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Engineering A Sustainable Future

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LIMITED INDOOR ENVIRONMENTAL EVALUATION

MIAMI FEDERAL DETENTION CENTER

33 NE 4TH STREET
MIAMI, FL 33132

Attention:
Mr. Gary Hammond, Facilities Manager
33 NE 4th Street
Miami, FL 33132

Prepared by:
ECO ADVISORS, LLC

3932 RCA Blvd., Suite 3204
Palm Beach Gardens, Florida 33410
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October 2009

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1. Introduction

ECO Advisors, LLC is pleased to present this summary of our Limited Indoor Environmental Evaluation (IEE) of the Law Library, Work Room and Engraving Room in the Miami Federal Detention Center located in Miami, Florida. Mr. Gary Hammond, Facilities Manager, retained Eco Advisors to conduct this IEE of the Site. This is termed a Limited IEE since it was focused at a specific area within the building.

2. Background

This IEE was limited to three areas, the Law Library, Work Room and Engraving Room (Site). The rooms are located on the third floor of the building, adjacent to each other and are conditioned by the same air handler unit (AHU). Occupants have complained of Suspect Visible Mold (SVM) on surfaces yet there were no reports of water intrusion or flooding. Each of the rooms are occupied for a few hours a day and are cleaned on a weekly basis

3. Scope of Work and Methodology

3.1. Scope of Work

ECO Advisors, LLC inspector Patrick Dilla, REM, accompanied by Mr. Garry Hammond, Facilities Manager, conducted the following Scope on October 2, 2009:

- A visual site inspection of the interior and exterior conditions of the Site and the Site air conditioning system(s)
- The collection of field parameters including temperature, relative humidity, moisture content in building materials, thermal imaging, particle counts and air flow patterning.
- A characterization of building conditions.

Methodology

Our standard methodology for acquiring and interpreting field measurements is included as **Appendix A.** Some methods described in the standard methodology were not applicable to this project and we employed the following specific methodology for this evaluation:

- Temperature and relative humidity: measured with a Mannix hydrometer
- Airborne particle counts: collected with a Lighthouse Laser Particle Counter.
- Relative air pressure differential between outdoors and inside of the building and air flow patterns: calculated with direct read micro-manometers.
- Thermal differentials in building material: initially screened with a FLIR Model B-2 Thermal Imaging Camera for "suspect locations".
- Moisture: measured with a direct-read pin-type or pinless moisture meter within building materials and to verify "suspect locations".

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4. Findings

Site Photographs are included as **Appendix B.**

4.1. General Observations

These general observations and/or conditions could affect the indoor environmental quality should they result in particulate release or mold activity.

Law Library

- Suspect Visible Mold (SVM) present on many book bindings and on the ceiling in center of room.
- There are two air supply diffusers and one return grill in this room; the air supply diffusers were rusted
- Dust, dirt and other debris observed in corners of room and hard to clean areas.
- The pneumatic tubing for the controls on the variable air volume (VAV) box, controlling air flow into this room, was disconnected and the damper was in an open position.
- The thermostat for this room is located in an adjacent computer room.
- Moisture content of building materials was normal and no water staining was observed around the windows along the west wall.

Work Room

- There are two air supply diffusers and one return grill in this room; the air supply diffusers were rusted
- Dust, dirt and other debris were observed in corners of room and hard to clean areas.
- The thermostat for this room was set in full cool mode.
- Moisture content of building materials was normal and no water staining was observed.

Engraving Room (Learning Center Storage)

- SVM was observed on the surface of a few items stored in this room. A surface sample from this area was microscopically examined by Eco Advisors and confirmed to be mold growth.
- There are two air supply diffusers and one return grill in this room
- Dust, dirt and other debris observed in corners of room and hard to clean areas.
- The thermostat for this room was set in full cool mode.
- Moisture content of building materials was normal and no water staining was observed.

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4.2. Field Measurements

4.2.1. Thermal Parameters and Particle Counts

Appendix C includes a Table with temperature, relative humidity, and a spreadsheet with particle counts collected from various locations throughout the Site.

Ideally, temperatures should be maintained above the dew point of the inside air (typically averaging around 72°F to 73°F in the summert ime) and relative humidity should be below 65% in occupied spaces. The recorded temperatures ranged from 68 °F to 70 °F and the recorded relative humidity ranged from 78% to 83%. These exceed ASHRAE recommended guidelines for summer conditions of temperature between 73 °F-78 °F and humidity less than 60%. Similar temperature and relative humidity conditions existed in areas served by the same AHU as the Site. Mold growth can occur on surface in environments exceeding 80% relative humidity.

The average air borne particulate level in Site was less than outdoors and less than particulate levels in unaffected areas within the building.

4.2.2. Pressurization

The Law Library, Work Room and Engraving Room have positive pressure with respect to adjacent hallways. Due to the configuration of the Site, pressure readings between the Site and outdoors were not obtained.

4.3. HVAC Inspection

All three rooms in the investigation area are provided conditioned air by one, chilled water, air handler unit (AHU-19). Supply air is ducted to each room and air is returned from each room through the plenum space above the plaster ceiling. Return air enters the mechanical room at wall openings through fire dampers. AHU-19 is located in the mechanical room which should act as a mixing chamber for return air and outdoor air.

The outdoor air intake duct opens within 6" of the face of AHU-19 intake and the damper was in the full open position. The return air opening to the plenum is located six feet away from the face of the AHU.

The mechanical room was clean and free of any stored items. The interior of the AHU fan had an excessive dust and debris load while the coil had a normal dust load and the drain pan was draining properly. Air filter material is of low efficiency spun polyester fiber changed on a monthly basis.

At the time of the Site visit the chilled water supply temperature was reported at 47 °F. Design specifications for AHU-19 indicate chilled water supply temperature should be 45 °F and outside air supply should be at 675 cubic feet per minute.

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5. Conclusions

There are a series of small problems that created a larger problem:

1. The chilled water temperature is 2 degrees higher than specified for the coil in the AHU. This elevated temperature reduces the efficiency of the coil 8 to 10% which affects moisture removal more than space temperature. The higher temperature could be a result on controlling the chiller operation from the supply chilled water temperature and not the return water temperature.
2. We suspect that more outside air than specified is being drawn into the AHU since the balancing damper is wide open. This condition brings in more moisture.
3. The outside air is ducted directly to the coil so that it enters before mixing with the return air. The engineer calculated that the mixed air would contain 71 grains of moisture and the coil would remove 10 grain of moisture from every lb. of dry air. The current configuration of ducted outside air will only remove 5.5 grains of moisture which will result in a higher relative humidity in the space.
4. The leaving air dry bulb temperature was specified to be 56 degrees. This limits additional moisture from occupants to a condition of 74 degrees and 50% relative humidity.
5. The variable air volume (VAV) box does not have a working temperature control and is running wide open. This is lowering the space temperature below the design and results in higher relative humidity since colder air cannot hold as much moisture.

6. Recommendations

The following recommendations are not mandatory corrective actions but will reduce the likelihood of mold activity.

1. Ventilation system
   a. Verify that the amount of outdoor air supply is to the design specification. The outside air intake is equipped with a damper to facilitate this.
   b. Repair the controls for the VAV box in the Law Library with a thermostat in the Library.
   c. Verify the chilled water supply temperature for AHU-19 and adjust to the design criteria. This might involve changing the chilled water controls.
   d. Install a new VAV box in the Computer Room which had a very different heat load from the Library.
   e. Remove the outside air duct back to where it enters the mechanical room so that the outside has a chance to mix with the return air before entering the cooling coil.
   f. Set the AHU leaving air temperature to 54 degrees or lower.
   g. Set all thermostats to 74 degrees.
   h. Monitor relative humidity in the Site area to verify the effectiveness of the repairs. If the above recommended actions do not reduce the relative humidity below 60% supplemental dehumidification may be necessary.

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2. Law Library, Work, Room, Engraving Room
   a. Micro-clean all surfaces to remove mold from surfaces. Each surface should be HEPA vacuumed followed by damp wiping with a mild cleaning solution. The SVM appeared to be surficial and easily cleaned using the proper techniques. Porous items unable to be cleaned should be disposed of and replaced.
   b. A Mold and Water Damage Remediation Protocol and Site Specific Work Plan should be followed to ensure successful cleaning efforts.
   c. Eco Advisors can draft the Protocol and Work Plan and confirm the effectiveness of the remediation by collecting surface and air samples.
   d. Future housekeeping efforts should include hard to reach areas to prevent dust reservoirs; a common source of indoor irritants.

7. Closing

This report was prepared for the exclusive use of the client. The contents of the report shall not be used or relied upon in any way by others without prior written approval of Eco Advisors, LLC. The opinions and recommendations presented herein are based upon information provided to Eco Advisors as of this date, conditions at the time of the inspection, and our professional expertise.

Report Prepared By:
Eco Advisors, LLC

Patrick Dilla
Sr. Project Manager

Report Approved By:
Eco Advisors, LLC

10/13/2009

Steven C. Bassett, P.E., F.NSPE
Sr. Engineer

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APPENDIX A

Standard Methodology

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METHODOLOGY

Temperature/Relative Humidity/Dew point

To evaluate thermal comfort parameters or ventilation parameters for comparison with ASHRAE or other applicable standards, ECO utilizes the following instruments:

- Thermo-Hygrometers – Hand held units display temperature and relative humidity (dew point optional) and the inspector records the results on field logs.

- Indoor Air Quality Data Loggers – Units record temperature and relative humidity (carbon dioxide and carbon monoxide optional) as a screening tool during the walkthrough or over a defined sampling period. For a defined sampling period placement of the unit is in a designated area with the probe securely attached. At the end of the sampling period, ECO downloads and evaluates the accumulated data utilizing instrument software.

Thermal Imaging Survey:

ECO representatives trained in thermal imaging (Level I Thermographer or equivalent) screen the operating heating, ventilation, and air conditioning (HVAC) system (at supply and returns, ductwork), plumbing, and the perimeter walls and envelope of the area of concern with a FLIR Model B-2. Infrared imaging reveals thermographic signatures or a pictorial representation of the heat of objects and temperature differences in similar materials.

Moisture Content of Building Materials:

ECO utilizes pinless and pin-probe moisture meters. ECO places the pinless sensing pad firmly against the building material or inserts the electrode pin probe into the building material. Moisture meter readout is in percentage (%) for wood, % wood moisture equivalent (a specific setting on the meter for different building materials), or a reference scale (relative moisture content).

Particle Counts:

ECO uses a Lighthouse Handheld 3016 Particle Monitor that measures up to 6 channels with specific particle sizes (<10 microns or < 3 microns) and displays real-time particle counts in particles per cubic foot (pc/ft3) or can be set to log at user-defined sampling intervals. ECO typically holds the aerosol monitor in the approximate center of the room/area and samples at a height of three to four feet. ECO also uses this monitor to evaluate pre- and post-filter of an air-scrubbing machine during remediation projects.

Fungi Spore Counts/Particulate:

- Air samples (ambient and wall cavities). ECO uses vacuum pumps calibrated to a flow rate of 15 – 20 liters of air per minute for both air and WallChek™ samples. The air sampling train includes the pump, tubing, and a spore trap (i.e. Air-O-Cell) cassette. The cassette has an interior adhesive slide that collects particulate (including fungal spores) as the air passes through the cassette. ECO locates the ambient air sampling set up in the room/area using a stand to hold the cassette at a

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height of three to four feet, or at a height approximating the breathing zone. ECO collects WallChek™ samples from inside wall cavities by puncturing a small hole in the wall above the baseboard and drawing the air through a small piece of tubing connected to the Air-O-Cell cassette using the vacuum pump.

- Tape-lift: ECO uses clear, laboratory supplied cellophane tape, or a laboratory-prepared tape mounted slide. ECO places the tape/slide on the suspect growth or test area. The tape/slide is lightly pressed against the surface and carefully removed. The tape is transferred onto a clean glass slide. The glass slides are labeled, placed inside laboratory supplied plastic slide containers and transferred to a clean plastic bag.

Cultureable Fungi/Bacteria:

- Air Samples. ECO uses the appropriate agar, designated by the microbiology laboratory, to sample the ambient air. ECO locates the sampling device in the center of the room/area at a height of three to four feet. ECO uses vacuum pumps calibrated to a flow rate of 17 liters of air per minute with the agar plate placed inside an Anderson N-6 Impact Sampler.

- Surface Swab: ECO uses a sterile swab (from laboratory supplied aseptic package), moistens the tip of the swab, and gently swabs the desired area thoroughly, using a rolling motion. Sterile templates are used for sampling defined areas. ECO inserts the swab into the tube of buffer; records surface area sampled, and seals the cap tightly. ECO places the sample in a cooler with blue ice and ships all samples to the laboratory within 24 hours.

INTERPRETATION OF DATA

Temperature and Relative Humidity

We compare the indoor environments to the current ASHRAE thermal comfort or ventilation standard to determine normal or typical ventilation conditions. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62, Ventilation for Acceptable Indoor Air Quality, and Standard 55, Thermal Comfort reference standards provide a chart to determine temperature and humidity comfort ranges. Refer to the attached chart that replaces the former recommended temperature range of 72°F to 78°F and relative humidity range of 30% to 60%). Carbon dioxide reference remains 700 parts per million (ppm) plus outdoors.

We expect indoor surface temperatures above the dew point of the inside air (typically averaging around 72°F to 73°F in the summertime) and relative humidity below 60% in the occupied space. The potential for microbial growth increases as the relative humidity increases over 60%. Relative humidity in excess of 70% and condensation on indoor surfaces can create sufficient moisture in the air and on building materials and surfaces to support microbial growth. Rules of thumb include: 1) as temperature decreases air becomes more moist and relative humidity increases, and 2) as pressure increases in a closed system the air becomes moister and relative humidity increases.

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Infrared Imaging Survey:

ECO's trained thermal imaging representatives (Thermographers) evaluate and interpret the individual heat signatures emitted by different building materials. Building materials with elevated moisture content that are in the process of drying out (i.e. water is evaporating) will appear cooler than similar materials with a moisture content that has reach equilibrium with the space. Moisture can also reduce the effect of insulation and may appear warmer than adjacent similar material. The Thermographers determine if the signature is or is not consistent with moisture/water intrusion.

Moisture Content

Normal or background moisture content corresponds to an "air-dry" condition in an ordinary indoor, inhabited environment. ECO surveys walls and other areas with potential moisture (known damage, under windows, around doors, around piping and HVAC units) and compares with unaffected materials to assess the significance of moisture in the materials in question. This comparative analysis assists in determining or mapping areas of water damage and the extent of building material removal.

Particle Counts

ECO compares particles per unit area over a given length of time for compliance with the OSHA standard. ECO compares particle counts of the room or area of concern with background counts when evaluating potential sources. In typical buildings, the indoor particle concentration is lower than outside. Exceptions to these premises warrant further data evaluation and investigation. Abnormal findings may be indicative of indoor sources of fungi, poor filtration in the air-conditioning system, or another particulate source. Other confounding conditions can cause abnormal findings and must be reviewed and excluded.

Bioaerosols (Fungi)

ECO uses several accepted protocols, studies, guidelines and our professional experience when evaluating bioaerosol reports. We:

- Use published information as "a tool" and understands the limitation of sample types. In determining the existence and source of microbial amplification in a residence or building, visible evidence of microbial contamination, construction, and building history weighs heavily on the assessment. Knowledge, experience, expert opinion, logic, and common sense are used to interpret the information.
- Use available information such as common dominant fungi spore types and major water damage indicators. Common dominant spores are ascospores, basidiospores, Cladosporium, and Aspergillus/Penicillium-like. Major Water-Damage Indicators are Stachybotrys, Chaetomium, Memnoniella, and Ulocladium and help assess a possible history of water damage in a building. Interpret low counts/concentrations with caution. The absence of Water Damage Indicators does not exclude the possibility of a water damage history.
- Understand the importance of identifying a source to rule out the possibility that the airborne spores originated from sources unrelated to water damage or the building components (i.e. moldy

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books, decaying debris in plants, etc.). Exceptions to these premises warrant further evaluation and investigation. Abnormal findings may be indicative of indoor sources of fungi, poor air-conditioning system filtration, a particulate source other than water damage, or other confounding conditions that require review and exclusion.

- Compare outdoor and indoor fungi. The indoor fungi levels should be lower than outside and, the types of indoor and outdoor fungi should be similar.

- Compare indoor levels with published data, such as the Baxter study[1] or EMLAB MoldRange reports. Baxter deals effectively with a wide range of natural spore levels that are dependent on the season, the surrounding vegetation, and even the time of day. MoldRange is a compilation of data from thousands of outside air samples. It enables you to get statistical information about, and easily communicate the types and amounts of fungal spores that are typically present in the outside air both by time of year and region of the country.

Bioaerosol (Bacteria)

Generally the presence of high levels of bacteria and/or pathogenic bacteria indicates the need for further investigation.

LABORATORY SUPPORT

ECO utilizes chain of custody forms to forward bioaerosol (fungi and bacteria) and tape-lift samples to AIHA-EMLAB accredited microbiology laboratories or to AIHA-EMPAT participants for analysis. The forms include the sample type, sample number, location, volume or sample collection area, and ECO representative who collected the sample.

[1] Daniel M. Baxter, 1998. Mold Spore Concentrations inside "Clean" and "Water-Damaged" Commercial and Residential Buildings.

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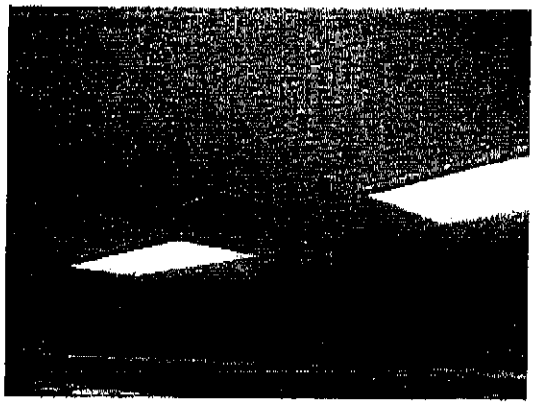
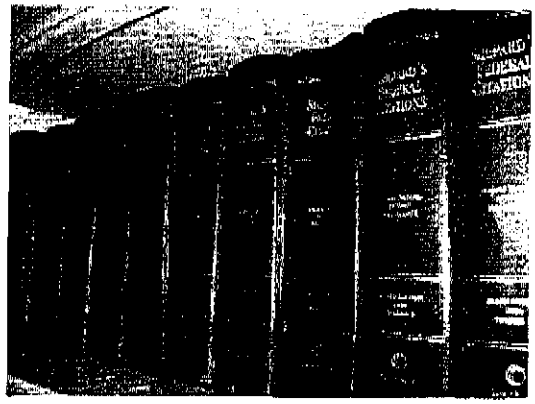
APPENDIX B

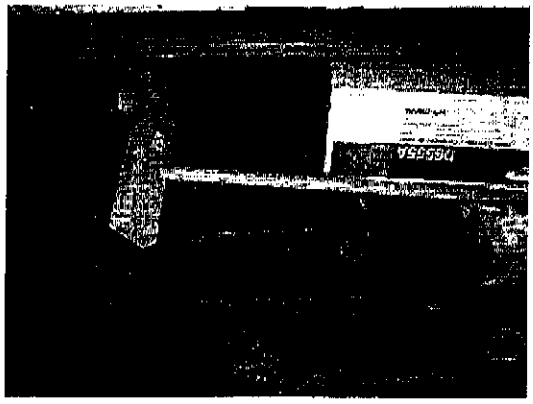
Site Photographs



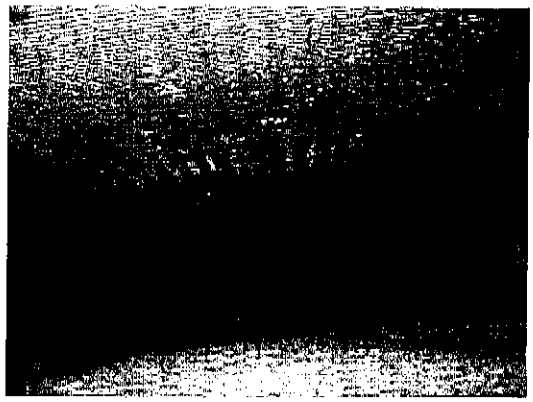
Law Library; rusty supply and SVM on ceiling



SVM on book bindings in Law Library



SVM on contents in Engraving Room



AHU-19 coil with normal dust load

REP ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS & ENGINEERS

Client :	Miami Federal Detention Center
Location:	Law Library, Engraving Rm, Work Room, AHU-19
Photo Date:	10/2/09

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APPENDIX C

Particle Count Data, Temperature, & Relative Humidity

ParticleCounts/ComfortParameters

Date: 10/02/09

Sampler: PSD

REP Project Manager: PSD

Project/Site Name: Miami Federal Detention

Serial #: REP-04

Mode: Manual	# of Cyc: 10
Data Display:: Cuml	Comm Addr: 1
Data Format: Raw	Aud Alert: OFF
Particle Volume: ft 3	Thresh: 1000
Environ Units: US	Date: MM:DD:YY
Sample Volume 0.04 ft3 (= 0.99 L)	Time: HH:MM:SS
Hold Time: 0:00:10	Contrast Adj: Less – More
Sample Time: 00:00:21	Adjust Audio: Less – More

Area	0.3	0.5	1.0	2.5	5.0	10.0	T	RH	Comments
Law Library*	14390	1672	387	134	47	20	69	83	AHU-19
Work Room*	12197	1299	222	63	22	8	69	82	AHU-19
Leisure Library	17002	3115	808	176	37	8	69	82	AHU-19
TeachersOffice	24924	6541	1954	434	55	14	68	78	AHU-19
Engraving Room*	10924	1144	203	49	27	9	69	79	AHU-19
Chapel	12461	1781	589	242	87	18	69	78	AHU-19
GeneralAssembly	12661	1510	275	66	18	7	60	80	AHU-19
Edu. Office	18814	1756	577	226	77	17	68	80	AHU-19
Edu. Supervisor	9612	1242	372	126	20	7	70	81	AHU-19
Capt. Clerk	11712	1949	848	416	150	31	72	62	Not AHU-19
3rd floor sally port	16634	2321	503	121	31	9	69	71	Not AHU-19
ISM	4353	472	69	15	6	3	70	52	Not AHU-19
Outdoor N	32785	8813	2407	681	107	41	87	65	
Outdoor W	40163	9505	3126	552	99	52	87	65	

Observations:* All controlled by the same VAV with the thermostat in the Computer Room.

X:\J\Federal Detention Center\R\Particle Counts Field Form.doc