



**COCHRANE VENTILATION INC.**

October 12, 2005

Mr. Bill Turner  
Turner Building Sciences LLC  
26 Pinewood Lane  
Harrison, ME 04040

**RE: 25 Sigourney Street - HVAC Hygiene Survey**

Dear Mr. Turner:

Please find enclosed the results of the HVAC Hygiene Survey conducted on Floors 6, 10, 12, 17, 18 and 19 of the building located at 25 Sigourney Street, Hartford, CT. The survey was conducted on October 12, 2005.

Should you have any questions or wish further assistance, please feel free to call us at 1-800-974-9055. Cochrane Ventilation Inc. appreciates the opportunity to work with you on this project.

Sincerely,

Michael J. Hickey

Michael Hickey  
Client Services  
800-974-9055

**State of Connecticut  
Office Building  
25 Sigourney Street  
Hartford, CT**

**HVAC Hygiene Survey**

October 12, 2005

**Project # 8473**

**Prepared by**

**Cochrane Ventilation Inc.**

**Phone: 800-974-9055    Fax: 978-657-0303**

[www.cochraneventilation.com](http://www.cochraneventilation.com)

*TABLE OF CONTENTS*

<b>PROJECT SCOPE</b>	<b>1 - 2</b>
<b>FINDINGS</b>	<b>3 - 4</b>
<b>RECOMMENDATIONS</b>	<b>5 - 6</b>
<b>APPENDIX A</b>	<b>6</b>
<b>DUCT INSPECTION FINDINGS BY LOCATION</b>	<b>7 - 17</b>
<b>PHOTOGRAPHS</b>	<b>18 - 22</b>

## **PROJECT SCOPE**

Turner Building Science, LLC, of Harrison, Maine, contracted Cochrane Ventilation, Inc. to conduct a ventilation duct survey and perform microbial bulk and tape lift sampling from various duct systems within the subject building.

The project scope was to conduct a ventilation survey of selected areas of the HVAC system serving Floors 6, 10, 12, 17, 18 and 19 of the State of Connecticut Office Building located at 25 Sigourney Street, Hartford, CT. The purpose of the survey was to determine the relative condition and cleanliness of the selected systems and to use the information as a general overview for the HVAC system. Additionally, CVI collected bulk and tape lift samples from duct insulation in select areas to determine the presence, if any, of fungi or microbial matter.

Since ductwork is the conduit through which conditioned air is conveyed to the occupied space, inspection of ductwork interiors is one means of evaluating potential sources of indoor air pollutants.

Contaminants found within the ductwork can be a source of indoor air pollutants or can indicate the presence of sources that are contributing contaminants to the conditioned air stream. The location and identification of types and relative quantities of contaminants (especially water damage and particulates) are important clues in the identification of indoor air pollutant sources.

Although sampling for microbiological contamination in ductwork is available, it is costly and does not always provide useful information. Mold, fungus and bacteria are common to the natural environment and most tests will yield positive results depending upon test sensitivity. The determination of specific microbial levels is not typically useful because there have been no exposure limits established at this time. Typically, if there is visible microbial growth, it should be eliminated.

Signs of water damage are important to investigate because of the potential for microbiological proliferation in standing water located within ventilation systems. The source of water leaks into ductwork should be corrected since chemical content of standing water in ventilation ductwork can also have a significant impact on air quality. Usually when there has been water damage within sheetmetal ductwork there are accumulations of water scale adhered to the duct walls. This is from the mineral content generally found in water that remains as water evaporates. Unless this scale is loose and traveling through the system as airborne particulate, there is usually no further concern over this material.

Particulate contamination can enter the ventilation ductwork by two primary means. It can be introduced into ductwork during construction, renovation or maintenance procedures, or it can be entrained in the ductwork as airborne particulate contamination in the ventilation air stream.

It is normal to find some degree of particulate contamination in ventilation ductwork and not all particulate is of concern to indoor air quality. All air delivered through the ductwork of ventilation systems is prone to airborne particulate contamination since no filtration system removes every particle, but only those larger than the matrix of the site specific filtering material.

Lighter particulate typically blows through a system to the termination points and into the room air unless it adheres to an obstruction in the airflow such as a turning vane, sheet metal screw, duct joint, etc. Heavier particles tend to drop out of the air stream when the energy in the air stream becomes insufficient to carry them. Also, heavier particles can be deposited where there are interruptions to smooth airflow that cause eddy currents within the ductwork such as bends, dampers, and branch duct take-offs.

The types of particulate mentioned above may be re-introduced into the air stream by specific events such as vibration and increases in air velocity.

A light film of gray dust on the interior bottom of ductwork is not unusual to find and is generally of little concern. This is typically comprised of normal airborne dust and leaves a transparent film that dulls the reflection of light.

## ***SUMMARY OF FINDINGS***

### **HVAC Ductwork**

The supply ductwork on Floors 6, 10, 12, 17, 18 and 19 was video surveyed along the two (2) main trunk lines that originate from the two (2) mechanical rooms (designated as North and South Mechanical Rooms) from each floor. The ducts on each floor are connected via a common loop that originates from the two mechanical rooms. CVI recorded video imagery from the Floors 6, 10, 12 and 17 (North and South Mechanical Rooms) and Floor 18 North Mechanical Room. The fresh air intake shafts were also recorded from the 10<sup>th</sup> Floor (South) and 19<sup>th</sup> Floor (North) Mechanical Rooms. The images inside the supply ducts located in the 18<sup>th</sup> Floor (South) and 19<sup>th</sup> Floor (North and South) Mechanical Rooms were not recorded due to technical problems.

Twelve (12) tape lift samples (two per floor) were collected from the fibrous glass insulation located within the supply discharge plenum, located between each unit and the sound attenuation duct. Twelve (12) bulk samples were collected from the interior of the fibrous glass insulated rigid duct board located downstream from the fan-powered variable-air volume (VAV) boxes. The VAV boxes were selected at random (two per floor) along the perimeter of each floor.

An additional bulk sample was collected from the fibrous glass insulation located on the access panel above the coil compartment of the unit located in the 17<sup>th</sup> Floor North Mechanical Room.

Photographs were taken at each sample collection point. The analytical results of these samples will be provided by Turner Building Sciences, LLC, via an addendum to this report.

The duct system consists of oval medium velocity ductwork. The discharge plenum of each supply system is lined with fibrous glass insulation. The duct then goes through a perforated sound attenuation duct, then into oval duct, all of which is externally insulated with fibrous glass. The VAV boxes are connected to the main distribution ducts by standard sheetmetal ducts, also externally insulated. The duct system then changes to rigid duct board that distributes the conditioned air to the diffusers via flexible ducts. The duct board is manufactured of foil-faced fibrous glass, which is unlined.

Typically, the fibrous glass insulation located in the supply discharge plenums have minor to moderate damage in the form of exposed edges of fibrous glass that have not been sealed. This can lead to fibers being introduced into the air stream. Location #06 (12<sup>th</sup> Floor North) and Photos #09 and #10 show where the duct insulation has been separated and now is blown back on itself, exposing a large area of damaged fibrous glass.

Video Locations #01 and #02 (6<sup>th</sup> Floor North and South Mechanical Rooms) indicate minor dust accumulation in the supply ducts.

Locations #03, #04 (10<sup>th</sup> Floor North and South), #06, #07 (12<sup>th</sup> Floor North and South) and #10 (18<sup>th</sup> Floor North) show light to moderate levels of dust accumulation on the lower sides

of the oval duct. There also appears to be some form of moisture or oily residue build-up that may be collecting the dust.

Location #04 (10<sup>th</sup> Floor South) has some plastic utensils and a piece of wood in the duct. There is also some foreign material in a section of flex duct coming off the main duct.

Locations #08 and #09 (17<sup>th</sup> Floor North and South) indicate light dust accumulations and scattered concrete debris present. It has been reported that the 17<sup>th</sup> Floor ducts were previously cleaned. It is not known when this work took place or who performed the work. The video indicates small sheetmetal patches and plastic plugs located throughout the ducts, which are typical of duct cleaning activities. Metal shavings were also noted at the plastic plug access locations.

Locations #05 (10<sup>th</sup> Floor South) and #11 (19<sup>th</sup> Floor North) are images of the fresh air shafts that run from the rooftop fan units down through the building. These appear to be in good overall condition.

Photos #16 and #17 (17<sup>th</sup> Floor North) are of suspected microbial growth located on the fibrous glass insulation located on the top panel of the air handler unit, above the coil compartment (reference bulk sample #14).

### **HVAC Unit**

The individual HVAC units were not assessed, as they were not included in the scope of this project.

## RECOMMENDATIONS

Cochrane Ventilation Inc. makes the following recommendations regarding the areas observed during the survey. All recommendations are based on the "Building Air Quality Action Plan" prepared by the US Environmental Protection Agency (USEPA) and National Institute for Occupational Safety and Health (NIOSH); and the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 62-1999 "Ventilation for Acceptable Indoor Air Quality" and 55-1992 "Thermal Environmental Conditions for Human Occupancy," as well as observations and measurements recorded at the time of the investigation.

### **HVAC Ductwork**

The condition of the HVAC supply ductwork varied from floor to floor. The light gray film that is visible on the duct surfaces is typical and is to be expected. Cleaning of the ductwork is unlikely to yield any measurable improvement in system performance or overall indoor air quality provided that the settled material is only nuisance dust as defined by the American Industrial Hygiene Association.

The oily residue seen at Locations #03, #04 (10<sup>th</sup> Floor North and South), #06, #07 (12<sup>th</sup> Floor North and South) and #10 (18<sup>th</sup> Floor North) should be investigated to determine the residues makeup and source.

CVI recommends the condition of the internal fibrous glass insulation be evaluated for structural stability and fiber shed. If it is determined that the fiberglass is shedding the State of Connecticut may wish to consider replacing the insulation or, as a short term measure, coating the interior surface to reduce fiber shedding.

Sampling and testing of materials other than suspected microbial growth inside the ducts was beyond the scope of this survey.

### **ADDITIONAL RECOMMENDATIONS:**

Consideration should be given to preparing an overall Indoor Air Quality Management Program, which will address all facets of facility management that could have an effect on indoor air quality issues. Some of the programs' components include facilities management training, outside contract vendors such as HVAC Contractors, Pest Management, and Housekeeping, in addition to procedures for renovations and systems balancing. After any modifications, adjustments or changes to the building systems, the impact and performance of the systems should be verified through commissioning to ensure that the goals of the service work have been achieved and the building systems are performing as expected.

CVI recommends the formulation of an overall proactive HVAC Hygiene Program as recommended by EPA, NFPA, and ASHRAE. The purpose of such a program is to integrate preventative maintenance practices with inspections and documentation of the air handling units and ductwork. Development of this integrated program can be phased in over a specified period. This will allow the facility to have an ongoing dynamic plan, which addresses specific components without requiring large capital appropriations.

The annual audit will include inspection of each air handler unit (AHU), along with its supply and return ductwork to ensure overall system hygiene, and to identify components that may need immediate attention.

## **APPENDIX A**

### **DIRTY DIFFUSERS ARE NO REASON TO CLEAN YOUR HVAC SYSTEM**

A common misconception is that dirty streaks on ceiling tiles around registers and diffusers means the ductwork is dirty when in fact the condition of the ductwork may be having no impact on the dirty ceiling tiles.

Dust and dirt around diffusers indicates that the air in the room is dirty but does not give any direct indication as to the source of the dust and dirt.

To illustrate, air, like water, is a highly mobile fluid. Both possess the same characteristics when it comes to physics and fluid dynamics. If the air in the ductwork is clean and the air in the room is dirty, the ducted air displaces the dirty room air as it exits the diffuser, setting the room air in motion. The dirty room air is forced away from the clean, ducted air and impacts on nearby surfaces such as walls, ceilings, etc. The force and angle of the ducted area will determine the size of the affected area. This same effect will take place at any point in the HVAC system from which air is exiting including leaky duct joints and holes.

To further illustrate the relationship between dirty diffusers and dirty room air, walk through the building and look at the vents. You will see that those vents located where there is the greatest source of room dust are dirtier than vents served by the same HVAC system in areas where there are lesser sources of dust. Photocopy rooms, loading docks and lobbies are examples of areas where the air is often dirtier, as will be the diffusers.

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 01 -State of Connecticut Office Building  
AREA SERVED: 6<sup>th</sup> Floor North Mechanical Room  
UNIT: 6N

---

Particulate: Observed minor dust accumulation  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damages - exposed edges  
Reheat Coil: N/A  
Additional Observations:

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 02 - State of Connecticut Office Building  
AREA SERVED: 6<sup>th</sup> Floor South Mechanical Room  
UNIT: 6S

---

Particulate: Observed minor dust accumulation  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damage - exposed edges  
Reheat Coil: N/A  
Additional Observations:

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 03 - State of Connecticut Office Building  
AREA SERVED: 10<sup>th</sup> Floor North Mechanical Room  
UNIT: 10N

---

Particulate: Moderate particulate with signs of moisture  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damage - exposed edges  
Reheat Coil: N/A  
Additional Observations:

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 04 - State of Connecticut Office Building  
AREA SERVED: 10<sup>th</sup> Floor South Mechanical Room  
UNIT: 10S

---

Particulate: Moderate particulate with signs of moisture  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damage – exposed edges  
Reheat Coil: N/A  
Additional Observations: Observed plastic utensils & pieces of wood in duct. Observed material in flex duct.

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 05 - State of Connecticut Office Building  
AREA SERVED: 10<sup>th</sup> Floor South Mechanical Room  
UNIT: Fresh Air Shaft

---

Particulate: N/A  
Rust: N/A  
Water Damage: N/A  
Structural Integrity: Good  
Fibrous Glass: N/A  
Reheat Coil: N/A  
Additional Observations:

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 06 - State of Connecticut Office Building  
AREA SERVED: 12<sup>th</sup> Floor North Mechanical Room  
UNIT: 12N

---

Particulate: Moderate particulate with signs of moisture  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Large pieces of insulation are loose on one end and has been flipped over by the air flow.  
Reheat Coil: N/A  
Additional Observations:

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 07 - State of Connecticut Office Building  
AREA SERVED: 12<sup>th</sup> Floor South Mechanical Room  
UNIT: 12S

---

Particulate: Moderate particulate with signs of moisture  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damage – exposed edges  
Reheat Coil: N/A  
Additional Observations:

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 08 - State of Connecticut Office Building  
AREA SERVED: 17<sup>th</sup> Floor North Mechanical Room  
UNIT: 17N

---

Particulate: Light dust, observed concrete debris  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damage – exposed edges  
Reheat Coil: N/A  
Additional Observations: 17<sup>th</sup> Floor previously cleaned - no report available. Observed plastic access plugs and metal shavings.

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 09 - State of Connecticut Office Building  
AREA SERVED: 17<sup>th</sup> Floor South Mechanical Room  
UNIT: 17S

---

Particulate: Light dust, observed concrete debris  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damage – exposed edges  
Reheat Coil: N/A  
Additional Observations: 17<sup>th</sup> Floor previously cleaned - no report available. Observed plastic access plugs and metal shavings.

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 10 - State of Connecticut Office Building  
AREA SERVED: 18<sup>th</sup> Floor north Mechanical Room  
UNIT: 18N

---

Particulate: Light dust, some signs of possible moisture  
Rust: None observed  
Water Damage: None observed  
Structural Integrity: Good  
Fibrous Glass: Minor damage – exposed edges  
Reheat Coil: N/A  
Additional Observations: 18<sup>th</sup> Floor drawing missing

## DUCT INSPECTION WORKSHEET

DATE: 10-12-05  
CLIENT: Turner Building Sciences LLC - 8473  
LOCATION: 11 - State of Connecticut Office Building  
AREA SERVED: 19<sup>th</sup> Floor North Fresh Air Shaft  
UNIT: 19N

---

Particulate: N/A  
Rust: N/A  
Water Damage: N/A  
Structural Integrity: Good  
Fibrous Glass: N/A  
Reheat Coil: N/A  
Additional Observations:



Picture #1  
6<sup>th</sup> Floor, North Mech. Room  
Supply Duct



Picture #2  
6<sup>th</sup> Floor, South Mech. Room  
Supply Duct



Picture #3  
6<sup>th</sup> Floor VAV Box  
Blue Dot #5



Picture #4  
6<sup>th</sup> Floor VAV Box  
Blue Dot #10



Picture #5  
10<sup>th</sup> Floor North Mech. Room  
Supply Duct



Picture #6  
10<sup>th</sup> Floor South Mech. Room  
Supply Duct



Picture #7  
10<sup>th</sup> Floor VAV Box  
Blue Dot #31



Picture #8  
10<sup>th</sup> Floor VAV Box  
Blue Dot #14



Picture #9  
12<sup>th</sup> Floor North Mech. Room  
Supply Duct, Torn Insulation



Picture #10  
12<sup>th</sup> Floor North Mech. Room  
Supply Duct, Torn Insulation



Picture #11  
12<sup>th</sup> Floor South Mech. Room  
Supply Duct



Picture #12  
12<sup>th</sup> Floor VAV Box #38



Picture #13  
12<sup>th</sup> Floor VAV Box #10 - Coil



Picture #14  
12<sup>th</sup> Floor VAV Box #10



Picture #15  
17<sup>th</sup> Floor North Mech. Room  
Supply Duct



Picture #16  
17<sup>th</sup> Floor North Mech. Room  
Top of Coil



Picture #17  
17<sup>th</sup> Floor North Mech. Room  
Top of Coil



Picture #18  
17<sup>th</sup> Floor South Mech. Room  
Supply Duct



Picture #19  
17<sup>th</sup> Floor VAV Box  
in the Main Lounge



Picture #20  
17<sup>th</sup> Floor VAV Box #38



Picture #21  
18<sup>th</sup> Floor North Mech. Room  
Supply Duct



Picture #22  
18<sup>th</sup> Floor South Mech. Room  
Supply Duct



Picture #23  
18<sup>th</sup> Floor VAV Box #29  
(North of Room 1829)



Picture #24  
18<sup>th</sup> Floor VAV Box #12  
(South of Room 1811)



Picture #25  
18<sup>th</sup> Floor VAV Box #12  
(South of Room 1811)



Picture #26  
19<sup>th</sup> Floor North Mech. Room  
Supply Duct



Picture #27  
19<sup>th</sup> Floor VAV Box  
(South of Room 1915)



Picture #28  
19<sup>th</sup> Floor VAV Box  
(South of Room 1915)



Picture #29  
19<sup>th</sup> Floor South Mech. Room  
Supply Duct



Picture #30  
19<sup>th</sup> Floor VAV Box  
(West of Room 1938)