IV. AIR VELOCITY MONITORS/INDOOR AIR QUALITY (IAQ) ASSESSMENT INSTRUMENTATION

NOTE: Always record the barometric pressure and air temperature when using air velocity meters. Refer to the user manual to determine the operating range for temperature and pressure. The measurement uncertainty may be greater when used at temperatures above or below room temperature.

A. FLOW HOODS

Application and Principle of Operation

A flow hood or balometer is an instrument used to measure volumetric air flow from supply or exhaust diffusers and grilles. The benefit of using a flow hood is that accurate measurements with a high degree of precision can be quickly obtained without the necessity of measuring grille sizes and conducting repeated velometer measurements over the face of the diffuser or grille. With the flow hood, the user can measure air volume, check HVAC system balance, verify air flow distribution within and between rooms, and in combination with other data, estimate the percent of outdoor air being supplied to a space. Additionally, if the diffuser area is known or measured, an accurate average linear air velocity can be calculated. Such applications may be important in assessing ventilation controls or conducting IAQ investigations. Other useful applications include determining volumetric airflow for dilution ventilation and evaluating airflow patterns to ensure that contaminants are not being pulled into unintended work areas. For more guidance on the appropriate use of flow hoods, please contact the SLTC.

Calibration

No field calibration is available; CTC handles calibration. Periodic factory calibration or equivalent by a laboratory is essential.

Maintenance

These instruments typically require little field maintenance other than battery pack servicing and zero balancing of the analog scales. Check the manufacturer's user manual for details.

B. THERMOANEMOMETERS

Application and Principle of Operation

A thermoanemometer (hotwire anemometer) is a handheld device with an extendable wand probe used to measure air speed (velocity). Due to their use of a heated wire, they are generally NOT suitable for use in hazardous areas where intrinsically safe equipment is required. Thermoanemometers can be used to monitor the effectiveness of ventilation systems and local exhaust systems. In general, thermoanemometers are appropriate for measuring laminar (nonturbulent) airflow. Multiple readings must be taken at different points in a plane which is perpendicular to the direction of airflow, and then averaged together. They are valuable when evaluating laboratory hoods for adequate face velocity. When the area of the hood face or exhaust diffuser is known (or measured) the volumetric airflow can be estimated by taking multi-point traverse measurements across the face of the hood or diffuser. A thermoanemometer can also be used effectively to assess downdraft/sidedraft tables and slot ventilation, because these all operate by establishing a stable capture velocity in a defined capture plane (e.g., at a specified distance from

the slots). They are not useful for assessing snorkel-type local exhaust, due to generally turbulent airflow in the capture zone of a snorkel. Additionally, if a duct has access ports, the interior duct speed can be estimated by taking a multipoint traverse. To ensure accurate readings, a duct traverse should not be taken within three duct diameters of any elbows, branches, fans or transitions due to turbulent airflow in these locations. For more guidance on the appropriate use of thermoanemometers, please contact the SLTC.

"Ventilation smoke" is available through the AESP and is a helpful complement to the thermoanemometer. Smoke released inside an enclosing hood, such as a laboratory fume hood or spray booth, or outside an exterior hood, such as a snorkel, slot ventilation, canopy hood, downdraft table, or side draft hood, will help visualize whether contaminants will be effectively contained and/or captured. Ventilation smoke will also help determine whether supply air turbulence near a hood may compromise the hood's effectiveness.

Calibration

No field calibration is available. Equipment should be sent to the CTC for calibration and document retention. The CTC calibration interval is once every two years.

Special Considerations

While thermal anemometers can be very accurate, their accuracy may be adversely affected by air turbulence, temperature variations, or dirty probes. Note the manufacturer's limitations of use. Thermal anemometers are generally not intended for use in gas mixtures other than air, corrosive atmospheres, or other hazardous gas streams.

Maintenance

These instruments typically require little field maintenance other than battery pack maintenance and zero balancing of analog scales, if applicable. Check the manufacturer's user manual for details.

C. OTHER AIR VELOCITY METERS

Other types of air velocity meters include rotating vane and swinging vane velometers. These are used infrequently, but may be useful in circumstances where a thermoanemometer cannot be used, for example, corrosive atmospheres or hazardous environments. Also, rotating vane anemometers can be used to assess snorkel-type local exhaust ventilation.

D. BIOAEROSOL MONITORS

Application and Principle of Operation

Assessment of bioaerosols may be useful in certain IAQ investigations. A bioaerosol monitor, usually a two-stage sampler, is also a multi-orifice cascade impactor. This unit is used when size distribution is not required and only respirable-nonrespirable segregation or total counts are needed. Ninety-five to 100 percent of viable particles above 0.8 microns in an aerosol can be collected on a variety of bacteriological agar. Trypticase soy agar is normally used to collect bacteria, and malt extract agar is normally used to collect fungi. Blood agar is typically used for collection of Stachybotrys chartarum. Bioaerosol monitors can be used in assessing sick-building syndrome, or buildings which may have source exposures to molds and bacteria which may be exacerbating or causing illness to the occupants. These samplers are also capable of collecting virus particles.

However, there is no convenient or practical method for cultivation and enumeration of viral particles.

The SLTC does NOT perform analysis of biological samples in-house. The SLTC coordinates analysis of biological samples by contracted laboratories. When considering biological sampling, contact the SLTC to discuss sampling requirements, technical support, assessment, and analytical coordination. The SLTC staff will review the sampling and analysis plans with the CSHOs and make recommendations where appropriate. The SLTC offers contracting services for analysis of fungi, bacteria (such as Legionella), and endotoxin. Other services can be arranged on a case-by-case basis.

Calibration

Bioaerosol meters must be flow-calibrated before use, using the same type of sampling media in the sampling train as will be used in the field. This can be done using an electronic calibration system with a high-flow cell.

Special Considerations

Prior to sampling, work with the SLTC HRT to determine the type of collection media required, sampling flow rates and times, and the analytical laboratory that will provide analysis. This specialized equipment is available from the HRT with instructions.

Maintenance

The sampler should be decontaminated prior to use by sterilization, or chemical decontamination with isopropanol.