Environmental Measurements
High School
Marshfield , MA

08/12/2020

PREPARED FOR:
Fred Russell
Buildings & Grounds Department
Marshfield, MA

PREPARED BY:

ENVIROTEST LAB, INC.
639 WASHINGTON STREET
DEDHAM, MA 02026
781-329-1133

Contact etestpaula@gmail.com for an email version of this report

Enclosed are the results for the environmental inspection conducted on August 12, 2020. On this day, environmental sampling, analysis and investigations were performed to determine the levels and conditions of the following: Carbon Dioxide, Carbon Monoxide, Microbial Volatile Organic Compounds (MVOCs), Humidity, Airborne Particulate, Temperature, Thermal Imagery identifiable issues, Moisture levels in building materials, Air Exchange, Visible Mold and Airborne Mold levels.

This report is written in sections where testing is described in detailed with specific reasons and methods explained. Envirotest recommends becoming familiar with the Test Parameters and **then** proceed to the Observation/Conclusion (Section A and B) of this report located below.

Numerical Results are located following each Test Parameter Section.

A. Observation

The entire school was inspected to determine air quality prior to opening.

The airborne levels of mold were normal and found to be comprised of mold types which are typical for normally functioning Working/Occupied/School spaces.

Air Quality throughout the school was found to be excellent in all areas analyzed.

The weather during the inspection was clear and about 91 degrees Fahrenheit at the beginning of the inspection.

Envirotest performed an environmental and air quality inspection to determine issues which could affect the building structure and the occupant's health.

From the testing performed, Envirotest has determined that at the time of the inspection, visual results and sampling indicate the following:

For the purposes of this report “North” as a direction is the front street facing door and NOT magnetic North

1. At the time of the inspection, there were no identified qualitative or quantitative problematic environmental issues which need to be addressed or remediated.

B. Conclusion

Envirotest recommends the following be performed to mitigate the situation(s) listed in section A. Immediate issues of concern should be dealt with sequentially as follows:

Suggestions for this specific Building:

1. At the time of the inspection there were no qualitative or quantitative air quality issues identified which need to be addressed or remediated.

Analysis Performed:

I. Carbon Dioxide (CO_2)

Area	CO_2 CONCENTRATION (PPMv)	Area	CO_2 CONCENTRATION (PPMv)
Main Office Areas	425 - 512	Rooms 234 - 237	403 - 405
Library	419	Rooms 243a - 249	403 - 411
Nurse, Guidance and Rooms 145a, 144a and 147a	406 - 429	Rooms 251 – 255, 208, 209 and STEM	401 - 403
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	409 - 421	Rooms 301, 303, 305 314a, 315 and 317	402 - 406
Rooms 131, 132, 135	406 - 409	Rooms 319, 321, 324 – 329 and 331 - 335	408 - 415
Student Dining and Rooms 172 and 171a	402 - 421	Rooms 338, 339 and 341	401 - 406
Auditorium	403	Rooms 344a, 345a 346-349	403 - 409
Gym Areas and Girls/Boys Lockers	401 - 408	Rooms 351 - 359	403 - 417
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	401 - 402	Outside Levels	401

Carbon Dioxide levels were found to be normal in all areas sampled.

II. Carbon Monoxide (CO)

Area	CO CONCENTRATION (PPMv)	Area	CO CONCENTRATION (PPMv)
Main Office Areas	0	Rooms 234 - 237	0
Library	0	Rooms 243a - 249	0
Nurse, Guidance and Rooms 145a, 144a and 147a	0	Rooms 251 – 255, 208, 209 and STEM	0
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	0	Rooms 301, 303, 305 314a, 315 and 317	0
Rooms 131, 132, 135	0	Rooms 319, 321, 324 – 329 and 331 - 335	0
Student Dining and Rooms 172 and 171a	0	Rooms 338, 339 and 341	0
Auditorium	0	Rooms 344a, 345a 346-349	0
Gym Areas and Girls/Boys Lockers	0	Rooms 351 - 359	0
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	0	Outside Levels	0

Carbon Monoxide was found to be normal in all areas sampled.

III. Volatile Organic Compounds (VOCs)

Area	VOC CONCENTRATION (ppb)	Area	VOC CONCENTRATION (ppb)
Main Office Areas	16 - 21	Rooms 234 - 237	10 - 13
Library	18	Rooms 243a - 249	9 - 16
Nurse, Guidance and Rooms 145a, 144a and 147a	20 - 24	Rooms 251 – 255, 208, 209 and STEM	8 - 18
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	16 - 18	Rooms 301, 303, 305 314a, 315 and 317	0 - 8
Rooms 131, 132, 135	10 - 21	Rooms 319, 321, 324 – 329 and 331 - 335	0 - 7
Student Dining and Rooms 172 and 171a	0 - 13	Rooms 338, 339 and 341	6 - 13
Auditorium	15	Rooms 344a, 345a 346-349	0 - 15
Gym Areas and Girls/Boys Lockers	0 - 12	Rooms 351 - 359	2 - 15
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	0 - 6	Outside Levels	0

VOC levels were found to be normal in all areas sampled.

IV. Humidity (%)

Area	Relative Humidity (%)	Area	Relative Humidity (%)
Main Office Areas	48	Rooms 234 - 237	48
Library	47	Rooms 243a - 249	49
Nurse, Guidance and Rooms 145a, 144a and 147a	48	Rooms 251 – 255, 208, 209 and STEM	49
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	49	Rooms 301, 303, 305 314a, 315 and 317	49
Rooms 131, 132, 135	48	Rooms 319, 321, 324 – 329 and 331 - 335	49
Student Dining and Rooms 172 and 171a	48	Rooms 338, 339 and 341	50
Auditorium	47	Rooms 344a, 345a 346-349	50
Gym Areas and Girls/Boys Lockers	49	Rooms 351 - 359	50
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	48	Outside Levels	52

The results indicate humidity levels were normal in all areas sampled.

V. Temperature (^{0}F)

Area	Temperature (^{0}F)	Area	Temperature (^{0}F)
Main Office Areas	74	Rooms 234 - 237	76 - 77
Library	75	Rooms 243a - 249	75 - 77
Nurse, Guidance and Rooms 145a, 144a and 147a	75 - 76	Rooms 251 – 255, 208, 209 and STEM	75 -= 77
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	74 - 76	Rooms 301, 303, 305 314a, 315 and 317	76 - 78
Rooms 131, 132, 135	76	Rooms 319, 321, 324 – 329 and 331 - 335	76 - 78
Student Dining and Rooms 172 and 171a	77 - 78	Rooms 338, 339 and 341	76 - 78
Auditorium	76	Rooms 344a, 345a 346-349	76 - 77
Gym Areas and Girls/Boys Lockers	75 - 76	Rooms 351 - 359	77
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	75 - 76	Outside Levels	91

Temperature levels were found to be normal in all areas sampled.

VI. Ultrafine Particulate Levels (Average per Area) (p/cc)

Area	Particulate Levels (p/cc)	Area	Particulate Levels (p/cc)
Main Office Areas	1248 - 1652	Rooms 234 - 237	1067- 1524
Library	1442 - 1597	Rooms 243a - 249	981 - 1328
Nurse, Guidance and Rooms 145a, 144a and 147a	1263 - 1478	Rooms 251 – 255, 208, 209 and STEM	1732 - 1863
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	1365 - 1582	Rooms 301, 303, 305 314a, 315 and 317	995 - 1004
Rooms 131, 132, 135	1272 - 1629	Rooms 319, 321, 324 – 329 and 331 - 335	896 - 1142
Student Dining and Rooms 172 and 171a	1292 - 1582	Rooms 338, 339 and 341	1738 - 1924
Auditorium	1222	Rooms 344a, 345a 346-349	829 -951
Gym Areas and Girls/Boys Lockers	1527	Rooms 351 - 359	804 - 1216
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	1082 - 1477	Outside Levels	2862

Airborne particulate was found to be normal in all areas sampled.

VII. Particulate Levels (ug/m^3)

Area	Particulate (ug/m ^{3})	Area	Particulate (ug/m ^{3})
Main Office Areas	0.01	Rooms 234 - 237	0.01
Library	0.01	Rooms 243a - 249	0.01
Nurse, Guidance and Rooms 145a, 144a and 147a	0.01	Rooms 251 – 255, 208, 209 and STEM	0.01
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	0.01	Rooms 301, 303, 305 314a, 315 and 317	0.01
Rooms 131, 132, 135	0.01	Rooms 319, 321, 324 – 329 and 331 - 335	0.01
Student Dining and Rooms 172 and 171a	0.01	Rooms 338, 339 and 341	0.01
Auditorium	0.01	Rooms 344a, 345a 346-349	0.01
Gym Areas and Girls/Boys Lockers	0.01	Rooms 351 - 359	0.01
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	0.01	Outside Levels	0.01

Airborne particulate was found to be normal in all areas tested.

VIII. Average Air Movement Per Area

Area	Air Movement (Exchanges/Per Hour)	Area	Air Movement (Exchanges/Per Hour)
Main Office Areas	4.5 – 5.7	Rooms 234 - 237	5.2 – 5.3
Library	4.3 – 5.2	Rooms 243a - 249	5.1 – 5.3
Nurse, Guidance and Rooms 145a, 144a and 147a	4.1 – 4.8	Rooms 251 – 255, 208, 209 and STEM	5.2 – 5.4
Rooms 141a, 139a, 138 and 113 - 117 and 119, 121, 123, 125, 126 a/b and 127	4.6 – 5.7	Rooms 301, 303, 305 314a, 315 and 317	5.2 – 5.4
Rooms 131, 132, 135	4.6 – 5.3	Rooms 319, 321, 324 – 329 and 331 - 335	5.3
Student Dining and Rooms 172 and 171a	4.5 – 5.9	Rooms 338, 339 and 341	5.4
Auditorium	5.3	Rooms 344a, 345a 346-349	5.6
Gym Areas and Girls/Boys Lockers	5.1	Rooms 351 - 359	401
Rooms 201, 202, 204, 205, 207, 217, 219 and 221-229a	4.6 – 5.3		

Air Movement was found to be acceptable in all areas tested.

IX. Moisture Levels in Building Materials

Area	Moisture location	Recommendation
Moisture was found to be normal in all areas sampled		

X. Visible Mold

Area	Mold Problem location	Recommendation
Mold was not found to be at problematic levels in any areas sampled.		

XI. Thermal Imagery

Area	Problem location	Recommendation
Thermal imagery did not indicate any obvious problems		

XII. Airborne Air-O-Cell Results (Appendix A)

1. The Airborne Fungal Levels In Spores/m^3:

AREA	Spores/m^3	Type of Mold Identified
Room 109	50	Cladosporium Aspergillus/Penicillium
Room 139a	50	Cladosporium
Room 171a	80	Cladosporium
Rooms 204	50	Cladosporium
Room 235	20	Cladosporium
Room 328	150	Cladosporium Aspergillus/Penicillium
Room 353	100	Cladosporium Aspergillus/Penicillium
Outside Sample	250	Cladosporium

a. Airborne Fungi Concentrations

Envirotest performed sampling for mold spores utilizing an Air-O-Cell® cassette. The Air-O-Cell® is a unique air sampling cassette specifically designed for the rapid collection of a wide range of airborne aerosols including mold spores, pollen, insect parts, skin cell fragments, fibers (e.g. asbestos, fiberglass, cellulose, clothing fibers, etc.) and inorganic particulate e.g. ceramic, fly ash, copy toner, etc.). The Air-O-Cell® collects both viable and non-viable sample specimens, providing a much broader overview of potential allergens contaminants than conventional sampling techniques.

The Air-O-Cell® operates upon the principle of inertial impaction. Particulate laden air is accelerated as it is drawn through the cassettes tapered inlet slit and directed towards a small slide containing the collection media, where the particles become impacted, and the air flow continues out the exit orifice. The adhesive nature of the collection media prevents the collected particulate from blurring or being washed off during the laboratory staining process, and eliminates sample loss from vibration during handling and shipment.

In the field, samples are taken at at 15 liters per minute and are run for a minimum of 1 minute in highly contaminated areas, 5 minutes in normal everyday environments and 10 minutes in clean room environments. After sampling is completed, the cassettes are sent to the laboratory, where the slides are removed and direct microscopic analysis can be immediately performed. The collection media is then stained with a biological stain or refractive index oils, allowing direct quantitative analysis of organic and inorganic particulate.

The Air-O-Cell® is a unique air sampling cassette specifically designed for the rapid collection of a wide range of airborne aerosols including mold spores, pollen, insect parts, skin cell fragments, fibers (e.g. asbestos, fiberglass, cellulose, clothing fibers, etc.) and inorganic particulate e.g. ceramic, fly ash, copy toner, etc.). The Air-O-Cell® collects both viable and non-viable sample specimens, providing a much broader overview of potential allergens contaminants than conventional sampling techniques and greatly enhances the overview of the environment when combined with Envirotest's other air sampling equipment.

Envirotest recommends that when count levels are above 1,000 that corrective action should be taken. When levels of CFU's rise above 5,000 indoor air quality complaints typically begin.

The airborne mold spore count is below the corrective action limit and below the level where indoor air quality complaints typically begin. The types of mold identified do not indicate actionable mold at the present time.

XIII. Surface sample results utilizing Biotape

1. Surface fungal level concentration:

AREA	Concentration	Mold Types Found
Desk Room 104	Low	Cladosporium sp.
Desk Room 141a	Low	Cladosporium sp.
Desk Room 205	None detected	
Desk Room 237	Low	Cladosporium sp.
Desk Room 303	Low	Cladosporium sp.
Desk Room 339	None detected	

Envirotest performed surface mold samples by utilizing Bio-Tape™. Bio-Tape™ provides a standardized sampling method for the determination of mold, microbial, bioaerosol, and inorganic dust contamination. It provides the ability to quickly take a sample and measure the relative degree of contamination.

Bio-Tape consists of a flexible plastic microscope slide with a pre-defined adhesive area. A center-line marker on the slide aids the user in locating the center when taking the sample and also aids the laboratory analyst in finding the center of the sample. Each slide is provided with a unique serial number for traceability and packed in a slide mailer to prevent cross contamination.

The sample results indicate low mold concentrations with mold types which are common for building materials found in normal building environments.

The following is an explanation of each parameter analyzed. All numbers correspond to analysis taken above.

I. **Carbon Dioxide (CO_2)**

Carbon Dioxide levels were analyzed using a TSI Q-Track Plus 8554 Air Quality Monitor with a data logger. CO_2 measurements were recorded by the data logger at marked intervals over the course of the monitoring period.. The TSI Q-Track Plus 8554 Air Quality Monitor uses an infrared sensor to analyze for CO_2. The CO_2 System was calibrated to NIST certified CO_2 standards before and after the monitoring period.

As a point of reference, ASHRAE[1] recommends levels of 1000 PPMv of CO_2 as the acceptable indoor limit[1]. This value (1000 ppm) corresponds to approximately 15 cubic feet per minute of outside air per person supplied to occupied spaces.

Carbon dioxide is a non-toxic gas. It has beneficial uses and is the "fizz" in carbonated beverages. When frozen, it is "dry ice". At concentrations from of 1,100 ppm to 5,000 ppm carbon dioxide can cause headaches. At extremely high levels of 100,000 ppm (10 percent) people lose consciousness in ten minutes, and at 200,000 ppm (20 percent) CO2 causes partial or complete closure of the glottis.

Levels of 2,500 to 5,000 ppm do not normally occur in structures. Use of any type of non-vented fuel-burning space heater, such as a kerosene, natural gas, or propane heater will result in elevated levels. High levels also can occur when several people are in a poorly ventilated room. Carbon

dioxide is commonly used as an indicator of the adequacy of ventilation systems. When the windows and doors are closed, all buildings need ventilation both summer and winter.
In buildings, the normally occurring leaks and cracks around windows and doors typically provide this ventilation. New, energy-efficient houses are now so tight that most leaks have been eliminated and some type of ventilation system may be needed.

In commercial buildings the required ventilation is typically provided by a fresh air intake to the heating and cooling system. Unfortunately, many firms have closed the fresh air intake to save energy. Many other systems were installed without fresh air intakes. In older buildings many fresh air exchangers and intakes may either be not working or in need of repair.

The American Society of Heating Refrigerating and Air-Conditioning Engineers, Inc. publishes "ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality." This standard specifies that the minimum ventilation rate per person is 15 cubic feet per minute (cfm) of outdoor air. Higher rates are in place for specified applications, i.e., 20 cfm for a school training shop, and 30 cfm for a hospital operating room. Residential dwellings are covered by a special specification, which is 0.35 air changes per hour, but not less than 15 cfm/person. (Note, additional special requirements are listed in the ASHRAE Standard and the complete standard should be consulted for specific recommendations.)

Since carbon dioxide is produced by human respiration, the amount of carbon dioxide can be easily used as an indicator of the adequacy of fresh air ventilation in occupied buildings. Outdoor levels are approximately 400 ppm. The ASHRAE standard requires that sufficient fresh air be provided to keep the level below 1,000 ppm. The CO2 levels in buildings with sufficient ventilation will range between these two readings.

Buildings with insufficient ventilation will range from 1,000 ppm up. Often the levels will be low in the morning and increase while the building is occupied. In buildings occupied during the day the reading should be taken in mid-afternoon, because this is when the CO2 reaches its highest level.

High levels of carbon dioxide often indicate inadequate ventilation. Persons in buildings with high CO2 levels may complain of burning eyes, tiredness, and headaches. These symptoms can be caused by a combination of carbon dioxide and the many other pollutants that occur in a poorly ventilated space.

When too little outdoor air enters a building, pollutants can accumulate to levels that can pose health and comfort problems. Unless special mechanical means of ventilation are designed and constructed into a building to minimize the amount of outdoor air that can "leak" into and out of the building, these buildings may have higher pollutant levels. .

Outdoor air enters and leaves buildings by: infiltration, natural ventilation, and mechanical ventilation. In a process known as infiltration, outdoor air flows into the house through openings, joints, and cracks in walls, floors, and ceilings, and around windows and doors. In natural ventilation, air moves

through opened windows and doors. Air movement associated with infiltration and natural ventilation is caused by air temperature differences between indoors and outdoors and by wind.

There are a number of mechanical ventilation devices, from outdoor-vented fans that intermittently remove air from a single room (bathroom vents) to air handling systems that use fans and duct work to continuously remove indoor air and distribute filtered and conditioned outdoor air to strategic points throughout the house. The rate at which outdoor air replaces indoor air is described as the air exchange rate. When there is little infiltration, natural ventilation, or mechanical ventilation, the air exchange rate is low and pollutant levels can increase.

[1] **ASHRAE Standard 62-1989(1989), "Ventilation for Acceptable Indoor Air Quality"**
American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc., Atlanta, Georgia.

II. Carbon Monoxide (CO)

The TSI Q-Track Plus 8554 Air Quality Monitor equipped with a datalogger for CO was used to monitor for CO. The TSI Q-Track Plus 8554 uses an electrochemical sensor to analyze for CO. This instrument was calibrated prior to all uses with outside air and daily by utilizing a 100 ppm CO span gas prior to use. Calibration is performed against a known standard to ensure precision and accuracy. Measurements were taken at marked intervals for the duration of the survey.

Carbon Monoxide is odorless, colorless, and highly toxic. It kills by reducing the oxygen supply in the body and is a deadly poison. It adversely affects human health at only a few parts per million and causes death at 250 parts per million (250 ppm). CO produces it's toxic effect by competing with oxygen for hemoglobin molecules in the blood. Since it has a greater affinity for hemoglobin than does oxygen, CO is more readily accepted into the blood stream. Low amounts of CO can cause headaches, while higher levels can be fatal.

Properly installed and maintained heating appliances cause little threat from carbon monoxide. Poorly installed and maintained systems can be deadly. All fossil fuels contain carbon. During the combustion process the carbon in the fuel combines with oxygen in the air. With sufficient oxygen, sufficient turbulence, and at high ignition temperatures, nearly all of the carbon combines with two atoms of oxygen, producing the relatively innocuous carbon dioxide.

Heating appliances are designed to provide excess oxygen, and a clean, properly installed and maintained system will produce primarily carbon dioxide (CO2), a large amount of water vapor, small amounts of carbon monoxide (CO), and a number of other pollutants. These products of combustion from a properly maintained heating system will be vented outdoors through the chimney, and do not pose an undue risk to the building occupants.

When insufficient oxygen is available for complete combustion, one atom of carbon combines with one atom of oxygen and carbon monoxide is produced. If the heating appliance or the venting system is defective, some or all of the carbon monoxide might be circulated into the building, posing an extremely hazardous health risk. A warning sign of heating trouble might be sudden excessive levels

of moisture in the building, since water vapor is also produced by combustion of fossil fuels. CO is also a by-product of tobacco smoke and motor vehicle exhaust.

III. Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) were tested with the use of the PpbRae. The PpbRae is the most sensitive hand held VOC monitor available. This machine measures with true parts per billion detection of extremely low level, low vapor pressure and highly toxic VOCs, like paint fumes, rug off-gassing, pesticide residues and isocyanates (polyurethane foam, insulation materials, surface coatings, car seats, furniture, foam mattresses, under-carpet padding, packaging materials, shoes, laminated fabrics, polyurethane rubber, and adhesives, and during the thermal degradation of polyurethane products.) This instrument senses measurements of off-gassing from carpets and fabrics, spot checks for ethylene oxide and formaldehyde.

At room temperature, volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. These include pesticides, solvents, fuels, plastics, perfumes, cleaning agents, hair sprays, rugs, oven cleaners, dry-cleaning fluids, building furnishings, office materials like copiers, certain printers, correction fluids, graphics and craft materials etc. VOCs are consistently found at higher levels indoors than outdoors. Products used in building, office, school, arts/crafts and hobby activities emit a wide array of VOCs. Pesticides sold for household use are technically classified as semi-volatile organic compounds. Very low airborne levels of these products have been found to cause symptoms like conjunctival irritation, nose and throat irritation, headache, allergic skin reaction, and nausea to sensitive individuals.

The sensor in this instrument is also very helpful in determining the origination of mold in buildings by sensing the microbial volatile organic compounds (mVOCs) in the air.

IV. Percent Relative Humidity (RH)

The TSI Q-Track Plus 8554 Air Quality Monitor and the TSI VELOCICALC air quality meter indicates % Relative Humidity.

a. Relative Humidity

Everyone is familiar with the word "humidity," especially as it applies to one's comfort indoors or outdoors. We can feel the humidity on the hot, sticky days of summer, and we know it is low when static electricity shocks us during cold, dry winters. But few people understand the science behind humidity or what is meant by the more precise term "relative humidity."
The National Oceanic and Atmospheric Administration (NOAA) defines relative humidity as: "A dimensionless ratio, expressed in percent (% RH), of the amount of atmospheric moisture present relative to the amount that would be present if the air were saturated. Since the latter amount is dependent on temperature, relative humidity is a function of both moisture content and temperature. As such, relative humidity by itself does not directly indicate the actual amount of atmospheric moisture present."

For example, if the air contains half as much water vapor as is possible, then the relative humidity reading would be 50% RH. Bear in mind that the warmer the air temperature, the more moisture it can hold, and vise versa. This is an important factor to remember when looking at a particular RH. Using the same example, there is less water vapor at 50% RH (65°) than 50% RH (85°). Almost every meteorologist and hygrometer expresses humidity in this fashion.

b. Humidity and Comfort

Our comfort, whether we feel warm or cold, is determined, among other factors, by the rate at which moisture is evaporated from our bodies. It is this fact which makes the humid summer day so uncomfortable. When there is already so much moisture in the air that the moisture from our skin evaporates very slowly. Therefore, as we perspire, we feel sticky and are generally uncomfortable. Conversely, if the air is dry, evaporation is much more rapid; the more rapid the evaporation, the cooler we feel.

c. Humidity and Health

Air has a tremendous need for moisture. So when we heat our buildings in the winter (drawing in cold, dry air), this air is going to take moisture from wherever it can. This dry air in our buildings and offices not only dries our skin, but also robs the delicate membranes of the nose and throat of their normal moisture. Low humidity may make us more uncomfortable or even subject to various respiratory problems.

However, there may be more effects of both high and low humidity than just discomfort. Studies show that humidity may affect three groups of factors with respect to health:

1. Biological contaminants including bacteria, viruses, fungi, and mites.
2. Pathogens causing respiratory problems including allergic rhinitis and asthma.
3. Chemical interactions including ozone production.

Some of these factors may thrive at low levels of RH while others may prefer high levels of RH. For example, certain bacteria thrive and grow at very low levels of humidity (0-20% RH) while other bacteria grow and thrive at very high levels of humidity (55%-100% RH).
Most Fungi remain dormant and do not start growing and thriving until %RH levels rise above 50% RH.

The optimal comfort zone for %RH is roughly between 35-45% RH in the summer months and 25-40% RH in the winter months. By following these guidelines the levels of bacteria, fungi, viruses, respiratory infections, allergic rhinitis and asthma will be kept in check.

d. Humidity and Energy Costs

In winter, heated, non-humidified air may dry out and/or shrink wood framing around doors and window frames. Gaps may occur allowing cold, dry outside air to enter the building. This heat loss

causes heating systems to output more dry air. To maintain a certain humidity level, many people compensate with the use of a humidifier. However, since it takes four times as much energy to heat water than to heat dry air, it costs more to maintain a specific humidity level in your building for health and comfort reasons. Monitoring the humidity and careful attention to areas of heat loss will help offset costs.

The benefit of humidified air is its effect on how we feel in certain temperatures. In the winter, the air is dry and the increased evaporation of moisture from our skin makes us feel cold. While 70°F is recommended for indoor air temperature, some find that the temperature (when dry) must be near 80°F or even higher for us to feel warm enough to be comfortable. The proper humidity will make 70°F feel comfortable and may help offset the increased energy it takes to heat humidified air. However, Envirotest does not recommend humidification of any sort during the winter months due to the inherent problems associated with humidifiers. Typically most humidifiers require excessive amounts of cleaning and can increase the humidity to levels where fungi and bacterial growth will occur. Envirotest recommends re-hydrating by consuming more liquids when humidity drops in the winter.

e. Interior Building Humidity

Low humidity in winter may cause drying and/or shrinking of furniture, wood floors and interior trim. Doors and drawers may warp or crack and glue joints in fine furniture and veneers may open or split. Low humidity may rob plants of their moisture, and it may contribute to wall and ceiling cracks. All of these problems may be the result of dry air absorbing moisture from whatever source it can find inside your building.

Buildup of moisture may also cause rotting of wood, mildew and mold. In areas of your building where humidity may be very high, such as Sub-Grade area, laundry rooms, Attics, or Crawl Spaces, it is important to prevent damage to your building from excessive moisture. Additional ventilation may be helpful in the case of excessive Attic humidity (Please see appendix C.)

V. Temperature

The TSI Q-Track Plus 8554 Air Quality Monitor and the TSI VELOCICALC air quality meter indicates Temperature.

Recommended temperature levels for optimal office comfort should be between 68 and 74 ^{0}F for interior comfort conditions. Temperature is an easy and basic indicator of whether the HVAC system is working correctly by indicating if the thermostats are calibrated correctly. In many instances, temperature is taken to determine if an Attic venting system is functioning properly and whether heat is accumulating in the Attic space.

VI. Ultrafine Particulate (p/cc)

Envirotest performed particulate testing to determine the amount of suspended particulate in the environment. Suspended particulate testing is performed utilizing the P-Trak Ultrafine particle counter. The P-Trak detects and counts particles smaller than 0.02 micrometers in diameter. These particles are the ones that often accompany or signal the presence of a pollutant that is the cause of complaints about indoor air quality. Because the P-Trak provides far greater sensitivity to very small particles than traditional instruments, it can actually be used to locate the source and migration of toxic exhaust gases, malfunctioning office equipment, pinhole leaks in heating system gaskets and a wide variety of other problems including airborne mold spores.

Typical Pollutant Sizes	
Bacteria	.01 to 1.0 Microns
Dust	1.0 to 10 Microns
Mold	1.0 to 10 Microns
Hair	10 to 100 Microns
Pollen	10 to 100 Microns
Diesel Particulate	0.1 – 100 Microns

The Following are common sources of airborne articulate. This list in by no means exhaustive, but it gives you an idea of the types of things to be aware of when you are looking for the source of contamination.

Mold	Bacteria
Hair	Combustion Exhaust
Skin Flakes	Dirty Clothing
Cosmetics	Chemicals
Perfumes	Caulks and Paints
Coughing / Sneezing	Aerosols
Excessive Movement	Ions (Rust)
Wood Fibers	Smoke
Paper Fibers	Thinners /Solvents
Tobacco Products	Food
Candles	Incense

Use of scented candles and incense contribute significant quantities of pollutants to the indoor environment, especially soot, benzene and lead. Due to the variability in candles and incense and their respective emission rates, great uncertainty would exist in a generalized risk assessment. The absence of consumer warnings concerning candle emissions and their potential health effects may contribute to exposure of susceptible individuals to respiratory inflammatory agents, carcinogens and teratogens.

Diesel particulate matter as found as a results of burning diesel fuel for heat, is part of a complex mixture that makes up diesel exhaust. Diesel exhaust is commonly found throughout the environment

and is estimated by EPA's National Scale Assessment to contribute to the human health risk. Diesel exhaust is composed of two phases, either gas or particle and both phases contribute to the risk. The gas phase is composed of many of the urban hazardous air pollutants, such as acetaldehyde, acrolein, benzene, 1,3-butadiene, formaldehyde and polycyclic aromatic hydrocarbons. The particle phase also has many different types of particles that can be classified by size or composition. The size of diesel particulate that are of greatest health concern are those that are in the categories of fine, and ultra fine particles. The composition of these fine and ultra fine particles may be composed of elemental carbon with adsorbed compounds such as organic compounds, sulfate, nitrate, metals and other trace elements. Diesel exhaust is emitted from a broad range of diesel engines; building heating systems, on road diesel engines of trucks, buses and cars and the off road diesel engines that include locomotives, marine vessels and heavy duty equipment. The most common exposure pathway is breathing the air that contains the diesel particulate matter. The fine and ultra fine particles are respirable which means that they can avoid many of the human respiratory system defense mechanisms and enter deeply into the lung. In the National Scale.

VII. Particulate Sampling P3 dust analysis

Envirotest utilizes the SIDEPAK AM510 Personal Aerosol Monitor analyzing and data logging aerosol concentration in real time. This machine is a belt-mountable laser photometer that allows a wide variety of size-selective aerosol inlet conditioners for breathing zone or area measurements with a respirable cyclone or integrated impactors. The results are given in real-time concentrations (mg/m3). Sensor type: 90° light scattering, 670 nm laser diode

The SIDEPAK has an Aerosol concentration range: 0.001 to 20 mg/m3 and can read particle sizes from 0.1 to 10 micrometer (µm). Envirotest performed testing to determine the levels of P3 (0.3 micrometers) aerosols.

VIII. Moisture Content

Moisture content was performed using a Protimeter Surveymaster SM. This meter measures water content utilizing radio frequency emissions and through two (2) pin electrodes. The results of testing utilizing the measure mode are in a percentage (%) format representing wood moisture equivalent. The test is performed by actually impinging wall material and writing results as the test is taken. This test is necessary when establishing the exact areas of moisture concentration and origination.

IX. Visible Results For Mold

Inspection for visible mold was performed by trained mold professionals observing visible surfaces and inside wall cavities and other small areas with the assistance of a TESTO-318-1 Boroscope. This machine is able to be inserted into walls and allows the user to visibly detect interior wall cavity utilizing fiber-optic technology with the supplied micro-light. Envirotest performs interior wall cavity observations by removing the electrical outlets and switch plate covers and inserting the probe directly into the wall cavity. Upon entrance into the wall cavity, Envirotest is able to observe any clue of mold activity or obvious mold staining of building materials and interior wall components.

X. Thermal Imagery

Envirotest utilizes a Flir Thermacam for thermal imaging or thermography of areas of a building. Thermography is the use of an infrared imaging and measurement camera to "see" and "measure " thermal energy emitted from an object.

Thermal, or infrared energy, is light that is not visible because its wavelength is too long to be detected by the human eye; it's the part of the electromagnetic spectrum that we perceive as heat. Unlike visible light, in the infrared world, everything with a temperature above absolute zero emits heat. Even very cold objects, like ice cubes, emit infrared. The higher the object's temperature, the greater the IR radiation emitted. Infrared allows us to see what our eyes cannot.

Infrared thermography cameras produce images of invisible infrared or "heat" radiation and provide precise non-contact temperature measurement capabilities. Envirotest utilizes this camera to pinpoint areas of varying temperatures to identify leaks under walls, floors and ceilings.

XI. Air Change Per Hour

The TSI Q-Track Plus 8554 Air Quality Monitor and the TSI VELOCICALC air quality meter reads air flow and air exchange.

The minimum ventilation (outdoor air) rates and minimum exhaust rates mandated by code. Most of the modern model codes (Uniform Mechanical Code, International Mechanical Code) refer to ANSI/ASHRAE Standard 62.0-2010 Ventilation for Acceptable Indoor Air Quality as the reference for ventilation rates according to occupancy and type of facility. It is important to note that ventilation is defined as outdoor air.

Air changes per hr (ACH / ACPH) simply describes how many times the quantity of air in a room (or structure) is completely replaced per hour.

If you have a 10’x10’x10′ room, the room contains 1000 cubic feet of air If the supply and return to the room is supplying a balanced 100 cfm (cubic feet per minute) of air to the room you would have 100 cfm x 60 minutes = 6,000 cfh (cubic feet per hour) which would equal 6 air changes per hour (6,000/1000 = 6).

Different spaces have different ventilation requirements based on occupancy level (how many people are in the room) and use type (see Table Below)

Suggested Air Changes For Proper Ventilation

Change Per Hour = Cubic feet per hour exhausted/Room Volume

Area	Minimum Recommended Air Change Per Hour
Classroom	4 - 6
Student Dining, 171a and 172	3 – 10
Rooms 234 - 237 and 131, 132, 135, 172 and 171a	3 – 8
Kitchen	1 – 5
Laboratory	2 – 5
Office	2 – 8
Restroom	4 - 7

APPENDIX 1
AIR STANDARDS

Constituent	Standard	Source
Carbon Monoxide	35 ppm 25 ppm 9 ppm	OSHA ACGIH-TLV* NAAQS
Carbon Dioxide	5,000 ppm 1,000 ppm 800 ppm	OSHA-PEL* ACGIH-TLV* ASHRAE MDPH (recommended)
Temperature	68-72 Fahrenheit	
Humidity	25-35%	
Hydrogen Sulfide	20 ppm 10 ppm/10 minutes Over 65 ppm	[1] OSHA Ceiling NIOSH Ceiling Evacuation
Volatile Organic Compounds (VOCs)	35 ppb	Envirotest Comfort
Nitrogen Dioxide	5 ppm 3 ppm	OSHA-PEL* ACGIH-TLV*
Ultrafine Particulate (Average building) Ultrafine Particulate (Average Construction Area)	<1,000 - <6,000 p/cc 5,000-30,000 p/cc	Envirotest Comfort Not to exceed results Typically compiled by Envirotest
Nuisance Dust	5 mg/m ^{3} 3 mg/m ^{3} 0.3 mg/m^3	OSHA ACGIH ASHRAE

1 Maximum concentration for short period (usually between 5 and 30 minutes, each gas is different) usually four such exposures are allowed per day and average exposures must still be within TWA.

2 Maximum one-time exposure, usually 10 minutes. No other exposure is allowed even below

3 "Threshold Limit Value" for the Time Weighted Average 8 hour day.

4 15 minutes "Short Term Exposure Limit" which should not be exceeded at any time during the working day and not be repeated more than four times per day. STELs should exceed three times the TWA for no more than a total of thirty minutes and never more than five times the TWA even if the TWA is never exceeded. there should be at least 60 minutes between STEL exposure periods and TWA should not be exceeded. (ACGIH Standard)

5 This is the concentration which could be "immediately dangerous to life or health" and represents the maximum level from which one could safely escape within thirty minutes. (ACGIH Standard)

Appendix A
Mold Information

INFORMATION CONCERNING MOLD IN INDOOR AIR QUALITY

Mold is a fungus that is an often fuzzy-looking growth that appears on the surface of organic materials in damp conditions, both outdoors and indoors. Molds may feed off the moist organic material similar in ways that plants feed from the ground. Molds may be a variety of colors: gray, green, yellow, orange, black or various other colors, and may have a velvety or wooly texture.

Molds reproduce by producing tiny spores that become airborne thus allowing them to propagate in other areas. Mold spores continually waft through the air, both indoors and out-of-doors, these spores are so small that when inside a room with no air movement they will tend to stay airborne for as much as two weeks before settling. Once they settle they will wait for a moisture episode to occur. When a moisture episode occurs or if the mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. Indoors, molds can grow on wood, paper, fabrics, carpet, foods and other organic materials.

Molds are a natural part of the environment, but human health problems may result when people are exposed to large amounts of mold, particularly indoors. To most people it is harmless and at worst a nuisance. However, inhaling excessive quantities of airborne mold particles or spores may lead to allergic illness, trigger asthma, cause respiratory infections, or bring about toxic effects from certain chemicals in the mold cells.

Certain molds have even been found to have a positive (antibiotic) effect (e.g. Penicillin). However, some people can become sensitive (allergic) to specific molds and/or classes of fungi. Clearly the most common type of exposure concern is for and among people who are asthmatic, allergic or prone to hypersensitivity pneumonitis since these individuals may react regardless of the amount of mold present.

When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or is not remediated promptly. There is no practical way to eliminate all mold and mold spores indoors. However, indoor mold growth can be controlled by controlling moisture.

ASSESSMENT

All that is needed for microbial growth to occur is a substrate, nutrients, warmth, and moisture. Wood, paper, some carpets and carpet backings, wallboard and other building materials and furnishings act as both substrate and nutrient. Substrates are surfaces that will trap nutrients such as dead skin cells, food crumbs, dust, dust mites, animal dander, dead insect parts and soil. This "dirt" can also contain the spores and "seeds" for such common microbiological contaminants as molds, fungi, mildews and bacteria. Sufficient moisture and adequate time for growth are often the final ingredients. Light is not always necessary and only moderate warmth (temperatures slightly above freezing) is required. These fungi have been around for a long time and have become adapted to all types of environments and conditions.

After an increasing frequency of visits involving concerns about airborne mold, Envirotest typically suggests sampling indoor airborne mold using Anderson plate methods as the method for testing.

1. Envirotest's microbiological air monitoring reports results appear as a number of Colony Forming Units (CFUs). CFUs are the number of live or growing colonies. Some sensitive individuals will react to the protein containing residue of mold and other biologicals that lie in the dust.
1. There are no standards against which sample results can be interpreted. However, included in appendix A is a list of the most commonly found molds and their exposure symptoms.
2. While there are a wide variety of sampling protocols and methods available to test for

microbiologicals, Envirotest depends on the Anderson sampling method, on-site visual assessments, bulk samples and wipe sample for testing. Environmental molds do not lend themselves to the more familiar "medical type" testing, since it depends upon culturing with standard methods and conditions. It must be known that the environment and the food that is available can change both the color and shape of the colonies. These are key to the identification of the mold. The same factors can also produce sterile or non-reproducing colonies. These also may be missed in testing that focuses upon "live spores" or "colony forming units".

3. As with all plants, the life cycle of molds varies with the season. It is not uncommon to have high levels of CFUs reported both indoors and outside during the growing season. The reproductivity of molds also varies from day to night.

RECOMMENDATIONS

Envirotest strongly recommends that mold removal be performed by a trained professional to decrease the chance of individual exposure and building contamination.

It is with all of the above in mind that, the following recommendations can be offered

1) Carpets, when present, should be subject to regular (daily) cleaning using one of the relatively new high efficiency (HEPA) vacuum cleaners. During this daily cleaning, look for water damage. Carpet should also be cleaned professionally on a periodic schedule (only between the months of November to February), or, whenever excessively soiled. Carpets must be thoroughly dried whenever professional cleaning is done. Basement sub-floors are not recommended as a base for carpeting due to the inherent buildup of moisture that can be caused and subsequent mold that can develop. Envirotest recommends a preference for solid surface materials or vinyl tile when carpet is to be replaced.

2) Attempt to identify areas of concern by visual inspection. Additional information can be gathered by professionally sampling the area(s) for the characteristic odors associated with mold. The ventilation system should also be examined in a similar way.

3) Eliminate all sources of water. All leaks should be fixed. Excessive humidity can often be removed and/or controlled with dehumidifiers.

4) Where mold contamination is suspected, many experts in the field feel it is simple and thorough enough to say "if you can see mold or smell mold: clean and/or decontaminate it." Cleaning and/or decontamination of surfaces can include any and all of the following:

a) Wash solid surfaces and launder all fabric based materials, which may have been exposed, with bleach (if possible), hot water and detergent.

b) Dry immediately and completely (exposure to strong sunlight is helpful during this process).

c) Decontamination of white clothes is best done by using a bleach solution.

d) Materials that can not successfully survive the above cleaning and/or decontamination should be replaced. However, the areas left behind should be decontaminated before replacement materials are installed. Areas of replacement, that then need painting, can best be painted with paints which have mold inhibitors included. This information is usually included on the label.

5) Any water damaged porous materials (e.g. ceiling tiles, carpet and wallboard) that cannot be dried out and cleaned within 48 to 72 hours should be removed and replaced. Bacteria and mold can begin to grow within this period of time.

6) Should there be further problems consult Envirotest to perform sampling to determine exact mold types and air quality problems.

Individual mold characteristics

Cladosporium

Cladosporium is an extremely common mold found in temperate climates. The Spores readily become airborne and are transported over long distances. The high season for Cladosporium is typically late summer and autumn while the low season is typically winter and early spring. Cladosporium has been isolated from many different types of soil and plant litter; enzymes produced by the mold breakdown cellulose, pectin and lignin that are major components of leaf litter.

Inside, Cladosporium can be found in dirty refrigerators, in condensation reservoirs, on moist window frames, and pretty much on any moist, porous surface. Cladosporium often discolors interior paint paper, or textiles stored in humid environments.

The ability for Cladosporium to rapidly and heavily sporulate makes this mod a common airway allergen associated with asthma and hay fever. Cladosporium may cause more serious illnesses in individuals with suppressed immune function.

Penicillium sp.

The spores of Penicillium contain mycotoxins responsible for causing a variety of allergy symptoms and illnesses. Mycotoxins are chemicals produced by fungi that are most concentrated in the spores but are also resent in actively growing mold filaments. Under normal circumstances, the indoor concentration of spores is generally low enough to not provoke an immune response except in those people who are sensitive to the specific mycotoxins or have compromised immune systems. Mycotoxins can cause a variety of short term, as well as long term illnesses. Symptoms due to mycotoxin exposure include or altered immune function, which may lead to opportunistic infections.

Stachybotrys atra

Stachybotrys is described as an indicator mold and when identified in either air or bulk sampling "may signal moisture presence or a potential for health problems" (Macher et al, 1999). Stachybotrys is generally found on materials with high cellulose content (such as wallboard and ceiling tiles) that become chronically moist or water damaged from excessive relative humidity, pipe or roof leaks, condensation, or flooding. several toxins are produced by Stachybotrys and are known to be toxic to humans exposed to significant quantities. If Stachybotrys spores are released into the air, there is a potential for allergic, respiratory, or immunological symptoms to develop or become exacerbated. These conditions include asthma, hypersensitivity pneumonitis, allergic rhinitis, dermatitis, sinusitis and conjunctivitis (New York City Department of Health, 1993).

Alternaria sp.

Alternaria is a very common fungal saprophyte found on decaying wood, in composts, on plants and food and in different types of soil. Its distribution is worldwide and is frequently found in outside air, where in temperate climates, the conidia (spore) levels reach their peak in late summer. Indoors it

can be found in dust and carpets, on damp spots around showers and window frames and virtually any area where condensation exists.

The ubiquitous and common Alternaria is an important fungal allergen. Allergies to Alternaria will most often cause an immediate mediated allergic response, however, there have been documented cases of hypersensitivity pneumonitis to airborne exposure of Alternaria spores. Serious infection associated with Alternaria is rare. Alternaria mycotoxins have not been the subject of much investigation although they are produced.

Aspergillus sp.

There are more than 160 species of Aspergilus, 16 of which have been documented as etiologic agents of human disease. They are among the most common groups of environmental fungi. Many species are isolated from a variety of substrates, including grains, nuts, cotton, organic debris and water damaged, organic building materials. The most frequently encountered opportunistic Aspergillus pathogen is A fumigatus and is seen most abundantly in decomposing organic materials. Aspergillus fumigatus and A niger have been identified as the more harmful species of the Aspergillus group.

Aspergillus is considered a common environmental mold that can pose health risks when it is present in elevated levels. Health problems due to Aspergillus exposure may include headaches, eye, and skin irritation, asthma aggravation of existing respiratory conditions , other typical allergic symptoms, and hypersensitivity pneumonitis. Hypersensitivity and allergic responses can be triggered by minimal exposure and especially in people who have an existing sensitivity to mold allergens and toxins or who have compromised or suppresses immune function. Aspergillus can proliferate successfully indoors when conditions become favorable resulting in an increase in the number of spores, and therefore, mycotoxin concentrations that can be harmful.

Aureobasidium pullulans

Aureobasidium is one of several "black yeasts" so called because of its slimy black appearance in cultures. It is a common saprophyte with worldwide distribution and is frequently isolated from soils. During autumn, Aureobasidium colonizes the surface of the leaves of many types of trees, producing pectins that breakdown the cell walls. The initial decomposition of leaves is generally caused by Aureobasidium paving the way for other molds to further breakdown the leaves. Aureobasidium is a known allergen, however, not much information is available on this mold to date.

Fusarium sp.

Fusarium species are soil fungi and have a worldwide distribution. Many are plant pathogens, however, several are pathogenic to humans and other animals causing mycotic infections especially in burn victims and transplant patients.

Paecilomyces sp.

Paecilomyces has been isolated from jute fibers, paper, PVC time (oak wood) optical lenses leather, photographic paper, cigar tobacco, grapes, bottled fruit juice undergoing pasteurization. Type I allergies (hay fever, asthma) and Type III hypersensitivity pneumonitis have been associated with Paecilomyces exposure. Species of the mold genus Paecilomyces are seldom associated with serious human infection.

Rhizopus sp.

Rhizopus is a common mold found on decaying fruits, in soil, house dust and frequently in the air. Rhizopus grows rapidly and produces countless, easily aerosolized spores. Human infections or diseases are rare.

Trichoderma sp.

Trichoderma is a common genus of molds, especially in soils and on decaying wood. A species of Trichoderma has bee linked with pulmonary fungus ball disease however disease is quite rare and only reported in those immuno-compromised.

Appendix B
Report Limitations and Disclosure

This report has been produced for Envirotest's client only and is not intended for dissemination outside the Envirotest-Client sphere without written consent from Envirotest personnel. This report is intended only as a general guide to help only Envirotest's client make his/her own evaluation of the overall condition of the inspected areas. The report expresses the personal opinions of the inspector, based upon his visual impressions of the conditions that existed at the time of the inspection only. The inspection and report are not intended to be technically exhaustive, or to imply that every component was inspected, or that every possible defect was discovered. No disassembly of equipment, moving of furniture, appliances or stored items, or excavation was performed. All components and conditions which by the nature of their location are concealed, camouflaged or difficult to inspect are excluded from the report.

Systems and conditions which are not within the scope of this inspection include, but are not limited to: formaldehyde, lead paint, asbestos, environmental hazards; pest infestation, Outdoor sheds, efficiency measurement of insulation or heating and cooling equipment, internal or underground drainage or plumbing, any systems which are shut down or otherwise secured; water wells (water quality and quantity) zoning ordinances; intercoms; security systems; heat sensors; cosmetics or building code conformity. Any general comments about these systems and conditions are informational only and do not represent an inspection.

The inspection report should not be construed as a compliance inspection of any governmental or non-governmental codes or regulations. The report is not intended to be a warranty or guarantee of the present or future adequacy or performance of the structure, its systems, or their component parts. This report does not constitute any express or implied warranty of merchantability or fitness for use regarding the condition of the property and it should not be relied upon as such. Any opinions expressed regarding adequacy, capacity, or expected life of components are general estimates based on information about similar components and occasional wide variations are to be expected between such estimates and actual experience.

To the best of our knowledge and belief, all statements and information in this report are true and correct.

Payment for this report shall constitute a binding contract that should any disagreement or dispute arise as a result of this inspection or report, it shall be decided by arbitration and shall be submitted for binding, non-appealable arbitration to the American Arbitration Association in accordance with its Construction Industry Arbitration Rules then obtaining, unless the parties mutually agree otherwise. In the event of a claim, Envirotest's Client will allow Envirotest and any other pertinent parties to inspect the claim prior to any repairs or waive the right to make the claim. Envirotest's Client agrees not to disturb or repair or have repaired anything which may constitute evidence relating to the complaint, except in the case of an emergency.

All appearances by Envirotest staff concerning this report, the property in question or for any other purpose shall be billed at the rate of $200.00/hour.

If any part of this statement or report is not not agreeable to you, please contact Envirotest at any time and we will endeavor to rectify issues with this report free of charge.