

# ***Spaul Environmental, Inc.***

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

Environmental and Medical Monitoring  
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Hazard Communication

8 February 1994

Ms. Judith Hunt, Director  
Risk Management and Safety Department  
School Board of Broward County  
1320 Southwest Fourth Street  
Ft. Lauderdale, FL 33312

RE: Follow-up Inspection of Air Handler Decontamination at Boyd  
Anderson High School

Dear Ms. Hunt:

On 14 January and 2 February 1994, Dr. Spaul conducted a follow-up inspection of the air handler decontamination at the above referenced school. This decontamination was performed by AirMax, Inc. of Miami.

Although the decontamination inside most air handlers was performed exceptionally well, there are some general recommendations that should be passed on to the contractor. The general recommendations to the contractor include:

- a) Need to bevel cut all access ports into the fiberboard duct and then seal all cut edges on both the cut duct and access port. All of the inspected access hatches were straight cut and none were sealed. These raw edges can become sources of future fiberglass releases and indoor air quality (IAQ) complaints if allowed to remain unsealed. Also, in several locations, the contractor treated the duct with Portersept, but failed to treat the access plugs.
  - Recommend that this contractor return to seal all cut raw edges, and to treat all access port plugs. If the contractor fails to promptly seal the raw fiberglass edges, then any health complaints and medical costs, consultant's costs, and other costs should be forwarded to the School Board's attorney for recovery. This contractor presents himself as

a knowledgeable person in this area, and should know better than to leave a job in this manner.

- b) Need to replace missing screws from panels that were accessed by the contractor. In his haste to complete the project, this contractor is not adequately resealing the air handler units. In some units, 10 of 14 screws were missing in the access panel that the contractor used to get inside the air handler, while adjoining panels had the full number of attachment screws.
- c) Some units were required to have three access hatches, yet only one was installed. The contractor shall be required to comply fully with the project bid specifications. It is recommended that the Maintenance Department (the department that administered this bid) check the number of required hatches with the actual number in order to check compliance with the bid proposal. Since the Maintenance Department will be the group that will maintain these units in the future, it would be in their best interest to ensure that all hatches are installed. Also, the access hatches are very small round holes that do not provide adequate access even for the smallest person. The access hatches should be at least 2' x 2', or as close to this size that can be fitted into the area.
- d) In many of the air handler rooms, the contractor was very sloppy in overspraying equipment and the floor with Portersept. In some rooms, the contractor even sprayed the fire extinguishers, which should now be replaced at his expense.
- e) It was reported that after these units had been cleaned by the contractor, the contractor had failed to properly protect the property in those classrooms and had failed to clean up the debris that was blown down the duct. This contractor should be aware that he needs to conduct an inspection after the units have been operating a few hours to check on debris from the air handler.

In addition to these general recommendations for the contractor, the school also has a duty to correct some problems that were observed.

The following list should provide this school with some guidance on items that the school can perform to reduce future IAQ problems.

- a) Remove the stored flammable equipment and boxes from the air handler rooms. No housecleaning chemicals or equipment should ever be stored in an air handler room. The Principal should instruct the custodial staff to promptly clean these items out of the air handler rooms.
- b) Fan belt covers should be re-attached to the air handler units. Several covers were found on the floor.
- c) Mixed types of filters are being used on the air handlers. All air handlers should be using the medium efficiency filters. If the school has a stock of low efficiency filters, this stock should be used up and then replaced with only medium removal efficiency rated filters.
- d) In air handler unit #5, Room 165, the school should call in a work order to repair the supply air duct that has separated at the junction of the vertical and horizontal duct runs.
- e) Call in a work order for most air handler units to install an air gap in the air handler condensate drain lines that are hard plumbed to the floor or sewer drains. The attachment of a breather line is not an acceptable alternative to the air gap.
- f) Call in a work order to repair the broken fire damper in the supply air duct in AHU #20. The vanes remain closed, and the damper assembly moves inside the duct. These closed vanes significantly reduce the amount of air that is being supplied to the zones where recent odor complaints have been reported.

It should be noted that the contractor had not yet completed the auditorium or gymnasium air handlers by the time of the first inspection. Those units were completed by the time of the follow-up evaluation.

There are several items that should be considered that may reduce the costs of these projects and that should not compromise the health or indoor air quality at a school.

- a) For air handler room walls that are covered in fiberboard insulation, contact the Facilities Department to determine if this wall insulation can be removed and/or replaced. To properly seal all of this fiberboard is very expensive, and if this material can be removed, then the removal cost would be much less than the sealing cost.
- b) The return air ducts should be HEPA vacuumed. It is not necessary to treat the return air ducts with the Oxine or the antimicrobial Portersept coating since these ducts are on the dry side of the system, and are not likely to grow molds. If molds are present in the return air ducts, then the source of the water should be determined, and that damp area should be treated with Oxine. The supply side ducts should continue to be coated with Portersept. Money can be cut from these projects by eliminating the Portersept treatment of the return air ducts.
- c) In some units, the insulation in the fan chamber is in good shape and would not need to be replaced. If the insulation is in good shape (not delaminating, frayed, or cut up), it can be treated and sealed. Although this step would also save money on these projects, it would require that the contractor be trusted or that a detailed evaluation be conducted prior to the bidding. Also, the contractor could provide a baseline bid; i.e., treatment in place of the insulation, and a per unit cost add-on to replace the insulation where discovered and agreed upon by the contractor and the School Board.

These three items could significantly reduce the decontamination costs.

The following detailed observations were noted during this evaluation. A random spot check of several air handlers was performed during this initial evaluation.

*Room 165, AHU #5:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed)
2. HEPA vacuum return duct work from hallway and then spray with

- Portersept (two). (completed)
3. Clean return grills in the hallway (two). (completed)
4. Clean fresh air intake grill and damper and spray with Portersept (top of door). (completed)
5. Install access door to clean the first 10 feet of duct work (need one). (completed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)
7. Very dirty filter.
8. Condensate line is hard plumbed to floor drain.
9. Missing screws in side panels.
10. Fan belt cover is missing.
11. Access panels in fiberboard supply duct were not coated.
12. Supply duct is blown out at vertical and horizontal duct runs.

*Room 107, AHU #4:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed)
2. HEPA vacuum return duct work from hallway and then spray with Portersept (two). (completed)
3. Clean return grills in the hallway (two). (completed)
4. Clean fresh air intake grill and damper and spray with Portersept (top of door). (completed)
5. Install access door to clean the first 10 feet of duct work (need one). (completed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)
7. Very dirty filter.
8. Condensate line is hard plumbed to floor drain.
9. Missing screws in side panels.
10. Although the contractor cleaned the air handler and part of the supply duct, the remaining portion of this supply duct needs to be cleaned. Light accumulations of surface molds were observed in some sections of this supply air duct.

*Room #121, AHU #2:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed)
2. HEPA vacuum return duct work from hallway or classrooms and then spray with Portersept (two). (completed)
3. Clean return grills in the classroom (two). (completed)

4. Clean fresh air intake grill and damper and spray with Portersept (remote). (completed)
5. Install supply access door to clean front of blowers and the first 10 feet of duct work (need two). (only one installed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)

*Room 104, AHU #3:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed)
2. HEPA vacuum return duct work from hallway or classrooms and then spray with Portersept (two). (completed)
3. Clean return grills in classrooms and hallway (two). (completed)
4. Clean fresh air intake grill and damper and spray with Portersept (top of door). (completed)
5. Install access door to clean front of blowers and the first 10 feet of supply duct work (one). (completed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)

*Room 130, AHU #1:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed)
2. HEPA vacuum return duct work from hallway and spray with Portersept (two). (completed)
3. Clean return grills in the hallway (two). (completed)
4. Clean fresh air intake grill and damper and spray with Portersept (top of door). (completed)
5. Install access door to clean front of blowers and the first 10 feet of duct work (need one). (completed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)
7. Condensate line is hard plumbed to floor drain.
8. Equipment is stored in AHU room.

*Room 152, AHU #6:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed)
2. HEPA vacuum return duct work from hallway and spray with Portersept (two). (completed)
3. Clean return grills in hallway (two). (completed)

4. Clean fresh air intake grill and damper and spray with Portersept (remote duct with damper). (completed)
5. Install access door to clean front of blowers and the first 10 feet of duct work (need three). (completed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)
7. Condensate line is hard plumbed to floor drain.
8. AHU room is clean.
9. Medium efficiency filters need to be changed.
10. Carbon dioxide in AHU room at 0915 hours = 1006 ppm.

*Room 239, AHU 22:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (excessive amount of overspray - sloppy job - need to replace fire extinguisher that was sprayed white)
2. HEPA vacuum return duct work from hallway and then spray with Portersept (two). (completed)
3. Clean return grills in the hallway (two). (completed)
4. Clean fresh air intake grill and damper and spray with Portersept (top of door). (completed)
5. Install access door to clean front of blowers and the first 10 feet of duct work (need three). (completed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)
7. Mixed low efficiency filters and medium efficiency filters are dirty.
8. Condensate line is hard plumbed to sewer.
9. Missing fan belt cover - not attached.
10. Fan belt is about to break.
11. Supply duct insulation is thickly coated but is deteriorated and should be replaced.

*Room 173, AHU #20:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed)
2. HEPA vacuum return duct work from hallway or classrooms and then spray with Portersept (two). (completed)
3. Clean return grills in the classroom (two). (completed)
4. Clean fresh air intake grill and damper and spray with Portersept (top of door). (completed)
5. Install access door to clean front of blowers and the first 10

- feet of duct work (need three). (only one installed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)
  7. Mixture of low and medium efficiency filters.
  8. Overspray on floor.
  9. Damper panel is moving in duct and vanes are staying closed.
  10. Insulation in supply duct at unit needs replacement.

*Room 219, AHU #23:*

1. Vacuum all walls covered with fiberglass with HEPA vacuum and spray with Portersept. (completed; overspray on lot of items)
2. HEPA vacuum return duct work from hallway or classroom and then spray with Portersept (one large return with damper). (completed)
3. Clean return grills in hallway or classroom. (completed)
4. Clean fresh air intake grill and damper and spray with Portersept (top of door). (completed)
5. Install access door to clean front of blowers and the first 10 feet of duct work (need three). (completed)
6. Install access door in side bottom of unit to inspect unit and to install biocidal strips (need one). (completed)
7. Very clean inside.

*Auditorium AHU:*

1. Filter tray has rusted out and will not hold filters.
2. Axial vanes are broken on fan.
3. Access panel, like all of the others on the air handler units, is too small to be functional.
4. The inside of the air handler unit is very clean.
5. Condensate line is hard plumbed to drain without an adequate air gap.
6. Base of fan housing is rusted out.
7. The leading edges of the fan blades have deteriorated from rust.
8. Filter rack needs filter spacers to fill in the gaps.

*Stage AHU:*

1. Spacers are missing in filter racks.
2. Condensate line is hard plumbed to storm or sewer drain.
3. Inside of unit is very clean.



*Air Handler Unit #14 - Band Room:*

1. The condensate line is hard plumbed to sewer or storm drain pipe.
2. Return air duct has deteriorated at the unit and has gaps to the air handler room.
3. Inside of unit is very clean.
4. The first five feet of return duct from the air handler back need to be replaced, due to damage (see #2).

*Air Handler Unit #15 - Chorus Room:*

1. Filters are very dirty and long overdue for changing.
2. Inside of unit and supply duct is very clean and has been properly treated.

*Office Bathrooms:*

1. Exhaust fans were not working.

*Boys' Bathroom #143:*

1. Odor complaints from this bathroom, even though room is cleaned.
2. There are three ceiling registers in this bathroom, which should include supply and exhaust vents. All three registers were acting as supply vents and were putting air into this bathroom, which gives it a positive pressure relative to the corridor, and blows odors into the corridor.
3. The exhaust fans should be checked and the bathroom should be put under a negative pressure relative to the corridor.

*Room 135:*

1. This is a small office behind Room 114.
2. The supply air vent to this room was closed, but was opened by Dr. Spaul.
3. The inside of this portion of supply air duct is clean and free of mold growths.
4. In Room 114A, the supply air vent was also closed.
5. This area appears to have been divided after the original construction, and it may need to be tested and balanced for comfort.
6. The carpet in these offices and in the classroom that is adjacent to Ms. Hardy's room should be replaced with floor tile.

*Gymnasium Air Handler Units (2):*

1. Condensation pans were not adequately cleaned, and the contractor should return to finish this job.
2. Fan shaft was not evenly coated with Portersept.
3. Mold growths and a lot of debris were left in the units.
4. The insulation was very thinly coated with Portersept, and some areas were missed.
5. Exterior mold growths on air handler housing should be removed.
6. Coils are not adequately cleaned and flushed. This job needs to be repeated in both units.

*Room 140 (Office):*

1. There is a water leak above the door, which needs to be repaired.
2. The ceiling tile needs to be replaced.

*Administrative Areas:*

1. A moldy odor is still present in this area and, from an inspection of the portions of supply duct that were not treated, light amounts of mold growths were present. The air handler and first portions of supply duct, which are the most likely sites for mold growths, have been cleaned and are in very good condition. The remaining portions of these supply ducts should be cleaned, disinfected, and treated with Portersept.
2. The Registrar's Data Processing areas have been subdivided without proper attention to the ventilation in these spaces. This area should be evaluated by a licensed mechanical engineer.
3. The small fan coil unit that is near the ceiling in this area has not been cleaned.
4. The carpet in the staff lounge and rear part of the Administrative Area should be replaced with floor tile. It is very dirty and has numerous water damaged areas.

*Carbon Dioxide Concentrations:*

<u>Room</u>	<u>Time</u>	<u>CO<sub>2</sub> (ppm)</u>	<u>Notes</u>
Ms. Hardy's office	12:00	1519	1 person
Room 153	2:08	>2000	25 students
Room 151	2:11	>2000	28 students
Main hall outside Admin Area	2:13	1417	in hall
230 Wing	2:15	>2000	in hall
Room 248	2:17	>2000	-
2nd Floor 240 Wing	2:18	>2000	-
Room 135	2:19	1609	26 students
Room 108	2:21	1450	no one present, supply vent closed

<u>Room</u>	<u>Time</u>	<u>CO<sub>2</sub> (ppm)</u>	<u>Notes</u>
Ms. Hardy's office	2:23	1582	no one present
Room 114	2:25	1445	no one present

NOTE: Until the "outside" air intakes are actually pulling from outdoors rather than from the main corridor, the carbon dioxide concentrations and related ill-health effects (Tight Building Syndrome) can be expected to continue at this school.

The carpet in corridor 160 is badly stained and odoriferous. It is recommended that this carpet be removed and replaced with floor tile.

I hope this list of items will assist the school, contractor, Maintenance Department, and School Board in evaluating these types of projects.

In summary, although it may appear that I am very critical of this contractor's work, please be clear that I think he has done one of the best jobs inside these air handler units that I have inspected. I hope that from this evaluation, he will take these comments positively and seriously, and will eliminate the shortcomings in his future work. With these very minor corrections, he, without a doubt, will be the very best air handler decontamination contractor that I have ever evaluated, and rest assured that over the years I have had an opportunity to evaluate almost all of the Florida contractors that do this type of work.

Should you have any questions about this evaluation, please do not hesitate to contact me.

Sincerely,



Wil A. Spaul, President  
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Certified Industrial Hygienist

Adjunct Associate Professor of Indoor Air Quality  
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