1.0 PURPOSE

1.1 This document provides guidelines to maintain adequate flow rates for various types of local exhaust ventilation (LEV) and identifies requirements to manage the elements of a comprehensive LEV program.

2.0 SCOPE

2.1 This document applies to all workplaces where there is potential exposure to chemical or physical agents in excess of the established exposure limits, where LEV is given priority consideration to control and minimize employee exposure.

2.2 The Detroit Refinery Industrial Hygienist will be the program administrator.

3.0 GUIDELINE

3.1 General Rules for Users of Fume Hoods:

3.1.1 Always inspect the hood prior to use.

3.1.2 Always try to work at least six inches inside plane of the hood sash.

3.1.3 Never put your head inside an operating hood.

3.1.4 Work with the hood sash in the lowest possible position.

3.1.5 When the hood is not in use, keep the sash closed.

3.1.6 Keep hoods clean and clear.

3.1.7 Keep exhaust fans on at all times.

3.1.8 Avoid opening/closing the sash rapidly.

3.1.9 Elevate bulky equipment to facilitate air flow under and around such equipment (i.e., maintain clear access to back baffle).

3.2 Inspection, Maintenance, and Cleaning Guidelines

3.2.1 The Responsible Person develops inspection and maintenance written programs and timelines. Refer to the appendices for examples of minimum audit schedules and examples of audit forms. Maintain records for at least three years or per the Marathon Petroleum Company LP (MPC) Records Retention Policy for all inspection and maintenance activities. Such records provide data to support frequency of inspection determinations.

3.2.2 The Qualified Maintenance or Contractor personnel inspect the general purpose lab fume hood systems at least annually.

- The Qualified Maintenance or Contractor personnel inspect severe service lab fume hood systems at least semi-annually that includes, but is not limited to:
    - Ashing,

- Flash point,
- Acid digestion, and
- Ramsbottom carbon testing.

Note: Actual inspection frequency should be based on frequency of use, service, and history, but must not exceed these minimum limits.

3.2.3 Cleaning frequency of lab fume hood systems should be based on inspection information.

3.2.4 A fume hood “system” includes much more than the basic fume hood as reproduced in Figure 1. The complete system includes:

- Fume hood,
- Baffles,
- Airfoil,
- Sash,
- Ductwork,
- Louvers/Dampers,
- Fans/Blowers, and
- Motors and drive mechanisms to the point of atmospheric discharge.

3.2.5 Thorough inspection information is vital to ensure appropriate fume hood operation and maintenance. For this reason, inspection access ports should be located strategically throughout the associated ductwork. Other methods of monitoring hoods and ductwork (boroscopes or cameras, for example) are acceptable, but are typically more expensive alternatives.

3.2.6 Visually inspect fans, blowers and drive mechanisms quarterly, and service per manufacturer recommendations.

3.2.7 For permanently installed LEV systems used in welding applications and laboratory-style hoods, ensure continuous monitoring of the LEV system using visual and/or audible indicators that allow the user to verify it is working as originally designed (NOTE: temporary and portable LEV systems are excluded from this requirement).

3.3 Flow-Measuring Devices

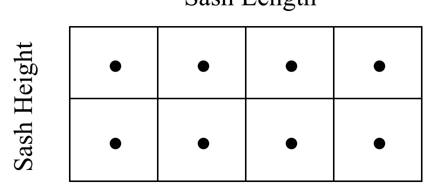
3.3.1 Equip all new hoods with a flow indicator, flow alarm, or face velocity alarm indicator. The device must be capable of indicating airflows at the design flow and +/- 20% of design flow. The devices must be calibrated at least annually. While older hoods are “grandfathered” from this requirement, it is strongly suggested that each facility budget appropriately to retrofit older hoods with these relatively inexpensive indicator/alarm systems.

3.3.2 Test laboratory hoods for face velocity and proper sash height on an annual basis.

3.4 Testing Methods for Laboratory Hoods (i.e., Canopy Hoods)

3.4.1 ***Calculate the area***, in square feet (ft^2) based on the height and width by opening the vertical or horizontal sash a known (i.e., measured) distance.

3.4.2 ***Calculate the average velocity***, in feet per minute (ft/min), by obtaining velocity measurements in a grid pattern, across the open area of the laboratory hood as shown in the example diagrams below. The dots indicate what is meant by a grid pattern and serves as an example of where to obtain measurements.



- Use a thermoanemometer (e.g., TSI Velocicalc®) to measure face or duct velocities. For laboratory hoods, obtain measurements, *at a minimum*, in the center of each square foot (i.e., 12-inch-by-12-inch) area of the hood face opening.

- There should be a minimum of 3 face velocity measurements for a laboratory hood with horizontal sashes (i.e., sash opens horizontally) or 5 face velocity measurements for a laboratory hood with vertical sashes (i.e., sash opens vertically).

- Average the measurements (i.e., added together, then divided by the number of measurements). The result is the *average face velocity* for the laboratory hood, **in ft/min**.

3.4.3 ***Calculate the flow rate***, in cubic feet per minute (ft^3/min or cfm), by multiplying the *calculated hood face opening area* (in ft^2) (i.e., found in 3.1.1) by the *average face velocity* (in ft/min)(i.e., found in 3.1.2). This calculation uses the basic formula for measuring flow rate (i.e., **Q = VA**), where Q is the flow rate, in ft^3/min; V is the average flow rate, in ft/min; and A is the area of the hood face opening, in ft^2.

3.4.4 ***Recommended flow rates,*** as referenced in the American Conference of Governmental Industrial Hygienists (ACGIH) *Industrial Ventilation: A Manual of Recommended Practice* for vertical or horizontal sash laboratory hoods, range between 80 and 100 cfm per ft^2 of hood face opening area. In other words, the *average face velocity* for these laboratory hoods should be between 80 and 100 ft/min.

- The optimum flow rate for a laboratory hood depends on the shape of the specific hood. In general, base average face velocity on the toxicity of the substances being handled.

- *Low toxicity:* Substances having a Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV®) greater than 750 parts of contaminant per million parts of contaminated air, on a volume-to-volume basis (ppm) should have a optimum flow rate of at least 80 ft/min.

- *High or Moderate toxicity :* Substances having a PEL or TLV® less than 750 ppm should have a optimum flow rate of at least 100 ft/min.

3.4.5 ***Recommended Sash Areas*** is based on the calculated *average hood face velocity* (in ft/min) and the calculated *area* of the opening (in ft^2) during testing, calculate the *maximum area* of the opening (in ft^2) to provide the minimum face velocity desired (i.e., 80 to 100 ft/min) for the hood based on the substances typically handled in the hood. Divide the calculated *average face velocity* by the minimum *desired average face velocity*, and multiply the quotient by the hood face opening area when velocity measurements were obtained.

Example: If (1) the hood face opening area was 2 ft^2 while measuring hood face velocities, (2) the resulting average hood face velocity was 300 ft/min, and (3) the desired minimum hood face velocity was 100 ft/min, the calculation for determining the greatest hood opening area (in ft^2) would be (300 ft/min ÷ 100 ft/min) x 2 ft^2.
*The resulting calculation would be 3 x 2 ft^2 = 6 ft^2. In other words, if a hood opening of 2 ft^2 provides an average hood face velocity of 300 ft/min, then a hood opening of 6 ft^2 will provide a minimum average hood face velocity of 100 ft/min. This example only gives the desired sash areas and not the desired sash heights.

Calculated Data:	**Want to Find:**
• Area (3.1.1) = ***2 ft^2*** • Average Velocity (3.1.2) = ***300 ft/min*** • Desired minimum Velocity(3.1.4.3) = ***100 ft/min***	• The greatest hood opening (area) and still allow the desired minimum Velocity (e.g., 80 or 100 ft/min)
Resulting Calculation: • Formula = [Average Velocity (ft/min) ÷ Desired Minimum Velocity(ft/min)] x Area (ft^2) • Formula = [300 ft/min ÷ 100 ft/min] x 2 ft^2 • Greatest Hood Opening Area to still allow desired minimum Velocity = ***6 ft^2***	

- For laboratory hoods with vertical sashes, divide the maximum calculated hood opening area (e.g., 6 ft^2) by the fixed hood width (in ft) to determine the maximum opening height (in ft).

- For laboratory hoods with horizontal sashes, divide the maximum calculated hood opening area (e.g., 6 ft^2) by the fixed hood height (in ft) to determine the maximum opening width (in ft).

- Marathon laboratory personnel should know the maximum sash (vertical or horizontal) opening distance on each laboratory hood to assure minimum acceptable (i.e., 80 to 100 ft/min) average face velocity. There may be a way, given the maximum opening height or width, that the hood can be modified to assure the sash(es) are not opened too far.

3.5 Testing Methods for Portable Capturing Hoods

3.5.1 ***Calculate the Area*** by measuring the diameter (for a circular duct) or the width and length (for a rectangular duct) at the point where velocity measurements will be obtained. Calculate the *area*; in **square feet (ft^2)** based on the welding exhaust duct's diameter or dimensions.

- Square Duct Area (ft^2) = Length (ft) x Width (ft)

- Round Duct Area (ft^2) = (3.141592) x $(\text{Radius})^2$

**Note: Ensure the ductwork is made of solid material and not collapsible/bendable material. Velocity measurements cannot be accurately taken on collapsible ductwork.*

3.5.2 ***Calculate the average velocity*** by providing a duct velocity traverse at designated points across the diameter of the duct. Drill a hole into the ductwork approximately 4-6 duct diameters downstream from the inlet. Use a thermoanemometer (e.g., TSI Velocicalc®) to measure face or duct velocities. For a welding exhaust duct, the distance from the inner wall of the duct is defined in Attachment A: Recommended Traverse Insertion Depths for Portable Round Ducts of this document and is referenced from the ACGIH *Industrial Ventilation: A Manual of Recommended Practice*. Average the measurements (i.e., added together, then divided by the number of measurements). The result is the *average face velocity* for the moveable capturing hood, **in ft/min**.

3.5.3 ***Calculate the flow rate*** in cubic feet per minute (ft^3/min or cfm), by multiplying the *duct cross-sectional area* (in ft^2) by the *duct velocity* (in ft/min). This calculation uses the basic formula for measuring flow rate (i.e., **$Q = VA$**), where Q is the flow rate, in ft^3/min; V is the average flow rate, in ft/min; and A is the area of the hood face opening.

3.5.4 ***Recommended Flow Rates***, as referenced in the ACGIH *Industrial Ventilation: A Manual of Recommended Practice*for portable capturing hoods used to ventilate welding operations in a fabrication shops, are 280 ft^3/min for a 6-inch *flanged* or cone hood (380 ft^3/min for a *plain* 6-inch duct) or 580 ft^3/min for a 9-inch *flanged* or cone hood (770 ft^3/min for a *plain* 9-inch duct). Compare the calculated flow rate from the average traverse air velocity and the cross-sectional area of the welding exhaust duct to determine if the flow rate is sufficient.

3.6 Program Effectiveness

3.6.1 Incorporated in the review of the annual IH monitoring plan

3.6.2 Using H2S monitoring data

3.6.3 Resolving employee complaints

3.6.4 Preventative maintenance of ventilation systems

3.7 Recordkeeping

3.7.1 Maintain records for each fume hood system, including:

- As-built drawings,
- Commissioning report,
- Testing and balance reports,
- Inspection reports,
- Maintenance logs,
- Reported problems,
- System modifications, and
- Equipment replacement or modifications.

3.7.2 This information must be readily available to all users of the hood system.

3.8 Job Hazard Analysis (JHA)

3.8.1 When the type and quantity of chemicals or gases present in a laboratory room could pose a significant hazard, equip the room with provisions to initiate emergency notification, and initiate operation of the ventilation system in a mode consistent with accepted safety practices. Perform a JHA to identify the credible emergency conditions that may occur.

3.9 Hood System Design Details

3.9.1 New fume hood systems must conform to guidelines in the latest edition of ACGIH *Industrial Ventilation: A Manual of Recommended Practice*, and the most current codes, guidelines, standards and any other applicable regional regulations.

3.9.2 Verify that electrical power and utility control valves are located outside the hood for new installations. In existing installations where service controls are within the hood, verify that additional shutoffs are located within 50 ft of the hood, accessible, and clearly marked.

3.9.3 Manifolded exhaust systems frequently have significant advantages over individual (single hood/single fan) systems and are encouraged, where appropriate.

3.9.4 If manifolded hood systems are not designed to perform with 100% of hoods operating at 100% capacity, establish a "Usage Factor".. With such a system, establish a training plan for all lab users for limitation awareness. Install an airfow alarm system to warn users when the system is approaching capacity limits.

3.9.5 Provide manifolded systems with at least two exhaust fans for redundant capacity, and connect emergency power to one or more of the fans.

3.9.6 Design systems to maintain negative pressure within all portions of the ductwork inside the building. This prevents contaminated air from leaking out of the duct into the building.

3.9.7 If condensation within the duct is likely, slope all horizontal duct runs downward at least one inch per ten feet in the direction of the airflow to a suitable drain or sump. If existing horizontal runs were not installed with appropriate slope, install drains at locations where there is evidence or likelihood of condensate accumulation. Develop an appropriate drain monitoring schedule.

3.9.8 Temperature inside a duct must never exceed 400F.

3.9.9 System materials must be resistant to corrosion by the agents to which they are exposed.

3.9.10 Operate systems continuously.

3.9.11 Discharges should be a minimum of ten feet above roof lines and air intakes, and in a vertical up-direction only. Discharge velocity should be approximately 2500-3000 fpm. This prevents downward flow of condensed moisture within the exhaust stack and encourages plume rise and dilution.

3.10 Ductless Hoods

3.10.1 Ductless hoods have limited application, and are generally discouraged. When using such devices, prominently posted signage on the hood to inform operators and maintenance personnel of the following:

- Allowable chemicals used in the hood,
- Type and limitations of filters in place,
- Filter change-out schedule, and
- Reminder that the hood re-circulates air to the room.

3.11 Canopy Hoods

3.11.1 Canopy Hoods have limited application and are generally ineffective. The capture range of a canopy hood is extremely limited. A canopy hood works best when thermal or buoyant forces exist that will move the contaminant up to the hood capture zone. Such hoods should only be used for nonhazardous service, such as capturing heated air or water vapor.

4.0 DEFINITIONS –

4.1 *Duct Velocity* – Measure of the speed with which a gas such as air is moving through a duct. It always flows in the direction that is perpendicular to the cross section of the duct.

4.2 *Flow Rate* – Measure of the speed with which a gas such as air is moving through a fan or duct.

4.3 *Horizontal Sash* – The panel on a laboratory fume hood providing a protective barrier between the worker conducting work and the contents of the hood by opening horizontally (i.e., side to side).

4.4 *Laboratory Canopy Hoods* – An enclosed and mechanically ventilated workplace located in a laboratory, that is designed to:

4.4.1 Draw air into the workspace and to prevent or minimize the escape of airborne contaminants out of the workspace, and

4.4.2 Allow a worker to conduct physical, chemical and biological manipulations inside the workspace.

4.5 Local Exhaust Ventilation (LEV) – A mechanical system that captures and removes process contaminants before they are released into the work area environment. The components of an LEV are typically the hood or air capture device, ducting, an air cleaner device, the fan and an exhaust.

Note: HVAC systems and general ventilation systems are not included in the scope of this program.

4.6 *Portable Capturing Hoods* – A mobile means of local exhaust ventilation or fume extraction when it becomes necessary to bring the ventilation to the work (e.g., welding a large piece of pipe). For use in shops where a conventional overhead or under-floor exhaust system is not practical.

4.7 *Sash* – A vertical or horizontal panel on a laboratory fume hood that defines that operational face opening and provides a protective barrier between the worker conducting work inside the hood and the contents of the hood.

4.8 *Vertical Sash* – The panel on a laboratory fume hood providing a protective barrier between the worker conducting work and the contents of the hood by opening vertically (i.e., up and down).

5.0 REFERENCES –

5.1 Michigan Occupational Safety & Health, General Industry, Hazardous Work in Laboratories, Part 431.

5.2 American Conference of Governmental Industrial Hygienists (ACGIH), *Industrial Ventilation: A Manua of Recommended PracticeI* (26th Edition, pp. 13-40 to 13-45).

5.3 Marathon Corporate Procedure, *Local Exhaust Ventilation Management Program*, HLT-2026.

5.4 OSHA Technical Manual, Section III, Chapter 3, US Department of Labor, Washington, D.C.

5.5 NFPA 45, Chapter 6, Laboratory Ventilation Systems and Hood Requirements, National Fire Protection Association.

6.0 ATTACHMENTS –

6.1 Attachment A: Recommended Traverse Insertion Depths for Portable Round Ducts
6.2 Attachment B: Traverse Points for Portable Round Ducts with 10 Locations
6.3 Attachment C: Recommended Traverse Insertion Depths for Portable Rectangular Ducts
6.4 Attachment D: Velocity Data Form for Fixed Hoods (Laboratory Hoods)
6.5 Attachment E: Velocity Data Form for Portable Hoods (Welding Fabrication Shops)
6.6 Attachment F: Fume Hood Velocity Field Data Sheet

7.0 REVISION HISTORY

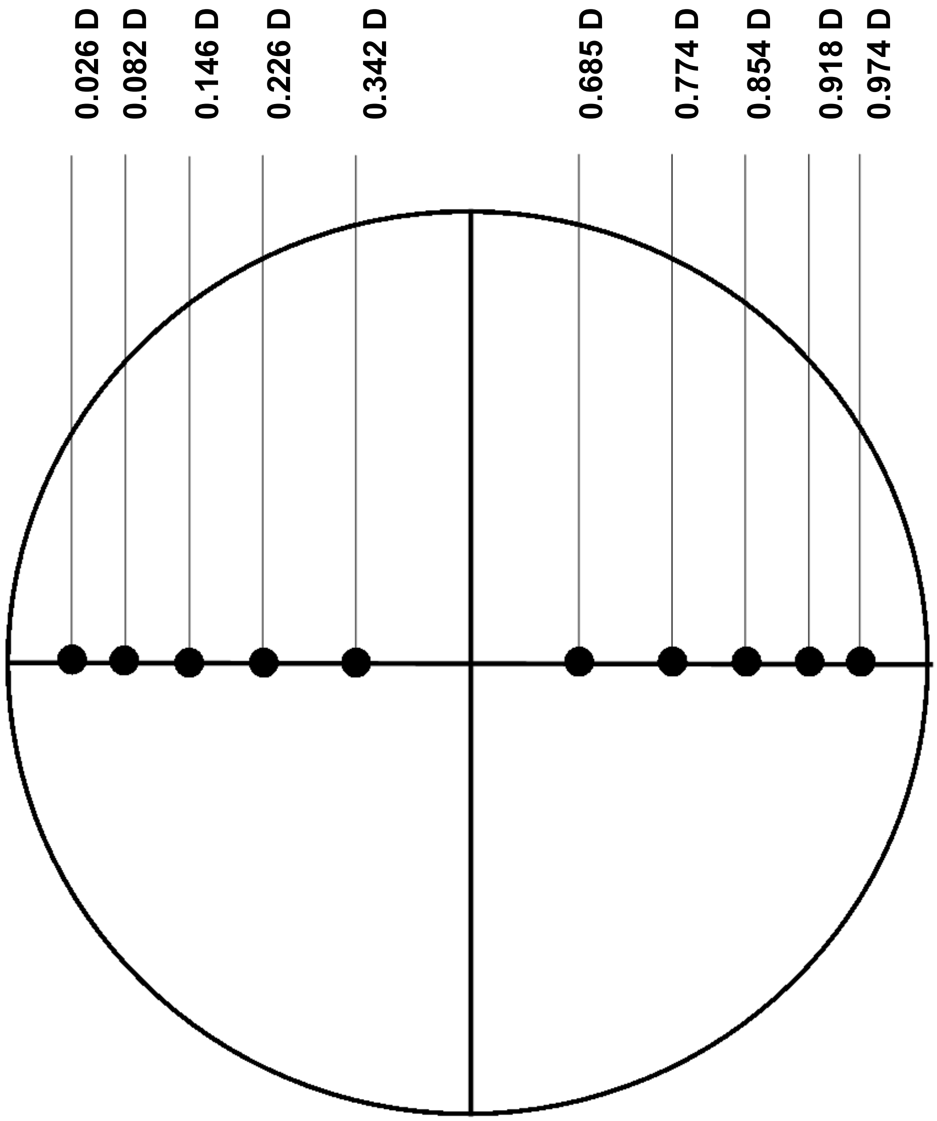
Revision number	Description of change	Written by	Approved by	Effective date
2	Added Section 3.3.2 under flow measuring devices to comply with Corporate HES&S Standard 420	J. Taggart	L. Mazur	09/19/12
3	Changed referenced corporate standard to HLT-2026. Minor language changes. Procedure Review, no major changes	J. Taggart	S. Windom	09/19/13
4	Added program administrator under subsection 2.2. Added	J. Taggart	J. Rabideau	12/12/14

	section 3.6 Program Effectiveness and added sub-items on how we are measuring it. Updated header			
5	Added Section 3.2.7 to comply with Corporate HESS/OEH standard. Procedure Review.	J. Taggart	J. Rabideau	3/31/15
6	Procedure Review, No Changes	J. Taggart	Al Morales	3/30/20

ATTACHMENT A
Recommended Traverse Insertion Depths for Portable Round Ducts

Duct Diameter	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8	Point 9	Point 10
3 "	⅛	½	⅞	2⅛	2 ½	2⅞				
3 ½ "	⅛	½	1	2½	3	3⅜				
4	⅛	⅝	1⅛	2⅞	3⅜	3⅞				
4 ½ "	¼	⅝	1⅜	3⅛	3⅞	4¼				
5″	¼	¾	1 ½	3½	4¼	4¾				
5 ½ "	¼	¾	1⅝	3⅞	4¾	5¼				
6″	¼	⅞	1¾	4¼	5⅛	5¾				
7″	⅛	⅝	1	1⅝	2⅜	4⅝	5⅜	6	6⅜	6⅞
8″	¼	⅝	1⅛	1¾	2¾	5¼	6¼	6⅞	7⅜	7¾
9″	¼	¾	1¼	2	3⅛	5⅞	7	7¾	8¼	8¾
10″	¼	⅞	1½	2¼	3⅜	6⅝	7¾	8½	9⅛	9¾
11″	¼	⅞	1⅝	2½	3¾	7¼	8½	9⅜	10⅛	10¾
12″	⅜	1	1¾	2¾	4⅛	7⅞	9¼	10¼	11	11⅝
13″	⅜	1	1⅞	2⅞	4½	8½	10⅛	11⅛	12	12⅝
14″	⅜	1⅛	2	3⅛	4¾	9¼	10⅞	12	12⅞	13⅝
15″	⅜	1¼	2¼	3⅜	5⅛	9⅞	11⅝	12¾	13¾	14⅝
16″	⅜	1¼	2⅜	3⅝	5½	10½	12⅜	13⅝	14¾	15⅝
17″	½	1⅜	2½	3⅞	5¾	11¼	13⅛	14½	15⅝	16½
18″	½	1½	2⅝	4⅛	6⅛	11⅞	13⅞	15⅜	16½	17½
19″	½	1½	2¾	4¼	6½	12½	14¾	16¼	17½	18½
20″	½	1⅝	2⅞	4½	6⅞	13⅛	15½	17⅛	18⅜	19½
22″	⅝	1¾	3¼	5	7½	14½	17	18¾	20¼	21⅜
24″	⅝	2	3½	5½	8¼	15¾	18½	20½	22	23⅜
26″	⅝	2⅛	3¾	5⅞	8⅞	17⅛	20⅛	22¼	23⅞	25⅜
28″	¾	2¼	4⅛	6⅜	9⅝	18⅜	21⅝	23⅞	25¾	27¼
30″	¾	2½	4⅜	6¾	10¼	19¾	23¼	25⅝	27½	29¼
32″	⅞	2⅝	4⅝	7¼	11	21	24¾	27⅜	29⅜	31⅛
34″	⅞	2¾	5	7¾	11⅝	22⅜	26¼	29	31¼	33⅛
36″	1	3	5¼	8⅛	12⅜	23⅝	27⅞	30¾	33	35
38"	1	3⅛	5½	8⅝	13	25	29⅜	32½	34⅞	37
40"	1	3¼	5⅞	9	13⅝	26⅜	31	34⅛	36¾	39
42″	1⅛	3⅜	6⅛	9½	14⅜	27⅝	32½	35⅞	38⅝	40⅞
44″	1⅛	3⅝	6⅜	10	15	29	34	37⅝	40⅜	42⅞
46"	1¼	3¾	6¾	10⅜	15¾	30¼	35⅝	39¼	42¼	44¾
48″	1¼	4	7	10⅞	16⅜	31⅝	37⅛	41	44	46¾

ATTACHMENT B
Traverse Points for Portable Round Ducts with 10 Locations



ATTACHMENT C
Recommended Traverse Insertion Depths for Portable Rectangular Ducts

Distance from wall in fractions of a duct width Traverse Position						
1	**2**	**3**	**4**	**5**	**6**	**7**
0.074	0.288	0.500	0.712	0.926		
0.061	0.235	0.437	0.563	0.765	0.939	
0.053	0.203	0.366	0.0500	0.634	0.797	0.947

How to use:

- Measure the diameter of the duct.
- Multiply the diameter of the duct by the number given in the rows depending on how many measurements are to be taken.
  *Note: A minimum of 4 measurements should be taken depending on the size of the duct.
- Calculated measuring distances can be rounded off to the nearest ⅛″.

- Example: Duct Diameter = 6 inches and we want to take 5 measurements
  - (6”) x (0.074) = 0.444 inches from the inner duct wall is where the first measurement will be taken;
  - (6) x (0.288) = 1.728 inches from the inner duct wall is where the second measurement will be taken;
  - (6”) x (0.500) = 3 inches from the inner duct wall is where the third measurement will be taken;
  - (6”) x (0.712) = 4.272 inches from the inner duct wall is where the fourth measurement will be taken;
  - (6”) x (0.926) = 8.334 inches from the inner duct wall is where the fifth measurement will be taken.

ATTACHMENT D
Velocity Data Form for Fixed Hoods (Laboratory Hoods)

Lab Hood Location: | Sash Schematic:

Sash Orientation:
Vertical ☐ Horizontal ☐

Step 1: **Area** (ft^2) — Formula: (Length) X (Width) = Area

Length = ________ Width = ________ Area = ________

Step 2: **Average Velocity** (ft/min) — Formula: (All calculated measurements added together) ÷ (The total number of measurements) = Average Velocity

Measurement Point

1	________	8	________
2	________	9	________
3	________	10	________
4	________	11	________
5	________	12	________
6	________	13	________
7	________	14	________

All measurements added together = ________

Average Velocity = ________

Step 3: **Flow Rate** (ft^3/min) — Formula: (Area) X (Average Velocity) = Flow Rate | Q = VA

Flow Rate = ________

Step 4: **Recommended Sash Area** (ft^2) — Formula: [(Average Velocity) ÷ (Desired Minimum Velocity)] X (Area) = Recommended Sash Area

Desired Minimum Velocity =
Based on the toxicity of the substance (low toxicity = at least 80 ft/min) (high toxicity = at least 100 ft/min)

Average Velocity ________ ÷ Desired minimum Velocity ________ X Area ________

Recommended Sash Area = ________

Step 5 **Recommended Sash Height** (ft) — Formula: (Recommended Sash Area) ÷ (Length) = (Recommended Sash Height)

Recommended Sash Height = ________

ATTACHMENT E
Velocity Data Form for Portable Hoods (Welding Fabrication Shops)

Portable Capturing Hood Location

Duct Schematic

Type of Duct:
Round ☐ Square ☐

Step 1: **Area** (ft^2)

Formula: Square Duct: (Length) x (Width) = Area
Round Duct: (3.141592) x $(Radius)^2$ = Area

Length = ______ Width = ______ Diameter = ______ Radius = ______

Area = ______

Step 2: **Average Velocity** (ft/min)

Formula: (All calculated measurements added together) ÷ (The total number of measurements) = Average Velocity

Measurement Point

1	______	6	______
2	______	7	______
3	______	8	______
4	______	9	______
5	______	10	______

**Note: The insertion depths for each measuring point must be in accordance with Attachment A (Round Ducts) or Attachment C (Square Ducts)*

All measurements added together = ______

Average Velocity = ______

Step 3: **Flow Rate** (ft^3/min)

Formula: (Area) X (Average Velocity) = Flow Rate Q = VA

Flow Rate = ______

Step 4: **Recommended Flow Rates**

Compare flow the rates from Step 3 with the minimum recommended ACGIH Flow Rates listed below:

	Recommended Flow Rates (ft^3/min)
6-inch flanged/cone hood	280
6-inch plain duct	380
9-inch flanged/cone hood	580
9-inch plain duct	770

ATTACHMENT F

Fume Hood Velocity Field Data Sheet

Hood Location ____________________

Sash at 100% Open

Hood Measurement ____________________

						0
						0
						0
						0

SUM 0   # measured squares 0

Sum / # of measured squares #DIV/0! avg face velocity/fpm

Sash Height where velocity is 80-120fpm

						0
						0
						0
						0

SUM 0   # measured squares 0

Sum / # of Measured Squares #DIV/0! avg face velocity/fpm