup>
Smuts, Periconia, Myxomycetes		Spores/m <sup>3</sup>
Penicillium/Aspergillus group		Spores/m <sup>3</sup>
Alternaria		Spores/m <sup>3</sup>
Drechslera / Bipolaris group		Spores/m <sup>3</sup>
Colorless		Spores/m <sup>3</sup>
Arthrinium		Spores/m <sup>3</sup>
Curvularia		Spores/m <sup>3</sup>
Stachybotrys		Spores/m <sup>3</sup>
Trichocladium		Spores/m <sup>3</sup>
Unknown		Spores/m <sup>3</sup>
Hyphal Elements		Spores/m <sup>3</sup>
Torula herbarum		Spores/m <sup>3</sup>
Geotrichum		Spores/m <sup>3</sup>
Epicoccum		Spores/m <sup>3</sup>
Pithomyces		Spores/m <sup>3</sup>
Chaetomium		Spores/m <sup>3</sup>
Ulocladium		Spores/m <sup>3</sup>
Rusts		Spores/m <sup>3</sup>
Clear brown		Spores/m <sup>3</sup>

**TOTAL SPORES:** <11 Spores/m<sup>3</sup> Spores/m<sup>3</sup>

**Detection Limits:** 11 Spores/m<sup>3</sup>

**Notes:** Detection Limit = 0 when a field blank is submitted.

**Date Analyzed:** 12/28/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

## *Certificate of Laboratory Analysis*

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/27/01
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Attn:	Job ID: 01 8087
Project: 23970-011-0000-00001	

Client Sample Number: B6B	Lab Sample Number: 01 8087-01
Sampling Location: Room B6	
Date Collected: 12/18/01	Volume/Area: 56.6 L
<b><u>TEST REQUESTED:</u></b> 1030 AIR, Total FUNGAL Count w/Identifications	
Total FUNGAL Count: 580 cfu/m <sup>3</sup>	
FUNGUS Isolated:	72%
Cladosporium species	
Sterilia mycelia	19%
Penicillium species	9%
<b><u>Detection Limits:</u></b> 18 cfu/m <sup>3</sup>	
<b><u>Date Analyzed:</u></b> 12/27/01	
<b><u>Analyst:</u></b> Debra Gulick, B.S., MT (ASCP)	

Client Sample Number: A10B	Lab Sample Number: 01 8087-02
Sampling Location: Room A10	
Date Collected: 12/18/01	Volume/Area: 56.6 L
<b><u>TEST REQUESTED:</u></b> 1030 AIR, Total FUNGAL Count w/Identifications	
Total FUNGAL Count: 830 cfu/m <sup>3</sup>	
FUNGUS Isolated:	66%
Cladosporium species	
Penicillium species	16%
Curvularia species	9%
<b><u>Detection Limits:</u></b> 18 cfu/m <sup>3</sup>	
<b><u>Date Analyzed:</u></b> 12/27/01	
<b><u>Analyst:</u></b> Debra Gulick, B.S., MT (ASCP)	

## Certificate of Laboratory Analysis

Michael Baker Corp.	Date Received: 12/22/01
420 Rouser Rd. Airport Business Park Bldg. 3	Date Reported: 12/27/01
Corapolis, PA 15108	Page 2 of 3
Attn:	Job ID: 01 8087
Project: 23970-011-0000-00001	

Client Sample Number: C3B	Lab Sample Number: 01 8087-03
Sampling Location: Room C3	
Date Collected: 12/18/01	Volume/Area: 56.6 L

**TEST REQUESTED:** 1030 AIR, Total FUNGAL Count w/Identifications

Total FUNGAL Count: 1100 cfu/m<sup>3</sup>

FUNGUS Isolated:	Cladosporium species	61%
	Penicillium species	18%
	Sterilia mycelia	18%
	Aspergillus species	2%

**Detection Limits:** 18 cfu/m<sup>3</sup>

**Date Analyzed:** 12/27/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

Client Sample Number: B13B	Lab Sample Number: 01 8087-04
Sampling Location: Room B13	
Date Collected: 12/18/01	Volume/Area: 56.6 L

**TEST REQUESTED:** 1030 AIR, Total FUNGAL Count w/Identifications

Total FUNGAL Count: 230 cfu/m<sup>3</sup>

FUNGUS Isolated:	Cladosporium species	54%
	Penicillium species	23%
	Sterilia mycelia	15%

**Detection Limits:** 18 cfu/m<sup>3</sup>

**Date Analyzed:** 12/27/01

**Analyst:** Debra Gulick, B.S., MT (ASCP)

**OBIOLOGY LABORATORY**

**SSOCIATES, INCORPORATED**

MICROBIOLOGY SPECIALISTS

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ael Baker Corp.  
Rouser Rd. Airport Business Park Bldg. 3  
ppolis, PA 15108

Date Received: 12/22/01  
Date Reported: 12/27/01  
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Job ID: 01 8087

ect: 23970-011-0000-00001

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**Sample Number:** A38                      **Lab Sample Number:** 01 8087-05  
**Sampling Location:** Room A3  
**Collected:** 12/18/01                      **Volume/Area:** 56.6 L

**REQUESTED:** 1030 AIR, Total FUNGAL Count w/Identifications

**FUNGAL Count:** 870 cfu/m<sup>3</sup>

**IS Isolated:** Cladosporium species 76%  
Sterilia mycelia 13%  
Penicillium species 9%

**ion Limits:** 18 cfu/m<sup>3</sup>

**alyzed:** 12/27/01

**t:** Debra Gulick, B.S., MT (ASCP)

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**Sample Number:** OUTB                      **Lab Sample Number:** 01 8087-06  
**Sampling Location:** Outside  
**Collected:** 12/18/01                      **Volume/Area:** 56.6 L

**REQUESTED:** 1030 AIR, Total FUNGAL Count w/Identifications

**FUNGAL Count:** 2700 cfu/m<sup>3</sup>

**IS Isolated:** Cladosporium species 83%  
Penicillium species 11%  
Sterilia mycelia 6%

**ion Limits:** 18 cfu/m<sup>3</sup>

**alyzed:** 12/27/01

**t:** Debra Gulick, B.S., MT (ASCP)

*Certificate of Laboratory Analysis*

Michael Baker Corp. Date Received: 12/22/01  
 420 Rouser Rd. Airport Business Park Bldg. 3 Date Reported: 12/27/01  
 Corapolis, PA 15108 Page 3 of 3  
 Attn: Job ID: 014 8086  
 Project: 23970-011-0000-00001

**Client Sample Number:** A3A **Lab Sample Number:** 014 8086-05  
**Sampling Location:** Room A3  
**Date Collected:** 12/18/01 **Volume/Area:** 56.6 L  
TEST REQUESTED: 1005 AIR, Total BACTERIAL Count w/Identifications  
 Total BACTERIAL Count: 650 cfu/m<sup>3</sup>  
 BACTERIA Isolated: Bacillus species 66%  
 Micrococcus species 20%  
 Coag-negative Staphylococcus species 14%  
Detection Limits: 18 cfu/m<sup>3</sup>  
Date Analyzed: 12/27/01  
Analyst: Kay Frick, B.S., MT (ASCP)

**Client Sample Number:** OUTA **Lab Sample Number:** 014 8086-06  
**Sampling Location:** Outside  
**Date Collected:** 12/18/01 **Volume/Area:** 56.6 L  
TEST REQUESTED: 1005 AIR, Total BACTERIAL Count w/Identifications  
Results: Count may be underestimated due to fungal growth.  
 Total BACTERIAL Count: 510 cfu/m<sup>3</sup>  
 BACTERIA Isolated: Bacillus species 79%  
 Multiple nonfermentative gram-neg rods 21%  
Detection Limits: 18 cfu/m<sup>3</sup>  
Date Analyzed: 12/27/01  
Analyst: Kay Frick, B.S., MT (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.  
 420 Rouser Rd. Airport Office Park Bldg 3  
 Coraopolis, PA 15108  
 Attn:  
 Project: 23970-011-0000-00001

Date Received: 12/22/01  
 Date Reported: 1/2/02  
 Page 1 of 1  
 Job ID: 01 8088

<b>Client Sample Number:</b> 85966	<b>Lab Sample Number:</b> 01 8088-01
<b>Sampling Location:</b> Room B6 Condensate Drain Tube - AC Serving Room B5	
<b>Date Collected:</b> 12/18/01	<b>Volume/Area:</b>

**TEST REQUESTED:** 1033 BULK, Total FUNGAL Count w/identifications

Total FUNGAL Count: 5800 cfu/g

FUNGUS Isolated:	Black yeast	59%
	Pithomyces species	22%
	Acremonium-like species	19%

**Detection Limits:** 220 cfu/g

**Date Analyzed:** 12/31/01

**Analyst:** Patricia R. Vestal, M.S., SM (ASCP)

<b>Client Sample Number:</b> 85976	<b>Lab Sample Number:</b> 01 8088-02
<b>Sampling Location:</b> Room B7 Condensate Drip Pan - AC Serving Room B8	
<b>Date Collected:</b> 12/18/01	<b>Volume/Area:</b>

**TEST REQUESTED:** 1033 BULK, Total FUNGAL Count w/identifications

**Results:** Unable to determine the weight of sample due to moisture content; sample treated as wipe.

Total FUNGAL Count: 3200 cfu/plt

FUNGUS Isolated:	Yeast (mixed species)	56%
	Cladosporium species	44%

**Detection Limits:** 100 cfu/plt

**Date Analyzed:** 12/31/01

**Analyst:** Patricia R. Vestal, M.S., SM (ASCP)

## Certificate of Laboratory Analysis

Michael Baker Corp.

Date Received: 12/22/01

420 Rouser Rd. Airport Business Park Bldg. 3

Date Reported: 12/26/01

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Attn:

Job ID: 01 8076

Project: 23970.011.0000.00001

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**Client Sample Number:** 85971

**Lab Sample Number:** 01 8076-01

**Sampling Location:** Room A8 Northwest Corner

**Date Collected:** 00/00/00

**Volume/Area:**

**TEST REQUESTED:** 1050 BULK, Direct Microscopic Exam

**Results:** Occasional Stachybotrys spores seen.  
Occasional algae seen.

**Detection Limits:** N / A

**Date Analyzed:** 12/26/01

**Analyst:** Ann Atkinson, B.S., MT (ASCP)

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## Certificate of Laboratory Analysis

Michael Baker Corp.

420 Rouser Rd. Airport Business Park Bldg. 3

Corapolis, PA 15108

Attn:

Project: 23970-011-0000-00001

Date Received: 12/22/01

Date Reported: 12/27/01

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Job ID: 01 8078

---

**Client Sample Number:** T1 **Lab Sample Number:** 01 8078-01

**Sampling Location:** Room B6-West Return Duct Lining

**Date Collected:** 12/19/01

**Volume/Area:**

**TEST REQUESTED:** 1051 WIPE, Direct Microscopic Exam

**Results:** Occasional unidentified brown spores seen.  
Occasional Epicoccum spores seen.  
Occasional smuts seen.  
Few hyphal elements seen.

**Detection Limits:** N/A

**Date Analyzed:** 12/27/01

**Analyst:** Ann Atkinson, B.S., MT (ASCP)

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**Client Sample Number:** T2 **Lab Sample Number:** 01 8078-02

**Sampling Location:** Room A11-Supply Duct Lining

**Date Collected:** 12/19/01

**Volume/Area:**

**TEST REQUESTED:** 1051 WIPE, Direct Microscopic Exam

**Results:** Occasional Drechslera spores seen. Few brown unidentified spores seen.  
Occasional Spegazzinia spores seen. Occasional Epicoccum spores seen.  
Occasional Curvularia spores seen. Moderate hyphal elements seen.

**Detection Limits:** N/A

**Date Analyzed:** 12/27/01

**Analyst:** Ann Atkinson, B.S., MT (ASCP)

*Subcutaneous-Mouse LD50: 2250 mg/kg*  
*Unreported-Mouse LD50: 2 g/kg*  
*Intraperitoneal-Mouse LD50: 640 mg/kg*  
*Inhalation-Rabbit, adult LCLo: 55,000 ppm/40M*  
*Skin-Rabbit, adult LD50: 12,124 mg/kg*

*NRTXDN 8,237,87 (21)*  
*GISAAA 45(12),64,80 (22)*  
*ANYAA9 243,104,75 (23)*  
*JIDHAN 26,69,44 (24)*  
*AIHAAP 30,470,69 (25)*

#### Consensus Reports:

Community Right-To-Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

#### Standards and Recommendations

OSHA PEL: TWA 100 ppm; STEL 150 ppm  
ACGIH TLV: TWA 50 ppm (skin); BEI: 1 mg(toluene)/L in venous blood at end of shift; 20 ppm toluene in end-exhaled air during shift; Not Classifiable as a Human Carcinogen  
DFG MAK: 50 ppm (190 mg/m<sup>3</sup>); BAT: 340 µg/dL in blood at end of shift  
NIOSH REL: (Toluene) TWA 100 ppm; CL 200 ppm/10M  
DOT Classification: 3; Label: Flammable Liquid

#### SAFETY PREL

Poison by intraperitoneal route. Moderately toxic by intravenous and subcutaneous routes. Mildly toxic by inhalation. An experimental teratogen. Human systemic effects by inhalation: CNS recording changes, hallucinations or distorted perceptions, motor activity changes, antipsychotic, psychophysiological test changes, and bone marrow changes. Experimental reproductive effects. Mutation data reported. A human eye irritant. An experimental skin and severe eye irritant.

Toluene is derived from coal tar, and commercial grades usually contain small amounts of benzene as an impurity. Inhalation of 200 ppm of toluene for 8 hours may cause impairment of coordination and reaction time; with higher concentrations (up to 800 ppm) these effects are increased and are observed in a shorter time. In the few cases of acute toluene poisoning reported, the effect has been that of a narcotic, the workman passing through a stage of intoxication into one of coma. Recovery following removal from exposure has been the rule. An occasional report of chronic poisoning describes an anemia and leukopenia, with biopsy showing a bone marrow hypoplasia. These effects, however, are less common in people working with toluene, and they are not as severe. At 200–500 ppm, headache, nausea, eye irritation, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher concentrations, the above complaints are increased and in addition, anemia, leukopenia, and enlarged liver may be found in rare cases. A common air contaminant, emitted from modern building materials (CENEAR 69,22,91). Used in production of drugs of abuse.

Flammable liquid. A very dangerous fire hazard when exposed to heat, flame, or oxidizers. Explosive in the form of vapor when exposed to heat or flame. Explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione, dinitrogen tetroxide, concentrated nitric acid, H<sub>2</sub>SO<sub>4</sub> + HNO<sub>3</sub>, N<sub>2</sub>O<sub>4</sub>, AgClO<sub>4</sub>, BrF<sub>3</sub>, UF<sub>6</sub>, sulfur dichloride. Forms an explosive mixture with tetranitromethane. Can react vigorously with oxidizing materials. To fight fire, use foam, CO<sub>2</sub>, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes.

**Analytical Methods:** For occupational chemical analysis use NIOSH: Hydrocarbons, Aromatic, 1501; Hydrocarbons, Bp: 36-126°C, 1500.

**Class:** Mutagen; Primary Irritant; Food Additive; Reproductively Active; Standards or Recommendations

**TOLUENE [Hawley]**

DPIM: TGK750

Hazard Rating: 3

CAS: 108-88-3

DOT Number: UN 1294

M Formula: C<sub>7</sub>H<sub>8</sub>

M Weight: 92.15

**Properties:**

Colorless liquid; benzol-like odor. Melting point: -95 to -94.5°, freezing point: -95°, boiling point: 110.4°, flash point: 40°F (CC), Underwriters Laboratory Classification: 75-80, lower explosive limit: 1.27%, upper explosive limit: 7%, density: 0.866 @ 20°/4°, autoignition temperature: 996°F, vapor pressure: 36.7 millimeter @ 30°, vapor density: 3.14. Insoluble in water; soluble in acetone; miscible in absolute alcohol, ether, chloroform.

**Synonyms:**

ANTISAL 1a  
 BENZENE, METHYL-  
 METHACIDE  
 METHANE, PHENYL-  
 METHYLBENZENE [Hawley]  
 METHYLBENZOL  
 NCI-C07272  
 PHENYLMETHANE [Hawley]  
 RCRA WASTE NUMBER U220  
 TOLUEEN (DUTCH)  
 TOLUEN (CZECH)  
 TOLUOL (DOT)  
 TOLUOLO (ITALIAN)  
 TOLU-SOL [Hawley]

**TOXICITY DATA with REFERENCE**

*Eye effects-Human 300 ppm*

*JHTAB 25,282,43 (1)*

*Skin-Rabbit, adult 435 mg Mild irritation effects*

*UCDS\*\* 7/23/70 (2)*

*Skin-Rabbit, adult 500 Moderate irritation effects*

*FCTOD7 20,563,82 (3)*

*Eye effects-Rabbit, adult 870 µg Mild irritation effects*

*UCDS\*\* 7/23/70 (4)*

*Eye effects-Rabbit, adult 2 mg/24H Severe irritation effects*

*28ZPAK -,23,72 (5)*

*Eye effects-Rabbit, adult 100 mg/30S rns Mild irritation effects*

*FCTOD7 20,573,82 (6)*

*oms-grasshopper-Inhalation 562 mg/L*

*MUREAV 113,467,83 (7)*

*Cytogenetic Analysis-Rat-Subcutaneous 12 g/kg/12D-I*

*GTPZAB 17(3),24,73 (8)*

*Inhalation-Mouse TCLO:400 ppm/7H (female 7-16D post):Reproductive effects*

*FAATDF 6,145,86 (9)*

*Oral-Mouse TDLo:9 g/kg (female 6-15D post):Teratogenic effects*

*TJADAB 19,41A,79 (10)*

*Oral-Human,LDLo:50 mg/kg*

*YAKUD5 22,883,80 (11)*

*Inhalation-Human TCLO:200 ppm:BRN,Central nervous system effects,Blood effects*

*JAMAAP 123,1106,43 (12)*

*Inhalation-Man TCLO:100 ppm:Central nervous system effects*

*WEHRBJ 9,131,72 (13)*

*Oral-Rat LD50:5000 mg/kg*

*AMIHAB 19,403,59 (14)*

*Inhalation-Rat LCLo:4000 ppm/4H*

*AIHAAP 30,470,69 (15)*

*Intraperitoneal-Rat LD50:1332 mg/kg*

*ENVRAL 40,411,86 (16)*

*Intravenous-Rat LD50:1960 mg/kg*

*MELAAD 54,486,63 (17)*

*Unreported-Rat LD50:6900 mg/kg*

*GISAAA 45(12),64,80 (18)*

*Inhalation-Mouse LC50:400 ppm/24H*

*NRTXDN 2,567,81 (19)*

*Intraperitoneal-Mouse LD50:59 mg/kg*

*NRTXDN 2,567,81 (20)*

**d-LIMONENE**

DPIM: LFU000

Hazard Rating: 3

CAS: 5989-27-5

M Formula: C<sub>10</sub>H<sub>16</sub>

M Weight: 136.26

**Properties:**

Colorless liquid or oil; citrus odor. Boiling point: 175.5–176°, density: 0.8402 @ 25°/4°, refractive index: 1.471. Miscible with alcohol, fixed oils; slightly soluble in glycerin; insoluble in propylene glycol, water.

**Synonyms:**

FEMA No. 2633

(+)–4-ISOPROPENYL-1-METHYLCYCLOHEXENE

d-(+)-LIMONENE

(+)–R-LIMONENE

d-p-MENTHA-1,8-DIENE

p-MENTHA-1,8-DIENE

(R)-1-METHYL-4-(1-METHYLETHENYL)-CYCLOHEXENE

NCI-C55572

**TOXICITY DATA with REFERENCE***Oral-Rat TDLo: 20,083 mg/kg (9-15D preg): Reproductive effects*

OYYAA2 10,179,75 (1)

*Oral-Rat TDLo: 20,083 mg/kg (9-15D preg): Teratogenic effects*

OYYAA2 10,179,75 (2)

*Oral-Rat TDLo: 38,625 mg/kg/2Y-C: Carcinogenic effects*

NTPTR\* NTP-TR-347,90 (3)

*Oral-Mouse TDLo: 67 g/kg/39W-1: Equivocal tumorigenic agent*

JNCIAM 35,771,65 (4)

*Oral-Rat LD50: 4400 mg/kg*

NIIRDN 6,887,82 (5)

*Intraperitoneal-Rat LD50: 3600 mg/kg*

NIIRDN 6,887,82 (6)

*Intravenous-Rat LD50: 110 mg/kg*

NIIRDN 6,887,82 (7)

*Oral-Mouse LD50: 5600 mg/kg*

NIIRDN 6,887,82 (8)

*Intraperitoneal-Mouse LD50: 600 mg/kg*

OYYAA2 8,1439,74 (9)

*Intraduodenal-Mouse LDLo: 1 g/kg*

OYYAA2 8,1439,74 (10)

**Consensus Reports:**

Reported in EPA TSCA Inventory.

**SAFETY PROFILE:**

Poison by intravenous route. Moderately toxic by intraperitoneal and intraduodenal routes. Mildly toxic by ingestion. Experimental reproductive effects. Questionable carcinogen with experimental tumorigenic and teratogenic data. Reacts explosively with iodine pentafluoride + tetrafluoroethylene (the pentafluoride reacts exothermically with the inhibitor and initiates explosive polymerization of the TFE). When heated to decomposition it emits acid smoke and irritating fumes. Used as a food additive, flavor agent, packaging material, as an inhibitor of tetrafluoroethylene polymerization, and as a gallstone solubilizer.

**Class:** Food Additive; Questionable Carcinogen; Reproductively Active

with trinitromethane, hydrogen peroxide (similar in power and sensitivity to glyceryl nitrate). Reacts with barium perchlorate to form the highly explosive propyl perchlorate. Ignites on contact with dioxygenyl tetrafluoroborate, chromium trioxide, potassium tert-butoxide (after a delay). Reacts with oxygen to form dangerously unstable peroxides. Vigorous reaction with sodium dichromate + sulfuric acid, aluminum (after a delay period). Reacts violently with  $H_2$  + Pd, nitroform, oleum,  $COCl_2$ , Al triisopropoxide, oxidants. Can react vigorously with oxidizing materials. To fight fire, use  $CO_2$ , dry chemical, alcohol foam. When heated to decomposition it emits acrid smoke and fumes. See also ALCOHOLS.

**Analytical Methods:** For occupational chemical analysis use NIOSH: Alcohols I, 1400.

**Class:** Food Additive; Questionable Carcinogen; Reproductively Active; Standards or Recommendations

Oral-Mouse LD50: 3600 mg/kg  
Inhalation-Mouse LCLo: 12,800 ppm/3H  
Intraperitoneal-Mouse LD50: 4477 mg/kg  
Subcutaneous-Mouse LDLo: 6000 mg/kg  
Intravenous-Mouse LD50: 1509 mg/kg  
Oral-Dog, adult LD50: 4797 mg/kg  
Intravenous-Dog, adult LDLo: 5120 mg/kg  
Intravenous-Cat, adult LDLo: 1963 mg/kg  
Oral-Rabbit, adult LD50: 6410 mg/kg  
Skin-Rabbit, adult LD50: 12,800 mg/kg

GISAAA 43(1), 8,78 (17)  
IAEC\*\* 17JUN74 (18)  
EVHPAZ 61,321,85 (19)  
HBTXAC 1,172,56 (20)  
EVHPAZ 61,321,85 (21)  
JLCMAK 29,561,44 (22)  
JLCMAK 29,561,44 (23)  
HBTXAC 1,172,55 (24)  
FAONAU 48A,114,70 (25)  
NPIRI\* 1,100,74 (26)

### Consensus Reports:

IARC Cancer Review: Group 3 IMEMDT 7,229,87. The isopropyl alcohol strong acid manufacturing process is on the Community Right-To-Know List. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

### Standards and Recommendations

OSHA PEL: TWA 400 ppm; STEL 500 ppm  
ACGIH TLV: TWA 400 ppm; STEL 500 ppm  
DFG MAK: 400 ppm (980 mg/m<sup>3</sup>)  
NIOSH REL: (Isopropyl Alcohol) TWA 400 ppm; CL 800 ppm/15M  
DOT Classification: 3; Label: Flammable Liquid

### SAFETY PROFILE:

Moderately toxic to humans by an unspecified route. Moderately toxic experimentally by intravenous and intraperitoneal routes. Mildly toxic by skin contact. Human systemic effects by ingestion or inhalation: flushing, pulse rate decrease, blood pressure lowering, anesthesia, narcosis, headache, dizziness, mental depression, hallucinations, distorted perceptions, dyspnea, respiratory depression, nausea or vomiting, coma. Experimental teratogenic and reproductive effects. Mutation data reported. An eye and skin irritant. Questionable carcinogen.

The single lethal dose for a human adult is about 250 mL, although as little as 100 mL can be fatal. It can cause corneal burns and eye damage. Acts as a local respiratory irritant and in high concentration as a narcotic. It has good warning properties because it causes a mild irritation of the eyes, nose, and throat at a concentration level of 400 ppm. It may induce a mild narcosis, the effects of which are usually transient, and it is somewhat less toxic than the normal isomer, but twice as volatile.

There is some evidence that humans can acquire a slight tolerance to this material. It is absorbed by the skin, but single or repeated applications on the skin of rats, rabbits, dogs, or human beings induced no untoward effects. It acts very much like ethanol in regard to absorption, metabolism, and elimination but with a stronger narcotic action. Chronic injuries have been detected in animals. Workers producing isopropanol show an excess of sinus and laryngeal cancers. This may be caused, completely or in part, by the by-product, isopropyl oil. Humans have ingested up to 20 mL diluted with water and noticed only a sensation of heat and slight lowering of the blood pressure. There are, however, reports of serious illness from as little as 10 mL taken internally. A common air contaminant.

Flammable liquid. A very dangerous fire hazard when exposed to heat, flame, or oxidizers. Moderately explosive when exposed to heat or flame. Reacts with air to form dangerous peroxides. The presence of 2-butanone increases the reaction rate for peroxide formation. Hydrogen peroxide sharply reduces the autoignition temperature. Violent explosive reaction when heated with aluminum isopropoxide + crotonaldehyde + heat. Forms explosive mixtures

**ISOPROPYL ALCOHOL [Hawley]**

DPIM: INJ000

Hazard Rating: 3

CAS: 67-63-0

DOT Number: UN 1219

M Formula: C<sub>3</sub>H<sub>8</sub>O

M Weight: 60.11

Structure: (CH<sub>3</sub>)<sub>2</sub>CHOH**Properties:**

Clear, colorless liquid; slight odor, slightly bitter taste. Melting point: -88.5 to -89.5°, boiling point: 82.5°, lower explosive limit: 2.5%, upper explosive limit: 12%, flash point: 53°F (CC), density: 0.7854 @ 20°/4°, refractive index: 1.377 @ 20°, vapor density: 2.07, Underwriters Laboratory Classification: 70, freezing point: -89.5°, autoignition temperature: 852°F. Miscible with water, alcohol, ether, chloroform; insoluble in salt solns.

**Synonyms:**

ALCOOL ISOPROPILICO (ITALIAN)  
ALCOOL ISOPROPYLIQUE (FRENCH)  
DIMETHYLCARBINOL [Hawley]  
ISOHOL  
ISOPROPANOL (DOT)  
ISO-PROPYLALKOHÖL (GERMAN)  
LUTOSOL  
PETROHOL  
i-PROPANOL (GERMAN)  
PROPAN-2-OL  
2-PROPANOL [Hawley]  
sec-PROPYL ALCOHOL (DOT)  
i-PROPYLALKOHÖL (GERMAN)  
SPECTRAR

**TOXICITY DATA with REFERENCE**

<i>Skin-Rabbit, adult 500 mg Mild irritation effects</i>	NTIS** AD-A106-944 (1)
<i>Eye effects-Rabbit, adult 16 mg</i>	AJOPAA 29,1363,46 (2)
<i>Eye effects-Rabbit, adult 10 mg Moderate irritation effects</i>	TXAPA9 55,501,80 (3)
<i>Cytogenetic Analysis-Saccharomyces cerevisiae 200 mmol/tube</i>	HEREAY 33,457,47 (4)
<i>Cytogenetic Analysis-Rat-Inhalation 1030 µg/m<sup>3</sup>/16W-1</i>	GTPZAB 25(7),33,81 (5)
<i>Oral-Rat TDLo:6480 mg/kg (male 26W pre):Reproductive effects</i>	GISAAA 43(1),8,78 (6)
<i>Inhalation-Rat TCLo:10,000 ppm/7H (female 1-19D post):Teratogenic effects</i>	FCTOD7 26,247,88 (7)
<i>Oral-Man TDLo:14,432 mg/kg:Central nervous system effects,Cardiovascular effects,Pulmonary system effects</i>	NEJMAG 277,699,67 (8)
<i>Oral-Human TDLo:223 mg/kg:Central nervous system effects,Cardiovascular effects</i>	JLCMAK 12,326,27 (9)
<i>Oral-Man LDLo:5272 mg/kg</i>	AJCPAI 38,144,62 (10)
<i>Oral-Human LDLo:3570 mg/kg:Central nervous system effects,Pulmonary system effects,Gastrointestinal tract effects</i>	34ZIAG -,339,69 (11)
<i>Unreported-Man LDLo:2770 mg/kg</i>	85DCAI 2,73,70 (12)
<i>Oral-Rat LD50:5045 mg/kg</i>	GISAAA 43(1),8,78 (13)
<i>Inhalation-Rat LCLo:16,000 ppm/4H</i>	JIDHAN 31,343,49 (14)
<i>Intraperitoneal-Rat LD50:2735 mg/kg</i>	EVHPAZ 61,321,85 (15)
<i>Intravenous-Rat LD50:1099 mg/kg</i>	EVHPAZ 61,321,85 (16)

### Standards and Recommendations

OSHA PEL: TWA 50 ppm; STEL 75 ppm

ACGIH TLV: TWA 50 ppm; STEL 75 ppm

DFG MAK: 100 ppm (400 mg/m<sup>3</sup>)

NIOSH REL: (Ketones) TWA 200 mg/m<sup>3</sup> (Proposed: BEI 2 mg/L MIBK in urine, end of shift)

DOT Classification: 3; Label: Flammable Liquid

### SAFETY

A poison by intraperitoneal route. Moderately toxic by ingestion. Mildly toxic by inhalation. Very irritating to the skin, eyes, and mucous membranes. An experimental teratogen. A human systemic irritant by inhalation. Narcotic in high concentration. Flammable liquid when exposed to heat, flame, or oxidizers. Ignites on contact with potassium-tert-butoxide. Moderately explosive in the form of vapor when exposed to heat or flame. May form explosive peroxides upon exposure to air. Can react vigorously with reducing materials. To fight fire, use alcohol foam, CO<sub>2</sub>, dry chemical. Incompatible with air, potassium-tert-butoxide. See also KETONES.

**Analytical Methods:** For occupational chemical analysis use NIOSH: Ketones I (Desorption in CS<sub>2</sub>), 1300.

**Class:** Primary Irritant; Food Additive; Reproductively Active; Standards or Recommendations



## HEXONE [Hawley]

DPIM: HFG500

Hazard Rating: 3

CAS: 108-10-1

DOT Number: UN 1245

M Formula: C<sub>6</sub>H<sub>12</sub>O

M Weight: 100.18

Structure: CH<sub>3</sub>CO-CH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>

### Properties:

Colorless mobile liquid; **fruity**, ethereal odor. Freezing point: -80.2°, boiling point: 116.8°, lower explosive limit: 1.4%, upper explosive limit: 7.5%, flash point: 62.6°F, density: 0.801, autoignition temperature: 858°F, vapor pressure: 16 millimeter @ 20°. Miscible with alcohol, ether; soluble in water.

### Synonyms:

FEMA No. 2731  
 HEXON (CZECH)  
 ISOBUTYL-METHYLKETON (CZECH)  
 ISOBUTYL METHYL KETONE  
 ISOPROPYLACETONE [Hawley]  
 METHYL-ISOBUTYL-CETONE (FRENCH)  
 METHYLISOBUTYLKETON (DUTCH, GERMAN)  
 METHYL ISOBUTYL KETONE (ACGIH, DOT)  
 4-METHYL-PENTAN-2-ON (DUTCH, GERMAN)  
 4-METHYL-2-PENTANON (CZECH)  
 2-METHYL-4-PENTANONE  
 4-METHYL-2-PENTANONE (FCC)  
 METILISOBUTILCHETONE (ITALIAN)  
 4-METILPENTAN-2-ONE (ITALIAN)  
 METYLOIZOBUTYLOKETON (POLISH)  
 MIBK [Hawley]  
 MIK  
 RCRA WASTE NUMBER U161  
 SHELL MIBK

### TOXICITY DATA with REFERENCE

<i>Eye effects-Human 200 ppm/15M</i>	JIHTAB 28,262,46 (1)
<i>Skin-Rabbit, adult 500 mg/24H Mild irritation effects</i>	28ZPAK -,42,72 (2)
<i>Eye effects-Rabbit, adult 500 mg/24H Mild irritation effects</i>	85JCAE -,284,86 (3)
<i>Eye effects-Rabbit, adult 40 mg Severe irritation effects</i>	UCDS** 4/25/58 (4)
<i>Eye effects-Rabbit, adult 500 mg/24H Mild irritation effects</i>	28ZPAK -,42,72 (5)
<i>Inhalation-Mouse TLo: 3000 ppm/6H (female 6-15D post): Teratogenic effects</i>	FAATDF 8,310,87 (6)
<i>Oral-Rat LD50: 2080 mg/kg</i>	UCDS** 4/25/58 (7)
<i>Intraperitoneal-Rat LD50: 400 mg/kg</i>	38MKAJ 2C,4748,82 (8)
<i>Oral-Mouse LD50: 2671 mg/kg</i>	TOLED5 30,13,86 (9)
<i>Inhalation-Mouse LC50: 23,300 mg/m<sup>3</sup></i>	GTPZAB 17(11),52,73 (10)
<i>Intraperitoneal-Mouse LD50: 268 mg/kg</i>	SCCUR* -,7,61 (11)
<i>Oral-Guinea Pig, adult LD50: 1600 mg/kg</i>	38MKAJ 2C,4748,82 (12)

### Consensus Reports:

Reported in EPA TSCA Inventory. Community Right-To-Know List.

respiratory tract and narcotic in high concentrations. Inhalation of 5000 ppm for 1/6 hour produces marked vertigo; 2500–1000 ppm for 12 hours produces drowsiness, fatigue, loss of appetite, paresthesia in distal extremities; 2500–500 ppm for 1/6 hour produces muscle weakness, cold pulsation in extremities, blurred vision, headache, anorexia, and onset of polyneuropathy; 2000 ppm for 1/6 hour produces no symptoms; 1000–500 ppm for 3–6 months produces fatigue, loss of appetite, distal paresthesia. Dangerous if abused.

Flammable liquid. A very dangerous fire and explosion hazard when exposed to heat or flame; can react vigorously with oxidizing materials. Mixtures with dinitrogen tetroxide may explode at 28°. To fight fire, use CO<sub>2</sub>, dry chemical. When heated to decomposition it emits acrid smoke and fumes.

**Analytical Methods:** For occupational chemical analysis use NIOSH: Hydrocarbons, Bp: 36–126°C, 1500.

**Class:** Mutagen; Primary Irritant; Food Additive; Reproductively Active; Standards or Recommendations

**n-HEXANE [Hawley]**

DPIM: HEN000

Hazard Rating: 3

CAS: 110-54-3

DOT Number: UN 1208

M Formula: C<sub>6</sub>H<sub>14</sub>

M Weight: 86.20

**Properties:**

Colorless clear liquid; faint odor. Freezing point: -93.6°, boiling point: 69°, Underwriters Laboratory Classification: 90-95, lower explosive limit: 1.2%, upper explosive limit: 7.5%, flash point: -9.4°F, density: 0.655 @ 25°/4°, autoignition temperature: 437°F, vapor pressure: 100 millimeter @ 15.8°, vapor density: 2.97. Insoluble in water; miscible in chloroform, ether, alcohol. Very volatile liquid.

**Synonyms:**

ESANI (ITALIAN)  
GETTYSOLVE-B  
HEKSAN (POLISH)  
HEXANE (DOT)  
HEXANEN (DUTCH)  
HEXANES (FCC)  
NCI-C60571

**TOXICITY DATA with REFERENCE**

*Eye effects-Rabbit, adult 10 mg Mild irritation effects*

TXAPA9 55,501,80 (1)

*Cytogenetic Analysis-Hamster: fibroblast 500 mg/L*

FCTOD7 22,623,84 (2)

*Inhalation-Rat TCLo: 10,000 ppm/7H (female 15D pre): Reproductive effects*

TOXID9 1,152,81 (3)

*Inhalation-Rat TCLo: 5000 ppm/20H (female 6-19D post): Teratogenic effects*

NTIS\*\* DE88-006812 (4)

*Inhalation-Human TCLo: 190 ppm/8W: Peripheral nervous system effects*

AJIMD8 10,111,86 (5)

*Oral-Rat LD50: 28,710 mg/kg*

TXAPA9 19,699,71 (6)

*Intraperitoneal-Rat LDLo: 9100 mg/kg*

TXAPA9 1,156,59 (7)

*Inhalation-Mouse LCLo: 120 g/m<sup>3</sup>*

AEPPAE 143,223,29 (8)

**Consensus Reports:**

Reported in EPA TSCA Inventory.

**Standards and Recommendations**

OSHA PEL: TWA 50 ppm

ACGIH TLV: (Proposed: TWA 50 ppm (skin)); BEI: 5 mg(2,5-hexanedione)/L in urine at end of shift; 40 ppm n-hexane in end-exhaled air during shift

DFG MAK: 50 ppm (180 mg/m<sup>3</sup>)

NIOSH REL: TWA (Alkanes) 350 mg/m<sup>3</sup>

DOT Classification: 3; Label: Flammable Liquid

**SAFETY PRECAUTIONS:**

Slightly toxic by ingestion and inhalation. Human systemic effects: hallucinations, structural change in nerve or sheath. Experimental teratogenic and reproductive effects. Mutation data reported. An eye irritant. Can cause a motor neuropathy in exposed workers. May be irritating to

pulmonary changes, alteration in gastric secretion, nausea or vomiting, other gastrointestinal changes, menstrual cycle changes, and body temperature decrease. Can also cause glandular effects in humans. Human reproductive effects by ingestion, intravenous, and intrauterine routes: changes in female fertility index. Effects on newborn include: changes in Apgar score, neonatal measures or effects, and drug dependence. Experimental reproductive effects. Human mutation data reported. An eye and skin irritant.

The systemic effect of ethanol differs from that of methanol. Ethanol is rapidly oxidized in the body to carbon dioxide and water, and, in contrast to methanol, no cumulative effect occurs. Though ethanol possesses narcotic properties, concentrations sufficient to produce this effect are not reached in industry. Concentrations below 1000 ppm usually produce no signs of intoxication. Exposure to concentrations over 1000 ppm may cause headache, irritation of the eyes, nose, and throat, and, if continued for an hour, drowsiness and lassitude, loss of appetite, and inability to concentrate. There is no concrete evidence that repeated exposure to ethanol vapor results in cirrhosis of the liver. Ingestion of large doses can cause alcohol poisoning. Repeated ingestions can lead to alcoholism. It is a central nervous system depressant.

Flammable liquid when exposed to heat or flame; can react vigorously with oxidizers. To fight fire, use alcohol foam, CO<sub>2</sub>, dry chemical. Explosive reaction with the oxidized coating around potassium metal. Ignites and then explodes on contact with acetic anhydride + sodium hydrogen sulfate. Reacts violently with acetyl bromide (evolves hydrogen bromide), dichloromethane + sulfuric acid + nitrate or nitrite, disulfuryl difluoride, tetrachlorosilane + water, and strong oxidants. Ignites on contact with disulfuric acid + nitric acid, phosphorus(III) oxide, platinum, potassium-tert-butoxide + acids. Forms explosive products in reaction with ammonia + silver nitrate (forms silver nitride and silver fulminate), magnesium perchlorate (forms ethyl perchlorate), nitric acid + silver (forms silver fulminate), silver nitrate (forms ethyl nitrate), silver(I) oxide + ammonia or hydrazine (forms silver nitride and silver fulminate), sodium (evolves hydrogen gas). Incompatible with acetyl chloride, BrF<sub>5</sub>, Ca(OCl)<sub>2</sub>, ClO<sub>3</sub>, CrO<sub>3</sub>, Cr(OCl)<sub>2</sub>, (cyanuric acid + H<sub>2</sub>O), H<sub>2</sub>O<sub>2</sub>, HNO<sub>3</sub>, (H<sub>2</sub>O<sub>2</sub> + H<sub>2</sub>SO<sub>4</sub>), (I + CH<sub>3</sub>OH + HgO), [Mn(ClO<sub>4</sub>)<sub>2</sub> + 2,2-dimethoxy propane], Hg(NO<sub>3</sub>)<sub>2</sub>, HClO<sub>4</sub>, perchlorates, (H<sub>2</sub>SO<sub>4</sub> + permanganates), HMnO<sub>4</sub>, KO<sub>2</sub>, KOC(CH<sub>3</sub>)<sub>3</sub>, AgClO<sub>4</sub>, NaH<sub>3</sub>N<sub>2</sub>, UO<sub>2</sub>(ClO<sub>4</sub>)<sub>2</sub>.

**Analytical Methods:** For occupational chemical analysis use NIOSH: Alcohols I, 1400.

**Class:** Mutagen; Primary Irritant; Food Additive; Confirmed Carcinogen; Reproductively Active; Standards or Recommendations

## TOXICITY DATA with REFERENCE

<i>Skin-Rabbit, adult 20 mg/24H Moderate irritation effects</i>	85JCAE -,189,86 (1)
<i>Skin-Rabbit, adult 500 mg/24H Severe irritation effects</i>	28ZPAK -,34,72 (2)
<i>Eye effects-Rabbit, adult 500 mg/24H Mild irritation effects</i>	85JCAE -,189,86 (3)
<i>Eye effects-Rabbit, adult 100 mg/24H Moderate irritation effects</i>	28ZPAK -,34,72 (4)
<i>Eye effects-Rabbit, adult 100 mg/4S rns Moderate irritation effects</i>	FCTOD7 20,573,82 (5)
<i>Mutation in Microorganisms-Escherichia coli 140 g/L</i>	MUREAV 130,97,84 (6)
<i>DNA Inhibition-Human: lymphocyte 220 mmol/L</i>	PNASA6 79,1171,82 (7)
<i>Cytogenetic Analysis-Mouse-Oral 40 g/kg</i>	NATUAS 302,258,83 (8)
<i>Oral-Woman TDLo: 41 g/kg (41W preg): Reproductive effects</i>	AJDCAI 129,1075,75 (9)
<i>Oral-Rat TDLo: 4 g/kg (13D preg): Teratogenic effects</i>	CYGEDX 15,23,81 (10)
<i>Oral-Mouse TDLo: 320 mg/kg/50W-1: Equivocal tumorigenic agent</i>	CALEDQ 13,345,81 (11)
<i>Rectal-Mouse TDLo: 120 g/kg/18W-1: Equivocal tumorigenic agent</i>	ZIETA2 59,203,28 (12)
<i>Oral-Mouse TD: 400 g/kg/57W-1: Equivocal tumorigenic agent</i>	ZIETA2 59,203,28 (13)
<i>Oral-Child LDLo: 2000 mg/kg</i>	ATXKAS 17,183,58 (14)
<i>Oral-cld TDLo: 14,400 mg/kg/30M-1</i>	ACPAAN 74,977,85 (15)
<i>Oral-Man TDLo: 700 mg/kg</i>	NETOD7 8,77,86 (16)
<i>Oral-Human LDLo: 1400 mg/kg</i>	NPIRI* 1,44,74 (17)
<i>Oral-Man TDLo: 50 mg/kg: Gastrointestinal tract effects</i>	JPETAB 56,117,36 (18)
<i>Oral-Man TDLo: 1430 µg/kg: Central nervous system effects</i>	JPETAB 197,488,76 (19)
<i>Oral-Woman TDLo: 256 g/kg/12W: Central nervous system effects, END</i>	JAMAAP 238,2143,77 (20)
<i>Subcutaneous-Infant LDLo: 19,440 mg/kg: Central nervous system effects, MET</i>	
<i>Oral-Rat LD50: 7060 mg/kg</i>	AJCPAI 5,466,35 (21)
<i>Inhalation-Rat LC50: 20,000 ppm/10H</i>	TXAPAS 16,718,70 (22)
<i>Intraperitoneal-Rat LD50: 3750 mg/kg</i>	NPIRI* 1,44,74 (23)
<i>Intravenous-Rat LD50: 1440 mg/kg</i>	EVHPAZ 61,321,85 (24)
<i>Oral-Mouse LD50: 3450 mg/kg</i>	TXAPAS 18,60,71 (25)
<i>Inhalation-Mouse LC50: 39 g/m<sup>3</sup>/4H</i>	GISAAA 32(3),31,67 (26)
<i>Intraperitoneal-Mouse LD50: 933 mg/kg</i>	GTPZAB 26(8),82 (27)
<i>Subcutaneous-Mouse LD50: 8285 mg/kg</i>	SCCUR* -,5,61 (28)
<i>Intravenous-Mouse LD50: 1973 mg/kg</i>	FAONAU 48A,99,70 (29)
<i>Oral-Dog, adult LDLo: 5500 mg/kg</i>	HBTXAC 1,128,56 (30)
<i>Intraperitoneal-Dog, adult LDLo: 3000 mg/kg</i>	HBTXAC 1,130,56 (31)
<i>Subcutaneous-Dog, adult LDLo: 6000 mg/kg</i>	BJMAG 1,207,44 (32)
	HBTXAC 1,130,56 (33)

### Consensus Reports:

IARC Cancer Review: Human Sufficient Evidence IMEMDT 44,259,88. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

### Standards and Recommendations

OSHA PEL: TWA 1000 ppm  
 ACGIH TLV: TWA 1000 ppm; Not Classifiable as a Human Carcinogen  
 DFG MAK: 1000 ppm (1900 mg/m<sup>3</sup>)  
 DOT Classification: 3; Label: Flammable Liquid (UN 1987, UN 1170); DOT Class: 3; Label: Flammable Liquid, Poison (UN 1986)

### SAFETY PHRASES:

Confirmed human carcinogen for ingestion of beverage alcohol. Experimental tumorigenic and teratogenic data. Moderately toxic to humans by ingestion. Moderately toxic experimentally by intravenous and intraperitoneal routes. Mildly toxic by inhalation and skin contact. Human systemic effects by ingestion and subcutaneous routes: sleep disorders, hallucinations, distorted perceptions, convulsions, motor activity changes, ataxia, coma, antipsychotic, headache,

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## ETHYL ALCOHOL [Hawley]

DPIM: EFU000

Hazard Rating: 3

CAS: 64-17-5

DOT Number: UN 1170/UN 1986/UN 1987

M Formula: C<sub>2</sub>H<sub>6</sub>O

M Weight: 46.08

### Properties:

Clear, colorless, very mobile liquid; fragrant odor and burning taste. Boiling point: 78.32°, Underwriters Laboratory Classification: 70, lower explosive limit: 3.3%, upper explosive limit: 19% @ 60°, freezing point: -117°, flash point: 55.6°F, density: 0.7893 @ 20°/4°, autoignition temperature: 793°F, vapor pressure: 40 millimeter @ 19°, vapor density: 1.59, refractive index: 1.364. Miscible in water, alcohol, chloroform, ether, and most organic solvs.

### Synonyms:

ABSOLUTE ETHANOL  
AETHANOL (GERMAN)  
AETHYLALKOHOL (GERMAN)  
ALCOHOL [Hawley]  
ALCOHOL, anhydrous  
ALCOHOL, dehydrated  
ALCOHOLS, n.o.s. (UN 1987) (DOT)  
ALCOHOLS, toxic, n.o.s. (UN 1986) (DOT)  
ALCOOL ETHYLIQUE (FRENCH)  
ALCOOL ETILICO (ITALIAN)  
ALGRAIN  
ALKOHOL (GERMAN)  
ALKOHOLU ETYLOWEGO (POLISH)  
ANHYDROL  
COLOGNE SPIRIT  
ETANOLO (ITALIAN)  
ETHANOL (MAK)  
ETHANOL 200 PROOF  
ETHANOL SOLUTIONS (UN 1170) (DOT)  
ETHYLALCOHOL (DUTCH)  
ETHYL ALCOHOL, anhydrous  
ETHYL ALCOHOL SOLUTIONS (UN 1170) (DOT)  
ETHYL HYDRATE  
ETHYL HYDROXIDE  
ETYLOWY ALKOHOL (POLISH)  
FERMENTATION ALCOHOL [Hawley]  
GRAIN ALCOHOL [Hawley]  
JAYSOL  
JAYSOL S  
METHYLCARBINOL  
MOLASSES ALCOHOL  
NCI-C03134  
POTATO ALCOHOL  
SD ALCOHOL 23-HYDROGEN  
SPIRIT  
SPIRITS of WINE  
TECSOL

*Inhalation-Dog. uluh LCLo:70 ppli*

*TXAPA9 2,363,60 (6)*

**Consensus Reports:**

IARC Cancer Review: Group 3 IMEMDT 7,149,87; Human Inadequate Evidence IMEMDT 41,237,86; Animal Limited Evidence IMEMDT 41,237,86. Reported in EPA TSCA Inventory, EPA Genetic Toxicology Program.

**Standards and Recommendations**

OSHA PEL: TWA 1000 ppm

ACGIH TLV: TWA 1000 ppm; Not Classifiable as a Human Carcinogen

DFG MAK: 500 ppm (1800 mg/m<sup>3</sup>)

DOT Classification: 2.2; Label: Nonflammable Gas

**SAFETY PROFILE:**

Mildly toxic by inhalation. Experimental reproductive effects. Mutation data reported. An asphyxiant in high concentrations. At elevated pressures, 50% mixtures with air are combustible although ignition is difficult. When heated to decomposition it emits toxic fumes of F<sup>-</sup> and Cl<sup>-</sup>. See also CHLORINATED HYDROCARBONS, ALIPHATIC; and FLUORIDES.

**Class:** Mutagen; Questionable Carcinogen; Reproductively Active; Standards or Recommendations

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## CHLORODIFLUOROMETHANE [Hawley]

DPIM: CFX500

Hazard Rating: **1**

CAS: 75-45-6

DOT Number: UN 1018

M Formula:  $\text{CHClF}_2$

M Weight: 86.47

### Properties:

Gas. D: 1.49 @ 69°/4°, melting point: -146°, boiling point: -40.8°, freezing point: -160°, autoignition temperature: 1170°F. Slightly soluble in water.

### Synonyms:

ALGEON 22  
ALGOFRENE 22  
ALGOFRENE TYPE 6  
ARCTON 4  
ARCTON 22  
CFC 22  
CHLORODIFLUOROMETHANE [Hawley]  
CHLORODIFLUOROMETHANE (ACGIH, DOT, OSHA)  
DAIFLON 22  
DIFLUOROCHLOROMETHANE [Hawley]  
DIFLUOROMONOCHLOROMETHANE [Hawley]  
DYMEL 22  
ELECTRO-CF 22  
ESKIMON 22  
F 22  
FC 22  
FLUGENE 22  
FLUOROCARBON-22  
FORANE 22  
FREON [Hawley]  
FREON 22 [Hawley]  
FRIGEN  
FRIGEN 22  
GENETRON 22  
HALTRON 22  
ISCEON 22  
ISOTRON 22  
KHALADON 22  
MONOCHLORODIFLUOROMETHANE [Hawley]  
PROPELLANT 22  
R-22  
R22 (DOT)  
REFRIGERANT 22  
UCON 22  
UCON 22/HALOCARBON 22

### TOXICITY DATA with REFERENCE

*Mutation in Microorganisms-Salmonella typhimurium 33 pph/24H-C*  
*Microsomal Mutagenicity Assay-Salmonella typhimurium 33 pph/24H-C*  
*Inhalation-Rat TCl<sub>0</sub>: 50,000 ppm/5H (56D male): Reproductive effects*  
*Inhalation-Rat LC50: 35 pph/15M*  
*Inhalation-Mouse LC50: 28 pph/20M*

TOLEDS 2,1,78 (1)  
TOLEDS 2,1,78 (2)  
FAATDF 1,266,81 (3)  
HUTODJ 1,239,82 (4)  
TXAPA9 59,64,81 (5)



*Inhalation-Rat LC50: 50,100 mg/m<sup>3</sup>/8H*  
*Intraperitoneal-Rat LDLo: 500 mg/kg*  
*Intravenous-Rat LD50: 5500 mg/kg*  
*Oral-Mouse LD50: 3000 mg/kg*  
*Inhalation-Mouse LCLo: 110 g/m<sup>3</sup>/1H*  
*Intraperitoneal-Mouse LD50: 1297 mg/kg*  
*Intravenous-Mouse LDLo: 4 g/kg*  
*Oral-Dog, adult LDLo: 8 g/kg*  
*Oral-Rabbit, adult LD50: 5340 mg/kg*  
*Skin-Rabbit, adult LD50: 20 g/kg*

*AIHAAP 20,364,59 (18)*  
*JPPMAB 11,150,59 (19)*  
*NPIRI\* 1,1,74 (20)*  
*PCJOAU 14,162,80 (21)*  
*AGGHAR 5,1,33 (22)*  
*SCCUR\* -,1,61 (23)*  
*FAONAU 48A,86,70 (24)*  
*FAONAU 48A,86,70 (25)*  
*FAONAU 48A,86,70 (26)*  
*UCDS\*\* 5/7/70 (27)*

### Consensus Reports:

On Community Right-To-Know List. Reported in EPA TSCA Inventory.

### Standards and Recommendations

OSHA PEL: TWA 750 ppm; STEL 1000 ppm  
ACGIH TLV: TWA 500 ppm; STEL 750 ppm; Not Classifiable as a Human Carcinogen  
DFG MAK: 500 ppm (1200 mg/m<sup>3</sup>)  
NIOSH REL: (Ketones) 10H TWA 590 mg/m<sup>3</sup>  
DOT Classification: 3; Label: Flammable Liquid

### SAFETY PROFILE:

Moderately toxic by various routes. A skin and severe eye irritant. Human systemic effects by inhalation: changes in EEG, changes in carbohydrate metabolism, nasal effects, conjunctiva irritation, respiratory system effects, nausea and vomiting, and muscle weakness. Human systemic effects by ingestion: coma, kidney damage, and metabolic changes. Narcotic in high concentration. In industry, no injurious effects have been reported other than skin irritation resulting from its defatting action, or headache from prolonged inhalation. Experimental reproductive effects. A common air contaminant. Highly flammable liquid. Dangerous disaster hazard due to fire and explosion hazard; can react vigorously with oxidizing materials.

Potentially explosive reaction with nitric acid + sulfuric acid, bromine trifluoride, nitrosyl chloride + platinum, nitrosyl perchlorate, chromyl chloride, thiothiazyl perchlorate, and (2,4,6-trichloro-1,3,5-triazine + water). Reacts to form explosive peroxide products with 2-methyl-1,3-butadiene, hydrogen peroxide, and peroxomonosulfuric acid. Ignites on contact with activated carbon, chromium trioxide, dioxygen difluoride + carbon dioxide, and potassium-tert-butoxide. Reacts violently with bromoform, chloroform + alkalis, bromine, and sulfur dichloride. Incompatible with CrO<sub>3</sub> (nitric + acetic acid), NOCl, nitryl perchlorate, permonosulfuric acid, NaOBr, (sulfuric acid + potassium dichromate), (thio-diglycol + hydrogen peroxide), trichloromelamine, air, HNO<sub>3</sub>, chloroform, and H<sub>2</sub>SO<sub>4</sub>. To fight fire, use CO<sub>2</sub>, dry chemical, alcohol foam. Used in production of drugs of abuse.

**Analytical Methods:** For occupational chemical analysis use OSHA: #ID-69 or NIOSH: Ketones I (desorption in CS<sub>2</sub>), 1300.

**Class:** Food Additive; Reproductively Active; Standards or Recommendations

**ACETONE [Hawley]**

DPIM: ABC750

Hazard Rating: 3

CAS: 67-64-1

DOT Number: UN 1090/UN 1091

M Formula: C<sub>3</sub>H<sub>6</sub>O

M Weight: 58.09

**Properties:**

Volatile, colorless liquid; fragrant mintlike odor. Melting point: -94.6°, boiling point: 56.2° @ 20 millimeter, refractive index: 1.356, flash point: 0°F (CC), lower explosive limit: 2.6%, upper explosive limit: 12.8%, density: 0.7972 @ 15°, autoignition temperature: (color) 869°F, vapor pressure: 240 hPa @ 20°, vapor density: 2.00. Miscible in water, alcohol, organic solvs, and ether.

**Synonyms:**

ACETON (GERMAN, DUTCH, POLISH)  
 ACETONE OILS (DOT)  
 CHEVRON ACETONE  
 DIMETHYLFORMALDEHYDE  
 DIMETHYLKETAL  
 DIMETHYL KETONE  
 FEMA No. 3326  
 KETONE, DIMETHYL  
 KETONE PROPANE  
 β-KETOPROPANE  
 METHYL KETONE  
 PROPANONE  
 2-PROPANONE [Hawley]  
 PYROACETIC ACID  
 PYROACETIC ETHER  
 RCRA WASTE NUMBER U002

**TOXICITY DATA with REFERENCE**

<i>Eye effects-Human 500 ppm</i>	JHTAB 25,282,43 (1)
<i>Skin-Rabbit, adult 395 mg open Mild irritation effects</i>	UCDS** 5/7/70 (2)
<i>Skin-Rabbit, adult 500 mg/24H Mild irritation effects</i>	28ZPAK -,42,72 (3)
<i>Eye effects-Rabbit, adult 3950 µg Severe irritation effects</i>	AJOPAA 29,1363,46 (4)
<i>Eye effects-Rabbit, adult 20 mg/24H Moderate irritation effects</i>	85JCAE -,280,86 (5)
<i>Cytogenetic Analysis-Saccharomyces cerevisiae 200 mmol/tube</i>	HEREAY 33,457,47 (6)
<i>Sex Chromosome Loss and Nondisjunction-Saccharomyces cerevisiae 47,600 ppm</i>	ANYAA9 407,186,83 (7)
<i>Inhalation-Mammal TClO:31,500 µg/m<sup>3</sup>/24H (1-13D preg):Reproductive effects</i>	GTPZAB 26(6),24,82 (8)
<i>Oral-Man TDLo:2857 mg/kg</i>	34ZIAG -,64,69 (9)
<i>Oral-Man TDLo:2857 mg/kg</i>	DIAEAZ 15,810,66 (10)
<i>Inhalation-Man TClO:12,000 ppm/4H:Central nervous system effects</i>	AOHYA3 16,73,73 (11)
<i>Inhalation-Man TDLo:440 µg/m<sup>3</sup>/6M</i>	GISAAA 42(8)42,77 (12)
<i>Inhalation-Man TDLo:10 mg/m<sup>3</sup>/6H</i>	GISAAA 42(8)42,77 (13)
<i>Inhalation-Human TClO:500 ppm:Eye effects</i>	JHTAB 25,282,43 (14)
<i>Inhalation-Man TClO:12,000 ppm/4H:Gastrointestinal tract effects</i>	AOHYA3 16,73,73 (15)
<i>Intravenous-Rat LD50:5500 mg/kg</i>	NPIRI* 1,1,74 (16)
<i>Oral-Rat LD50:5800 mg/kg</i>	JTEHD6 15,609,85 (17)

**Baker**

*Baker and Associates*  
**ATTACHMENT C**

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*Chemical Information Sheets*

# SCHNEIDER LABORATORIES

INCORPORATED

2512 W. Cary Street • Richmond, Virginia • 23220-5117  
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AIHA/ELLAP 100527, NVLAP 1150, NYELAP 11413, CAELAP 2078, NC 593, SC 93003

## LABORATORY ANALYSIS REPORT

Asbestos and Other Fibers Counted By NIOSH 7400 Method, Issue 2, Aug. 12, 1994

ACCOUNT: 1929-01-252  
CLIENT: Baker Environmental  
ADDRESS: 420 Rouser Road, Airport Office Park Bld  
Coraopolis, PA 15108

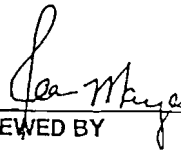
DATE COLLECTED: 12/20/2001  
DATE RECEIVED: 12/24/2001  
DATE ANALYZED: 12/26/2001  
DATE REPORTED: 12/26/2001  
RESPIRATOR:

PO NO.:  
PROJECT NAME: Brittin ES  
PROJECT NO.: 23970-011-0000-00001  
JOB LOCATION: Fort Stewart, GA

### Area and Environmental Samples

SLI Sample No.	Client Sample No.	Sample Identification	Sample Date	Flow Rate (L/min)	Sample Time (min)	Sample Volume (L)	Fiber Count (f/field)	Actual Exposure (f/cc)
2131459	85980	B6	12/20/2001	0.00	0	865.8	0.075	0.004
2131460	85981	B13	12/20/2001	0.00	0	405.3	0.065	0.008
2131461	85982	B5	12/20/2001	0.00	0	380.1	0.090	0.012
2131462	85983	B8	12/20/2001	0.00	0	426.0	0.270	0.031
2131463	85984	A10	12/20/2001	0.00	0	445.8	0.080	0.009
2131464	85985	A11	12/20/2001	0.00	0	445.5	0.065	0.007
2131465	85986	C3	12/20/2001	0.00	0	461.0	Too overloaded to count	
2131466	85979	Blank	12/20/2001	0.00	0	0.0	< 0.055	

ANALYST: MELISSA M. KANODE  
Total no. of pages in report = 1

  
REVIEWED BY

JEAN L. MAYES

OSHA PEL is 0.1 f/cc for 8h TWA. Method limit: 0.01 f/cc.

Exposure calculations are based on client-supplied information. 8 hour TWAs assume zero exposure for time not sampled.

Microscopic field area (mm<sup>2</sup>): 0.00785. Estimated limit of detection: 7 f/mm<sup>2</sup>.

Estimated relative standard deviations: Intra-Laboratory: ± 0.30; Inter-Laboratory: ± 0.36.

Data Table PPB

Client #				EQL
DCL #	Blank			
Chlorobenzene	ND			1
Ethylbenzene	ND			1
M&P Xylene	ND			3
O Xylene	ND			2
Styrene	ND			2
Bromform	ND			2
1,1,2,2-Tetrachloroethane	ND			2
4-Ethyl Toluene	ND			2
1,3,5-Trimethylbenzene	ND			2
1,2,4-Trimethylbenzene	ND			2
1,3-Dichlorobenzene	ND			2
1,4-Dichlorobenzene	ND			2
Benzyl Chloride	ND			2
1,2-Dichlorobenzene	ND			2
1,2,4-Trichlorobenzene	ND			2
Hexachlorobutadiene	ND			2

ND indicates not detected at or above the EQL value.

Internal Standard Recovery

% Rec Bromochloromethane	103		
% Rec 1,4-Difluorobenzene	99		
% Rec Chlorobenzene-d5	90		

Unknown Compounds Tentative Identification  
PPB


\* Tentative identification based on NBS spectral library. Quantitated values are based on a response factor of 1 and comparison to the closest internal standard and should be considered estimates.

*Mark Johnson*

Mark Johnson  
Analyst

*Dixie Updey*

Reviewer

Data Table PPB

Client #				EQL
DCL #	Blank			
Propene	ND			3
Dichlorodifluoromethane	ND			3
Freon 114	ND			3
Chloromethane	ND			4
1,3-Butadiene	ND			2
Vinyl Chloride	ND			3
Bromomethane	ND			2
Chloroethane	ND			3
Trichlorofluoromethane	ND			2
2-Propanol	ND			3
1,1-Dichloroethene	ND			2
Freon 113	ND			2
Acetone	ND			2
Carbon Disulfide	ND			2
Methylene Chloride	ND			3
MTBE	ND			2
Trans 1,2-Dichloroethene	ND			2
Vinyl Acetate	ND			2
Hexane	ND			2
1,1-Dichloroethane	ND			2
Cis-1,2-Dichloroethene	ND			2
2-Butanone	ND			1
Chloroform	ND			1
Tetrahydrofuran	ND			1
1,1,1-Trichloroethane	ND			2
Cyclohexane	ND			1
Carbon Tetrachloride	ND			2
Heptane	ND			1
Benzene	ND			2
1,2-Dichloroethane	ND			2
Trichloroethene	ND			1
1,2-Dichloropropane	ND			2
Bromodichloromethane	ND			2
cis-1,3-Dichloropropene	ND			2
4-Methyl 2-Pentanone	ND			2
Toluene	ND			2
trans-1,3-Dichloropropene	ND			2
1,1,2-Trichloroethane	ND			2
Tetrachloroethene	ND			2
2-Hexanone	ND			2
Dibromochloromethane	ND			2
1,2-Dibromoethane	ND			2

ND indicates not detected at or above the EQL value.

Data Table PPB

Client #	108648	108658	108586	108595	EQL
DCL #	01-41273	01-41274	01-41275	01-41276	
Chlorobenzene	ND	ND	ND	ND	1
Ethylbenzene	ND	ND	ND	ND	1
M&P Xylene	ND	ND	ND	ND	3
O Xylene	ND	ND	ND	ND	2
Styrene	ND	ND	ND	ND	2
Bromform	ND	ND	ND	ND	2
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	2
4-Ethyl Toluene	ND	ND	ND	ND	2
1,3,5-Trimethylbenzene	ND	ND	ND	ND	2
1,2,4-Trimethylbenzene	ND	ND	ND	ND	2
1,3-Dichlorobenzene	ND	ND	ND	ND	2
1,4-Dichlorobenzene	ND	ND	ND	ND	2
Benzyl Chloride	ND	ND	ND	ND	2
1,2-Dichlorobenzene	ND	ND	ND	ND	2
1,2,4-Trichlorobenzene	ND	ND	ND	ND	2
Hexachlorobutadiene	ND	ND	ND	ND	2

ND indicates not detected at or above the EQL value.

Internal Standard Recovery

% Rec Bromochloromethane	107	108	108	107
% Rec 1,4-Difluorobenzene	103	102	107	103
% Rec Chlorobenzene-d5	99	100	99	101

Unknown Compounds Tentative Identification  
PPB

Chlorodifluoromethane*	11	25		26
Ethanol*	43			
Limonene*		61		29
Unknown Alkane*		13		23
Unknown Hydrocarbon*				67

\* Tentative identification based on NBS spectral library. Quantitated values are based on a response factor of 1 and comparison to the closest internal standard and should be considered estimates.

Data Table PPB

Client #	108648	108658	108586	108595	EQL
DCL #	01-41273	01-41274	01-41275	01-41276	
Propene	ND	ND	ND	ND	3
Dichlorodifluoromethane	ND	ND	ND	ND	3
Freon 114	ND	ND	ND	ND	3
Chloromethane	ND	ND	ND	ND	4
1,3-Butadiene	ND	ND	ND	ND	2
Vinyl Chloride	ND	ND	ND	ND	3
Bromomethane	ND	ND	ND	ND	2
Chloroethane	ND	ND	ND	ND	3
Trichlorofluoromethane	ND	ND	ND	ND	2
2-Propanol	24	95	29	110	3
1,1-Dichloroethene	ND	ND	ND	ND	2
Freon 113	ND	ND	ND	ND	2
Acetone*	70	20	12	26	2
Carbon Disulfide	ND	ND	ND	ND	2
Methylene Chloride	ND	ND	ND	ND	3
MTBE	ND	ND	ND	ND	2
Trans 1,2-Dichloroethene	ND	ND	ND	ND	2
Vinyl Acetate	ND	ND	ND	ND	2
Hexane	ND	3	ND	3	2
1,1-Dichloroethane	ND	ND	ND	ND	2
Cis-1,2-Dichloroethene	ND	ND	ND	ND	2
2-Butanone	ND	ND	ND	ND	1
Chloroform	ND	ND	ND	ND	1
Tetrahydrofuran	ND	ND	ND	ND	1
1,1,1-Trichloroethane	ND	ND	ND	ND	2
Cyclohexane	ND	ND	ND	ND	1
Carbon Tetrachloride	ND	ND	ND	ND	2
Heptane	ND	ND	ND	ND	1
Benzene	ND	ND	ND	ND	2
1,2-Dichloroethane	ND	ND	ND	ND	2
Trichloroethene	ND	ND	ND	ND	1
1,2-Dichloropropane	ND	ND	ND	ND	2
Bromodichloromethane	ND	ND	ND	ND	2
cis-1,3-Dichloropropene	ND	ND	ND	ND	2
4-Methyl 2-Pentanone	ND	4	3	4	2
Toluene	3	20	3	10	2
trans-1,3-Dichloropropene	ND	ND	ND	ND	2
1,1,2-Trichloroethane	ND	ND	ND	ND	2
Tetrachloroethene	ND	ND	ND	ND	2
2-Hexanone	ND	ND	ND	ND	2
Dibromochloromethane	ND	ND	ND	ND	2
1,2-Dibromoethane	ND	ND	ND	ND	2

ND indicates not detected at or above the EQL value.

\* Acetone results should be considered estimated due to high %RSD in calibration





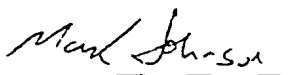
Submitted To: Warren Lehew  
Baker Environmental  
AOP Bldg. 3, 420 Rouser Road  
Coraopolis, PA  
15108

Reference Data:

Sample Location: BRITT W E.S.  
Sample Type: Canister  
Client Sample No.: 108648 through 108595  
PO #: 23970-011-0000-00001  
Method Reference: TO-14 modified  
Sample Set ID#: 01-M-7090  
DATACHEM Lab No.: 01-41273 through 01-41276  
Received Date: 12/26/2001  
Analysis Date: 01/02/2002

The above numbered samples were analyzed for volatile organic compounds by EPA method TO-14 using an Entech 7000 Cryogenic Preconcentrator and a Hewlett-Packard GC/MS/DS operating in the scan mode.

Quantitation is based upon average response factors generated from a three point curve. Results relate only to the items tested.

  
Mark Johnson

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800 280-8071, FAX 415 893-9469