

# IAQ EVALUATION

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**Initial Wall Cavity Evaluation  
17<sup>th</sup>, 18<sup>th</sup>, & 19<sup>th</sup> Floors  
Tunxis Management Company  
25 Sigourney Street  
Hartford, Connecticut**

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APRIL 25, 2000

TURNER BUILDING SCIENCE, LLC

TURNER  
GROUP

MECHANICAL ENGINEERS • BUILDING SCIENTISTS • IAQ CONSULTANTS

**TURNER BUILDING SCIENCE, LLC**

PO BOX 89, US ROUTE 2, DANVILLE GREEN, DANVILLE, VERMONT 05828 TEL. (802) 684-2134 Fax (802) 684-2267

April 25, 2000

Ms. Vibha Buckingham  
Property Manager  
Tunxis Management Company  
25 Sigourney Street  
Hartford, CT 06103

Dear Ms. Buckingham:

**SUBJECT: Report on Initial IAQ Evaluation  
Tunxis Management Company  
Hartford, Connecticut  
TBS # 2335-01, 2335-02, & 2335-03**

In accordance with our approved scope of work, we are pleased to offer the following report of our observations and analysis of the spore trap samples collected during our recent evaluation of the top three floors of the office building at 25 Sigourney Street in Hartford, Connecticut. The work was performed in accordance with our proposal dated March 15, 2000 and our addendum dated March 28, 2000.

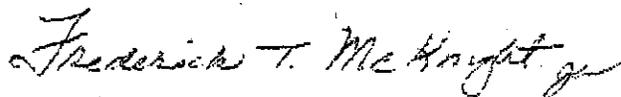
The focus of this work effort was to evaluate the potential mold sources and identify possible locations and extents where mold may be present within the wall structure. Our primary tool to identify likely locations was our visual observations conducted on site on March 29, 2000. We also reviewed logs maintained by the State of Connecticut, Department of Revenue Services and walked the perimeter of each of the subject floors with the building engineer who identified all the locations of past leaking of which he was aware.

The enclosed report is of a technical nature, therefore, the reader will need to have technical knowledge of the facility to properly evaluate the recommendations made herein. We have made some recommendations within the enclosed report for further study, analysis, and system modifications. With your approval, Turner Building Science LLC would be pleased to revise our approved scope of work to perform the recommended studies, analysis, and design work.

Turner Building Science, LLC has enjoyed the opportunity to serve as professional consultants to Tunxis Management Company. Please contact me if you have any questions or need further clarification of any items within this report. You can reach me at our Vermont office at (802) 684-2134.

Sincerely,

TURNER BUILDING SCIENCE, LLC



Frederick T. McKnight  
Chief Indoor Air Quality Engineer

FTM/jea

Enclosures

cc: William A. Turner, TBS

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## 1.0 INTRODUCTION AND EXECUTIVE SUMMARY

At the request of Ms. Vibha Buckingham, Property Manager, Turner Building Science, LLC conducted an initial mold source evaluation of the offices located on the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> floors of a large office building at 25 Sigourney Street, Hartford, Connecticut. This report concludes all currently approved site work, tests and measurements as outlined in our approved scope of work. We have made some recommendations for improvement, as well as some for further testing and study. We are available to perform any of our recommended testing, studies, or design. The completion of all the recommendations made herein could be expected to improve the indoor air quality of the facility. However, in the event that occupant symptoms do not subside, further evaluation may be required.

In essence, our observations and testing lead us to believe that some microbial sources, possibly amplified sources located within the wall cavities, may be exacerbating existing reported respiratory conditions in some occupants. Further, inappropriate building space pressures may also be a factor in the possible migration of contaminants and nuisance odors on the subject floors. Determining the current total ventilation rate, as well as measuring building operating pressures under a variety of expected operating conditions, and additional testing to isolate possible contaminants and nuisance odors are recommended herein. Further, mitigation efforts to remove known and suspect microbial sources from the building wall components are also recommended.

We have summarized our recommendations in the listing below:

**Recommendation #1: Stop All Known Water Leaks**

**Recommendation #2: Eliminate Mold Sources from within the Walls of the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> Floors**

**Recommendation #3: Mitigation Work Area Isolation and Containment**

**Recommendation #4: Optional Further Wall Cavity Sampling**

**Recommendation #5: Carpet Treatment**

**Recommendation #6: Change Building Operating Pressure**

**Recommendation #7: Further Sampling and Information Gathering**

## 2.0 INITIAL SCOPE OF WORK

It is also our understanding that water-damaged baseboard panels are suspect of harboring mold amplification sites in certain areas on the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> floors of the facility.

During this initial one-day on-site evaluation, we met with appropriate representatives who were familiar with the suspect areas, reviewed reports that were generated by others regarding evaluation of molds, and reviewed building plans and HVAC (air-handling) plans of equipment that served the areas.

While on site, we also collected spore trap samples from wall cavities utilizing minimal intrusive procedures that include drilling a 3/8" hole in the wallboard. (Note: We are not responsible for repairs required to patch holes made for evaluation purposes.)

### Additional Scope Covered in Our Addendum

The additional work includes spore trap sampling, completed on March 20, 2000; additional site work to map all water intrusion areas on the 17<sup>th</sup>, 18<sup>th</sup> and 19<sup>th</sup> floors that were visible on March 29, 2000 and known to Tunkis Management Company; and attendance at a site meeting on April 7, 2000.

We are not aware of any legal or workers compensation proceedings related to this situation. However, we are aware that data generated by our services could be utilized for such proceedings

### 3.0 BUILDING DESCRIPTION

The building at 25 Sigourney Street was built specifically as an office building. Reportedly, it was constructed in 1985. The building has 19 floors; the lower 6 floors are used for automobile parking. The State of Connecticut leases the top floors. In general, the building is a steel frame structure with concrete floors. The walls are a brick exterior façade with a cavity frame wall on the interior side. Identification of components between the brick façade and the interior frame wall are unknown. The inside finish of the cavity wall is painted gypsum wallboard. Windows are fixed, tinted, double glazed in bronze colored metal frames, assumed to be aluminum. The upper three floors (17, 18, & 19) have a number of terraces along the perimeter. The wall area in front of each terrace has a sliding glass door for access to the terrace. The building floor plan for the upper three floors is open, with building services in the core and office space on the perimeter. Each floor has a plenum ceiling (utilized as a return air plenum). The occupied space and the plenum are separated by a drop ceiling.

Reportedly, the mechanical system includes two air handlers per floor that feed VAV boxes throughout the floor. Outside air is introduced to each air handler from a common rooftop unit (common in that it feeds outside air to all air handlers).

#### 4.0 TESTS PERFORMED

##### **Microbial Growth in Buildings:**

Conditions which support microbiological growth are sources of food, such as skin scales and other organic materials, sources of moisture including condensation, roof leakage, foundation seepage, other unintended water intrusions, and moist or humid air (relative humidity above 70%), and comfortable temperatures (40°F or warmer). A few of the places where these conditions can be met inside a building include internal insulation of duct work and air handlers, carpeted slab on grade floors, cool moist concrete slabs, wall cavities or any porous building component that is first wet and is not actively dried out within a short time after wetting.

##### **Wall Cavity Sampling:**

Spore Trap samples were collected using a Zefon Air-O-Cell sampling cassette. Particles in the air were impacted and adhered to the sampling media contained in the cassette. A mass flow controlled pump calibrated at 15 liters per minute was used to collect the airborne spore sample. A sample volume of 45 liters was pumped through the cassette, using a 3-minute run time. In accordance with procedures that were initially developed by Aerotech Labs Inc., physical samples of airborne dust in wall cavities were collected in various suspect locations based on our visual observations. Aggressive sampling techniques were employed during the collection of wall air samples. Light finger tapping on the wallboard was the extent of the aggressive sampling technique. A control sample was also collected in an area reported not to have suffered water damage.

All collected samples were shipped to Environmental Microbiology Laboratory for processing. The spore trap samples were analyzed microscopically.

##### **Lab Processing:**

The spore trap samples are subjected to microscopic examination to evaluate the spores present in the sample. The spore concentration is reported in units of spores per cubic meter for each of the species of fungus identified and as a total of all species present. Wall cavity air samples should not be evaluated on the same basis as indoor air and outdoor air samples even if collected on similar Zefon Air-O-Cell sampling cassettes. The purpose of wall cavity sampling is to locate reservoirs as opposed to determining potential exposure. Sample results in the range of 10,000 ( $10^4$ ) and above suggest that amplified microbial sources may likely be present in the cavity.

The provided lab report can be reviewed in the Appendix A. Further discussion on the specifics of the samples collected for this project can be found in Section 5.

## **5.0 OBSERVATIONS AND RECOMMENDATIONS FOR IMPROVEMENTS**

### **5.1 Interviews and Meetings:**

While on site for our initial work effort, I met with Vibha Buckingham, Property Manager, and discussed the areas of concern and obtained information pertaining to the nature and location of the occupant complaints. Vibha also requested that we complete wall sampling during this visit.

I toured the upper three floors with the building engineer and observed a number of typical leakage locations. The building engineer reported the extent of the current set of repairs to the terraces and the coping (cap stones) on the parapet running along the perimeter of the roof. He also reported that the vast majority of leaks have now been stopped but some leaking still occurs at the windows, especially during wind driven rain events.

I attended a meeting with a number of occupants representing the building IAQ committee, the building engineer, the property manager, union representatives, and other health officials. The meeting resulted in a request that the perimeter be mapped to identify all leakage sites on the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> floors and to attend a meeting scheduled for April 7, 2000. The intent of the mapping was not only to locate known leakage sites but to also locate other visible water intrusion sites that may not be known to the facilities management.

We received verbal approval to proceed with the expanded scope of work. A written addendum dated March 28, 2000 was submitted outlining the additional scope and associated fees.

### **5.2 Wall Cavity Sampling:**

Wall cavity sampling was completed on March 20, 2000. The objective was to define preliminary extents of possible mold growth inside the wall at typical leakage sites. Three typical leakage sites were observed. The sites were: window walls with sliding glass door that opened out onto terraces; fixed full-height windows; and fixed partial-height windows. In all, thirteen samples were collected. Two of the selected sites where sampling was completed were observed to have visible mold growth on the base of the wall. These two sites were the window wall with a sliding door, and the full-height fixed window. The third site did not have any visible mold growth but displayed signs of water damage. A partial-height window, this site was reportedly typical of the areas known to still leak. The leak reportedly is at the top of the window. The fourth site where sampling was completed was a window site where no visible sign of water damage was observing and there was reportedly no known history of leaking occurred at the site.

Wall cavity samples were collected at:

- the base of the wall,
- at a height of approximately 25 to 35 inches above the floor
- and at a height approximately 40 to 50 inches above the floor.

At the site with the partial height window where the leak was reportedly at the top of the window, a fourth sample was collected at a height of approximately 60 to 70 inches above the floor.

#### **Test Results:**

The results of the sampling indicate that the bottom (base) of the wallboard at the window wall and full height windows is likely supporting mold growth within the wall cavity, especially where there are signs of past water intrusions. The leakage sites that occur at the top of windows are also likely to have mold growth within the wall close to the top of the window as well. Based on the current limited sample set, wall areas not known to have leaked on the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> floors may also likely be supporting mold growth within the wall cavity. NOTE: While the testing provides information about the extents of possible growth (height up the wall cavity), it does not provide information about the exact areas within the wall cavity that may be supporting mold growth. While it is likely (based on the reported species of mold) that the gypsum board is supporting mold growth, is also likely that the exterior sheathing layer (if it is composed of organic materials) is also supporting mold growth.

As part of the expanded scope of work, a day was devoted to observations of the complete perimeter of the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> floors. The building engineer accompanied me and we mapped all known and observed leakage sites. We located areas where we observed signs of past water damage on floor plans (see appendix B).

#### **Recommendation #1: Stop All Known Water Leaks**

We recommend that all known water leaks be repaired and made watertight. Mold growth, likely within the wall cavities and possibly present in the carpet at the perimeter, will continue to grow as long as there is a moisture source. We recommend stopping all leaks as soon as possible and before any mitigation efforts of wall cavities are implemented. It is our understanding that other experts are under contract to stop the remaining known leaks. It is our understanding that, in May of 2000, temporary measures will be implemented to address the remaining leak areas and that, in fiscal year 2001, a permanent repair of the known remaining leaks will be implemented.

#### **Recommendation #2: Eliminate Mold Sources from within the Walls of the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> Floors**

After successful completion of recommendation #1 above, based on the lab results of the current data set and under conditions of isolation and containment, we recommend, as a minimum, removal of all wallboard less than 30" above the floor on all three floors. We also recommend removal of wallboard at window areas observed to have been leaking at the top as indicated on the floor maps in our appendix B. The areas subject to leaking from the tops of windows should have the wallboard removed from the floor to the ceiling at least three (3) wall cavity spaces from the window. After removal of the interior side wallboard, cleaning and sanitizing, if applicable, of the remaining wall cavity surfaces should be completed. If the cavity surfaces are observed to be supporting mold growth and are not cleanable, removal of those surfaces should be completed. Do

not leave visible mold growth in the wall cavity. Porous, organic based materials are unlikely to respond favorably to cleaning and sanitizing and may require replacement in addition to the recommended replacement of the interior wallboard.

**Recommendation #3: Mitigation Work Area Isolation and Containment**

All wall mitigation work should be completed in a work area that has been isolated from the occupied spaces by a physical barrier. All occupant workstation furniture, files and other occupant belongings should be removed from the mitigation work area prior to the start of mitigation efforts. The mitigation workspace should be at a lower air pressure than all surrounding spaces during the entire mitigation process. Any air transferred from the mitigation work area to the occupied space (as a means to lower air pressure in the mitigation workspace) should be filtered through an HEPA filter. ✓

**Recommendation #4: Optional Further Wall Cavity Sampling**

Further wall cavity sampling can be completed and may result in reducing the area (and cost) of wallboard and wall cavity space that is recommended for mitigation and removal in recommendation #2 above.

**Recommendation #5: Carpet Treatment**

We understand that the carpets around the perimeter of the three floors are scheduled to be cleaned using an efficient extractor system to minimize wetting of the carpet. We also understand that the carpet will be dried (mechanically, if necessary) within 24 hours.

Note: Any water that seeps under the existing carpet tiles should be removed as part of the drying cycle. Then a mild biocide should be applied. If a musty carpet odor returns after completion of the cleaning, we recommend removal of the old carpet and replacement with new carpet.

**5.3 Building Pressures:**

Measurements of building operation pressures and observations were made of visible conditions indicating building pressure conditions on the 6<sup>th</sup> level of the parking garage, and the 17<sup>th</sup> and 19<sup>th</sup> floors.

After collecting wall cavity samples on the 19<sup>th</sup> floor, at location 1937, the wall cavity operating pressure was measured. Outside conditions were slightly breezy at ground level prior to the start of our activities. The wall cavity space was measured at slightly negative pressure with respect to the occupied space but not significantly so (less than a Pascal). When nearby doors were opened or closed, the wall cavity went positive with respect to the occupied space. During these measurements, the HAVC was on and reportedly operating normally. Other operating parameters of the system were not known.

After completing sampling on the 17<sup>th</sup> floor, similar wall cavity measurements were taken. The wall cavity was significantly higher in pressure than the occupied space. (The occupied space was negative with respect to the wall cavity.) During these measurements, the HVAC system was in night cycle (off).

During the site visit when leak mapping was completed (March 29, 2000), the door between the building and the parking garage on the 6<sup>th</sup> level was unable to close by itself due to the air pressure difference between the outside (the 6<sup>th</sup> level of the garage is open to the ambient) and the building. The door was hinged to open into the building. A negative (lower) pressure in the building (stairwell) would be required to hold the door open. Also observed during the mapping of leaks were cold drafts of air streaming into the occupied space at areas of non-continuous drywall. Further, on the 17<sup>th</sup> floor, while in the office of a gentleman known to have problems regulating his body temperature, foam sealant (draft stop) was observed around the perimeter of the sliding door in the office space. The building engineer reported applying the foam to try to limit the cold air leaking into the space through the cracks between the door and the frame. The HVAC system was reported to be operating in normal occupied cycle during the times these observations were made.

#### **Recommendation #6: Change Building Operating Pressure**

We recommend changing the building operating pressure to be 2 to 4 Pascals positive with respect to the outside. While a slight negative pressure with respect to the outside may not be detrimental to operation of buildings in a northern climate when the building walls are not suspected of supporting mold growth, it may be detrimental to occupants when the building walls are supporting mold growth. Our recommendation to pressurize the spaces should be completed as soon as possible. **WARNING:** We do not have sufficient information to determine if the existing equipment has the capacity to maintain space conditions while maintaining a positive pressure to the 17<sup>th</sup>, 18<sup>th</sup>, & 19<sup>th</sup> floors. Further evaluation of the system capacity should be completed. Insufficient cooling capacity to maintain the space conditions while pressurizing the space may result in loss of humidity control. High humidity in the occupied space may present sufficient moisture for some species of mold to continue to grow. Address lack of capacity with addition equipment as may be necessary.

#### **5.4 Occupant Reported Odors and Topical Irritation**

While on site, reports were received, of a second hand nature, of an occupant who was suffering from a topical irritation on her face and hands. Reportedly, the irritation occurred when the occupant was in contact with certain plastic surfaces, a telephone and desk surface in a particular workstation. The occupant has reportedly relocated to a different workstation and is no longer suffering from the irritation. Another occupant in the area of the suspect work area also reported odors of a repugnant and indescribable nature.

#### **Recommendation #7: Further Sampling and Information Gathering**

We recommend further space evaluation and some airborne and surface sampling as well as further (first hand) information gathering to determine possible mitigation strategies.

# Appendix A

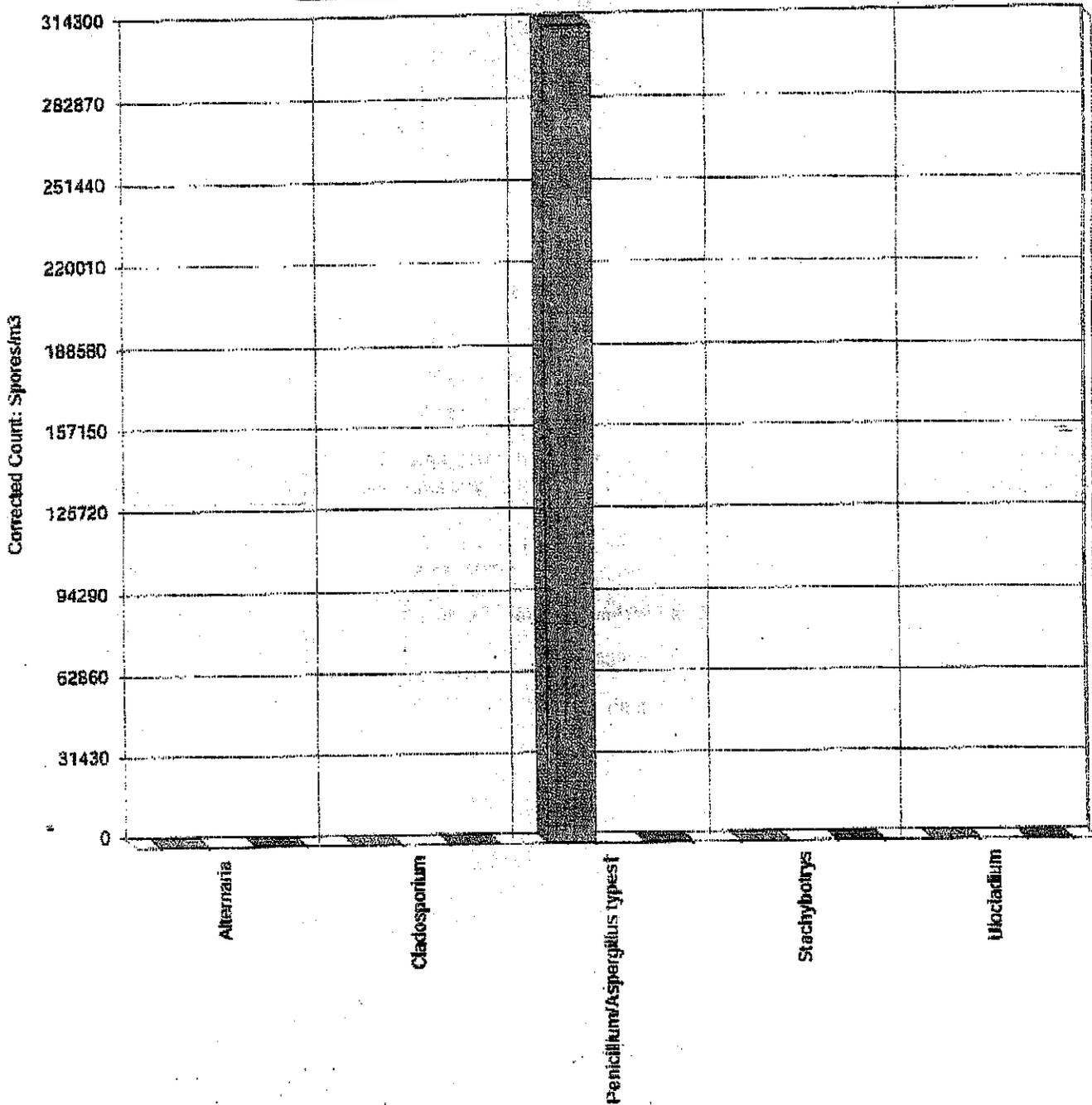
## Environmental Microbiology Lab Report

April 2000

4-04-2000: 2331; Hartford, CT

**Spore Trap Report: Non-Viable Methodology**  
Instrument Used: Zefon Air-O-Cell volumetric air sampler

■	WS-1-2331: 19th floor, room 1937, base
□	WS-2-2331: 19th floor, room 1937, 30" high
■	WS-3-2331: 19th floor, room 1937, 46" high



**Comments:**

Note: Graphical output may understate the importance of certain "marker" genera.

## Environmental Microbiology Laboratory, Inc.

Client: The H.L. Turner Group  
 C/O: Mr. Frederick McKnight  
 Re: 2331, Hartford, CT

Date of Sampling: 03-20-2000  
 Date of Receipt: 03-22-2000  
 Date of Report: 04-04-2000

**SPORE TRAP REPORT: NON-VIABLE METHODOLOGY**

Instrument Used: Zefon Air-O-Cell volumetric air sampler

Location:	WS-1-2331: 19th floor, room 1937, base		WS-2-2331: 19th floor, room 1937, 30" high		WS-3-2331: 19th floor, room 1937, 46" high	
	None		None		None	
Comments (see below)	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Alternaria					1	22
Arthrinium						
Ascomspores*						
Aureobasidium pullulans						
Basidiospores*						
Botrytis						
Chaetomium			6	133		
Cladosporium						
Curvularia						
Drechslera/Bipolaris group						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†	14,140	314,222			8	178
Pithomyces						
Rusts*						
Smuts*, Periconia, Myxomycetes*						
Stachybotrys	6	133	3	67	1	22
Stemphylium						
Torula herbarum						
Ulocladium	2	44				
Unknown						
Zygomycetes (possible)						
Background debris (1-4+)††	>> 4+		4+		4+	
Sample volume (liters)	45		45		45	
<b>TOTAL SPORES/M3</b>		<b>314,399</b>		<b>200</b>		<b>222</b>

**Comments:**

\* Most of these spore types are not seen with culturable methods (Anderson sampling), although some may appear as nonsporulating colonies. Most of the basidiospores are "mushroom" spores while the rusts and smuts are plant pathogens.

† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Pezizomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.

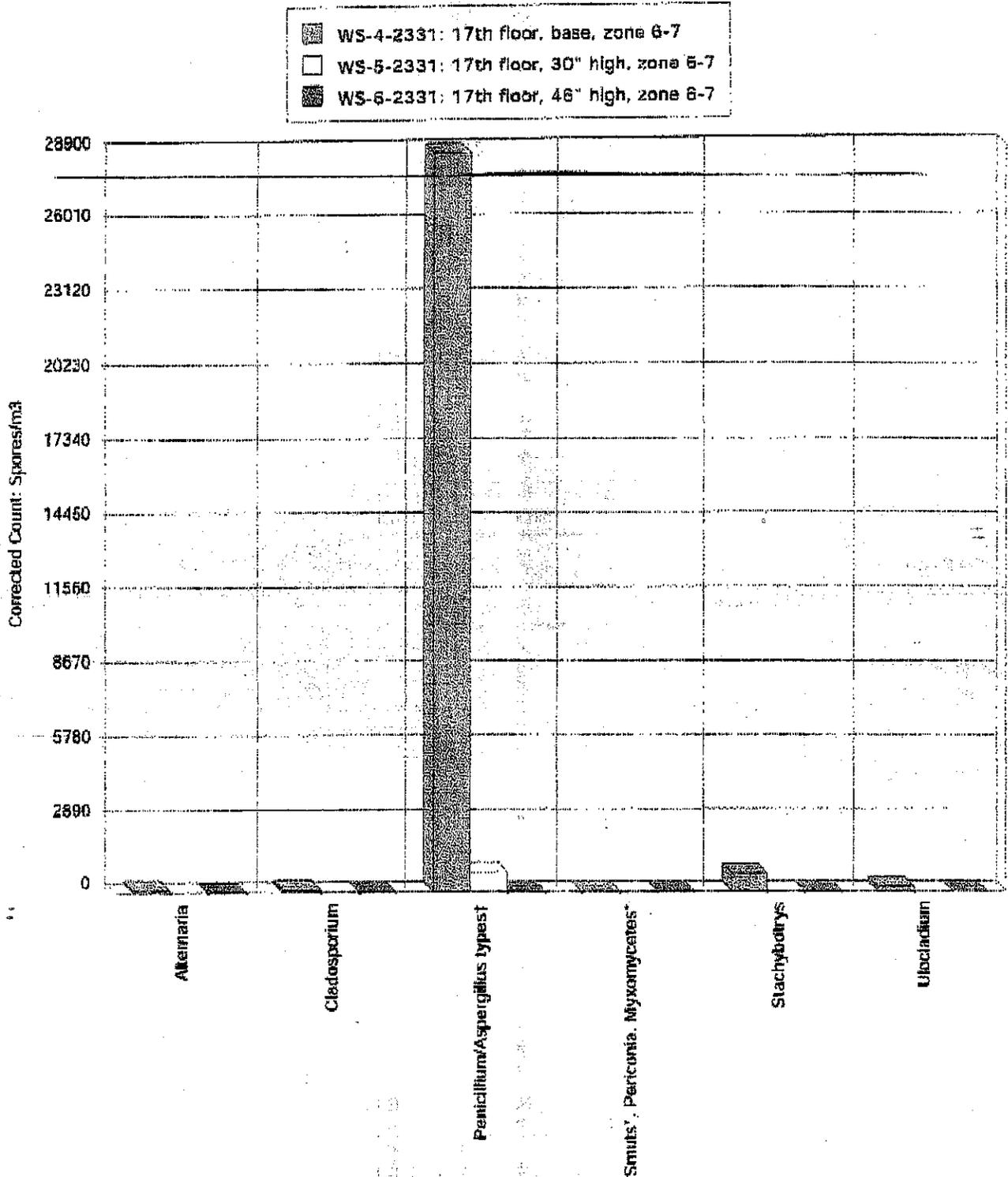
†† Background debris is an indication of the amount of non-biological particulate matter present on the slide (dust in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. To evaluate dust levels it is important to account for differences in sample volume. This background material is also an indication of visibility for the analyst and resultant difficulty in reading the slide. For example, high background debris may obscure small spores such as the *Penicillium/Aspergillus* group. Counts from areas with 4+ background debris should be regarded as minimum counts and may actually be higher than reported.

04-04-2000: 2331: Hartford, CT

Environmental Microbiology Laboratory, Inc.

### Spore Trap Report: Non-Viable Methodology

Instrument Used: Zefon Air-O-Cell volumetric air sampler



**Comments:**

Note: Graphical output may understate the importance of certain "marker" genera.

## Environmental Microbiology Laboratory, Inc.

Client: The H.L. Turner Group  
 C/O: Mr. Frederick McKnight  
 Re: 2331; Hartford, CT

Date of Sampling: 03-20-2000  
 Date of Receipt: 03-22-2000  
 Date of Report: 04-04-2000

**SPORE TRAP REPORT: NON-VIABLE METHODOLOGY**

Instrument Used: Zefon Air-O-Coll volumetric air sampler

Location:	WS-4-2331:		WS-5-2331:		WS-6-2331:	
	17th floor, base, zone 6-7		17th floor, 30" high, zone 6-7		17th floor, 46" high, zone 6-7	
Comments (see below)	None		None		None	
	raw ct.	spores/m <sup>3</sup>	raw ct.	spores/m <sup>3</sup>	raw ct.	spores/m <sup>3</sup>
Alternaria	4	89				
Arthrinium						
Ascospores*						
Aureobasidium pullulans						
Basidiospores*						
Botrytis						
Chaetomium						
Cladosporium	4	89	1	22		
Curvularia						
Drechslera/Bipolaris group						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†	1,296	28,800	36	800		
Pithomyces						
Rusts*						
Smuts*, Periconia, Myxomycetes*	2	44				
Stachybotrys	31	689				
Stemphylium						
Torula herbarum						
Ulocladium	10	222				
Unknown						
Zygomycetes (possible)						
Background debris (1-4+)††	> 4+		> 4+		> 4+	
Sample volume (liters)	45		45		45	
<b>TOTAL SPORES/M<sup>3</sup></b>		<b>29,933</b>		<b>822</b>		<b>&lt; 22</b>

**Comments:**

\* Most of these spore types are not seen with culturable methods (Andersen sampling), although some may appear as nonsporulating colonies. Most of the basidiospores are "mushroom" spores while the rusts and smuts are plant pathogens.

† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Puccinomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.

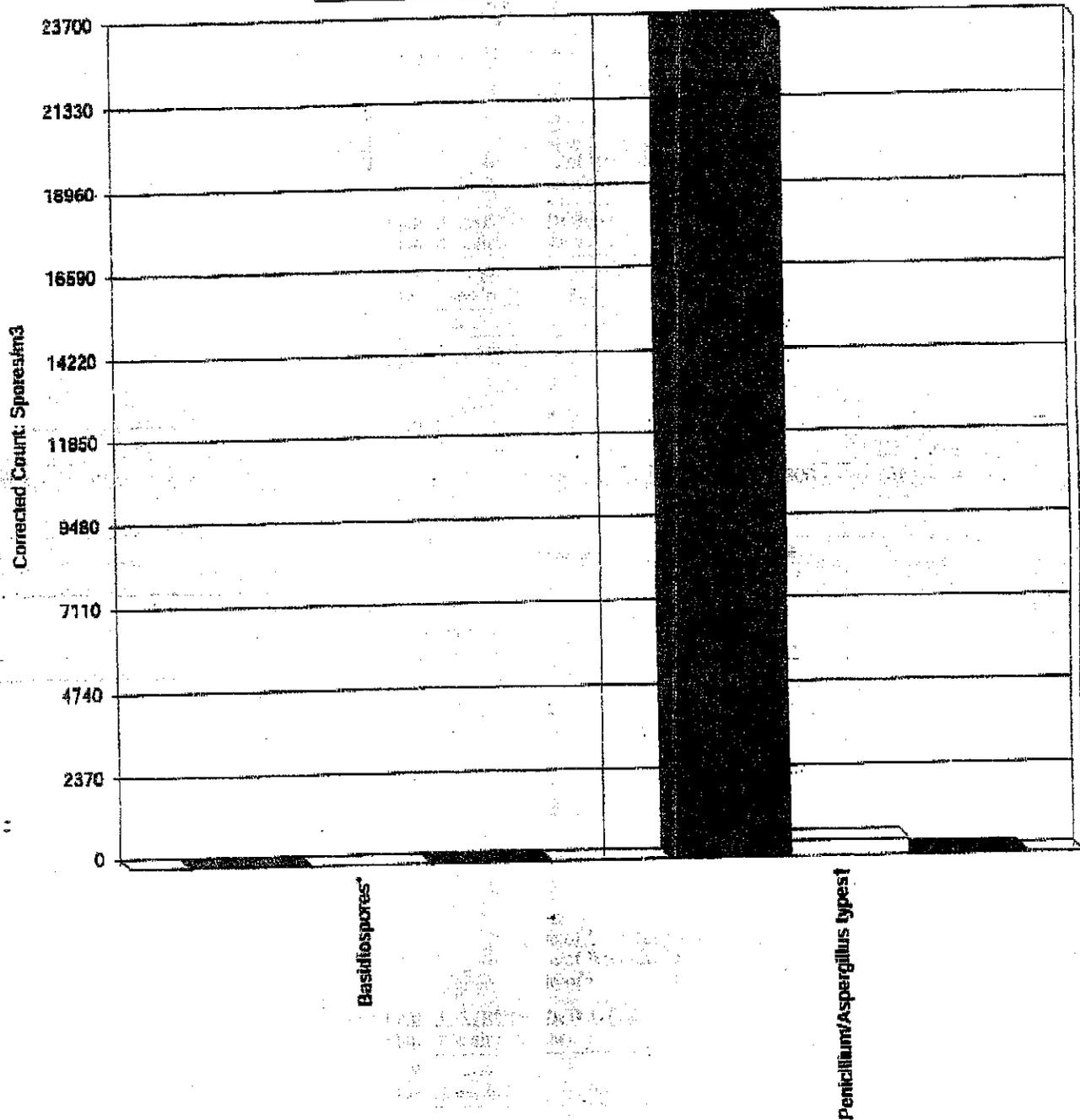
†† Background debris is an indication of the amount of non-biological particulate matter present on the slide (just in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. To evaluate dust levels it is important to account for differences in sample volume. This background material is also an indication of visibility for the analyst and resultant difficulty in reading the slide. For example, high background debris may obscure small spores such as the *Penicillium/Aspergillus* group. Counts from areas with 4+ background debris should be regarded as minimum counts and may actually be higher than reported.

04-04-2000: 2331; Hartford, CT

Environmental Microbiology Laboratory, Inc.

**Spore Trap Report: Non-Viable Methodology**  
Instrument Used: Zefon Air-O-Cell volumetric air sampler

- WS-7-2331: 17th floor, zone 4, base
- WS-8-2331: 17th floor, zone 4, 30" high
- WS-9-2331: 17th floor, zone 4, 48" high



Comments:

Note: Graphical output may understate the importance of certain "marker" genera.

## Environmental Microbiology Laboratory, Inc.

Client: The H.L. Turner Group  
 C/O: Mr. Frederick McKnight  
 Re: 2331; Hartford, CT

Date of Sampling: 03-20-2000  
 Date of Receipt: 03-22-2000  
 Date of Report: 04-04-2000

**SPORE TRAP REPORT: NON-VIABLE METHODOLOGY**

Instrument Used: Zefon Air-O-Cell volumetric air sampler

Location:	WS-7-2331: 17th floor, zone 4, base		WS-8-2331: 17th floor, zone 4, 30" high		WS-9-2331: 17th floor, zone 4, 48" high	
	None		None		None	
Comments (see below)	raw ct.	spores/m <sup>3</sup>	raw ct.	spores/m <sup>3</sup>	raw ct.	spores/m <sup>3</sup>
Alternaria						
Arthrinium						
Ascospores*						
Aureobasidium pullulans						
Basidiospores*					1	22
Botrytis						
Chaetomium						
Cladosporium						
Curvularia						
Drechslera/Bipolaris group						
Epicoccum						
Fusarium						
Myrothecium						
Nigrospora						
Other colorless						
Penicillium/Aspergillus types†	1,064	23,644	20	444	4	89
Pithomyces						
Rusts*						
Smuts*, Periconia, Myxomycetes*						
Stachybotrys						
Stemphylium						
Torula herbarum						
Ulocladium						
Unknown						
Zygomycetes (possible)						
Background debris (1-4+)††	> 4+		> 4+		> 4+	
Sample volume (liters)	45		45		45	
<b>TOTAL SPORES/M<sup>3</sup></b>		<b>23,644</b>		<b>444</b>		<b>111</b>

**Comments:**

\* Most of these spore types are not seen with culturable methods (Andersen sampling), although some may appear as nonsporulating colonies. Most of the basidiospores are "mushroom" spores while the rusts and smuts are plant pathogens.

† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Faecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be underestimated.

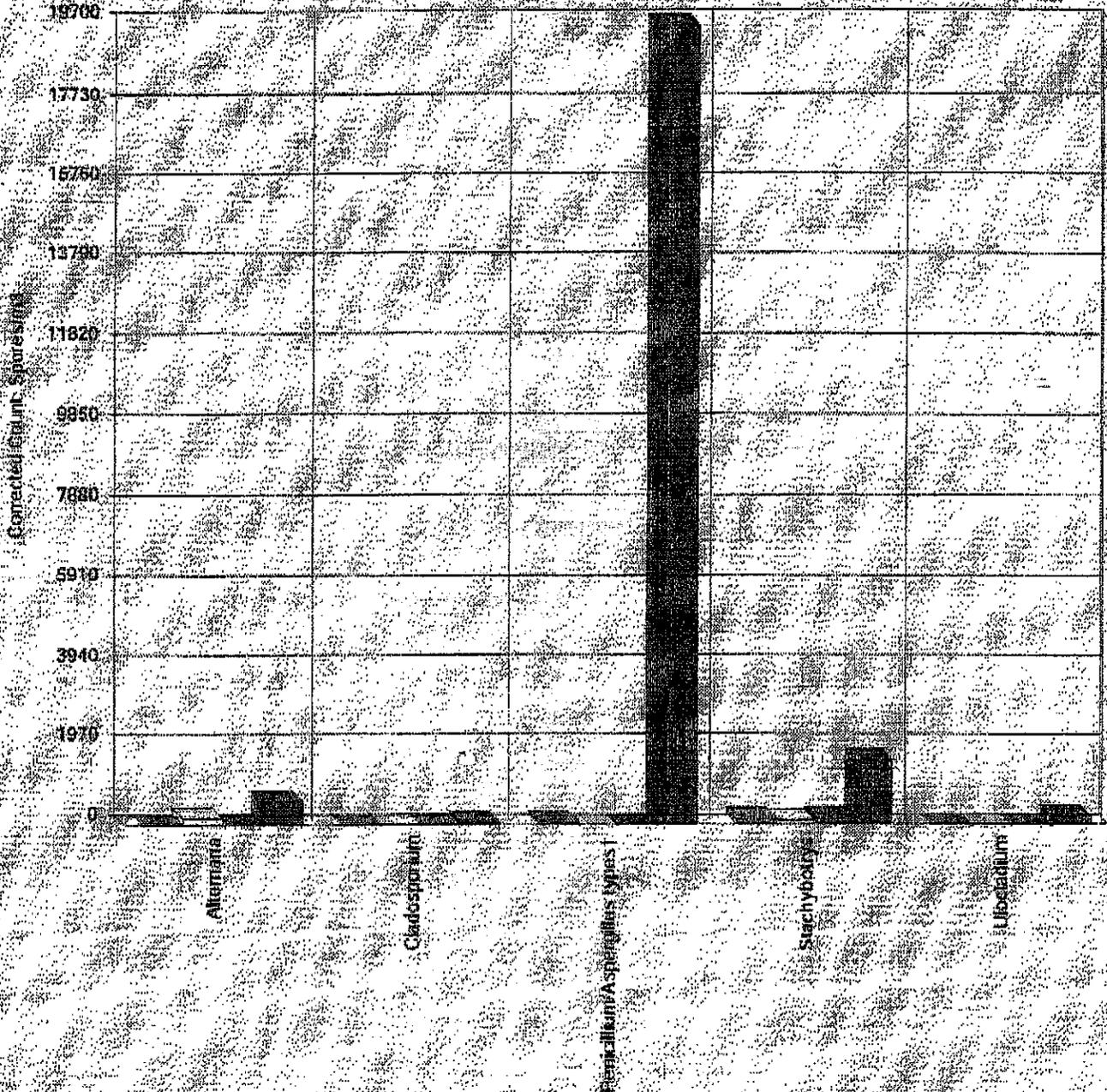
†† Background debris is an indication of the amount of non-biological particulate matter present on the slide (just in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. To evaluate dust levels it is important to account for differences in sample volume. This background material is also an indication of visibility for the analyst and resultant difficulty in reading the slide. For example, high background debris may obscure small spores such as the *Penicillium/Aspergillus* group. Counts from areas with 4+ background debris should be regarded as minimum counts and may actually be higher than reported.

04-04-2000: 2331, Hartford, CT

Environmental Microbiology Laboratory, Inc.

### Spore Trap Report: Non-Viable Methodology Instrument Used: Zefon Air-O-Cell volumetric air sampler

- WS-10-2331: 19th floor, zone 1, room 1914, base
- WS-11-2331: 19th floor, zone 1, room 1914, 30" high
- WS-12-2331: 19th floor, zone 1, room 1914, 60" high
- WS-13-2331: 19th floor, zone 1, room 1914, 72" high



#### Comments:

Note: Graphical output may underestimate the importance of certain "marker" genera.

## Environmental Microbiology Laboratory, Inc.

Client: The H.L. Turner Group  
 C/O: Mr. Frederick McKnight  
 Re: 2331; Hartford, CT

Date of Sampling: 03-20-2000  
 Date of Receipt: 03-22-2000  
 Date of Report: 04-04-2000

**SPORE TRAP REPORT: NON-VIABLE METHODOLOGY**

Instrument Used: Zefon Air-O-Cell volumetric air sampler

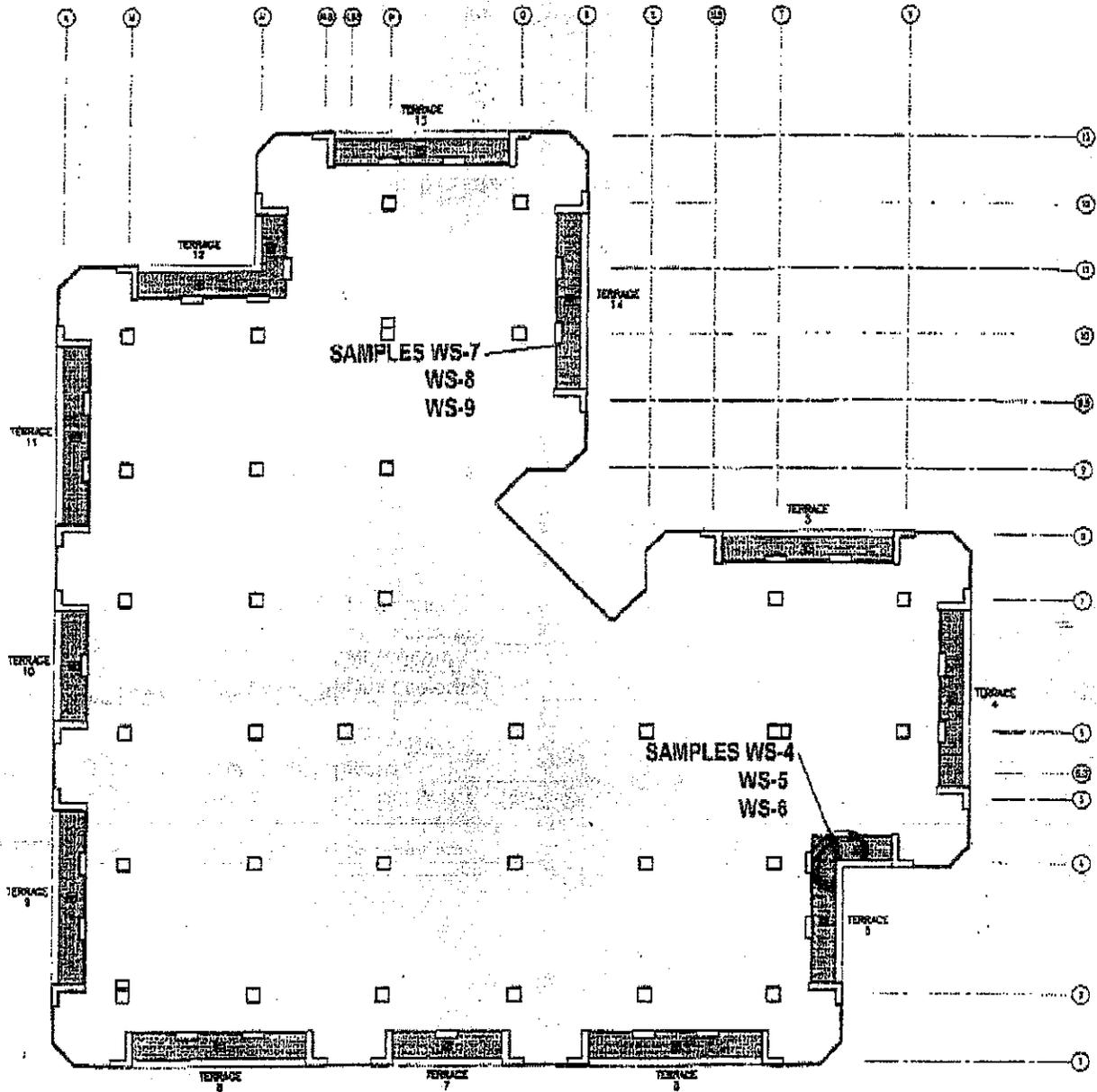
Location:	WS-10-2331: 19th floor, zone 1, room 1914, base		WS-11-2331: 19th floor, zone 1, room 1914, 30" high		WS-12-2331: 19th floor, zone 1, room 1914, 60" high		WS-13-2331: 19th floor, zone 1, room 1914, 72" high	
	None		None		None		None	
Comments (see below)	raw ct.	spores/m <sup>3</sup>	raw ct.	spores/m <sup>3</sup>	raw ct.	spores/m <sup>3</sup>	raw ct.	spores/m <sup>3</sup>
Alternaria	1	22	8	178	2	44	27	600
Arthrinium								
Ascospores*								
Aureobasidium pullulans								
Basidiospores*								
Botrytis								
Chaetomium								
Cladosporium							4	89
Curvularia								
Drechslera/Bipolaris group								
Epicoccum								
Fusarium								
Myrothecium								
Nigrospora								
Other colorless								
Penicillium/Aspergillus types†	4	89					884	19,644
Pitheomyces								
Rusts*								
Smuts*, Periconia, Myxomycetes**								
Stachybotrys	9	200	6	133	9	200	72	1,600
Stemphylium								
Torula herbarum								
Ulocladium	2	44	1	22	1	22	10	222
Unknown								
Zygomycetes (possible)								
Background debris (1-4+)††	> 4+		> 4+		4+		> 4+	
Sample volume (liters)	45		45		45		45	
<b>TOTAL SPORES/M<sup>3</sup></b>		<b>355</b>		<b>333</b>		<b>266</b>		<b>22,155</b>

**Comments:**

\* Most of these spore types are not seen with culturable methods (Andersen sampling), although some may appear as nonsporulating colonies. Most of the basidiospores are "mushroom" spores while the rusts and smuts are plant pathogens.

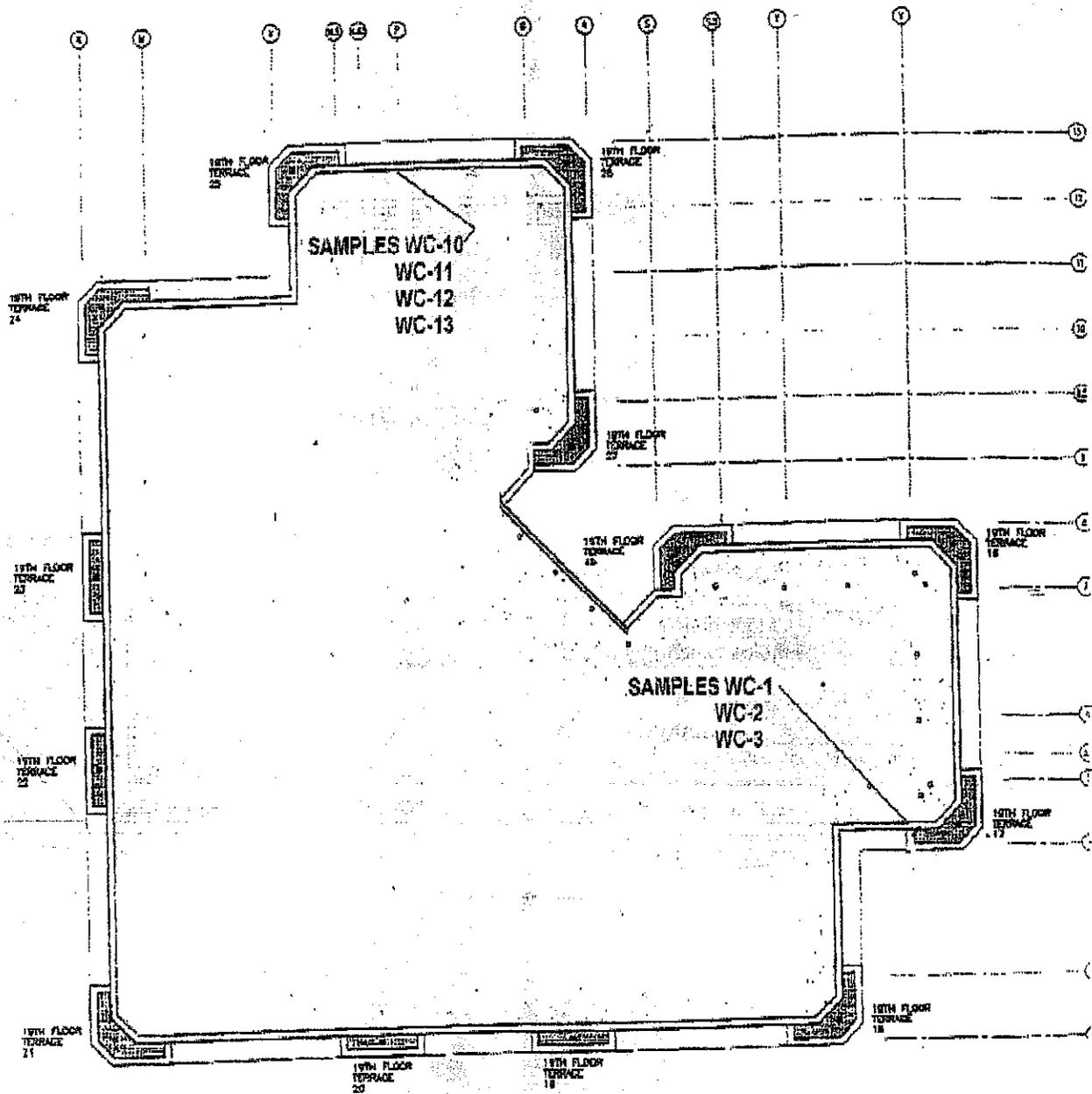
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paccilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.

†† Background debris is an indication of the amount of non-biological particulate matter present on the slide (dust in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. To evaluate dust levels it is important to account for differences in sample volume. This background material is also an indication of visibility for the analyst and resultant difficulty in reading the slide. For example, high background debris may obscure small spores such as the *Penicillium/Aspergillus* group. Counts from areas with 4+ background debris should be regarded as minimum counts and may actually be higher than reported.



**SEVENTEENTH FLOOR PLAN**

**SAMPLES LOCATION  
COLLECTED 3/20/00**



**NINETEENTH FLOOR  
SAMPLE SITES  
COLLECTED 3/20/00**

## **Appendix B**

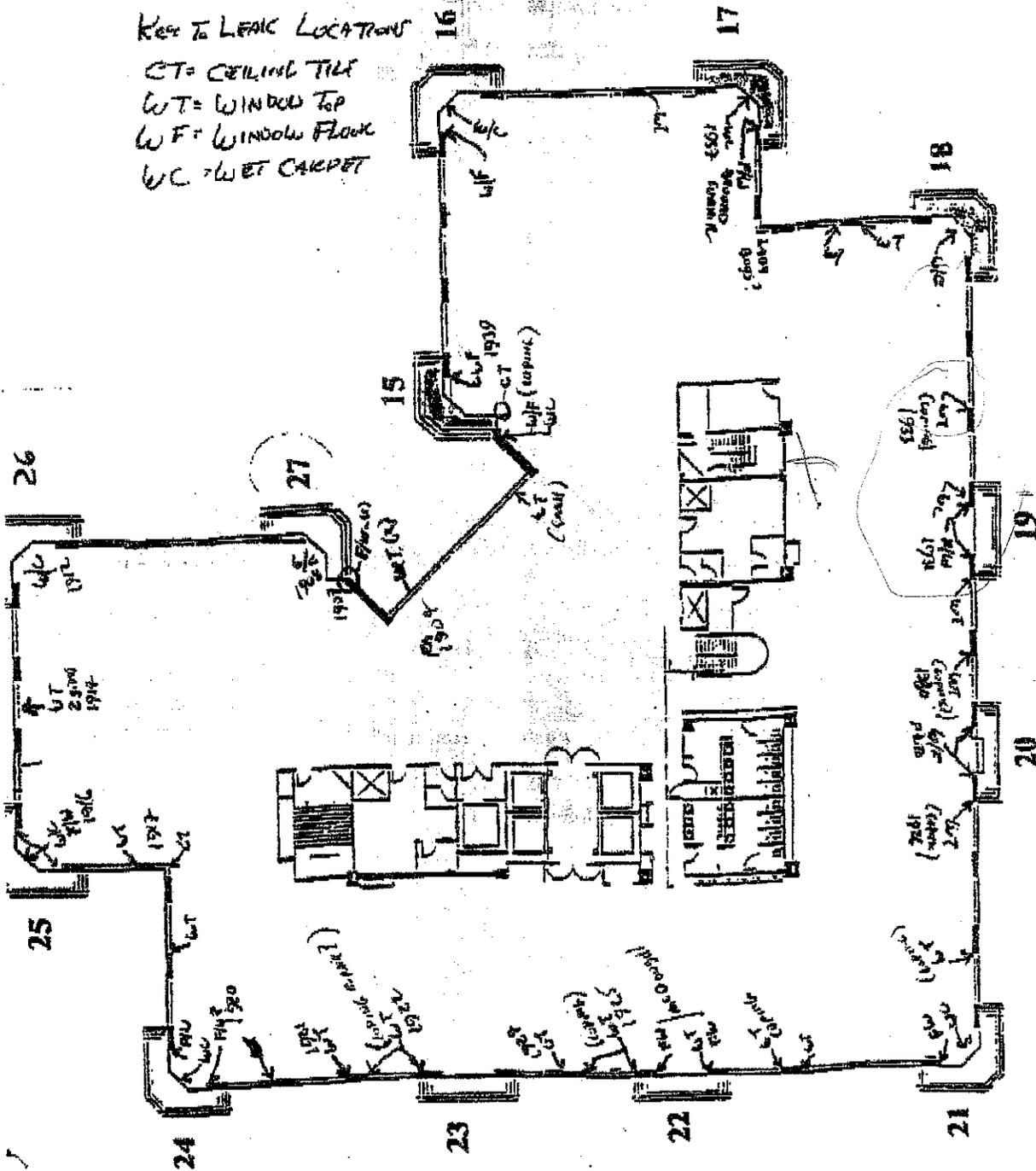
**Visible Water Intrusion Map 17, 18, & 19<sup>th</sup> Floors**

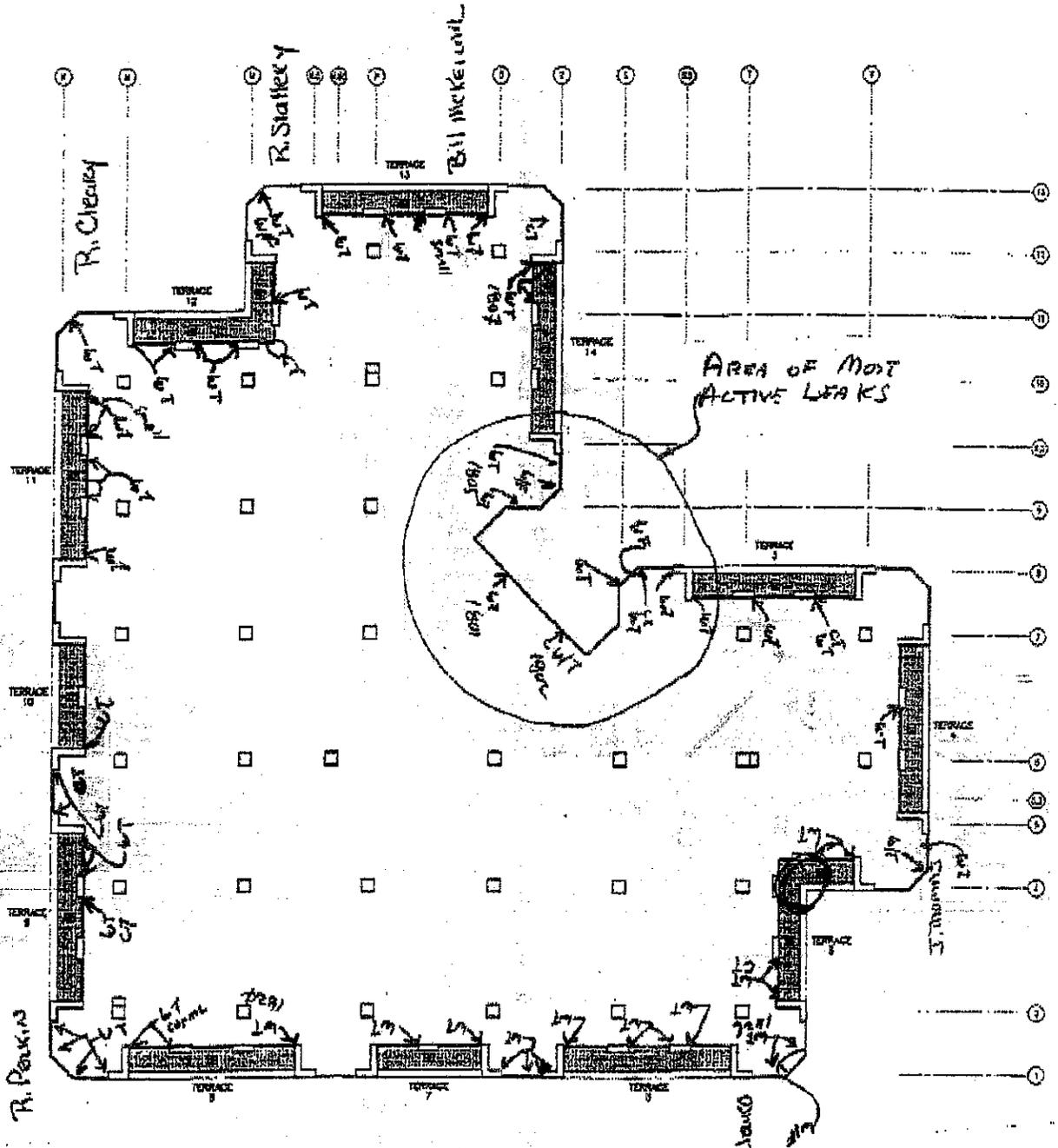
**April 2000**

NINETEENTH FLOOR  
OBSERVED 3/29/00

KEY TO LEAK LOCATIONS

- CT = CEILING TILE
- WT = WINDOW TOP
- WF = WINDOW FLOOR
- WC = WET CARPET

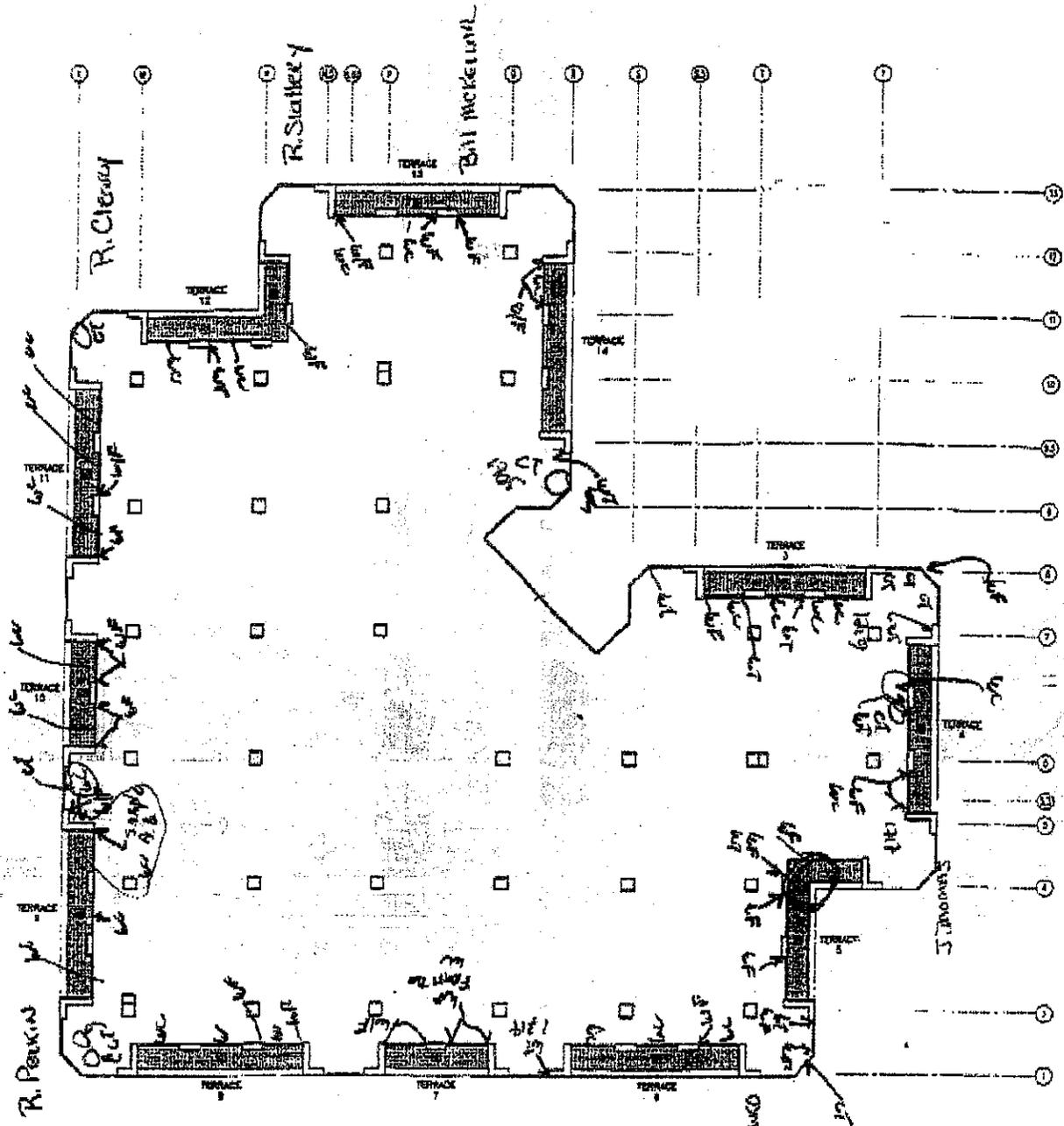




EIGHTEENTH FLOOR  
OBSERVED 3/29/00

KEY TO LEAK  
LOCATIONS

- WT = WINDOW TOP
- CT = CEILING TILE
- WF = WINDOW-FLOOR
- WC = WET CARPET



SEVENTEENTH FLOOR  
OBSERVED 3/29/00

KEY TO LEAK  
LOCATIONS  
WT = WINDOW TOP  
WF = WINDOW FLOOR  
CT = CEILING TILE  
UC = WET CARPET

**CORPORATE OFFICES:**

27 Locks Road  
Concord, NH 03301  
Telephone: (603) 228-1122  
Fax: (603) 228-1126  
E-mail: [bjohnson@hlturner.com](mailto:bjohnson@hlturner.com)  
Web Page: [www.hlturner.com](http://www.hlturner.com)

**BRANCH OFFICES:**

26 Pinewood Lane  
Harrison, ME 04040-4334  
Telephone: (207) 583-4571  
Fax: (207) 583-4572

PO Box 89, US Rte. 2  
Danville, VT 05828  
Telephone: (802) 684-2134  
Fax: (802) 684-2267

PO Box 653  
Londonderry, VT 05148-0653  
Telephone: (802) 824-5616  
Fax: (802) 824-3936

6 Waite Avenue  
Burlington, MA 01803  
Telephone: (800) 305-2289