October 11, 2002

Doug Pearson
Madison Metropolitan School District
471 Pflaum Road
Madison, WI 53718-6765

Dear Doug:

Enclosed is the report of the industrial hygiene evaluation that was performed at Chavez Elementary in July and August. These are the final samples taken to sample for fungal contamination in the office area. Also included are the final samples taken for total volatiles and formaldehyde. In these samples, formaldehyde was detected at only a trace in those samples where detection was made. Total volatiles were above the 0.09 part per million goal for new buildings in the classroom areas but were detected at very low concentrations. I recommend one last test in a classroom on each floor to verify that these concentrations have fallen below my goal of 0.09 parts per million. The US Green Building Council also recommends, in their LEED (Leadership in Energy and Environmental Design) program, interior total volatile levels at no greater than 0.05 ppm above outside air. Total volatiles were not detected in the outside air during this sample period. The LMC sample was below 0.09 ppm but above 0.05 at 0.053 ppm. I recommend a final sample in that area also.

Please contact me if you have any questions. I appreciate the opportunity to perform these services.

Sincerely,

Sharon J. Bessa, RN, CIH, COHN

Enclosure

Industrial Hygiene Evaluation of

Indoor Air Quality

Cesar Chavez Elementary School

3502 Maple Grove Road

Madison, Wisconsin

Performed By: Sharon J. Bessa, RN, CIH, COHN

Completed On: July 16 and August 21, 2002

Reported On: October 1, 2002

Industrial Hygiene Evaluation of

Indoor Air Quality

This is the report of an industrial hygiene evaluation that was conducted on July 16 and August 21, 2002 by Sharon J. Bessa, RN, CIH, COHN.

I. Project Summary

A. Scope of the Work

This work was performed at the request of Doug Pearson of the Madison Metropolitan School District to conduct final fungal contamination samples in the office area and final chemical outgassing samples throughout the building.

B. Findings

1. Fungal spore counts in air samples, viable and non-viable, were detected at acceptable concentrations. (See Tables I, III.) Note: When the sample results were e-mailed in August there was a question regarding the non-viable sample results in the LMC and outside air. It appeared that the sample results in these two areas had been switched. The laboratory technician subsequently confirmed that the switch had been made in the lab and corrected results were sent to me.

2. Carpet dust spore concentrations were elevated but the predominant mold type (where there was predominance) were those typical of outside air: *Cladosporium* and basidiomycetes. The concentrations were likely to be overestimated because of the very small quantity of dust in the samples. The carpet had been vacuumed using a high efficiency filter just prior to the sample extraction. It was very difficult to extract any dust from these locations. There was no indication that the carpet had mold growth: no visible mold, no odors and the carpets adhesive was intact. (See Table II.)

2. Formaldehyde was not detected in the first floor classrooms and was detected at a trace concentration (too low for quantification) in the remaining areas. (See Table IV.)

3. Total volatile organic compounds were detected in a range from 0.015 parts per million (ppm) in the office area to 0.136 ppm in one of the first floor classrooms. (See Table IV.)

4. Particulate concentrations were very low, ranging from 0.024 to 0.050 milligrams per cubic meter of air. Carbon dioxide concentrations in this building during low occupancy ranged from 350 to 421 parts per million compared to 318 in outside air. Temperature ranged from 71.6 to 76.2 and relative humidity ranged from an average of 45.9% to 55.1%. Outside air temperature peaked at 89.8 degrees Fahrenheit and relative humidity at 75.6%. (See Table V.)

C. Conclusions and Recommendations

1. There is no indication of a need for further evaluation of fungal contamination in this building.

2. The total volatile concentrations are very low and should not results in health effects or symptoms unless someone had an unusual sensitivity.
The concentrations do exceed this consultant's goal of 0.09 ppm for new buildings as well as exceeding the concentration recommended by the US Green Building Council. The Council, in the LEED (Leadership in Energy and Environmental Design) Program recommends total volatiles at no greater than 0.05 ppm above outside air. Total volatiles were not detected in outside air in this sample set.
The floor of the mechanical room had been sealed and painted in the week prior to the samples. This may account for some of the volatiles that were detected. 4 -Phenylcyclohexene, a potential contaminant from synthetic latex adhesive used in carpeting, was not detected.
Run the air handling units 24/7 to increase the flushing of the total volatile organic compounds. Retest in the LMC and classrooms in October.

II. Method of Investigation

A. Sampling Strategy

The sampling was conducted to measure fungal contamination in this school following extensive mold remediation. Formaldehyde and total volatile samples were taken to measure the concentration of these substances following reconstruction and the placement of new area carpets.

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.

5. See the attached "Interpretation of Mold Samples" for additional information on quality control.

Table XX Page 1:3
Concentration of Airborne Viable Mold Spores
Chavez Elementary School
July 16, 2002

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Office Reception Area Room 100											
131	24			12	12						48
231	24		12						12a	NSF 12	60
331	82	141	24	12							259
144	71			12		12					95
244	12	12	24								48
344	35		47								82
Room 101											
132	94		12	12			47b 12c				177
232	94	24	35	12							165
332	35		24				12b				71
145	35		24	12		12					83
245	82		12			35					129
345	130			35							165
Room 100A											
133	118	24	35								177
233	141										141
333	106		12						12a		130
146	212			12			24b 12c				260
246	71	12		12							95
346	71						12a				83
Room 100B Health Office											
134	47		12		12						71
234	35		12				12d	12a			71
334	59			12							71
147	59			12				12e			83
247	35		12			12		12d	12c		83
347	94	12									106

Table XX Page 2:3
July 16, 2002

Sample	Mold Genus in Colony Forming Units per Cubic Meter of Air										Total
	1	2	3	4	5	6	7	8	9	10	
Room 100C Health Office											
135	35	24	35				12d	12f	12b 12d		142
235	24		12	35						12a	83
335	24		12				24b				60
148	35		12	12				12d			71
248	35			12				12d	12f		71
348	94							12c			106
Room 100E											
136	35	12		12						NSF 12	71
236		12	12				12b 12d				60
336	106					12	12b		12e		142
149	24		12								36
249	71		12				35a				118
349	59					12		12c			83
Room 100F											
137	12									12b NSF 12	36
237	35			12	12	24					83
337	71				12	12					95
150	35						12a				47
250	12								12c		24
350	24										24
Room 100G											
138	35		12		12						59
238	24		12								36
338	47	12	12	12							83
151	35					24					59
251	24								12g		36
351	12	12					12b				36

Table XX Page 3:3
July 16, 2002

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											
139	47		24	12					12b 12c		107
239	71		24								95
339	12						12b				24
152	35		12				12e				59
252	35					12					47
352	47		24								71
Room 100J Conference Room											
140			35	12	12			12a			71
240	59						12b		12c		83
340	35		12				12b				59
153	12		24			12					48
253	59								47a		106
353	94		24			12					130
Room 105											
141	24		12					12a			48
241	24							12c			36
341	24		12					12a			48
154	59	35					12e	24b 12d			142
254	71	12				24	24e		35d		166
354	35	12				24					71
Room 110 LMC											
142	24			12						12b	48
242			24			12					36
342											ND
155	21										21
255	12										12
355				12						NSF 24	36
Outside Air											
143	498		93	23	35			12b			661
243	836		118		24			12b			990
343	565			35	12						612
156	895		71	24	35			35b			1060
256	754		59	12			12c		12a		849
356	919		47					35b			1001

Key for Table XX

1 = *Cladosporium* sp.
2 = *Penicillium* sp.
3 = *Alternaria sp.*
4 = Basidiomycete
5 = *Epicoccum* nigrum
6 = *Acremonium* sp.
7 = *Aspergillus* species a = versicolor, b = fumigatus, c = niger, d = glaucus group, e = ochraceus
8 = a = *Pithomyces* sp., b = *Fusarium* sp., c = *Arthrinium* sp., d = *Beauveria* sp., e = *Rhodotorula* sp., f = *Chyrsosporium* sp.
9 = a = *Cylindrocarpon* sp., b = *Phoma* sp., c = *Aureobasidium* pullulans, d = Aerobic Actinomycete, e = *Stemphylium* sp., f = *Phialophora* sp., g = *Aphanocladium* sp.
10 = a = *Stachybotrys* chartarum, b = *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
200 Series Malt Extract Agar with Sodium Chloride
300 Series Cornmeal Agar

Interpretation of Results

These concentrations are typical of those in building which do not have a history of water intrusion or visible mold. However, there are significant limitations to mold air samples - most of them result in an underestimation of mold spore concentrations.
"Acceptable" concentrations is a comparison to "control" samples in areas or buildings without history or evidence of visible mold. "Acceptable" concentrations in relation to avoiding health effects have not been established.
Reference should be made to the attached document for additional information on sampling procedures and limitations: Interpretation of Mold Sample Results.

Table XXI
Carpet Sample Results
Chavez Elementary School
July 16, 2002

Sample # Agar	Sample Location	Material in Grams*	Genus/Species	Colony Forming Units/Square Inch
599 Malt Extract	**Room 100**	**0.01**	Basidiomycete *Cladosporium* sp. *Acremonium* sp. *Alternaria* sp.	80,000 20,000 10,000 10,000 Total: 120,000
599 Malt with Sodium Chloride			Basidiomycete *Cladosporium* sp. *Acremonium* sp.	60,000 10,000 10,000 Total: 80,000
599 Cornmeal			Basidiomycete *Acremonium* sp.	40,000 10,000 Total: 50,000
598 Malt Extract	**Room 100J**	**0.02**	*Penicillium* sp. *Trichoderma* harzianum	10,000 5,000 Total: 15,000
598 Malt with Sodium Chloride			*Aspergillus* fumigatus *Acremonium* sp. *Cladosporium* sp. *Alternaria* sp.	5,000 5,000 5,000 5,000 Total: 20,000
598 Cornmeal			*Acremonium* sp. *Penicillium* sp. *Cladosporium* sp. *Alternaria* sp.	5,000 5,000 5,000 5,000 Total: 20,000
597 Malt Extract	**LMC**	**0.01**	*Cladosporium* sp. *Trichoderma* koningii *Rhizopus* sp. Non-sporulating Fungi	40,000 20,000 10,000 10,000 Total: 80,000
597 Malt with Sodium Chloride			*Cladosporium* sp. *Alternaria* sp. *Rhizopus* sp. *Penicillium* sp.	30,000 20,000 10,000 10,000 Total: 70,000
597 Cornmeal			*Cladosporium* sp. *Trichoderma* koningii *Rhizopus* sp.	30,000 20,000 10,000 Total: 60,000

Table XXI Notes and Interpretation

*Due to the low quantity of dust that was extracted from the carpet (it was difficult to extract even this quantity) these sample results overestimate the concentration of spores when the results are extrapolated to a gram of dust.

There are no standards for concentration of spores in dust. Typical spore concentrations range from approximately 5000 to 100,000 in control samples. There were no locations that could be considered for control samples in this building since it was not possible to identify an area that was not constructed during a different time frame or under different conditions.
These samples were taken to evaluate the carpet for any indication of mold GROWTH. These samples indicate that there is no indication of mold growth in the carpet in these rooms.

Table XXII Page 1:2

Chavez Elementary School
Viable and Non-Viable Fungal Spores and Fragments
July 16, 2002

Sample Number	Mold Genus In Colony Forming Units per Cubic Meter of Air										Total
	1	2	3	4	5	6	7	8	9	10	
Office Reception Area Room 100											
431	37	110	37	37		73	73				367
444	658		73								731
Room 101											
432	366	329			73	146					914
445	146	73	73		73						365
Room 100A											
433	512	329				146	37	37			1061
446	146	293	73	73		219					804
Room 100B Health Office											
434	73	37	37								147
447	73	73				73					219
Room 100C Health Office											
435	146	37									183
448	146		146								292
Room 100E											
436	37	73									110
449	219	293			146	73	73				804

Table XXII Page 2:2

Chavez Elementary School
Viable and Non-Viable Fungal Spores and Fragments
July 16, 2002

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 100F											
437	110										110
450											ND
Room 100G											
438	73	37		37	73	110					330
451	73										73
Room 100H											
439		73									73
452		146									146
Room 100J Conference Room											
440	73			37		73					183
453		146				73					219
Room 105											
441		73		37		37					147
454	219	439	73	146		73					950
Room 110 LMC											
442		37									37
455											ND
Outside Air											
443	6437	3511		293	329	622		266	293	146a 37b	12070
456	6656		585	3511	219	805		146	146		12068

Key Table XXII
1 = *Cladosporium* sp. 2 = Basidiospores 3 = Myxomycetes/Smuts/Rusts
4 = Ascospores 5 = Miscellaneous hyphae 6 = Unidentified
7 = *Epicoccum* sp. 8 = *Alternaria* sp. 9 = *Penicillium/Aspergillus* sp.
10 = a = *Cercospora*-like sp. b = *Drechslera* sp.

Interpretation of Results
These concentrations are typical of those in building which do not have a history of water intrusion or visible mold. However, there are significant limitations to mold air samples - most of them result in an underestimation of mold spore concentrations.
"Acceptable" concentrations is a comparison to "control" samples in areas or buildings without history or evidence of visible mold. "Acceptable" concentrations in relation to avoiding health effects have not been established.
Reference should be made to the attached document for additional information on sampling procedures and limitations: Interpretation of Mold Sample Results.

Table XXIII
Cesar Chavez Elementary
Concentration of Total Volatile Organic Compounds and Formaldehyde
August 21, 2002

Sample #	Sample Location	Sample Duration	Total Volatiles Parts per Million	Formaldehyde Parts per Million
600/700	Blank	--	1.77	ND<0.57
601/701	Room 113	1217 1614	0.133	≤0.019
602/702	Room 124	1220 1616	0.136	ND< 0.005
604/704	Room 213	1222 1620	0.127	≤0.009
605/705	Room 202	1224 1624	0.129	≤0.009
606/706	Room 135	1227 1628	0.101	≤0.014
607/707	LMC	1228 1630	0.053	≤0.037
608/708	Office 100H	1229 1635	0.015	≤0.014
609/709	Outside Air	1234 1639	ND< 0.004	≤0.009
OSHA 8 Hour Limit **OSHA 15 Minute Limit**			**Not Established** **Typical is 50 to 100 ppm**	**0.75 ppm** **2.0 ppm**
ACGIH 15 Minute Ceiling				**0.3 ppm**
EPA BASE Partial Survey Data (Not new buildings)			**0.009 - 0.147 ppm**	**0.0008 - 0.024 ppm**
Canada Residential			**NA**	**Less than 0.05**
SJB Goal for New Buildings			**No Greater than 0.09 ppm**	**No Greater than 0.04 ppm**

600s = Total volatile organic compounds as hexane 700s = Formaldehyde

* Blank quantities are in micrograms per tube and the quantity has been subtracted from the detected quantities.

ND = None Detected followed by the minimum detection quantity.

4-Phenylcyclohexene, a contaminant that has been identified in outgassing from synthetic latex carpet glue, was not detected in these samples to a detection limit ranging from 0.001 to 0.010 parts per million.

603 and 703 were not analyzed - the pump died.

≤ = Less than or equal, the concentration that follows is the minimum detection limit that could be identified with accuracy. This translates to a trace of formaldehyde.

The total volatile organics appeared to be low molecular weight alcohols or ketones. These concentrations are typical of those in a new building and should not cause health effects. The concentrations should gradually decrease as more outside air dilutes the building during cooler weather. The concentrations will be re-checked in late October.

Table XXIV
Cesar Chavez Elementary School
Indoor Air Quality Measurements
August 21, 2002

Location	Particulates*	Carbon Dioxide	Temperature	Relative Humidity	Carbon Monoxide
Classroom 113	0.024	421	74.2	45.9%	0
Classroom 213	0.026	412	76.2	42.4%	0
LMC	0.039	402	72.0	53.4%	0
Room 100H	0.050	350	71.6	55.1%	0
Outside Air	0.102	318	89.8 Peak: 89.8	64.5% Peak: 75.6%	1

These measurements were taken while the school was not fully occupied to establish background conditions during chemical monitoring.

*In milligrams per cubic meter of air.
Temperature is in degrees Fahrenheit.
Each sample was taken for approximately 10-15 minutes. The value listed is the average measured during this time period.