



Fermilab
ES&H Section

INDUSTRIAL HYGIENE PROCEDURES

EXHAUST SYSTEM SURVEY PROCEDURES

March 5, 1999

PURPOSE

The purpose of the annual exhaust survey is to assure that local exhaust systems adequately control the hazards for which they are being used. Control is deemed acceptable if airflow performance meets the requirements set forth in ES&H Manual Chapter 5091.

DISCUSSION

The air flow requirements set forth in ES&H Manual Chapter 5091 are based on ACGIH and NIOSH ventilation design and performance criteria.

EQUIPMENT

- Kurz 441 Air Velocity Meter
or
Alnor 6000AP Air Velocity Meter
or
TSI 8346 Air Velocity Meter
- Alnor 530 Micromanometer
- Tape Measure
- Calculator
- Exhaust System Survey Forms
- Exhaust System Inventory

- Exhaust System Survey Stickers
 - a. Substandard Air Flow
 - b. Maximum Duct to Work Distance
 - c. Maximum Sash Height
 - d. NOTICE: Surveyed for _____
- Indelible ink pen
- Environment, Safety and Health Section Scheduled Review Request Form

PROCEDURE

1. Preparation for Survey

- A. The Division/Section Industrial Hygienist will provide training on the use of the equipment, ventilation requirements, and survey procedures.
- B. Print the survey forms from the IH Forms database in Manuals on the ES&H Web-site.
- C. Print a list of the exhaust systems from the Exhaust System Survey database in On-line Databases on the ES&H Web-site.

2. General Survey Procedures

- A. When entering a building to test a ventilation unit, introduce yourself to the Building Manager. Explain the purpose of your visit.
- B. Verify the information from the previous survey. In particular, operations (spray painting, welding etc.) and associated health hazards must be determined and recorded in full. This is a critical part of the survey. If necessary, ask the Building Manager for help.

3. Specific Survey Procedures

A. GENERAL GUIDANCE

For all surveyed exhaust systems, remove the old SURVEYED FOR sticker. Replace it with a new SURVEYED FOR sticker with the date, sequence number, and your initials.

Place substandard airflow stickers on units, which do not meet air, flow requirements. Cooperative Students shall notify the Division/Section Industrial Hygienist of any systems that are reported as being substandard. Notify the Building Manager. The Industrial Hygienist will determine if the unit should be tagged out per ES&H Chapter 5091 requirements.

Enter data on the Exhaust System Survey Form. Include the calibration date for the instrument used.

B. LAB HOODS

Place the hood sash at the marked maximum sash height level. Sketch the hood opening. Divide the hood opening into 6-8 equal areas and take a reading in each area. Record readings on the sketch. Calculate the average. The average should be between 100 and 125 feet per minute. If it is not, move the sash until the correct average is obtained. At no point should a reading be below 50 fpm. Also, check general condition [items stored improperly inside hood that impair exhaust, holes in duct work, duct work doesn't vent outside (yes, this has happened – exhausted to attic), sash doesn't stay at mark height- it slides down, close to windows or doors, etc.] These are general observations that could be added to almost any exhaust unit.

Place a MAXIMUM SASH HEIGHT sticker at the correct sash height level of the hood.

C. SPRAY BOOTHS

Sketch the booth opening. Divide the booth opening into 6-8 equal areas and take a reading in each area. Record readings on the sketch. Calculate the average. The average should be above or equal to 100 feet per minute. At no point should a reading be below 50 fpm.

D. POWER TOOLS

Do not turn power tools on unless you have permission from the Building Manager.

The range of capture velocities is 500 - 2000 fpm at the point of operation. The lower end is for low toxicity contaminants in infrequent operations. The upper end is for highly toxic materials in continuous operations. **USE THIS MEASUREMENT ONLY IF THE VENTILATION CAN BE TURNED ON WITHOUT TURNING ON THE TOOL.** If this is not possible, contact the manufacturer for evaluation recommendations.

E. ABRASIVE BLAST BOOTH

The only abrasive-blasting booth at Fermilab is located in IB2. Ask the Building Manager to turn the ventilation on.

The minimum average flow across work should equal 20 cfm/ft². Average airflow into the air inlets of the booth should be a minimum of 250 fpm. To measure the average inward velocity, open a booth door. Divide the door area into 6-9 equal areas and take a reading in each area. Record readings on a sketch. Calculate the average.

F. BURNING (DOWNDRAFT) TABLES

The minimum average velocity through the table face is 100 fpm. Sketch the table. Divide the table into 6-8 equal areas and take a reading in each area. Record readings on the sketch. Calculate the average. The average should at least 100 feet per minute.

G. CANOPY HOODS

Take a series of readings at the hood edge. Calculate the average. The average should be a minimum of 100 feet per minute. The Horizontal Hood Overhang = $0.4 \cdot D$, where D is the vertical distance between the work surface and the bottom of the hood.

H. WELD DUCTS

Find the distance from the duct for which you can obtain a minimum velocity of 100 feet per minute. Fill in and apply a **MAXIMUM DUCT-TO-WORK DISTANCE** sticker. If the welder cannot use the unit at the maximum distance (cannot possibly use

the hood at 3" distance – too close) the flow is considered substandard.

I. SLOT EXHAUST

Determine at several locations the distance from the slot needed to obtain a minimum velocity of 50-100 fpm at the work and work surface. The maximum distance is 2 ft.

Note: The lower end of this range applies to low toxicity contaminants with a low generation rate. The upper end of the range applies to higher toxicity contaminants with a higher generation rate.

Fill in and apply a MAXIMUM DUCT-TO-WORK DISTANCE sticker.

J. VEHICLE EXHAUST

Record and take a series of readings at each duct and calculate the average for each duct. Obtain the dimensions of the duct to calculate the area. Calculate the volumetric flow ($Q=VA$). The minimum flow per vehicle is 100 cfm for gasoline below 200 horsepower, 200 cfm for gasoline over 200 horsepower and 400 cfm for diesel.

K. ABRASIVE CABINET

Unlike most other local exhaust systems, abrasive blast cabinet exhaust systems are assessed using static pressure measurement. Static pressure measurements are taken with the Alnor Micrometer. The suction cup on this unit should be placed over a hole in the cabinet. If there is no hole in the unit, a wing nut can usually be removed (ask the Building Manager about this). The minimum allowable static pressure is 0.043 inches of water.

If the cabinet is not completely enclosed (the two holes for the gloves are open), take a measurement of the inward flow at these holes. You should get an average velocity of 500 fpm.

4. SURVEY REPORTS

- A. Send Exhaust System Survey results to the ES&H Section for entry into the Exhaust System Survey Database.

- B. The Division/Section industrial hygienist will review survey results and determine findings per ES&H Manual Chapter 5091. Findings are entered into ESHTRK. Be sure to enter any units without operating instructions or that were tagged out into ESHTRK.