

Overview - 6-ft Concept Fume Hood Tested by Knutson Ventilation

The 6-ft Concept was tested at the full vertical open sash position, which provided an average 55-fpm face velocity, nominal 60-fpm. With no change made to the hood the vertical sash component was closed and the horizontal sash was opened to its maximum width and the face velocity were recorded. The average face velocity measured was 85- fpm.

The containment testing at either sash position provided values of .01 ppm. The release rate of SF₆ (Sulfur Hexafluoride) was 8-lpm, and the mannequin's breathing zone was located 18" from the work surface.

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March 13, 2002

Jon Zboralski
Fisher Hamilton
1316 18th Street
PO Box 137
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Re: Concept Hood Testing Model 54L2752PB
Project 346-004

Dear Mr. Zboralski:

At your request, Gerhard W. Knutson of Knutson Ventilation conducted ASHRAE performance tests on your Concept Hood. The tests were conducted in the Fisher Hamilton test laboratory in Two Rivers, Wisconsin.

SUMMARY

1. The 6-foot Concept Hood, when tested with a modified ASHRAE 110 tests, performed adequately. The hood was tested in the full vertical open position with a nominal face velocity of 55 fpm and in the horizontal sash condition with a nominal face velocity of 84 fpm.
2. With the vertical sash full open, the face velocity, measured on a three by five grid, varied by less than 15 percent from the average face velocity.
3. With the horizontal sash full open, the face velocity, measured on a three by three grid, varied by less than 10 percent of the average face velocity.
4. Smoke visualization tests showed adequate airflow patterns and minimal turbulence within the hood.
5. The tracer gas readings, during the performance tests, were at or below the minimum detection level of 0.01 ppm.

HOOD DESCRIPTION

The SafeAir Concept hood was a 6-foot, bench top hood with a combination sash. During the vertical operation, the hood has a mechanism that lowers the sash to a nominal 18-inch height. Photo 1 shows the hood with the sash at the vertical operating position. The nominal opening is 62 inches wide and 18 inches high. For set up, the hood has a sash stop, which holds the sash in the full open position. Under set up conditions, the sash height is 24 inches.

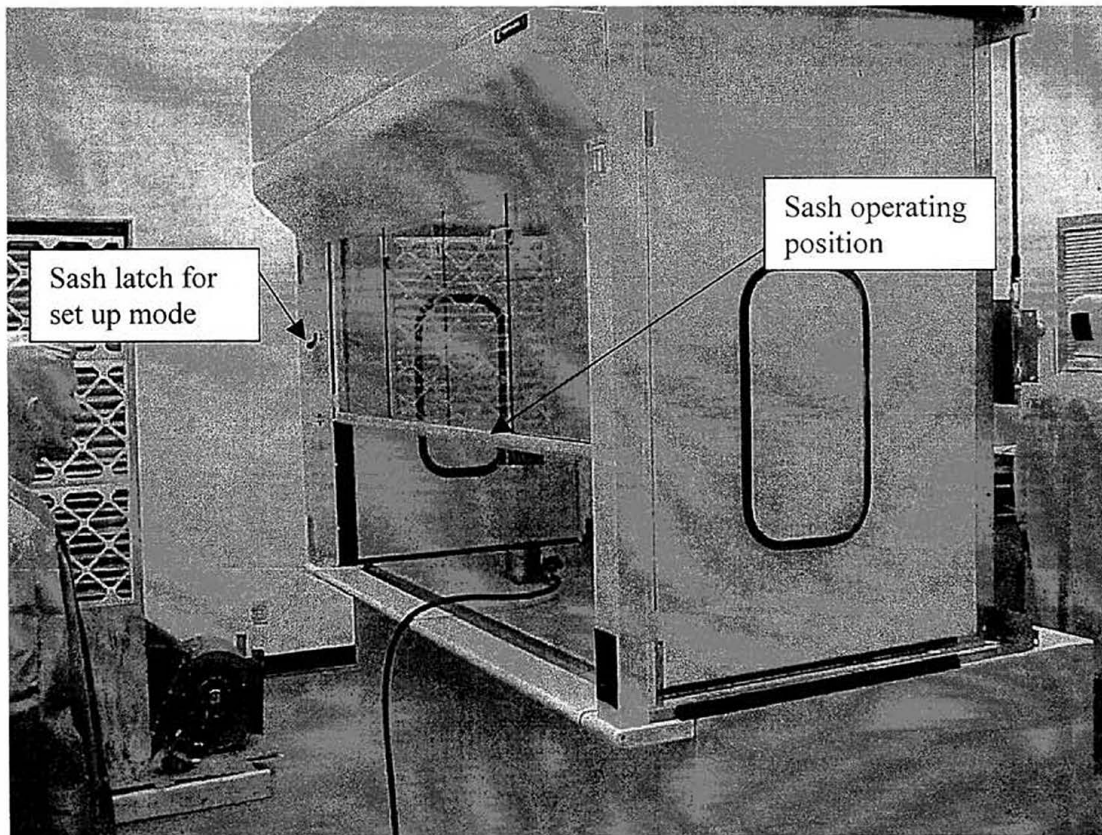


Photo 1: Concept Hood with sash a normal operating position

Alternatively, the hood can be used with horizontal sashes. The chemist can position the horizontal sashes to accommodate the works. The nominal sash opening is 27.5 inches by 27 inches.

As shown in Photo 2, the hood has a clear sight panel that allows the operator to see into the top of the hood without opening the sash above the normal maximum.

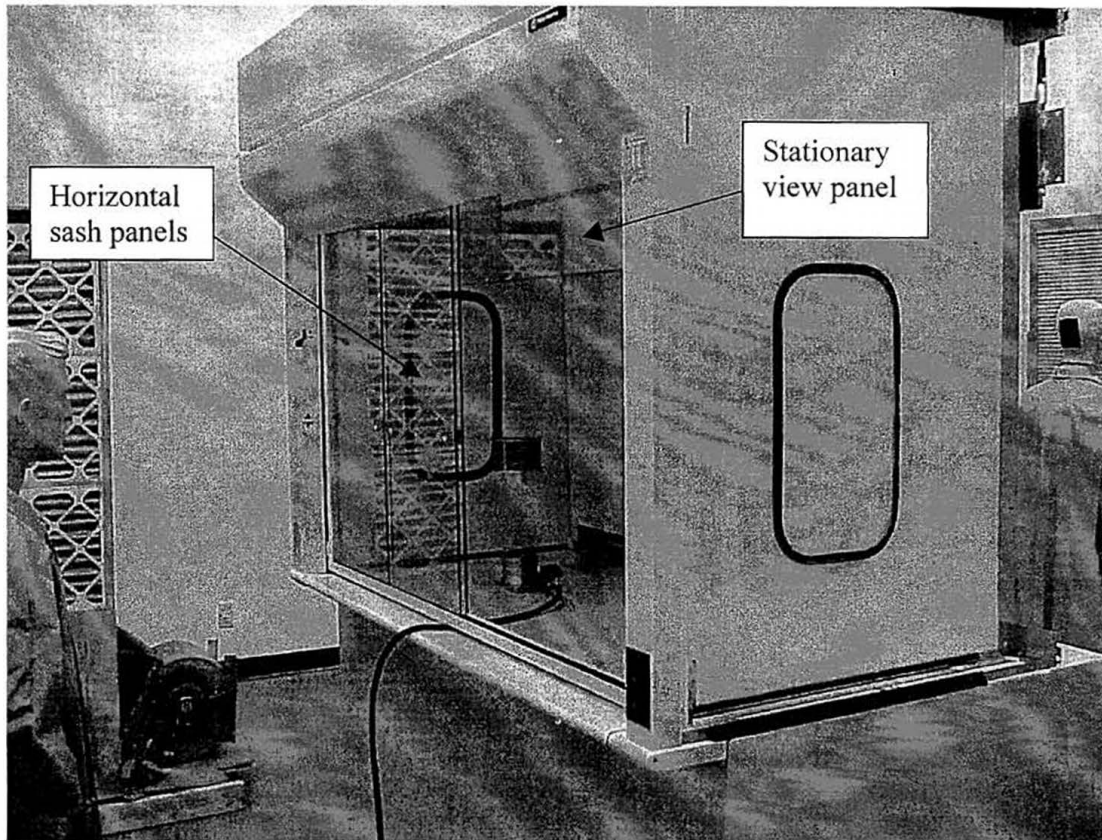


Photo 2: Concept hood with sash in horizontal open position

HOOD TESTING

The test procedures followed the ASHRAE 110 Standard, with two exceptions. First, the release rate was eight liters per minute (compared with the standard 4 lpm). Second, the breathing zone of the mannequin was 18 inches above the work surface, rather than the specified 26 inches above the work surface.

Ventilation Measurements

The investigator used a calibrated TSI air velocity transducer, Model 8455-06, to measure the face velocity for each hood condition. For the vertical opening, the sash was placed at the sash stop, 24 inches above the work surface. The hood face opening was divided into equal fifteen equal rectangular areas. The velocity was measured at the center of the rectangles. The test results are shown in Table 1. For the horizontal sash opening, the investigator opened the horizontal panels to the maximum on the left side, the center and the right side. The openings were divided into nine equal rectangles. The measurements are reported in Table 2.

TABLE 1
FACE VELOCITY MEASUREMENTS
NOMINAL 60 FPM FACE VELOCITY
VERTICAL SASH FULL OPEN

	1	2	3	4	5
A	53 fpm	50 fpm	55 fpm	46 fpm	59 fpm
B	47 fpm	57 fpm	51 fpm	53 fpm	55 fpm
C	57 fpm	59 fpm	60 fpm	60 fpm	55 fpm
Average	55 fpm				
Maximum	60 fpm (110 %)				
Minimum	46 fpm (85 %)				

TABLE 2
FACE VELOCITY MEASUREMENTS
HORIZONTAL WINDOWS FULL OPEN

	Left side open			Center open			Right side open		
	1L	2L	3L	1C	2C	3C	1R	2R	3R
A	91	78	76	85	76	80	87	79	79
B	87	80	78	84	82	82	87	78	85
C	86	86	89	90	87	87	88	83	86
Average	84 fpm			84 fpm			84 fpm		
Max	91 fpm (109%)			90 fpm (107%)			88 fpm (106%)		
Min	76 fpm (91%)			76 fpm (91%)			78 fpm (94%)		

The average velocity for the horizontal opening was higher than for the vertical opening because of the difference in the area of the opening. The design conditions have a nominal face velocity of 100 fpm with the horizontal windows open. This results in a nominal face velocity of 60 fpm with the sash full open and a nominal face velocity of 80 fpm with the vertical windows open to a height of 18 inches.

Smoke Tests

Work Surface

Smoke released on the work surface flowed smoothly to the rear of the hood toward the lower slot. The work surface did not have a dished work surface. With a dished work surface, the airflow patterns would have demonstrated minor turbulence as the air flowed past the dished lip. However, the turbulence should be minor and not result in reverse flow.

Airfoil

Smoke released under the airfoil generally flowed smoothly into the hood. Smoke released outside the hood and below the airfoil caused a minor eddy and a small amount of smoke to curl back on the top of the airfoil.

Smoke released on the top of the airfoil occasionally lingered before it flowed into the hood. Proper work practices should be followed to ensure procedures are not conducted on the airfoil sill. Good work practices ensure that the work is conducted six inches inside the plane of the sash.

The close examination of the inlet airflow is not included in ASHRAE Standard 110-1995. Moreover, the air flowing under and over the airfoil comes from the laboratory outside the hood. This air should be free of contamination.

Sidewall Airflow

Air entering along the sidewall flows smoothly with no noticeable reverse flow at the sidewall of the hood.

Internal Smoke

Some of the smoke released along the back baffle moved forward, in a typical fashion, and entered the hood roll. A portion of the smoke passed between the sight panel and the sash. It followed the back of the sash to the sash pull. The smoke was retained by the sash and as it passed the sash pull, it was drawn into the hood.

Tracer Gas Tests

The results of the tracer gas tests are summarized in Table 3. Figures 1 and 2 show a graphical representation of the test results.

**TABLE 3
TRACER GAS TESTS
6-FOOT SAFEAIRE CONCEPT HOOD**

Sash Position	Face Velocity	Tracer gas results			Hood Rating	Notes
		Left	Center	Right		
Vertical	55 fpm	< 0.01	< 0.01	< 0.01	AM < 0.01	1 and 2
Horizontal	84 fpm	< 0.01	< 0.01	< 0.01	AM < 0.01	1 and 2

Notes

1. The release rate was 8 lpm while the ASHRAE Standard 110 requires 4 lpm.
2. The mannequin height was 18 inches above the work surface

Figure 1
Concept Hood
Vertical Sash

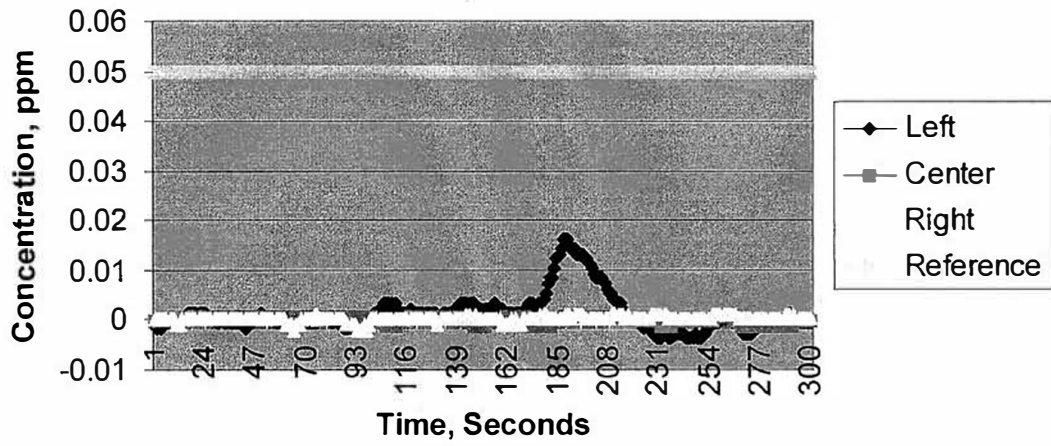
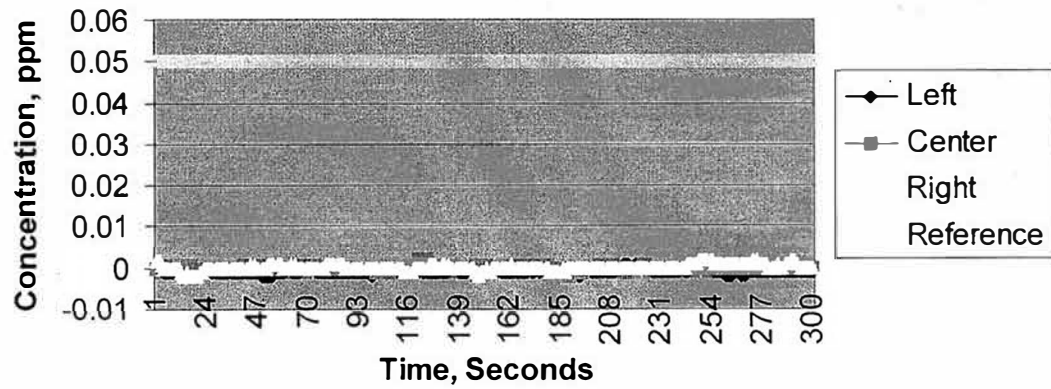
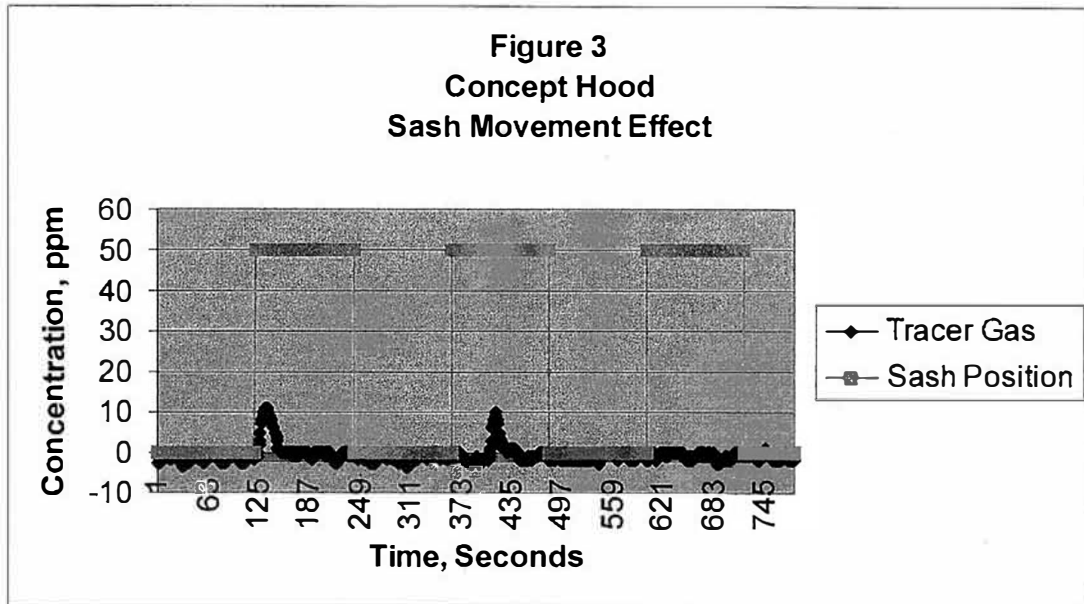


Figure 2
Concept Hood
Horizontal Sash



Sash movement effect tests were conducted. The movement of the sash had a minor effect tracer gas levels. Figure 3 shows the results.



If you have any questions, concerning this report, please contact us.

Sincerely,

Gerhard W. Knutson, Ph.D., CIH
President