Laboratory Ventilation Management Program Appendix 10.2.3

Stanford University Biosafety Cabinet Performance and Testing Requirements

The following describes Stanford's expectations for performance, testing, and certification of biosafety cabinets (BSC). All vendors must ensure their procedure meets these expectations. If a separate procedure is developed to meet Stanford's requirements, technicians assigned to Stanford must be trained on the new procedure and note its use in the report.

Standards

Stanford expects all testing and certification operations to meet the requirements of the following regulations and standards:

- Cal/OSHA 8 CCR 5154.2
- NSF/ANSI 49 – 2019; Normative Annex N-5

Certification Test Requirements

Prior to beginning tests we expect the technician to inspect the following:

1. Ensure cabinet in good condition, all panels in place, no corrosion of panels/work surface, sash in place and moves. Blower turns on.
    a. If there is damage to the BSC, excessive storage, or signs of poor decontamination practices, do not proceed with the tests and report to client.
2. Identify the type of cabinet and record on the report.

Required tests

The following tests are required at Stanford. Table 1 describes the specifications for the instruments used and the test acceptance criteria.

Table 1. Acceptance criteria for required BSC tests

Test type	Instrument	Pass	Fail	Standard
Inward face velocity[1, 2]	Calibrated anemometer[3] Calibrated total capture flow hood (type B1)	See table 2	See table 2	§5154.2
Downflow velocity	Calibrated anemometer[3], DIM[4], pitot tube	Within ±5% manufacturer-specified value, AND all point readings <25% or <±16 fpm (whichever greater) from average reading	> ±5% manufacturer-specified value, OR any point reading >25% or >±16 fpm (whichever greater) from average reading	NSF 49-2019, Annex 5
Quantitative aerosol challenge	Aerosol generator and calibrated	For non-NSF certified cabinets,	For non-NSF certified cabinets,	§5154.2

Test type	Instrument	Pass	Fail	Standard
	aerosol photometer[5]	penetration ≤ 0.03%	penetration > 0.03%	
		For NSF-certified cabinets, penetration < 0.01%	For NSF-certified cabinets, penetration > 0.01%	NSF 49
Qualitative smoke capture	Smoke generator	- Smooth downflow with no dead spots or refluxing; - No smoke escape; AND - No smoke billowing or penetrating to work surface.	Observed dead spots; refluxing; ambient air flowing over work surface; OR smoke escape at sides or top of sash.	§5154.2 NSF 49
Exhaust flow in thimble connections		Alarms at -20% of flow OR has a ribbon	No ribbon or alarm present; ribbon not showing inward flow; alarm does not sound at -20% flow	N-5.7.3.2

1. For type A and B3 cabinets the average intake face velocity at the normal operating work access opening shall be determined by measuring the exhaust air velocity, calculating the cabinet's exhaust air volume, and dividing this volume by the open area of the work access opening.

2. For type B2 cabinets the average face velocity shall be calculated based on total exhaust air volume (velocity measurement at exhaust port), supply airflow volume, and work access area. Average face velocity is calculated by the following equation: [(average exhaust velocity X area of exhaust port) - (average supply downflow velocity X open area of supply HEPA filter)] / (area of normal work access opening) = average face velocity

3. Anemometer must be held rigidly with a stand and not hand-held. Must have an accuracy of ± 3 ft/min (± 0.015 m/s) or 3% of the indicated velocity, whichever is larger, shall be used. If room temperature is outside the range 65-75F, use the manufacturer's manual to correct the reading.

4. DIM is direct inflow measurement instrument. Must have an accuracy of ± 3% of reading ± 7 ft3/min (± 12 m3/h) or in accordance with NSF 49-2019 Annex N-2

5. Aerosol photometer shall be capable of detecting penetrations >0.005% of particles ≥ 0.3 um. Use a suitable oil meeting 8 CCR 5154.2 App. A.

Table 2. Inward face velocity acceptance criteria

Type	Min inward face velocity (fpm)
Class I	75
Class II, Type A	75
Class II, Type B1, B2 or B3	100
Class III	No class IIIs at SU, report to client if found

Optional tests

The following tests are not required by SU, but may be requested by the client. Use acceptance criteria from NSF 49.

Pressure test (soap bubble test)

Lighting intensity/UV test

Vibration

Noise

Report Elements

Information expected on report:

- BSC information
  - Manufacturer name
  - Cabinet model
  - Serial number
  - Type
- Site visit information
  - Technician name
  - Date performed
  - Temperature of room
  - Building and room number
- Test information
  - Name of test (s) performed
  - SOP title used for test
- Equipment information
  - All instruments used, including make, model, serial number, and last calibration.
- Test data
  - Individual airflow readings and grid
  - Size of sash working opening
  - Filter leak test penetration readings and challenge concentration
  - Acceptance criteria for downflow values (specific to each BSC).
  - Clearly state if each test is passed or failed
- Corrective actions
  - Note any corrective actions taken to repair a BSC. If a repair was made after a test failure, note the as-found state and test data/readings.

Actions following test failure

As appropriate, the technician may repair the BSC and retest, with the client's permission. Notify the client of all failures.