Interim Report

Industrial Hygiene Evaluation of

Indoor Air Quality

Cesar Chavez Elementary School

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Madison, WI 53719

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In Progress From November 9, 2001

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Interim Report Industrial Hygiene Evaluation

Air Quality at Chavez Elementary School

This is the interim report of an industrial hygiene evaluation of air quality that is being conducted at Cesar Chavez Elementary School by Sharon J. Bessa, RN, CIH, COHN. This report may be copied and distributed but must be sent in as a report with a total of 11pages plus Tables I - X and the following attachments: Interpretation of Mold Sample Results, Mold Sample Summary December 14, 2001 and Remediation (Mold Removal) Procedures dated December 19, 2001. Additional background documentation from the laboratory is on file but is not in electronic format. This documentation will be sent with the hard copy of this report.

I. Project Summary

A. Scope of the Work

This work was performed at the request of Tom Kannal and Doug Pearson of the Madison Metropolitan School District to complete an indoor air quality evaluation of this school following reports of health effects from the teaching staff. This scope of work does not include an evaluation of building envelope or moisture intrusion prevention techniques. Identification of the source of moisture intrusion and prevention techniques is being performed by another contractor.

B. Brief Chronology

A detailed chronology of sampling and mold investigation steps is in Section III.

1. November 9, 2001

   Initial walkthrough survey and screening for total volatile organic compounds (TVOCs), formaldehyde, and mold spores. Measurements were taken for carbon dioxide and particulate concentration, temperature and relative humidity.
   Air handling units (AHUs) were inspected.
   Two areas were inspected where known water intrusion and drywall replacement had taken place: Room 125B, the janitor's closet and Room 229, storage area. There was no evidence of visible mold.
   The building had an odor or taste of a new building. It was recommended that the staff open windows as much as possible and that the air handlers be adjusted to bring in maximum outside air.

2. November 14, 2001

   November 9 chemical sample results received. One TVOC sample at 0.11 parts per million, above the recommended 0.9 ppm. Formaldehyde concentrations were below the recommended 0.04 ppm. Recommendation repeated to increase outside air dilution. Resampling planned for November 20 with results by November 21.

3. November 20, 2001
   Met with Marquis Harding from Honeywell. All minimum outside air settings had been doubled with the office area at 30% (outside air), classrooms and IMC at 40%.
   Discussed calibration of carbon dioxide sensors - compared ductwork readings with TSI Q Trak. One sensor appeared to be out of calibration. Periodic calibration recommended.
   Teacher points out area of visible mold in the laundry room.

4. November 21, 2001
   Second set of chemical sample results received. See Table III.
   Mold sample results received, Table II. These indicate a need to investigate further. Teacher points out area in hallway in Kindergarten (K) wing where custodian had noted that mold had been visible.

   Meeting held with teachers and parents to discuss findings and recommendations.
   Requested accurate information regarding where water intrusions had occurred in this building.

4. November 26, 2001
   Building survey conducted with contractors. Visible mold identified behind baseboards in the K wing and Room 140. These areas are closed.
5. November 27, 2001
   Teachers in Room 207, 130 and 133 report that they have had symptoms but were outside the K wing.
   Small spots of mold seen beneath the supply air ductwork in Room 207. Survey above the suspended ceiling is conducted.
6. November 28, 2001
   Survey above the ceiling tile continues. Mold is found in eight more rooms upstairs and in the hallway.
   Meeting with Madison School Board and meeting with parents and teachers.
7. November 29, 2001
   Meeting with staff and teachers.
   Remediation set up in K wing continues.
8. November 29 - December 20, 2001
   Mold remediation in progress.

C. Findings to Date

Findings relating to mold can be found in Section III.

1. Total Volatile Organic Compounds (TVOCs) detected on November 9 ranged from 0.03 to 0.11 parts per million (ppm). One sample exceeded this consultant's recommended limit of 0.09 ppm. The air handler in the classroom area was not functioning which would affect these findings. Isopropyl alcohol, used to clean the mold sampling equipment, was identified separately in these samples.

2. Formaldehyde concentrations on November 9 ranged from 0.02 to 0.038 ppm. A level at or below 0.04 ppm is recommended by this consultant to avoid irritation. Samples taken on November 20 were taken with a sorbent tube lot that had a high background concentration in the blank tube. Blank tubes (those which are not used for sampling but are handled in the same manner) are submitted with the samples. The tubes used for formaldehyde sampling always contain detectable formaldehyde. In the samples taken on November 20, the amount detected in the blank was higher than usual indicating that the tube lot may have been too old. It is always assumed that the background in the tubes used for sampling is the same as the background found on the blank, although this may not be true. The quantity of formaldehyde found in the blank is subtracted from the sample results. In this case, the results are presented in two ways: one set is the value with the amount from the blank (2.0 micrograms) subtracted, the second value is the amount detected in the air with a level subtracted that is typical of blank values (0.8 micrograms).

3. Carbon dioxide average concentrations, measured on November 20, with a TSI Q Trak, ranged from 497 to 708 parts per million. These measurements were taken with the outside air percentage increased and the windows open. Outside air is typically 350 to 450 ppm. Carbon dioxide measurements are used as an indicator of the amount of outside air that is in a building. The greater the percentage of outside air, the closer the inside air values are to 350 - 450 ppm. It is recommended that levels remain below 1000 ppm to provide adequate dilution of air contaminants.

4. Average particulate concentrations ranged from 0.007 to 0.077 milligrams per cubic meter of air measured with a TSI Dust Trak. These are typical of an office or school room.

5. Temperatures on November 20 averaged 70.8 to 75.0 degrees Fahrenheit in the sample locations.

6. The average relative humidity in the sample locations on November 20 ranged from 24.1 to 27.7%. It is recommended that levels remain below 60%.

7. The teaching staff had compiled a self-reported list of symptoms prior to this on-site survey. A total of 50 work in this facility including teaching and support staff. The symptom survey was completed by 39 occupants.

Symptom	**# Reporting Symptom out of 39 Total**
Sinus congestion	17
Upper respiratory irritation/hoarseness	13
Cough	12
Throat irritation	11
Fatigue	10
Asthma diagnosed or exacerbated	8
Eye Irritation	7
Sinus infection	5
Headache	5
Other Allergy symptoms (itchy eyes, etc.)	3
Chest tightness, shortness of breath	3
Nausea	3
Dryness (eyes or throat)	2
Stomach pain	2
Flu symptoms	1
Fever	1
Pneumonia	1
Lightheaded	1
Eye infection	1
Earaches	1
Reaction to medication	1
Developed allergy	1

Since the school was closed on November 28 it was not possible to conduct one-on-one interviews to gain additional information on occupant symptoms or how they might relate to building conditions.

8. There was no access to the drain pans and cooling coils in AHU #5 (Cafeteria), AHU #1 (First and second floor classrooms) and AHU #3 (IMC). Access to #8 is difficult. Carbon dioxide sensors are in place in the return air ducts but they have not been calibrated. (One was later discovered to be malfunctioning.) The on-site custodian does not have enough information or training to manage this system adequately for air quality.

Coils were clean and shiny, drain pans were dry and clean in AHU #6 (Stage), #7 (Office), #4 (Gym) and #8 (Maintenance Office and Kitchen). Filters were American Air Filters Varicel Type SH, a two inch pleated filter. Dust spot efficiency was not known.

9. The exhaust for the kiln in Room 208B is directed into the canopy hood. This canopy hood is several feet above the kiln.

10. A wet ceiling tile in Room 126 is below the exhaust duct for the dryer.

D. Summary of Conclusions and Recommendations to Date

Recommendations (Plan/Action) relating to mold can be found in Section III.

1. The concentration of TVOCs and formaldehyde are consistent with those that are typically seen in new buildings. This building contains a large amount of "fiberboard" furniture which is manufactured using urea formaldehyde adhesive. The air handling units should be adjusted to bring in the maximum amount of outside air that can be brought in as tolerated by temperature levels. This recommendation is on hold until the mold remediation is completed. Samples will be taken following the remediation to measure TVOCs and formaldehyde before the building is re-occupied.

2. Provide access to the drain pans for inspection and cleaning the coils. Set up a schedule to complete this work.

3. Set up a calibration schedule for the carbon dioxide sensors. These also typically have no more than a one year life.

4. Train the on-site custodians on basic preventive maintenance and monitoring of the air handling units.

Additional recommendations for pro-active indoor air quality maintenance will be made in the final report.

5. Move the exhaust for the kiln into the exhaust duct and out of the canopy hood. Lower the canopy hood or add sides to the hood to increase capture velocity.

6. Repair the leak (around the exhaust or from the exhaust duct) in Room 126.

7. Numerous additional recommendations to minimize or prevent additional water intrusion/condensation in this building are necessary. These are being compiled by the building forensic engineering consultant. This third-party consultant should follow through with inspection of these items as building materials are replaced.

II. Method of Investigation

A. Sampling Strategy

The survey was conducted on November 9 to fulfill the following objectives:
1. Screen for outgassing of chemicals from new materials.
2. Screen for mold based on the report that there had been condensation problems in this building.
3. Measure basic air quality parameters: carbon dioxide concentrations, temperature and relative humidity.
4. Review symptom survey to identify potential environmental causes.

Samples sites were chosen to represent each air handling unit where there was full time occupancy: the classrooms (both floors), the office area and the library.

Classroom sampling sites were chosen on the basis of reported symptoms as well as an attempt to avoid instructional periods to prevent distraction.

B. Quality Assurance

1. Sample pumps were calibrated before and after the sampling was conducted. The pump performance was noted at intervals of approximately thirty minutes.

2. Direct reading instruments were calibrated as required by their operation.

3. A blank filter or sorbent tube was submitted and analyzed for the substances that were monitored.

4. All analysis was performed at an AIHA accredited laboratory.

Quality assurance relating to mold sampling can be found in the Appendix item: Interpretation of Mold Sample Results.

III. Chronology of Mold Investigation

Date 2001	Activity	Location	Findings	Plan/Action
11/09	Mold spore screening samples taken based on reports of upper respiratory symptoms and a history of building water intrusion.	Representative samples taken for each air handler in the office, classrooms and library.		Two sample sets were taken using two types of agar.
11/20	Mold results received. (See Table II)		Elevated spore counts. Mold is predominately Cladosporium and Penicillium (common outdoor mold genus).	Identify location of water intrusion. Visual inspection and building material samples in these areas.
11/26	Meeting with contractors to identify locations of water intrusion.	Room 129 History of mold. One wall of drywall replaced.	None	Core samples of dry wall taken above baseboard.
		Hallway outside 129	Visible mold beneath baseboard	Core samples taken of drywall above baseboard. Swab sample of visible mold taken for identification.
		Entryway to classrooms in Kindergarten (K) wing	Visible mold beneath baseboard	Rooms were closed. Teachers notified. Remediation contractor called in.
		Room 140B	Visible mold in spots above baseboard. Cause unknown.	Room closed for remediation.
		Room 203		Swab from flex duct
		Room 210, hallway adjacent to elevator.	Visible mold above baseboard.	Rooms closed.
11/27	Remediation activity begins	Room 122- 124	Visible mold beneath baseboard throughout classrooms on drywall.	

Chronology of Mold Investigation Continued

Date 2001	Activity	Location	Findings	Plan/Action
11/27	Inspection begins above the ceiling.	Room 207	Mold under supply air ductwork above suspended ceiling.	Room closed.
11/28	Inspection continues above the ceiling.	Second floor	Several feet of mold at the roof level.	Rooms closed. School closed.
11/29	Custodian reports visible mold on filter frame	Reportedly from AHU #5 (Cafeteria) (Filters already removed.)	Mold spots and water stains on paper filter frame.	Piece of paper frame and swab of mold taken for identification of mold type.
11/30	Requested third party to investigate building to diagnose problems, recommend solutions, verify corrective actions.			
	Remediation activity continues	Rooms 122-124	Mold found on wood bases of sink cabinets on slab.	Sink cabinets pulled first floor to inspect bases.
12/1	Visual inspection	Rooms 122-124	Ready to sample following air scrubbing.	Sample on December 3.
12/3	Post remediation samples	Rooms 122-124	Area appears negative to second containment area.	
	Microbial volatile (MVOCs) samples taken.	Rooms 216 Outdoor air		
12/4	Bulk drywall and insulation samples taken.	Rooms 122-124 138 as control.		
12/6	Swab and bulk sample results from 11/26	Room 203 duct K wing	See Table IV	
12/7	Checked wood sink bases. Swabs taken by T. Kannal 12/6	Rooms 111-113 Rooms 115-116	Visible mold	Contain and remove
	Visual inspection	Rooms 126 - 129	Ready to sample following scrubbing.	
12/8	Post remediation samples	Rooms 126-129 Room 124 Gym		Second sample of Rm 124 due to possible contamination to first containment from second area.
12/10	Checked with lab on MVOCs		Very low concentration - may not be enough to identify	

Chronology of Mold Investigation Continued

Date 2001	Activity	Location	Findings	Plan/Action
12/10, 12/11	Post remediation samples taken.	Rooms 130, 133, 118-120		
12/11	Results of 12/4 bulk samples. (See Table VII)	Room 122-124, Room 138	*Stachybotrys* sp. and *Chaetomium* sp. indicating high water activity in building material.	
12/12	Results of swabs from wood sink bases and swab and paper bulk from filter frame (taken 11/29)		See Table V	
	Results from K wing first half post remediation	Rooms 122-124 and 140	See Table VI Second set is elevated, predominately *A.* versicolor Could be active mold source or contamination from adjacent containment.	Wait until second sample taken in Room 124 results come back.
12/13	Air samples (post cleaning)	Office, kitchen		
12/14	Swab samples received (See Table VIII)	Sink bases	*Aspergillus* sp. *Penicillium* sp.	
12/18	Sample results (See Table IX)	Second half K wing containment	All are acceptable.	Drywall and insulation around SA ducts removed - if no visible mold containment down.
12/20	Sample results (See Table X)	Office and Kitchen	All are acceptable.	

Chavez Mold Sample Summary
December 14, 2001

Mold Sample Types

Four types of mold samples have been taken:

Sample Type	Sample Method	What We Learn
Air	Andersen Sampler using 2 types of culture media. Two sample sets are taken, at least 2 hours apart, each location.	**Total Spore Concentration** Spores are counted on the agar plates, calculated as Colony Forming Units per cubic meter of air (CFUs/M3) In one minute of sampling at 28.3 liters of air, one spore on the plate = 35 CFUs/M3. **Mold Identification** Genus (*Cladosporium)* and sometimes species (*Aspergillus* versicolor).
Bulk	Piece of building material	**Total Spore Concentration** **Mold Identification**
Wipe	Hard surfaces	**Total Spore Concentration** **Mold Identification**
Wipe	Visible mold	**Mold Identification**

Remediation procedures are designed INDEPENDENT of mold identification. All molds are considered to be allergens - removal under containment is necessary.

Chemical Tests

Mold produces three types of chemical products secondary to their metabolism:
1. Antibiotics, e.g., penicillin
2. Volatile organic compounds (VOCs), e.g., alcohols and aldehydes
3. Mycotoxins, e.g., tricothecens, satratoxins, aflatoxin

Samples for VOCs were taken on 12/3/01 and have been analyzed by the State Lab of Hygiene. Total concentrations of the volatiles are very low. At this time they are working to identify the compounds. Since the concentrations are very low it may not be possible to distinguish these volatiles from background volatiles that come from new construction and other common sources.

Mycotoxin sampling is done on a research level only.

The data on health effects from VOCs and mycotoxins is inconclusive. The possibility of health effects provides an additional reason to remove mold under carefully controlled procedures.

November 9, 2001: Air samples taken (using the Andersen sampler) to screen for mold.
November 20, 2001: Results indicated elevated spore counts. Mold was identified as the type found in outdoor air.

November 26, 2001: Efforts were made to identify locations of water intrusion or condensation. Building material samples were taken. In the process of doing this visible mold was found behind the baseboards in the Kindergarten wing.

Bulk material samples were taken of drywall and wipe samples of the visible mold were taken for identification. Results of these samples indicated typical, common outdoor mold.

Remediation in Kindergarten Wing - First Floor
This wing was divided into two containment areas (A&B). These areas were isolated with plastic and machines were placed in each room to pull air into the room and through a high efficiency filter. Removal of the mold material was first performed on the "A" side. As removal proceeded, mold was found beneath most of the baseboards. Mold was also found on wood cabinet bases. A variety of mold types were identified from wipe samples taken on the bases.

Drywall and insulation were removed to the four foot level in this area. Wood cabinet bases and suspended ceiling tiles were removed and discarded. The area was vacuumed (using a high efficiency filter) and hard surfaces were damp wiped.
Visual inspection verified that the area was visibly clean. Air scrubbers ran for 24 hours and air samples were taken on December 3, 2001.

Air Sample Procedure
Air samples are always a snapshot of conditions. Mold releases spores episodically (sporadically!) The goal of air sampling is to capture spores when they are airborne. Two sample sets are taken at least two hours apart to increase the likelihood of capturing spores when they are airborne.

Acceptable criteria for post remediation samples (these are my criteria):
1. Total spore concentration approximately 300 or less (This is the concentration commonly found indoors in areas where there has not been a history of water intrusion.)
2. No more than one spore (35 CFUs/M3) of *Stachybotrys* or *Aspergillus* versicolor since these may release mycotoxins.

Spores cannot be seen with the naked eye. Spores range in size from 2 to 10 microns in diameter (a human hair is about 50 microns). It is not unusual to have elevated post remediation spore counts (that is why post samples are taken!) Common reasons for elevated results:
1. The area needs additional cleaning. This is most common where there is carpeting or other fibrous material that acts as a trap for the spores.
2. Remediated area is under negative pressure - air from other locations is pulled into the containment area. It is possible to pull air in from outside or from another contaminated area inside the building.
3. There is more mold in the containment area.

Results for 12/03/01:
1. First set of samples looked great. One sample of 8 taken in containment was 319, next highest was 212. Predominantly outdoor mold types. These are acceptable results.
2. Second set of samples were not acceptable: total counts 742 - 1904.
Predominant mold type was *Aspergillus* versicolor. This indicates an interior source.

Possibilities:
1. Air was pulled during the second sample set from Area B which had not been cleaned.
2. Something (someone entering?) contaminated the area between the sample sets or the second set of samples was contaminated by handling (not by air contamination).
3. Active mold source in Area A.

Since it appeared that air may be pulled from Area B to Area A, after Area B was cleaned and samples were taken in that containment, an additional sample was taken in Area A. We will await the results of these samples before making a decision on the next step.

Bulk samples of building materials and wipe samples of visible mold from several locations contained a variety of mold types. Some of these samples contained mold identified as *Stachybotrys.* Additional building material samples will be taken for spore counts and identification of mold type.

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Sharon J. Bessa & Associates, Inc.
Interpretation of Mold Sample Results

Sampling Limitations

Air sampling for mold spores and other bioaerosols has strong limitations. The American Conference of Governmental Industrial Hygienists (ACGIH) in their 1999 booklet TLVs (Threshold Limit Values) and BEIs (Biological Exposure Indices) states: "Even when investigators work from testable hypotheses and well-formulated sampling plans, results from environmental bioaerosol monitoring may be inconclusive and possibly misleading."

The ACGIH Bioaerosols Committee has developed guidelines for the assessment and control of bioaerosol exposures. These guidelines suggest five activities for evaluating bioaerosol exposures and for recommending control measures:

1. Visual inspection of the building.
2. Assessment of occupant symptoms.
3. Evaluation of building performance.
4. Monitoring of potential environmental sources.
5. Application of professional judgement.

The information collected through air monitoring is only one of the factors that should be considered when selecting the approach to use when bioaerosol exposures are suspected. Reliance on the "numbers" alone may result in inappropriate decision-making due to the limitations of this monitoring. These limitations exist because:

a. Different methods of sample collection and analysis may result in different estimates of mold concentrations. Different sample media (agar) results in the growth of different quantities and different types of mold.

b. The actual cause of health effects from mold is not being quantified when mold spore counts (how much mold grows on a culture plate) are made. Actual antigens (the agents causing an allergic reaction) are not quantified. The concentration of "culturable fungi" (that which will grow on a culture plate) is used to represent the concentration of antigens. Antigens, however, may be present in an environment as particles from a spore coating which will not grow (are not "culturable") on an agar plate. This results in an underestimation of exposure.

Mycotoxins may be the source of additional health effects from mold. The concentration of "culturable fungi" does not quantify the concentration of these chemicals in the environment.

c. The most commonly used sampling devices are those that direct air flow onto a culture plate. This method , while minimizing the loss of culturable fungi through spore damage or drying, has two strong limitations. The sampling device is too large to collect personal breathing zone samples requiring "area" samples. These "area" samples may not accurately reflect human exposure. Second, the samples are taken for a short period of time (minutes) to prevent overgrowth on the culture plate. Some fungi release spores as “concentration bursts” that may not be detected in the short samples. It is suspected that these bursts may produce health effects.

Minimizing the Sampling Limitations

The sampling protocol used by Sharon J. Bessa & Associates, Inc. is designed to minimize the limitations:

1. Two sample sets are taken at each collection site, at least two hours apart. This provides at least two “snapshots” of the mold spore concentrations.
2. Two or three different agars are used for each sample set. This provides 4 to 6 sample plates at each collection site.
3. The samples are taken in an “aggressive” manner. Mold spores are particles that settle on horizontal surfaces after being released. Brushing or raking the carpet, moving papers or books, etc. makes spores airborne while the sample is being taken.
4. "Control" samples are taken in locations where there is no known history or evidence of water damage or mold growth. These samples provide information on the background level of mold contamination in a building.

Quality Control

1. The sampling pump is calibrated before and after each sample day.
2. Cross contamination is minimized by establishing a “clean” and a “contaminated” work space for handling the sampling equipment. The equipment is disinfected between each sample set and each plate is sealed in a plastic bag after the sample is taken.
3. Blanks (unsampled agar plates) are sent for analysis from each location.
4. Samples are kept in a cooler prior to being delivered to the laboratory by the consultant; they are not shipped nor sent by courier.

Acceptable Limits

Acceptable limits for mold sample concentrations (air or bulk samples) have not been established by the Occupational Safety and Health Administration, the Environmental Protection Agency, the National Institute of Occupational Safety and Health or the State of Wisconsin. There are no current limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) for either total mold spore counts or for specific mold genera or species. This organization lists the reasons for this lack of established limits:

1. Health effects vary from one mold genera to another.
2. The type and severity of health effect varies with individual susceptibility. While the most common response to mold exposure is an allergic reaction, recent studies have suggest an association between mold exposure and a variety of systemic health effects.
3. Information relating mold concentrations to specific health effects is insufficient to establish a dose – response relationship. The absence of meaningful epidemiological data is due to the limitations of sampling.

How the Samples are Taken

The sampling device (Andersen 2-stage) consists of two metal filter plates and a pump. A plate of culture media (agar) is placed inside the device below the filter plates. Air is drawn by the pump through the filter plates and mold spores are deposited onto the agar. The air is collected for one minute for a total volume of 28.3 liters.

The plates are removed from the sampler, covered and sealed in a plastic bag. They are taken to the laboratory where they are incubated at 25 degrees Centigrade for 5 to 7 days. The total number of colonies are counted on each plate and the plate is viewed under the microscope to identify the mold by genera (in some cases, by species.)

Results are presented as a concentration: Total Colony Forming Units per Cubic Meter of Air. Although a cubic meter of air is not collected (only 28.3 liters per minute are collected; there are 1000 liters in a cubic meter), the results are presented as if a cubic meter had been collected to allow for comparison of samples when different volumes are used. Some consultants take longer samples or the pump may run an extra second or two resulting in air volumes slightly higher than 28.3 liters. One colony on a culture plate from a sample collected with 28.3 liters of air is equal to 35 colony forming units per cubic meter of air. (28.3 liters divided by 1000 liters [a cubic meter] is 0.0283. 1.0 colony divided by 0.0283 cubic meters equals 35 colony forming units per cubic meters of air.)

Reviewing the Sampling Results

There is no requirement to perform air sampling and there is unlikely to be such a requirement in the near future. Some organizations may wish to forego the expense of sampling and spend their money on remediation. This is acceptable. However, despite the strong limitations, air sampling does provide some quantification of current conditions. These results can be compared to the concentration of mold detected after remediation. This may be important where mold is suspected but is not visible.

Building environments are not sterile and detection of mold spores is expected. Both the concentration and the type of mold detected are important factors to consider in interpreting the results and making recommendations for remediation. The following guidelines for interpreting the sampling results are compiled from three sources:

1. American Conference of Governmental Industrial Hygienists: Bioaerosols Assessment and Control Cincinnati, 1999.
2. American Industrial Hygiene Association: Field Guide for the Determination of Biological Contaminants in Environmental Samples Fairfax, 1996.
3. This consultant's experience and professional judgment.

The following factors are considered in interpreting mold sample results:

1. Total Count of Colony Forming Units per Cubic Meter of Air

This factor shows the greatest variation between the two sample sets taken at each location. It is not unusual to find variations greater than ten-fold between the two sample sets. Typically, there is less variation between the concentrations of mold growing on different agar than between the two sets of samples taken at least two hours apart. This is probably a reflection of the "concentration bursts" or the episodic release of mold spores by the fungus.

Total Count Comparisons are made in two ways:

a. Between samples taken indoors and outdoors. When a mold problem does not exist, the spore concentration in the building should be less than the concentration detected in outdoor samples.

b. Between samples taken in suspect areas and control areas.
The mold spore concentration in most control areas is typically less than or equal to 247 - 300 colony forming units per cubic meter of air. Therefore, when this concentration is exceeded, this may indicate a source of mold at a sample location.

2. Genera and Species
Mold is identified by microscopically examining the "fruiting bodies" or stalks of the mold where spores are produced and released. In most cases, it is possible to identify the mold by genus (plural is genera). The genus is capitalized and in italics: *Cladosporium, Penicillium, Alternaria.* Some mold can also be identified microscopically to the species level. Examples are *Aspergillus* versicolor, *Stachybotrys* atra. If the mold does not produce fruiting bodies these are identified only as "Non-sporulating fungi".

The following mold genera are found in most samples taken outdoors in Wisconsin: *Cladosporium, Penicillium, Alternaria, Epicoccum* and *Aspergillus*. These are also commonly detected in indoor samples. In interpreting sample results the dominant genera/species in the indoor samples is compared to the dominant genera/species found in the outdoor samples. An indoor mold source is suspected when the dominant type of mold in indoor samples is not the same as the dominant type detected in outdoor samples.

3. Most mold comes from soil and leaf decay and the primary health effect is allergic reaction. Four types of mold (the "A" List") cause greater concern and caution when they are identified in indoor samples. These molds are known to produce mycotoxins or chemicals that have been associated with symptoms other than allergic reaction:

Stachybotrys atra or chartarum
Aspergillus versicolor
Aspergillus fumigatus
Fusarium monilitiform

It is important to review sampling results without undue emphasis on any single factor or any single sample. Two examples illustrate the importance of considering all factors and applying professional judgment:

Example #1 Total colony counts taken indoors may be the same as outdoor air. This may indicate a problem, but, if the building has a lot of natural ventilation or if the samples were taken in an area where there was a lot of foot traffic (mold spores enter the building by ventilation as well as being tracked in on shoes and clothing), this may simply indicate contamination from the outdoors. Outdoor air sample concentrations vary with the season and the weather within each season. Obviously, outdoor air samples are not taken in the winter months or when it is raining. Outdoor air concentrations are often very low immediately following a rain shower. These and other factors that affect outdoor air concentrations must be considered in making this comparison with indoor concentrations.

Example #2 One colony of *Aspergillus* versicolor on a culture plate (this is equal to 35 colony forming units per cubic meter of air) does not necessarily indicate an indoor source. However, if there are six colonies (212 colony forming units per cubic meter of air) and this is matched with a history of flooding with dry wall that remained wet for over 48 hours, this may indicate an indoor source for mold.

Each of the sample location results should be interpreted using the above four items along with the visual inspection of the building, assessment of occupant symptoms, evaluation of current and historical building performance. This, along with professional judgement, will result in a reasonable interpretation of the data.

Remediation of the Mold

Remediation or removal of mold growth is necessary to:

1. Halt exposure to excessive mold spore or mycotoxin concentrations.
2. Prevent continued growth of the mold.
3. Prevent or minimize deterioration of building materials.

Mold growth is very difficult to control once it has grown in building materials and it is best to use a professional service company to perform the remediation.. Mold has roots (some mold has longer, more invasive roots than other molds) and, in some cases, it is necessary to remove the building material itself to remove the mold. Mold spores are present in most materials such as fiberglass insulation. In some cases, a bulk sample of the material is taken to quantify the concentration of mold spores per square inch. Many materials contain mold spores in hundreds of colony forming units per square inch. When materials are excessively contaminated with mold spores the concentration is in the thousands per square inch.

The presence of an excessive concentration of mold spores may cause health effects in building occupants. Building materials must be kept from becoming too damp or wet to prevent active mold growth. Measuring the moisture content of a building material may provide an indication of whether the material should be removed. The use of a high efficiency or microfiltration vacuum cleaner on carpets and other surfaces is important in reducing the spore concentration when a building has been contaminated. This should always be done prior to or in place of any type of wet extraction. If the mold growth is extensive, it may be necessary to isolate the area and remove the mold and moldy materials using work practices that are similar to those used in asbestos abatement procedures. There is never a guarantee that mold growth will not recur in a building that has been contaminated. Remediation professionals will want baseline air sampling and follow-up sampling after clean up to objectively measure their progress or success in reducing mold spore counts.

Cesar Chavez Elementary
Remediation (Mold Removal) Procedures
This is a brief, non-technical summary of procedures to date. It is not meant to be a comprehensive listing of all of the findings and work performed in this building.

The building was thoroughly inspected for **visible** mold. This was accomplished in two ways:

1. Baseboard molding was pulled back in a least one area on each wall of every room. The molding on the block walls in some cases could not be removed because the adhesive remained intact. In areas where mold was identified the molding was pulled back entirely until an area was reached where mold was no longer seen.
2. Tiles were lifted to see above the suspended ceiling in every room and hallway.

As work began in the first floor Kindergarten wing, it became evident that the wood bases on which the sink cabinets were placed were moldy. As a result of this discovery, all cabinets were removed to inspect the bases and the cabinets themselves.

Where Mold Was Found

First Floor

Mold was found behind the baseboards and in some areas it extended to approximately two feet above the baseboards. The Kindergarten rooms, the OT/PT room, the janitor's closet and the laundry room (Rooms 122-128) had mold beneath most of the baseboards and drywall and insulation were removed to four feet. Ceramic tile was removed to one foot in the bathrooms.

A small amount of mold (less than two square feet) was found in the following rooms beneath or just above the baseboard: 140B, 130, 133.

A more extensive length of mold was found behind the baseboards in Room 119.

A few feet of mold beneath the baseboards was found in Rooms 118 and 120.

Mold was found on all of the wood bases for the sink cabinets in all rooms in the Kindergarten wing.

Mold was also found on wood bases for the sinks in Rooms 111- 113 and 115-116.

Sink bases in Rooms 134 – 138, also placed on the slab were inspected but mold was not found.

Second Floor

Small spots of mold was found on the drywall underneath the supply air ductwork in Rooms 203, 204, 207 and 210.

Mold was found underneath the baseboard and occasionally extending to two feet in: Rooms: 210 – 216, 223 and the Hallways in this area.

Extensive mold was found on the drywall at the roof level above the suspended ceiling: Rooms: 203-204 and 210 - 216 and 223 and 224.

Mold was found on the upper side of a ceiling tile in Room 228B underneath the VAV box where there was evidence of condensation (mineralization on the metal box.)

Mold Remediation (Removal) Procedures
All rooms or hallways with visible mold were enclosed in plastic sheeting. Air "scrubbers" with high efficiency filters were placed in these "containment" areas and, using plastic tubing, were used to pull the air from the building to the outside. These "scrubbers" filter the air but also keep the area in the plastic containment under negative pressure. In other words, all air movement is into the containment area to prevent spores from being dispersed into other areas which did not have visible mold.

Removal protocol:
All material with visible mold is removed. This has been almost exclusively drywall. Additional material beyond the area with visible mold is removed – usually an additional two to four feet. This depends upon the location and on whether the mold was fairly dense or very spotty.

All areas of the school are being cleaned including those areas that did not have visible mold. Cleaning is done using a vacuum cleaner with a high efficiency filter that traps particle down to 0.3 microns in diameter. A typical mold spore will not be smaller than about 2 microns. (Human hair is about 50 microns in diameter).

Some hard surfaces such as metal studs and floors are damp wiped using a dilute bleach solution. Ceiling tiles and carpeting have been disposed in rooms with visible mold. Materials such as paper and books were lightly vacuumed. Materials were not thrown out unless they were obviously waste materials. Items that could be laundered were bagged and will be washed.

Animals have been removed from the building. Plants have been removed or will not be replaced in rooms after they have been cleaned. Plant leaves and soil contain mold and spores from these could be picked up in air samples. Additional materials such as dried sphagnum moss were also disposed or removed.

Ductwork will be cleaned with the interior insulation removed and replaced.
Bulk sample analysis of drywall beneath the supply air ducts revealed mold types that indicate that the drywall has been very wet for some period of time. This material will be removed within a glove box. If there is visible mold an air scrubber will remain in the area for at least 48 hours and air samples will be taken. If there is no visible mold, final air samples for mold spores will be taken.

Sharon J. Bessa, RN, CIH, COHN
December 19, 2001

Table I Page 1:2
Cesar Chavez Elementary
Concentration of Total Volatile Organic Compounds and Formaldehyde
November 9, 2001
Air Handling Unit #1 was not in operation during these samples.

Sample Number	Sample Location	Sample Duration	Formaldehyde	Total Volatiles	Isopropyl Alcohol
100/200	Blank	--	0.80 micrograms per tube*	ND<0.57 micrograms/tube	ND<1.81 micrograms/ tube
101/201	Room 126	1154 1543	0.034	0.11	0.14
102/202	Office	1159 1555	0.033	0.03	0.14
103/203	IMC	1152 1554	0.027	0.03	0.11
104/204	Room 202	1202 1535	0.020	0.08	0.17
105/205	Room 228	1200 1530	0.038	0.07	0.38
OSHA 8 Hr. Permissible Exposure Level OSHA 15 Minute Exposure Level			**0.75 ppm 2.0 ppm**	**Not Established**	**400 ppm**
ACGIH 8 Hr. Recommended Level Recommended 15 Min. Ceiling Level			**Not Established 0.3 ppm**	**Not Established**	**400 ppm** 500 ppm**
EPA BASE Study in Commercial Office (these were not newly constructed)			**0.0008 - 0.024**	**0.009 - 0.147 Mean 0.045**	**NA**
Canada Guidelines for Residential Indoor Air (assuming 24 hour exposure and more vulnerable population)			**Less than 0.05 ppm Action Level: 0.10 ppm**	**Not Established**	**NA**
This Consultant's Goal for New Buildings			**No greater than 0.04 ppm**	**No greater than 0.09 ppm**	**NA**

100s = Total volatiles and alcohol and 200s = Formaldehyde.
NA - Isopropyl alcohol was used to clean sampling equipment in the vicinity of the testing. This would not be expected to be present at other times.
Blank value is in micrograms per tube. *Subtracted from detected values.
ND = None Detected followed by the minimum detection limit.
Concentrations are in parts per million.
Flow rates ranged from 0.19 to 0.22 liters per minute.
Media: SKC 226-01 for total volatiles and Supelco ORBO 24 for formaldehyde.
**May be changed to 200 and 400 ppm.
Measuring "Total Volatile Organic Compounds" is a method used to indicate the concentration of organic contaminants present at very low levels in indoor air. Instead of looking specifically for each individual contaminant, analysis looks at all of the organics that were detected when the sample is collected on a charcoal tube. The source of TVOCs can be building or construction components as well as interior components such as carpeting, adhesives used in carpeting or wall covers. The source may also be building

occupants (perfume, after shave, deodorant) and the activities of occupants such as photocopying, and cleaning products used in the building.

Typical concentrations found in commercial office buildings range in an EPA BASE Study: Range: 0.009 – 0.147 ppm, mean 0.045 ppm in buildings that were "non-complaint" and not containing a large quantity of new construction materials.
These are very low levels of chemical contamination and the concentration of TVOCs detected does not seem to correlate well with the typical symptoms associated with indoor air quality studies.
The molecular weight of hexane is chosen to represent the molecular of all of the TVOCs that could have been detected.

< = less than. The number following indicates the lowest level that could have been accurately quantified if TVOCs had been detected.

Table II Page 1:2
Concentration of Mold Spores
Cesar Chavez Elementary
November 9, 2001

Sample Number	Mold Genus In Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Classroom 127											
101	495	495								71NSF 35b	1096
301	495	283					35a	35a			848
109	212	389	35							35NSF	671
309	283	318	71				35c		35a		742
Room 116											
102	177	601				71		71a		35NSF	955
302	318	389			35					35c	777
110	71	177	35	35							318
310	141	318						35b			494
Room 140											
103	353	565	71			35					1024
303	565	777	35								1377
111	35	177									212
311	71	212			35				35b		353
IMC											
104	106	283	71								460
304	141	389									530
112	106	106	35								247
312	212	212					35a	35b			494

1 = *Cladosporium* sp. 2 = *Penicillium* sp. 3 = *Alternaria* sp. 4 = *Epicoccum* nigrum
5 = *Acremonium* sp. 6 = *Fusarium* sp. 7 = *Aspergillus* a = niger, b = flavus, c = versicolor
8 = a = *Ustilago* sp. b = Aerobic actinomycete 9 a = *Phoma* b = *Aureobasidium* pullulans
10 a = *Mucor* sp. b = *Trichoderma* harzianum c = *Rhizopus* sp.
NSF = Non sporulating fungi (could not identify).
100s = Malt Extract Agar, 300s = Cornmeal Agar

Table II Page 2:2
Concentration of Mold Spores
Cesar Chavez Elementary

Table II Page 2:2
Concentration of Mold Spores
Cesar Chavez Elementary School
November 9, 2001

Sample Number	Mold Genus In Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Room 228											
105	106	353	35								494
305	131	326	33								490
113	212	141	35						35b		423
313	177	177					35a				389
Room 203											
106	212	495									707
306	4130	989	71	106							5296
114	106	71	35				35a	106a			353
314	989	247	35	35						35a	1341
Office Room 100H											
107	389	1630				71					2090
307	1240	2260	35			35					3570
115	71	212									283
315	247	177									424
Outside Air											
108	2120	247	106	35							2508
308	1840	283		71			35b			35NSF	2264
116	2610	919	71	35						35a	3670
316	6780	177	141	71							7169

1 = *Cladosporium* sp. 2 = *Penicillium* sp. 3 = *Alternaria* sp. 4 = *Epicoccum* nigrum
5 = *Acremonium* sp. 6 = *Fusarium* sp. 7 = *Aspergillus* a = niger, b = flavus, c = versicolor
8 = a = *Ustilago* sp. b = Aerobic actinomycete 9 a = *Phoma* b = *Aureobasidium* pullulans
10 a = *Mucor* sp. b = *Trichoderma* harzianum c = *Rhizopus* sp.
NSF = Non sporulating fungi (could not identify).
100s = Malt Extract Agar, 300s = Cornmeal Agar

Table III
Cesar Chavez Elementary
Concentration of Total Volatile Organic Compounds and Formaldehyde
November 9, 2001 and November 20, 2001

Sample Location	Carbon Dioxide	Formaldehyde	Total Volatiles
Blank	Air Handling Unit not in operation in Class-rooms on 11/9/01, windows open on 11/20/01	0.80/2.0/0.8** micrograms per tube	ND<0.57 micrograms/tube
Room 126		0.034 0.028 0.005**	0.11 0.06
Office		0.033 0.020 None Detected**	0.03 0.05
IMC		0.027 0.030 0.007**	0.03 0.03
Room 202*		0.020 0.024 0.005**	0.08 0.06
Room 228		0.038 0.103 None Detected**	0.07 0.03
OSHA 8 Hr. Limit 15 Minute Limit		**0.75 ppm 2.0 ppm**	**Not Established Typical is 50 - 100 ppm**
ACGIH 15 Minute Ceiling		**0.3 ppm**	
EPA BASE Survey (not new buildings)		**0.0008 - 0.024**	**0.009 - 0.147**
Canada Residential		**Less than 0.05**	**NA**
SJB Goal New Buildings		**No Greater than 0.04**	**No Greater than 0.09**

*Room 207 on November 20. 2001.

**Blank value is subtracted from the detected quantity. Blank value of 2.0 micrograms is unusually high - 0.8 micrograms is typical. The third number listed is the concentration present if 2.0 micrograms is subtracted from the detected concentration. The value listed above this is the concentration that would be found if only 0.8 micrograms were subtracted from the values detected.

Table IV
Cesar Chavez Elementary School
Bulk Sample Results
First Floor, Room 203
November 26, 2001

Sample Number CCS 112601	Sample Location	Material	Genus/Species	Colony Forming Units Per Square Inch
999	Room 203	Swab Flex Duct	NSF	100
998	Room 129 NE Corner, above baseboard	Core of drywall	None Detected	<100
997	Room 129 East Wall, above baseboard, one foot north of outlet	Core of drywall	*Penicillium* sp.	1200
996	Room 129 East Wall, above baseboard between outlets	Core of drywall	None Detected	<100
995	Room 140B	Swab visible mold	*Alternaria* sp.	*
994	Hallway, across from Room 126, wall of 129, at baseboard, 2 feet from corner	Core of drywall	Basidiomycete	400
993	Not taken			
992	Room 124, behind baseboard	Swab of visible mold	*Penicillium* sp.	*
991	Room 124, behind baseboard	Swab of visible mold	*Penicillium* sp. *Chaetomium* sp.	
990	Hallway across from 125B	Swab of visible mold	*Penicillium* sp. *Cladosporium* sp. *Alternaria* sp.	*

NSF = Non-sporulating fungi (did not grow adequately for identification)
* Identification of the mold only - concentration of spores not requested.

Table V
Cesar Chavez Elementary School
Bulk Sample Results
Wood Sink Bases and Filter Paper
November 29, 2001

Sample Number CCS 112901	Sample Location	Material	Genus/Species	Colony Forming Units Per Square Inch
887	Filter Frame	Paper bulk	*Penicillium* sp. *Rhodotorula* sp. *Cladosporium* sp. *Alternaria* sp. *Aureobasidium* pullulans	49, 000 3000 1700 500 200
888	Swab	Filter frame	*Fusarium* sp. *Rhodotorula* sp. *Cladosporium* sp. *Alternaria* sp. *Aureobasidium* pullulans Yeast	*
886	Swab Gold mold	Visible mold sink base**	*Aspergillus* versicolor *Penicillium* sp. *Aspergillus* glaucus group NSF	*
885	Swab Dark brown	Visible mold sink base**	*Aspergillus* versicolor *Penicillium* sp. *Aspergillus* glaucus group	*
884	Swab White/brown	Visible mold sink base**	*Aspergillus* versicolor *Penicillium* sp.	*

*For identification only - not spore concentration.
**Sink base from one of the rooms in the first containment area - 122-124. Base had been removed from the room. Location of room not noted.
NSF = Non-sporulating fungi - could not be identified.

Table VI Page 1:2
Concentration of Airborne Mold Spores
Cesar Chavez Elementary School
Post Remediation - First Floor
December 3, 2001

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Room 122											
101	71	71	35	35							212
301		71	71				35b				177
109	1200	71	212	35		35					1553
309	1550	71	283								1904
Room 123											
102	35	35	35	35	71						211
302		35	35	35	35						140
110	1590		71	71		106b 35c					1873
310	989	212	71			71b					1343
Room 124											
103		71	35	35		35					176
303	71	71	71		71	35					319
111	389	141	177	35							742
311	1020	71	71			35a 106b					1303
Hallway Outside 124											
104	106		35	35							176
304			35			35					70
112	671	71	177								919
312	989		35		71	35a 35d					1165
Room 140 A											
105				35							35
305		71		35							106
113			71	35	35		35a				176
313				35				35a			70

1 = *Aspergillus* versicolor 2 = *Cladosporium* 3 = *Penicillium* 4 = Basidiomycete
5 = *Malbranchea* sp. 6 = *Aspergillus* a = fumigatus, b = glaucus, c = sydowii, d = ustus
e = niger 7 a = *Alternaria* sp. b = *Acremonium* sp. 8 a = *Aureobasidium* pullulans,
b = Aerobic Actinomycete 9 a = *Epicoccum* nigrum, b = *Ulocladium* sp.
10 = *Fusarium* sp. NSF = Non-sporulating Fungi (not identifiable)
Total = Total Colony Forming Units per Cubic Meter of Air ND = None Detected
Sample Media: 100 Series Malt Extract Agar 300 Series Cornmeal Agar

Table VI Page 2:2
Concentration of Airborne Mold Spores
Cesar Chavez Elementary School
Post Remediation - First Floor
December 3, 2001

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Room 140											
106			35	71	71	35					212
306			35					35a			70
114	106		106	71				35b			318
314	283	35				35					353
Room 140 B (Containment)											
107			35	71					35a		141
307				35							35
115	35			35	35						105
315	71		71								142
Outside Air											
108		106			35	353	35a		71a 35b	35NSF	670
308		318		106	141	353			35a	35a	988
116	141	671	318	35	71	35	71a				1342
316	141	919	71	106	212	141a		35b	35a		1660

1 = *Aspergillus* versicolor 2 = *Cladosporium* 3 = *Penicillium* 4 = Basidiomycete
5 = *Malbranchea* sp. 6 = *Aspergillus* a = fumigatus, b = glaucus, c = sydowii, d = ustus
e = niger 7 a = *Alternaria* sp. b = *Acremonium* sp. 8 a = *Aureobasidium* pullulans,
b = Aerobic Actinomycete 9 a = *Epicoccum* nigrum, b = *Ulocladium* sp.
10 = *Fusarium* sp. NSF = Non-sporulating Fungi (not identifiable)
Total = Total Colony Forming Units per Cubic Meter of Air ND = None Detected
Sample Media: 100 Series Malt Extract Agar 300 Series Cornmeal Agar
Samples were collected in an aggressive manner using an Anderson 2-Stage Cascade Impactor. Collection was for one minute starting at the time noted unless otherwise indicated for a total volume of 28.3 liters of air.

No fungi was detected in the blanks.

Table VII
Cesar Chavez Elementary School
Bulk Sample Results
Drywall and Insulation
December 4, 2001

Sample Number CCS 120401	Sample Location	Material	Genus/Species	Colony Forming Units Per Square Inch
777	Room 122 Wall toward hallway, at seam under water pipe	Drywall	*Chaetomium* sp.	600
776	Room 122 Under SA duct*	Drywall	*Chaetomium* sp.	100
775	Room 122 Below I Beam	Drywall	*Acremonium* sp.	100
774	Room 123 Above doorway	Insulation	None Detected	
773	Room 123 From wall toward 123A	Insulation	*Penicillium* sp. Basidiomycete	100 100
772	Hallway under SA duct	Drywall	*Stachybotrys* chartarum	200
771	Room 124 At second floor level	Insulation	*Aspergillus* versicolor and glaucus group *Penicillium* sp.	300 100 100
770	Room 124 At second floor level	Drywall	*Aspergillus* versicolor *Penicillium* sp.	100 100
769	Room 138 Under SA duct	Drywall	None Detected	
768	Room 138 Under SA duct	Insulation	*Stachybotrys* chartarum	200

*SA = supply air

Table VIII
Cesar Chavez Elementary School
Bulk Sample Results
Swabs of Wood Sink Bases
December 6, 2001
Taken by Tom Kannal of Madison Metropolitan School District

Sample Number 120601	Sample Location	Material	Genus/Species
1	Room 111	Swab Visible Mold	*Aspergillus* versicolor, fumigatus and glaucus group *Penicillium* sp.
2	Room 112	Swab Visible Mold	*Aspergillus* versicolor, fumigatus and glaucus group *Penicillium* sp.
3	Room 113	Swab Visible Mold	*Aspergillus* versicolor, sydowii, and glaucus group *Cladosporium* sp.
4	Room 114	Swab Visible Mold	*Aspergillus* versicolor, fumigatus and glaucus group *Penicillium* sp.
5	Room 115	Swab Visible Mold	*Aspergillus* versicolor *Penicillium* sp.

Table IX Page 1:2
Concentration of Airborne Mold Spores
Cesar Chavez Elementary School
Post Remediation - First Floor
December 8, 2001

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Hallway Outside 129											
101A	106										106
301A	71	35			35						141
109A					106						106
309A	35	141			35						211
Room 129											
102A		35									35
302A			35								35
110A	35	35									70
310A	71										71
Room 128											
103A	141	35			35					35NSF	246
303A	106		35								141
111A	35				35					35NSF	105
311A		35								71NSF	106
Room 127											
104A	71									35NSF	106
304A	35			71	35	35b					176
112A	35				71	35c				71NSF	212
312A		71			35					35NSF	141

1 = Basidiomycete 2 = *Cladosporium* sp. 3 = *Penicillium* sp. 4 = *Aspergillus* versicolor
5 = *Malbranchea* sp. 6 = *Aspergillus* a = fumigatus, b = glaucus, c = nidulans d = terreus
7 = *Ustilago* sp. 8 = *Ustilago* sp. 9 a = *Epicoccum* nigrum, b = *Beauveria* sp.
10 = *Chaetomium* sp.
NSF = Non-sporulating Fungi (not identifiable)
Total = Total Colony Forming Units per Cubic Meter of Air ND = None Detected
Sample Media: 100 Series Malt Extract Agar 300 Series Cornmeal Agar
Samples were collected in an aggressive manner using an Anderson 2-Stage Cascade Impactor. Collection was for one minute starting at the time noted unless otherwise indicated for a total volume of 28.3 liters of air.

Fungi was not detected in the blanks.

Table IX Page 2:2
Concentration of Airborne Mold Spores
Cesar Chavez Elementary School
Post Remediation - First Floor
December 8, 2001

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Room 126											
105A		35	177			35a				71NSF	318
305A	Sample not submitted. Contaminated during closing lid.										
113A	141										141
313A		35				35a				35NSF	105
Outside Air											
106A	283				247					71NSF	601
306A	141	212			35						388
114A		177			35					247NSF 35Y	494
314A	212	141			35		35	35			458
Gymnasium											
107A	177	106									283
307A	141	71									212
115A	106	71	71		35			35	35a		353
315A	71	106			71				35b		283
Room 124 (In First Containment Area)											
108A	71		141		35						247
308A	71		71		35		35				212
116A	35		71			35d				35	176
316A	71	35			35						141

1 = Basidiomycete 2 = *Cladosporium* sp. 3 = *Penicillium* sp. 4 = *Aspergillus* versicolor
5 = *Malbranchea* sp. 6 = *Aspergillus* a = fumigatus, b = glaucus, c = nidulans d = terreus
7 = *Ustilago* sp. 8 = *Ustilago* sp. 9 a = *Epicoccum* nigrum, b = *Beauveria* sp.
10 = *Chaetomium* sp.
NSF = Non-sporulating Fungi (not identifiable)
Total = Total Colony Forming Units per Cubic Meter of Air ND = None Detected
Sample Media: 100 Series Malt Extract Agar 300 Series Cornmeal Agar
Samples were collected in an aggressive manner using an Anderson 2-Stage Cascade Impactor. Collection was for one minute starting at the time noted unless otherwise indicated for a total volume of 28.3 liters of air.

999A Swab of table top in Gym
near 104B - *Aspergillus* fumigatus 100 CFU/square inch
998A near office hallway - *Penicillium* sp.

Table X Page 1:3
Concentration of Airborne Mold Spores
Cesar Chavez Elementary School
Post Cleaning - Office Area
December 13, 2001

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	2	3	4	5	6	7	8	9	10	
Kitchen											
101C	141										141
201C	71										71
301C	177									71NSF	248
113C	318	35			35						388
213C	106										106
313C	495										495
Room 100 Main Office											
102C	141	35					71			71NSF	318
202C			35								35
302C	106	35									141
114C	283		35								318
214C		35		35							70
314C	141	35									176
Room 101 Mail											
103C	71	35			71						177
203C		35	35								70
303C	141				71	35a					247
115C	212		35								247
215C											ND
315C	318										318
Room 100A											
104C	177	35			71						283
204C											ND
304C	141	35	35		106						317
116C	212	106									318
216C	35		35								70
316C	71		35								106

1 = Basidiomycete 2 = *Cladosporium* sp. 3 = *Penicillium* sp. 4 = *Alternaria* sp.
5 = *Malbranchea* sp. 6 *Aspergillus* a = fumigatus b = nidulans 7 = *Rhodotorula* sp.
8 = *Epicoccum* nigrum 9 = *Beauveria* sp. 10 = *Aspergillus* versicolor
NSF = Non-sporulating Fungi (not identifiable) Fungi was not detected in the blanks.
Total = Total Colony Forming Units per Cubic Meter of Air ND = None Detected
Sample Media: 100 Series Malt Extract Agar
200 Series Malt Extract Agar with Sodium Chloride
300 Series Cornmeal Agar

Table X Page 2:3
Concentration of Airborne Mold Spores
Cesar Chavez Elementary School
Post Cleaning - Office Area
December 13, 2001

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	2	3	4	5	6	7	8	9	10	
Room 100B											
105C	177				35						212
205C	35										35
305C	177										177
117C	212										212
217C					35						35
317C	141										141
Room 100E											
106C	353			35			35				423
206C	35	71									106
306C	318	35									353
118C				71				35			106
218C											ND
318C	106	35									141
Room 100F											
107C	141	71	71								283
207C											ND
307C	177	35				35a					247
119C	141		35								176
219C	35			35							70
319C	212										212
Room 100G											
108C	177		389								566
208C			212						35		247
308C	177		212								389
120C	106	35									141
220C	Sample not submitted.										
320C	141	35					35				211

1 = Basidiomycete 2 = *Cladosporium* sp. 3 = *Penicillium* sp. 4 = *Alternaria* sp.
5 = *Malbranchea* sp. 6 *Aspergillus* a = fumigatus b = nidulans 7 = *Rhodotorula* sp.
8 = *Epicoccum* nigrum 9 = *Beauveria* sp. 10 = *Aspergillus* versicolor
NSF = Non-sporulating Fungi (not identifiable)
Total = Total Colony Forming Units per Cubic Meter of Air ND = None Detected
Sample Media: 100 Series Malt Extract Agar
200 Series Malt Extract Agar with Sodium Chloride
300 Series Cornmeal Agar

Table X Page 3:3
Concentration of Airborne Mold Spores
Cesar Chavez Elementary School
Post Cleaning - Office Area
December 13, 2001

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Room 100H											
109C	106	35	71	35							247
209C			35	35							70
309C	212	106		35							353
121C	141	35									176
221C											ND
321C	212										212
Room 100J											
110C	35			71							106
210C		35									35
310C	212	35	35								282
122C	177	35									212
222C	Damaged plates - not submitted.										
322C											
Room 105 Music											
111C	35										35
211C											ND
311C	141										141
123C	177										177
223C											ND
323C	141	35									176
Outside Air											
112C	707				141						848
212C	777										777
312C	1100	35	35		35						1205
124C	565	35			177	35				71	883
224C	671	106	35	35							847
324C	1020	35			141						1196

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Sample Media: 100 Series Malt Extract Agar
200 Series Malt Extract Agar with Sodium Chloride
300 Series Cornmeal Agar