

Salazar Consulting Group, Inc.

*A professional team of engineers, industrial hygienists,
safety experts, physicians, and health scientists.*

Indoor Environmental Quality Evaluations
Environmental and Medical Monitoring
EPA/OSHA Compliance
Expert Testimony

Hazardous Waste Control
Hazard Communication
Safety Evaluations
Training

September 16, 2005

Mr. Jeffrey S. Moquin
Director, Risk Management Department
The School Board of Broward County
7770 West Oakland Park Boulevard
Sunrise, Florida 33351-6750

RE: Preliminary Indoor Environmental Quality Evaluation
Apollo Middle School
6800 Arthur Street
Hollywood, Florida 33024
SCG File No. 1031.20

Dear Mr. Moquin:

Salazar Consulting Group, Inc. (SCG) performed a Preliminary Indoor Environmental Quality Evaluation of select areas of Apollo Middle School located in Hollywood, Florida, on August 24, 2005. The evaluation was performed at the request of The School Board of Broward County for independent assessment of indoor conditions in response to on-going occupant complaints regarding indoor environmental quality. Complaints reportedly include development of non-specific allergy-type symptoms allegedly associated with building occupancy. The scope of the evaluation initially focused on Administrative Suite areas but expanded, as allowed by inherent time constraints, to include remote locations in response to occupant concerns reported to SCG while on-site. Evaluative tasks included preliminary discussions with facility administration and occupants; observations of indoor building areas, ceiling plenum spaces, and respective/accessible ventilation system components; and measurement of environmental parameters to include temperature, relative humidity, and carbon dioxide levels from indoor and outdoor locations. Details of conditions observed and data collected on the date of evaluation follow.

Historical Information/Occupant Remarks

Current indoor environmental quality-related issues and concerns reported by facility administration and/or building occupants prior to or during completion of evaluative tasks included the following:

- Visible mold allegedly develops periodically on hallway wall surfaces within the 400-, 700-, and 800-wings; visible mold activity is reportedly cleaned/sanitized when detected.

- Indoor environmental quality problems have allegedly "plagued" the Social Worker's Office (Room No. 163) for over two (2) years.
- Various building occupants allege development of non-specific allergy-type symptoms associated with building occupancy; occupants report such effects to be historical and on-going, with minimal relief offered and full resolution unachieved by response measures implemented to date.
- Recent asbestos-abatement project within Bookkeeping Office storage room resulted in development of detectable odor allegedly associated with vinyl floor tile adhesive product.
- Musty odors and water intrusion issues have historically affected Administrative Suite areas.
- Ventilation to Room Nos. 606 and 800 is allegedly inadequate.
- Indoor environmental quality within the facility is reportedly "poor" and allegedly degraded as a result of previous facility renovation projects.
- Some occupants report concerns with recent "cancer" diagnoses among colleagues.

Observed Building Conditions

NOTE: Ceiling tile systems and respective ceiling plenum spaces present as generally unremarkable within evaluated areas unless noted otherwise.

Administrative Reception Areas

1. Vinyl floor tiles generally in good condition/clean.
2. Housekeeping appears generally adequate.
3. Live foliage plants displayed sporadically.
4. Heavy staining suggestive of moisture contact effects readily visible along bottom surfaces of one (1) upholstered office partition (approximately four [4] foot high panel).

Bookkeeping Office

1. Floor carpet generally in good condition/clean.
2. Housekeeping appears generally adequate despite availability of numerous dust-collecting items.
3. Slight suspect spotting visible on entry door jamb and immediately adjacent wall surface.

Budgetkeeper Office

1. Floor carpet generally in good condition/clean.
2. Housekeeping appears generally adequate.
3. Suspect spotting visible sporadically on door jambs and immediately adjacent wall surfaces.

Administrative Workroom

1. Vinyl floor tile generally in good condition/clean.
2. Slight suspect spotting visible on wall surfaces.
3. Housekeeping appears generally adequate.

Room No. 105

Suspect spotting previously visible on wall surfaces reportedly "painted over"; visible evidence of recent painting obvious but suspect spotting absent.

Registrar Office (Room No. 201)

1. Vinyl floor tile generally in good condition/clean.
2. One (1) penetrated ceiling tile.
3. Slightly stained ceiling tile suggestive of moisture contact; ceiling plenum spaces present as generally unremarkable at stain location.
4. Housekeeping appears generally adequate despite availability of dust-collecting items.

Principal's Office (Room No. 201L)

1. Vinyl floor tile generally in good condition/clean.
2. Housekeeping appears generally adequate.
3. Suspect spotting on entry door surfaces.

Room No. 601

1. Vinyl floor tile generally in good condition/clean.
2. Housekeeping appears generally adequate.
3. Ceiling plenum spaces not observed at time of evaluation.
4. One (1) stained ceiling tile.
5. Two (2) deodorizers available in room.

Room No. 605

1. Vinyl floor tile generally in good condition/clean.
2. Housekeeping appears generally adequate.

3. Ceiling plenum spaces not observed at time of evaluation.
4. One (1) stained ceiling tile.

Room Nos. 606, 806

1. Vinyl floor tile generally in good condition/clean.
2. Ceiling plenum spaces not observed at time of evaluation.
3. Slight settled dust/debris visible sporadically on environmental surfaces.

Room No. 703

1. Vinyl floor tile generally in good condition/clean.
2. Settled dust/debris visible on environmental surfaces sporadically.
3. Ceiling plenum spaces not observed at time of evaluation.
4. Two (2) deodorizers available in room.

Room No. 807

1. Vinyl floor tile generally in good condition/clean.
2. Settled dust/debris visible on environmental surfaces sporadically.
3. Numerous dust-collecting items available within room.
4. Ceiling plenum spaces not observed at time of evaluation.

Ventilation System Observations

Administrative Reception and Room Nos. 601, 605, 703, 806, and 807

Slight dust/debris visible on supply/return air registers.

Bookkeeping Office, Budgetkeeper Office, and Room No. 606

Slight dust/debris visible on supply air registers.

Air Handling Units – General Observations

1. All air handling units housed in Mechanical Room No. 159.
2. Air dampers installed prior to cooling coils allow potential routing of unconditioned air past coils and delivery directly to respective indoor locations.

Air Handling Unit Nos. 1, 2, 6, and 8 (service 800-wing, sections of 700-wing, Administrative Suite, and 400-wing, respectively)

1. Pleated filters in good condition/clean, but improper installations allow air by-pass.
2. Internal insulation of outdoor/return air conveyance duct systems with visible surface imperfections, but otherwise present as generally unremarkable.
3. Internal surfaces of supply air ducts clean/coated, but with slight imperfections.

4. Cooling coils present as generally unremarkable/clean.
5. Condensate drain pans free of standing water/clean.

Air Handling Unit Nos. 3 and 4 (service sections of 700-wing and 600-wing, respectively)

1. Pleated filters in good condition/clean, but improper installations allow air by-pass.
2. Internal insulation of outdoor/return air conveyance duct systems with visible surface imperfections, but otherwise present as generally unremarkable.
3. Internal surfaces of supply air ducts clean/coated, but with slight imperfections.
4. Cooling coils present as generally unremarkable/clean.
5. Standing water accumulated in condensate drain pans.

Environmental Parameter Measurements

Environmental parameter data collected at the time of evaluation are summarized in Table 1. Detected indoor temperatures ranged from 72.1 degrees Fahrenheit (°F) to 76.9 °F with an average of 73.9 °F, relative humidities ranged from 52.4 percent (%) to 64.7 % with an average of 59.0 %, and carbon dioxide levels ranged from 572 parts carbon dioxide per million parts air (ppm) to 1186 ppm with an average of 842 ppm.

Temperature, relative humidity, and carbon dioxide levels detected outdoors at the time of evaluation were 92.3 °F, 61.0 %, and 360 ppm, respectively.

NOTE: Indoor environmental parameter data (temperature, relative humidity, and carbon dioxide levels) collected were compared with generally recommended criteria levels published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE). These guidelines generally suggest maintenance of indoor temperature at 69.0 °F to 79.0 °F, relative humidity below 60.0 %, and an indoor-to-outdoor carbon dioxide differential of 700 ppm or less.

**Table 1. Environmental Parameter Measurements
 Apollo Middle School
 Collection Date: August 24, 2005**

TIME	LOCATION	DB (°F)	RH (%)	CO ₂ (ppm)	COMMENTS
9:50a	Administrative Reception (front)	74.4	60.1	593	≈ 6 occupants
9:54a	Administrative Reception (back)	72.1	64.7	572	≈ 4 occupants
10:00a	Bookkeeping Office (Room No. 201F)	76.9	54.2	583	≈ 3 occupants
10:10a	Budgetkeeper Office (Room No. 201H)	73.3	60.2	584	1 occupant
10:18a	Administrative Work Room (Room No. 201J)	72.4	63.7	581	unoccupied
12:11p	Registrar Office (Room No. 201N)	72.6	64.0	729	2 occupants
12:20p	Room No. 201T	72.5	63.1	702	unoccupied
12:30p	Principal's Secretary Office (Room No. 201L)	73.7	60.0	725	1 occupant
1:15p	Outdoors	92.3	61.0	360	clear day
1:40p	Room No. 606	73.6	57.5	1118	≈ 21 occupants
1:47p	Room No. 605	73.6	57.0	1070	≈ 24 occupants
1:56p	Room No. 601	75.5	52.4	1083	≈ 23 occupants
2:00p	Room No. 703	74.5	57.9	1136	≈ 22 occupants
2:06p	Room No. 806	75.3	54.7	1186	≈ 20 occupants
2:14p	Room No. 807	74.0	55.8	1118	≈ 10 occupants

DB (°F) = dry bulb temperature (degrees Fahrenheit)
 RH (%) = relative humidity (percent)
 CO₂ (ppm) = carbon dioxide (parts carbon dioxide per million parts air)
 ≈ = approximately

Conclusions and Recommendations

Based upon conditions observed and data collected at the time of evaluation, SCG recommends completion, at a minimum, of the following remedial measures:

1. Further evaluate areas of the facility from which occupants voice concerns and which were not included as part of the assessment completed by SCG; provide corrective measures as deemed necessary.

Initial project assessment activities focused on areas within the Administrative Suite. However, occupants voiced concerns affecting numerous additional areas of the facility once SCG arrived on-site. Unfortunately, SCG was not able to observe and assess conditions within all indoor locations from which complaints were received due to time limitations. It is therefore imperative that The School Board of Broward County communicate with occupants of the facility and determine precise locations where further evaluative measures are being requested so that response measures may be provided as warranted.

2. Further evaluate the status of occupant concerns associated with recent asbestos abatement tasks within the Bookkeeping Office storage room.

The adequacy and effectiveness of previously implemented response measures in this regard apparently have not been sufficient to eliminate occupant concerns. Although SCG did not identify conditions within the storage room suggestive of on-going occupant exposure sources, continuing occupant concerns dictate that further evaluative and/or communication measures be provided.

3. Accurately identify and effectively eliminate historical moisture sources reportedly affecting indoor areas of the facility, particularly within the Administrative Suite.

SCG did not identify evidence of moisture sources significantly impacting indoor environmental conditions at the time of evaluation. However, occupant reports indicate historical moisture sources continue to affect the facility in various locations. Therefore, further communication with occupants should be provided to determine precise locations with known or suspect moisture effects, and further evaluative and/or corrective measures provided as deemed necessary.

4. Solicit occupant discussion regarding perception of excess "cancer" risks associated with occupancy of the school.

Numerous occupants voiced concerns with knowledge of cancer diagnoses among several colleagues. Although a causative link between indoor environmental quality and development of cancer health effects is unlikely, building occupants should be encouraged to voice their concerns so that a scientifically-sound method of assessment may be developed. Specific

response measures should be dictated by discovery of pertinent details and investigative outcomes.

5. Discourage use of live foliage plants indoors.

Indoor foliage serves as a prime source of microbial (mold) and other biological allergens. Foliage allergens may be associated with the plant material itself, or with the medium (soil) in which it is growing. Therefore, limit use of live plants indoors to minimize development of indoor allergen reservoirs.

6. Identify and eliminate the source of suspect moisture staining visible on lower surfaces of the upholstered (approximately four [4] foot high) partition located in the Administrative Reception area.

Lower surfaces of the partition were obviously stained, apparently from moisture contact. The cause of such staining should be identified so that it may be prevented in the future, and the affected panel should be cleaned/sanitized or eliminated if cleaning/sanitizing is not feasible/effective.

7. Minimize, to the extent feasible, the availability of dust-collecting items within classrooms and/or offices.

Numerous dust-collecting items were observed within classroom and office locations. Efforts to provide proper storage of items and reduce clutter within occupied spaces should be encouraged to further minimize opportunity for development of dust allergen sources. Minimizing the availability of dust-collecting items will also facilitate completion of routine housekeeping activities.

8. Clean/sanitize suspect spotting visible on door, door jamb, and/or wall surfaces within the Bookkeeping Office, Budgetkeeper Office, Administrative Workroom, and Principal's Office (Room No. 201L).

Although inadequate control of indoor environmental conditions, particularly relative humidity, is the prime suspect of observed conditions, the true source(s) of visible suspect spotting was(were) not identified at the time of evaluation. Therefore, building conditions affecting indoor occupied spaces should be thoroughly evaluated and specific corrective measures provided as deemed necessary. Suspect spotting visible on indoor environmental surfaces should be cleaned/sanitized by methods in accordance with generally accepted industry guidelines (e.g., by methods discussed in the United States Environmental Protection Agency publication titled Mold Remediation in Schools and Commercial Buildings).

9. Monitor the adequacy of wall cleaning/re-painting efforts in Room No. 201 (Registrar Office); provide additional corrective measures as dictated by developing conditions.

Suspect spotting visible on wall surfaces reportedly prompted recent re-painting of affected wall surfaces. Painted surfaces presented as generally unremarkable at the time of evaluation, but the adequacy of cleaning/sanitizing efforts prior to painting was reportedly questionable. Affected wall surfaces within the room should be closely monitored and additional evaluative and/or remedial measures provided if dictated by developing conditions.

10. Further evaluate conditions within ceiling plenums above Room Nos. 601, 605, 606, 703, 806, and 807.

SCG observed ceiling plenum spaces above several indoor locations and found existing conditions as generally unremarkable. However, time constraints did not allow for observations of plenum spaces above the locations listed. Although it is expected that conditions within the respective ceiling spaces will also be found as generally unremarkable, SCG recommends physical access of the designated spaces to provide verification of such. Further evaluative and/or remedial measures should be provided as warranted by detected conditions.

11. Identify and eliminate existing sources, if any, of staining to ceiling tiles in Room Nos. 201 (Registrar Office), 601, and 605.

Stained ceiling tiles are typically indicative of water sources migrating through building roof/wall systems and/or associated with ventilation system components. Moisture affected tiles may provide adequate sources of moisture and nutrients for growth of allergenic microorganisms (molds). Therefore, stained ceiling tiles should be removed and replaced immediately upon detection, and moisture sources ultimately identified and eliminated.

12. Maintain the integrity of the false ceiling plenum within Room No. 201 (Registrar Office) by ensuring proper placement of intact (undamaged) tiles within the respective ceiling tile system.

Allergenic dust and debris are commonly found within false ceiling plenums. To reduce the opportunity for allergens to migrate indoors from these spaces, the integrity of false ceiling tile systems must remain intact. Therefore, any misaligned, penetrated, or missing ceiling tiles should be replaced to minimize introduction of plenum-derived allergens indoors.

13. Discourage use of air deodorizers in classrooms/offices.

Room deodorizers are frequently used to 'mask' unpleasant odors. However, these 'air fresheners' typically contain a host of chemicals which may be irritating to indoor occupants. These products do not solve an odor problem; their use

should be discouraged. A clean, well-ventilated indoor environment is rarely in need of such products.

14. Provide routine and frequent cleaning of indoor environmental surfaces within Room Nos. 606, 703, 806, and 807 to minimize accumulation of settled dust/debris.

Dust is typically comprised of a variety of potentially allergenic elements. Therefore, thorough and effective housekeeping is critical to maintaining the lowest achievable levels of indoor dust. Dusting activities should be performed frequently and by methods minimizing dust-generation (use of dust-attracting cloths or other similar supplies are recommended).

15. Clean/sanitize ventilation supply/return air registers in Room Nos. 601, 605, 606, 703, 806, 807, and the Bookkeeping and Budgetkeeper Offices.

Visible dust/debris was noted on ventilation system supply and/or return air registers in these locations. Accumulated debris on these components allows development of allergen reservoirs with subsequent aerosolization throughout indoor areas. The air registers should be cleaned/sanitized with an appropriate sanitizing solution.

16. Consult with a mechanical engineer or other appropriate professional to evaluate the design, operation, and effectiveness of air dampers installed prior to cooling coils of air handling units servicing the facility, as applicable; provide corrective measures as deemed necessary.

The design and operation of air dampers installed immediately preceding cooling coils within air handling units servicing the facility reportedly allows unconditioned outdoor air to by-pass the cooling coils and be routed directly to indoor classrooms/offices. If this occurrence is in fact possible, then it is likely that the routine provision of unconditioned air into the facility may be responsible, at least in part, for development of suspect spotting visible sporadically on environmental surfaces and subsequent complaints from indoor occupants. The design, operation, and effectiveness of the air damper systems should be thoroughly evaluated by an appropriate professional and corrective measures provided as deemed necessary.

17. Ensure proper sizing and installation of air filtration media within Air Handling Unit Nos. 1, 2, 3, 4, 6, and 8.

Properly installed filters should allow air flow in the direction specified on each filter, and should be assembled in the filter bank so as to eliminate gaps/voids between filters and prevent air by-pass by the filtration media.

18. Further evaluate the condition of internal insulative materials installed within Air Handling Unit Nos. 1, 2, 3, 4, 6, and 8; provide improvements to visible imperfections as deemed feasible.

Internal insulative materials presented as coated, presumably with an anti-microbial product. However, the integrity of insulative materials was compromised in numerous locations within most of the air handling units observed. Significantly damaged insulative materials should be identified and eliminated within the respective units to avoid aerosolization of insulation-derived particles/fibers within indoor occupied spaces.

19. Ensure proper drainage of water from the condensate drain pans of Air Handling Unit Nos. 3 and 4; clean/sanitize the drain pans.

Accumulation of water in air handling unit condensate drain pans provides opportunity for development and dissemination of microbial reservoirs. Accumulated water may also serve to elevate relative humidity levels within indoor spaces serviced by affected units. Therefore, proper drainage of collected water must be afforded to air handling unit condensate drain pans, and any residual debris eliminated by periodic cleaning/sanitizing.

20. Further evaluate relative humidity control within the Administrative Reception areas, Budgetkeeper Office (Room No. 201H), Administrative Work Room (Room No. 201J), Registrar Office (Room No. 201N), Principal's Secretary Office (Room No. 201L), and Room No. 201T; provide corrective measures as deemed necessary.

Detected relative humidity levels were slightly elevated within these locations at the time of evaluation. Relative humidity control within these locations should be further evaluated to ensure maintenance generally below the ASHRAE-recommended maximum of 60.0%. Consultation with a knowledgeable and experienced ventilation system professional is recommended to determine the most appropriate response measure(s).

21. Further evaluate the effectiveness of carbon dioxide control within Room Nos. 601, 605, 606, 703, 806, and 807.

Carbon dioxide levels detected within these locations slightly exceeded the ASHRAE-recommended criteria level of approximately 1060 ppm (700 ppm above the outdoor concentration of 360 ppm). Carbon dioxide is frequently used as a surrogate of ventilation adequacy in occupied indoor environments. The levels detected do not pose a health threat to occupants, but rather identify opportunities for ventilation system improvements. Therefore, further evaluation of the performance and/or operation of the respective ventilation systems is recommended to ensure the provision of adequate ventilation to these indoor locations.

22. Further evaluate ventilation adequacy within Room No. 800; provide corrective measures as deemed necessary.

Occupants report inadequate ventilation within Room No. 800. However, SCG was unable to evaluate control of indoor environmental parameters within this room due to time limitations. SCG recommends the District complete such evaluation, and offer response measures as deemed necessary.

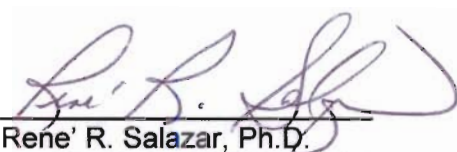
It is important to note that several of the recommendations listed above were also included in the summary report previously provided by Salazar & Spaul Environmental Consultants, Inc. (previous business name of Salazar Consulting Group, Inc.) on April 15, 2001. SCG strongly recommends timely implementation of the improvement measures described, at a minimum, and continued and routine monitoring of the facility so that immediate response measures may be provided as warranted by any developing conditions detected. Please understand that if improvements remain lacking occupant complaints may persist.

Again, please be reminded that SCG was retained exclusively for the purpose of evaluating current conditions within select areas of the facility and tasked solely with providing recommendations for additional remedial efforts appearing necessary as of the time of evaluation. SCG is only able to offer comment on the need for additional response measures given the conditions observed and/or reported and data collected at the time of evaluation. SCG is not able to offer comment on the suitability of current building conditions for current or future occupancy by any specific individual(s); consultation with an appropriate health practitioner is recommended to discuss specific health concerns allegedly associated with occupancy by any specific individual(s).

SCG appreciates the opportunity to be of assistance. Please do not hesitate to contact us should you have any questions and/or comments regarding the information provided.

Sincerely,

SALAZAR CONSULTING GROUP, INC.

By: 
Rene R. Salazar, Ph.D.
Certified Industrial Hygienist