THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

October 22, 2008

The Honorable Scott J. Bloch
Special Counsel
U.S. Office of Special Counsel
1730 M Street N.W., Suite 218
Washington, DC 20036

Re: OSC File Nos. DI-08-0494, DI-08-0497 and DI-08-0550

Dear Mr. Bloch:

Thank you for your correspondence of March 11, 2008, concerning whistleblower disclosures from three former and current air traffic controllers at Federal Aviation Administration's (FAA's) air traffic control facility at Detroit Metropolitan Airport (DTW), alleging that despite previous remedial efforts, mold and moisture problems at the air traffic control facility have not been fully remediated, causing the whistleblowers to continue to experience adverse health effects. I delegated responsibility for investigating this matter to the Assistant Secretary for Administration who also serves as the Department's Designated Agency Safety and Health Official. The Assistant Secretary has completed her investigation and provided me the enclosed report containing her findings and recommendations.

The Assistant Secretary's investigation has substantiated the allegations that mold and moisture problems at the air traffic control facility have not been fully remediated. Specifically, the investigation found visible mold growth in unoccupied floors of the air traffic control tower, indicating that moisture intrusion returned despite past remedial efforts by the FAA. In addition, while FAA has made significant efforts over the last few years to remediate the mold and moisture problems, some key expert recommendations for remediation have not been completed. Regarding adverse health effects, the investigation indicated that approximately 15 employees, including the whistleblowers, continue to experience adverse health effects which they believe is caused by exposure to mold and moisture in their work environment. However, there have not been any new Occupational Safety and Health Administration (OSHA) recordable employee injuries or illnesses related to mold or air quality since July 2006. In addition, the measured airborne fungal spores detected within the facility do not indicate elevated mold spore concentrations that would be likely to adversely impact employee health.

Based on the findings that the mold and moisture problems have not been fully remediated, the Assistant Secretary made several recommendations in the investigative report to remedy the mold and moisture problems at the air traffic control facility. The recommendations include:

- Perform a comprehensive inspection of the tower's elevator shaft and wall cavities on all floors to determine the full extent of the moisture and mold problem.
- Remove any identified mold and molded porous materials that are discovered and develop a communication plan and safety control plan to be shared with employees working within the facility. Removal of molded materials shall be conducted in a safe and controlled manner, similar to asbestos abatement and in accordance with the Environmental Protection Agency's Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water.
- Remove all unnecessary wall board and porous materials from the unoccupied areas of the air traffic control tower. These materials may become a food source for mold should they become wet. If wallboard must be reinstalled for fire rating reasons, investigate using paperless wallboard, cement backer board, or mold resistant drywall. Drywall surfaces shall not be in direct contact with the concrete floor deck and shall have a ½ inch gap.
- Monitor the facility for moisture intrusion, mold growth, and condensation. Utilize the data from the temperature and humidity sensors that have been installed in the elevator shaft and tower rooms to determine if condensation is occurring. Make corrective action to prevent such occurrences and stop moisture intrusion into the structure.
- Replace the leaking base building roof and develop a communication and safety control plan to be shared with all employees at the facility.
- Evaluate other FAA air traffic control towers of similar Leo Daly design and construction to determine if they have similar moisture and mold growth problems.

In response to the investigative report's findings and recommendations, Acting Administrator Sturgell issued the attached memorandum containing FAA's Action Plan to accomplish these recommendations. We have reviewed FAA's Action Plan and believe FAA's planned actions address the report's findings and recommendations. The Assistant Secretary for Administration will monitor the status of recommendations via monthly written updates from FAA.

If you have any questions or require further information, please feel free to contact me or Linda J. Washington, Assistant Secretary for Administration, on (202) 366-2332.

Sincerely yours,

Mary E. Peters

Enclosures (2)

Federal Aviation Administration

Memorandum

Date: SEP 17 2008

To: Linda Washington, Assistant Secretary for Administration, Designated Agency Safety and Health Official

From: Robert A. Sturgell, Acting Administrator

Prepared by: Steve Zaidman, Vice President, Technical Operations Services

Subject: Whistleblower Investigation – Allegations of Mold and Moisture Problems at Detroit Metropolitan Airport

Thank you for providing us your report on the Investigation of Mold and Moisture at the Federal Aviation Administration (FAA) Detroit Metropolitan Air Traffic Control Tower (DTW) Facility dated August 21, 2008.

Since discovery of mold at DTW in 2004, the FAA has diligently pursued the remediation of mold and elimination of water intrusion at the tower and base building to ensure that both facilities provide a safe and healthful workplace for our employees. To date, the FAA has expended in excess of $1million for remediation and modification efforts and approximately 45 personnel (FAA and contractor) have had some level of involvement.

Based on the corrective actions that the FAA has taken at these facilities, and the sampling and testing, which have been conducted by FAA and independent third parties, we strongly believe that both facilities provide a safe and healthful work environment for our employees. We hope that by accepting all your recommendations, this will further demonstrate FAA's commitment to ensure that DTW and the base building contain no health hazards for our employees. The recommendations and FAA's plans to implement them are included in attachment 1.

We note that your investigation did not find any indicators of poor indoor air quality and did not detect elevated mold spore concentration. In fact, indoor concentrations were consistently lower than outdoor concentrations.

Finally, although we plan to implement your recommendations, our review of the report disclosed information that we believe is inaccurate or misleading and does not correctly identify the existing conditions or the efforts that FAA has taken to protect its employees. This information is detailed in attachment 2 to this memorandum. We highly recommend you consider making the appropriate adjustments to your report. The FAA remains dedicated to providing a safe and healthful work environment for all its employees.

Attachments

Attachment 1

FAA Action Plan to Accomplish Recommendations Contained in
OST DTW Mold Investigation Report Dated August 21, 2008

Air Traffic Control Tower Mold/Moisture Recommendations

A. OST Recommendation (ATCT): Conduct a comprehensive inspection of the wall cavities on every floor of the air traffic control tower, making sure to inspect the wall cavity from the unoccupied room side of the elevator shaft.

FAA Response: The FAA will retain a Certified Industrial Hygienist experienced with mold and indoor air quality issues to complete the recommended action. **Action:** Project completion date is December 31, 2008.

B. OST Recommendation (ATCT): Based on the comprehensive inspection, remove all visibly contaminated (molded and water damaged porous materials) from the air traffic control tower.

FAA Response: The FAA will develop and implement projects to remove molded and water damaged porous materials identified from the inspection. **Action:** Design and engineering will begin immediately upon completion of the inspection with contract work following as soon as possible.

C. OST Recommendation (ATCT): Develop a mold remediation project communication plan for the facility to improve communication efforts between FAA management and union employees.

FAA Response: The FAA will develop a plan to improve communication.
Action: Project communication plan implementation date is October 1, 2008.

D. OST Recommendation (ATCT): Remove all unnecessary wallboard and carpeting from unoccupied areas of the air traffic control tower and remove any wallboard currently in contact with concrete floors.

FAA Response: The FAA will assess which wallboard and carpeting is not needed in the unoccupied areas of the ATCT. A project will be developed to remove these items. **Action:** This effort will be included in the work to be accomplished under Recommendation B.

E. OST Recommendation (ATCT): Evaluate the fire rating of cement backer board and mold resistant/paperless wallboard.

FAA Response: The FAA will evaluate wallboard that needs to be replaced in the ATCT and attempt to substitute with fire-rated, mold-resistant products. When the wallboard is replaced, a gap will be left between the concrete floor slab and new wallboard to prevent wicking of moisture into the panel. **Action:** This effort will be included in the work to be accomplished under Recommendation B.

F. OST Recommendation (ATCT): Continue efforts to prevent moisture intrusion into the air traffic control tower and prevent condensation from forming.

FAA Response: The FAA will continue to prevent water intrusion and condensation issues in the ATCT. Comments and recommendations were submitted to the OST indicating that the corrective measures identified were completed and controlling the ATCT moisture issues. Further preventative measures such as gaps between the drywall and the concrete slab floors, removal of unnecessary wallboard and carpeting, and monitoring the environmental conditions (i.e., with sensors) in various areas will be pursued by FAA. **Action:** Monitoring is on-going; other items will be accomplished under Recommendation B.

G. OST Recommendation (ATCT): Actively monitor moisture in the elevator shaft and unoccupied areas of the air traffic control tower and implement corrective actions as necessary.

FAA Response: The monitoring is currently in progress. To date, there are no indications of excessive moisture and/or humidity. **Action:** The monitoring is on-going and will be documented for historical recordkeeping.

H. OST Recommendation (ATCT): Review the policies at FAA's Detroit Air Traffic Control Tower to ensure that employees are encouraged to report work-related health and medical problems.

FAA Response: The FAA will review such policies. **Action:** Policy will be reviewed and made available to all facility personnel on-site by October 1, 2008.

I. OST Recommendation (ATCT): Evaluate other FAA air traffic control towers for mold and moisture infiltration problems. The Detroit Metropolitan Airport air traffic control tower is of a Leo Daly design. FAA operates other Leo Daly designed towers of similar construction and characteristics. It is prudent for FAA to inspect these other towers to determine if similar mold and moisture problems exist at those facilities.

FAA Response: The DTW ATCT is a Leo Daly designed tower. The FAA will inspect Leo Daly designed towers throughout the country to determine if mold and moisture problems exist at these facilities. **Action:** The inspection of all Leo Daly towers will be completed by December 31, 2008.

Base Building Roof Moisture Recommendations

J. OST Recommendation (Base Building): Replace the leaking base building roof.

FAA Response: **Action:** Prior to the Department's investigation, the FAA had plans to replace the roof. At the Department's request, those plans were placed on hold pending the conclusion of the investigation. A new roofing membrane will be installed by March 30, 2009.

K. OST Recommendation (Base Building): Continue to immediately remove and replace water damaged building materials as necessary.

FAA Response: The FAA will continue to remove and replace such items. When such incidents arise, an investigation shall be made to identify the moisture source and correct it. **Action:** Issues should not continue after roof replacement under Recommendation J.

L. OST Recommendation (Base Building): Develop a roof project communication plan for the facility to improve communication efforts between FAA management and union employees.

FAA Response: Local FAA management will develop a communication plan to educate employees about the roof project and the control efforts being implemented to ensure a safe working environment. **Action:** Roof replacement efforts, including scope specifics and work hours, will be coordinated with facility management and employees in the accomplishment of Recommendation J by October 1, 2008.

Attachment 2

FAA Comments on OST DTW Mold Investigation Report Dated August 21, 2008

These comments are based on a thorough review of the report. We believe these comments are significant from the standpoint of ensuring the accuracy and completeness of the final report. We recommend that you review this information and revise the report accordingly.

1. Page 3, Executive Summary - 3rd and 4th bullets: The report states that FAA employees attributed a variety of symptoms to their exposure to mold and moisture at the Detroit Tower and that NIOSH's medical review failed to establish a link between the mold/ moisture and many of the symptoms.

The July 24, 2006 NIOSH report summarizing their Health Hazard Evaluation includes a medical review on pages 4-5. After reviewing the written symptoms profile and medical records provided by the employees, NIOSH concluded that:

- They could not find an association between Detroit Tower moisture/mold issues and the development of asthma in individuals without previous asthma;
- They could not find an association between the Detroit Tower moisture issues and the development of Chlamydiae pneumonia; and
- Citing research conducted by the Institute of Medicine of the National Academies, the evidence of an association between damp indoor environments or exposure to moldy environments and skin symptoms, mucous membrane irritation syndrome, lower respiratory illness in otherwise healthy adults, fatigue, neuropsychiatric symptoms, and immune diseases is either inadequate or insufficient.

In the interest of completeness and accuracy, we believe the following would be more appropriate wording for your report:

As part of a Health Hazard Evaluation, NIOSH conducted a medical review. They reviewed the written symptoms profile and medical records provided by site employees. They were unable to find an association between the Detroit Tower moisture/mold issues and many of the symptoms experienced by the employees.

2. Page 5, 3rd paragraph, 2nd sentence and page 8, 1st paragraph after bullets, 2nd sentence - You state that the FAA was advised to clean visible mold from the elevator shaft liner using a biocide chemical. The FAA took a conservative approach and did not use a biocide. We used a deodorizer called Dri-Eaz Milgo SR. It is not marketed or approved by the EPA as a biocide. It is primarily used as a spray to deodorize residential carpets by carpet cleaners and is suitable for use as a residential laundry aid. The only hazardous ingredient listed in the MSDS is isopropyl alcohol (3-6 percent). The manufacturer recommends the addition of 8 ounces per gallon for wall applications.

The FAA contractor added approximately 2 ounces per gallon. Once this dilution was completed, there was less than 0.5 percent alcohol in the liquid being sprayed. Common isopropyl alcohol in first aid kits is used at 70 percent strength.

3. Page 8, Footnote - The footnote refers to a Dr. Richard's Shoemaker. It is our understanding that this is the same "Dr. Ritchie Shoemaker" referred to in the court findings that follow: On July 22, 2008, the U.S District Court for the District of Columbia ruled in the case of Young and Ghee v. Burton and Lewis & Tompkins. The lawsuit sought recovery for damages suffered by plaintiffs as result of exposure to toxic mold while residing at the Stanton Glen Apartment (page 1). The judge dismissed the charges for the following reason:

"Based on the record herein, including testimony presented at a Daubert hearing, the Court concludes that Dr. Shoemaker's diagnosis of plaintiffs, as well as his opinions relating to general and specific causation are not sufficiently grounded in scientifically valid principles and methods...(pages 1-2)."

According to Page 15 of the same document, Dr. Shoemaker's:

"testimony has been excluded in a number of jurisdictions, including Virginia, Florida, and Alabama... A D.C. superior court judge excluded Dr. Shoemaker's testimony because neither his theory on the effects of indoor mold exposure nor his methodology in diagnosing the plaintiffs with chronic biotoxin- associated illness (CBAI) was generally accepted within the scientific community." Wright v. Fort Lincoln Realty Co., et al, No. o3ca4555, at 2-4 (D.C. Sup,. Ct. Oct 15, 2007).

While we did commission the inspection, we now believe Dr. Shoemaker's methodology and work to be unreliable.

Thank you for the opportunity to provide these clarifications. I hope the information is useful in preparing your report.

INVESTIGATION OF MOLD AND MOISTURE AT THE FEDERAL AVIATION ADMINISTRATION DETROIT METROPOLITAN AIR TRAFFIC CONTROL TOWER FACILITY

August 21, 2008

EXECUTIVE SUMMARY

The scope and objective of this investigation was to determine whether there continues to be mold and moisture problems at the DTW air traffic control facility as alleged by the whistleblowers, and if so, to determine the appropriate remedial actions that FAA should take to resolve this problem. The whistleblowers specifically allege that:

1. FAA's attempts to remediate the mold and eliminate moisture sources in the facility have been insufficient.
2. Union requests to perform invasive testing within wall cavities and observations behind wallboard panels surrounding the tower elevator shaft have been denied by FAA.
3. There is direct evidence that mold is still in the facility and that the moisture problem in the facility has not been sufficiently corrected; FAA has placed pans and buckets above drop ceilings to catch water that is intruding into the base building.

As discussed below, our investigation has substantiated the whistleblowers' allegations that there continues to be a mold and moisture problem at the facility and that, although FAA has made significant efforts to remediate the mold and moisture intrusion, it has not followed through on several key recommendations to correct this ongoing problem. Based on the site observation, review of documentation and results of bioaerosol fungal spore air monitoring, we found:

- Inspections of tower wall cavities on the outside of the elevator shaft revealed apparent mold growth on the 9th and 4th floors, which are unoccupied floors.
- Visible mold was discovered on new drywall that had been installed in the remediation area in room 928 of the tower. Additionally, visible mold was observed on the back side of the green wallboard elevator shaft inside the wall cavity in 928. The mold appeared to be related to moisture wicking up the new drywall that was in contact with the concrete floor slab. The amount of visible mold was small, less than 10 square feet.
- A very small amount of visible mold was also observed in room 428 on the green wallboard elevator shaft inside the wall cavity. No visible mold was observed in the new drywall that was installed in the remediation area in room 428. The amount of visible mold was small, less than 10 square feet.
- All wallboard was observed to be dry within the air traffic control tower. However, the observation of mold growth in the tower, despite past remedial efforts, indicates that the tower continues to have a chronic moisture control problem.
- In many areas of the tower, drywall is in direct contact with the concrete floor surface.
- The base building roof is leaking badly in several areas. Catch pans and a funnel were observed above the drop ceiling in an attempt to catch rain water and snow melt that is entering the building.
- Approximately 20 stained ceiling tiles were observed to have been recently removed from the base building. These tiles had become wet from base building roof leaks. FAA management indicated that stained/wet ceiling tiles are removed and replaced as a part of routine maintenance.
- The measured airborne fungal spores detected within the facility does not indicate elevated mold spore concentrations that would be likely to adversely impact employee health.
- The highest indoor concentrations of airborne fungal spores were noted in the unoccupied rooms 928 and 428 of the tower. This correlation is likely due to the air monitoring

occurring after the wall cavities were cut open and molded materials observed. It should be noted that the 9th floor and 4th floor of the tower are unoccupied and that airborne fungal spore concentrations within the tower cab, break room, and base building were all much lower than concentrations found outdoors.

- The spore Stachybotrys was detected within unoccupied areas of the tower facility, but not in outside air samples. Stachybotrys is a mold spore that is not commonly found indoors and is an indicator of chronic moisture intrusion.
- Other measured air quality data for temperature, relative humidity, carbon monoxide, carbon dioxide, and airborne particles did not reveal any indicators of poor indoor air quality in either the tower or base building.
- A review of OSHA 300 log employee injury and illness data revealed 15 employees reported injuries or illnesses related to mold, indoor air quality, or respiratory illness in 2005 and 2006.
- The most recent OSHA 300 log case related to mold or air quality was reported almost 2 years ago, on July 24, 2006. However, at least 15 employees, including the whistleblowers, claim that they continue to suffer adverse health effects due to the mold and moisture problems within the facility.
- Some past recommendations submitted by outside agencies and consultants have been completed; however other items are still considered incomplete or in progress. Most importantly, moisture and condensation problems continue to remain at the base building. Areas in the tower where previous mold growth had occurred and been remediated were observed to have evidence of past moisture intrusion and visible mold growth again. While the building materials were observed to be dry in the tower at the time of our inspection, the mold growth indicates that moisture intrusion or condensation continued, despite past remedial efforts. See Appendix A of this report for greater detail on the status of past recommendations.
- FAA failed to perform a detailed inspection of wall cavities within the air traffic control tower or allow the union to conduct wall cavity inspections of the elevator shaft walls. Subsequent wall cavity inspections performed as part of this investigation did indeed reveal visible mold. Such inspections should have occurred at the facility years earlier.

As detailed later in this report, our recommendations to FAA include:

- Perform a comprehensive inspection of the tower's elevator shaft and wall cavities on all floors to determine the full extent of the moisture and mold problem.
- Remove any identified mold and molded porous materials that are discovered and develop a communication plan and safety control plan to be shared with employees working within the facility. Removal of molded materials shall be conducted in a safe and controlled manner, similar to asbestos abatement and in accordance with the Environmental Protection Agency's *Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water* http://www.epa.gov/mold/table2.html.
- Remove all unnecessary wall board and porous materials from the unoccupied areas of the air traffic control tower. These materials may become a food source for mold should they become wet. If wallboard must be reinstalled for fire rating reasons, investigate using paperless wallboard, cement backer board, or mold resistant drywall. Drywall

surfaces shall not be in direct contact with the concrete floor deck and shall have a ½ inch gap.

- Monitor the facility for moisture intrusion, mold growth, and condensation. Utilize the data from the temperature and humidity sensors that have been installed in the elevator shaft and tower rooms to determine if condensation is occurring. Make corrective action to prevent such occurrences and stop moisture intrusion into the structure.
- Replace the leaking base building roof and develop a communication and safety control plan to be shared with all employees at the facility.
- Review FAA's policies to ensure that employees are encouraged to report work-related medical and health issues. Management should create an environment that promotes the prompt reporting of work-related injuries, illnesses and health symptoms and openly support the taking of approved sick leave when necessary in accordance with FAA's policies and union agreements.
- Evaluate other FAA air traffic control towers of similar Leo Daly design and construction to determine if they have similar moisture and mold growth problems.

METHODOLOGY

The investigative team from the Office of the Secretary of Transportation (OST), consisted of the Departmental Safety and Occupational Health Manager, a senior attorney from the Office of General Counsel and a contract Certified Industrial Hygienist (CIH). The team investigated the whistleblowers' allegations that the mold and moisture problems at the air traffic control facility have not been fully remediated, that the FAA has denied requests by the Union to perform invasive testing of wall cavities and that moisture is continuing to intrude into the building. The team reviewed documentation received from both the whistleblowers and FAA management, including previous reviews and investigations conducted at the facility by several contractors and government entities including the DOT Office of Inspector General; National Institute for Occupational Safety and Health (NIOSH), the U.S. Public Health Service, Office of Federal Occupational Health (FOH); Department of Labor's Occupational Safety and Health Administration (OSHA). The team also reviewed medical related information received from the whistleblowers and correspondence and reports from the union's expert. The most recent independent review of the FAA's remediation efforts was conducted by an arbitrator who heard grievances filed by the union concerning mold contamination at the DTW facility. The Arbitrator's decision was issued on October 5, 2007. In this decision, the Arbitrator found that "at this point, the Agency has employed every reasonable means of abating the mold and preventing future problems." However, the Arbitrator stated that his conclusion was tentative and that if the mold contamination continued, then it was incumbent on the Agency to make further efforts to remediate the problem.

The investigation also included a site visit on May 19-20 which consisted of meetings with management and interviews with each of the three whistleblowers who were accompanied by a union attorney during their interview. In addition, a site inspection was conducted by the Departmental Safety and Occupational Health Manager and the contract certified industrial hygienist which consisted of a visual inspection of the facility for mold and moisture intrusion and bioaerosol air monitoring for fungal spores. The visual inspection included an invasive inspection of wall cavities using a boroscope, and a visual inspection of the elevator shaft from

the roof of the elevator car. Management and union representatives accompanied OST on this site inspection. In addition on May 20, a union expert, among others, also observed the inspection. The industrial hygiene report, including air sampling results and notes and photographs from the visual inspection are appended to this report as Appendix C and D.

BACKGROUND

Visible mold growth was identified in several areas of the Detroit air traffic control tower during a routine inspection on September 28, 2004. The Detroit Metropolitan air traffic control tower is a Leo Daly design, constructed in 1990. The tower is approximately 230 feet tall, with a 3 level base building attached to it to connect to the main terminal. The majority of the tower shaft is unoccupied areas with no storage inside. There is a central elevator shaft used to transport employees from the base building up to the air traffic control tower cab.

In 2005 and 2006 FAA made efforts to remove the identified mold from the tower structure, seal the structure to prevent additional moisture intrusion, and made modifications to the building's heating, ventilation, and air conditioning system to help improve the air balance, prevent condensation, and create a positive air pressure in the facility. FAA was advised to clean visible mold from the elevator shaft liner using a biocide chemical and on January 22, 2005, employees were evacuated from the facility due to the strong chemical odor. This resulted in 7 employee injury/illness claims reported on that date due to employees suffering respiratory illnesses caused by the elevator shaft cleaning efforts.

Since 2005, numerous agencies and contractors including the Occupational Safety and Health Administration, National Institute for Occupational Safety and Health, and Federal Occupational Health have visited the site or conducted a review of documentation related to the facility and employee health issues. The conclusions of these experts generally indicated that the air traffic control tower building did have evidence of moisture intrusion and mold growth, that employees may be experiencing health effects, and that actions were necessary to stop moisture from entering the structure, that visible mold needed to be remediated, and that improvements must be made to the tower's heating, ventilation, and air conditioning systems to prevent moisture condensation.

During that time, the union was prevented from conducting intrusive wall cavity inspections or conducting air monitoring and industrial hygiene samples within the facility. The Office of the Inspector General also conducted an inspection of the facility and released a report of their findings on July 11, 2006, recommending that FAA alleviate the source of moisture, finding that until the moisture sources had been controlled, mold will continue to be an ongoing problem. Employees at the facility claim that they still suffer mold related respiratory illnesses and that the facility continues to suffer from moisture intrusion and mold problems.

STATUS OF PAST RECOMMENDATIONS

Several agencies and consultants have inspected the facility or reviewed documentation regarding the mold and moisture problems at the Detroit Air Traffic Control Tower. The key recommendations focused on:

1. Sealing the building envelope to prevent moisture from entering the building.
2. Making improvements to the building's heating, ventilation, and air conditioning systems to prevent condensation within the facility.
3. Removing areas of visible mold growth and remediating areas of the facility.
4. Preventing wicking of moisture into wallboard surfaces by having at least a ¼" gap above tower floor slab surfaces.
5. Removing materials that could become food sources for mold from the tower.
6. Conducting ongoing inspections of the facility for moisture and mold growth.

While FAA has made progress to implement many corrective actions, key expert recommendations remain incomplete. FAA has sealed the tower structure to prevent moisture intrusion, reconfigured and improved the tower's ventilation systems to help prevent condensation and removed mold and molded materials from areas where it was found. However, several improvements and moisture control recommendations from expert reports remain incomplete.

- For a time FAA did conduct inspections of the elevator shaft liner for the return of moisture and mold growth. FAA, however, stopped these inspections because no mold or moisture was found. Applied Environmental recommended at least annual inspections be performed.
- Federal Occupational Health recommended that on occurrence of moisture intrusion, determine and correct the source of moisture infiltration. While much has been done to seal moisture from intruding into the air traffic control tower, the base building roof has had ongoing leaks and is scheduled for replacement.
- Jacobs Engineering recommended that tower wallboard surfaces not contact the concrete floor slab to prevent wicking of moisture. Furthermore, Jacobs recommended removing the drywall from the unoccupied storage rooms of the tower. Such paper-faced wallboard may become a food source for mold growth should moisture return.
- At the time of the site visit FAA installed a "memory card" into the HVAC controls to allow long-term data collection of the humidity and temperature sensors within the tower. It is unclear why the data logging was not activated sooner, seeing the importance in monitoring the temperature and humidity levels in the tower to help identify and prevent condensation. The attached Appendix A of this report lists the status of the past expert recommendations submitted to FAA.

WHISTLEBLOWER EMPLOYEE INTERVIEWS

Former and current Air Traffic Control Specialists Vincent Sugent, Elizabeth Dale, and David Parker were interviewed as part of the investigation to obtain a clear understanding of their health symptoms and concerns regarding mold and moisture at the facility. The whistleblowers

stated that as air traffic controllers they work 8-10 hour shifts inside the air traffic control tower cab. The majority of their time is spent directly at the top of the tower in the cab area, or one level below within the Junction Level break room. The employees attend meetings or visit other levels of the base building for short periods of time as necessary.

The three whistleblowers reported experiencing similar health symptoms such as: respiratory illnesses, asthma, laryngitis, headaches, coughs, elbow pain, sneezing, and short term memory loss. The whistleblowers have all sought medical treatment for their health issues and report some level of improvement. Two of the individuals have been through a treatment plan using the medication cholestyramine. None of the whistleblowers indicate that they had previous allergies or have been tested to see if they are allergic to mold. They do report to have ongoing health problems and may be sensitized to mold spores that they would experience within the facility, or elsewhere.

Each of the whistleblowers expressed concern with the thoroughness of the efforts that FAA has taken to remove mold from the facility and prevent moisture leaks. They claim that mold is still present within the facility and that it needs to be properly removed. All three individuals stated they believe other FAA employees working at the facility are experiencing similar health problems, but do not report their symptoms for fear of losing their jobs. FAA's air traffic controllers must complete an annual medical evaluation and report any health symptoms and medications that they are taking. The whistleblowers indicate that local FAA management issued a memorandum that employees are not to abuse sick leave and that air traffic controllers are hesitant to use sick leave or report all of their health problems during their annual medical evaluations.

EMPLOYEE INJURIES AND ILLNESSES

OSHA Form 300A, Summary of Work-Related Injuries and Illnesses for the Detroit air traffic control tower were obtained and reviewed for trends. Approximately 160 employees work at the facility, 135 are air traffic controllers and 35 are technical operations employees. See Appendix B for a detailed breakdown of employee illnesses and injuries.

Year	Number of Employee Injuries and Illnesses	Percent of Total
2004	4	14.8%
2005	12	44.4%
2006	7	30.0%
2007	2	7.4%
2008 (1/01/08-6/23/08)	2	7.4%
Total	27	100%

The following trends were noted with FAA employees working at the facility.

- Since January 1, 2004, 27 total injuries and illnesses have been reported at the Detroit Air Traffic Control Tower. 74.4% of the cases occurred in 2005 and 2006.

- Since January 1, 2004, 56% of the reported employee injuries and illnesses appear to have been related to poor indoor air quality, mold, or respiratory illness. These cases all appear to have occurred in 2005 and 2006 during the majority of mold remediation efforts that were conducted within the facility.
- Employees were not reporting cases related to indoor air quality, mold, or respiratory illness prior to 2005, or in 2007 and 2008.
- 2004 - No reported employee injuries or illnesses related to indoor air quality, mold, or respiratory illnesses.
- 2005 – 12 employee illnesses related to indoor air quality, mold, or respiratory illness. 100% of cases were air traffic controllers. 58% of the cases were directly related to the January 22, 2005 attempt to clean mold from surfaces of the elevator shaft using a biocide chemical.
- 2006 – 3 employee injuries/illnesses were possibly related to air quality or mold in the facility. These air traffic controllers had skin rashes, difficulty breathing, or eye irritation and swelling.
- 2007 – No employee injuries or illnesses related to indoor air quality, mold, or respiratory illnesses.
- 2008 (January 1, 2008 – June 23, 2008) – One TRACON employee became ill due to fumes and odors from a computer electrical fire. No employee injuries or illnesses related to mold or respiratory illnesses were recorded.

Based on the Occupational Safety and Health Administration 300 log injury and illness data, FAA employees working at the Detroit air traffic control tower experienced respiratory illnesses related to indoor air quality in 2005 and 2006. The majority of these cases were directly related to chemical odors from elevator shaft cleaning efforts that took place on January 22, 2005. OSHA 300 log injury and illness data from 2007 and 2008 indicates that zero FAA employees experienced injuries and illnesses related to poor indoor air quality. The most recent OSHA recorded case related to mold or air quality was reported on July 24, 2006, so there has been no new related case for 2 years. This could be an indicator that air quality within the facility has not caused new respiratory illness cases in 2007 and 2008. Alternatively, the possibility exists that air traffic controllers are not reporting air quality or mold related cases due to fear that they could loose their jobs or for other reasons. The whistleblowers claim that air traffic controllers are reluctant to report certain health symptoms and medications they are using for fear of not passing their medical clearance examinations. The whistleblowers all maintain that they continue to experience adverse health effects from exposure to mold and moisture in their work environment. [1] It is noted that the Federal worker's compensation system is designed as a no fault system to protect Federal employees that sustain work related injuries or illnesses. Based on the review of employee injuries and illnesses, whistleblower interviews, and direct

[1] Vincent Sugent, one of the whistleblowers, submitted documentation from his physician, Dr. Richard Shoemaker, in which Dr. Shoemaker describes medical treatment he is providing to a cohort of 15 employees at the DTW air traffic control facility. Dr. Shoemaker opines in this document that there is a defined association between exposure to the workplace and the employees' health symptons. He also reports that those members of the cohort who are following his treatment recommendations are much improved. In addition, on August 12, 2008, Mr. Sugent, provided information that he and other controllers are continuing to experience adverse health effects in the workplace and that one employee had reported adverse health effects to a flight surgeon and had his medical certificate withdrawn.

observation of conditions with the Detroit air traffic control tower and base building, this investigative team is in agreement with the findings in the July 24, 2006, health hazard evaluation by the National Institute for Occupational Safety and Health (NIOSH), which states:

"When considered collectively, the various reports and documents provided to NIOSH describe a situation whereby leaks in the building envelope had allowed water to enter the ATCT, wick into drywall, and create a suitable substrate for mold growth. Mold contamination on drywall resulted in employees' health concerns. This situation has existed since sometime in 2004 (possibly earlier), and can be expected to continue or recur until all leaks have been repaired, HVAC deficiencies corrected, and all mold sources located and successfully remediated. Until this remediation takes place, the employees who experience upper airway symptoms when exposed to mold may continue to experience them."

Subsequently, when additional medical information for six Detroit Metropolitan Airport air traffic control tower employees was provided to NIOSH in 2006, the agency made the following reply to FAA in a letter dated January 11, 2007:

"Although the six records identified employees with respiratory health effects that may be associated with mold exposure, the added information does not change the conclustions or the recommendations we noted in the letter sent to you on July 24, 2006. We believe that the implementation of our initial recommendations should be sufficient to eliminate the factors that make the environment conductive for mold growth and also prevent further employee exposure. Because of the lack of specificity of the medical findings, the statistical problems associated with studying a small population, and the lack of any added benefit from carrying out an extensive mold study at the control tower, we have decided not to reopen this evaluation. We encourage management to implement our recommendations and affected employees to continue to seek care from their healthcare providers in the management of their health problems and concerns."

FINDINGS

1. The visual inspection conducted on May 19 and 20 revealed that the mold and moisture problems at the DTW air traffic control facility have not been fully remediated. Specifically, we found:

- Inspections of tower wall cavities on the outside of the elevator shaft revealed apparent mold growth on the 9th and 4th floors, which are unoccupied floors of the tower. [2]
- Visible mold was discovered on new drywall that had been installed in the remediation area in room 928 of the tower (both in the external tower wall and elevator shaft wall cavities). Additionally, visible mold was observed on the back side of the green wallboard elevator shaft inside the wall cavity in 928. The mold appeared to be related to moisture wicking up the new drywall that was in contact with the concrete floor slab. The amount of visible mold was small, less than 10 square feet.
- A very small amount of visible mold was also observed in room 428 on the green wallboard elevator shaft inside the wall cavity. No visible mold was observed in the new drywall that was installed in the remediation area in room 428. The amount of visible mold was small, less than 10 square feet.

[2] *On June 9-12, 2008. FAA conducted its own inspection of the Detroit air traffic control tower wall cavities and has identified additional locations that have mold contamination.*

- All observed wallboard in the air traffic control tower was observed to be dry at the time of the survey. Wallboard in rooms 928 and 428 of the tower did show past evidence of moisture intrusion that allowed mold to return after previous remediation efforts.
- In many areas of the tower, drywall is in direct contact with the concrete floor surface.
- The base building roof is leaking badly in several areas. Catch pans and a funnel were observed above the drop ceiling in an attempt to catch rain water and snow melt that is entering the building.
- Approximately 20 stained ceiling tiles were observed to have been recently removed from the base building facility. These tiles had become wet from base building roof leaks. FAA management indicated that stained/wet ceiling tiles are removed and replaced as a part of routine maintenance.
- A visual inspection of the tower elevator shaft revealed no visible mold growth. Areas where past cleaning had been completed were evident. There was visual evidence of past moisture tracking down the shaft wall. No moisture or condensation was observed in the elevator shaft at the time of the inspection. The shaft did not appear to be a conduit or active pathway for mold spores to travel within the facility. Notes and photographs from the visual inspection are contained in Appendix C.

2. *Air Monitoring Results revealed that indoor fungal concentrations were insignificant when compared to concentrations outdoors. Stachybotrys spores were detected on the ninth and fourth unoccupied levels. The Stachybotrys spores are significant in such that they are an indicator that the tower has had a chronic moisture control problem.*

Bioaerosol samples were collected at two base building locations, five tower locations, and outdoors for comparison. The sampling was conducted at two different time periods on May 20, 2008, beginning at approximately 8:30AM and 11:30AM. The concentrations of airborne fungal spores detected was considered insignificant and do not indicate elevated mold spore concentrations within the tower or base building that would be likely to adversely impact employee health.

The fungus Stachybotrys was detected on the 9th and 4th floors of the air traffic control tower and was likely detected in these areas due to the wallboard panels that were removed and visible mold that was discovered. Stachybotrys is a mold spore that is not commonly found indoors and is an indicator of chronic moisture intrusion. Stachybotrys produces a sticky spore that is not easily airborne, unless disturbed. Mold spore concentrations within the air traffic control tower cab were observed to be much lower than mold spore concentrations found outdoors. This is a good indicator that the building's ventilation systems are properly filtering out mold spores. The elevator shaft itself does not appear to be an effective conduit to spread mold spores throughout the air traffic control tower. Higher spore concentrations were found on the 9th and 4th floors of the tower, in areas where we disturbed molded drywall materials. If the tower elevator shaft were effective in disbursing fungal spores, higher concentrations of mold spores would have been evident in the tower cab, Junction level break room, or inside the base building. Likewise, if the elevator shaft was an effective pathway for mold spores to spread, it could be concluded that the disturbed Stachybotrys spores would have spread to other floors or other areas of the facility. Spread of Stachybotrys spores was not observed or concluded from the air monitoring results. While the finding of Stachybotrys spores is significant because it is an indicator that

there is or has been a chronic moisture problem in the tower, it does not pose a health hazard more than any other mold or fungal spore that individuals can become sensitized to.

Mold spore and air quality measurements were collected in the following locations:

- Air Traffic Control Tower Cab
- Junction Level (Break Room, and Debriefing Room)
- 10th Floor. Room 1028 (former Union office)
- 9th Floor. Room 928
- 4th Floor. Room 428
- 2nd Floor, Base Building. TRACON Radar Room 212
- 1st Floor, Base Building. Open area outside of Room 109
- Outside – On top of 2nd Floor Base Building near air intakes.
- Outside – On ground level of Base Building near air intakes.

Other measured data for temperature, relative humidity, carbon monoxide, carbon dioxide, and airborne particles did not reveal any indicators of indoor air quality problems. All recorded measurements were within legal, regulatory limits and within or insignificantly below ASHRAE recommended ranges. Detected airborne particle counts were insignificant for each size range and not significant when compared to outdoor levels. The industrial hygiene report and air sampling results are contained in Appendix D.

RECOMMENDATIONS

By October 15, 2008, the Administrator of the Federal Aviation Administration shall provide a written report to the Secretary of Transportation on the status of the recommendations submitted below. The report shall include actions the agency has taken to comply with the recommendations and list the dates that such corrective actions were completed.

Air Traffic Control Tower Mold / Moisture Recommendations

A. **Conduct a comprehensive inspection of the wall cavities on every floor of the air traffic control tower, making sure to inspect the wall cavity from the unoccupied room side of the elevator shaft.** The inspection should look for evidence of mold contamination, condensation, and moisture intrusion.

B. **Based on the comprehensive inspection, remove all visibly contaminated (molded and water damaged porous materials) from the air traffic control tower.** Non porous substrates (such as metal studs or concrete materials) can be cleaned to remove visible mold growth. Do not use a biocide to clean the materials. Dispose of and replace building materials necessary. Place a sticky sided contact paper on top of visible mold to minimize the chance of mold spores becoming airborne during removal. Wallboard materials should be cut out 18 inches beyond the edge of where visible mold growth and water damage was discovered. The remediation of the mold and water damaged materials must be conducted in a similar manner as asbestos abatement. This would include setting up plastic sheeting and a negative-air machine equipped with HEPA filtration to contain and filter any airborne fungal spores that are released during cleanup.

A written safety control plan for the mold remediation shall be developed to identify and control any safety hazards associated with the remediation work. Strong consideration should be given to conducting the remediation work at night to minimize the number of potential employees impacted. Care should be taken to at a minimum adhere to the Environmental Protection Agency's *Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water http://www.epa.gov/mold/table2.html.*

C. **Develop a mold remediation project communication plan for the facility to improve communication efforts between FAA management and union employees.** Items such as memorandums and safety meetings are needed to educate employees about the mold discovered within the air traffic control tower and the safety control efforts that will be implemented to remedy the conditions. These meetings will provide employees an opportunity to voice their concerns, and allow FAA management to demonstrate that efforts are being implemented to ensure the safety and health of all working within the facility.

D. **Remove all unnecessary wallboard and carpeting from unoccupied areas of the air traffic control tower and remove any wallboard currently in contact with concrete floors.** Paper faced wallboard is a potential food source for mold growth should the wallboard become wetted from moisture intrusion or condensation. Undamaged or molded wallboard necessary to maintain the required fire ratings may be left in place. Remove any wallboard currently in contact with concrete floors in the unoccupied levels of the air traffic control tower. New wallboard materials that are installed must have at least a one half inch gap from the concrete floor slab or be provided with a strip of silicone caulking at the concrete/wallboard junction to prevent condensation and/or moisture intrusion from wicking into the wallboard.

E. **Evaluate the fire rating of cement backer board and mold resistant / paperless wallboard.** Use such materials as a substitute for the removed paper faced wallboard in the air traffic control tower. Wallboard with paper could act as a future food source for mold, should condensation or moisture intrusion return.

F. **Continue efforts to prevent moisture intrusion into the air traffic control tower and prevent condensation from forming.** Implement the recommendations that were submitted to FAA within the Jacobs Engineering moisture assessment report dated August 31, 2005. This report recommends HVAC improvements and moisture control items that were still not implemented at the date of our 5/19-20/2008 investigation. Such uncompleted recommendations include:

1. Installing a cooling coil into the ductwork to remove moisture from the outside air that is brought into the building. *FAA may need to make the financial commitment necessary to increase the tower's cooling capacity by installing appropriately sized or additional chiller equipment.*
2. The bottom edge of gypsum wallboard should be cut back approximately ¼" above the floor slab to prevent wicking or moisture into the panel. An appropriate fire rated sealant should be installed between the slab and gypsum wallboard.

3. Eliminate situations where moist, warm air is allowed to contact cool surfaces.
4. Recommend removal of the drywall from all the "storage" rooms in the tower.

G. **Actively monitor moisture levels in the elevator shaft and unoccupied areas of the air traffic control tower and implement corrective actions as necessary.** Use the data collected from the temperature and relative humidity sensors that have been installed in the elevator shaft and unoccupied areas of the tower to identify places of differing temperature and relative humidity. Large fluctuations of temperature and relative humidity levels between the elevator shaft and unoccupied areas of the tower, could cause condensation on wall surfaces or lead to condensation on hot/cold water lines or heating and cooling ductwork.

H. **Review the policies at FAA's Detroit air traffic control tower to ensure that employees are encouraged to report work-related health and medical problems.** Management should create an environment that promotes the prompt reporting of work-related injuries, illnesses and health symptoms and openly support the taking of approved sick leave when necessary in accordance with FAA's policies and union agreements.

I. **Evaluate other FAA air traffic control towers for mold and moisture infiltration problems.** The Detroit Metropolitan Airport air traffic control tower is of a Leo Daly design. FAA operates other Leo Daly designed towers of similar construction and characteristics. It is prudent for FAA to inspect these other towers to determine if similar mold and moisture problems exist at those facilities. FAA shall report back to the Secretary of Transportation in writing with their findings at other tower facilities by December 31, 2008.

Base Building Roof Moisture Recommendations

J. **Replace the leaking base building roof.** Ensure adequate control measures are in place (such as de-energizing air handlers and sealing outside air intakes) to safely prevent infiltration of airborne chemical contaminants from outside the building. A thorough pre-construction survey and written safety control plan shall be conducted to identify any ways that the roofing project could negatively impact FAA employees working within the air traffic control tower or base building. Consideration should be given to conducting the roof replacement during night hours so as to impact as few FAA employees as possible. If TRACON workers may be negatively impacted, consider moving such operations to a temporary alternate location while the roofing repairs are being made.

K. **Continue to immediately remove and replace water damaged building materials as necessary.** Items such as wet and stained ceiling tiles, insulation, and wallboard must be promptly removed so as not to provide a food source for mold growth. When water damaged materials are discovered, an investigation shall be made to identify the moisture source and correct it.

L. **Develop a roof project communication plan for the facility to improve communication efforts between FAA management and union employees.** Items such

as memorandums and safety meetings are needed to educate employees about the roof replacement project and the safety control efforts that will be implemented throughout the project. These meetings will give employees an opportunity to voice their concerns, and allow FAA management to demonstrate that efforts are being implemented to ensure the safety and health of all working within the facility.

APPENDIX A: SUMMARY OF PAST RECOMMENDATIONS

6/13/2007

Applied Environmental, Inc.

1. Remain vigilant for any new cases of water leakage or incursion events. Take prompt action to asses and dry affected materials. ***Status - Incomplete. Prompt action has not been taken to repair the leaking base building roof. Action has been taken to seal the joints and exterior of the tower structure and cab.***
2. Promptly investigate and correct the source of moisture and staining and replacing ceiling tiles in a timely manner. ***Status - Incomplete. Ceiling tiles are replaced, but there has been a delay in repairing the base building roof leaks.***
3. Establish a routine inspection of the elevator shaft (on at least a yearly basis) to assure that water incursion and/or mold growth is not present. ***Status - Incomplete. At one time FAA performed frequent inspections of the elevator shaft for water incursion and mold growth. FAA has since stopped the process after finding that mold and moisture did not recur.***

7/11/2006

Office of the Secretary of Transportation, Office of Inspector General

1. The FAA Administrator provide the requesting Members of Congress and the OIG with a list of the planned actions to complete mold remediation efforts and alleviate moisture infiltration at the facility and include the expected completion date for each project. ***Status – Complete. The FAA provided the members of Congress with letters listing the planned actions to complete the mold remediation and moisture infiltration. Letters were sent on January 3, 2007.*** [3]

6/24/2006

National Institute for Occupational Safety and Health

1. Inspect all locations where building materials may have become wet. Mold that is not actively growing can still present a hazard, and may resume growing when conditions become favorable. ***Status - Incomplete. At the time of the survey, FAA had not performed wall cavity inspections in the walls surrounding the tower elevator shaft. Since mold was previously identified the 3rd, 4th, and 9th floors of the tower, it could be reasoned that conditions for mold and moisture could be found on other floors.***
2. Perform corrective actions recommended in the Jacobs Engineering Group report to help ensure that all sources of moisture are eliminated and the HVAC system operates properly. ***Status - Incomplete. All recommendations from the Jacobs Engineering Report have not been completed. Not all wallboard has been replaced from the unoccupied tower rooms, wallboard is still touching the concrete floor deck, and a cooling coil has not been installed to take moisture out of air that is brought into the building's outside air intakes.***

6/19/2006

U.S. Department of Labor, Occupational Safety and Health Administration

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[3] *The OIG found that the FAA had taken actions to remove mold from the facility, but not alleviate the sources of moisture causing mold growth..*

1. Eliminate all sources of water intrusion into the facility. Damp or wet building materials and furnishings should be cleaned and dried within 24-48 hours to prevent the growth of mold. ***Status – Incomplete. Exterior sealing/caulking of the tower was completed November 2, 2006. The base building roof leaks badly and is in need of replacement.***
2. Maintain and operate the outside air ventilation system in accordance with design specifications. Provide 500 cfm of outside air to the cab and keep the cab under positive pressure through proper maintenance and operation of air handler numbers 13 and 14. All HVAC systems should be operated to keep the facility under positive pressure to prevent infiltration of unconditioned air. Pressurizing the lower floors will help minimize the stack effect in the elevator shaft and middle tower area. ***Status – Complete. HVAC modifications completed February 2007 and FAA indicates the facility is at a positive pressure.***

5/05/2006

Federal Occupational Health

1. Continue to document and map all moisture intrusion events. ***Status – Complete and ongoing.***
2. On occurrence of moisture intrusion, determine and correct the source of moisture infiltration. Abate any affected areas following properly developed and approved procedures using qualified and environmentally trained personnel. ***Status – Incomplete. The leaking base building roof has yet to be replaced and repaired.***
3. Monitor and oversee all future fungal abatement activities from development to completion with proper documentation. ***Status – Ongoing.***
4. Utilizing a HEPA vacuum, vacuum all surfaces within the elevator shaft under negative pressure and monitor for new occurrence of fungal growth. Should the decision be made to encapsulate these walls, verify any product used to assure that the integrity and "Fire Rating" status of the walls is not compromised. ***Status – Completed 6/26/2006.***
5. Educate and inform employees of ongoing fungal abatement activities within the facility. ***Status – Incomplete. Communication between FAA management and employees is strained. A large amount of distrust between both groups was observed. Additional efforts need to be made to bridge the communication and trust gaps.***
6. Investigate the facility link between the terminal and the FAA to determine the +/- pressure effect to the FAA. ***Status – Complete. 2/2007 there was a positive pressure established in the FAA facility compared to the Terminal Building.***
7. Inspect and repair all expansion joint for failing caulking. Review data on replacement materials to ensure proper materials are utilized in repair efforts. ***Status – Complete. Structure wall panels and caulking were replaced and building sealed to prevent moisture intrusion.***
8. Correct gypsum wallboard in contact with decking floor that would allow a "wicking" to occur should gross moisture intrusion occur. ***Status – Incomplete. Wallboard is still in direct contact with the floor in many areas.***
9. To reduce the potential for microbial growth in the facility, the relative humidity should be adjusted and maintained within the ASHRAE recommended range of 30% to 60%. ***Status – Complete. Temperature and relative humidity sensors were activated in the elevator shaft and tower floors on 5/19/2008. The documented average relative humidity levels during the site survey was within or insignificantly below the ASHRAE recommended range of 40%-60% for summer.***

8/31/2005

Jacobs Engineering – Moisture Assessment Report

1. All non-rated internal partitions and associated doors, frames, and hardware within the tower shaft should be removed. ***Status – Complete. Doors and combustible items removed from unoccupied floors of the tower.***
2. The bottom edge of gypsum wallboard should be cut back approximately ¼" above the floor slab to prevent wicking of moisture into the panel. An approved, fire rated sealant should be installed between the slab and gypsum wallboard. A rubber vinyl wall base should also be installed to conceal the cut. ***Status – Incomplete. Wallboard is still touching the floor slab in many areas of the tower.***
3. The shaft liner panels within the elevator shaft should be wet-wiped, cleaned, and may be painted. ***Status – Complete. The shaft cleaning was completed on 5/26/2006.***
4. All vertical exterior pre-cast panel joints should have the sealant joints stripped, and appropriate new backer rod and sealant installed. ***Status – Complete. The exterior caulking and sealing of the tower was completed on 11/2/2006.***
5. The concrete decks should have a fluid applied waterproof traffic membrane installed. ***Status – Complete. The exterior caulking and sealing was completed on 11/2/2006.***
6. Reactivate the vestibule ventilation system and install a cooling coil into the ductwork to remove the moisture from the outside air. Put the tower under positive pressure to prevent untreated moisture and dust laden air entering into the facility. ***Status – Incomplete. It is our understanding that a cooling coil has not been installed to remove moisture from outside air that is draw into the facility. Work has been done to bring the HVAC systems into compliance with ASHRAE guidelines.***
7. The entire HVAC system needs to be rebalanced to provide positive pressure at all times. ***Status – Complete. 2/2007 there was a positive pressure established in the FAA facility compared to the Terminal Building.***
8. Close the air gap under the door to the ESD's area. Presently unconditioned moisture laden outside air enters to the ESD's control room increasing the loads on the newly installed AHU. ***Status – Unknown. Improvements to the building HVAC system such as digital controls for the valves, balancing of the air flow, duct cleaning and changes in the make-up air have been performed. Further evaluation of the ATCT temperature/humidity conditions is being conducted prior to implementing further changes.***
9. Recommend removal of the drywall from all the "storage" rooms in the tower. ***Status – Incomplete. Drywall in the unoccupied rooms of the tower is still in place and has not been removed.***
10. Assess mechanical ventilation system and improve operational control. Conduct a full assessment of the HVAC system to identify repairs and upgrades to properly control and operate the building ventilation in the tower. ***Status – In Progress. Improvements to the HVAC system such as digital controls for the valves, balancing of the air flow, duct cleaning and changes in the make-up air have been performed. Further evaluation of the ATCT temperature/humidity conditions is being conducted prior to implementing further changes***
11. Conduct routine visual mold inspections. ***Status - Incomplete. At one time FAA performed frequent inspections of the elevator shaft for water incursion and mold growth. FAA has***

since stopped the process after finding that mold and moisture did not recur. Periodic inspections should be resumed and documented.

12. Clean the interior elevator shaft wall surfaces by wet-wiping with a bleach solution. ***Status – Complete. The shaft cleaning was completed on 5/26/2006.***
13. During periodic inspections, identify sources of moisture and correct to prevent reoccurrence. ***Status – Complete. Except for the discontinued elevator shaft inspections, the facility is checked for sources of moisture on an ongoing basis.***
14. Remove gypsum wallboard where it is in contact with concrete floor to create a minimum ¼" gap between the concrete floor and wallboard to prevent moisture wicking. ***Status – Incomplete. Drywall in the tower is still in contact with the concrete floor.***
15. Check and evaluate waterproofing at exterior joints, corners, and structure penetrations to prevent water intrusion. ***Status – Complete. The exterior caulking and sealing was completed on 11/2/2006.***
16. Check and ensure all chilled water and exterior drain pipes are properly insulated. ***Status – Complete. Pipes and ductwork have been insulated in attempts to control condensation.***
17. Where there is recurring water damage, check building utilities for leaks or improper installations. ***Status – Incomplete but in progress. The leaking base building roof is in the process of being replaced.***
18. Eliminate situations where moist, warm air is allowed to contact cool surfaces. ***Status – Incomplete. Modifications have been made to the building's HVAC system and temperature and relative humidity sensors have been installed in the tower elevator shaft and in some unoccupied rooms of the tower. FAA is monitoring the data obtained from the sensors. The fact that mold has returned in areas where it was previously abated indicates that moisture and condensation problems may remain.***
19. Maintain floor areas clean by periodic cleaning, and eliminate unnecessary clutter and storage. ***Status – Complete. Materials were removed from the unoccupied areas of the tower that were previously used as storage rooms.***

APPENDIX B: DETAIL OF DETROIT METROPOLITAN AIRPORT FAA EMPLOYEE INJURIES AND ILLNESSES

The table below lists employee injuries and illnesses for the Detroit Metropolitan Airport since January 1, 2004. Each row of the table represents and individual employee injury or illness. The names of each employee have been removed for confidentiality purposes. Each case documents the organization the employee works in, the date of the injury/illness, the location where the injury/illness took place, and a description of the problem.

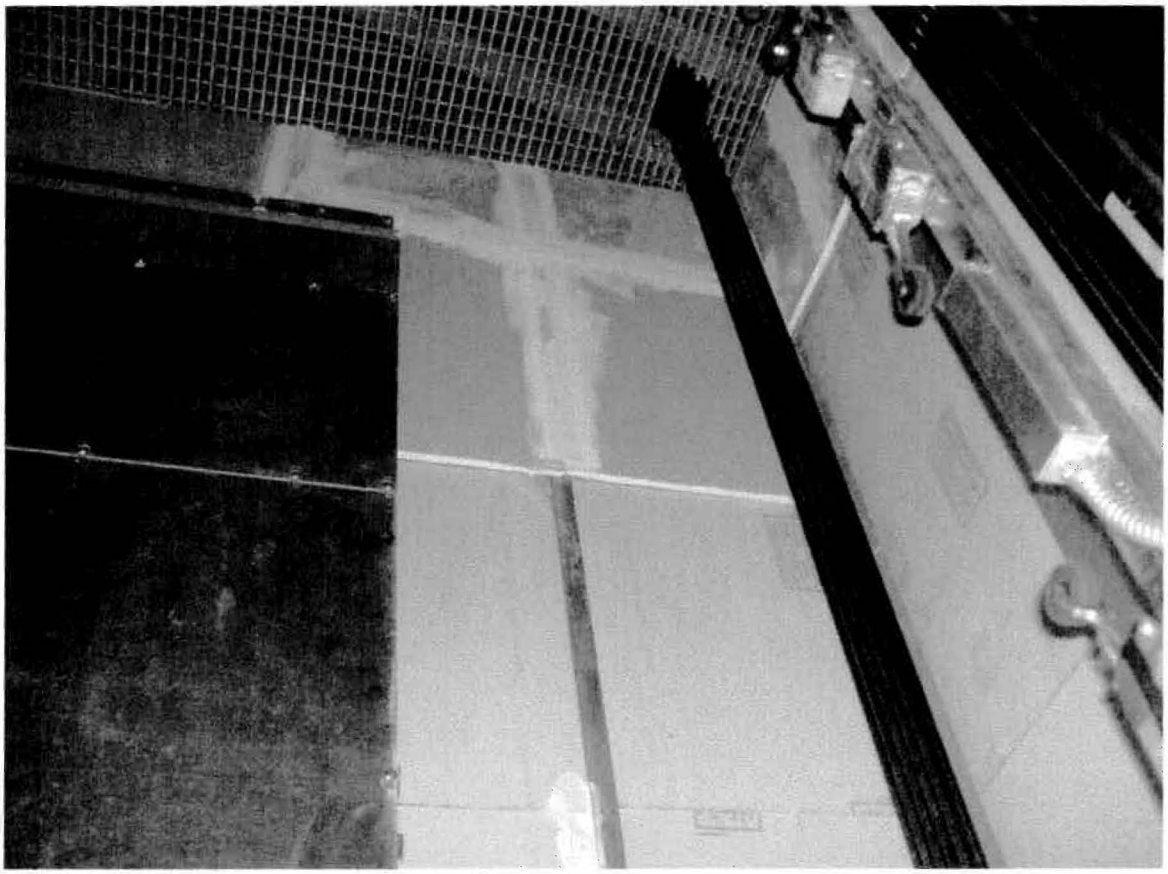
Organization	Year	Date of Injury/Illness	Location	Description
Air Traffic Control	2004	01/06/2004	2nd landing from tower cab	Right ankle swollen.
Air Traffic Control	2004	05/24/2004	Tower cab	Strained left knee.
Air Traffic Control	2004	07/12/2004	TRACON – 2nd floor base building	Tone in left ear.
Air Traffic Control	2004	08/09/2004	TRACON – 2nd Floor base building. Entrance door.	Jammed left shoulder and wrist.
Air Traffic Control	2005	01/22/2005	Tower cab	Exposure to chemicals for black mold removal, affected lungs and throat.
Air Traffic Control	2005	01/22/2005	Tower cab	Exposure to chemicals for black mold removal
Air Traffic Control	2005	01/22/2005	Tower cab	Exposure to chemicals for black mold removal
Air Traffic Control	2005	01/22/2005	Tower cab	Exposure to chemicals for black mold removal
Air Traffic Control	2005	01/22/2005	Tower cab	Exposure to chemicals for black mold removal
Air Traffic Control	2005	01/22/2005	Tower cab	Exposure to chemicals for black mold removal
Air Traffic Control	2005	01/22/2005	Tower cab	Exposure to chemicals for black mold removal
Air Traffic Control	2005	02/28/2005	Tower cab	Occupational asthma. Black mold exposure.
Air Traffic Control	2005	05/23/2005	Tower cab	Exposure to chemicals for black mold removal, affected lungs and throat.
Air Traffic Control	2005	07/25/2005	Tower cab	Exposure to chemicals for black mold removal, affected lungs and throat.
Air Traffic Control	2005	12/14/2005	Tower cab	Minimal obstructive airway disease.
Air Traffic Control	2005	12/19/2005	Tower cab	Exposure to chemicals for black mold removal, affected lungs and throat. Occupational asthma. Chlamydia pneumonia.
Air Traffic Control	2006	01/09/2006	Training Department	Strained back moving furniture.
Air Traffic Control	2006	01/26/2006	TRACON – 2nd Floor base building	Allergic type reactions and respiratory distress.
Air Traffic Control	2006	05/17/2006	Training	Skin rash and itching. Difficulty

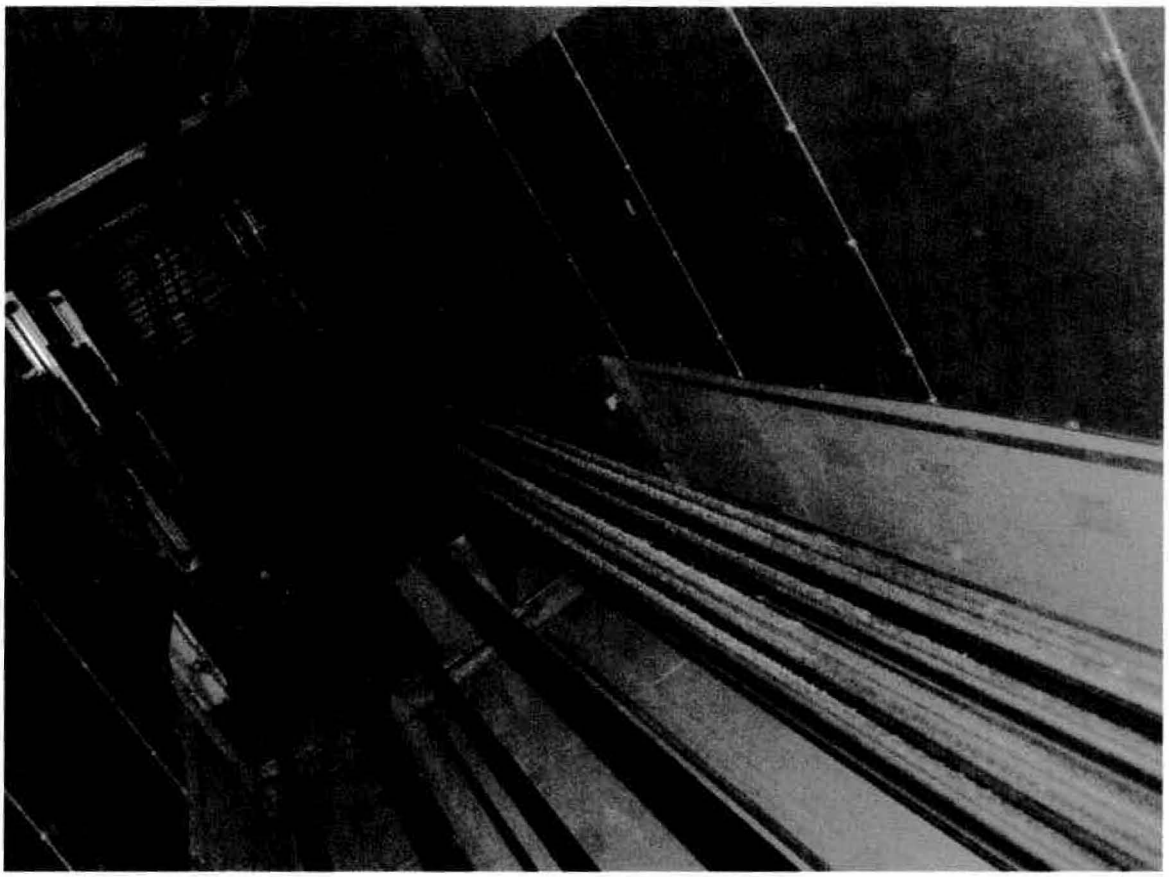
			Department	breathing.
Air Traffic Control	2006	07/24/2006	Tower cab	Irritation of left eye, swelling, drooping, and tearing due to dust in the lid. Excessive dust in the tower cab.
Technical Operations	2006	08/08/2006	Facility Airport Operating Area	Bee sting on neck while outside at airport.
Technical Operations	2006	09/14/2006	Base Building	Fractured right ankle, fell from ladder.
Air Traffic Control	2006	11/28/2006	Tower cab	Adjusting controller chair, severe abdominal pain.
Air Traffic Control	2007	04/26/2007	Tower Cab	Ringing in left ear and headache.
Air Traffic Control	2007	08/07/2007	Stairs going to Break Room	Strained left foot and knee.
Air Traffic Control	2008	04/22/2008	TRACON – 2nd Floor base building	Computer electrical fire. Became dizzy, nauseous, and light heade3d.
Technical Operations	2008	04/29/2008	ESU Building	Unloading crate from vehicle to hand truck. Strain.

APPENDIX C: VISUAL OBSERVATIONS FROM SITE VISIT ON MAY 19-20

Elevator Shaft

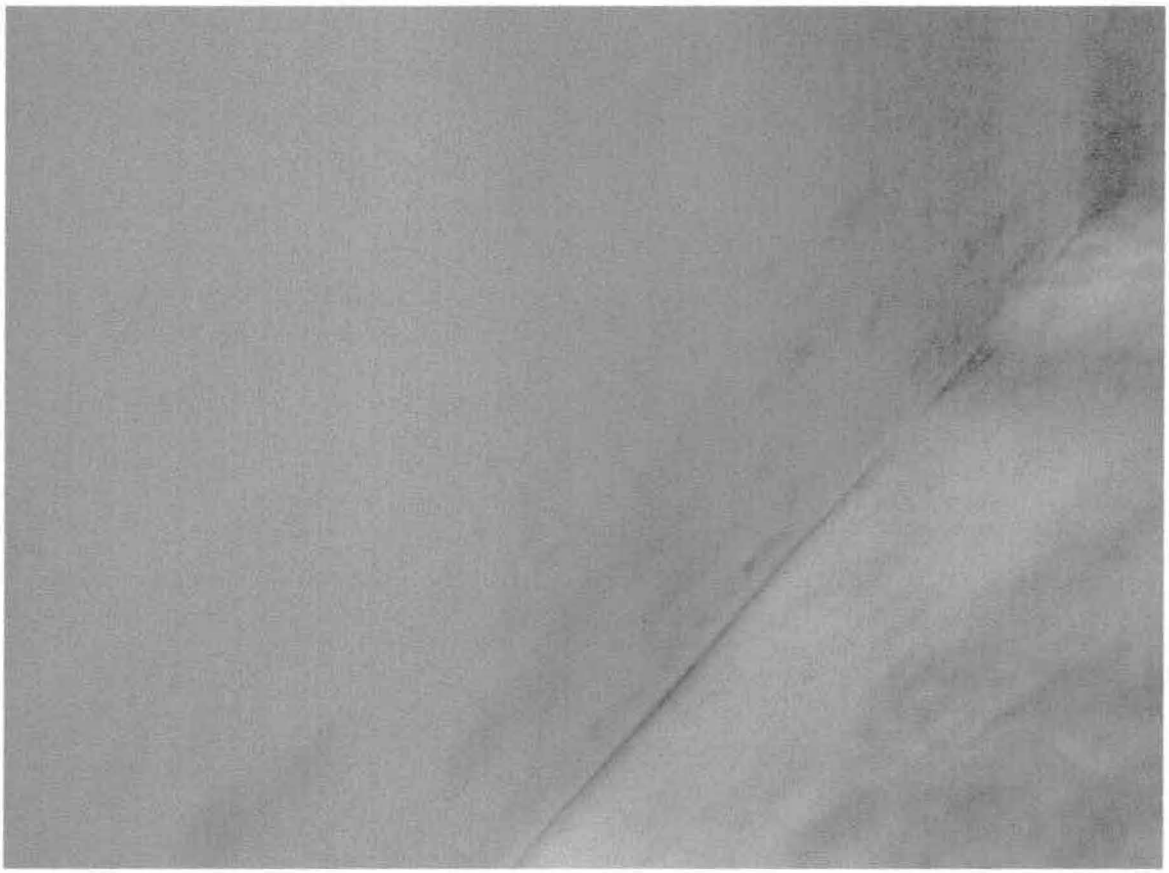
- A visual inspection of the air traffic control elevator shaft was performed.
- The shaft runs from the basement, up to the control tower Cab (14 levels).
- The shaft is constructed of 1 inch wallboard to form a liner, metal studs (with paper backed fiberglass insulation), and two layers of ½ inch drywall to form the outer layer.
- The shaft was observed to have visual evidence of having been cleaned. Some past tracking of water stains was observed. Areas where mold had been cleaned away from the wall board liner were lighter in color than areas where past mold growth was present.
- The elevator shaft had air supply and return vents.
- The elevator shaft had devices installed to measure temperature and relative humidity. FAA had not been using the sensors, but decided to activate them during the investigation. There are 9 moisture monitors in total; some are outside the elevator shaft in unoccupied tower space.





Room 928 (unoccupied space)

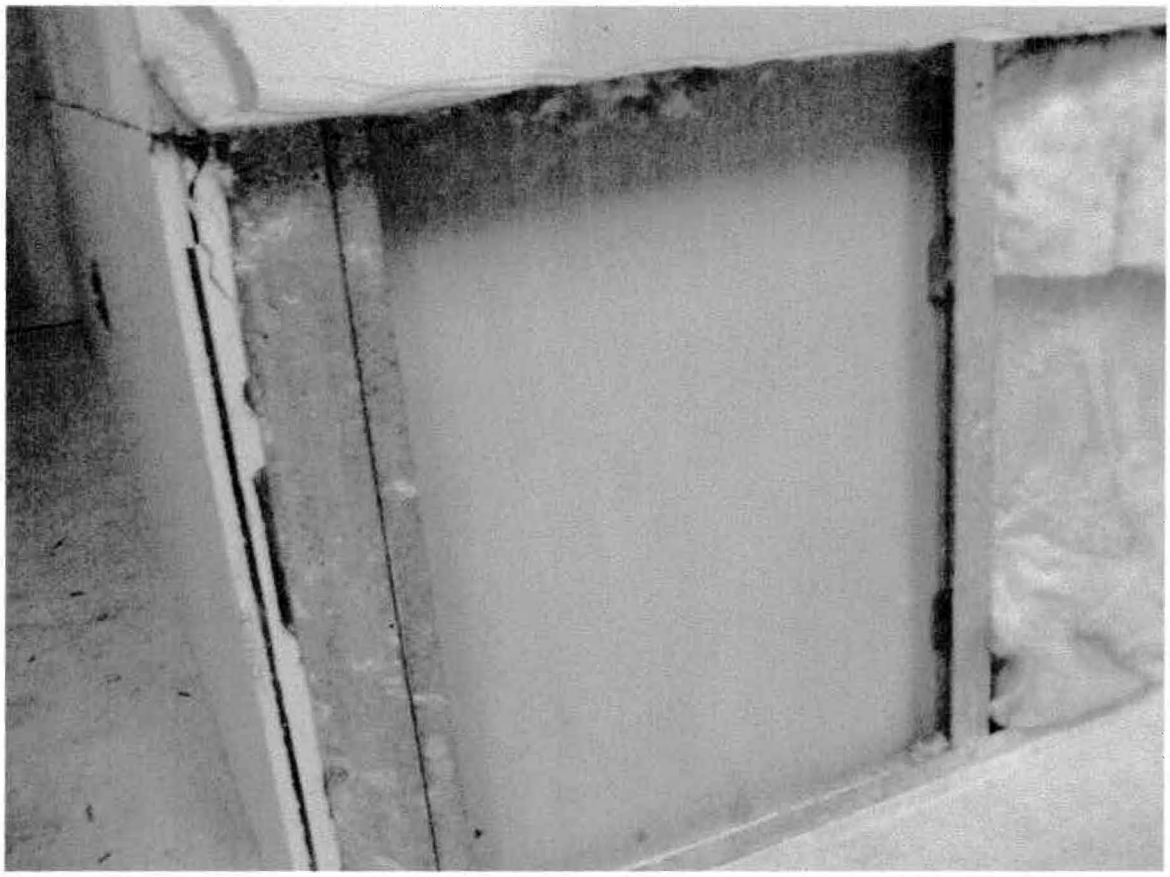
- Room 928 was observed to have had portions of wall board removed in a past remediation effort. The wall board was screwed into place, but the seams not taped. Wall board was in direct contact with the concrete slab deck.
- Two layers of wall board were unscrewed and removed from two locations. Another location a rectangular access hole was cut through the drywall.
- Visible mold was observed on the back side of the first layer of wall board.
- Visible mold was observed on the front and back of the second layer of wall board.
- Visible mold was observed on the back side of the elevator shaft liner.
- No moisture was observed.
- Visible mold area was less than 10 square feet and to be considered a Level I, small isolated area according to the NY City and EPA Mold Guidelines.



Room 428 (unoccupied space)

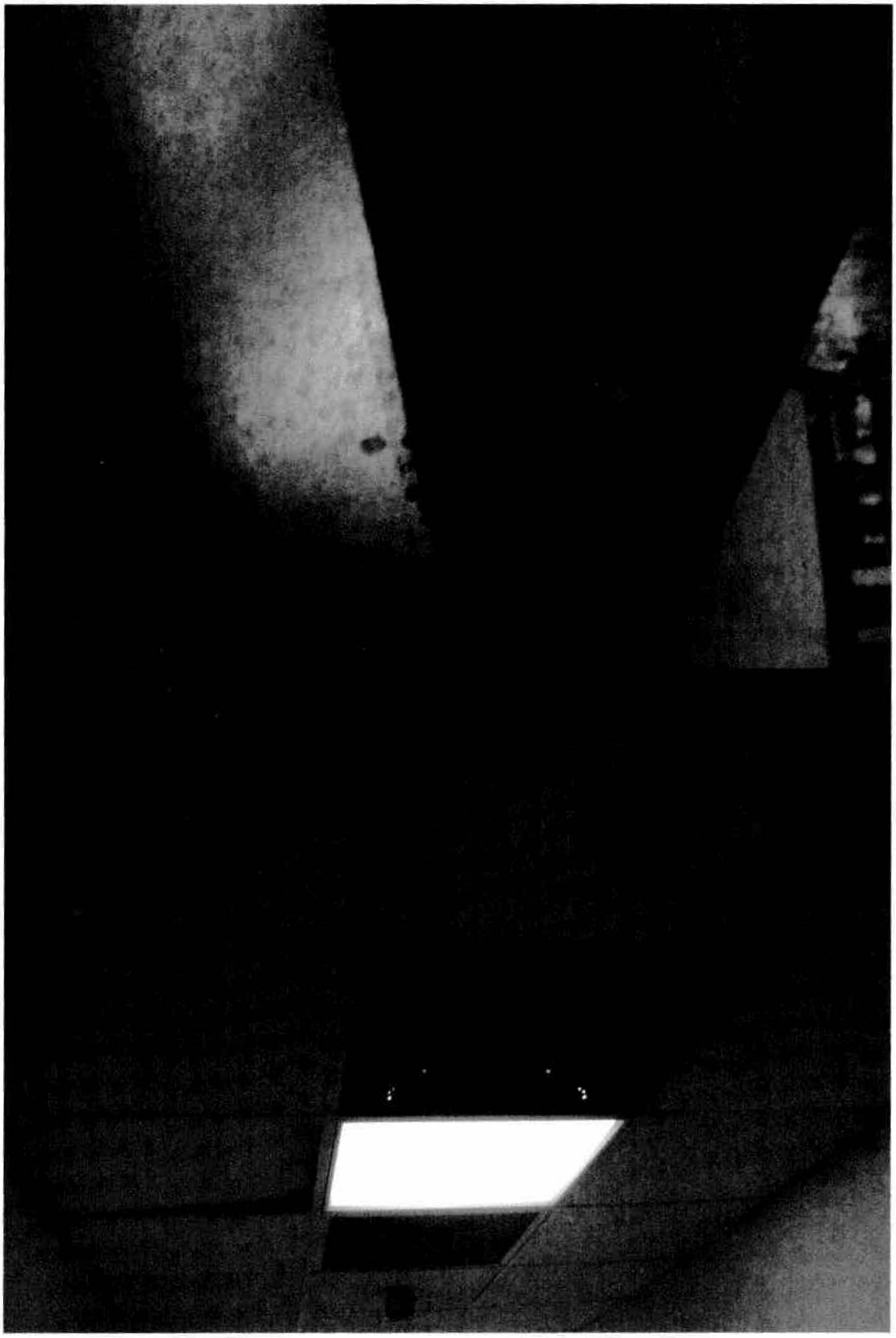
- Room 428 was observed to have had portions of wall board removed in a past remediation effort. The wall board was screwed into place, but the seams not taped. Wall board was in direct contact with the concrete slab deck.
- Two layers of wall board were unscrewed and removed from the back side of the elevator shaft.
- No visible mold was observed on the front or back sides of the first and second layers of wall board.
- A small strip of mold growth was observed on the back side of the elevator shaft liner.
- No moisture was observed.
- Visible mold area was less than 10 square feet and to be considered a Level I, small isolated area according to the NY City and EPA Mold Guidelines.

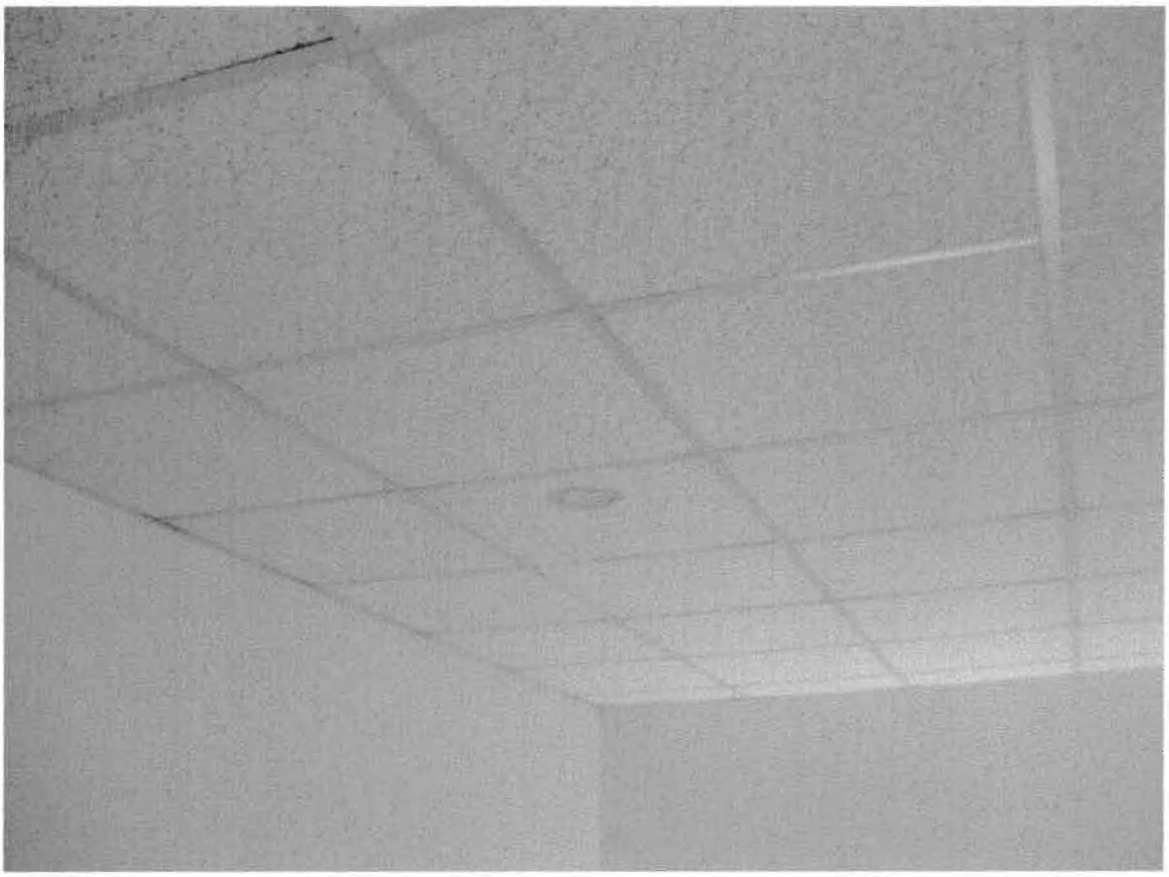
- Two stained ceiling tiles were observed in the stairway leading up to the 2nd Floor of the Base Building.



Base Building Observations

- An active roof leak was observed on the 2nd Floor of the Base Building, outside of room 222 and the employee locker area.
- Plastic trays were located above the drop ceiling to collect water.
- The trays had absorbent socks in them to absorb the water.
- A funnel was in the ceiling and a hose connected to it to collect rain water and divert it to a janitor's closet sink in Room 222.
- No mold growth was visible on the under-side of the steel roof deck or above the ceiling.
- 3 to 4 ceiling tiles had been removed in this area and looked new. One tile was beginning to show a new stain.
- Water was intruding into the building around a roof drain penetration.





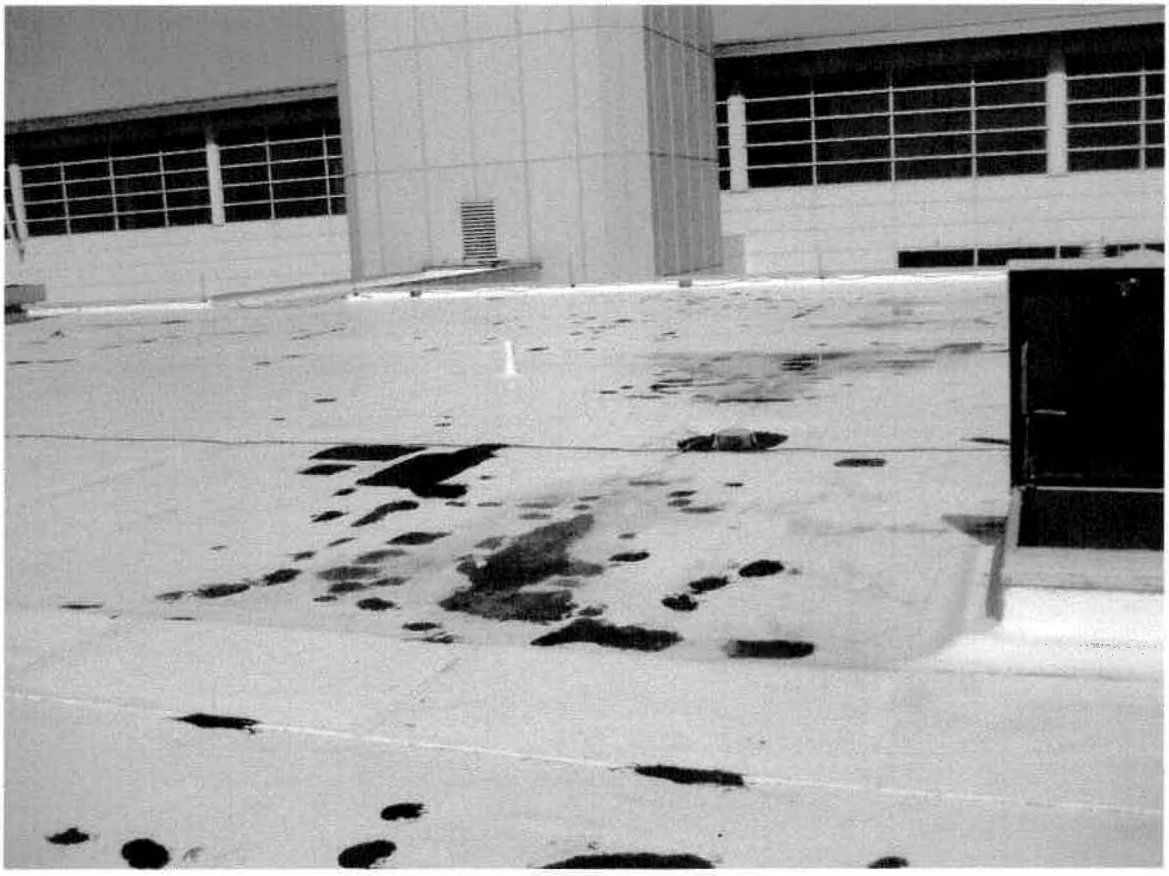
Base Building Ceiling Tiles

- Approximately 20 ceiling tiles were observed to be stacked in the ESU Building. FAA Management indicated the tiles had been removed over the weekend of 5/17/08 and 5/18/08 as a normal operational practice. As facility maintenance technicians observe stained ceiling tiles after periods of rain, the ceiling tiles are removed and disposed of. The ceiling tiles were discarded into a dumpster, but removed from the dumpster after Mr. Sugent's objection and placed into the ESU Building. The ceiling tiles are fiberglass insulated, foil backed, and vinyl faced tiles that do not offer a good food source for mold growth. The tiles were observed to have some staining.


RESTRICTED

Base Building Roof

- The roof of the Base Building was inspected. Attempts to repair and patch the roof have been made in the past and a portion of the roof membrane is torn. A very small area of the roof had some standing water. The roof needs to be replaced as is evidenced by the stained ceiling tiles on the 2nd floor of the Base Building. It is a built-up roof with fiberglass insulation over top of the steel deck and does not offer a good food source for mold growth.



APPENDIX D: INDUSTRIAL HYGIENE REPORT

June 9, 2008

Mr. Thomas Black
Department of Transportation
1201 New Jersey Avenue, SE
Room W58-303
Washington, DC 20590

Dear Mr. Black:

On May 19 and 20, 2008, M. A. Cecil and Associates, Inc. conducted an inspection in the Detroit Metropolitan Airport Traffic Control Tower.

In accordance with the scope of work, the goal for this inspection was to determine if mold colonization was present in the control tower and to conduct bioaerosol air sampling in the control tower and base building. The following parameters were evaluated: bioaerosol (fungi and environmental bacteria), fungal spores, airborne particulate, carbon dioxide, carbon monoxide, temperature, and relative humidity.

The enclosed report includes the results of the sampling, discussion of the results and recommendations. If you have any questions or require additional information, please contact me at (301) 855-7710.

Sincerely,

Michael A. Cecil, CIH

Enclosure

INDOOR AIR QUALITY SURVEY

at the

DETROIT METROPOLITAN AIRPORT

AIR TRAFFIC CONTROL TOWER

Detroit, Michigan

Prepared for:

MR. TOM BLACK
DEPARTMENT OF TRANSPORTATION
1201 NEW JERSEY AVENUE, SE
ROOM W58-303
WASHINGTON, DC 20590

M. A. CECIL & ASSOCIATES, INC
4475 SHANNON WAY
PORT REPUBLIC, MARYLAND

May 2008

EXECUTIVE SUMMARY

M. A. Cecil and Associates, Inc. conducted an inspection in the Detroit Metropolitan Airport Traffic Control Tower. The inspection was conducted on May 19 and 20, 2008. The scope of work included an inspection of the control tower elevator shaft to determine if mold colonization was present and to conduct bioaerosol sampling in the control tower and base building. The goal was to determine if further mold remediation was required and evaluate the likelihood of employees being exposed to mold. A visual inspection (non invasive) of the elevator shaft was conducted followed by an invasive inspection of several locations within the tower.

The inspection of wall cavities on the fourth and ninth floors revealed that apparent mold growth is present in the ATCT. The location of the apparent mold growth observed and the previously abated contaminated drywall was likely caused by water intrusion. Based on the Jacobs Engineering inspection report water/moisture was able to enter the tower shaft at joints in the pre-cast concrete panels where deteriorated caulking and backer rod was unable to prevent moisture intrusion. The likely scenario is that water pooled on a given level's concrete floor and through wicking action was taken into the drywall thus allowing mold colonization. Furthermore, it is likely that the introduction of moisture laden air into the tower environment caused condensation to occur and further add moisture to the drywall. The surface mold previously observed and subsequently removed from the elevator shaft liner could have been due to condensation and/or poor moisture/temperature control of the elevator shaft environment.

Several corrective actions have been completed in the ATCT. Mold contaminated drywall was removed from several unoccupied levels of the tower. The exterior surface of the ATCT and base building were sealed with a moisture resistant sealant. Deteriorated caulking and backer rod was removed from pre-cast joints and replaced. Heaters have been installed and ventilation system modifications have been completed in an effort to control and or prevent condensation in the ATCT and moisture and temperature sensors were installed to monitor conditions in the elevator shaft and unoccupied tower levels. Also, cab roof leaks were sealed.

Based on the corrective actions completed thus far, the bioaerosol sampling results obtained during this survey, and the location of apparent mold growth it is suspected that FAA employees are not exposed to significant bioaerosol concentrations. Apparent mold growth was not noted on outward surfaces of drywall in the elevator shaft or on unoccupied level walls. The identified apparent mold growth was located between layers of intact drywall and in unoccupied areas. The unoccupied areas are not serviced by existing ventilation systems currently servicing occupied levels of the tower and totally independent from the base building ventilation systems. The only connection would be the air moved through the piston action of the elevator car in the elevator shaft which contains relief vents allowing air to be discharged at the top and bottom of the shaft.

Based on the sampling results and observations the following recommendations are offered.

- Perform comprehensive inspection of the elevator shaft drywall liner to identify mold contamination. Remove any porous material, such as drywall, which is visibly contaminated with mold or stained. Do not attempt to clean porous materials. Clean

remaining substrates, and replace building materials as necessary. The remediation must be conducted in a similar manner as asbestos abatement and as previously performed on the third, fourth, and ninth unoccupied levels of the ATCT.

- Proceed with the base building roof replacement. The roof must be replaced as it is the major source of water intrusion remaining. Ensure adequate control measures are in place and implemented to prevent infiltration of airborne volatile organic compounds likely to be generated from the roof replacement process. Consideration should be given to conducting the roof replacement during night hours.

- Remove drywall from unoccupied levels of the ATCT other than drywall necessary to maintain the required fire rating. If it is necessary to install drywall on unoccupied levels of the ATCT; replace drywall currently in contact with concrete floors with drywall installed with at least a one half inch gap or provide a strip of silicone caulking at the concrete/drywall junction to prevent condensation and/or moisture intrusion from wicking into the drywall.

- Alternatively, evaluate the fire rating for cement or backer board or mold resistant drywall now commercially available to be used as a substitute material for the removed drywall. Install a two foot high strip (from the floor) of a substitute material for walls located on unoccupied tower levels.

- Remove and discard the existing carpet in the former union office located in the tower.

- Monitor temperature and moisture levels in the elevator shaft and unoccupied levels and implement corrective actions as necessary to prevent condensation on surface materials.

- Continue to inspect the ATCT on a regular basis and remove and replace water damaged building materials as necessary.

INTRODUCTION

M. A. Cecil and Associates, Inc. conducted an inspection in the Detroit Metropolitan Airport Traffic Control Tower. The inspection was conducted on May 19 and 20, 2008. The scope of work included an inspection of the control tower elevator shaft to determine if mold colonization was present and to conduct bioaerosol sampling in the control tower and base building. The goal was to determine if further mold remediation was required and evaluate the likelihood of employees being exposed to mold. A visual inspection (non invasive) of the elevator shaft was conducted followed by an invasive inspection of several locations within the tower. To date, various entities have reported that only surface mold had been present on the elevator shaft lining and no invasive inspections were completed. In addition to the inspection numerous inspection reports were reviewed concerning past conditions, mold remediation, and recommendations to control moisture intrusion into the tower.

BACKGROUND

The Detroit Metropolitan Airport Air Traffic Control Tower (ATCT) is approximately 230 feet tall attached to a two story base building. Generally, the tower is constructed of concrete and steel. The two upper levels of the tower, cab and junction levels are occupied. The remaining levels 10 through 2 are unoccupied. Interior walls (perimeter) of the unoccupied levels are gypsum wall board on metal stud wall systems. The elevator shaft (central to the tower) is constructed with four layers of gypsum wallboard; the inner shaft is lined with two layers of fire rated gypsum wallboard on metal frame work and the outer shaft (unoccupied levels) is lined with two layers of gypsum wallboard.

There has been numerous water intrusion episodes reported occurring over the course of several years. The sources of water intrusion included roof leaks, water infiltration at pre-cast concrete panel joints due to deteriorated caulking, poor moisture and temperature control in the elevator shaft causing surface condensation, and deficiencies in the tower ventilation system allowing infiltration of unconditioned air. Numerous inspections were completed resulting in a general consensus to prevent moisture intrusion, rectify ventilation deficiencies, clean the visible 'surface' mold in the elevator shaft, and conduct mold remediation on the third, fourth, and ninth unoccupied levels of the tower.

To date, several FAA employees maintain that they have experienced allergic-like reactions and various illnesses thought to be related to the control tower environment.

EVALUATION METHODS

BIOAEROSOLS

A scope of work for this inspection was developed based on review of the various documents associated with the ATCT. This inspection included an inspection of the elevator shaft liner, the tower shaft (unoccupied levels), and the base building. Air sampling was conducted to evaluate bioaerosols, spores, airborne particulate, carbon dioxide, temperature, and relative humidity.

Bioaerosol sampling was performed using a single stage SAS Bioaerosol Sampler. The sampler draws air through a microsieve plate at a calibrated rate. This process accelerates airborne particles,

impacting them onto malt extract agar filled plates. The samples were incubated at 25°C and examined everyday for 7-10 days. Once on the agar plates, viable particles can grow into visible colonies. Their numbers give an indication of the airborne concentration of viable fungi and bacteria. During the incubation period subsequent colonies are isolated, identified to genus and counted to calculate airborne concentrations for each sample location.

SPORE SAMPLING
Microbial spore sampling was performed by drawing air through an Aerotrap spore sampler and aimed directly at a sticky and optically clear sampling media (microscope slide). An air-sampling rate of fifteen liters per minute was used. This process accelerates airborne particles, impacting them onto the gel strip inside the sampler. The slides were analyzed via microscopy and particles identified.

CARBON DIOXIDE
Carbon dioxide levels were measured using a KD Engineering Air Box Monitor. The instrument uses a non-dispersive infrared (NDIR) detector and was calibrated against a certified gas standard. Concentrations were spot checked at each sampling location.

CARBON MONOXIDE
Carbon monoxide levels were monitored using the KD Engineering Air Box Monitor. Concentrations were spot checked at each sampling location. The sampling was conducted simultaneously with carbon dioxide testing.

TEMPERATURE AND RELATIVE HUMIDITY
Temperature and relative humidity were monitored with the Air Box Monitor. Measurements were recorded for each sampling location. The sampling was conducted simultaneously with carbon dioxide testing.

AIRBORNE PARTICULATE
Particulate sampling was performed with a TSI Aerotrak (Model 8220) optical particle counter. This monitor uses laser technology to determine size of airborne particles. Particles are counted in six different size ranges.

RESULTS/DISCUSSION

INSPECTION
FAA has completed several of the recommended items contained in the Jacobs Engineering report entitled Moisture Assessment Report for the ATCT at Detroit Metropolitan Airport (August 2005). The tower pre-cast panel joints were stripped and new backer rod and sealant installed. The exterior of the tower and base building were sealed (paint-like product) in April/May 2006. Several ventilation system deficiencies were corrected to allow for sufficient air flow and conditioning of supply air to positively pressurize the tower thus preventing the infiltration of moisture and particulate laden air. Moisture sensors have been installed in the elevator shaft and at select locations of the tower shaft in an effort to monitor conditions in the shaft so that appropriate controls can be applied when needed (such as tempered air in winter months). The monitors were activated at the time of this inspection. Roof leaks in the cab have been sealed. Apparent mold growth (on drywall) noted on the third, fourth, and ninth levels were removed and drywall replaced.

Apparent mold growth on elevator shaft drywall was cleaned. An appropriate response plan has been implemented for leaks in general in the tower and base building.

A walk-through inspection was conducted in the tower and base building with concentration placed on the elevator shaft and the fourth and ninth unoccupied levels. The inspection of the elevator shaft was conducted from the roof of the elevator car. The car was stopped at every other level so that two levels of the shaft were inspected at each stop. There were no current signs of moisture intrusion or apparent mold growth in the elevator shaft. Several dried water stained/rust colored areas were noted and several discolored areas (surface mold removed) were noted also. A moldy or musty odor was not noted in the elevator shaft. The elevator pit sump was dry and the pit was relatively clean.

Drywall panels were physically removed from the fourth and ninth unoccupied levels corresponding to the discolored or cleaned areas within the elevator shaft. Drywall panels were removed from previously abated areas on both levels. The removal of the panels allowed for the inspection of the back side of the inner layer of the fire rated drywall of the elevator shaft liner without compromising the fire rating of the elevator liner. On the ninth level (928) two wall sections of the elevator shaft drywall were removed. Apparent mold growth was noted at both locations on the back surface of the outer layer of drywall, on the front surface of the inner layer of drywall, and on the back surface of the inner layer of fire rated drywall (inner layer of shaft liner). Apparent mold growth was identified on the backing of drywall located at the perimeter wall (at a column/cross member) also. This drywall was remediated previously. On the fourth level (428) drywall was removed from one wall of the elevator shaft wall. Minimal apparent mold growth was noted only on the back surface of the inner layer of fire rated drywall (inner layer of shaft liner) which corresponded specifically with an area of discoloration at the front corner (at floor level) of the elevator shaft liner.

The walk-through inspection included other levels of the tower and the first and second floor of the base building. There were no current signs of moisture intrusion with the exception of the roof leak in the second floor corridor adjacent to the janitor closet/roof access. The roof leak appeared to be at a roof drain. There were no signs of apparent mold growth. A moldy or musty odor was not noted in the base building. The existing built-up roof is composed primarily of fiberglass and asphalt products. The existing metal decking appeared intact at several inspection points.

BIOAEROSOLS

Bioaerosols are airborne particles that are living or that are released from living organisms. These living particles include fungi, bacteria, and plant pollens. Many of these particles have been implicated in human respiratory and skin allergies, hypersensitivity reactions and toxic effects.

Fungal spores and other viable particles may enter a space through the outside air intakes and due to their small size, are not effectively eliminated from the air stream by the air filtration system. Once they have settled out of the air stream, the spores may grow almost anywhere within a building where conditions permit. Optimal conditions include: a surface for growth, organic nutrients, darkness, and moisture. These conditions are often provided in the indoor environment. Areas in which microorganisms may proliferate or bioamplify include internal surfaces of air handling units and ducts, especially if insulated, ceiling tiles (wet or moist), carpet, and areas which remain dark, seldom cleaned, or congested with furniture and office materials.

Indoor environmental bacterial populations can be from humans as well as environmental sources. All humans shed skin flakes and bacteria. Commonly detected bacteria in indoor environments such as *Micrococcus* and *Staphylococcus* likely originate from human sources. Environmental bacteria such as *Bacillus* and *Pseudomonas* normally originate from soils, plants, or water.

Generally, there is insufficient evidence to show that bacteria are a cause of allergies. Exposure to significant concentrations of airborne bacteria could challenge an individual's immune system. However, bacterial byproducts (proteins and endotoxins) have been suggested as causative agents for occupant illnesses such as Monday morning fever. Monday morning fever is an allergic reaction to endotoxins produced by Gram negative bacteria such as *Pseudomonas* and *Flavobacterium.*

Fungi (molds and yeast) produce spores during their growth or reproductive cycle. The asexual and/or sexual spores are often considered allergens. It is not known what concentration of spores is required to evoke an allergic reaction. It is known, that individuals exposed intermittently to significantly elevated levels of allergens or moderate levels continuously for a time period (months or years) may become sensitized. An individual sensitized to an allergenic agent is said to have developed an allergy to that agent. Once sensitized, the individual experiences an allergic reaction at each time of exposure. The degree and extent of the reaction is dependent on the exposure concentration, the length of exposure and the individual. Therefore, a sensitized individual may react to relatively low and in some cases undetectable concentrations of allergens while a non-sensitized or less sensitized individual in the same indoor environment will not experience any symptoms.

Airborne fungi and bacteria naturally occur in most indoor environments. Currently, there are neither indoor air quality guidelines nor regulations for the determination of measured bioaerosol concentrations. However, excessive numbers or unusual types of microorganisms may cause health problems in sensitive individuals. Interpretation of such sample results depends on professional judgment as to whether types and amounts of organisms are comparable to normal background and the likelihood that the identified organisms will cause allergic reactions or infections. Since spores are only released into the air intermittently, any visible growth, water damage, or excessive dust may be considered an indication of potential bioaerosol problems, even where air sampling results are negative.

Bioaerosol samples were collected at five tower levels, two base building locations, and outdoors for comparison. The sampling was conducted at two time periods beginning at approximately 8:30 AM and 11:30 AM. The detected fungal concentrations for the first sampling period were insignificant. The indoor concentrations were less than the outdoors. However, the fungus, *Stachybotrys* was detected on the ninth and fourth unoccupied levels. Although this fungus is common in the environment it should not be present in the indoor environment. If detected, it is an indicator of chronic water intrusion and colonization of cellulose based building materials. The detection of *Stachybotrys* could have been due to the disturbance created during drywall panel removal to facilitate wall cavity inspections. *Stachybotrys* produces a sticky spore that does not readily become airborne unless physically disturbed. Exposure to *Stachybotrys* would not present any more of a health hazard then exposure to any other fungus in which an individual has become sensitized. Again, the degree and extent of the reaction is dependent on the exposure concentration,

the length of exposure, and the individual. The detected environmental bacteria concentrations were insignificant. The primary bacteria detected were human associated.

The detected fungal concentrations for the second sampling period were insignificant. Two colonies of *Stachybotrys* were detected on the fourth level. The detected environmental bacteria concentrations were insignificant. The primary bacteria detected were human associated. A full listing of sites sampled, species found, and concentration of each can be found in Appendix A.

SPORE SAMPLING

Spore samples were collected at five tower levels, two base building locations, and outdoors for comparison. The sampling was conducted at two time periods beginning at approximately 8:30 AM and 11:30 AM. Indoor spore concentrations were lower than the outdoor concentration. The sample locations and concentrations are summarized in the attached table 2.

CARBON DIOXIDE

Carbon dioxide is a colorless, odorless, non-combustible gas that is a natural by-product of human respiration, fermentation, and combustion. Carbon dioxide has many important functions in maintaining normal body activities and is a key factor in the control of respiration and cerebral circulation. Plants consume carbon dioxide. As a result of the production consumption process, an atmospheric carbon dioxide concentration of 300 parts per million is typical.

The carbon dioxide data was used to determine the effectiveness of the ventilation system in supplying outside air to the indoor environment. NIOSH recommends to prevent employee discomfort, average carbon dioxide concentrations should not exceed 1,000 ppm. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) recommends that indoor carbon dioxide concentrations should not be in excess of 700 ppm over the outdoor concentration.

Average carbon dioxide concentrations were within the ASHRAE recommendation. The average carbon dioxide concentration for each sampling location was as follows:

Location	CO2 Average
Tower cab	455
Tower break room	595
Tower union office	657
Level 928	671
Level 428	817
TRACON	690
Base – 1st floor office (near 109)	515
Outdoors	375

ASHRAE recommends that office workers be supplied with 20 cubic feet per minute of outside air per occupant, in order to maintain acceptable carbon dioxide levels. This is based on an occupancy rate of seven occupants per 1,000 square feet (143 sq. ft./occupant) of floor space. The supplied cubic footage per minute of outside air per occupant may be determined with detected carbon dioxide levels with the use of the following ASHRAE derived equation:

$$\text{cfm / person} = \frac{10{,}500}{CO_2\ (\text{indoor}) - CO_2\ (\text{outdoor})}$$

Carbon dioxide levels below 900 ppm, based on a 375 ppm outdoor concentration would indicate sufficient outside air was introduced at or above 20 cfm/person.

CARBON MONOXIDE

Carbon monoxide (CO) is one of the most prevalent of all indoor air pollutants, introduced into a building from combustion sources. Indoor sources for air contamination can be produced from tobacco smoke, improperly vented combustion sources, or from leaking heat exchangers.

OSHA has established a PEL of 50 parts of CO per million parts of air for an 8-hour industrial exposure. At this level of exposure, it is felt that most people will not experience any adverse health effects. The ambient air quality standard for CO, set by the U.S. Environmental Protection Agency (EPA), is 9 ppm and is considered more appropriate for application to office environments.

The average carbon monoxide concentrations at each sampling location (identical to carbon dioxide locations) were consistently less than 5.0 ppm.

TEMPERATURE AND RELATIVE HUMIDITY

The primary functions of a building's ventilation system are to control temperature and humidity and to provide clean outdoor air for the dilution of odors and air contaminants. ASHRAE Standard 55-1992: *Thermal Environmental Conditions for Human Occupancy* is utilized for guidance on air temperatures, relative humidity, air movement and other thermal comfort parameters. Many complaints of poor air quality are actually caused or exacerbated by temperature and/or humidity values outside of the normal comfort ranges of 73-79°F and 40-60% humidity for summer or 68-74.5°F and 30-50% humidity for winter. The temperatures and relative humidity are summarized in the following table.

Location	Average Temperature (°F)	Average Relative Humidity (%)
Tower cab	72.1	28
Tower break room	73.1	29
Tower union office	75.2	30
Level 928	74.3	29
Level 428	70.7	35
TRACON	75.9	29
Base – 1st floor office (near 109)	74.9	25
Outdoors	72.1	25

The average temperatures were within or insignificantly below the ASHRAE recommended range for summer (73-79°F). The average relative humidity was within or insignificantly below the ASHRAE recommended range of 40-60% for summer.

AIRBORNE PARTICULATE

Airborne particulate sampling was conducted at each sampling location (same as bioaerosols). This sampling was conducted as a screening to indicate the possibility that airborne mold spores were present in the indoor environment in lieu of other sampling techniques. Generally, the physical size of mold spores is in the range of 3 to 10 microns.

The particle counter counts particles in six size ranges. The detected particle counts, in each size range, are summarized in the attached table. The particle count for each size range and at each location was not significant when compared to the outdoors. During the AM sampling period there was an increase at the fourth and ninth levels; however, it occurred in all six ranges and was believed to be related to the resultant dust generated by removal of drywall panels and by individuals walking in the room. The same scenario appeared to have affected the PM sampling results.

VENTILATION
Dilution ventilation is used to control indoor air contaminants such as carbon dioxide, water vapor, particulate matter, biological aerosols and volatile organic compounds.

The ventilation of the tower (occupied levels) is provided by one unit located in a mechanical room on the junction level. Outside air is provided to the unit. The general condition of the unit was good. The filters (charcoal and pleated) were properly installed. Reportedly the pleated filters are changed quarterly and the charcoal filters changed approximately every six months. FAA has an O&M plan in place for unit maintenance and cleaning. The base building ventilation is provided by a roof mounted unit. Outside air is provided to the unit. Reportedly the pleated filters are changed quarterly. O&M procedures are completed at regularly scheduled intervals.

CONCLUSIONS/RECOMMENDATIONS

The inspection of wall cavities on the fourth and ninth floors revealed that apparent mold growth is present in the ATCT. The location of the apparent mold growth observed and the previously abated contaminated drywall was likely caused by water intrusion. Based on the Jacobs Engineering inspection report water/moisture was able to enter the tower shaft at joints in the pre-cast concrete panels where deteriorated caulking and backer rod was unable to prevent moisture intrusion. The likely scenario is that water pooled on a given level's concrete floor and through wicking action was taken into the drywall thus allowing mold colonization. Furthermore, it is likely that the introduction of moisture laden air into the tower environment caused condensation to occur and further add moisture to the drywall. The surface mold previously observed and subsequently removed from the elevator shaft liner could have been due to condensation and/or poor moisture/temperature control of the elevator shaft environment.

Several corrective actions have been completed in the ATCT. Mold contaminated drywall was removed from several unoccupied levels of the tower. The exterior surface of the ATCT and base building were sealed with a moisture resistant sealant. Deteriorated caulking and backer rod was removed from pre-cast joints and replaced. Heaters have been installed and ventilation system modifications have been completed in an effort to control and or prevent condensation in the ATCT and moisture and temperature sensors were installed to monitor conditions in the elevator shaft and unoccupied tower levels. Also, cab roof leaks were sealed.

Based on the corrective actions completed thus far, the bioaerosol sampling results obtained during this survey, and the location of apparent mold growth it is suspected that FAA employees are not exposed to significant bioaerosol concentrations. Apparent mold growth was not noted on outward surfaces of drywall in the elevator shaft or on unoccupied level walls. The identified apparent mold growth was located between layers of intact drywall and in unoccupied areas. The unoccupied

areas are not serviced by existing ventilation systems currently servicing occupied levels of the tower and totally independent from the base building ventilation systems. The only connection would be the air moved through the piston action of the elevator car in the elevator shaft which contains relief vents allowing air to be discharged at the top and bottom of the shaft.

Based on the sampling results and observations the following recommendations are offered.

- Perform comprehensive inspection of the elevator shaft drywall liner to identify mold contamination.

- Completely remove (plus one foot beyond visible contamination) any porous material, such as drywall, which is visibly contaminated with mold or stained. Do not attempt to clean porous materials. Clean remaining non porous substrates, and replace building materials as necessary. A water/detergent solution with a stiff bristle brush is sufficient followed by rinsing with water/detergent solution. Chemical biocides are not recommended. The remediation must be conducted in a similar manner as asbestos abatement and as previously performed on the third, fourth, and ninth unoccupied levels of the ATCT. Containments should be constructed with restricted access. A negative pressure/air filtration system must be installed and the system should be exhausted to the tower staircase. The removal and cleaning process should not be conducted until negative pressure has been established in each containment. Also, the placement of contact paper (one side sticky) over apparent mold growth prior to physical removal of drywall will minimize the amount of airborne spores and fungal particulate. The collection of spore trap samples can be used for containment clearance purposes; however, there is no substitute for a thorough visual inspection at the completion of the abatement process. The abatement process should be conducted overnight when minimal FAA employees are present.

- Proceed with the base building roof replacement. The roof must be replaced as it is the major source of water intrusion remaining. A rubber membrane roof with heat sealed seams has been specified. Evaluate material safety data sheets for all materials to be used for the roof replacement and ensure adequate control measures are in place and implemented to prevent infiltration of airborne volatile organic compounds likely to be generated from the roof replacement process. Consideration should be given to conducting the roof replacement during night hours.

- Remove drywall from unoccupied levels of the ATCT other than drywall necessary to maintain the required fire rating of the elevator shaft. If it is necessary to install drywall on unoccupied levels of the ATCT; replace drywall currently in contact with concrete floors with drywall installed with at least a one half inch gap or provide a strip of silicone caulking at the concrete/drywall junction to prevent condensation and/or moisture intrusion from wicking into the drywall.

- Alternatively, evaluate the fire rating for cement or backer board or mold resistant drywall now commercially available to be used as a substitute material for the removed drywall. Install a two foot high strip (from the floor) of a substitute material for walls located on unoccupied tower levels.

- Remove and discard the existing carpet in the former union office located in the tower.

- Monitor temperature and moisture levels in the elevator shaft and unoccupied levels and implement corrective actions as necessary to prevent condensation on surface materials.

- Continue to inspect the ATCT on a regular basis and remove and replace water damaged building materials as necessary.

Table 1
Bioaerosol Sampling Results
Detroit ATCT
May 19-20, 2008

Location	Fungal/Bacterial ID	Colony Counts	Concentration (cfu/m^3)
Tower Cab (AM)	No Growth	<1	
	Total Fungi	**<1**	**<7**
	Coag-negative Staphylococcus species	2	14
	Micrococcus species	2	14
	Total Bacteria	**4**	**28**
Tower Break room (AM)	No Growth	<1	
	Total Fungi	**<1**	**<7**
	Coag-negative Staphylococcus species	2	14
	Micrococcus species	3	21
	Total Bacteria	**5**	**35**
Union Office (tower)	Non-sporulating colony	1	7
	Total Fungi	**1**	**7**
	Micrococcus species	10	70
	Total Bacteria	**10**	**70**
Level 928	Penicillium species	5	35
	Stachybotrys species	7	49
	Ulocladium species	3	21
	Total Fungi	**15**	**105**
	Bacillus species	6	42
	Coag-negative Staphylococcus species	6	42
	Micrococcus species	12	85
	Total Bacteria	**24**	**169**
Level 428	Cladosporium species	2	14
	Penicillium species	2	14
	Stachybotrys species	1	7
	Ulocladium species	1	7
	Total Fungi	**6**	**42**
	Coag-negative Staphylococcus species	7	49
	Micrococcus species	7	49
	Total Bacteria	**14**	**98**
TRACON	Rhizopus species	1	7
	Total Fungi	**1**	**7**
	Coag-negative Staphylococcus species	3	21
	Micrococcus species	4	28
	Total Bacteria	**7**	**49**
Base Building 1st Floor office	Aspergillus versicolor	1	7
	Cladosporium species	1	7
	Total Fungi	**2**	**14**
	Coag-negative Staphylococcus species	2	14
	Micrococcus species	7	49
	Total Bacteria	**9**	**63**

Table 1 (continued)
Bioaerosol Sampling Results
Detroit ATCT
May 19-20, 2008

Location	Fungal/Bacterial ID	Colony Counts	Concentration (cfu/m^3)
Outdoors (roof)	Alternaria species	2	14
	Aspergillus fumigatus	2	14
	Cladosporium species	12	85
	Non-sporulating colonies	4	28
	Total Fungi	**20**	**141**
	Bacillus species	6	42
	Coag-negative Staphylococcus species	3	21
	Total Bacteria	**9**	**63**
Tower Cab (PM)	No Growth	<1	
	Total Fungi	**<1**	**<7**
	Coag-negative Staphylococcus species	1	7
	Total Bacteria	**1**	**7**
Tower Breakroom (PM)	Coelomycete species	1	7
	Rhodotorula species	1	7
	Total Fungi	**2**	**14**
	Coag-negative Staphylococcus species	5	35
	Micrococcus species	3	21
	Total Bacteria	**8**	**56**
Union Office (tower)	Cladosporium species	2	14
	Total Fungi	**2**	**14**
	Coag-negative Staphylococcus species	13	92
	Micrococcus species	5	35
	Total Bacteria	**18**	**127**
Level 928	Non-sporulating colony	1	7
	Stachybotrys species	2	14
	Ulocladium species	2	14
	Total Fungi	**5**	**35**
	Coag-negative Staphylococcus species	6	42
	Micrococcus species	8	56
	Total Bacteria	**14**	**98**
Level 428	Cladosporium species	2	14
	Penicillium species	1	7
	Ulocladium species	1	7
	Total Fungi	**4**	**28**
	Coag-negative Staphylococcus species	7	49
	Micrococcus species	10	70
	Total Bacteria	**17**	**119**
TRACON	Ulocladium species	1	7
	Total Fungi	**1**	**7**
	Coag-negative Staphylococcus species	5	35
	Micrococcus species	1	7
	Total Bacteria	**6**	**42**

Table 1 (continued)
Bioaerosol Sampling Results
Detroit ATCT
May 19-20, 2008

Location	Fungal/Bacterial ID	Colony Counts	Concentration (cfu/m^3)
Base Building 1st Floor office	Yeast	1	7
	Total Fungi	**1**	**7**
	Coag-negative Staphylococcus species	3	21
	Micrococcus species	2	14
	Total Bacteria	**5**	**35**
Outdoors	Alternaria species	2	14
	Cladosporium species	12	85
	Non-sporulating colonies	2	14
	Penicillium species	1	7
	Yeast	1	7
	Total Fungi	**18**	**127**
	Coag-negative Staphylococcus species	219	1,542
	Total Bacteria	**219**	**1,542**

Table 2
Spore Sampling Results
Detroit ATCT
May 19-20, 2008

Location	Presumptive Fungal ID	Counts of Fungal Structures	Fungal Structures/m^3
Tower Cab (AM)	None	<1	Total: <13
Tower Breakroom (AM)	None	<1	Total: <13
Union Office (tower)	Cladosporium	2	Total: 27
Level 928	Alternaria	1	
	Penicillium/Aspergillus group	6	
	Stachybotrys	1	
	Unknown	1	Total: 119
Level 428	Alternaria	1	
	Cladosporium	2	Total: 40
TRACON	Smuts,Periconia,Myxomycetes	2	Total: 27
Base Building 1st Office Floor	None	<1	Total: <13
Outdoors (base roof)	Ascospores	5	
	Basidiospores	36	
	Cladosporium	7	
	Epicoccum	1	
	Hyphal Elements	4	
	Penicillium/Aspergillus group	2	
	Smuts,Periconia,Myxomycetes	3	Total: 773
Tower Cab (PM)	Algae	1	
	Basidiospores	1	
	Smuts,Periconia,Myxomycetes	2	Total: 53
Tower Breakroom (PM)	Penicillium/Aspergillus group	1	Total: 13
Union Office (tower)	Basidiospores	1	
	Cladosporium	2	
	Hyphal Elements	1	
	Smuts,Periconia,Myxomycetes	1	Total: 66
Level 928	Alternaria	1	
	Cladosporium	1	
	Hyphal Elements	1	
	Penicillium/Aspergillus group	1	
	Stachybotrys	1	Total: 65
Level 428	None	0	Total: <13
TRACON	Basidiospores	1	Total: 13
Base Building 1st Floor Office	Penicillium/Aspergillus group	2	
	Smuts,Periconia,Myxomycetes	1	Total: 40
Outdoors	Ascospores	7	
	Basidiospores	43	
	Cladosporium	5	
	Colorless	1	
	Smuts,Periconia,Myxomycetes	4	Total: 799

Table 3
Particle Count
Detroit ATCT
May 19-20, 2008

Location (AM)	Particle Size (micron)					
	0.3-0.5	0.5-1	1-3	3-5	5-10	>10
Tower Cab	3521	272	98	56	35	27
Tower Breakroom	5978	356	115	40	19	22
Union Office	9388	736	515	284	206	113
Level 928	12732	1714	1331	819	584	206
Level 428	22146	3825	2964	1769	1198	301
TRACON 212	5394	212	70	30	22	29
109	6558	324	163	111	90	29
Outside	52939	2501	385	103	66	19

Location (PM)	Particle Size (micron)					
	.3-.5	.5-1	1-3	3-5	5-10	>10
Tower Cab	9555	1073	167	48	42	10
Tower Breakroom	7172	752	277	105	70	26
Union Office	9985	780	426	252	185	97
Level 928	10707	640	243	128	112	44
Level 428	362088	182537	174390	103522	85340	35466
TRACON 212	1556757	92056	37464	16769	12131	3211
109	6054	406	200	113	92	32
Outside	73072	4256	286	105	91	10