



Fume Hood Calibration, Face Velocity Testing

Fume hoods are utilized to properly evacuate materials that might lead to air quality problems and to related negative health effects. In order to operate properly, a well-balanced face velocity flow is crucial to ensure adequate chemical removal, while not over-ventilating at the cost of the resultant reconditioning of exhausted air (an energy cost that can be quite significant). US OSHA recommends utilizing a fume hood, or alternate local ventilation device, when working with any volatile substance with a TLV < 50ppm¹. In schools and laboratories, volatile substances often react leading to the creation of gases or odors. The reactants in the room where the chemicals are present could contaminate the rest of the building if fume hoods are not calibrated properly. A properly operating and verified mechanical ventilation system is of utmost importance.



For most fume hoods, a face velocity of 80-100 fpm (0.41-0.51 m/s) is adequate (in lieu of specific regulations or SOPs that require different values). Hoods that are equipped with exceptional containment may be able to operate below 80 fpm. However, operating a hood below 60 fpm (0.3 m/s) is generally not recommended².

¹ US OSHA, 29 CFR Part 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories.

² ANSI/AIHA Z9.5-2003 American National Standards for Laboratory Ventilation.

There are many factors beyond proper operator training that can influence laboratory hood performance. Examples include:

- HVAC room-air ventilation
- Wind blowing through open windows and doors²
- People walking by (can create turbulence up to 0.5 m/sec)³
- Mobile equipment passing by
- Obstruction in the path of capture
- Leaks in exhaust ducting

Verifying that any of these common causes are not a factor is important to ensure safe, optimal performance out of your fume hood.

Fume hood calibrations should be performed on an annual basis⁴, whenever damaged, or after a significant change has been made to the operational characteristics of a system (i.e. hood structure, supply air duct). Taking more frequent periodic tests can be a good indicator of the status of the hoods, bearing that no significant changes have been made since the last test. In addition, the ability to test face velocity under varied conditions (e.g. with the HVAC system operating in different modes) can help ensure that the hood is operating as expected under all anticipated conditions.

There are two different procedures that are commonly conducted to calibrate lab hoods; the Tracer Gas Test and the Face Velocity Test. To perform a Face Velocity Test, the velocity should be measured at the hood face at a minimum of 10 points to get an average. The sash should be open, and the area should be divided into imaginary rectangles of equal area measuring no more than 12" x 12" (4.7cm x 4.7cm). For the perimeter of the hood the distance should be approximately 6 in. from the top, bottom and the sides of the opening. The velocity probe should be positioned in the middle of each grid and then

³ National Fire Protection Association, Standard NFPA 45-2000 A6.9.1

⁴ NEBB Procedural Standards for Fume Hood Performance Testing. 2009-First Edition.





measured (in averaging mode) for at least 10 seconds. All points should then be multiplied by the open area to determine the flow rate².

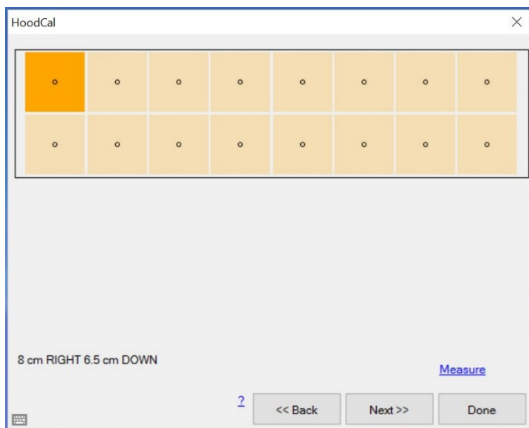
GrayWolf offers the handheld AdvancedSense® PRO environmental test meter with portable thermal air velocity probes (models AS-201 and AS-202A). These probes provide unsurpassed accuracy over a broad range, particularly exceptional in the range crucial to test face velocity on fume hoods. GrayWolf's software averages the readings (at user defined rates), which may then be easily data-logged with text notes, template forms and photos (e.g. of the hood under test) recorded to the data file.

With GrayWolf's optional HoodCal™ software, step-by-step instructions are provided to perform a Face Velocity Test. HoodCal allows for the area of the sash to be input, and then guides the operator to properly position the probe within a displayed, calculated grid to ensure accurate measurements.

HoodCal software also allows the user to set a range of face velocity limits (acceptable results are usually within +/-10%² of manufacturer specifications). When the procedure is complete, a report of all measured velocities is provided along with a PASS/FAIL indication according to the GrayWolf default or based on user entered tolerances.

Documenting all pertinent information about each fume hood as well as the surrounding environmental conditions are an important part of the calibration process. To prevent the migration of potentially toxic contaminants from a laboratory to occupants adjacent areas, in all rooms that handle chemicals, the pressure in the lab should be lower than the pressure in those contiguous areas. With GrayWolf's AdvancedSense PRO meter, not only can a fume hood face velocity calibration be performed, but highly accurate differential pressures can be checked/logged (requires the optional DP-702LH sensor to be installed). The combination of a properly calibrated fume hood and a negatively pressurized area will create a much safer work environment, both inside and outside of the lab.

The overall effectiveness of a laboratory fume hood can be further determined by ensuring that the air concentration of all chemicals of concern remain lower than government and industry worker guidelines. GrayWolf offers additional sensors for the AdvancedSense PRO for monitoring a wide array of toxic gases, and VOCs in real-time. Onboard government and industry guidelines are instantly viewable, on-site, including OSHA TWAs, NIOSH RELs or ACGIH PELs and more.



Example HoodCal Screen

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