FUME HOOD COMMISSIONING AND PERFORMANCE TESTING

A fume hood commissioning and performance testing process are critical in ensuring the proper function of a laboratory ventilation system. When fume hoods are installed as part of new construction they will be certified by a Test and Balance (TaB) service as part of the building commissioning process. Fume hoods installed as part of a laboratory renovation project will also be certified by a TaB service.

The following excerpt from the University of California EH&S Laboratory Safety Design Guide and the UCI D&CS Construction Specifications provide important points to include in a commissioning process:

A written commissioning plan shall accompany design documents and be approved by the commissioning authority in advance of construction activities. The commissioning plan, along with the other project documents, shall be available to all potential suppliers and contractors prior to bid. The commissioning plan shall address the operation of the entire ventilation system where the hoods, laboratories, and associated exhaust and air supply ventilation systems are considered subsystems. The plan shall include, in addition to written procedures to verify or validate the proper operation of all system components:

• Laboratory Chemical Hood Specification and Performance Tests
• Preoccupancy Hood and Ventilation System Commissioning Tests
• Preoccupancy Laboratory Commissioning Tests

Preliminary and final commissioning documents shall be issued to the appropriate parties by the University representative. The documents shall include:

• Design Flow Specifications
• Laboratory and System Drawings for Final System Design
• Copy of Test and Balance Report
• Commissioning Test Data
• List of Ventilation System Deficiencies uncovered and the details of how (and if) they were satisfactorily resolved

Operational deficiencies and other problems uncovered by the commissioning process shall be communicated to the responsible party (i.e., installer, subcontractor, etc.) for prompt correction.
Before performing laboratory fume hood testing, measure, adjust and record the supply airflow and airflow patterns of each supply air outlet that is located in the same room as the hood.

Adjust the air outlet flow pattern to minimize turbulence and to achieve the desired airflow patterns at the face and inside the hood. Verify that adequate makeup air is available to achieve the indicated flow of the hood.

The volumetric flow exhausted from a laboratory chemical hood shall be determined by measuring the flow in the exhaust duct, using industry-approved methods.

**Fume Hood General Balancing Requirements:**

Fume hoods shall be balanced with an inward flow, to a minimum of 100 feet per minute (fpm) face velocity across the opening, with a minimum of 70 fpm at any point.

Fume hoods equipped with automatic controls and occupancy sensors, shall be balanced for the controls system “unoccupied mode” (no employee working in the vicinity of the fume hood opening) to 60 fpm when all of the conditions of California Title 8 General Industrial Safety Order are met.

Measure, adjust, and record the airflow of each laboratory fume hood by duct Pitot-tube traverse with the laboratory fume hood sash in the design open position.

- For laboratory fume hoods installed in variable exhaust systems, measure, adjust, and record the hood exhaust airflow at maximum and at minimum airflow conditions.

- For laboratory fume hoods designed with integral makeup air, measure, adjust, and record the exhaust and makeup airflow.

- For laboratory fume hoods that are connected to centralized exhaust systems using automatic dampers, adjust the damper controller to obtain the indicated exhaust airflow.

After balancing is complete, do the following:

Measure and record the static pressure at the hood duct connection with the hood operating at indicated airflow.

Measure and record the face velocity across the open sash face area. Measure the face velocity at each point in a grid pattern. Perform measurements at a
maximum of 12 inches between points and between any point and the perimeter of the opening.

1. For laboratory fume hoods designed to maintain a constant face velocity at varying sash positions, also measure and record the face velocity at 50 and 25 percent of the design open sash position.

2. Calculate and report the average face velocity by averaging all velocity measurements.

3. Calculate and report the exhaust airflow by multiplying the calculated average face velocity by the sash open area. Compare this quantity with the exhaust airflow measured by duct Pitot-tube traverse. Report differences.

4. If the average face velocity is less than the indicated face velocity, retest the average face velocity and adjust hood baffles, fan drives, and other parts of the system to provide the indicated average face velocity.

Check each laboratory fume hood for the capture and containment of smoke by using a hand-held emitting device. Observe the capture and containment of smoke flow pattern across the open face and inside the hood. Make adjustments necessary to achieve the desired results.

With the room and laboratory fume hoods operating at indicated conditions, perform an "as installed" performance test of the laboratory fume hood according to ANSI/ASHRAE 110-1995 Method of Testing Performance of Laboratory Fume Hoods, modified. Test each laboratory fume hood in occupied mode, unoccupied mode, and at minimum flow mode and document the test results.

**ANSI/ASHRAE 110-1995 Testing**

Tests demonstrating proper operation and performance of the fume hood will be conducted after installation and prior to use of the hood according to ANSI/ASHRAE 110-1995 “Method of Testing Performance of Laboratory Fume Hoods" as required by CCR,Title 8, 5154.1. All tests shall be conducted at a design opening sash height of 18 inches.

ASHRAE 110-1995 testing would be performed using sulfur hexafluoride as the tracer gas or in accordance with UC variance file No. 09-V-141 granted on April 21, 2011 that allows the use of nitrous oxide at a tracer gas source rate of 5.5 lpm.
APPENDIX C

The ANSI/ASHRAE 110-1995 testing would be performed upon commissioning and when required by CCR, Title 8, §5154.1. Testing would also occur if a fume hood was not maintaining capture as indicated by face velocity and/or smoke visualization testing even after repair, or if there are any major changes to laboratory rooms or ventilation systems that could impact hood performance.

Each hood shall have a label indicating the date of the most current tracer gas test and the date the next test is due. The records of tracer gas tests and velocity verifications shall be maintained for 5 years.