



Healthy Buildings

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January 29, 2018

Jody Vanleuven
Executive Director Risk Management
California State University, San Bernardino
5500 University Parkway
San Bernardino, CA 92407

Dear Ms. Vanleuven:

Focused IAQ Inspection 5500 University Parkway, John M. Pfau Library

Healthy Buildings was asked to examine the indoor air quality in representative areas of the John M. Pfau Library at the above address in San Bernardino, California. Since there have been occupant complaints of odors associated with the outdoor construction activities adjacent to the library, the client, California State University, San Bernardino, requested this inspection and testing as a proactive measure. Our inspection was completed on January 2 and 3, 2018. Information was gathered concerning the nature of complaints and the history of conditions in the areas. Several indoor air quality indicators were sampled including: airborne dusts, volatile organic compounds, formaldehyde and other gases. In addition, air samples were taken and analyzed for naphtha (via NIOSH 1500 Modified) and full spectrum VOCs (via EPA Method TO-17). This letter style report records our observations, measurements, analytical results, conclusions and recommendations.

Reporting Guidelines

Healthy Buildings has included in this report standards, threshold limit values, time weighted averages, or other recommended acceptable levels for various indoor air pollutants based on the findings and publications of several U.S. government agencies, independent industrial hygiene organizations, and other bodies. Furthermore, based on our professional opinion, we have selected the most appropriate guidelines in interpreting the data gathered during this inspection. If further information is required in appreciating the guidelines used by Healthy Buildings, please feel free to request such information.

Observations

The areas inspected and tested were located in representative areas of the John M. Pfau Library. The library is divided into three parts: an older portion, new and the wedge wing. The areas contained furnishings and equipment typical to library and educational/classroom spaces and were in overall good condition. At the time of the inspection, construction was being conducted outdoors and adjacent to the

library. We were informed by the client that construction activities included concrete pouring and weatherproofing of outdoor surfaces. It was observed that plastic sheeting was placed on the north entrance of the library (Wedge wing) and fans were placed at the south entrance. Air scrubbers installed with HEPA filters were noted to be placed around the Basement and the 1st floor of the older portion of the library.

In representative areas of the library the following observations were noted:

Basement Level

- In Basement Room 53 (Cataloguing and Tech Services) and Basement Room 49 (Library Receiving), a faint chemical-type odor was noted.
- In the perimeter Stairwell adjacent to Basement Room 49 (Library Receiving), noticeable chemical-type odors were noted.
- In Basement Room PL-014 (Photography), an air scrubber was noted in the area but not operating at the time of our inspection.
- In the Basement Open Student Space (by the south entrance), automatic doors were observed with heavy dust-generating construction activities noted directly outdoors.
- In the South Basement Entrance by Room PL-002 (Academic Technologies & Innovations), the entrance door could not close completely leaving a gap to the outdoors.
- In the Basement Hallway, a noticeable chemical-type odor was detected with the odor dissipating upon entrance to the nearby rooms.

1st Floor

- In the 1st Floor Library Circulation Area, air scrubbers were noted and a very faint chemical-type odor was also detected.
- In the 1st Floor south entrance, two carpet fans were observed and automatic doors, in which the inner automatic doors were in an open position.

3rd Floor

- In the 3rd Floor Perimeter Office 301, it appeared that there was little to no air supply in this area.
- In the 3rd through 5th Floors, warm temperatures were noted with visible dust observed on various window panes.

Air Handling System Inspection

Ventilation needs to the representative areas inspected are provided by air handling units (AHU) 5, 6, 1 wedge, 2 wedge, 3 wedge, MZ 1, MZ 2, MZ 3 and MZ 4. Please see Table 1 below for the specific areas these units serve. Some components of the units could not be accessed and were therefore not inspected at this time.

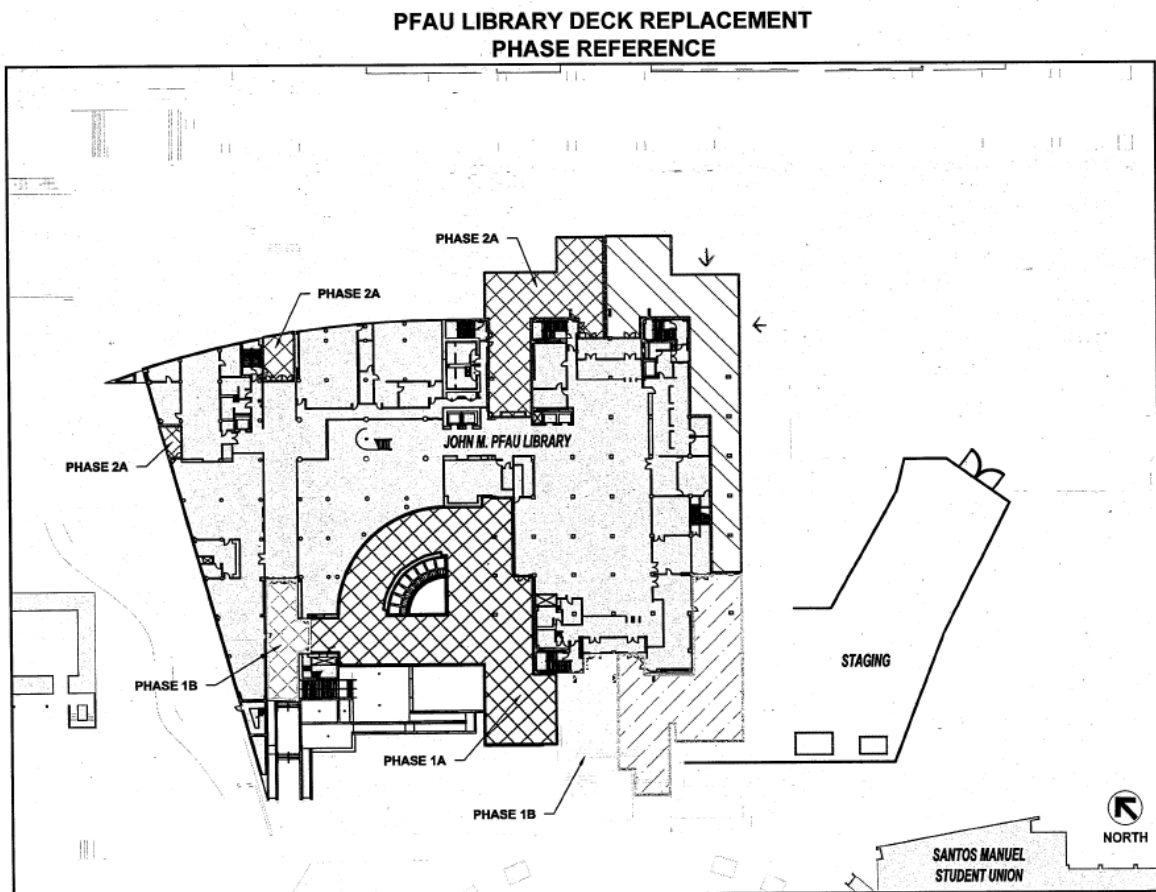
We examined the accessible portions of the units thoroughly for issues relating to ventilation, filtration and hygiene:

- Outdoor air dampers were open. It should be noted that the outside air dampers for units MZ1, MZ3 and MZ4 were fixed and unable to be closed or adjusted. It was also observed that the outside air intakes for these units were located nearby the construction activities. In addition, an outside air plenum was observed located by the loading dock. It should be noted that the client informed Healthy Buildings that during the installation of the outdoor waterproofing the units were either turned off or the dampers were closed.
- Good quality air filters were installed where inspected. The filters were acceptably clean and properly installed in all units except MZ 3, where some main filters were noted to have fallen from the frame.
- The coils and condensate trays were in good condition in all units, except MZ 1, where moderate loading was noted in the condensate tray.
- Condensate drainage and traps were correct.
- The fan chambers were clean and in excellent condition for most units. In the 2 wedge unit, there was suspect microbial growth noted on the back side of the air supply fan and the vibration collar. Also, the fan chamber insulation in MZ 1 and 3 wedge was noted to be slightly torn/frayed. Lastly, for units 5, 6, MZ 2 and MZ 4, access to the units' various chambers was limited.
- No odors were noted.

Overall, the inspected components of the units were in good condition showing a high standard of maintenance.

Diagram (not to scale)

The south basement entrance was found under a negative air pressure relative to the adjacent area, namely the outdoor construction activities. In addition, Basement Rooms #002 and #003 were under an adverse negative pressure relative to the adjacent common hallway. Therefore, odors or contaminants produced outdoors and in the basement common hallway are free to enter the adjacent, respective occupied spaces if these pressure relationships are maintained. Lastly, we found the Basement Hallway under a negative pressure relative to the loading dock.



Air Quality Checks Conducted (See Following Tables for Detailed Results)

Air quality tests in representative areas for carbon dioxide, carbon monoxide, airborne particulates, common indoor gases and volatile organic compounds along with comfort factors such as temperature and humidity are summarized below.

1. The temperatures throughout the spaces were within the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommended comfort range with some areas slightly above this range. Relative humidity levels were within seasonal norms but below the recommended range.

2. Carbon dioxide levels in all areas were satisfactory with the highest reading below the ASHRAE suggested upper limit of outdoor levels plus 700 parts per million (ppm). This suggests that the ventilation and air exchange rate was adequate at the time of our testing.
3. Carbon monoxide, a toxic, odorless byproduct of fuel combustion, was less than detection limits, indicating no indoor sources of this contaminant during the inspection. Testing for miscellaneous gases, including nitrogen dioxide, sulfur dioxide and hydrogen sulfide, were entirely satisfactory with none of these gases found to be present in amounts greater than the Recommended Exposure Limits (RELs) for these tests.
4. All airborne dust levels expressed as respirable sized particulates were below our stringent guideline of 50 $\mu\text{g}/\text{m}^3$. This indicates very good standards of filtration.
5. Formaldehyde levels were found to be less than permissible exposure limits and were below generally accepted irritation levels for sensitized persons.
6. Measures of the total concentration of volatile organic compounds (TVOCs) were less than 500 $\mu\text{g}/\text{m}^3$, within the comfort range of exposure.
7. In addition, a sample was collected and analyzed (via EPA Method TO-17) for specific volatile organic compounds (VOC) from Basement Room 53. The sample was taken by passing known volumes of air through a multi bed Sorbent Tube and analyzed by capillary gas chromatography and mass spectroscopy. The results are analyzed with respect to relevant maximum recommended standards and guidelines for commercial indoor environments. The results showed generally low numbers and the measure of the total concentration of target volatile organic compounds (TVOCs) was less than 500 $\mu\text{g}/\text{m}^3$, within the comfort range of exposure.
8. Sampling for naphtha (via NIOSH 1500 Modified) in the Basement Room 53, Basement Room PL-002 and the 1st Floor Circulation Area showed results below the detection limit and were therefore not concerning.

Conclusions and Recommendations

In response to environmental concerns, Healthy Buildings conducted a focused indoor air quality inspection in representative areas of the John M. Pfau Library located at 5500 University Parkway in San Bernardino, California on January 2 and 3, 2018. Please note the following findings and recommendations:

- The data collected indicate that the indoor air quality in the tested areas meets applicable indoor air quality standards. Measurements were collected for several allergens and irritants including respirable dusts, and various gases [e.g. volatile organic compounds (VOCs), formaldehyde, carbon monoxide, sulfur dioxide, nitrogen dioxide]. While nuisance odors were noted, all measurements were at background levels and well below occupational exposure thresholds and irritation levels. Thermal comfort conditions (temperature and relative humidity) were within suggested ranges for the majority of areas and ventilation rates appeared to be acceptable. While not necessarily applicable to the nuisance odors present, some recommendations are provided for the air handling units.

- In addition, the air sample results for naphtha and full spectrum VOCs from representative areas were typical and not concerning.

Air Handling Units

- It should be noted that the outside air dampers for units MZ1, MZ3 and MZ4 were fixed and unable to be closed or adjusted. Also, it was observed that the outside air intakes for these units were located nearby the construction activities. Consider installing carbon filtration filters over outside air intakes to prevent the migration of outdoor pollutants and construction-related odors and dust from entering the air handling units adjacent to construction activities.
- In unit MZ 3, some of the main filters were noted to have fallen from the frame allowing a substantial fraction of the supply air to bypass filtration. We recommend reinstalling these filters and securing them with clips, clasps or spacer bars to hold the filters in place.
- In unit MZ 1, moderate loading was noted in the condensate tray. In order to prevent drain blockage and development of excessive bacteria and fungi we recommend cleaning the tray. The condensate tray should be treated with a rust protectant solution after cleaning. A suitable product is "Defender II", by The State Chemical Company, Cleveland, Ohio, 800-782-2436.
- In the 2 wedge unit, there was minor suspect microbial growth noted on the back side of the air supply fan and the vibration collar. These minor patches of suspect growth can be treated as a routine housekeeping function and remediated in-house. The procedure should be conducted outside normal office hours while wearing rubber gloves, eye goggles and an N95 (NIOSH Approved 95% efficient) respirator. The contaminated surface can be treated with a disinfectant solution that is approved for use inside HVAC systems, such as Fosters First Defense 40-80 (www.Fosterproducts.com), EnviroCon (Bio-Cide International, 2650 Venture Drive, OK 73069, 800.323.1398) or Sporidicin Disinfectant Solution (Sporidicin Products, 525 Locust Grove, Spartanburg, SC 29303, 1-800-762-3472). After thoroughly wetting the surfaces with the disinfectant, the suspect areas can be removed by scrubbing with any soap or detergent solution.
- The fan chamber insulation in units MZ 1 and 3 wedge was noted to be slightly torn/frayed. This insulation should be repaired and sealed with an encapsulating preparation to prevent further deterioration and possible shedding of fibrous glass particles into the supply airstream. This damaged material can usually be effectively sealed with a spray or brush type encapsulant, such as Flex Seal™, manufactured by Controlled Release Technologies (www.novatech-usa.com/Products) or Fiberlock IAQ 7000 (www.fiberlock.com). We do suggest that rather than sealing patches of loose insulation, the whole surface of the exposed insulation should be sealed. This will retard further deterioration and significantly extend the life of the air handling unit. Should either of these encapsulants be used, it is important to let it dry completely before reattaching access doors or disturbing the applied surface in any way.
- Access to the various chambers of units 5, 6, MZ 2 and MZ 4 was limited. The addition of access doors will allow inspection and cleaning procedures to be done more easily. Consider installing suitable air tight access doors to the chambers of these AHUs.

Air Pressure Differentials/Pressure Relationships

- The south basement entrance was found under a negative air pressure relative to the adjacent area, namely the outdoor construction activities. In addition, Basement Rooms #002 and #003 were under an adverse negative pressure relative to the adjacent common hallway. Therefore, odors or contaminants produced outdoors and in the basement common hallway are free to enter the adjacent, respective, occupied spaces if these pressure relationships are maintained. Therefore, whenever possible, we recommend maintaining the south basement entrance under a positive pressure to prevent outdoor contaminants, odors and dust from construction-related activities from entering the building at this location. It should be noted that at the time of the inspection, heavy (dust generating) construction activities were noted at this location. In addition, Basement Rooms #002 and #003 should also be placed under a positive pressure relative to the common hallway whenever possible to prevent odors and pollutants from entering these spaces as well.
- Lastly, we found the Basement Hallway under an adverse negative pressure relative to the loading dock. This creates the possibility for migration of motor vehicle fumes into the building, including the highly toxic and odorless carbon monoxide gas. At the time of our inspection, no vehicular fumes appeared to be entering the building as confirmed by the absence of any elevated carbon monoxide levels in the tested representative areas of the building. However, the potential for harm is present and as usage of the dock changes together with prevailing wind conditions, there is a likelihood that this problem will manifest itself. For these reasons, we suggest that you monitor this condition regularly and post signs to prevent vehicle idling at the loading dock.

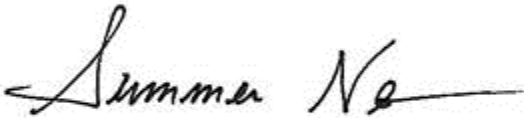
Library Areas

- Although several areas in the library, particularly in the Basement, had chemical-type nuisance odors detected, air sampling showed that all VOC, naphtha and other odor-related measurements were at background levels and well below occupational exposure thresholds and irritation levels at the time of testing. We recommend keeping the spaces well ventilated and the addition of the above-mentioned carbon-filtration on the outside air intakes during current and future construction activities.
- In the South Basement Entrance by Room PL-002 (Academic Technologies & Innovations), the entrance door could not close completely leaving a gap to the outdoors. We recommend repairing the door to keep the area mostly sealed from outdoor construction activities.
- In the 3rd Floor Perimeter Office 301, it appeared that there was little to no air supply in this area. We recommend increasing ventilation to this area.
- In the 3rd through 5th Floors, visible dust was observed on various window panes. We recommend thoroughly cleaning these windows and the surrounding areas to include HEPA vacuuming of surfaces.

For Healthy Buildings,



Melissa C. Lopez
Client Services Manager
[Healthy Buildings | Testing & Diagnostics Group | Western Region](#)



Danielle Summer Neumann
Industrial Hygiene Program Manager, CIH, CAC, LRCIA
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Attachments: Tables of Results / Photographs

Table 1. Visual Inspection of Air Handling Units

<div style="display: flex; align-items: center; justify-content: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Unit Components</div> <div style="text-align: center;">AHU (area served)</div> </div>		5 (2F older portion of library)	6 (3F older portion of library)	1 wedge (Wedge & new portion of the library)	2 wedge (Wedge & new portion of the library)
Dampers	Outside Air Damper Setting %	100%	100%	Unit off	Unit off
	Outside Air Damper Condition	Good	Good	Good	Good
	Return Air Damper Setting %	No view	No view	Unit off	Unit off
	Return Air Damper Condition	N/A	N/A	Good	Good
Filters	Pre Filter Fit	Good	Good	None	None
	Pre Filter Condition	Good	Good	None	None
	Pre Filter Loading	Trace	Trace	None	None
	Main Filter Fit	Good	Good	Good	Good
	Main Filter Condition	Good	Good	Good	Good
	Main Filter Loading	Trace	Trace	Trace	Trace
Chill Coils	Chill Coil Fin Loading	No view	No view	Trace	Trace
	Chill Coil Frame Rust	No view	No view	Trace	Trace
Condensate Tray	Condensate Tray Water Content	No view	No view	Dry	Dry
	Condensate Tray Loading	No view	No view	Trace	Trace
	Condensate Tray Rust	No view	No view	Trace	Trace
	Condensate Tray Chempacks (Y/N)	No view	No view	No	No
Heat Coils	Heat Coil Fin Loading	No view	No view	Trace	Trace
	Heat Coil Frame Rust	No view	No view	Trace	Trace
R/A Fan	Return Air Fan Loading	Trace	Light	Trace	Trace
	Return Air Fan Rust	Light	Trace	Trace	Trace
	Return Air Fan Chamber Loading	Trace	Trace	Trace	Trace
	Return Air Fan Chamber Insulation	Good	Good	Good	Good
A/S Fan	Air Supply Fan Loading	Light	Light	Trace	Trace with suspect microbial growth on vibration collar and back side of air supply fan
	Air Supply Fan Rust	Trace	Trace	Trace	Trace

	<i>Air Supply Fan Chamber Loading</i>	Trace	Trace	Trace	Trace
	<i>Air Supply Fan Chamber Insulation</i>	Good	Good	Good	Good
Notes		No view of cooling and heat coils and condensate tray. Access panel should be installed for routine maintenance purposes.	No view of cooling and heat coils and condensate tray. Access panel should be installed for routine maintenance purposes.		

<div> <div>AHU (area served)</div> <div>Unit Components</div> </div>		3 wedge (Wedge & new portion of the library)	MZ 1 (Part of basement & 1F older portion of library)	MZ 2 (Part of basement & 1F older portion of library)	MZ 3 (Part of basement & 1F older portion of library)
Dampers	Outside Air Damper Setting %	Unit off	Constant	25%	Constant
	Outside Air Damper Condition	Good	Dampers fixed and unable to be adjusted	Good	Dampers fixed and unable to be adjusted
	Return Air Damper Setting %	Unit off	Constant	100%	Constant
	Return Air Damper Condition	Good	Dampers fixed and unable to be adjusted	Good	Dampers fixed and unable to be adjusted
Filters	Pre Filter Fit	None	None	None	None
	Pre Filter Condition	None	None	None	None
	Pre Filter Loading	None	None	None	None
	Main Filter Fit	Good	Good	Good	Fair
	Main Filter Condition	Good	Good	Good	Good
	Main Filter Loading	Trace	Trace	Trace	Trace
Chill Coils	Chill Coil Fin Loading	Trace	Trace	No view	Trace
	Chill Coil Frame Rust	Trace	Trace	No view	Trace
Condensate Tray	Condensate Tray Water Content	Dry	Dry	No view	Dry
	Condensate Tray Loading	Trace	Moderate	No view	Trace
	Condensate Tray Rust	Trace	Trace	No view	Trace
	Condensate Tray Chempacks (Y/N)	No	No	No view	No
Heat Coils	Heat Coil Fin Loading	Trace	Trace	Trace	Trace
	Heat Coil Frame Rust	Trace	Trace	Trace	Trace
R/A Fan	Return Air Fan Loading	Trace	N/A	N/A	N/A
	Return Air Fan Rust	Trace	N/A	N/A	N/A
	Return Air Fan Chamber Loading	Trace	N/A	N/A	N/A
	Return Air Fan Chamber Insulation	Good	N/A	N/A	N/A
A/S Fan	Air Supply Fan Loading	Trace	Trace	Trace	Trace
	Air Supply Fan Rust	Trace	Trace	Trace	Trace
	Air Supply Fan Chamber Loading	Trace	Light	Trace	Trace

	<i>Air Supply Fan Chamber Insulation</i>	Good	Frayed/torn	None	Good
Notes			Insulation was slightly frayed/torn in fan chamber. Units have been turned off when working around this area.	Limited view of heat coils. No view of cooling coils, condensate tray. Access panel should be installed for routine maintenance purposes.	Some of the filters had fallen out of frame

<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border-bottom: 1px solid black; width: 100%;"> Unit Components </div> <div> AHU (area served) </div> </div>		MZ 4 (Part of basement & 1F old portion library)
Dampers	Outside Air Damper Setting %	Constant
	Outside Air Damper Condition	Dampers fixed and unable to be adjusted
	Return Air Damper Setting %	25%
	Return Air Damper Condition	Good - Dampers fixed and unable to be adjusted
Filters	Pre Filter Fit	None
	Pre Filter Condition	None
	Pre Filter Loading	None
	Main Filter Fit	Good
	Main Filter Condition	Good
	Main Filter Loading	Trace
Chill Coils	Chill Coil Fin Loading	No view
	Chill Coil Frame Rust	No view
Condensate Tray	Condensate Tray Water Content	No view
	Condensate Tray Loading	No view
	Condensate Tray Rust	No view
	Condensate Tray Chempacks (Y/N)	No view
Heat Coils	Heat Coil Fin Loading	No view
	Heat Coil Frame Rust	No view
R/A Fan	Return Air Fan Loading	N/A
	Return Air Fan Rust	N/A
	Return Air Fan Chamber Loading	N/A
	Return Air Fan Chamber Insulation	N/A
A/S Fan	Air Supply Fan Loading	Trace
	Air Supply Fan Rust	Trace
	Air Supply Fan Chamber Loading	Trace

	<i>Air Supply Fan Chamber Insulation</i>	Good
Notes		No view of cooling and heat coils and condensate tray. Access panel should be installed for routine maintenance purposes.

Table 2. Prefilter Status

AHU	Filter type	Fit	Loading	Condition	MERV
5	Tackified polyester	Good	Trace	Good	11
6	Tackified polyester	Good	Trace	Good	11

Table 3. Main Filter Status

AHU	Filter type	Fit	Loading	Condition	MERV	Notes
5	Tackified polyester	Good	Trace	Good	11	
6	Tackified polyester	Good	Trace	Good	11	
1 wedge	Tackified polyester	Good	Trace	Good	11	Unit off for inspection
2wedge	Tackified polyester	Good	Trace	Good	11	Unit off for inspection
3 wedge	Tackified polyester	Good	Trace	Good	11	Unit off for inspection
MZ 1	Tackified polyester	Good	Trace	Good	11	
MZ 2	Tackified polyester	Good	Trace	Good	11	
MZ 3	Tackified polyester	Fair	Trace	Good	11	Some of the filters had fallen out of frame
MZ 4	Tackified polyester	Good	Trace	Good	11	

Table 4. Visual Inspection of the Air Supply Duct Internals

No	Location	Observations
1	2F Classroom 211 A/S Diffuser	Trace gray granular deposits
2	2F Classroom 293 A/S Branch	Trace granular deposits
3	2F Classroom 269 A/S Branch	Light mixed granular deposits
4	Basement Room 53 Cataloging & Tech Services A/S Diffuser	Trace gray granular deposits
5	Basement Room 49 Library A/S Diffuser	Trace gray granular deposits

Table 5. Testing in Occupied Areas

No	Location	Carbon monoxide ppm	Carbon dioxide ppm	Temps °F	Relative Humidity %	Airborne Particles (RSP) µg/m ³
1	Outside	<1.0	280	71.2	37	28

No	Location	Carbon monoxide ppm	Carbon dioxide ppm	Temps °F	Relative Humidity %	Airborne Particles (RSP) µg/m ³
2	Basement Room 53 Cataloging & Tech Services	<1.0	340	74.6	11.1	8
3	Basement Room 53 Cataloging & Tech Services (back Area)	<1.0	355	74.6	11.2	10
4	Basement Room 53J Cataloging & Tech Services	<1.0	360	74.3	11.2	44
5	Basement Room 49 Library Receiving	<1.0	313	73.7	10.6	12
6	Basement Room 49 Library Receiving Stairwell	<1.0	392	71.4	11.9	15
7	Basement Room PL-014 Photography	<1.0	334	70.3	12.2	8
8	Basement Open Student Space (by South Entrance)	<1.0	309	71.4	12.3	15
9	Basement Room PL-002 Academic Technologies & Innovations	<1.0	412	73.9	10.9	23
10	Basement Room 003	<1.0	384	72.2	11.3	10
11	Basement Room PL-013 Campus Security	<1.0	345	70.6	12	9
12	1F Room 110 Interlibrary Loan	<1.0	335	73.5	10.6	7
13	1F Circulation	<1.0	316	74.8	10.5	8
14	1F Open Library Area (by Computers)	<1.0	325	74.6	10.9	7
15	1F SW Open Study Area	<1.0	310	74.4	10.4	5
16	2F Open Study Area	<1.0	306	72	12.4	3
17	2F Room 2006 Information Technologies Services	<1.0	348	71.8	12	4
18	2F Room 2105 Admin Computing & Business Intelligence	<1.0	404	72.4	14.4	5
19	2F E Hallway	<1.0	495	77.9	7.5	5
20	2F Classroom 211	<1.0	301	78.5	8.8	2
21	2F Classroom 293	<1.0	382	80.3	6.6	4
22	2F Classroom 283	<1.0	267	78.5	6.8	4
23	2F Classroom 269	<1.0	374	78.1	7.2	8
24	2F Classroom 214	<1.0	314	80.1	8.6	2

No	Location	Carbon monoxide ppm	Carbon dioxide ppm	Temps °F	Relative Humidity %	Airborne Particles (RSP) µg/m ³
25	3F N Open Library/Study Area	<1.0	364	77.6	7.1	4
26	3F S Open Library/Study Area	<1.0	354	77.9	8.4	4
27	3F W Open Library/Study Area	<1.0	320	77.9	10.5	5
28	4F N Perimeter Library/Study Area	<1.0	379	78.9	9.5	3
29	4F E Perimeter Library/Study Area	<1.0	372	79.9	9.2	3
30	4F W Perimeter Library/Study Area	<1.0	390	78.1	8.3	5
31	4F S Perimeter Library/Study Area	<1.0	295	77.7	7.9	4
32	5F N Perimeter Library/Study Area	<1.0	385	77.5	7.8	3
33	5F E Perimeter Library/Study Area	<1.0	395	77.6	8.4	4
34	5F S Perimeter Library/Study Area	<1.0	273	78.7	8.4	4
35	5F W Perimeter Library/Study Area	<1.0	394	77	9.4	2
36	3F Perimeter Office 301	<1.0	327	75.5	9.5	5
37	3F N Open Library/Study Area	<1.0	364	79.4	8.4	4
Recommended Standards Summer		9	Outdoor plus 700	73-79	30-65	50
Recommended Standards Winter		9		68-75	20-65	50

Table 6. Testing for Miscellaneous Gases

No	Location	SO ₂ ppm	NO ₂ ppm	H ₂ S ppm
1	Outside	<0.1	<0.1	<1
2	Basement Room 53 Cataloging & Tech Services	<0.1	<0.1	<1
3	Basement Room 53 Cataloging & Tech Services (back Area)	<0.1	<0.1	<1
4	Basement Room 53J Cataloging & Tech Services	<0.1	<0.1	<1
5	Basement Room 49 Library Receiving	<0.1	<0.1	<1
6	Basement Room 49 Library Receiving Stairwell	<0.1	<0.1	<1
7	Basement Room PL-014 Photography	<0.1	<0.1	<1
8	Basement Open Student Space (by South Entrance)	<0.1	<0.1	<1

No	Location	SO ₂ ppm	NO ₂ ppm	H ₂ S ppm
9	Basement Room PL-002 Academic Technologies & Innovations	<0.1	<0.1	<1
10	Basement Room 003	<0.1	<0.1	<1
11	Basement Room PL-013 Campus Security	<0.1	<0.1	<1
12	1F Room 110 Interlibrary Loan	<0.1	<0.1	<1
13	1F Circulation	<0.1	<0.1	<1
14	1F Open Library Area (by Computers)	<0.1	<0.1	<1
15	1F SW Open Study Area	<0.1	<0.1	<1
16	2F Open Study Area	<0.1	<0.1	<1
17	2F Room 2006 Information Technologies Services	<0.1	<0.1	<1
18	2F Room 2105 Admin Computing & Business Intelligence	<0.1	<0.1	<1
19	2F E Hallway	<0.1	<0.1	<1
20	2F Classroom 211	<0.1	<0.1	<1
21	2F Classroom 293	<0.1	<0.1	<1
22	2F Classroom 283	<0.1	<0.1	<1
23	2F Classroom 269	<0.1	<0.1	<1
24	2F Classroom 214	<0.1	<0.1	<1
25	3F N Open Library/Study Area	<0.1	<0.1	<1
26	3F S Open Library/Study Area	<0.1	<0.1	<1
27	3F W Open Library/Study Area	<0.1	<0.1	<1
28	4F N Perimeter Library/Study Area	<0.1	<0.1	<1
29	4F E Perimeter Library/Study Area	<0.1	<0.1	<1
30	4F W Perimeter Library/Study Area	<0.1	<0.1	<1
31	4F S Perimeter Library/Study Area	<0.1	<0.1	<1
32	5F N Perimeter Library/Study Area	<0.1	<0.1	<1
33	5F E Perimeter Library/Study Area	<0.1	<0.1	<1
34	5F S Perimeter Library/Study Area	<0.1	<0.1	<1
35	5F W Perimeter Library/Study Area	<0.1	<0.1	<1
36	3F Perimeter Office 301	<0.1	0.1	<1
37	3F N Open Library/Study Area	<0.1	<0.1	<1

Table Key	Name	Recommended Exposure Limit (REL)	Limit of Detection parts per million (ppm)
SO ₂	Sulfur dioxide	0.25	0.1
NO ₂	Nitrogen dioxide	0.20	0.1
H ₂ S	Hydrogen sulfide	1	1

Table 7. Differential Air Pressure Tests

No	Flow from	Flow to	Status
1	2F Classroom 211 Air Diffuser	2F Classroom 211	Favorable
2	2F Classroom 269 Air Diffuser	2F Classroom 269	Favorable
3	Basement Hallway by Stairwell 6	Basement Men's and Women's Restroom by Stairwell 6	Favorable
4	1F Women's Restroom by Stairwell 6	1F Women's Restroom	Adverse, Strong Supply Near Door
5	1F Hallway by Stairwell 6	1F Men's Restroom	Favorable
6	1F Hallway	1F Stairway 6	Favorable
7	Basement Room #53	Basement Hallway	Favorable
8	Basement Room #49	Basement Hallway	Favorable
10	Basement Hallway (By Men's Restroom (nearby the Loading Dock))	Basement Men's Restroom	Favorable
11	Basement Hallway by Loading Dock	Basement Women's Restroom	Favorable
12	Basement Loading Dock	Basement Hallway	Adverse
13	Basement Room #PL-014	Basement Hallway	Favorable
14	Basement Hallway by Stairwell 9	Basement Men's and Women's Restroom	Favorable
16	Basement Outside S Side	Basement S Hallway by Student Space	Adverse
17	Basement S Hallway by Student Space	Basement Room #002	Adverse
18	Basement S Hallway	Basement Room #003	Adverse
19	1F S Entrance/exit Old Library	Outside	Favorable
20	1F Stairway 1	Outside S	Favorable
21	1F S Wedge Entrance/Exit	Outside	Favorable
22	1F Wedge Men's and Women's Restroom (by ITS Training)	1F Wedge Hallway	Adverse, OK, Strong Supply Near Door
23	3F Old Portion Hallway	3F Old Portion Men's and Women's Restroom	Favorable
24	5F Hallway	5F Men's and Women's Restroom	Favorable
25	2F Hallway	2F Men's and Women's Restroom (by Stairwell 9)	Favorable
26	2F Hallway	2F Stairway 9	Favorable
27	2F Hallway	2F Men's and Women's Restroom (by Stair 6)	Favorable
28	2F Hallway (new Portion)	2F Stairway 9	Favorable

Favorable – air flows in right direction

Adverse – air flows in wrong direction

Neutral – air flows essentially equal

Immaterial – pressure differential of no consequence

Table 8. Sampling and Analysis for Formaldehyde Content

No	Location	Formaldehyde concentration (ppm)
1	Outside	<0.05
2	Basement Room 53 Cataloging & Tech Services	<0.05
3	Basement Room 53 Cataloging & Tech Services (back Area)	<0.05
4	Basement Room 53J Cataloging & Tech Services	<0.05
5	Basement Room 49 Library Receiving	<0.05
6	Basement Room 49 Library Receiving Stairwell	<0.05
7	Basement Room PL-014 Photography	<0.05
8	Basement Open Student Space (by South Entrance)	<0.05
9	Basement Room PL-002 Academic Technologies & Innovations	<0.05
10	Basement Room 003	<0.05
11	Basement Room PL-013 Campus Security	<0.05
12	1F Room 110 Interlibrary Loan	<0.05
13	1F Circulation	<0.05
14	1F Open Library Area (by Computers)	<0.05
15	1F SW Open Study Area	<0.05
16	2F Open Study Area	<0.05
17	2F Room 2006 Information Technologies Services	<0.05
18	2F Room 2105 Admin Computing & Business Intelligence	<0.05
19	2F E Hallway	<0.05
20	2F Classroom 211	<0.05
21	2F Classroom 293	<0.05
22	2F Classroom 283	<0.05
23	2F Classroom 269	<0.05
24	2F Classroom 214	<0.05
25	3F N Open Library/Study Area	<0.05
26	3F S Open Library/Study Area	<0.05
27	3F W Open Library/Study Area	<0.05
28	4F N Perimeter Library/Study Area	<0.05
29	4F E Perimeter Library/Study Area	<0.05
30	4F W Perimeter Library/Study Area	<0.05
31	4F S Perimeter Library/Study Area	<0.05
32	5F N Perimeter Library/Study Area	<0.05
33	5F E Perimeter Library/Study Area	<0.05
34	5F S Perimeter Library/Study Area	<0.05

35	5F W Perimeter Library/Study Area	<0.05
36	3F Perimeter Office 301	<0.05
37	3F N Open Library/Study Area	<0.05
ACGIH Short-Term Exposure Limit (STEL)		0.3
Healthy Building's Recommended Standard		0.050

According to the World Health Organization, formaldehyde levels below 0.05 ppm are of no concern. The standard used by the State of Washington for commercial buildings is also 0.05 ppm. This value has been adopted by Healthy Buildings as the appropriate standard for typical indoor non-industrial environments such as commercial offices.

Table 9. Screening for Total Volatile Organic Compounds (TVOC)

No	Location	TVOC $\mu\text{g}/\text{m}^3$
1	Outside	<45
2	Basement Room 53 Cataloging & Tech Services	<45
3	Basement Room 53 Cataloging & Tech Services (back Area)	<45
4	Basement Room 53J Cataloging & Tech Services	<45
5	Basement Room 49 Library Receiving	<45
6	Basement Room 49 Library Receiving Stairwell	<45
7	Basement Room PL-014 Photography	<45
8	Basement Open Student Space (by South Entrance)	<45
9	Basement Room PL-002 Academic Technologies & Innovations	<45
10	Basement Room 003	<45
11	Basement Room PL-013 Campus Security	<45
12	1F Room 110 Interlibrary Loan	<45
13	1F Circulation	<45
14	1F Open Library Area (by Computers)	<45
15	1F SW Open Study Area	<45
16	2F Open Study Area	<45
17	2F Room 2006 Information Technologies Services	<45
18	2F Room 2105 Admin Computing & Business Intelligence	<45
19	2F E Hallway	<45
20	2F Classroom 211	<45
21	2F Classroom 293	<45
22	2F Classroom 283	<45
23	2F Classroom 269	<45
24	2F Classroom 214	<45
25	3F N Open Library/Study Area	<45
26	3F S Open Library/Study Area	<45
27	3F W Open Library/Study Area	<45
28	4F N Perimeter Library/Study Area	<45
29	4F E Perimeter Library/Study Area	<45
30	4F W Perimeter Library/Study Area	<45
31	4F S Perimeter Library/Study Area	<45
32	5F N Perimeter Library/Study Area	<45
33	5F E Perimeter Library/Study Area	<45
34	5F S Perimeter Library/Study Area	<45
35	5F W Perimeter Library/Study Area	<45
36	3F Perimeter Office 301	<45
37	3F N Open Library/Study Area	<45

No	Location	TVOC $\mu\text{g}/\text{m}^3$
	Healthy Buildings' Recommended Standard	<500

Table 10. Naphtha via NIOSH 1500 Modified



LA Testing
 5431 Industrial Drive, Huntington Beach, CA 92649

Order ID: 331800616

Attn:	Summer Neumann	Customer ID:	32HB172
	Healthy Buildings	Customer PO:	
	25381 Commercentre Dr. Ste 150	Date Received:	01/05/18
	Lake Forest, CA 92630	LA Testing Order:	331800616
Phone:	714-742-1838		
Fax:			
Email:	sneumann@healthybuildings.com		
Project:	1712084SC		
Report Date:	01/11/18	Date Analyzed:	01/09/18

VM+P-Naphtha* on 226-01 with NIOSH 1500 Modified

Lab ID	Vol (L)	Sample ID	Analyte	mg/tube	ppm	Reporting Limit (mg)
331800616-0001	6.7	4045	Naphtha	<0.0074	<0.25	0.0074
331800616-0002	5.8	4047	Naphtha	<0.0074	<0.28	0.0074
331800616-0003	6.0	4040	Naphtha	<0.0074	<0.28	0.0074
331800616-0004	-	4044	Naphtha	<0.0074	NA	0.0074

Sample received in acceptable condition unless otherwise noted. This report may not be reproduced except in full, without written approval by LA Testing. Unless otherwise noted, the results in this report have not been blank corrected. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted. *Naphtha is quantitated as VM+P-Naphtha.

MNH
 Analyst

Michael Chapman
 Michael Chapman, Laboratory Manager
 Or other approved signatory

AIHA-LAP, LLC Accredited - Laboratory ID #101650

Page 1 of 1



EMSL Order Number (Lab Use Only):

#331800616

Huntington Beach, CA 92649
(714) 828-4999
(714) 828-4944

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Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By S. Newman Jt	Date 1/4/18 1030	Received By AP/COPS	Date 1/5/18 10:00A
Comments:			

Table 11. Total Volatile Organic Compounds (TVOC) via EPA Method TO-17



Healthy Buildings
 3251 Old Lee Highway, Suite 100
 Fairfax, VA 22030
 Ph: (703) 323-4400
 Fax: (703) 323-4440

Total Volatile Organic Compound (TVOC) Analysis by GC/MS

Lab ID/Sample # 43744
 Client Project # 1712084SC
 Tube Serial # G0140098
 Sample Description Basement Rm 53
 Analyst MN
 Analysis Date 1/9/2018
 Collection Date 1/2/2018
 Total Liters 5.40

Analyte	Concentration (ug/m ³)	
Propylene	< 0.64	U
Dichlorodifluoromethane	2.55	
1,2-Dichlorotetrafluoroethane	< 2.59	U
Chloromethane	< 0.76	U
Vinyl Chloride	< 0.95	U
1,3-Butadiene	< 0.82	U
Bromomethane	< 1.44	U
Chloroethane	< 0.98	U
Trichlorofluoromethane	< 2.08	U
Ethanol	< 0.70	U
1,1,2-Trichloro-1,2,2-trifluoroethane	3.29	
1,1-Dichloroethylene	< 1.47	U
Acetone	16.52	
Carbon disulfide	< 1.15	U
2-Propanol	2.82	
Dichloromethane	< 1.29	U
tert-Butyl methyl ether	< 1.33	U
cis-1,2-Dichloroethylene	< 1.47	U
Hexane	< 1.30	U
1,1-Dichloroethane	< 1.50	U
Vinyl Acetate	2.62	B
trans-1,2-Dichloroethylene	< 1.47	U
Ethyl Acetate	< 1.33	U
Tetrahydrofuran	< 1.09	U
Chloroform	< 1.81	U
Cyclohexane	2.02	
1,1,1-Trichloroethane	< 2.02	U
Carbon Tetrachloride	< 2.33	U



Healthy Buildings
 3926 Pender Drive, Suite 120
 Fairfax, VA 22030
 Ph: (703) 323-4400
 Fax: (703) 323-4440

Total Volatile Organic Compound (TVOC) Analysis by GC/MS

Benzene	< 1.18	U
1,2-Dichloroethane	1.52	
Heptane	< 1.52	U
Trichloroethylene	< 1.99	U
1,2-Dichloropropane	< 1.71	U
1,4-Dioxane	< 1.33	U
Bromodichloromethane	< 2.48	U
trans-1,3-Dichloropropene	< 1.68	U
4-Methyl-2-Pentanone	< 1.52	U
Toluene	5.49	
cis-1,3-Dichloropropene	< 1.68	U
1,1,2-Trichloroethane	< 2.02	U
Tetrachloroethylene	< 2.51	U
2-Hexanone	< 1.52	U
Dibromochloromethane	< 3.15	U
1,2-Dibromoethane	< 2.84	U
Chlorobenzene	< 1.70	U
Ethylbenzene	3.60	
m,p-Xylene	7.22	
o-Xylene	4.65	
Styrene	2.64	
Bromoform	< 3.83	U
1,1,2,2-Tetrachloroethane	< 2.54	U
4-Ethyltoluene	4.41	
1,2,4-Trimethylbenzene	2.15	
Mesitylene	4.06	
1,3-Dichlorobenzene	< 2.23	U
1,4-Dichlorobenzene	< 2.23	U
Benzyl chloride	< 1.92	U
1,2-Dichlorobenzene	< 2.23	U
1,2,4-Trichlorobenzene	< 2.75	U
Hexachloro-1,3-butadiene	< 3.95	U
4-PCH	ND	
Total Target VOCs	76.85	



Healthy Buildings
 3251 Old Lee Highway, Suite 100
 Fairfax, VA 22030
 Ph: (703) 323-4400
 Fax: (703) 323-4440

Total Volatile Organic Compound (TVOC) Analysis by GC/MS

Tentatively Identified Compounds

iso-Pentane	78.84	J
Dimethyl ether	1.89	J
m-Methylstyrene	4.18	J
1,2,4-Trimethylbenzene	2.47	J
Camphor	3.00	J

Total VOCs **167.23**

U - This flag indicates the compound was analyzed for but not detected.

J - This flag indicates an estimated value.

N - This flag indicates presumptive evidence of a compound. This flag is only used for TICs, where the identification is based on a mass spectral library search and must be used in combination with the J flag.

B - This flag is used when the analyte is found in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user to take appropriate action.

E - This flag identifies compounds whose response exceed the response of the highest standard in the initial calibration range of the instrument for that specific analysis.

ND - Not Detected

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Volatile Organic Compounds (VOCs) – Background Information

Organic chemicals that may be emitted as gases or “volatilize” at room temperatures are described as volatile organic compounds. These compounds are released by “off-gassing” from diverse sources, such as occupants, pests, manufactured building products, furnishings, paints, cleaners, etc. In commercial buildings, it is not uncommon to find VOC levels two to ten times higher than outdoor levels since there are multiple sources in buildings. However, they are normally present in very dilute concentrations in the air, usually measurable in parts per million (ppm) or micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$). In assessing these compounds there are three factors of concern: odors, irritation and potential health effects to toxic effects. No federal agency has set permissible exposure levels for mixtures of these compounds in the indoor air. The Molhave Dose Response scale is generally accepted as a guideline for interpreting TVOC exposure in commercial environments. Molhave developed a classification of four grades of TVOC concentrations and Healthy Buildings has adopted that classification with the slight modification that extends the “comfort range” for TVOCs from undetectable to $500 \mu\text{g}/\text{m}^3$ (0.3 ppm). This reflects the standard adopted by the US Green Building Council in their Leadership in Energy and Environmental Design (LEED™) rating system for “Green,” or “environmentally friendly” buildings. This was in turn based on the standard adopted by the State of Washington and is still the most stringent standard for TVOCs in the United States.

Tentative Dose Response to TVOCs			
Grade	Airborne TVOC* concentration ($\mu\text{g}/\text{m}^3$)	Symptoms	Effects
A	<500	No irritation or discomfort expected	The comfort range
B	500-3,000	Irritation and discomfort possible if other exposures interact	The multi-factorial exposure range
C	3,000-25,000	Exposure effect and probable headache possible if other exposures interact	The discomfort range
D	>25,000	Additional neurotoxic effects other than headache may occur	The toxic range

*Via photoionization measurement, equivalent to isobutylene.



MZ 3 poly tacky filter with trace dirt loading



MZ 3 - A/S fan with trace dirt loading on the inlet & housing.



MZ 3 - coils with trace dirt loading



MZ 4 - poly tacky filters with trace dirt loading



MZ 4 - A/S fans with trace dirt loading & rust on the inlet & housing



MZ 4 - return air dampers



MZ 4 - O/A supply



MZ 2 - O/A Supply



MZ 2 O/A dampers



MZ 2 R/A dampers



MZ 2 - poly tacky filter with trace dirt loading



MZ 2 - A/S fan with trace dirt loading & rust on inlet & housing



MZ 2 - heat coils with trace dirt loading & rust



MZ 1 - Poly tacky filter with trace dirt loading



MZ 1 - A/S fan with trace dirt loading and rust on the inlet and housing.



MZ 1 - condensate tray with moderate dirt loading and trace rust.



MZ 1 - coils with trace dirt loading and rust.



MZ 1 - torn insulation in the A/S chamber



Wedge 1 O/A dampers



Wedge AHU 1 - polytack filters with trace dirt loading.



Wedge AHU 1 - coils with trace dirt loading and rust.



Wedge AHU 1 - A/S fan with trace dirt loading and rust on the inlet & housing.



Wedge AHU 1 - R/A fan with trace dirt loading and rust on the inlet and housing



Wedge AHU 1 - O/A



Wedge AHU 2 - condensate tray with trace dirt loading and rust.



Wedge AHU 2 - suspect microbial growth on the vibration collar on the A/S fan



Wedge AHU 2 - A/S fan with trace dirt loading and rust on the inlet.



Wedge AHU 2 - polytacky filter with trace dirt loading



Wedge AHU 2 - suspect microbial growth on the back side on the A/S fan



Wedge AHU 2 - R/A fan with trace dirt loading and rust.



Wedge AHU 3 - torn insulation in fan chamber



Wedge AHU 3 - A/S fan with trace dirt loading and rust on the inlet & housing



Wedge AHU 3 - cooling coils with trace dirt and rust loading.



Wedge AHU 3 - polytacky filters with trace dirt loading.



Wedge AHU 3 - R/A fan with trace dirt loading and rust on the inlet and housing.



O/A for MZ 3 and 4



O/A wedge 2 & 3



O/A for new addition portion of the library



O/A for floors 2-5 of the old portion of the library



AHU 5 - A/S fan light dirt loading and trace rust on the inlet and housing



AHUs 5 & 6 - polytacky filters with trace dirt loading on O/A dampers



AHU 5 - polytacky filters with trace dirt loading



AHU 6 polytacky filters with trace dirt loading



AHU 5 A/S fan with light dirt loading and trace rust



AHU 5 - O/A dampers closed



Air Scrubbers were placed throughout the Basement and 1F of older portion of the library



Air scrubbers were placed around the basement and 1F of the older portion of the library with HEPA filters and 1" pleated filters installed



Basement Room 53 Cataloging and Tech Services



Basement Room 49 Library Receiving Stairwell with single pane windows



Basement Room PL-014 Photography



Basement South Side Entrance – reported issues with backhoe and dust control



Basement Open Student Space (by south entrance)



Air Sampling for VOC & Naphtha conducted



1F South Side with automatic doors open.



2F Room 2105 Admin Computing & Buisness Intelligence



2F North Entrance



2F Classroom 214



3F N Open Library/Study Area



4F Perimeter Library/Study Area



5F S Perimeter Library/Study Area



2F Classroom 214 air diffuser with trace/light dirt loading.



South Basement Entrance by Room PL-002 Academic Technologies & Innovations door could not close completely leaving gap



3F Room 301 outside office window - water proofing laid on ground.



Open air plenum above the Loading Dock



Two carpet fans were placed by 1F S entrance/exit



O/A for Wedge AHU 1



Exhaust



O/A for MZ 1



O/A for MZ 2

Glossary of Technical Terms	
Carbon dioxide (CO ₂)	A byproduct of respiration and normal constituent of the atmosphere. Measurement of carbon dioxide can provide an indication of ventilation rates in a building and/or a threshold of comfort
Carbon monoxide (CO)	A toxic byproduct of fuel combustion. While odorless, carbon monoxide gas is often accompanied by other odorous combustion products (aldehydes, oxides of nitrogen, etc)
Counts per cubic meter of air (count/m ³)	A calculated unit of measurement for quantifying airborne mold spores per unit volume of air
Formaldehyde (HCHO)	A pungent, organic compound associated with certain new furnishings, glues, pressed woods, vehicle exhaust and tobacco smoke. Reacts in the atmosphere to become a component of smog
Hydrogen Sulfide (H ₂ S)	Or sewer gas. A toxic and flammable gas associated with rotten egg odor from the bacterial breakdown or organic matter. Detectable by the human sense of smell at extremely low concentration.
Hyphae	A long branching filamentous cell of a fungi or “root” structures. Their presence often indicates active growth
Infrared Thermography	The science of detecting radiation in the infrared range. As radiation increases with temperature, thermography allows one to detect the variation in temperature allowing building diagnosticians to “see” moisture accumulation or potential air leakage not otherwise visible.
Micrograms per cubic meter (µg/m ³)	A unit of concentration common to particles and gases which describes the weight or mass of the contaminant per unit volume of air. A microgram is 1/1,000,000th of a gram.
Micrometer (µm)	A common unit of measurement for microscopic particles. Unit of measure that is 1/1,000,000th the length of a meter
Moisture meter	An instrument capable of measuring the moisture content of porous and semi-porous materials; used in the assessment of moisture and a metric for potential mold growth
Mold	Include all species of microscopic fungi that grow in the form of multicellular filaments called hyphae; common consequence to moisture damaged material
Nitrogen Dioxide (NO ₂)	A toxic and pungent gas common to internal combustion engines and power plants. Reaction products include ozone.
Relative humidity	The amount of water vapor that exists in a gaseous mixture of air and water relative to temperature. Measured in %.
Respirable Suspended Particulate	A classification of dust which describes a particle size range averaging less than 10 micrometers (µm) in diameter. Excessive particles in the respirable range are more likely to be implicated in respiratory distress
Spores	The reproductive structure of mold (fungi) adapted for dispersal. Typically, 1-20 micrometers in diameter. Have been implicated in allergy-like symptoms and rare cases of infection
Sulfur Dioxide (SO ₂)	A toxic gas associated common to coal burning, power plants, and the incomplete combustion of lower grade fuels.
Tape Lift	A technique to collect surface molds or settled particles for microscopic analysis
Temperature	A physical property of air describing heat or cold measured in degrees Fahrenheit
Total Volatile Organic Compounds (TVOCs)	An aggregate measure of volatile organic compounds in air expressed in ppm or µg/m ³ .
Ultrafine Particles	A classification of airborne particles with diameters in the range of 0.02 – 1.0 micrometers characterized by their ability to reach the gas exchange regions of the lung; under considerable investigation as a trigger for respiratory distress
Volatile Organic Compounds	Classes of organic chemical compounds (containing carbon) with high enough vapor pressures to exist as gases under normal temperature and pressure conditions. Odors common to fuels, paints, new furnishings, etc.