Mold Sampling Procedures:

Mold Sampling Procedures:

- 1. General Comments:
 - 1. This mold assessment comes with 1 outdoor air sample and 1 indoor air sample. All additional samples will be charged to the client at an additional fee; therefore, they have the sole right to choose what is sampled and what is not sampled, even against the inspector's recommendations. The client has the right to request the mold assessment and sampling be conducted at any time, date, or under any weather conditions, even when those conditions may have an adverse effect on the sampling results. Additional charges may apply for additional trips.
 - 2. Samples of the indoor air and the outside air should be taken for comparison. There should not be any mold inside the building that is not found outside. The concentration of mold inside a building should not be higher than the concentration of mold outside.
 - 3. Keep in mind that mold spores in the air being sampled can vary greatly in relation to the life cycle of the mold, atmospheric and environmental conditions, and the amount of ventilation. There are seasonal and diurnal variability in airborne mold at an indoor environment.
 - 4. Air sampling is recommended if the mold growth is suspected (for example, musty odors), but cannot be identified by a visual examination. The purpose of such air sampling is to determine the location and/or extent of mold contamination as well as a simple confirmation that mold growth exists somewhere in the building. All mold spores have a source, and identifying the source is the goal.
 - 5. Because the outdoor sample is the control, and it is used to compare with the indoor sample, the samples should be collected as close as possible in time and under the similar conditions. Air samples should be collected at the same air flow rate, for the same duration of time, near the same height above the floor in all rooms that are sampled indoors, and using the same type of collection device.
- 2. Air Flow Rate
 - 1. There are many different types of air pumps, measurement meters, and spore collectors that can be used for an air sample at a mold inspection. The air pump should be adjusted to collect air at a flow rate that is recommended by the manufacturer of the collection device.
 - 2. The flow rate could be 15, 10 or even 5 liters per minute. The result of an air pump sample is recorded in spores per meter cubed (spores/m3).
 - 3. If the air flow rate is too fast, the spores will bounce off the collector plate or slide and will not stick. If the airflow rate is too slow, the spores float around the collector plate or slide and will not stick.
- 3. Rotameter
 - 1. Rotameters are air flow meters that provide field accuracy in an easy-to-read instrument. The principle of operation is simple: air flow passes through a vertical, tapered tube and pushes a

small ball or float having a diameter slightly less than the smaller tube end. As the little ball rises, the clearance between the ball and the tube wall increases. The ball becomes stationary when the diameter of the tube is large enough to allow the total airflow past the ball. The flow rate is determined by reading the number on the tube at the middle position of the stabilized ball.

- 4. Surface Sampling
 - 1. Surface sampling can provide information regarding whether the visible apparent mold is in fact actual microbial growth (mold) or not, measure the relative degree of the mold contamination, and can serve to confirm that the sampled mold growth may be producing mold spores in the air.
 - 2. Area of Concern One Sample Recommended
 - If there is an area of concern (a room or area with moisture intrusion, water damage, musty odors, or apparent mold growth), the inspector may recommend at least one (1) surface sample in EACH area of concern. In a room or area with moisture intrusion, water damage, or musty odors in which air sampling has already been conducted, surface sampling will not be recommended. It is recommended that all apparent and visible mold growth be surface sampled, regardless of where air samples were taken.
 - 2. Additional surface samples may be recommended at the discretion of the inspector.
 - 3. No Areas of Concern Not Required
 - 1. If there are no areas of concern (no moisture intrusion, no water damage, no musty odors, and no apparent mold growth), the inspector will recommend not to perform a surface sampling.
 - 2. Surface samples may be recommended in other areas of the building at the discretion of the inspector.
 - 4. Swab
 - 1. A swab comes inside a plastic tube container. The cellulose swab is moistened with a liquid preservative stored in an ampoule at one end of the tube container. Any bacteria collected with the swab are transferred via the swab into a tube. The tube is sent directly to a laboratory for analysis.
 - 2. A swab provides immediate determination of the presence of fungal spores as well as what types of fungi are present.
 - 3. Areas of Concern
 - 1. Inspector shall recommend at least one (1) swab sample when a visual examination of the building yields moisture intrusion, water damage, apparent mold growth, or musty odors. Additional sampling may be recommended at the discretion of the inspector.
 - 4. Sampling

- In general, an inspector will typically hold the tube container so that the ampoule with the liquid preservative is at the top. The user pinches the plastic tube so the liquid will flow down onto the swab. To remove the moistened swab, the user pulls on the cap. Rub and roll the wet swab over a one-inch square area of the apparent mold growth. The swab should collect visible apparent mold. Insert the swab back into the tube. Secure the cap.
- 5. Each Sample
 - 1. A unique sample number should be recorded for each swab sample. The inspector will write the number on the tube itself. The Chain-of-Custody document should have the sample number, location, date, and time of the sampling.
- 6. Each Room
 - 1. The inspector will sample in each room or area where there is visible apparent mold if the client approves.
- 7. Each Color
 - 1. If there is apparent mold growth with different colors in the room or area, the inspector will take a sample of each different colored mold if the client approves. The different colors may indicate different mold types.
- 8. Each Substrate
 - 1. If mold is visible on different substrates or building materials such as wood, drywall, or wallpaper, then a sample from each different material is recommended by the inspector.

5. Tape

- A tape system provides a quick way to sample visible mold. A tape-lift system is the most common surface sampling technique. It can be used instead of a swab sample. Many samples can be collected in a short period of time. Samples that show hyphae fragments and reproductive structures can provide proof of mold growth.
- 2. One of the most popular tape sampling products is the Bio-Tape[™] system. There are many advantages of using tape lift systems such as the Bio-Tape[™] instead of using regular tape. Bio-Tape[™] is easier to handle, the tapes are individually numbered, it requires less laboratory preparation time, and the slides are flexible and will not break.
- 3. The sampling result is not quantitative. The presence of fungi can be confirmed, genera can be identified, and possibly a semi-quantitative estimation of the amount of each genus can be determined.
- 4. Sampling
 - 1. The procedure to using a tape lift system such as Bio-Tape[™] is as follows:
 - 1. The inspector shall remove the slide from the mailer;

- 2. The inspector shall record the sample number and all other identification information prior to taking the sample;
- 3. The inspector shall peel off the protective liner from the slide to expose the adhesive;
- 4. The inspector shall place the slide with sticky side down on the contaminated area being sampled;
- 5. The inspector shall press down gently and make contact. Excessive pressure is not necessary;
- 6. The inspector shall lift the slide from the surface and place back into the slide mailer. Do not replace the protective liner;
- 7. The inspector shall record all information on the Chain-of-Custody document, including property address, date, time, and sample number;
- 8. The inspector shall mail or drop off the sample to the laboratory.

5. PPE

- 1. Because there is direct contact with and disturbance of the contaminated area, PPE is recommended, including gloves and a respirator rated as N-95 or higher.
- 6. Each Sample
 - 1. A unique sample number should be recorded for each tape sample. The Chainof-Custody document should have the sample number, location, date, and time of the tape sampling.

7. Each Room

1. The inspector shall take the tape sample in each room or area where there is visible apparent mold if the client approves. Tape sampling is not recommended if swab samples have already been taken in areas of concern.

8. Each Color

1. If there is apparent mold growth with different colors in the room or area, the inspector recommends a tape sample of each different colored mold if the client approves. The different colors may indicate different mold types. Tape sampling is not recommended if swab samples have already been taken in areas of concern.

9. Each Substrate

- 1. If mold is visible on different substrates or building materials such as wood, drywall, or wallpaper, then a tape sample from each different material is recommended. Tape sampling is not recommended if swab samples have already been taken in areas of concern.
- 5. Outdoor Air Sampling

1. One Outdoor Samples

- 1. The inspector shall perform one outdoor sample of the highest quality general air to be used as control samples (or background samples). This sample to be used for comparison with the indoor sample(s).
- 2. Upon Arrival
 - 1. The outdoor sampling should begin soon after arriving at the property, assuming that the weather is clean and calm. It is better for an inspector to perform the outdoor sampling while the weather is favorable than to wait. The outdoor conditions may change drastically during the examination and sampling of the building interior.
- 3. Weather
 - 1. If possible, air sampling should not be conducted during unusually severe storms or periods of unusually high winds. Severe weather will affect the sampling and analysis results in several ways.
 - 2. First, a high wind will increase the variability of airborne mold spore concentration because of wind-induced differences in air pressure between the building interior and exterior. Second, rapid changes in barometric pressure increase the chance of a large difference in the interior and exterior air pressures, consequently changing the rate of airborne mold spores being sucked into the building.
 - 3. Rain
 - 1. If possible, air pump sampling should not take place outdoors if it is raining heavily. If possible, it is recommended to wait for at least two hours after the heavy rain has stopped before taking an air pump sample. Alterations or adjustments to the normal procedure or locations of taking air pump samples, particularly for the control sample, must be recorded in a Chain-of-Custody.
 - 4. Above Freezing
 - Air pump sampling ideally should not take place when the outdoor air temperature is below 32° Fahrenheit. All air sampling are recommended to take place when the air temperature is above freezing.
 - 5. Snow covering
 - 1. If the ground is completely covered with snow, outdoor air pump sampling is not recommended to be performed. A partial covering or a light dusting of snow is acceptable.
 - 6. Ten Minutes
 - On a clean day with severe winds, air pump sampling should run for 10 minutes. (Be sure to refer to the manufacturer's recommendation. There are cassettes that require only 5 minutes such as the Z5.) When the outdoor air is something other than clean and lacking significant wind, then the time of the sampling should be reduced to 5 minutes or less, or per the manufacturer's

recommendation. A breeze, the mowing of grass, nearby construction, and dusty air all affect the sampling conditions.

4. Location

- The sampling device, if located on the windward side of the building, should be positioned so as to face the wind directly. The sampling device should point towards the wind, in the direction of the point from which the wind is blowing. The sampling device should be three to six feet (3-6 ft.) from the ground surface (breathable space).
- 2. Typically, the device should be about 10 feet away from the entry door. The idea is to have the outdoor sample located in areas where the devices will collect a representative sampling of the air that may enter the building through the entry door or nearby open windows (the openings on the sides of the building).
- 3. Ten Feet
 - 1. If there is a main ventilation component of the building that draws into the building fresh air from outside, sampling should be performed ten feet (10 ft.) feet from that intake.
 - 2. The sampling should be performed at least ten feet (10 ft.) from the most frequently used entrance to the building.
 - 3. The air sampling devices should be kept at least ten feet (10 ft.) away from all openings, air intakes, registers, exhaust vents, vent pipes, ventilation fans, etc.
- 4. Nothing Overhead
 - 1. Sampling should not be performed under an overhang, soffit or eave; carport; porch roof, or any other roof or overhead structure.

6. Indoor Air Sampling

- 1. Closed-Building Conditions
 - 1. Indoor air sampling should be made under closed-building conditions. Closed-building conditions are necessary for in order to stabilize the air that may contain mold spores or mVOCs, and to increase the reproducibility of the air sampling and measurement.
 - 2. Windows on all levels and external doors should be kept closed (except during normal entry and exit) during the sampling period. Normal entry and exit include a brief opening and closing of a door, but-to the extent possible-external doors should not be left open for more than a few minutes.
 - 3. In addition, external-internal air exchange systems (other than a furnace) such as highvolume, whole house and window fans should not be operating. However, attic fans intended to control attic and not whole building temperature or humidity should continue to operate. Combustion or make-up air supplies should not be closed.
 - 4. Normal operation of permanently installed energy recovery ventilators (also known as heat recovery ventilators or air-to-air heat exchangers) may also continue during closed-

building conditions. In buildings where permanent radon mitigation systems have been installed, these systems should be functioning during the air-sampling period.

5. Closed-building conditions will generally exist as normal living conditions in northern areas of the country when the average daily temperature is low enough so that windows are kept closed. Depending on the geographical area, this can be the period from late fall to early spring.

2. HVAC

- 1. Take One Air Sample
 - 1. At least one air sampling shall be taken near an air supply register of the HVAC system. It is preferred to sample during the operation of the HVAC system. The sampling should be taken no less than 15 minutes after the HVAC system is turned on.
 - 2. Ideally, there would be at least three sampling devices similarly situated throughout the building, but financial or time constraints may limit the number of samples that can be taken.

2. Location

- 1. At least one air sample should be taken three to five feet (3-5 ft.) from an air supply register, with the sampling device oriented so that air from the supply register directly enters the sampling device.
- 3. Agitation
 - 1. A gentle or vigorous mechanical agitation of the ductwork (a bump or shake) is appropriate but not required.

3. Indoor Air

- 1. Take One Air Sample
 - 1. The inspector shall perform at least one (1) indoor sample. Additional samples may be performed at the request of the client.
- 2. Areas of Concern
 - 1. At least one (1) air sample is recommended to be taken near the center of EACH room or area of the building in which there are areas of concern (moisture intrusion, water damage, musty odors, and visible apparent mold growth).
- 3. No Areas of Concern
 - 1. At least one (1) indoor air sample is recommended be taken in a lived-in common room, such as the family, living, or entertainment room or sleeping area (The location is determined at the request of the client). It is best practice to perform one (1) indoor air sample on each level.
- 4. Location

- An indoor air sampling should only take place in a livable space in the building. Sampling in areas such as closets, under-floor crawlspaces, unfinished attics, storage or utility rooms, or inside the HVAC system is prohibited. Unfinished basements that can be finished in the future may be sampled.
- 2. The indoor air sample should be taken in the middle or center area of the area or room and/or near a supply register.
- 3. The air collection device should be at head height (about three to six feet above the floor surface).
- 5. Ten Minutes
 - Inside the building, the air pump sampling should run for 10 minutes. If there is a lot of indoor activity, then the air pump sampling should be reduced to 5 minutes. If there is an active source of dust, such as construction or cleaning, then the air sampling time should be reduced to 1 minute. Be sure to follow the recommendations of the manufacturer of the sampling device or collector; there are some devices that are designed to take a sample in 5 minutes (i.e. Z5 cassette).
- 7. Sampling
 - The sampling equipment must be protected, clean, and properly maintained at all times. The sampling device shall be clean, free from dirt or debris prior to starting a sample. If re-usable collection devices are used, then they shall be handled and cleaned prior to use in accordance with the manufacturer's recommendation. The collector may re-usable and have sticky slides already prepared, or the collector may be a one-time-use self-contained device.
 - 2. Slides, cassettes, and one-time-use devices should be stored in cool, dry environments. The slides must be protected from direct sunlight. Sampling devices (slides, swabs, cassettes, tapes) older than one year or past their expiration date should not be used.
 - 3. Set the air collector at a normal breathing height, which is about 3 to 6 feet above the ground level or floor surface. A tripod is typically used to set the collector height.
 - 4. Calibrate the flow of the pump. Do not attach the sampling device, cassette or collector on the tubing yet. Measure the flow rate of the pump with a rotameter that has been calibrated to a standard. Make sure that the flow rate is set to the manufacturer's recommendation. For example, an Air-O-Cell cassette flow rate is 15 liters of air per minute. The pump should be calibrated regularly (once a day).
 - 5. After calibration, securely attach the tubing of the pump to the sampling device or collector. Turn on the pump. Start sampling. Record start time.
 - 6. After turning on the air pump, check the airflow rate. The flow rate should not vary. A flow change greater than five percent (5%) requires a new air sample to be taken. All air samples must have the same volume. A digital time controller on the equipment is highly recommended.

- 7. Examine the collector. There should not be an overload on the slide. There should be a fine trace, hardly visible to the human eye, of dust and spores on the slide. A slide that has an easily visible trace on it may be unreadable. If that is the case, the environmental conditions may need improvement or a new sampling location may be needed. If a slide is heavy, a new sample should be taken.
- 8. Remember, all air samples must have the same volume. Refer to manufacturer's recommendations about sampling time and volume for each type of sampling device.
- 9. Record the time that the pump stopped. Mark the sampling device with a unique sampling number. Record that information on the Chain-of-Custody.
- 10. Place slides in a protective carrying case. Or close the collector if a cassette is used. A new sample must be taken, if a slide is accidentally touched, smeared, or contaminated, because it will be unreadable.
- 11. Calculate the volume by multiplying the liters of air pumped by the number of minutes. An example of the calculation is 20 liters of air pump multiplied by 10 minutes equals 20 liters per minute equals 200 liters (20L x 10 minutes = 200 L).