

**Georgia Gulf Chemicals & Vinyls, LLC
Aberdeen Plant
Safety Health Manual**

Subject: **Ventilation Systems**

CODE: ASHP 37

Revision: 1

Effective: January 1, 2000

Approved By:

CMM Signature on File

Safety & Health Manager

Approved By:

PJK Signature on File

Plant Manager

I. SCOPE

This policy applies to all contaminant control ventilation systems within the Aberdeen Plant.

II. PURPOSE

The purpose of this policy is to establish the minimum design, operation, and maintenance requirements and procedures for certain ventilation systems.

This policy:

- A. Sets forth the requirements that will, when combined with appropriate work practices, achieve safe concentrations of air contaminants in areas protected by affected systems.
- B. Establishes the Aberdeen specific general design requirements and criteria relative to ventilation systems allowing compliance with the appropriate regulations.
- C. Establishes training requirements for affected Aberdeen Plant employees to ensure all are provided with consistent information on proper ventilation practices.
- D. Establishes the minimum testing, inspection, and documentation requirements for affected ventilation systems.

HI. RESPONSIBILITIES

- A. The Aberdeen Plant "Cognizant Person" (Industrial Hygiene and Safety Coordinator) shall coordinate the ventilation program for the facility. The responsibilities of the cognizant person include, but are not limited to:
- B. The responsibilities of the cognizant person include, but are not limited to:
 - 1. Ensuring that testing and monitoring are done on schedule.
 - 2. Record keeping
 - 3. Ensuring visual checks and preventative maintenance are performed as required.
 - 4. Training employees
 - 5. Approving changes of ventilation systems as described in Section 8 of this policy.
- C. The Cognizant person may or may not be responsible for performing all of the task listed in Section III (A), but must maintain a working knowledge of each area to ensure that the requirements in each area are satisfied.

IV. GENERAL USE AND DESIGN

- A. The following are general guidelines to be used in the design of ventilation systems and in developing specific work rules where affected systems are used for the control of occupational exposures.
- B. These are minimum guidelines and are not intended to be an all-inclusive list of design requirements of all ventilation systems.

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IV. GENERAL USE AND DESIGN - Continued**1. Exhaust**

- a. It is essential that air exhaust points be located in a manner that recirculation of the contaminated air will not occur. The location of exhaust points shall be separated from the air intakes by considerable distances and special consideration given to prevailing wind direction.
- b. Air exhaust points must be evaluated to assure the exhaust point does not create an exposure potential due to worker presence in the area or anticipated flow patterns. This could occur for side wall exhausts or other non-elevated points.
- c. Exhaust ductwork should be under negative pressure while in any occupied space or location inside of an occupied building such as a drop ceiling or crawl space.
- d. The environmental and regulatory impact of the exhaust shall be considered prior to installation. This requires review and approval by the plant Environmental Manager.

2. Supply Air

- a. Anytime a ventilation system, fume hood, etc. is installed, the supply air requirements shall be an integral part of the design.

C. General Design Principles - Fume Hoods

Note: The following design requirements are intended for **new** or **modified** systems and are not retrofit requirements for existing systems.

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IV. GENERAL USE AND DESIGN - Continued**C. General Design Principles - Fume Hoods - continued**

1. All hoods shall be equipped with a continuous flow-monitoring device capable of notifying of a change in operating conditions with both audible and visual alarms. **This is not an immediate retrofit requirement for all hoods. All new hoods, and any existing hood, that is modified for any reason shall have a flow-monitoring device installed.**
2. Hoods shall be located away from heavy traffic aisles, and from doorways. Location of hoods next to doors may be acceptable if,
 - a. there is a second, safe means of egress from the room,
 - b. traffic flow past the hood is low.
3. All bench hoods shall have a recessed work surface and airfoil sill.
4. Hoods shall be designed to have at least 2.5 linear feet of working space per worker at the face. Workers are the largest obstruction to an airflow and crowded conditions will impact hood performance.
5. Alarms - If alarm systems are capable of being locally silenced by the user, "tag-out" shall be used to communicate status of the system to the users. The "tag" system requires the following minimum information (four items) to be written by the person tagging-out the alarm:
 - a. Name and Signature of person authorized to tag it out
 - b. Date and time
 - c. Reason
 - d. Expected date of return to service

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IV. GENERAL USE AND DESIGN - Continued**C. General Design Principles - Fume Hoods - continued**

6. The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) test 110-1985 is recognized as the most accurate test method for ventilation systems. This test shall be considered when establishing a baseline of performance for new or modified laboratory fume hoods which will or may potentially handle highly toxic chemicals with Immediately Dangerous to Life and Health (IDLH) concentrations of <10 parts per million as established by the National Institute for Occupational Safety and Health.
7. All hoods shall be of by-pass design. The intent of this requirement is to maintain a constant purge of the hood. Hoods of by-pass design intake room air at an alternate location on the hood (other than the face or as a supplement (make-up air to maintain a certain flow) relative to the position of the sash.
8. All hoods shall be equipped with vertically opening sashes.

D. General design - Special Systems (Snorkels, Ductless Fume Hoods, etc.)

1. For fixed set-ups, such as analytical instruments, local exhaust hoods or "drops/snorkels" shall be considered rather than bench hoods. Snorkels shall be designed in accordance with the latest edition of the ACGIH "Industrial Ventilation Manual" and Sections 5.1-5.2 of this standard.

2. Mini-hoods

As a general rule, Mini-hoods shall not be used in the Aberdeen Plant. Where an exception is required, approval of the Plant's Cognizant Person and the Safety & Health Manager shall first be obtained before installing or using such equipment.

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IV. GENERAL USE AND DESIGN - Continued**C. General Design Principles - Fume Hoods - continued****3. Ductless Fume Hoods**

Special review and written approval by the Cognizant Person shall be provided prior to the installation of any ductless fume hood. Ductless fume hoods have limited application due to the wide variety of chemicals potentially used. The adsorption and/or filtration technique used to clean the exhaust air must be evaluated for each chemical. The ability to monitor for the breakthrough or saturation of the filtration device is key to the safe use of such hoods.

D. General Use Guidelines - All Ventilation Systems

1. The placement of apparatus which can materially block airflow patterns in the ventilation system shall be minimized.
- *2. All apparatus or other sources of emissions shall be kept at least 6 inches back from the face of the hood. Moving an apparatus 3-4 inches back from the front edge can reduce vapor concentration at the face by up to 90%.
3. Users shall keep their faces outside the plane of the capture area (i.e. Hood sash, capture area for snorkels etc.) when contaminants are being generated.
4. Hood sash openings shall be kept to a minimum at all times. Keeping the sash opening small improves the performance of the hood and decreases flow disruptions.
- *5. Do not use ventilation systems as a waste disposal mechanism.

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IV. GENERAL USE AND DESIGN - Continued**D. General Use Guidelines - All Ventilation Systems - continued**

Do not place electrical receptacles or other spark sources inside the ventilation system when flammable liquids or gases are present unless the source is rated for the area or specific approval has been granted by the Cognizant Person.

*Applies to fume hoods only.

V. PERFORMANCE SPECIFICATIONS (PER TYPE)**A. Hoods - Average Face Velocity (AFV)**

1. The face velocity requirement for laboratory hoods is an average of 100 FPM $\pm$ 10% deviation. Single points, when measured at a traverse, shall not be lower than 80 FPM or greater than 120 FPM. Any exception to the AFV must be approved by the Plant's Cognizant Person.

2. Constant Monitoring and Alarms

- a. All hoods shall be constantly monitored by a device equipped with an alarm system capable of notifying users of changes outside of the reference range established during initial testing and set-up. Alarms shall be tested on a routine basis.

B. Snorkel Vents

1. There is no standard that dictates the minimum flow requirements for this type of local exhaust. There are no simple criteria for defining adequate air velocity. Section V (B) (2) (a) describes a process for determining the efficiency of snorkel vents.

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V. PERFORMANCE SPECIFICATIONS (PER TYPE) - Continued2. Efficiency Determination Process

A. The minimum flow requirement for snorkel vents is determined by its ability of remove contaminants from the point of generation. The following items shall be considered when identifying this requirement:

- i. Type of chemical (hazard level)
- ii. Air flow level based on the hazard level
- iii. Smoke test performance (final determination)

3. If the snorkel effectively removes the smoke from its point of generation, the velocity can then be used as a measure of performance.

4. Changes in duct length, type (material of construction), position (bends etc.), or hood angle can change the airflow patterns and efficiency of the snorkel.

5. **NOTE:** If the physical or chemical characteristics of the contaminant are significantly different from that of the smoke used to perform the test, then further evaluation of the ventilation system will be necessary. Further information on this subject can be found of the ACGIH "Industrial Ventilation Manual".

6. Vent Location - New Systems

A. Snorkel vents shall be located such that **no** direct air currents are concentrated on the air intake vent.

C. Mini-Hoods shall be designed for 100-125 FPM capture velocity. Capture velocity is taken at a point in front of the work area. Normally this is at the front of the table or bench.

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V. PERFORMANCE SPECIFICATIONS (PER TYPE) - Continued**D. Walk-in Hoods**

1. Average Face Velocity - Walk-in hoods shall meet the minimum face velocity requirements for fume hoods with the following exception:
 - a. When determining face velocity, the measurement may be taken relative to the position of the sash provided written procedures have been established to communicate to the user the sash position requirements for performing specific tasks within the hood and the flow measurements are marked on the hood next to the sash. Any exception to this procedure must be approved by the Plant's Cognizant Person.

VI. Evaluation of Ventilation Equipment**A. Test Methods**

1. Hoods: The three (3) methods used to evaluate hood flow quality are:

- a. Anemometer or electronic micro-manometer (quantitative);
- b. American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) 110-1985 test (quantitative- most accurate);
- c. Smoke (qualitative)

2. Test Procedure

- a. Initial evaluations or modified systems: the hood face will be sectioned into 1-foot squares (approximate depending on the size of the hood) with the sash fully opened.
- b. Other than initial evaluations: the hood face will be sectioned into 2-foot squares (approximate depending on the size of the hood) with the sash fully opened.

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VI. Evaluation of Ventilation Equipment – Continued**2. Test Procedure - continued**

- c. The face velocity will be measured at the center point of the 2-foot squares (1 foot for initial evaluations) “2 inches from the plane of the sash. The face velocity is the average value obtained from a measurement duration of at least 15 seconds. Face velocity values will be recorded on a log sheet and retained as described in the records section of this procedure.

3. Snorkel Vents: all processes on snorkel vents shall be evaluated based on the type hazard involved. Data on the potential hazard level, smoke tests, and as appropriate, industrial hygiene monitoring shall be used to evaluate the final design configuration.

4. Mini-hoods: the evaluation of a mini-hood will be determined by its design as indicated in Section V (C).

B. Calibration of Testing Equipment

1. Testing equipment shall be calibrated annually traceable to a recognized standard.
2. Testing equipment shall be labeled with the date and person/company that performed the calibration.
3. A certificate of calibration for the testing equipment shall be retained by the facility.

C. Test Procedures - New or Modified Systems**1. Hoods**

- a. All hoods, including walk-ins and mini-hoods, shall be evaluated both quantitatively and qualitatively prior to use.

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VI. Evaluation of Ventilation Equipment - Continued**2. Snorkel Vents**

The efficiency of snorkel vents shall be determined by performing a smoke test and, as appropriate, contaminant monitoring (industrial hygiene monitoring) prior to use.

D. Frequency of Testing - Existing Ventilation Systems**1. Hoods (All)**

- a. The average face velocity shall be confirmed on a quarterly basis.

2. Snorkels

Smoke, velocity measurements, or, as appropriate, industrial hygiene monitoring shall be performed on a quarterly basis to verify snorkel performance.

E. Documentation of Testing

- 1. Recording of information for the above test methods is based on the type method selected:
 - a. Smoke Test - recording of the visual observations during the smoke test shall be documented on a form such as the example in Appendix .
 - b. Face Velocity - recording of data on a face velocity test requires a complete grid profile. An example of this profile is shown in Appendix 1.
 - c. ASHRAE 110-1985 - recording of data for the ASHRAE 110-1985 test method is defined in the test procedure.

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VI. Evaluation of Ventilation Equipment - Continued**F. Use Restrictions**

1. Hoods or snorkels, that are not operating within the acceptable criteria stated above after adjustments and maintenance have been performed, shall be restricted for use.

VII. Preventive Maintenance (Per Type)

- A. Preventative Maintenance – General** – (Note: The Cognizant Person is responsible for ensuring a hood preventive maintenance inspection is completed on the following systems on at least a semi-annual basis:

1. Supply Air System

- A. Air Handler
- B. Supply Air Duct Work
- C. Supply Air Controls
 - a. Volume
 - b. Climatic

2. Exhaust Air Mover

- A. Exhauster
- B. Exhaust Air Duct Work
- C. Exhaust Air Controls

3. Hood

- A. Interior

1. Corrosion
2. Baffle Placement
3. Sash Operation
4. General Condition

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VI. Evaluation of Ventilation Equipment - Continued

A. Preventative Maintenance – General

B. Exterior

1. Integrity of Duct Connection
2. Integrity of Wall Penetration
3. Sash Obstructions: Top of hood, Electrical, Piping etc.

C. Mechanically Sound

D. Backflow protection device for any external utilities.

4. Snorkels

- A. Mechanically Sound
- B. Ductwork
- C. Blower
- D. Damper
- E. Outside Exhaust Vent
- F. Corrosion Control

5. External Air Treatment (If applicable)

B. Periodic Maintenance (Minimum Interval Indicated)

1. Air Movers -All Systems

- A. Lubrication – Monthly
- B. Belts – Annually
- C. Vibration Isolators – Annually
- D. Record Volts/Amps of motor – Annually
- E. Record motor rpm – Annually

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VII. Preventive Maintenance (Per Type) - Continued

F. Record exhauster rpm – Annually

2. Duct Work

A. Smoke Test / Pressure Leakage test at start up

B. Visual - Annually

3. Controls

A. Emergency Shut Down – Annually

B. Calibration of Volume Controls – Annually

C. Calibration of Alarm Settings - Annually

C. Inspection/ Repair/Follow-up Report

1. A report stating the, "as found" and "as left" conditions of the ventilation system, with details on any repairs or adjustments made during the evaluation will be prepared. The report shall include details identifying:

A. The mechanical portions of the hoods that were evaluated and inspected.

B. Description of any mechanical deficiencies that were not repaired.

C. The individual responsible for following-up on deficiencies, and the scheduled repair date.

D. The necessary documentation for each hood showing the date of the last evaluation.

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VII. Preventive Maintenance (Per Type) - Continued**D. Deficiencies**

1. When deficiencies are found that compromise the safe use of any fume hood, the Cognizant Person must be immediately notified to establish and post hood use restrictions. Mechanical defects found will be repaired as soon as possible. Face velocity measurements will be made after repairs are completed to verify effectiveness and proper operation of the hoods.

VIII. MOC Process for Ventilation Systems

- A. This section describes the requirements for having a documented process to review and approve changes in ventilation design, operation or use. It is essential that changes, as described below, be reviewed to ensure that additional risk is not introduced with these changes.
- B. Changes related to ventilation systems covered by this standard shall be documented and reviewed / approved by the cognizant person. Changes requiring review include the following:
 1. New chemical use that results in a significant change in hazard category, regulatory impact, or overall risk.
 2. Significant change in use volume for chemicals handled in the hood.
 3. Change in emission rate of contaminants. This includes such things as discharge of pressurized gases, heating of liquids, and frequency of testing.
 4. Changes in procedures/tasks that increase worker exposure potential such as an increased number of tasks or operations requiring frequent or consistent sash opening.

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VIII. MOC Process for Ventilation Systems - Continued

5. Other changes around the ventilation device (i.e. hood, snorkel, etc.) shall be considered for impact on the system operation or efficiency. These include changes in air conditioning or heating system, and obstructions to general air flow or dilution air availability such as partitions or addition of laboratory furnishings, addition of ventilation system intake/discharge points, etc.
 6. Changes to the Mechanical System, repairs, modifications, or adjustments. These changes may include but are not limited to items such as the modifying of duct work, changing of alarm set-points, raising or lowering of air velocity, etc.
- C. The items listed in 8.2 should be reviewed to determine if:
1. The ventilation system has the capability to control the contaminants generated.
 2. Chemicals used are compatible with materials of construction and other chemicals used in the hood. This may impact preventative maintenance frequency.
 3. There is an increase in the potential for worker exposure.
 4. There are any regulatory considerations for hood emissions.
 5. The ventilation system will perform as per original design and testing.
- D. The process shall include a provision for assessing the adequacy of the operation of the ventilation system after the change has occurred.
- E. The Cognizant Person shall be designated with the authority to approve changes.

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IX. Training

As necessary, training shall be provided for all employees, Vista or contract, required to use, maintain or test ventilation systems as defined in this standard. The training program shall include:

1. Provisions for initial training on new systems and MOC of modified systems/processes.
2. Annual refresher training.
3. Preventative maintenance procedures (as applicable to the employee's job).
4. Performance testing certification (as applicable to the employee's job responsibilities).
5. The contents of the facility's written program.

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APPENDIX I**Hood Evaluation Form**

Inspection Date: _____ Hood Location: _____

Hood Number: _____ Last Calibration Date: _____

Hood Length (in feet): _____ Hood Height (in feet): _____

Apply thermo anemometer reading (fpm) to its corresponding squared hood section. Shade or cross-out squares not needed.

Average Face Velocity: _____ fpm

Hood is: **Acceptable** **Not Acceptable**

Acceptance Criteria: The average face velocity must be within the range of 100 fpm $\pm$ 10 % with no single point less than 80 fpm or greater than 120 fpm.

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APPENDIX II**VENTILATION SMOKE TEST OBSERVATIONS**

Ventilation System: _____ Hood # (if applicable): _____
Contaminants Exhausted: _____
Smoke Captured (circle one): All Partial None
Turbulence: _____
Inspected By: _____ Date Inspected: _____

VENTILATION SMOKE TEST OBSERVATIONS

Ventilation System: _____ Hood # (if applicable): _____
Contaminants Exhausted: _____
Smoke Captured (circle one): All Partial None
Turbulence: _____
Inspected By: _____ Date Inspected: _____

VENTILATION SMOKE TEST OBSERVATIONS

Ventilation System: _____ Hood # (if applicable): _____
Contaminants Exhausted: _____
Smoke Captured (circle one): All Partial None
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VENTILATION SMOKE TEST OBSERVATIONS

Ventilation System: _____ Hood # (if applicable): _____
Contaminants Exhausted: _____
Smoke Captured (circle one): All Partial None
Turbulence: _____
Inspected By: _____ Date Inspected: _____

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APPENDIX IIIVentilation System Locations – 1999

Aberdeen Chemical Plant

<u>Ventilation Type</u>	<u>Location</u>	<u>Qty.</u>
Laboratory Hood	Process Chemistry Lab	1
Laboratory Hood	Q/C Development Lab	6
Exhaust Hood	S.A. Module	3
Walk-in Hood	Color Weigh Room	1

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