Spaul Environmental, Inc.

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

Environmental and Medical Monitoring
EPA/OSHA Compliance
Hazardous Waste Control
Indoor Air Quality Evaluations

Safety Evaluations
Training
Expert Testimony
Hazard Communication

12 March 1993

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

RE: Boyd Anderson High School

Dear Ms. Hunt:

On 26 February 1993 Dr. Wil A. Spaul, a Certified Industrial Hygienist, and Mr. Mark Commiskey, Chemical Manager for the School Board of Broward County, conducted an inspection of the administrative area at Boyd Anderson High School. It was reported that complaints of eye and nose irritation, excessive tiredness, and frequent headaches were occurring in this room. Additionally, allergy complaints were also reported.

This group of non-allergic complaints are frequently associated with reduced outdoor air flow to the work area, and is frequently referred to as "Tight Building Syndrome". Although the complaints can occur almost daily while being exposed to these conditions, the complaints usually disappear within a few hours away from the space.

The air handler that services the administrative area was inspected for adequate outdoor air flow and general hygiene.

The following observations were noted:

ROOM 130 & AHU-1

- Excessive carbon dioxide concentrations (1477 ppm at 2:15 pm in the main corridor outside the Administrative Area, and no one present). This level at this time of day with no one present is

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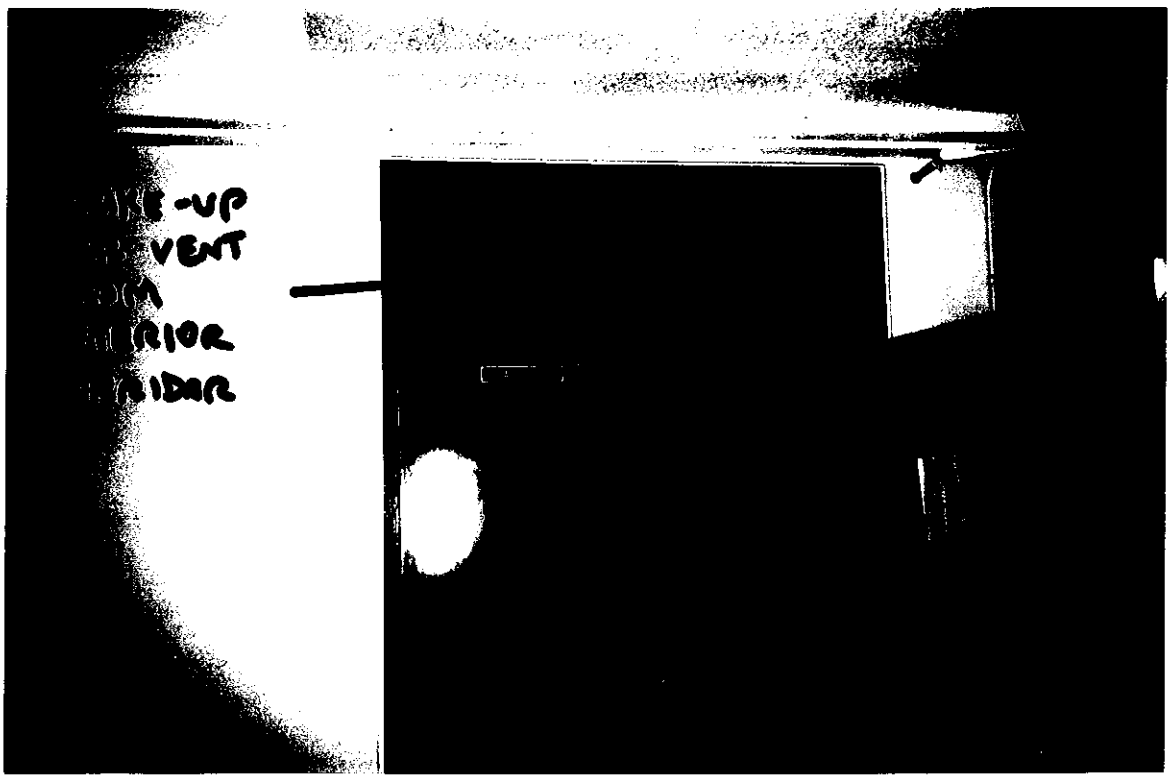
considered excessive and is indicative of inadequate outdoor air flow;

- Administrative staff members report symptoms that are compatible with "Tight Building Conditions";
- Outside air damper in air handler unit was closed; this air damper connects the air handler room to the corridor where the carbon dioxide level was 1477 ppm. This system does not pull outdoor air into the air handler since the corridor has now been enclosed and has elevated CO_2 levels.
- Mold growths and dust accumulation on fan blades and housing inside return air fan chamber due to low efficiency filters;
- Excessive accumulation of microbial growths on coils. Special care should be provided to the worker who must clean this unit due to the "bacterial gelatin" growth on these coils;
- Thick mold blanket in base of condensation pan. Standing water was present at this time in condensation pan;
- Cleaning equipment and a battery charging operation was also found inside this air handler room;
- The insulation in this air handler should be replaced since the mold growth is so thick that it is beyond decontamination;
- The fiberglass on the walls in this air handler room should be HEPA vacuumed and then encapsulated to reduce the likelihood of a potential release of fiberglass fibers into the air stream. This entire air handler room was very dirty and should be maintained in a cleaner condition by the school's custodial staff;
- The filters in this air handler were very dirty at the time of this evaluation;
- The front side of the coils were plugged with accumulated dirt that resulted from not properly seating the filters in the filter housing and allowing dirt to by-pass the filters;
- The office area, which is serviced by this air handler had carbon dioxide readings (at 2:28 ppm) that were more elevated than 2000 ppm, which is at the maximum reading for the monitor that was used.

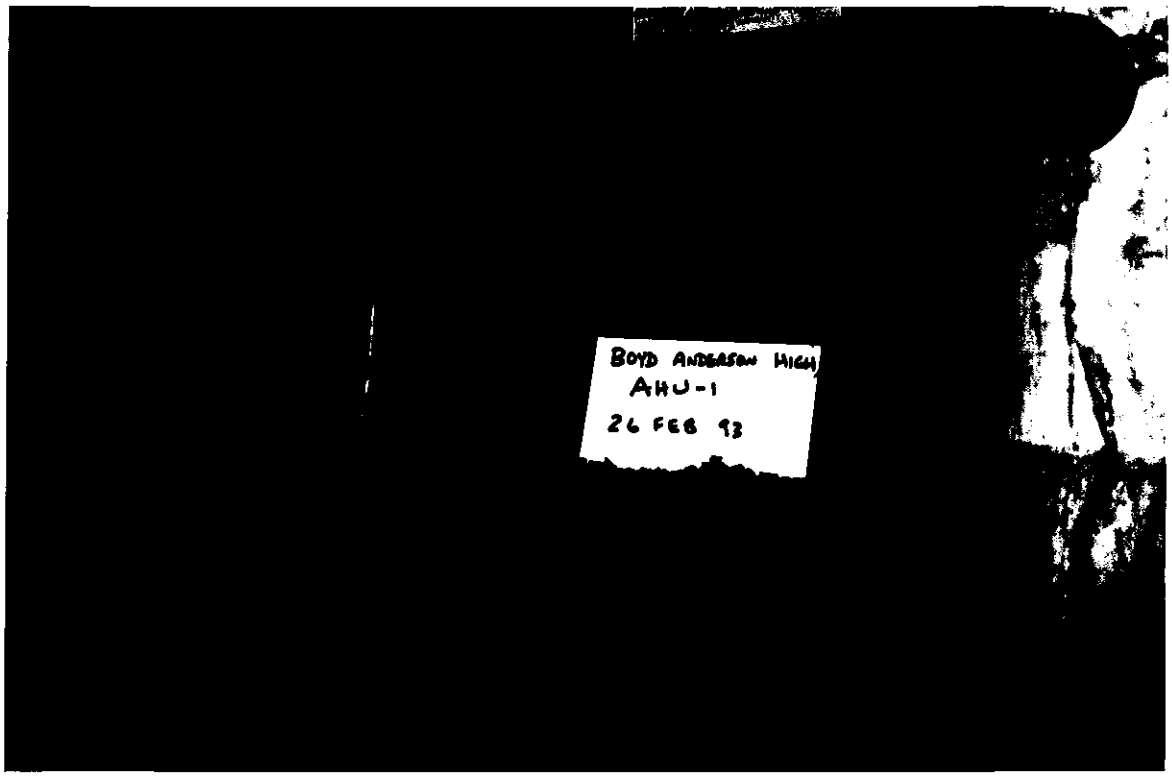
PHOTOGRAPHIC DOCUMENTATION:

Photograph 1: Location Of Make-up Air From Corridor

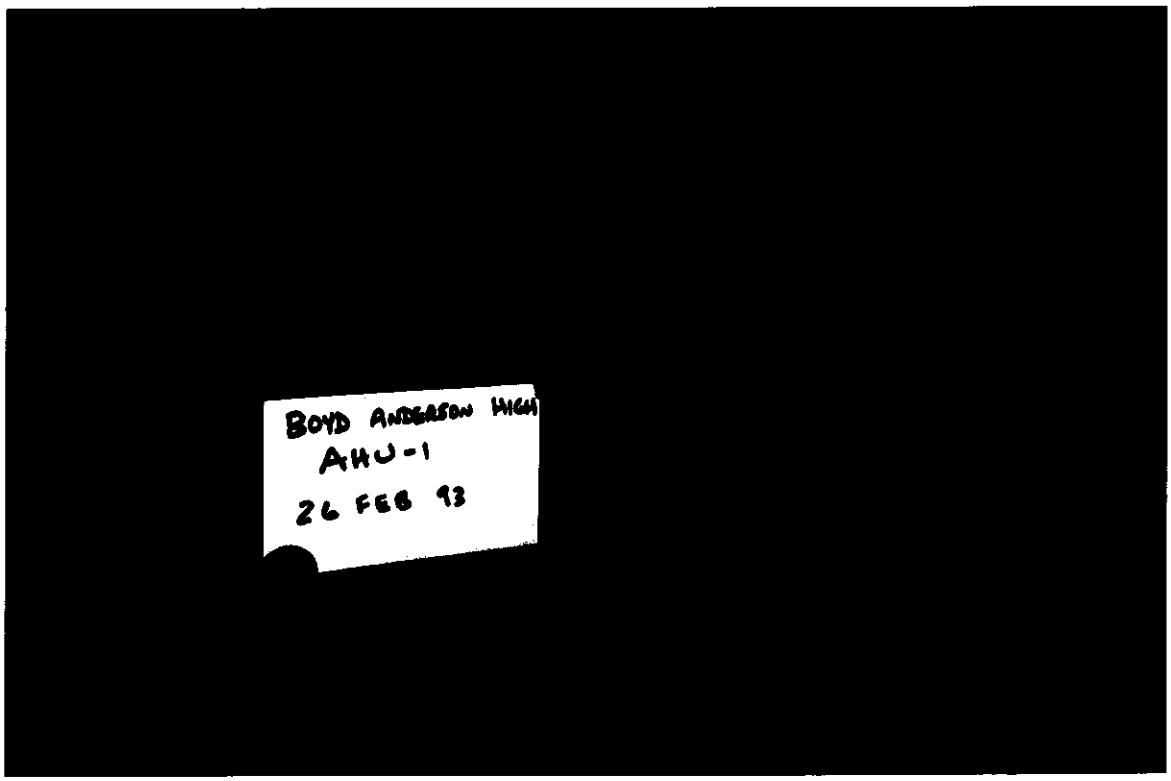


Photograph 2: Cleaning Equipment That Is Improperly Stored In Air Handler Room

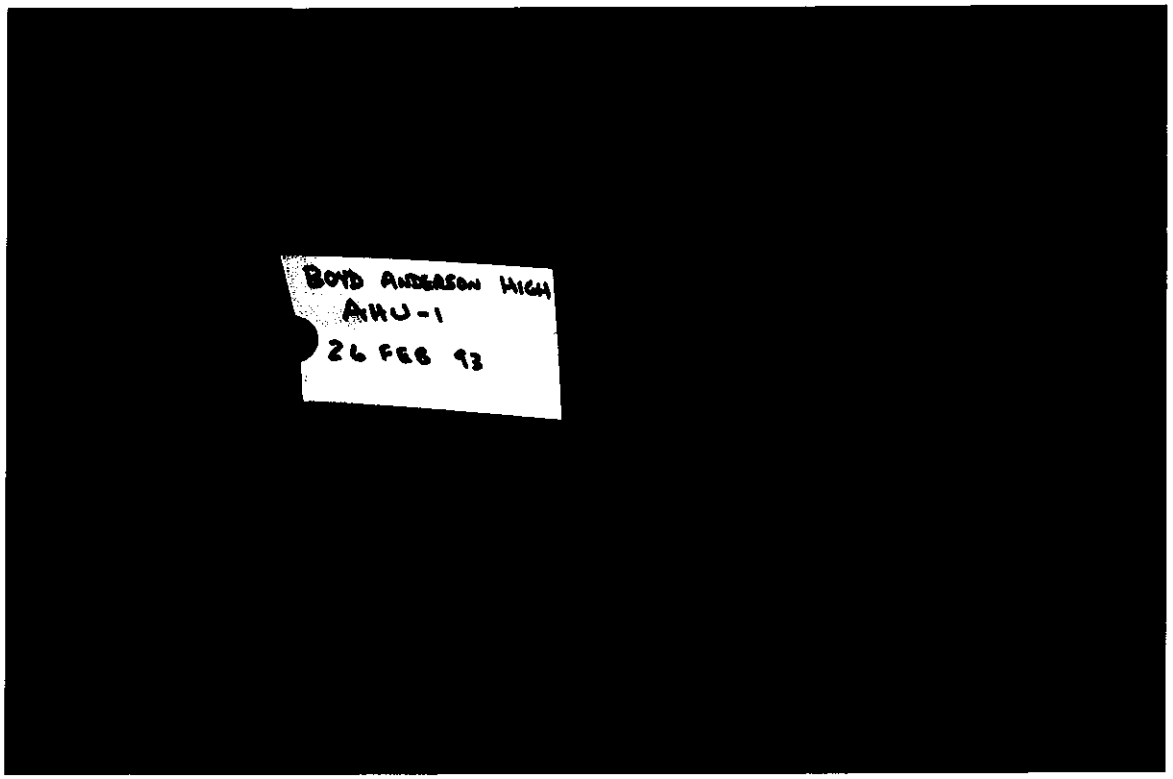
Photograph 3: Accumulated Debris On Exterior Housing Of Air Handler Unit #1 (AHU-1)



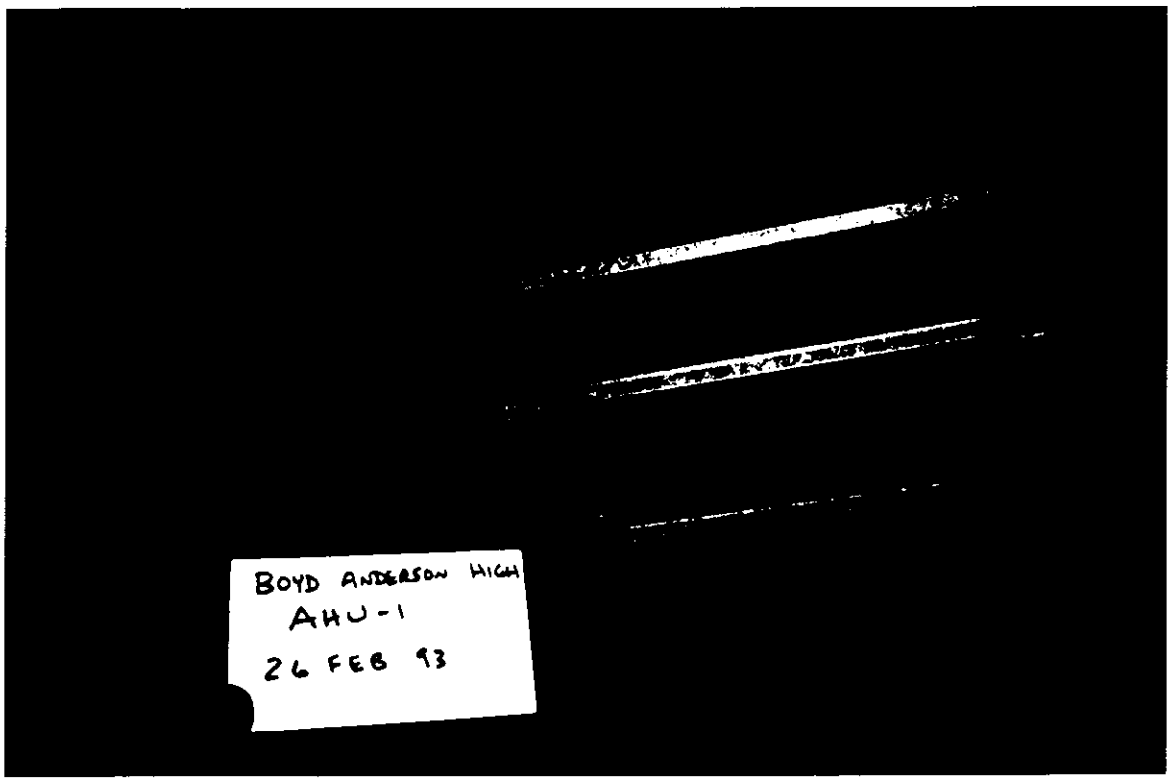
Photograph 4: Frayed, Torn, and Dirty Fiberglass On Walls Inside Air Handler Room. Needs To Be Cleaned And Sealed



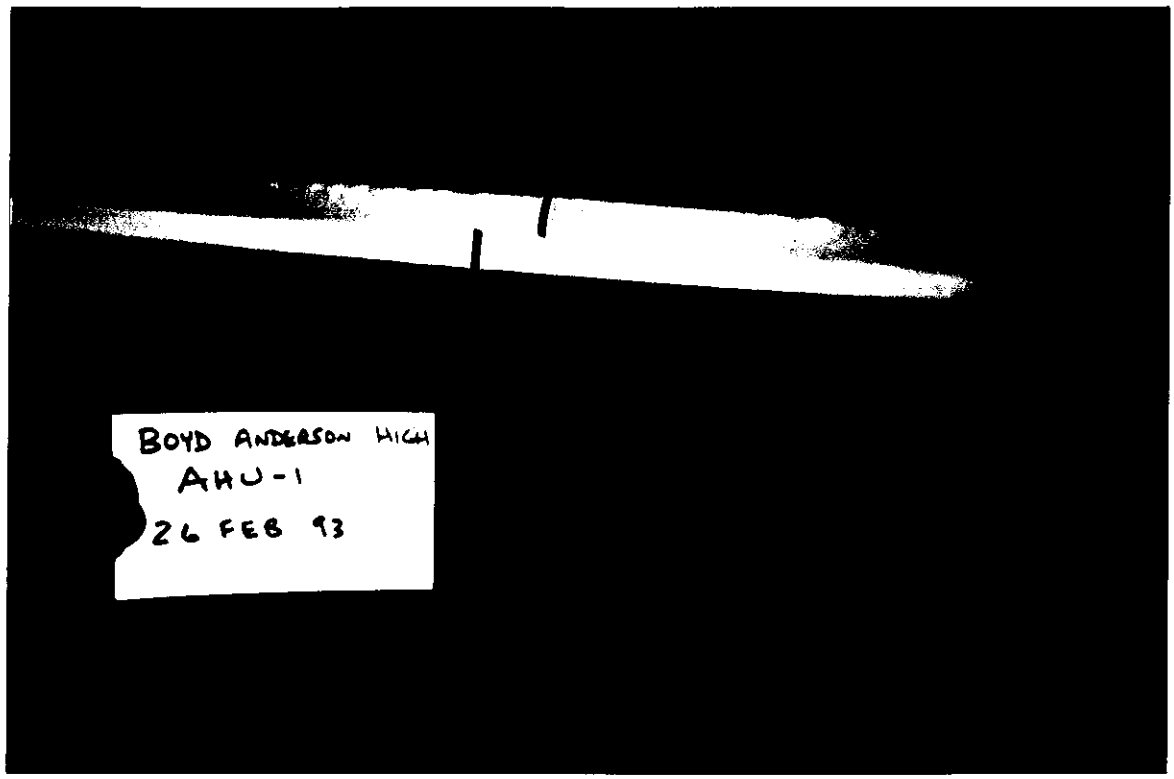
Photograph 5: Close-up Of Dirty Low Removal Efficiency Filters In AHU-1



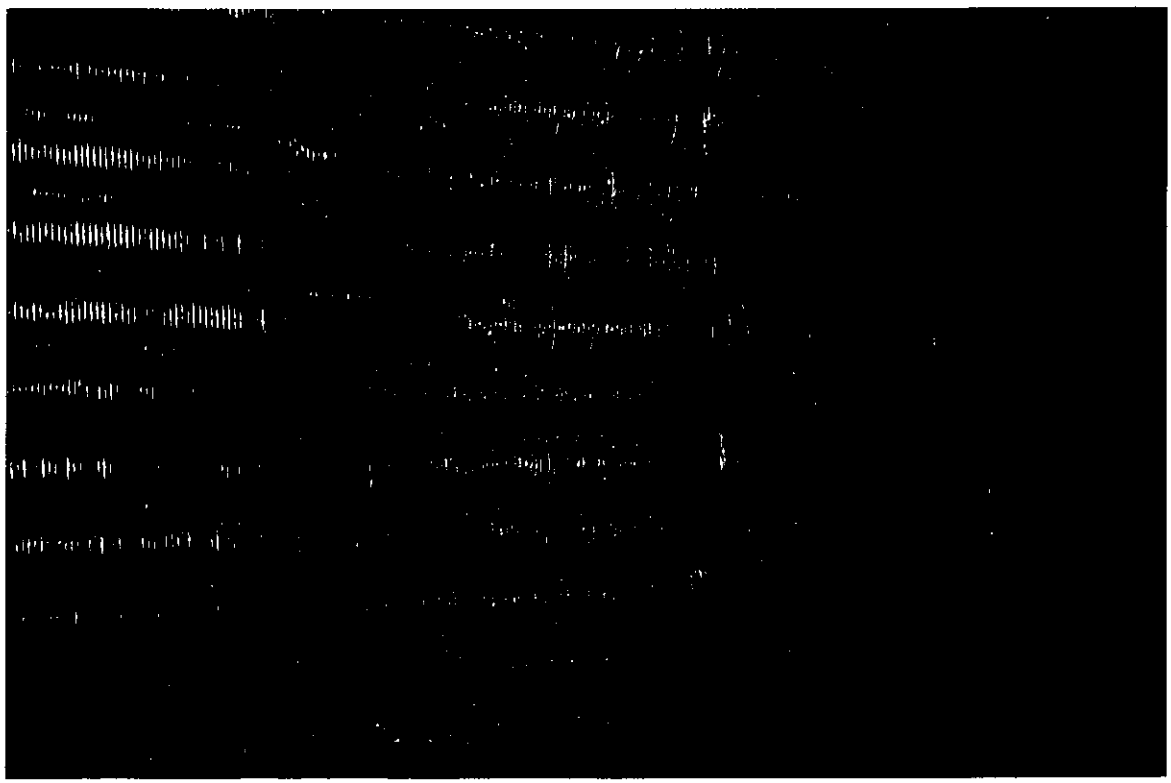
Photograph 6: AHU-1 Return Air Dampers Almost Closed And Not Responsive

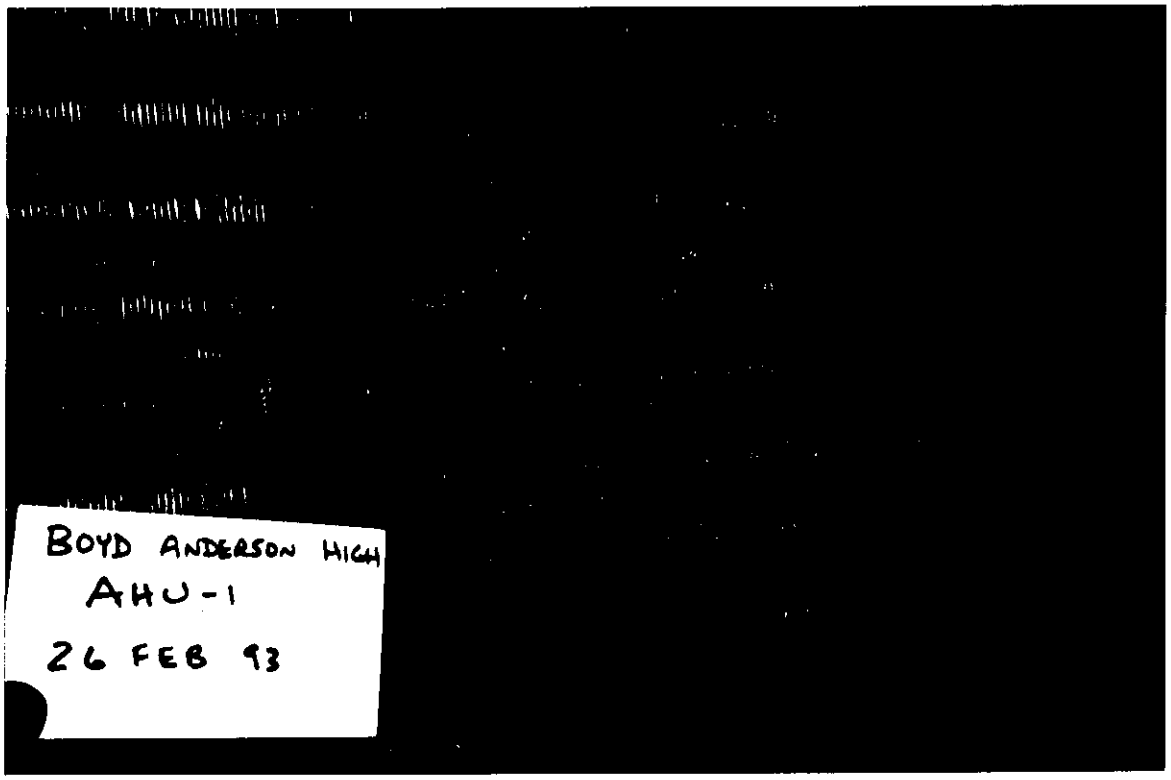


Photograph 7: Accumulated Debris On Return Side Of Coils. Note Plugged Condition



Photographs 8-10: Gelatinous Microbial Slime And Accumulated Debris On Coils




BOYD ANDERSON HIGH
AHU-1
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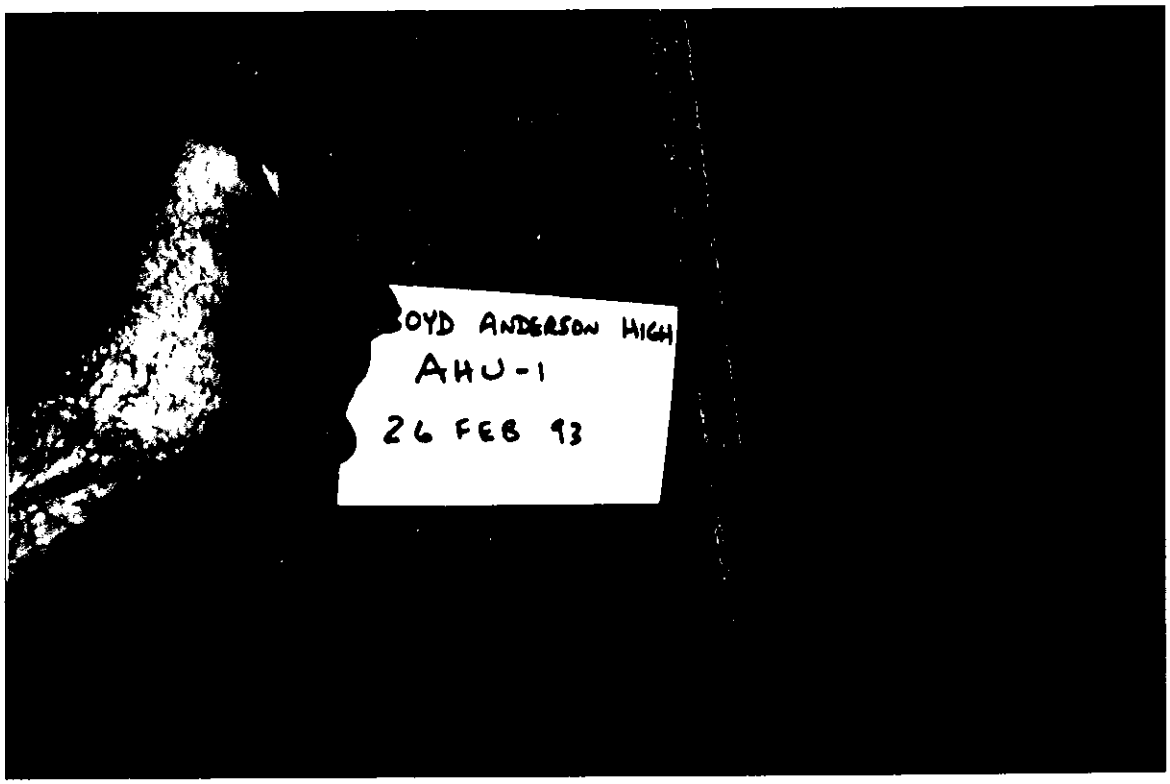
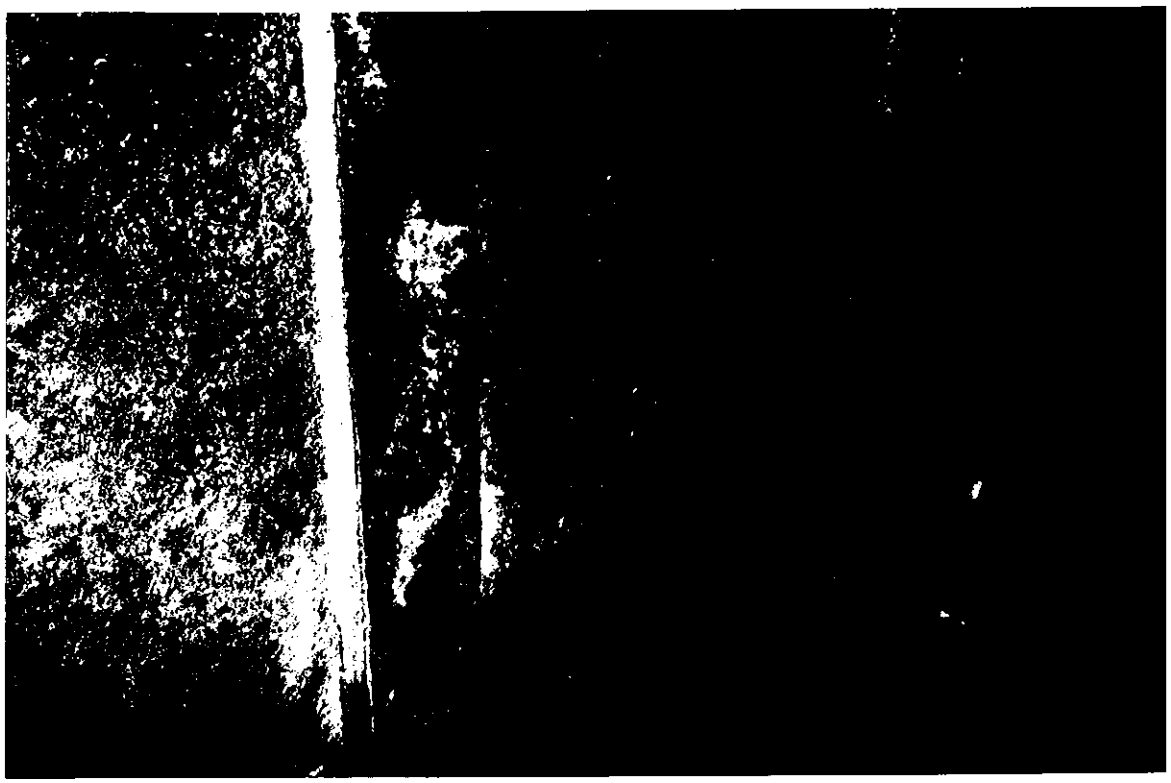
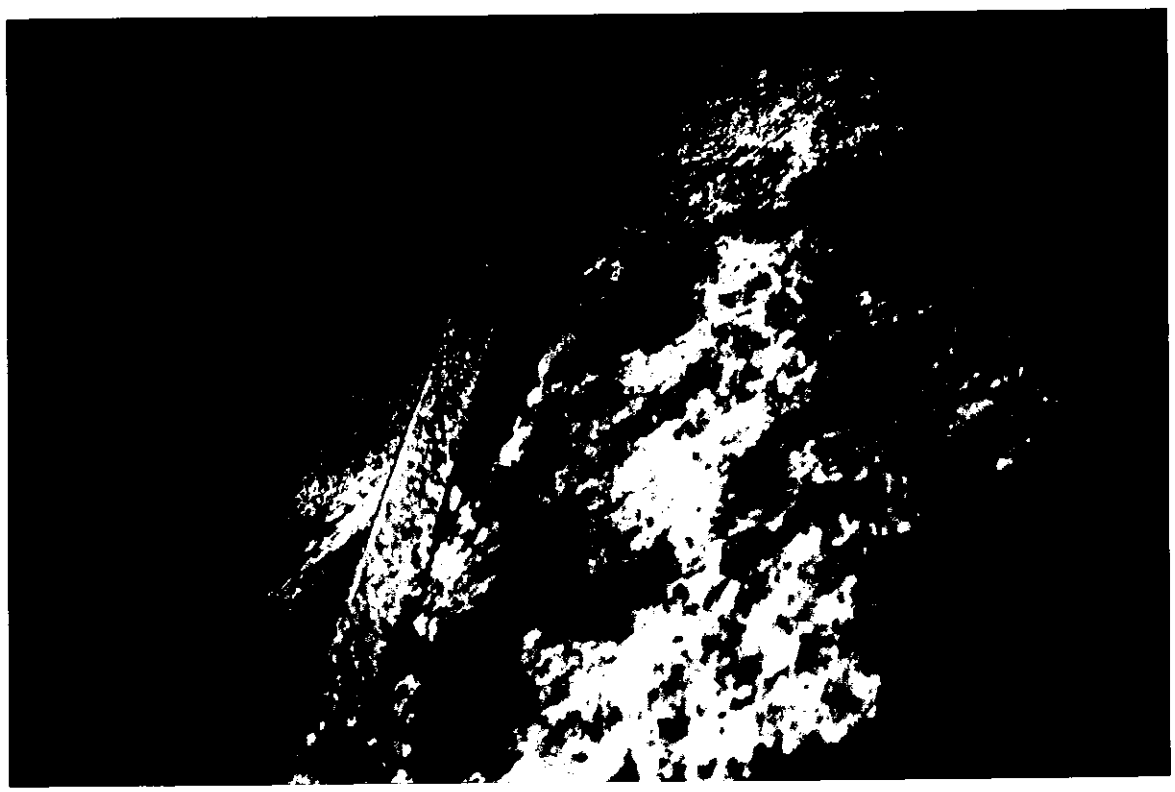
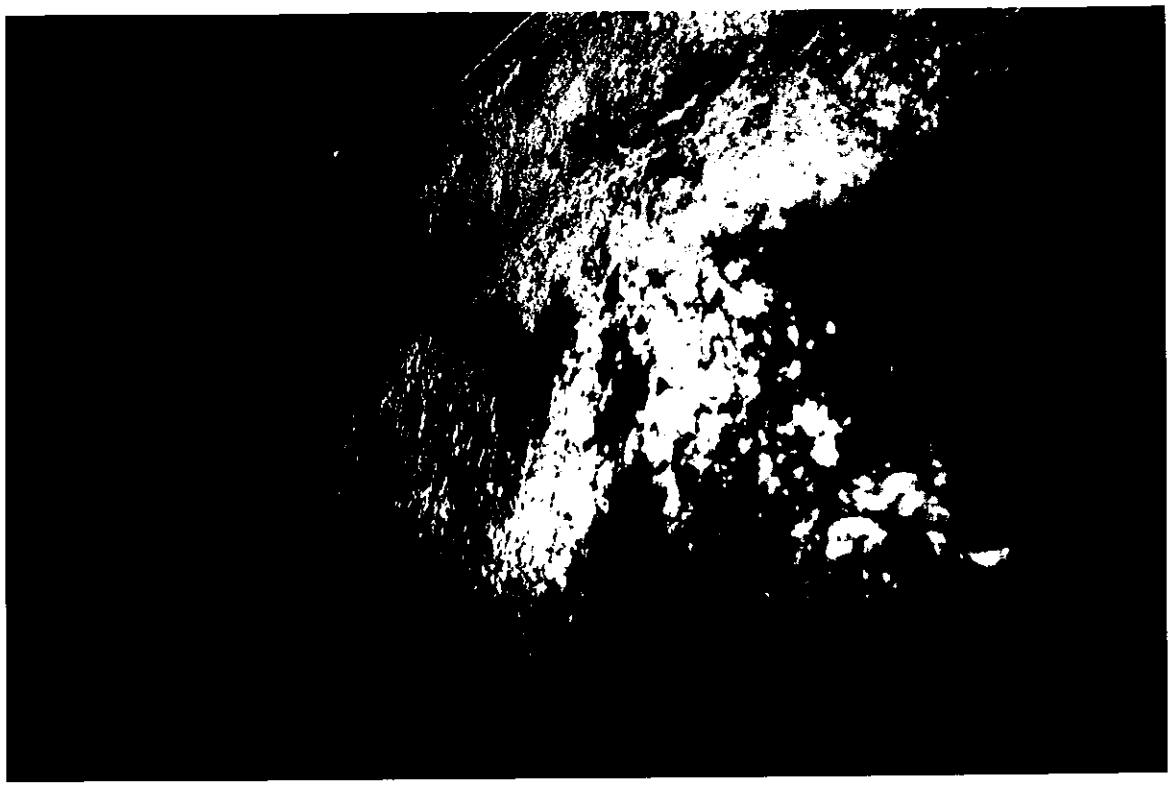
Photographs 11-17: Excessive White Mold Growths On Various Black Insulation Panels Inside AHU-1. This Amount Of Growth Is "Grossly Excessive"



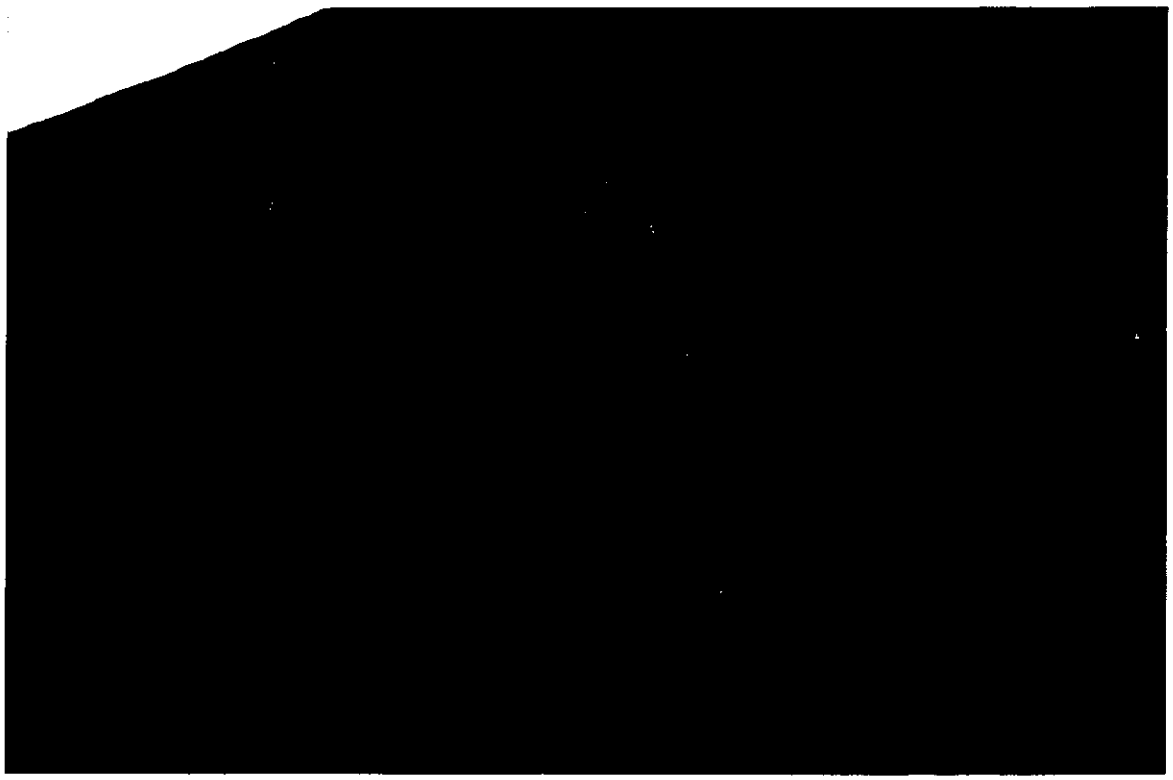


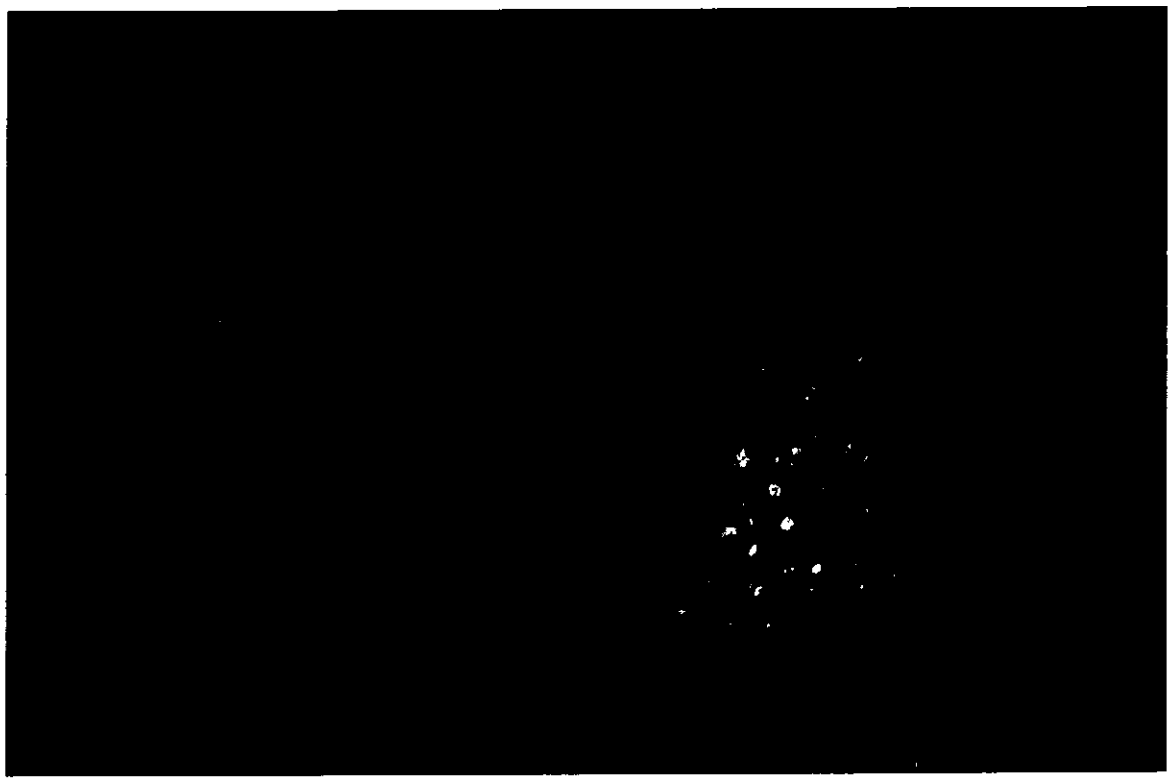




Photographs 18 & 19: Thick Bioslime Blanket In Condensation Pan

Photographs 20 & 21: Microbial Growth On Fan Shaft





SUMMARY:

1. There is an inadequate flow of outdoor air into much of this building as a result of pulling make-up air from the corridor, which originally was designed as an open area but now has been enclosed. This corridor is not provided a source of outdoor air and also has elevated carbon dioxide levels. This reduced air flow can result in "tight building" conditions, which are often associated with frequent headaches, eye and nose burning, excessive tiredness, difficulty thinking, dizziness, symptom onset about mid-morning or later, and symptom relief within a few hours away from the building. Additionally, since there is inadequate flushing of the building, odors tend to remain longer than would be expected within the building.

2. From the amount of microbial growths that were present inside this air handler that could be inspected, it is not surprising that

allergy complaints are present in this building. The amount of growths that were present in this unit would be considered "grossly excessive".

3. After about a week to ten days after these systems have been cleaned, allergy symptom relief should be observed. The "tight building" symptoms should be eliminated within a day or two after adequate outdoor airflows are provided. A Florida licensed Mechanical Engineer should evaluate and provide alternatives for providing outdoor air to these interior air handler rooms, since it is likely that the other air handler rooms that pull air from this central corridor also have a similar problem.

4. Air handler rooms serve as the mixing chamber for return air and make-up air. For this reason, the air handler rooms should be kept clean and should not be used as a storage space for equipment, particularly those that can release odors such as floor cleaning equipment or battery charging operations.

5. The excessive amount of debris accumulation and microbial growths is a result of inadequate filter removal efficiency (low efficiency filters), improper filter placement in the filter housing, inadequate filter changing, and a lack of preventive maintenance inside this unit. These problems are the responsibility of both the school's custodial staff, and the area maintenance staff (for preventive maintenance inside the unit).

RECOMMENDATIONS:

1. Thoroughly inspect and clean the inside of all air handlers for this school. This procedure should include the use of a foaming coil cleaner with a thorough rinse, and an "Oxine" and then a "Portercept" treatment of the insulation and inside of the air handler. The condensation pans should be flushed. For units that have mold accumulations that are as extensive as is found in AHU-1, the insulation should be replaced.

2. Have a licensed Mechanical Engineer evaluate the make-up air and exhaust system for this area, and determine methods to provide outdoor air to these interior air handlers that draw make-up air

from the enclosed corridor. The exhaust air flows should also be evaluated for this building to ensure that the exhaust air flow is adequate for the additional outdoor air.

3. Upgrade the return air filter to at least a medium removal efficiency filter (50%) and seal the edges around the filter in the return air intake. Install a similar removal efficiency filter on the outdoor make-up air intake from the corridor to assist in keeping the air handler room clean.

4. Check the building pressurization to ensure that the buildings are maintained under a slight positive pressure relative to outdoors.

5. Clean and seal the fiberglass on the air handler wall.

6. The chilled water system should be operated at less than 44°F to ensure that proper dehumidification is being provided by the air handlers. Additionally, the system should operate from about 7:00 am to about 7:00 pm to provide dehumidification of these spaces.

7. As a precautionary step, apply a couple of 12-15" biocidal strips to the condensation pan after the units have been cleaned. This will inhibit the regrowth of the microbial slime blanket in the condensation pan.

It has been a pleasure to have been able to assist you with this project. Please do not hesitate to contact me if you have any questions about this report.

Sincerely,

Wil A. Spaul, PC

Wil A. Spaul, President
PhD, MPH, MSCE
Certified Industrial Hygienist

Adjunct Associate Professor of Indoor Air Quality
College of Public Health
University of South Florida - Tampa