

**ASHRAE 110 (SEFA 1) Type-Test Report for 180cm (6ft)
Wide Bench-Type Fume Hood of Topair Systems INC**

Ref: ANSI/ASHRAE 110-2016 - SEFA 1-2010

Model: CF-180-PP

by

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INV/ASHRAE110/1033

Date: 17th October 2023

1. INTRODUCTION

ASHRAE 110 type tests carried out to 180cm wide bench type ductless fume hood of Topair Systems INC are reported. General information on the test methods and procedures can be found in reference 1. The ASHRAE 110 test methods and procedures were used to determine frontal flow and containment characteristic of the fume hood. The fume hood was connected to the test room extract system. In this way the test gas was exhausted to outside rather than back into the room.

2. DESCRIPTION OF TEST ROOM FACILITIES

The test room was approx 10.0m long, 5.0m wide and 4.0m high. The tests facilities include a variable-speed extract air system to adjust the flow rate to the required value. The extract flow rate is measured by a venturimeter with an accuracy of better than 3%. The make-up air was brought in through the perforated ceiling tiles opposite the fume hood so as to allow a test room pressure in the range of -1Pa to -5Pa. The test room differential pressure, temperature, relative humidity and velocity during tests were:

| | |
|-----------------------------|------------------------|
| Room differential pressure: | -3Pa (+/-10%) |
| Room air temperature: | 21°C (+/-10%) |
| Room air relative humidity: | 50% (+/-10%) |
| Room air velocity: | much less than 0.1 m/s |

3. DESCRIPTION OF FUME HOOD

The fume hood tested is a 180cm wide bench-type ductless fume hood, designed and built by Topair Systems INC, **Model CF-180-PP**.

External dimensions: Width = 1800mm
Height = 2060mm
Depth = 700mm (max)

Internal dimensions: Width = 1725mm
Height = 700mm (max)
Depth = approx 620mm

Baffle slots/dimensions: Top baffle slots = approx 60nos of 75mm x 8mm
Bottom baffle slots = approx 180nos of 75mm x 8mm

Other dimensions: Sash opening width = 1725mm
Sash opening height = 500mm from bottom cill
Air assisted sash airfoil with approx 15mm air gap
Sash internal top gap when sash at 500mm = approx 20mm
Sash gap from bottom cill when sash closed = approx 20mm
Bottom cill air gap = approx 25mm

4. VELOCITY TESTS

Velocity tests were performed at 500mm sash opening. The velocity type-test grid for the test opening is shown in Figure 1. The average face velocity for the test opening was 100fpm +/-5%, ie 0.51m/s +/-5%.

5 FLOW VISUALISATION TESTS

The following observations were made:

- on work top = GOOD
- along the opening edges = GOOD
- near top LHS corner = GOOD
- near top RHS corner = GOOD
- near bottom LHS corner = GOOD
- near bottom RHS corner = GOOD

6 CONTAINMENT TESTS

6.1 Static Sash Tests

The containment tests were performed in accordance with the procedure described in reference 1 and for the same test opening as in the velocity tests. Figure 2 shows the positioning of the containment test system with respect to the test opening. The containment results for the three test positions (P01, P02 & P03) were less than 0.010ppm, indicating that the fume hood containment performance is very good.

6.2 Scanning of Static Sash Openings

Traversing of the sampling probe (at a rate of approx 10fpm, ie 0.05m/s) along the edges of the test opening and under the cill airfoil resulted in SF6 levels much less than 0.050ppm.

6.3 Sash Movement Effect Test

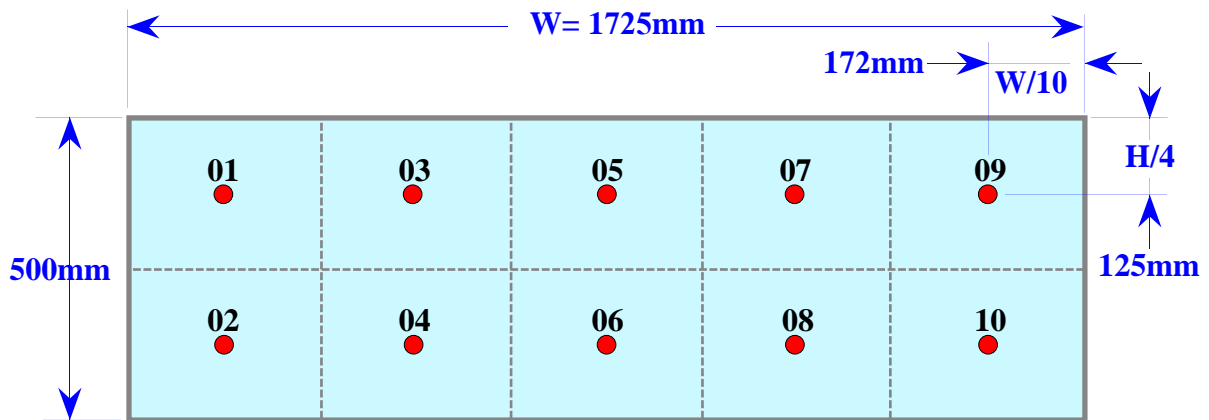
These tests were performed at test position P01 only. During this test, the sash is initially at 25% of test opening. After 60sec the sash is opened to the test opening at a speed of approx 0.5m/s. After a further 60sec, the sash is closed back to 25%. This process is repeated for three times. The maximum of 45-sec rolling average over this test period was less than 0.010ppm, indicating that the sash movement effect on containment is insignificant.

REFERENCES

1. ANSI/ASHRAE 110-2016, *Methods of Testing Performance of Laboratory Fume Hoods*, 2016.
2. SEFA 1-2010, *Laboratory Fume Hoods - Recommended Practices*, 2010.

List of instrumentation used during tests:

1. Miran 205-B infrared gas analyser - SN: 76185-382 (*for containment tests*)
2. Critical orifice - 0.64mm - SN: ASHRAE-02 (*for test gas flow rate metering*)
3. VelociCalc 9545-A - SN: 0713014 (*for velocity tests*)



| | | | | | |
|---------------------|------|------|------|------|------|
| Grid point | 01 | 03 | 05 | 07 | 09 |
| Mean velocity (fpm) | 104 | 97 | 96 | 97 | 103 |
| Mean velocity (m/s) | 0.53 | 0.49 | 0.49 | 0.49 | 0.52 |
| Grid point | 02 | 04 | 06 | 08 | 10 |
| Mean velocity (fpm) | 102 | 97 | 97 | 98 | 104 |
| Mean velocity (m/s) | 0.52 | 0.49 | 0.49 | 0.50 | 0.53 |

Face Velocity = 100fpm ±5% (0.51m/s ±5%)

Figure 1 ASHRAE 110-2016 velocity test results.

- Mannequin is positioned at locations shown below.
- Sampling probe is at breathing zone of mannequin which is 560mm up from work top and 75mm out from sash plane.
- Test gas injector is positioned on work top at locations shown below. Front edge of injector barrel is at 150mm in from sash plane. Centreline of injector is at 300mm from left and right inside walls of fume hood.
- Test gas is 100% SF6.
- Test gas flow rate is 4.0lt/min.

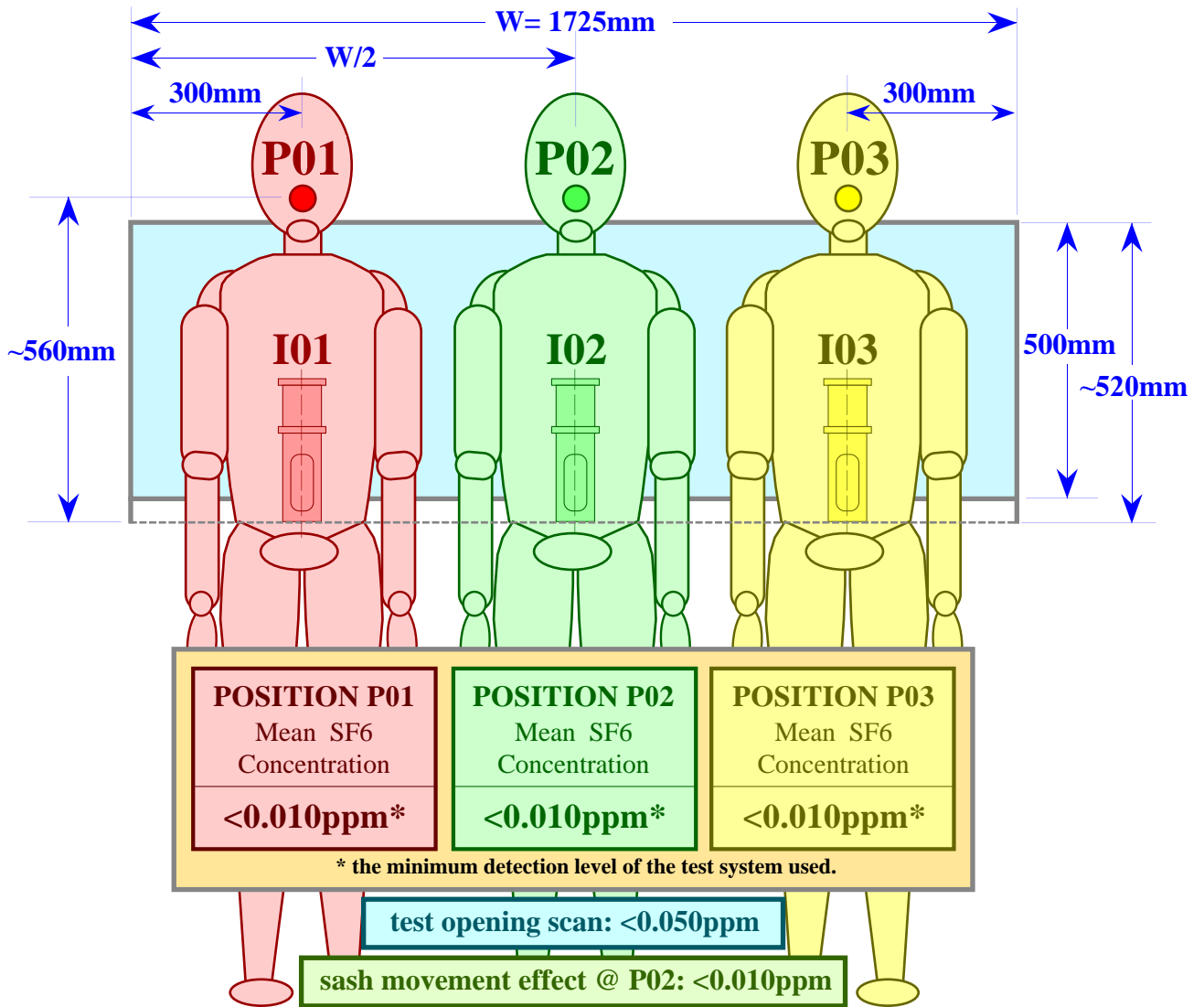


Figure 2 ASHRAE 110-2016 containment test results.

CERTIFICATE OF TYPE TESTING IN ACCORDANCE WITH ASHRAE 110 & SEFA 1

CERTIFICATE & REPORT NO: INV/ASHRAE110/1033

DATE: 17th October 2023

Fume Hood Manufacturer:
Topair Systems INC
300 First Avenue, Suite 102
Needham
MA 02494
USA



Fume Hood Model-Type:
CF-180-PP
180cm wide bench-type ductless
External Dimensions:

Width = 1800mm
Height = 2060mm
Depth = 700mm (max)

Internal Dimensions:
Width = 1725mm
Height = 700mm (max)
Depth = 620mm (max)

Test Opening:
Width: 1725mm
Height: 500mm

Fume Hood Flow:
Face velocity: 100fpm (0.51m/s)

Fume Hood Containment:
At all test positions: <0.010ppm
Test opening scans: <0.050ppm
Sash movement effect: <0.010ppm

This is to certify that the fume hood described above has been type tested in accordance with ASHRAE 110-2016, as required by SEFA 1-2010, and resulted in performance characteristics given in test report INV/ASHRAE110/1014.

Tested and Certified by: Dr A F Bicen

A handwritten signature in blue ink that reads 'A.F. Bicen'.



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