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1.0 Purpose

This standard establishes requirements for Local Exhaust Ventilation (LEV) used at the Galveston Bay Refinery and identifies Safety Department as the Plan Administrator.

2.0 Scope

This standard applies to all LEV's or dilution ventilation used for controlling potential exposures to chemical or physical agents. This does not address Confined Space Ventilation, see Confined Space entry GBR-HESS-PR-01 or IDLH Confined Space Entry GBR-HESS-PR-05 for the corresponding requirements.

3.0 Procedure

3.1 Roles and Responsibilities

3.1.1 Maintenance Shop

3.1.1.1 Operate, Maintain, and Inspect the Stationary LEV System as outlined in this standard.

3.1.2 Portable LEV Users

3.1.2.1 Operate, and Inspect Portable LEV Systems as outlined in this standard.

3.1.2.2 If LEV is inadequate or not functioning properly, contact the Safety Department for further guidance.

3.1.3 Laboratory

3.1.3.1 Arrange for annual inspections of fume hoods and associated ducts and fans and evaluation of performance of fume hoods and ventless fume hoods.

3.1.3.2 Provide evaluation of performance to the Safety Department for certification and/or approval.

3.1.4 Safety Department

3.1.4.1 Responsible for the administration of this plan and evaluation for the need of engineering controls, including LEV systems.

3.1.4.2 Approve LEV systems and equipment. See Attachment A for a list approved equipment.

3.1.4.2.1 When portable LEV are listed in Attachment A and used in accordance with Attachment B, the equipment does not require approval by theSafety Department.

3.1.4.2.2 Provide initial and annual certification or approval of all Local Exhaust Ventilation systems, based on a Third-Party or MPC Measurements.

3.2 Strategy to Evaluate the Need for LEV

3.2.1 The need for new LEV systems will be evaluated in accordance with the GBR Comprehensive Industrial Hygiene Program. If there are exposures that are found to be unacceptable after qualitative and/or quantitative assessments have been performed, then suitable engineering controls will be implemented, which could include LEV

systems.

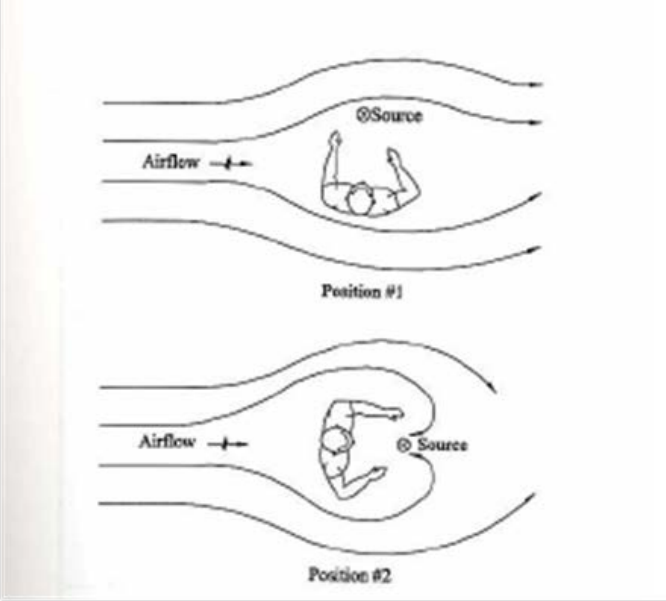
3.3 Design Criteria for Ventilation Systems

3.3.1 When using an LEV, the Employee position in relation to an exposure source should be such that the contaminants are being pulled away from the employee, without exposing the employee in the process.

3.3.2 Ventilation airflow should never be directed from the contaminant source towards the breathing zone of an employee as this can negate the benefits of the LEV or dilution ventilation.

3.3.3 A work station/task should be designed, whenever possible, so that the employee is not standing directly upwind to the exposure source as in Position #2 in Figure 1, as this will allow the contaminant to swirl back into the breathing zone. This is particularly applicable for sample collection enclosures and laboratory fume hoods.

Figure 1: Work position effect



Source: Industrial Ventilation: A Manual of Recommended Practice. 25th Ed., ACGIH, Worldwide, 2004.

3.4 Velocity Requirements for Local Exhaust Ventilation Systems

3.4.1 Capture Velocity – Point of Use (POU) airflow/velocities should be designed and maintained to provide capture velocities appropriate to the containment to be controlled according to the table below.

Contaminant to be controlled	**Capture Velocity Required (minimum at exposure source)**
Gas / Oil Vapors	80-120 fpm
Particulates	200 – 500 fpm

Welding Fumes	150 fpm
Particulates from grinding /abrasive blasting, etc.	500 – 2000 fpm

Amended from: Industrial Ventilation: A Manual of Recommended Practice. 25th Ed., ACGIH, Worldwide, 2004 (Table 3-1).

3.5 Abrasive Blasting Cabinets

3.5.1 Abrasive blasting cabinets, located in the Central Shops or any portable abrasive blasting cabinet, use non-silica containing beads to remove rust and/or old paint from small parts, pipe, etc. The dust generated by this operation is collected in an inverted bag filter. Filtered air is vented to the work area atmosphere adjacent to the cabinet. The cabinet and air filtration system serve to control emissions that could otherwise result in over exposures to dust or lead and other metals that can be contained in paints and scale.

3.5.2 Blast Cabinet Maintenance Requirements

3.5.2.1 Removal of filter cake (dust) that falls from the inverted bag filters into the accumulation pan will be done by each area. This preventative maintenance will be performed quarterly. The removal and disposal of the dust from each blast cabinet pan must be handled according to the following procedures due to the potential that this material contains elevated concentrations for lead and other metals:

3.5.2.1.1 Dust from each cabinet's dust collector must be placed in a common 55-gallon drum that maintains a positive seal within process. This drum will also be used to store and dispose of filters and dust from portable welding fume extractors.

3.5.2.1.2 Dust from around the blast cabinet and dust collector and any dust at the base of the dust collector that may have resulted from accumulation pan overflow must be removed using a HEPA filtered vacuum.

3.5.2.1.3 Personnel that perform the filter removal/cleanup operations noted above must contact the Waste Coordinator to arrange for proper disposal and storage of filters and accumulated material prior to removal.

3.5.2.1.4 Personnel that perform the dust removal operations noted above must wear impermeable gloves, full-body disposable coveralls, goggles, and a half-face respirator with P100 cartridges.

3.5.2.2 Conduct inspection of the hose from the blast cabinet to dust collector prior to and during each use. This hose is the most likely location of a leak because it remains under positive pressure during cabinet operation.

3.5.3 Blast Cabinet Performance Testing

3.5.3.1 Operators of blast cabinets must visually inspect the blast cabinet and dust collector for evidence of dust leaks both prior to and during operation.

3.5.3.1.1 Evidence of dust leaks should be reported to the Maintenance Supervisor.

3.5.3.1.2 A blast cabinet/dust collector that leaks must not be used.

3.5.3.1.3 A "Do Not Use – Broken Equipment" sign shall be placed over the window of a leaking blast cabinet until repairs have been completed.

3.5.3.2 Evaluation of blast cabinet dust collection system performance will be conducted at least once per year. Specific assessments include:

3.5.3.2.1 Testing of blast cabinets using smoke tubes to verify that air is moving into rather than out through any small openings in the cabinet and hoses.

3.5.3.2.2 Arrange for annual inspections of blasting cabinets and associated ducts and fans and evaluation of performance of fume hoods and ventless fume hoods.

3.5.3.2.3 Provide evaluation of performance to the Safety Department for certification and/or approval.

3.5.3.3 Employees who use abrasive blasting cabinets will ensure there are no visible emissions from the system while they are in use. After blasting is completed, it is required to run the equipment until the air inside the cabinet has been cleared before opening the door to the cabinet.

3.5.4 Ensure that all abrasive blasting activities at the site are conducted in compliance with GBR-HESS-ENV-39 Abrasive Blasting Management. Abrasive blasting surface preparation activities generate air particulate emissions. In addition, spent blasting media is considered a solid waste.

3.6 Spray Booths

3.6.1 The spray booth shall be constructed and operated such that all air is swept or guided towards the exhaust outlet.

3.6.2 The spray booth shall be kept clean of any combustible material or debris while in operation.

3.6.3 The spray booth shall be positioned such that it has three feet clearance on all sides for cleaning and separation from other processes.

3.6.4 While in use the spray booth must:

3.6.4.1 Capture all overspray

3.6.4.2 Provide sufficient ventilation to prevent a LEL greater than 10%.

3.6.4.3 Employees applying coating must wear half-face respiratory with organic cartridge until exposure monitoring indicates otherwise.

3.6.5 All electrical equipment used inside the spray booth during spray application must meet Class 1 Div 2 requirements.

3.6.6 No open flame or hot work-related activities shall take place inside the booth when applying a coating.

3.6.7 Ensure that all paint waste handling activities are in compliance with GBR-HESS-ENV-44 Paint Waste Management including the collection, storage, and paint waste drum labeling provisions.

3.6.8 An MOC should be initiated prior to installation of any new paint spray booths. These facilities require environmental air permit authorization prior to installation and are

required to meet certain regulatory provisions.

3.7 Welding Fume Ventilation System

3.7.1 GBR has a stationary local exhaust ventilation system in the weld shop. This system is used to capture welding fumes from Carbon Steel and Hex Chrome welding operations routinely conducted in the weld shop.

3.7.2 Maintenance requirements necessary to ensure proper operation of welding fume ventilation equipment and prevent exposures include:

3.7.2.1 Inspect hoses for cracks/openings prior to each use.

3.7.2.2 Repair of any leaks or replacement of cracked hose prior to use.

3.7.2.3 The Owning Department shall verify that the welding fume ventilation system is functional prior to and during use.

3.7.2.3.1 Test ventilation equipment using smoke tubes or observe welding operation to verify that fumes are captured from a distance of 12 inches from the inlet to the extractor.

3.7.2.4 A qualified individual, as determined by the owning department and approved by the Safety Department, shall evaluate the performance of the ventilation system at least annually.

3.7.2.4.1 Arrange for annual inspections of Welding Fume Ventilation System and associated ducts and fans and evaluation of performance of fume hoods and ventless fume hoods.

3.7.2.4.2 Provide evaluation of performance to the Safety Department for certification and/or approval.

3.7.2.5 The owning department shall maintain the record of annual inspections.

3.8 Portable Ventilation Systems

3.8.1 When evaluating controls for respiratory protection hazards, and a fixed ventilation system isn't practical, portable ventilation shall be used prior to other controls.

3.8.2 When portable LEVs are listed in Attachment A and used in accordance with Attachment B, the equipment does not require approval by the Safety Department.

3.8.3 Portable ventilation systems include:

3.8.3.1 Air Powered Fan with capture hose extension (i.e., a sock, baghouse, etc.)

3.8.3.2 Airhorn with capture hose extension (i.e., a sock, baghouse, etc.)

3.8.3.3 Portable Fume Extractor w/ HEPA filter

3.8.3.4 Portable Ventless hood w/ appropriate filter

3.8.4 Air Powered Fan and Airhorns are pneumatically driven ventilation equipment that can be used with plant air or an air compressor.

3.8.5 When using an Air Powered Fan or Airhorn you must (see Attachment A):

3.8.5.1 Position the hood opening near the exposure source,

3.8.5.2 Ensure the air supply hose is secured to the air powered fan or airhorn, Note:

Do not use portable ventilation that is attached to plant air when working inside a confined space. See GBR–HESS–PR– 01 for CSE ventilation requirements.

3.8.5.3 Air Powered Fan or Airhorns must pull air out of the vessel and not push into the vessel, potentially introducing contaminants from a mechanical source. Note: Using an air powered fan, reduces the CFM by 90% of its published flow rate.

3.8.5.4 Ensure airhorn or air powered fan is properly grounded.

3.8.5.4.1 Each exhaust unit will be grounded/bonded via a cable and connection device to a permanently grounded structure. The connection point shall be of metallic finish to ensure continuity (galvanized steel). This ground/bond must be established before any energy is introduced to the equipment. For further assistance contact a qualified electrician.

3.8.5.5 Use a visual indicator to ensure flow is adequate (smoke tubes, fumes, flags, caution tape, piece of paper),

3.8.5.6 Exhaust the air being captured to a safe location,

3.8.5.7 Barricade the exhaust location as necessary so as to not expose bystanders.

3.8.6 When using an air powered fan, always inspect the fan guard to ensure it is intact and not damaged. Do not use a fan that is not adequately guarded.

3.8.7 Portable fume extractors and ventless hoods use a filtration system to filter the captured air. (See Attachment B)

3.8.8 When using portable fume extractor:

3.8.8.1 Check the filter prior to use for appropriate type and life expectancy,

3.8.8.2 Fume extractors use a HEPA filter,

3.8.8.3 Ventless Hoods use a charcoal or specific chemical filter,

3.8.8.4 Replace filter at manufacturer recommended frequencies or when indicated,

3.8.8.5 All new equipment must have a flow indicator, and it must be checked prior to use.

3.9 Fume Hoods

3.9.1 All laboratory (lab) fume hood systems used at Galveston Bay Refinery shall meet at a minimum the requirements of RSP-1801-001 – Fume Hood System Requirements for Refinery and RAD Laboratories.

4.0 Definitions

4.1 ***Air Powered Fan*** – pneumatic driven fan used to push or pull air often installed on confined spaces for ventilation. Air Powered Fans are also referenced commonly reference as Coppus® Blowers.

4.2 ***American Conference of Governmental Industrial Hygienists (ACGIH)*** – The ACGIH is a member-based organization and community of professionals that advances worker health and safety through education and the development and dissemination of scientific and technical knowledge.

4.3 ***Capture Velocity*** – The air velocity in front of the hood opening necessary to overcome opposing air currents and to capture the contaminated air at that point by causing it to flow into the hood. Capture velocity is the result of the hood air flow rate and hood configuration.

4.4 ***Contaminant*** – A contaminant, while addressing ventilation, is an airborne or potential airborne agent that is undesirable. Contaminants include gases, vapors, and aerosols (particulate matter, dust, fog, fume, mist, smog, smoke).

4.5 ***Cubic Feet per Minute (cfm)*** – Unit of measurement of the flow of air that indicates how much volume in cubic feet pass by a stationary point in one minute.

4.6 ***Face Velocity*** – The air velocity at the hood opening.

4.7 ***Feet per Minute (fpm)*** - Unit of measurement for air velocity.

4.8 ***General/Dilution Ventilation*** – ventilation used to prevent the accumulation of a contaminant by increasing the volume of airflow into a space or area. Example: Use of an air powered fan on a drum, vessel, or tower during a confined space entry.

4.9 ***Local Exhaust Ventilation (LEV)*** – any system that is actively pulling contaminated air directly out of the worker's breathing zone qualifies as an LEV. Examples: "fume hoods" or ducted ventilation to an operator's work area. LEV systems are comprised of up to four basic elements: the hood(s), the duct system (including the exhaust stack and/or recirculation duct), the air cleaning device, and the fan.

4.10 ***Ventilation Manual*** – Published by the ACGIH, the Ventilation Manual provides research data and information on the design, maintenance, and evaluation of industrial exhaust ventilation systems.

5.0 References

5.1 Industrial Ventilation: A Manual of Recommended Practice, 25th edition, American Conference of Governmental Industrial Hygienists, 2004.

5.1 HLT 2026 Local Exhaust Ventilation Management

5.2 MPC RSP-1801-001 – Fume Hood System Requirements for Refinery and RAD Laboratories

5.3 GBR-HESS-ENV-39 Abrasive Blasting Management

5.4 GBR-HESS-ENV-44 Paint Waste Management

6.0 Attachments

6.1 Attachment A: Examples of Local Exhaust Ventilation

6.2 Attachment B: Invasive Work Exposure Control Using Portable Local Ventilation Systems

7.0 Revision History

Revision Number	Description of Change	Written by	Approved by	Revision Date	Effective Date
0	Original Issue. Integrated site procedure and replaces GBR-HESS-SM-06 under MOC 59590.	B. T. Gandee	V. J. Meeks	4/22/2019	4/30/2019

Attachment A – Approved Local Exhaust Ventilation Systems & Equipment

Attachment A - Approved Local Exhaust Ventilation Systems & Equipment *

Equipment	Diamter of Base	Type	Manfucaturer	Uses
ASI-1000	7.38"	Venturi-Style Blower (Airhorn)	Air Systems	A, C, D
ASI-1200	7.38"	Venturi-Style Blower (Airhorn)	Air Systems	A, C, D
ASI-2900	11.16"	Venturi-Style Blower (Airhorn)	Air Systems	A, C, D
ASI-4100	14.31"	Venturi-Style Blower (Airhorn)	Air Systems	A, C, D
ASI-JF20	20"	Pneumatic Circular Jet Fan (Coppus Fan)	Air Systems	A, C, D
ASI-JF24	24"	Pneumatic Circular Jet Fan (Coppus Fan)	Air Systems	A, C, D
RF-12	12"	Pneumatic Circular Jet Fan (Coppus Fan)	Dresser-Rand Coppus	A, C, D
RF-16	16"	Pneumatic Circular Jet Fan (Coppus Fan)	Dresser-Rand Coppus	A, C, D
RF-20	20"	Pneumatic Circular Jet Fan (Coppus Fan)	Dresser-Rand Coppus	A, C, D
RF-24	24"	Pneumatic Circular Jet Fan (Coppus Fan)	Dresser-Rand Coppus	A, C, D
CP-20	20"	Pneumatic Circular Jet Fan (Coppus Fan)	Dresser-Rand Coppus	A, C, D
FILTAIR ® Capture 5	-	Portable Fume Extractor	Miller	B
FILTAIR ® 130	-	Portable Fume Extractor	Miller	B
FILTAIR ® 400	-	Portable Fume Extractor	Miller	B
Bernared FILTAIR ® Fume Extraction Gun	-	Portable Fume Extractor	Miller	B
WeldFilter C10	-	Portable Fume Extractor	Nederman	B
WeldFilter C20	-	Portable Fume Extractor	Nederman	B
FilterCart Original	-	Portable Fume Extractor	Nederman	B
FilterCart W3	-	Portable Fume Extractor	Nederman	B
FilterCart Carbon	-	Portable Fume Extractor	Nederman	A, B

Types of Uses

A - Temporary Local Exhaust (hydrocarbons)
B - Temporary Local Exhaust (welding fumes/particulate)
C - Initial Line Breaking (LEL/Exposure Control)
D - Ventilation of Confined Space

For performance see manufacturers spec shee

Air Systems
Dresser-Rand Coppus
Nederman

*If portable LEV equipment is not listed in this Attachment, contact the IH Group. All local exhaust ventilation (LEV) systems and equipment shall be evaluated and approved by the Industrial Hygiene Group prior to use in accordance with sections 3.1.4.2 and 3.2.1.

Examples of Ventilation

Pneumatic Circular Jet Fan (i.e. Coppus)

Airhorn - Type A Use

Airhorn - Type B Use

Venturi-Style Blower (Airhorn)

Portable Fume Extractor

Attachment B – Invasive Work Exposure Control Using Portable Local Ventilation Systems

<u>Portable Eductor Suction</u> used to capture toxic and flammable gases/vapors at the point of emission, dilute the emissions and discharge them at a remote location to prevent work area exposures to toxic gases/vapors and fire hazard.

A. Portable Eductor Applications: Use in situation where gas/vapor emissions resulting from opening a bleeder or opening a flange could be:

1) Stopped by closing a valve or tightening flange bolts;

2) At IDLH concentrations, greater than 10% of LEL and/or greater than 10 ppm H2S if not captured before being released to a work area;

3) Under pressure or being purged with nitrogen;

4) Accompanied by a volume of liquid hydrocarbon that could prevent the control of emissions by:

- Depositing toxic/flammable liquid on the work area decking;
- Moving the emission source (i.e. liquid hydrocarbon) away from where emissions can be captured by the ventilation system.

Note: If preparing equipment, see PR-11 Safe Equipment Preparation for additional requirements, and note that a variance may be required when used as mitigation.

B. Portable Eductor Safety Procedure Requirements:

1) **<u>Barricade the exhaust point</u>** at a distance to ensure no impact to surrounding work.

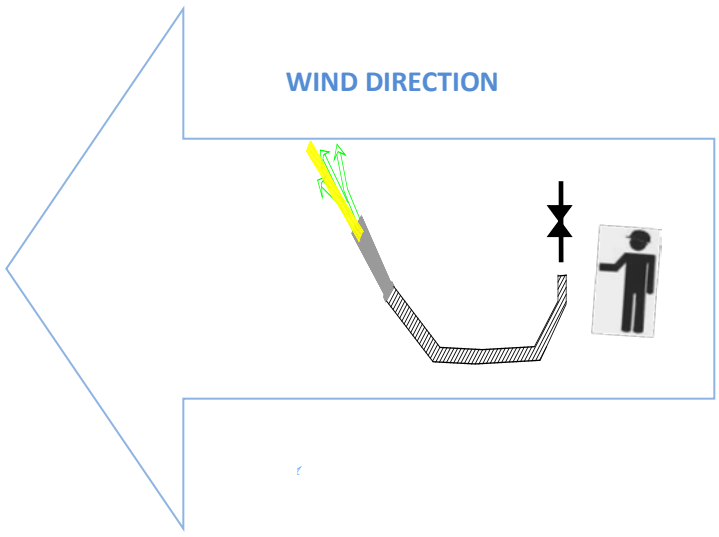
2) **<u>Ground Portable Eductor</u>** with a ground cable before using to capture contaminant emissions to prevent buildup of static electricity that could serve as ignition source.

3) **<u>Position Eductor to discharge at a safe location</u>** at least 6 feet downwind from bleeder/valve or flange to be opened.

4) **<u>Position Eductor suction within 6 inchs below bleeder/valve or flange to ensure</u>** that gas/vapor/liquid emissions are captured before release to the work area.

5) **<u>Check eductor prior to performing invasive work</u>** to verify good air flow.

Note: Rust in air lines or hoses can cause blockage of ports (~ 1/16” diameter) inside the eductor that can significantly reduce the air moving capability.



6) **<u>Work from upwind of the bleeder/valve whenever possible but do not block the wind.</u>**

7) **<u>Consider using Respiratory Protection.</u>** Half-face organic vapor/acid gas/P100 (OV/AG/P100) cartridge respirators and protective clothing. Refer to GBR-HESS-PPE-05.

Note: If any of the procedure requirements above cannot be met, use of an educator to perform the invasive work must be reassessed to determine what additional exposure control measures are warranted.

<u>Portable Eductor Blower</u> is an eductor used to push toxic and flammable gases/vapors away from the work area and significantly dilute concentrations to eliminate the potential for fire hazard exposures in a work area around leaking equipment.

A. Blower Applications: Use in situations where gas/vapor emissions:

1) Greater than 10% of the LEL were detected during testing of the atmosphere within 1 foot of a leaking flange, clamp, etc.

2) The leak that is causing the high LEL cannot be stopped by closing a valve or tightening a flange without entering an area where the LEL is >10%.

B. Blower Safety Procedure Requirements:

1) **<u>Install DANGER Tape/Sign perimeters</u>** at a safe distance around the leaking flange, clamp, etc. to ensure no impact to surrounding work.

2) **<u>Ground Portable Blower</u>** with a ground cable before using to blow air at leak to prevent build-up of static electricity that could serve as ignition source.

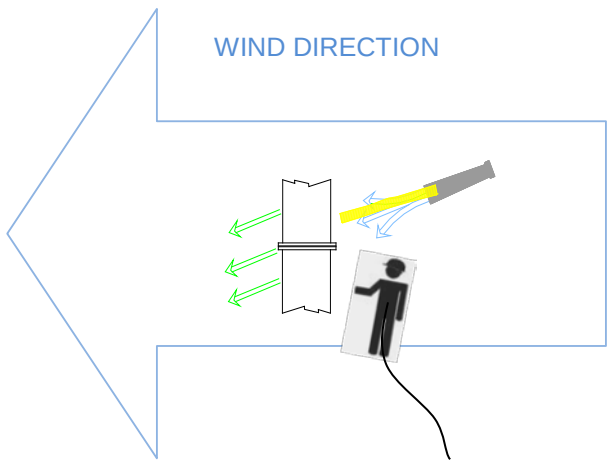
3) **<u>Position Blower discharge within 3 feet of leak</u>** and retest the work area to confirm that the combustible gas/vapor concentration in the area around the leak is less than 10% of the LEL.

4) **<u>Check eductor prior to performing invasive work</u>** to verify good air flow.

5) **<u>Bunker gear or flash suits, supplied air respirators and LEL monitors must be used</u>** by personnel working on the leak.

6) **<u>NO ONE SHOULD WORK FROM A POSITION BETWEEN A BLOWER AND A LEAK</u>**- this can cause emission to be drawn back at the person(s) blocking the air flow.

7) It may be necessary to assign a person to move the blower to control emissions from the leak if personnel working on the leak might move to positions that could block air flow from the eductor.



Note: If any of the procedure requirements above cannot be met, use of an educator to perform the invasive work must be reassessed to determine what additional exposure control measures are warranted.